# URANIUM ONE USA, INC

# SHOOTARING CANYON URANIUM MILL TAILINGS STORAGE FACILITY DESIGN REPORT

## MAY 27, 2008

Submitted to

Utah Department of Environmental Quality
Division of Radiation Control
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# 1.0 INTRODUCTION

## 1.1 Terms of Reference

This design report presents the updated design of the Tailings Storage Facility (TSF) to manage tailings discharged from the Shootaring Canyon Uranium Mill.

Uranium One Utah, Inc. (Uranium One) is submitting this design report to the State of Utah Department of Environmental Quality, Division of Radiation Control (DRC) to support the amendment of the present license UT-0900480 from Standby to Operational status. This report has been prepared for Uranium One by Tetra Tech, Inc. (Tetra Tech).

The previous design report was submitted to DRC by Plateau Resources, Ltd and Hydro-Engineering, LLC as part of a Tailings Management Plan (TMP) in 2007 (Hydro-Engineering, LLC, 2005a). This submittal amends the plans previously submitted to the DRC and U. S. Nuclear Regulatory Commission (NRC) for the Shootaring Canyon Uranium Mill site. This Design Report incorporates changes to the original Tailings Management Plan due to design optimization, as well as addresses comments from DRC provided in Interrogatories Round 2 and 3 (URS, 2007, 2008).

## 1.2 Document Organization

It is our understanding that the required documents for submittal to DRC for license UT-0900480 for the Shootaring Canyon TSF are as listed below:

- RESPONSES TO INTERROGATORIES
- REVISED TAILINGS MANAGEMENT PLAN
    - Vol. 1 Tailings Storage Facility Design Report (this submittal)
    - Vol. 2 Tailings Storage Facility Operations Plan
    - Vol. 3 Tailings Storage Facility Environmental Compliance Monitoring Plan

- CONSTRUCTION DOCUMENTS
    - Vol. 1 Tailings Storage Facility Design Drawings
    - Vol. 2 Tailings Storage Facility Technical Specifications (includes Quality Assurance/Quality Control Plan)
    - Vol. 3 Tailings Storage Facility Health and Safety Plan for Construction

- REVISED ENVIRONMENTAL REPORT
- STANDARD OPERATING PROCEDURES (previously submitted)
- REVISED TAILINGS RECLAMATION PLAN
    - Vol. 1 Tailings Storage Facility Reclamation Plan
    - Vol. 2 Tailings Storage Facility Reclamation Cost Estimate

The revised Tailings Management Plan will be comprised of three report volumes which will include this Design Report, an Operations Plan, and a Compliance Monitoring Plan. The Operations Plan and Compliance Monitoring Plan will be submitted at a later date.

## 1.3 Project Summary

The site is located in a sparsely populated area of Garfield County, southeastern Utah, approximately 50 miles south of Hanksville, Utah, 14 miles north of Bullfrog Basin Marina, and 2 miles west of Utah State

Highway 276 (see Figure 1-1). A small town, Ticaboo, is located 2.6 miles south of the site. A map of the site and surrounding area with some of the site features is presented in Figure 1-2.

In general, the revised design consists of construction of a two 40-acre cell system, which includes a South Cell (39.9 acres) and a North Cell (39.3 acres). The tailings will be deposited as a slurry into the cells using conventional slurry discharge methods. The facility will be constructed, operated, and reclaimed in phases as outlined below:

| | |
|---|---|
| Phase I | Construction of South Cell to Elevation 4430 ft for Initial Storage for Mill Startup (Year 0) |
| Phase II | Deposit Tailings in South Cell while Completing Construction of North and South Cells to Elevation 4466 ft for Ultimate TSF (Years 1-5) |
| Phase III | Tailings Deposition in North and South Cells (Years 6-18) |
| Phase IV | Reclamation and Closure (Years 19-20) |

In Phase I, the South Cell will incorporate the existing earthfill South Dam and will be constructed first to accommodate mill tailings discharge as soon as possible. With milling operations and discharge into the South Cell, work will continue in Phase II to construct the remaining portions of the TSF and raise the South Dam. During the operational deposition in Phase III, the North and South Cells will be separated by a progressively raised divider berm. Tailings will be deposited by alternating between the cells during the operational lifetime of the facility, ensuring that no more than two cells, each less than 40 acres, are in operation at any one time. The surface of the cell that is not in active deposition will remain wet or flooded to serve the dual role of radon emanation barrier and evaporative surface. When the storage capacity of both cells has been reached, the TSF will be reclaimed for closure of the facility.

A multilayered liner system with a leachate collection system and leak detection system with a compacted clay basal liner will be used for containment and collection of the mill tailings solution in the tailings cells. The proposed liner system is discussed in more detail in Section 7.0 of this report.

# 2.0 EXISTING SITE CONDITIONS AND SITE GEOLOGY

## 2.1 Previous Activities

Previous activities at the site were outlined in Hydro-Engineering (2005b) and are summarized here for reference. The Shootaring Canyon mill was designed and constructed between 1978 and 1981. The mill was originally designed and licensed process 750 to 1,000 tons/day of ore. The mill operated for 76 days in the spring and summer of 1982, processing approximately 25,000 cubic yards of ore. The ore was processed in an acid leach circuit at an average daily rate of 500 tons per day at average ore grade of 0.15 percent $U_3O_8$. Tailings were discharged into the engineered tailings storage facility, consisting of an earthen and clay dam constructed across a natural topographic depression. The existing tailings are located above an existing cross valley berm on a clay liner system above the natural sandstone in the tailings area. These tailings were discharged into the facility during April through August of 1982 (during the 76 days of operation).

Approximately 18 acres of the site were leveled for construction of the plant, office, ore stockpile pads, plant buildings, and auxiliary structures. The surface gradient for runoff is sloped toward the TSF area. Filling was required over the balance of the graded area. Typically, depths of cut ranged up to about 15 feet in depth except in localized areas (such as the ore dump pocket and connection conveyor tunnel) where excavation was as deep as 45 feet. The maximum fill depth was approximately 40 feet at the southwest corner of the ore storage pad.

Historically, the project area has been used for seasonal livestock grazing and as wildlife habitat. Human use of the project area for other recreational activities has been minimal, due to its isolated location and the availability of other more pristine areas in southeastern Utah for human recreational activities.

## 2.2 Existing Structures

The facilities that exist at the mill site and TSF are illustrated on Figure 2-1. Major site features include the mill and associated support buildings. Several existing ore stockpiles are adjacent to the mill and the TSF.

Figure 2-1 shows the TSF, and includes the location of tailings from the 1982 operations, which were only discharged upstream of the cross-valley berm. This figure also shows the east dike and north dike which bound the 11e.(2) byproduct material.

The mill building contains the ore grinding and extraction circuits and the yellowcake drying and packaging area. The plant facilities include the laboratory and shop buildings, generator building, exterior reagent storage tanks, fuel storage tanks, ore stockpiles, and outside materials storage areas as shown in Figure 2-2. Counter-current decantation (CCD) tanks and reagent tanks are on an exterior concrete pad. During mill operations, ore was stockpiled at the prepared ore pad just north of the mill after being weighed on the receiving scale. Ore was sampled prior to entering the mill building. As mentioned above, the mill tailings were discharged as a slurry to the TSF west of the mill.

## 2.3 Climate and Vegetation

The climate in the area is classified as arid with an average annual precipitation of approximately 7 inches. The majority of the precipitation is in the form of rain. Average annual snowfall depth is approximately 12 inches. Average annual evaporation for the area is approximately 66 inches. Temperatures in the area range from -33 degrees F to 97 degrees F (Lyntek, 2008). Vegetation consists of sagebrush, blackbrush, rabbit brush and small junipers (Pool, 2006).

## 2.4 Topography

The TSF is located within a valley that narrows to the south of the existing South Dam. There is a steep butte that runs along the west side of the proposed TSF with elevations over 4,700 feet. A number of low-lying sandstone mesas are located across the site. The elevations in the TSF area range from approximately 4,360 to 4,470 feet. The existing South Dam crest elevation is 4,430 feet.

## 2.5 Geology

The geology, hydrogeology, and seismic conditions for the Shootaring Canyon millsite are summarized below from previous reports (Woodward Clyde Consultants, 1978a and Hydro-Engineering, 2005b).

### 2.5.1 Regional Geology

The Shootaring Canyon Uranium Mill site is located in the physiographic province of the Colorado Plateau. This region typically consists of broad uplifts and intervening basins which are formed by wide areas of flat lying rocks that are separated by abrupt monoclinal structures. The Henry Mountains, located immediately north-northeast of the site, consist of intrusive dioritic laccoliths.

The site is located near the southern end of the Henry Mountains structural basin. The basin consists of Mesozoic to Cenozoic age sedimentary rocks, and are cut by the Tertiary intrusive forming the Henry Mountains. A regional geology map for the area is presented in Figure 2-3. The site is located in an area characterized by buttes, mesas and canyons approximately five miles southwest of Mt. Ellsworth of the Henry Mountains. A generalized geologic cross-section across the Henry Mountain Basin is presented in Figure 2-4. A stratigraphic section of the area surrounding the site is presented in Figure 2-5.

The basin is elliptical, with its longer axis 100 miles in length trending northerly and its shorter axis 50 miles in length trending easterly. The basin is bounded on the west by the Waterpocket Fold (monocline) and on the east by the Monument Upwarp. Elevations within the basin range from 4,000 to 7,000 feet. Major peaks rise 4,000 to 5,000 feet above the surrounding basin. Fault development in the area is associated with the intrusive igneous centers of the Henry Mountains. These faults commonly have a northeasterly or northwesterly strike and do not generally extend far from the intrusive bodies. Faults are not known to exist within the project area.

### 2.5.2 Site Specific Geology

The mill is situated on a low mesa and a small, isolated catchment to the west contains the TSF. A tall butte separates the site from Shitamaring Canyon. Drainage from the site is to the southwest into Shitamaring Creek. The tributary in which the TSF is located has been called Shootaring Canyon. Local relief ranges from 200 to 500 feet. Geologic structure is relatively simple in the immediate area, with the various sedimentary formations dipping gently (2 to 3 degrees) to the west, as shown in the uranium mill site geologic map presented in Figure 2-6.

Sedimentary rocks exposed at the surface are predominantly sandstones of Upper Jurassic age. The high buttes and mesas west and north of the site are capped by the Salt Wash Member of the Morrison Formation. This fluvial sandstone unit contains the uranium deposits that are mined in the area. Exposed cliffs surrounding the buttes and mesas are comprised primarily of the thinly bedded reddish-brown siltstones and mudstones of the Summerville Formation, underlain by the generally massive fine grained reddish-brown Entrada Sandstone. The Entrada Sandstone is the bedrock underlying the mill and the TSF.

In the vicinity of the site the Entrada Sandstone is approximately 420 feet thick. Cementing agents are commonly calcite and ferric iron. The depositional environment is believed to be primarily eolian. Shale is also present locally and is evidence of episodes of marginal marine conditions.

No major faulting has been observed in the Entrada Sandstone at the site. Limited sets of joints are widely spaced, steeply dipping and sealed with calcite and gypsum. Joint trends are northwesterly and northeasterly, coinciding with the regional structural pattern.

Beneath the Entrada lies the Carmel Formation, which is a heterogeneous unit approximately 160 feet thick composed of sandstone, siltstone, mudstone, limestone and gypsum. In the Shootaring Canyon area, the Carmel Formation appears to include substantial layers of shale or mudstone. The Carmel is underlain by the Navajo Formation which is approximately 800 feet thick in the vicinity of the site. The base of the Navajo is approximately 1,400 feet beneath the surface of the site.

### 2.5.3 Subsurface Conditions

The subsurface conditions are controlled by the soil and bedrock deposits at the site as presented in Figure 2-6. The surface soils consist of Quaternary alluvial deposits, talus deposits, eolian sands, and pediment gravels. The Quaternary soils are underlain by Jurassic Entrada Sandstone. The Entrada Sandstone is underlain by the Carmel and Navajo formations as presented in the Generalized Geologic Cross-Section (Figure 2-4) and Generalized Stratigraphic Section (Figure 2-5). The following is a general summary of the various soil and geologic units.

#### 2.5.3.1 Alluvial Deposits

The alluvium exists in the bottom of the drainages and consists of loose, subangular to angular fine sand with varying amounts of mudstone and gravel to cobble-sized clasts of sandstone. The alluvial deposits have a thickness of less than two feet.

#### 2.5.3.2 Talus Deposits

Talus deposits exist on the western side of the property. The talus deposits are the result of weathering of the east facing slope of the mesa that exists on the western edge of the property. The source of the talus deposits are the Entrada Sandstone which make up the mesa. The talus consists of sandstone which falls from the ledge of the mesa and litters the steep-sided mesa slopes. The talus consists of loose, fine sand with abundant gravel to boulder-sized clasts of sandstone. The talus deposits cover the east face of the mesa and the thickness varies from a few inches on the steep mesa slopes to as great as 20 feet along the drainages that flow off the mesa.

#### 2.5.3.3 Eolian Sands

Eolian sands exist in the bottom of Shootaring Canyon in isolated pockets and in a more significant deposit in the north-east portion of the site, as shown in Figure 2-6. These windblown sands consist of fine to very fine, poorly graded sand. These sands are reddish in color, are non-plastic, and contain some calcium carbonate lenses in the upper portion of the deposit. The thickness of these eolian sands is limited to a few feet in the southern portion of the site, however, the depth increases in the northern portion of the site to be in excess of seventeen feet.

#### 2.5.3.4 Pediment Gravels

Pediment gravels are located along the ridge-line where the mill is constructed, and along the adjacent ridge-line east of the mill. The pediment gravels typically consist of gravel and cobble-sized clasts in a matrix of sand and silt with some occasional clay. The thickness of the gravel can be as great as 30 feet.

#### Entrada Sandstone

The Entrada Sandstone consists of an interbedded reddish brown to orange fine grained sandstone, white fine sandstone, and dark red sandy siltstone, with calcite and ferric iron cementation. The sand grains are subrounded to subangular and uniform in size. The sandstone is massive and generally unjointed with occasional calcite filled fractures and joints. The bedding planes are widely spaced. The sandstone is occasionally interbedded with shale beds up to 3 feet thick.

### 2.5.4 Geohydrology

The groundwater conditions at this site have been defined in the initial Woodward-Clyde investigations and updated by Hydro-Engineering, LLC (1998, 1999, 2000 and 2005c). Additional groundwater monitoring data are presented by Hydro-Engineering, LLC (2001, 2002, and 2005c) and Tetra Tech (2008). The uppermost groundwater in the area of the TSF is in the Entrada Sandstone aquifer with water levels approximately 140 feet below ground surface (bgs) below the tailings cell area. An additional saturated zone appears to be present in the Upper Entrada in limited portions beneath the site and at approximately 50 to 140 feet bgs.

Figure 2-7 shows the water level elevations in the Upper Entrada and the Entrada Aquifer based on 2003 and 2007 monitoring data. The groundwater flow direction in the Entrada Aquifer is generally towards the south with a gradient of 0.01 ft/ft. The saturated zone of the Upper Entrada is not continuous across the site and appears to be present underneath the south central portion of the site with a general flow direction to the south.

Figure 2-8 shows the location of site monitoring wells and the location of three cross-sections previously prepared by Hydro-Engineering, LLC (2005c). The cross-sections are presented in this report as Figures 2-9, 2-10, and 2-11. These cross-sections are based on interpretations of monitoring well data and geologic and geophysical (neutron) logs. These cross-sections show general lithology and groundwater levels at the site based on 2003 and 2007 monitoring data. The Carmel Formation appears to be present beneath the site at an elevation of 3,900 to 3,950 ft mean seal level (MSL). Groundwater in the Entrada Aquifer is present beneath the site at an elevation of approximately 4,250 ft MSL. The previous interpretations of the Neutron logs identified several areas presumed to be lower permeability sandstone within the Entrada Sandstone, and are presented on the cross-sections.

### 2.5.5 Seismology

Tetra Tech conducted a geophysical survey at the Shootaring Canyon Uranium Mill site to assist in mapping the potential rippability of sandstone at the site. The geophysical survey (using seismic refraction) was conducted on March 4, 2008. The geophysical report is attached in Appendix A of this document.

Seismic data from three lines located as shown on Figure 2-12 was collected for this investigation. Each line consisted of 24 geophones each spaced ten feet apart for a total length of 240 feet each. The seismic data was collected utilizing a Seistronix RAS 24 (24-channel) seismograph, 4.5 Hz geophones and a 12-pound hammer as a seismic source. Shots were performed at nine locations along each seismic line to increase data resolution.

The interpreted seismic cross sections indicate that the seismic velocities range from 1,000 feet per second (ft/s) to approximately 8,000 ft/s from ground surface to a maximum depth of investigation of 75 feet bgs. The average sandstone velocities ranged from approximately 4,000 to 5,000 ft/s. The slower velocities are representative of near surface unconsolidated soil with higher velocities representing weathered rock to more competent rock at depth. These values fall within the typical velocity ranges for weathered material and the sandstone rocks found at the site as logged in boring Tt-4, which was drilled near seismic line # 2. Additional discussion of the boring Tt-4 is provided in Section 2.6.3.

The Caterpillar Company has compiled charts that relate seismic velocities in various geologic materials to the ability of specific size and power bulldozers to excavate these materials by ripping. Figure 2-13 shows a Caterpillar rippability chart for a D9 Caterpillar bulldozer (Catepillar, 2008). This chart indicates that sandstones with seismic p-wave velocities less than approximately 8,000 ft/s are considered to be rippable, sandstones with p-wave velocities of approximately 8,000 ft/s to 9,500 ft/sec are marginally rippable, and velocities over 9,500 ft/sec are non-rippable.

The seismic refraction survey was successful in providing data to assist in interpreting and mapping rippability of the bedrock subsurface underneath the site where seismic data was collected. Based on the interpretation of the seismic p-wave velocities refraction data, the Entrada Sandstone appears to be rippable to depth of approximately 75 feet bgs. A more detailed description of the seismic refraction survey and data interpretation are provided in Appendix A.

### 2.5.6 Potential Geologic Hazards

This section discusses the potential for geologic hazards at the site and potential affects on site operations and safety. The potential for several geologic hazards exists in this area of Utah and may include landslides, subsidence, flooding, erosion, earthquake shaking, fault rupture, tectonic deformation, and liquefaction. Specific concerns at the site include landslides in the form of rock fall and earthquake shaking. No evidence of the other potential geologic hazards has been documented or observed at the site.

Ground shaking is caused by seismic events which cause the ground to shake as seismic waves cause small temporary displacements of the ground. The strength and frequency of these waves and the length of time the shaking lasts affects the amount of damage caused. Ground shaking can also trigger soil liquefaction, landslides, and other types of ground failure. The site is located in a Uniform Building Code (UBC) seismic zone 1 which indicates that damage from earthquake ground shaking is not likely. However, the seismicity of the site has been evaluated as discussed in more detail in Section 2.5.7 of this report. The results of the seismicity analysis have been used in design of the TSF.

As indicated in Hydro-Engineering, LLC (2005b), the predominant feature along the west side of the TSF is a narrow mesa. This mesa is composed of the native sandstone bedrock which underlies the TSF. The nearly vertical cliff areas that cap the mesa are between 100 and 200 feet high. At the base of the sandstone cliff areas the ground slopes at roughly a 2:1 (horizontal:vertical) slope. Scattered on the surface of the side slopes are an assortment of sandstone blocks from past rock fall events.

When additional sandstone blocks spall from the cliffs, this material will first impact the 2:1 sandstone slopes near the base of the cliff above the tailings cap, and these side slopes will absorb the initial kinetic energy of the falling material. The fractured and weathered sandstone rocks would then slide or tumble into the previously fallen sandstone talus further reducing the kinetic energy. A majority of the rock fall material has historically been retained at elevation higher than the proposed final elevation of the TSF. Additionally, the current TSF plan includes a bench outside the edge of the TSF at elevation 4430 that ranges in width from 40 feet to 150 feet along the entire west side of the TSF for Phase I, and a similar bench at the ultimate elevation of 4466 ranging in width from 30 feet to 100 feet for Phase II. These benches will serve to arrest any remaining rock fall debris that might travel beyond the historic talus area. Special procedures for monitoring, evaluation and repair of the HDPE liner in the event that falling rock reaches the cell will be provided in the Operations Plan.

#### 2.5.7 Seismicity

A probabilistic seismic hazard analysis was performed for the Shootaring Canyon Uranium Mill site. This analysis considered potential seismic sources within 200 miles of the site, including background seismicity based on the recurrence of historic earthquakes which have occurred between the years of 1787 and 2007, and Quaternary faults as identified in the U.S. Geological Survey (USGS) Quaternary Fault and Fold Database (USGS et al. 2006). The peak horizontal ground motion (PGA) was evaluated for a 10,000-year return period, equivalent to a 10 percent chance of exceedance within a 1,000-year design life of the TSF in accordance with U.S. Environmental Protection Agency (EPA) Promulgated Standard for Remedial Actions at Inactive Uranium Processing Sites (40 CFR 192). Results of the analysis demonstrate that the PGA at this return period is estimated to be 0.18 g. This ground motion is almost entirely (>99 percent) contributed to background events not associated with a known Quaternary fault. The complete seismic hazard analysis for the site is included in Appendix B.

## 2.6 Field Investigations

### 2.6.1 Woodward-Clyde Consultants Geotechnical Investigations

#### Woodward-Clyde Consultants 1977 Field Investigation (Woodward-Clyde, 1978d)

Woodward-Clyde Consultants performed a field investigation in 1977 and associated laboratory testing as part of their September 1978 “Tailings Management Plan and Geotechnical Engineering Studies”. The Geotechnical investigation consisted of nine core borings and one check boring along the center-line of the two proposed dams and upstream and downstream of the proposed dam axis. The borings ranged in depth from 1.5 to 100.5 feet below the existing ground surface at the time of the investigation. The locations of the borings are shown on Figure 2-15 of this report. Logs of the borings are included as Appendix C.1.1 of this report.

Test pits were also excavated as part of the Woodward-Clyde 1977 investigation. Six test pits were excavated in the proposed plant site, five test pits were excavated along the proposed center-line of the upper dam, and ten test pits were excavated for the purposes of borrow exploration. The locations of the test pits are shown on Figure 2-14 of this report. Logs of the test pits are included as Appendix C.1.1 of this report.

Laboratory testing of the borings included water content, dry density, and Atterberg limits. Laboratory testing for the borrow samples included Atterberg limits and grain size analysis. For one of the borrow samples, a silty sandy clayey soil, laboratory testing included one compaction test, three unconfined compression tests, one consolidated-undrained triaxial compression test, and permeability tests. The permeability tests were conducted using an acidic solution. The laboratory test results from the Woodward-Clyde study are included as Appendix C.1.2 of this report and are summarized in Table 2-1. In-situ permeability tests were also performed for Borings S-1 through S-8, and S-10 and testing was also conducted on aggregate proposed for use in concrete. These test results are not included in the summary table.

## Table 2-1. Summary of Laboratory Tests, Woodward-Clyde Consultants 1977 Field Investigation

| Boring/Test Pit ID | Sample Depth (ft) | Material Description | In Situ | | Atterberg Limits LL/PL/PI (%) | Particle-Size Analysis | | | USCS Classification | Standard Laboratory Compaction Maximum Dry Unit Weight, $\gamma_{d,max}$, (pcf) @ Optimum Water Content, $w_{opt}$, (%) | CU Triaxial Compression Test | | Unconfined Compressive Strength (psf) and Axial Strain (%) at Failure for 95 % of $\gamma_{d,max}$ at $w_{opt}$ and $w_{opt}$ ± 2 % | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Moisture Content (%) | Dry Unit Weight (pcf) | | Percent Gravel | Percent Sand | Percent Fines | | | c' (psf) | ϕ' (deg.) | $w_{opt}$ - 2 % (i.e., 12 %) | $w_{opt}$ (i.e., 14 %) | $w_{opt}$ + 2 % (i.e., 16 %) |
| S-1 | 8 | Sandstone | 2 | 120 | | | | | | | | | | | |
| S-1 | 5 - 6 | Sandstone | | | | 0 | 97 | 3 | SP | | | | | | |
| S-3 | 10 | Sandstone | 2 | 120 | | | | | | | | | | | |
| S-7 | 10 | Sandstone | 8 | 126 | | | | | | | | | | | |
| S-7 | 8 - 9 | Sandstone | | | | 0 | 78 | 22 | SM | | | | | | |
| S-8 | 7 | Sandstone | 3 | 124 | | | | | | | | | | | |
| Borrow Area F | Surface | Silty Sandy Clay | | | 33/17/16 | 0 | 37 | 63 (43 % silt, 20 % clay) | CL | 116.2 @ 14.0 | 400 | 27 | 3,195 @ 2.0 % | 2,192 @ 2.0 % | 1,741 @ 3.0 % |
| Borrow Area approx. 1 mile south of mining camp | Surface | Silty Sandy Clay | | | 36/22/14 | | | | | | | | | | |
| TP-S14 | Surface | Fine Sand | | | | 0 | 94 | 6 | SP-SM | | | | | | |

### Woodward-Clyde Consultants 1979 Field Investigation (Woodard-Clyde, 1979)

Woodward-Clyde Consultants performed additional field investigations and laboratory testing as part of their May 1979, "Stage 1 – Tailings Impoundment and Dam Final Design Report". Ten additional borings were drilled as part of this study in depths ranging from 27.5 to 152.5 feet below the existing ground surface at the time of the investigation. Three borings explored the alluvial material and bedrock in the saddle area, five borings explored the bedrock along the proposed center-line of the embankment, and two borings were located upstream and downstream of the proposed embankment. The locations of the borings are shown on Figure 2-14 of this report and the logs of the borings are included as Appendix C.1.3 of this report.

Seven additional test pits were also excavated as part of this investigation. These test pits were excavated within the impoundment in an area covered with windblown silty sand. The test pits were excavated with a dozer to bedrock, with the intent of establishing quantities and properties of the sand. The location of the test pits are shown on Figure 2-14 of this report, and the logs of the test pits are included as Appendix C.1.3.

No laboratory testing was performed on the boring or test pits samples. However, additional laboratory testing was performed of the borrow area materials and were reported in this May 1979 report. The laboratory test results for the borrow are materials are presented in Appendix C.1.4 of this report.

## 2.6.2 Hydro-Engineering LLC Geotechnical Investigations

### Hydro-Engineering 2002 Field Investigation (Hydro-Engineering, 2005b)

Hydro-Engineering performed additional field investigations after construction of the South Dam as part of their 2005 Tailings Reclamation and Decommissioning Plan (Hydro-Engineering, 2005b). The field investigation for this study was performed in June 2002. Twelve air rotary drill holes and approximately 40 hand auger drill holes were excavated. Samples were taken from the borings for radiological and materials measurement. The locations of the borings are shown on Figure 2-14 of this report. Logs of the borings are included as Appendix C.2.1 of this report

Approximately 40 additional test pits were also excavated as part of Hydro-Engineering's 2005 investigation. These test pits were used to collect samples and define lithologic conditions in the upper few feet of the Shootaring site. The locations of the borings are shown on Figure 2-14 of this report. Logs of the borings are included as Appendix C.2.1 of this report.

Laboratory testing was performed of selected samples from the field investigation. Test results are included in Appendix C.2.2 of this report and included moisture content, gradation, Atterberg limits, standard Proctor, and in-situ double ring infiltrometer and evaporation tests. Laboratory test results of gradation analyses of Quarry Rock, Tailings Samples, and Ore Samples are also included in the analyses.

### Hydro-Engineering 2005 Laboratory Test Results (Hydro-Engineering, 2005a)

Laboratory testing results are interspersed throughout the appendices of the 2005 Tailings Management Plan (Hydro-Engineering, 2005a) as support for the design analyses. No field exploration was performed as part of this report. Shear strength test data for two clay borrow samples was included within Appendix A as an attachment to a December 11, 1997 letter from Inberg-Miller Engineers to U.S. Energy Corporation. The testing was conducted by Woodward-Clyde and is dated June 12, 1979. Shear strength test data for a sample of sand from the Cross Valley Berm was also included in Appendix A. The laboratory test results are included as an attachment to a May 2, 1997 letter from Inberg-Miller Engineers to U.S. Energy Corporation. The testing was performed by Inberg-Miller Engineers. These results for the three shear strength tests are presented in Appendix C.2.3 of this report.

Gradation curves for Entrada sand, Shootaring tailings, mixed tailings, slime tailings, quarry fines, and screened rocky soil were presented in Appendix B of the 2005 Tailings Management Plan (Hydro-Engineering, 2005a). It appears the Shootaring Tailings curve is sample T7 as provided in the Tailings Reclamation and Decommissioning Plan. The Entrada Sand curves are NP6 and NP10. The grain size results for these curves were summarized in the spreadsheets with the laboratory results from the Tailings Reclamation and Decommissioning Plan. The text notes the mixed tailings and slime tailings samples were taken from a uranium tailings facility in central Wyoming and are not from the site. These laboratory test results are presented in Appendix C.2.3 of this report.

Laboratory test results for samples for the ore pad were included within Appendix E of the 2005 Tailings Management Plan (Hydro-Engineering, 2005a) as part of a November 8, 1998 letter from Inberg-Miller Engineers to U.S. Energy Corporation. The testing was performed by Inberg-Miller Engineers. The testing included one standard Proctor and one hydraulic conductivity test. These laboratory test results are presented in Appendix C.2.3 of this report.

Laboratory test results for samples of claystone were included within Appendix F of the 2005 Tailings Management Plan (Hydro-Engineering, 2005a) as part of a September 20, 2005 letter from Inberg-Miller Engineers to U.S. Energy Corporation. The testing was performed by Inberg-Miller Engineers. The testing included Atterberg limits tests, gradations, standard Proctor, and permeability. These laboratory test results are presented in Appendix C.2.3 of this report.

Laboratory test results for samples of Entrada sand were included as Appendix I of the 2005 Tailings Management Plan (Hydro-Engineering, 2005a). The testing was performed by Inberg-Miller Engineers and is dated December 1, 2006. The testing included two standard Proctor tests. These laboratory test results are presented in Appendix C.2.3 of this report.

### 2.6.3 Tetra Tech and Uranium One Field Investigations and Borrow Source Evaluation

Investigations of the proposed on-site and off-site borrow areas were performed to determine if adequate material sources exist for construction of a low permeability earthen liner. Quantity, properties and collection of clay soils and sand for potential use in construction of a low-permeability earthen liner are discussed herein. The current regulatory approval requires that a 1-foot thick clay liner with a saturated hydraulic conductivity value no greater than 1.0 x $10^{-7}$ cm/s be constructed as the bottom layer of the liner system.

Borrow sources for the clay included on-site areas in the North and South Cells. A portion of the test pit locations shown on Figure 2-15 are locations of potential clay borrow. This is discussed in more detail in the following sections. Off-site clay samples were obtained from Utah State Lease area, Section 2, T36S R9E in Garfield County, Utah. Uranium One has a lease to this area for the purpose of obtaining borrow material. The location of the Utah State Lease area is shown on Figure 2-16.

Field investigations were also performed to evaluate the competency of the Entrada sandstone and the depth to Entrada sandstone across the North and South Cells and the proposed location for the process ponds.

The table below lists field investigation dates and the samples collected during the investigations. The field investigations are discussed in more detail in the following subsections.

**Table 2-2. Summary of Tetra Tech and Uranium One Field Investigations**

| Date(s) | Field Investigation | Samples Collected |
|---|---|---|
| January 21, 2008 | Tetra Tech - Collect bulk samples of samples of on-site sands. | Samples 1, 2, 3 and 4 |
| March 5, 2008 | Tetra Tech - Collect bulk samples of clay from Utah State Lease, Section 2, T36S R9E | TT-CB-1 (Jmb red) and<br>TT-CB-2 (Jmb green) |
| March 8, 2008 | Tetra Tech – Nuclear density measurements to determine in-place densities and water contents | Ten bulk bucket samples of on-site sand collected. |
| March 10-11, 2008 | Tetra Tech - Drilled borings for geophysical investigation and to evaluate existing conditions of soils for the South Dam. | Tt-1 through Tt-5, CA samples and Shelby Tube samples denoted by boring i.d. and depth. |
| March 17-19, 2008 | Tetra Tech - Excavated test pits to determine depth to Entrada sandstone, to collect bulk samples of on-site clay, and to collect bulk samples of on-site sand. | Tt-TP1 through Tt-TP36,<br>Bulk samples denoted by test pit i.d. and depth. |
| April 8, 2008 | Tetra Tech - Collect bulk samples of clay from Utah State Lease, Section 2, T36S R9E | Jmb red 2, Jmb green 2, and<br>Jmb green 3 |

Note: Jmb is used as a geologic abbreviation for the Brushy Basin Formation shale.

### January 21, 2008 Field Investigation

Four disturbed, bulk samples of sand were collected on January 21, 2008 under the direction of Tetra Tech by Greg Smith of Geo-Smith Engineering, LLC of Grand Junction, Colorado. Two samples were taken from the northern portion of the proposed Process Pond area, denoted Sample 1 and Sample 2. Sample 1 contained some calcium carbonate ($CaCO_3$) which is denoted in the sample name. One sample was obtained from the eastern side of the proposed South Cell, denoted Sample 3. The last sample, Sample 4, was taken from a waste pile created by an Entrada Sandstone excavation near the proposed divider berm between the North and South cells. Sample locations are shown on the Figure 2-15. The bulk samples were retained in 5-gallon buckets.

Laboratory testing was performed for Sample 1 and a composite of Sample 2, 3, and 4. Laboratory testing included Atterberg limits and sieve analysis. Laboratory testing was performed by Capstone Enterprises West, LLC of Grand Junction, Colorado. The Atteberg limits test was performed in accordance with ASTM D4318. The sieve analysis was performed in accordance with ASTM D422.

The results of the geotechnical laboratory testing are summarized in Table 2-3 and provided in Appendix C.3.3.1. The grain-size distributions are shown on Figure 2.21.

### Table 2-3. Laboratory Testing Results for January 21, 2008 Field Investigation

| Sample | Particle-size parameters | | | | | Atterberg Limits LL/PL/PI (%) | USCS Class. |
|---|---|---|---|---|---|---|---|
| | % gravel | % sand | % fines | Cc | Cu | | |
| Sample 1 (w/ $CaCO_3$) | 0 | 86 | 14 | 2.9 | 1.2 | NP | SM |
| Sample 2,3 & 4 | 0 | 93 | 7 | 2.3 | 1.2 | NP | SP-SM |

Notes:
NP = non-plastic
USCS Class = Unified Soil Classification System Classification
Cc = coefficient of uniformity
Cu = coefficient of curvature

**March 5, 2008 Field Investigation**

Two samples of Brushy Basin Shale were obtained from the Utah State Lease area Section 2, T36S R9E. Sample locations are shown on Figure 2-17 and are noted as TT-CB-1 (Jmb red) and TT-CB-2 (Jmb green).

Laboratory testing was performed for the Jmb red and Jmb green samples. Laboratory testing including Atterberg limits, sieve analysis and standard Proctor were performed by Capstone Enterprises West, LLC of Grand Junction, Colorado. A permeability test was performed by Tetra Tech of Billings, Montana. The Atteberg limits test was performed in accordance with ASTM D4318. The sieve analysis was performed in accordance with ASTM D422. The standard Proctor test was performed in accordance with ASTM D698. The permeability test was performed in accordance with ASTM D5084, method C (falling head-rising tailwater).

The results of the geotechnical laboratory testing are summarized in Table 2-4 and provided in Appendix C.3.3.1. The grain-size distributions are shown on Figure 2.22.

### Table 2-4. Laboratory Testing Result for March 5, 2008 Field Investigation

| Sample | Sample Description | Particle-size | | | Atterberg Limits LL/PL/PI (%) | USCS Class. | Standard Proctor Max DD (pcf)/$w_{opt}$ (%) | Permeability (cm/s) |
|---|---|---|---|---|---|---|---|---|
| | | % coarse | % silt | % clay | | | | |
| Jmb red | Brushy Basin Clay from Utah State Lease area | 31 | 30 | 39 | 66/25/41 | CH | 93.6/24.0 | $5.1 \times 10^{-9}$ |
| Jmb green | | 32 | 32 | 36 | 46/19/27 | CL | NA | NA |

Notes:
NP = non-plastic
LL = liquid limit
PL = plastic limit
PI = plasticity index
USCS Class = Unified Soil Classification System Classification
Max DD = maximum dry density
$w_{opt}$ = optimum water content (gravimetric)

### March 8, 2008 Field Investigation

Nuclear density measurements were conducted at the test pit locations listed in Table 2-5 to evaluate in-place densities of the sand, weathered Entrada sandstone, and non-native and liner material clay. The test pit locations where measurements were made are shown on Figure 2-15. Ten bulk samples of sand were collected.

**Table 2-5. Nuclear Density Measurements**

| Test No. | Test Location | Probe Depth (in) | Material Type | Moisture Content (%) | Dry Density (pcf) | Wet Density (pcf) | Comments |
|---|---|---|---|---|---|---|---|
| 1 | Tt-TP26 | 12 | sand | 6.5 | 101.1 | 107.6 | |
| 2 | Tt-TP29 | 12 | sand | 5.3 | 110.4 | 116.2 | |
| 3 | Tt-TP25A | bkstr | sandstone | 2.9 | 114.1 | 117.4 | |
| 4 | Tt-TP25 | 12 | clay | 16.8 | 99.2 | 115.9 | Clay not native to area |
| 5 | Tt-TP21 | 12 | sand | 4.2 | 104.3 | 108.6 | |
| 6 | Tt-TP18 | 12 | clay | 10.6 | 95.9 | 106.0 | Clay liner material |
| 7 | Tt-TP14 | 12 | sand | 4.1 | 115.3 | 120.1 | Likely sandstone at 8-in. depth |
| 8 | Tt-TP15 | bkstr | sandstone | 5.1 | 116.0 | 121.9 | |
| 9 | Tt-TP13 | bkstr | sandstone | 2.5 | 118.2 | 121.1 | |
| 10 | Tt-TP11 | 10 | sand | 3.1 | 104.1 | 107.3 | Very loose sand |
| 11 | Tt-TP8 | 12 | sand | 9.8 | 108.9 | 119.5 | |
| 12 | Tt-TP6 | bkstr | sandstone | 6.4 | 113.2 | 120.4 | |

Note: bkstr = backscatter
sandstone = weathered Entrada sandstone

Six measurements were taken of the sand and the average in-place wet density was calculated as 113 pcf with an average water content of 6 percent. Four measurements were taken of the weathered Entrada sandstone and the average in-place wet density was calculated as 120 pcf with an average water content of 4 percent. One measurement was taken of a non-native clay and the clay liner material. The measured in-place wet densities were measured as 116 and 106 pcf at a water content of 17 and 11 percent, respectively.

Laboratory testing was performed on one bucket of sand. Laboratory testing included Atterberg limits, percentage passing the No. 200 sieve, and standard Proctor. Laboratory testing was performed by Tetra Tech of Fort Collins, Colorado. The Atterberg limits test was performed in accordance with ASTM D4318. The standard Proctor test was performed in accordance with ASTM D698. The percentage passing the No. 200 sieve was performed in accordance with ASTM D1140.

The results of the geotechnical laboratory testing are summarized in Table 2-6 and provided in Appendix C.3.3.2.

**Table 2-6. Laboratory Testing Result for October 9, 2007 Field Investigation**

| Sample | Sample Description | Particle-size | | | Atterberg Limits LL/PL/PI (%) | USCS Class. | Standard Proctor Max DD (pcf)/$w_{opt}$ (%) |
|---|---|---|---|---|---|---|---|
| | | % gravel | % sand | % fines | | | |
| Bulk sample from site | Silty Sand (Entrada sand) | 0 | 85 | 15 | NP | CH | 110.1/12.6 |

Notes:
NP = non-plastic
USCS Class = Unified Soil Classification System Classification
Max DD = maximum dry density
$w_{opt}$ = optimum water content (gravimetric)

### March 10-11, 2008 Field Investigation

A drilling program was undertaken March 10 and 11, 2008 to investigate the depth of the Entrada Sandstone bedrock interface, and the competency of the bedrock. Locations of borings are illustrated on Figure 2-15. A small, track-mounted Dietrich D-50 drill rig equipped with 8-inch O.D., 4 ½-inch I.D. hollow-stem auger (HSA) was used. Three borings were advanced using HSA drilling techniques through surface sands and the weathered exterior of the sandstone bedrock to depths of 16 feet, 9¾ feet, and 3 feet below surface grade for borings Tt-1, Tt-2 and Tt-3, respectively.

Competency with depth of the Entrada Sandstone was investigated with a 60-foot rock core boring, denoted Tt-4. The purpose of the boring was to provide correlations with a surface-seismic investigation. Results of the seismic investigation were reported in Section 2.5.5 of this report.

Determination of the relative competency of the rock was recorded by percent recovery of coring operations. Considerable quantities of sandstone wash-out of zones of no-recovery indicated soft, weakly cemented rock.

An additional HSA boring, Tt-5, was advanced into the existing South Dam to investigate the condition of the clay core. One relatively undisturbed core sample was obtained; and one 2-inch I.D., 3-inch long California drive sample was collected of the fine sand and one relatively undisturbed California drive sample was collected of the clay core. Additionally, three 3-inch I.D. Shelby Tube were collected of the clay core. Mechanical breakdown of the drill rig caused termination of this boring at 26-feet below adjacent surface grade.

Copies of all boring logs are provided in Appendix C.3.1.

Laboratory testing was not performed on any boring samples.

### March 17-19, 2008 Field Investigation

A tractor-mounted Caterpillar 420D backhoe equipped with an extension boom was used to excavate the thirty-six tests pits to depths ranging from 0.5 feet to 14 feet on March 17, 2008 through March 19, 2008. Test pit logs were recorded and are provided in Appendix C.3.2 while test pit locations are denoted as TT-TP-1 through TT-TP-36 and shown on Figure 2-15. All test pits were stopped by backhoe refusal or by the maximum excavation depth of the backhoe. Disturbed bulk samples were obtained as part of the investigation. 3 bucket samples of excavated Entrada sandstone, and 4 buckets of on-site clay (denoted Poulter clay) were obtained for further laboratory analysis.

The existing tailings area has a clay liner that was constructed in the 1980s under the direction of Mr. Don Poulter, a Field Engineer for Woodward-Clyde consulting engineers. Mr. Poulter was on-site during the March 2008 field investigation to discuss the existing liner construction. Mr. Poulter indicted that the liner material was created from processed clay obtained from the Brushy Basin Shale Member of the Morrison Formation. Clay liner was placed in the area north of the northern-most divider berm and as an apron along the upstream toe of the South Dam. A portion of the test pit field investigation was performed to determine the properties of the "Poulter Clay".

Laboratory testing was performed on two bucket samples, Tt-TP-6 (weathered Entrada sandstone) and Tt-TP-27 (eolian sand). Laboratory testing was performed by Capstone Enterprises West, LLC of Grand Junction, Colorado. The Atterberg limits test was performed in accordance with ASTM D4318. The sieve analysis was performed in accordance with ASTM D422. The results of the geotechnical laboratory testing are summarized in Table 2-7 and provided in Appendix C.3.3.1. The grain-size distributions are shown on Figure 2.21.

Laboratory testing was performed on one bucket sample of Poulter Clay. Laboratory testing including Atterberg limits, sieve analysis was performed by Capstone Enterprises West, LLC of Grand Junction, Colorado. A permeability test was performed by Tetra Tech of Billings, Montana. The Atterberg limits test was performed in accordance with ASTM D4318. The sieve analysis was performed in accordance with ASTM D422. The standard Proctor test was performed in accordance with ASTM D698. The permeability test was performed in accordance with ASTM D5084, method C (falling head-rising tailwater).

The results of the geotechnical laboratory testing are summarized in Table 2-7 and provided in Appendix C.3.3.1 and C.3.3.2. The grain-size distributions are shown on Figure 2.21 and 2-22.

**Table 2-7. Laboratory Testing Result for March 17-19, 2008 Field Investigation**

| **Sample** | **Sample Description** | **Particle-size** | | | **Atterberg Limits LL/PL/PI (%)** | **USCS Class.** | **Standard Proctor Max DD (pcf)/$w_{opt}$ (%)** | **Permeability (cm/s)** |
|---|---|---|---|---|---|---|---|---|
| | | **% coarse** | **% silt** | **% clay** | | | | |
| Tt-TP-27 | Weathered Entrada sandstone | 0 | 91 | 9 | NP | SP-SM | NA | NA |
| Tt-TP-6 | Eolian sand | 0 | 87 | 13 | NP | SM | NA | NA |
| Poulter Clay | clay | 33 | 42 | 25 | 72/26/46 | CH | 92.5/24.4 | $1.8 \times 10^{-9}$ |

Notes:

NP = non-plastic
LL = liquid limit
PL = plastic limit
PI = plasticity index
USCS Class = Unified Soil Classification System Classification
Max DD = maximum dry density
$w_{opt}$ = optimum water content (gravimetric)

**April 8, 2008 Field Investigation**

A reconnaissance of the Utah State Lease area was made by Mr. Gregory Smith (Geo-Smith Engineering, LLC) and Mr. Craig Goodknight (S.M. Stoller) under the direction of Tetra Tech on April 8, 2008 to evaluate materials at the site and estimate the useable quantity of clay.

A native borrow area is available at the Utah State Lease area as a source of clay from the Brushy Basin Shale Member. This unit is composed of mudstone, claystones with minor lenses of sandstones and conglomerate and contains bentonitic clay. The borrow area is located approximately 16 miles from the Shootaring site adjacent to the Burr Trail Scenic Backway on the Big Thompson Mesa as shown on Figure 2-16. The Brushy Basin Member of the Morrison Formation crops out at the site as shown in Figure 2-18. The Brushy Basin is a clayey soil of late Jurassic age capped by 10 feet to 20+ feet of Cedar Mountain/Dakota Sandstone of Late Jurassic-Early Cretaceous age. The clayey nature of the Brushy Basin is revealed in a “popcorn” structure shown in Figure 2-19.

Weaker Brushy Basin clays have slumped and rotated downward as seen by dipping beds in the upper left center of Figure 2-18. Slumping has caused overlying sandstones to be transported downward, and create the small knolls as evident by the angular sandstone boulders shown in Figure 2-18. Overall regional thickness of the Brushy Basin member is approximately 300 feet, however useable thickness at this site is estimated to be on the order of 80 feet to 100 feet due to a thick sand seam located in the upper section of the unit shown in Figure 2-20.

Three additional disturbed grab samples were taken in early April, 2008 for classification purposes to verify material consistency of the unit. These samples are Jmb red 2, Jmb green 2 and Jmb green 3. The locations of the samples are shown on Figure 2-17.

Laboratory testing was performed for the samples by Capstone Enterprises West, LLC of Grand Junction, Colorado. Laboratory testing included Atterberg limits and sieve analysis. The Atteberg limits test was performed in accordance with ASTM D4318. The sieve analysis was performed in accordance with ASTM D422.

The results of the geotechnical laboratory testing are summarized in Table 2-8 and provided in Appendix C.3.3.1. The grain-size distributions are shown on Figure 2.22.

**Table 2-8. Laboratory Testing Result for April 8, 2008 Field Investigation**

| Sample | Sample Description | Particle-size | | | Atterberg Limits LL/PL/PI (%) | USCS Class. |
|---|---|---|---|---|---|---|
| | | % coarse | % silt | % clay | | |
| Jmb red 2 | Brushy Basin Clay from Utah State Lease area | 11 | 35 | 54 | 96/30/66 | CH |
| Jmb green 2 | | 8 | 28 | 64 | 11/27/84 | CH |
| Jmb green 3 | | 21 | 35 | 44 | 57/24/33 | CH |

Notes:
NP = non-plastic
LL = liquid limit
PL = plastic limit
PI = plasticity index
USCS Class = Unified Soil Classification System Classification
Max DD = maximum dry density
w = gravimetric water content

## Clay Borrow Evaluation

The estimated total quantity of clay needed for Phase I construction is 51,933 cy, for Phase II construction is 98,857 cy, and for reclamation is 129,067 cy. A significant quantity of clay of approximately 250,000 cy from the Brushy Basin Shale Member is available at the Utah State Lease area, limited by the cost of excavation, transport and reclamation. Areas capped by sandstone and sparse vegetation would require processing to remove unwanted material. The shale will require processing to break down existing structure, and moisture conditioning prior to placement. During the site reconnaissance on April 8, 2008, it was revealed that the expected initial useable volume will be excavated from a section below an elevation of approximately 5,080 feet. The area used to determine the clay quantity is shown on Figure 2-17.

On-site clay was also evaluated for borrow material. The quantity of on-site clay (denoted as Poulter clay) available is estimated to be 35,000 cy as determined from the test pit field investigation performed. Approximately 31,000 cy of clay is estimated to exist in the area north of the northern-most divider berm and approximately 4,000 cy in the upstream apron of the South Cell dam.

Clay samples evaluated for use as a clay liner include Jmb Red and Poulter Clay. The laboratory results for these samples were presented in previous sections and are provided again in Table 2-9 for comparison purposes. It is anticipated that lab permeability values must be less than 1 x $10^{-8}$ cm/s in order to meet the field permeability requirement of 1 x $10^{-7}$ cm/s.

**Table 2-9. Moisture Density Relationships and Saturated Hydraulic Conductivity (ASTM D5084, method C)**

| | Moisture-density relationship | | Remolded Compaction | | Saturated hydraulic conductivity (cm/s) [@ 5 psf confining pressure] |
|---|---|---|---|---|---|
| Sample | Max DD (pcf) | $w_{opt}$ (%) | Density (pcf) [% Max DD] | w (%) | |
| Poulter clay | 92.5 | 24.4 | 92.5[100] | 24.4 | 1.8 x $10^{-9}$ |
| Jmb red | 93.6 | 24.0 | 93.5[100] | 24.0 | 5.1 x $10^{-9}$ |

Notes:
Max DD = Maximum dry density
$w_{opt}$ = optimum water content (gravimetric)
w = water content (gravimetric)

# 3.0 REGULATORY CRITERIA

## 3.1 State and Federal Regulations

Prior to the State of Utah obtaining agreement state status in 2004, the tailings at the Shootaring Canyon Uranium Mill site were regulated primarily by the U.S. Nuclear Regulatory Commission (NRC) pursuant to 10 CFR 40, Appendix A, and the U.S. Environmental Protection Agency (EPA) under 10 CFR 61, Subparts A and W which are administered by the State of Utah Division of Air Quality. Although this recent change has transferred primacy of regulatory authority to the State of Utah, the existing framework of regulations previously administered by the NRC still serves as a useful guideline. The State of Utah will regulate the site according to rules and regulations presented in R313 - Environmental Quality, Radiation Control. These rules include; through reference, clarification or exception; sections of 10 CFR 40 extending through Appendix A. With this in mind, the applicable state and federal regulations are referenced and described in Sections 3.1.1 through 3.1.4. Additional, enhanced, or modified regulations developed by the State of Utah are discussed in Section 3.2.

NRC and EPA have a Memorandum of Understanding (MOU) that covers joint expectations under what was originally Subpart T of 40 CFR 61 (uranium mill tailings closure) and a generic MOU on elimination of dual regulation. The NRC regulations also incorporate other standards by reference that were promulgated by the EPA pursuant to the Uranium Mill Tailings Radiation Control Act (UMTRCA - 1978), and Section 112 of the Clean Air Act, as amended. Compliance with these regulations under the authority of the State of Utah is provided through R313 and referenced sections of 10 CFR 40. In the following discussion, applicable state and federal regulations are summarized in **bold** lettering and the means by which this Design Report and the Reclamation Plan will meet these regulations are discussed immediately below the bold caption.

### 3.1.1 Utah DRC and NRC Regulations - Guiding Principles

- **Permanent isolation of tailings (10 CFR 40 Appendix A, Criterion 1)**

  The general goal or broad objective referenced in R313-24 and Criterion 1 of 10 CFR 40 Appendix A for siting and design decisions is the permanent isolation of 11e.(2) byproduct material by minimizing disturbance and dispersion by natural forces, and to do so without ongoing maintenance over a finite time frame (1,000 years to the extent reasonably achievable, and, in any case, for at least 200 years as per Criterion 6). The site features to be considered in achieving this objective include the site’s remoteness from populated areas, hydrologic and other natural conditions as they contribute to continued immobilization and isolation of contaminants from ground-water sources, and the potential for minimizing erosion, disturbance, and dispersion by natural forces over the long term. The primary emphasis of this Criterion is on the long-term isolation of 11e.(2) byproduct material, which is a function of both site conditions and engineering design, and shall be accomplished in a manner that no active maintenance is required.

  The Shootaring Canyon Uranium Mill siting was approved by the NRC in the early 1980s in Garfield County, a remote portion of Southeastern Utah to which the region power grid had not yet and still has not reached. Siting criteria were evaluated prior to construction of the existing mill and TSF (Woodward-Clyde 1978a, 1978b, and 1978c). The 2006 Census indicates that Garfield County has an area of approximately 5,174 square miles and a population of 4,534, a decrease of approximately 1201 people since the year 2000 (population 5,735). This represents and average population density of less than 0.9 persons per square mile or roughly 3 percent of the average population density of 27.2 persons per square mile for the largely rural state of Utah.

The small town of Ticaboo, located approximately 3 miles to the south of the mill, was originally developed as the company mine and mill town. Its population is currently less than 55 full time residents, though as workers for the mines and mill move to the town this population is anticipated to increase to approximately 500 to 600 persons, mostly supporting the mill and mine workers. The town includes a 70 room hotel which services tourism primarily associated with Lake Powell approximately 14 miles to the south. The nearest residence is located approximately 1.5 miles to the east of the site. The tourism to the area is highly seasonal with extended periods of reduced visitation in the late fall, winter and early spring. This area has remained relatively unpopulated and the increase in local population that is anticipated to occur is due primarily to workers and service providers servicing the local uranium mill and mining activities.

The TSF is sited in a local ephemeral drainage depression between sandstone mesas with a very small drainage catchment (<0.35 sq. mile) in one of the most arid areas of the State (an annual average precipitation of approximately 7 inches). The combination of these characteristics (a natural depression with low potential erosive energies, a small catchment area from which surface water erosive forces can accumulate, and an arid climate where probable maximum precipitation events are relatively small compared to other regions in the US and the State of Utah), provide an excellent environment for the immobilization and isolation of contaminants and for minimizing erosion, disturbance, and dispersion by natural forces over the long term.

Hydrogeologically, the site is located on Entrada Sandstone, principally a uniform fine grained sandstone of the San Rafael group that contains some thin layers of shale and siltstone units. The Entrada Sandstone, which hosts the uppermost unconfined aquifer in the region, overlies the Carmel Formation, which is a regional aquitard between the overlying Entrada Sandstone and the underlying Navajo Sandstone that consists mainly of clay, shales and interbedded fine sandstones and is approximately 160 feet thick in the site area (Hydro-Engineering, 1998). Both the Entrada Sandstone aquifer and the Navajo Sandstone aquifer are Class IA aquifers of high water quality. The Navajo Sandstone aquifer is the regional aquifer used for drinking water. Though of high quality, the Entrada is not currently used for drinking water in or near the mill area.

Lower permeability (hydraulic conductivity) units within the Entrada Sandstone have been observed at the site that create locally perched ground water conditions above the regional water table in the Entrada Sandstone. Ground water monitoring and aquifer testing indicates that the horizontal permeabilities of the Entrada Sandstone range from approximately 0.08 feet per day (ft/day) to 0.21 ft/day while the lower permeability zones above the regional water table range from 0.02 ft/day to 0.18 ft/day. Hydraulic gradients in the Entrada Sandstone average approximately 0.011 ft/ft and average ground water flow is estimated to range from 0.02 ft/day (8 ft/yr) to 0.009 ft/day (3 ft/year) based on an effective porosity of 0.1 (Hydro-Engineering, 1998.) Therefore, any potential for future impacts to local ground water would be promptly detected first by the leak detection system in the engineered liner system that is above the secondary liner and, should both synthetic liners and the low permeability clay sub-liner not prove effective in containing leakage, constituents in the ground water would move so slowly that ground water impacts could be promptly detected and appropriate corrective action could be implemented such that drinking water standards and class of use would be maintained and contamination would not pass the points of compliance or property boundary. By virtue of its previous license approval, NRC has determined that the combination of remoteness of the location, the physical environment and hydrogeologic environment affords the requisite reasonable assurance of protection of public health, safety and the environment through the immobilization and isolation of contamination from groundwater sources, minimizing potential erosion, disturbance, and dispersion by natural forces to support siting the mill in its current location. The application of best available technologies in this license application only increases this assurance of protection.

- **No ongoing maintenance (10 CFR 40 Appendix A, Criterion 1)**

  The erosion protection, cover and liner reclamation designs presented in the existing Tailings Reclamation and Decommissioning Plan (Hydro-Engineering, 2005b and subsequent revisions) will meet all applicable standards and guidance (including US NRC, 2002 and DOE, 1989), and for long-term stabilization and isolation of the tailings and 11e.(2) byproduct material without relying on long-term maintenance in a manner consistent with the numerous Title I and Title II uranium mill tailings facilities already reclaimed, approved and transferred to the Federal Government for long-term stewardship. Uranium One plans to update the Tailings Reclamation and Decommissioning Plan to incorporate design changes as well as to address DRC Interrogatory comments. The revised Reclamation Plan will meet the same standards and guidelines as the current Reclamation Plan.

  The tailings will be dewatered to mitigate seepage and tailings settlement. Cover surfaces have slopes designed to be stable under Probable Maximum Precipitation (PMP) flows and the reclaimed tailings surface will be covered with rock mulch or rock riprap to afford erosion protection. A low permeability clay cap and an overlying HDPE geomembrane will control infiltration. These are described in the Reclamation Plan dated December 2005 and subsequent revisions. These same design components will be included in the revised Reclamation Plan to be submitted at a later date.

- **Tailings disposal (10 CFR 40 Appendix A, Criterion 3)**

  The TSF is located within a natural drainage behind an existing constructed dam. The cells are surrounded on the east and west sides by bluffs which protect the area from wind erosion and minimize dispersion. There are currently no nearby active mine pits that would serve as alternate disposal sites. Because the tailings will be contained within a structure using a Best Available Technology (BAT) liner system and will be reclaimed and covered with a multi-layer cover to include a geomembrane and erosion protection rock mulch, the proposed disposal method will minimize the potential for exposure of the tailings or dispersal of the tailings by mechanical forces.

- **Closed with 1000-year design life, and in any case at least 200 years (10 CFR 40 Appendix A, Criterion 6)**

  The reclamation design complies with applicable NRC staff technical positions, guidelines and recommendations. See above.

### 3.1.2 Design Requirements

**Siting (10 CFR 40 Appendix A, Criterion 4)**

- **Upstream Drainage Minimized**

  The TSF is in a natural drainage enclosed on the downstream end by an engineered, NRC and Utah State Engineer approved dam within a very small watershed runoff area. The total watershed area to the dam is approximately 225 acres. During operations, the runoff will collect in the impoundment and be evaporated. After reclamation, runoff to the north and east, including the mill area, will be diverted offsite. The small drainage area of the west bluff will run on to the reclaimed tailings and then be collected in a channel along the east of the impoundment. The total drainage area, including the TSF, will be 114 acres.

- **Wind Protection**

  The TSF is effectively surrounded by natural cliffs and hills. The revised Reclamation Plan will include a rock mulch over the tailings surface, which will prevent wind erosion of the tailings cover system. A net deposition of windborne soils is expected to occur over the impoundment area, rather than loss of covering over the tailings due to wind erosion.

- **Erosion Potential Limited through Flat Cover Slopes and Designed Covers**

  The final TSF cover will be graded to provide sufficiently flat slopes to mitigate erosional forces but allow precipitation runoff. Rock mulch erosion protection will be included as part of the cover design for the entire tailings area. The top reclamation surface will also be configured to limit upland contributing drainage area to overland flow.

- **Conservative Factors of Safety Attained through Flat Embankment Slopes**

  TSF embankments and sides will be designed with sufficiently flat slopes to provide conservative factors of safety.

- **Not Susceptible to Earthquake Damage**

  The TSF design accounts for stresses induced by the postulated maximum credible earthquake for the Shootaring TSF region based on the report titled “Seismic Hazard Analysis for Shootaring Canyon Uranium Processing Facility” attached as Appendix B. The slope stability analyses are included in Section 5 of this Design Report.

- **Deposition Promoted**

  Where possible, final cover slopes will be flat enough to promote deposition of wind-borne and water-borne sediment, and in any case, to limit erosion to acceptable levels during the 1000-year stability period.

**Ground Water Protection Standards (Utah Administrative Code Rule, UAC R317-6, 10 CFR 40 Appendix A, 40 CFR 192, etc.)**

- **Liner that will prevent migration of wastes out of the impoundment (UAC Rule R317-6).**

  The TSF cells are designed with a competent multilayered liner system (double HDPE liner with leak detection and clay sub-liner) to provide waste containment for the cells. The liner system will be constructed of materials that have the appropriate chemical and physical properties to prevent failure per 10 CFR 40 Appendix A Criterion 5(a)(2)(a) (see Section 7.2). The liner system will be placed on a competent foundation or base pursuant to 10 CFR 40 Appendix A Criterion 5(a)(2)(b). The divider berm, side slopes, and South Dam raise have been designed and will be constructed and maintained to prevent failure pursuant to 10 CFR 40 Appendix A Criterion 5(a)(5**).** Site licensed activities are administered under Ground Water Quality Discharge Permit UGW 170003, and the requirements regarding groundwater protection for the TSF are contained therein.

- **If liner left in place following operations, wastes cannot migrate into liner during active life of facility (10 CFR 40 Appendix A, Criterion 5A(1))**

  The proposed design will prevent the migration of wastes into the liner system during and following operations. The operation of the leachate collection system will continue until the tailings drainage and consolidation are more than 90 percent complete. The post-closure cover system will limit infiltration to immeasurably small levels. The volume of free liquids within the TSF cells after closure will be very small.

- **Impoundment must not be overtopped (10 CFR 40 Appendix A, Criterion 5A(4))**

  Minimum freeboard to store PMP inflow and operational water as well as to allow adequate height for wave action is included in the design of the TSF.

- **Leakage detection system required for synthetic liners (Utah Administrative Code Rule R317-6, BAT requirement).**

  A leakage detection system will be provided, independent of any ground-water monitoring program.

- **Tailings must be dewatered by a drainage system at the bottom of the impoundment (Utah Administrative Code Rule R317-6, BAT requirement).**

  A leachate collection system will be installed in the TSF cells and operated until the drainage rate approaches minimal levels.

- **Must install two or more liners and a leak collection system between such liners (Utah Administrative Code Rule R317-6, BAT requirement).**

  A double synthetic liner with leak detection system will be installed over a one-foot compacted clay base as described in this Design Report. Additionally, a leachate collection system will be installed in a filter/drainage bed over the double liner and clay base.

**Closure (10 CFR 40 Appendix A, Criterion 6 and as Directed by NRC Staff Technical Position [STP] for Erosion Protection covers)**

- **Eliminate free liquids**

  The volume of free liquids in the decant pool will be minimized in the TSF cells during operations by dewatering with the leachate collection system. Operation of the leachate collection system will be continued until the collection rates stabilize at levels of less than 1.5 gpm per 10 percent of the typical full production operational collection rate.

- **Stabilize wastes**

  Tailings will be allowed to stabilize (90 percent consolidation) prior to placement of the reclamation cover. The method of tailings deposition has been designed to promote rapid tailings consolidation.

- **Cover the impoundment to:**
  - **Minimize long-term liquid migration**
  - **Promote drainage and minimize erosion**
  - **Accommodate settling and subsidence**
  - **Maintain effectiveness with minimum maintenance**

The final cover will be designed: (1) with a HDPE geomembrane and low permeability clay cap to minimize infiltration and emanation of radon gas; (2) to minimize reliance on active post-closure maintenance due to its conservative erosion-resistant design; (3) to promote drainage while minimizing erosion through flat slopes and/or rock protection; (4) to control run-on and drainage of waters and (5) to accommodate any tailings settlement. Further, the site is located in a geographical area where annual evaporation (approximately 70 inch/yr.) exceeds the annual precipitation, (approximately 7 inch/yr.).

**Radon Standards**

- **Post-operations (40 CFR 61, Subpart T; currently EPA – NRC MOU):**
  - **radon emissions not to exceed 20 pCi/m$^2$-s**
  - **must be in compliance after ceasing to be operational until license termination**

The reclamation cover design incorporates a radon barrier capable of reducing emissions to levels below the radon standard for the required time period while reducing infiltration of surface waters into the TSF cells.

### 3.1.3 EPA Regulations (40 CFR 61, National Emission Standards for Hazardous Air Pollutants [NESHAPs])

Any modifications to the existing TSF cells shall be in accordance with 40 CFR 61. Operations, maintenance and monitoring of the TSF shall comply with 40 CFR 61 for radon emanation.

### 3.1.4 10 CFR 40 Appendix A Criterion 6 through Criterion 10

**Criterion 6 - Closure Cover**. The closure cover design is currently as described in the "Tailings Reclamation and Decommissioning Plan for Shootaring Canyon Uranium Project – 2005, Revised: December 2006". The Reclamation Plan will be updated to incorporate the revised TSF cell design as well as to address comments from the DRC.

**Criterion 7 – Pre-operational Monitoring**. The mill and the major TSF structures exist at the site. Pre-construction monitoring has been conducted, and the ongoing monitoring program including any proposed changes will be presented in a Compliance Monitoring Report to be submitted at a later date.

**Criterion 7A – Detection Monitoring**. The ground-water monitoring program is currently being updated and will be submitted to the DRC in a separate submittal as part of an Environmental Compliance Monitoring Report. The ground-water monitoring program is administered under Ground Water Quality Discharge Permit UGW 170003.

**Criterion 8 – Airborne Emissions**. Airborne emissions related to the TSF are associated with fugitive dust emissions. The main sources of fugitive dust at the site are from road dust from haul/access roads, ore stockpiling, direct particulate emissions from the ore stocks and TSF, and construction activities. Fugitive emissions from the TSF will be minimized through design and the routine implementation of ponding and spraying. Fugitive emissions from roads and other actively worked areas will be controlled by application of water or chemical agents as the need arises. The Standard Operating Procedure (SOP) for fugitive dust control is under development and will be provided in the final SOP document to be submitted to the DRC at a later date.

**Criterion 8A – Daily Inspection of Waste Retention Systems**. The draft SOP for dam and facilities inspection is under development and will be provided in the final SOPs to be submitted to the DRC at a later date.

**Criterion 9 – Financial Surety**. The financial surety for decontamination and decommissioning is described in the "Tailings Reclamation and Decommissioning Plan for Shootaring Canyon Uranium Project – 2005, Revised: December 2006". The Reclamation Plan will be updated to incorporate the revised cell design as well as to address comments from the DRC.

**Criterion 10 – Long-Term Surveillance**. The CPI adjusted long-term surveillance fee is included in the financial surety described in the "Tailings Reclamation and Decommissioning Plan for Shootaring Canyon Uranium Project – 2005, Revised: December 2006". The Reclamation Plan will be updated to incorporate the revised cell design as well as to address comments from the DRC.

## 3.2 State of Utah Regulations

The State of Utah entered into an agreement with the NRC in 2004 that resulted in the State of Utah assuming primacy in the regulation of uranium milling and tailings facilities. With this agreement, the applicable regulations as cited in Section 3.1 and any modifications or additions are under the administration of the State of Utah.

### 3.2.1 Ground Water Protection (UAC Rule R317-6)

The administrative rule stipulates that any newly constructed facility which discharges or would probably result in a discharge of pollutants that may move directly or indirectly into the ground water must apply for a ground water discharge permit. The rule identifies a broad range of facilities to which it applies, and specifically includes facilities with waste storage piles, landfills and dumps, mining, milling and metallurgical operations. The rule also requires that any facility constructed or operated before the rule was enacted (August 1989), must submit a notice of the nature and location of any discharges to the state within 180 days of the adoption of the rule, and submit an application for a discharge permit upon notification by the state. The design of the multilayered liner system, as outlined within this Design Report, will prevent discharge of pollutants either directly or indirectly into the ground water for this milling operation. The site is administered under Ground Water Quality Discharge Permit UGW 170003. This permit will be updated based on this design and the associated compliance monitoring plan and standard operating procedures that are being submitted.

### 3.2.2 Design Basis

To meet BAT requirements as part of UAC R317-6, Plateau Resources chose to use the Engineering Design Basis as defined by the DRC (Utah DEQ, 2007). Uranium One has chosen to follow this same approach for the revised design. DRC provided Uranium One with a summary and clarification of the BAT design basis requirements in their letter dated November 9, 2007 (Utah DEQ, 2007). It is Uranium One's understanding that Uranium One must meet or exceed the design guidelines agreed upon by the DRC and Plateau Resources and stated in the original March 17, 1999 Ground Water Discharge Permit (Utah DEQ, 1999) to meet the Engineering Design Basis for BAT. The design guidelines as listed in the March 17, 1999 Permit (Utah DEQ, 1999) are listed in italics below for reference:

a. *slurried tailings waste;*
b. *a 3-inch corrugated advanced drainage system (ADS) HDPE pipe leachate collection system installed within a sand filter bed;*
c. *a 60-mil HDPE primary liner with a maximum allowable design leakage rate of 200 gallons per acre of disposal cell area, per day;*
d. *HDPE leak detection collection sumps for leak detection liquid collection;*
e. *a geonet leak detection layer;*
f. *a 60-mil HDPE secondary liner to be anchored with anchor trenches;*
g. *at least 12 inches of compacted clay with a maximum permeability of* $1x\ 10^{-7}$ *centimeters per second;*
h. *native soil and/or bedrock will be graded, shaped, and prepared for the basal clay liner. Maximum side slope will be 3H:1V.*

Uranium One will meet the intent of the design guidelines above for the current design. Design features that differ from the design guidelines are the LCS piping and the grading of the cell side slopes. The current LCS piping design includes 4- to 8-inch diameter SDR 15.5 HDPE pipe. The 3-inch corrugated pipe listed in the design guidelines was determined to have insufficient load bearing capacity. The maximum side slopes for the cells will be 2.5H:1V, except for the upstream face of the existing dam. The side slopes are stable for operational and pseudostatic conditions.

The November 9, 2007 letter from the DRC also summarized additional BAT engineering design basis and operation requirements provided in the December 28, 1998 DRC and Division of Water Quality Statement of Basis (SOB). This summary information is provided in italics below for reference:

A. <u>Double HDPE Liners and Leak Detection System</u> *– including a double HDPE membrane liner system with an intervening leak detection system (LDS) to detect leakage from the upper HDPE membrane.*

B. <u>Composite Liner System</u> *– the lower HDPE membrane was to be placed in intimate contact with an underlying clay layer to form a composite liner, which would greatly minimize leakage that could be released to the impoundment's foundation. Neither the December 28, 1998 SOB nor the March 17, 1999 Permit include a direct explanation for the minimum clay layer thickness (1-foot) or maximum permeability (1.0E-7 cm/sec). However, it appears that the maximum clay permeability was derived from EPA RCRA guidance for landfill construction (see Design and Construction of RCRA/CERCLA Final Covers, EPA/625/4-91/025, May, 1991, Chapters 1 and 2), and that the minimum clay thickness is based on good engineering practice for constructability. We also acknowledge that the clay thickness specification could have been arrived at by negotiation.*

C. <u>Leachate Collection System and Maximum Allowable Head</u> *– a leachate collection system (LCS), including HDPE piping and sand filter layer, was to be located above the primary HDPE liner.*

*This design, in concert with an operational requirement of a 3-foot maximum head on the primary HDPE membrane, would greatly reduce the leachate driving head and potential leakage thru the upper HDPE membrane.*

D. *<u>LDS Maximum Allowable Leakage Rate</u> – the approved design included a 200 gallon/acre/day maximum allowable leakage rate (ALR) for the leak detection system (LDS), based on 1992 EPA guidance (EPA, 1992). The geonet material specifications for the LDS was to include a transmissivity that was greater than this ALR, so as to ensure free flowing conditions to the LDS collection sumps.*

E. *<u>BAT Performance Monitoring Criteria</u> – head monitoring of the LCS and flow rate monitoring of the LDS were to be used as the primary points of compliance, and as an early warning system to demonstrate protection of groundwater quality. BAT compliance was achieved at the impoundment, so long as: 1) head values in the LCS remained below 3-feet above the lowest point on the primary HDPE membrane, and 2) daily LDS flow rates were below the 200 gallon/acre/day ALR value. Although not mentioned in the December 28, 1998 SOB, this approach to compliance monitoring is allowed in the GWQP Rules under UAC R317-6-6.9(B).*

F. *<u>BAT Performance Monitoring Plan and Reporting</u> - the original Permit also required a BAT Performance Monitoring Plan be submitted and approved by the Executive Secretary before liner system construction (Permit, Part II.H.2). Details regarding BAT monitoring (LCS head and LDS daily flow rate) were stipulated in Part II.E.2. BAT reporting requirements were also specified in Part II.G.2*

G. *<u>De-Minimus Discharge</u> – based on the above engineering design and operational parameters, any discharge from the lower HDPE liner to the foundation was deemed a de-minimus discharge.*

H. *<u>Contingencies for BAT Failure</u> – in the December 28, 1998 DRC/DWQ SOB the Executive Secretary also laid out possible remedial actions should BAT failure be found to exist in either the LCS head or the LDS flow rates, including (ibid., p. 6): 1) isolation of the point of failure and retrofit construction, 2) cell closure should retrofit construction be infeasible, and 3) contaminant transport modeling to demonstrate that groundwater quality will be protected despite the BAT failure.*

I. *<u>Other BAT Related Considerations</u> – a few other issues were also considered in the SOB that are related to BAT design for the facility under the original Permit. These include:*

   1) *<u>Existing Groundwater Monitoring Well Network</u> - the Executive Secretary largely accepted the existing groundwater monitoring well network as it stood in 1998, with two exceptions (see December 28, 1998 DRC/DWQ SOB, pp. 3-4):*

      a) *<u>Two New Vertical Gradient Wells</u> – as outlined in Part II.H.3 of the original Permit, two new wells were to be installed to determine head and groundwater quality conditions in an area below the perched aquifer, i.e. middle Entrada aquifer. These included new well RM16 to be installed adjacent to existing well RM11, and new well RM17 to be installed adjacent to RM13.*

      b) *<u>Ore Storage Pad Well</u> – Part II.H.3 of the original Permit also required installation of a new well RM2R, to be installed on the downgradient side of the ore storage pad.*

   *The December 28, 1998 SOB (p. 4) also explained that so long as the BAT performance standards were met (i.e., maximum LCS head and/or daily LDS flow rates), that : "… neither contaminant transport modeling nor a well spacing evaluation is necessary".*

   2) *<u>Cover Design Model and Performance Criteria</u> – an infiltration model was required for the closed cell condition to demonstrate the absence of a "bathtub" effect (see original Permit, Part II.H.6).*

3) *Reclamation Plan – was to incorporate the findings of the infiltration model used to evaluate the long-term cover design. This plan was to be submitted for Executive Secretary approval before commencement of milling operations (see original Permit, Part II.H.8).*

# 4.0 TAILINGS DISPOSAL CONCEPT

## 4.1 General Site Layout

This section describes the general concept for tailings disposal at the Shootaring Canyon tailings storage facility (TSF). The current plan for mill tailings disposal utilizes the TSF site previously permitted, constructed, and owned by Plateau Resources. The general layout of the TSF site is presented on Drawing P1.1.

The TSF site occupies a broad valley flanked by a high, narrow sandstone mesa along the west side and a low bluff along the east side. The mill site is located at the top of the bluff to the east. The valley was drained by a dry wash sloping from north to south.

A zoned earth embankment dam was constructed across the valley in the early 1980s as part of the initial TSF. This dam, referred to as the “Shootaring Dam” in previous investigations by others and as the “South Dam” in this report, has a height of approximately 120 feet and is listed as a jurisdictional dam with the Utah State Engineer’s Office. Several other low, non-jurisdictional embankments were also previously constructed upstream of the South Dam during the initial mill operations. The ‘cross valley berm’ (~30 feet high) is located approximately 1,500 feet north of the South Dam, and another small embankment dam (~15 feet high), called the ‘north dike’ in some previous studies, was constructed another 700 feet north of the cross valley berm. An additional embankment, termed the ‘east dike’ in previous studies, was constructed north of the cross-valley berm and parallel to and east of the natural drainage channel (as shown on Drawing P.1.1).

As discussed later in this section, a small volume of tailings was produced during the initial mill operation and discharged into the facility. In addition, 11e.(2) byproduct materials from cleanup of several nearby sites, unprocessed ore, and contaminated soils from a previous tailings fluid spill exist within the boundaries of the TSF. All of these materials will be relocated to within the lined TSF during operations.

## 4.2 Cell Configuration

Tailings disposal will take place within a two-cell system encompassing a total of 80 acres of area, to be in compliance with EPA radon emanation requirements. The tailings disposal concept includes phased construction of a South Cell (39.9 acres) and a North Cell (39.3 acres), as shown on Drawing P1.1. Tailings will be deposited in stages by switching back and forth between the South and North Cells. The South Cell will be constructed first, to a lined elevation of 4430 feet, to expedite mill startup and to minimize startup capital costs. A process and evaporation pond will be designed when design criteria for this component have been finalized. Details of construction and operation sequencing are presented in the following section.

## 4.3 Construction and Operation Sequencing

The TSF will be constructed and operated in four phases listed below. Elevations listed below are in feet above mean sea level.

| | |
|---|---|
| Phase I | Construction of South Cell to Elevation 4430 ft for Initial Storage for Mill Startup (Year 0) |
| Phase II | Deposit Tailings in South Cell while Completing Construction of North and South Cells to Elevation 4466 ft for Ultimate TSF (Years 1-5) |
| Phase III | Tailings Deposition in North and South Cells (Years 6-18) |
| Phase IV | Reclamation and Closure (Years 19-20). |

In Phase I, the South Cell will be constructed to the interim elevation 4430 incorporating and lining the existing earthfill dam (South Dam), which will minimize earthwork so that milling can begin as soon as possible. The proposed grading of the South Cell for Phase 1 is shown on Drawing P1.3. Phase I deposition in the South Cell will proceed to a maximum pool elevation of 4423.5 (established by freeboard calculations). After milling operations commence, work will continue in Phase II to construct the remaining portions of the TSF. The proposed grading at the North and South Cells for Phase 2 is shown on Drawing P2.1. During the operational deposition in Phase III, the North and South Cells will be separated by a progressively raised low earthen divider berm, as shown on Drawings D1 and D2. Tailings will be deposited to elevation 4458 and 4461 in the North and South Dam, respectively, by alternating back and forth between the cells during the operational lifetime of the facility, ensuring that tailings in the inactive cell are covered at all times. The surface of the cell that is not in active deposition will be maintained in a wet or flooded condition to serve the dual role of radon barrier and evaporative surface. When the storage capacity of both cells has been reached, the TSF will be reclaimed during Phase IV. The depositional staging through the lifetime of mill operation is presented in Table 4-1.

**Table 4-1. Summary of TSF Depositional Staging**

| Depositional Stage | Project Period (year) (Year 0 = Phase I Construction) | Phase | Cell | Max Pool Elevation |
|---|---|---|---|---|
| 1 | 1-4.9 | Phase I | South | 4423.5 |
| 1 | 4.9 – 5.8 | Phase II | South | 4429 |
| 2 | 5.8 – 6.9 | Phase II | North | 4439 |
| 3 | 6.9 – 11.6 | Phase II | South | 4449 |
| 4 | 11.6 – 15.3 | Phase II | North | 4458 (full) |
| 5 | 15.3 – 18.5 | Phase II | South | 4461 (full) |

## 4.4 Existing Tailings and Contaminated Soils

An estimated 99,700 cy of tailings, 11e.(2) byproduct materials and locally contaminated materials exist within the TSF boundaries, as shown on drawing P1.2. These materials will be moved to the South Cell after it has been lined. The materials to be moved are summarized on Table 4-2.

**Table 4-2. Summary of Materials to be Moved to South Cell**

| Material[1] | Source | Location | Quantity (cy)[1] |
|---|---|---|---|
| Tailings | Produced April 1982 August 1982 | North Cell<br>North of Cross-Valley Berm | 25,000 |
| 11e.(2) Byproduct Materials | Imported from Hanksville and Hydro-Jet sites | North Cell<br>North Dike, East Dike | 50,000 |
| Ore | Erosion protection for cross-valley berm | North Cell<br>Cross-Valley Berm | 6,700 |
| Contaminated Soil | Soils contaminated by 1982 tailings spill for which cleanup does not meet current standards | South Cell<br>North of South Dam | 18,000 |
| | | Total | 99,700 |

[1] Material quantities reported in Hydro-Engineering (2005b)

The contaminated soils from the 1982 tailings fluid spill will be removed and temporarily relocated to the area upstream of the cross-valley berm while the South Cell is constructed during Phase I. When construction of the South Cell is complete, all of the materials listed in Table 4-2 will be relocated there for permanent storage. All areas where materials have been removed will be resurveyed prior to construction to ensure that cleanup criteria have been met. Verification of this clean up will be provided to DRC for concurrence and no construction will begin until DRC concurrence is received.

It is noted that there is some disparity in the quantities listed in Table 4.2 as reported in Hydro-Engineering (2005b). Page 1-1 reports 25,000 cy of existing tailings and 39,100 cy of 11e.(2) byproduct material. In contrast, page 9-3 reports 83,000 cy of existing tailings and 50,000 cy of 11e.(2) byproduct material. SRK (2007) reports on page 3-38 that 27,825 lbs of $U_3O_8$ was produced at the mill from April through August of 1982. Using an ore production rate of 750 TPD and a grade of 0.007%, Tetra Tech calculated that it would take only 27 days to produce this quantity of yellowcake. In contrast, we calculate that it would take 4.8 months to produce 83,000 cy of tailings, running at full capacity for the entire period. Although the 4.8 month figure is plausible, it is highly unlikely that the mill operated at full capacity from the first ton of production in April to shutdown in August. In consideration of these observations, the 25,000 cy figure appears more credible, and is the figure we have reported herein. Regardless, there is sufficient interim storage capacity in the clay lined existing tailings cell for contaminated soils and all 11e.(2) byproduct material will be transferred to the new south cell once constructed.

### 4.5 Radionuclide Control

Environmental protection from the radionuclides in the tailings and contaminated soils will consist of an underlying liner system, TSF capacity considerations, and management of dust control and air quality. Groundwater resources will be protected with a multi-layer composite liner system consisting of a compacted clay liner (CCL), a secondary HDPE geomembrane with a geonet leak detection system, primary HDPE geomembrane, and a leachate collection system over the primary liner. This liner system will be supplemented by leak detection sumps and downgradient groundwater monitoring wells. Surface water drainage through the site and the TSF capacity will be designed so that all potentially contaminated waters are stored within the TSF. Ambient air quality will be protected from the release of radon-222 from exposed tailings surfaces by a combination of water cover, interim soil cover, and surface spraying. Annual radon monitoring will be performed to comply with NESHAPS requirements as described in the Compliance Monitoring Plan that will be submitted at a future date.

# 5.0 CELL DESIGN

The design of the cell floors, side slopes, embankments and access roads are discussed in the subsections below, followed by the results of slope stability analyses and a discussion of earthwork and TSF storage volumes. Elevations presented in this section are in feet above mean sea level.

Phase I will consist of constructing the South Cell to a lined elevation of 4430 for initial tailings disposal. Both the North and South Cells will be constructed to a lined elevation of 4466 during Phase II at the same time that tailings are being deposited in the South Cell.

## 5.1 Floor Grading

The floor grading for the South and North Cells are presented in drawings P1.3 and P2.1, respectively. The floors of both cells will slope gently to the south, roughly following the existing topography. Floor grades generally range from 4.0 percent to 6.3 percent in the South Cell, and 3.3 percent to 4.5 percent in the North Cell. Sumps will be constructed near the center of the South Dam for the South Cell, and at the southeast corner of the North Cell. The rough grading for both cells included removal of contaminated soils in the South Cell, and removal of the tailings, ore, and imported 11e.(2) byproduct material (described in previous sections), as shown on drawing P1.2.

## 5.2 Side Slopes

The side slopes of both the North and South Cells will be 2.5:1(horizontal:vertical) as shown on Drawing P1.10. The slopes will be constructed of random onsite fill materials produced during cell excavation. A minimum 1-foot thick compacted clay liner (CCL) having a maximum permeability of $1x10^{-7}$ cm/s beneath the composite liner system will be constructed to provide additional protection of groundwater resources. However, the CCL on the 2.5:1 side slopes will have twice the required thickness for constructability. To ensure sufficient compaction to achieve the maximum permeability, the CCL on the side slopes may have to be overbuilt to accommodate the width of construction equipment, and then cut back to the design thickness; the minimum CCL thickness has been doubled to ensure its integrity during this procedure. Areas where the outboard perimeter of the TSF meets existing grades will be trimmed to a slope of 1:1 where the slope is in bedrock (likely for the majority of the east and west sides), and to 2:1 where the slope is in undisturbed natural soils (most likely for portions of the north and east sides of the North Cell).

The northern edge of the TSF lies very near and parallel to the north property line. The property to the north is BLM land. As shown on drawings P2.1 and P2.5, it will be necessary to fill a shallow depression located immediately across the northwest corner in order to prevent storage of precipitation runoff at this location. This construction task will have to be negotiated with BLM prior to implementation of Phase II.

## 5.3 South Dam

Details for the South Dam are presented on drawings P1.7 and P2.7. The crest of the existing South Dam is presently at elevation 4432. The upstream face of the existing South Dam has a slope of 2:1, and will remain at this slope. The existing riprap will be removed and stockpiled for reuse. For Phase I, the riprap at the upstream face will be removed, the surface will be prepared, and a 2-foot thick compacted clay liner (CCL) having a maximum permeability of $1x10^{-7}$ cm/s will be constructed to elevation 4430 on the side slopes.

During Phase II, the dam will receive a homogeneous downstream raise to elevation 4468. The upstream and downstream slope faces of the Phase II raise above elevation 4432 will be 2.5:1. The slopes of the upstream dam face will receive a 2-foot thick compacted CCL having a maximum permeability of $1 \times 10^{-7}$ cm/s prior to placement of the composite liner system to elevation 4460.

### 5.4 Divider Berm

The North and South Cells will be separated by a divider berm. Details for the divider berm are presented on Drawing D1. The initial divider berm will be constructed of random site fill to the same elevation as the existing South Dam (at elevation 4432). The liner for Phase I will be at elevation 4430 and will terminate at the upstream berm crest, where it will be integrated with the North Cell liner during Phase II. Subsequent staged raises to the divider berm will be constructed of compacted tailings. The upstream and downstream faces of the initial divider berm will be 2.5:1, with 2:1 slopes used for the subsequent stages.

### 5.5 Access Roads

Access around the perimeter of the cells will be provided by constructing narrow roads around the cell perimeters. Sections and details of the access roads are presented on drawing P1.10. Temporary access around the 4432 elevation of the South Cell during Phase II will be provided by preserving the outermost 17 feet of the bench at this elevation for tailings distribution piping and service/maintenance vehicle access. The surfaces of all access roads will be sloped toward the cell at a 1 percent grade to facilitate surface runoff. The access roads will be constructed 2 feet higher than the liner elevation to provide both vertical distance for surface drainage ditches and cover protection for the HDPE liner from maintenance traffic.

As shown in the details on drawing P1.10, the HDPE liner will run the entire 17-foot width of the 4430 access road beneath the roadway, and will be sloped toward the cell at a 1 percent grade. The composite liner at the 4430 level will terminate in an anchor trench located 17 feet inside the edge of the road. The HDPE liner at elevation 4460 will terminate in an anchor trench located 8 feet inside the cell edge.

Surface drainage from the slopes above the cells will be collected in ditches and conveyed into the cells via concrete drainage fords at prescribed spacings, as shown in drawings P1.5 to P1.10 and P2.3 to P2.8. The safety berms constructed several feet inside of the cell edges will contain openings at 200-foot intervals to provide access to the cell for precipitation runoff. Surface runon around the perimeter of the TSF will be collected in ditches and conveyed to the TSF across the access roads via concrete drainage fords. Surface water control is discussed in detail in Section 8.

Several design features were incorporated into the access road section depicted in drawing P1.10. The access road cross section provides 2 feet of cover over the HDPE liner for protection from light construction traffic. The lowermost layer of the road section consists of an 8-inch thick layer of 1-inch screened rock over protective geotextile fabric. The purpose of this layer is to minimize the buildup of hydraulic head across the roadway after the tailings level rises above the access road in subsequent depositional phases by providing continuous drainage along the primary HDPE liner. Additionally, as shown on drawing P1.10, the anchor trench for the Phase I composite liner at elevation 4430 will be terminated along the outboard edge of the 17-foot wide access road. The reasons for this configuration are threefold: (1) this location for the anchor trench will provide easy access to the Phase I liner for integration with the Phase II liner; (2) the roadbed over the liner for the 17-foot access road width will provide temporary ballast to the liner when the anchor trench is severed during integration with the Phase II liner; and (3) having the liner run the full width of the temporary bench will provide additional protection against release of any tailings fluids that might occur along the roadway during Phase I operational deposition.

## 5.6 Composite Liner System

Details for the composite liner system are presented on Drawings L1 through L5. The drainage gravel layer of the LCS will stop at the cell floor, and will not continue up the side slopes. Anchor trenches will be constructed along the top of each cell. The LCS/LDS systems for Phase I and Phase II will be integrated to ensure continuity of the liner and drainage systems. Drawing L5 presents a detail and construction sequences for integration of the Phase I/II composite liner system. Liner design criteria are presented in Section 7.

## 5.7 Mill Process Pond(s)

Mill process rates of fluids to be discharged to the process ponds are not available at this time. The planned location of the ponds is shown on drawing P1.1. The ponds will be constructed with the same liner detail as for the primary tailings storage cells except that there will be no leachate collection system. Final design of the ponds will be completed when design requirements have been finalized.

## 5.8 Slope Stability

Analyses of the embankments and side slopes were conducted to ensure sufficient stability for the slopes and embankments for all configurations and conditions expected to be exist during the operational life of the TSF. Seepage and stability analyses were conducted using GeoStudio 2007 design software (Version 7.12, Build 4143, GEO-SLOPE International, Ltd.).

In addition to static analyses, pseudostatic analyses were conducted for each configuration to assess slope stability during seismic activity. As described in Section 2.5, the probabilistic seismic hazard analysis for the Shootaring Canyon site indicates a peak ground acceleration (PGA) of 0.18g for a 10,000 year return period, equivalent to a 10 percent chance of exceedance in the 1,000 year design life of the TSF. A horizontal coefficient of 2/3 of the PGA, or 0.12g, was for pseudostatic analyses.

The soil strength parameters used in the analyses were taken from previous investigations or were adapted from these investigations. The tailings beach sands were assumed to have higher shear strength properties and higher density than the unconsolidated tailings. Similarly, the sands used to construct the divider berms will consist of compacted sands from tailings beaches and from cycloned tailings stockpiled during deposition, and will have higher densities than the as-placed beach sands. Consequently, the compacted tailings to be used to construct the divider berm raises are expected to have the same strength properties as the random fill materials. Design soil strength parameters for the stability analyses are presented in Table 5-1.

### Table 5-1. Design Soil Strength Parameters for Slope Stability Analyses

| Soil Type[1] | Use | Total Unit Weight pcf | Cohesion psf | Friction Angle deg |
|---|---|---|---|---|
| Clay core | South dam (as-built) core | 122 | 0 | 27 |
| Sand filter | South dam (as-built) filter | 125 | 0 | 32 |
| Clayey sand & gravel | South dam (as-built) shell | 139 | 0 | 40 |
| Toe drain material | South dam (as-built) toe drain | 130 | 0 | 35 |
| Entrada Sandstone | Foundation and prepared foundation | 140 | 1,000 | 45 |
| Compacted Random Fill (On-site materials and excavated Entrada Sandstone) | Floor grading, side slopes, divider berm (first stage), Phase II South Dam raise | 125 | 0 | 32 |
| Unconsolidated tailings | Stored waste | 100 | 0 | 10 |
| Tailings beach sand[2] | Divider berm (stages 2 – 5) | 115 | 0 | 28 |
| Compacted tailings | Divider berm (stages 2 – 5) | 125 | 0 | 32 |

[1] Soil strength parameters from Hydro-Engineering, LLC (2005b)
[2] Modified from unconsolidated tailings and compacted random fill

Operational stability of the South Dam was analyzed assuming full failure of the leachate collection and liner systems. Seepage analyses were performed to determine the design phreatic surface for slope stability analyses.

The divider berm was analyzed at the key stages of initial tailings deposition and conditions that will exist for all depositional subsequent depositional stages.

For slope stability analyses, the phreatic surfaces for analyses of the side slopes and South Dam were assumed to be incident with the slope faces at the maximum pool elevations, although the actual pool surface will likely be distant from the slope faces below the tailings beaches spigotted from the cell perimeters. For the side slopes and divider berm, the phreatic surface was assumed to have a more realistic condition typical of tailings deposition, where the pool surface is distant from the slope face, and the LCS draws the phreatic surface steeply downward so that it is not incident on the faces of the divider berm. Tailings deposition will be managed to ensure these conditions are met during operational deposition.

Slope stability was analyzed for the South Dam, side slopes, and the divider berm for the end of construction phase and for intermediate or final stages of operational deposition. Both static and pseudostatic analyses were conducted for both the upstream and downstream faces of the embankments. The results of slope stability analyses are summarized in Table 5-2 and presented graphically in Appendix D.

**Table 5-2. Results of Slope Stability Analyses**

| **Slope** | **Safety Factor**<br>**Static** | <br>**Pseudostatic (0.12g)** |
|---|---|---|
| *Side Slopes* | | |
| End of Construction | 1.7 | 1.2 |
| End of Phase I Deposition | 1.7 | 1.1 |
| *South Dam- Phase I* | | |
| End of Phase I Deposition | | |
| Downstream Face | 1.7 | 1.3 |
| Upstream Face | 1.6 | 1.1 |
| *South Dam- Phase II* | | |
| End of Construction | | |
| Upstream Face | 1.6 | 1.2 |
| End of Phase II Deposition | | |
| Downstream Face | 1.5 | 1.1 |
| Upstream Face | 1.6 | 1.2 |
| *Divider Berm* | | |
| End of Stage I Deposition | | |
| Downstream Face[1] | 5.6 | 2.8 |
| Upstream Face[1] | 1.6 | 1.2 |
| End of Stage III Deposition | | |
| Downstream Face[1] | 1.3 | 1.0 |

[1] Upstream/downstream measured relative to global drainage channel

These results indicate acceptable safety factors for all of the slope configurations and tailings conditions that are anticipated during the depositional life of the TSF. It is noted that although the pseudostatic safety factor for the downstream face of the divider berm at the end of Stage 3 deposition (Figure D-22) is 1.0 instead of the preferred 1.1, the critical surface is a shallow slope surface opposite the cell with active deposition. This configuration of the critical surface is entirely within the embankment and does not pass into the tailings, so no breach of the divider berm at this location would be expected. Any temporary breach that might occur would be minimal due to the deposition of tailings sands immediately upstream of the berm, and would be fully contained within the confines of the South Dam. Additionally, this slope will be regraded to a flatter angle as part of final reclamation.

## 5.9 Earthwork

Cut and fill quantities for earthwork and tailings storage volumes for the storage facility are presented in Table 5-3. In summary, a net 19,268 cy of cut will be required to construct Phase I, which will be temporarily stockpiled in the North Cell during Phase I. Phase II will require a net 14,076 cy of fill, for a total Phase I/II balance of 5,192 cy of fill. The total tailings storage capacity for Phase I will be 1,521,202 cy (which includes the 99,700 cy of contaminated materials to be relocated from the North Cell), and for Phase II will be 3,425,648 cy, for a total storage capacity of 4,946,850 cy. The cut fill quantities shown are for earthwork only, and do not include liner system components (e.g. compacted clay liners, drainage aggregate, etc.).

## Table 5.3. Earthwork Volumes and Tailings Storage Quantities

| Phase | Cut[1] (cy) | Fill[1] (cy) | Net[1] (cy) | Total Storage (cy) |
|---|---|---|---|---|
| Phase I | | | | |
| Pool elevation South Cell = 4423.5 | 303,686 | 284,418 | 19,268 (cut) | 1,521,202 |
| Phase II | | | | |
| Pool elevation North Cell = 4458<br>Pool elevation South Cell = 4460 | 564,648 | 578,724 | 14,076 (fill) | 3,425,648 |
| Phase I + II Combined | 868,334 | 863,142 | 5,192 (cut) | 4,946,850 |

[1] Cut and fill volumes are for mass earthwork only, and do not include LCS/LDS components (e.g. compacted clay liners, drainage aggregate, etc.)

# 6.0 TAILINGS AND WATER MANAGEMENT

## 6.1 Tailings Deposition

Tailings slurry will be delivered to the storage cells via a primary pipeline from the mill. Tailings for each phase will be received by a distribution station, and from there they will be distributed to the appropriate cell for deposition through secondary piping. The purpose of the distribution stations is to provide a means of controlling and delivering the tailings to the cell in the event of a spigoting or secondary distribution problem which requires the secondary distribution to be temporarily shut down for maintenance or repair, thus allowing continuous uninterrupted tailings flow.

From the distribution stations, the secondary distribution piping will deliver the tailings to the cell for final storage. Deposition of the tailings will be via conventional spigots or cyclone separation. Tailings will be first deposited at the floor to provide an initial protective cover for the exposed LCS drainage layer. The initial tailings deposition must be performed in such a manner to minimize disturbance or erosion of the exposed filter sand above the drainage gravel. After the LCS drainage materials have been sufficiently covered, tailings discharge will take place primarily from the sides slopes. Deposition will occur first in the South Cell, and will then cycle back and forth between the South and North Cells until both cells are full. Full details and plans for tailings deposition are presently being developed, and will be presented in the Operations Plan.

## 6.2 Tailings Production from Mill

Lyntek, Inc. is currently performing the evaluation of the restart of the Shootaring Mill and has forecast that the upgraded mill will produce 1,053,000 lbs of uranium per year (Lyntek, 2008). Based on an average ore processing rate of 750 tons/day, the rates of discharge of the tailings solids and water are of 31.3 and 32.3 tons/hr, respectively (Lyntek, 2007). These values assume a specific gravity of 2.7 for the solids and 1.0 for the water.

Uranium One does not currently plan to recycle tailings water back to the mill. The tailings water will be used as a cover and dust control for the tailings cells during operation. The cell that is not in active deposition will remain flooded or receive water spray to serve the dual role of radon cover and evaporative surface.

## 6.3 Water Balance

A detailed water and tailings mass balance computer model was developed for the Shootaring Mill using the dynamic modeling platform called GoldSim (V. 9.6. GoldSim Technology Group, LLC. Copyright 1998-2007). GoldSim is a Windows-based computer program used to simulate engineering systems and is highly suited to work with the system variability of a mine site as it is being constructed and operated. The model simulates the key inflows and outflows to the system during the life of the mill. See Appendix E.1 for a more detailed description of the GoldSim Model. See Appendix E.2 for a summary of water inflows and outflow to each cell during the life of the Mill.

Once the model was developed, it was used to identify tailings and pool elevations and to estimate the times during operations that the discharge is cycled between the North and the South Cells based on operational parameters. These operations parameters included:

1. Maintenance of adequate freeboard in both cells.
2. The pond surface elevation between the two cells not to exceed 10 feet.
3. Tailings deposition begins May 1, 2009.

### 6.3.1 Model Inflows

**Tailings Slurry** – Tailings slurry is produced at a rate of 63.6 tons/hr over the entire life of the mill. This production rate is over 350 days per year. The tailings slurry is 49.2 percent solids by weight with a solids density of 97 lb/ft$^2$. An additional 100,000 cubic yards of existing tailings currently within the TSF limits which will be excavated and added to the South Cell after it is complete. The rate of excavation is assumed to be approximately 1,380 yds$^3$/day for 60 days.

**Return Water from Leachate Collection System** – Water is collected from the Leachate Collection System (LCS) and is returned to the top of the pond either directly or with the tailings slurry. In either case, since the rate at which water is removed from the system is the same as the rate at which it is returned to the system, the net effect on the water balance is zero and, therefore, was not included in the water balance model.

**Precipitation** – Average monthly rainfall values were used to determine the precipitation contribution to the tailings water pool. The precipitation rates (Table 6-1) used were from the water balance conducted for the Tony M Mine (Tetra Tech, 2006). Appendix 2 from the Tony M Mine 2006 Report has been attached as Appendix E.3 of this report for reference.

**Table 6-1. Monthly Average Precipitation**

| Month | Department of Interior | Station Location | | | | | Average |
|---|---|---|---|---|---|---|---|
| | | Wahweap, AZ | Page, AZ | Mexican Hat, UT | Moab, UT | Piute Dam, UT | |
| Station Number | | 29114 | 26180 | 425582 | 425733 | 426897 | |
| Jan | 0.66 | 0.48 | 0.50 | 0.52 | 0.66 | 0.61 | 0.55 |
| Feb | 0.68 | 0.54 | 0.48 | 0.47 | 0.61 | 0.56 | 0.53 |
| Mar | 0.70 | 0.61 | 0.62 | 0.46 | 0.81 | 0.54 | 0.61 |
| Apr | 0.36 | 0.37 | 0.44 | 0.36 | 0.82 | 0.61 | 0.52 |
| May | 0.505 | 0.37 | 0.41 | 0.39 | 0.73 | 0.76 | 0.53 |
| Jun | 0.31 | 0.19 | 0.16 | 0.21 | 0.42 | 0.48 | 0.29 |
| Jul | 0.49 | 0.54 | 0.50 | 0.64 | 0.78 | 0.85 | 0.66 |
| Aug | 0.63 | 0.74 | 0.70 | 0.66 | 0.86 | 1.15 | 0.82 |
| Sep | 0.73 | 0.64 | 0.69 | 0.70 | 0.85 | 0.96 | 0.77 |
| Oct | 0.75 | 0.80 | 0.88 | 0.83 | 1.02 | 0.53 | 0.81 |
| Nov | 0.78 | 0.61 | 0.55 | 0.51 | 0.70 | 0.57 | 0.59 |
| Dec | 0.69 | 0.41 | 0.49 | 0.49 | 0.75 | 0.63 | 0.55 |
| Annual | 7.28 | 6.30 | 6.42 | 6.24 | 9.01 | 8.25 | 7.24 |

Precipitation falling on the lined impoundment area was modeled by multiplying the lined area by the monthly rainfall. Precipitation inflows to the North Cell are assumed to be zero while it is being constructed based on the assumption that runoff water collected during construction would be removed to facilitate liner construction. During Phase I, the precipitation collection area for the South Cell is 34.52 acres, which increases to 41.85 acres during Phase II and is 40.31 acres for the North Cell (see Appendix G.3).

Precipitation in the catchment areas above each of the cells can produce runoff which can contribute to the pond size. The amount of runoff produced will be different depending on if the precipitation falls on primarily rock cliffs or the sandy soils and eroded sandstone soils in the valley. To more accurately model these two distinct regions within the catchment areas each basin was divided in to two areas of possible runoff: “cliffs” and “Other”. The cliffs include the west bluff, consisting of Dakota and Entrada sandstone, slope varying 1.5:1 to vertical, and some talus, and the other areas included the mill site, wind-eroded sandstone, wind-deposited sandy soils in valley, and residual soils on the east bluff. Each of these areas was assigned a runoff coefficient based on the month and the topography (see Section 8 and Appendix G.3).

Runoff produced by precipitation falling on the catchment area above each impoundment was modeled by multiplying the total area by the monthly average rainfall and the monthly runoff coefficient.

### 6.3.2 Model Outflows

The outflow from the TSF includes evaporation from the open water surface and water that becomes permanently entrained in the tailings mass. It was assumed in the modeling that no water is removed from the decant pond. The impoundment will be lined with a double 60 mil HDPE liner, so no seepage or deep infiltration losses were incorporated into the water balance model.

**Evaporation –** Evaporative losses from the water pool were modeled by multiplying the impoundment water pool area by the monthly evaporation rate. The evaporation rates (Table 6-2) used were estimated from the water balance conducted for the Tony M. Mine (Tetra Tech, 2006). See Appendix E.3 for discussion of estimation of the evaporation rates.

**Table 6-2. Net Evaporation Rates**

| Month | Department of Interior | Weather Station Location | | | | | Estimated Evap. for Mine Site |
|---|---|---|---|---|---|---|---|
| | | Wahweap | Page | Mexican Hat | Moab | Piute Dam | |
| **Station Number** | | **29114** | **26180** | **425582** | **425733** | **426897** | |
| January | 2.54 | | | | | | 2.5 |
| February | 2.72 | | | | | | 2.7 |
| March | 3.10 | 4.29 | 3.58 | | | | 3.2 |
| April | 4.24 | 6.39 | 5.79 | 5.80 | 4.53 | | 4.8 |
| May | 5.10 | 9.26 | 7.71 | 8.02 | 6.59 | 5.52 | 7.1 |
| June | 6.89 | 10.91 | 9.64 | 9.84 | 8.02 | 7.11 | 8.8 |
| July | 7.71 | 11.01 | 9.36 | 9.62 | 8.26 | 6.56 | 8.8 |
| August | 8.37 | 10.05 | 7.78 | 7.77 | 6.77 | 5.23 | 7.3 |
| September | 7.47 | 7.20 | 5.50 | 5.67 | 4.53 | 4.23 | 5.0 |
| October | 5.25 | 4.96 | 3.00 | 3.17 | | 2.91 | 3.1 |
| November | 3.42 | 2.56 | 1.13 | 0.89 | | | 2.5 |
| December | 3.31 | | | | | | 2.4 |
| **Annual** | **60.12** | **66.63** | **53.49** | **50.77** | **38.70** | **31.55** | **58.2** |

Note: Evaporation rate data from surrounding weather stations was derived from a Class A pan evaporation data using a evaporation pan factor of 0.70.

The surface area was calculated based on a volume versus surface area relationship developed for each of the cells (Table 6-4). The total volume of material (solids and water) contained in the cell at any given time was input into this relationship to calculate the surface area available for evaporation. The total volume in the cell at each time step was calculated by summing the total solids, the volume of entrained water, and the volume of water pool at each point in time.

**Entrained Water** – Entrained water is the residual portion of the input water that is assumed to be held within the pore spaces of the tailings and is not available as free water. The model assumes the placed tailings remain saturated and that 20 percent of the discharged water is entrained within the solids.

**Reclaimed Water** – It was assumed that no water will be reclaimed and returned back to the mill.

**Table 6-4 Volume/Area/Elevation Relationship for the North and South Cells**

| North Cell | | |
|---|---|---|
| **Elevation** | **Area (sq. ft.)** | **Total Volume (ft^3)** |
| 4407 | 7,434 | - |
| 4410 | 50,326 | 86,640 |
| 4420 | 270,118 | 1,688,860 |
| 4430 | 680,638 | 6,442,640 |
| 4440 | 1,078,494 | 15,238,300 |
| 4450 | 1,443,297 | 27,847,255 |
| 4460 | 1,649,909 | 43,313,285 |
| 4466 | 1,710,598 | 53,394,806 |
| 4468 | 1,730,985 | 56,836,389 |
| **South Cell** | | |
| **Elevation** | **Area (sq. ft.)** | **Total Volume (ft^3)** |
| 4363 | 6,380 | - |
| 4370 | 109,686 | 406,231 |
| 4380 | 346,213 | 2,685,726 |
| 4390 | 620,015 | 7,516,866 |
| 4400 | 900,865 | 15,121,266 |
| 4410 | 1,108,011 | 25,165,646 |
| 4420 | 1,209,713 | 36,754,266 |
| 4430 | 1,315,462 | 49,380,141 |
| 4440 | 1,490,284 | 63,408,871 |
| 4450 | 1,583,228 | 78,776,431 |
| 4460 | 1,678,626 | 95,085,701 |
| 4466 | 1,737,064 | 105,332,771 |
| 4468 | 1,756,738 | 108,826,573 |

### 6.3.3 Results

Tailings are discharged into the North Cell and South Cell during the life of the impoundment (Table 6-5) (See Appendix E.2, Table 1, for a full listing of pond and surface elevations over time). Tailings are first deposited in the South Cell while Phase II is being constructed. In order to maintain an adequate freeboard in the South Cell of 6 feet, Phase II needs to be completed by the time the free water elevation reaches 4423.5 ft, which occurs at 3.9 years (Mar 2013). At this point, the new embankment resulting from construction of Phase 2 allows for continued deposition of tailings to the South Cell until a pond elevation of 4429 is reached (Feb 2014). Tailings discharge is then switched to the North Cell until a water elevation of 4439 (Mar 2015) and then back to the South Cell until 4449 is reached (Dec 2019). Discharge is then switched back to the North Cell until it reaches capacity at a pool elevation of 4458 (Aug 2023), which results in a freeboard of 8 feet. Discharge is then switch back to the South Cell until it reaches capacity at a pool elevation of 4461 (Nov 2026), which results in a freeboard of 5 feet in the South Cell.

A water cover must be maintained on the tailings surface of each of the cell as a radon barrier. As each of the cell's surface areas increase the losses due to evaporation also increase. Starting in August, 2016 through Dec, 2019, while tailings is actively being discharged to the South Cell, additional make-up water must be added to the North Cell in order to maintain a water cover on the tailings surface (Table 6-6). Additional water must be added to the North Cell again from Dec, 2023 through Nov, 2026. South cell make-up water is required from Aug, 2020 through Nov, 2023 and then again for three separate three-month periods in 2024, 2025, and 2026.

**Table 6-5. Summary of Tailings Staging**

| Discharge to | Milestone | Date | Comment |
|---|---|---|---|
| South Cell | 4423.5 | Mar 2013 | Phase 2 completed |
| South Cell | 4429 | Feb 2014 | Switch to the North Cell |
| North Cell | 4439 | Mar 2015 | Switch to the South Cell |
| South Cell | 4449 | Dec 2019 | Switch to the North Cell |
| North Cell | 4458 | Aug 2023 | North Cell full, switch to the South Cell |
| South Cell | 4461 | Nov 2026 | South Cell full |

**Table 6-6. Make-up water flows to North and South Cells**

| South Cell make-up water flows | | North Cell make-up water flows | |
|---|---|---|---|
| Period | Flow Range | Period | Flow Range |
| 8/2020 – 11/2023 | 6-175 gpm<br>97 gpm average | 9/2016 – 12/2019 | 10-80 gpm<br>39 gpm average |
| 9/2024 – 11/2024 | 12-50 gpm<br>32 gpm average | 12/2023 – 11/2026 | 27-167 gpm<br>97 gpm average |
| 9/2025 – 11/2025 | 13-60 gpm<br>44 gpm average | | |
| 9/2026 – 11/2026 | 50-148 gpm<br>76 gpm average | | |

# 7.0 LINER SYSTEM DESIGN

## 7.1 Liner System Description

Utah Administrative Code Rule R317-6 (10 CFR 40 Appendix A, Criterion 5A(1)) requires the use of a liner system under the tailings that "is designed, constructed, and installed to prevent any migration of wastes out of the impoundment to the adjacent subsurface soil, ground water, or surface water at any time during the active life (including the closure period) of the impoundment". This performance criterion is met by the design of a multilayered liner system with two geomembranes consisting of high-density polyethylene (HDPE). This liner system is consistent with Best Available Technology (BAT) for liner systems. The liner system includes a leachate collection system (above the upper HDPE geomembrane) and a leak detection system (between the HDPE geomembranes).

Tailings fluid collected in the leachate collection system will be either (1) recycled to the process circuit, (2) discharged to evaporation ponds, or (3) retained within the TSF to submerge portions of the tailings during operation. The leak detection design provides monitoring of fluids between HDPE geomembranes and removal of fluids (if detected) to remove the gradient for flow across the lower HDPE geomembrane. This significantly reduces the probability of leachate reaching underlying groundwater.

HDPE geomembrane was selected for superior performance for durability and low permeability. The components of the liner system listed from the bottom to the top, are shown in Figure 7-1 and described below:

- Minimum of 12 inches of compacted clay, serving as the base layer
- Secondary 60-mil HDPE geomembrane, overlaying the clay to form a composite liner
- HDPE geonet and 3-inch diameter HDPE perforated pipe for the leak detection system (LDS)
- Primary 60 mil HDPE geomembrane
- Leachate collection system (LCS) consisting of 4- to 8-inch HDPE perforated pipe in gravel bedding
- Minimum of 18 inches of drainage gravel
- Minimum of 6-inch thick sand filter layer to separate tailings from the drainage layer

Preparation of the liner system construction will be outlined in detail in the Construction Quality Control and Quality Assurance (QCQA) Plan as a separate submittal. Detailed specifications for each liner component will be included in the Technical Specifications as a separate submittal.

The components of the liner system are described in the following sections. Elevations are in feet above mean sea level.

## 7.2 Clay Liner

The clay liner will consist of a minimum of 12 inches of compacted clay and will be subject to the following specifications: (1) a maximum particle size of 1 inch, (2) at least 30 percent passing the No. 200 sieve, (3) a plasticity index greater than 10, and (4) a maximum field hydraulic conductivity of 1 x $10^{-7}$ cm/s when compacted to 95 percent of the Standard Proctor maximum dry density within the specified moisture range as determined by ASTM D698 and ASTM D2216.

The existing clay liner and additional clay material encountered within the footprint of the North and South Cells will be removed and surveyed for compliance with radiological cleanup criteria described in relevant sections of "Tailings Reclamation and Decommissioning Plan for Shootaring Canyon Uranium

Project – 2005, Revised: December 2006” (Hydro-Engineering, 2005b). Clay will be stockpiled and used as appropriate as fill during regrading, as compacted clay for liner, as general fill, or placed in the TSF as waste material.

## 7.3 Secondary HDPE Liner

A 60-mil HDPE geomembrane will be installed above the clay liner to provide a composite liner below the LDS. The geomembrane will be textured on both sides to provide additional stability and to facilitate construction.

## 7.4 Leak Detection System (LDS)

The LDS is designed to intercept leachate that passes through defects in the primary liner (if present). The LDS consists of a geonet drain, overlying the secondary composite liner of HDPE geomembrane and compacted clay. The geonet drain is intercepted by 3-inch diameter perforated HDPE pipe where necessary to collect solution from the geonet drain. The layout of the LDS is shown in Drawings L1 and L3.

The LDS in each cell has been subdivided into four subareas by overall site grading, or the use of small berms. The separation berms will be constructed as small (approximately 1 foot high) ridges on top of the compacted clay liner, and will be overlain with the full thickness of drainage system. Any leakage from a subarea will report to a separate subcell within the LDS sump system. Should the Action Leakage Rate (ALR) be exceeded in any sump, the subarea contributing to the flow can be identified for repair or abandoned.

An HDPE geonet will be used for leak detection through the primary HDPE geomembrane. The specifications for the geonet will be provided in the Technical Specifications. Specifically, the geonet will require a minimum transmissivity of 1 x $10^{-3}$ $m^2/s$. The calculations for the LDS capacity are discussed in 7.4.2. The leak detection system is designed to handle flow significantly greater than the established ALR of 200 gallons per acre per day.

The main collectors of the LDS will carry fluid to separate sumps. Each sump is constructed as a dual sump with separate collection areas for the leak detection discharge and the leachate collection discharge. The LDS sump will be divided into 4 separate chambers to collect leakage from each of the 4 individual drainage areas. Within each composite sump, there are two 12-inch diameter access pipes for pump installation within both the leak detection sump and the leachate collection sump, for a total of four pump installation pipes per sump. There is also a 4-inch diameter access pipe in the leak detection and the leachate collection portions of the sump. These access pipes will be used for installation of water level monitoring equipment.

### 7.4.1 Action Leakage Rates

The specified ALR from the previous Tailings Management Plan (Hydro-Engineering, 2005a) was 200 gal/day/acre and the acceptability of this ALR was confirmed with the following analysis. The U.S. EPA (1992) presents a method for estimating leakage through the primary liner for a properly installed and functioning liner system. Although there is a minute rate of leakage through HDPE through permeation or diffusion, the permeation rate is insignificant when contrasted with the leakage through small punctures or defects in the installed liner. The leakage through a hole is estimated by the following equation:

$$Q = C_b \times a \times \sqrt{2 \times g \times h_w}$$

where $Q$ = leakage rate ($ft^3/s$);
$a$ = hole area ($ft^2$);
$C_b$ = dimensionless coefficient;
$h_w$ = liquid depth (ft); and
$g$ = gravity ($ft/s^2$).

Using an assumed hole diameter of 0.082 in (2.08 mm), a $C_b$ coefficient of 0.6 for freely-draining conditions, a total head of three feet, and a hole density of 1 hole per acre results in an ALR of 200 gal/day/acre.

The ALR of 200 gal/day/acre can be converted to a Sump Action Leakage Rate (SALR) by taking the product of the ALR and the area contributing to the sump. There are a total of eight sumps for tailings cells ND1 through ND4 and SD1 through SD4 as shown in Drawing L4. Table 7-1 presents the maximum leakage capture area for each sump and the SALR for each sump.

**Table 7-1. Sump Action Leakage Rate for All Cells**

| Sump | Liner Area (acre) | SALR | |
|---|---|---|---|
| | | (gal/day) | (gal/min) |
| ND1 | 9.91 | 1983 | 1.38 |
| ND2 | 9.64 | 1927 | 1.34 |
| ND3 | 8.01 | 1601 | 1.11 |
| ND4 | 12.30 | 2461 | 1.71 |
| SD1 | 8.71 | 1742 | 1.21 |
| SD2 | 6.65 | 1329 | 0.93 |
| SD3 | 8.93 | 1786 | 1.24 |
| SD4 | 16.00 | 3200 | 2.22 |

If the SALR is exceeded for any sump, a series of steps will be taken to reduce the rate of discharge from the leak detection system. If the change in rate of discharge from the leak detection system is fairly abrupt, it may indicate a new contact with a liner puncture. In an area of recent tailings placement or tailings solution ponding, the liner will be examined for damage. This may include excavating through recently placed tailings or evacuating ponded tailings solution to try to expose the area of the liner where the leak is likely to be located. If a damaged section of liner is located, the liner will be repaired and tested. During this process, the location of tailings placement will be changed or the tailings placement will be suspended. If the contributing punctures in the primary liner cannot be located, all ponded tailings solution will be pumped from the suspect area to an adjacent cell or to the most distant practical location within the cell. If the rate of discharge to the leak detection subsequently declines to acceptable levels, restrictions will be placed on the moisture content of tailings that can be placed with the area of the cell where the leak occurred. Only reduced moisture tailings will be allowed to be placed in the section of the cell contributing to the sump where the allowable leak detection rate was exceeded. No ponding of solution will be allowed within the section of the cell contributing to the leak detection sump. Details of this procedure will be provided in the Operations Plan as a separate submittal.

Based on the SALRs presented in Table 7-1, the required pump capacity for the leak detection system on each cell is approximately 5.5 gpm. There is a wide variety of 4-inch diameter submersible pumps available with sufficient Total Dynamic Head (TDH) to service the evacuation of the leakage detection sump. The pumped discharge from the leakage detection sump will be metered with a combination totalizing/instantaneous meter and discharged to the tailings pond surface for disposal through evaporation or recycled through the mill. The preliminary frequency of sump evacuation for active tailings areas will be once per day with a daily record of evacuated volume. The frequency may be reduced to a weekly evacuation and recording if the total evacuated volume is less than the daily SALR for the sump. Fluid-level monitoring equipment will be installed in the leak detection sump prior to operation of the corresponding tailings cell area. The fluid-level monitoring equipment will, at a minimum, provide a measurement of the depth of fluid in the sump and an adjustable alarm level to activate a light or siren type alarm. The fluid level monitoring equipment may also incorporate features to allow pump control. Acceptable fluid-level monitoring equipment may include suitable pressure transducers or transmitters. After a period of record for evacuation is established, level controls within the sump access pipes may be installed or existing controls adjusted to automate the pump operation and evacuation process provided an alarm system remains in place to clearly indicate excessive fluid levels. The leakage detection fluid evacuation equipment will be inspected daily after a sump is activated and this will continue as long as there is measurable discharge to the leakage detection sump. SOP-AP3 details the inspection procedures.

### 7.4.2 Capacity of LDS

Leakage through the primary liner will be conveyed by the LDS consisting of geonet and perforated piping. The conveyance capacity of the geonet is primarily a function of the transmissivity of the geonet and the hydraulic gradient. The flow per unit width of geonet can be calculated by the following equation:

$$\frac{q}{w} = \frac{T \times i}{LTRF}$$

where q/w = flow rate per unit width
T = geonet transmissivity
i = hydraulic gradient
LTRF = Long Term Reduction Factor

The minimum specified transmissivity of the geonet is 1.0 x $10^{-3}$ $m^2$/sec (1.08 x $10^{-2}$ $ft^2$/sec) at a loading of 10,000 psf normal force. If flow is contained within the geonet drain, the gradient is equivalent to the slope of the geonet. The Long Term Reduction Factor is the product of the mid range of the reduction factors to account for factors such as intrusion of geosynthetic into the geonet's core space and chemical or biological clogging, as recommended by Koerner (2005) for a primary leachate collection application, and is estimated to be 9.1.

As the flow path within a unit width of geonet increases, the anticipated leakage flow rate will also increase, until the geonet is overwhelmed. To prevent the geonet from reaching its flow capacity, the geonet is intercepted at intervals by a perforated leak detection pipe. The LDS pipe will carry flow at a minimum slope of 1 percent to the sump. The LDS pipe capacity is calculated using Manning's equation, assuming a 3-in diameter HDPE pipe, with a roughness coefficient of 0.01, and a minimum pipe slope of 0.01 ft/ft.

The LDS geonet and pipe capacities and associated factors of safety are summarized in Appendix F.1. All factors of safety are adequate to ensure that the anticipated Action Leakage Rates reporting to each sump area are well within the capacity of the LDS components. In addition, fluid head within the LDS will be contained within the geonet and LDS pipe, and therefore the anticipated Action Leakage Rates will result in fluid head on the secondary liner well below the regulatory requirement of one foot.

## 7.5 Primary HDPE Geomembrane Liner

The bottom component of the LCS will be a 60-mil HDPE geomembrane. The geomembrane will be textured on both sides to provide additional stability and to facilitate construction. The liner will be protected on the upper side by a minimum of 18 inches of 1-inch minus drainage gravel.

## 7.6 Leachate Collection System (LCS)

In order to limit the amount of head on the primary liner and to decrease time to dewater the tailings, a LCS has been designed. The LCS consists of 4- to 8-inch diameter perforated HDPE pipe encased in 18 inches of drainage gravel. Six inches of filter sand will be placed over the gravel to prevent piping of tailings into the drainage gravel. The LCS will be placed on the floor of the cells. Due to the steepness of the side slopes (2.5H:1V), leachate accumulation on the side slopes will be relatively small, and therefore the LCS will not extend up the side slopes of the cells. The minimum spacing between pipes has been designed to limit the head on the primary liner to 18 inches or less (thickness of the gravel drain). The size of the pipe has been designed to carry all of the predicted leachate at half the pipe capacity. Additional pipe capacity and flow through the drainage gravel add redundancy in the LCS design.

The main leachate collectors will carry leachate to the LCS sump. The layout of the LCS is shown in Drawing L2. Details of the LCS system are shown on Drawing L3 and L4. Details of the leachate collection sump construction are shown on Drawing L4.

The maximum drainage distance to a collection pipe along the base of the cell(s) is limited to 80 feet or less. The gravel drain around the pipes will also provide substantial conveyance capacity to supplement that in the pipes.

### 7.6.1 Drainage Aggregate

The drainage gravel serves the following functions: (1) providing a continuous drainage layer at the base of the tailings to prevent build-up of head on the primary liner, (2) adding drainage capacity to Leachate Collection System, (3) preventing intrusion of tailings into the 0.25-inch slots in the perforated drainage pipe, (4) guarding the HDPE liner against penetration of stones or other objects, and (5) protecting the HDPE liner against damage from construction equipment. The gradation envelope that represents acceptable particle sizes for the drainage gravel is shown in Figure 7-2. The drainage gravel will have a maximum particle size ($D_{100}$) of 1 inch, in order to protect the integrity of the primary HDPE liner. The minimum particle size is designed to meet filter criteria with the pipe perforations of 0.25 inches, according to guidance given in the National Engineering Handbook, Part 633, Chapter 26 “Gradation Design of Sand and Gravel Filters” (USDA, 1994).

The drainage gravel will be placed on the floor of the lined cells. The drainage gravel will not be placed on the side slopes of the lined cells.

### 7.6.2 Sand Filter

The sand filter is designed to prevent migration of tailings material into the pore spaces of the drainage gravel. The Tailings Reclamation and Decommissioning Plan (Hydro-Engineering, 2005b) presented the gradation results from three tailings samples. These gradations are shown in Figure 7-2. As the milling process that produced these tailings is similar to the process that will produce future tailings at the site, it is reasonable to assume that these gradations represent likely gradations of whole tailing samples of future tailings. As the tailings are discharged, tailings will segregate with the coarser fraction settling out close to the discharge point, and the finer fraction settling out at further locations. Therefore, it is likely that a finer gradation than that presented in the Tailings Reclamation and Decommissioning Plan will exist at discrete locations. In order to estimate this finer fraction, the gradation from sample T4 was adjusted to represent the finest 50 percent of the whole gradation (i.e. the smallest 50 percent of the tailings settle out at a location far from discharge point). This adjusted gradation is shown on Figure 7-2. From this adjusted gradation, a gradation envelope for filter sand meeting filter criteria with both the fine tailings and the drainage gravel was developed using criteria presented in National Engineering Handbook, Gradation Design of Sand and Gravel Filters (USDA, 1994). These gradations are all shown in Figure 7-2.

### 7.6.3 Collection Piping Fluid Capacity

Expected discharge rates from the mill to the TSF is approximately 176 gpm of slurry, at a solids content of 49 percent. The net result is approximately 127 gpm of fluid, and 49 gpm of solids (Lyntek, 2007). The proposed LCS consists of 4-in diameter perforated pipe placed on a 40-foot spacing within the lowest portions of the TSF floor, with the spacing increasing to a 80-foot spacing elsewhere. The capacity of a pipe flowing full can be estimated using Manning's equation as follows:

$$Q = \frac{1.49}{n} AR^{\frac{2}{3}} S^{\frac{1}{2}}$$

where Q = flow capacity
n = Manning roughness coefficient, 0.01 for HDPE pipe
A = area of flow, equal to area of pipe when flowing full
R = hydraulic radius, equal to D/4 when flowing full
D = inside diameter of pipe
S = slope

The capacity of a 4-in diameter pipe placed at a minimum 1 percent grade is approximately 110 gpm. Therefore, during initial discharge, the liquid portion of the slurry will flow across the upper surface of the leachate collection system gravel. As it travels downgradient, it will percolate into the drainage gravel. It will travel a maximum distance of 20 to 40 feet (depending on discharge location) before the majority of the flow is intercepted by a perforated pipe and carried to the sump. The amount of flow above the capacity of a single 4-inch pipe will continue to travel downgradient until it is intercepted by a second pipe. Between any two pipes of the leachate collection system, there is adequate capacity to convey the maximum expected flow of 127 gpm of fluid.

Once the floor of the TSF has been covered by tailings, the maximum leachate flow rate will be a function of the maximum anticipated gradient within the tailings, and the saturated hydraulic conductivity of the tailings. Under the highest anticipated gradient of 2 within the tailings (under ponded conditions), and estimated hydraulic conductivity of the tailings of approximately 2 x $10^{-5}$ cm/s, the highest leachate flow rate under saturated conditions is expected to be approximately 1.3 x $10^{-6}$ cfs per square foot of placed tailings. The leachate collection system consists of 4-in perforated collector pipes placed at 40 to 80 foot spacings. Leachate within the 4-in pipe will flow downgradient to a main collector pipe. Required pipe diameters were calculated using Manning's equation, considering anticipated flows from tributary areas, a roughness coefficient of 0.01 for HDPE pipe, and a minimum of factor of safety of two. Table 7-2 below summarizes the flow calculations. Additional calculations are provided in Appendix F.1.

**Table 7-2. Leachate Collection Pipe Sizes**

| Pipe Segment | Design Pipe Size (in) |
|---|---|
| 4-inch Collector | 4 |
| N1 | 5 |
| N2 | 8 |
| N3 | 5 |
| N4 | 7 |
| N5 | 6 |
| S1 | 5 |
| S2 | 5 |
| S3 | 7 |
| S4 | 6 |
| S5 | 5 |
| S6 | 6 |

### 7.6.4 Limiting Head on Primary Liner

During initial discharge of tailings, the maximum fluid levels will essentially be the height of the drainage gravel and filter sand, or 24 inches, above the primary liner. As the fluid runs across the surface of the filter sand, it will percolate down into the gravel, and then be intercepted by the perforated LCS pipe and carried to the sump. The maximum fluid level is below the operational requirement of a 3-foot maximum head on the primary HDPE geomembrane liner, as summarized in Utah DEQ (2007).

After the floor of the TSF is covered by tailings, fluid pressure on the primary liner will be minimized by controlling the spacing of the 4-inch LCS collection pipes. Pipe spacing was determined using the McWhorter-Sunada equation (Strachan and Dorey, 1988) as follows:

$$L = 2 * h_{\max}\sqrt{\frac{k_g}{q}}$$

where L = pipe spacing
$h_{max}$ = maximum allowable head on primary liner between collection pipes
$k_g$ = hydraulic conductivity of gravel drain
q = maximum infiltration rate through tailings, equal to $k_t$*i
$k_t$ = saturated hydraulic conductivity of tailings
i = maximum gradient in tailings

The maximum allowable head on the primary liner, $h_{max}$, was limited to 18 inches, in order to contain the saturated zone within the drainage gravel. The hydraulic conductivity of the gravel drain was estimated from typical values for clean gravels to be 3 x $10^{-2}$ cm/s.

The hydraulic conductivity of tailings was estimated from literature values for hydraulically placed uranium tailings (Keshian and Rager, 1988). As the tailings are discharged into the tailings storage facility, the coarser tailings will settle out near the discharge location, and the finer slimes will settle out at further locations. Therefore, the hydraulic conductivity at discrete locations will vary significantly. However, as the discharge locations are moved within the facility, a typical column of tailings above the primary liner is expected to have a composite vertical hydraulic conductivity comparable to typical values for fine sands to a combination of sand/slime. From Keshian and Rager (1988), the vertical hydraulic conductivity is estimated to vary from between 2 x $10^{-5}$ cm/s to 1 x $10^{-4}$ cm/s.

Tailings discharge procedures will result in ponding of tailings fluid upon the tailings. The ratio of ponded fluid to consolidating tailings may approach a value of one during the initial portions of tailings discharge. This ratio results in a maximum gradient in the tailings of two.

The pipe spacing calculation results in a required pipe spacing of 40 to 80 feet. The 40-foot spacing is incorporated in the lower swale portions of the basin floor, while the 80-foot spacing is incorporated in the upper portions.

### 7.6.5 Piping Structural Design

The perforated standard wall collection system piping will be 4- to 8-inch diameter SDR 15.5 HDPE. The pipes will be bedded at the base of a clean gravel envelope. The gravel will be compacted with small vibratory compactor on both sides of the pipe to compact materials around and over the pipe. This will produce a very dense envelope around the drainage pipes which corresponds to the desirable material Class I with compaction condition for the pipe bedding Soil Modulus (E') value.

The maximum thickness of tailings will be in the South Cell and will be 100 feet. The lowest elevation of tailings for the design is 4360 feet and the maximum elevation of the tailings is 4460 feet. For a cover thickness of 6.5 feet and a random fill of up to 1.5 feet, the maximum anticipated overburden thickness for the leachate collection piping is approximately 108 feet. A value of 110 feet was used for the calculations. The small diameter and favorable bedding conditions for the standard wall perforated HDPE pipe will provide a substantial and sufficient load bearing capacity. A minimum of 16 inches of compacted material must be in place over the pipe (24 inches of material over the primary liner) before general equipment traffic will be allowed. Only specialized low ground pressure or other approved equipment will be allowed on areas where the cover over the pipe or primary liner is less than 16 inches or 24 inches respectively. With these restrictions on equipment traffic and live loading during the construction, the critical loading condition will be the static overburden load at maximum thickness and full cell utilization.

The analyses have incorporated the maximum overburden on the leachate collection pipes, the selected pipe type for the leachate collection pipes, and a reduced value of the modulus of elasticity of HDPE pipe to represent long term conditions. The method for determining the acceptability of the pipe installation is based on methods presented in the "Polyethylene Pipe Handbook" available on-line from Plastic Pipe Institute (PPI, 2006). The results of the calculations indicate that the 4- to 8- inch diameter SDR 15.5 perforated pipe would withstand the maximum static overburden load of 110 feet of tailings at a moist density of 100 pcf. Additional information regarding piping structural design is provided in Appendix F.2.

## 7.7 Liner Anchorage

Liner anchorage for all of the tops of slopes for both Phases I and II will be provided by anchor trenches. The liner system anchorage calculations are provided in Appendix F.3 and present the most critical slope and loading condition for anchor trench design. The most conservative parameters were used for the analysis with a slope of 2.5:1 and a cover thickness on the runout of 1.5 feet. The specified minimum runout for the anchor trenches is 3 feet with a minimum trench depth of 24 inches. This is sufficient for the critical areas of anchorage on the perimeter of the cells. In some areas, the runout length will be increased to provider easier tie-in of Phase I and Phase II liners. A typical detail for the anchor trench is shown in Figure 7-3.

Liner uplift calculations are included in Appendix F.4. Based on the calculations, the liner system will be capable of withstanding the design wind without tearing or pulling apart for the current anchor trench design. The anchor trenches as designed will withstand the tension forces that will be generated by the wind uplift.

Supplemental restraints for the liner system are recommended for the side slopes and the upstream face of the South Dam and upstream and downstream faces of the divider berm during construction of the South and North Cells to help maintain the position of the liner system. Based on the calculations in Appendix F.4, it is recommended that the supplemental support be provided by adding weight on the liner system in the form of corrugated 24-inch diameter HDPE culverts filled with on-site sand spaced a maximum of 50 feet between the restraints. Alternative weighting methods and configurations proposed by the lining construction contractor must be approved by Uranium One.

## 7.8 Integration of Phase I/Phase II Liner Systems

Phase I will involve construction of the composite LCS/LDS liner system in the South Cell to elevation 4430. During Phase II, the liner system in both the North and South Cells will be constructed to the ultimate liner elevation at 4466 feet. Special procedures have been developed to integrate the Phase I/II liner system in the South Cell. The objectives of integration of the Phase I/II liners in the South Cell are threefold:

1. To ensure the integrity of the primary and secondary 60-mil HDPE geomembranes;
2. To ensure continuity of the LDS drainage geonet; and
3. To ensure a maximum head of 3 feet on the primary liner in accordance with the terms of the groundwater permit.

The Phase I liner at elevation 4430 will be anchored in trenches along the outboard edge of the perimeter access road, as shown in the details on Drawing P1.10. The anchor trench will be located 17 feet beyond the edge of the cell at elevation 4432. The liner at this elevation will be sloped toward the cell at a grade of 1% to facilitate drainage of tailings fluids toward the cell once the pool reaches this elevation in Phase II. The access roads will be constructed over the 4430 liner by providing 2 feet of protective cover. The lower 8 inches of the protective cover across the full road width will consist of 1-inch screened rock to provide a continuous drainage path beneath the higher-density, lower permeability compacted road materials. The screened rock will be placed over a geotextile fabric to protect the primary HDPE liner.

The Phase II liner will be integrated with the Phase I liner beneath the perimeter access road surface. The integration sequence is depicted in the details on Drawing L5. The sequence of the integration following construction of the Phase II slopes above elevation 4430 will generally be as follows:

1. Remove the roadway materials to expose the outermost 7 feet of the Phase I liner system (this will be the portion of the liner that lies on the slope between the anchor trench at elevation 4432 and the flatter portion of the liner at elevation 4430). The remaining roadway materials inside the repair area will remain covered for temporary stability ballast while liner integration is performed.
2. Pull back the protective geotextile fabric to expose the Phase I primary HDPE liner.
3. Cut only the Phase I primary HDPE geomembrane liner and Phase I geonet along the top of the anchor trench, leaving the Phase I secondary HDPE geomembrane liner anchor intact within the trench.
4. Clean the full exposed surface of the Phase I secondary HDPE geomembrane liner and prepare it for welding.
5. Place the Phase II secondary HDPE geomembrane liner over the Phase I secondary HDPE geomembrane liner, providing a minimum overlap of 7 feet inboard of the Phase I anchor trench.

Provide continuous welds along the edges of both the Phase I and Phase II liners and elsewhere per the HDPE geomembrane manufacturer.

6. Lay the Phase I primary geonet back over the spliced secondary HDPE geomembrane liner. Trim the edge of the Phase I geonet to provide a clean edge for butt splicing to the Phase II geonet. Splice the Phase I and Phase II geonet per manufacturer recommendations.
7. Lay the Phase I primary HDPE geomembrane liner back over the spliced Phase I and Phase II geonet, and prepare it for welding.
8. Lay the Phase II primary HDPE geomembrane liner over the Phase I primary HDPE geomembrane liner. Provide continuous welds along both edges of the Phase I and Phase II primary geomembrane liners and elsewhere per the HDPE geomembrane manufacturer recommendations.
9. Replace the protective geotextile fabric and reconstruct the access road section as before.

### 7.9 Compatibility of HDPE Materials to Leachate

The liners, geonet, and piping will be comprised of HDPE. The general specifications for the HDPE materials will be included in the Technical Specifications to be submitted at a later date. In addition to the structural and strength related specifications, specifications related to UV and environmental stability, as well as chemical resistance of the HDPE will be included. Many sources of chemical resistance data were consulted for the purposes of anticipating possible degradation of the liner system. Based on the review of available data, no measurable chemical degradation of the HDPE materials is expected. The identified process stream constituents that were evaluated as potentially detrimental to the liner include: sulfuric acid, sodium chlorate, and kerosene. Other constituents such as flocculants, sodium hydroxide, ammonia, tridecanol, tertiary amine, or sodium bicarbonate may be added or otherwise introduced to the process stream and eventually discharged to the tailings, but not at concentrations that are considered significant. The UV stability is related to carbon black content specifications to be forthcoming in the Specifications.

The acidification of the process stream is considered the primary chemical alteration that has the potential to affect the liner. The estimated free acid (sulfuric) concentration in the discharge to the tailings is 5 g/liter or approximately 5 percent. All available chemical resistance information indicates that this concentration is not damaging to HDPE and that acid concentrations can be dramatically greater than 5 percent without damaging the liner. Poly-flex Chemical Resistance Tables (Poly-Flex, 2005) lists non-oxidizing acids as having little or no effect on an HDPE liner. Table 5.8 in Koerner (2005) lists HDPE as having “generally good resistance” to inorganic acids at temperatures ranging from 38 to 70 degrees Celsius. ISCO Industries (2007) lists HDPE as having “satisfactory” chemical resistance to sulfuric acid for concentrations less than 50 percent at temperatures ranging from 21 to 60 degrees Celsius. Zeus Industrial Products, Inc. (2007) lists HDPE as chemically resistant to sulfuric acid for concentrations less than 50 percent at temperatures ranging from 20 to 60 degrees Celsius. Advanced Drainage Systems, Inc. (2007) lists HDPE as chemically resistant to sulfuric acid for concentrations less than 50 percent at temperatures ranging from 20 to 60 degrees Celsius.

There are many sources that document studies supporting the position that the proposed flexible HDPE geomembrane liner material is compatible with acidic process solutions. Numerous studies that have been conducted on the effect of various solutions on geomembranes primarily associated with municipal and industrial landfills. There are limited studies that have been conducted to evaluate the effect of mine waste leachates on geomembranes. Two of these studies are discussed below.

Mitchell (1985) performed geomembrane chemical compatibility tests with simulated uranium mill process solution for three types of geomembranes: HDPE, CSPE, and PVC. The simulated solution consisted primarily of water and sulfuric acid at pH values ranging from 1.5 to 2.5. The HDPE geomembrane samples used for the testing consisted of a section of 40 mil HDPE geomembrane which included a fillet-welded field seam. Temperatures used during the testing ranged from 18 to 76 degrees Celsius. The results of the testing indicated that the acid process solution was “not very aggressive with any of the materials or seams [tested].” The HDPE geomembrane performed better and was more stable than the other geomembranes.

Gulec, et al. (2005) performed chemical compatibility tests on three geosynthetic materials including a geomembrane, geotextile, and drainage geocomposite. Acidic water consisting of sulfuric acid and water was one of the solutions used in the study. The geomembrane evaluated was a 60 mil HDPE geomembrane. The results of the study indicate that a 60 mil HDPE geomembrane is resistant to acidic solutions such as that which will be used at the site.

Current information indicates that HDPE is chemically resistant to acidic uranium mill process solution. The testing conducted by Mitchell (1985) and Gulec et al. (2005) provides lab data to support the use of an HDPE liner as part of the TSF liner system. Mitchell’s testing was conducted on a 40 mil HDPE and Gulec’s testing was conducted on a 60 mil HDPE In both cases, the results indicated the HDPE geomembranes were chemical resistant to acidic solutions. A 60 mil HDPE liner has been recommended for the liner at the site.

The same sources listed above for chemical resistance of HDPE to sulfuric acid indicate that sodium chlorate will not damage HDPE. The expected addition of sodium chlorate to the ore stream is at a rate of approximately 1.7 lb/ton of ore feed, so concentration of the salt in the discharge stream will be very small. Available chemical resistance information indicates that pure kerosene will damage HDPE lining, particularly at very high temperatures (60 deg C or 140 deg F). The anticipated kerosene loss rate from the Solvent Exchange process is 0.5 gal kerosene per 1000 gallons of process feed, which equates to a concentration of approximately 500 ppm. Kerosene is volatile and the concentration in any free solution in the tailings cell(s) will likely be smaller than that in the discharge stream leaving the mill. Ultimately, the limited amount of kerosene that remains within the tailings will become relatively immobile because of adsorption to the tailings solids. It is also possible that the kerosene will undergo a biodegradation process. Because the maximum plausible kerosene concentration in the discharge to the tailings is very small and the degree of contact with the liner system is very limited, there is negligible potential for damage to the liner, geonet, or piping by the presence of small concentrations of kerosene.

# 8.0 SURFACE WATER DRAINAGE AND EROSION PROTECTION

This section documents the design of surface water management, erosion protection features, and freeboard determination for the TSF.

## 8.1 Design Basis

Conceptual design and preliminary sizing of operational surface water management and erosion protection facilities was conducted according to NUREG/CR-4620, NUREG 1623, NRC RG 1.59, and NRC RG 3.11. All operational surface water control features were sized for the 100-year discharge, computed using conservative assumptions of runoff coefficient and time of concentration. Freeboard for the TSF was based on the Probable Maximum Flood (PMF) series (per Regulatory Guide 3.11), along with 100-year wind and wave effects.

All potentially contaminated surface water (i.e., runoff from ore pads and restricted areas of the mill site) is directed to the lined TSF.

## 8.2 Drainage System Features and Layout

During mill operations, potentially contaminated surface runoff will be routed to a lined TSF, where it will be impounded and ultimately evaporated. Clean water will also discharge to these facilities, but via separate conveyance systems. Some clean water (from outside the restricted area) will discharge offsite. Potentially contaminated surface water will be impounded only within the tailings storage facility, and will not leave the site.

Major runoff control features include the following:

- A rock-lined diversion ditch north of the proposed process/evaporation pond, diverting offsite runoff around the pond.
- Collection ditches just inside the mill/ore pad restricted area perimeter fences, diverting sediment-laden and potentially contaminated mill site runoff to the lined tailings storage facility. Hydraulic residence time was evaluated for these ditches to ascertain any tendency to infiltrate potentially contaminated water; the cumulative hydraulic residence time to any particular discharge point was less than 15 minutes.
- Rock chutes conveying mill area runoff water down the sides of the bluff to the TSF.
- Concrete fords at intervals around the tailings cell perimeter, conveying runoff across the TSF perimeter road and into the tailings. Fords were used instead of culverts in order to minimize the amount of perimeter berm fill required above the top of the liner system.
- Roadside swales along the TSF perimeter road, collecting lateral inflow from offsite areas and conveying it to the concrete fords. Swale depth was limited to 1 foot to minimize embankment quantities above the liner system.
- Rock-lined rundowns conveying concentrated runoff from cliff faces across the 1% berm and directly to the concrete fords. Rundowns were warranted where contour mapping indicated significant flow concentrations that would overwhelm the capacity of the lateral swales.
- Culverts transmitting ditch flow under service roads.

All operational ditches, fords, and culverts were sized for the 100-year peak flow, computed with the Rational Method, using conservative assumptions of the runoff coefficient (0.9) and Kirpich’s method for time of concentration. Rainfall intensities were downloaded from NOAA Atlas 14 (Precipitation

Frequency Data Server, 2008). The table below summarizes design dimensions. Design calculations are found in Appendix G.1.

**Table 8-1. Drainage Channel Design Summary**

| Channel type | Slope | Depth (ft) | Base Width (ft) | Side Slope | Lining |
|---|---|---|---|---|---|
| Lateral (along tailings cell access road) | 0.4% | 1 | 4 | 2:1 | 2.5" gravel |
| Ford (across access road) | 1.0% | 1 | 0* | 6:1 | concrete |
| Rundown (cliff toe to ford) | 1.0% | 1.5 | 6 | 2:1 | 6" riprap |
| Chute (mill to tailings) | 23% - 44% | 2 | 6 | 3:1 | 24" riprap |
| Offsite (north of process pond) | 3.6% | 3 | 6 | 2:1 | 24" riprap |
| Mill (below bluff toe) | 3.0% - 5.4% | 2 | 4 - 6 | 2:1 | 12" - 24" riprap |
| On mill site | 0.5% | 1.5 | 2 | 2:1 | 2.5" gravel |

**Note: F2-14, B=8'; F2-18, B=4'*

## 8.3 Phasing of Surface Water Controls

During Phase I, potentially contaminated water from the mill/ore storage site will be routed either to the South Cell, or to the existing tailings impounded behind the small dam located north of the existing cross-valley berm. A portion of the unrestricted mill site area will flow onto the restricted area, and be commingled with potentially contaminated water, after which it will be treated as contaminated and routed to the TSF. Non-impacted (no potential for contamination) surface water from the bluffs adjacent to the South Cell will be routed to the South Cell to make up for evaporation within the cell. Any non-impacted surface water arriving from areas north of the South Cell will simply continue present flow patterns, leading to retention, infiltration, or evaporation from portions of the valley floor north of the proposed divider berm. Non-impacted surface water from the southern and eastern portions of the mill site lying outside the restricted area will be routed via roadside ditches and culverts to the canyon lying east of the bluff on which the mill sits. Drawing P1.9 shows the Phase I drainage layout.

At the beginning of Phase II, any residues from the runoff directed into the existing tailings area will be removed, along with the existing tailings, and placed into the South Cell. During Phase II operations, potentially contaminated mill site runoff will be routed to the TSF, generally following the same flow paths as Phase I. Non-impacted surface water from the bluffs adjacent to the cells will be routed into the appropriate TSF cell. Non-impacted surface water from north of the North Cell will be conveyed to the North Cell via a rock-lined ditch, and retained within the North Cell. Non-impacted surface water east of the mill will continue to drain into the east canyon, as in Phase I. Drawing P2.8 shows the Phase II drainage layout.

Offsite area OS1-1 (OS2-1 in Phase 2 maps) is a natural topographic depression, which overflows first to the north (away from the TSF) at an elevation between 4498 feet and 4500 feet, and overflows to the south at an elevation slightly above 4500 feet. For most rainfall events, including the 100-year operational design event, the depression retains all surface runoff from its contributing area (23.2 acres), and does not contribute any discharge towards the TSF. For extremely severe events such as the Probable Maximum Precipitation (PMP), the depression retains some, but not all, of the runoff, and may contribute discharge towards the TSF, depending on the relative elevations and conveyance capacities of the two overflow areas. At the present level of design detail, the depression was considered to be non-contributing for drainage design, but conservatively assumed to contribute fully for purposes of freeboard determination.

## 8.4 Maintenance Requirements

Ongoing maintenance of minor flow controls will generally involve spot-fixes of observed minor erosion, and removal of rockfall and sediment from ditches. Failure of minor drainage controls is possible for rainfall events exceeding the 100-year recurrence interval. Failure could also occur due to sediment or rockfall restricting flow capacity of ditches, and would typically result in washout of road base material without damage to the liner system. In the event of failure, the controls would need to be reconstructed and road repaired, but contaminated water would remain contained within the TSF.

## 8.5 TSF Freeboard

TSF freeboard consists of three components: rise due to the design flood, wind setup, and wave runup. During operations no spillway is provided on the TSF, and surface runoff is to be stored within the tailings disposal facility. The design flood for TSF freeboard is the 6-hour Probable Maximum Flood (PMF) series, preceded or followed by a 100-year, 6-hour event. The PMF series is defined as the PMF, preceded by a flood equivalent to about 40% of the PMF, occurring 3 to 5 days prior to the main flood. (U.S. NRC Regulatory Guide 3.11, p 3.11-7, 1977). This is combined with the effects of the 100-year windspeed.

The site PMP was determined using the method presented in the National Weather Service (NWS) Hydrometeorological Report (HMR) 49. Using the HMR 49 method, the 6-hour local storm PMP was determined to be 9.1 inches for the project site. Using the NOAA Atlas 14 6-hour, 100-year rainfall of 1.79 inches, the PMP series was determined to consist of 14.53 inches (140 percent of 9.1 inches, plus 1.79 inches) of precipitation. Conservatively assuming that all offsite runoff arrives in the TSF (i.e., neglecting to subtract non-contributing/depression areas), and using an overall runoff coefficient of 0.90, the PMP flood volume was determined for each cell and operations phase. The rise due to the design PMP series was computed based on the cell grading geometry.

The 100-year wind/wave effects were determined using the methods in ANSI/ASCE 7-93, and the Corps of Engineers' Coastal Engineering Manual. Wind setup (wind tide) was evaluated under conservative assumptions of operating water depth. The total freeboard requirements are shown in the table below, organized by cell and phase. Detailed calculations are located in Appendix G.2.

**Table 8-2. Freeboard Summary**

| Parameter | Phase I | Phase II | Phase II |
|---|---|---|---|
| | South Cell | | North Cell |
| WSE Rise due to design flood (ft): | 2.98 | 2.18 | 4.48 |
| Wind setup (ft): | 0.36 | 0.43 | 0.33 |
| Wave runup (ft): | 2.85 | 2.34 | 2.59 |
| Total freeboard (ft): | 6.19 | 4.94 | 7.40 |
| Use: rounded up to the next half-foot (ft): | 6.50 | 5.00 | 7.50 |

## 8.6 Surface Water Yield

Because off-tailings areas within the Shootaring Dam watershed will drain into the TSF, it was necessary to estimate the surface water yield from these areas over the life of the project. The surface water yield was used to for the water balance, and to check freeboard. Surface water yield was estimated monthly, based on precipitation data used for the Tony M Mine (Tetra Tech, 2006) reduced by a runoff coefficient that varied monthly. Surface water yield was estimated for an 'average' year, assumed to apply for all simulation years. Because rainfall data was available for entire months, rather than individual storm events, no effective runoff modeling was possible, and coefficients were established using engineering judgment. Coefficients were established with a target aggregate annual surface water yield between 30 and 45 percent of rainfall, typical for small watersheds in the region. Two sets of runoff coefficients were used: one set for bare rock, and one for soil/sand-covered areas. Coefficients were assigned their highest values during summer and early fall, months subject to intense thunderstorms during which most rainfall can be expected to run off. Coefficients for bare rock / cliffs were 0.1 to 0.15 higher than those for soil or sand-covered areas, reflecting the lack of infiltration capacity or vegetation of the rocky areas. Details of the calculations can be found in Appendix G.3.

# 9.0 REFERENCES

Advanced Drainage Systems, Inc., 2007. *Technical Note 4.01, Chemical Resistance of Polyethylene and Elastomers.* www.ads-pipe.com

Benson, C.E., 1998. "Test pads and in situ (field) hydraulic conductivity measurements," in Short Course Notes, *Liners and Covers for Waste Containment Facilities,* Craig H. Benson, David E. Daniel and Charles D. Shackelford instructors, sponsored by GEO Institute, October 26-28, Rosemont, Illinois.

Catepillar, 2008. Catepillar Performance Handbook. Page 164. January.

Davidson, E.S., 1967. "Geology of the Circle Cliffs area, Garfield and Kane Counties, Utah, *U.S. Geological Survey Bulletin 1229.*

Gipson, A.H. Jr., 1985. "Permeability testing on clayey soil and silty sand-bentonite mixture using acid liquor," *Hydraulic Barriers in Soil and Rock, ASTM STP 874,* A.I. Johnson, R.K. Frobel, N.J. Cavalli, and C.B. Pettersson, eds., American Society for Testing and Materials, Philadelphia, pp. 140-154.

Gleason, M.H., Daniel, D.E. and G.R. Eykholt, 1997. "Calcium and sodium bentonite for hydraulic containment applications," *Journal of Geotechnical and Geoenvironmental Engineering,* 123(5):438-445.

Gulec, S.B., C.H. Benson, and T.B. Edil, 2005. "Effect of Acidic Mine Drainage on the Mechanical and Hydraulic Properties of Three Geosynthetics." Journal of Geotechnical and Geoenvironmental Engineering, Vol. 131, No. 8, ASCE, pp. 937-950.

Hung, M.D. and L.C. Wong, 1992. "Impact of molding water content on hydraulic conductivity of compacted sand-bentonite", *Canadian Geotechnical Journal*, 29:253-262.

Hydro-Engineering, LLC, 2005a. Tailings Management Plan for Shootaring Canyon Uranium Processing Facility. Amended December 2005. revised April 2007.

Hydro-Engineering, LLC, 2005b. Tailings Reclamation and Decommissioning Plan for Shootaring Canyon Uranium Project Garfield County, Utah December, 2005, revised December 2006.

Hydro-Engineering, LLC, 2005c. Ground-Water Hydrology of the Shootaring Tailings Site, 2005. Prepared for Plateau Resources Limited.

Hydro-Engineering, LLC, 2002. Ground-Water Monitoring of Shootaring Tailings Site, 2001. Prepared for Plateau Resources Limited.

Hydro-Engineering, LLC, 2001. Ground-Water Monitoring of Shootaring Canyon Tailings Site, 2000. Prepared for Plateau Resources Limited.

Hydro-Engineering, LLC, 2000. Update of the Ground-Water Hydrology of Shootaring Canyon Tailings Site. Prepared for Plateau Resources Limited.

Hydro-Engineering, LLC, 1999. Aquifer Properties of New Wells and Recommended Sampling Rates. Prepared for Plateau Resources Limited.

Hydro-Engineering, LLC, 1998. Ground-Water Hydrology of Shootaring Canyon Tailings Site. Prepared for Plateau Resources Limited.

Hydro-Engineering, LLC, 2005. Tailings Reclamation and Decommissioning Plan for Shootaring Canyon Uranium Project, Garfield County, Utah.

ISCO Industries, 2007. *Chemical Resistance of High Density Polyethylene Pipe*. www.isco-pipe.com.

Kenney. T.C., W.A. van Veen, M.A. Swallow, and M.A. Sungaila, 1992. "Hydraulic conductivity of compacted bentonite-sand mixtures," *Canadian Geotechnical Journal*, 29:364-374.

Keshian, B., and R. Rager, 1988. Geotechnical Properties of Hydraulically Placed Uranium Mill Tailings in *Hydraulic Fill Structures*, Geotechnical Special Publication No. 21, ed. D.J.A. Van Zyl and S.G. Vick. American Society of Civil Engineers, New York, New York

Koerner, R.M., 2005. *Designing with Geosynthetics*. Fifth Edition, Prentice Hall, New Jersey.

Lyntek, Inc., 2007. Draft Uranium One Material Balance Calculations. Email communication to Toby Wright, Uranium One, dated December 5, 2007.

Lyntek, Inc., 2008. Definitive Cost Estimate for the Restart of the Shootaring Canyon Mill, Ticaboo, Utah. March 28.

Mitchell, D. H., 1985. "Geomembrane Compatibility Tests Using Uranium Acid Leachate", Journal of Geotextiles and Geomembranes, Vol. 2, No. 2, Elsevier Publ. Co., pp.111-128

Plastic Pipe Design Manual, available on-line from www.vylonpipe.com, Lamson Vylon Pipe, Cleveland, Ohio.

Plateau Resources, Ltd. and Hydro-Engineering, LLC, 2007. Tailings Management Plan for Shootaring Canyon Uranium Processing Facility.

Poly-Flex, Inc., 2005. *Reference Manual*. March. pp. 39-40.

Pool, Thomas C., 2006. Technical Report on the Henry Mountains Complex Uranium Mountain Project, Utah, U.S.A. prepared for International Uranium Corporation. September 9.

SRK Consulting, 2007. sxr Uranium One Inc. Due Diligence Review: U.S. Energy Corp. Uranium Assets- Colorado, Utah and Wyoming, USA. Project No. 166901. January.

Stern, R.T, and C.D. Shackelford, 1998. "Permeation of sand-processed clay mixtures with calcium chloride solutions," *Journal of Geotechnical and Geoenvironmental Engineering*, 124(3):231-241.

Strachan, C, and R. Dorey, 1988. Geotechnical Studies in *Introduction to Evaluation, Design, and Operation of Precious Metal Heap Leaching Projects*, ed. D.J.A. Van Zyl, I.P.G. Hutchinson, and J.E. Kiel. Society of Mining Engineers, Inc., Littleton, Colorado, pp.152-175.

Tetra Tech, Inc., 2006. Tony M. Mine Notice of Intent to Commence Large Mining Operations, Appendix 2. November 17.

Tetra Tech, 2008. Shootaring Canyon Mill Annual Ground Water Monitoring Report. May 5.

URS, 2007. Utah Division of Radiation Control, Uranium One, Inc., Shootaring Canyon Uranium Processing Facility, Request to Resume Operations, Interrogatories – Round 2. August 24.

URS, 2008. Utah Division of Radiation Control, Uranium One, Inc., Shootaring Canyon Uranium Processing Facility, Request to Resume Operations, Interrogatories – Round 3. February.

United States Department of Agriculture (USDA), 1994. *National Engineering Handbook*, *Part 633*, Chapter 26, Gradation Design of Sand and Gravel Filters.

U.S. Department of Energy (DOE), 1989. UMTRA-DOE Technical Approach Document, Revision II, UMTRA-DOE/AL 050425.0002. December

U.S. Environmental Protection Agency (EPA), 1992. Action Leakage Rates for Leak Detection Systems. Supplemental Background Document for the Final Double Liners and Leak Detection Systems Rule for Hazardous Waste Landfills, Waste Piles, and Surface Impoundments. EPA/530-R-92-004. NTIS Publication PB92-128214. Office of Solid Waste, Washington, D.C. January.

U.S. Nuclear Regulatory Commission (NRC), 1977. Design Basis Floods for Nuclear Power Plants Regulatory Guide (RG) 1.59. Revision 2, August.

U.S. Nuclear Regulatory Commission (NRC), 1977. Design, Construction, and Inspection of Embankment Retention Systems for Uranium Mills. Regulatory Guide (RG) 3.11. Revision 2, December.

U.S. Nuclear Regulatory Commission (NRC), 2002. Design of Erosion Protection for Long-Term Stabilization. NUREG-1623. September.

Utah Department of Environmental Quality (Utah DEQ), 1999. Ground Water Quality Discharge Permit. Permit #UGW170003, issued March 19, 1999.

Utah Department of Environmental Quality (Utah DEQ), 2007. Follow-up to Discussions of November 1, 2007, Shootaring Canyon Uranium Tailings Impoundment: BAT Engineering Design Options. Letter to Uranium One from Loren B. Morton, Section Manager, Division of Radiation Control. November 9.

Woodward-Clyde Consultants, 1978a. Environmental Report, Shootaring Canyon Uranium Project, Garfield County. Prepared for Plateau Resources Limited. Revised June 16, 1980

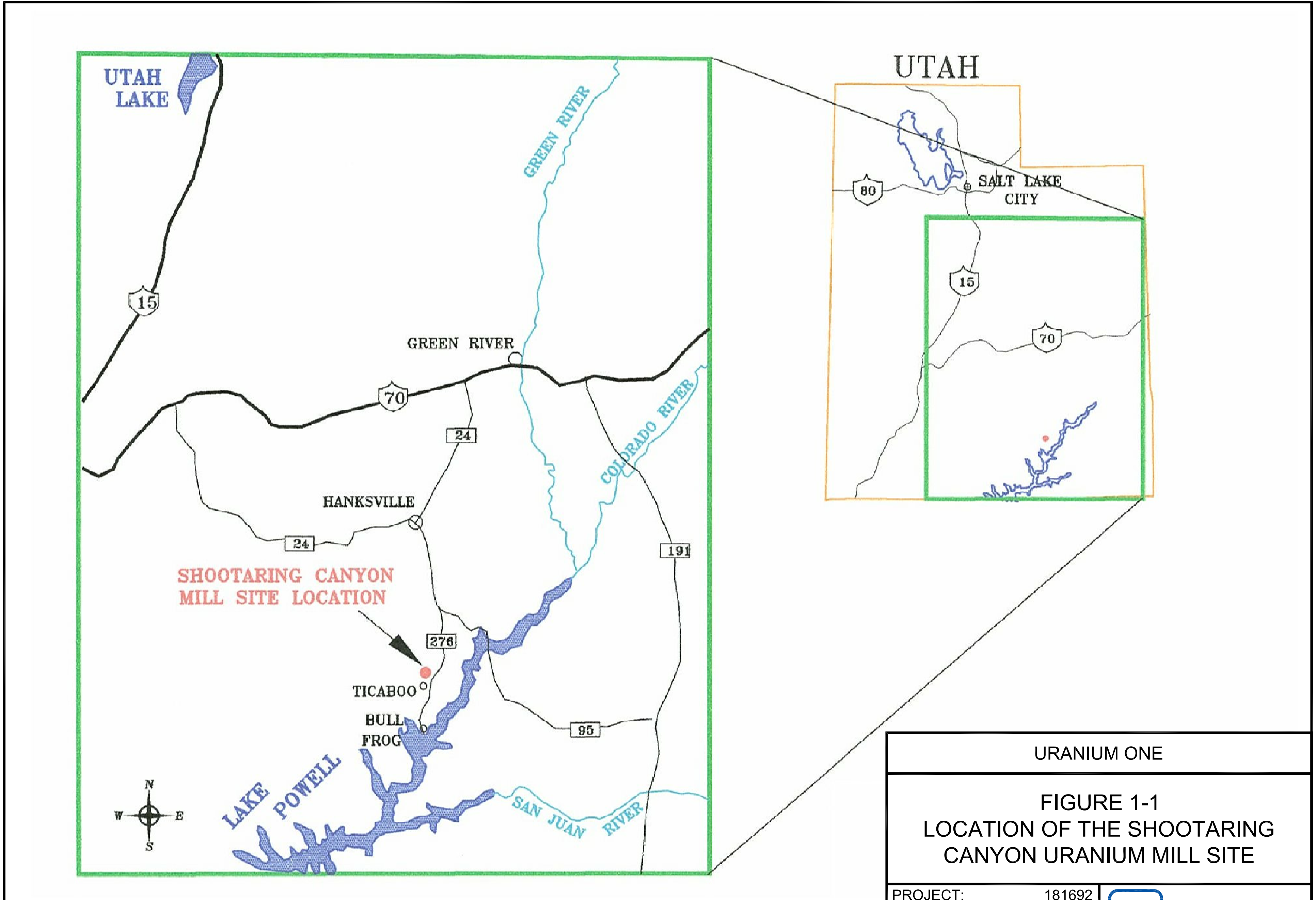
Woodward-Clyde Consultants, 1978b. Supplemental S1 Environmental Report, Shootaring Canyon Uranium Project, Garfield County, Utah. Prepared for Plateau Resources Limited. June.

Woodward-Clyde Consultants, 1978c. Supplemental S2 Environmental Report, Shootaring Canyon Uranium Project, Garfield County, Utah. Prepared for Plateau Resources Limited. September.

Woodward-Clyde Consultants, 1978d. Tailings Management Plan and Geotechnical Engineering Studies, Shootering Canyon Uranium Project, Garfield County, Utah. September.

Woodward-Clyde Consultants, 1979. Stage 1 – Tailings Impoundment and Dam Final Design Report, Shootering Canyon Uranium Project, Garfield County Utah, May.

Zeus Industrial Products, Inc., 2007. *Chemical Resistance of HDPE*. www.zeusinc.com.



Source: Hydro-Engineering, 2005b.

URANIUM ONE

# FIGURE 1-1
# LOCATION OF THE SHOOTARING CANYON URANIUM MILL SITE

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| PROJECT: | 181692 |
| DATE: | MAY 2008 |
| FILE: | FIG_1-1.DWG |

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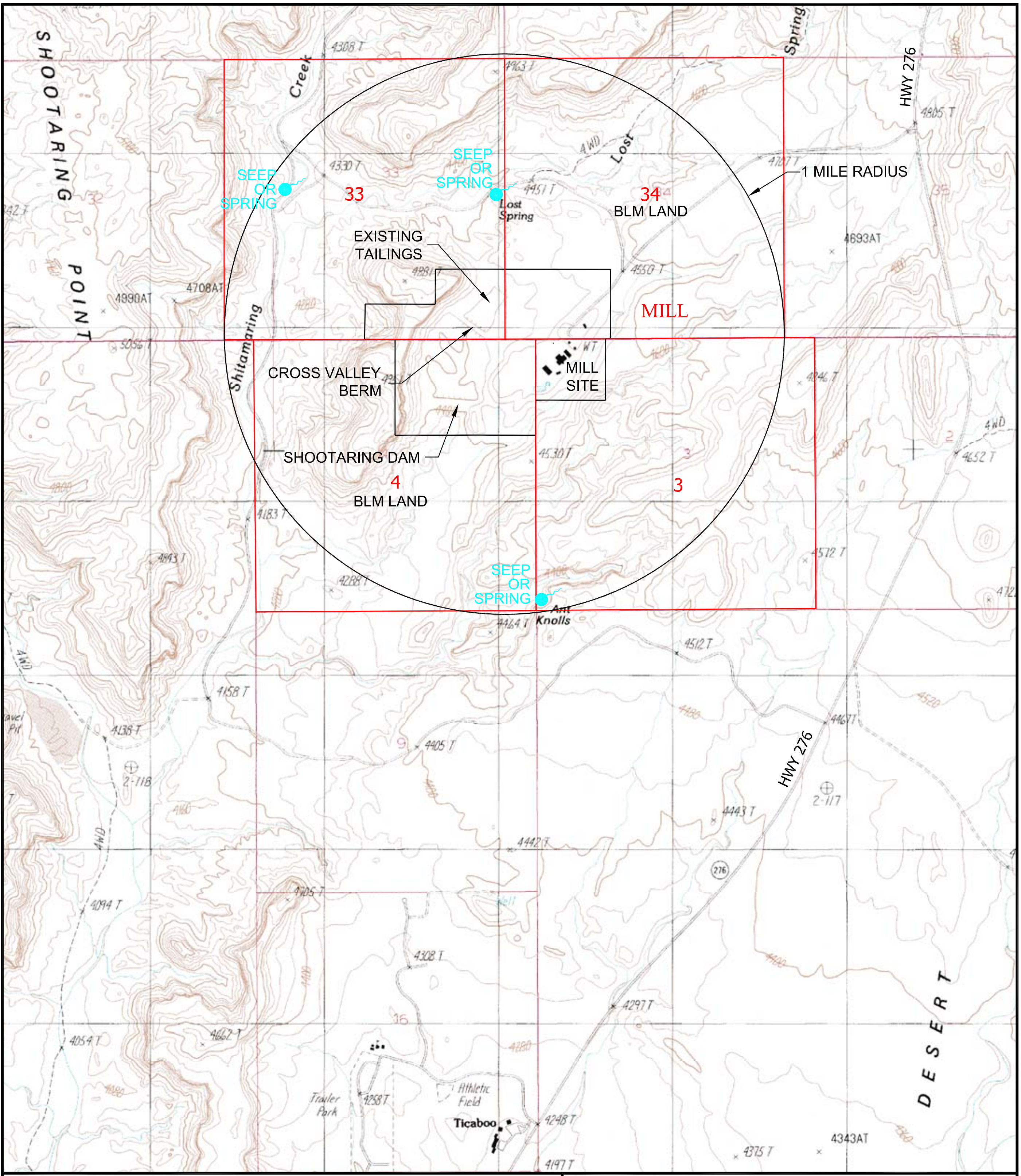

Based on: Hydro-Engineering, 2005b.

URANIUM ONE

## FIGURE 1-2
## SHOOTARING CANYON URANIUM MILL SITE LOCATION AND FEATURES

| | |
|---|---|
| PROJECT: | 181692 |
| DATE: | MAY 2008 |
| FILE: | FIG-SITE-QD |

TETRA TECH

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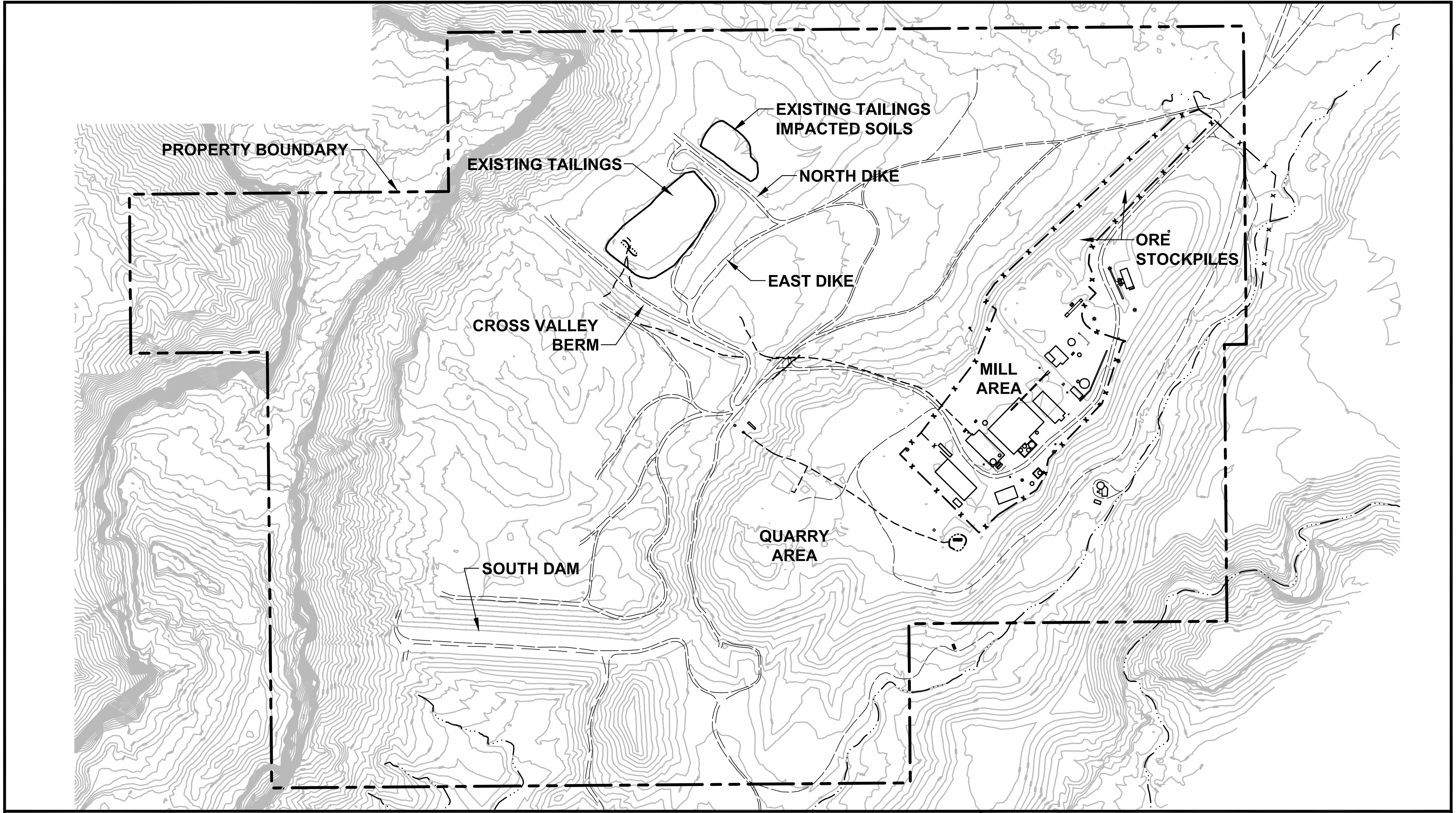
E:\181692\design\FIG-EX-COND.dwg SAVED: 5/23/08 PRINTED: 5/27/08 BY: TOM.BOEHLER



LEGEND

- PROPERTY BOUNDARY
- ROAD
- FENCE LINE
- DRAINAGE OR STREAM
- BUILDING

NORTH

SCALE IN FEET
0 600

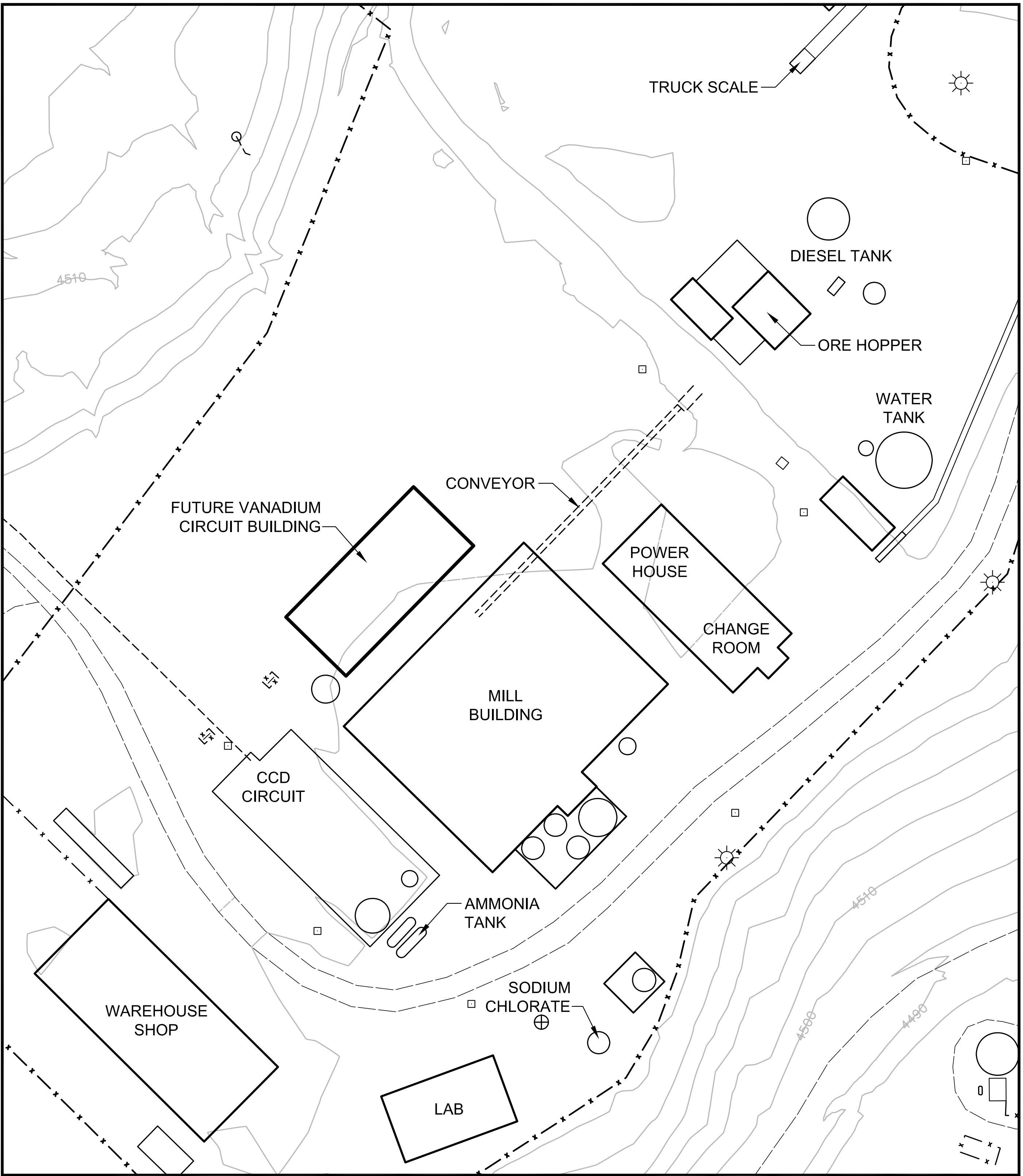
CONTOUR INTERVAL
10 FT.

URANIUM ONE

## FIGURE 2-1
## EXISTING CONDITIONS
## SHOOTARING CANYON
## URANIUM MILL SITE

| | |
|---|---|
| PROJECT: | 181692 |
| DATE: | MAY 2008 |
| FILE: | FIG-EX-COND |

TETRA TECH



URANIUM ONE

## FIGURE 2-2
## SHOOTARING CANYON URANIUM MILL PLANT AND RELATED FACILITIES

| | |
|---|---|
| PROJECT: | 181692 |
| DATE: | MAY 2008 |
| FILE: | FIG-MILL-01 |

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## EXPLANATION

### IGNEOUS ROCKS

TERTIARY

- Tp — Laccoliths, bysmaliths, and similar intrusions, mostly diorite porphyry, some basalt on Mount Ellen; some monzonite on Mount Pennell
- Tdp — Stocks, mostly diorite porphyry, some aplite, some quartz diorite porphyry on Mount Ellen; some monzonite porphyry on Mount Pennell
- Ts — Shattered sedimentary rocks irregularly intruded by igneous materials

### SEDIMENTARY ROCKS

CRETACEOUS — *Upper Cretaceous*

- Kmv — Mesaverde formation
- Mancos shale
  - Kmm — Masuk member
  - Kme — Emery sandstone member
  - Kmbg — Blue Gate shale member
  - Kmf — Ferron sandstone member
  - Kmt — Tununk shale member
- Kd — Dakota sandstone

*UNCONFORMITY*

JURASSIC — *Upper Jurassic*

- Jm — Morrison formation

*UNCONFORMITY*

- San Rafael group
  - Js — Summerville formation
  - Jcu — Curtis formation

*UNCONFORMITY*

  - Je — Entrada sandstone
  - Jca — Carmel formation

*UNCONFORMITY*

JURASSIC (?)

- Glen Canyon group
  - Jn — Navajo sandstone
  - Jk — Kayenta formation
  - Jw — Wingate formation

*UNCONFORMITY*

TRIASSIC — *Upper Triassic*

- Ŧc — Chinle formation
- Ŧs — Shinarump conglomerate

*UNCONFORMITY*

*Lower Triassic*

- Ŧm — Moenkopi formation

*UNCONFORMITY*

PERMIAN

WESTERN SEQUENCE

- Pk — Kaibab limestone
- Pc — Coconino sandstone

EASTERN SEQUENCE

- Pwr, Por, Pcm — Cutler formation

Pwr, *White Rim sandstone member*
Por, *Organ Rock tongue;* Pcm, *Cedar Mesa sandstone member*
*(*Por *and* Pcm *not mapped on Mt. Ellsworth)*

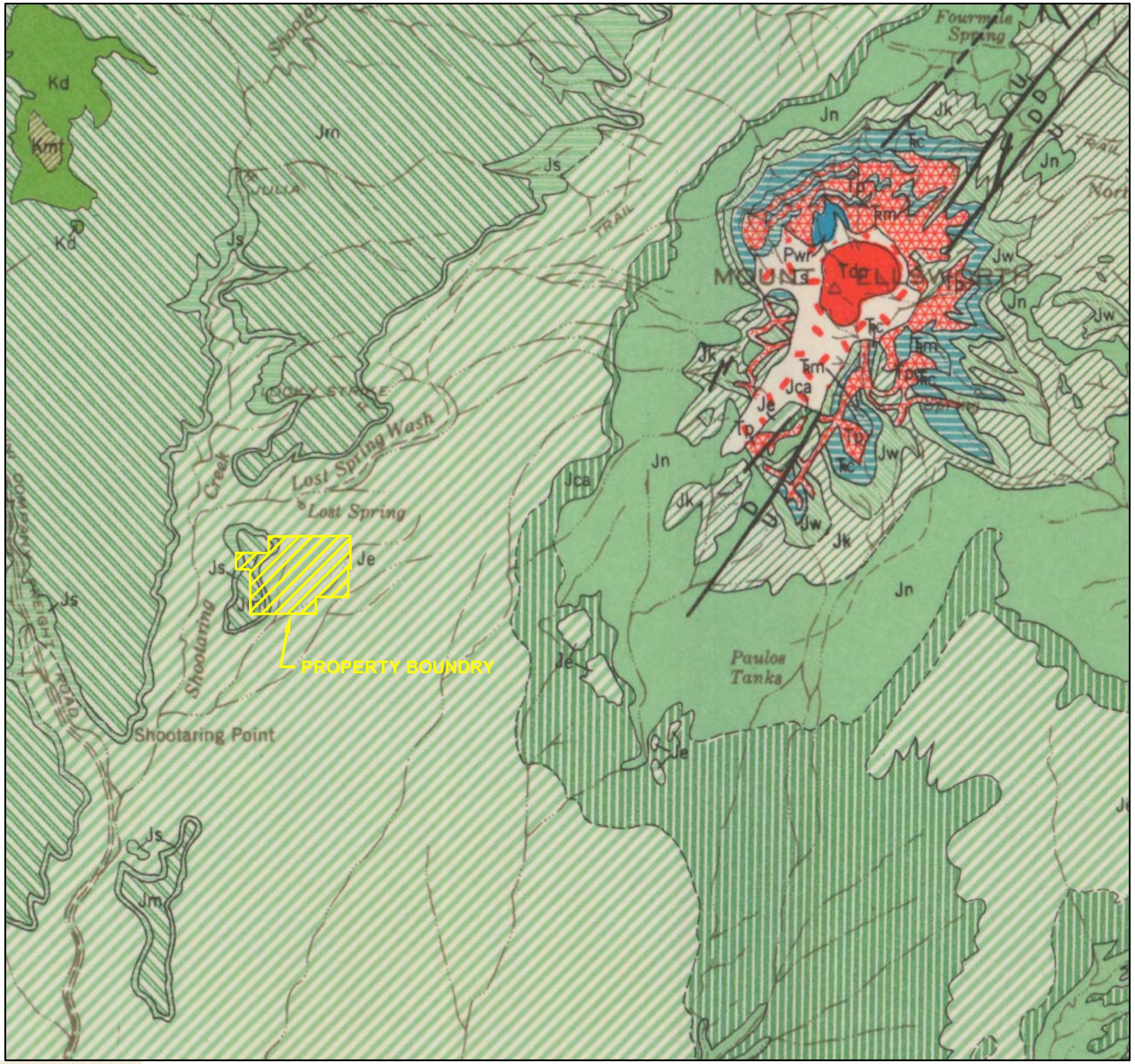
Contact, dashed where approximately located

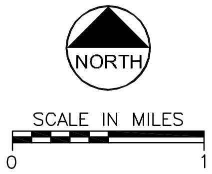
Fault, showing dip
*Dashed where approximately located, dotted where concealed.* U, *upthrown side;* D, *downthrown side*

Vertical fault

Spring or tank

Prospect





Source:
Hunt, C.B., et al. 1939. "Geologic Map of the Henry Mountains Region, Utah", United States Department of the Interior Geological Survey, Professional Paper 228, Plate 1.

URANIUM ONE

FIGURE 2-3
SHOOTARING CANYON
URANIUM MILL SITE
REGIONAL GEOLOGIC MAP

| | |
|---|---|
| PROJECT: | 181692 |
| DATE: | MAY 2008 |
| FILE: | GEO-REGIONAL |

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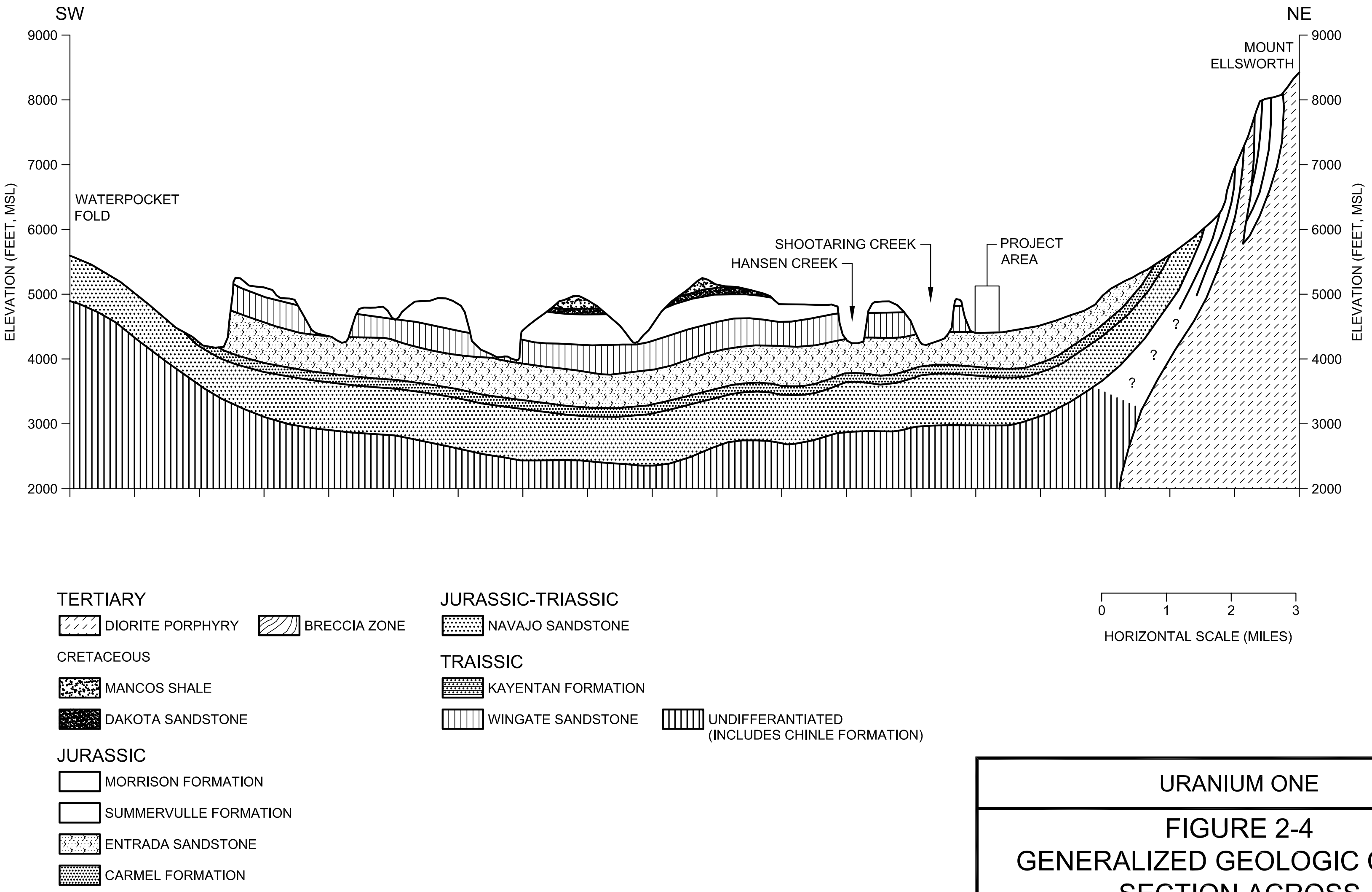


Source: Hydro-Engineering, 2005b
(Developed from USGS Geological Survey, 1952.).

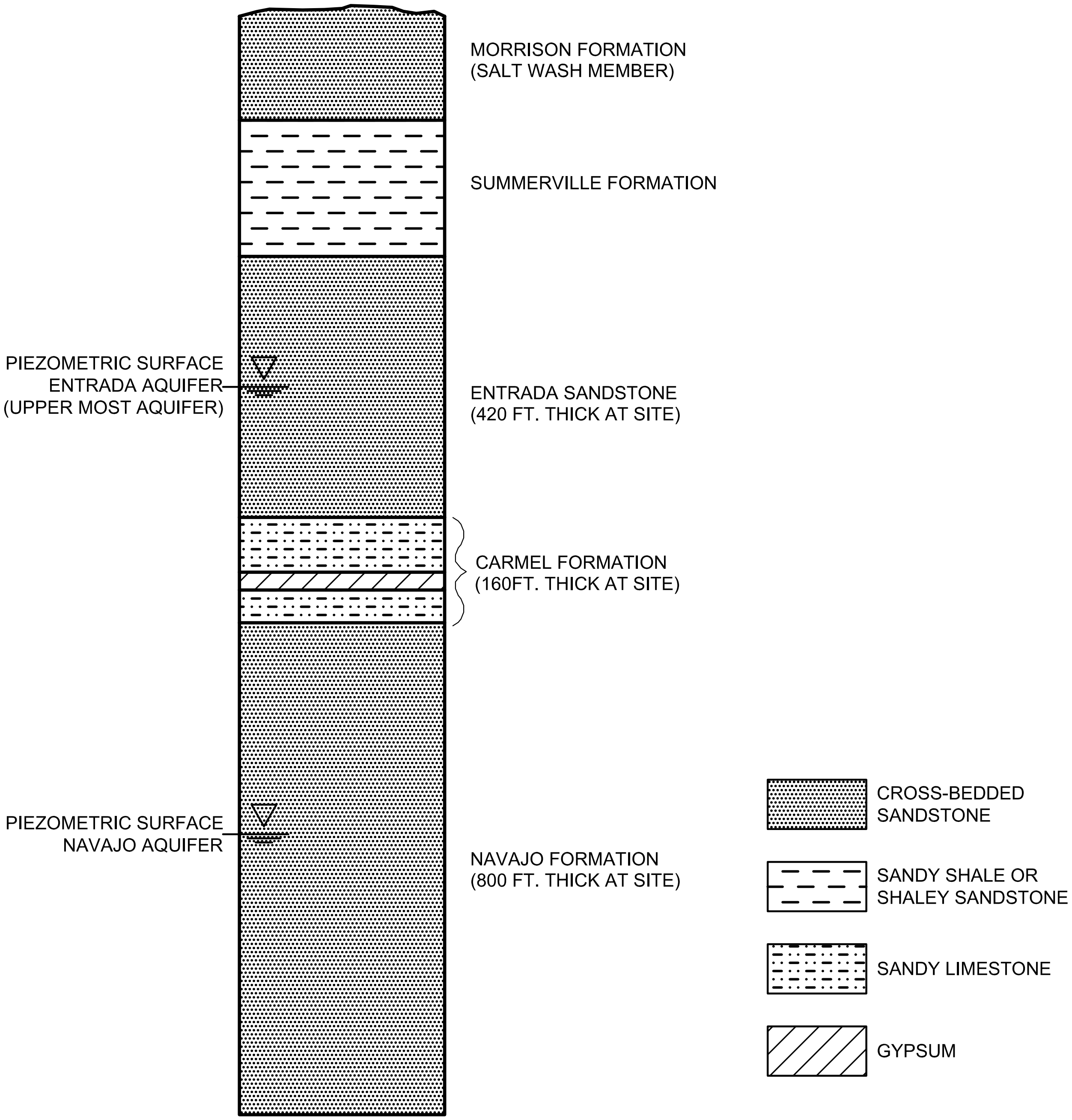
URANIUM ONE

## FIGURE 2-4
## GENERALIZED GEOLOGIC CROSS SECTION ACROSS THE HENRY MOUNTAIN BASIN

| | |
|---|---|
| PROJECT: | 181692 |
| DATE: | MAY 2008 |
| FILE: | FIG-GEO-XS-01 |

TETRA TECH

# SHOOTARING STRATIGRAPHIC SECTION



Based on: Hydro-Engineering, 2005b

URANIUM ONE

FIGURE 2-5
GENERALIZED SHOOTARING
STRATIGRAPHIC SECTION

| | |
|---|---|
| PROJECT: | 181692 |
| DATE: | MAY 2008 |
| FILE: | FIG-GEO-XS-01 |

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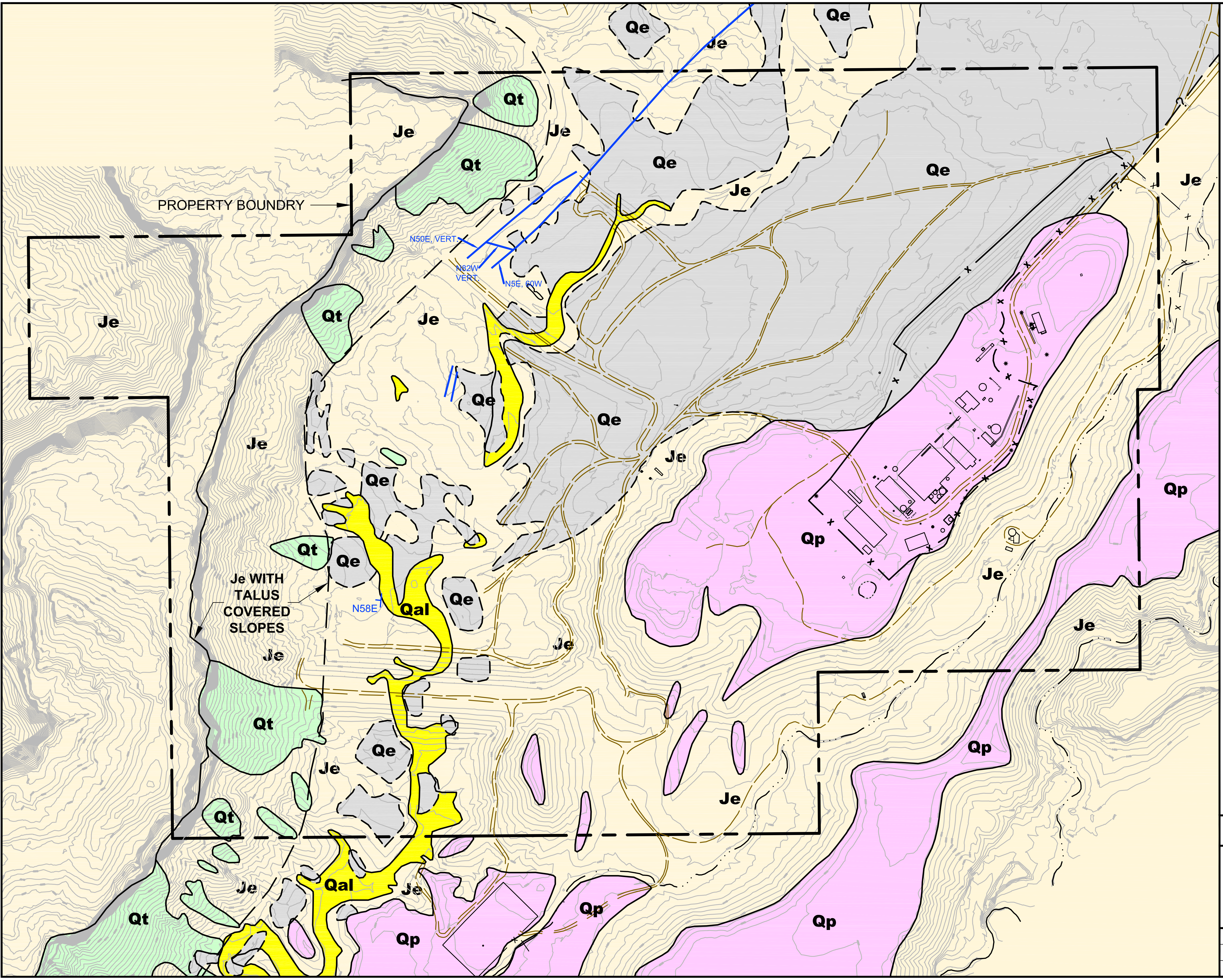

LEGEND

| | |
|---|---|
| **Qal** | STREAM DEPOSITS |
| **Qt** | TALUS DEPOSITS |
| **Qe** | EOLIAN SAND |
| **Qp** | PEDIMENT GRAVELS |
| **Je** | ENTRADA FORMATION |
| – – | APPROX. LIMITS OF SIGNIFICANTLY THICK EOLIAN SAND |
| ― | APPROXIMATE LITHOLOGIC CONTACT |
| ― | FAULT |
| N58E┤ | STRIKE AND DIP INFORMATION |

Based on:
Woodward-Clyde Consultants, 1978. Tailings Management Plan and Geotechnical Engineering Studies, Shootaring Canyon Project, Garfield County, Utah, September.

NORTH

SCALE IN FEET
0 400

CONTOUR INTERVAL
10 FT.

URANIUM ONE

FIGURE 2-6
SHOOTARING CANYON
URANIUM MILL SITE
GEOLOGIC MAP

PROJECT: 181692
DATE: MAY 2008
FILE: GEOLOGY-SITE

TETRA TECH

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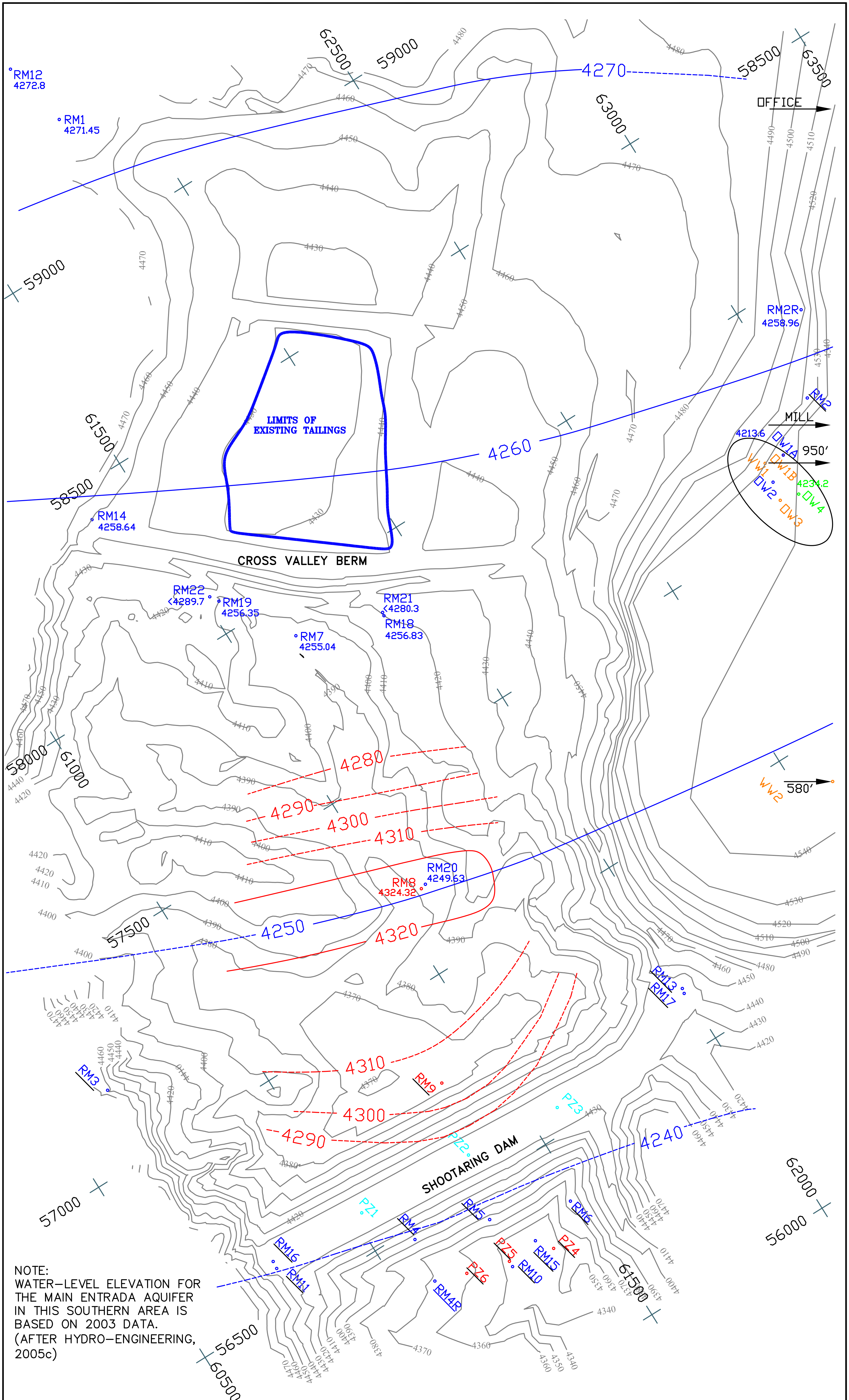
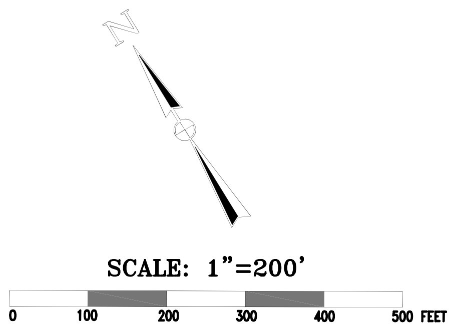


NOTE:
WATER-LEVEL ELEVATION FOR THE MAIN ENTRADA AQUIFER IN THIS SOUTHERN AREA IS BASED ON 2003 DATA. (AFTER HYDRO-ENGINEERING, 2005c)



SCALE: 1"=200'

Source: Hydro-Engineering, 2005c and Tetra Tech, 2008.

**--LEGEND--**

| | |
|---|---|
| ° RM1 | ENTRADA WELL |
| ° RM8 | PERCHED WATER ZONE WELL |
| ° PZ1-PZ3 | DAM PIEZOMETER |
| • DW4 | CARMEL WELL |
| ° DW3 | NAVAJO WELL |
| RM10 | ABANDONED WELL |
| 4246.8 | PERCHED WATER ZONE PIEZOMETRIC SURFACE |
| 4237.7 | ENTRADA PIEZOMETRIC SURFACE |

URANIUM ONE

FIGURE 2-7
WATER-LEVEL ELEVATION IN THE PERCHED WATER ZONE AND ENTRADA AQUIFER, DECEMBER 2007, FT-MSL

| | |
|---|---|
| PROJECT: | 181692 |
| DATE: | MAY 2008 |
| FILE: | FIG_2-3 |

TETRA TECH

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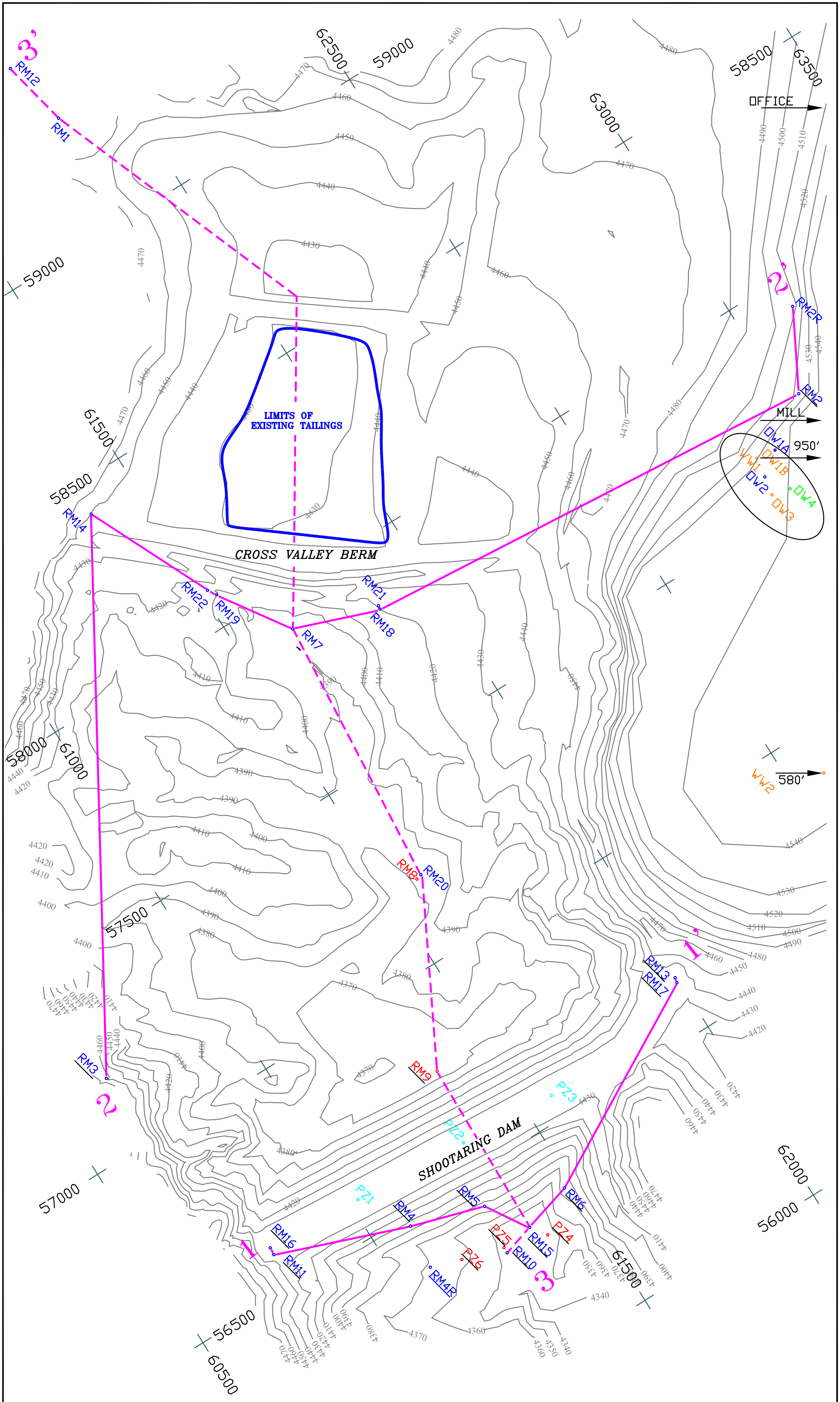


## --LEGEND--

| | |
|---|---|
| ○ RM1 | ENTRADA WELL |
| ○ RM10 | PERCHED WATER ZONE WELL |
| ○ PZ1-PZ3 | DAM PIEZOMETER |
| ○ DW4 | CARMEL WELL |
| ○ DW3 | NAVAJO WELL |
| RM10 | ABANDONED WELL |

SCALE: 1"=200'

0 100 200 300 400 500 FEET

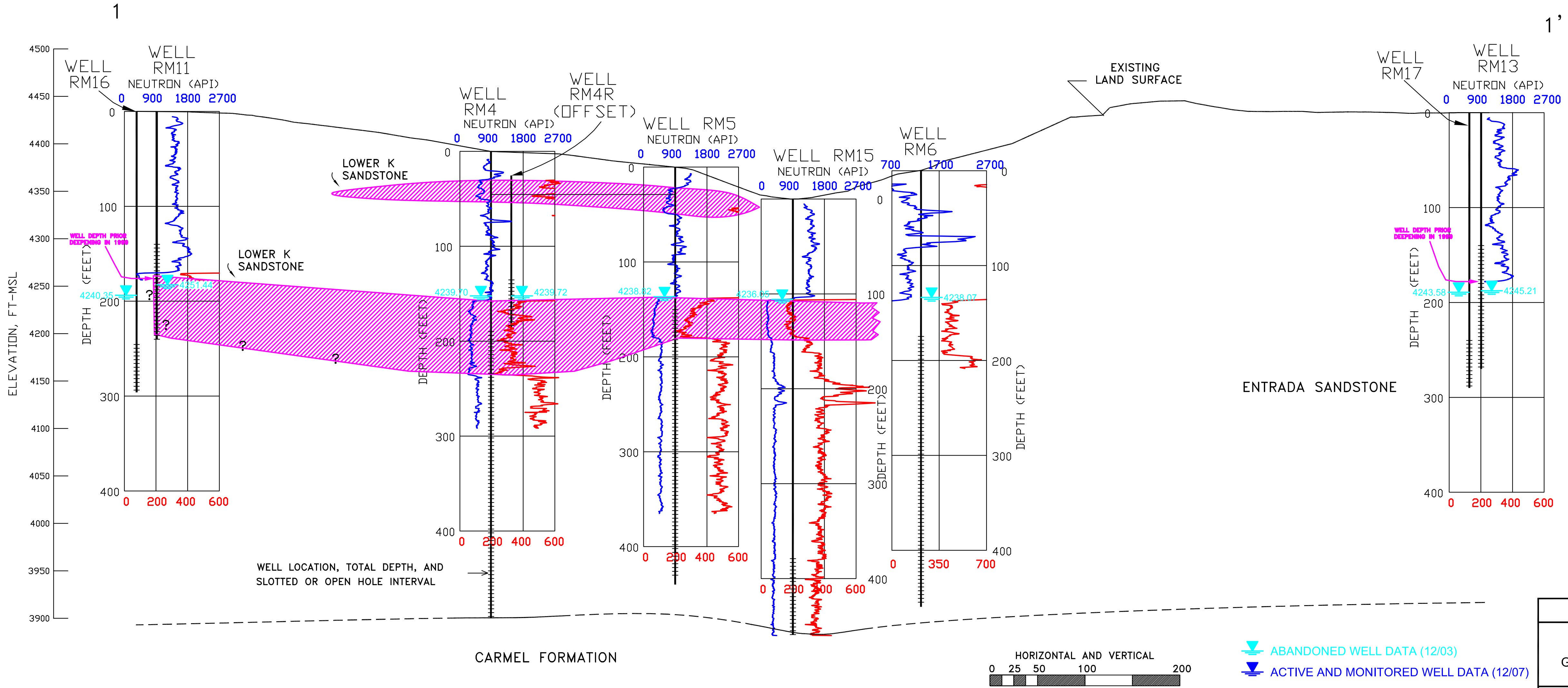
Source: Hydro-Engineering, 2005c

URANIUM ONE

FIGURE 2-8
LOCATION OF WELLS AND
GEOLOGIC CROSS SECTIONS

PROJECT: 181692
DATE: MAY 2008
FILE: FIG_2-4.DWG

TETRA TECH



Source: Hydro-Engineering, 2005c and Tetra Tech, 2008

URANIUM ONE

FIGURE 2-9
GEOLOGIC CROSS SECTION 1-1'

| | |
|---|---|
| PROJECT: | 181692 |
| DATE: | MAY 2008 |
| FILE: | FIG_2-5-7 |

TETRA TECH

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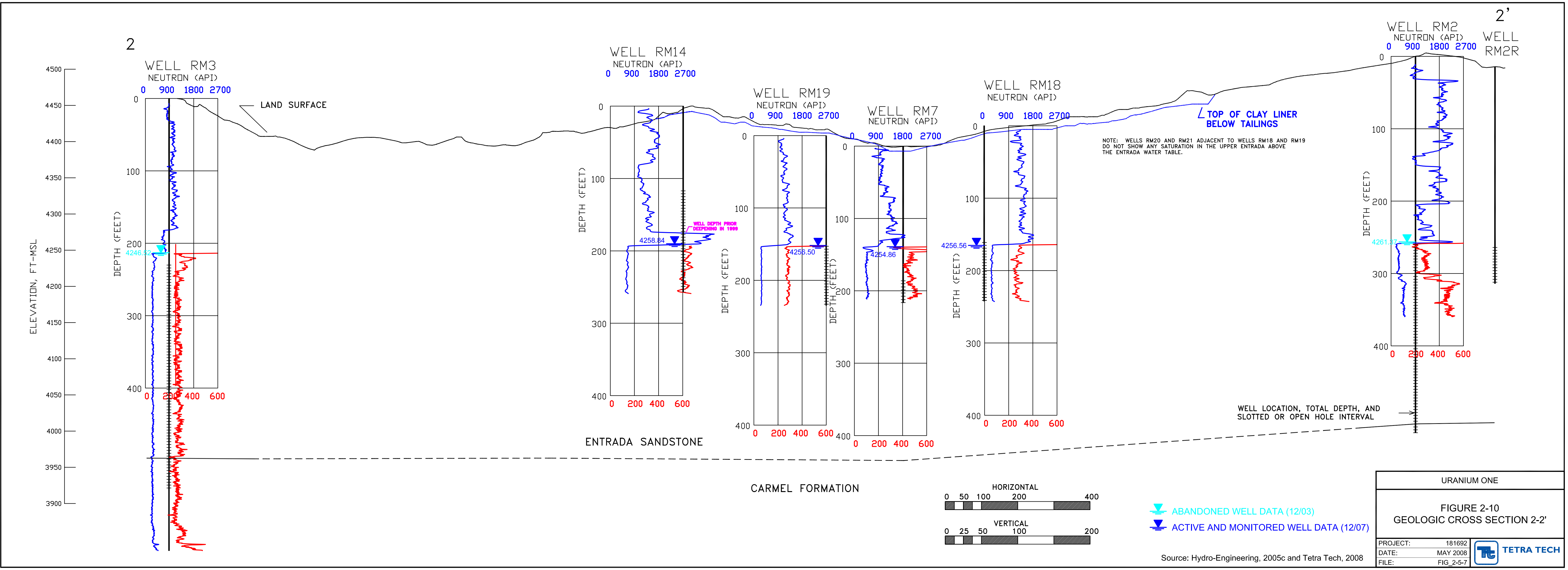

NOTE: WELLS RM20 AND RM21 ADJACENT TO WELLS RM18 AND RM19 DO NOT SHOW ANY SATURATION IN THE UPPER ENTRADA ABOVE THE ENTRADA WATER TABLE.

▼ ABANDONED WELL DATA (12/03)

▼ ACTIVE AND MONITORED WELL DATA (12/07)

Source: Hydro-Engineering, 2005c and Tetra Tech, 2008

URANIUM ONE

FIGURE 2-10
GEOLOGIC CROSS SECTION 2-2'

PROJECT: 181692
DATE: MAY 2008
FILE: FIG_2-5-7

TETRA TECH

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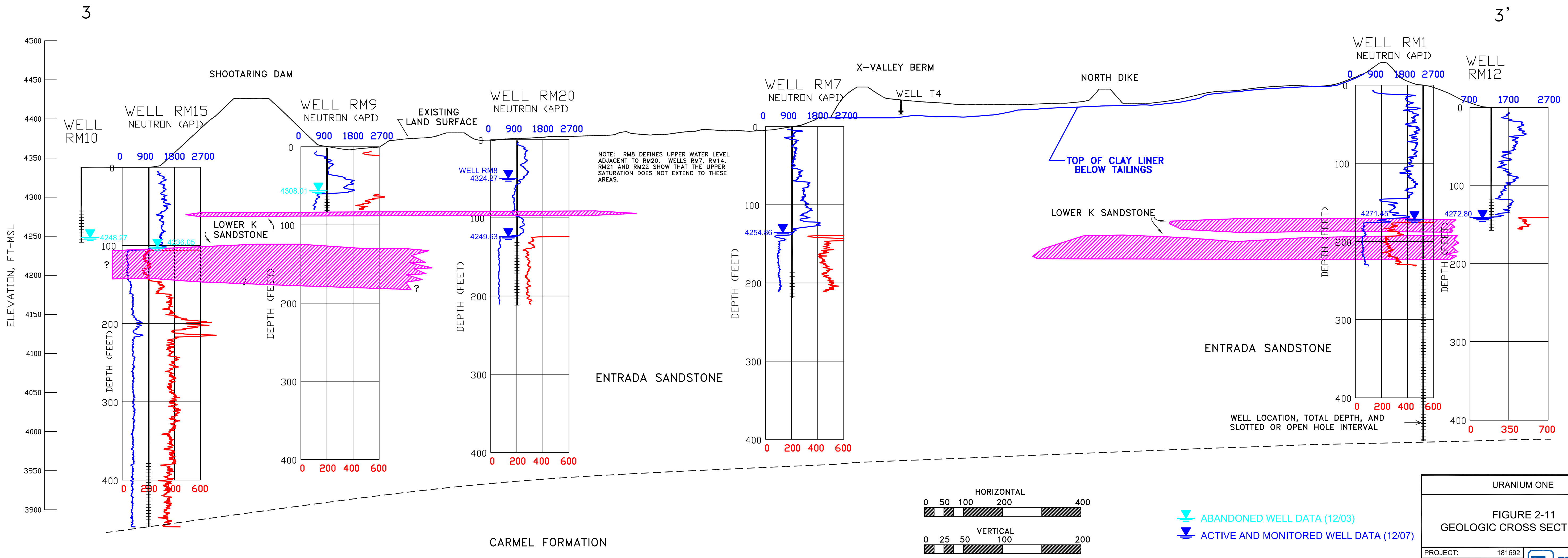

Source: Hydro-Engineering, 2005c and Tetra Tech, 2008

URANIUM ONE

FIGURE 2-11
GEOLOGIC CROSS SECTION 3-3'

| | |
|---|---|
| PROJECT: | 181692 |
| DATE: | MAY 2008 |
| FILE: | FIG_2-5-7 |

TETRA TECH

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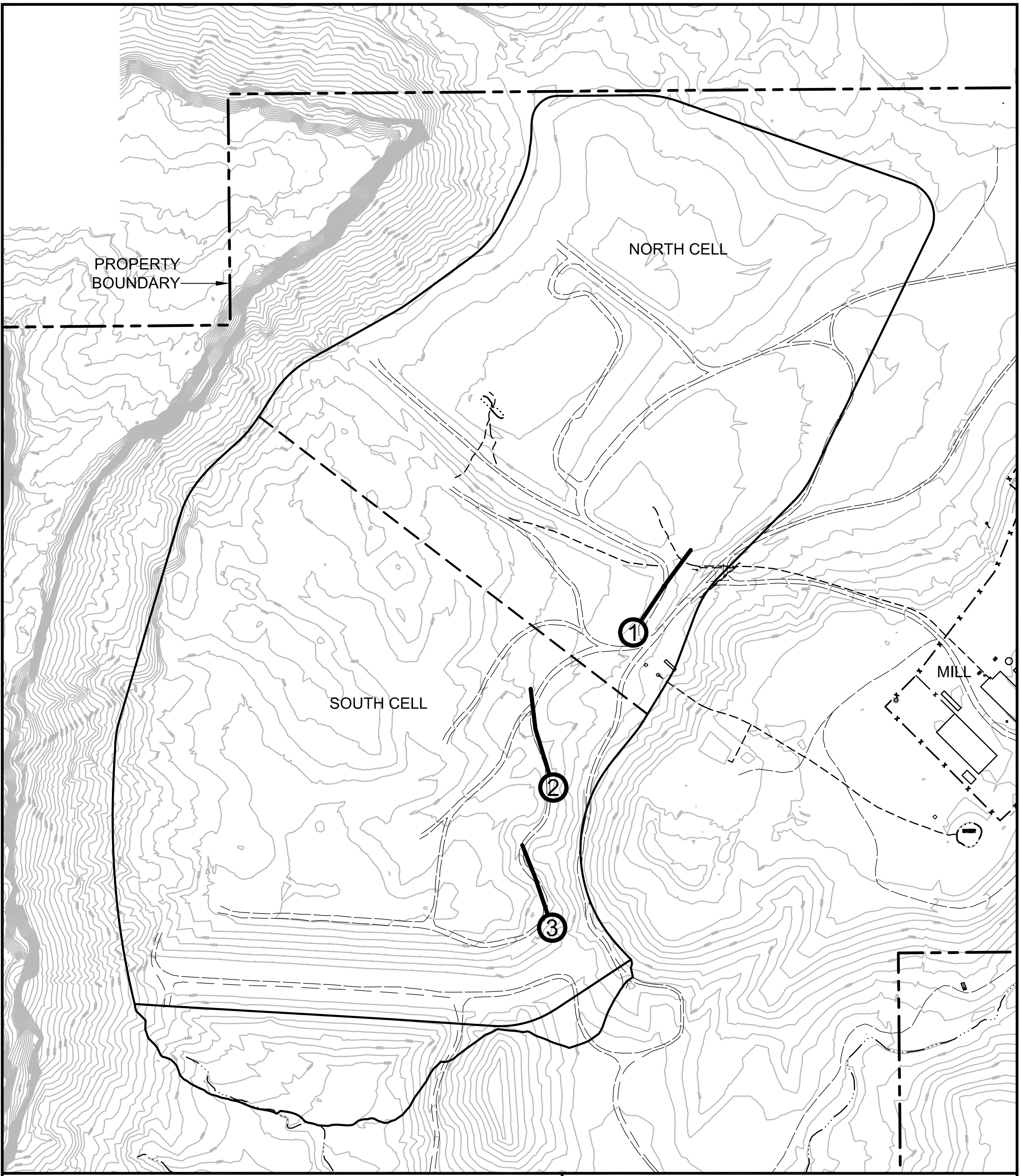

LEGEND

① SEISMIC LINES AND IDENTIFICATION

NORTH

SCALE IN FEET

0 400

CONTOUR INTERVAL
10 FT.

URANIUM ONE

## FIGURE 2-12
## MAY 4, 2008 GEOPHYSICAL SURVEY LOCATION OF SEISMIC LINES

| | |
|---|---|
| PROJECT: | 181692 |
| DATE: | MAY 2008 |
| FILE: | FIG-GEOPHYS-01 |

TETRA TECH

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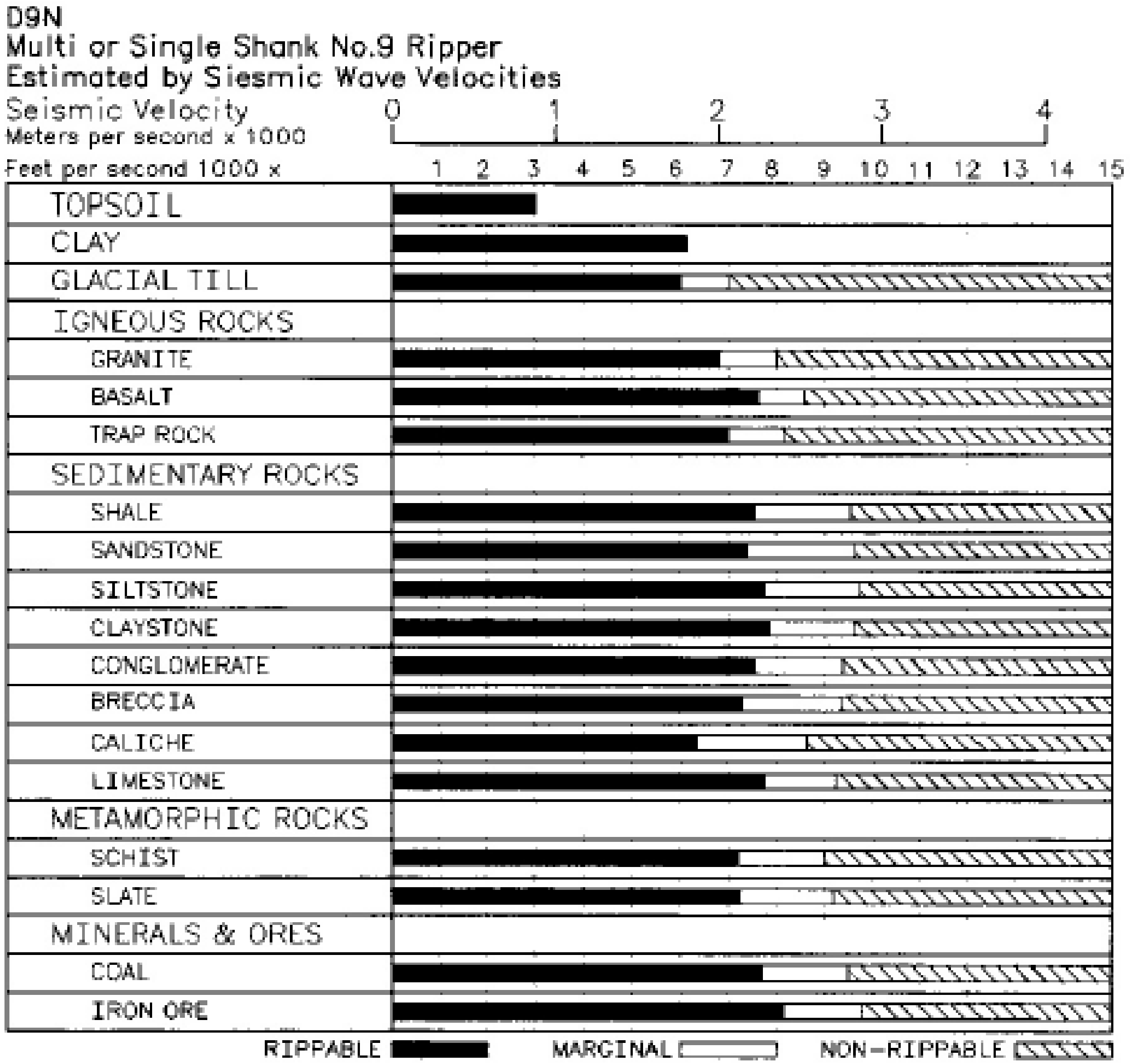

Reference: Caterpillar 2008. Caterpiller Performance Handbook. Page 164. January.

URANIUM ONE

FIGURE 2-13
ROCK RIPPABILITY AS RELATED TO
SEISMIC VELOCITIES
(CATERPILLAR)

| | |
|---|---|
| PROJECT: | 181692 |
| DATE: | MAY 2008 |
| FILE: | FIG-GEOPHYS-01 |

TETRA TECH

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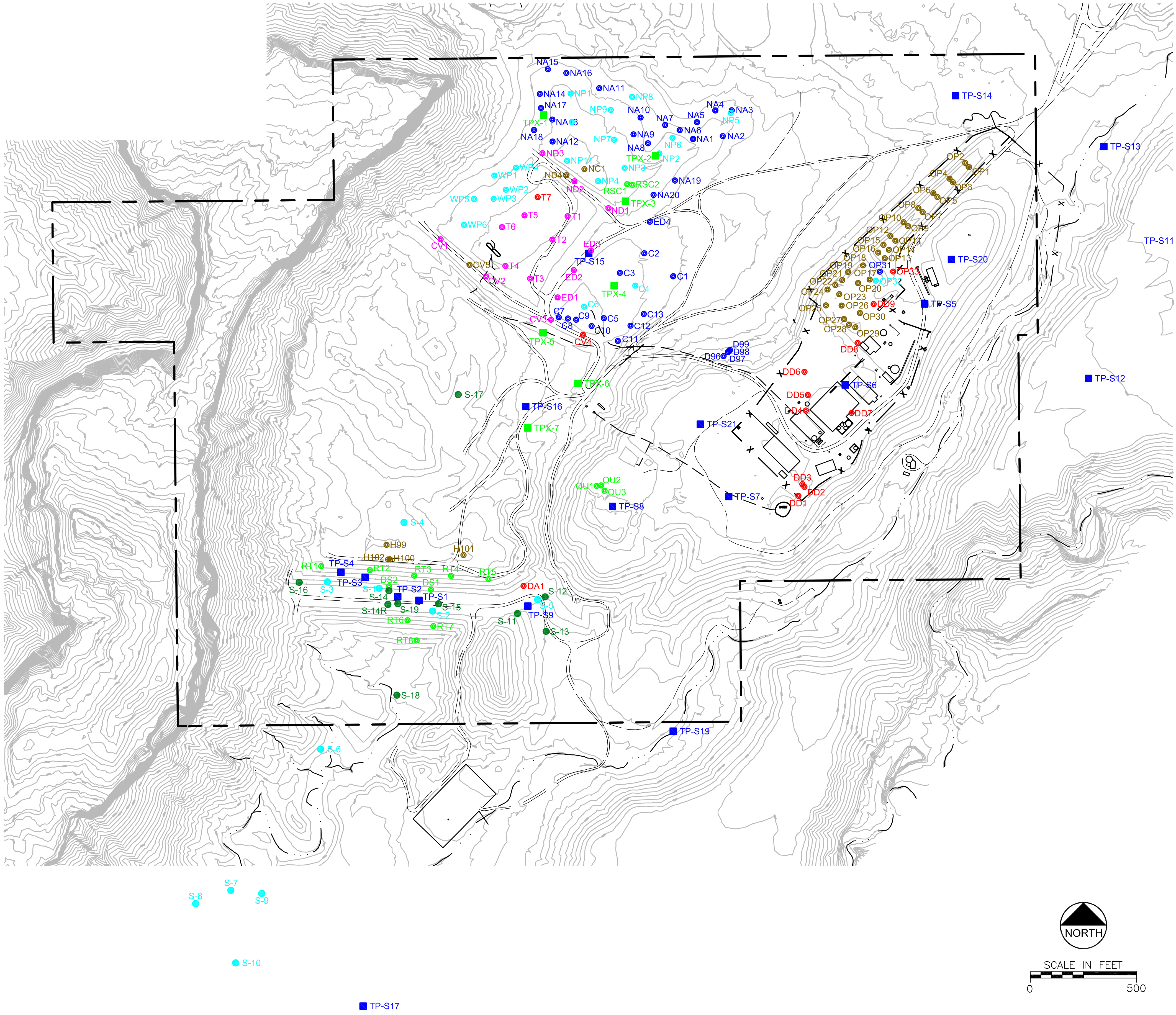

TP-S10 ■

## LEGEND

BORING, TEST PIT, AND SAMPLE LOCATIONS FROM HYDRO-ENGINEERING JUNE 2002 FIELD INVESTIGATION

NA15 ● HAND AUGER SITES

ND3 ● BACKHOE PIT SITES

WP4 ● BACKHOE PIT/ HAND AUGER OR DRILL SITES

CV4 ● DRILL HOLE SITES

RSC1 ● ROCK SAMPLE SITES

ND4 ● OTHER SAMPLE SITES

REFERENCE:
HYDRO-ENGINEERING. LLC. 2005. TAILINGS RECLAMATION AND DECOMMISSIONING PLAN FOR SHOOTARING CANYON URANIUM PROJECT, GARFIELD COUNTY, UTAH. DECEMBER 2005, REVISED DECEMBER 2006.

BORING AND TEST PIT LOCATIONS FROM WOODWARD-CLYDE CONSULTANTS SEPTEMBER/OCTOBER 1977 FIELD INVESTIGATION

S-5 ● TEST BORING LOCATION

TP-S1 ■ TEST PIT LOCATION

REFERENCE:
WOODWARD-CLYDE CONSULTANTS, 1978. PRELIMINARY GEOTECHNICAL ENGINEERING REPORT SHOOTARING CANYON URANIUM PROJECT, GARFIELD COUNTY, UTAH. APRIL.

BORING AND TEST PIT LOCATIONS FROM WOODWARD-CLYDE CONSULTANTS SEPTEMBER/OCTOBER 1978 FIELD INVESTIGATION

S-11 ● TEST BORING LOCATION

TPX-1 ■ TEST PIT LOCATION

REFERENCE:
WOODWARD-CLYDE CONSULTANTS, 1979. STAGE 1 - TAILINGS IMPOUNDMENT AND DAM FINAL DESIGN REPORT, SHOOTARING CANYON URANIUM PROJECT, GARFIELD COUNTY, UTAH. APRIL.

URANIUM ONE

FIGURE 2-14
HISTORICAL BORING, TEST PIT,
AND SAMPLE LOCATIONS

PROJECT: 181692
DATE: MAY 2008
FILE: FIG-EXPL-01

TETRA TECH

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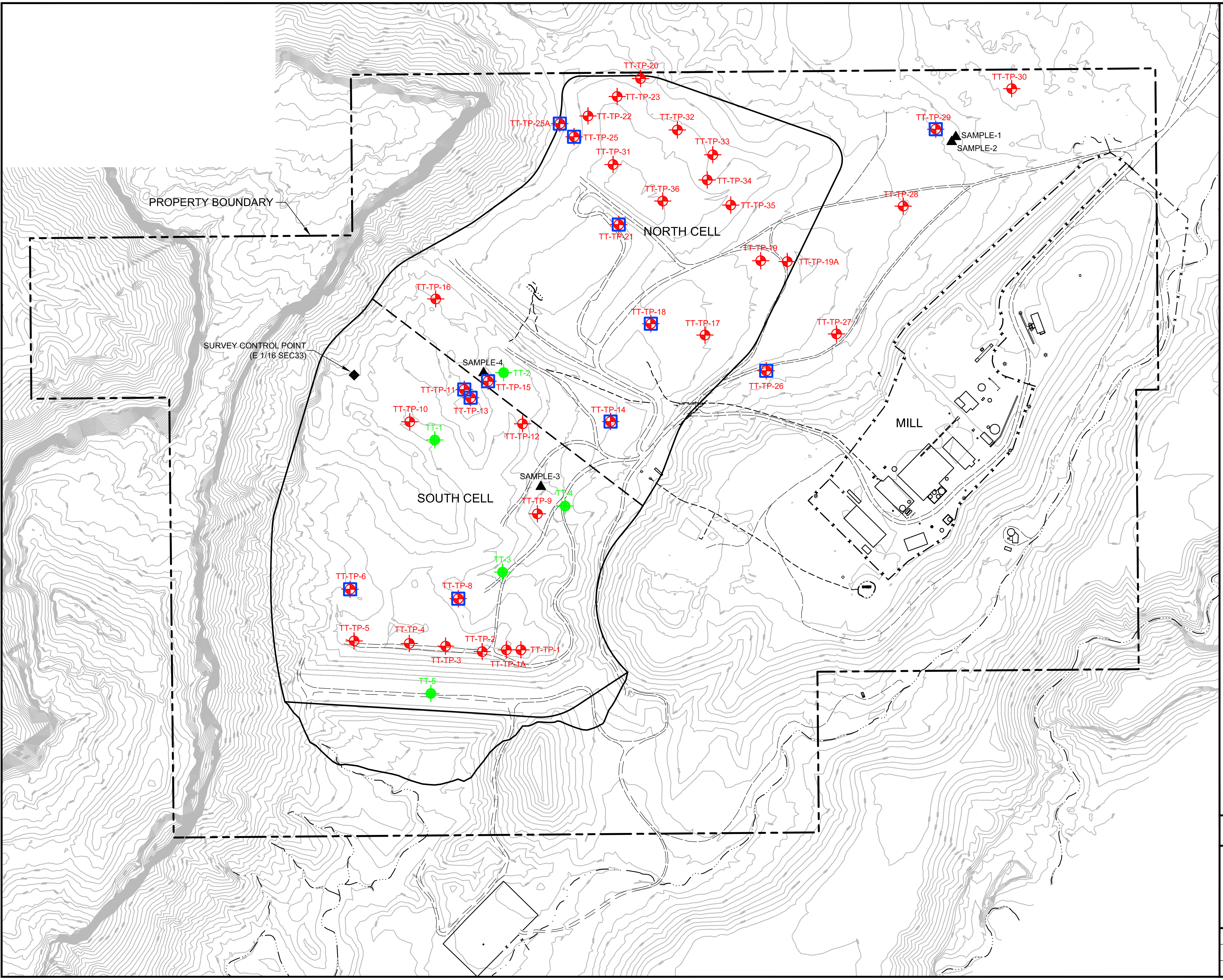

LEGEND

- 🟢 LOCATION BOREHOLES DRILLED APRIL 10-11, 2008
- 🔴 LOCATION OF TEST PITS EXCAVATED APRIL 17-19, 2008
- ▲ LOCATION OF TEST PITS EXCAVATED JANUARY 21, 2008
- ☐ LOCATION OF NUCLEAR DENSITY MEASUREMENTS, MARCH 8, 2008

NORTH

SCALE IN FEET
0 400

CONTOUR INTERVAL
10 FT.

URANIUM ONE

## FIGURE 2-15
## TETRA TECH 2008 FIELD INVESTIGATIONS BOREHOLE AND TEST PIT LOCATIONS

PROJECT: 181692
DATE: MAY 2008
FILE: FIG-GEO-INV-01

TETRA TECH

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E:\181692\design\FIG_CLAYLEASE.dwg SAVED: 5/23/08 PRINTED: 5/27/08 BY: TOM.BOEHLER

Project No. 181692

May 2008

FIGURE 2-16
LOCATION OF CLAY LEASE AREA

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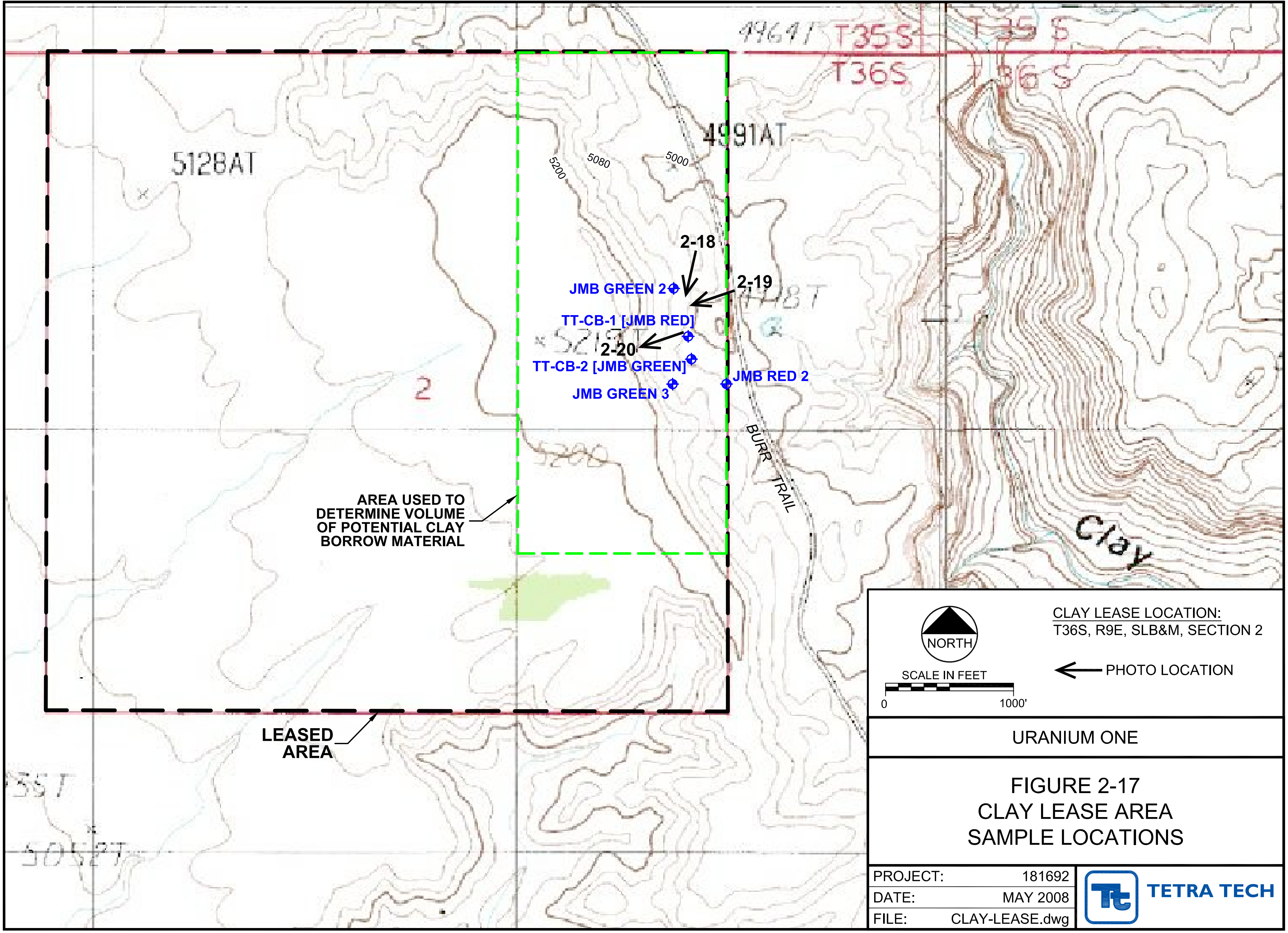


CLAY LEASE LOCATION:
T36S, R9E, SLB&M, SECTION 2

URANIUM ONE

# FIGURE 2-17
# CLAY LEASE AREA SAMPLE LOCATIONS

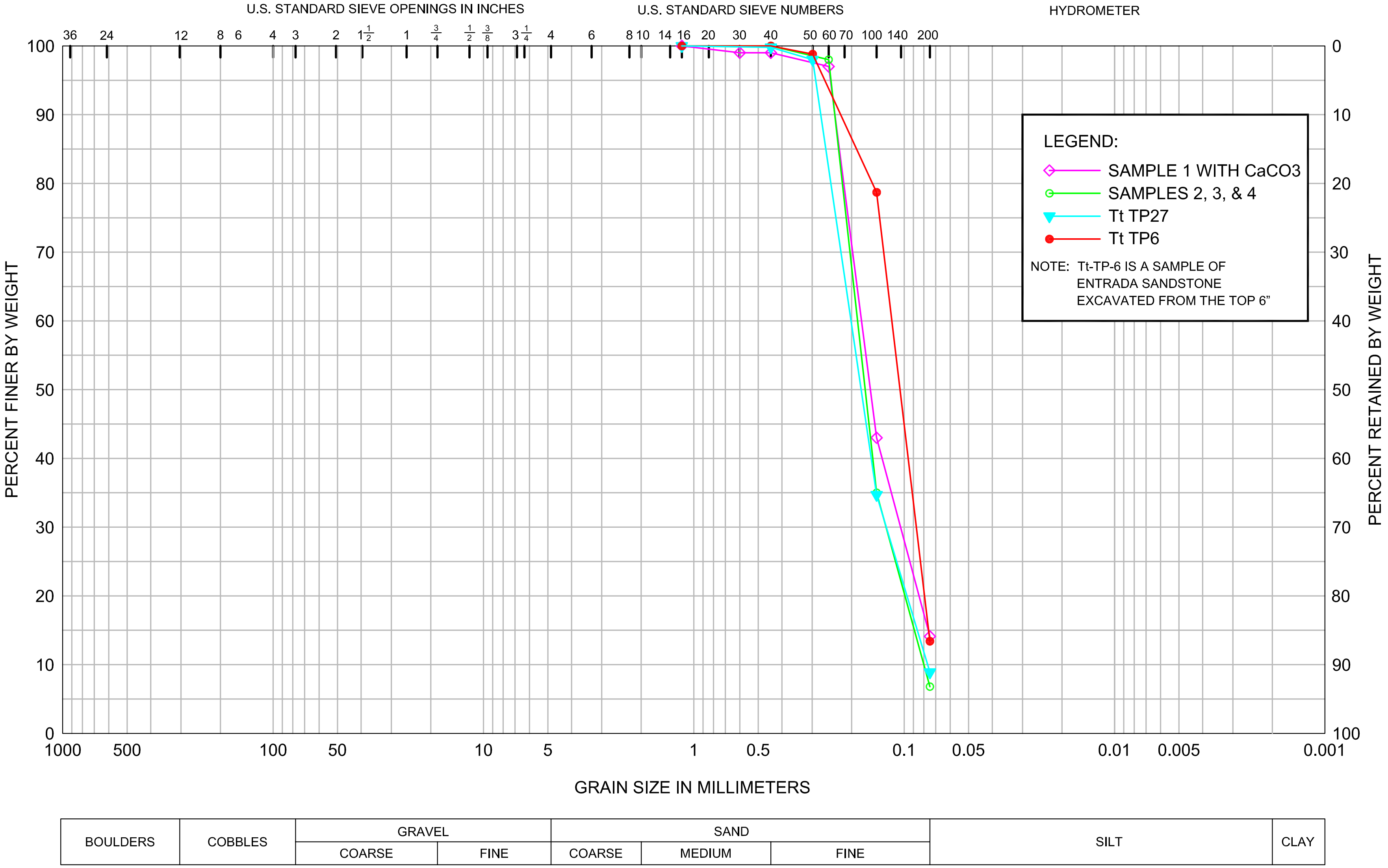
| | |
|---|---|
| PROJECT: | 181692 |
| DATE: | MAY 2008 |
| FILE: | CLAY-LEASE.dwg |

TETRA TECH

**Figure 2-18**
**Section 2 Clay Borrow Area**

**Figure 2-19**
**"Popcorn" Texture of Brushy Basin Soils**

**Figure 2-20**
**Sand in Brushy Basin Member**

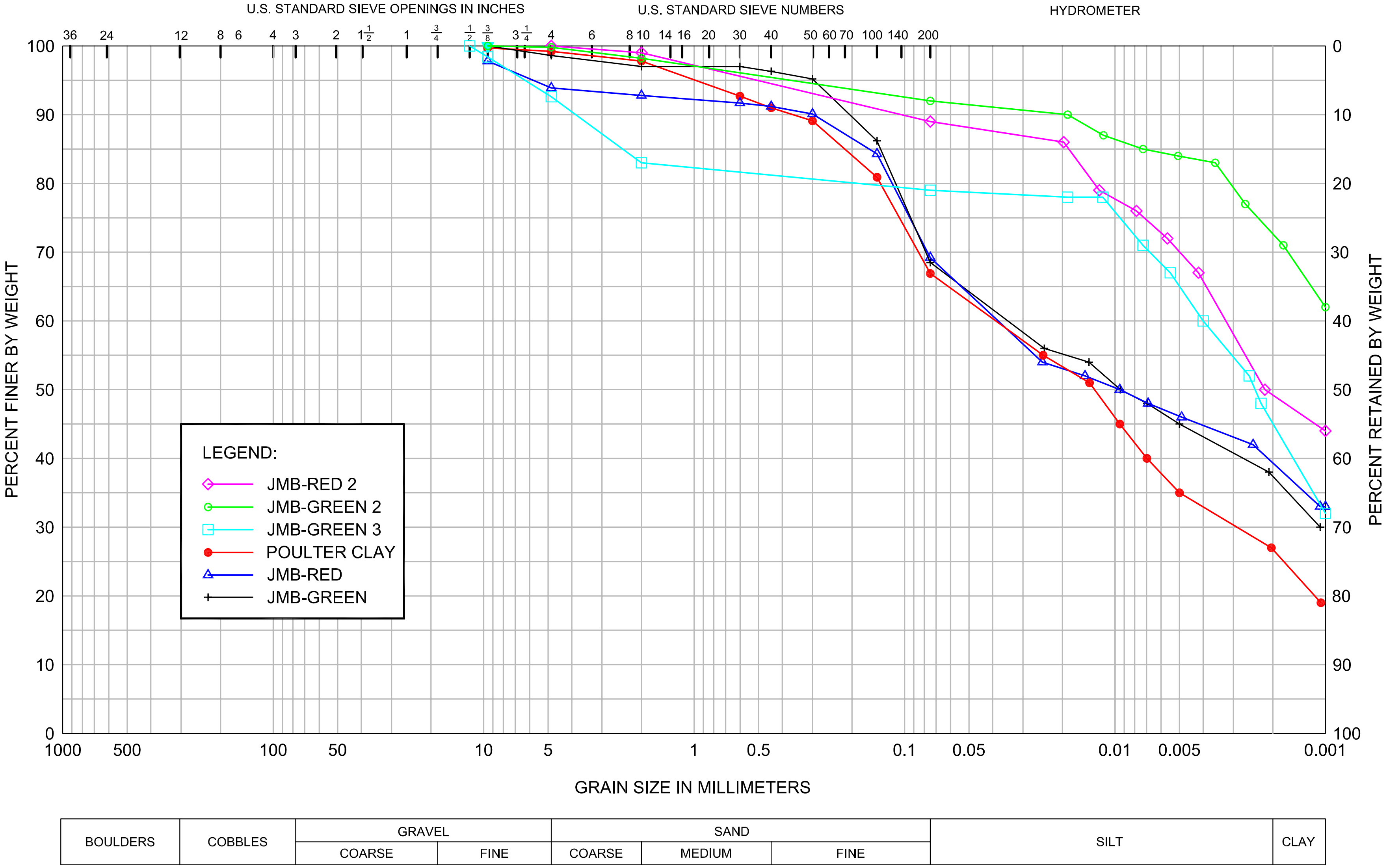


NOTE: Tt-TP-6 IS A SAMPLE OF
ENTRADA SANDSTONE
EXCAVATED FROM THE TOP 6”

Project No. 181692

May 2008

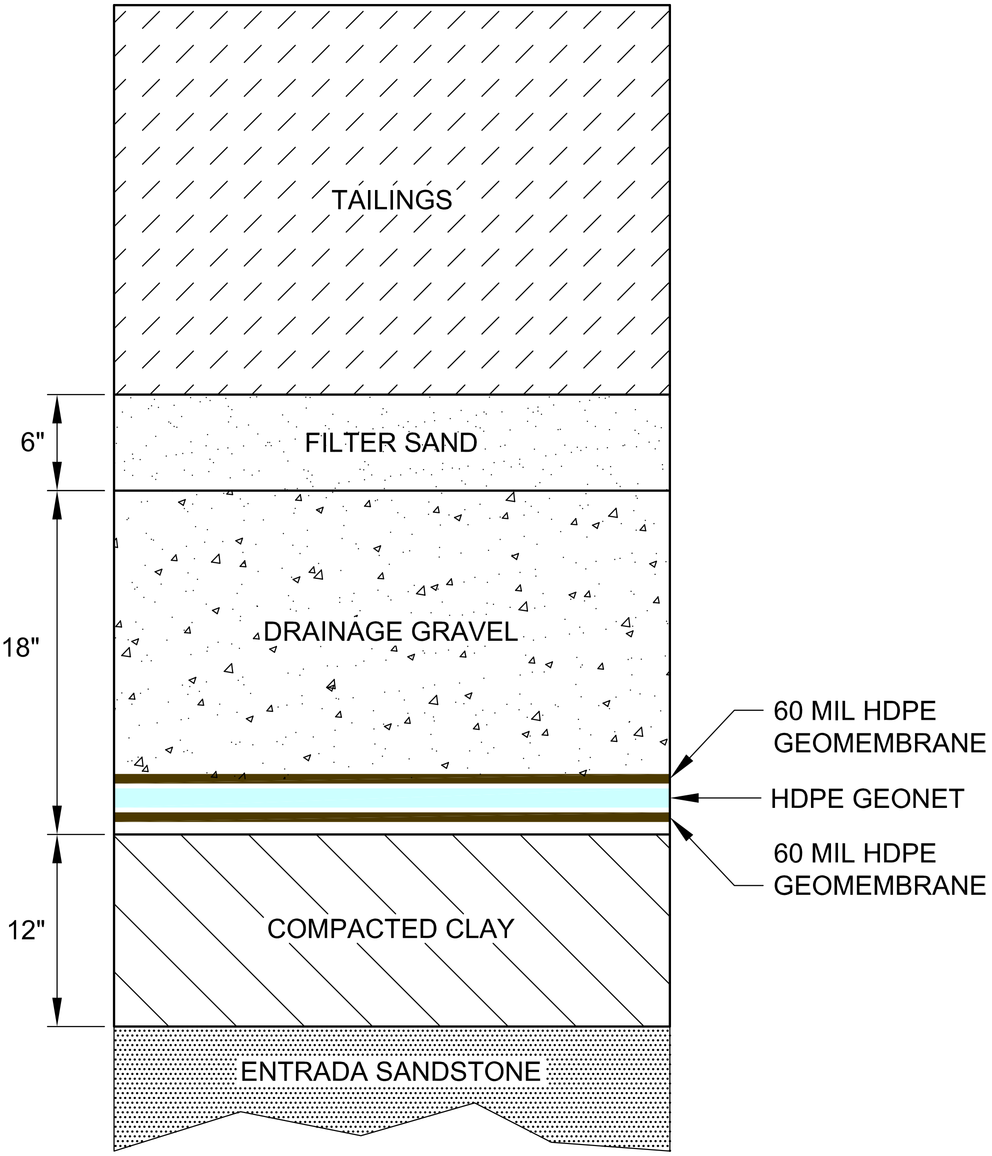
## FIGURE 2-21
## PARTICLE SIZE DISTRIBUTION CURVES FOR SAND SAMPLES



Project No. 181692

May 2008

## FIGURE 2-22
## PARTICLE SIZE DISTRIBUTION CURVES FOR CLAY SAMPLES



NOT TO SCALE

URANIUM ONE

# FIGURE 7-1
# TAILINGS STORAGE FACILITY LINER SYSTEM

| | |
|---|---|
| PROJECT: | 181692 |
| DATE: | MAY 2008 |
| FILE: | FIG-LINER-01 |

TETRA TECH

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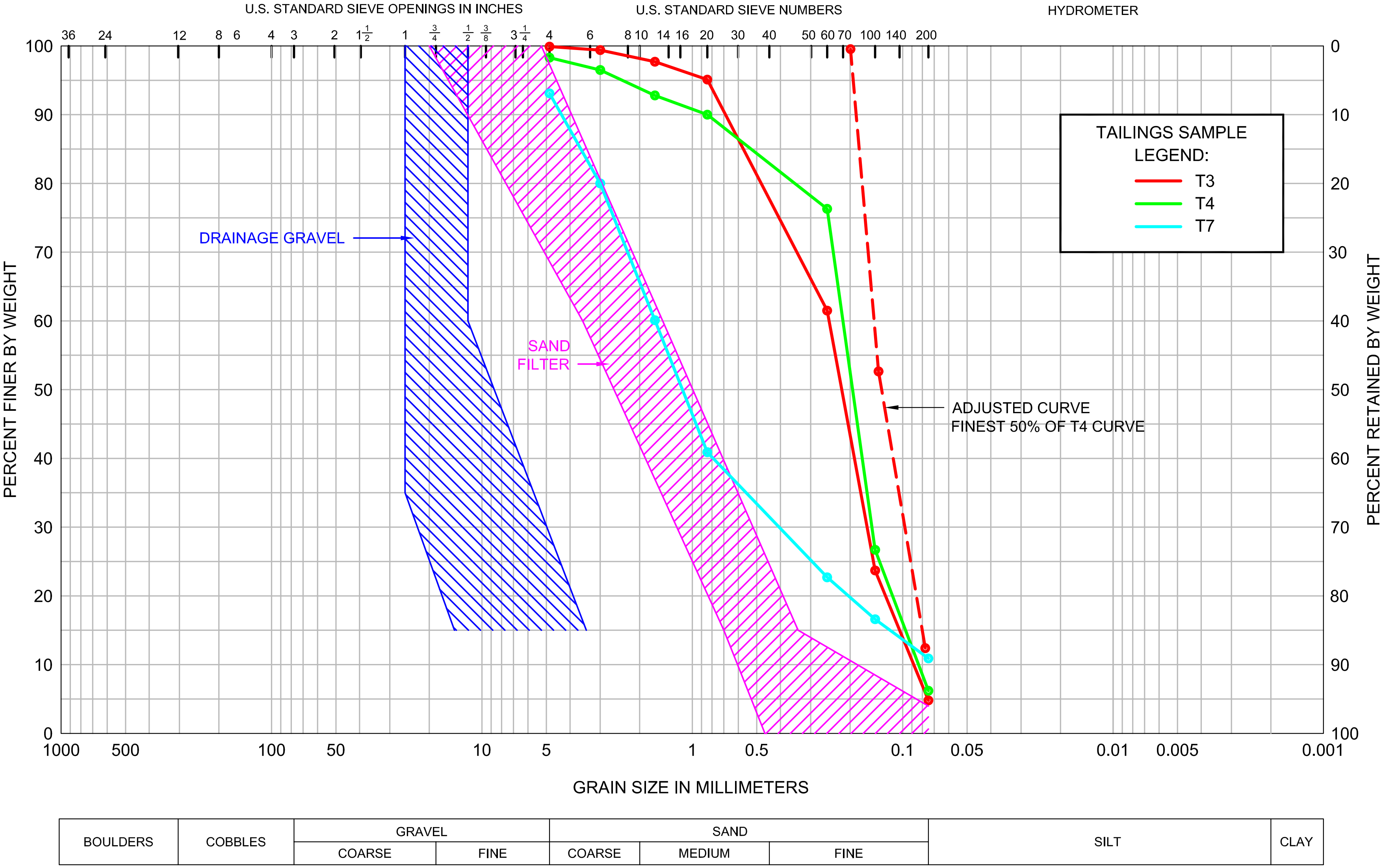
E: \181692\design\FIG-GSD-CHRT-EL.dwg SAVED: 5/9/08 PRINTED: 5/27/08 BY: TOM.BOEHLER

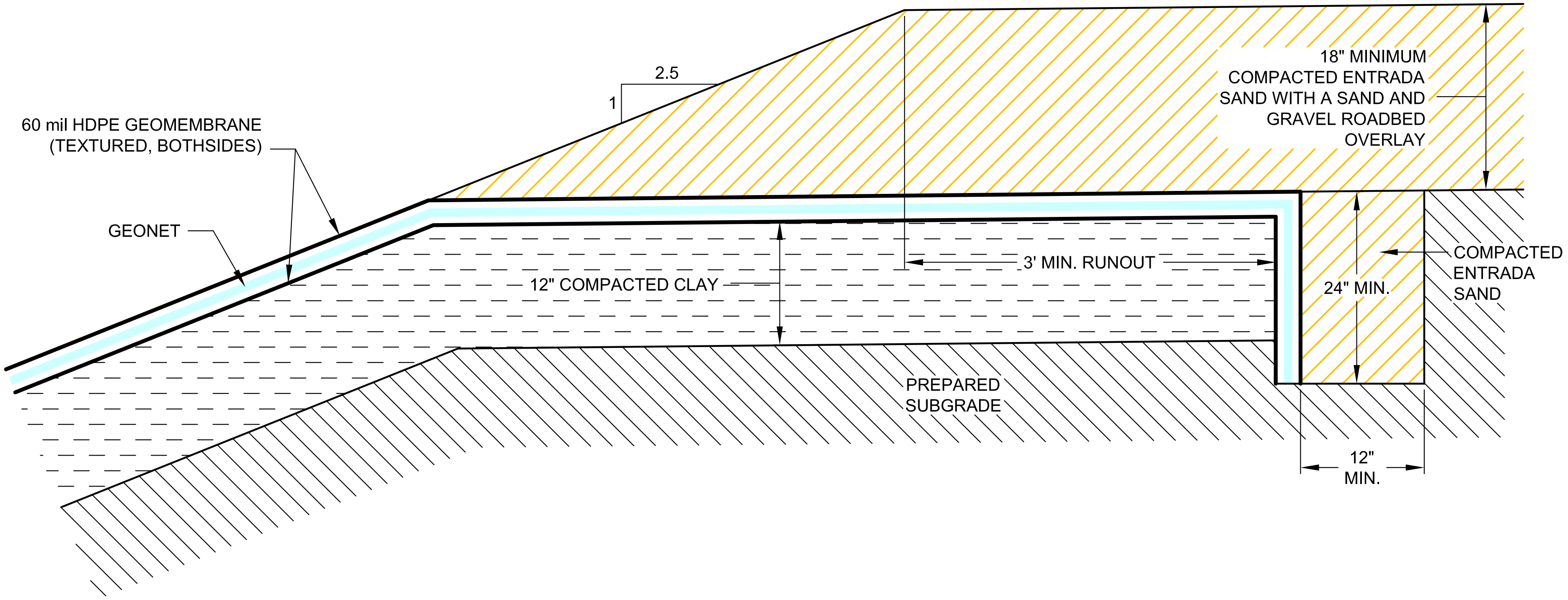


Project No. 181692

May 2008

**Figure 7-2**
**Gradation Curves**
**Shootaring Tailings, Sand Filter, and Drainage Gravel**

E:\181692\design\FIG-LINER-01.dwg SAVED: 5/12/08 PRINTED: 5/27/08 BY: TOM.BOEHLER



NOT TO SCALE

URANIUM ONE

# FIGURE 7-3
# LINER ANCHOR TRENCH TYPICAL DETAIL

| | |
|---|---|
| PROJECT: | 181692 |
| DATE: | MAY 2008 |
| FILE: | FIG-LINER-01 |

TETRA TECH

# APPENDICES

# APPENDIX A
# GEOPHYSICAL INVESTIGATION

# APPENDIX A
## Geophysical Investigation

Tetra Tech conducted a geophysical survey in Utah at the Shootaring Canyon Uranium Mill site to assist in mapping the potential rippability of sandstone at the site. This work was completed to assist in the construction of a Tailings Storage Facility (TSF) at the site.

The geophysical survey using seismic refraction was conducted on March 4, 2008. The seismic refraction method was used to collect seismic data at 3 locations at the site. The refraction survey was successful in providing data to assist in the mapping the potential rippability of the sandstone bedrock. This report provides a brief summary and description of the site background, the seismic methodology, field investigation activities, and interpretation of results from the geophysical surveys.

## SITE DESCRIPTION

The site is located in an area characterized by buttes, mesas and canyons approximately five miles southwest of Mt. Ellsworth of the Henry Mountains. The mill is situated on a low mesa and a small, isolated catchment to the west contains the TSF. A tall butte separates the site from Shitamaring Canyon. Drainage from the site is to the southwest into Shitamaring Creek. The tributary in which the tailings dam is located has been called Shootaring Canyon. Local relief ranges from 200 to 500 feet. Geologic structure is relatively simple in the immediate area, with the various sedimentary formations dipping gently (2 to 3 degrees) to the west.

Sedimentary rocks exposed at the surface are predominantly sandstones of Upper Jurassic age. The high buttes and mesas west and north of the site are capped by the Salt Wash Member of the Morrison Formation. This fluvial sandstone unit contains the uranium deposits that are mined in the area. Exposed cliffs surrounding the buttes and mesas are comprised primarily of thinly bedded reddish-brown siltstones and mudstones of the Summerville Formation, underlain by the generally massive fine grained reddish-brown Entrada Sandstone. The Entrada Sandstone is the bedrock underlying the mill and the TSF. Review of the boring log Tt-4 (see Appendix C.3) indicates that sandstone is present to the base of the boring (60 feet). The boring log indicates that the sandstone is medium to fine grained and thinly bedded at the site.

## APPROACH AND GEOPHYSICAL METHODS

A brief description of the seismic refraction methodology and theory is included. Seismic methods require the generation of a sound wave into the subsurface of the earth and instrumentation to measure and record the refracted waves. This is accomplished by the use of a seismic source (hammer and plate, shotgun, explosive, etc.), seismograph, and a length of cable with multiple geophones. The seismograph measures the travel times of elastic waves generated by the source through the subsurface. Geophones sense the seismic vibrations, convert them to electrical impulses and send them to the seismograph to be recorded.

The refraction method measures the compressional wave (p-wave) velocity to image the subsurface. Refraction wave paths cross boundaries between materials in a way that energy travels from source to receiver in the shortest possible time. Source to receiver travel time of and the corresponding geometry of the geophone spread are then used to calculate velocities and depths. The seismic velocities are characteristic of the type and density of the unconsolidated material and or rock represented.

The seismic refraction data is interpreted using software for selecting first arrival times and calculating the seismic velocities for each unit and the depth to rock. This process provides high-resolution seismic refraction interpretations by providing depth information under each geophone to various geologic layers. Tomographic processing algorithms can also be used with multiple shot data and provide a higher resolution interpretation of spatial changes in subsurface velocities. Seismic data are typically presented in two-dimensional (2-D) cross section showing changes in velocity at depth.

Certain site-specific conditions if present can limit the resolution of the seismic refraction interpretation, which may include cultural noise (automobiles, machinery, etc.) and/or the presence of thin and/or slower velocity zones at depth, which can create erroneous depths in the interpretation of the data.

The Caterpillar Company has compiled charts that relate seismic velocities in various geologic materials to the ability of specific size and power bulldozers to excavate these materials by ripping. The Caterpillar rippability chart for a D9 Caterpillar bulldozer was presented in Section 2 as Figure 2-13. This chart indicates that sandstones with seismic p-wave velocities less then approximately 8,000 feet per second (ft/s) are considered to be rippable. The chart also indicates that sandstones with p-wave velocities of approximately between 8,000 ft/s to 9,500 ft/sec are marginally rippable and velocities over 9,500 ft/sec are non rippable.

## FIELD INVESTIGATION ACTIVITIES

The seismic data was collected utilizing a Seistronix RAS 24 (24-channel) seismograph, 4.5 Hz geophones and a 12-pound hammer as a seismic source. Each line consisted of 24 geophones each spaced ten feet apart for a total length of 240 feet each. Shots were performed at nine locations along each seismic line and include: two off-end locations (10 and 50 feet from each end geophone); geophones 1 and 24; and between geophone pairs 6 and 7, 12 and 13, and 18 and 19. Data from each shot were recorded at 0.5 millisecond intervals for one second and stored on a laptop computer connected to the RAS-24 seismograph. The autostacking feature of the seismograph was used to stack multiple hammer blows at each location in order to increase the signal to noise ratio of the data.

Seismic data from three lines located as shown on Figure 2-14 (Section 2) was collected for this investigation. The location of the survey lines were surveyed with a hand held GPS unit (Garmin GPSMAP 76) after completion of the site geophysical investigation.

## DATA INTERPRETATION

The data were analyzed using Geometrics' SeisImager and Rimrock Geophysics SIP software. P-wave data was determined by using SIP to pick the first arrival times which where input into both the SIP and SeisImager's tomographic modeling algorithms to interpret comparative 2-D cross sections of P-wave velocities. The interpreted seismic cross sections are attached to this letter report. Typically tomographic data provides interpretation of changes in spacial velocity and the SIP method provides both interpretation of distinct changes at depth and identification of specific layers at depth.

The interpreted seismic cross sections from SeisImager's tomographic modeling are presented in Attachment A and indicate that the seismic velocities range from 1,000 feet per second (ft/s) to approximately 8,000 ft/s. The slower velocities are representative of near surface unconsolidated material with higher velocities representing weathered rock to more competent rock at depth. These values fall within the typical velocity ranges for weathered material and the sandstone rocks found at the site. The higher velocity numbers (< 7,000 ft/s) were present near the ends and the bottom depths of each interpreted cross section and location where the SeisImager results are less accurate and likely over estimate the actual subsurface velocities.

The interpretation from the SIP program indicates the presence of two distinct velocity layers at the site. The first layer is relatively shallow with average p-wave velocities ranging from 1,300 ft/s to 2,200 ft/s with a bottom depth of 2 to 10 feet below ground surface (bgs). The underlying velocity zone ranges from approximately 3,900 ft/s to 5,300 ft/s. Interpretations of the seismic data indicate that the interpreted depth of investigation to the bottom of each cross section ranges from approximately 50 to 75 bgs.

Based on the interpretations of the seismic data and comparison to the rippability chart in Figure 2-13 it appears that the majority of sandstone present at each of the seismic lines to a depth of 75 feet bgs is rippable with the potential for some material at the greater depths potentially categorized as marginally rippable. None of the data from seismic lines 1, 2, and 3 indicate that non rippable materials with p-wave velocities greater then 9,500 ft/s are present to depth of 75 feet bgs.

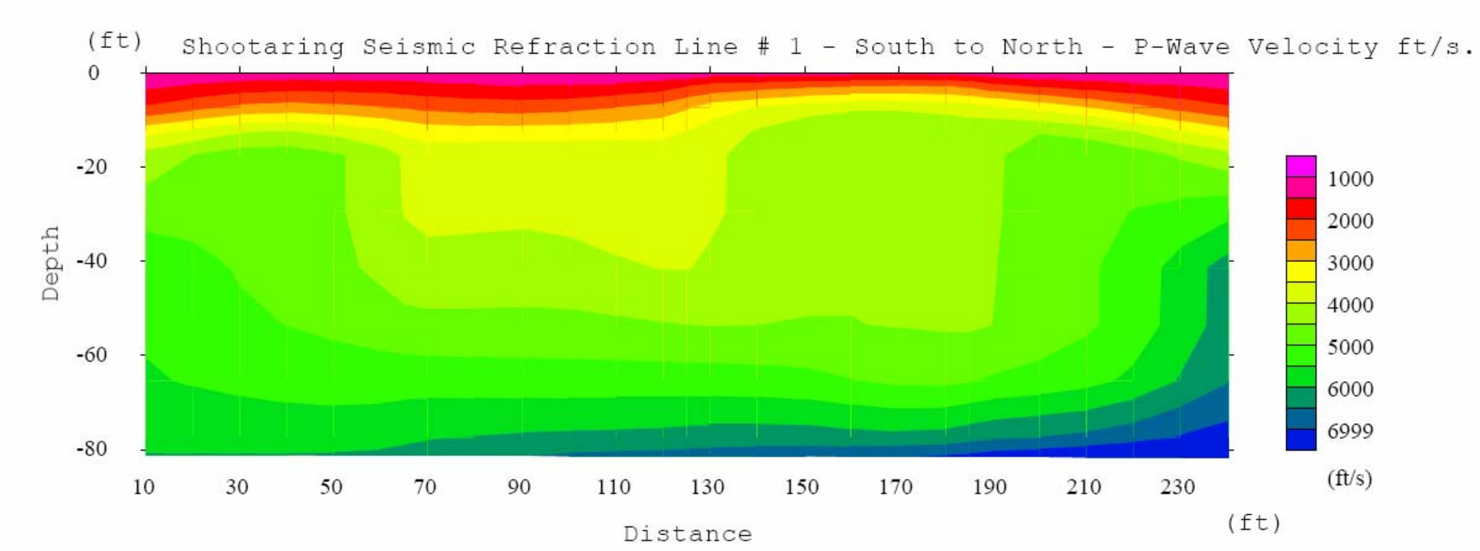
## SUMMARY

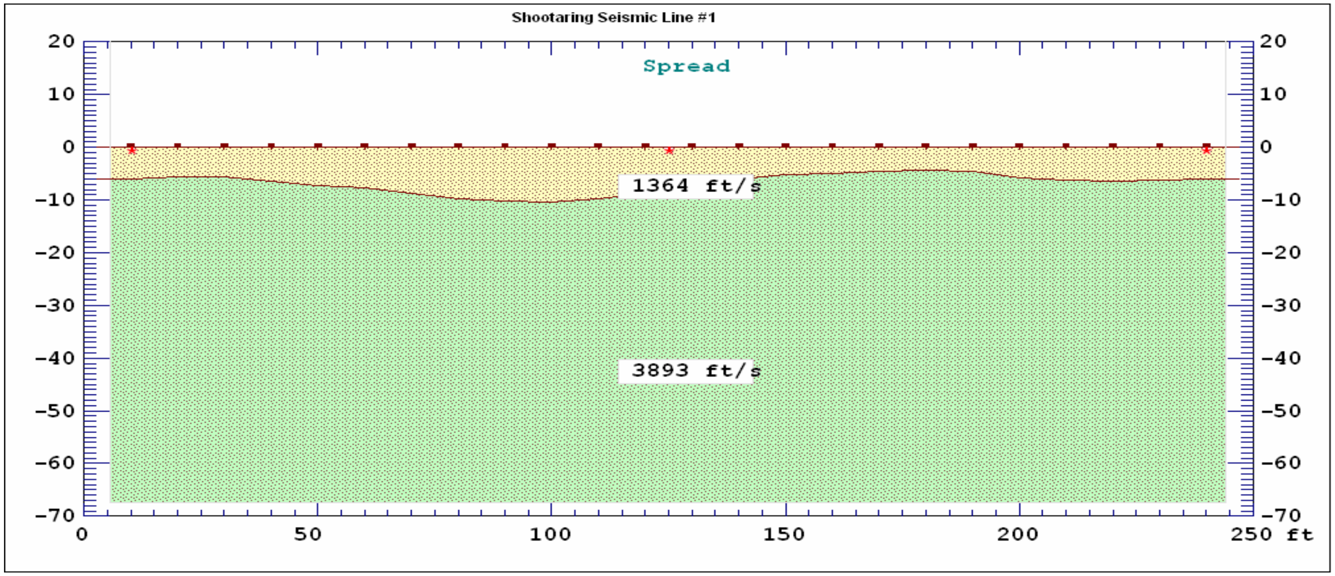
The seismic refraction survey was successful in providing data to assist in interpreting rippability of the bedrock subsurface underneath the site where seismic data was collected. Based on the interpretation of the seismic refraction data, the Entrada Sandstone appears to be rippable to depth of approximately 75 feet bgs.

Seismic Refraction, like any remote sensing technique, requires the interpretation of indirect methods of measurement. As such, there is an inherent margin of error, which is unavoidable. Our methods of data acquisition and interpretation are as complete as is reasonably possible, and we believe them to be a reasonable representation of the subsurface conditions. However, due to the subjective nature of any type of interpretation, we cannot guarantee that our results are accurate in all areas. The findings identified by this survey should be compared closely to selective in-situ methods such as the geotechnical borings collected at the site before designs are based on these findings.

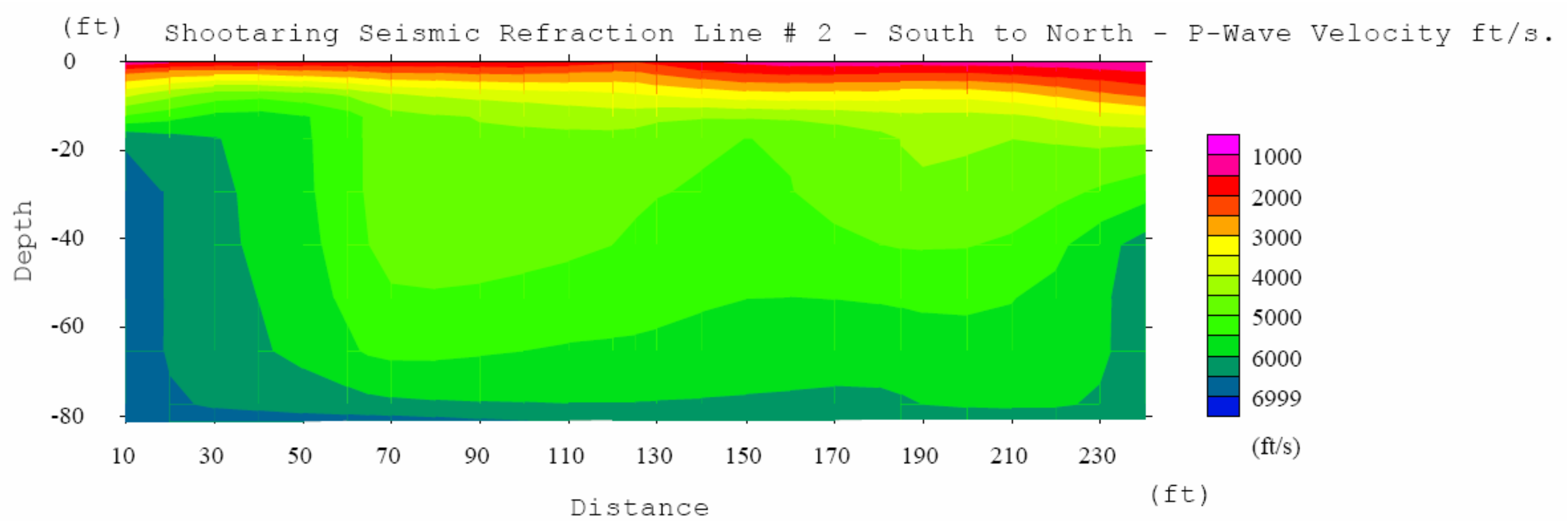
# ATTACHMENT A
## SEISMIC LINES 1, 2, AND 3 – P-WAVE VELOCITY CROSS SECTIONS

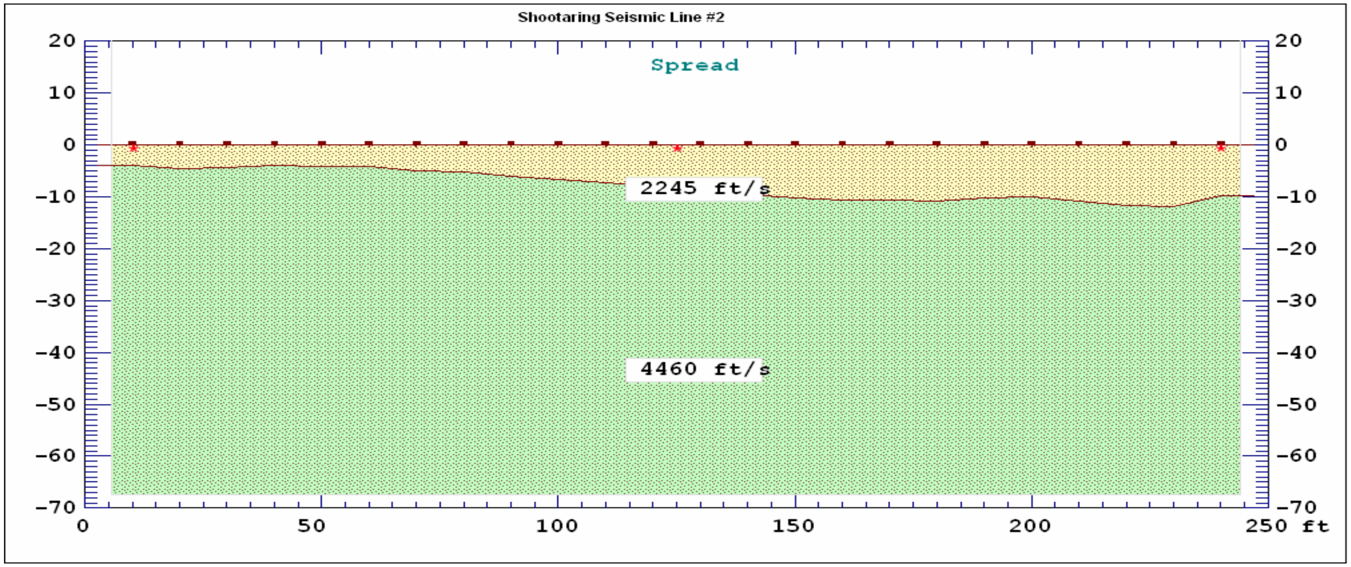
# Shootaring Seismic Line # 1



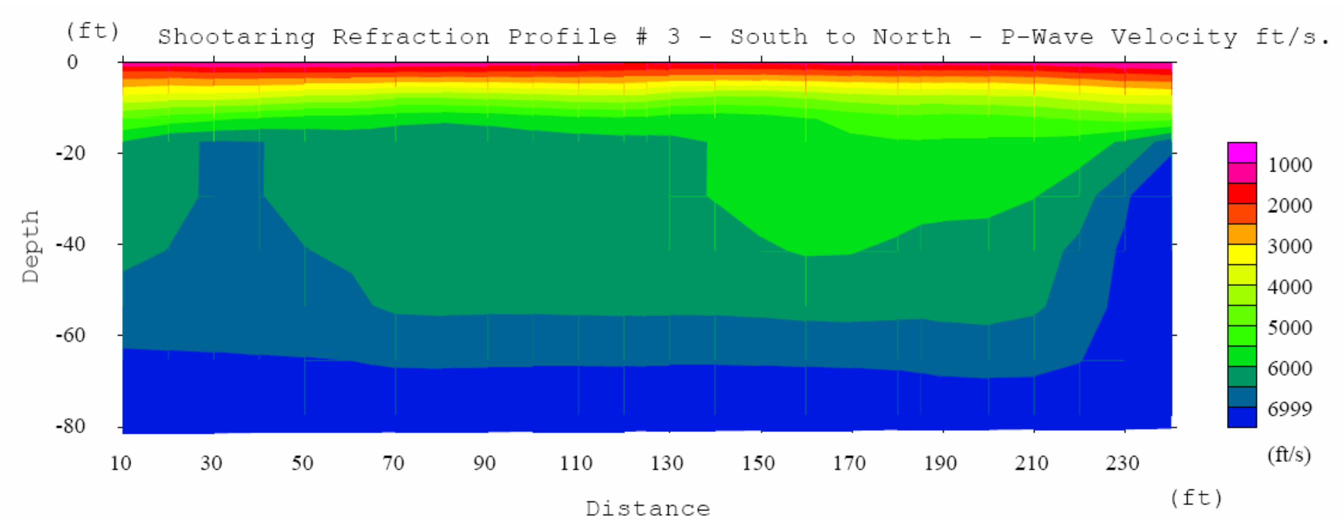


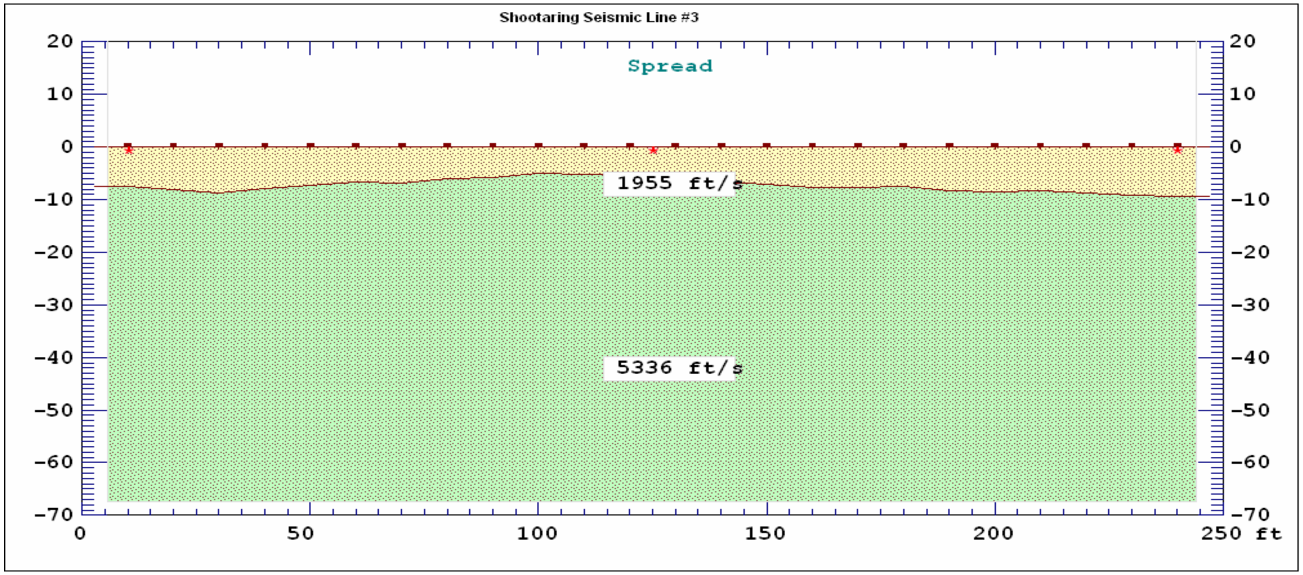
# Shootaring Seismic Line # 2





# Shootaring Seismic Line # 3





# APPENDIX B
# SEISMIC HAZARD ANALYSIS FOR SHOOTARING CANYON URANIUM PROCESSING FACILITY

# Seismic Hazard Analysis for Shootaring Canyon Uranium Processing Facility

*Prepared for:*

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*Prepared by:*

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*Fax (970) 223-7171*
Tetra Tech Project No. 181692

November 12, 2007
Revised April 8, 2008

# TABLE OF CONTENTS

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# LIST OF FIGURES

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# 1.0 INTRODUCTION

The Shootaring Canyon Uranium Processing Facility is currently in Standby status. Uranium One, Inc. is proposing to convert the present license to Operational status. This seismic hazard analysis has been prepared to characterize the peak horizontal ground acceleration (PGA) for use in seismic stability analyses of the facility.

## 1.1 Project Location

The site is located in a sparsely populated area of Garfield County, southeastern Utah, approximately 50 miles south of Hanksville, Utah (see Figure 1). A small town, Ticaboo, is located 2.6 miles south of the site. For the purposes of these analyses, the central location of the facility has coordinates of 37.72°N latitude and 110.70°W longitude.

## 1.2 Previous Work

Seismicity of the Shootaring site has been discussed in several previous consultants' reports. The Tailings Management Plan (Plateau Resources, Ltd et al., 2007) included results of several tailings stability and deformation analysis in Appendix A of the referenced report. Appendix A.1 includes results from a January 9, 1997 pseudostatic analysis of the Shootaring Canyon Dam. The analysis was performed using a horizontal seismic coefficient of 0.19 g based on a published report by Lawrence Livermore National Laboratories (Bernreuter et al., 1995). Appendix A.5 includes a June 14, 1999 deformation analysis on the Shootaring Canyon Dam. The analyses were performed using a peak acceleration of 0.33 g based on a U.S. Geological Survey (USGS) Peak Acceleration Map. Specific references for the map were not provided in the Tailings Management Plan (Plateau Resources Ltd, et al., 2007), but as will be discussed in Section 1.2.2, it is assumed that the peak acceleration corresponds to a 1 percent probability of exceedance in 50 years.

### *1.2.1 Lawrence Livermore National Laboratories*

Lawrence Livermore National Laboratories (Bernreuter et al., 1995) performed a seismic hazard analysis for the Shootaring Canyon site as part of a study of all Title II sites performed for the U.S. Nuclear Regulatory Commission (NRC). The purpose of the study was to evaluate the seismic design assumptions for mining sites where uranium tailings are being stored by performing simplified deterministic and probabilistic analyses. Results of this study concluded that the PGA using deterministic methods is 0.3 g (median plus one sigma) and using probabilistic methods is 0.19 g for an annual probability of exceedance (PE) of $1x10^{-4}$.

The deterministic analysis concentrated on three faults of the Bright Angel fault system. The three faults evaluated include the fault closest to the site, and then two larger, but more distant, faults of the system. This analysis concluded that the closest fault (4 km long, located 9 km from the site) has the greatest potential impact on the site. Attenuation equations used in the analysis were not specified.

The probabilistic analysis considered the pattern of random earthquakes occurring in an undefined source zone around the site. Earthquake catalogs from the past 30 years (presumably from 1965 to 1995) were used to estimate a recurrence model for the area. The three faults of the Bright Angel fault system were not incorporated into their probabilistic analysis.

### 1.2.2 USGS

The source of the Peak Acceleration Map presented in the Tailings Management Plan, Appendix A.4 (Plateau Resources, Ltd. et al., 2007) was not referenced in Appendix A.4. A reproduction of this map is presented for convenience in Appendix A of this report. The map appears to be similar to interactive maps available from the USGS National Seismic Hazard Mapping Project (NSHMP) website using 1996 NSHMP data (USGS, 2007a), also shown in Appendix A. However, the peak acceleration contours shown in Appendix A.4 are higher than the peak accelerations shown on the website for either a 2 percent or 10 percent probability of exceedance in 50 years. Although a peak acceleration contour map showing 1 percent probability of exceedance is not currently available on the USGS website, it is assumed that at some point, this interactive map was available and it is this map that was presented in Appendix A.4. This assumption is supported by data obtained from the USGS National Seismic Hazard Mapping Project (NSHMP) website for 1996 Interactive Deaggregations (USGS, 2007a). Using the site location coordinates and a return period of 4975 years (which corresponds to a 1 percent probability of exceedance in 50 years), the mapping project reports an acceleration of 0.34 g. Therefore, it is assumed that the value of 0.33 g is an interpolated value from a map provided by NSHMP corresponding to a 1 percent chance of exceedance in 50 years, using 1996 data.

In 2002, the NSHMP was updated. Using 2002 data (USGS, 2007b), the peak acceleration at the site for a return period of 4975 years is reported as 0.32 g. The hazard is almost entirely (99.2 percent) attributed to background seismicity within the Colorado Plateau around the site. It should be noted that for purposes of assigning attenuation models for the NSHMP, the USGS drew a boundary between the central and eastern United States (CEUS) and western United States (WUS). The Shootaring Canyon site is located just within this CEUS boundary area. For areas within this CEUS boundary, attenuation relations of Toro et al. (1997), Frankel et al. (1996), Atkinson and Boore (1995), and Campbell (2002) were used. The output for this data is included in Appendix A.

## 2.0 REGIONAL PHYSIOGRAPHIC AND TECTONIC SETTING

The Shootaring Canyon site is located within the Colorado Plateau physiographic province in southeastern Utah. The Colorado Plateau is a broad, roughly circular region of relative structural stability within a more structurally active region of disturbed mountain systems. Broad basins and uplifts, monoclines, and belts of anticlines and synclines are characteristic of the plateau (Kelley, 1979). Igneous intrusions have formed several mountains, such as the Henry Mountains near the facility. However, most of the topographic relief in the Colorado Plateau is the result of erosion of deep canyons rather than upstanding mountain ranges (Thornbury, 1965).

The site is located near the southern end of the Henry Mountains' structural basin. The basin contains sedimentary rocks ranging from Mesozoic to Cenozoic in age, which are cut by the Tertiary intrusives forming the Henry Mountains, including Mt. Ellsworth. Fault development in the area is associated with the intrusive igneous centers of the Henry Mountains. These faults commonly have a northeasterly or northwesterly strike and do not generally extend far from the intrusive bodies. Faults are not known to exist within the project.

The interior of the Colorado Plateau is characterized by low heat-flow (Bodell and Chapman, 1982) and a thick (45 km) crust (Keller, Braile, and Morgan, 1979), as compared to the surrounding Basin and Range Province and Rio Grande rift. The transition zone between the interior and the surrounding provinces may be as wide as 100 to 150 km (Zoback and Zoback, 1989). This data suggest a weakening of the sides of the plateau lithosphere. Such weakening is consistent with the normal faulting along the margins of the plateau. The source of the relative stability of the Colorado Plateau thus is probably related to the cooler interior that has been stronger than the surrounding regions (Morgan and Swanberg, 1985).

The contemporary seismicity of the Colorado Plateau was investigated by Wong and Humphrey (1989) based on seismic monitoring. Their study characterized the seismicity of the plateau as being of small to moderate magnitude, of a low to moderate rate of occurrence with earthquakes widely distributed. Seismicity in the plateau appears to be the result of the reactivation of pre-existing faults not expressed at the surface but favorably oriented to the tectonic stress field. Very few earthquakes can be associated with known geologic structures or tectonic features in the plateau. The generally small size of the earthquakes and their widespread distribution is consistent with a highly faulted Precambrian basement and upper crust, and a moderate level of differential tectonic stresses. Earthquakes in the plateau generally occur within the upper 15 to 20 km of the upper crust (Smith, 1978, Wong and Chapman, 1986) although events have occurred as deep as 58 km (Wong and Humphrey, 1989). The predominant mode of tectonic deformation within the plateau appears to be normal faulting on northwest- to north-northwest-striking faults, with some localized occurrences of strike-slip displacement on northwest- or northeast-striking planes at shallow depths. The contemporary state of stress within the plateau is characterized by approximately northeast-trending extension (Wong and Humphrey, 1989).

# 3.0 SEISMICITY

## 3.1 Earthquake Catalogs

This seismic hazard analysis for the site included a review of historic earthquakes which have occurred within 200 miles of the site. Catalogs from the USGS NSHMP for the Western United States (WUS) and Central and Eastern United States (CEUS) (Mueller et al., 1997) were used. These catalogs, compiled by the USGS for their study, included removal of duplicate events as well as aftershocks and foreshocks related to the primary earthquake events in order to obtain a catalog of independent events. The database includes historical seismic events over the period from 1787 through December 2001. The WUS and CEUS catalogs were supplemented with events occurring between January 2002 and September 2007 by searching the National Earthquake Information Center (NEIC) database, also maintained by the USGS. This supplemental search resulted in three additional earthquakes. The catalog searches were limited to events with moment magnitude (Mw) greater than or equal to 4.0. A total of 114 events are included in the record. Earthquake activity is relatively diffuse and generally of small magnitudes, as shown in Figure 1. The earthquakes are tabulated in Appendix B.1.

The largest event is estimated in the WUS catalog to have an Mw of 6.5. This event occurred near Richfield, Utah on November 14, 1901. The epicenter is approximately 105 miles northwest of the site, within the Intermountain seismic belt (ISB), a seismically active zone between the western border of the Colorado Plateau, and the Basin and Range physiographic province.

The event closest to the site had an epicenter about 20 miles southeast of the site. This earthquake, which occurred on August 22, 1986, had an Mw of 4.0. As discussed in Wong and Humphrey (1989), this event is the largest earthquake known to have occurred in southeastern Utah. The focal mechanism for the earthquake exhibited normal faulting on northwest-striking fault planes.

In addition to the evaluation of significant earthquakes (Mw>4) as described above, a search of low magnitude events (Mw>2.4) within 80 miles of the site was also conducted using the NEIC database. These events are shown in Figure 2 and are tabulated in Appendix B.2.

# 4.0 SEISMIC HAZARD ANALYSIS

Seismic hazard analyses are typically conducted using one of two methods: (1) deterministic analysis or (2) probabilistic analysis. In the deterministic analyses, the ground motions from the maximum credible earthquake (MCE) associated with capable faults are attenuated to the site. A capable fault is defined by the United States Nuclear Regulatory Commission (NRC), in Appendix A to Part 100—Seismic and geologic siting criteria for Nuclear Power Plants, as a fault that has exhibited one or more of the following characteristics: 1) movement at or near the ground surface at least once within the past 35,000 years, or movement of a recurring nature within the past 500,000 years; 2) macroseismicity (magnitude 3.5 or greater) determined with instruments of sufficient precision to demonstrate a direct relationship with the fault; or 3) a structural relationship to a capable fault such that movement on one fault could be reasonably expected to cause movement on the other. The ground motions from the MCE associated with the fault are attenuated to the site using established attenuation equations. In deterministic analyses, typically median plus one sigma ground motions are reported.

Background, or floating, earthquakes are typically evaluated deterministically by placing the largest earthquake that can be assumed to occur unassociated with a known fault at a distance of 15 km from the site. In areas of low seismic activity, deterministic analyses tend to significantly overestimate ground accelerations.

In probabilistic analyses, ground motions and the associated probability of exceedance are estimated in order for the amount of risk associated with the design ground motion to be evaluated. As specified by the U.S. Environmental Protection Agency (EPA) Promulgated Standards for Remedial Actions at Inactive Uranium Processing Sites (40 CFR 192), the controls of residual radioactive material are to be effective for up to 1,000 years, to the extent reasonably achievable and, in any case, for at least 200 years. For the purpose of the seismic hazard evaluation, a 10,000-year return period is adopted for evaluating long-term stability of the facility. The probability that the 10,000-year event will be exceeded within a 200- to 1,000-year design life is between 2 and 10 percent. This is consistent with the International Building Code (IBC, 2006) which specifies designing for ground motions associated with a 2 percent probability of exceedance in a 50-year design life, or a return period of approximately 2,500 years. Similarly, a 2,500-year return period is appropriate during operational conditions, considering a design life of 50 years.

Seismic hazard analysis was performed using software EZ-FRISK, version 7.25 (Risk Engineering, Inc, 2008).

## 4.1 Seismic Sources

### *4.1.1 Active Faults*

Quaternary faults were identified using the USGS Quaternary Fault and Fold database (USGS et al. 2006). Faults within 200 miles of the site are shown in Figure 1. A tabulated list of the faults is included in Appendix C.1. NRC documentation in 10 CFR Appendix A to Part 40 and 10 CFR Appendix A to Part 100 gives specific criteria for faults that should be considered as follows:

**Table 1 Minimum Criteria for Considering Faults (NRC 10 CFR Part 100, Appendix A)**

| Distance from site (miles) | Minimum length of fault to be considered (miles) |
|---|---|
| 0 to 20 | 1 |
| 20 to 50 | 5 |
| 50 to 100 | 10 |
| 100 to 150 | 20 |
| 150 to 200 | 40 |

All faults from the Quaternary Fault and Fold database that met these minimum requirements were considered as seismic sources for the deterministic seismic hazard analysis. This is a conservative approach, as the definition of a Quaternary fault is movement within the past 1.8 million years, and the definition of an active fault, as described in Section 4.0, is between 35,000 and 500,000 years. The MCE associated with each fault was calculated based on correlations between fault length and magnitude, as developed by Wells and Coppersmith (1994).

For the probabilistic analysis, faults that are included in the USGS Quaternary fault and fold database and have the potential to produce peak ground accelerations of 0.05 g or greater (based on deterministic methods) were selected for further evaluation in the probabilistic model. These criteria resulted in the inclusion of the following seven faults:

1) Bright Angel fault system, Fault 1, (2514),
2) Bright Angel fault system, Fault 2, (2514);
3) Bright Angel fault system, Fault 3, (2514);
4) Needles fault zone, (2507);
5) Shay graben, (2513);
6) Aquarius and Awapa plateau faults, (2505); and
7) Thousand Lakes fault (2506).

These faults are shown in Figure 2. These faults were not considered in the USGS NSHMP because their activity in the Quaternary is suspect, or because their movement in the mid to late Quaternary did not meet the USGS definition of an active fault.

The three faults of the Bright Angel fault system are included in the hazard analysis due to their proximity to the site and potential impacts. This fault system is classified as Class B in the Quaternary fault and fold database (USGS et al, 2006). The definition of Class B faults is geologic evidence that demonstrates the existence of Quaternary deformation, but either (1) the fault might not extend deeply enough to be a potential source of significant earthquakes, or (2) the currently available geologic evidence is too strong to confidently assign the feature to Class C but not strong enough to assign it to Class A. The fault system is described as an expansive area of poorly understood suspected Quaternary faults in the Colorado Plateau. The faults are entirely within bedrock, thus Quaternary deformation can not be proven. Focal mechanism studies by both Brumbaugh (2005) and Wong and Humphrey (1989) indicate that within the Colorado Plateau, northwest striking normal faults are compatible with the modern state of stress of northeast-trending extension of the plateau, and northeast trending faults tend to not be active. Based on this data, the northeast trending faults of the Bright Angel fault system (labeled Fault 1 and 3 on Figure 2) will be assigned a low probability of seismogenic activity (0.10). Although Quaternary deformation has not been proven (USGS et al., 2006) and USGS did not consider this fault system to be active in the NSHMP, the northwest-trending Fault 2 will be assigned a higher probability of seismogenic activity of 0.50 because it is oriented favorably to the stress field.

The Needles fault zone has been removed from the probabilistic analysis because it is a structure resulting from salt movement that does not extend deeper than the evaporites of the Paradox Formation and is not considered seismogenic (Wong et al. 1996, Huntoon, 1982).

The Shay Graben faults have been assigned a lower probability of seismogenic activity (0.10) due to evidence for late-Quaternary deformation being associated with salt-dissolution collapse (Wong et al. 1996, Oviatt, 1988).

Descriptions of the faults (USGS et al. 2006) are included in Appendix D. Additional uncertainties in the fault characteristics are incorporated into the probabilistic analysis by representing the possible scenarios with a weight value. In general, the mean value is given a weight of 0.6, with the mean plus or minus one standard deviation values each given a weight of 0.2. The parameters used in the probabilistic analysis are described below, and are summarized in Appendix C.2.

Fault dips were assumed to vary between 40 and 80 degrees, with a mean value of 60 degrees. This is consistent with the NSHMP, which assumes a dip of 60 degrees for most normal faults within the western U.S., and with previous seismic hazard analyses in the Colorado Plateau (Wong et al., 1996). Fault depths were assumed to vary between 12 and 20 km, with a mean value of 15 km, as is typical in western U.S. (Wong and Chapman, 1990). Maximum magnitudes for the faults were estimated based upon the empirical relationship developed by Wells and Coppersmith (1994) for surface rupture length, with an uncertainty of 0.3 corresponding to the standard error in the Wells and Coppersmith (1994) relationship. The recurrence relationships for the faults were modeled using both Gutenberg-Richter exponential and normal magnitude recurrence models. The exponential model was given a weight of 0.2 and the normal magnitude model was given a weight of 0.8 in the analysis. Slip rates are used to characterize rates of fault activity. However, very limited data was available regarding slip rates, and the USGS fault and fold database categorizes all the 7 considered faults as simply having a slip-rate less than 0.2 mm per year. Slip rates were therefore modeled as being between 0.005 and 0.2 mm per year, similar to rates of activity assigned to many faults of questionable quaternary activity in the Rio Grande Rift area east of the Colorado Plateau (Wong et al., 2004).

### *4.1.2 Background Event*

Many earthquakes occur that are not associated with a known structure. These events are termed background events, or floating earthquakes. Evaluation of the background event allows for potential low to moderate earthquakes not associated with tectonic structures to contribute to the seismic hazard of the site. The maximum magnitude for these background events within the Intermountain U.S. ranges between local magnitude ($M_L$) 6.0 and 6.5 (Woodward-Clyde 1996). Larger earthquakes would be expected to leave a detectable surface expression, especially in arid to semiarid climates, with slow erosion rates and limited vegetation. In seismically less active areas such as the Colorado Plateau, the maximum magnitude associated with a background event is assumed to be 6.3, consistent with that used in seismic evaluations performed for uranium tailing sites in Green River (DOE 1991a, pg. 26), and Grand Junction (DOE 1991b, pg. 71).

The hazard from background earthquakes is assessed using two approaches, each given equal weight in the probabilistic analysis. The first approach uses areal source zones and assumes a uniformly distributed seismicity within the zone. The second approach uses gridded seismicity which retains a degree of stationarity using 0.1 degree latitude and longitude grid spacing, as used by USGS for the NSHMP (Frankel et al. 1996).

The earthquake magnitude and recurrence interval of an areal source zone were assessed by looking at the earthquake record within 200 miles of the site, filtered to include only events with Mw values equal or greater than 4.0, as described in Section 3.1. The entire 200-mile radius circle about the site was evaluated as a source zone with uniformly distributed seismicity. As shown in Figure 1, the NW quadrant of the 200-mile radius circle has a high concentration of Quaternary faults and historical earthquake events. This zone corresponds to the Intermountain Seismic Belt (ISB), an area of significant earthquake activity. Including these events is conservative, as the recurrence interval of events in the remaining portion of the circle, including around the site, is overestimated.

In computation of background seismicity recurrence, all events know to be associated with faults considered in the hazard analysis should be removed from the analysis. On November 14, 1901, an earthquake with an estimated Mw of 6.5 occurred in Sevier County at an approximate location of 38.7° latitude and -112.1° longitude. As shown in Figure 2, this location is close to several Quaternary faults (Joseph Flats area faults and syncline - 2468, Elsinore fault - 2470, Dry Wash fault and syncline - 2496, Annabella graben - 2472, and Sevier fault northern portion - 2355). The earthquake record shows a total of 9 earthquakes with Mw equal or greater than 4.0 in this immediate area. The Mw 6.5 event has been removed from the background analysis since it is likely related to one of these structures, and an event of this magnitude will likely have a surface expression. For conservatism, the other eight events of lesser magnitude have been retained in the analysis.

The earthquake recurrence of the source zone was described by the truncated-exponential form of the Gutenberg-Richter relationship of log N = a – bM using the maximum likelihood procedure by Weichert (1980). The completeness periods for various magnitudes were estimated by Mueller et al. (1997). Table 2 gives the completeness period dates and the number of earthquakes during each period. Figure 3 shows the temporal distribution of earthquakes within the study area, and Figure 4 shows the recurrence curve.

**Table 2 Completeness Periods and Event Counts Used in Recurrence Calculations**

| Magnitude Range (Mw) | Completeness Period | Number of Earthquakes |
|---|---|---|
| 4.0-4.9 | 1/1963 - 8/2007 | 56 |
| 5.0-5.9 | 1/1930 - 8/2007 | 22 |
| 6.0-7.0 | 1/1850 - 8/2007 | 1 |

A study by Wong et al. (1996) also evaluated the recurrence of background events within the Colorado Plateau. The areal source zone is the interior portion of the plateau, as shown in Figure 1. The recurrence relationship developed for that study is shown on Figure 4. The relationship developed by Wong et al. (1996) is a robust analysis which limits the source zone to that most seismically similar to the project site. However, the seismicity record goes only through 1994. Therefore, the recurrence relationship for the 200-mile radius about the site is retained in the analysis because it incorporates events through 2007. The two recurrence relationships are evaluated in the hazard analysis with equal weight.

## 4.2 Attenuation Relations

Attenuation of ground motions from the location of a seismic event to the site was calculated using attenuation relations. Due to the absence of abundant strong ground motion records, no specific attenuation relation exists solely for Utah; thus, several attenuation relations from other areas were considered for use at the site. For the purposes of this study, the following three attenuation relationships were used: Spudich et al. (1999), Abrahamson and Silva (1997), and Campbell and Bozorgnia (2007). The empirical attenuation relations are appropriate for soft rock sites in the western U.S. An important consideration in the selection of appropriate attenuation relationships is that the area is located in an extensional tectonic regime where fault type is predominately normal. Spudich et al. (1999) was developed from an extensional earthquake database. Abrahamson and Silva (1997) and Campbell and Bozorgnia (2007) include normal faulting factors in the relations. The hazard was truncated at three standard deviations about the median value of each of the three attenuation relationships. Results from each relationship, along with the lognormal mean of the three relations are reported in Table 3.

## 4.3 Peak Ground Acceleration

Based on deterministic methods, the median plus one sigma ground motion from the background event results in a PGA of 0.24 g. Seven faults are identified as potentially capable of producing site PGA of 0.05 g or greater, and are summarized in Table 3.

**Table 3 PGA for Significant Faults, Deterministic Analysis**

| Source Name | ID No. | Distance from Site (km) | MCE | PGA Median (Median plus 1 sigma) | | | |
|---|---|---|---|---|---|---|---|
| | | | | Spudich et al. (1999) | Abrahamson and Silva (1997) | Campbell and Bozorgnia (2007) | Lognormal mean |
| Background Event | --- | 15 | 6.3 | 0.12 (0.19) | 0.20 (0.33) | 0.13 (0.23) | 0.15 (0.24) |
| Bright Angel, Fault 1 | 2514 | 9 | 5.8 | 0.14 (0.22) | 0.20 (0.35) | 0.16 (0.28) | 0.16 (0.28) |
| Bright Angel, Fault 2 | 2514 | 13 | 6.2 | 0.13 (0.21) | 0.21 (0.36) | 0.14 (0.25) | 0.16 (0.27) |
| Bright Angel, Fault 3 | 2514 | 35 | 6.7 | 0.07 (0.11) | 0.10 (0.16) | 0.07 (0.12) | 0.08 (0.13) |
| Needles Fault | 2507 | 60 | 6.8 | 0.04 (0.06) | 0.06 (0.09) | 0.04 (0.07) | 0.05 (0.07) |
| Thousand Lake Fault | 2506 | 90 | 7.0 | 0.03 (0.05) | 0.04 (0.07) | 0.03 (0.06) | 0.03 (0.06) |
| Shay graben Fault | 2513 | 88 | 6.9 | 0.03 (0.05) | 0.04 (0.07) | 0.03 (0.06) | 0.03 (0.06) |
| Aquarius and Awapa Fault | 2505 | 89 | 6.9 | 0.03 (0.05) | 0.04 (0.06) | 0.03 (0.05) | 0.03 (0.05) |

As compared to the background event, only the faults of the Bright Angel Fault Zone result in PGA values of comparable magnitude. However, the likelihood of any of these events occurring within the design life of the project can only be evaluated by looking at the probabilistic analysis.

Table 4 shows the seismic source contribution to the total mean hazard at a return period of 10,000 years (or 1x10$^{-4}$ annual percent exceedance). The mean PGA is estimated to be 0.18 g. The total hazard curve is shown in Figure 5 and the source contribution is shown in Figure 6. As shown in Figure 6, at this frequency, the hazard is almost entirely contributed to the background event. Input to the EZ-FRISK analysis is included in Appendix E.

**Table 4 Hazard Contribution to Total Mean Hazard for 10,000-year Return Period, Probabilistic Analysis**

| Source Name | ID No. | Distance from Site (km) | PGA |
|---|---|---|---|
| Background Event – Ext Gridded | --- | --- | 0.07 |
| Background Event – CO Plateau Int (Wong et al. 1996) | --- | --- | 0.11 |
| Background Event – 200-mile radius about site | --- | --- | 0.13 |
| Bright Angel, Fault 1 | 2514 | 9 | <0.01 |
| Bright Angel, Fault 2 | 2514 | 13 | <0.01 |
| Bright Angel, Fault 3 | 2514 | 35 | <0.01 |
| Needles Fault | 2507 | 60 | <0.01 |
| Thousand Lake Fault | 2506 | 90 | <0.01 |
| Shay graben Fault | 2513 | 88 | <0.01 |
| Aquarius and Awapa Fault | 2505 | 89 | <0.01 |
| Total Hazard | --- | --- | 0.18 |

## 4.4 Amplification

Geologic maps of the area (Hackman and Wyant, 1973) indicate that the site is underlain by Lower Cretaceous Morrison and Upper Jurassic Summerville formation of sandstones, mudstones, and siltstones. As defined in Campbell and Bozorgnia (2003), the site is categorized as a firm rock site, based on underlying geologic unit consisting of pre-Tertiary sedimentary rock. As such, further amplification of ground motions due to underlying soils was not considered. If further investigations indicate that the materials within the upper 30 meters are not classified as firm rock, soil amplification should be considered.

# 5.0 RESULTS AND CONCLUSIONS

Based on the probabilistic analysis, a PGA (at an annual PE of $1x10^{-4}$) of 0.18 g should be used for long-term seismic stability analyses. The U.S. Department of Energy (DOE, 1989) recommends that a seismic coefficient of two-thirds of the peak acceleration be used to analyze long-term, pseudostatic stability analyses. Therefore, for long-term pseudostatic analyses, a seismic coefficient of 0.12 g is recommended.

The value of 0.18 g is lower than the 0.32 g from the USGS 2002 Interactive Deaggragations (USGS, 2007a). It is likely that the majority of the difference is a result of using different attenuation relationships. As discussed in Section 1.2.2, the site is very close to the border drawn by USGS between the WUS and CEUS zones. Because the site lies within the CEUS area, the USGS applied attenuation relations developed for the CEUS. However, it is the opinion of the author that using attenuation relations that are specific to normal extensional faulting is appropriate. This is supported by other studies done in the area (e.g. Wong et al. 1996, Halling 2002, Wong et al. 2004).

During operational conditions, designing for an annual PE of $4x10^{-4}$, or a 2500-year return period would correlate roughly to a 2 percent chance of exceedance in 50 years. Using this criterion, the PGA is 0.10 g and the seismic coefficient is 0.07 g.

# REFERENCES

Abrahamson, N.A., Silva, W.J. (1997) Empirical Response Spectral Attenuation Relations for Shallow Crustal Earthquakes. *Seismological Research Letters* 68(1): 94-127.

Atkinson, G.M. and D. M. Boore (1995) Ground motion relations for eastern North America. *Bulletin of the Seismological Society of America* 85: 17-30.

Bernreuter, D., McDermott, E., Wagoner, J. (1995) *Seismic Hazard Analysis of Title II Reclamation Plans*. Prepared for U.S. Nuclear Regulatory Commission. Lawrence Livermore National Laboratory, UCRL-ID-121733.

Bodell, J.M., and Chapman, D.S. (1982) Heat Flow in the North-Central Colorado Plateau. *Journal of Geophysical Research* 87: 2869-2884.

Brumbaugh, D.S. (2005) Active faulting and seismicity in a prefractured terrane: Grand Canyon, Arizona. *Bulletin of the Seismological Society of America* 95: 1561-1566.

Campbell, K.W. (2002) Prediction of strong ground motion using the hybrid empirical method: example application to eastern North America, submitted to *Bulletin of the Seismological Society of America.*

Campbell, K.W., and Bozorgnia, Y. (2003) Updated near-Source Ground-Motion (Attenuation) Relations for the Horizontal and Vertical Components of Peak Ground Acceleration and Acceleration Response Spectra. *Bulletin of the Seismological Society of America* 93(1): 314-331.

Campbell, K.W. and Bozorgnia, Y. (2007) *NGA Ground motion relations for the geometric mean horizontal component of peak and spectra ground motion parameters.* Pacific Earthquake Engineering Research Center Report 2007/02, 246 p.

DOE (U.S. Department of Energy) (1989) *Technical Approach Document: Revision II, Uranium Mill Tailings Remedial Action Project*. Washington D.C.

DOE (U.S. Department of Energy) (1991a) *Remedial Action Plan and Final Design for Stabilization of the Inactive Uranium Mill Tailings at Green River, Utah.*

DOE (U.S. Department of Energy) (1991b) *Remedial Action Plan and Site Design for Stabilization of the Inactive Uranium Mill Tailings Site at Grand Junction, Colorado.*

Frankel, A. (1995) Mapping seismic hazard in the Central and Eastern United States, *Seismological Research Letters* 66(4): 8-21.

Frankel, A., Mueller, C., Barnard, T., Perkins, D., Leyendecker, E., Dickman, N., Hanson, S., and Hopper, M, (1996) *National seismic hazard maps – Documentation June 1996*. USGS, Open-file Report 96-532.

Hackman, R.J., and Wyant, D.G. (1973) *Geology, Structure, and Uranium Deposits of the Escalante Quadrangle, Utah and Arizona* USGS scale 1:250,000.

Halling, M.W., J.R. Keaton, L.R. Anderson, and W. Kohler, 2002. *Deterministic Maximum Peak Bedrock Acceleration Maps for Utah*, Utah Geological Survey Miscellaneous Publication 02-11, July.

Huntoon, P.W. (1982) The Meander anticline, Canyonlands, Utah, an unloading structure resulting from horizontal gliding on salt. *Geologic Society of America Bulletin* 93: 941-950.

International Building Code (2006) International Code Council, Inc.

Keller, G.R., Braile, L.W., and Morgan, P. (1979) Crustal Structure, Geophysical Models and Contemporary Tectonism of the Colorado Plateau. *Tectonophysics* 61:131-147.

Kelley, V.C. (1979) Tectonics of the Colorado Plateau and New Interpretation of Its Eastern Boundary. *Tectonophysics* 61: 97–102.

Morgan P. and Swanberg, C.A. (1985) On the Cenozoic Uplift and Tectonic Stability of the Colorado Plateau. *Journal of Geodynamic* 3: 39-63.

Mueller, C., Hopper, M, and Frankel, A. (1997). Open-File Report 97-464 Preparation of Earthquake Catalogs for the National Seismic-Hazard Maps: Contiguous 48 States, USGS.

Oviatt, C.G. (1988) Evidence for Quaternary deformation in the Salt Valley anticline, southeastern Utah. *Utah Geological Survey Bulletin* 122: 61-76.

Plateau Resources, Ltd and Hydro-Engineering, LLC (2007) *Tailings Management Plan, Amended December, 2005, Revised April, 2007 for Shootaring Canyon Uranium Processing Facility.* Prepared for Utah Department of Environmental Quality, Division of Radiation Control. Report Dated April, 2007.

Risk Engineering, Inc. (2008). EZ-FRISK, version 7.25. Boulder, CO.

Smith, R. B. (1978) Seismicity, Crustal Structure and Interplate Tectonics of the Interior of the Western Cordillera, in Smith, R.B., and Eaton, G.P., eds., *Cenozoic tectonics and regional geophysics of the western Cordillera*: Geological Society of America Memoir 152: 111-144.

Spudich, W.B., Joyner, W.B., Lindh, A.G., Boore, D.M., Margaris, B.M., and Fletcher, J.B. (1999) SEA99: A Revised Ground Motion Prediction Relation for use in Extensional Tectonic Regimes. *Bulletin of the Seismological Society of America* 89(5): 1156-1170.

Thornbury, M. (1965) *Regional Geomorphology of the United States*, John Wiley and Sons, Inc., New York.

Toro, G., Abrahamson, N., and Schneider, J. (1997). Model of strong ground motions from earthquakes in the central and eastern North America: best estimates and uncertainties. *Seismological Research Letters* 68: 41-57.

USGS (2007a). http://earthquake.usgs.gov/research/hazmaps/interactive/index.php, *Interactive Deaggregation, 1996*, Viewed October 2007.

USGS (2007b). http://earthquake.usgs.gov/research/hazmaps/interactive/index.php, *Interactive Deaggregation, 2002*, Viewed October 2007.

USGS, Arizona Geological Survey, New Mexico Bureau of Mines and Mineral Resources, and Utah Geological Survey (2006). http//earthquakes.usgs.gov/regional/qfaults/, Quaternary fault and fold database for the United States, Viewed October 2007.

Weichert, D. (1980) Estimation of the earthquake recurrence parameters for unequal observation periods for different magnitudes. *Bulletin of the Seismological Society of America* 70: 1337-1346.

Wells, D.L., and Coppersmith, K.J. (1994). *New Empirical Relationships among Magnitude, Rupture Length, Rupture Width, Rupture Area, and Surface Displacement*, Bulletin of the Seismological Society of America, 84(4), pp. 974–1002, August.

Woodward-Clyde Consultants (1996) *Evaluation and Potential Seismic and Salt Dissolution Hazards at the Atlas Uranium Mill Tailings Site, Moab, Utah*, Oakland, California, unpublished Consultant's report for Smith Environmental Technologies and Atlas Corporation, SK9407.

Wong, I. G., and Chapman, D.S. (1986) Deep intraplate earthquakes in the intermountain U.S.: Implications to thermal and stress conditions in the lower crust and upper mantle, *Earthquake Notes* 57: 6.

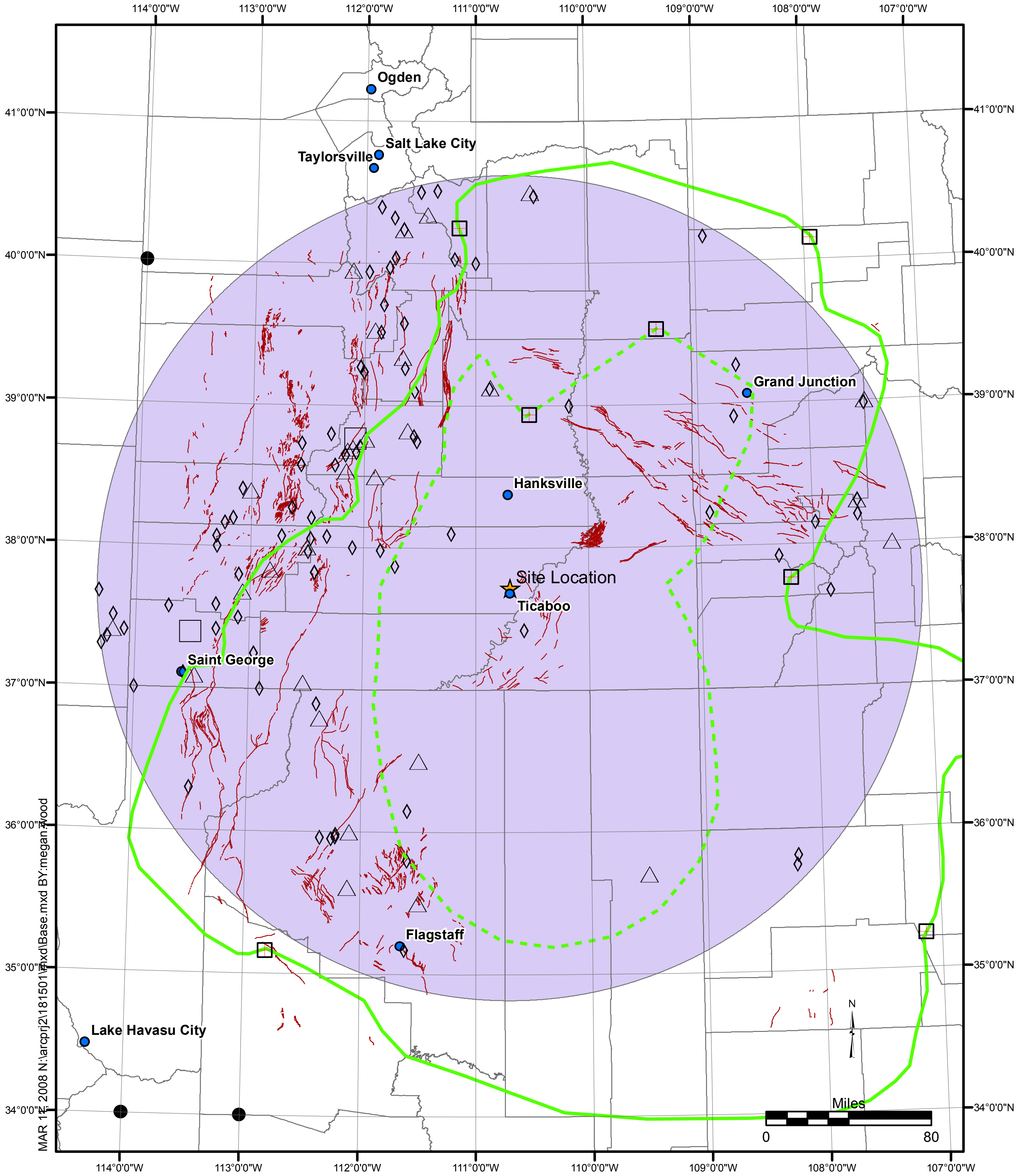
Wong I.G., and Chapman, D.S. (1990) Deep intraplate earthquakes in the western U.S. and their relationship to lithospheric temperatures. *Bulletin of the Seismological Society of America* 80: 589-599.

Wong, I.G., and Humphrey, J.R. (1989) Contemporary seismicity, faulting, and the state of stress in the Colorado Plateau, *Geological Society of America Bulletin* 101: 1127-1146.

Wong, I.G., Olig, S.S., and Bott, J.D.J. (1996) Earthquake potential and seismic hazards in the Paradox Basin, southeastern Utah, in A.C. Huffman, W.R. Lund, and L.H. Godwin, eds., *Geology and Resources of the Paradox Basin, 1996 Special Symposium*, Utah Geological Association and Four Corners Geological Society Guidebook 25: 241-250.

Wong, I., Olig, S., Dober, M., Silva, W., Wright, D., Thomas, P., Gregor, N., Sanford, A., Lin, K., and Love, D (2004) Earthquake Scenario and Probabilistic ground-shaking hazard maps for the Albuquerque-Belen-Santa Fe, New Mexico, corridor. *New Mexico Geology* 26(1): pp. 3-33.

Zoback, M. L., and Zoback, M. D. (1989) Tectonic stress field of the continental United States, in Pakiser, L.C., and Mooney, W.D., eds., *Geophysical Framework of the Continental United States*: Geological Society of America Memoir 172: 523-540.



Earthquakes (Moment Magnitude)

| | |
|---|---|
| ◊ | 4-4.9 |
| △ | 5-5.9 |
| □ | 6-6.9 |
| — | Quaternary Faults and Folds |

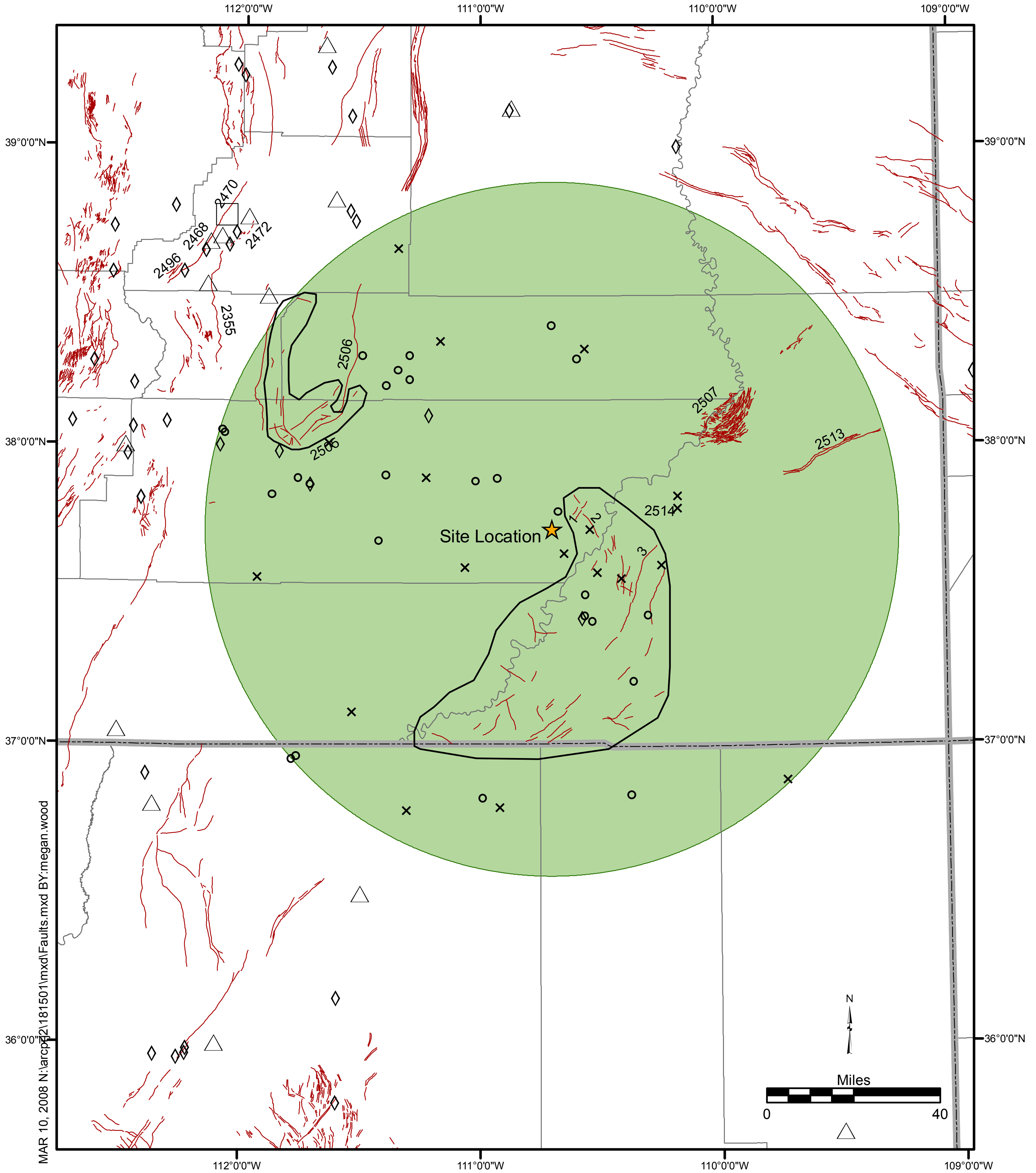
| | |
|---|---|
| 🟩 | Colorado Plateau |
| ⬚ | Colorado Plateau Interior Seismic Zone |

MAR 11, 2008

**FIGURE 1**

## HISTORICAL EARTHQUAKES AND QUATERNARY FAULTS WITHIN 200 MILES OF SHOOTARING CANYON SITE

**SHOOTARING 181501**



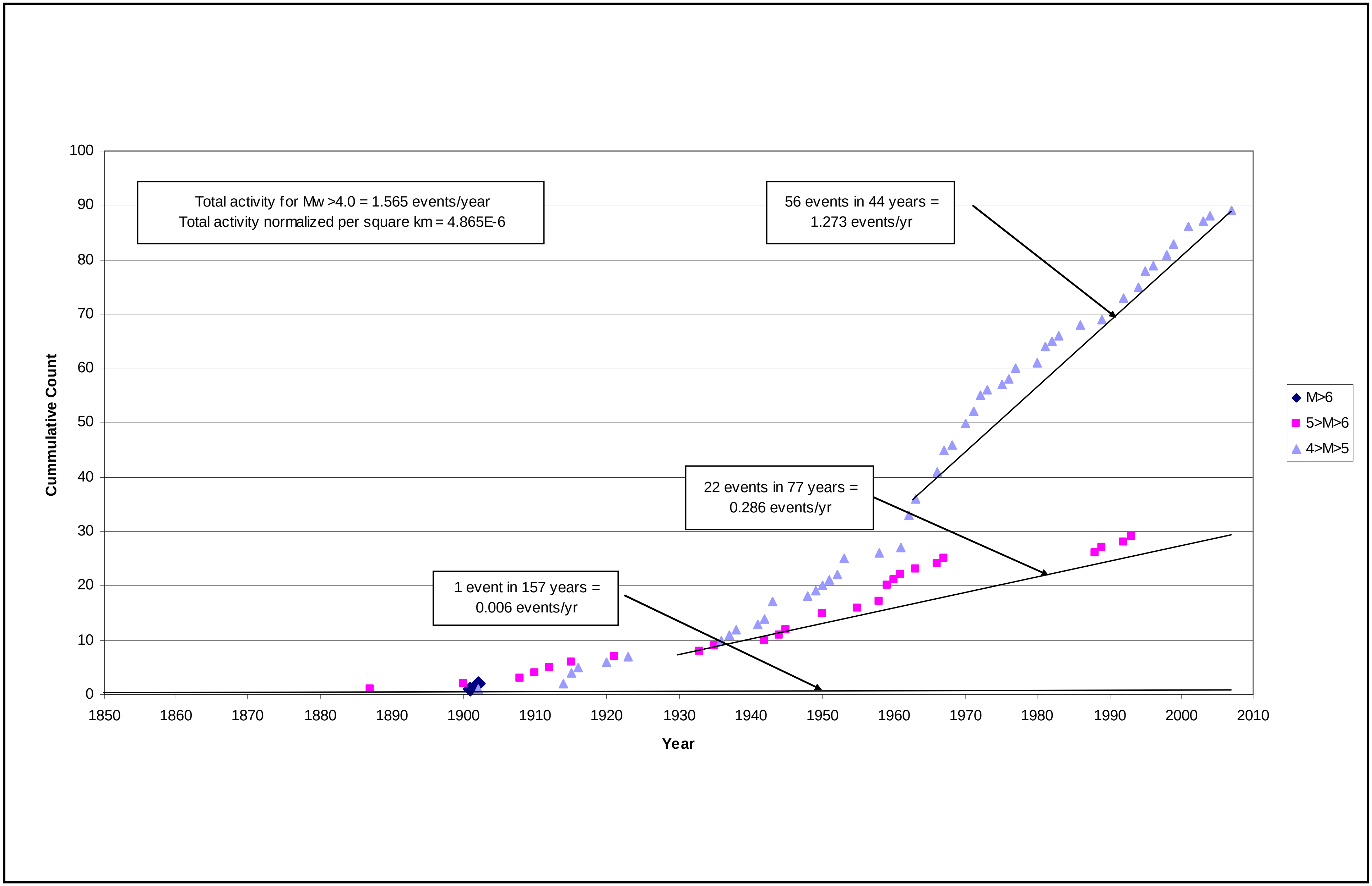
MAR 10, 2008 N:\arcprj2\181501\mxd\Faults.mxd BY:megan.wood

MAR 10, 2008

**FIGURE 2**

## FAULTS DISCUSSED IN SEISMIC HAZARD ANALYSIS

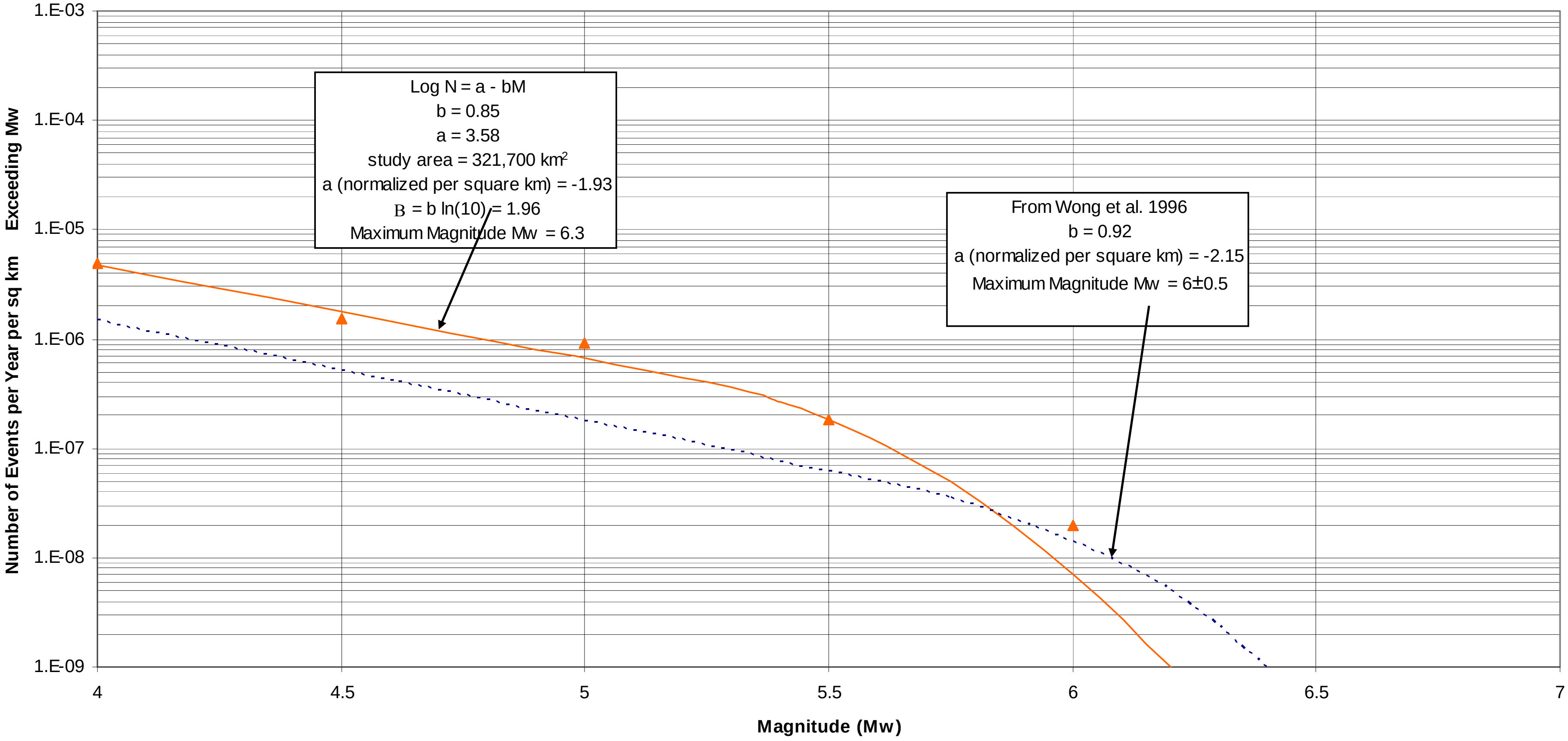
**SHOOTARING 181501**



Project No: 181692

April 2008

## FIGURE 3
## TEMPORAL DISTRIBUTION OF EARTHQUAKES WITHIN 200 MILES OF SHOOTARING CANYON SITE



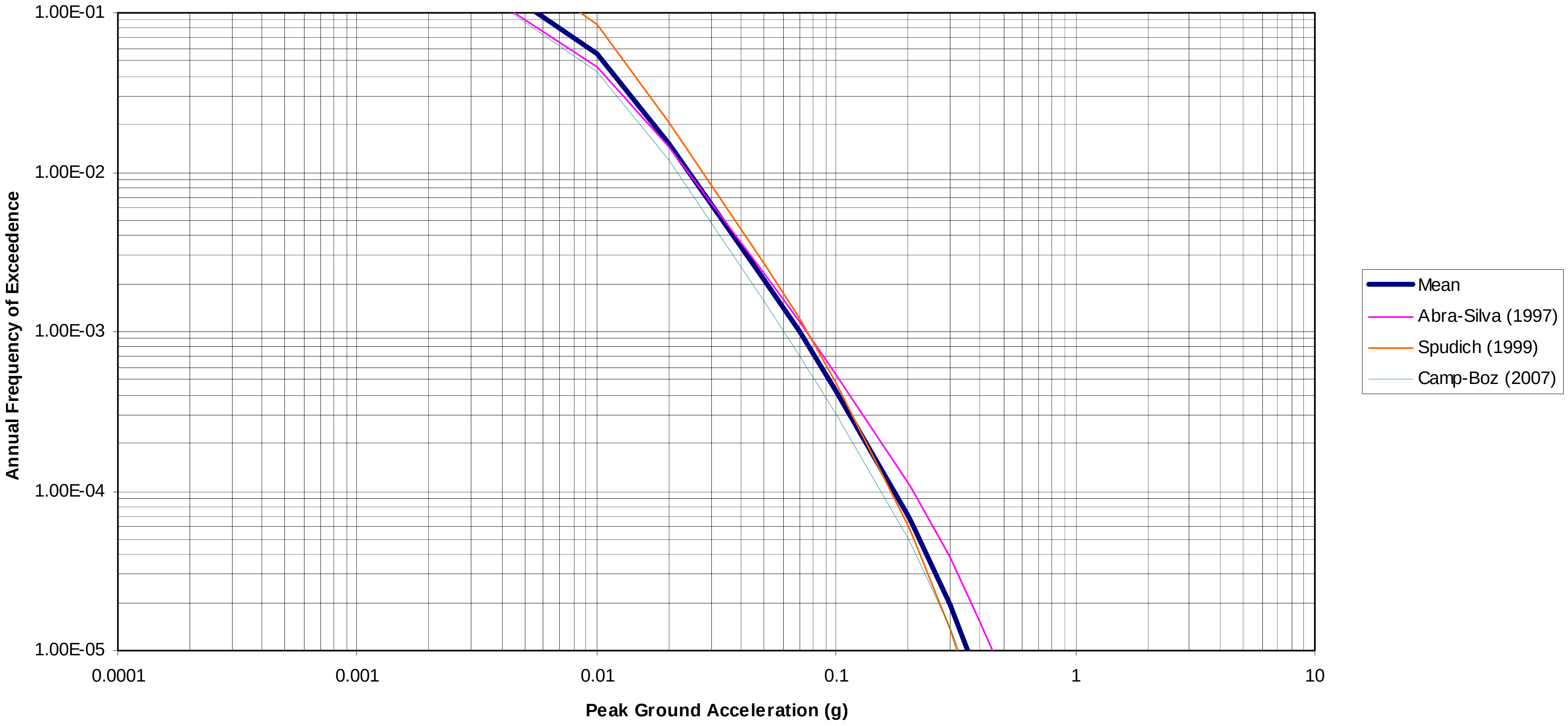
Log N = a - bM
b = 0.85
a = 3.58
study area = 321,700 $km^2$
a (normalized per square km) = -1.93
$B$ = b ln(10) = 1.96
Maximum Magnitude Mw = 6.3

From Wong et al. 1996
b = 0.92
a (normalized per square km) = -2.15
Maximum Magnitude Mw = 6±0.5

Project No: 181692

April 2008

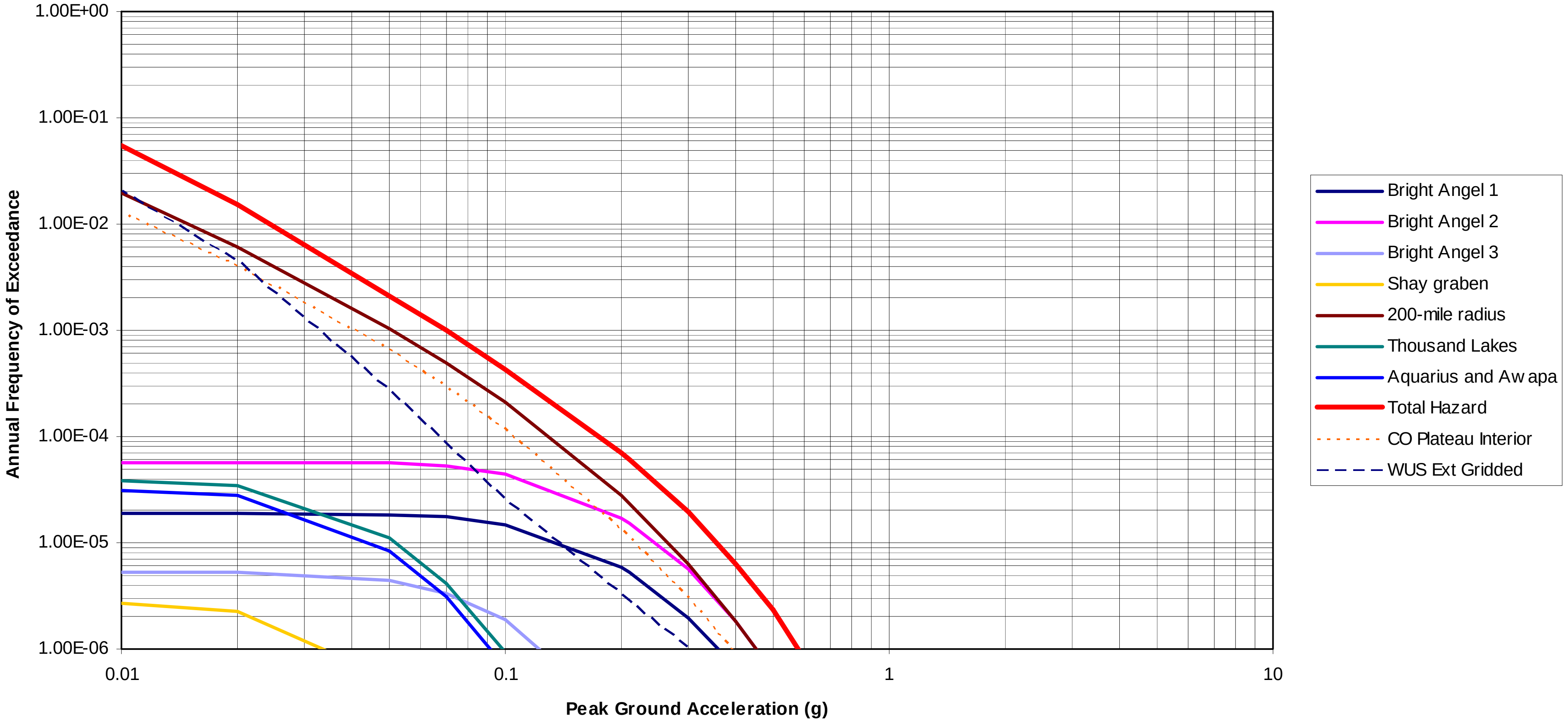
## FIGURE 4
## RECURRENCE CURVES FOR EARTHQUAKES
## SHOOTARING CANYON SITE



Project No: 181692

April 2008

**FIGURE 5**
**TOTAL SEISMIC HAZARD CURVE**
**SHOOTARING CANYON SITE**



Project No: 181692

April 2008

**FIGURE 6**
**SOURCE CONTRIBUTION TO TOTAL SEISMIC HAZARD**
**SHOOTARING CANYON SITE**

# APPENDIX A

# DEAGGREGATION OF SEISMIC HAZARD FOR PGA FROM USGS NATIONAL SEISMIC HAZARDS MAPPING PROJECT

no fault-specific sources; site: NEHRP B-C boundary

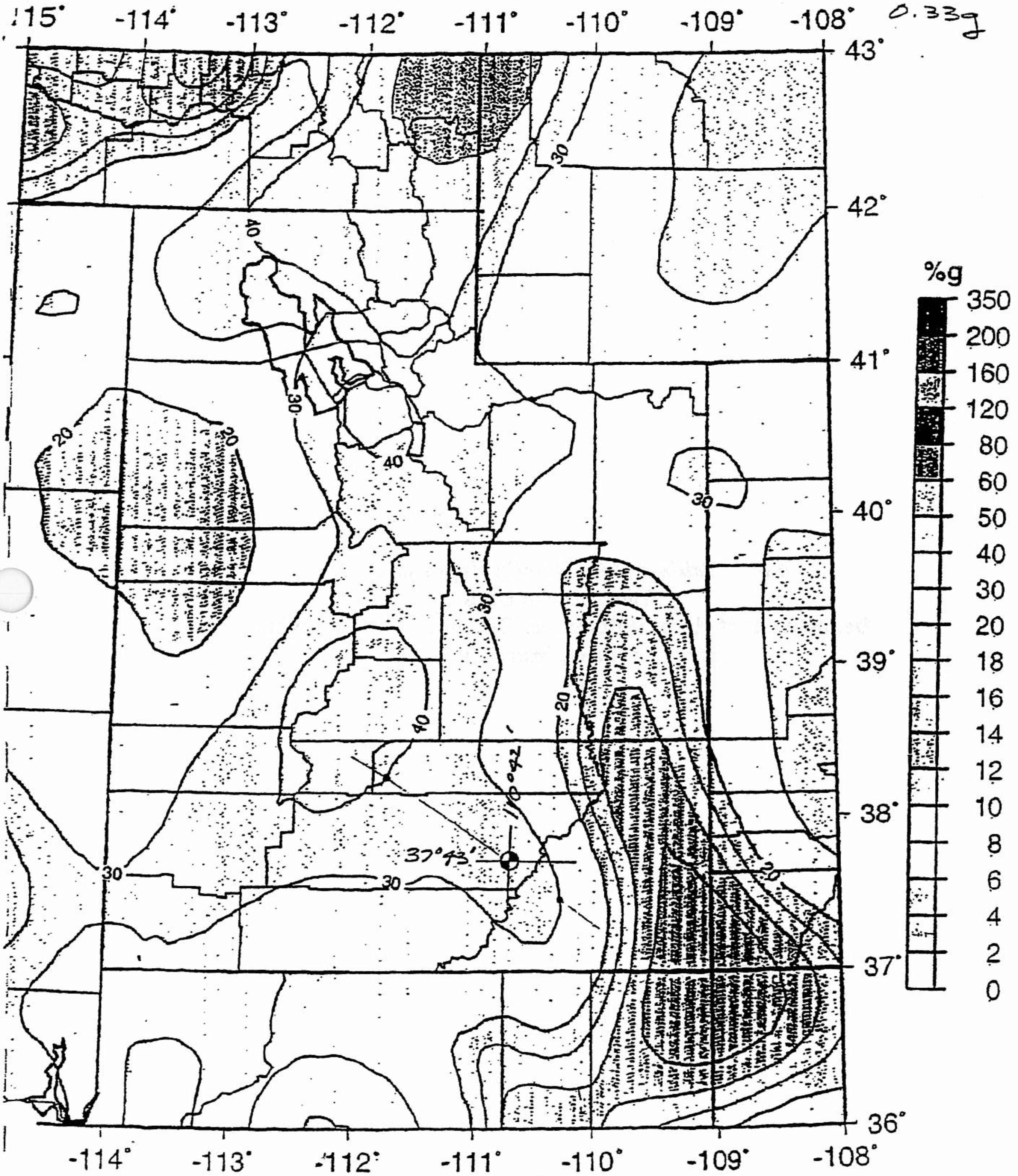
U.S. Geological Survey

National Seismic Hazard Mapping Project

$\frac{23}{77} = 0.3$

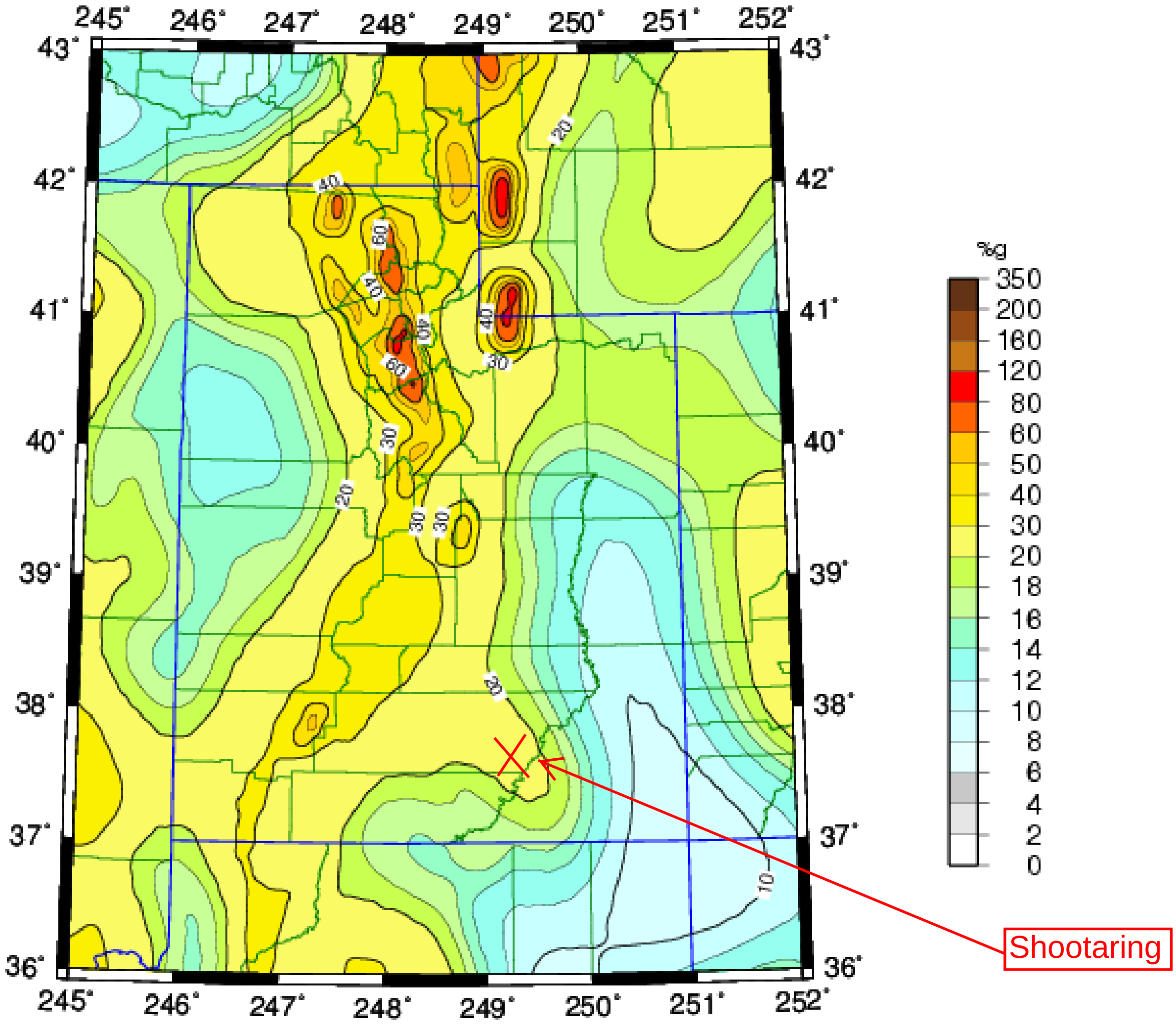
$0.3 \times 10 = 3$

0.33g



From Plateau Resources, Ltd et al. (2007),
Appendix A.5 Newmark Analysis, Letter Report, by Inberg-Miller Engineers, June 14, 1999.

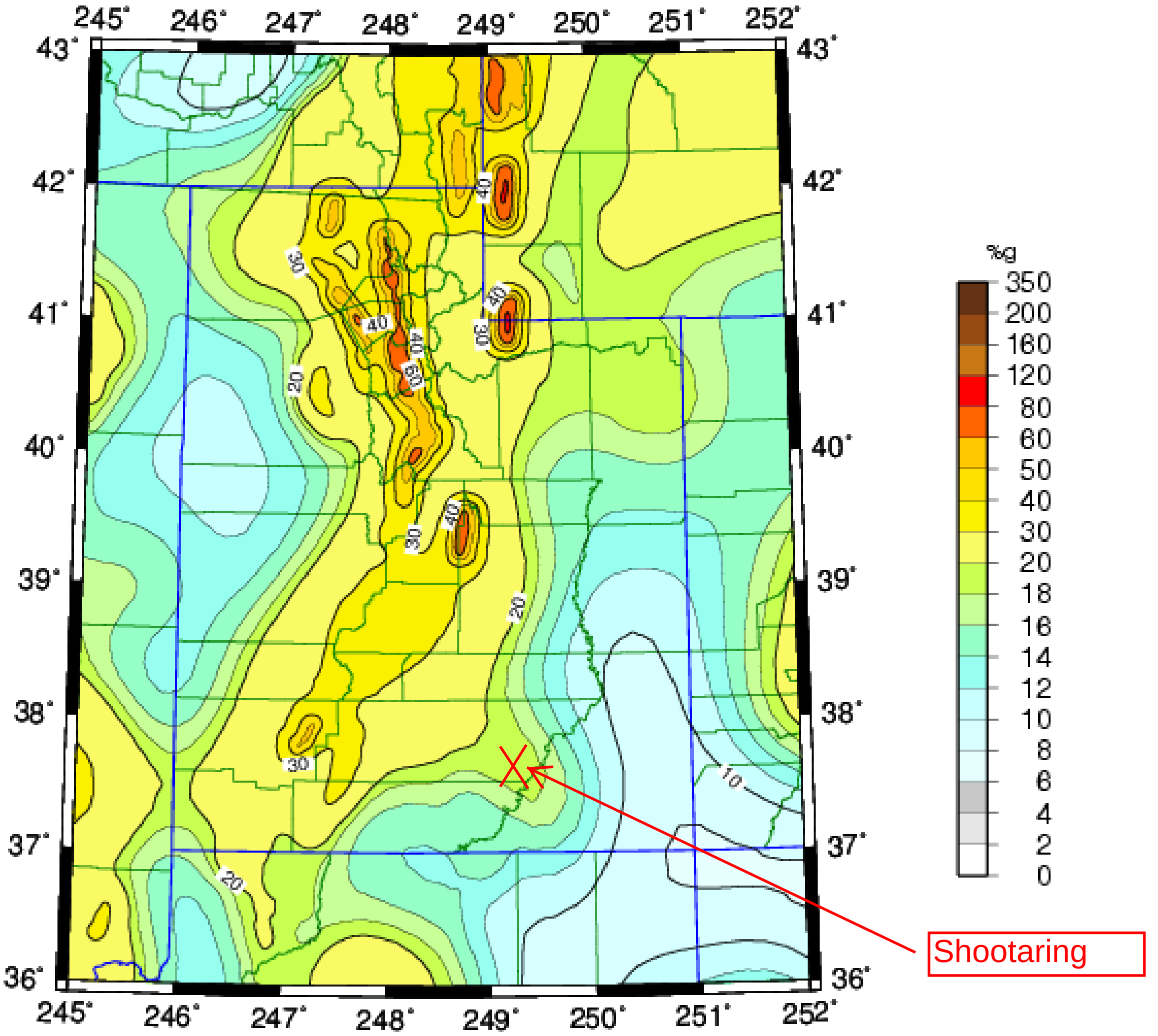
USGS National Seismic Hazard Mapping Project (1996)



Peak Acceleration (%g) with 2% Probability of Exceedance in 50 Years
site: NEHRP B-C boundary
U.S. Geological Survey
National Seismic Hazard Mapping Project

Albers Conic Equal-Area Projection
Standard Parallels: 29.5 and 45.5 degrees

USGS National Seismic Hazard Mapping Project (2002)



Peak Acceleration (%g) with 2% Probability of Exceedance in 50 Years
site: NEHRP B-C boundary
U.S. Geological Survey
National Seismic Hazard Mapping Project

Albers Conic Equal-Area Projection
Standard Parallels: 29.5 and 45.5 degrees

**Deaggregation of Seismic Hazard for PGA & 2 Periods of Spectral Accel.**
**Data from U.S.G.S. National Seismic Hazards Mapping Project, 2002 version**

```
PSHA Deaggregation. %contributions. site: Shootaring  long: 110.700 W., lat: 37.720 N.
USGS 2002-03 update files and programs. dM=0.2. Site descr:ROCK
Return period: 4975 yrs. Exceedance PGA =0.3227    g.
#Pr[at least one eq with median motion>=PGA in 50 yrs]=0.00478
DIST(KM) MAG(MW) ALL_EPS EPSILON>2  1<EPS<2 0<EPS<1 -1<EPS<0 -2<EPS<-1 EPS<-2
   11.0   4.60   6.015   0.739   2.631   2.261   0.368   0.016   0.000
   27.0   4.61   0.266   0.266   0.000   0.000   0.000   0.000   0.000
   12.0   4.80  13.152   1.476   5.427   5.169   1.031   0.049   0.000
   29.9   4.80   0.580   0.580   0.000   0.000   0.000   0.000   0.000
   12.3   5.03  11.236   0.788   4.426   4.679   1.251   0.092   0.000
   29.7   5.03   1.448   0.986   0.462   0.000   0.000   0.000   0.000
   12.8   5.21   4.981   0.306   1.750   2.237   0.639   0.049   0.000
   29.9   5.22   0.971   0.499   0.472   0.000   0.000   0.000   0.000
   13.3   5.40   8.620   0.393   2.670   4.115   1.356   0.085   0.001
   31.3   5.40   2.355   0.972   1.383   0.000   0.000   0.000   0.000
   55.4   5.41   0.070   0.070   0.000   0.000   0.000   0.000   0.000
   13.0   5.62   4.794   0.153   1.145   2.418   1.016   0.060   0.002
   30.6   5.62   2.361   0.595   1.467   0.300   0.000   0.000   0.000
   57.6   5.63   0.124   0.124   0.000   0.000   0.000   0.000   0.000
   14.4   5.81   5.249   0.159   1.222   2.641   1.130   0.094   0.004
   33.1   5.80   2.273   0.512   1.468   0.293   0.000   0.000   0.000
   58.3   5.82   0.208   0.193   0.014   0.000   0.000   0.000   0.000
   15.4   6.01   4.942   0.133   1.060   2.434   1.183   0.127   0.004
   35.6   6.01   1.738   0.294   1.168   0.276   0.000   0.000   0.000
   57.8   6.01   0.255   0.188   0.067   0.000   0.000   0.000   0.000
   81.6   6.02   0.067   0.067   0.000   0.000   0.000   0.000   0.000
   14.3   6.21   4.533   0.086   0.802   2.099   1.360   0.180   0.005
   34.2   6.21   2.512   0.283   1.395   0.834   0.000   0.000   0.000
   59.7   6.22   0.393   0.235   0.157   0.000   0.000   0.000   0.000
   85.3   6.23   0.086   0.084   0.002   0.000   0.000   0.000   0.000
   14.4   6.42   3.253   0.050   0.503   1.420   1.085   0.189   0.005
   34.5   6.42   2.209   0.177   1.010   0.968   0.054   0.000   0.000
   60.6   6.42   0.475   0.185   0.291   0.000   0.000   0.000   0.000
   88.3   6.42   0.089   0.082   0.007   0.000   0.000   0.000   0.000
  115.2   6.43   0.061   0.061   0.000   0.000   0.000   0.000   0.000
   14.2   6.59   2.058   0.033   0.290   0.850   0.738   0.144   0.004
   34.4   6.59   1.603   0.102   0.623   0.809   0.069   0.000   0.000
   58.6   6.60   0.338   0.084   0.246   0.008   0.000   0.000   0.000
   84.0   6.59   0.129   0.083   0.045   0.000   0.000   0.000   0.000
  119.6   6.60   0.076   0.072   0.003   0.000   0.000   0.000   0.000
   14.8   6.79   3.162   0.033   0.393   1.296   1.177   0.254   0.008
   36.0   6.78   2.185   0.126   0.759   1.169   0.131   0.000   0.000
   60.1   6.79   0.603   0.113   0.445   0.045   0.000   0.000   0.000
   85.0   6.79   0.219   0.101   0.119   0.000   0.000   0.000   0.000
  115.5   6.80   0.124   0.081   0.042   0.000   0.000   0.000   0.000
   14.9   6.98   1.734   0.012   0.194   0.712   0.656   0.155   0.005
   36.3   6.98   1.226   0.059   0.341   0.666   0.147   0.012   0.000
   60.5   6.98   0.418   0.056   0.286   0.076   0.000   0.000   0.000
   85.7   6.97   0.153   0.047   0.106   0.000   0.000   0.000   0.000
  115.0   6.95   0.066   0.033   0.033   0.000   0.000   0.000   0.000
  126.8   7.00   0.071   0.040   0.031   0.000   0.000   0.000   0.000
   63.6   7.16   0.055   0.007   0.035   0.012   0.000   0.000   0.000
   62.8   7.32   0.055   0.005   0.031   0.019   0.000   0.000   0.000
```

```
Summary statistics for above PSHA PGA  deaggregation, R=distance, e=epsilon:
 Mean src-site R=   20.3 km; M= 5.63; eps0=   0.07. Mean calculated for all sources.
Modal src-site R=   12.0 km; M= 4.80; eps0=   0.31 from peak (R,M) bin
Gridded source distance metrics: Rseis Rrup and Rjb
 MODE R*=  13.6km; M*= 4.80; EPS.INTERVAL: 1 to 2 sigma  % CONTRIB.=  5.427

Principal sources (faults, subduction, random seismicity having >10% contribution)
Source Category:              % contr.   R(km)    M   epsilon0 (mean values)
Midwest/CEUS gridded              99.20    20.4   5.62    0.07
Individual fault hazard details if contrib.>1%:
******************** Intermountain Seismic Belt***********************************
```

**Deaggregation of Seismic Hazard for PGA & 3 Periods of Spectral Accel.**
**Data from U.S.G.S. National Seismic Hazards Mapping Project, 1996 version**

```
PSHA Deaggregation. %contributions. site: Shootaring  long: 110.7000 W., lat: 37.7200 N.
Return period: 4975yrs. Exceedance PGA=0.3396090g. Computed annual rate=.20093E-03
DIST(KM) MAG(MW) ALL-EPS EPSILON>2  1<EPS<2 0<EPS<1 -1<EPS<0 -2<EPS<-1 EPS<-2
  11.7   4.84  25.886   5.081  12.688   8.053   0.064   0.000   0.000
  37.1   4.86   1.119   1.119   0.000   0.000   0.000   0.000   0.000
  57.5   4.87   0.096   0.096   0.000   0.000   0.000   0.000   0.000
  11.0   5.24  20.617   1.336   7.575  10.030   1.675   0.000   0.000
  29.5   5.26   7.455   3.431   3.938   0.086   0.000   0.000   0.000
  58.5   5.29   0.365   0.365   0.000   0.000   0.000   0.000   0.000
  11.8   5.70  13.565   0.580   3.236   7.129   2.591   0.029   0.000
  31.2   5.73   9.444   2.048   5.774   1.622   0.000   0.000   0.000
  59.5   5.76   0.983   0.924   0.059   0.000   0.000   0.000   0.000
  88.3   5.78   0.102   0.102   0.000   0.000   0.000   0.000   0.000
  12.3   6.22   7.887   0.307   1.494   3.448   2.414   0.224   0.000
  32.9   6.24   9.304   0.874   4.602   3.700   0.129   0.000   0.000
  60.6   6.27   1.872   0.940   0.931   0.000   0.000   0.000   0.000
  88.7   6.28   0.297   0.292   0.005   0.000   0.000   0.000   0.000
 112.7   6.29   0.167   0.167   0.000   0.000   0.000   0.000   0.000
  13.1   6.79   0.222   0.038   0.084   0.078   0.022   0.000   0.000
  73.0   6.76   0.080   0.028   0.052   0.000   0.000   0.000   0.000
  89.0   6.75   0.089   0.046   0.043   0.000   0.000   0.000   0.000
 113.5   6.75   0.055   0.044   0.011   0.000   0.000   0.000   0.000
  89.4   7.09   0.051   0.011   0.041   0.000   0.000   0.000   0.000

Summary statistics for above PSHA PGA  deaggregation, R=distance, e=epsilon:
 Mean src-site R=   19.7 km; M= 5.45; e0=   0.51; e=  1.22 for all sources.
Modal src-site R=   11.7 km; M= 4.84; e0=   0.79 from peak (R,M) bin
Primary distance metric: EPICENTRAL
 MODE R*=  12.1km; M*= 4.83; EPS.INTERVAL: 1 to 2 sigma  % CONTRIB.= 12.688

Principal sources (faults, subduction, random seismicity having >10% contribution)
Source:                      % contr.   R(km)    M   epsilon0 (mean values)
CEUS gridded seismicity,Frankel   61.52    19.9   5.44    0.42
CEUS gridded seismicity,Toro att  37.51    19.7   5.45    0.65
```

# APPENDIX B

# EARTHQUAKE EVENTS NEAR SHOOTARING CANYON SITE

# APPENDIX B.1

# EARTHQUAKE EVENTS WITH MAGNITUDE GREATER OR EQUAL TO 4.0 OCCURRING WITHIN 200 MILES OF SHOOTARING CANYON SITE

## Appendix B.1: Earthquake events with Magnitude greater or equal to 4.0 occurring within 200 miles of Shootaring Canyon site

Source:
Open-File Report 97-464 "Preparation of Earthquake Catalogs for the National Seismic-Hazard Maps: Contiguous 48 States" by Charles Mueller, Margaret Hopper, and Arthur Frankel.
Western US Moment Magnitude Catalog

WUS > 4 Mw
**BOLD** data is more recent than January 1996

| Magnitude (Mw) | Longitude (degree, west) | Latitude (degree, north) | Depth (km) | Year | Month | Day | Hour | Minute | Second | Catalog |
|---|---|---|---|---|---|---|---|---|---|---|
| 5.7 | -112.522 | 37.047 | 0 | 1887 | 12 | 5 | 15 | 30 | 0 | DNAG |
| 5.7 | -112.114 | 39.952 | 0 | 1900 | 8 | 1 | 7 | 45 | 0 | DNAG |
| 6.5 | -112.083 | 38.769 | 0 | 1901 | 11 | 14 | 4 | 39 | 0 | DNAG |
| 4.3 | -112.639 | 38.279 | 0 | 1902 | 7 | 31 | 7 | 0 | 0 | DNAG |
| 6.3 | -113.52 | 37.393 | 0 | 1902 | 11 | 17 | 19 | 50 | 0 | DNAG |
| 5 | -113.007 | 38.393 | 0 | 1908 | 4 | 15 | 0 | 0 | 0 | DNAG |
| 5 | -112.149 | 38.682 | 0 | 1910 | 1 | 10 | 13 | 0 | 0 | DNAG |
| 5.7 | -111.5 | 36.5 | 0 | 1912 | 8 | 18 | 21 | 12 | 0 | DNAG |
| 4.3 | -113.713 | 37.572 | 0 | 1914 | 12 | 14 | 5 | 30 | 0 | DNAG |
| 5 | -111.655 | 40.239 | 0 | 1915 | 7 | 15 | 22 | 0 | 0 | DNAG |
| 4.3 | -111.781 | 39.972 | 0 | 1916 | 2 | 5 | 6 | 25 | 0 | DNAG |
| 4.3 | -113.573 | 37.106 | 0 | 1920 | 11 | 26 | 0 | 0 | 0 | DNAG |
| 5.2 | -112.1 | 38.7 | 0 | 1921 | 9 | 29 | 14 | 12 | 0 | USHIS |
| 4.3 | -113.233 | 38.166 | 0 | 1923 | 5 | 14 | 12 | 10 | 0 | DNAG |
| 5 | -112.827 | 37.842 | 0 | 1933 | 1 | 20 | 13 | 10 | 0 | DNAG |
| 5 | -112.1 | 36 | 0 | 1935 | 1 | 10 | 8 | 10 | 0 | DNAG |
| 4.3 | -113.5 | 36.3 | 0 | 1936 | 1 | 22 | 3 | 38 | 0 | SRA |
| 4.3 | -112.958 | 37.25 | 0 | 1936 | 5 | 9 | 10 | 25 | 0 | DNAG |
| 4.7 | -113.3 | 38 | 0 | 1936 | 9 | 21 | 6 | 20 | 0 | USHIS |
| 4.3 | -112.433 | 37.822 | 0 | 1937 | 2 | 18 | 4 | 15 | 0 | DNAG |
| 4 | -114 | 37 | 0 | 1938 | 12 | 28 | 4 | 37 | 36 | DNAG |
| 4 | -114.3 | 37.3 | 0 | 1941 | 5 | 6 | 3 | 11 | 42 | CDMG |
| 4.3 | -111.65 | 39.58 | 0 | 1942 | 6 | 4 | 22 | 4 | 0 | DNAG |
| 5 | -113.065 | 37.682 | 0 | 1942 | 8 | 30 | 22 | 8 | 0 | DNAG |
| 4 | -114.1 | 37.4 | 0 | 1943 | 3 | 6 | 20 | 14 | 30 | SRA |
| 4.3 | -112.26 | 38.58 | 0 | 1943 | 11 | 3 | 9 | 30 | 0 | DNAG |
| 4 | -114.25 | 37.35 | 0 | 1943 | 11 | 6 | 3 | 55 | 0 | CDMG |
| 5 | -111.986 | 38.765 | 0 | 1945 | 11 | 18 | 1 | 15 | 0 | DNAG |
| 4.3 | -111.637 | 39.263 | 0 | 1948 | 11 | 4 | 13 | 18 | 0 | DNAG |
| 4.7 | -113.1 | 37.5 | 0 | 1949 | 11 | 2 | 2 | 29 | 29 | CDMG |
| 4.3 | -111.729 | 40.038 | 0 | 1950 | 5 | 8 | 22 | 35 | 0 | DNAG |
| 5 | -111.9 | 38.5 | 0 | 1950 | 11 | 18 | 1 | 15 | 0 | DNAG |
| 4.3 | -111.655 | 40.239 | 0 | 1951 | 8 | 12 | 0 | 26 | 0 | DNAG |
| 4.3 | -111.86 | 40.396 | 0 | 1952 | 9 | 28 | 20 | 0 | 0 | DNAG |
| 4.3 | -111.5 | 40.5 | 0 | 1953 | 5 | 24 | 2 | 54 | 29 | DNAG |
| 4.3 | -112.433 | 37.822 | 0 | 1953 | 10 | 22 | 3 | 0 | 0 | DNAG |

## Appendix B.1: Earthquake events with Magnitude greater or equal to 4.0 occurring within 200 miles of Shootaring Canyon site

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 5 | -107.3 | 38 | 0 | 1955 | 8 | 3 | 6 | 39 | 42 | DNAG |
| 5 | -111.44 | 40.341 | 0 | 1958 | 2 | 13 | 22 | 52 | 0 | DNAG |
| 4.3 | -111.833 | 39.711 | 0 | 1958 | 11 | 28 | 13 | 30 | 39 | DNAG |
| 5 | -112.5 | 38 | 0 | 1959 | 2 | 27 | 22 | 19 | 52 | DNAG |
| 5.6 | -112.37 | 36.8 | 0 | 1959 | 7 | 21 | 17 | 39 | 29 | USHIS |
| 5 | -111.5 | 35.5 | 0 | 1959 | 10 | 13 | 8 | 15 | 0 | USHIS |
| 5 | -111.66 | 39.34 | 0 | 1961 | 4 | 16 | 5 | 2 | 39.3 | DNAG |
| 4.3 | -114.333 | 37.667 | 0 | 1961 | 9 | 26 | 21 | 46 | 20 | CDMG |
| 4.7 | -107.6 | 38.2 | 25 | 1962 | 2 | 5 | 14 | 45 | 51.1 | USHIS |
| 4.4 | -112.9 | 37 | 21 | 1962 | 2 | 15 | 9 | 6 | 45.1 | SRA |
| 4.5 | -112.4 | 36.9 | 26 | 1962 | 2 | 15 | 7 | 12 | 42.9 | USHIS |
| 4.5 | -112.1 | 38 | 33 | 1962 | 6 | 5 | 22 | 29 | 45 | USHIS |
| 4.4 | -114.2 | 37.5 | 0 | 1962 | 7 | 8 | 15 | 58 | 6 | CDMG |
| 4.3 | -111 | 40 | 33 | 1962 | 9 | 7 | 8 | 47 | 19 | DNAG |
| 5 | -111.91 | 39.53 | 7 | 1963 | 7 | 7 | 19 | 20 | 39.6 | USHIS |
| 4 | -111.19 | 40.03 | 7 | 1963 | 7 | 9 | 20 | 25 | 25.8 | SRA |
| 4 | -111.55 | 39.1 | 7 | 1966 | 4 | 23 | 20 | 20 | 53.3 | SRA |
| 4.2 | -111.85 | 37.98 | 7 | 1966 | 5 | 20 | 13 | 40 | 47.9 | SRA |
| 5.4 | -114.2 | 37.4 | 33 | 1966 | 9 | 22 | 18 | 57 | 36.5 | USHIS |
| 4.4 | -111.6 | 35.8 | 34 | 1966 | 10 | 3 | 16 | 3 | 50.9 | SRA |
| 4.2 | -113.16 | 38.2 | 7 | 1966 | 10 | 21 | 7 | 13 | 48.9 | SRA |
| 4.2 | -112.3 | 38.8 | 33 | 1967 | 6 | 22 | 21 | 51 | 29.9 | DNAG |
| 4.2 | -111.6 | 36.15 | 33 | 1967 | 9 | 4 | 23 | 27 | 46.2 | SRA |
| 5.6 | -112.16 | 38.54 | 7 | 1967 | 10 | 4 | 10 | 20 | 12.8 | USHIS |
| 4 | -112.04 | 39.27 | 7 | 1968 | 1 | 16 | 9 | 42 | 52.1 | SRA |
| 4 | -113.082 | 38.407 | 0 | 1970 | 3 | 30 | 15 | 15 | 52.7 | DNAG |
| 4.1 | -111.72 | 37.87 | 7 | 1970 | 4 | 18 | 10 | 42 | 11.5 | SRA |
| 4.2 | -112.47 | 38.06 | 7 | 1970 | 5 | 23 | 22 | 55 | 23.2 | SRA |
| 4.1 | -113.1 | 37.8 | 7 | 1971 | 11 | 10 | 14 | 10 | 23 | SRA |
| 4.5 | -112.17 | 38.65 | 7 | 1972 | 1 | 3 | 10 | 20 | 38.9 | USHIS |
| 4.3 | -112.07 | 38.67 | 7 | 1972 | 6 | 2 | 3 | 15 | 48.2 | SRA |
| 4.5 | -111.35 | 40.51 | 7 | 1972 | 10 | 1 | 19 | 42 | 29.5 | USHIS |
| 4.6 | -111.97 | 39.94 | 5 | 1980 | 5 | 24 | 10 | 3 | 36.3 | SRA |
| 4.3 | -111.74 | 40.32 | 1 | 1981 | 2 | 20 | 9 | 13 | 1.2 | USHIS |
| 4.4 | -113.3 | 37.59 | 1 | 1981 | 4 | 5 | 5 | 40 | 39.7 | USHIS |
| 4.3 | -111.62 | 35.17 | 0 | 1981 | 12 | 6 | 9 | 9 | 20.3 | DNAG |
| 4.3 | -112.04 | 38.71 | 5 | 1982 | 5 | 24 | 12 | 13 | 26.6 | USHIS |
| 4 | -112.565 | 38.577 | 0 | 1983 | 12 | 9 | 8 | 58 | 40.7 | SRA |
| 4.6 | -112.009 | 39.236 | 1 | 1986 | 3 | 24 | 22 | 40 | 23.4 | USHIS |
| 5.3 | -111.614 | 38.824 | 10 | 1989 | 1 | 30 | 4 | 6 | 22.7 | USHIS |
| 4 | -112.257 | 35.952 | 5 | 1989 | 3 | 5 | 0 | 40 | 30.8 | PDE |
| 4 | -112.355 | 35.96 | 5 | 1992 | 3 | 14 | 5 | 13 | 31.6 | PDE |
| 4.4 | -111.554 | 38.783 | 0 | 1992 | 6 | 24 | 7 | 31 | 20.2 | PDE |
| 4 | -112.219 | 35.982 | 5 | 1992 | 7 | 5 | 18 | 17 | 29.9 | PDE |
| 5.7 | -113.472 | 37.09 | 15 | 1992 | 9 | 2 | 10 | 26 | 20.9 | PDE |
| 5.3 | -112.112 | 35.611 | 10 | 1993 | 4 | 29 | 8 | 21 | 0.8 | PDE |
| 4.1 | -112.327 | 38.078 | 5 | 1994 | 9 | 6 | 3 | 48 | 37.6 | PDE |

# Appendix B.1: Earthquake events with Magnitude greater or equal to 4.0 occurring within 200 miles of Shootaring Canyon site

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 4 | -112.223 | 35.964 | 5 | 1995 | 4 | 17 | 8 | 23 | 46.2 | PDE |
| 4 | -113.294 | 37.416 | 5 | 1995 | 6 | 8 | 8 | 29 | 16.5 | PDE |
| **4.5** | **-112.467** | **38.206** | **5** | **1998** | **1** | **2** | **7** | **28** | **29** | **PDE** |
| **4.1** | **-112.49** | **37.97** | **2** | **1998** | **6** | **18** | **11** | **0** | **40** | **PDE** |
| **4.2** | **-112.727** | **38.077** | **5** | **1999** | **10** | **22** | **17** | **51** | **15.6** | **PDE** |
| **4** | **-111.53** | **38.75** | **2** | **1999** | **12** | **22** | **8** | **3** | **31** | **PDE** |
| **4.1** | **-112.56** | **38.73** | **0** | **2001** | **2** | **23** | **21** | **43** | **50** | **PDE** |
| **4.4** | **-111.521** | **38.731** | **3** | **2001** | **7** | **19** | **20** | **15** | **34** | **PDE** |

## Appendix B.1: Earthquake events with Magnitude greater or equal to 4.0 occurring within 200 miles of Shootaring Canyon site

Source:
Open-File Report 97-464 "Preparation of Earthquake Catalogs for the National Seismic-Hazard Maps:
Contiguous 48 States" by Charles Mueller, Margaret Hopper, and Arthur Frankel.
Central/Eastern US Bodywave Magnitude Catalog

CEUS > 4 mb
**BOLD** data is more recent than January 1996

| Magnitude (mb) | Longitude (degree, west) | Latitude (degree, north) | Depth (km) | Year | Month | Day | Hour | Minute | Second | Catalog |
|---|---|---|---|---|---|---|---|---|---|---|
| 5 | -107.5 | 39 | 0 | 1944 | 9 | 9 | 4 | 12 | 20 | DNAG |
| 5 | -109.5 | 35.7 | 0 | 1950 | 1 | 17 | 0 | 51 | 0 | DNAG |
| 5.3 | -110.5 | 40.5 | 0 | 1950 | 1 | 18 | 1 | 55 | 51 | USHIS |
| 4.3 | -110.163 | 38.997 | 0 | 1953 | 7 | 30 | 5 | 45 | 0 | DNAG |
| 5.5 | -107.6 | 38.3 | 49 | 1960 | 10 | 11 | 8 | 5 | 30.5 | USHIS |
| 4.3 | -111.22 | 38.1 | 7 | 1963 | 9 | 30 | 9 | 17 | 39.3 | SRA |
| 4.2 | -107.6 | 38.3 | 33 | 1966 | 9 | 4 | 9 | 52 | 34.5 | SRA |
| 4.4 | -107.51 | 38.98 | 33 | 1967 | 1 | 12 | 3 | 52 | 6.2 | SRA |
| 4.1 | -107.86 | 37.67 | 33 | 1967 | 1 | 16 | 9 | 22 | 45.9 | SRA |
| 4 | -108.31 | 37.92 | 33 | 1970 | 2 | 3 | 5 | 59 | 35.6 | SRA |
| 4 | -108.68 | 38.91 | 5 | 1971 | 11 | 12 | 9 | 30 | 44.6 | SRA |
| 4.1 | -108.65 | 39.27 | 5 | 1975 | 1 | 30 | 14 | 48 | 40.3 | SRA |
| 4.6 | -108.212 | 35.817 | 0 | 1976 | 1 | 5 | 6 | 23 | 33.9 | SNMX |
| 4.2 | -108.222 | 35.748 | 0 | 1977 | 3 | 5 | 3 | 0 | 55.8 | SNMX |
| 4.8 | -110.47 | 40.47 | 6 | 1977 | 9 | 30 | 10 | 19 | 20.4 | USHIS |
| 4 | -110.574 | 37.42 | 5 | 1986 | 8 | 22 | 13 | 26 | 33.3 | SRA |
| 5.4 | -110.869 | 39.128 | 10 | 1988 | 8 | 14 | 20 | 3 | 3.9 | USHIS |
| 4.5 | -107.976 | 38.151 | 10 | 1994 | 9 | 13 | 6 | 1 | 23 | PDE |
| 4.1 | -108.925 | 40.179 | 5 | 1995 | 3 | 20 | 12 | 46 | 16.3 | PDE |
| **4.2** | **-110.878** | **39.12** | **0** | **1996** | **1** | **6** | **12** | **55** | **58.6** | **PDE** |

## Appendix B.1: Earthquake events with Magnitude greater or equal to 4.0 occurring within 200 miles of Shootaring Canyon site

Source: NEIC Earthquake search

FILE CREATED: Mon Sep 17 20:44:04 2007
Circle Search Earthquakes= 649
Circle Center Point Latitude: 37.720N Longitude: 110.700W
Radius: 320.000 km
Catalog Used: PDE
Data Selection: Historical & Preliminary Data

**BOLD** data is more recent than January 1996

| Magnitude (Mw) | Longitude (degree, west) | Latitude (degree, north) | Depth (km) | Year | Month | Day | Hour | Minute | Second | Catalog |
|---|---|---|---|---|---|---|---|---|---|---|
| **4.6** | **-111.857** | **39.516** | **0** | **2003** | **4** | **17** | **1** | **4** | **19** | **PDE** |
| **4.1** | **-108.915** | **38.236** | **0** | **2004** | **11** | **7** | **6** | **54** | **59** | **PDE** |
| **4.1** | **-113.305** | **38.071** | **7** | **2007** | **8** | **18** | **13** | **16** | **31** | **PDE-Q** |

# APPENDIX B.2

# EARTHQUAKE EVENTS WITHIN 80 MILES OF SHOOTARING CANYON SITE

## Appendix B.2 Earthquake events within 80 miles of Shootaring Canyon Site

Source: NEIC Earthquake Search Results
UNITED STATES GEOLOGICAL SURVEY
EARTHQUAKE DATA BASE

FILE CREATED: Wed Mar 5 16:19:19 2008
Circle Search Earthquakes= 19
Circle Center Point Latitude: 37.720N Longitude: 110.700W
Radius: 129.000 km
Catalog Used: PDE
Data Selection: Historical & Preliminary Data
Catalog Used: USHIS
Data Selection: Significant U.S. Earthquakes (USHIS)
Catalog Used: SRA
Data Selection: Eastern, Central and Mountain States of U.S. (SRA)

| | Date | | | COORDINATES | | DEPTH | Magnitude (Mw) |
|---|---|---|---|---|---|---|---|
| CATALOG SOURCE | YEAR | MO | DA | LAT | LONG | km | |
| SRA | 1885 | 12 | 17 | 38.3 | -111.5 | | 3.0 |
| SRA | 1896 | 10 | 14 | 38.4 | -110.7 | | 3.0 |
| SRA | 1935 | 10 | 6 | 37.9 | -111.4 | | 3.7 |
| SRA | 1943 | 8 | 14 | 38.2 | -111.4 | | 3.7 |
| SRA | 1955 | 3 | 27 | 38.3 | -111.3 | | 3.7 |
| SRA | 1962 | 3 | 16 | 36.88 | -109.72 | | 2.4 |
| USHIS | 1962 | 6 | 5 | 38 | -112.1 | 33 | 4.5 |
| SRA | 1962 | 8 | 19 | 38.05 | -112.09 | 7 | 3.2 |
| SRA | 1963 | 9 | 30 | 38.1 | -111.22 | 7 | 4.3 |
| SRA | 1966 | 5 | 20 | 37.98 | -111.85 | 7 | 4.1 |
| SRA | 1967 | 2 | 1 | 37.83 | -110.17 | 7 | 2.5 |
| SRA | 1967 | 5 | 8 | 37.79 | -110.17 | 7 | 2.7 |
| SRA | 1968 | 2 | 23 | 37.6 | -110.24 | 7 | 2.8 |
| SRA | 1968 | 9 | 24 | 38.04 | -112.08 | 7 | 3.6 |
| SRA | 1969 | 8 | 19 | 37.64 | -110.65 | 7 | 2.6 |
| SRA | 1970 | 4 | 18 | 37.87 | -111.72 | 7 | 3.7 |
| SRA | 1972 | 7 | 13 | 37.56 | -111.94 | 7 | 2.9 |
| SRA | 1976 | 11 | 19 | 38.66 | -111.35 | 7 | 2.5 |
| SRA | 1976 | 12 | 28 | 38.35 | -111.17 | 7 | 2.5 |
| SRA | 1977 | 8 | 12 | 36.79 | -110.92 | 7 | 2.6 |
| SRA | 1977 | 9 | 21 | 37.11 | -111.54 | 7 | 2.7 |
| SRA | 1977 | 11 | 29 | 36.82 | -110.99 | 7 | 3.0 |
| SRA | 1979 | 4 | 30 | 37.88 | -111.02 | 7 | 3.8 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| SRA | 1979 | 10 | 23 | 37.89 | -110.93 | 7 | 3.5 |
| SRA | 1981 | 4 | 9 | 37.72 | -110.54 | 2 | 2.7 |
| SRA | 1981 | 5 | 29 | 36.83 | -110.37 | 1 | 3.0 |
| SRA | 1981 | 9 | 10 | 37.5 | -110.56 | 2 | 3.1 |
| SRA | 1982 | 4 | 17 | 38.22 | -111.3 | 9 | 3.0 |
| SRA | 1982 | 8 | 25 | 38.01 | -111.64 | 7 | 2.7 |
| SRA | 1983 | 1 | 27 | 37.778 | -110.674 | 7 | 3.3 |
| PDE | 1983 | 5 | 3 | 38.288 | -110.592 | 7 | 3.0 |
| PDE | 1983 | 8 | 4 | 37.556 | -110.409 | 7 | 2.7 |
| SRA | 1983 | 12 | 15 | 37.575 | -110.51 | 3 | 2.8 |
| PDE | 1986 | 5 | 14 | 37.429 | -110.561 | 5 | 3.2 |
| PDE | 1986 | 8 | 22 | 37.42 | -110.574 | 5 | 4.0 |
| SRA | 1986 | 11 | 7 | 37.43 | -110.297 | 1 | 3.0 |
| PDE | 1988 | 8 | 8 | 37.894 | -111.23 | 15 | 2.8 |
| PDE | 1991 | 1 | 26 | 37.681 | -111.429 | 9 | 3.3 |
| PDE | 1991 | 6 | 25 | 37.209 | -110.358 | 1 | 3.0 |
| PDE | 1997 | 10 | 20 | 37.834 | -111.879 | 10 | 3.1 |
| PDE | 1998 | 3 | 29 | 38.25 | -111.35 | 3 | 3.2 |
| PDE | 2002 | 9 | 22 | 36.78 | -111.31 | 1 | 2.9 |
| PDE | 2002 | 9 | 26 | 37.41 | -110.53 | 3 | 3.0 |
| PDE | 2003 | 4 | 17 | 39.516 | -111.857 | 0 | 4.4 |
| PDE | 2003 | 7 | 8 | 36.95 | -111.79 | 6 | 3.3 |
| PDE | 2003 | 11 | 7 | 36.96 | -111.77 | 9 | 3.1 |
| PDE | 2003 | 12 | 29 | 38.324 | -110.56 | 4 | 2.9 |
| PDE | 2005 | 4 | 8 | 37.593 | -111.066 | 6 | 2.8 |
| PDE | 2005 | 8 | 20 | 37.89 | -111.77 | 0 | 3.2 |

# APPENDIX C
# QUATERNARY FAULTS AND FOLDS WITHIN 200 MILES OF SHOOTARING CANYON SITE

# APPENDIX C.1
# DETERMINISTIC CHARACTERISTICS

## Appendix C.1: Quaternary faults and folds within 200 miles of Shootaring Canyon site - Deterministic Characteristics

| Name of Fault | ID Number | Age of Most Recent Prehistoric Deformation (ya)$^1$ | Slip-rate (mm/yr) | Fault Length (km) | Fault Type | Distance from site to surface trace of fault, (km) | MCE$^2$ | PGA | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | Spudich et al. (1999) for rock sites | | Abrahamson and Silva (1997) for normal faults | | Campbell and Bozorgnia (2003) corrected | | Campbell and Bozorgnia (2007) | | Lognormal Mean | |
| | | | | | | | | Mean | Mean +1SD | Mean | Mean +1SD | Mean | Mean +1SD | Mean | Mean +1SD | Mean | Mean +1SD |
| Random Earthquake | | | | | | 15 | 6.3 | 0.12 | 0.19 | 0.20 | 0.33 | 0.14 | 0.23 | 0.13 | 0.23 | 0.15 | 0.24 |
| Fault 1, Bright Angel Fault Zone (Class B) | 2514 | Class B | <0.2 | 4.0 | N | 9 | 5.8 | 0.13 | 0.22 | 0.20 | 0.35 | 0.17 | 0.28 | 0.16 | 0.28 | 0.16 | 0.28 |
| Fault 2, Bright Angel Fault Zone (Class B) | 2514 | Class B | <0.2 | 10.0 | N | 13 | 6.2 | 0.13 | 0.21 | 0.21 | 0.36 | 0.16 | 0.25 | 0.14 | 0.25 | 0.16 | 0.27 |
| Fault 3, Bright Angel Fault Zone (Class B) | 2514 | Class B | <0.2 | 23.0 | N | 35 | 6.7 | 0.07 | 0.10 | 0.10 | 0.16 | 0.08 | 0.12 | 0.07 | 0.12 | 0.08 | 0.13 |
| Needles fault zone (Class B) | 2507 | Class B | <0.2 | 28.5 | | 60 | 6.8 | 0.04 | 0.06 | 0.06 | 0.09 | 0.05 | 0.07 | 0.04 | 0.07 | 0.05 | 0.07 |
| Thousand Lake fault | 2506 | <750,000 | <0.2 | 48.3 | | 90 | 7.0 | 0.03 | 0.05 | 0.04 | 0.07 | 0.04 | 0.06 | 0.03 | 0.06 | 0.03 | 0.06 |
| Shay graben faults (Class B) | 2513 | Class B | <0.2 | 39.5 | | 88 | 6.9 | 0.03 | 0.05 | 0.04 | 0.07 | 0.03 | 0.05 | 0.03 | 0.06 | 0.03 | 0.06 |
| Aquarius and Awapa Plateaus faults | 2505 | <1,600,000 | <0.2 | 35.7 | | 89 | 6.9 | 0.03 | 0.05 | 0.04 | 0.06 | 0.03 | 0.05 | 0.03 | 0.05 | 0.03 | 0.05 |
| Paunsaugunt fault | 2504 | <1,600,000 | <0.2 | 44.1 | | 114 | 7.0 | 0.02 | 0.04 | 0.03 | 0.05 | 0.03 | 0.04 | | | 0.03 | 0.04 |
| Sevier/Toroweap fault zone, Sevier section | 997a | <130,000 | 0.2-1 | 88.7 | | 142 | 7.3 | 0.02 | 0.04 | 0.03 | 0.05 | 0.03 | 0.04 | | | 0.03 | 0.04 |
| Moab fault and Spanish Valley faults (Class B) | 2476 | Class B | <0.2 | 72.4 | N | 137 | 7.2 | 0.02 | 0.03 | 0.03 | 0.05 | 0.03 | 0.04 | | | 0.03 | 0.04 |
| West Kaibab fault system | 994 | <1,600,000 | <0.2 | 82.9 | N | 152 | 7.3 | 0.02 | 0.03 | 0.03 | 0.05 | 0.03 | 0.04 | | | 0.03 | 0.04 |
| Wasatch monocline (Class B) | 2450 | <1,600,000 | <0.2 | 103.5 | | 164 | 7.4 | 0.02 | 0.03 | 0.03 | 0.05 | 0.03 | 0.04 | | | 0.02 | 0.04 |
| Joes Valley fault zone, west fault | 2453 | <15,000 | 0.2-1 | 57.2 | | 137 | 7.1 | 0.02 | 0.03 | 0.03 | 0.05 | 0.02 | 0.04 | | | 0.02 | 0.04 |
| Southern Joes Valley fault zone | 2456 | <750,000 | <0.2 | 47.2 | | 137 | 7.0 | 0.02 | 0.03 | 0.03 | 0.04 | 0.02 | 0.04 | | | 0.02 | 0.04 |
| Central Kaibab fault system | 993 | <1,600,000 | <0.2 | 71.5 | N | 157 | 7.2 | 0.02 | 0.03 | 0.03 | 0.04 | 0.02 | 0.04 | | | 0.02 | 0.04 |
| Salt and Cache Valleys faults (Class B) | 2474 | Class B | <0.2 | 57.9 | N | 147 | 7.1 | 0.02 | 0.03 | 0.03 | 0.04 | 0.02 | 0.04 | | | 0.02 | 0.04 |
| Lisbon Valley fault zone (Class B) | 2511 | <1,600,000 | <0.2 | 37.5 | | 134 | 6.9 | 0.02 | 0.03 | 0.03 | 0.04 | 0.02 | 0.03 | | | 0.02 | 0.03 |
| Sevier fault | 2355 | <1,600,000 | <0.2 | 41.3 | N | 139 | 7.0 | 0.02 | 0.03 | 0.03 | 0.04 | 0.02 | 0.03 | | | 0.02 | 0.03 |
| Sevier Valley-Marysvale-Circleville area faults | 2500 | <750,000 | <0.2 | 34.9 | | 137 | 6.9 | 0.02 | 0.03 | 0.03 | 0.04 | 0.02 | 0.03 | | | 0.02 | 0.03 |
| Ten Mile graben faults (Class B) | 2473 | Class B | <0.2 | 34.6 | N | 137 | 6.9 | 0.02 | 0.03 | 0.03 | 0.04 | 0.02 | 0.03 | | | 0.02 | 0.03 |
| Joes Valley fault zone, east fault | 2455 | <15,000 | 0.2-1 | 56.6 | | 159 | 7.1 | 0.02 | 0.03 | 0.03 | 0.04 | 0.02 | 0.03 | | | 0.02 | 0.03 |
| Markagunt Plateau faults (Class B) | 2535 | <750,000 | <0.2 | 56.4 | | 162 | 7.1 | 0.02 | 0.03 | 0.03 | 0.04 | 0.02 | 0.03 | | | 0.02 | 0.03 |
| Paradox Valley graben (Class B) | 2286 | <1,600,000 | <0.2 | 56.4 | N | 162 | 7.1 | 0.02 | 0.03 | 0.03 | 0.04 | 0.02 | 0.03 | | | 0.02 | 0.03 |
| Sevier/Toroweap fault zone, northern Toroweap section | 997b | <130,000 | <0.2 | 80.9 | | 182 | 7.3 | 0.02 | 0.03 | 0.03 | 0.04 | 0.02 | 0.03 | | | 0.02 | 0.03 |
| Eminence fault zone | 992 | <1,600,000 | <0.2 | 36.0 | | 155 | 6.9 | 0.02 | 0.03 | 0.02 | 0.04 | 0.02 | 0.03 | | | 0.02 | 0.03 |
| Price River area faults (Class B) | 2457 | <1,600,000 | <0.2 | 50.9 | N | 174 | 7.1 | 0.02 | 0.02 | 0.02 | 0.04 | 0.02 | 0.03 | | | 0.02 | 0.03 |
| Bright Angel fault zone | 991 | <1,600,000 | <0.2 | 66.0 | N | 193 | 7.2 | 0.01 | 0.02 | 0.02 | 0.03 | 0.02 | 0.03 | | | 0.02 | 0.03 |
| Sevier Valley faults and folds (Class B) | 2537 | <130,000 | <0.2 | 23.6 | | 145 | 6.7 | 0.02 | 0.02 | 0.02 | 0.03 | 0.02 | 0.03 | | | 0.02 | 0.03 |
| Big Gypsum Valley graben (Class B) | 2288 | Class B | <0.2 | 33.1 | | 160 | 6.8 | 0.01 | 0.02 | 0.02 | 0.03 | 0.02 | 0.03 | | | 0.02 | 0.03 |
| Valley Mountains monocline (Class B) | 2449 | <1,600,000 | <0.2 | 38.6 | | 174 | 6.9 | 0.01 | 0.02 | 0.02 | 0.03 | 0.02 | 0.03 | | | 0.02 | 0.03 |
| Ryan Creek fault zone | 2263 | <1,600,000 | <0.2 | 39.5 | N | 181 | 6.9 | 0.01 | 0.02 | 0.02 | 0.03 | 0.02 | 0.03 | | | 0.02 | 0.03 |

## Appendix C.1: Quaternary faults and folds within 200 miles of Shootaring Canyon site - Deterministic Characteristics

| Name of Fault | ID Number | Age of Most Recent Prehistoric Deformation (ya)[1] | Slip-rate (mm/yr) | Fault Length (km) | Fault Type | Distance from site to surface trace of fault, (km) | MCE[2] | PGA | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | Spudich et al. (1999) for rock sites | | Abrahamson and Silva (1997) for normal faults | | Campbell and Bozorgnia (2003) corrected | | Campbell and Bozorgnia (2007) | | Lognormal Mean | |
| | | | | | | | | Mean | Mean +1SD | Mean | Mean +1SD | Mean | Mean +1SD | Mean | Mean +1SD | Mean | Mean +1SD |
| Tushar Mountains (east side) fault | 2501 | <1,600,000 | <0.2 | 18.5 | | 148 | 6.5 | 0.01 | 0.02 | 0.02 | 0.03 | 0.02 | 0.02 | | | 0.02 | 0.03 |
| Beaver Basin faults, eastern margin faults | 2492a | <15,000 | <0.2 | 34.2 | | 175 | 6.9 | 0.01 | 0.02 | 0.02 | 0.03 | 0.02 | 0.02 | | | 0.02 | 0.03 |
| Beaver Basin faults, intrabasin faults | 2492b | <15,000 | <0.2 | 38.9 | | 184 | 6.9 | 0.01 | 0.02 | 0.02 | 0.03 | 0.02 | 0.02 | | | 0.02 | 0.03 |
| Joes Valley fault zone, intragraben faults | 2454 | <15,000 | <0.2 | 34.0 | | 181 | 6.9 | 0.01 | 0.02 | 0.02 | 0.03 | 0.02 | 0.02 | | | 0.02 | 0.02 |
| Unnamed faults east of Atkinson Masa | 2269 | <1,600,000 | <0.2 | 41.1 | N | 194 | 7.0 | 0.01 | 0.02 | 0.02 | 0.03 | 0.02 | 0.02 | | | 0.02 | 0.02 |
| Gunnison fault | 2445 | <15,000 | <0.2 | 42.0 | N | 197 | 7.0 | 0.01 | 0.02 | 0.02 | 0.03 | 0.02 | 0.02 | | | 0.02 | 0.02 |
| White Mountain area faults | 2451 | <1,600,000 | <0.2 | 16.4 | | 157 | 6.5 | 0.01 | 0.02 | 0.02 | 0.03 | 0.01 | 0.02 | | | 0.01 | 0.02 |
| Main Street fault zone | 1002 | <130,000 | <0.2 | 87.3 | N | 266 | 7.3 | 0.01 | 0.02 | 0.02 | 0.03 | 0.01 | 0.02 | | | 0.01 | 0.02 |
| Mineral Mountains (west side) faults | 2489 | <15,000 | <0.2 | 36.6 | | 203 | 6.9 | 0.01 | 0.02 | 0.02 | 0.03 | 0.01 | 0.02 | | | 0.01 | 0.02 |
| Clear Lake fault zone (Class B) | 2436 | <15,000 | <0.2 | 35.5 | | 215 | 6.9 | 0.01 | 0.02 | 0.02 | 0.02 | 0.01 | 0.02 | | | 0.01 | 0.02 |
| Hurricane fault zone, Anderson Junction section | 998c | <15,000 | 0.2-1 | 42.2 | | 233 | 7.0 | 0.01 | 0.02 | 0.02 | 0.02 | 0.01 | 0.02 | | | 0.01 | 0.02 |
| Wasatch fault zone, Nephi section | 2351h | <15,000 | 1-5 | 43.1 | | 240 | 7.0 | 0.01 | 0.02 | 0.02 | 0.02 | 0.01 | 0.02 | | | 0.01 | 0.02 |
| San Francisco Mountains (west side) fault | 2486 | <750,000 | <0.2 | 41.4 | | 238 | 7.0 | 0.01 | 0.02 | 0.02 | 0.02 | 0.01 | 0.02 | | | 0.01 | 0.02 |
| Cricket Mountains (west side) fault | 2460 | <15,000 | <0.2 | 41.0 | | 238 | 7.0 | 0.01 | 0.02 | 0.02 | 0.02 | 0.01 | 0.02 | | | 0.01 | 0.02 |
| Wah Wah Mountains (south end near Lund) fault | 2485 | <130,000 | <0.2 | 40.2 | | 239 | 6.9 | 0.01 | 0.02 | 0.01 | 0.02 | 0.01 | 0.02 | | | 0.01 | 0.02 |
| Hurricane fault zone, southern section | 998f | <1,600,000 | <0.2 | 66.6 | N | 282 | 7.2 | 0.01 | 0.02 | 0.02 | 0.02 | 0.01 | 0.02 | | | 0.01 | 0.02 |

[1] ya = years ago

[2] Wells and Coppersmith, 1994

Class B=Geologic evidence demonstrates the existence of Quaternary deformation, but either (1) the fault might not extend deeply enough to be a potential source of significant earthquakes, or (2) the currently available geologic evidence is too strong to confidently assign the feature to Class C but not strong enough to assign it to Class A.

Fault Type: N=normal, R=reverse

# APPENDIX C.2
# PROBABILISTIC CHARACTERISTICS

## Appendix C.2: Quaternary faults and folds capable of generating 0.05 g or greater at Shootaring Canyon site - Probabilistic Characteristics

| Name of Fault | ID Number | Age of Most Recent Prehistoric Deformation (ya)[1] | Probability of Activity | Dip [2] (degrees) | Maximum Seismogenic Depth [2] (km) | Rate of Activity (mm/yr) [2] | MCE[2,3] |
|---|---|---|---|---|---|---|---|
| Fault 1, Bright Angel Fault Zone (Class B) | 2514 | Class B | 0.1 | 60 (0.6)<br>40 (0.2)<br>80 (0.2) | 15 (0.6)<br>12 (0.2)<br>20 (0.2) | 0.02 (0.6)<br>0.2 (0.2)<br>0.005 (0.2) | 5.8 (0.6)<br>5.5 (0.2)<br>6.1 (0.2) |
| Fault 2, Bright Angel Fault Zone (Class B) | 2514 | Class B | 0.5 | 60 (0.6)<br>40 (0.2)<br>80 (0.2) | 15 (0.6)<br>12 (0.2)<br>20 (0.2) | 0.02 (0.6)<br>0.2 (0.2)<br>0.005 (0.2) | 6.2 (0.6)<br>6.5 (0.2)<br>5.9 (0.2) |
| Fault 3, Bright Angel Fault Zone (Class B) | 2514 | Class B | 0.1 | 60 (0.6)<br>40 (0.2)<br>80 (0.2) | 15 (0.6)<br>12 (0.2)<br>20 (0.2) | 0.02 (0.6)<br>0.2 (0.2)<br>0.005 (0.2) | 6.7 (0.6)<br>7.0 (0.2)<br>6.4 (0.2) |
| Needles fault zone (Class B) | 2507 | Class B | 0 | 60 (0.6)<br>40 (0.2)<br>80 (0.2) | 15 (0.6)<br>12 (0.2)<br>20 (0.2) | 0.02 (0.6)<br>0.2 (0.2)<br>0.005 (0.2) | 6.8 (0.6)<br>7.1 (0.2)<br>6.5 (0.2) |
| Thousand Lake fault | 2506 | <750,000 | 1 | 60 (0.6)<br>40 (0.2)<br>80 (0.2) | 15 (0.6)<br>12 (0.2)<br>20 (0.2) | 0.02 (0.6)<br>0.2 (0.2)<br>0.005 (0.2) | 7.0 (0.6)<br>7.3 (0.2)<br>6.7 (0.2) |
| Shay graben faults (Class B) | 2513 | Class B | 0.1 | 60 (0.6)<br>40 (0.2)<br>80 (0.2) | 15 (0.6)<br>12 (0.2)<br>20 (0.2) | 0.02 (0.6)<br>0.2 (0.2)<br>0.005 (0.2) | 6.9 (0.6)<br>7.2 (0.2)<br>6.6 (0.2) |
| Aquarius and Awapa Plateaus faults | 2505 | <1,600,000 | 1 | 60 (0.6)<br>40 (0.2)<br>80 (0.2) | 15 (0.6)<br>12 (0.2)<br>20 (0.2) | 0.02 (0.6)<br>0.2 (0.2)<br>0.005 (0.2) | 6.9 (0.6)<br>7.2 (0.2)<br>6.6 (0.2) |

[1] ya = years ago

[2] Number in parentheses represents weights for each parameter

[3] Wells and Coppersmith, 1994

Class B=Geologic evidence demonstrates the existence of Quaternary deformation, but either (1) the fault might not extend deeply enough to be a potential source of significant earthquakes, or (2) the currently available geologic evidence is too strong to confidently assign the feature to Class C but not strong enough to assign it to Class A.

# APPENDIX D

# DESCRIPTION OF FAULTS WITHIN PROJECT AREA, FROM USGS ET AL. 2006

# Complete Report for Bright Angel fault system (Class B) No. 2514

**Brief Report ||Partial Report**

**Compiled in cooperation with the Utah Geological Survey**

***citation for this record:*** **Black, B.D., and Hecker, S., compilers, 1999, Fault number 2514, Bright Angel fault system, in Quaternary fault and fold database of the United States: U.S. Geological Survey website, http://earthquakes.usgs.gov/regional/qfaults, accessed 10/15/2007 12:30 PM.**

| | |
|---|---|
| **Synopsis** | Expansive area of poorly understood suspected Quaternary faults in the Colorado Plateau near the junction between the Colorado and San Juan Rivers. Owing to uncertainties in the timing of fault movement, we consider these faults to be Class B structures. |
| **Name comments** | **Fault ID Comments:**<br>Refers to fault number 15-1 in Hecker (1993 #642). |
| **County(s) and State (s)** | GARFIELD COUNTY, UTAH<br>KANE COUNTY, UTAH<br>SAN JUAN COUNTY, UTAH |
| **AMS sheet(s)** | Escalante |
| **Physiographic province(s)** | COLORADO PLATEAUS |
| **Reliability of location** | Good<br>Compiled at 1:500,000 scale.<br>*Comments:* Mapped or discussed by Hintze (1963 #4991), Shoemaker and others (1978 #2155), and Woodward-Clyde Consultants (1982 #5025). Fault traces from 1:250,000-scale geologic mapping of Hintze (1963 #4991). |
| **Geologic setting** | Diffuse area of bedrock faults of varying orientation in the Monument upwarp/Glen Canyon area of the Colorado Plateaus in southeastern Utah. |
| **Length (km)** | 102 km. |
| **Average strike** | N6°W |
| **Sense of movement** | Normal |

| | |
|---|---|
| **Dip** | *Comments:* Varies. |
| **Paleoseismology studies** | |
| **Geomorphic expression** | Faults are entirely within bedrock, thus Quaternary deformation can not be proven. The geometry and orientation of the faults are similar to known or questionable Quaternary structures in the San Francisco volcanic field in Arizona (Menges and Pearthree, 1983 #2073). A drainage system in the Cataract Creek basin in Arizona(?) appears to be older than movement on the fault system. Fold activity in the region is possible, although uncertain. Owing to uncertainties in the timing of fault movement, we consider these faults to be Class B structures. |
| **Age of faulted surficial deposits** | Jurassic, Quaternary(?) |
| **Historic earthquake** | |
| **Most recent prehistoric deformation** | Quaternary (<1.6 Ma)<br>*Comments:* Based on geometry and orientation, and antecedent drainage. |
| **Recurrence interval** | |
| **Slip-rate category** | Less than 0.2 mm/yr |
| **Date and Compiler (s)** | 1999<br>Bill D. Black, Utah Geological Survey<br>Suzanne Hecker, U.S. Geological Survey |
| **References** | #642 Hecker, S., 1993, Quaternary tectonics of Utah with emphasis on earthquake-hazard characterization: Utah Geological Survey Bulletin 127, 157 p., 6 pls., scale 1:500,000.<br>#4991 Hintze, L.H., compiler, 1963, Geologic map of southwestern Utah: Utah State Land Board, 1 sheet, scale 1:250,000.<br>#2073 Menges, C.M., and Pearthree, P.A., 1983, Map of neotectonic (latest Pliocene-Quaternary) deformation in Arizona: Arizona Bureau of Geology Mineral Technology Open-File Report 83-22, 48 p., scale 1:500,000.<br>#2155 Shoemaker, E.M., Squires, R.L., and Abrams, M.J., 1978, Bright Angel and Mesa Butte fault systems in northern Arizona, in Smith, R.B., and Eaton, G.P., eds., Cenozoic tectonics and regional geophysics of the Western Cordillera: Geological Society of America Memoir 152, p. 341-367.<br>#5025 Woodward-Clyde Consultants, 1982, Geologic characterization report for the Paradox Basin study region, Utah study areas, volume II, Gibson Dome: Technical report to Battelle Memorial Institute, Office of Nuclear Waste Isolation, under Contract ONWI-290, variously paginated, scale 1:340,000. |

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# Complete Report for Needles fault zone (Class B) No. 2507

**Brief Report ||Partial Report**

**Compiled in cooperation with the Utah Geological Survey**

***citation for this record:*** **Black, B.D., DuRoss, C.B., and Hecker, S., compilers, 2004, Fault number 2507, Needles fault zone, in Quaternary fault and fold database of the United States: U.S. Geological Survey website, http://earthquakes.usgs.gov/regional/qfaults, accessed 10/31/2007 04:12 AM.**

| | |
|---|---|
| **Synopsis** | Poorly understood diffuse zone of suspected Holocene faulting along the Colorado River, which may have formed from gravity tectonics and salt flowage. Because of their possible non-seismogenic origin, we considered these features to be Class B structures. |
| **Name comments** | **Fault ID Comments:**<br>Refers to fault number 18-11 in Hecker (1993 #642). |
| **County(s) and State(s)** | GARFIELD COUNTY, UTAH<br>SAN JUAN COUNTY, UTAH<br>WAYNE COUNTY, UTAH |
| **AMS sheet(s)** | Salina<br>Moab<br>Escalante |
| **Physiographic province(s)** | COLORADO PLATEAUS |
| **Reliability of location** | Poor<br>Compiled at 1:340,000 scale.<br>*Comments:* Mapped or discussed by Baker (1933 #4973), McGill and Stromquist (1974 #5000), Stromquist (1976 #5011), Hite (1982 #4992), Huntoon (1982 #586; 1988 #4994), Woodward-Clyde Consultants (1982 #5025), Biggar (1987 #4975), and Oviatt (1988 #5006). Fault traces from 1:340,000-scale geologic mapping of Woodward-Clyde Consultants (1982 #5025). |
| **Geologic setting** | The Needles fault zone consists of a diffuse zone of east- to northeast-oriented normal faults along Cataract Canyon, in and adjacent to Canyonlands National Park, in the Paradox Basin of eastern Utah. Extensional faulting may have initiated by a combination of (1) gravitational slip of sedimentary strata on evaporite deposits (Huntoon, 1982 #586, 1988 #4994; Crider and others, 2002 #6759), (2) mobilization and down-dip flowage of |

| | |
|---|---|
| | evaporites toward the Colorado River (Baker, 1933 #4973, McGill and Stromquist, 1974 #5000; Stromquist, 1976 #5011), and/or (3) salt dissolution and collapse (Hite, 1982 #4992). The gravitational-slip model may explain the formation of the anticlines resulting from compression across the floors of Cataract Canyon and its deep tributary canyons (Huntoon, 1982 #586, 1988 #4994). Extension may have begun in the late Cenozoic, and is considered active today (Huntoon, 1988 #4994; Crider and others, 2002 #6759). |
| **Length (km)** | 29 km. |
| **Average strike** | N10°E |
| **Sense of movement** | Normal |
| **Dip** | *Comments:* Varies. |
| **Paleoseismology studies** | |
| **Geomorphic expression** | The faults bound grabens of varying ages. Youthfulness of faulting is suggested by good preservation of an abandoned, pre-graben drainage network and persistence of grabens as closed depressions. Sinkholes, some which may be historical, in many closed graben valleys may have formed by opening of bedrock fissures or, alternatively, by periodic flushing of material from old fissures. Stream braiding and aggradation within the grabens also suggest recent (Holocene?) subsidence. Changes in drainage patterns from north to south and the relatively simple, linear pattern of grabens at the eastern margin of the area suggest graben formation has progressed northward and eastward, away from the river. The oldest grabens (closest to the river) are inferred to have begun forming between about 1.4 Ma (based on a conservatively high estimate of canyon incision) and 85 ka (extrapolated from a 65 ka age for shallow graben sediments located a quarter of the distance from the river to the eastern margin of the graben system). Thus, some grabens may have formed as early as during early Pleistocene time. The long-term rate of extension across the fault zone is estimated at 2-20 mm/yr, based on geodetic and satellite radar interferometry (InSAR) monitoring of the deformation (Crider and others, 2002 #6759). |
| **Age of faulted surficial deposits** | Holocene(?). |
| **Historic earthquake** | |
| **Most recent prehistoric deformation** | Latest Quaternary (<15 ka)<br>*Comments:* Based on drainage disruption, 14C and TL ages, and soil development. |
| **Recurrence interval** | |
| **Slip-rate category** | Less than 0.2 mm/yr<br>*Comments:* Development of extensional grabens from west to east has apparently occurred at accelerated rates of 5-14 mm/yr associated with downcutting episodes on the Colorado River, and the process may be ongoing. However, any slip rate associated with deep tectonic processes is probably <0.2 mm/yr. |
| **Date and Compiler (s)** | 2004<br>Bill D. Black, Utah Geological Survey<br>Christopher B. DuRoss, Utah Geological Survey<br>Suzanne Hecker, U.S. Geological Survey |
| **References** | #4973 Baker, A.A., 1933, Geology and oil possibilities of the Moab District, Grand and San Juan Counties, Utah: U.S. Geological Survey Bulletin 841, 95 p. |

#6759 Crider, J.G., Owen, S.E., and Marsic, S.D., 2002, Monitoring active deformation in the grabens of Canyonlands National Park: Online, Geological Society of America Abstracts with Programs, , accessed November 3, 2004.

#642 Hecker, S., 1993, Quaternary tectonics of Utah with emphasis on earthquake-hazard characterization: Utah Geological Survey Bulletin 127, 157 p., 6 pls., scale 1:500,000.

#4992 Hite, R.J., 1982, Task 1B--Geology, technical progress report for the quarter 1 July-30 September, 1982: Unpublished consultant's report for Battelle Memorial Institute, Office of Nuclear Waste Isolation, ONWI-9.

#4994 Huntoon, P., 1988, Late Cenozoic gravity tectonic deformation related to the Paradox salts in the Canyonlands area of Utah, in Doelling, H.H., Oviatt, C.G., and Huntoon, P.W., eds., Salt deformation in the Paradox region: Utah Geological and Mineral Survey Bulletin 122, p. 79-93.

#586 Huntoon, P.W., 1982, The Meander anticline, Canyonlands, Utah--An unloading structure resulting from horizontal gliding on salt: Geological Society of America Bulletin, v. 93, p. 941-950.

#5000 McGill, G.E., and Stromquist, A.W., 1974, A model for graben formation by subsurface flow; Canyonlands National Park, Utah: Amherst, University of Massachusetts, Department of Geology and Geography Contribution No. 15, p. 79.

#5011 Stromquist, A.W., Jr., 1976, Geometry and growth of grabens, lower Red Lake Canyon area, Canyonlands National Park, Utah: University of Massachusetts Department of Geology and Geography Contribution 28, p. 118.

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# Complete Report for Shay graben faults (Class B) No. 2513

**Brief Report** ||**Partial Report**

**Compiled in cooperation with the Utah Geological Survey**

***citation for this record:*** **Black, B.D., and Hecker, S., compilers, 1999, Fault number 2513, Shay graben faults, in Quaternary fault and fold database of the United States: U.S. Geological Survey website, http://earthquakes.usgs.gov/regional/qfaults, accessed 10/31/2007 04:14 AM.**

| | |
|---|---|
| **Synopsis** | Poorly understood suspected Quaternary faults that bound a graben on the northern side of Shay Mountain in eastern Utah. Because of their possible non-seismogenic origin, we considered these features to be Class B structures. |
| **Name comments** | **Fault ID Comments:**<br>Refers to fault number 19-1 in Hecker (1993 #642). |
| **County(s) and State (s)** | SAN JUAN COUNTY, UTAH |
| **AMS sheet(s)** | Cortez<br>Moab |
| **Physiographic province(s)** | COLORADO PLATEAUS |
| **Reliability of location** | Good<br>Compiled at 1:170,000 scale.<br>*Comments:* Mapped by Woodward-Clyde Consultants (1982 #5025). Fault traces from 1:170,000- scale mapping of Woodward-Clyde Consultants (1982 #5025). |
| **Geologic setting** | Northeast-trending graben-bounding faults along the northern side of Shay Mountain in the Paradox Basin of eastern Utah. |
| **Length (km)** | 40 km. |
| **Average strike** | N66°E |
| **Sense of movement** | Normal |
| **Dip** | |
| **Paleoseismology studies** | |

| | |
|---|---|
| **Geomorphic expression** | The faults form scarps that bound and define a northeast-trending graben. The north Shay fault has generally poorer surface expression than the south fault and is less likely to have had Quaternary displacement. The south Shay fault exhibits dip-slip displacement totaling less than 100 m and is regarded as a possible seismotectonic feature. Because of their possible non-seismogenic origin, we considered these features to be Class B structures. |
| **Age of faulted surficial deposits** | Quaternary pediment gravels |
| **Historic earthquake** | |
| **Most recent prehistoric deformation** | Quaternary (<1.6 Ma)<br>*Comments:* Based on escarpment morphology and estimated age of displaced pediment surfaces. |
| **Recurrence interval** | |
| **Slip-rate category** | Less than 0.2 mm/yr |
| **Date and Compiler (s)** | 1999<br>Bill D. Black, Utah Geological Survey<br>Suzanne Hecker, U.S. Geological Survey |
| **References** | #642 Hecker, S., 1993, Quaternary tectonics of Utah with emphasis on earthquake-hazard characterization: Utah Geological Survey Bulletin 127, 157 p., 6 pls., scale 1:500,000.<br>#5025 Woodward-Clyde Consultants, 1982, Geologic characterization report for the Paradox Basin study region, Utah study areas, volume II, Gibson Dome: Technical report to Battelle Memorial Institute, Office of Nuclear Waste Isolation, under Contract ONWI-290, variously paginated, scale 1:340,000. |

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# Complete Report for Thousand Lake fault (Class A) No. 2506

**Brief Report** ||**Partial Report**

**Compiled in cooperation with the Utah Geological Survey**

***citation for this record:*** **Black, B.D., and Hecker, S., compilers, 1999, Fault number 2506, Thousand Lake fault, in Quaternary fault and fold database of the United States: U.S. Geological Survey website, http://earthquakes.usgs.gov/regional/qfaults, accessed 10/30/2007 01:53 PM.**

| | |
|---|---|
| **Synopsis** | Poorly understood Quaternary fault that bounds the western side of Thousand Lake and the Boulder Mountains. |
| **Name comments** | **Fault ID Comments:**<br>Refers to fault number 14-1 in Hecker (1993 #642). |
| **County(s) and State(s)** | GARFIELD COUNTY, UTAH<br>SEVIER COUNTY, UTAH<br>WAYNE COUNTY, UTAH |
| **AMS sheet(s)** | Delta |
| **Physiographic province(s)** | COLORADO PLATEAUS |
| **Reliability of location** | Good<br>Compiled at 1:250,000 scale.<br>*Comments:* Mapped or discussed by Smith and others (1963 #4582), Anderson and Barnhard (1986 #895), Harty (1987 #4580), and Sergent, Hauskins, and Beckwith (1991 #4581). Fault traces from 1:250,000-scale mapping of Williams and Hackman (1971 #4578). |
| **Geologic setting** | Long, generally north-trending, sinuous range-front fault along the west side of Thousand Lake and Boulder Mountains, west of Capitol Reef. |
| **Length (km)** | 48 km. |
| **Average strike** | N10°E |
| **Sense of movement** | Normal |
| **Dip** | |

| | |
|---|---|
| **Paleoseismology studies** | |
| **Geomorphic expression** | Remnants of Fremont River strath terraces (presumably truncated by faulting) may date from early Wisconsin time (>30 ka to 130 ka) and correlate with terraces on the downthrown side of the fault (Smith and others, 1963 #4582), but supporting evidence appears tenuous (Harty, 1987 #4580; Sergent and others, 1991 #4581). Projection of the terrace profiles suggests about 85 m of vertical displacement during late Pleistocene (post-early Wisconsin) to Holocene time (Smith and others, 1963 #4582). The extent of possible late Quaternary faulting is unknown, but based on the estimated terrace displacement and the distribution of total post-Oligocene throw along the fault, Anderson and Barnhard (1986 #895) postulated that Pleistocene displacements may exceed 100 m along the northern portion of the fault. |
| **Age of faulted surficial deposits** | Middle to late Quaternary. |
| **Historic earthquake** | |
| **Most recent prehistoric deformation** | Middle and late Quaternary (<750 ka)<br>*Comments:* |
| **Recurrence interval** | |
| **Slip-rate category** | Less than 0.2 mm/yr |
| **Date and Compiler (s)** | 1999<br>Bill D. Black, Utah Geological Survey<br>Suzanne Hecker, U.S. Geological Survey |
| **References** | #895 Anderson, R.E., and Barnhard, T.P., 1986, Genetic relationship between faults and folds and determination of Laramide and neotectonic paleostress, western Colorado Plateau-transition zone, central Utah: Tectonics, v. 5, p. 335-357.<br>#2479 Dohrenwend, J.C., and Moring, B., C., 1993, Reconnaissance photogeologic map of late Tertiary and Quaternary faults in Nevada: Geological Society of America Abstracts with Programs, v. 25, no. 5, p. 31.<br>#4580 Harty, K.M., 1987, Field reconnaissance of Thousand Lake fault zone: Utah Geological and Mineral Survey, memorandum, 2 p.<br>#642 Hecker, S., 1993, Quaternary tectonics of Utah with emphasis on earthquake-hazard characterization: Utah Geological Survey Bulletin 127, 157 p., 6 pls., scale 1:500,000.<br>#4581 Sergent, Hauskins, and Beckwith, 1991, Report for final preliminary engineering geology, geoseismic, and geotechnical study, proposed Torrey Dam and Reservoir, approximately one mile west of Torrey, Utah, for Wayne County Conservancy District: Salt Lake City, consultant's report prepared for Utah Department of Natural Resources, Division of Water Resources, SHB Job No. E90-2027, 18 p.<br>#4582 Smith, J.F., Jr., Huff, L.C., Hinrichs, E.N., and Luedke, R.G., 1963, Geology of the Capitol Reef area, Wayne and Garfield Counties, Utah: U.S. Geological Survey Professional Paper 363, 102 p.<br>#4578 Williams, P.L., and Hackman, R.J., 1971, Geology, structure, and uranium deposits of the Salina quadrangle, Utah: U.S. Geological Survey Miscellaneous Investigations Map I-591, scale 1:250,000. |

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# Complete Report for Aquarius and Awapa Plateaus faults (Class A) No. 2505

**Brief Report ||Partial Report**

**Compiled in cooperation with the Utah Geological Survey**

***citation for this record:*** **Black, B.D., and Hecker, S., compilers, 1999, Fault number 2505, Aquarius and Awapa Plateaus faults, in Quaternary fault and fold database of the United States: U.S. Geological Survey website, http://earthquakes.usgs.gov/regional/qfaults, accessed 10/30/2007 01:54 PM.**

| | |
|---|---|
| **Synopsis** | Poorly understood Quaternary(?) faults in the Aquarius and Awapa Plateaus. |
| **Name comments** | **Fault ID Comments:**<br>Refers to fault number 14-2 in Hecker (1993 #642). |
| **County(s) and State(s)** | GARFIELD COUNTY, UTAH<br>PIUTE COUNTY, UTAH<br>WAYNE COUNTY, UTAH |
| **AMS sheet(s)** | Salina |
| **Physiographic province(s)** | COLORADO PLATEAUS |
| **Reliability of location** | Good<br>Compiled at 1:250,000 scale.<br>*Comments:* Mapped or discussed by Williams and Hackman (1971 #4578) and Luedke and Smith (1978 #4579). Fault traces from 1:250,000-scale mapping of Williams (1964 #2789) and Williams and Hackman (1971 #4578). |
| **Geologic setting** | Diffuse area of normal faulting in Tertiary and Quaternary volcanic rocks in the Aquarius and Awapa Plateaus near the eastern boundary of the Basin and Range province. |
| **Length (km)** | 36 km. |
| **Average strike** | N19°E |
| **Sense of movement** | Normal |
| **Dip** | |

| | |
|---|---|
| **Paleoseismology studies** | |
| **Geomorphic expression** | Faults displace or define the margins of Tertiary to Quaternary (<5 Ma) basalts. |
| **Age of faulted surficial deposits** | Quaternary(?) |
| **Historic earthquake** | |
| **Most recent prehistoric deformation** | Quaternary (<1.6 Ma)<br>*Comments:* |
| **Recurrence interval** | |
| **Slip-rate category** | Less than 0.2 mm/yr |
| **Date and Compiler(s)** | 1999<br>Bill D. Black, Utah Geological Survey<br>Suzanne Hecker, U.S. Geological Survey |
| **References** | #642 Hecker, S., 1993, Quaternary tectonics of Utah with emphasis on earthquake-hazard characterization: Utah Geological Survey Bulletin 127, 157 p., 6 pls., scale 1:500,000.<br>#4579 Luedke, R.G., and Smith, R.L., 1978, Map showing distribution, composition, and age of late Cenozoic volcanic centers in Colorado, Utah, and southwestern Wyoming: U.S. Geological Survey Miscellaneous Investigations Map I-1091-B, scale 1:1,000,000.<br>#2789 Williams, P.L., 1964, Geology, structure, and uranium deposits of the Moab quadrangle, Colorado and Utah: U.S. Geological Survey Miscellaneous Geologic Investigations I-360.<br>#4578 Williams, P.L., and Hackman, R.J., 1971, Geology, structure, and uranium deposits of the Salina quadrangle, Utah: U.S. Geological Survey Miscellaneous Investigations Map I-591, scale 1:250,000. |

# APPENDIX E
# EZ-FRISK SOFTWARE INPUT

```
                 ***********************************************
                 *****               EZ-FRISK              *****
                 ***** SEISMIC HAZARD ANALYSIS DEFINITION  *****
                 *****       RISK ENGINEERING, INC.        *****
                 *****          BOULDER, CO  USA           *****
                 ***********************************************

PROGRAM VERSION
  EZ-FRISK 7.25

ANALYSIS TITLE:
  Seismic Hazard Analysis Round Three Interrogatory

ANALYSIS TYPE:
  Single Site Analysis

SITE COORDINATES
  Latitude 37.72
  Longitude -110.7

HAZARD DEAGGREGATION
  Status: ON
  Period: PGA
  Amplitude: 0.21
  Bin Configuration
    Magnitude
      Scale:         Moment Magnitude
      Lowest Value:  5 Mw
      Highest Value: 9 Mw
      Bin Size:      0.1
    Distance
      Lowest Value:  0 km
      Highest Value: 102.5 km
      Bin Size:      2.5 km
    Epsilon
      Lowest Value:  -2.2
      Highest Value: 4.2
      Bin Size:      0.2

SOIL AMPLIFICATION
  Method: Do not use soil amplification

ATTENUATION EQUATION SITE PARAMETERS
  Vs30 (m/s): 760
  Z25 (km): 0

AMPLITUDES - Acceleration (g)
  0.0001
  0.001
  0.01
  0.02
  0.05
  0.07
  0.1
  0.2
  0.21
  0.3
  0.4
  0.5
  0.7
  1
  2
  3

PERIODS (s)
  PGA
  5.e-002
  0.1
  0.2
  0.3
  0.4
```

```
  0.5
  0.75
  1.
  2.
  3.
  4.

DETERMINISTIC FRACTILES

PLOTTING PARAMETERS
  Period at which to plot PGA: 0.0001

CALCULATIONAL PARAMETERS
  Fault Seismic Sources -
    Down dip integration increment       :   1 km
    Horizontal integration increment     :   1 km
    Number rupture length per EarthQuake :   4
    Include near-source directivity      :   NO
  Area Seismic Sources -
    Maximum inclusion distance           :   1000 km
    Vertical integration increment       :   3 km
    Number of rupture azimuths           :   3
    Minimum epicentral distance step     :   0.5 km
    Maximum epicentral distance step     :   10 km
  Background Seismic Sources -
    Maximum inclusion distance            :   400 km
    Default number of rupture azimuths    :   10
    Maximum distance for default azimuths :   20 km
    Minimum distance for one azimuth      :   70
  All Seismic Sources -
    Magnitude integration step           :   0.1 M
    Apply magnitude scaling              :   NO

ATTENUATION EQUATIONS

  Name: Abra.-Silva (1997) Rock USGS 2002
  Database: C:\Program Files\EZ-FRISK 7.25\Files\standard.bin-attendb
  Base: Abrahamson-Silva 1997
  Truncation Type: Trunc Sigma*Value
  Truncation Value: 3
  Magnitude Scale: Moment Magnitude
  Distance Type: Distance To Rupture

  Name: Abra.-Silva (1997) Rock USGS 2002 Gridded
  Database: C:\Program Files\EZ-FRISK 7.25\Files\standard.bin-attendb
  Base: Abrahamson-Silva 1997
  Truncation Type: Trunc Sigma*Value
  Truncation Value: 3
  Magnitude Scale: Moment Magnitude
  Distance Type: Distance To Rupture

  Name: Campbell-Bozorgnia (2008) NGA 3 sigma
  Database: C:\Documents and Settings\roslyn.stern\Local Settings\Application Data\Risk
Engineering\EZ-FRISK\Files\user.xml-attendb
  Base: Campbell-Bozorgnia 2008 NGA
  Truncation Type: Trunc Sigma*Value
  Truncation Value: 3
  Magnitude Scale: Moment Magnitude
  Distance Type: Distance To Rupture

  Name: Spudich 1999 Rock USGS 2002
  Database: C:\Program Files\EZ-FRISK 7.25\Files\standard.bin-attendb
  Base: Spudich 1997/99
  Truncation Type: Trunc Sigma*Value
  Truncation Value: 3
  Magnitude Scale: Moment Magnitude
  Distance Type: Horizontal Distance To Rupture

SEISMIC SOURCES

Name: Bright Angel Fault Zone - Fault 1
```

```
Region: Utah
Category: Fault Seismic Source
Database: C:\Documents and Settings\roslyn.stern\Local Settings\Application Data\Risk
Engineering\EZ-FRISK\Files\user.xml-faultdb
Fault Mechanism: Normal
Magnitude Scale: Moment Magnitude
Probability of Activity: 0.10000000
Deterministic Magnitude: 5.8

Fault Profile Parameters:
        Dip1      Dip2    Depth1    Depth2    Depth3
          60        60         0       0.1        15

Magnitude Recurrence Distributions:
        ModelType    Weight    RateType        Rate    MinMag    MaxMag      Beta
Mean     Sigma    Delta1    Delta2
      Exponential       0.1        Slip  2.000e-002  5.500000  6.100000  1.842100
5.800000  0.120000  0.000000  0.000000
      Exponential  0.050000        Slip  5.000e-003  5.500000  6.100000  1.842100
5.800000  0.120000  0.000000  0.000000
      Exponential  0.050000        Slip  2.000e-001  5.500000  6.100000  1.842100
5.800000  0.120000  0.000000  0.000000
           Normal  0.400000        Slip  2.000e-002  5.500000  6.100000  0.000000
5.800000  0.120000  0.000000  0.000000
           Normal  0.200000        Slip  5.000e-003  5.500000  6.100000  0.000000
5.800000  0.120000  0.000000  0.000000
           Normal  0.200000        Slip  2.000e-001  5.500000  6.100000  0.000000
5.800000  0.120000  0.000000  0.000000

Rupture Length Parameters
          Al        Bl      Sigl        Aw        Bw      Sigw        Aa        Ba
Sigw
    4.000000  0.000000  0.010000  4.000000  0.000000  0.010000  0.000000  0.000000
0.000000
    4.000000  0.000000  0.010000  4.000000  0.000000  0.010000  0.000000  0.000000
0.000000
    4.000000  0.000000  0.010000  4.000000  0.000000  0.010000  0.000000  0.000000
0.000000
    4.000000  0.000000  0.010000  4.000000  0.000000  0.010000  0.000000  0.000000
0.000000
    4.000000  0.000000  0.010000  4.000000  0.000000  0.010000  0.000000  0.000000
0.000000
    4.000000  0.000000  0.010000  4.000000  0.000000  0.010000  0.000000  0.000000
0.000000

Trace Coordinates:
  Latitude   Longitude
    37.7529  -110.6010
    37.7824  -110.5760

Attenuation Equations for Source:
  Name: Abra.-Silva (1997) Rock USGS 2002
  Name: Spudich 1999 Rock USGS 2002
  Name: Campbell-Bozorgnia (2008) NGA 3 sigma

*******************************************

Name: Bright Angel Fault Zone - Fault 2
Region: Utah
Category: Fault Seismic Source
Database: C:\Documents and Settings\roslyn.stern\Local Settings\Application Data\Risk
Engineering\EZ-FRISK\Files\user.xml-faultdb
Fault Mechanism: Normal
Magnitude Scale: Moment Magnitude
Probability of Activity: 0.50000000
Deterministic Magnitude: 6.2

Fault Profile Parameters:
        Dip1      Dip2    Depth1    Depth2    Depth3
          60        60         0       0.1        15
```

```
Magnitude Recurrence Distributions:
        ModelType    Weight    RateType        Rate    MinMag    MaxMag      Beta
Mean     Sigma    Delta1    Delta2
      Exponential       0.1        Slip  2.000e-002  5.900000  6.500000  1.842100
6.200000  0.120000  0.000000  0.000000
      Exponential  0.050000        Slip  5.000e-003  5.900000  6.500000  1.842100
6.200000  0.120000  0.000000  0.000000
      Exponential  0.050000        Slip  2.000e-001  5.900000  6.500000  1.842100
6.200000  0.120000  0.000000  0.000000
           Normal  0.400000        Slip  2.000e-002  5.900000  6.500000  0.000000
6.200000  0.120000  0.000000  0.000000
           Normal  0.200000        Slip  5.000e-003  5.900000  6.500000  0.000000
6.200000  0.120000  0.000000  0.000000
           Normal  0.200000        Slip  2.000e-001  5.900000  6.500000  0.000000
6.200000  0.120000  0.000000  0.000000

Rupture Length Parameters
          Al        Bl      Sigl         Aw        Bw      Sigw         Aa        Ba
Sigw
    4.000000  0.000000  0.010000  4.000000  0.000000  0.010000  0.000000  0.000000
0.000000
    4.000000  0.000000  0.010000  4.000000  0.000000  0.010000  0.000000  0.000000
0.000000
    4.000000  0.000000  0.010000  4.000000  0.000000  0.010000  0.000000  0.000000
0.000000
    4.000000  0.000000  0.010000  4.000000  0.000000  0.010000  0.000000  0.000000
0.000000
    4.000000  0.000000  0.010000  4.000000  0.000000  0.010000  0.000000  0.000000
0.000000
    4.000000  0.000000  0.010000  4.000000  0.000000  0.010000  0.000000  0.000000
0.000000

Trace Coordinates:
  Latitude   Longitude
    37.7711  -110.4590
    37.6928  -110.5040

Attenuation Equations for Source:
  Name: Abra.-Silva (1997) Rock USGS 2002
  Name: Spudich 1999 Rock USGS 2002
  Name: Campbell-Bozorgnia (2008) NGA 3 sigma

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Name: Bright Angel Fault Zone - Fault 3
Region: Utah
Category: Fault Seismic Source
Database: C:\Documents and Settings\roslyn.stern\Local Settings\Application Data\Risk
Engineering\EZ-FRISK\Files\user.xml-faultdb
Fault Mechanism: Normal
Magnitude Scale: Moment Magnitude
Probability of Activity: 0.10000000
Deterministic Magnitude: 6.7

Fault Profile Parameters:
        Dip1      Dip2    Depth1    Depth2    Depth3
         120       120         0       0.1        15

Magnitude Recurrence Distributions:
        ModelType    Weight    RateType        Rate    MinMag    MaxMag      Beta
Mean     Sigma    Delta1    Delta2
      Exponential       0.1        Slip  2.000e-002  6.360000  6.960000  1.842100
6.660000  0.120000  0.000000  0.000000
      Exponential  0.050000        Slip  5.000e-003  6.360000  6.960000  1.842100
6.660000  0.120000  0.000000  0.000000
      Exponential  0.050000        Slip  1.000e-001  6.360000  6.960000  1.842100
6.660000  0.120000  0.000000  0.000000
           Normal  0.400000        Slip  2.000e-002  6.360000  6.960000  0.000000
6.660000  0.120000  0.000000  0.000000
           Normal  0.200000        Slip  5.000e-003  6.360000  6.960000  0.000000
6.660000  0.120000  0.000000  0.000000
```

```
           Normal  0.200000        Slip  1.000e-001  6.360000  6.960000  0.000000
6.660000  0.120000  0.000000  0.000000

Rupture Length Parameters
          Al        Bl      Sigl        Aw        Bw      Sigw        Aa        Ba
Sigw
    4.000000  0.000000  0.010000  4.000000  0.000000  0.010000  0.000000  0.000000
0.000000
    4.000000  0.000000  0.010000  4.000000  0.000000  0.010000  0.000000  0.000000
0.000000
    4.000000  0.000000  0.010000  4.000000  0.000000  0.010000  0.000000  0.000000
0.000000
    4.000000  0.000000  0.010000  4.000000  0.000000  0.010000  0.000000  0.000000
0.000000
    4.000000  0.000000  0.010000  4.000000  0.000000  0.010000  0.000000  0.000000
0.000000
    4.000000  0.000000  0.010000  4.000000  0.000000  0.010000  0.000000  0.000000
0.000000

Trace Coordinates:
  Latitude   Longitude
    37.3762  -110.4140
    37.6652  -110.2590

Attenuation Equations for Source:
  Name: Abra.-Silva (1997) Rock USGS 2002
  Name: Spudich 1999 Rock USGS 2002
  Name: Campbell-Bozorgnia (2008) NGA 3 sigma

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Name: Needles
Region: Utah
Category: Fault Seismic Source
Database: C:\Documents and Settings\roslyn.stern\Local Settings\Application Data\Risk
Engineering\EZ-FRISK\Files\user.xml-faultdb
Fault Mechanism: Normal
Magnitude Scale: Moment Magnitude
Probability of Activity: 0.00000000
Deterministic Magnitude: 6.8

Fault Profile Parameters:
        Dip1      Dip2    Depth1    Depth2    Depth3
          60        60         0       0.1        15

Magnitude Recurrence Distributions:
        ModelType    Weight    RateType        Rate    MinMag    MaxMag      Beta
Mean     Sigma    Delta1    Delta2
      Exponential       0.1        Slip  2.000e-002  6.500000  7.100000  1.842100
6.800000  0.120000  0.000000  0.000000
      Exponential  0.050000        Slip  5.000e-003  6.500000  7.100000  1.842100
6.800000  0.120000  0.000000  0.000000
      Exponential  0.050000        Slip  2.000e-001  6.500000  7.100000  1.842100
6.800000  0.120000  0.000000  0.000000
           Normal  0.400000        Slip  2.000e-002  6.500000  7.100000  0.000000
6.800000  0.120000  0.000000  0.000000
           Normal  0.200000        Slip  5.000e-003  6.500000  7.100000  0.000000
6.800000  0.120000  0.000000  0.000000
           Normal  0.200000        Slip  2.000e-001  6.500000  7.100000  0.000000
6.800000  0.120000  0.000000  0.000000

Rupture Length Parameters
          Al        Bl      Sigl        Aw        Bw      Sigw        Aa        Ba
Sigw
    4.000000  0.000000  0.010000  4.000000  0.000000  0.010000  0.000000  0.000000
0.000000
    4.000000  0.000000  0.010000  4.000000  0.000000  0.010000  0.000000  0.000000
0.000000
    4.000000  0.000000  0.010000  4.000000  0.000000  0.010000  0.000000  0.000000
0.000000
```

```
    4.000000  0.000000  0.010000  4.000000  0.000000  0.010000  0.000000  0.000000
0.000000
    4.000000  0.000000  0.010000  4.000000  0.000000  0.010000  0.000000  0.000000
0.000000
    4.000000  0.000000  0.010000  4.000000  0.000000  0.010000  0.000000  0.000000
0.000000

Trace Coordinates:
  Latitude   Longitude
    38.1900  -109.8600
    38.0400  -110.1600

Attenuation Equations for Source:
  Name: Abra.-Silva (1997) Rock USGS 2002
  Name: Spudich 1999 Rock USGS 2002
  Name: Campbell-Bozorgnia (2008) NGA 3 sigma

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Name: Shay graben
Region: Utah
Category: Fault Seismic Source
Database: C:\Documents and Settings\roslyn.stern\Local Settings\Application Data\Risk
Engineering\EZ-FRISK\Files\user.xml-faultdb
Fault Mechanism: Normal
Magnitude Scale: Moment Magnitude
Probability of Activity: 0.10000000
Deterministic Magnitude: 6.9

Fault Profile Parameters:
        Dip1      Dip2    Depth1    Depth2    Depth3
         120       120         0       0.1        15

Magnitude Recurrence Distributions:
        ModelType    Weight    RateType        Rate    MinMag    MaxMag      Beta
Mean     Sigma    Delta1    Delta2
      Exponential       0.1        Slip  2.000e-002  6.600000  7.200000  1.842100
6.900000  0.120000  0.000000  0.000000
      Exponential  0.050000        Slip  5.000e-003  6.600000  7.200000  1.842100
6.900000  0.120000  0.000000  0.000000
      Exponential  0.050000        Slip  1.000e-001  6.600000  7.200000  1.842100
6.900000  0.120000  0.000000  0.000000
           Normal  0.400000        Slip  2.000e-002  6.600000  7.200000  0.000000
6.900000  0.120000  0.000000  0.000000
           Normal  0.200000        Slip  5.000e-003  6.600000  7.200000  0.000000
6.900000  0.120000  0.000000  0.000000
           Normal  0.200000        Slip  1.000e-001  6.600000  7.200000  0.000000
6.900000  0.120000  0.000000  0.000000

Rupture Length Parameters
          Al        Bl      Sigl        Aw        Bw      Sigw        Aa        Ba
Sigw
    4.000000  0.000000  0.010000  4.000000  0.000000  0.010000  0.000000  0.000000
0.000000
    4.000000  0.000000  0.010000  4.000000  0.000000  0.010000  0.000000  0.000000
0.000000
    4.000000  0.000000  0.010000  4.000000  0.000000  0.010000  0.000000  0.000000
0.000000
    4.000000  0.000000  0.010000  4.000000  0.000000  0.010000  0.000000  0.000000
0.000000
    4.000000  0.000000  0.010000  4.000000  0.000000  0.010000  0.000000  0.000000
0.000000
    4.000000  0.000000  0.010000  4.000000  0.000000  0.010000  0.000000  0.000000
0.000000

Trace Coordinates:
  Latitude   Longitude
    38.0400  -109.2800
    37.9100  -109.7200

Attenuation Equations for Source:
```

```
  Name: Abra.-Silva (1997) Rock USGS 2002
  Name: Spudich 1999 Rock USGS 2002
  Name: Campbell-Bozorgnia (2008) NGA 3 sigma

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Name: Ext Gridded
Region: WUS - USGS2002 Bkgd
Category: Gridded Seismic Source
Database: C:\Documents and Settings\roslyn.stern\Local Settings\Application Data\Risk
Engineering\EZ-FRISK\Regions\USGS 2002 v210\Files\Background Data\usgs2002.xml-gridSsDb
Magnitude Scale: Moment Magnitude

Attenuation Equations for Source:
  Name: Abra.-Silva (1997) Rock USGS 2002 Gridded
  Name: Spudich 1999 Rock USGS 2002
  Name: Campbell-Bozorgnia (2008) NGA 3 sigma

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Name: Aquarius and Awapa plateau 40_12
Region: Utah
Category: Fault Seismic Source
Database: C:\Documents and Settings\roslyn.stern\Local Settings\Application Data\Risk
Engineering\EZ-FRISK\Files\user.xml-faultdb
Fault Mechanism: Normal
Magnitude Scale: Moment Magnitude
Probability of Activity: 0.04000000
Deterministic Magnitude: 6.9

Fault Profile Parameters:
        Dip1      Dip2    Depth1    Depth2    Depth3
          40        40         0       0.1        12

Magnitude Recurrence Distributions:
        ModelType    Weight    RateType        Rate    MinMag    MaxMag      Beta
Mean     Sigma    Delta1    Delta2
      Exponential       0.1        Slip  2.000e-002  6.600000  7.200000  1.842100
6.900000  0.120000  0.000000  0.000000
      Exponential  0.050000        Slip  5.000e-003  6.600000  7.200000  1.842100
6.900000  0.120000  0.000000  0.000000
      Exponential  0.050000        Slip  2.000e-001  6.600000  7.200000  1.842100
6.900000  0.120000  0.000000  0.000000
           Normal  0.400000        Slip  2.000e-002  6.600000  7.200000  0.000000
6.900000  0.120000  0.000000  0.000000
           Normal  0.200000        Slip  5.000e-003  6.600000  7.200000  0.000000
6.900000  0.120000  0.000000  0.000000
           Normal  0.200000        Slip  2.000e-001  6.600000  7.200000  0.000000
6.900000  0.120000  0.000000  0.000000

Rupture Length Parameters
          Al        Bl      Sigl        Aw        Bw      Sigw        Aa        Ba
Sigw
    4.000000  0.000000  0.010000  4.000000  0.000000  0.010000  0.000000  0.000000
0.000000
    4.000000  0.000000  0.010000  4.000000  0.000000  0.010000  0.000000  0.000000
0.000000
    4.000000  0.000000  0.010000  4.000000  0.000000  0.010000  0.000000  0.000000
0.000000
    4.000000  0.000000  0.010000  4.000000  0.000000  0.010000  0.000000  0.000000
0.000000
    4.000000  0.000000  0.010000  4.000000  0.000000  0.010000  0.000000  0.000000
0.000000
    4.000000  0.000000  0.010000  4.000000  0.000000  0.010000  0.000000  0.000000
0.000000

Trace Coordinates:
  Latitude   Longitude
    38.0300  -111.7800
    38.1700  -111.5200
```

```
Attenuation Equations for Source:
  Name: Abra.-Silva (1997) Rock USGS 2002
  Name: Spudich 1999 Rock USGS 2002
  Name: Campbell-Bozorgnia (2008) NGA 3 sigma

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Name: Aquarius and Awapa plateau 40_15
Region: Utah
Category: Fault Seismic Source
Database: C:\Documents and Settings\roslyn.stern\Local Settings\Application Data\Risk
Engineering\EZ-FRISK\Files\user.xml-faultdb
Fault Mechanism: Normal
Magnitude Scale: Moment Magnitude
Probability of Activity: 0.12000000
Deterministic Magnitude: 6.9

Fault Profile Parameters:
        Dip1      Dip2    Depth1    Depth2    Depth3
          40        40         0       0.1        15

Magnitude Recurrence Distributions:
        ModelType    Weight    RateType        Rate    MinMag    MaxMag      Beta
Mean     Sigma    Delta1    Delta2
      Exponential       0.1        Slip  2.000e-002  6.600000  7.200000  1.842100
6.900000  0.120000  0.000000  0.000000
      Exponential  0.050000        Slip  5.000e-003  6.600000  7.200000  1.842100
6.900000  0.120000  0.000000  0.000000
      Exponential  0.050000        Slip  2.000e-001  6.600000  7.200000  1.842100
6.900000  0.120000  0.000000  0.000000
           Normal  0.400000        Slip  2.000e-002  6.600000  7.200000  0.000000
6.900000  0.120000  0.000000  0.000000
           Normal  0.200000        Slip  5.000e-003  6.600000  7.200000  0.000000
6.900000  0.120000  0.000000  0.000000
           Normal  0.200000        Slip  2.000e-001  6.600000  7.200000  0.000000
6.900000  0.120000  0.000000  0.000000

Rupture Length Parameters
          Al        Bl      Sigl        Aw        Bw      Sigw        Aa        Ba
Sigw
    4.000000  0.000000  0.010000  4.000000  0.000000  0.010000  0.000000  0.000000
0.000000
    4.000000  0.000000  0.010000  4.000000  0.000000  0.010000  0.000000  0.000000
0.000000
    4.000000  0.000000  0.010000  4.000000  0.000000  0.010000  0.000000  0.000000
0.000000
    4.000000  0.000000  0.010000  4.000000  0.000000  0.010000  0.000000  0.000000
0.000000
    4.000000  0.000000  0.010000  4.000000  0.000000  0.010000  0.000000  0.000000
0.000000
    4.000000  0.000000  0.010000  4.000000  0.000000  0.010000  0.000000  0.000000
0.000000

Trace Coordinates:
  Latitude   Longitude
    38.0300  -111.7800
    38.1700  -111.5200

Attenuation Equations for Source:
  Name: Abra.-Silva (1997) Rock USGS 2002
  Name: Spudich 1999 Rock USGS 2002
  Name: Campbell-Bozorgnia (2008) NGA 3 sigma

*******************************************

Name: Aquarius and Awapa plateau 40_20
Region: Utah
Category: Fault Seismic Source
Database: C:\Documents and Settings\roslyn.stern\Local Settings\Application Data\Risk
Engineering\EZ-FRISK\Files\user.xml-faultdb
Fault Mechanism: Normal
```

```
Magnitude Scale: Moment Magnitude
Probability of Activity: 0.03990000
Deterministic Magnitude: 6.9

Fault Profile Parameters:
        Dip1      Dip2    Depth1    Depth2    Depth3
          40        40         0       0.1        20

Magnitude Recurrence Distributions:
        ModelType    Weight    RateType        Rate    MinMag    MaxMag      Beta
Mean     Sigma    Delta1    Delta2
      Exponential       0.1        Slip  2.000e-002  6.600000  7.200000  1.842100
6.900000  0.120000  0.000000  0.000000
      Exponential  0.050000        Slip  5.000e-003  6.600000  7.200000  1.842100
6.900000  0.120000  0.000000  0.000000
      Exponential  0.050000        Slip  2.000e-001  6.600000  7.200000  1.842100
6.900000  0.120000  0.000000  0.000000
           Normal  0.400000        Slip  2.000e-002  6.600000  7.200000  0.000000
6.900000  0.120000  0.000000  0.000000
           Normal  0.200000        Slip  5.000e-003  6.600000  7.200000  0.000000
6.900000  0.120000  0.000000  0.000000
           Normal  0.200000        Slip  2.000e-001  6.600000  7.200000  0.000000
6.900000  0.120000  0.000000  0.000000

Rupture Length Parameters
          Al        Bl      Sigl        Aw        Bw      Sigw        Aa        Ba
Sigw
    4.000000  0.000000  0.010000  4.000000  0.000000  0.010000  0.000000  0.000000
0.000000
    4.000000  0.000000  0.010000  4.000000  0.000000  0.010000  0.000000  0.000000
0.000000
    4.000000  0.000000  0.010000  4.000000  0.000000  0.010000  0.000000  0.000000
0.000000
    4.000000  0.000000  0.010000  4.000000  0.000000  0.010000  0.000000  0.000000
0.000000
    4.000000  0.000000  0.010000  4.000000  0.000000  0.010000  0.000000  0.000000
0.000000
    4.000000  0.000000  0.010000  4.000000  0.000000  0.010000  0.000000  0.000000
0.000000

Trace Coordinates:
  Latitude   Longitude
    38.0300  -111.7800
    38.1700  -111.5200

Attenuation Equations for Source:
  Name: Abra.-Silva (1997) Rock USGS 2002
  Name: Spudich 1999 Rock USGS 2002
  Name: Campbell-Bozorgnia (2008) NGA 3 sigma

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Name: Aquarius and Awapa plateau 60_12
Region: Utah
Category: Fault Seismic Source
Database: C:\Documents and Settings\roslyn.stern\Local Settings\Application Data\Risk
Engineering\EZ-FRISK\Files\user.xml-faultdb
Fault Mechanism: Normal
Magnitude Scale: Moment Magnitude
Probability of Activity: 0.12000000
Deterministic Magnitude: 6.9

Fault Profile Parameters:
        Dip1      Dip2    Depth1    Depth2    Depth3
          60        60         0       0.1        12

Magnitude Recurrence Distributions:
        ModelType    Weight    RateType        Rate    MinMag    MaxMag      Beta
Mean     Sigma    Delta1    Delta2
      Exponential       0.1        Slip  2.000e-002  6.600000  7.200000  1.842100
6.900000  0.120000  0.000000  0.000000
```

```
      Exponential  0.050000        Slip  5.000e-003  6.600000  7.200000  1.842100
6.900000  0.120000  0.000000  0.000000
      Exponential  0.050000        Slip  2.000e-001  6.600000  7.200000  1.842100
6.900000  0.120000  0.000000  0.000000
           Normal  0.400000        Slip  2.000e-002  6.600000  7.200000  0.000000
6.900000  0.120000  0.000000  0.000000
           Normal  0.200000        Slip  5.000e-003  6.600000  7.200000  0.000000
6.900000  0.120000  0.000000  0.000000
           Normal  0.200000        Slip  2.000e-001  6.600000  7.200000  0.000000
6.900000  0.120000  0.000000  0.000000

Rupture Length Parameters
          Al        Bl      Sigl        Aw        Bw      Sigw        Aa        Ba
Sigw
    4.000000  0.000000  0.010000  4.000000  0.000000  0.010000  0.000000  0.000000
0.000000
    4.000000  0.000000  0.010000  4.000000  0.000000  0.010000  0.000000  0.000000
0.000000
    4.000000  0.000000  0.010000  4.000000  0.000000  0.010000  0.000000  0.000000
0.000000
    4.000000  0.000000  0.010000  4.000000  0.000000  0.010000  0.000000  0.000000
0.000000
    4.000000  0.000000  0.010000  4.000000  0.000000  0.010000  0.000000  0.000000
0.000000
    4.000000  0.000000  0.010000  4.000000  0.000000  0.010000  0.000000  0.000000
0.000000

Trace Coordinates:
  Latitude   Longitude
    38.0300  -111.7800
    38.1700  -111.5200

Attenuation Equations for Source:
  Name: Abra.-Silva (1997) Rock USGS 2002
  Name: Spudich 1999 Rock USGS 2002
  Name: Campbell-Bozorgnia (2008) NGA 3 sigma

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Name: Aquarius and Awapa plateau 60_15
Region: Utah
Category: Fault Seismic Source
Database: C:\Documents and Settings\roslyn.stern\Local Settings\Application Data\Risk
Engineering\EZ-FRISK\Files\user.xml-faultdb
Fault Mechanism: Normal
Magnitude Scale: Moment Magnitude
Probability of Activity: 0.36000000
Deterministic Magnitude: 6.9

Fault Profile Parameters:
        Dip1      Dip2    Depth1    Depth2    Depth3
          60        60         0       0.1        15

Magnitude Recurrence Distributions:
        ModelType    Weight    RateType        Rate    MinMag    MaxMag      Beta
Mean     Sigma    Delta1    Delta2
      Exponential       0.1        Slip  2.000e-002  6.600000  7.200000  1.842100
6.900000  0.120000  0.000000  0.000000
      Exponential  0.050000        Slip  5.000e-003  6.600000  7.200000  1.842100
6.900000  0.120000  0.000000  0.000000
      Exponential  0.050000        Slip  2.000e-001  6.600000  7.200000  1.842100
6.900000  0.120000  0.000000  0.000000
           Normal  0.400000        Slip  2.000e-002  6.600000  7.200000  0.000000
6.900000  0.120000  0.000000  0.000000
           Normal  0.200000        Slip  5.000e-003  6.600000  7.200000  0.000000
6.900000  0.120000  0.000000  0.000000
           Normal  0.200000        Slip  2.000e-001  6.600000  7.200000  0.000000
6.900000  0.120000  0.000000  0.000000

Rupture Length Parameters
```

```
          Al        Bl      Sigl        Aw        Bw      Sigw        Aa        Ba
Sigw
    4.000000  0.000000  0.010000  4.000000  0.000000  0.010000  0.000000  0.000000
0.000000
    4.000000  0.000000  0.010000  4.000000  0.000000  0.010000  0.000000  0.000000
0.000000
    4.000000  0.000000  0.010000  4.000000  0.000000  0.010000  0.000000  0.000000
0.000000
    4.000000  0.000000  0.010000  4.000000  0.000000  0.010000  0.000000  0.000000
0.000000
    4.000000  0.000000  0.010000  4.000000  0.000000  0.010000  0.000000  0.000000
0.000000
    4.000000  0.000000  0.010000  4.000000  0.000000  0.010000  0.000000  0.000000
0.000000

Trace Coordinates:
  Latitude   Longitude
    38.0300  -111.7800
    38.1700  -111.5200

Attenuation Equations for Source:
  Name: Abra.-Silva (1997) Rock USGS 2002
  Name: Spudich 1999 Rock USGS 2002
  Name: Campbell-Bozorgnia (2008) NGA 3 sigma

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Name: Aquarius and Awapa plateau 60_20
Region: Utah
Category: Fault Seismic Source
Database: C:\Documents and Settings\roslyn.stern\Local Settings\Application Data\Risk
Engineering\EZ-FRISK\Files\user.xml-faultdb
Fault Mechanism: Normal
Magnitude Scale: Moment Magnitude
Probability of Activity: 0.12000000
Deterministic Magnitude: 6.9

Fault Profile Parameters:
        Dip1      Dip2    Depth1    Depth2    Depth3
          60        60         0       0.1        20

Magnitude Recurrence Distributions:
        ModelType    Weight    RateType        Rate    MinMag    MaxMag      Beta
Mean     Sigma    Delta1    Delta2
      Exponential       0.1        Slip  2.000e-002  6.600000  7.200000  1.842100
6.900000  0.120000  0.000000  0.000000
      Exponential  0.050000        Slip  5.000e-003  6.600000  7.200000  1.842100
6.900000  0.120000  0.000000  0.000000
      Exponential  0.050000        Slip  2.000e-001  6.600000  7.200000  1.842100
6.900000  0.120000  0.000000  0.000000
           Normal  0.400000        Slip  2.000e-002  6.600000  7.200000  0.000000
6.900000  0.120000  0.000000  0.000000
           Normal  0.200000        Slip  5.000e-003  6.600000  7.200000  0.000000
6.900000  0.120000  0.000000  0.000000
           Normal  0.200000        Slip  2.000e-001  6.600000  7.200000  0.000000
6.900000  0.120000  0.000000  0.000000

Rupture Length Parameters
          Al        Bl      Sigl        Aw        Bw      Sigw        Aa        Ba
Sigw
    4.000000  0.000000  0.010000  4.000000  0.000000  0.010000  0.000000  0.000000
0.000000
    4.000000  0.000000  0.010000  4.000000  0.000000  0.010000  0.000000  0.000000
0.000000
    4.000000  0.000000  0.010000  4.000000  0.000000  0.010000  0.000000  0.000000
0.000000
    4.000000  0.000000  0.010000  4.000000  0.000000  0.010000  0.000000  0.000000
0.000000
    4.000000  0.000000  0.010000  4.000000  0.000000  0.010000  0.000000  0.000000
0.000000
```

```
    4.000000  0.000000  0.010000  4.000000  0.000000  0.010000  0.000000  0.000000
0.000000

Trace Coordinates:
  Latitude   Longitude
    38.0300  -111.7800
    38.1700  -111.5200

Attenuation Equations for Source:
  Name: Abra.-Silva (1997) Rock USGS 2002
  Name: Spudich 1999 Rock USGS 2002
  Name: Campbell-Bozorgnia (2008) NGA 3 sigma

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Name: Aquarius and Awapa plateau 80_12
Region: Utah
Category: Fault Seismic Source
Database: C:\Documents and Settings\roslyn.stern\Local Settings\Application Data\Risk
Engineering\EZ-FRISK\Files\user.xml-faultdb
Fault Mechanism: Normal
Magnitude Scale: Moment Magnitude
Probability of Activity: 0.04000000
Deterministic Magnitude: 6.9

Fault Profile Parameters:
        Dip1      Dip2    Depth1    Depth2    Depth3
          80        80         0       0.1        12

Magnitude Recurrence Distributions:
        ModelType    Weight    RateType        Rate    MinMag    MaxMag      Beta
Mean     Sigma    Delta1    Delta2
      Exponential       0.1        Slip  2.000e-002  6.600000  7.200000  1.842100
6.900000  0.120000  0.000000  0.000000
      Exponential  0.050000        Slip  5.000e-003  6.600000  7.200000  1.842100
6.900000  0.120000  0.000000  0.000000
      Exponential  0.050000        Slip  2.000e-001  6.600000  7.200000  1.842100
6.900000  0.120000  0.000000  0.000000
           Normal  0.400000        Slip  2.000e-002  6.600000  7.200000  0.000000
6.900000  0.120000  0.000000  0.000000
           Normal  0.200000        Slip  5.000e-003  6.600000  7.200000  0.000000
6.900000  0.120000  0.000000  0.000000
           Normal  0.200000        Slip  2.000e-001  6.600000  7.200000  0.000000
6.900000  0.120000  0.000000  0.000000

Rupture Length Parameters
          Al        Bl      Sigl        Aw        Bw      Sigw        Aa        Ba
Sigw
    4.000000  0.000000  0.010000  4.000000  0.000000  0.010000  0.000000  0.000000
0.000000
    4.000000  0.000000  0.010000  4.000000  0.000000  0.010000  0.000000  0.000000
0.000000
    4.000000  0.000000  0.010000  4.000000  0.000000  0.010000  0.000000  0.000000
0.000000
    4.000000  0.000000  0.010000  4.000000  0.000000  0.010000  0.000000  0.000000
0.000000
    4.000000  0.000000  0.010000  4.000000  0.000000  0.010000  0.000000  0.000000
0.000000
    4.000000  0.000000  0.010000  4.000000  0.000000  0.010000  0.000000  0.000000
0.000000

Trace Coordinates:
  Latitude   Longitude
    38.0300  -111.7800
    38.1700  -111.5200

Attenuation Equations for Source:
  Name: Abra.-Silva (1997) Rock USGS 2002
  Name: Spudich 1999 Rock USGS 2002
  Name: Campbell-Bozorgnia (2008) NGA 3 sigma
```

```
*******************************************

Name: Aquarius and Awapa plateau 80_15
Region: Utah
Category: Fault Seismic Source
Database: C:\Documents and Settings\roslyn.stern\Local Settings\Application Data\Risk
Engineering\EZ-FRISK\Files\user.xml-faultdb
Fault Mechanism: Normal
Magnitude Scale: Moment Magnitude
Probability of Activity: 0.12000000
Deterministic Magnitude: 6.9

Fault Profile Parameters:
        Dip1      Dip2    Depth1    Depth2    Depth3
          80        80         0       0.1        15

Magnitude Recurrence Distributions:
        ModelType    Weight    RateType        Rate    MinMag    MaxMag      Beta
Mean     Sigma    Delta1    Delta2
      Exponential       0.1        Slip  2.000e-002  6.600000  7.200000  1.842100
6.900000  0.120000  0.000000  0.000000
      Exponential  0.050000        Slip  5.000e-003  6.600000  7.200000  1.842100
6.900000  0.120000  0.000000  0.000000
      Exponential  0.050000        Slip  2.000e-001  6.600000  7.200000  1.842100
6.900000  0.120000  0.000000  0.000000
           Normal  0.400000        Slip  2.000e-002  6.600000  7.200000  0.000000
6.900000  0.120000  0.000000  0.000000
           Normal  0.200000        Slip  5.000e-003  6.600000  7.200000  0.000000
6.900000  0.120000  0.000000  0.000000
           Normal  0.200000        Slip  2.000e-001  6.600000  7.200000  0.000000
6.900000  0.120000  0.000000  0.000000

Rupture Length Parameters
          Al        Bl      Sigl        Aw        Bw      Sigw        Aa        Ba
Sigw
    4.000000  0.000000  0.010000  4.000000  0.000000  0.010000  0.000000  0.000000
0.000000
    4.000000  0.000000  0.010000  4.000000  0.000000  0.010000  0.000000  0.000000
0.000000
    4.000000  0.000000  0.010000  4.000000  0.000000  0.010000  0.000000  0.000000
0.000000
    4.000000  0.000000  0.010000  4.000000  0.000000  0.010000  0.000000  0.000000
0.000000
    4.000000  0.000000  0.010000  4.000000  0.000000  0.010000  0.000000  0.000000
0.000000
    4.000000  0.000000  0.010000  4.000000  0.000000  0.010000  0.000000  0.000000
0.000000

Trace Coordinates:
  Latitude   Longitude
    38.0300  -111.7800
    38.1700  -111.5200

Attenuation Equations for Source:
  Name: Abra.-Silva (1997) Rock USGS 2002
  Name: Spudich 1999 Rock USGS 2002
  Name: Campbell-Bozorgnia (2008) NGA 3 sigma

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Name: Aquarius and Awapa plateau 80_20
Region: Utah
Category: Fault Seismic Source
Database: C:\Documents and Settings\roslyn.stern\Local Settings\Application Data\Risk
Engineering\EZ-FRISK\Files\user.xml-faultdb
Fault Mechanism: Normal
Magnitude Scale: Moment Magnitude
Probability of Activity: 0.04000000
Deterministic Magnitude: 6.9

Fault Profile Parameters:
```

```
        Dip1      Dip2    Depth1    Depth2    Depth3
          80        80         0       0.1        20

Magnitude Recurrence Distributions:
        ModelType    Weight    RateType        Rate    MinMag    MaxMag      Beta
Mean     Sigma    Delta1    Delta2
      Exponential       0.1        Slip  2.000e-002  6.600000  7.200000  1.842100
6.900000  0.120000  0.000000  0.000000
      Exponential  0.050000        Slip  5.000e-003  6.600000  7.200000  1.842100
6.900000  0.120000  0.000000  0.000000
      Exponential  0.050000        Slip  2.000e-001  6.600000  7.200000  1.842100
6.900000  0.120000  0.000000  0.000000
           Normal  0.400000        Slip  2.000e-002  6.600000  7.200000  0.000000
6.900000  0.120000  0.000000  0.000000
           Normal  0.200000        Slip  5.000e-003  6.600000  7.200000  0.000000
6.900000  0.120000  0.000000  0.000000
           Normal  0.200000        Slip  2.000e-001  6.600000  7.200000  0.000000
6.900000  0.120000  0.000000  0.000000

Rupture Length Parameters
          Al        Bl      Sigl         Aw        Bw      Sigw         Aa         Ba
Sigw
    4.000000  0.000000  0.010000  4.000000  0.000000  0.010000  0.000000  0.000000
0.000000
    4.000000  0.000000  0.010000  4.000000  0.000000  0.010000  0.000000  0.000000
0.000000
    4.000000  0.000000  0.010000  4.000000  0.000000  0.010000  0.000000  0.000000
0.000000
    4.000000  0.000000  0.010000  4.000000  0.000000  0.010000  0.000000  0.000000
0.000000
    4.000000  0.000000  0.010000  4.000000  0.000000  0.010000  0.000000  0.000000
0.000000
    4.000000  0.000000  0.010000  4.000000  0.000000  0.010000  0.000000  0.000000
0.000000

Trace Coordinates:
  Latitude   Longitude
    38.0300  -111.7800
    38.1700  -111.5200

Attenuation Equations for Source:
  Name: Abra.-Silva (1997) Rock USGS 2002
  Name: Spudich 1999 Rock USGS 2002
  Name: Campbell-Bozorgnia (2008) NGA 3 sigma

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Name: Thousand Lakes 40_12
Region: Utah
Category: Fault Seismic Source
Database: C:\Documents and Settings\roslyn.stern\Local Settings\Application Data\Risk
Engineering\EZ-FRISK\Files\user.xml-faultdb
Fault Mechanism: Normal
Magnitude Scale: Moment Magnitude
Probability of Activity: 0.04000000
Deterministic Magnitude: 7

Fault Profile Parameters:
        Dip1      Dip2    Depth1    Depth2    Depth3
          40        40         0       0.1        12

Magnitude Recurrence Distributions:
        ModelType    Weight    RateType        Rate    MinMag    MaxMag      Beta
Mean     Sigma    Delta1    Delta2
      Exponential       0.1        Slip  2.000e-002  6.700000  7.300000  1.842100
7.000000  0.120000  0.000000  0.000000
      Exponential  0.050000        Slip  5.000e-003  6.700000  7.300000  1.842100
7.000000  0.120000  0.000000  0.000000
      Exponential  0.050000        Slip  2.000e-001  6.700000  7.300000  1.842100
7.000000  0.120000  0.000000  0.000000
```

```
           Normal  0.400000        Slip  2.000e-002  6.700000  7.300000  0.000000
7.000000  0.120000  0.000000  0.000000
           Normal  0.200000        Slip  5.000e-003  6.700000  7.300000  0.000000
7.000000  0.120000  0.000000  0.000000
           Normal  0.200000        Slip  2.000e-001  6.700000  7.300000  0.000000
7.000000  0.120000  0.000000  0.000000

Rupture Length Parameters
          Al        Bl      Sigl         Aw        Bw      Sigw         Aa         Ba
Sigw
    4.000000  0.000000  0.010000  4.000000  0.000000  0.010000  0.000000  0.000000
0.000000
    4.000000  0.000000  0.010000  4.000000  0.000000  0.010000  0.000000  0.000000
0.000000
    4.000000  0.000000  0.010000  4.000000  0.000000  0.010000  0.000000  0.000000
0.000000
    4.000000  0.000000  0.010000  4.000000  0.000000  0.010000  0.000000  0.000000
0.000000
    4.000000  0.000000  0.010000  4.000000  0.000000  0.010000  0.000000  0.000000
0.000000
    4.000000  0.000000  0.010000  4.000000  0.000000  0.010000  0.000000  0.000000
0.000000

Trace Coordinates:
  Latitude   Longitude
    38.1200  -111.5900
    38.5500  -111.5200

Attenuation Equations for Source:
  Name: Abra.-Silva (1997) Rock USGS 2002
  Name: Spudich 1999 Rock USGS 2002
  Name: Campbell-Bozorgnia (2008) NGA 3 sigma

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Name: Thousand Lakes 40_15
Region: Utah
Category: Fault Seismic Source
Database: C:\Documents and Settings\roslyn.stern\Local Settings\Application Data\Risk
Engineering\EZ-FRISK\Files\user.xml-faultdb
Fault Mechanism: Normal
Magnitude Scale: Moment Magnitude
Probability of Activity: 0.12000000
Deterministic Magnitude: 7

Fault Profile Parameters:
        Dip1      Dip2    Depth1    Depth2    Depth3
          40        40         0       0.1        15

Magnitude Recurrence Distributions:
        ModelType    Weight    RateType        Rate    MinMag    MaxMag      Beta
Mean     Sigma    Delta1    Delta2
      Exponential       0.1        Slip  2.000e-002  6.700000  7.300000  1.842100
7.000000  0.120000  0.000000  0.000000
      Exponential  0.050000        Slip  5.000e-003  6.700000  7.300000  1.842100
7.000000  0.120000  0.000000  0.000000
      Exponential  0.050000        Slip  2.000e-001  6.700000  7.300000  1.842100
7.000000  0.120000  0.000000  0.000000
           Normal  0.400000        Slip  2.000e-002  6.700000  7.300000  0.000000
7.000000  0.120000  0.000000  0.000000
           Normal  0.200000        Slip  5.000e-003  6.700000  7.300000  0.000000
7.000000  0.120000  0.000000  0.000000
           Normal  0.200000        Slip  2.000e-001  6.700000  7.300000  0.000000
7.000000  0.120000  0.000000  0.000000

Rupture Length Parameters
          Al        Bl      Sigl         Aw        Bw      Sigw         Aa         Ba
Sigw
    4.000000  0.000000  0.010000  4.000000  0.000000  0.010000  0.000000  0.000000
0.000000
```

```
    4.000000  0.000000  0.010000  4.000000  0.000000  0.010000  0.000000  0.000000
0.000000
    4.000000  0.000000  0.010000  4.000000  0.000000  0.010000  0.000000  0.000000
0.000000
    4.000000  0.000000  0.010000  4.000000  0.000000  0.010000  0.000000  0.000000
0.000000
    4.000000  0.000000  0.010000  4.000000  0.000000  0.010000  0.000000  0.000000
0.000000
    4.000000  0.000000  0.010000  4.000000  0.000000  0.010000  0.000000  0.000000
0.000000

Trace Coordinates:
  Latitude   Longitude
    38.1200  -111.5900
    38.5500  -111.5200

Attenuation Equations for Source:
  Name: Abra.-Silva (1997) Rock USGS 2002
  Name: Spudich 1999 Rock USGS 2002
  Name: Campbell-Bozorgnia (2008) NGA 3 sigma

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Name: Thousand Lakes 40_20
Region: Utah
Category: Fault Seismic Source
Database: C:\Documents and Settings\roslyn.stern\Local Settings\Application Data\Risk
Engineering\EZ-FRISK\Files\user.xml-faultdb
Fault Mechanism: Normal
Magnitude Scale: Moment Magnitude
Probability of Activity: 0.04000000
Deterministic Magnitude: 7

Fault Profile Parameters:
        Dip1      Dip2    Depth1    Depth2    Depth3
          40        40         0       0.1        20

Magnitude Recurrence Distributions:
        ModelType  Weight    RateType        Rate    MinMag    MaxMag      Beta
Mean     Sigma    Delta1    Delta2
      Exponential       0.1        Slip  2.000e-002  6.700000  7.300000  1.842100
7.000000  0.120000  0.000000  0.000000
      Exponential  0.050000        Slip  5.000e-003  6.700000  7.300000  1.842100
7.000000  0.120000  0.000000  0.000000
      Exponential  0.050000        Slip  2.000e-001  6.700000  7.300000  1.842100
7.000000  0.120000  0.000000  0.000000
           Normal  0.400000        Slip  2.000e-002  6.700000  7.300000  0.000000
7.000000  0.120000  0.000000  0.000000
           Normal  0.200000        Slip  5.000e-003  6.700000  7.300000  0.000000
7.000000  0.120000  0.000000  0.000000
           Normal  0.200000        Slip  2.000e-001  6.700000  7.300000  0.000000
7.000000  0.120000  0.000000  0.000000

Rupture Length Parameters
          Al        Bl      Sigl        Aw        Bw      Sigw        Aa        Ba
Sigw
    4.000000  0.000000  0.010000  4.000000  0.000000  0.010000  0.000000  0.000000
0.000000
    4.000000  0.000000  0.010000  4.000000  0.000000  0.010000  0.000000  0.000000
0.000000
    4.000000  0.000000  0.010000  4.000000  0.000000  0.010000  0.000000  0.000000
0.000000
    4.000000  0.000000  0.010000  4.000000  0.000000  0.010000  0.000000  0.000000
0.000000
    4.000000  0.000000  0.010000  4.000000  0.000000  0.010000  0.000000  0.000000
0.000000
    4.000000  0.000000  0.010000  4.000000  0.000000  0.010000  0.000000  0.000000
0.000000

Trace Coordinates:
  Latitude   Longitude
```

```
    38.1200  -111.5900
    38.5500  -111.5200

Attenuation Equations for Source:
  Name: Abra.-Silva (1997) Rock USGS 2002
  Name: Spudich 1999 Rock USGS 2002
  Name: Campbell-Bozorgnia (2008) NGA 3 sigma

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Name: Thousand Lakes 60_12
Region: Utah
Category: Fault Seismic Source
Database: C:\Documents and Settings\roslyn.stern\Local Settings\Application Data\Risk
Engineering\EZ-FRISK\Files\user.xml-faultdb
Fault Mechanism: Normal
Magnitude Scale: Moment Magnitude
Probability of Activity: 0.12000000
Deterministic Magnitude: 7

Fault Profile Parameters:
        Dip1      Dip2    Depth1    Depth2    Depth3
          60        60         0       0.1        12

Magnitude Recurrence Distributions:
        ModelType    Weight    RateType        Rate    MinMag    MaxMag      Beta
Mean     Sigma    Delta1    Delta2
      Exponential       0.1        Slip  2.000e-002  6.700000  7.300000  1.842100
7.000000  0.120000  0.000000  0.000000
      Exponential  0.050000        Slip  5.000e-003  6.700000  7.300000  1.842100
7.000000  0.120000  0.000000  0.000000
      Exponential  0.050000        Slip  2.000e-001  6.700000  7.300000  1.842100
7.000000  0.120000  0.000000  0.000000
           Normal  0.400000        Slip  2.000e-002  6.700000  7.300000  0.000000
7.000000  0.120000  0.000000  0.000000
           Normal  0.200000        Slip  5.000e-003  6.700000  7.300000  0.000000
7.000000  0.120000  0.000000  0.000000
           Normal  0.200000        Slip  2.000e-001  6.700000  7.300000  0.000000
7.000000  0.120000  0.000000  0.000000

Rupture Length Parameters
          Al        Bl      Sigl          Aw        Bw      Sigw        Aa        Ba
Sigw
    4.000000  0.000000  0.010000  4.000000  0.000000  0.010000  0.000000  0.000000
0.000000
    4.000000  0.000000  0.010000  4.000000  0.000000  0.010000  0.000000  0.000000
0.000000
    4.000000  0.000000  0.010000  4.000000  0.000000  0.010000  0.000000  0.000000
0.000000
    4.000000  0.000000  0.010000  4.000000  0.000000  0.010000  0.000000  0.000000
0.000000
    4.000000  0.000000  0.010000  4.000000  0.000000  0.010000  0.000000  0.000000
0.000000
    4.000000  0.000000  0.010000  4.000000  0.000000  0.010000  0.000000  0.000000
0.000000

Trace Coordinates:
  Latitude   Longitude
    38.1200  -111.5900
    38.5500  -111.5200

Attenuation Equations for Source:
  Name: Abra.-Silva (1997) Rock USGS 2002
  Name: Spudich 1999 Rock USGS 2002
  Name: Campbell-Bozorgnia (2008) NGA 3 sigma

*******************************************

Name: Thousand Lakes 60_15
Region: Utah
Category: Fault Seismic Source
```

```
Database: C:\Documents and Settings\roslyn.stern\Local Settings\Application Data\Risk
Engineering\EZ-FRISK\Files\user.xml-faultdb
Fault Mechanism: Normal
Magnitude Scale: Moment Magnitude
Probability of Activity: 0.36000000
Deterministic Magnitude: 7

Fault Profile Parameters:
        Dip1      Dip2    Depth1    Depth2    Depth3
          60        60         0       0.1        15

Magnitude Recurrence Distributions:
        ModelType    Weight    RateType        Rate    MinMag    MaxMag      Beta
Mean     Sigma    Delta1    Delta2
      Exponential       0.1        Slip  2.000e-002  6.700000  7.300000  1.842100
7.000000  0.120000  0.000000  0.000000
      Exponential  0.050000        Slip  5.000e-003  6.700000  7.300000  1.842100
7.000000  0.120000  0.000000  0.000000
      Exponential  0.050000        Slip  2.000e-001  6.700000  7.300000  1.842100
7.000000  0.120000  0.000000  0.000000
           Normal  0.400000        Slip  2.000e-002  6.700000  7.300000  0.000000
7.000000  0.120000  0.000000  0.000000
           Normal  0.200000        Slip  5.000e-003  6.700000  7.300000  0.000000
7.000000  0.120000  0.000000  0.000000
           Normal  0.200000        Slip  2.000e-001  6.700000  7.300000  0.000000
7.000000  0.120000  0.000000  0.000000

Rupture Length Parameters
          Al        Bl      Sigl        Aw        Bw      Sigw        Aa        Ba
Sigw
    4.000000  0.000000  0.010000  4.000000  0.000000  0.010000  0.000000  0.000000
0.000000
    4.000000  0.000000  0.010000  4.000000  0.000000  0.010000  0.000000  0.000000
0.000000
    4.000000  0.000000  0.010000  4.000000  0.000000  0.010000  0.000000  0.000000
0.000000
    4.000000  0.000000  0.010000  4.000000  0.000000  0.010000  0.000000  0.000000
0.000000
    4.000000  0.000000  0.010000  4.000000  0.000000  0.010000  0.000000  0.000000
0.000000
    4.000000  0.000000  0.010000  4.000000  0.000000  0.010000  0.000000  0.000000
0.000000

Trace Coordinates:
  Latitude   Longitude
    38.1200  -111.5900
    38.5500  -111.5200

Attenuation Equations for Source:
  Name: Abra.-Silva (1997) Rock USGS 2002
  Name: Spudich 1999 Rock USGS 2002
  Name: Campbell-Bozorgnia (2008) NGA 3 sigma

*******************************************

Name: Thousand Lakes 60_20
Region: Utah
Category: Fault Seismic Source
Database: C:\Documents and Settings\roslyn.stern\Local Settings\Application Data\Risk
Engineering\EZ-FRISK\Files\user.xml-faultdb
Fault Mechanism: Normal
Magnitude Scale: Moment Magnitude
Probability of Activity: 0.12000000
Deterministic Magnitude: 7

Fault Profile Parameters:
        Dip1      Dip2    Depth1    Depth2    Depth3
          60        60         0       0.1        20

Magnitude Recurrence Distributions:
```

```
        ModelType    Weight    RateType        Rate    MinMag    MaxMag      Beta
Mean     Sigma    Delta1    Delta2
      Exponential       0.1        Slip  2.000e-002  6.700000  7.300000  1.842100
7.000000  0.120000  0.000000  0.000000
      Exponential  0.050000        Slip  5.000e-003  6.700000  7.300000  1.842100
7.000000  0.120000  0.000000  0.000000
      Exponential  0.050000        Slip  2.000e-001  6.700000  7.300000  1.842100
7.000000  0.120000  0.000000  0.000000
           Normal  0.400000        Slip  2.000e-002  6.700000  7.300000  0.000000
7.000000  0.120000  0.000000  0.000000
           Normal  0.200000        Slip  5.000e-003  6.700000  7.300000  0.000000
7.000000  0.120000  0.000000  0.000000
           Normal  0.200000        Slip  2.000e-001  6.700000  7.300000  0.000000
7.000000  0.120000  0.000000  0.000000

Rupture Length Parameters
          Al        Bl      Sigl        Aw        Bw      Sigw        Aa        Ba
Sigw
    4.000000  0.000000  0.010000  4.000000  0.000000  0.010000  0.000000  0.000000
0.000000
    4.000000  0.000000  0.010000  4.000000  0.000000  0.010000  0.000000  0.000000
0.000000
    4.000000  0.000000  0.010000  4.000000  0.000000  0.010000  0.000000  0.000000
0.000000
    4.000000  0.000000  0.010000  4.000000  0.000000  0.010000  0.000000  0.000000
0.000000
    4.000000  0.000000  0.010000  4.000000  0.000000  0.010000  0.000000  0.000000
0.000000
    4.000000  0.000000  0.010000  4.000000  0.000000  0.010000  0.000000  0.000000
0.000000

Trace Coordinates:
  Latitude   Longitude
    38.1200  -111.5900
    38.5500  -111.5200

Attenuation Equations for Source:
  Name: Abra.-Silva (1997) Rock USGS 2002
  Name: Spudich 1999 Rock USGS 2002
  Name: Campbell-Bozorgnia (2008) NGA 3 sigma

*******************************************

Name: Thousand Lakes 80_12
Region: Utah
Category: Fault Seismic Source
Database: C:\Documents and Settings\roslyn.stern\Local Settings\Application Data\Risk
Engineering\EZ-FRISK\Files\user.xml-faultdb
Fault Mechanism: Normal
Magnitude Scale: Moment Magnitude
Probability of Activity: 0.04000000
Deterministic Magnitude: 7

Fault Profile Parameters:
        Dip1      Dip2    Depth1    Depth2    Depth3
          80        80         0       0.1        12

Magnitude Recurrence Distributions:
        ModelType    Weight    RateType        Rate    MinMag    MaxMag      Beta
Mean     Sigma    Delta1    Delta2
      Exponential       0.1        Slip  2.000e-002  6.700000  7.300000  1.842100
7.000000  0.120000  0.000000  0.000000
      Exponential  0.050000        Slip  5.000e-003  6.700000  7.300000  1.842100
7.000000  0.120000  0.000000  0.000000
      Exponential  0.050000        Slip  2.000e-001  6.700000  7.300000  1.842100
7.000000  0.120000  0.000000  0.000000
           Normal  0.400000        Slip  2.000e-002  6.700000  7.300000  0.000000
7.000000  0.120000  0.000000  0.000000
           Normal  0.200000        Slip  5.000e-003  6.700000  7.300000  0.000000
7.000000  0.120000  0.000000  0.000000
```

```
           Normal  0.200000        Slip  2.000e-001  6.700000  7.300000  0.000000
7.000000  0.120000  0.000000  0.000000

Rupture Length Parameters
          Al        Bl      Sigl        Aw        Bw      Sigw        Aa        Ba
Sigw
    4.000000  0.000000  0.010000  4.000000  0.000000  0.010000  0.000000  0.000000
0.000000
    4.000000  0.000000  0.010000  4.000000  0.000000  0.010000  0.000000  0.000000
0.000000
    4.000000  0.000000  0.010000  4.000000  0.000000  0.010000  0.000000  0.000000
0.000000
    4.000000  0.000000  0.010000  4.000000  0.000000  0.010000  0.000000  0.000000
0.000000
    4.000000  0.000000  0.010000  4.000000  0.000000  0.010000  0.000000  0.000000
0.000000
    4.000000  0.000000  0.010000  4.000000  0.000000  0.010000  0.000000  0.000000
0.000000

Trace Coordinates:
  Latitude   Longitude
    38.1200  -111.5900
    38.5500  -111.5200

Attenuation Equations for Source:
  Name: Abra.-Silva (1997) Rock USGS 2002
  Name: Spudich 1999 Rock USGS 2002
  Name: Campbell-Bozorgnia (2008) NGA 3 sigma

*******************************************

Name: Thousand Lakes 80_15
Region: Utah
Category: Fault Seismic Source
Database: C:\Documents and Settings\roslyn.stern\Local Settings\Application Data\Risk
Engineering\EZ-FRISK\Files\user.xml-faultdb
Fault Mechanism: Normal
Magnitude Scale: Moment Magnitude
Probability of Activity: 0.12000000
Deterministic Magnitude: 7

Fault Profile Parameters:
        Dip1      Dip2    Depth1    Depth2    Depth3
          80        80         0       0.1        15

Magnitude Recurrence Distributions:
        ModelType    Weight    RateType        Rate    MinMag    MaxMag      Beta
Mean     Sigma    Delta1    Delta2
      Exponential       0.1        Slip  2.000e-002  6.700000  7.300000  1.842100
7.000000  0.120000  0.000000  0.000000
      Exponential  0.050000        Slip  5.000e-003  6.700000  7.300000  1.842100
7.000000  0.120000  0.000000  0.000000
      Exponential  0.050000        Slip  2.000e-001  6.700000  7.300000  1.842100
7.000000  0.120000  0.000000  0.000000
           Normal  0.400000        Slip  2.000e-002  6.700000  7.300000  0.000000
7.000000  0.120000  0.000000  0.000000
           Normal  0.200000        Slip  5.000e-003  6.700000  7.300000  0.000000
7.000000  0.120000  0.000000  0.000000
           Normal  0.200000        Slip  2.000e-001  6.700000  7.300000  0.000000
7.000000  0.120000  0.000000  0.000000

Rupture Length Parameters
          Al        Bl      Sigl        Aw        Bw      Sigw        Aa        Ba
Sigw
    4.000000  0.000000  0.010000  4.000000  0.000000  0.010000  0.000000  0.000000
0.000000
    4.000000  0.000000  0.010000  4.000000  0.000000  0.010000  0.000000  0.000000
0.000000
    4.000000  0.000000  0.010000  4.000000  0.000000  0.010000  0.000000  0.000000
0.000000
```

```
    4.000000  0.000000  0.010000  4.000000  0.000000  0.010000  0.000000  0.000000
0.000000
    4.000000  0.000000  0.010000  4.000000  0.000000  0.010000  0.000000  0.000000
0.000000
    4.000000  0.000000  0.010000  4.000000  0.000000  0.010000  0.000000  0.000000
0.000000

Trace Coordinates:
  Latitude   Longitude
    38.1200  -111.5900
    38.5500  -111.5200

Attenuation Equations for Source:
  Name: Abra.-Silva (1997) Rock USGS 2002
  Name: Spudich 1999 Rock USGS 2002
  Name: Campbell-Bozorgnia (2008) NGA 3 sigma

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Name: Thousand Lakes 80_20
Region: Utah
Category: Fault Seismic Source
Database: C:\Documents and Settings\roslyn.stern\Local Settings\Application Data\Risk
Engineering\EZ-FRISK\Files\user.xml-faultdb
Fault Mechanism: Normal
Magnitude Scale: Moment Magnitude
Probability of Activity: 0.04000000
Deterministic Magnitude: 7

Fault Profile Parameters:
        Dip1      Dip2    Depth1    Depth2    Depth3
          80        80         0       0.1        20

Magnitude Recurrence Distributions:
        ModelType    Weight    RateType        Rate    MinMag    MaxMag      Beta
Mean     Sigma    Delta1    Delta2
      Exponential       0.1        Slip  2.000e-002  6.700000  7.300000  1.842100
7.000000  0.120000  0.000000  0.000000
      Exponential  0.050000        Slip  5.000e-003  6.700000  7.300000  1.842100
7.000000  0.120000  0.000000  0.000000
      Exponential  0.050000        Slip  2.000e-001  6.700000  7.300000  1.842100
7.000000  0.120000  0.000000  0.000000
           Normal  0.400000        Slip  2.000e-002  6.700000  7.300000  0.000000
7.000000  0.120000  0.000000  0.000000
           Normal  0.200000        Slip  5.000e-003  6.700000  7.300000  0.000000
7.000000  0.120000  0.000000  0.000000
           Normal  0.200000        Slip  2.000e-001  6.700000  7.300000  0.000000
7.000000  0.120000  0.000000  0.000000

Rupture Length Parameters
          Al        Bl      Sigl        Aw        Bw      Sigw        Aa        Ba
Sigw
    4.000000  0.000000  0.010000  4.000000  0.000000  0.010000  0.000000  0.000000
0.000000
    4.000000  0.000000  0.010000  4.000000  0.000000  0.010000  0.000000  0.000000
0.000000
    4.000000  0.000000  0.010000  4.000000  0.000000  0.010000  0.000000  0.000000
0.000000
    4.000000  0.000000  0.010000  4.000000  0.000000  0.010000  0.000000  0.000000
0.000000
    4.000000  0.000000  0.010000  4.000000  0.000000  0.010000  0.000000  0.000000
0.000000
    4.000000  0.000000  0.010000  4.000000  0.000000  0.010000  0.000000  0.000000
0.000000

Trace Coordinates:
  Latitude   Longitude
    38.1200  -111.5900
    38.5500  -111.5200

Attenuation Equations for Source:
```

```
  Name: Abra.-Silva (1997) Rock USGS 2002
  Name: Spudich 1999 Rock USGS 2002
  Name: Campbell-Bozorgnia (2008) NGA 3 sigma

*******************************************

Name: 200-mile radius circle around Shootaring
Region: Utah
Category: Area Seismic Source
Database: C:\Documents and Settings\roslyn.stern\Local Settings\Application Data\Risk
Engineering\EZ-FRISK\Files\user.xml-areadb
Fault Mechanism: Normal
Magnitude Scale: Moment Magnitude
Probability of Activity: 0.25
Minimum Depth: 3 km
Maximum Depth: 20 km

Boundary Coordinates:
  Latitude   Longitude
  -109.6290    40.4976
  -109.5150    40.4693
  -108.4690    40.0373
  -107.6650    39.3720
  -107.1800    38.5446
  -107.0530    37.6406
  -107.2820    36.7494
  -107.8350    35.9565
  -108.2390    35.6021
  -108.6510    35.3360
  -109.4470    35.0011
  -110.7480    34.8185
  -111.8400    34.9685
  -112.8290    35.3814
  -113.6260    36.0196
  -114.1520    36.8545
  -114.3510    37.7207
  -114.1920    38.6220
  -113.6760    39.4386
  -112.8470    40.0860
  -111.7850    40.4946
  -109.6290    40.4976

Magnitude Recurrence Distribution:
  Minimum Magnitude: 4 Mw
  Maximum Magnitude: 6.3 Mw
  Activity Rate: 1.55
  Beta: 1.96
  Al: -4
  Bl: 0

Attenuation Equations for Source:
  Name: Abra.-Silva (1997) Rock USGS 2002 Gridded
  Name: Spudich 1999 Rock USGS 2002
  Name: Campbell-Bozorgnia (2008) NGA 3 sigma

*******************************************

Name: Wong et al. 1996
Region: Utah
Category: Area Seismic Source
Database: C:\Documents and Settings\roslyn.stern\Local Settings\Application Data\Risk
Engineering\EZ-FRISK\Files\user.xml-areadb
Fault Mechanism: Normal
Magnitude Scale: Moment Magnitude
Probability of Activity: 0.25
Minimum Depth: 3 km
Maximum Depth: 20 km

Boundary Coordinates:
  Latitude   Longitude
  -112.0000    39.4000
```

```
  -108.6000    39.4000
  -108.6000    35.2000
  -112.0000    35.2000
  -112.0000    39.4000

Magnitude Recurrence Distribution:
  Minimum Magnitude: 3 Mw
  Maximum Magnitude: 6 Mw
  Activity Rate: 1.83
  Beta: 2.12
  Al: -4
  Bl: 0

Attenuation Equations for Source:
  Name: Abra.-Silva (1997) Rock USGS 2002 Gridded
  Name: Spudich 1999 Rock USGS 2002
  Name: Campbell-Bozorgnia (2008) NGA 3 sigma

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Echo File Creation Time: 09:55:42 Monday, March 10, 2008
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# APPENDIX C
# FIELD INVESTIGATIONS

# APPENDIX C.1
# WOODWARD-CLYDE GEOTECHNICAL INVESTIGATIONS

# APPENDIX C.1.1
# LOGS OF BORINGS AND TEST PITS
# WOODWARD-CLYDE CONSULTANTS 1977 FIELD INVESTIGATION
# (WOODWARD-CLYDE, 1978D)

Project: PLATEAU RESOURCES LIMITED
SHOOTERING CANYON URANIUM PROJECT
Garfield County, Utah

# Log of Boring No. S-1

Date Drilled: Sept 22 - 23, 1977

Type of Boring: NX Core

Hammer Weight: --

Remarks:

|  |  |  |  | LABORATORY TES |  |  |
|---|---|---|---|---|---|---|
| Depth, Ft. | Samples | Recovery | MATERIAL DESCRIPTION | Moisture Content, % | Dry Density, pcf | Unconfined Compressive |
|  |  |  | Surface Elevation: 4350± |  |  |  |
|  |  |  | FINE SANDSTONE |  |  |  |
|  |  |  | Generally medium hard, red-brown, with calcareous cement and trace to some silt |  |  |  |
|  |  |  | ---Moderately hard |  |  |  |
| 5 |  |  | Light tan, thinly-bedded |  |  |  |
|  |  | 90% |  | 2 | 122 | – |
|  |  |  | Moderately hard, light tan |  |  |  |
| 10 |  |  |  |  |  |  |
|  |  | 90% |  |  |  |  |
| 15 |  |  | Light tan, thinly-bedded |  |  |  |
|  |  | 100% |  |  |  |  |
| 20 |  |  |  |  |  |  |
|  |  | 100% |  |  |  |  |
|  |  |  | Soft, friable, light tan |  |  |  |
| 25 |  |  |  |  |  |  |
|  |  | 90% | Soft, light red-brown |  |  |  |
| 30 |  |  | Soft, friable |  |  |  |
|  |  | 100% |  |  |  |  |
| 35 |  |  |  |  |  |  |
|  |  | 100% |  |  |  |  |

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# Log of Boring No. S-1

(Contin

| Depth, Ft. | Samples | Recovery | MATERIAL DESCRIPTION | Moisture Content, % | Dry Density, pcf | Unconfined Compressiv Strengt psf |
|---|---|---|---|---|---|---|
| 40 | | | | | | |
| | | 90% | | | | |
| | | | Soft, friable, light red-brown | | | |
| 45 | | | | | | |
| | | 85% | | | | |
| | | | Soft, friable, light red-brown | | | |
| 50 | | | | | | |
| | | 90% | | | | |
| 55 | | | Soft, friable, light red-brown | | | |
| | | 90% | | | | |
| 60 | | | | | | |
| | | 100% | | | | |
| | | | Soft, friable, light red-brown | | | |
| 65 | | | | | | |
| | | 75% | | | | |
| 70 | | | | | | |
| | | 100% | | | | |
| 75 | | | | | | |
| | | | SILTY CLAYSTONE<br>Soft, dark red-brown | | | |
| | | 95% | FINE SANDSTONE<br>Generally medium hard to moderately hard, red-brown, with trace to some silt and calcareous cement | | | |
| 80 | | | | | | |

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Garfield County, Utah

# Log of Boring No. S-1

(Continued

| Depth, Ft. | Samples | Recovery | MATERIAL DESCRIPTION | Moisture Content, % | Dry Density, pcf | Unconfined Compressive Stre |
|---|---|---|---|---|---|---|
| | | 70% | | | | |
| 85 | | | | | | |
| | | 98% | } Gray | | | |
| 90 | | | | | | |
| | | 100% | | | | |
| 95 | | 100% | | | | |
| | | | } Soft, friable, with gray | | | |
| | | 94% | | | | |
| 100 | | | | | | |
| | | | BOTTOM OF BORING @ 100.5' | | | |
| 105 | | | | | | |
| 110 | | | | | | |
| 115 | | | | | | |
| 120 | | | | | | |
| 125 | | | | | | |

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Garfield County, Utah

# Log of Boring No. S-2

**Date Drilled:** October 1, 1977

**Type of Boring:** NX Core

**Hammer Weight:** --

**Remarks:**

**Surface Elevation:** 4370±

| Depth, Ft. | Samples | Recovery | MATERIAL DESCRIPTION | LABORATORY TES Moisture Content, % | Dry Density, pcf | Unconfined Compressive Strength, |
|---|---|---|---|---|---|---|
| | | | FINE SAND<br>Loose, dry, tan, with trace of silt | | | |
| 5 | | 100% | FINE SANDSTONE<br>Generally medium hard, red-brown, with calcareous cement and trace to some silt | | | |
| 10 | | 100% | | | | |
| 15 | | 100% | } Soft, friable | | | |
| 20 | | 83% | | | | |
| 25 | | 90% | } Soft, friable | | | |
| 30 | | 88% | | | | |
| 35 | | 80% | } Soft, friable, light red-brown | | | |

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# Log of Boring No. S-2

(Continued)

| Depth, Ft. | Samples | Recovery | MATERIAL DESCRIPTION | Moisture Content, % | Dry Density, pcf | Unconfined Compressive Strengt |
|---|---|---|---|---|---|---|
| 40 | | | | | | |
| | | 88% | | | | |
| 45 | | | Soft, friable, light red-brown | | | |
| | | 80% | | | | |
| 50 | | | | | | |
| | | | Soft, friable, light red-brown | | | |
| | | 90% | | | | |
| 55 | | | | | | |
| | | 70% | | | | |
| 60 | | | | | | |
| | | | Very soft, friable | | | |
| | | 90% | | | | |
| 65 | | | | | | |
| | | 80% | | | | |
| 70 | | | | | | |
| | | 82% | | | | |
| 75 | | | | | | |
| | | 100% | Moderately hard | | | |
| 80 | | | | | | |

BOTTOM OF BORING @ 81.0'

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Garfield County, Utah

# Log of Boring No. S-3

Date Drilled: September 26 - 29, 1977
Remarks:
Type of Boring: NX Core
Hammer Weight: --

| Depth, Ft. | Samples | Recovery | MATERIAL DESCRIPTION | LABORATORY TESTS Moisture Content, % | Dry Density, pcf | Unconfined Compressive Strength, |
|---|---|---|---|---|---|---|
| | | | Surface Elevation: 4380± | | | |
| 5 | | 80% | FINE SANDSTONE<br>Generally medium hard, red-brown, with calcareous cement and trace to some silt<br>Soft, friable | | | |
| 10 | | 83% | | 2 | 120 | – |
| 15 | | 95% | Gray<br>Soft, friable | | | |
| | | | SILTY CLAYEY FINE SANDSTONE<br>Medium hard, dark red-brown | | | |
| 20 | | 98% | FINE SANDSTONE<br>Generally medium hard, red-brown, with calcareous cement and trace to some silt<br>Soft | | | |
| 25 | | 80% | Soft, friable, tan-brown | | | |
| 30 | | 100% | Soft, friable | | | |
| 35 | | 100% | | | | |
| | | 80% | | | | |

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Garfield County, Utah

# Log of Boring No. S-3

(Continued)

| Depth, Ft. | Samples | Recovery | MATERIAL DESCRIPTION | Moisture Content, % | Dry Density, pcf | Unconfined Compressive Stren |
|---|---|---|---|---|---|---|
| 40 | | | | | | |
| | | | Soft, friable | | | |
| | | 100% | | | | |
| 45 | | | | | | |
| | | | Medium-grained, tan-brown | | | |
| | | 92% | | | | |
| 50 | | | | | | |
| | | 100% | | | | |
| 55 | | | | | | |
| | | 100% | | | | |
| 60 | | | | | | |
| | | 90% | | | | |
| | | | Soft, friable | | | |
| 65 | | | | | | |
| | | 95% | | | | |
| 70 | | | | | | |
| | | 90% | Soft, friable, thinly-bedded | | | |
| 75 | | | | | | |
| | | 97% | | | | |
| 80 | | | BOTTOM OF BORING @ 80.0' | | | |

Project: PLATEAU RESOURCES LIMITED
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Garfield County, Utah

# Log of Boring No. S-4

Date Drilled: September 29 - 30, 1977

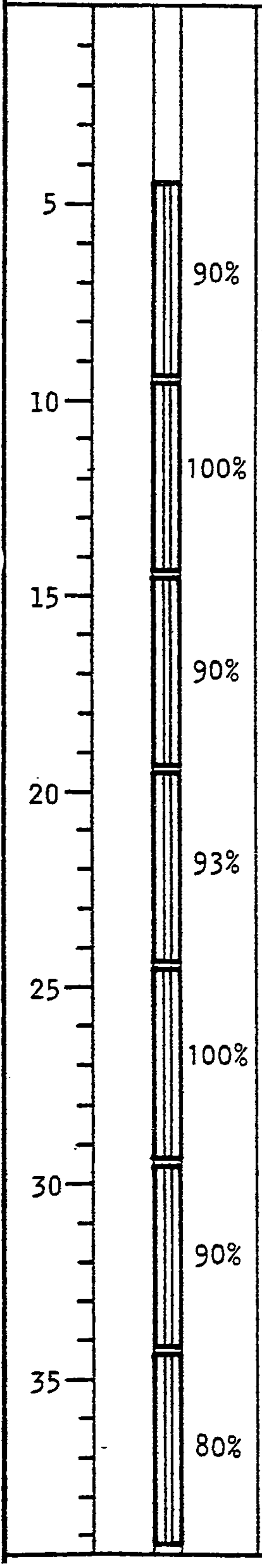
Type of Boring: NX Core

Hammer Weight: --

Remarks:

| Depth, Ft. | Samples | Recovery | MATERIAL DESCRIPTION | LABORATORY TESTS<br>Moisture Content, % | Dry Density, pcf | Unconfined Compressive Strength, psf |
|---|---|---|---|---|---|---|

Surface Elevation: 4355±



F I N E S A N D S T O N E

Generally medium hard, red-brown, with calcareous cement and trace to some silt

Soft, friable

Soft, friable

Soft, friable, thinly-bedded

Project: PLATEAU RESOURCES LIMITED
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Garfield County, Utah

# Log of Boring No. S-4

(Continued)

| Depth, Ft. | Samples | Recovery | MATERIAL DESCRIPTION | Moisture Content, % | Dry Density, pcf | Unconfined Compressive Streng |
|---|---|---|---|---|---|---|
| 40 | | | | | | |
| | | 96% | | | | |
| | | | Soft, friable | | | |
| 45 | | | | | | |
| | | 95% | | | | |
| | | | Soft, friable | | | |
| 50 | | | | | | |
| | | 92% | | | | |
| 55 | | | | | | |
| | | 69% | Very soft, very friable, light tan | | | |
| 60 | | | | | | |
| | | 85% | | | | |
| 65 | | | | | | |
| | | 96% | | | | |
| 70 | | | | | | |
| | | | Soft, friable, light tan-brown | | | |
| | | 95% | | | | |
| 75 | | | | | | |
| | | 40% | Moderately hard, with gray bands | | | |
| 80 | | | | | | |

BOTTOM OF BORING @ 80.5'

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Garfield County, Utah

# Log of Boring No. S-5

**Date Drilled:** October 7, 1977
**Type of Boring:** 3" Rotary & NX Core
**Hammer Weight:** 140 lbs.
**Remarks:**

| Depth, Ft. | Samples | Recovery | MATERIAL DESCRIPTION | LABORATORY TEST | | |
|---|---|---|---|---|---|---|
| | | | | Moisture Content,% | Dry Density, pcf | Unconfined Compressive Strength, |
| | | | Surface Elevation: 4425± | | | |
| 0–12 | | | **SILTY SAND**<br>Dense, dry, light red-brown, with trace to some gravel; and white calcareous cement | | | |
| 5 | 1 | 48 blows / 12" | | | | |
| 10 | 2 | 25 blows / 0" | | | | |
| 12–21 | | | **COBBLES, GRAVEL & SAND**<br>Dense, cuttings indicate igneous rock fragments | | | |
| 15 | | | | | | |
| 20 | 3 | 84 blows / 10½" | **SILTY SAND:** Very dense, dry, red-brown, with rock fragments | | | |
| 23– | | | **FINE SANDSTONE**<br>Generally medium hard, red-brown, with calcareous cement and trace to some silt | | | |
| 25 | | 88% | Thinly-bedded | | | |
| 30 | | | Soft, friable | | | |
| | | 97% | | | | |
| 35 | | 99% | Soft to medium hard, thinly-bedded | | | |

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SHOOTERING CANYON URANIUM PROJECT
Garfield County, Utah

# Log of Boring No. S-5

(Continued)

| Depth, Ft. | Samples | Recovery | MATERIAL DESCRIPTION | Moisture Content, % | Dry Density, pcf | Unconfined Compressive Streng p |
|---|---|---|---|---|---|---|
| 40 | ▥ | | | | | |
| | ▥ | 100% | | | | |
| 45 | ▥ | | | | | |
| | ▥ | | Soft, friable | | | |
| | ▥ | 100% | | | | |
| | ▥ | | Fractured | | | |
| 50 | ▥ | | | | | |
| | ▥ | 100% | | | | |
| 55 | ▥ | | Soft, friable, light red-brown | | | |
| | ▥ | 85% | | | | |
| 60 | ▥ | | | | | |
| | | | BOTTOM OF BORING @ 61.4' | | | |
| 65 | | | | | | |
| 70 | | | | | | |
| 75 | | | | | | |
| 80 | | | | | | |

KEY:

▯ 2" O.D. Standard Split-Spoon Sampler

▨ 2" I.D. Modified California Sampler

▥ NX Core (2⅛" Diameter)

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Garfield County, Utah

# Log of Boring No. S-6

**Date Drilled:** October 2, 1977
**Type of Boring:** NX Core
**Hammer Weight:** --
**Remarks:**

Surface Elevation: 4330±

| Depth, Ft. | Samples | Recovery | MATERIAL DESCRIPTION | LABORATORY TEST<br>Moisture Content, % | Dry Density, pcf | Unconfined Compressive Strength, |
|---|---|---|---|---|---|---|
| 0 | | | F I N E S A N D<br>Loose, dry, tan | | | |
| | | | S A N D : Medium dense, dry, tan, with some gravel | | | |
| 5 | | 81% | F I N E S A N D S T O N E<br>Generally soft to medium hard, red-brown, with calcareous cement and trace to some silt<br>--- Soft, friable | | | |
| 10 | | 90% | ← Silty clay weathering product in joint | | | |
| 15 | | 90% | | | | |
| 20 | | 95% | Soft, friable | | | |
| 25 | | 91% | Occasionally becoming thinly-bedded ↓ | | | |
| 30 | | 100% | Soft, friable | | | |
| 35 | | 91% | | | | |

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# Log of Boring No. S-6
(Continued)

| Depth, Ft. | Samples | Recovery | MATERIAL DESCRIPTION | Moisture Content, % | Dry Density, pcf | Unconfined Compressive Stre |
|---|---|---|---|---|---|---|
| 40 | | | | | | |
| | | 89% | | | | |
| 45 | | | Soft, friable | | | |
| | | 80% | Soft, friable | | | |
| 50 | | | | | | |
| | | 93% | | | | |
| 55 | | | Soft to medium hard | | | |
| | | 67% | | | | |
| 60 | | | Soft, friable, light tan-brown | | | |
| | | 92% | | | | |
| 65 | | | Very soft, friable, light tan-brown | | | |
| 70 | | 75% | | | | |
| | | | BOTTOM OF BORING @ 71.8' | | | |
| 75 | | | | | | |
| 80 | | | | | | |

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# Log of Boring No. S-7

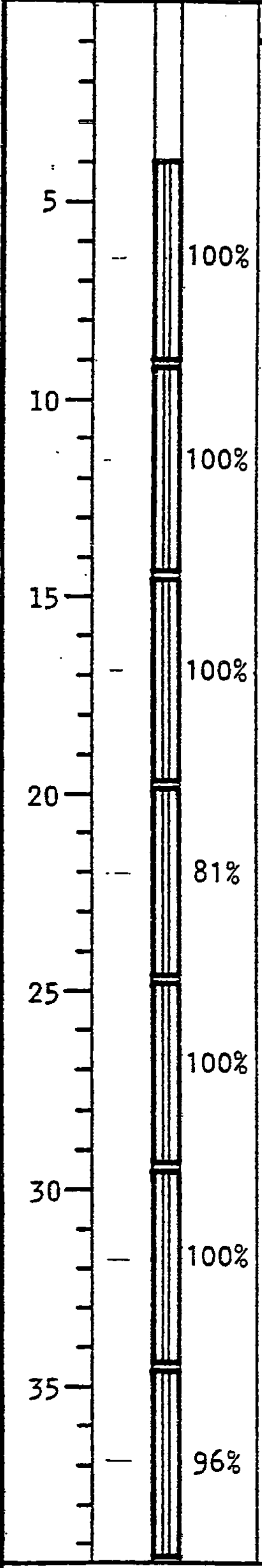
**Date Drilled:** October 6, 1977

**Type of Boring:** NX Core

**Hammer Weight:** --

**Remarks:**

Surface Elevation: 4300±



## MATERIAL DESCRIPTION

SILTY SAND: Loose, dry, pink, with gravel

FINE SANDSTONE

Generally medium hard, red-brown, with calcareous cement and trace to some silt

Gray

Fractured

Soft, friable

Soft, friable

Soft, friable

LABORATORY TESTS

| Moisture Content, % | Dry Density, pcf | Unconfined Compressive Strength, psf |
|---|---|---|
| 8 | 126 | - |

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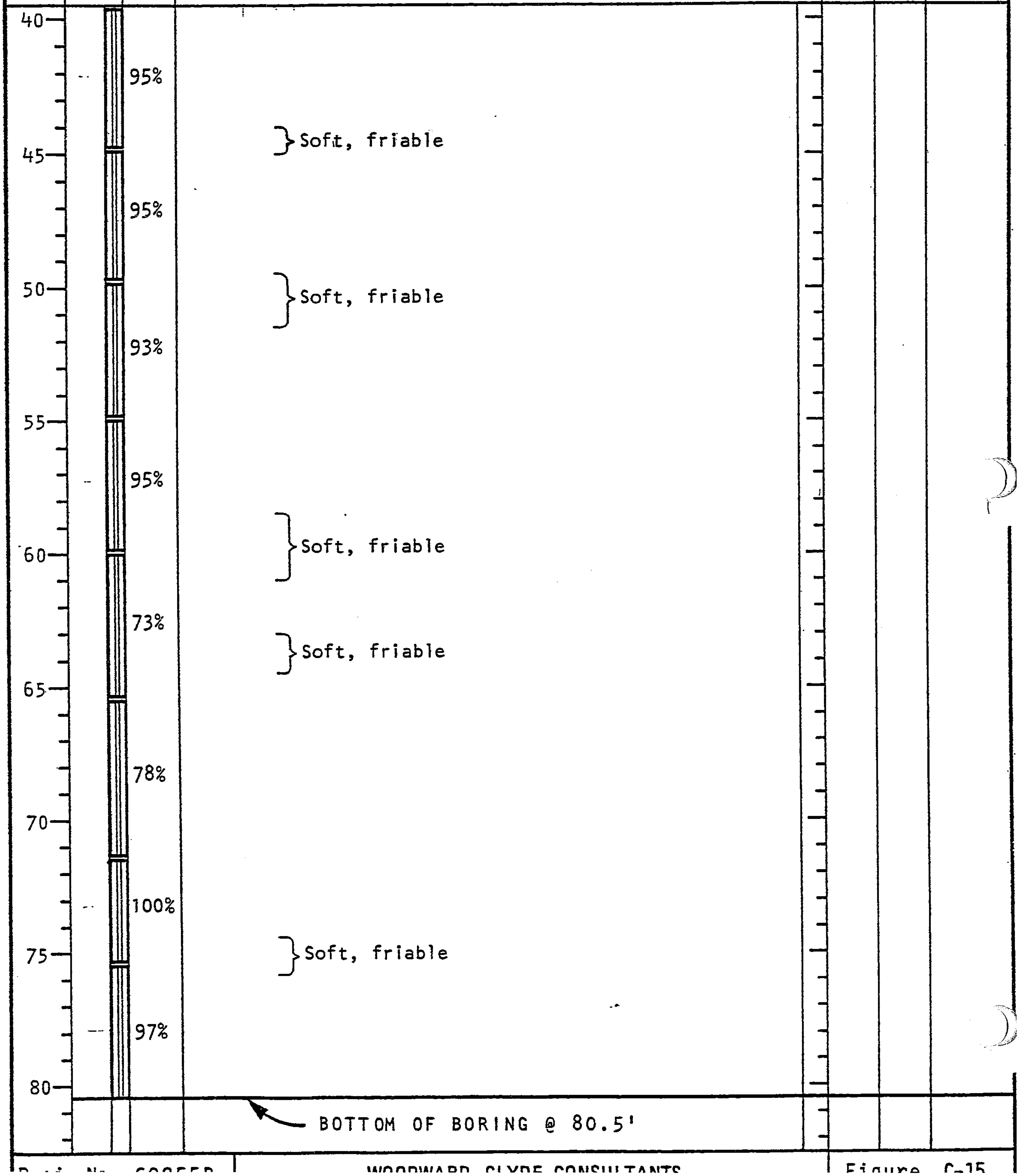
# Log of Boring No. S-7
(Continued)

| Depth, Ft. | Samples | Recovery | MATERIAL DESCRIPTION | Moisture Content, % | Dry Density, pcf | Unconfined Compressive Stre |
|---|---|---|---|---|---|---|



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Garfield County, Utah

# Log of Boring No. S-8

Date Drilled: October 3 - 4, 1977

Type of Boring: NX Core

Hammer Weight: --

Remarks:

Surface Elevation: 4325±

| Depth, Ft. | Samples | Recovery | MATERIAL DESCRIPTION | LABORATORY TESTS Moisture Content, % | Dry Density, pcf | Unconfined Compressive Strength, psf |
|---|---|---|---|---|---|---|
| 5 | | | FINE SANDSTONE | | | |
| | | 92% | Generally medium hard, red-brown, with calcareous cement, and trace to some silt | 3 | 124 | - |
| 10 | | 100% | | | | |
| 15 | | | Soft, friable, whitish-gray | | | |
| | | 89% | | | | |
| | | | Soft, friable | | | |
| 20 | | 100% | | | | |
| 25 | | | Soft, friable | | | |
| | | 100% | | | | |
| | | | SILTY CLAYSTONE: Soft, dark red-brown, very fractured, with calcareous cement | | | |
| 30 | | | SILTY CLAYEY FINE SANDSTONE Medium hard, dark red-brown, with calcareous cement | | | |
| | | 100% | Gray | | | |
| 35 | | | FINE SANDSTONE Medium hard, light red-brown, with calcareous cement, and trace to some silt | | | |
| | | 95% | | | | |
| | | | Whitish-gray | | | |

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# Log of Boring No. S-8
(Continued)

| Depth, Ft. | Samples | Recovery | MATERIAL DESCRIPTION | Moisture Content, % | Dry Density, pcf | Unconfined Compressive Stren |
|---|---|---|---|---|---|---|
| 40 | | | | | | |
| | | 100% | | | | |
| 45 | | | | | | |
| | | 100% | Soft, friable | | | |
| 50 | | | BOTTOM OF BORING @ 49.5' | | | |
| 55 | | | | | | |
| 60 | | | | | | |
| 65 | | | | | | |
| 70 | | | | | | |
| 75 | | | | | | |
| 80 | | | | | | |

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# Log of Boring No. S-9

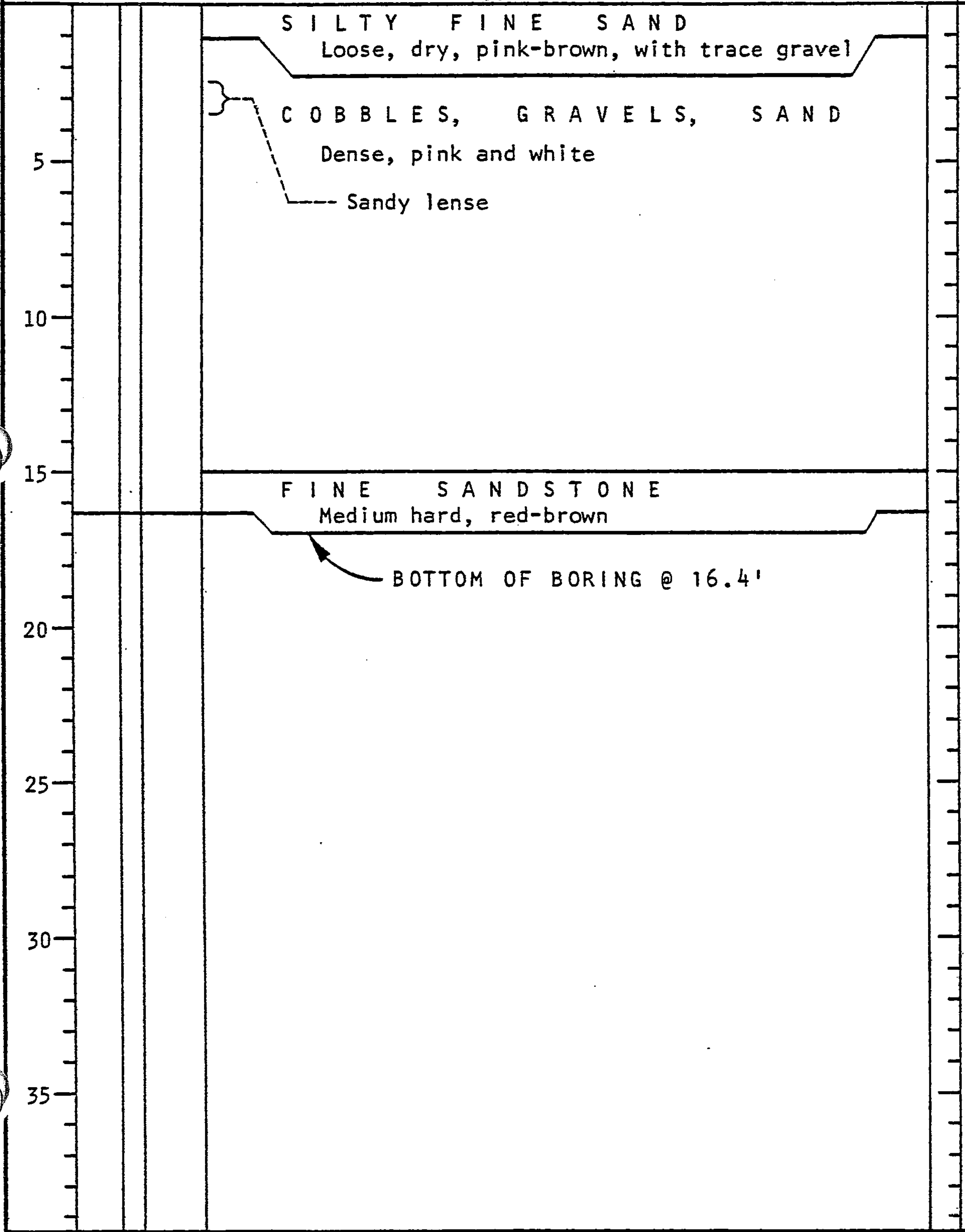
**Date Drilled:** October 8, 1977

**Type of Boring:** 3" Rotary

**Hammer Weight:** --

**Remarks:**

| Depth, Ft. | Samples | Recovery | MATERIAL DESCRIPTION | LABORATORY TESTS | | |
|---|---|---|---|---|---|---|
| | | | | Moisture Content, % | Dry Density, pcf | Unconfined Compressive Strength, psf |
| | | | Surface Elevation: 4350± | | | |



SILTY FINE SAND
Loose, dry, pink-brown, with trace gravel

COBBLES, GRAVELS, SAND
Dense, pink and white
Sandy lense

FINE SANDSTONE
Medium hard, red-brown

BOTTOM OF BORING @ 16.4'

Proj. No. 60255B

WOODWARD-CLYDE CONSULTANTS

Figure C-18

Project: PLATEAU RESOURCES LIMITED
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Garfield County, Utah

# Log of Boring No. S-10

Date Drilled: October 4 - 5, 1977
Type of Boring: NX Core
Hammer Weight: --
Remarks:

| Depth, Ft. | Samples | Recovery | MATERIAL DESCRIPTION | Moisture Content, % | Dry Density, pcf | Unconfined Compressive Strength, |
|---|---|---|---|---|---|---|
| | | | Surface Elevation: 4290± | | | |
| | | | SANDY GRAVEL AND COBBLES<br>Loose, dry, tan | | | |
| | | | FINE SANDSTONE | | | |
| 5 | | | Generally medium hard, red-brown, with calcareous cement and trace to some silt | | | |
| | | 95% | | | | |
| | | | Soft, friable, tan | | | |
| 10 | | | | | | |
| | | 91% | | | | |
| | | | Soft to medium hard | | | |
| 15 | | | | | | |
| | | 100% | Soft, friable | | | |
| 20 | | | | | | |
| | | 100% | | | | |
| 25 | | | | | | |
| | | 100% | | | | |
| | | | SILTY CLAYSTONE: Red-brown | | | |
| | | | FINE SANDSTONE<br>Generally medium hard, red-brown, with calcareous cement and trace to some silt | | | |
| 30 | | | | | | |
| | | 100% | Gray | | | |
| 35 | | | | | | |
| | | 88% | Soft, friable | | | |

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SHOOTERING CANYON URANIUM PROJECT
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# Log of Boring No. S-10

(Continued)

| Depth, Ft. | Samples | Recovery | MATERIAL DESCRIPTION | Moisture Content, % | Dry Density, pcf | Unconfined Compressive Stren ps |
|---|---|---|---|---|---|---|
| 40 | | | | | | |
| | | 95% | | | | |
| 45 | | | Soft, friable (Core loss from 45' - 47') | | | |
| | | 50% | | | | |
| 50 | | | BOTTOM OF BORING @ 50.0' | | | |
| 55 | | | | | | |
| 60 | | | | | | |
| 65 | | | | | | |
| 70 | | | | | | |
| 75 | | | | | | |
| 80 | | | | | | |

# TEST PIT LOGS

## PRELIMINARY GEOTECHNICAL REPORT
(Woodward-Clyde Consultants, April 1978)

**Project:** PLATEAU RESOURCES LIMITED
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Garfield County, Utah

# Log of Test Pit No. TP-S1

**Date Drilled:** September 14, 1977
**Type of Boring:** Test Pit
**Hammer Weight:** --
**Remarks:**

| Depth, Ft. | Samples | Blows/Ft. | MATERIAL DESCRIPTION | LABORATORY TESTS | | |
|---|---|---|---|---|---|---|
| | | | | Moisture Content, % | Dry Density, pcf | Unconfined Compressive Strength, |
| | | | Surface Elevation: 4380± | | | |
| | | | **FINE SAND**<br>Loose, dry, red-brown, with trace gravel and roots | | | |
| | | | **FINE SANDSTONE**<br>Soft, red-brown, thinly-bedded, with calcareous cement | | | |
| | | | BOTTOM OF TEST PIT @ 3.0' | | | |
| 5 | | | | | | |
| 10 | | | | | | |
| 15 | | | | | | |

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# Log of Test Pit No. TP-S2

Date Drilled: September 14, 1977
Type of Boring: Test Pit
Hammer Weight: --
Remarks:

| Depth, Ft. | Samples | Blows/Ft. | MATERIAL DESCRIPTION | LABORATORY TEST | | |
|---|---|---|---|---|---|---|
| | | | | Moisture Content, % | Dry Density, pcf | Unconfined Compressive Strength, |
| | | | Surface Elevation: 4360± | | | |
| | | | FINE SAND<br>Loose, dry, red-brown | | | |
| | | | FINE SAND<br>Dense, red-brown, with calcareous cement and angular gravel | | | |
| | | | BOTTOM OF TEST PIT @ 3.0' | | | |
| 5 | | | | | | |
| 10 | | | | | | |
| 15 | | | | | | |

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# Log of Test Pit No. TP-S3

**Date Drilled:** September 14, 1977
**Type of Boring:** Test Pit
**Hammer Weight:** --
**Remarks:**

| | | | | LABORATORY TES | | |
|---|---|---|---|---|---|---|
| Depth, Ft. | Samples | Blows/Ft. | MATERIAL DESCRIPTION | Moisture Content, % | Dry Density, pcf | Unconfined Compressive Strength. |
| | | | Surface Elevation: 4360± | | | |
| | | | FINE SAND: Loose, red-brown | | | |
| | | | FINE SANDSTONE<br>Soft, white-gray, calcareous | | | |
| | | | SILTY CLAYEY FINE SANDSTONE<br>Soft, dark red-brown | | | |
| | | | BOTTOM OF TEST PIT @ 2.3' | | | |
| 5 | | | | | | |
| 10 | | | | | | |
| 15 | | | | | | |

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Garfield County, Utah

# Log of Test Pit No. TP-S4

Date Drilled: September 14, 1977
Type of Boring: Test Pit
Hammer Weight: --
Remarks:

| Depth, Ft. | Samples | Blows/Ft. | MATERIAL DESCRIPTION | LABORATORY TESTS<br>Moisture Content, % | <br>Dry Density, pcf | <br>Unconfined Compressive Strength, psf |
|---|---|---|---|---|---|---|
| | | | Surface Elevation: 4370± | | | |
| | | | FINE SAND<br>Loose, red-brown | | | |
| | | | FINE SAND<br>Dense, red-brown, calcareous with angular gravel | | | |
| | | | BOTTOM OF TEST PIT @ 2.3' | | | |
| 5 | | | | | | |
| 10 | | | | | | |
| 15 | | | | | | |

**Project:** PLATEAU RESOURCES LIMITED
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Garfield County, Utah

# Log of Test Pit No. TP-S5

**Date Drilled:** September 20, 1977
**Type of Boring:** Test Pit
**Hammer Weight:** --
**Remarks:**

| | | | | LABORATORY TEST | | |
|---|---|---|---|---|---|---|
| Depth, Ft. | Samples | Blows/Ft. | MATERIAL DESCRIPTION | Moisture Content, % | Dry Density, pcf | Unconfined Compressive Strength, |
| | | | Surface Elevation: 4565± | | | |
| | | | FINE SAND<br>Loose, dry, red-brown, with roots | | | |
| | | | ——?—— ——?—— ——?—— | | | |
| | | | FINE SAND<br>Dense, red-brown, friable | | | |
| 5 | | | BOTTOM OF TEST PIT @ 4.5' | | | |
| 10 | | | | | | |
| 15 | | | | | | |

Proj. No. 60255B | WOODWARD-CLYDE CONSULTANTS | Figure C-2

**Project:** PLATEAU RESOURCES LIMITED
SHOOTERING CANYON URANIUM PROJECT
Garfield County, Utah

# Log of Test Pit No. TP-S6

**Date Drilled:** September 20, 1977
**Type of Boring:** Test Pit
**Hammer Weight:** --
**Remarks:**

| Depth, Ft. | Samples | Blows/Ft. | MATERIAL DESCRIPTION | Moisture Content, % | Dry Density, pcf | Unconfined Compressive Strength, psf |
|---|---|---|---|---|---|---|
| | | | Surface Elevation: 4560± | | | |
| | | | FINE SAND<br>Loose, dry, red-brown, with roots | | | |
| | | | HARD, SUB-ROUNDED BOULDERS (to 18" ø)<br>COBBLES, AND GRAVEL<br>Mixed with silty sand and with calcareous cement<br>(PEDIMENTS) | | | |
| 5 | | | BOTTOM OF TEST PIT @ 5.0' | | | |
| 10 | | | | | | |
| 15 | | | | | | |

**Project:** PLATEAU RESOURCES LIMITED
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Garfield County, Utah

# Log of Test Pit No. TP-S7

**Date Drilled:** September 20, 1977

**Type of Boring:** Test Pit

**Hammer Weight:** --

**Remarks:**

| Depth, Ft. | Samples | Blows/Ft. | MATERIAL DESCRIPTION | Moisture Content,% | Dry Density, pcf | Unconfined Compressive Strength, |
|---|---|---|---|---|---|---|
| | | | Surface Elevation: 4545± | | | |
| | | | FINE SAND<br>Loose, red-brown, with roots | | | |
| | | | ——?—— ——?—— ——?—— | | | |
| | | | SAND<br>With weak calcareous cement and some gravel | | | |
| 5 | | | HARD, SUB-ROUNDED BOULDERS (18" -24" ø)<br>COBBLES, GRAVEL<br>Mixed with silty sand and calcareous cement<br>(PEDIMENTS) | | | |
| | | | BOTTOM OF TEST PIT @ 5.5' | | | |
| 10 | | | | | | |
| 15 | | | | | | |

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Garfield County, Utah

# Log of Test Pit No. TP-S8

**Date Drilled:** September 20, 1977
**Remarks:**
**Type of Boring:** Test Pit
**Hammer Weight:** --

| Depth, Ft. | Samples | Blows/Ft. | MATERIAL DESCRIPTION | LABORATORY TEST | | |
|---|---|---|---|---|---|---|
| | | | | Moisture Content,% | Dry Density, pcf | Unconfined Compressive Strength, |
| | | | Surface Elevation: 4535± | | | |
| | | | FINE SAND<br>Loose, red-brown, with roots and gravel | | | |
| | | | ——?—— ——?—— ——?—— | | | |
| | | | HARD, SUB-ROUNDED BOULDERS (to 18" ø)<br>COBBLES, GRAVEL<br>Mixed with silty sand and with calcareous cement<br>(PEDIMENTS) | | | |
| 5 | | | | | | |
| | | | BOTTOM OF TEST PIT @ 6.0' | | | |
| 10 | | | | | | |
| 15 | | | | | | |

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# Log of Test Pit No. TP-S9

Date Drilled: September 20, 1977
Type of Boring: Test Pit
Hammer Weight: --
Remarks:

| Depth, Ft. | Samples | Blows/Ft. | MATERIAL DESCRIPTION | LABORATORY TEST |  |  |
|---|---|---|---|---|---|---|
|  |  |  |  | Moisture Content, % | Dry Density, pcf | Unconfined Compressive Strength, |
|  |  |  | Surface Elevation: 4425± |  |  |  |
|  |  |  | FINE SAND<br>Dense, red-brown, with some sub-rounded to sub-angular hard gravels with calcareous cement |  |  |  |
| 5 |  |  | BOTTOM OF TEST PIT @ 5.0' |  |  |  |
| 10 |  |  |  |  |  |  |
| 15 |  |  |  |  |  |  |

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# Log of Test Pit No. TP-S10

Date Drilled: September 20, 1977

Type of Boring: Test Pit

Hammer Weight: --

Remarks:

| Depth, Ft. | Samples | Blows/Ft. | MATERIAL DESCRIPTION | LABORATORY TESTS | | |
|---|---|---|---|---|---|---|
| | | | | Moisture Content, % | Dry Density, pcf | Unconfined Compressive Strength, psf |
| | | | Surface Elevation: 4610± | | | |
| | | | BOULDERS, COBBLES, GRAVEL AND SAND<br>With some calcareous cement<br>(PEDIMENTS)<br>Strong calcareous cement | | | |
| | | | BOTTOM OF TEST PIT @ 3.5' | | | |
| 5 | | | | | | |
| 10 | | | | | | |
| 15 | | | | | | |

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# Log of Test Pit No. TP-S11

Date Drilled: September 20, 1977

Type of Boring: Test Pit

Hammer Weight: --

Remarks:

| Depth, Ft. | Samples | Blows/Ft. | MATERIAL DESCRIPTION | LABORATORY TEST | | |
|---|---|---|---|---|---|---|
| | | | | Moisture Content, % | Dry Density, pcf | Unconfined Compressive Strength, |
| | | | Surface Elevation: 4600± | | | |
| | | | SAND<br>Red-brown, with some gravel and roots | | | |
| | | | BOULDERS, COBBLES, GRAVEL AND SAND<br>With strong calcareous cement<br>(PEDIMENTS) | | | |
| | | | BOTTOM OF TEST PIT @ 2.0' | | | |
| 5 | | | | | | |
| 10 | | | | | | |
| 15 | | | | | | |

**Project:** PLATEAU RESOURCES LIMITED
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Garfield County, Utah

# Log of Test Pit No. TP-S12

**Date Drilled:** September 20, 1977
**Type of Boring:** Test Pit
**Hammer Weight:** --
**Remarks:**

| Depth, Ft. | Samples | Blows/Ft. | MATERIAL DESCRIPTION | LABORATORY TESTS | | |
|---|---|---|---|---|---|---|
| | | | | Moisture Content, % | Dry Density, pcf | Unconfined Compressive Strength, psf |
| | | | Surface Elevation: 4580± | | | |
| | | | FINE SAND<br>Red-brown, with trace gravel and roots | | | |
| | | | HARD, SUB-ROUNDED, BOULDERS, COBBLES, GRAVELS AND SAND: With strong calcareous cement<br>(PEDIMENTS) | | | |
| | | | BOTTOM OF TEST PIT @ 2.0' | | | |
| 5 | | | | | | |
| 10 | | | | | | |
| 15 | | | | | | |

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# Log of Test Pit No. TP-S13

Date Drilled: September 20, 1977

Type of Boring: Test Pit

Hammer Weight: --

Remarks:

| Depth, Ft. | Samples | Blows/Ft. | MATERIAL DESCRIPTION | LABORATORY TEST<br>Moisture Content, % | Dry Density, pcf | Unconfined Compressive Strength, |
|---|---|---|---|---|---|---|
| | | | Surface Elevation: 4525± | | | |
| | | | HARD, SUB-ROUNDED BOULDERS (to 24" ø), COBBLES, GRAVELS AND SAND<br>With slight calcareous cement<br>(PEDIMENTS) | | | |
| | | | BOTTOM OF TEST PIT @ 2.8' | | | |
| 5 | | | | | | |
| 10 | | | | | | |
| 15 | | | | | | |

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# Log of Test Pit No. TP-S14

**Date Drilled:** September 22, 1977
**Type of Boring:** Test Pit
**Hammer Weight:** --
**Remarks:**

| Depth, Ft. | Samples | Blows/Ft. | MATERIAL DESCRIPTION | LABORATORY TESTS<br>Moisture Content, % | Dry Density, pcf | Unconfined Compressive Strength, |
|---|---|---|---|---|---|---|
| | | | Surface Elevation: 4520± | | | |
| | | | FINE SAND<br>Red-brown with occasional roots | | | |
| | | | Loose, dry | | | |
| | | | Medium dense, slightly moist | | | |
| 5 | | | | | | |
| | | | BOTTOM OF TEST PIT @ 6.0' | | | |
| 10 | | | | | | |
| 15 | | | | | | |

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# Log of Test Pit No. TP-S15

**Date Drilled:** September 22, 1977
**Type of Boring:** Test Pit
**Hammer Weight:** --

**Remarks:**

| Depth, Ft. | Samples | Blows/Ft. | MATERIAL DESCRIPTION | LABORATORY TEST | | |
|---|---|---|---|---|---|---|
| | | | | Moisture Content, % | Dry Density, pcf | Unconfined Compressive Strength, |
| | | | Surface Elevation: 4445± | | | |
| | | | FINE SAND<br>Red-brown with occasional roots<br>Loose<br>Medium dense | | | |
| 5 | | | | | | |
| | | | BOTTOM OF TEST PIT @ 5.5' | | | |
| 10 | | | | | | |
| 15 | | | | | | |

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# Log of Test Pit No. TP-S16

**Date Drilled:** September 22, 1977

**Type of Boring:** Test Pit

**Hammer Weight:** --

**Remarks:**

| Depth, Ft. | Samples | Blows/Ft. | MATERIAL DESCRIPTION | Moisture Content, % | Dry Density, pcf | Unconfined Compressive Strength, psf |
|---|---|---|---|---|---|---|
| | | | Surface Elevation: 4430± | | | |
| | | | FINE SAND<br>Loose, red-brown, with roots | | | |
| | | | ? ? ? | | | |
| | | | WEATHERED SANDSTONE<br>Soft, red-brown, with calcareous cement | | | |
| | | | BOTTOM OF TEST PIT @ 2.5' | | | |
| 5 | | | | | | |
| 10 | | | | | | |
| 15 | | | | | | |

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# Log of Test Pit No. TP-S17

**Date Drilled:** September 23, 1977

**Type of Boring:** Test Pit

**Hammer Weight:** --

**Remarks:**

| Depth, Ft. | Samples | Blows/Ft. | MATERIAL DESCRIPTION | LABORATORY TEST<br>Moisture Content, % | <br>Dry Density, pcf | <br>Unconfined Compressive Strength, |
|---|---|---|---|---|---|---|
| | | | Surface Elevation: 4355± | | | |
| | | | FINE SAND<br>Loose to medium dense, red-brown, with trace angular gravel and roots | | | |
| 5 | | | HARD, SUB-ROUNDED TO SUB-ANGULAR COBBLES & GRAVEL AND SAND<br>With calcareous cement<br>(PEDIMENTS) | | | |
| | | | BOTTOM OF TEST PIT @ 5.5' | | | |
| 10 | | | | | | |
| 15 | | | | | | |

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# Log of Test Pit No. TP-S18

**Date Drilled:** September 23, 1977

**Type of Boring:** Test Pit

**Hammer Weight:** --

**Remarks:**

| Depth, Ft. | Samples | Blows/Ft. | MATERIAL DESCRIPTION | LABORATORY TESTS | | |
|---|---|---|---|---|---|---|
| | | | | Moisture Content, % | Dry Density, pcf | Unconfined Compressive Strength, psf |
| | | | Surface Elevation: 4320± | | | |
| | | | FINE SAND<br>Loose to medium dense, red-brown with trace gravel and roots | | | |
| | | | HARD, SUB-ROUNDED TO SUB-ANGULAR BOULDERS, COBBLES, GRAVEL AND SAND<br>With calcareous cement<br>(PEDIMENTS) | | | |
| 5 | | | BOTTOM OF TEST PIT @ 4.5' | | | |
| 10 | | | | | | |
| 15 | | | | | | |

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# Log of Test Pit No. TP-S19

**Date Drilled:** September 23, 1977

**Type of Boring:** Test Pit

**Hammer Weight:** --

**Remarks:**

| Depth, Ft. | Samples | Blows/Ft. | MATERIAL DESCRIPTION | LABORATORY TEST |  |  |
|---|---|---|---|---|---|---|
|  |  |  |  | Moisture Content, % | Dry Density, pcf | Unconfined Compressive Strength, |
|  |  |  | Surface Elevation: 4410± |  |  |  |
|  |  |  | HARD, SUB-ROUNDED TO SUB-ANGULAR BOULDERS, COBBLES, GRAVEL AND SAND<br>With slight calcareous cement<br>With roots<br>(PEDIMENTS) |  |  |  |
|  |  |  | BOTTOM OF TEST PIT @ 3.5' |  |  |  |
| 5 |  |  |  |  |  |  |
| 10 |  |  |  |  |  |  |
| 15 |  |  |  |  |  |  |

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# Log of Test Pit No. TP-S20

Date Drilled: October 7, 1977
Type of Boring: Test Pit
Hammer Weight: --
Remarks:

| Depth, Ft. | Samples | Blows/Ft. | MATERIAL DESCRIPTION | LABORATORY TESTS |  |  |
|---|---|---|---|---|---|---|
|  |  |  |  | Moisture Content, % | Dry Density, pcf | Unconfined Compressive Strength, psf |
|  |  |  | Surface Elevation: 4575± |  |  |  |
|  |  |  | FINE SAND<br>Loose, red-brown, with roots |  |  |  |
|  |  |  | — ? — — ? — — ? — |  |  |  |
|  |  |  | HARD, SUB-ROUNDED TO SUB-ANGULAR BOULDERS, COBBLES, GRAVEL AND SAND<br>With calcareous cement<br>(PEDIMENTS) |  |  |  |
|  |  |  | BOTTOM OF TEST PIT @ 3.5' |  |  |  |
| 5 |  |  |  |  |  |  |
| 10 |  |  |  |  |  |  |
| 15 |  |  |  |  |  |  |

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Garfield County, Utah

# Log of Test Pit No. TP-S2

**Date Drilled:** October 7, 1977

**Type of Boring:** Test Pit

**Hammer Weight:** --

**Remarks:**

| Depth, Ft. | Samples | Blows/Ft. | MATERIAL DESCRIPTION | LABORATORY TEST | | |
|---|---|---|---|---|---|---|
| | | | | Moisture Content, % | Dry Density, pcf | Unconfined Compressive Strength, |
| | | | Surface Elevation: 4545± | | | |
| | | | FINE SAND<br>Loose, red-brown, with some gravel and roots | | | |
| | | | HARD, SUB-ROUNDED TO SUB-ANGULAR BOULDERS, COBBLES, GRAVEL AND SAND<br>With calcareous cement<br>(PEDIMENTS) | | | |
| | | | BOTTOM OF TEST PIT @ 3.0' | | | |
| 5 | | | | | | |
| 10 | | | | | | |
| 15 | | | | | | |

# APPENDIX C.1.2
# LABORATORY TEST RESULTS
# WOODWARD-CLYDE CONSULTANTS 1977 FIELD INVESTIGATION
# (WOODWARD-CLYDE, 1978D)

## TABLE C-1

## SUMMARY OF WATER PRESSURE TEST RESULTS

| Boring No. | Test Section Interval (Ft.) | Gage Pressure (psi) | Approx. Average Water Inflow (GPM) | Calculated Permeability ($10^{-5}$ cm/sec) |
|---|---|---|---|---|
| S-1 | 13.0-24.0 | 20 | 0 | - |
| | 23.0-44.0 | 40 | 0 | - |
| | 45.0-66.0 | 55 | 0 | - |
| | 65.0-86.0 | 75 | 0 | - |
| | 84.5-100.5 | 90 | 0 | - |
| S-2 | 6.0-14.5 | 10 | 0 | - |
| | 14.0-35.0 | 26 | 1.3 | 3.7 |
| | 35.5-56.5 | 23 | 0.9 | 2.2 |
| | 35.5-56.5 | 46 | 0.7 | 1.2 |
| | 60.0-81.0 | 35 | 1.0 | 1.6 |
| S-3 | 5.0-14.0 | 5 | 0.2 | 4.0 |
| | 15.5-36.5 | 25 | 0.2 | 5.7 |
| | 35.0-56.0 | 45 | 0.1 | 0.2 |
| | 59.0-80.0 | 35 | 0.1 | 0.2 |
| S-4 | 8.5-14.5 | 11 | 0.1 | 1.7 |
| | 13.0-34.3 | 25 | 0.5 | 1.5 |
| | 34.0-55.0 | 45 | 0.6 | 1.0 |
| | 34.0-55.0 | 22 | 0.3 | 0.7 |
| | 54.0-80.5 | 35 | 0.5 | 0.7 |
| S-5 | 45.0-61.4 | 25 | 0.5 | 1.4 |
| | 45.0-61.4 | 50 | 0.5 | 0.9 |
| S-6 | 7.0-15.0 | 11 | 0 | - |
| | 15.0-36.0 | 25 | 1.9 | 5.2 |
| | 25.0-36.0 | 30 | 0.5 | 1.9 |
| | 36.0-57.0 | 24 | 0.7 | 1.6 |
| | 57.0-71.8 | 33 | 1.0 | 2.4 |
| | 57.0-71.8 | 65 | 1.0 | 1.6 |
| S-7 | 6.5-19.5 | 10 | 0 | - |
| | 18.5-39.5 | 28 | 0.5-0.7 | 1.3 |
| | 39.0-60.0 | 25 | 0.8 | 1.7 |
| | 57.5-80.5 | 35 | 0.7 | 1.1 |
| | 57.5-80.5 | 70 | 0.8 | 0.8 |
| S-8 | 6.0-14.3 | 10 | 0 | - |
| | 23.5-34.5 | 30 | 1.7 | 6.8 |
| | 34.0-49.5 | 21 | 0.6 | 2.1 |
| S-10 | 6.5-14.5 | 10 | 0 | - |
| | 13.8-34.8 | 28 | 0.6 | 1.6 |

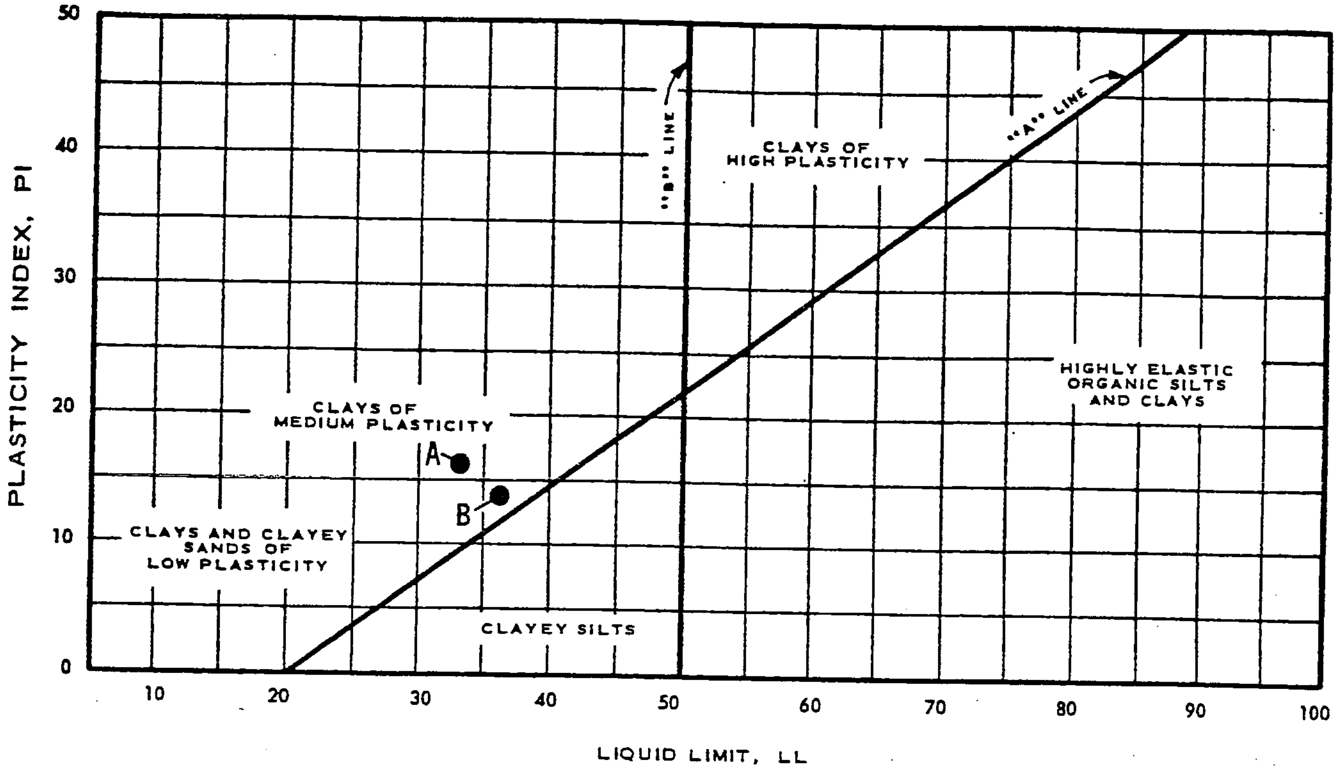
## TABLE C-2

## SIMULATED EFFLUENT USED IN PERMEABILITY TESTS

Mountain States Engineers furnished Woodward-Clyde a chemical assay of a simulated tailings liquor that will be sent to the tailings pond. The chemical assay of the simulated liquor was shipped on February 6, 1978 and was as follows:

| | |
|---|---|
| Sulfate | 26,500 mg/l |
| Magnesium | 3,500 mg/l |
| Calcium | 26 mg/l |
| Chloride | 160 mg/l |
| Iron | 1,730 mg/l |
| Silica | 520 mg/l |
| Aluminum | 320 mg/l |
| $V_2O_5$ | 530 mg/l |
| $U_3O_8$ | 906 mg/l |

The solution is an acid leach liquor that has not been run through solvent extraction. The actual plant liquor will have an uranium content of about 0.4 ppm. This solution has a pH of 1.5.

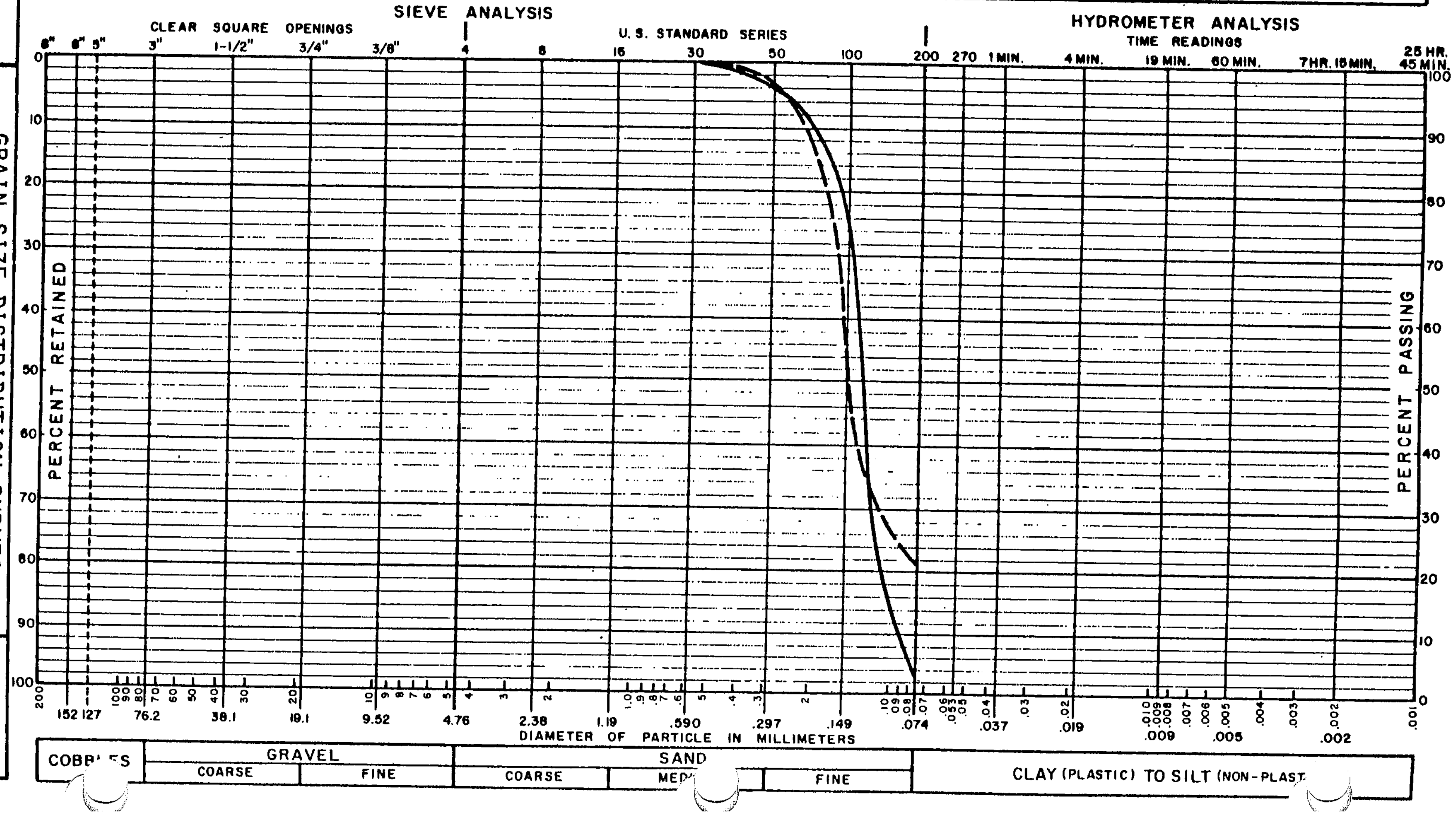


## CLASSIFICATION TEST RESULTS

| SAMPLE IDENTIFICATION | | | ATTERBERG LIMITS | | | GRAIN SIZES - % DRY WEIGHT | | | |
|---|---|---|---|---|---|---|---|---|---|
| LETTER DESIG'N | SAMPLE NO. | DEPTH, FT. | LIQUID LIMIT | PLASTICITY INDEX | PLASTIC LIMIT | SAND | SILT | CLAY | COLLOIDAL |
| A | Borrow Area F | Surface | 33 | 16 | 17 | 37 | 43 | 8 | 12 |
| B | Approx. 1 mile south of mining camp | Surface | 36 | 14 | 22 | - | - | - | - |

| | | |
|---|---|---|
| Project No. 60255B<br>WOODWARD-CLYDE CONSULTANTS | PLASTICITY CLASSIFICATION<br>SHOOTERING CANYON URANIUM PROJECT | Figure C-42 |

| SAMPLE NO. | SYMBOL | DEPTH | LL | PI | UNIFIED CLASSIFICATION |
|---|---|---|---|---|---|
| S - 1 | ——— | 5'-6' | - | - | SP |
| S - 7 | — — — | 8'-9' | - | - | SM |

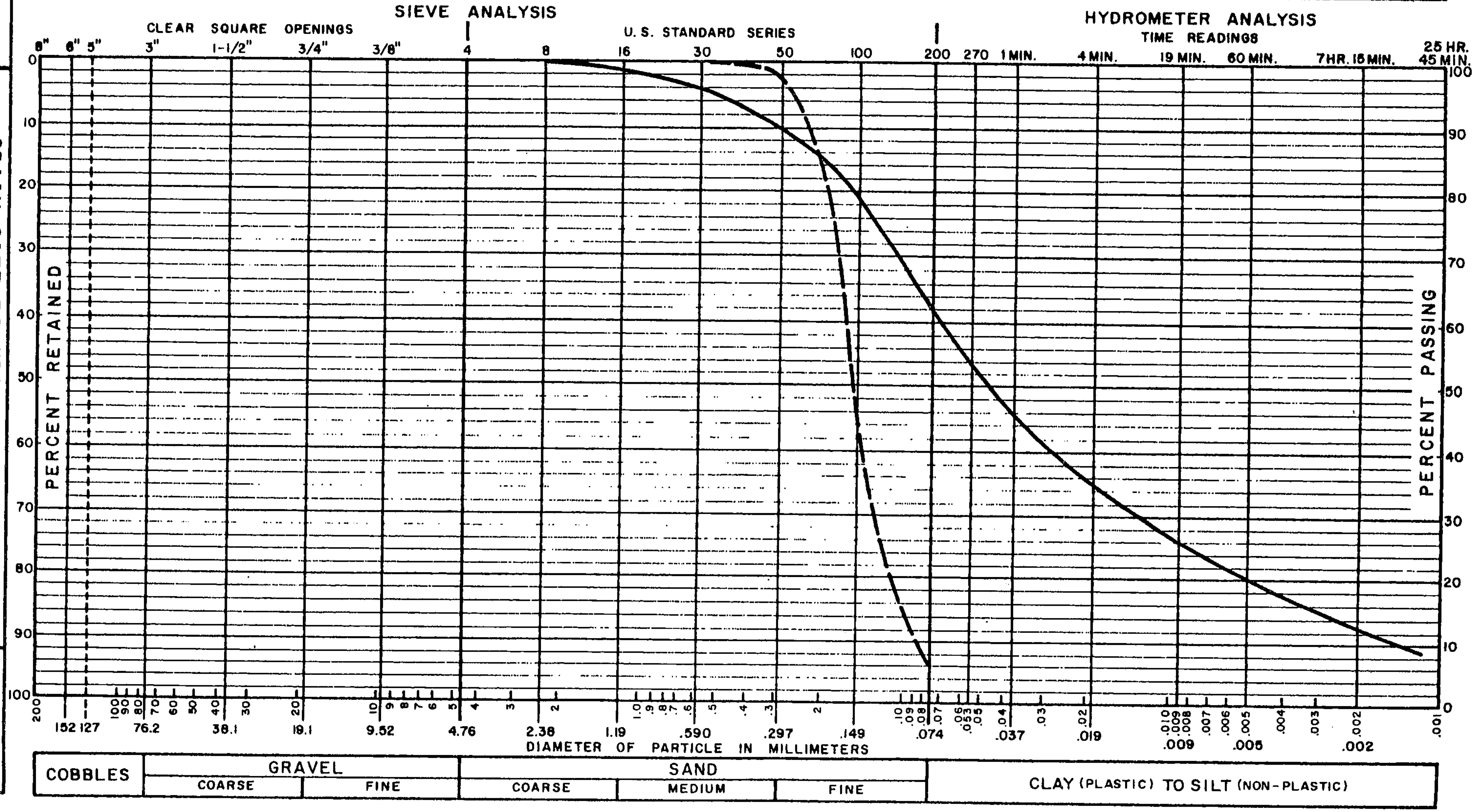


Project No. 60255B
WOODWARD-CLYDE CONSULTANTS

GRAIN SIZE DISTRIBUTION CURVES
SHOOTERING CANYON URANIUM PROJECT

Figure C-43

| SAMPLE NO. | SYMBOL | DEPTH | LL | PI | UNIFIED CLASSIFICATION |
|---|---|---|---|---|---|
| Borrow Area F | ——— | Surface | 33 | 16 | CL |
| TP - S14 | – – – – | – | – | – | SP-SM |

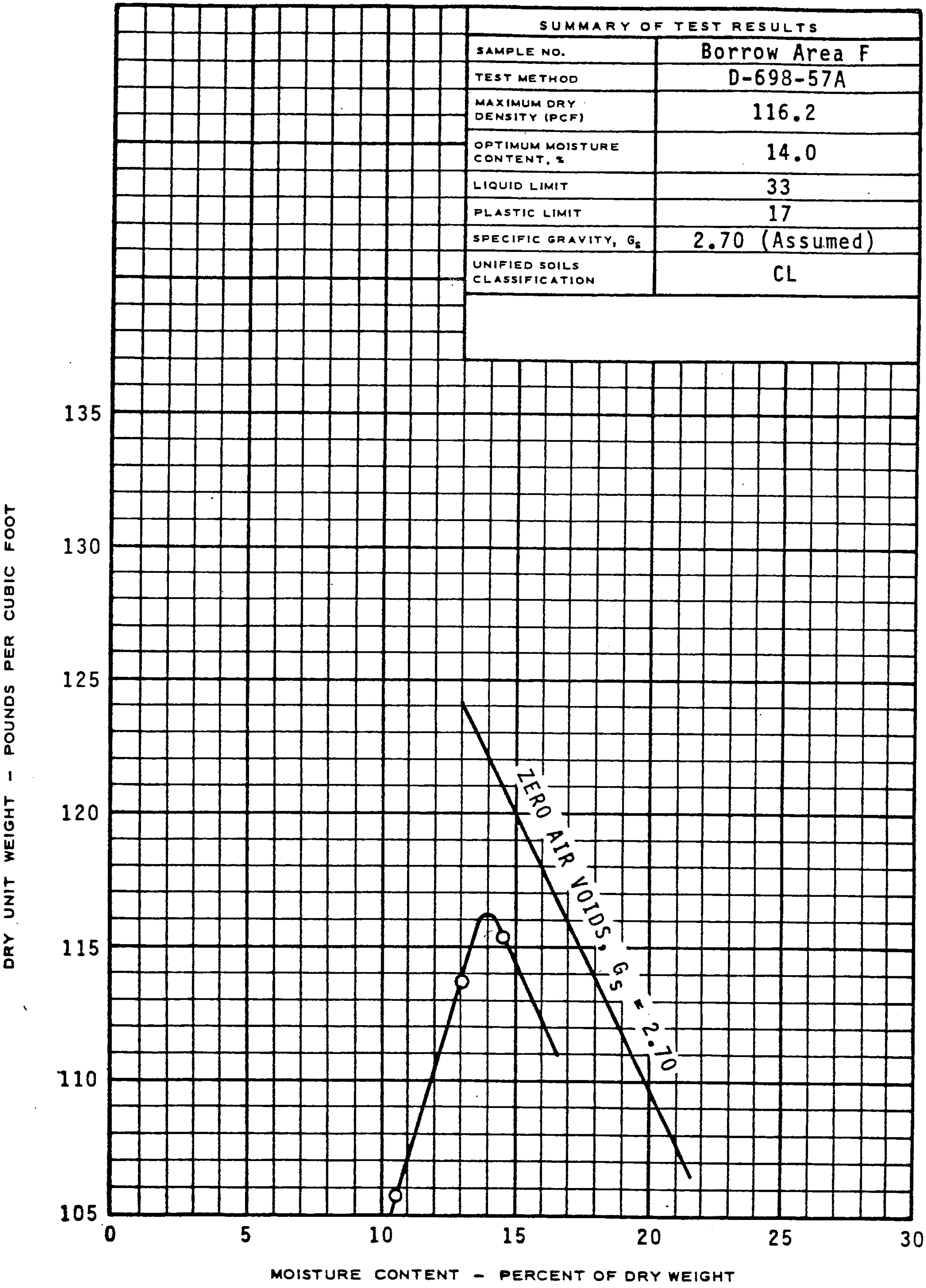


Project No. 60255B
WOODWARD-CLYDE CONSULTANTS

GRAIN SIZE DISTRIBUTION CURVES

SHOOTERING CANYON URANIUM PROJECT

Figure C-44



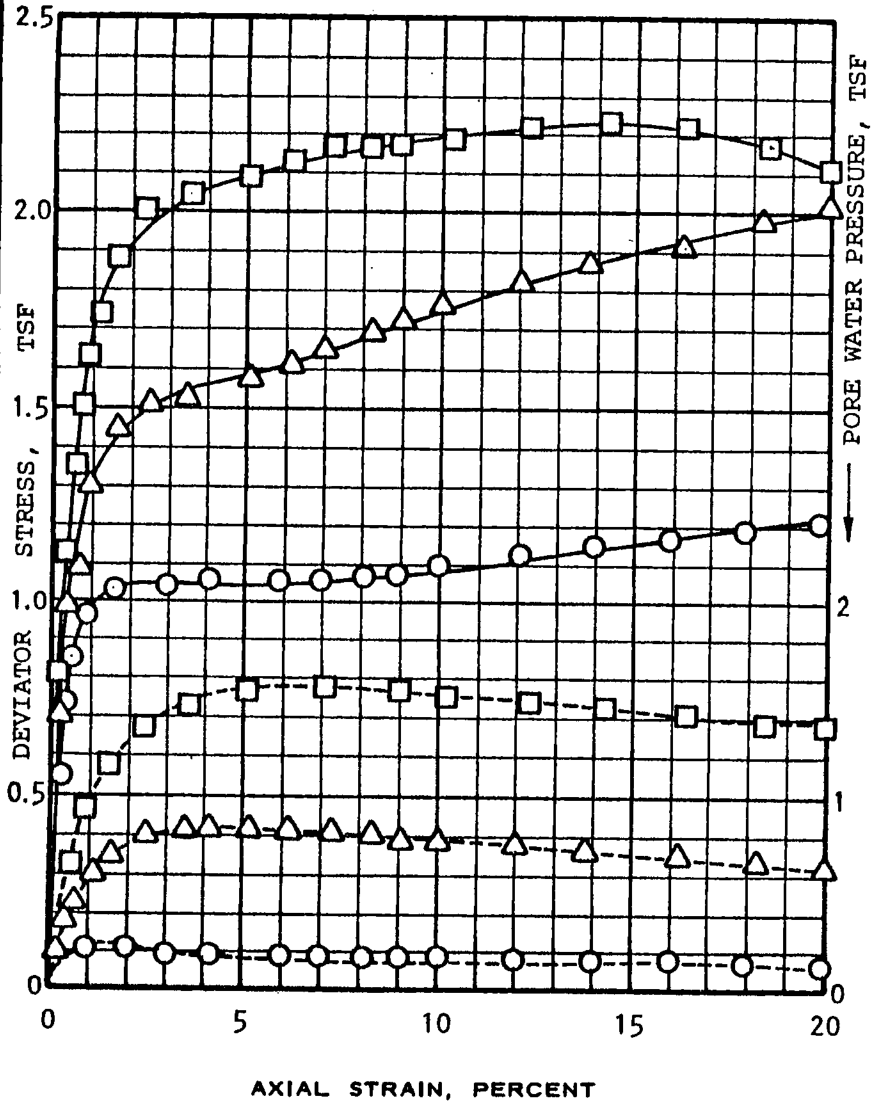
SUMMARY OF TEST RESULTS

| | |
|---|---|
| SAMPLE NO. | Borrow Area F |
| TEST METHOD | D-698-57A |
| MAXIMUM DRY DENSITY (PCF) | 116.2 |
| OPTIMUM MOISTURE CONTENT, % | 14.0 |
| LIQUID LIMIT | 33 |
| PLASTIC LIMIT | 17 |
| SPECIFIC GRAVITY, $G_s$ | 2.70 (Assumed) |
| UNIFIED SOILS CLASSIFICATION | CL |

Project No. 60255B
WOODWARD-CLYDE CONSULTANTS

COMPACTION TEST RESULTS
SHOOTERING CANYON URANIUM PROJECT

Figure C-45

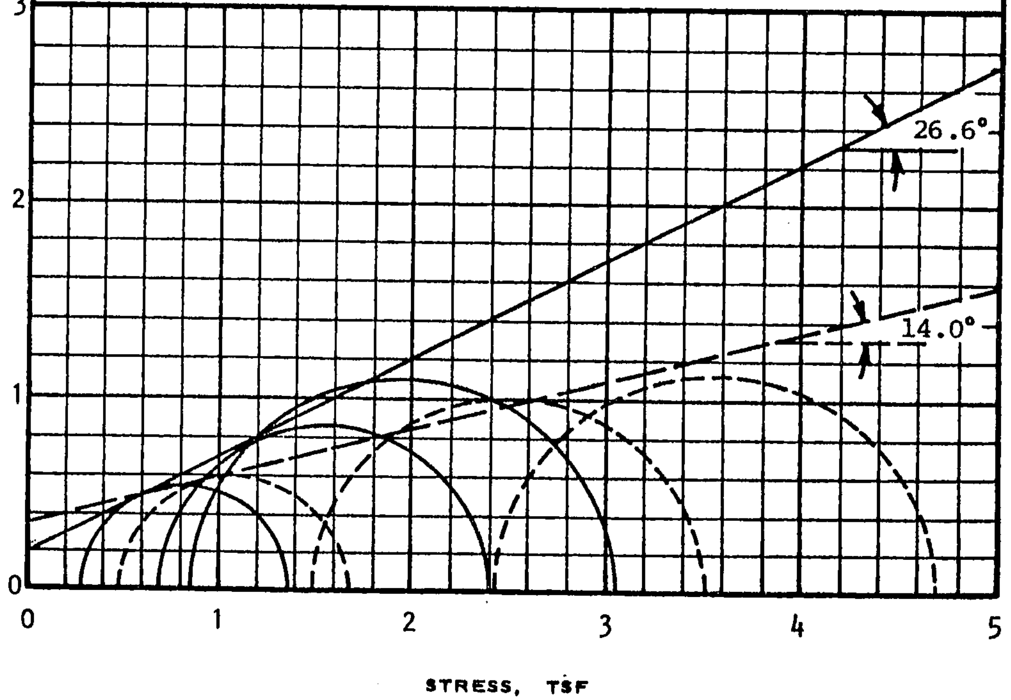


DEVIATOR STRESS, $\sigma_1 - \sigma_3$ – SOLID LINES

PORE WATER PRESSURE, U – DASH LINES

| SPECIMEN NO. | INITIAL MOISTURE CONTENT (%) | INITIAL DRY DENSITY (PCF) | CONFINING PRESSURE, (TSF) | DEVIATOR STRESS AT FAILURE (TSF) | PORE PRESSURE AT FAILURE (TSF) |
|---|---|---|---|---|---|
| 1 ( ○ ) | 15 | 110.5 | 0.49 | 1.05 | 0.20 |
| 2 ( △ ) | 15 | 110.5 | 1.47 | 1.72 | 0.79 |
| 3 ( □ ) | 15 | 110.5 | 2.44 | 2.16 | 1.56 |

c' = 0.2 TSF     ϕ' = 26.6°



TYPE OF SPECIMEN : REMOLDED

TYPE OF TEST : CONSOLIDATED, UNDRAINED

EFFECTIVE STRESS – SOLID LINES

TOTAL STRESS – DASH LINES

Project No. 60255B

**WOODWARD-CLYDE CONSULTANTS**

TRIAXIAL COMPRESSION TEST

SHOOTERING CANYON URANIUM PROJECT

Figure C-46

# APPENDIX C.1.3
# LOGS AT BORINGS AND TEST PITS
# WOODWARD-CLYDE CONSULTANTS 1979 FIELD INVESTIGATION
# (WOODWARD-CLYDE, 1979)

# APPENDIX A

# FIELD EXPLORATION

## PREVIOUS WORK

As a part of the preliminary design and feasibility stage of this project, WCC conducted a field exploration program in September and October 1977. The program consisted of exploratory borings, permeability tests and test pits. A complete discussion of the preliminary design exploration program is contained in the WCC report dated September 1978 (Woodward-Clyde Consultants 1978a).

Additional exploration was considered necessary to fill in gaps in the preliminary exploration, discover and test the permeability of any vertical or nearly vertical joints which might exist, and to determine engineering properties and in-place quantities of some proposed borrow materials. The aim of the final phase exploration was to gather additional data and to confirm the findings of the preliminary exploration.

## BORINGS

A total of ten (10) exploratory borings ranging in depth from 27.5 to 152.5 feet below the existing ground surface were drilled for this study at the approximate locations shown on Figure 1. The borings were advanced with NX wireline coring equipment using water as the drilling fluid. The drilling was performed between 12 February and 8 March 1979, and was observed by Mr. Benjamin P. Doty, Staff Engineer with our firm.

Three borings, S-11, S-12 and S-13, explored the alluvial materials and bedrock in the saddle area.

Five borings, S-14, S-14R, S-15, S-16 and S-19, explored the bedrock along the proposed center line of the embankment. These borings were all inclined approximately 35° from vertical. All of these borings, with the exception of S-16, had a bearing and plunge of S65E, 55°, and were intended to intersect two high angle joint sets observed in the preliminary exploration. S-16, angled into the right abutment with a bearing and plunge of S75W, 55°, was intended to intersect a third high angle joint set which might have been opened by stress relief into the valley.

Two borings, S-17 and S-18, were located upstream and downstream, respectively of the proposed embankment.

NX core recovered from the inner tube of the wireline core barrel was logged in the field and placed in carefully labeled core boxes. The core is presently stored at the Shootering Mine warehouse for examination by prospective bidders.

Three soil samples from Boring S-11 and one from Boring S-12 were obtained with a 2-inch O.D. split-spoon sampler. The samples were visually identified in the field and saved as bag samples for possible later laboratory identification. The sampler was driven into the soil at the bottom of the hole with a 140-pound hammer falling 30 inches, and the blow count to drive the sampler was recorded to check on the density and consistency of the in-place soil.

Boring logs were prepared from the field data and are presented as Figures A-1 through A-10. The approximate surface elevations of the borings indicated on the logs have been estimated from their locations on the topographical map prepared for this project.

## TEST PITS

Seven test pits (TPX-1 through TPX-7) were excavated within the impoundment in an area presently covered by windblown silty sand. The pits were excavated with a dozer to bedrock, with the intent of establishing quantities and properties of the sand.

Logs of the test pits were prepared from the field data and are presented as Figures A-11 through A-17. The approximate surface elevations of the test pits indicated on the logs have been estimated from their locations on the topographical map prepared for this project.

## BORROW AREA EXPLORATION

During the two stages of investigation, potential sources of materials were located for the embankment, for the impoundment lining and for concrete aggregates. Sources identified are shown on Figure 2. Estimates were made of quantities available. These are also tabulated on Figure 2.

The design section and the embankment zoning were controlled by nature of the available local materials.

## BORROW AREA SAMPLING FOR EMBANKMENT CORE AND IMPOUNDMENT LINER

Additional samples for permeability testing were required from all potential borrow sources of clayey soils considered suitable for embankment core or reservoir liner in order to supplement the preliminary investigation. All samples, after being identified in the field, were placed in sealed plastic bags and transported to our laboratory for testing. These areas are located on Figure 2.

## Borrow Area F

Borrow Area F was previously identified to be in the Summerville Formation. It was sampled at the base of the bluff with a backhoe in an attempt to simulate construction excavation. The material was taken from about 3 feet below the ground surface. Intact material was hand sampled from the rest of the bluff for comparison. An existing embankment which had been constructed of Summerville material is located near the Shootering Mine Site. This embankment was also sampled with the backhoe to determine the effects of construction activities such as excavation and compaction on grain size and permeability.

## Borrow Area G

Borrow Area G was selected to be in the Brushy Basin Member of the Morrison Formation. It was sampled at the base of the bluff with a backhoe. The sample material was taken from approximately three feet below the ground surface. An additional sample was taken from some excavated and reworked material which was found at this site in order to investigate any changes which such handling might have produced.

## Borrow Area H

Borrow Area H, also in the Brushy Basin Member of the Morrison Formation, was sampled at the top of the bluff with a backhoe. The sample material was taken from approximately three feet below the ground surface.

## Borrow Area I

Borrow Area I was selected to be representative of the Mancos Shale. The material was shovel-sampled by hand.

## Borrow Area J

Borrow Area J was located and sampled by Plateau Resources, Ltd. and is just south of Borrow Area H (See Inset, Figure 2). The area is in the Brushy Basin Member of the Morrison Formation. Samples were taken from two different locations on the face of an exposed bluff and were sent to Woodward-Clyde Consultants for classification.

# FIELD PERMEABILITY TESTS

In-situ permeability tests were performed in Borings S-14 through S-19, in order to gather data in previously unexplored areas, to test for increased permeability produced by any high angle joints which might exist, and to confirm the results of the preliminary exploration field permeability tests.

## Equipment

The tests were performed between an inflatable BX packer with an 18" gland (fabricated by Boyles Bros., the drilling contractor) and the bottom of the NX core hole (an interval generally about 20 feet in length). Injection pressures were measured at the surface with a 300 psi bourdon gage with pressure markings every 2-1/2 psi. Inflow was also measured at the surface with a Trident water meter with markings for each 0.1 gallons. Time was kept with a Timex wrist watch. Water under pressure was supplied by the circulating pump, a gasoline-engine-driven three-piston pump.

## Procedure

Test procedure followed the methods outlined in the USBR Earth Manual. The pressure was held at half the full pressure gauge reading for 5 minutes, at the full gauge pressure for 10 minutes, and at half the full gauge pressure reading for another 5 minutes. The water meter was read every minute. Total head on the interval was kept to about 0.9 psi per foot of depth to avoid lifting the relatively light Entrada Sandstone. After a complete test, the single packer injection apparatus was removed from the hole, the hole was advanced twenty feet and another test was performed with the packer generally about 20 feet above the new bottom of the hole. In this manner, a continuous permeability profile was obtained.

## Results

Coefficients of permeability for the sections tested were computed by the procedure described in the Earth Manual, and the results are presented in Table A-1. The computed coefficients of permeability ranged from $7 \times 10^{-7}$ to $3 \times 10^{-4}$ cm/sec.

Test S-17 (22.5-26.5) is quite interpretive as reported. The test was actually run with the bottom of the packer at 22.5, against the bottom of the hole at 61.5. Immediately preceding the 22.5-61.5 test, a test was run on the interval 41.25-61.5.

No take was observed for the 41.25-61.5 test. Using the same pressure as the 41.25-61.5 test, a stable take of about 2.0 gpm was observed in the 22.5-61.5 test. Obviously, the take was occurring somewhere in the 22.5-41.25 interval. Using this reasoning, a permeability of 7.4 x $10^{-5}$ cm/sec can be calculated under a head of 78 feet. Observation of the boring log reveals that the rock from the surface to a depth of 26.5 feet was quite soft and core recovery was difficult. The hole starts into the rock on the limb of a small fold (about in the center of the impoundment area) and the rock exposed at the surface is cut by numerous healed and open joints. When sound rock was encountered at 26.5 feet, the hole apparently had penetrated the entire heavily jointed zone and entered more typical, relatively impermeable Entrada Sandstone. Using this reasoning, and a head of 71 feet, calculated at the average depth of 22.5-26.5 interval, a permeability of 2.7 x $10^{-4}$ cm/sec was calculated. This is in such good agreement with the overlying S-17 (10.0 - 20.0) test, that the agreement was taken as corroboration that the measured inflow was actually occurring over the 22.5 - 26.5 interval, and the test is so reported.

## TABLE A-1: PERMEABILITY TESTS AT SHOOTERING CANYON, FEBRUARY AND MARCH 1979

| Hole | Inclination From Vertical (Degrees) | Test Interval (Feet) | Total Head (Feet) | Inflow (GPM) | Permeability (CM/SEC) |
|---|---|---|---|---|---|
| S-14 | 35 | 21.7 - 42 | 55 | 0.05[a] | $2.5\text{x}10^{-6}$ |
| | | 10.0 - 52 | 54 | 2.0 | $5.3\text{x}10^{-5}$ |
| S-15 | 35 | 11.3 - 21.3 | 24 | 0.05[a] | $9.9\text{x}10^{-6}$ |
| | | 21.3 - 41.3 | 48 | 0.05[a] | $2.9\text{x}10^{-6}$ |
| | | 41.3 - 61.3 | 87 | 0.05[a] | $1.6\text{x}10^{-6}$ |
| | | 61.3 - 81.3 | 127 | 0.3 | $6.5\text{x}10^{-6}$ |
| S-16 | 35 | 6.25- 21.25 | 27 | 0.05[a] | $6.4\text{x}10^{-6}$ |
| | | 21.1 - 41.25 | 53 | 0.05[a] | $2.6\text{x}10^{-6}$ |
| | | 41.0 - 61.25 | 86 | 0.1 | $3.1\text{x}10^{-6}$ |
| S-17 | 0 | 10.0 - 20.0 | 23 | 1.4 | $2.7\text{x}10^{-4}$ |
| | | 22.5 - 26.5[b] | 78 | 2.0 | $2.7\text{x}10^{-4}$ |
| | | 41.25- 61.5 | 75 | 0.05[a] | $1.8\text{x}10^{-6}$ |
| S-18 | 0 | 12 - 32.5 | 45 | 0.05[a] | $3.0\text{x}10^{-6}$ |
| | | 32.5 - 52.5 | 86 | 0.3 | $9.2\text{x}10^{-6}$ |
| | | 52.7 - 72.5 | 126 | 0.05[a] | $1.1\text{x}10^{-6}$ |
| | | 72,4 - 92.5 | 151 | 0.05[a] | $9.1\text{x}10^{-7}$ |
| | | 92.5 -111.5 | 174 | 0.05[a] | $8.2\text{x}10^{-7}$ |
| | | 112.5 -132.5 | 191 | 0.05[a] | $7.1\text{x}10^{-7}$ |
| | | 132.7 -152.5 | 214 | 1.2[c] | $1.6\text{x}10^{-5}$ |
| S-19 | 35 | 41.25- 61.5 | 88 | 0.05[a] | $1.5\text{x}10^{-6}$ |

a. Inflow was less than lowest measureable flow (0.1 gpm). An inflow of 0.05 gpm was assumed for computational purposes, resulting in a maximum permeability for the interval.

b. Interval in question, see text for discussion.

c. Inflow corrected by estimating water leaking past the packer and observed to be flowing from the top of the surface casing.

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Garfield County, Utah

# Log of Boring No. S-11

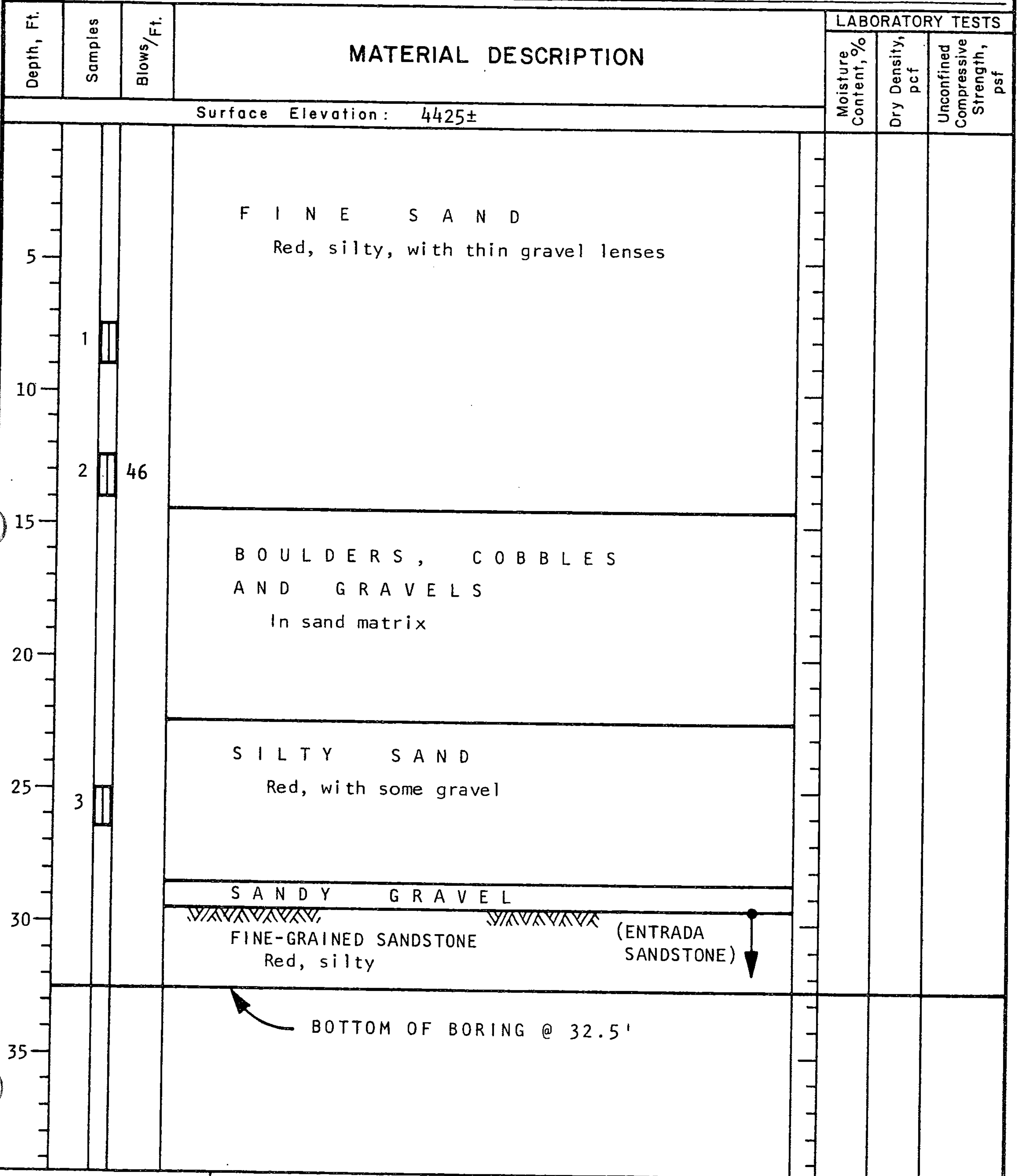
**Date Drilled:** March 6, 1979

**Type of Boring:** Rotary Wash with NX Core

**Hammer Weight:** 140 lbs.

**Remarks:** All Samples Taken with 2" O.D. Standard Split-Spoon Sampler

Surface Elevation: 4425±



FINE SAND
Red, silty, with thin gravel lenses

BOULDERS, COBBLES AND GRAVELS
In sand matrix

SILTY SAND
Red, with some gravel

SANDY GRAVEL

FINE-GRAINED SANDSTONE
Red, silty

(ENTRADA SANDSTONE)

BOTTOM OF BORING @ 32.5'

Proj. No. 60255J

**Woodward-Clyde Consultants**

Figure A-1

**Project:** PLATEAU RESOURCES LIMITED
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Garfield County, Utah

# Log of Boring No. S-12

**Date Drilled:** March 6, 1979
**Type of Boring:** Rotary Wash with NX Core
**Hammer Weight:** 140 lbs.

**Remarks:** All Samples Taken with 2" O.D. Standard Split-Spoon Sampler

| Depth, Ft. | Samples | Blows/Ft. | MATERIAL DESCRIPTION | LABORATORY TESTS Moisture Content, % | LABORATORY TESTS Dry Density, pcf | LABORATORY TESTS Unconfined Compressive Strength, psf |
|---|---|---|---|---|---|---|

Surface Elevation: 4425±

SANDY COBBLES: Red, silty

FINE SAND
Red, silty, with thin layers of silty sandy gravel

1

BOULDERS, COBBLES AND GRAVELS
In a red silty sand matrix

SILTY SAND
Red, with occasional thin sandy gravel lenses

FINE-GRAINED SANDSTONE
Red, silty

(ENTRADA SANDSTONE)

BOTTOM OF BORING @ 27.5'

5
10
15
20
25
30
35

Proj. No. 60255J

**Woodward-Clyde Consultants**

Figure A-2

**Project:** PLATEAU RESOURCES LIMITED
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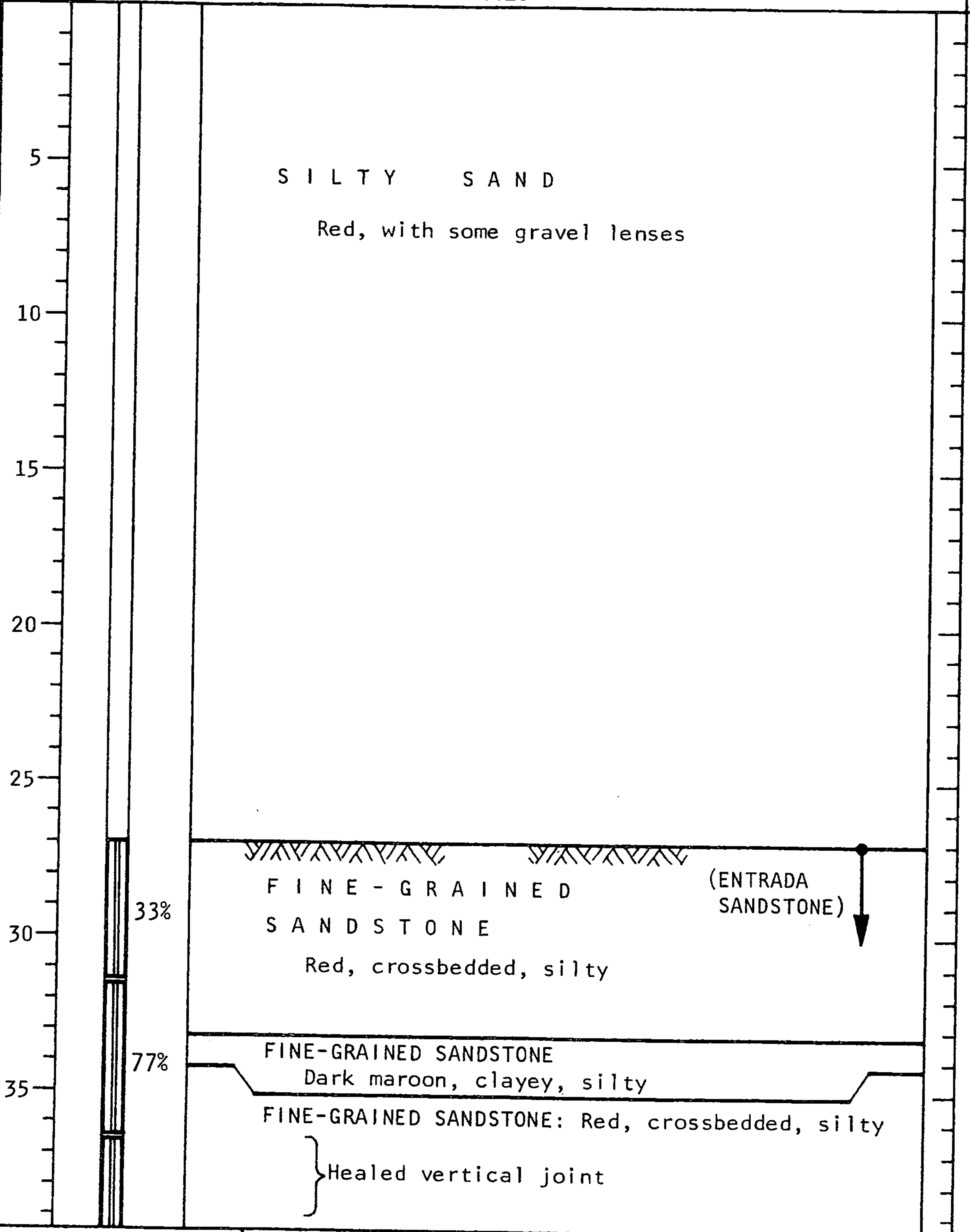
# Log of Boring No. S-13

**Date Drilled:** March 5, 1979
**Type of Boring:** Rotary Wash with NX Core
**Hammer Weight:** --
**Remarks:**

| Depth, Ft. | Samples | Recovery | MATERIAL DESCRIPTION | LABORATORY TESTS | | |
|---|---|---|---|---|---|---|
| | | | | Moisture Content, % | Dry Density, pcf | Unconfined Compressive Strength, psf |

Surface Elevation: 4420±



SILTY SAND
Red, with some gravel lenses

FINE-GRAINED SANDSTONE
Red, crossbedded, silty

(ENTRADA SANDSTONE)

FINE-GRAINED SANDSTONE
Dark maroon, clayey, silty

FINE-GRAINED SANDSTONE: Red, crossbedded, silty

Healed vertical joint

Proj. No. 60255J

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Figure A-3a

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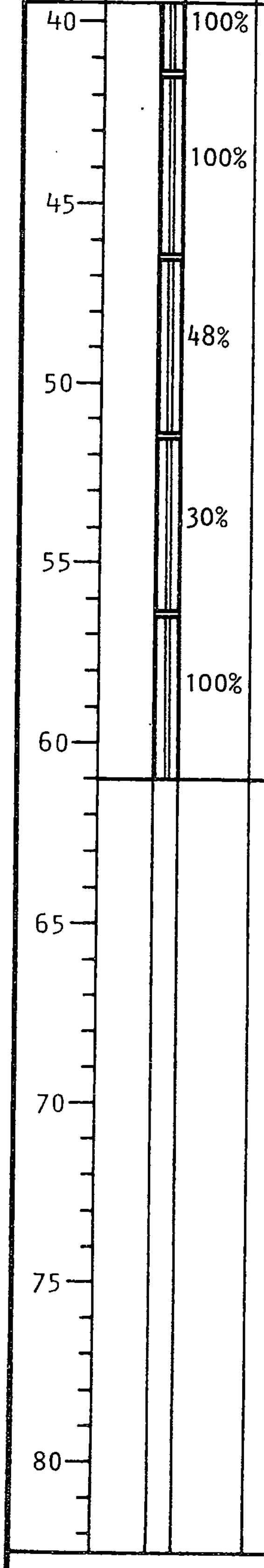
# Log of Boring No. S-13
(Continued)

| Depth, Ft. | Samples | Recovery | MATERIAL DESCRIPTION | Moisture Content, % | Dry Density, pcf | Unconfined Compressive Stren p |
|---|---|---|---|---|---|---|



F I N E - G R A I N E D S A N D S T O N E Cont'd..........

Red, crossbedded, silty

BOTTOM OF BORING @ 61.0'

Proj. No. 60255J

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Figure A-3b

**Project:** PLATEAU RESOURCES LIMITED
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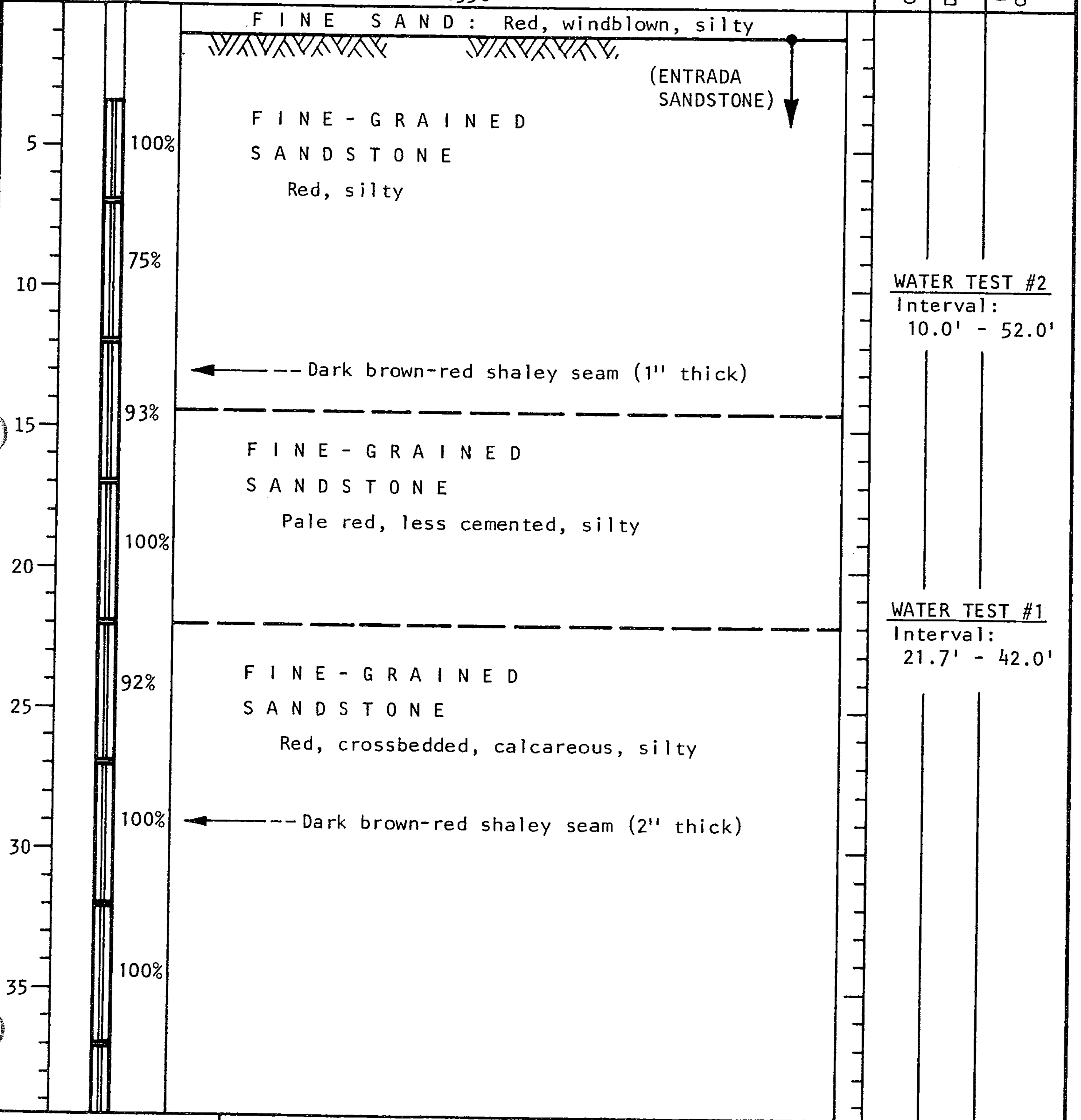
# Log of Boring No. S-14

**Date Drilled:** February 13, 1979
**Type of Boring:** Inclined Rotary Wash with NX Core
**Hammer Weight:** --

**Remarks:** Orientation: S65E, 55.
See Table A-1 for water test data and results

| Inclined Linear Distance, Ft. | Samples | Recovery | MATERIAL DESCRIPTION | LABORATORY TESTS: Moisture Content, % | Dry Density, pcf | Unconfined Compressive Strength, psf |
|---|---|---|---|---|---|---|

Surface Elevation: 4358±



FINE SAND: Red, windblown, silty

(ENTRADA SANDSTONE)

FINE-GRAINED SANDSTONE
Red, silty

Dark brown-red shaley seam (1" thick)

FINE-GRAINED SANDSTONE
Pale red, less cemented, silty

FINE-GRAINED SANDSTONE
Red, crossbedded, calcareous, silty

Dark brown-red shaley seam (2" thick)

WATER TEST #2
Interval:
10.0' - 52.0'

WATER TEST #1
Interval:
21.7' - 42.0'

Proj. No. 60255J

**Woodward-Clyde Consultants**

Figure A-4a

Project: PLATEAU RESOURCES LIMITED
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# Log of Boring No. S-14
(Continued)

| Inclined Linear Distance, Ft. | Samples | Recovery | MATERIAL DESCRIPTION | Moisture Content, % | Dry Density, pcf | Unconfined Compressive Stre--th, |
|---|---|---|---|---|---|---|
| 40 | | 95% | | | | |
| | | | FINE-GRAINED SANDSTONE Cont'd......... | | | |
| | | 88% | | | | |
| 45 | | | Red, crossbedded, calcareous, silty | | | |
| | | 62% | | | | |
| 50 | | | | | | |
| | | | BOTTOM OF BORING @ 52.0' | | | |
| 55 | | | | | | |
| 60 | | | | | | |
| 65 | | | | | | |
| 70 | | | | | | |
| 75 | | | | | | |
| 80 | | | | | | |

Proj. No. 60255J

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Figure A-4b

**Project:** PLATEAU RESOURCES LIMITED
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Garfield County, Utah

# Log of Boring No. S-14R

**Date Drilled:** February 26, 1979

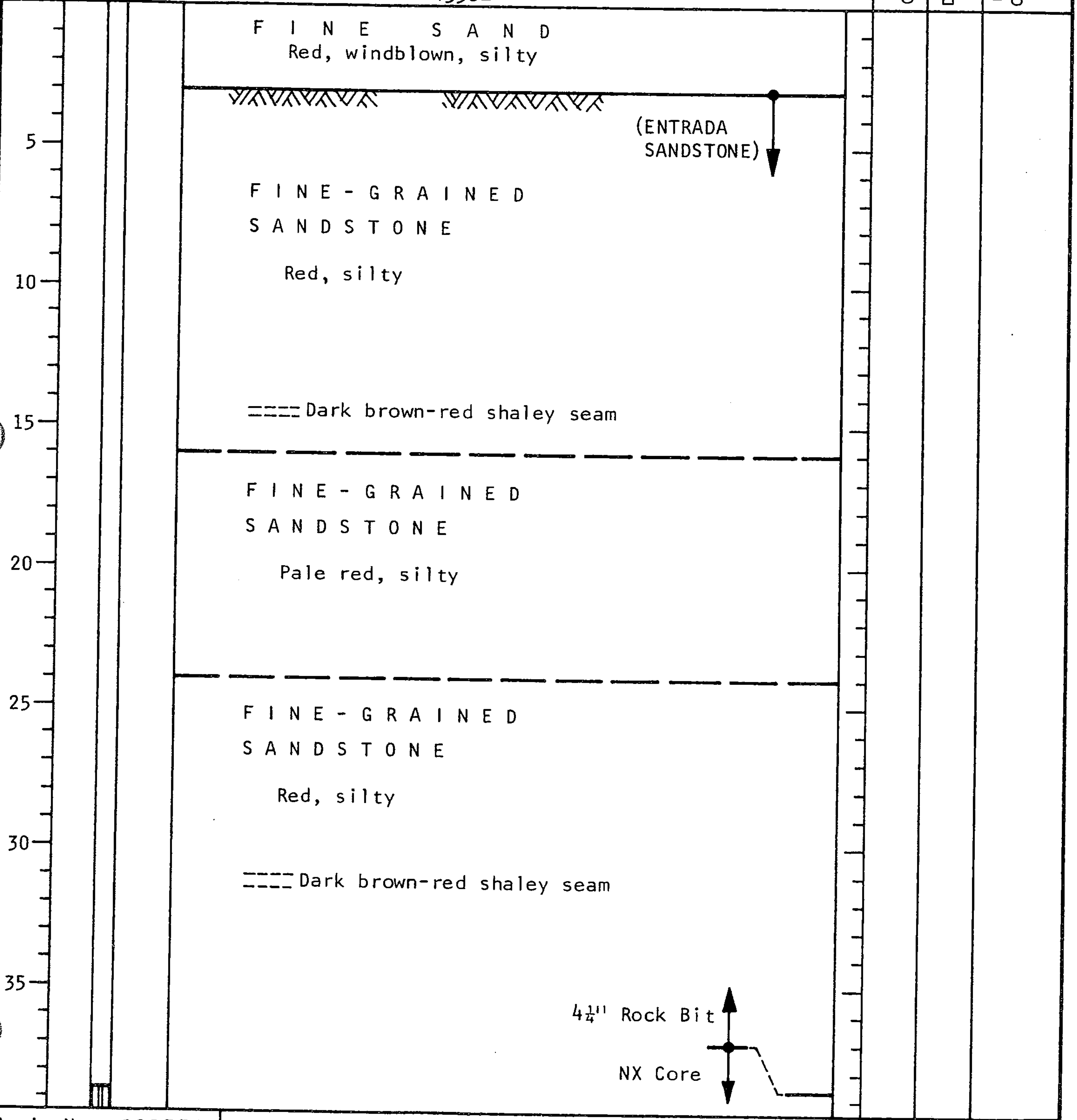
**Type of Boring:** 4¼" Rock Bit & NX Core

**Hammer Weight:** --

**Remarks:** Orientation: S65E, 55

| Inclined Linear Distance, Ft. | Samples | Recovery | MATERIAL DESCRIPTION | LABORATORY TESTS | | |
|---|---|---|---|---|---|---|
| | | | | Moisture Content, % | Dry Density, pcf | Unconfined Compressive Strength, psf |

Surface Elevation: 4358±



FINE SAND
Red, windblown, silty

FINE-GRAINED SANDSTONE
Red, silty

==== Dark brown-red shaley seam

FINE-GRAINED SANDSTONE
Pale red, silty

FINE-GRAINED SANDSTONE
Red, silty

==== Dark brown-red shaley seam

Proj. No. 60255J

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Figure A-5a

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# Log of Boring No. S-14R

(Continued)

| Inclined Linear Distance, Ft. | Samples | Recovery | MATERIAL DESCRIPTION | Moisture Content, % | Dry Density, pcf | Unconfined Compressive Str |
|---|---|---|---|---|---|---|
| 40 | | 0% | FINE-GRAINED SANDSTONE Cont'd.......... | | | |
| | | 80% | Red, silty | | | |
| 45 | | | | | | |
| | | | BOTTOM OF BORING @ 46.0' | | | |
| 50 | | | | | | |
| 55 | | | | | | |
| 60 | | | | | | |
| 65 | | | | | | |
| 70 | | | | | | |
| 75 | | | | | | |
| 80 | | | | | | |

Proj. No. 60255J

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Figure A-5b

**Project:** PLATEAU RESOURCES LIMITED
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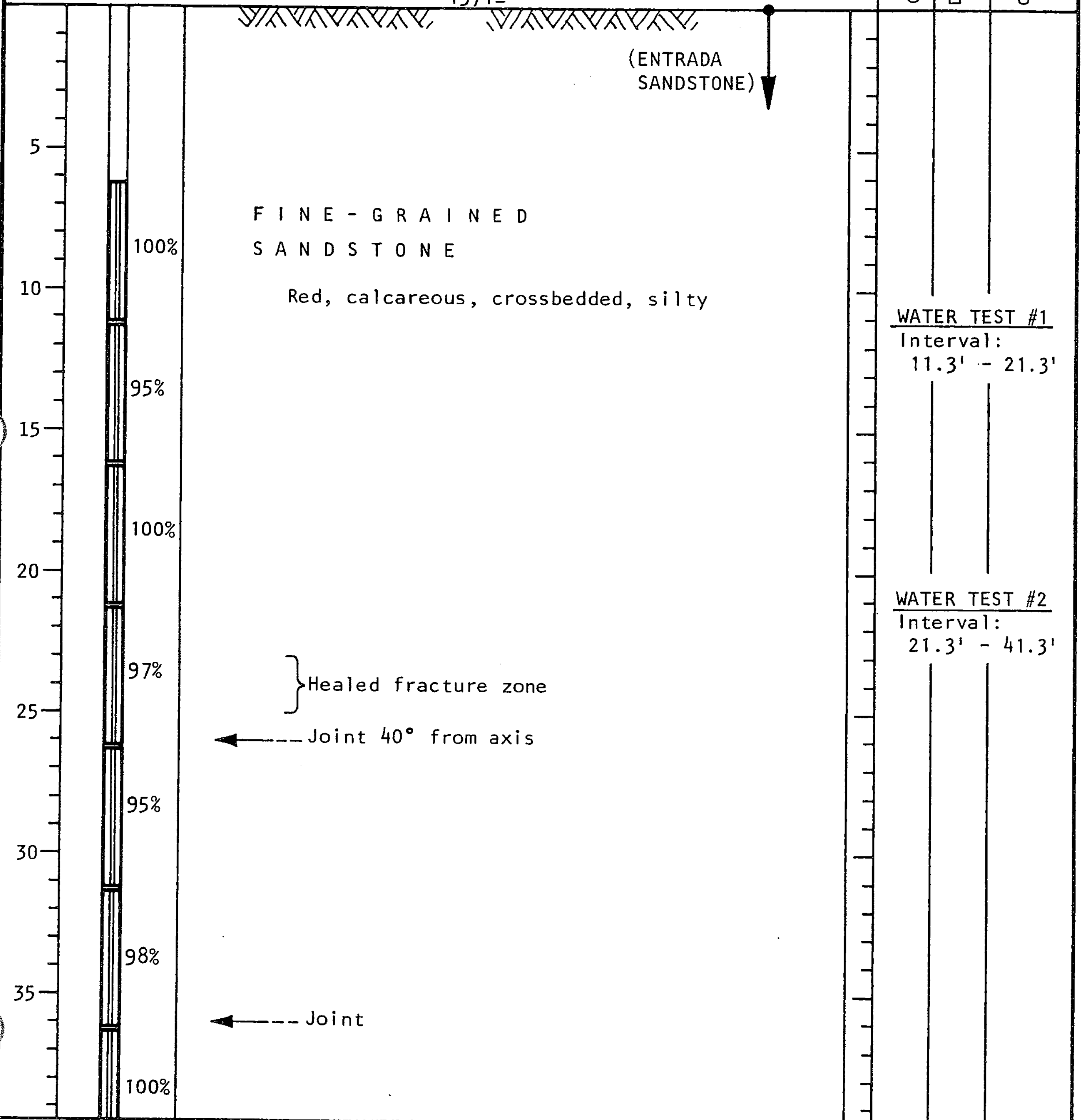
Garfield County, Utah

# Log of Boring No. S-15

**Date Drilled:** February 12, 1979
**Type of Boring:** Inclined Rotary Wash with NX Core
**Hammer Weight:** --
**Remarks:** Orientation: S65E, 35
See Table A-1 for water test data and results

| Inclined Linear Distance, Ft. | Samples | Recovery | MATERIAL DESCRIPTION | LABORATORY TESTS: Moisture Content, % | Dry Density, pcf | Unconfined Compressive Strength, psf |
|---|---|---|---|---|---|---|

Surface Elevation: 4371±



(ENTRADA SANDSTONE)

FINE-GRAINED SANDSTONE

Red, calcareous, crossbedded, silty

Healed fracture zone

Joint 40° from axis

Joint

WATER TEST #1
Interval:
11.3' - 21.3'

WATER TEST #2
Interval:
21.3' - 41.3'

Proj. No. 60255J

**Woodward-Clyde Consultants**

Figure A-6a

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Garfield County, Utah

# Log of Boring No. S-15

(Continued)

| Inclined Linear Distance, Ft. | Samples | Recovery | MATERIAL DESCRIPTION | Moisture Content, % | Dry Density, pcf | Unconfined Compressive Strength, |
|---|---|---|---|---|---|---|
| 40 | | | | | | |
| | | | Uncemented zone | WATER TEST #3<br>Interval:<br>41.3' - 61.3' | | |
| | | | Healed fracture zone | | | |
| | | 97% | | | | |
| 45 | | | | | | |
| | | | ← --Joint | | | |
| | | 100% | | | | |
| 50 | | | | | | |
| | | | Uncemented zone | | | |
| | | 92% | | | | |
| 55 | | | | | | |
| | | | (ENTRADA SANDSTONE) | | | |
| | | 83% | | | | |
| 60 | | | | | | |
| | | | | WATER TEST #4<br>Interval:<br>61.3' - 81.3' | | |
| | | 72% | | | | |
| | | | Uncemented zone | | | |
| 65 | | | | | | |
| | | 78% | | | | |
| | | | Uncemented zone | | | |
| 70 | | | | | | |
| | | 97% | | | | |
| 75 | | | Uncemented zone | | | |
| | | 98% | | | | |
| 80 | | | BOTTOM OF BORING @ 81.3' | | | |

Proj. No. 62055J

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Figure A-6b

**Project:** PLATEAU RESOURCES LIMITED
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Garfield County, Utah

# Log of Boring No. S-16

**Date Drilled:** February 16, 1979

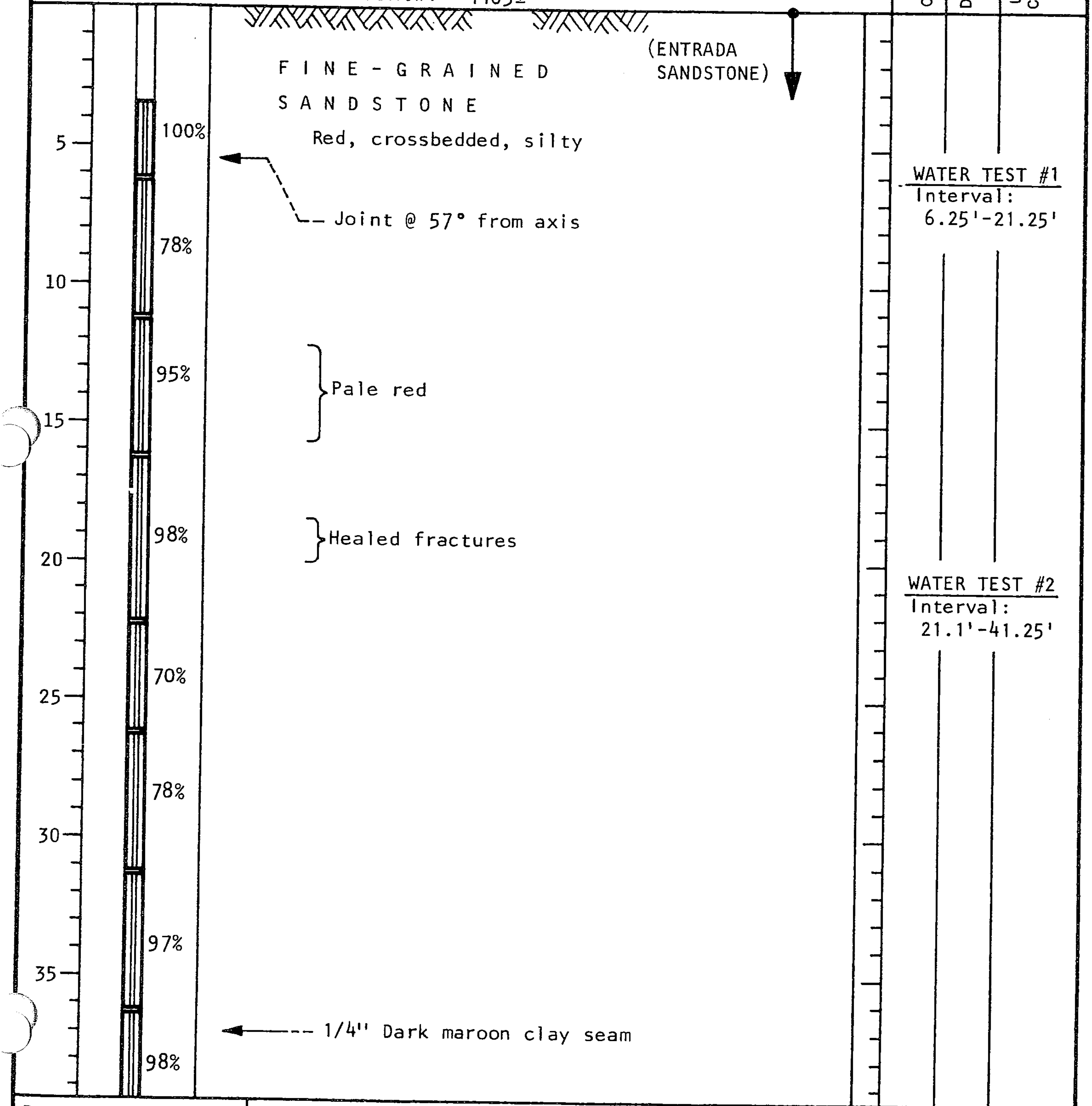
**Type of Boring:** Inclined Rotary Wash with NX Core

**Hammer Weight:** --

**Remarks:** Orientation: S75W, 55
See Table A-1 for water test data and results

| Inclined Linear Distance, Ft. | Samples | Recovery | MATERIAL DESCRIPTION | LABORATORY TESTS: Moisture Content, % | Dry Density, pcf | Unconfined Compressive Strength, psf |
|---|---|---|---|---|---|---|

Surface Elevation: 4405±



FINE-GRAINED SANDSTONE
Red, crossbedded, silty

(ENTRADA SANDSTONE)

Joint @ 57° from axis

Pale red

Healed fractures

1/4" Dark maroon clay seam

WATER TEST #1
Interval:
6.25'-21.25'

WATER TEST #2
Interval:
21.1'-41.25'

Proj. No. 60255J

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Figure A-7a

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Garfield County, Utah

# Log of Boring No. S-16
(Continued)

| Inclined Linear Distance, Ft. | Samples | Recovery | MATERIAL DESCRIPTION | Moisture Content, % | Dry Density, pcf | Unconfined Compressive Strength, |
|---|---|---|---|---|---|---|
| 40 | | | | WATER TEST #3<br>Interval:<br>41.0'-61.25' | | |
| | | 95% | FINE-GRAINED SANDSTONE Cont'd...... | | | |
| 45 | | | | | | |
| | | 92% | Pale red | | | |
| 50 | | | Uncemented | | | |
| | | 95% | | | | |
| 55 | | | Healed fracture | | | |
| | | 98% | (ENTRADA SANDSTONE) | | | |
| 60 | | | | | | |
| | | | BOTTOM OF BORING @ 61.25' | | | |
| 65 | | | | | | |
| 70 | | | | | | |
| 75 | | | | | | |
| 80 | | | | | | |

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Garfield County, Utah

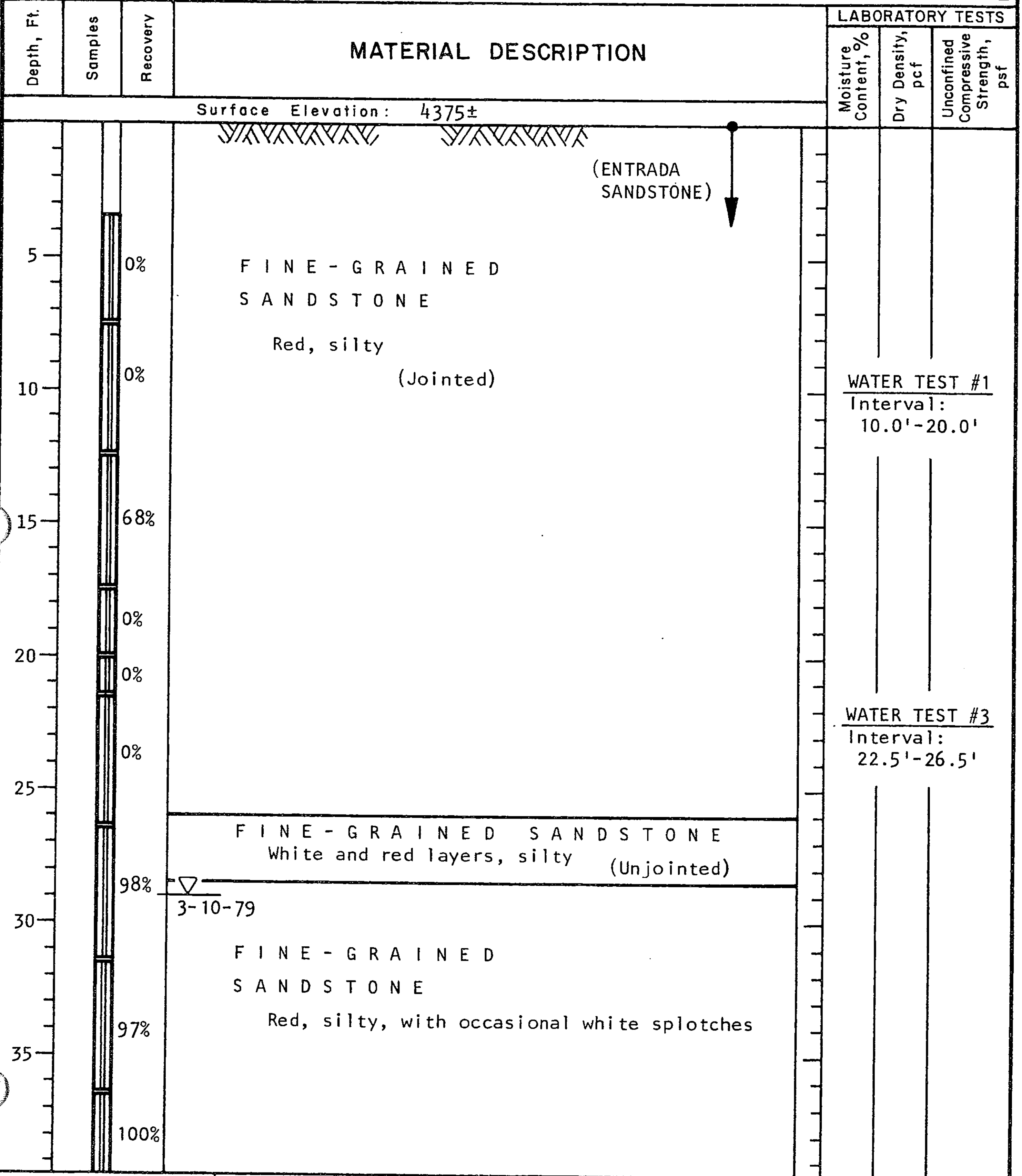
# Log of Boring No. S-17

**Date Drilled:** March 1, 1979

**Type of Boring:** Rotary Wash with NX Core

**Hammer Weight:** --

**Remarks:** See Table A-1 for water test data and results



(ENTRADA SANDSTONE)

FINE-GRAINED SANDSTONE
Red, silty
(Jointed)

FINE-GRAINED SANDSTONE
White and red layers, silty (Unjointed)

FINE-GRAINED SANDSTONE
Red, silty, with occasional white splotches

WATER TEST #1
Interval:
10.0'-20.0'

WATER TEST #3
Interval:
22.5'-26.5'

Proj. No. 60255J

**Woodward-Clyde Consultants**

Figure A-8a

Project: PLATEAU RESOURCES LIMITED
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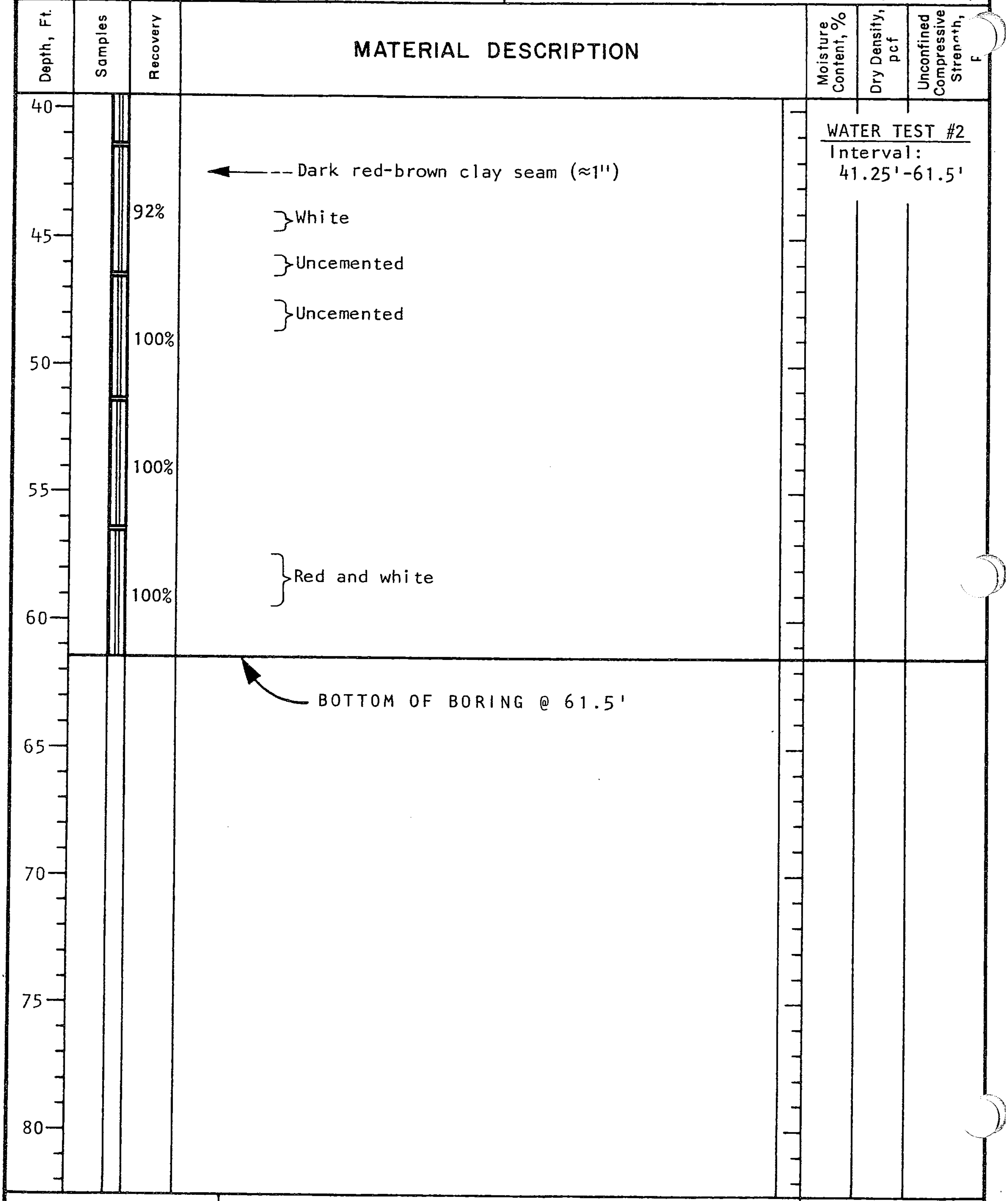
Garfield County, Utah

# Log of Boring No. S-17

(Continued)



Proj. No. 60255J

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Figure A-8b

**Project:** PLATEAU RESOURCES LIMITED
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Garfield County, Utah

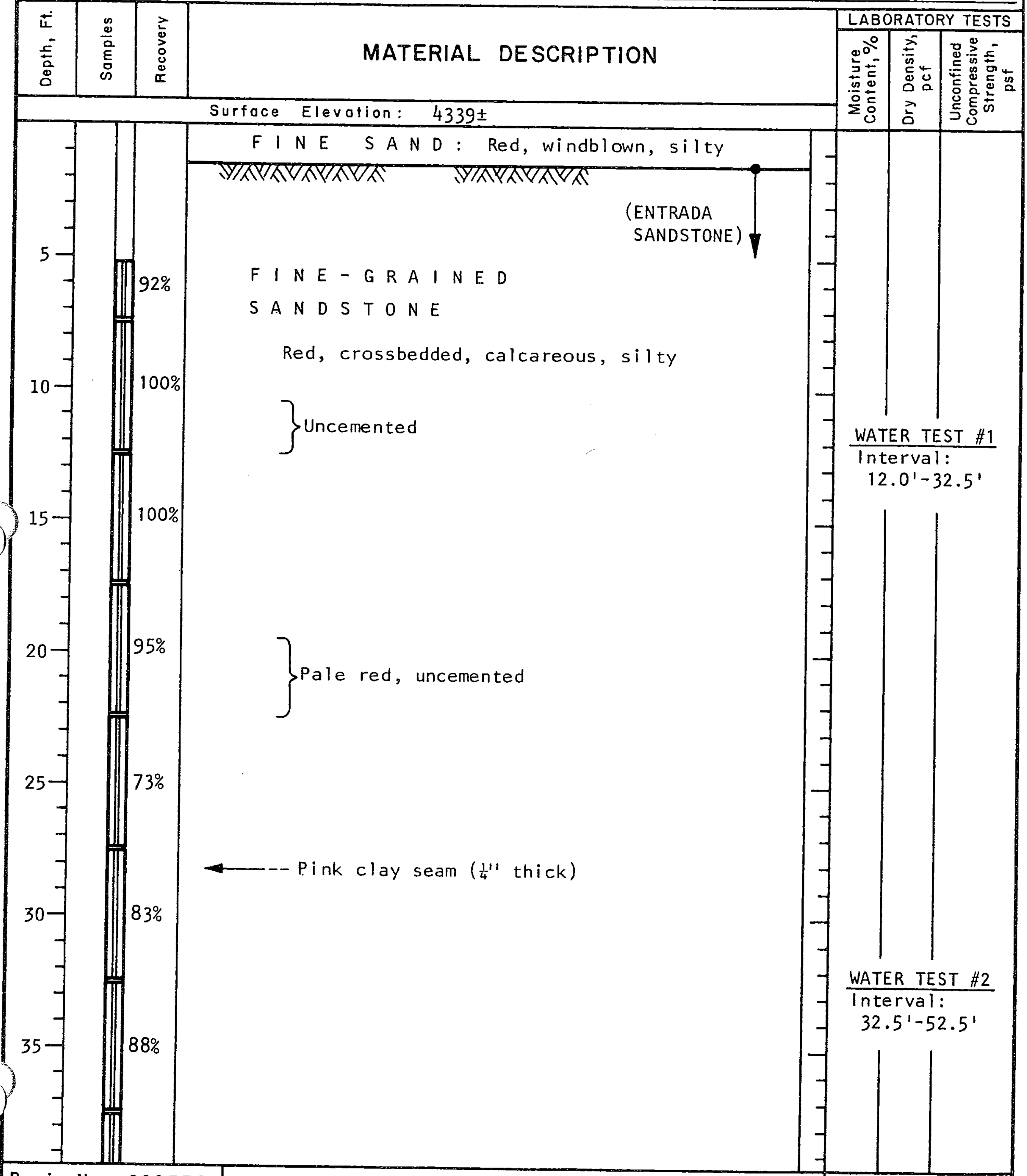
# Log of Boring No. S-18

**Date Drilled:** February 20, 1979

**Type of Boring:** Rotary Wash with NX Core

**Hammer Weight:** --

**Remarks:** See Table A-1 for water test data and results.



FINE SAND: Red, windblown, silty

FINE-GRAINED SANDSTONE

Red, crossbedded, calcareous, silty

}Uncemented

}Pale red, uncemented

←--- Pink clay seam (¼" thick)

WATER TEST #1
Interval:
12.0'-32.5'

WATER TEST #2
Interval:
32.5'-52.5'

Proj. No. 60255J

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Figure A-9a

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# Log of Boring No. S-18

(Continued)

| Depth, Ft. | Samples | Recovery | MATERIAL DESCRIPTION | Moisture Content, % | Dry Density, pcf | Unconfined Compressive Stre |
|---|---|---|---|---|---|---|
| 40 | | 100% | Poorly cemented | | | |
| 45 | | 60% | | | | |
| 50 | | 68% | Brown | | | |
| | | | | WATER TEST #3<br>Interval:<br>52.7'-72.5' | | |
| 55 | | 97% | | | | |
| 60 | | 90% | | | | |
| | | | Water table on 3-10-79 | | | |
| 65 | | 67% | | | | |
| 70 | | 27% | Poorly cemented | | | |
| | | | | WATER TEST #4<br>Interval:<br>72.4'-92.5' | | |
| 75 | | 97% | FINE- TO MEDIUM-GRAINED SANDSTONE<br>Red-brown to pale red-brown, crossbedded | | | |
| 80 | | 87% | FINE-GRAINED SANDSTONE<br>Red, silty | | | |

Proj. No. 60255J

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Figure A-9b

Project: PLATEAU RESOURCES LIMITED
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Garfield County, Utah

# Log of Boring No. S-18

(Continued)

| Depth, Ft. | Samples | Recovery | MATERIAL DESCRIPTION | Moisture Content, % | Dry Density, pcf | Unconfined Compressive Strength, psf |
|---|---|---|---|---|---|---|
| 85 | | 97% | | | | |
| | | | FINE-GRAINED SANDSTONE Cont'd......... | | | |
| 90 | | 97% | Red, silty | | | |
| 95 | | 100% | | | | |
| | | | | WATER TEST #5<br>Interval:<br>92.5'-111.5' | | |
| 100 | | 100% | | | | |
| 105 | | 86% | | | | |
| 110 | | 100% | | | | |
| | | 100% | | WATER TEST #6<br>Interval:<br>112.5'-132.5' | | |
| 115 | | 50% | }Poorly cemented | | | |
| 120 | | 92% | | | | |
| | | 60% | | | | |
| 125 | | | | | | |

Proj. No. 60255J

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Figure A-9c

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Garfield County, Utah

# Log of Boring No. S-18

(Continued)

| Depth, Ft. | Samples | Recovery | MATERIAL DESCRIPTION | Moisture Content, % | Dry Density, pcf | Unconfined Compressive Str[illegible]gth, |
|---|---|---|---|---|---|---|
| | | | Thin layers of cementation | | | |
| 130 | | 88% | | | | |
| | | | | WATER TEST #7<br>Interval:<br>132.7'-152.5' | | |
| 135 | | 23% | Layered cementation | | | |
| 140 | | 20% | | | | |
| 145 | | 10% | Poorly cemented | | | |
| 150 | | 0% | | | | |
| | | | BOTTOM OF BORING @ 152.5' | | | |
| 155 | | | | | | |
| 160 | | | | | | |
| 165 | | | | | | |

Proj. No. 60255J

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Figure A-9d

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Garfield County, Utah

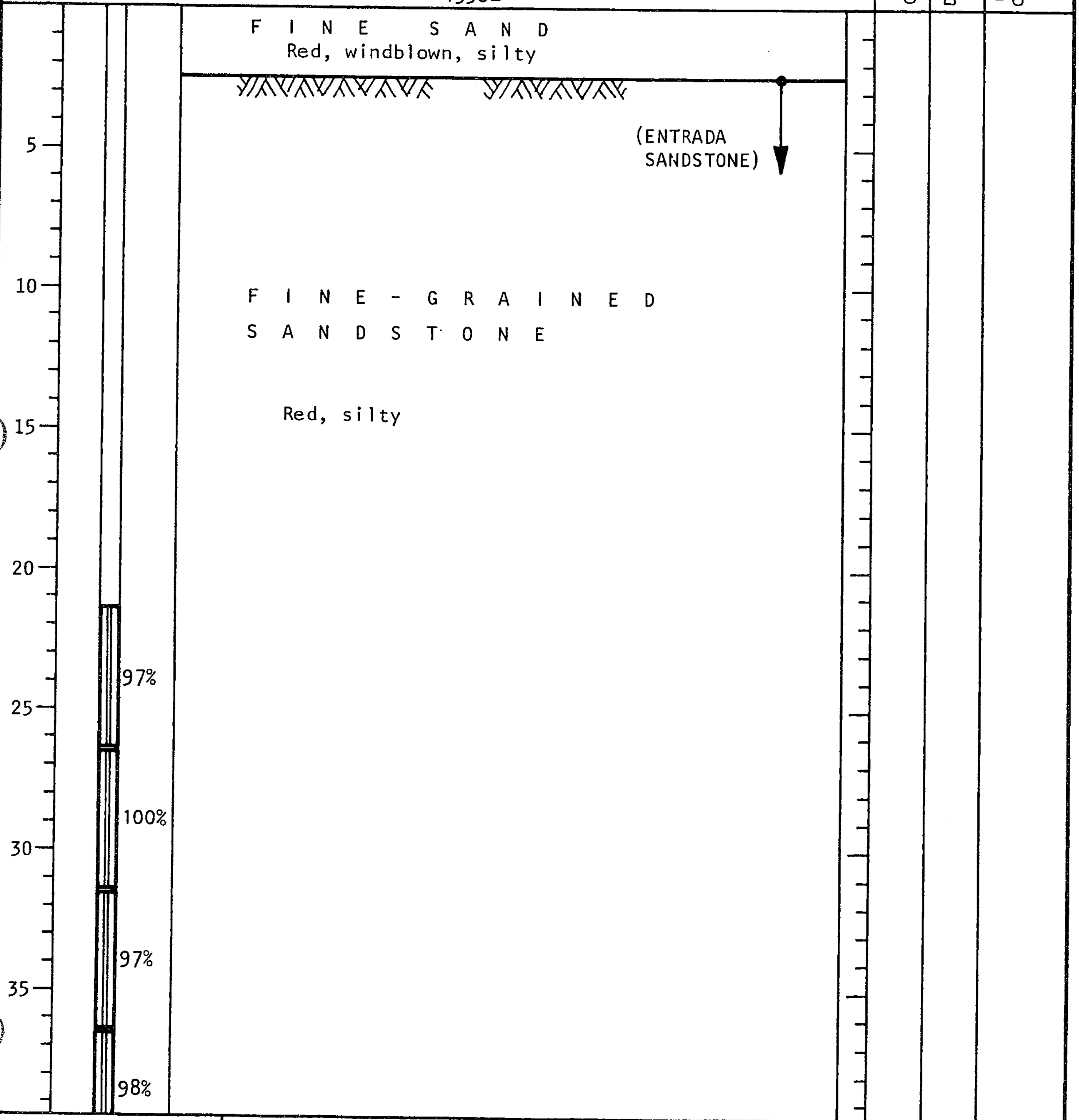
# Log of Boring No. S-19

Date Drilled: February 27, 1979
Type of Boring: Inclined Rotary Wash with NX Core
Hammer Weight: --

Remarks: Orientation: S65E, 55.
See Table A-1 for water test data and results

| Inclined Linear Distance, Ft. | Samples | Recovery | MATERIAL DESCRIPTION | LABORATORY TESTS | | |
|---|---|---|---|---|---|---|
| | | | | Moisture Content, % | Dry Density, pcf | Unconfined Compressive Strength, psf |

Surface Elevation: 4358±



FINE SAND
Red, windblown, silty

FINE-GRAINED SANDSTONE

Red, silty

Figure A-10a

Project: PLATEAU RESOURCES LIMITED
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Garfield County, Utah

# Log of Boring No. S-19
(Continued)

| Inclined Linear Distance, Ft. | Samples | Recovery | MATERIAL DESCRIPTION | Moisture Content, % | Dry Density, pcf | Unconfined Compressive Strength, |
|---|---|---|---|---|---|---|
| 40 | | | FINE-GRAINED SANDSTONE Cont'd......<br>Red, silty | WATER TEST #1<br>Interval:<br>41.25'-61.5' | | |
| | | 90% | | | | |
| 45 | | | | | | |
| | | 100% | | | | |
| 50 | | | | | | |
| | | 38% | FINE-GRAINED SANDSTONE<br>Poorly cemented, silty | | | |
| 55 | | | | | | |
| | | 0% | | | | |
| 60 | | | | | | |
| | | | BOTTOM OF BORING @ 61.5' | | | |
| 65 | | | | | | |
| 70 | | | | | | |
| 75 | | | | | | |
| 80 | | | | | | |

Proj. No. 60255J

**Woodward-Clyde Consultants**

Figure A-10b

**Project:** PLATEAU RESOURCES LIMITED
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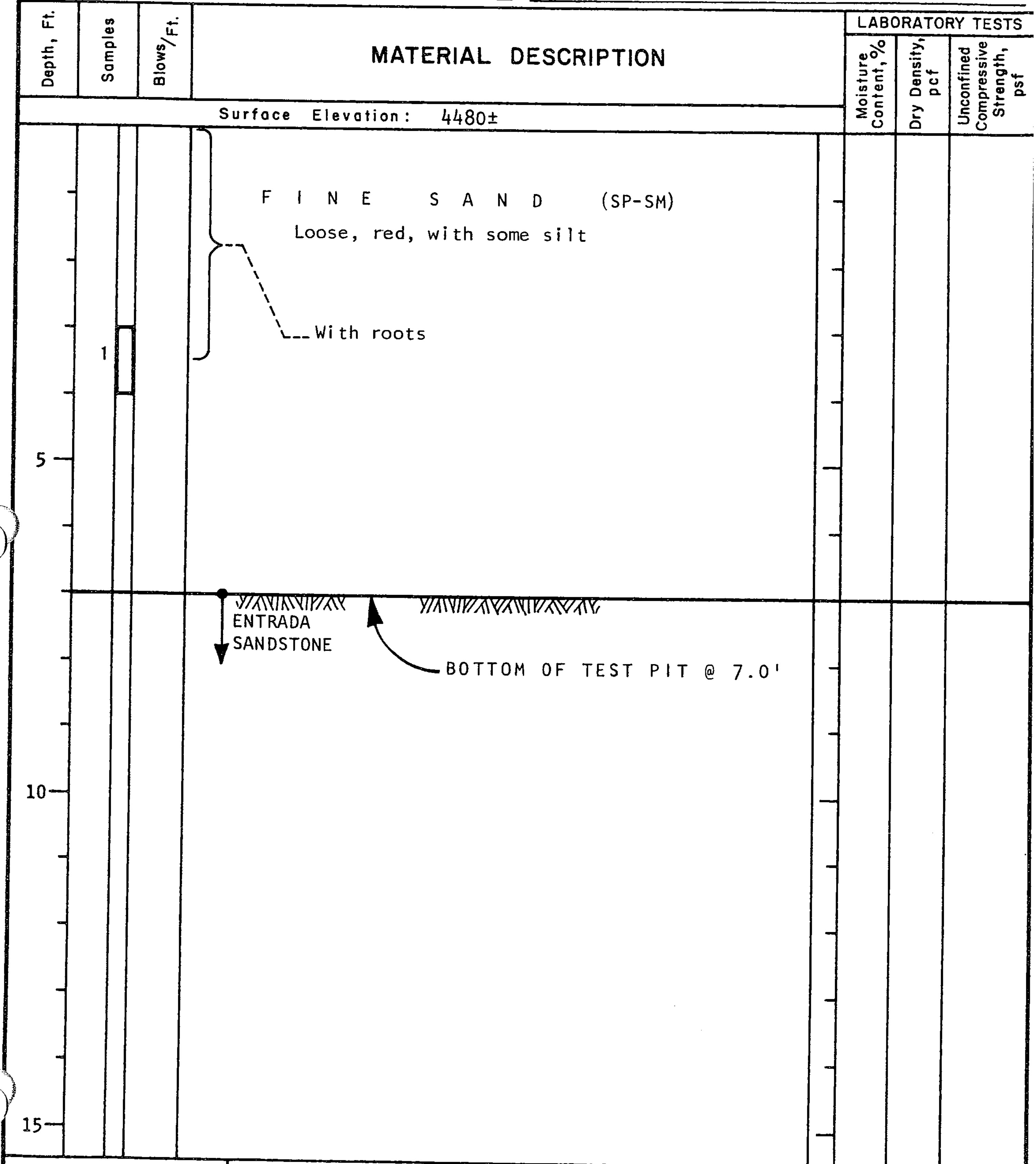
# Log of Test Pit No. TPX-1

**Date Drilled:** March 1, 1979
**Type of Boring:** Test Pit with Dozer
**Hammer Weight:** --
**Remarks:** Only Bulk Samples Taken



FINE SAND (SP-SM)
Loose, red, with some silt

With roots

ENTRADA SANDSTONE

BOTTOM OF TEST PIT @ 7.0'

Proj. No. 60255J

**Woodward-Clyde Consultants**

Figure A-11

**Project:** PLATEAU RESOURCES LIMITED
SHOOTERING CANYON URANIUM PROJECT
Garfield County, Utah

# Log of Test Pit No. TPX-2

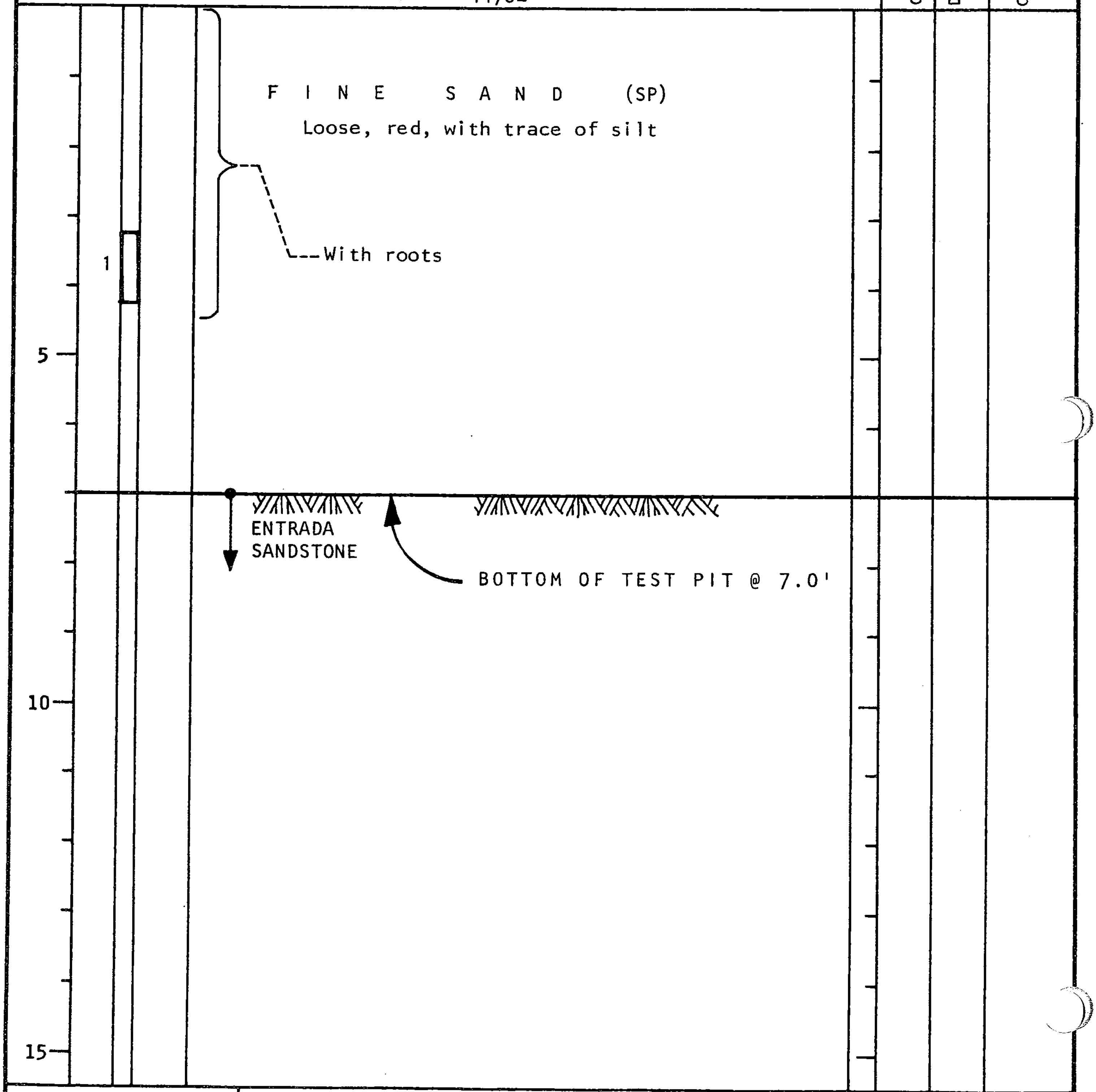
**Date Drilled:** March 1, 1979

**Type of Boring:** Test Pit with Dozer

**Hammer Weight:** --

**Remarks:** Only Bulk Samples Taken

| Depth, Ft. | Samples | Blows/Ft. | MATERIAL DESCRIPTION | LABORATORY TESTS | | |
|---|---|---|---|---|---|---|
| | | | | Moisture Content, % | Dry Density, pcf | Unconfined Compressive Strength, psf |
| | | | Surface Elevation: 4470± | | | |



Proj. No. 60255J

**Woodward-Clyde Consultants**

Figure A-12

**Project:** PLATEAU RESOURCES LIMITED
SHOOTERING CANYON URANIUM PROJECT
Garfield County, Utah

# Log of Test Pit No. TPX-3

**Date Drilled:** March 1, 1979
**Type of Boring:** Test Pit with Dozer
**Hammer Weight:** --
**Remarks:** Only Bulk Samples Taken

| Depth, Ft. | Samples | Blows/Ft. | MATERIAL DESCRIPTION | LABORATORY TESTS | | |
|---|---|---|---|---|---|---|
| | | | | Moisture Content, % | Dry Density, pcf | Unconfined Compressive Strength, psf |
| | | | Surface Elevation: 4460± | | | |
| | | | FINE SAND (SP-SM)<br>Loose, red, with some silt | | | |
| 5 | | | | | | |
| | 1 | | GRAVELLY SAND (SW-SM)<br>With some silt | | | |
| | | | FINE SAND (SP-SM)<br>Red, with some silt | | | |
| | | | ENTRADA SANDSTONE<br>BOTTOM OF TEST PIT @ 8.0' | | | |
| 10 | | | | | | |
| 15 | | | | | | |

Proj. No. 60255J

**Woodward-Clyde Consultants**

Figure A-13

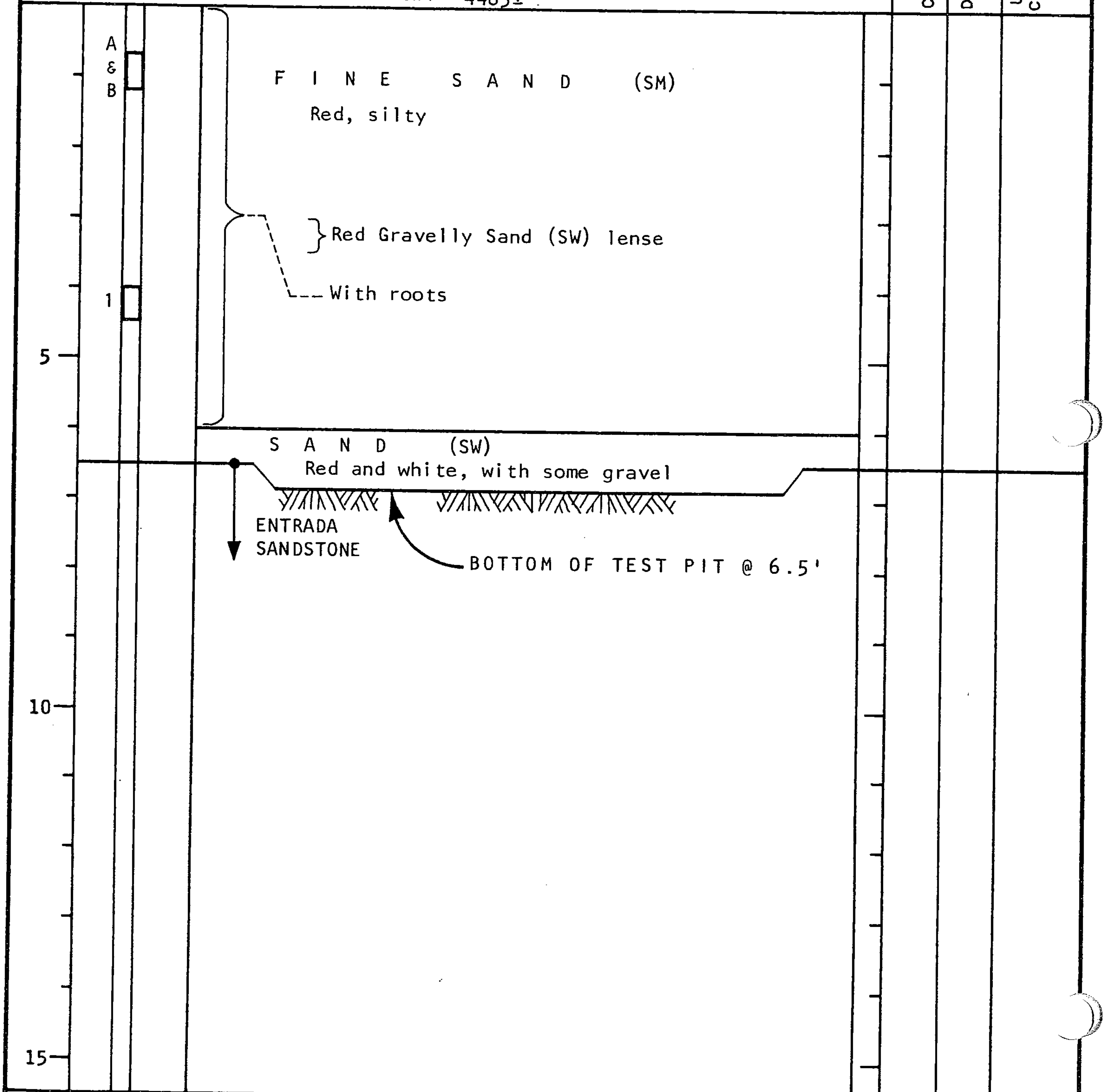
**Project:** PLATEAU RESOURCES LIMITED
SHOOTERING CANYON URANIUM PROJECT
Garfield County, Utah

# Log of Test Pit No. TPX-4

**Date Drilled:** March 1, 1979
**Type of Boring:** Test Pit with Dozer
**Hammer Weight:** --
**Remarks:** Only Bulk Samples Taken

| Depth, Ft. | Samples | Blows/Ft. | MATERIAL DESCRIPTION | LABORATORY TESTS | | |
|---|---|---|---|---|---|---|
| | | | | Moisture Content, % | Dry Density, pcf | Unconfined Compressive Strength, psf |

Surface Elevation: 4485±



FINE SAND (SM)
Red, silty

Red Gravelly Sand (SW) lense

With roots

SAND (SW)
Red and white, with some gravel

ENTRADA SANDSTONE

BOTTOM OF TEST PIT @ 6.5'

Proj. No. 60255J

**Woodward-Clyde Consultants**

Figure A-14

**Project:** PLATEAU RESOURCES LIMITED
SHOOTERING CANYON URANIUM PROJECT
Garfield County, Utah

# Log of Test Pit No. TPX-5

**Date Drilled:** March 1, 1979

**Type of Boring:** Test Pit with Dozer

**Hammer Weight:** --

**Remarks:** Only Bulk Samples Taken

| Depth, Ft. | Samples | Blows/Ft. | MATERIAL DESCRIPTION | LABORATORY TESTS<br>Moisture Content,% | Dry Density, pcf | Unconfined Compressive Strength, psf |
|---|---|---|---|---|---|---|
| | | | Surface Elevation: 4455± | | | |
| | | | FINE SAND (SP-SM)<br>Golden red, with some silt | | | |
| | | | FINE SAND (SP-SM)<br>Red, with some silt | | | |
| 5 | | | With roots | | | |
| | | | Silt Sandy Gravel (GC) lense | | | |
| | | | ENTRADA SANDSTONE | | | |
| | | | BOTTOM OF TEST PIT @ 7.5' | | | |
| 10 | | | | | | |
| 15 | | | | | | |

Proj. No. 60255J

**Woodward-Clyde Consultants**

Figure A-15

**Project:** PLATEAU RESOURCES LIMITED
SHOOTERING CANYON URANIUM PROJECT
Garfield County, Utah

# Log of Test Pit No. TPX-6

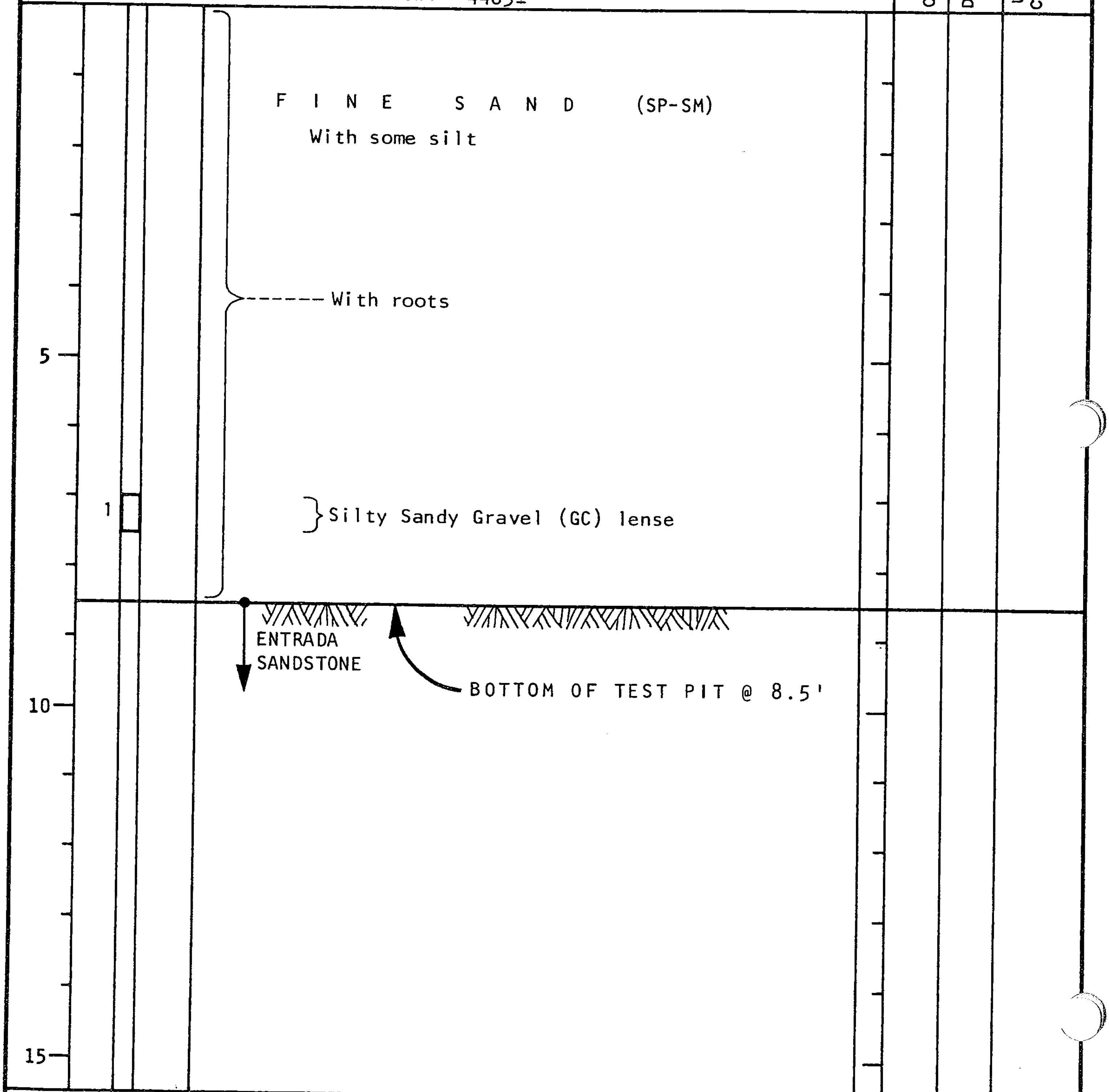
**Date Drilled:** March 1, 1979

**Type of Boring:** Test Pit with Dozer

**Hammer Weight:** --

**Remarks:** Only Bulk Samples Taken

| Depth, Ft. | Samples | Blows/Ft. | MATERIAL DESCRIPTION | LABORATORY TESTS | | |
|---|---|---|---|---|---|---|
| | | | | Moisture Content, % | Dry Density, pcf | Unconfined Compressive Strength, psf |
| | | | Surface Elevation: 4485± | | | |



FINE SAND (SP-SM)
With some silt

With roots

Silty Sandy Gravel (GC) lense

ENTRADA SANDSTONE

BOTTOM OF TEST PIT @ 8.5'

Proj. No. 60255J

**Woodward-Clyde Consultants**

Figure A-16

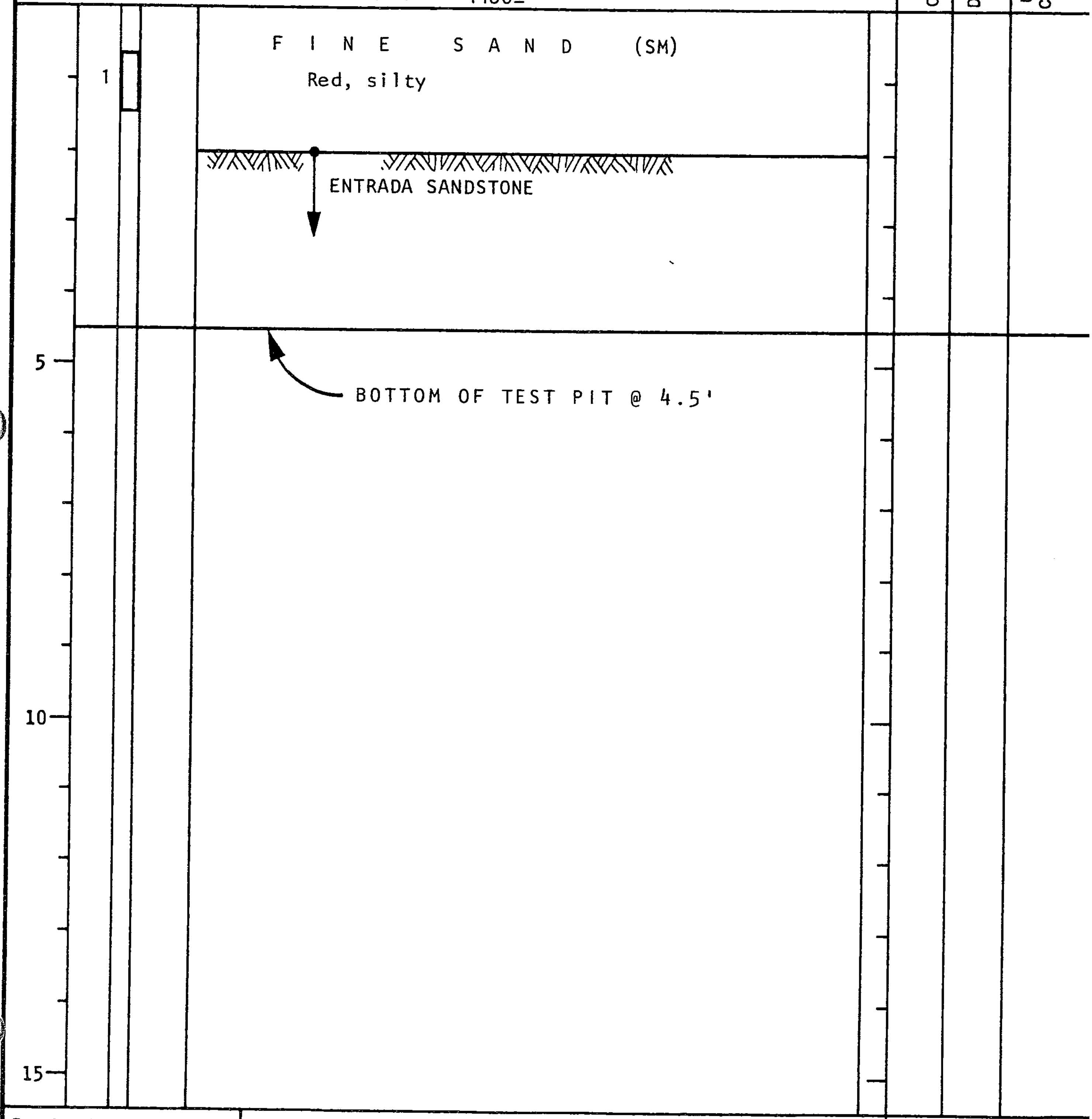
**Project:** PLATEAU RESOURCES LIMITED
SHOOTERING CANYON URANIUM PROJECT
Garfield County, Utah

# Log of Test Pit No. TPX-7

**Date Drilled:** March 1, 1979
**Type of Boring:** Test Pit with Dozer
**Hammer Weight:** --
**Remarks:** Only Bulk Samples Taken

| Depth, Ft. | Samples | Blows/Ft. | MATERIAL DESCRIPTION | LABORATORY TESTS | | |
|---|---|---|---|---|---|---|
| | | | | Moisture Content, % | Dry Density, pcf | Unconfined Compressive Strength, psf |

Surface Elevation: 4460±



FINE SAND (SM)
Red, silty

ENTRADA SANDSTONE

BOTTOM OF TEST PIT @ 4.5'

Proj. No. 60255J

**Woodward-Clyde Consultants**

Figure A-17

# APPENDIX C.1.4
# LABORATORY TEST RESULTS
# WOODWARD-CLYDE CONSULTANTS 1979 FIELD INVESTIGATION
# (WOODWARD-CLYDE, 1979)

# APPENDIX B

## LABORATORY TESTS

A complete discussion of the laboratory testing program related to the preliminary geotechnical investigation was presented earlier (Woodward-Clyde Consultants 1978a).

Testing reported herein was conducted as part of the final design phase of the WCC investigation. The materials tested were representative samples from potential Borrow Areas, $E_2$, F, G, H, and I (see Figure 2). A description of the different areas has been presented in Appendix A. For the purpose of physical identification of the different types of available impermeable materials, Atterberg Limits, hydrometer tests, and compaction tests were run on six (6) different samples--1 each from Borrow Areas H and I, and 2 each from Borrow Areas F and G. Sieve analyses were run using several representative samples from Borrow Area $E_2$ (Zone 3 material). The two curves shown on Figure B-2 represent the approximate range of gradation to be expected in Borrow Area $E_2$. Also, several samples from Borrow Area $E_2$ were combined and a compaction curve was determined for that material. The results of these tests are presented on Figures B-1 through B-12.

Permeability tests were run on the potential Zone 1 and clay lining materials using two different liquids as the permeant. To establish a base measurement, conventional constant head permeability tests were run using de-ionized water. The samples were then flushed with a simulated acidic effluent obtained from Mountain States Engineers. Constant head tests were again run using the acid effluent as the permeant. The sequence of testing for each sample is presented in Table B-1.

The samples were compacted at 95 percent of the maximum dry density and 1-2 percent wet of the optimum water content as determined by the compaction tests (Figures 6-11). Moisture content of the samples was carefully measured before testing began and after the series was completed. The temperature and applied head were then systematically increased in efforts to determine any long-term effects the effluent might have on the clay lining in connection with its permeability. The results of the permeability tests are presented in Table B-2.

For the purpose of detecting any chemical reactions that might occur between the clay material and permeant, the permeant was collected after each test in the series and measured for pH and conductivity. These results are presented in Table B-3.

Triaxial strength tests were to be run on prepared samples of Mancos Shale and Brushy Basin Shale. However, due to a breakdown in the data acquisition system used in our laboratory, the tests have not yet been completed. Upon the completion of the tests, a supplemental report presenting the results will be submitted by June 5, 1979.

## TABLE B-1: SEQUENCE OF PERMEABILITY TESTS

| SEQUENCE | PERMEANT | TEMPERATURE | APPLIED HEAD |
|---|---|---|---|
| 1 | Water | 20° C | 0.1 kg/cm$^2$ |
| 2 | Effluent | 20° C | 0.1 kg/cm$^2$ |
| 3 | Effluent | 52° C | 0.1 kg/cm$^2$ |
| 4 | Effluent | 52° C | 0.2 kg/cm$^2$ |

## TABLE B-2: PERMEABILITY TEST RESULTS

| SEQUENCE | * BORROW AREA "F" (Sample #1) | BORROW AREA "F" (Sample #2) | BORROW AREA "H" | BORROW AREA "I" |
|---|---|---|---|---|
| 1 | $2 \times 10^{-3}$ cm/sec | $4 \times 10^{-8}$ cm/sec | $6.1 \times 10^{-9}$ cm/sec | $2 \times 10^{-9}$ cm/sec |
| 2 | —— | | $3.0 \times 10^{-9}$ cm/sec | |
| 3 | —— | | $7.7 \times 10^{-9}$ cm/sec | |
| 4 | —— | | $4.0 \times 10^{-9}$ cm/sec | |

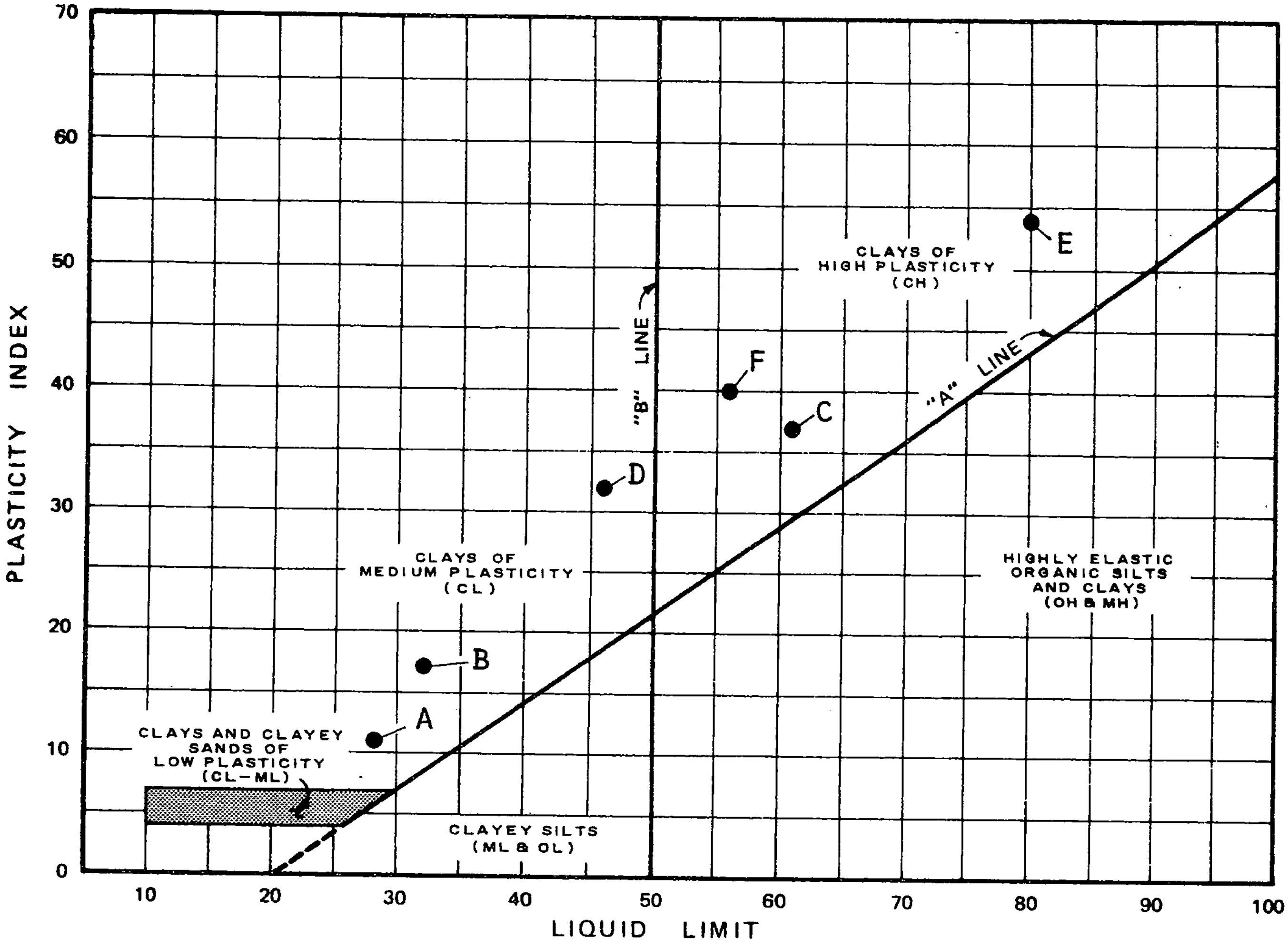
* Sample abandoned because of Low Permeability

## TABLE B-3: pH / CONDUCTIVITY* MEASUREMENTS

| SEQUENCE | BORROW AREA "F" (Sample #1) | BORROW AREA "F" (Sample #2) | BORROW AREA "H" | BORROW AREA "I" |
|---|---|---|---|---|
| 1 | —— | | 6.60/310 | |
| 2** | —— | | 1.40/33,200 | |
| 3 | —— | | 1.45/34,000 | |
| 4 | —— | | 1.45/36,200 | |

* Conductivity measured in μmho

** Initial measurements of Effluent: pH = 1.5, Conductivity = 23,000 μmho



## CLASSIFICATION TEST RESULTS

| SAMPLE IDENTIFICATION | | | | ATTERBERG LIMITS | | | GRAIN SIZES - % DRY WEIGHT | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| LETTER DESIG'N | Area | SAMPLE NO. | DEPTH, FT. | LIQUID LIMIT | PLASTICITY INDEX | PLASTIC LIMIT | SAND | SILT | CLAY | COLLOIDAL |
| A | Borrow Area F | 1 | 3' | 28 | 11 | 17 | – | – | – | – |
| B | Borrow Area F | 2 | 3' | 32 | 17 | 15 | – | – | – | – |
| C | Borrow Area G | 1 | 3' | 61 | 37 | 24 | – | – | – | – |
| D | Borrow Area G | 2 | ½' | 46 | 32 | 14 | – | – | – | – |
| E | Borrow Area H | 1 | 3' | 80 | 54 | 26 | – | – | – | – |
| F | Borrow Area I | 1 | 2' | 56 | 40 | 16 | – | – | – | – |

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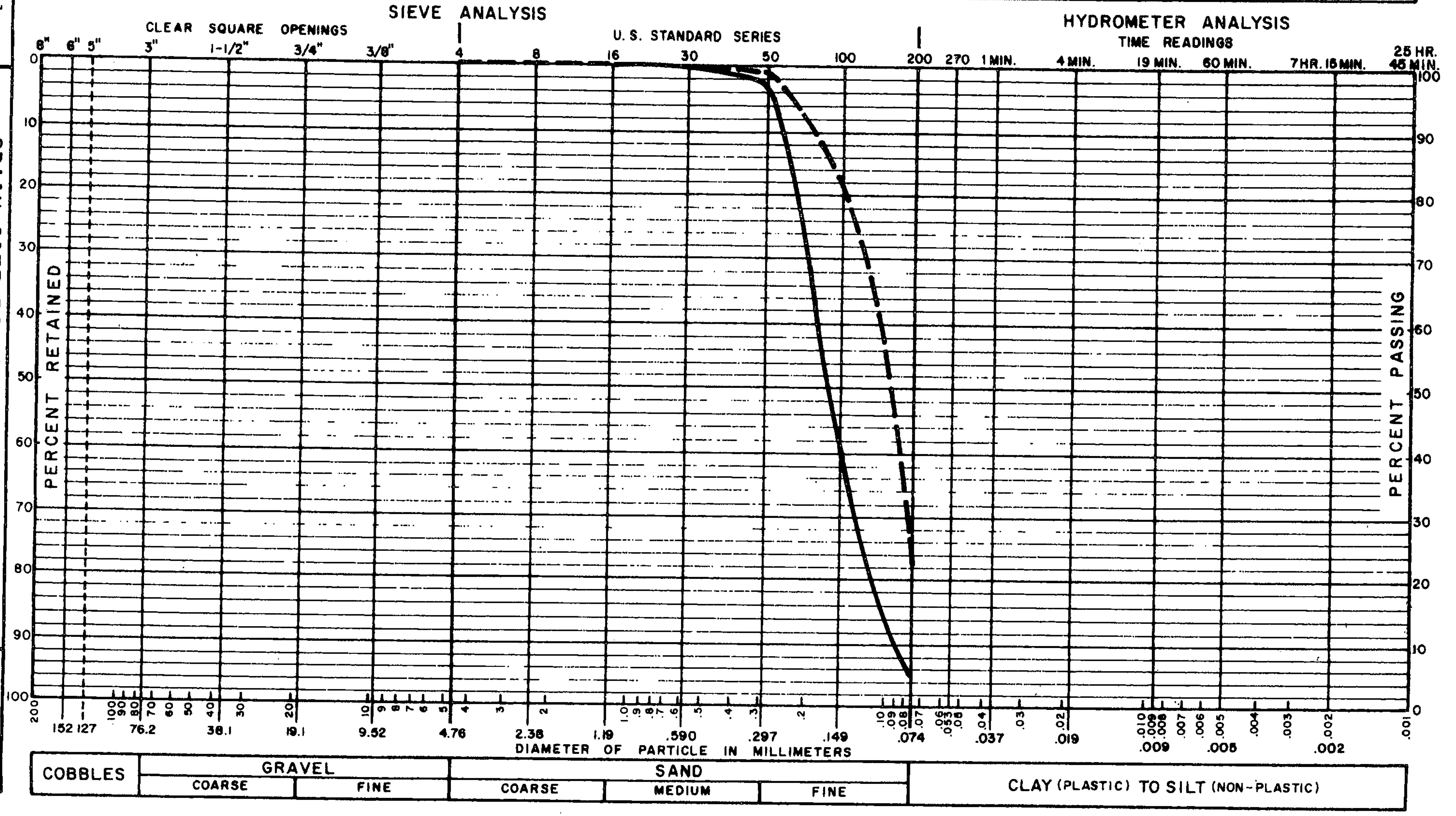
PLASTICITY CLASSIFICATION

PRL - SHOOTERING CANYON URANIUM PROJECT

Figure B-1

| SAMPLE NO. | SYMBOL | DEPTH | LL | PI | UNIFIED CLASSIFICATION |
|---|---|---|---|---|---|
| BORROW AREA $E_2$ (Sample TPX-2-1) | ——— | 4' | — | — | — |
| BORROW AREA $E_2$ (Sample TPX-7-1) | — — — | 1' | — | — | — |



Project No. 60255J

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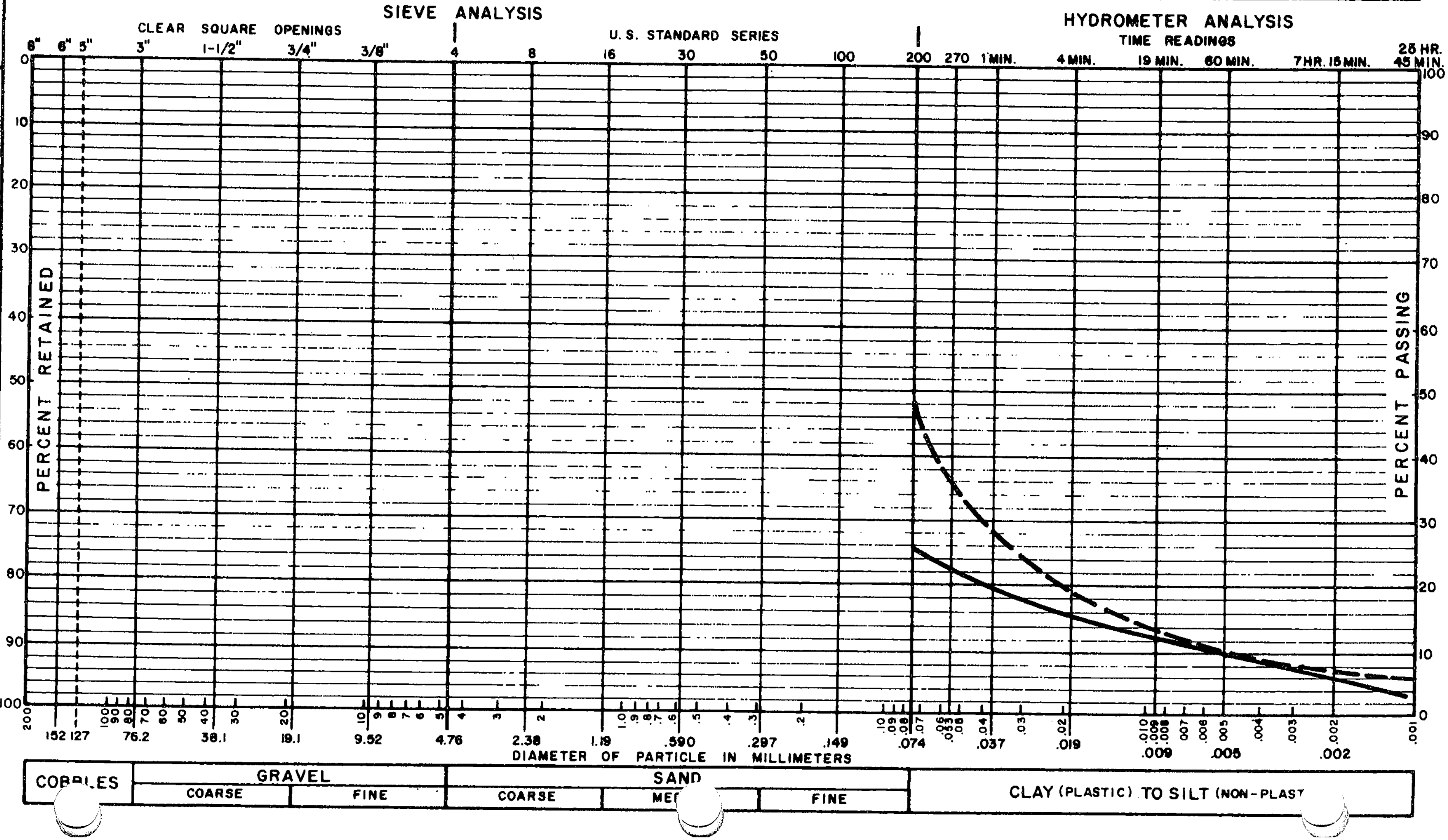
## GRAIN SIZE DISTRIBUTION CURVES

PRL - SHOOTERING CANYON URANIUM PROJECT

Figure B-2

| SAMPLE NO. | SYMBOL | DEPTH | LL | PI | UNIFIED CLASSIFICATION |
|---|---|---|---|---|---|
| BORROW AREA "F" (Sample #1) | ——— | 3' | 28 | 11 | CL |
| BORROW AREA "F" (Sample #2) | – – – | 3' | 32 | 17 | CL |



Project No. 60255J

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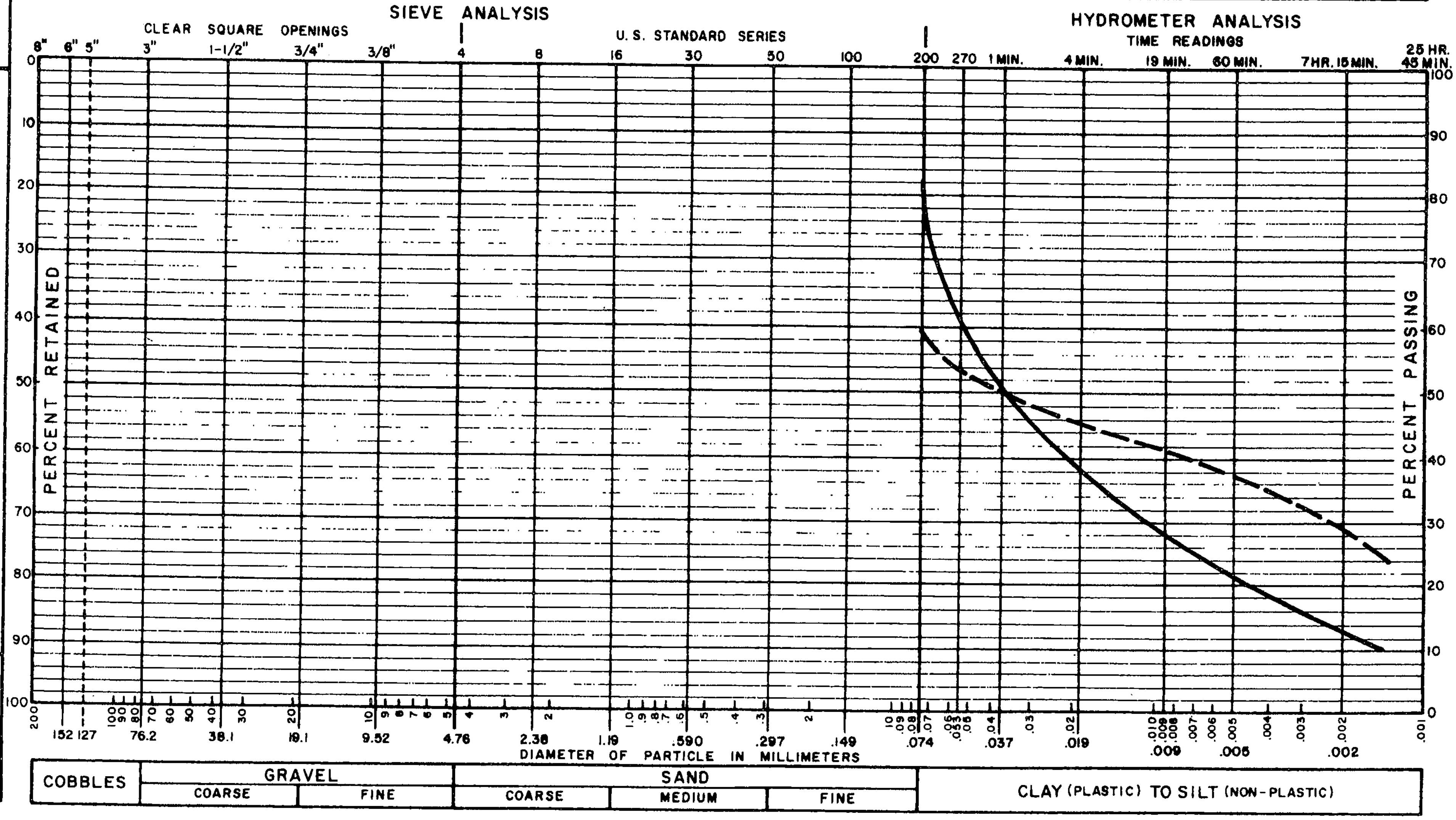
HYDROMETER ANALYSIS CURVES

PRL - SHOOTERING CANYON URANIUM PROJECT

Figure B-3

| SAMPLE NO. | SYMBOL | DEPTH | LL | PI | UNIFIED CLASSIFICATION |
|---|---|---|---|---|---|
| BORROW AREA "G" (Sample #1) | ——— | 3' | 61 | 37 | CH |
| BORROW AREA "G" (Sample #2) | — — — | ½' | 46 | 32 | CL-CH |

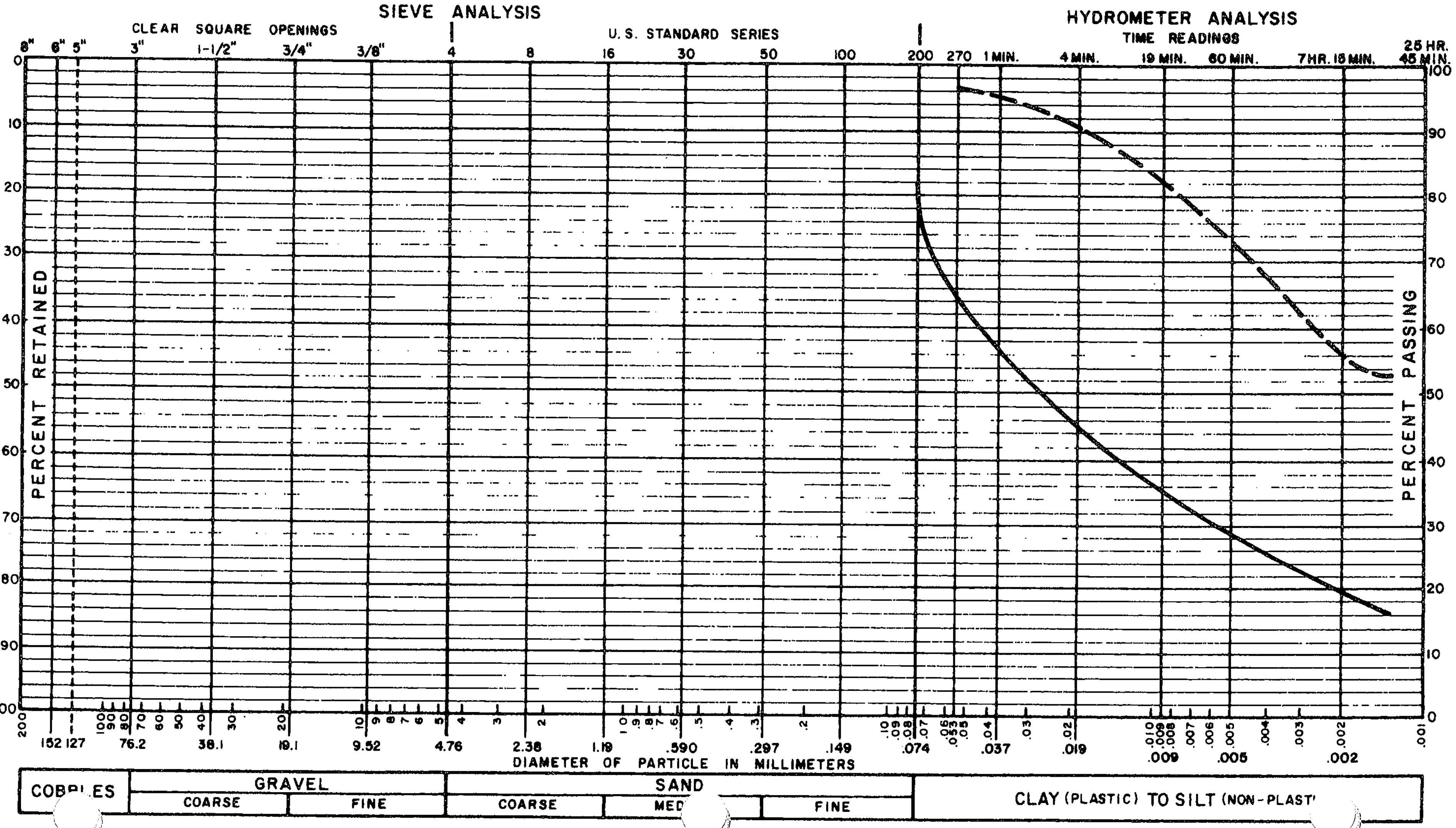


Project No. 60255J
**Woodward-Clyde Consultants**

HYDROMETER ANALYSIS CURVES
PRL - SHOOTERING CANYON URANIUM PROJECT

Figure B-4

| SAMPLE NO. | SYMBOL | DEPTH | LL | PI | UNIFIED CLASSIFICATION |
|---|---|---|---|---|---|
| BORROW AREA "H" (Sample #1) | ——— | 3' | 80 | 54 | CH |
| BORROW AREA "I" (Sample #1) | — — — | 2' | 56 | 40 | CH |



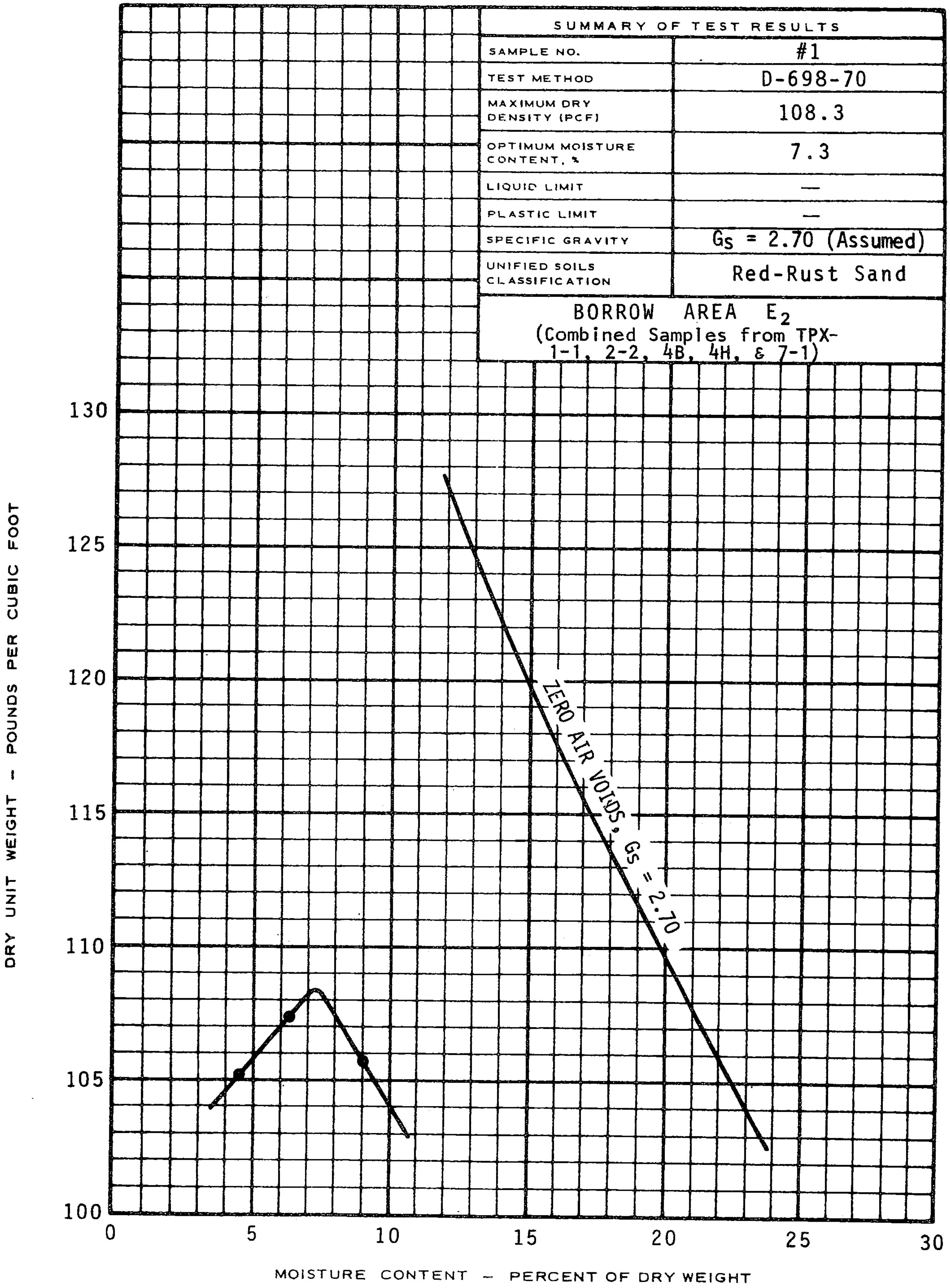
Project No. 60255J

**Woodward-Clyde Consultants**

## HYDROMETER ANALYSIS CURVES

PRL - SHOOTERING CANYON URANIUM PROJECT

Figure B-5

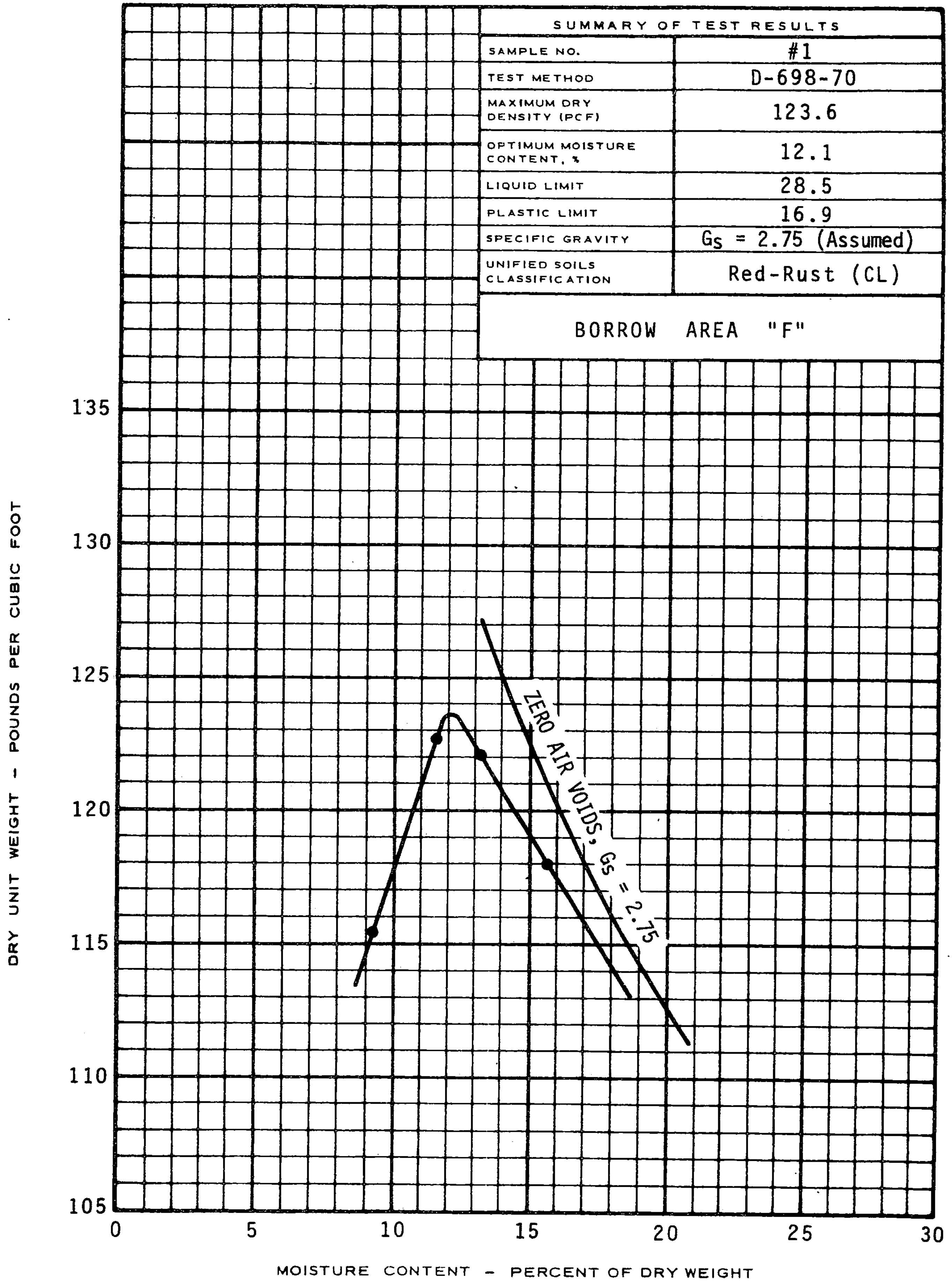


SUMMARY OF TEST RESULTS

| | |
|---|---|
| SAMPLE NO. | #1 |
| TEST METHOD | D-698-70 |
| MAXIMUM DRY DENSITY (PCF) | 108.3 |
| OPTIMUM MOISTURE CONTENT, % | 7.3 |
| LIQUID LIMIT | — |
| PLASTIC LIMIT | — |
| SPECIFIC GRAVITY | $G_S$ = 2.70 (Assumed) |
| UNIFIED SOILS CLASSIFICATION | Red-Rust Sand |

BORROW AREA $E_2$
(Combined Samples from TPX-1-1, 2-2, 4B, 4H, & 7-1)

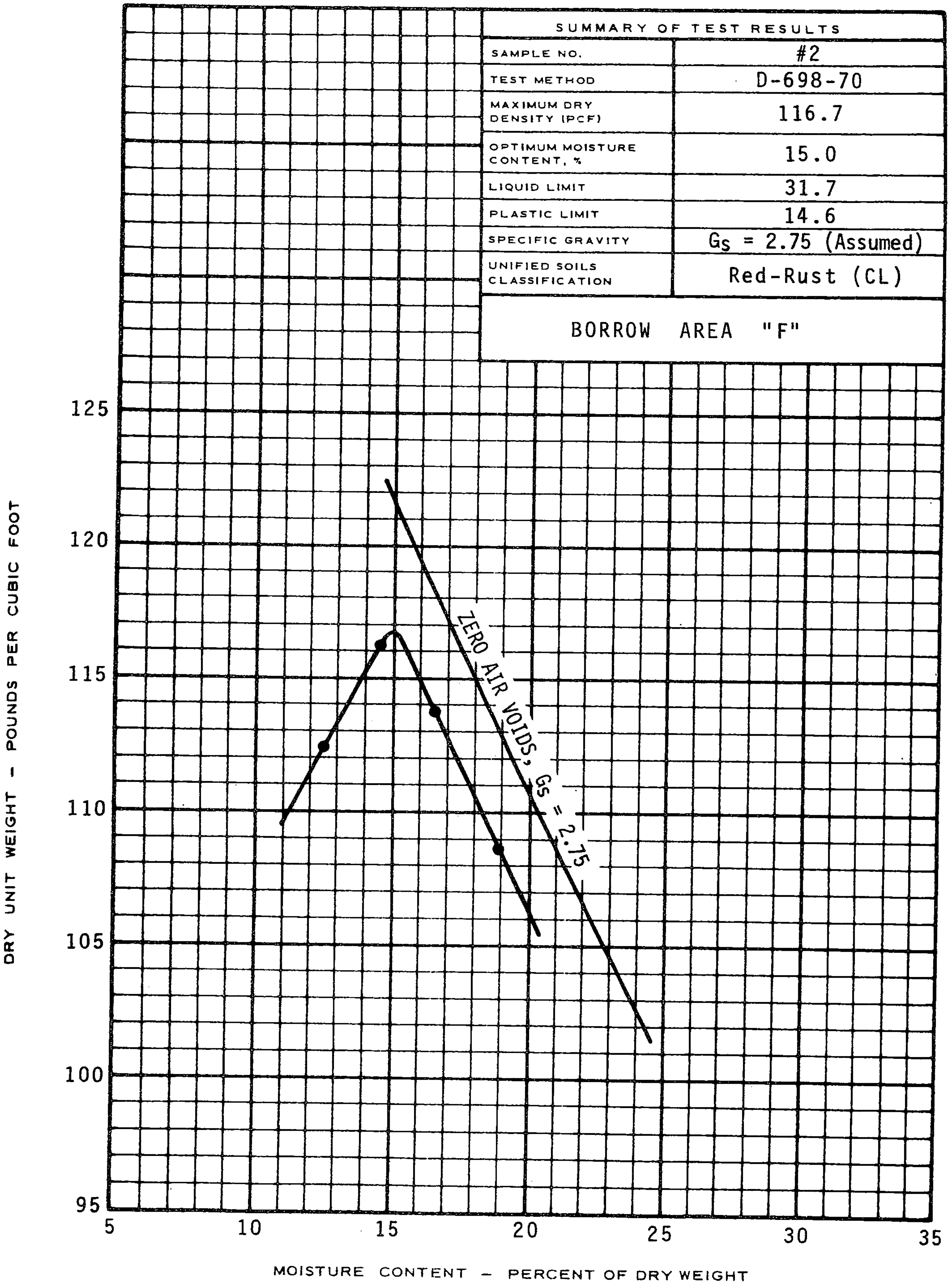
| | | |
|---|---|---|
| Project No. 60255J<br>**Woodward-Clyde Consultants** | COMPACTION TEST RESULTS<br>PRL - SHOOTERING CANYON URANIUM PROJCET | Figure B-6 |



| SUMMARY OF TEST RESULTS | |
|---|---|
| SAMPLE NO. | #1 |
| TEST METHOD | D-698-70 |
| MAXIMUM DRY DENSITY (PCF) | 123.6 |
| OPTIMUM MOISTURE CONTENT, % | 12.1 |
| LIQUID LIMIT | 28.5 |
| PLASTIC LIMIT | 16.9 |
| SPECIFIC GRAVITY | $G_S$ = 2.75 (Assumed) |
| UNIFIED SOILS CLASSIFICATION | Red-Rust (CL) |

BORROW AREA "F"

| | | |
|---|---|---|
| Project No. 60255J<br>**Woodward-Clyde Consultants** | COMPACTION TEST RESULTS<br>PRL - SHOOTERING CANYON URANIUM PROJECT | Figure B-7 |



SUMMARY OF TEST RESULTS

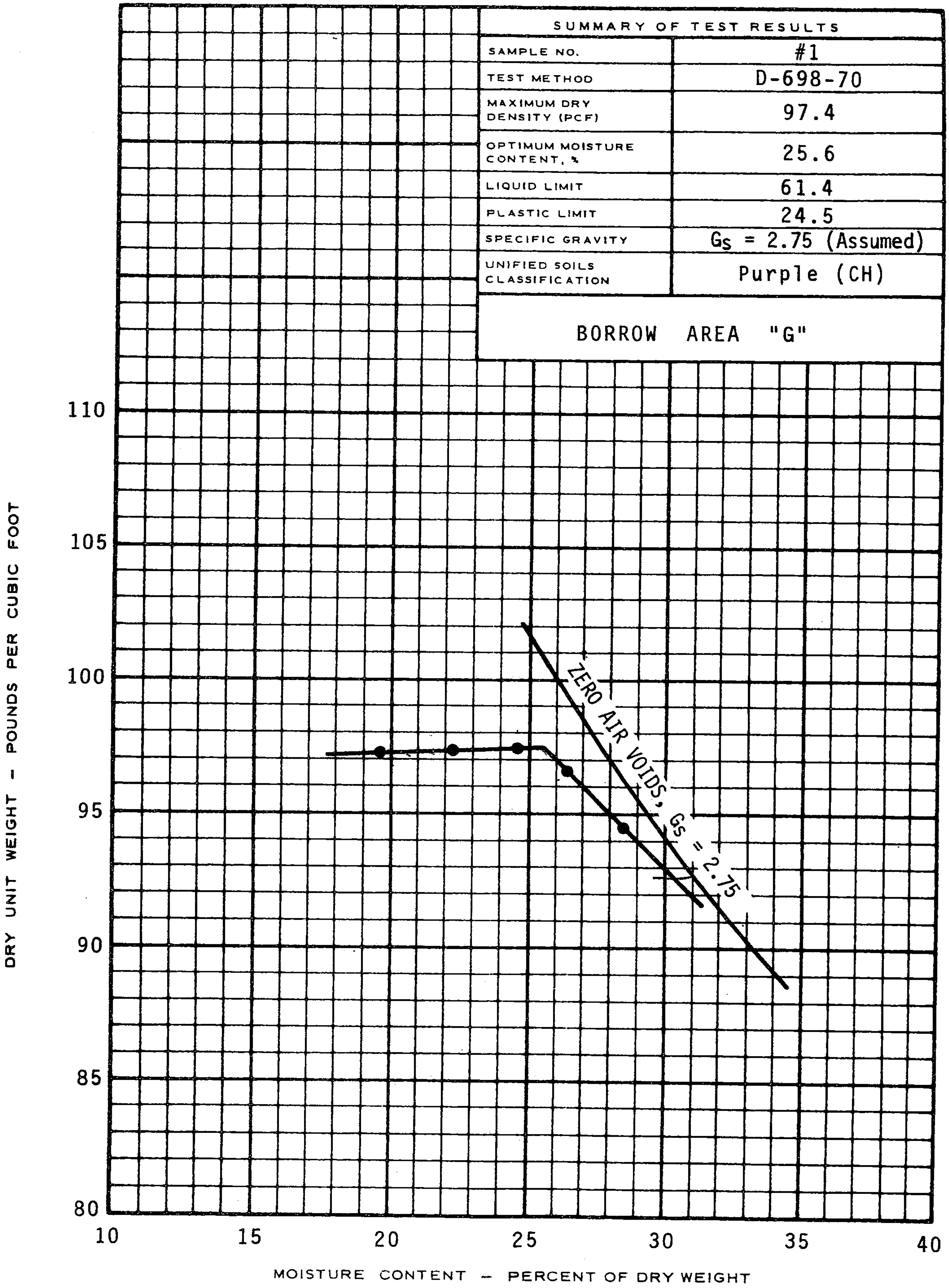
| | |
|---|---|
| SAMPLE NO. | #2 |
| TEST METHOD | D-698-70 |
| MAXIMUM DRY DENSITY (PCF) | 116.7 |
| OPTIMUM MOISTURE CONTENT, % | 15.0 |
| LIQUID LIMIT | 31.7 |
| PLASTIC LIMIT | 14.6 |
| SPECIFIC GRAVITY | $G_s$ = 2.75 (Assumed) |
| UNIFIED SOILS CLASSIFICATION | Red-Rust (CL) |

BORROW AREA "F"

Project No. 60255J
**Woodward-Clyde Consultants**

COMPACTION TEST RESULTS
PRL - SHOOTERING CANYON URANIUM PROJECT

Figure B-8

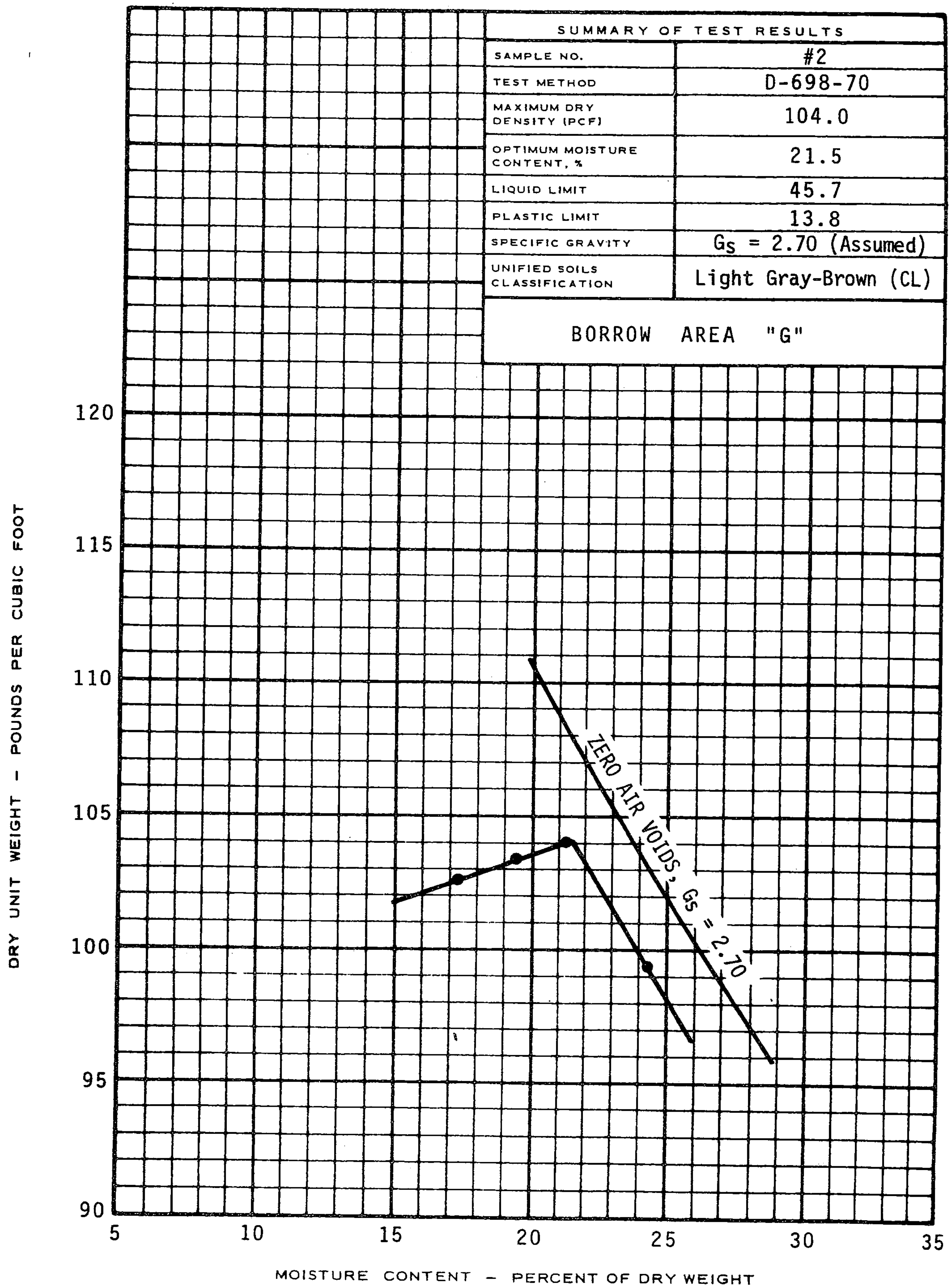


SUMMARY OF TEST RESULTS

| | |
|---|---|
| SAMPLE NO. | #1 |
| TEST METHOD | D-698-70 |
| MAXIMUM DRY DENSITY (PCF) | 97.4 |
| OPTIMUM MOISTURE CONTENT, % | 25.6 |
| LIQUID LIMIT | 61.4 |
| PLASTIC LIMIT | 24.5 |
| SPECIFIC GRAVITY | $G_S$ = 2.75 (Assumed) |
| UNIFIED SOILS CLASSIFICATION | Purple (CH) |

BORROW AREA "G"

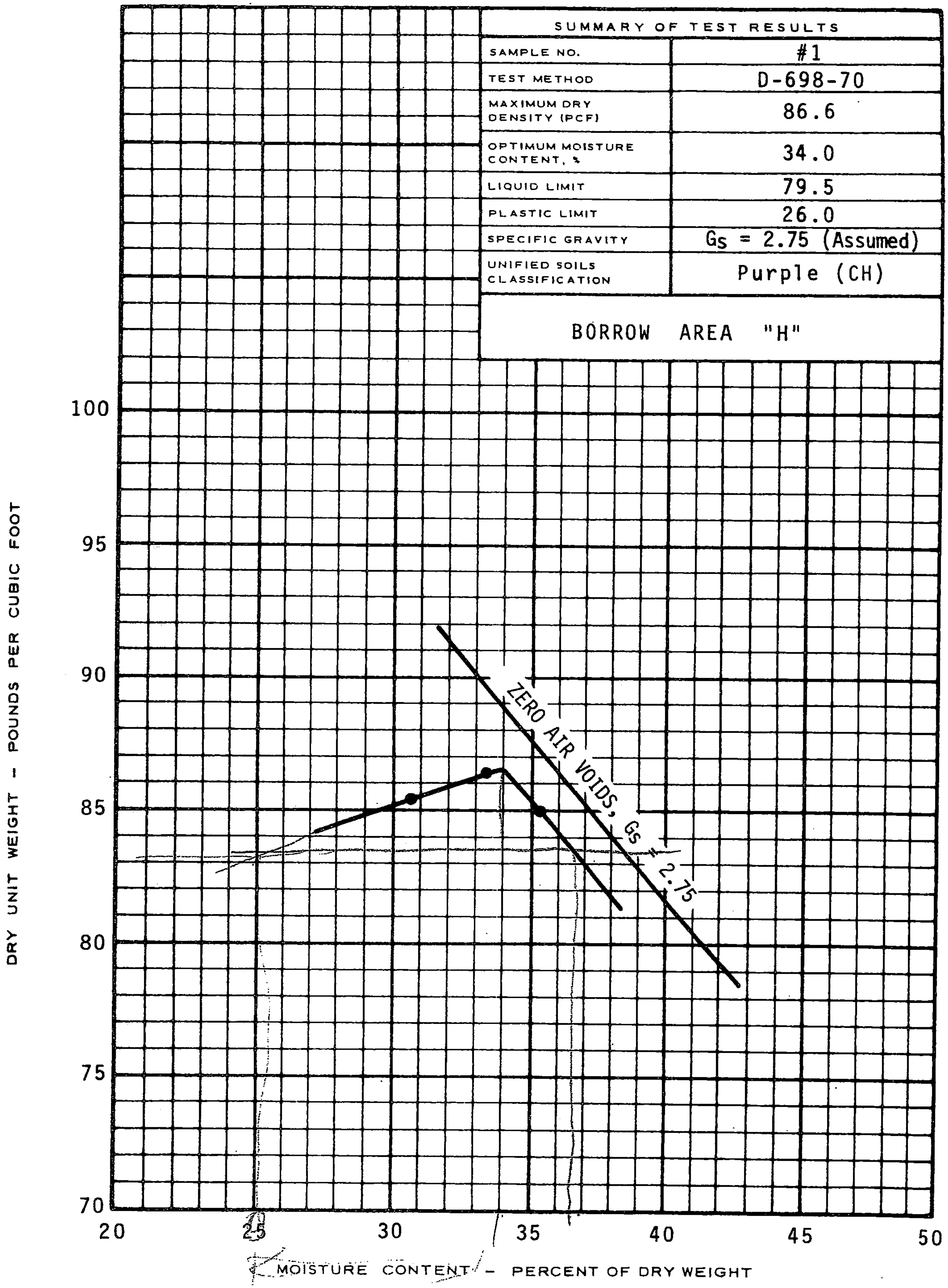
| | | |
|---|---|---|
| Project No. 60255J<br>**Woodward-Clyde Consultants** | COMPACTION TEST RESULTS<br>PRL - SHOOTERING CANYON URANIUM PROJECT | Figure B-9 |



| SUMMARY OF TEST RESULTS | |
|---|---|
| SAMPLE NO. | #2 |
| TEST METHOD | D-698-70 |
| MAXIMUM DRY DENSITY (PCF) | 104.0 |
| OPTIMUM MOISTURE CONTENT, % | 21.5 |
| LIQUID LIMIT | 45.7 |
| PLASTIC LIMIT | 13.8 |
| SPECIFIC GRAVITY | $G_s$ = 2.70 (Assumed) |
| UNIFIED SOILS CLASSIFICATION | Light Gray-Brown (CL) |

BORROW AREA "G"

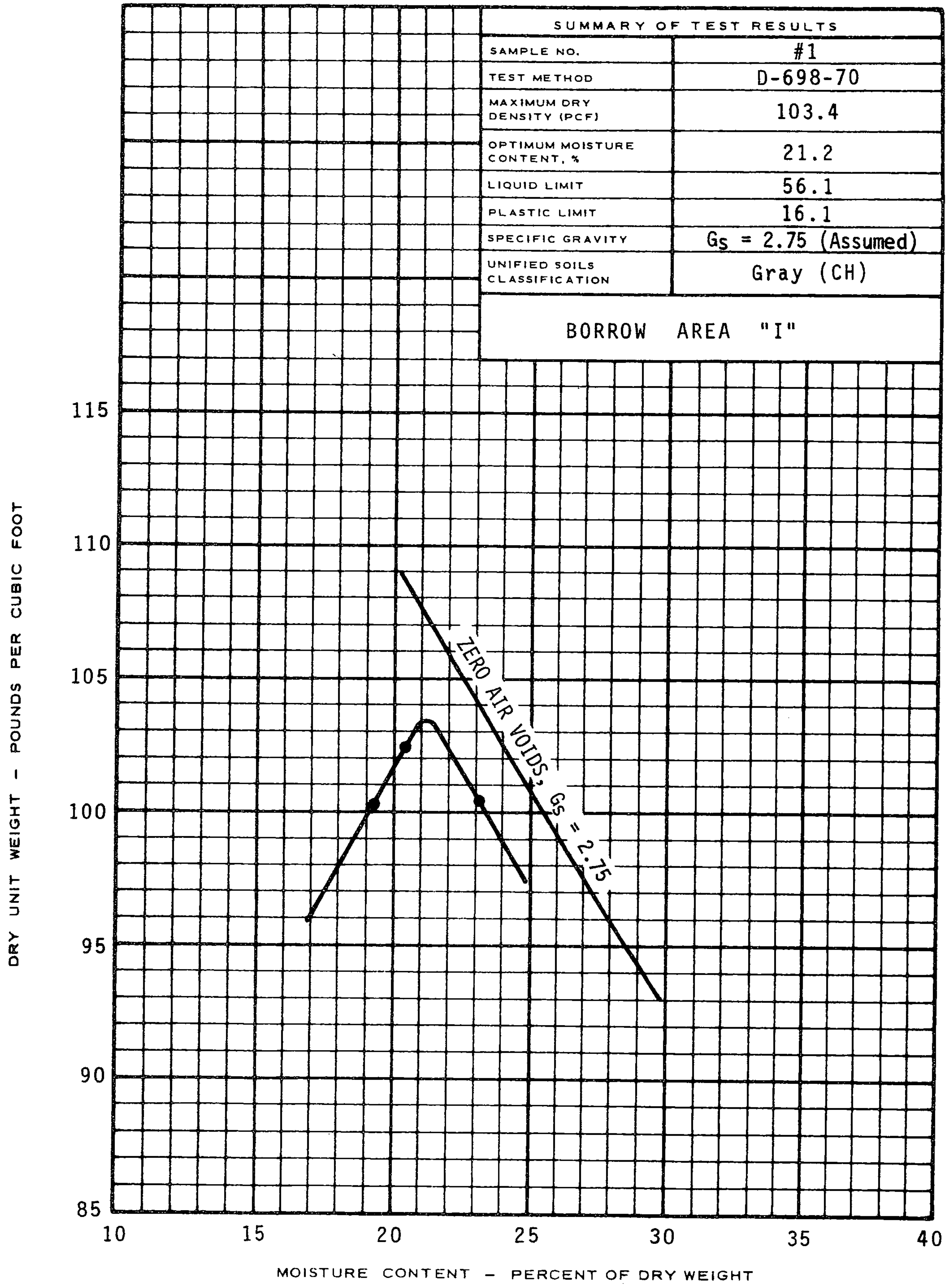
| | | |
|---|---|---|
| Project No. 60255J<br>**Woodward-Clyde Consultants** | COMPACTION TEST RESULTS<br>PRL - SHOOTERING CANYON URANIUM PROJECT | Figure B-10 |



| SUMMARY OF TEST RESULTS | |
|---|---|
| SAMPLE NO. | #1 |
| TEST METHOD | D-698-70 |
| MAXIMUM DRY DENSITY (PCF) | 86.6 |
| OPTIMUM MOISTURE CONTENT, % | 34.0 |
| LIQUID LIMIT | 79.5 |
| PLASTIC LIMIT | 26.0 |
| SPECIFIC GRAVITY | $G_S$ = 2.75 (Assumed) |
| UNIFIED SOILS CLASSIFICATION | Purple (CH) |

BORROW AREA "H"

| | | |
|---|---|---|
| Project No. 60255J<br>**Woodward-Clyde Consultants** | COMPACTION TEST RESULTS<br>PRL - SHOOTERING CANYON URANIUM PROJECT | Figure B-11 |



SUMMARY OF TEST RESULTS

| | |
|---|---|
| SAMPLE NO. | #1 |
| TEST METHOD | D-698-70 |
| MAXIMUM DRY DENSITY (PCF) | 103.4 |
| OPTIMUM MOISTURE CONTENT, % | 21.2 |
| LIQUID LIMIT | 56.1 |
| PLASTIC LIMIT | 16.1 |
| SPECIFIC GRAVITY | $G_s$ = 2.75 (Assumed) |
| UNIFIED SOILS CLASSIFICATION | Gray (CH) |

BORROW AREA "I"

| | | |
|---|---|---|
| Project No. 60255J<br>**Woodward-Clyde Consultants** | COMPACTION TEST RESULTS<br>PRL - SHOOTERING CANYON URANIUM PROJECT | Figure B-12 |

# APPENDIX C.2
# HYDRO-ENGINEERING GEOTECHNICAL INVESTIGATIONS

# APPENDIX C.2.1
# LOGS OF BORINGS AND TEST PITS
# HYDRO-ENGINEERING 2002 FIELD INVESTIGATION
# (HYDRO-ENGINEERING, 2005B)

# APPENDIX A

## BACKHOE PIT AND TEST HOLE INFORMATION

# APPENDIX A

## TABLE OF CONTENTS

## A.1 BACKHOE PIT AND TEST HOLE INFORMATION

Appendix A presents the lithologic logs obtained from the backhoe pit, drill hole, hand auger, and backhoe-hand auger/drill hole combinations that were obtained during the site evaluation in June of 2002. Also presented in Appendix A are the results of the rock thickness tests that were performed on the Shootaring Dam rock.

Table A-1 presents the lithologic logs from the eleven backhoe pits used in the site evaluation. Table A-2 presents the lithologic logs from the fourteen drill holes used in the site evaluation. Table A-3 presents the lithologic logs from the thirty-six auger holes used in the site evaluation. In some locations, backhoe pits were used in combination with the hand auger or drill hole to determine the lithology. Table A-4 presents the lithologic logs from the twenty-one backhoe pit-auger/drill hole combinations that were used in the site evaluation. Table A-5 presents the results of the ten rock thickness checks that were performed on the upstream and downstream faces of the Shootaring Dam.

## TABLE A-1. LITHOLOGIC LOGS OF BACKHOE PITS

**LITHOLOGIC LOGS**

| ***Backhoe Pit*** | ***top meas. (in.)*** | ***bottom meas. (in.)*** | ***Descriptions*** |
|---|---|---|---|
| CV4 | 0 | 18 | tan sand, rocks and clay |
| CV4 | 18 | 30 | very fine red sand, hard |
| DA1 | 0 | 39.6 | rock, sand and clay |
| DA1 | 39.6 | 48 | brown clay w/little green clay |
| DD4 | 0 | 0 | gravel @ surface |
| DD4 | 0 | 17 | very fine red sand, some rock |
| DD5 | 0 | 12 | gravel & red fine sand |
| DD5 | 12 | 17 | large rocks & clay |
| DD6 | 0 | 4 | rock & red sand |
| DD6 | 4 | 17 | red very fine sand |
| DD7 | 0 | 12 | gravel & red sand |
| DD7 | 12 | 17 | very fine sand |
| DD8 | 0 | 6 | tan very fine sand |
| DD8 | 6 | 12 | clay, rock and sand |
| DD9 | 0 | 6 | tan, very fine sand |
| DD9 | 6 | 12 | clay, rock and sand |
| ED4 | 0 | 12 | red sand and clay |
| ED4 | 12 | 48 | brown clay |
| OP33 | 0 | 15.6 | red very fine sand |
| OP33 | 15.6 | 34.8 | gray sand ore |
| OP33 | 34.8 | 40.8 | tan fine sand |
| OP33 | 40.8 | 46.8 | red very fine sand |
| T7 | 0 | 44.4 | red very fine sand |
| T7 | 44.4 | 46.8 | tails slimes |
| T7 | 46.8 |  | rock layer |

## TABLE A-2. LITHOLOGIC LOGS OF DRILL HOLES.

| LITHOLOGIC LOGS | | | |
|---|---|---|---|
| | | | |
| ***Drill Holes*** | ***top meas. (in.)*** | ***bottom meas. (in.)*** | ***Descriptions*** |
| CV1 | 0 | 36 | tan rock, sand and clay |
| CV1 | 36 | 60 | red very fine sand |
| CV1 | 60 | 228 | red very fine sand |
| CV1 | 228 | 264 | brown clay |
| CV1 | 264 | 324 | red very fine |
| CV2 | 0 | 36 | tan rock, sand and clay |
| CV2 | 36 | 300 | very fine red sand |
| CV2 | 300 | 360 | very fine red sand |
| CV2 | 360 | 492 | very fine red sand |
| CV2 | 492 | 564 | brown clay |
| CV2 | 564 | 588 | white very fine sandstone, Entrada |
| CV2 | 588 | 600 | red silty, very fine sandstone |
| CV3 | 0 | 30 | tan rock, sand and clay |
| CV3 | 30 | 120 | red very fine sand, dry |
| CV3 | 120 | 180 | red very fine sand w/ little moisture |
| CV3 | 180 | 216 | red very fine sand w/ little moisture |
| CV3 | 216 | 258 | brown clay, dry |
| CV3 | 258 | 300 | red very fine sandstone, Entrada |
| ED1 | 0 | 12 | rock, sand and clay |
| ED1 | 12 | 48 | red very fine sand |
| ED1 | 48 | 144 | tan very fine sand and clay |
| ED1 | 144 | 162 | brown clay |
| ED1 | 162 | 180 | red very fine sandstone, Entrada |
| ED3 | 0 | 12 | rock, sand and clay |
| ED3 | 12 | 53 | tan very fine silty sand |
| ED3 | 54 | 72 | red very fine sand |
| ED3 | 72 | 102 | brown clay |
| ED3 | 102 | 120 | red very fine sandstone, Entrada |
| ND1 | 0 | 12 | rock, clay and sand |
| ND1 | 12 | 60 | tan very fine sand |
| ND1 | 60 | 72 | tan & brown very fine sand w/ piece of wood & plastic |
| ND1 | 72 | 84 | concrete |
| ND1 | 84 | 108 | red very fine sand |
| ND1 | 108 | 126 | brown clay |
| ND1 | 126 | 144 | red very fine sandstone, Entrada |
| ND2 | 0 | 24 | rock, clay and sand |
| ND2 | 24 | 84 | very fine sand, clays & rocks |
| ND2 | 84 | 120 | tan very fine sand, moist |
| ND2 | 120 | 180 | brown sand & clay w/ some rock & wood, plastic |
| ND2 | 180 | 240 | very fine tan sand |
| ND2 | 240 | 288 | very fine tan sand |
| ND2 | 288 | 312 | clay |
| ND3 | 0 | 24 | rock, sand and clay |
| ND3 | 24 | 48 | brown sand & clay w/ some wood |
| ND3 | 48 | 120 | tan fine sand |
| ND3 | 120 | 168 | tan fine sand |

## TABLE A-2. LITHOLOGIC LOGS OF DRILL HOLES. (cont'd.)

**LITHOLOGIC LOGS**

| *Drill Holes* | *top meas. (in.)* | *bottom meas. (in.)* | *Descriptions* |
|---|---|---|---|
| ND3 | 168 | 180 | red very fine sand |
| ND3 | 180 | 204 | brown clay |
| ND3 | 204 | 240 | red very fine sand, Entrada |
| ND3 | 240 |  | white sandstone |
| T1 | 0 | 60 | red very fine sand w/some clay |
| T1 | 60 | 90 | very fine tan & brown sand w/ some clay |
| T1 | 90 | 108 | rock, sand and clay |
| T1 | 108 | 126 | red very fine sand |
| T1 | 126 | 162 | brown clay |
| T1 | 162 | 174 | red very fine sand |
| T2 | 0 | 18 | red very fine sand |
| T2 | 18 | 60 | tan very fine sand, tails |
| T2 | 60 | 108 | tan very fine sand, tails, some slime |
| T2 | 108 | 120 | red very fine sand |
| T2 | 120 | 126 | brown sand clay |
| T2 | 126 | 168 | brown clay |
| T2 | 168 | 180 | light brown very fine sand |
| T3 | 0 | 24 | red very fine sand |
| T3 | 24 | 60 | tan fine sand, tailings |
| T3 | 60 | 96 | tan fine sand, tailings w/little moisture |
| T3 | 96 | 204 | tan fine sand, tailings w/little moisture |
| T3 | 204 | 216 | red very fine sand |
| T3 | 216 | 234 | rock and fine sand |
| T3 | 234 | 270 | red very fine sand |
| T3 | 270 | 348 | brown clay |
| T3 | 348 | 372 | red very fine sand, Entrada |
| T4 | 0 | 18 | very fine red sand |
| T4 | 18 | 60 | tan tailings sand and slimes |
| T4 | 60 | 120 | tan tailings sand |
| T4 | 120 | 156 | shelby tube |
| T4 | 120 | 192 | tan tailings sand |
| T4 | 192 | 216 | rock and red very fine sand |
| T4 | 216 |  | top of clay |
| T5 | 0 | 24 | very fine red sand |
| T5 | 24 | 54 | tailings slime |
| T5 | 54 | 66 | rock, sand and clay |
| T5 | 66 | 78 | red very fine sand |
| T5 | 78 |  | clay |
| T6 | 0 | 18 | red very fine sand |
| T6 | 18 | 24 | tailings slime |
| T6 | 24 | 72 | red very fine sand |
| T6 | 72 | 96 | gravel, tan sand |
| T6 | 96 |  | clay |

## TABLE A-3. LITHOLOGIC LOGS OF AUGER HOLES.

**LITHOLOGIC LOGS**

| ***Auger Holes*** | ***top meas. (in.)*** | ***bottom meas. (in.)*** | ***Descriptions*** |
|---|---|---|---|
| C1 | 0 | 12 | red clay w/ some white mudstone |
| C1 | 12 | 36 | red very fine sandstone, Entrada |
| C10 | 0 | 8 | red clay w/some fine sand |
| C10 | 8 | 42 | red clay w/green clay |
| C10 | 42 | 59 | very fine red sand |
| C11 | 0 | 9 | very fine sand and clay |
| C11 | 9 | 38 | red very fine sand |
| C12 | 0 | 34 | red clay w/some green sandy mudstone |
| C12 | 34 |  | red very fine sandstone |
| C13 | 0 | 38 | red clay w/ 20% green mudstone |
| C13 | 38 | 41 | very fine red sand |
| C2 | 0 | 12 | red clay w/approx. 20% white mudstone |
| C2 | 12 | 24 | red clay w/approx. 20% white mudstone |
| C2 | 24 | 36 | red very fine sandstone, Entrada |
| C3 | 0 | 34 | red clay w/20% mudstone, little 1-6" rock |
| C3 | 34 | 38 | red very fine sandstone, Entrada |
| C5 | 0 | 18 | red clay w/little red & white mudstone |
| C5 | 18 | 24 | very fine red sandstone, Entrada |
| C7 | 0 | 15 | red clay |
| C7 | 15 | 21 | very fine gray sandstone |
| C7 | 21 | 33 | very fine sandstone |
| C7 | 33 | 66 | red clay |
| C7 | 66 |  | rock |
| C8 | 0 | 17 | red clay |
| C8 | 17 | 20 | very fine red sand |
| C8 | 20 | 69 | clay, red |
| C8 | 69 | 84 | very fine red sandstone |
| C9 | 0 | 7 | red clay |
| C9 | 7 | 14 | very fine red sand |
| C9 | 14 | 50 | red clay w/ some green clay |
| C9 | 50 | 60 | very fine red sandstone |
| D96 | 0 | 42 | red sand |
| D96 | 42 | 72 | red sand |
| D96 | 72 | 102 | red sand |
| D97 | 0 | 54 | red sand |
| D97 | 54 | 66 | red sand |
| D98 | 0 | 18 | red sand |
| D98 | 18 | 30 | red sand |
| D98 | 30 | 42 | red sand |
| D99 | 0 | 42 | red sand |
| D99 | 42 |  | white sand |
| NA1 | 0 | 5 | rock, sand and clay |
| NA1 | 5 | 21 | very fine red sand |
| NA1 | 21 | 43 | red clay w/little green clay |

## TABLE A-3. LITHOLOGIC LOGS OF AUGER HOLES. (cont'd.)

| LITHOLOGIC LOGS | | | |
|---|---|---|---|
| | | | |
| | *top* | *bottom* | |
| *Auger Holes* | *meas. (in.)* | *meas. (in.)* | *Descriptions* |
| NA1 | 43 | 49 | red clay and very fine sand |
| NA1 | 49 | 54 | very fine red sand |
| NA1 | 54 | 85 | red clay |
| NA1 | 85 | 86 | red very fine sand, Entrada |
| NA10 | 0 | 6 | rock, sand and clay |
| NA10 | 6 | 27 | red sand, very fine |
| NA10 | 27 | 75 | clay |
| NA10 | 75 | | sand |
| NA11 | 0 | 12 | rock, sand and clay |
| NA11 | 12 | 30 | red very fine sand |
| NA11 | 30 | 58 | brown clay w/little green mudstone |
| NA11 | 58 | 64 | red very fine sandstone, Entrada |
| NA12 | 0 | 10 | rock, sand and clay |
| NA12 | 10 | 20 | very fine red sand |
| NA12 | 20 | 55 | purple clay w/ some green clay |
| NA12 | 55 | 60 | very fine red sandstone, Entrada |
| NA13 | 0 | 10 | rock, clay and sand |
| NA13 | 10 | 21 | red very fine sand |
| NA13 | 21 | 38 | purple clay w/ some green clay |
| NA13 | 38 | 40 | very fine red sandstone, Entrada |
| NA14 | 0 | 1 | very fine red sand w/ small gravel |
| NA14 | 1 | 15 | red very fine sand |
| NA14 | 15 | 53 | brown clay w/ green clay |
| NA14 | 53 | 59 | red very fine sandstone, Entrada |
| NA15 | 0 | 15 | sand, rock and clay |
| NA15 | 15 | 22 | red sand |
| NA15 | 22 | 68 | clay |
| NA15 | 68 | | red sand |
| NA16 | 0 | 10 | rock, sand and clay |
| NA16 | 10 | 25 | red sand |
| NA16 | 25 | 55 | clay |
| NA16 | 55 | | red sand |
| NA17 | 0 | 12 | rock, sand and clay |
| NA17 | 12 | 23 | red sand |
| NA17 | 23 | 48 | clay |
| NA17 | 48 | | sand |
| NA18 | 0 | 11 | rock, sand and clay |
| NA18 | 11 | 24 | red sand |
| NA18 | 24 | 72 | clay |
| NA18 | 72 | | sand |
| NA19 | 0 | 6 | rock, clay and sand |
| NA19 | 6 | 16 | sand |
| NA19 | 16 | 73 | clay |
| NA19 | 73 | | sand |

## TABLE A-3. LITHOLOGIC LOGS OF AUGER HOLES. (cont'd.)

| LITHOLOGIC LOGS | | | |
|---|---|---|---|
| | | | |
| ***Auger Holes*** | ***top meas. (in.)*** | ***bottom meas. (in.)*** | ***Descriptions*** |
| NA2 | 0 | 15 | sand, rock and clay |
| NA2 | 15 | 27 | very fine red sand |
| NA2 | 27 | 42 | red clay |
| NA2 | 42 | 47 | very fine red sand, Entrada |
| NA20 | 0 | 10 | rock, clay and sand |
| NA20 | 10 | 22 | sand |
| NA20 | 22 | 44 | clay |
| NA20 | 44 | | sand |
| NA3 | 0 | 7 | rock, sand and clay |
| NA3 | 7 | 20 | very fine sand |
| NA3 | 20 | 71 | red clay |
| NA4 | 0 | 11 | rock, sand and clay |
| NA4 | 11 | 20 | fine red |
| NA4 | 20 | 78 | clay |
| NA4 | 78 | | red Entrada |
| NA5 | 0 | 4 | rock, sand and clay |
| NA5 | 4 | 16 | red fine sand |
| NA5 | 16 | 21 | clay |
| NA5 | 21 | | red Entrada |
| NA6 | 0 | 12 | rock, sand and clay |
| NA6 | 12 | 25 | red sand |
| NA6 | 25 | 65 | clay |
| NA6 | 65 | | sand |
| NA7 | 0 | 5 | rock, sand and clay |
| NA7 | 5 | 25 | red sand, fine |
| NA7 | 25 | 59 | clay |
| NA7 | 59 | | sand |
| NA8 | 0 | 6 | rock, sand and clay |
| NA8 | 6 | 18 | very fine red sand |
| NA8 | 18 | 29 | red clay w/ little green clay |
| NA8 | 29 | 34 | red clay & sandy green mudstone |
| NA8 | 34 | 37 | red very fine sandstone, Entrada |
| NA9 | 0 | 3 | sand, rock and clay |
| NA9 | 3 | 14 | very fine red sand |
| NA9 | 14 | 53 | red clay w/ some green silty clay |
| NA9 | 53 | 60 | red very fine sandstone, Entrada |
| OP31 | 0 | 8.4 | red very fine sand |
| OP31 | 8.4 | 42 | ore sand, hit rock |

## TABLE A-4. LITHOLOGIC LOGS OF DRILL OR AUGER HOLE/BACKHOE PITS

| LITHOLOGIC LOGS | | | |
|---|---|---|---|
| | | | |
| | top | bottom | |
| ***Auger/Backhoe Pit*** | ***meas. (in.)*** | ***meas. (in.)*** | ***Descriptions*** |
| C4 | 0 | 60 | red clay w/ green & brown mudstone approx. 15% up to 4" size |
| C4 | 60 | 66 | sand and clay |
| C4 | 66 | 72 | very fine red sand, Entrada |
| C6 | 0 | 12 | red clay dry, some rock |
| C6 | 12 | 36 | moist clay, red, some white sandstone |
| C6 | 36 | 58 | Entrada sandstone |
| ED2 | 0 | 24 | rock, sand and clay |
| ED2 | 24 | 54 | tan very fine sand |
| ED2 | 54 | 60 | red sand |
| ED2 | 60 | 126 | very fine to very coarse sand |
| ED2 | 126 | 142 | clay |
| ED2 | 142 | 180 | very fine red sandstone, Entrada |
| NP1 | 0 | 12 | rock, sand and clay |
| NP1 | 12 | 21 | Sand |
| NP1 | 21 | 38 | clay |
| NP1 | 38 | | Sand |
| NP10 | 0 | 16 | clay, sand and rock |
| NP10 | 16 | 28 | Sand |
| NP10 | 28 | 100 | clay |
| NP10 | 100 | | Sand |
| NP11 | 0 | 20 | sand, rock and clay |
| NP11 | 20 | 31 | sand |
| NP11 | 31 | 86 | clay |
| NP11 | 86 | | sand |
| NP2 | 0 | 10 | rock, sand and clay |
| NP2 | 10 | 32 | red very fine sand |
| NP2 | 32 | 66 | red clay w/ some white clay |
| NP2 | 66 | 72 | red very fine sandstone, Entrada |
| NP3 | 0 | 10 | rock, sand and clay |
| NP3 | 10 | 22 | red sand |
| NP3 | 22 | 40 | clay |
| NP3 | 40 | | red sand |
| NP4 | 0 | 12 | rock, clay and sand |
| NP4 | 12 | 19 | red sand |
| NP4 | 19 | 69 | clay |
| NP4 | 69 | | sand |
| NP5 | 0 | 7 | rock, sand and clay |
| NP5 | 7 | 23 | Sand |
| NP5 | 23 | 85 | clay |
| NP5 | 85 | | sand |
| NP6 | 0 | 12 | rock, clay and sand |
| NP6 | 12 | 18 | sand |
| NP6 | 18 | 27 | rock, clay and sand |

## TABLE A-4. LITHOLOGIC LOGS OF DRILL OR AUGER HOLE/BACKHOE PITS (cont'd.)

**LITHOLOGIC LOGS**

| *Auger/Backhoe Pit* | *top meas. (in.)* | *bottom meas. (in.)* | *Descriptions* |
|---|---|---|---|
| NP6 | 27 | 45 | Sand |
| NP6 | 45 | 87 | clay |
| NP6 | 87 | | Sand |
| NP7 | 0 | 12 | rock, clay and sand |
| NP7 | 12 | 22.5 | Sand |
| NP7 | 22.5 | 53.5 | clay |
| NP7 | 53.5 | | sand |
| NP8 | 0 | 10 | clay, rock and sand |
| NP8 | 10 | 27 | sand |
| NP8 | 27 | 64 | clay |
| NP8 | 64 | | sand |
| NP9 | 0 | 21 | clay, rock and sand |
| NP9 | 21 | 37 | sand |
| NP9 | 37 | 71 | clay |
| NP9 | 71 | | sand |
| OP32 | 0 | 4.8 | very fine red sand |
| OP32 | 4.8 | 44.4 | ore sand |
| OP32 | 44.4 | 55.2 | red very fine sand |
| WP1 | 0 | 12 | rock, clay and sand |
| WP1 | 12 | 30 | Sand |
| WP1 | 30 | 54 | clay |
| WP1 | 54 | | Sand |
| WP2 | 0 | 6 | rock and clay |
| WP2 | 6 | 19 | Sand |
| WP2 | 19 | 23 | rock and clay |
| WP2 | 23 | 38 | Sand |
| WP2 | 38 | 82 | clay |
| WP2 | 82 | | Sand |
| WP3 | 0 | 6 | rock and clay |
| WP3 | 6 | 18 | Sand |
| WP3 | 18 | 28.5 | rock, clay and sand |
| WP3 | 28.5 | 42.5 | Sand |
| WP3 | 42.5 | 72.5 | clay |
| WP3 | 72.5 | | Sand |
| WP4 | 0 | 11 | rock, clay and sand |
| WP4 | 11 | 21 | Sand |
| WP4 | 21 | 69 | clay |
| WP4 | 69 | | Sand |
| WP5 | 0 | 14 | rock, clay and sand |
| WP5 | 14 | 28 | Sand |
| WP5 | 28 | 45 | rock, clay and sand |
| WP5 | 48 | 51 | Sand |
| WP5 | 51 | 91 | clay |
| WP5 | 91 | | Sand |

## TABLE A-4. LITHOLOGIC LOGS OF DRILL OR AUGER HOLE/BACKHOE PITS (cont'd.)

| LITHOLOGIC LOGS | | | |
|---|---|---|---|
| | | | |
| | ***top*** | ***bottom*** | |
| ***Auger/Backhoe Pit*** | ***meas. (in.)*** | ***meas. (in.)*** | ***Descriptions*** |
| WP6 | 0 | 4 | rock, clay and sand |
| WP6 | 4 | 14 | Sand |
| WP6 | 14 | 28 | rock, clay and sand |
| WP6 | 28 | 45 | Sand |
| WP6 | 45 | 62.5 | clay |
| WP6 | 62.5 | | Sand |

## TABLE A-5. TAILINGS DAM ROCK THICKNESS

| SAMPLE SITE | THICKNESS (FT.) |
|---|---|
| DS1 | 1.9 |
| DS2 | 2.3 |
| RT1 | 2.1 |
| RT2 | 2.2 |
| RT3 | 2.1 |
| RT4 | 2.0 |
| RT5 | 2.3 |
| RT6 | 2.6 |
| RT7 | 3.6 |
| RT8 | 3.8 |

# APPENDIX C.2.2
# LABORATORY TEST RESULTS
# HYDRO-ENGINEERING 2002 FIELD INVESTIGATION
# (HYDRO-ENGINEERING, 2005B)

# APPENDIX C

# MATERIALS PROPERTIES

# APPENDIX C

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## TABLES

## APPENDIX C

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FIGURES

ATTACHMENTS

## C.1 Tailings and Ore Physical Properties

Samples were taken from the tailings and the ore piles and tests were run on these samples to determine the physical properties of these materials for use in the design of the tailings reclamation plan. Gradation results from tailings samples T3, T4 and T7 are presented in Tables C-1, C-2, and C-3, respectively. Tailings samples T3 and T4 are tailings sand samples and tailings sample T7 is a sample of the tailings slime. Tables C-4, C-5, and C-6 present the gradation results from ore samples OP31, OP32, and CV4, respectively. Ore samples OP31 and OP32 were taken directly from the ore piles. Ore sample CV4 was taken from the cross-valley berm at a depth of 0"-5".

# TABLE C-1. Gradation Results for Tailings Sample T3, 8' – 10'8"

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*Toll Free 888.235.0515 • 307.235.0515 • Fax 307.234.1639 • casper@energylab.com • www.energylab.com*

## LABORATORY ANALYTICAL REPORT

**Client:** US Energy
**Project:** Plateau Resources Shootaring Canyon
**Lab ID:** C02060335-007
**Client Sample ID:** T3 8-10'8"

**Report Date:** 07/08/02
**Collection Date:** 06/05/02
**Date Received:** 06/10/02
**Matrix:** SOIL

| Analyses | Result | Units | Qual | RL | MCL/ QCL | Method | Analysis Date / By |
|---|---|---|---|---|---|---|---|
| **PHYSICAL PROPERTIES** | | | | | | | |
| Moisture | 5.1 | % | | 0.1 | | USDA26 | 06/12/02 10:27 / vh |
| **RADIONUCLIDES - TOTAL** | | | | | | | |
| Radium 226 | 45.6 | pCi/g-dry | | 0.1 | | E903.0 | 06/27/02 03:08 / rs |
| Radium 226 precision | 1.6 | ± | | | | E903.0 | 06/27/02 03:08 / rs |
| Thorium 230 | 12.4 | pCi/g-dry | | 0.1 | | E907.0 | 06/21/02 10:30 / ph |
| Thorium 230 precision | 0.5 | ± | | | | E907.0 | 06/21/02 10:30 / ph |
| Uranium | 100 | pCi/g-dry | | 0.01 | | SW6020 | 06/23/02 02:47 / smd |
| **SIEVES** | | | | | | | |
| 0.125 Inch Sieve, Passed | 99.9 | % | | 1.0 | | ASA15-2 | 06/26/02 07:00 / lmh |
| 0.125 Inch Sieve, Retained | ND | % | | 1.0 | | ASA15-2 | 06/26/02 07:00 / lmh |
| 0.185 Inch Sieve, Passed | 99.4 | % | | 1.0 | | ASA15-2 | 06/26/02 07:00 / lmh |
| 0.185 Inch Sieve, Retained | ND | % | | 1.0 | | ASA15-2 | 06/26/02 07:00 / lmh |
| No. 12 Sieve, Passed | 97.7 | % | | 1.0 | | ASA15-2 | 06/26/02 07:00 / lmh |
| No. 12 Sieve, Retained | 1.6 | % | | 1.0 | | ASA15-2 | 06/26/02 07:00 / lmh |
| No. 20 Sieve, Passed | 95.1 | % | | 1.0 | | ASA15-2 | 06/26/02 07:00 / lmh |
| No. 20 Sieve, Retained | 2.6 | % | | 1.0 | | ASA15-2 | 06/26/02 07:00 / lmh |
| No. 60 Sieve, Passed | 61.5 | % | | 1.0 | | ASA15-2 | 06/26/02 07:00 / lmh |
| No. 60 Sieve, Retained | 33.6 | % | | 1.0 | | ASA15-2 | 06/26/02 07:00 / lmh |
| No. 100 Sieve, Passed | 23.7 | % | | 1.0 | | ASA15-2 | 06/26/02 07:00 / lmh |
| No. 100 Sieve, Retained | 37.8 | % | | 1.0 | | ASA15-2 | 06/26/02 07:00 / lmh |
| No. 200 Sieve, Passed | 4.8 | % | | 1.0 | | ASA15-2 | 06/26/02 07:00 / lmh |
| No. 200 Sieve, Retained | 18.9 | % | | 1.0 | | ASA15-2 | 06/26/02 07:00 / lmh |

**Report Definitions:**
RL - Analyte reporting limit.
QCL - Quality control limit.
MCL - Maximum contaminant level.
ND - Not detected at the reporting limit.

# TABLE C-2. Gradation Results for Tailings Sample T4, 10' – 13'

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## LABORATORY ANALYTICAL REPORT

**Client:** US Energy
**Project:** Plateau Resources Shootaring Canyon
**Lab ID:** C02060335-008
**Client Sample ID:** T4 10'-13'

**Report Date:** 07/08/02
**Collection Date:** 06/05/02
**Date Received:** 06/10/02
**Matrix:** SOIL

| Analyses | Result | Units | Qual | RL | MCL/ QCL | Method | Analysis Date / By |
|---|---|---|---|---|---|---|---|
| **PHYSICAL PROPERTIES** | | | | | | | |
| Moisture | 9.4 | % | | 0.1 | | USDA26 | 06/12/02 10:27 / vh |
| **RADIONUCLIDES - TOTAL** | | | | | | | |
| Radium 226 | 51.8 | pCi/g-dry | | 0.1 | | E903.0 | 06/27/02 03:17 / rs |
| Radium 226 precision | 1.9 | ± | | | | E903.0 | 06/27/02 03:17 / rs |
| Thorium 230 | 28.8 | pCi/g-dry | | 0 1 | | E907 0 | 06/21/02 10:30 / ph |
| Thorium 230 precision | 0.8 | ± | | | | E907.0 | 06/21/02 10:30 / ph |
| Uranium | 21.5 | pCi/g-dry | | 0.01 | | SW6020 | 06/23/02 02:50 / smd |
| **SIEVES** | | | | | | | |
| 0.125 Inch Sieve, Passed | 98.3 | % | | 1.0 | | ASA15-2 | 06/26/02 07:00 / lmh |
| 0.125 Inch Sieve, Retained | 1.7 | % | | 1.0 | | ASA15-2 | 06/26/02 07:00 / lmh |
| 0.185 Inch Sieve, Passed | 96.5 | % | | 1.0 | | ASA15-2 | 06/26/02 07:00 / lmh |
| 0.185 Inch Sieve, Retained | 96.5 | % | | 1.0 | | ASA15-2 | 06/26/02 07:00 / lmh |
| No. 12 Sieve, Passed | 92.8 | % | | 1.0 | | ASA15-2 | 06/26/02 07:00 / lmh |
| No. 12 Sieve, Retained | 3.7 | % | | 1.0 | | ASA15-2 | 06/26/02 07:00 / lmh |
| No. 20 Sieve, Passed | 90.0 | % | | 1.0 | | ASA15-2 | 06/26/02 07:00 / lmh |
| No. 20 Sieve, Retained | 2.8 | % | | 1.0 | | ASA15-2 | 06/26/02 07:00 / lmh |
| No. 60 Sieve, Passed | 76.3 | % | | 1.0 | | ASA15-2 | 06/26/02 07:00 / lmh |
| No. 60 Sieve, Retained | 13.7 | % | | 1.0 | | ASA15-2 | 06/26/02 07:00 / lmh |
| No. 100 Sieve, Passed | 26.7 | % | | 1.0 | | ASA15-2 | 06/26/02 07:00 / lmh |
| No. 100 Sieve, Retained | 49.6 | % | | 1.0 | | ASA15-2 | 06/26/02 07:00 / lmh |
| No. 200 Sieve, Passed | 6.2 | % | | 1.0 | | ASA15-2 | 06/26/02 07:00 / lmh |
| No. 200 Sieve, Retained | 20.6 | % | | 1.0 | | ASA15-2 | 06/26/02 07:00 / lmh |

**Report Definitions:**
RL - Analyte reporting limit.
QCL - Quality control limit.
MCL - Maximum contaminant level.
ND - Not detected at the reporting limit.

# TABLE C-3. Gradation Results for Tailings Slime T7

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## LABORATORY ANALYTICAL REPORT

**Client:** US Energy
**Project:** Plateau Resources Shootaring Canyon
**Lab ID:** C02060335-009
**Client Sample ID:** T7

**Report Date:** 07/08/02
**Collection Date:** 06/05/02
**Date Received:** 06/10/02
**Matrix:** SOIL

| Analyses | Result | Units | Qual | RL | MCL/ QCL | Method | Analysis Date / By |
|---|---|---|---|---|---|---|---|
| **PHYSICAL PROPERTIES** | | | | | | | |
| Moisture | 41.0 | % | | 0.1 | | USDA26 | 06/12/02 10:27 / vh |
| **RADIONUCLIDES - TOTAL** | | | | | | | |
| Radium 226 | 139 | pCi/g-dry | | 0.1 | | E903.0 | 06/27/02 03:21 / rs |
| Radium 226 precision | 5.0 | ± | | | | E903.0 | 06/27/02 03:21 / rs |
| Thorium 230 | 3800 | pCi/g-dry | | 0.1 | | E907.0 | 06/21/02 10:30 / ph |
| Thorium 230 precision | 25.0 | ± | | | | E907.0 | 06/21/02 10:30 / ph |
| Uranium | 3880 | mg/kg-dry | | 0.02 | | SW6020 | 06/23/02 03:01 / smd |
| **SIEVES** | | | | | | | |
| 0.125 Inch Sieve, Passed | 93.1 | % | | 1.0 | | ASA15-2 | 06/26/02 07:00 / lmh |
| 0.125 Inch Sieve, Retained | 6.9 | % | | 1.0 | | ASA15-2 | 06/26/02 07:00 / lmh |
| 0.185 Inch Sieve, Passed | 80.0 | % | | 1.0 | | ASA15-2 | 06/26/02 07:00 / lmh |
| 0.185 Inch Sieve, Retained | 13.1 | % | | 1.0 | | ASA15-2 | 06/26/02 07:00 / lmh |
| No. 12 Sieve, Passed | 60.1 | % | | 1.0 | | ASA15-2 | 06/26/02 07:00 / lmh |
| No. 12 Sieve, Retained | 20.0 | % | | 1.0 | | ASA15-2 | 06/26/02 07:00 / lmh |
| No. 20 Sieve, Passed | 40.9 | % | | 1.0 | | ASA15-2 | 06/26/02 07:00 / lmh |
| No. 20 Sieve, Retained | 19.2 | % | | 1.0 | | ASA15-2 | 06/26/02 07:00 / lmh |
| No. 60 Sieve, Passed | 22.7 | % | | 1.0 | | ASA15-2 | 06/26/02 07:00 / lmh |
| No. 60 Sieve, Retained | 18.2 | % | | 1.0 | | ASA15-2 | 06/26/02 07:00 / lmh |
| No. 100 Sieve, Passed | 16.6 | % | | 1.0 | | ASA15-2 | 06/26/02 07:00 / lmh |
| No. 100 Sieve, Retained | 6.1 | % | | 1.0 | | ASA15-2 | 06/26/02 07:00 / lmh |
| No. 200 Sieve, Passed | 10.9 | % | | 1.0 | | ASA15-2 | 06/26/02 07:00 / lmh |
| No. 200 Sieve, Retained | 5.7 | % | | 1.0 | | ASA15-2 | 06/26/02 07:00 / lmh |

**Report Definitions:**
RL - Analyte reporting limit
QCL - Quality control limit.
MCL - Maximum contaminant level.
ND - Not detected at the reporting limit.

## TABLE C-4. Gradation Results for Ore Sample OP31

ENERGY LABORATORIES
*ENERGY LABORATORIES, INC. • 2393 Salt Creek Highway (82601) • P.O. Box 3258 • Casper, WY 82602*
*Toll Free 888.235.0515 • 307.235.0515 • Fax 307.234.1639 • casper@energylab.com • www.energylab.com*

### LABORATORY ANALYTICAL REPORT

**Client:** US Energy
**Project:** Plateau Resources Shootaring Canyon
**Lab ID:** C02060335-001
**Client Sample ID:** OP1 (OP31)

**Report Date:** 07/08/02
**Collection Date:** 06/06/02
**Date Received:** 06/10/02
**Matrix:** SOIL

| Analyses | Result | Units | Qual | RL | MCL/ QCL | Method | Analysis Date / By |
|---|---|---|---|---|---|---|---|
| **PHYSICAL PROPERTIES** | | | | | | | |
| Moisture | 1.8 | % | | 0.1 | | USDA26 | 06/12/02 10:27 / vh |
| **SIEVES** | | | | | | | |
| 0.125 Inch Sieve, Passed | 91.1 | % | | 1.0 | | ASA15-2 | 06/26/02 07:00 / lmh |
| 0.125 Inch Sieve, Retained | 8.9 | % | | 1.0 | | ASA15-2 | 06/26/02 07:00 / lmh |
| 0.185 Inch Sieve, Passed | ND | % | | 1.0 | | ASA15-2 | 06/26/02 07:00 / lmh |
| 0.185 Inch Sieve, Retained | ND | % | | 1.0 | | ASA15-2 | 06/26/02 07:00 / lmh |
| No. 12 Sieve, Passed | 88.1 | % | | 1.0 | | ASA15-2 | 06/26/02 07:00 / lmh |
| No. 12 Sieve, Retained | 2.4 | % | | 1.0 | | ASA15-2 | 06/26/02 07:00 / lmh |
| No. 20 Sieve, Passed | 85.1 | % | | 1.0 | | ASA15-2 | 06/26/02 07:00 / lmh |
| No. 20 Sieve, Retained | 3.0 | % | | 1.0 | | ASA15-2 | 06/26/02 07:00 / lmh |
| No. 60 Sieve, Passed | 61.2 | % | | 1.0 | | ASA15-2 | 06/26/02 07:00 / lmh |
| No. 60 Sieve, Retained | 23.9 | % | | 1.0 | | ASA15-2 | 06/26/02 07:00 / lmh |
| No. 100 Sieve, Passed | 24.5 | % | | 1.0 | | ASA15-2 | 06/26/02 07:00 / lmh |
| No. 100 Sieve, Retained | 36.7 | % | | 1.0 | | ASA15-2 | 06/26/02 07:00 / lmh |
| No. 200 Sieve, Passed | 6.6 | % | | 1.0 | | ASA15-2 | 06/26/02 07:00 / lmh |
| No. 200 Sieve, Retained | 17.9 | % | | 1.0 | | ASA15-2 | 06/26/02 07:00 / lmh |

**Report Definitions:**
RL - Analyte reporting limit.
QCL - Quality control limit.
MCL - Maximum contaminant level.
ND - Not detected at the reporting limit

# TABLE C-5. Gradation Results for Ore Sample OP32

ENERGY LABORATORIES, INC. • 2393 Salt Creek Highway (82601) • P.O. Box 3258 • Casper, WY 82602
Toll Free 888.235.0515 • 307.235.0515 • Fax 307.234.1639 • casper@energylab.com • www.energylab.com

## LABORATORY ANALYTICAL REPORT

**Client:** US Energy
**Project:** Plateau Resources Shootaring Canyon
**Lab ID:** C02060335-002
**Client Sample ID:** OP2 (OP32)

**Report Date:** 07/08/02
**Collection Date:** 06/06/02
**Date Received:** 06/10/02
**Matrix:** SOIL

| Analyses | Result | Units | Qual | RL | MCL/ QCL | Method | Analysis Date / By |
|---|---|---|---|---|---|---|---|
| **PHYSICAL PROPERTIES** | | | | | | | |
| Moisture | 3.3 | % | | 0.1 | | USDA26 | 06/12/02 10:27 / vh |
| **SIEVES** | | | | | | | |
| 0.125 Inch Sieve, Passed | 94.2 | % | | 1.0 | | ASA15-2 | 06/26/02 07:00 / lmh |
| 0.125 Inch Sieve, Retained | 5.8 | % | | 1.0 | | ASA15-2 | 06/26/02 07:00 / lmh |
| 0.185 Inch Sieve, Passed | 93.4 | % | | 1.0 | | ASA15-2 | 06/26/02 07:00 / lmh |
| 0.185 Inch Sieve, Retained | ND | % | | 1.0 | | ASA15-2 | 06/26/02 07:00 / lmh |
| No. 12 Sieve, Passed | 90.7 | % | | 1.0 | | ASA15-2 | 06/26/02 07:00 / lmh |
| No. 12 Sieve, Retained | 2.7 | % | | 1.0 | | ASA15-2 | 06/26/02 07:00 / lmh |
| No. 20 Sieve, Passed | 86.5 | % | | 1.0 | | ASA15-2 | 06/26/02 07:00 / lmh |
| No. 20 Sieve, Retained | 4.2 | % | | 1.0 | | ASA15-2 | 06/26/02 07:00 / lmh |
| No. 60 Sieve, Passed | 60.8 | % | | 1.0 | | ASA15-2 | 06/26/02 07:00 / lmh |
| No. 60 Sieve, Retained | 25.7 | % | | 1.0 | | ASA15-2 | 06/26/02 07:00 / lmh |
| No. 100 Sieve, Passed | 25.5 | % | | 1.0 | | ASA15-2 | 06/26/02 07:00 / lmh |
| No. 100 Sieve, Retained | 35.3 | % | | 1.0 | | ASA15-2 | 06/26/02 07:00 / lmh |
| No. 200 Sieve, Passed | 6.2 | % | | 1.0 | | ASA15-2 | 06/26/02 07:00 / lmh |
| No. 200 Sieve, Retained | 19.3 | % | | 1.0 | | ASA15-2 | 06/26/02 07:00 / lmh |

**Report Definitions:**
RL - Analyte reporting limit
QCL - Quality control limit.
MCL - Maximum contaminant level
ND - Not detected at the reporting limit.

# TABLE C-6. Gradation Results for Ore Sample CV4 on Cross Valley Berm, 0" – 5"

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Toll Free 888.235.0515 · 307.235.0515 · Fax 307.234.1639 · casper@energylab.com · www.energylab.com

## LABORATORY ANALYTICAL REPORT

**Client:** US Energy
**Project:** Plateau Resources Shootaring Canyon
**Lab ID:** C02060335-010
**Client Sample ID:** CV4 0-0.5

**Report Date:** 07/08/02
**Collection Date:** 06/04/02
**Date Received:** 06/10/02
**Matrix:** SOIL

| Analyses | Result | Units | Qual | RL | MCL/ QCL | Method | Analysis Date / By |
|---|---|---|---|---|---|---|---|
| **PHYSICAL PROPERTIES** | | | | | | | |
| Moisture | ND | % | | 0.1 | | USDA26 | 06/12/02 10:27 / vh |
| **RADIONUCLIDES - TOTAL** | | | | | | | |
| Radium 226 | 45.8 | pCi/g-dry | | 0.1 | | E903.0 | 06/27/02 03:31 / rs |
| Radium 226 precision | 1.6 | ± | | | | E903.0 | 06/27/02 03:31 / rs |
| Thorium 230 | 56.2 | pCi/g-dry | | 0.1 | | E907.0 | 06/21/02 10:30 / ph |
| Thorium 230 precision | 1.0 | ± | | | | E907.0 | 06/21/02 10:30 / ph |
| Uranium | 71.5 | pCi/g-dry | | 0.01 | | SW6020 | 06/23/02 03:13 / smd |
| **SIEVES** | | | | | | | |
| 0.125 Inch Sieve, Passed | 91.9 | % | | 1.0 | | ASA15-2 | 06/26/02 07:00 / lmh |
| 0.125 Inch Sieve, Retained | 8.1 | % | | 1.0 | | ASA15-2 | 06/26/02 07:00 / lmh |
| 0.185 Inch Sieve, Passed | 90.5 | % | | 1.0 | | ASA15-2 | 06/26/02 07:00 / lmh |
| 0.185 Inch Sieve, Retained | 1.4 | % | | 1.0 | | ASA15-2 | 06/26/02 07:00 / lmh |
| No. 12 Sieve, Passed | 88.7 | % | | 1.0 | | ASA15-2 | 06/26/02 07:00 / lmh |
| No. 12 Sieve, Retained | 1.8 | % | | 1.0 | | ASA15-2 | 06/26/02 07:00 / lmh |
| No. 20 Sieve, Passed | 85.7 | % | | 1.0 | | ASA15-2 | 06/26/02 07:00 / lmh |
| No. 20 Sieve, Retained | 3.0 | % | | 1.0 | | ASA15-2 | 06/26/02 07:00 / lmh |
| No. 60 Sieve, Passed | 61.4 | % | | 1.0 | | ASA15-2 | 06/26/02 07:00 / lmh |
| No. 60 Sieve, Retained | 24.3 | % | | 1.0 | | ASA15-2 | 06/26/02 07:00 / lmh |
| No. 100 Sieve, Passed | 23.4 | % | | 1.0 | | ASA15-2 | 06/26/02 07:00 / lmh |
| No. 100 Sieve, Retained | 38.0 | % | | 1.0 | | ASA15-2 | 06/26/02 07:00 / lmh |
| No. 200 Sieve, Passed | 5.7 | % | | 1.0 | | ASA15-2 | 06/26/02 07:00 / lmh |
| No 200 Sieve, Retained | 17.7 | % | | 1.0 | | ASA15-2 | 06/26/02 07:00 / lmh |

**Report Definitions:**
RL - Analyte reporting limit.
QCL - Quality control limit.
MCL - Maximum contaminant level.
ND - Not detected at the reporting limit.

## C.2 Clay Barrier Physical Properties

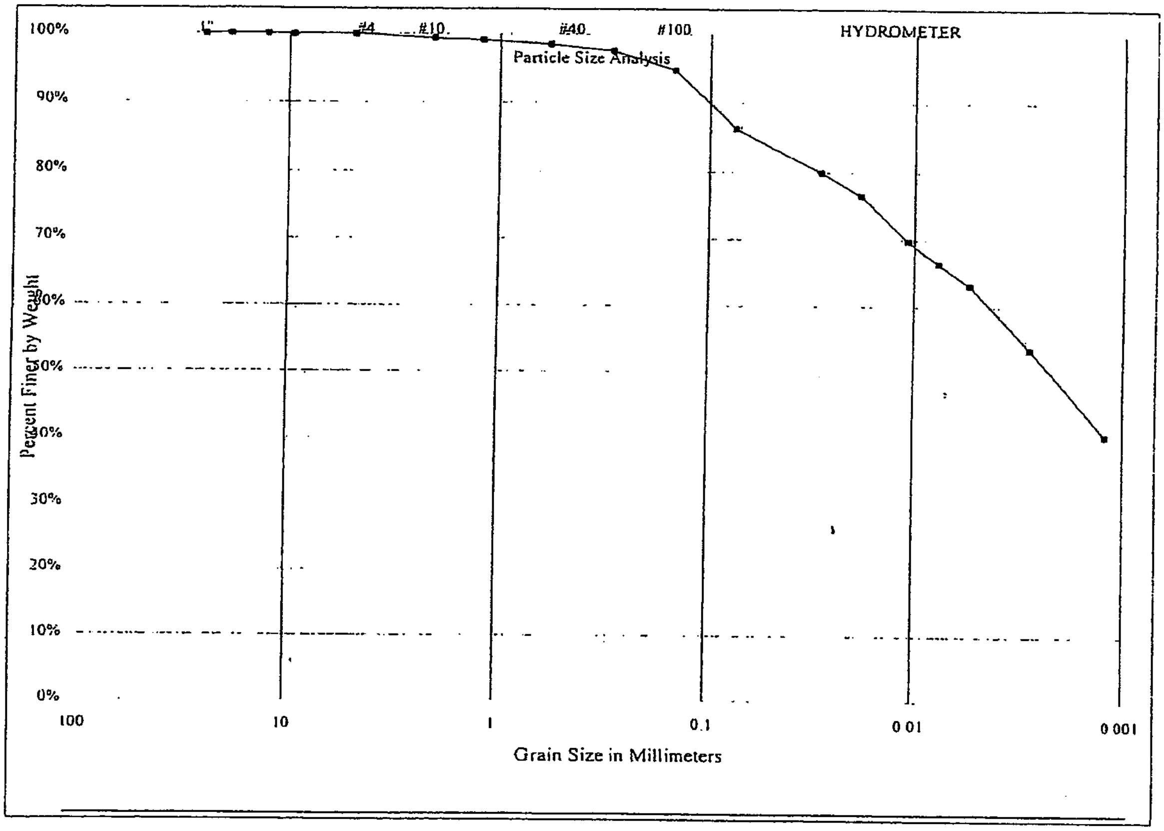
Clay samples were taken from various locations at the site to determine physical properties for the clay that is to be used for the radon/infiltration barrier in the tailings cell. Gradation results for clay samples NP11, NP10, NP6, WP4, NP4, C4, and DA1 are presented in Tables C-7, C-8, C-9, C-10, C-11, C-12, and C-13, respectively. Samples NP11, NP10, NP6, WP4, and NP4 were taken from backhoe pits around the existing tailings cell where the clay liner system was in place. Sample C4 was taken from the exposed clay east of the east dike. Sample DA1 was taken from a backhoe pit on the top of the Shootaring Canyon Dam. Table C-14 presents the liquid limits, plastic limits, plasticity indexes and lab permeability results for these same samples. Moisture density analyses were performed on the samples from NP11, NP10, NP6, C4, and Dam 1. Tables C-15 through C-19 present the results of these tests.

Double ring infiltrometer tests were performed on the clay at various locations to determine the in-situ permeability of the clay. Figures C-1, C-2, C-3, C-4, C-5, C-6, and C-7 present the results of these infiltrometer tests in locations WP1, WP2, NP2, NP3, NP5, NP7, and NP8, respectively. Figure C-8 presents evaporation test results that were performed at locations NP2 and NP5.

# TABLE C-7. Gradation Results for Clay Sample NP11

## SIEVE & HYDROMETER TEST ASTM D422

| | | | |
|---|---|---|---|
| IME SAMPLE NO : | NP-11 | DATE RECEIVED | 06/20/2002 |
| CLIENT. | US Energy | TYPE OF SAMPLE | |
| CLIENT SAMPLE NO.: | NP-11 | | |
| SOIL DESCRIPTION: | Weak red clay w/ white clay | | |



| Sieve Size | PARTICLE SIZE (mm) | PERCENT FINER |
|---|---|---|
| 1" | 25.4000 | 100.0% |
| 3/4" | 19.1000 | 100.0% |
| 1/2" | 12.7000 | 100.0% |
| 3/8" | 9.5200 | 100.0% |
| NO. 4 | 4.7600 | 100.0% |
| NO 10 | 2.0000 | 99.4% |
| NO 16 | 1.1900 | 99.1% |
| NO 30 | 0.5900 | 98.5% |
| NO 50 | 0.2970 | 97.6% |
| NO. 100 | 0.1490 | 94.7% |
| NO. 200 | 0.0740 | 86.3% |
| Hydrometer Range | 0.0283 | 79.9% |
| | 0.0181 | 76.5% |
| | 0.0108 | 69.8% |
| | 0.0077 | 66.4% |
| | 0.0055 | 63.1% |
| | 0.0028 | 53.5% |
| | 0.0012 | 40.5% |

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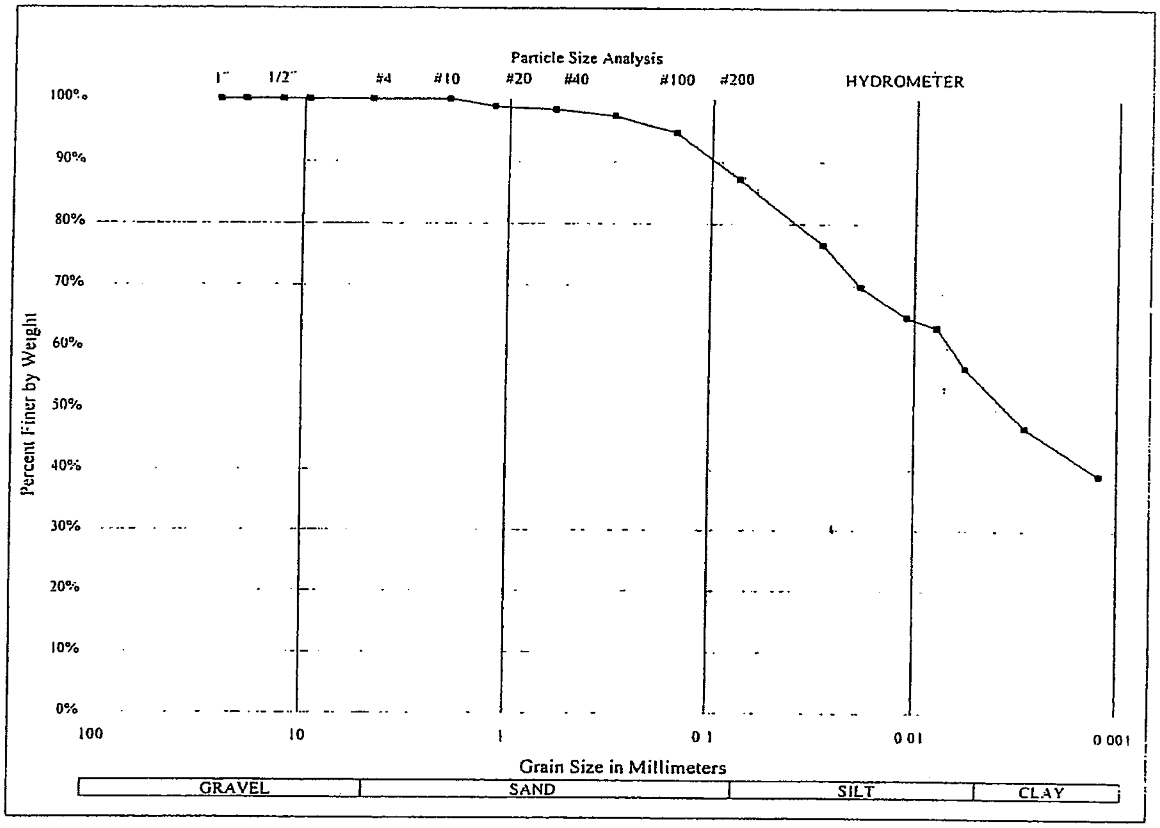
## TABLE C-8. Gradation Results for Clay Sample NP10

### SIEVE & HYDROMETER TEST ASTM D422

| | | | |
|---|---|---|---|
| IME SAMPLE NO . | NP-10 | DATE RECEIVED: | |
| CLIENT. | US Energy | TYPE OF SAMPLE | |
| CLIENT SAMPLE NO.: | NP-10 | | |
| SOIL DESCRIPTION: | Weak red clay w/ white clay | | |



| Sieve Size | PARTICLE SIZE (mm) | PERCENT FINER |
|---|---|---|
| 1" | 25.4000 | 100.0% |
| 3/4" | 19.1000 | 100.0% |
| 1/2" | 12.7000 | 100.0% |
| 3/8" | 9.5200 | 100.0% |
| NO. 4 | 4.7600 | 100.0% |
| NO.10 | 2.0000 | 100.0% |
| NO. 16 | 1.1900 | 98.8% |
| NO. 30 | 0.5900 | 98.3% |
| NO 50 | 0.2970 | 97.4% |
| NO. 100 | 0.1490 | 94.6% |
| NO. 200 | 0.0740 | 87.2% |
| Hydrometer Range | 0.0287 | 76.5% |
| | 0.0187 | 69.8% |
| | 0.0110 | 64.9% |
| | 0.0078 | 63.2% |
| | 0.0056 | 56.7% |
| | 0.0029 | 47.0% |
| | 0.0012 | 39.2% |

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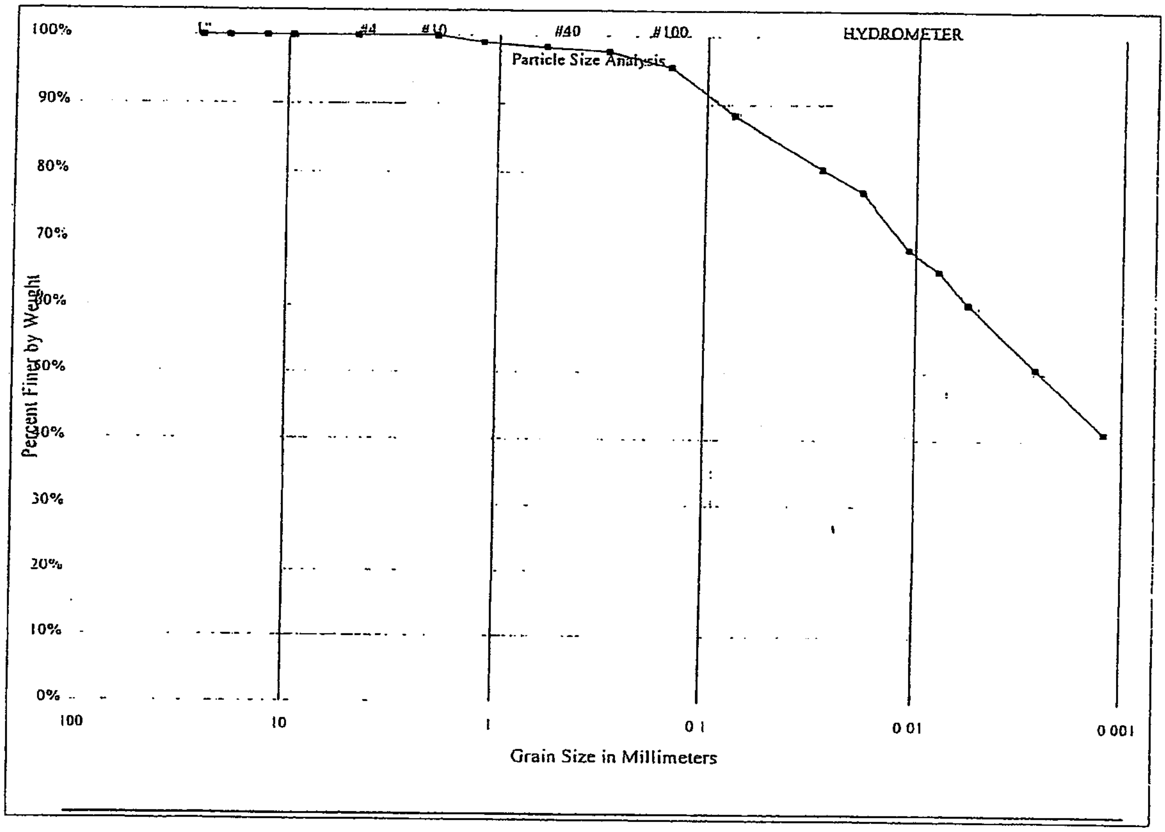
## TABLE C-9. Gradation Results for Clay Sample NP6

### SIEVE & HYDROMETER TEST ASTM D422

| | | | |
|---|---|---|---|
| IME SAMPLE NO.: | NP-6 | DATE RECEIVED | 06/20/2002 |
| CLIENT: | US Energy | TYPE OF SAMPLE | |
| CLIENT SAMPLE NO : | NP-6 | | |
| SOIL DESCRIPTION: | Weak red clay w/ white clay | | |



| Sieve Size | PARTICLE SIZE (mm) | PERCENT FINER |
|---|---|---|
| 1" | 25.4000 | 100.0% |
| 3/4" | 19.1000 | 100.0% |
| 1/2" | 12.7000 | 100.0% |
| 3/8" | 9.5200 | 100.0% |
| NO. 4 | 4.7600 | 100.0% |
| NO. 10 | 2.0000 | 100.0% |
| NO. 16 | 1.1900 | 99.0% |
| NO 30 | 0.5900 | 98.3% |
| NO. 50 | 0.2970 | 97.7% |
| NO. 100 | 0.1490 | 95.4% |
| NO. 200 | 0.0740 | 88.4% |
| Hydrometer Range | 0.0283 | 80.6% |
| | 0.0181 | 77.2% |
| | 0.0108 | 68.7% |
| | 0.0078 | 65.4% |
| | 0.0056 | 60.5% |
| | 0.0026 | 50.6% |
| | 0.0012 | 41.1% |

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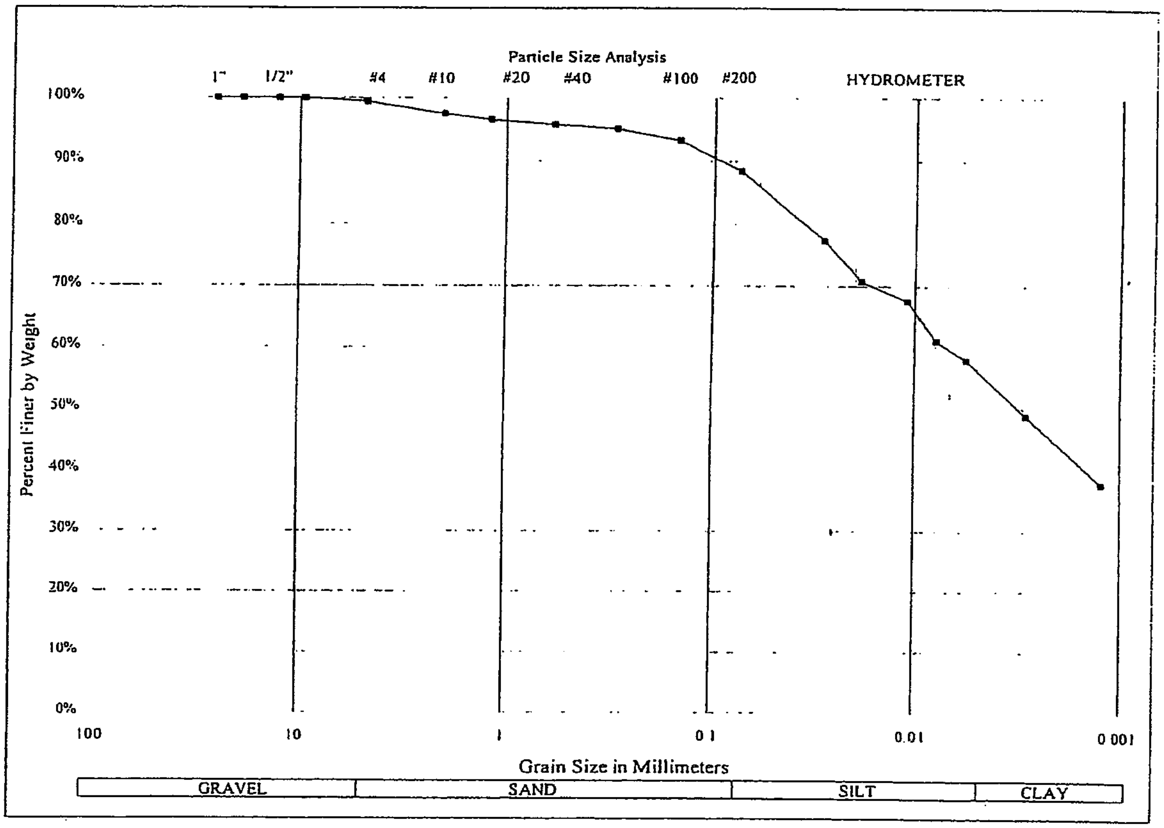
# TABLE C-10. Gradation Results for Clay Sample WP4

## SIEVE & HYDROMETER TEST ASTM D422

|  |  |  |  |
|---|---|---|---|
| IME SAMPLE NO. | WP-4 | DATE RECEIVED | 06/20/2002 |
| CLIENT. | US Energy | TYPE OF SAMPLE |  |
| CLIENT SAMPLE NO . | WP-4 |  |  |
| SOIL DESCRIPTION: | Weak red clay w/ white clay |  |  |



| Sieve Size | PARTICLE SIZE (mm) | PERCENT FINER |
|---|---|---|
| 1" | 25.4000 | 100.0% |
| 3/4" | 19.1000 | 100.0% |
| 1/2" | 12.7000 | 100.0% |
| 3/8" | 9.5200 | 100.0% |
| NO. 4 | 4.7600 | 99.4% |
| NO 10 | 2.0000 | 97.5% |
| NO. 16 | 1.1900 | 96.5% |
| NO 30 | 0.5900 | 95.8% |
| NO. 50 | 0.2970 | 95.1% |
| NO. 100 | 0.1490 | 93.2% |
| NO. 200 | 0.0740 | 88.4% |
| Hydrometer Range | 0.0286 | 77.4% |
|  | 0.0186 | 70.8% |
|  | 0.0109 | 67.6% |
|  | 0.0079 | 61.1% |
|  | 0.0056 | 57.9% |
|  | 0.0029 | 48.8% |
|  | 0.0012 | 37.8% |

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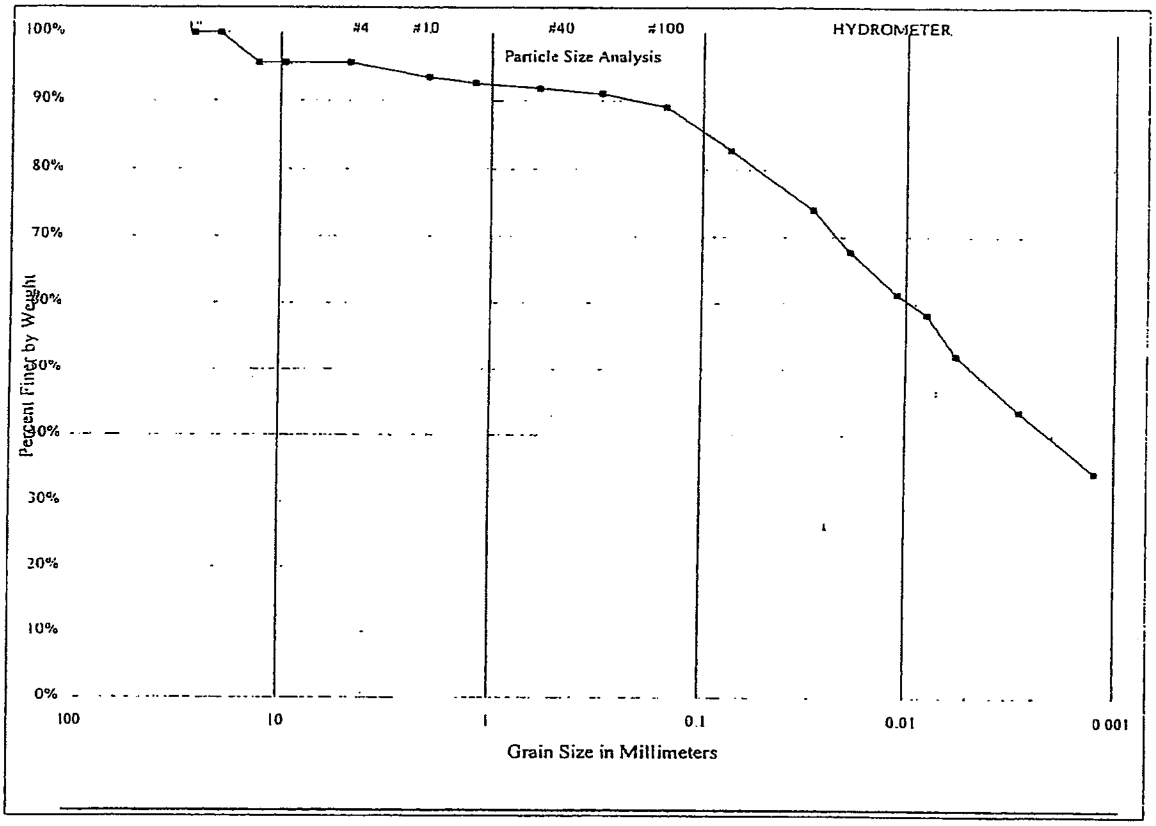
# TABLE C-11. Gradation Results for Clay Sample NP4

## SIEVE & HYDROMETER TEST ASTM D422

| | | | |
|---|---|---|---|
| IME SAMPLE NO.: | NP-4 | DATE RECEIVED | 06/20/2002 |
| CLIENT: | US Energy | TYPE OF SAMPLE | |
| CLIENT SAMPLE NO.. | NP-4 | | |
| SOIL DESCRIPTION: | Weak red clay w/ white clay | | |



| Sieve Size | PARTICLE SIZE (mm) | PERCENT FINER |
|---|---|---|
| 1" | 25.4000 | 100.0% |
| 3/4" | 19.1000 | 100.0% |
| 1/2" | 12.7000 | 95.6% |
| 3/8" | 9.5200 | 95.6% |
| NO. 4 | 4.7600 | 95.6% |
| NO.10 | 2.0000 | 93.4% |
| NO 16 | 1.1900 | 92.5% |
| NO 30 | 0.5900 | 91.8% |
| NO 50 | 0.2970 | 91.0% |
| NO 100 | 0.1490 | 89.1% |
| NO. 200 | 0.0740 | 82.8% |
| Hydrometer Range | 0.0287 | 74.0% |
| | 0.0187 | 67.7% |
| | 0.0111 | 61.3% |
| | 0.0079 | 58.3% |
| | 0.0057 | 52.0% |
| | 0.0029 | 43.5% |
| | 0.0012 | 34.4% |

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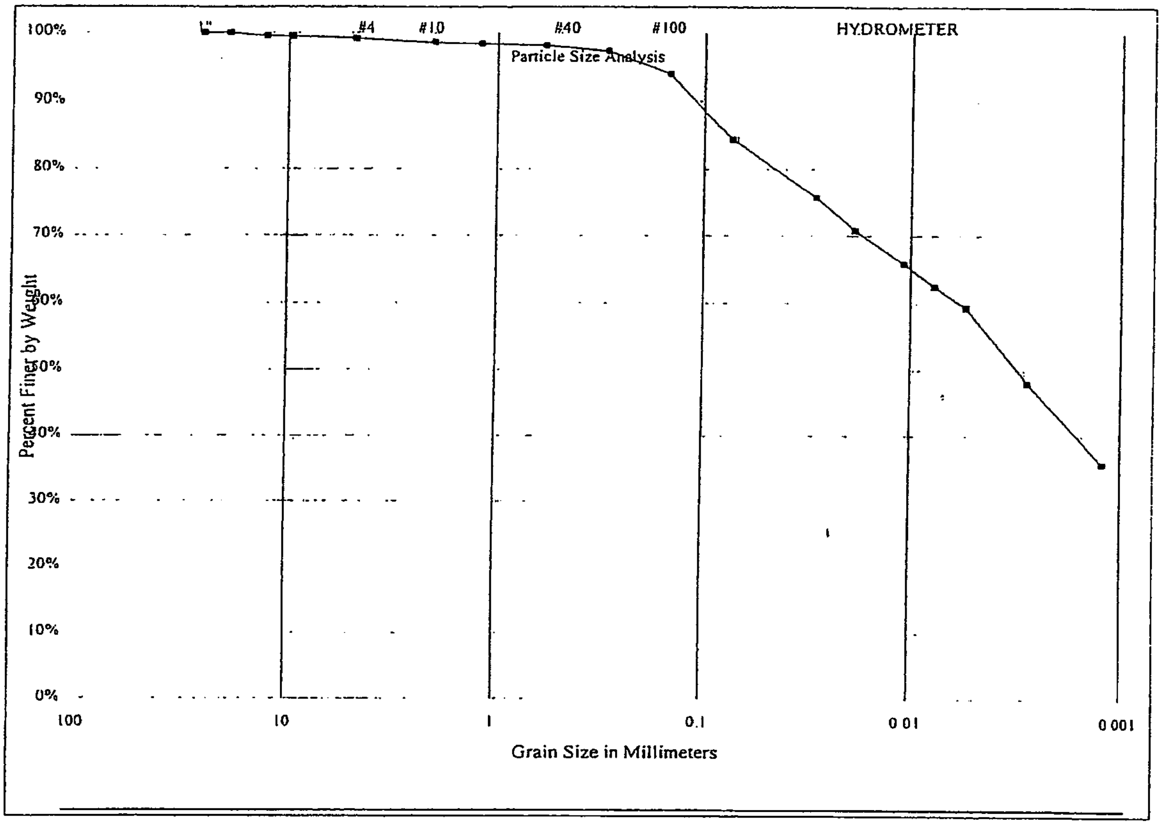
# TABLE C-12. Gradation Results for Clay Sample C4

SIEVE & HYDROMETER TEST ASTM D422

IME SAMPLE NO.. C-4 DATE RECEIVED 06/20/2002
CLIENT: US Energy TYPE OF SAMPLE
CLIENT SAMPLE NO.: C-4
SOIL DESCRIPTION: Weak red clay w/ white clay



| Sieve Size | PARTICLE SIZE (mm) | PERCENT FINER |
|---|---|---|
| 1" | 25.4000 | 100.0% |
| 3/4" | 19.1000 | 100.0% |
| 1/2" | 12.7000 | 99.5% |
| 3/8" | 9.5200 | 99.5% |
| NO. 4 | 4.7600 | 99.1% |
| NO.10 | 2.0000 | 98.6% |
| NO. 16 | 1.1900 | 98.4% |
| NO 30 | 0.5900 | 98.1% |
| NO. 50 | 0.2970 | 97.4% |
| NO 100 | 0.1490 | 94.0% |
| NO. 200 | 0.0740 | 84.4% |
| Hydrometer Range | 0.0285 | 75.7% |
|  | 0.0184 | 70.8% |
|  | 0.0108 | 65.8% |
|  | 0.0078 | 62.4% |
|  | 0.0055 | 59.3% |
|  | 0.0029 | 48.1% |
|  | 0.0012 | 35.8% |

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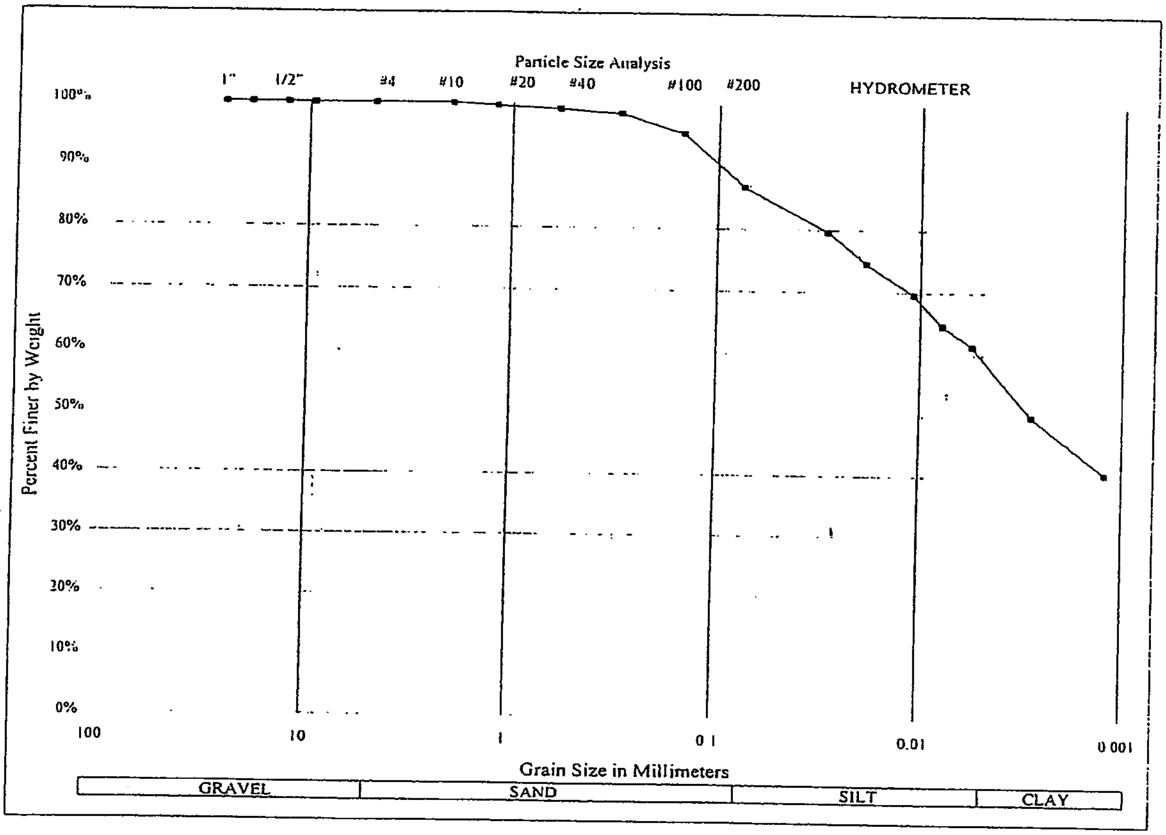
## TABLE C-13. Gradation Results for Clay Sample DA1

SIEVE & HYDROMETER TEST ASTM D422

| | | | |
|---|---|---|---|
| IME SAMPLE NO.. | Dam 1 | DATE RECEIVED | 06/20/2002 |
| CLIENT: | US Energy | TYPE OF SAMPLE | |
| CLIENT SAMPLE NO.: | Dam 1 | | |
| SOIL DESCRIPTION: | Weak red clay w/ white clay | | |



| Sieve Size | PARTICLE SIZE (mm) | PERCENT FINER |
|---|---|---|
| 1" | 25.4000 | 100.0% |
| 3/4" | 19.1000 | 100.0% |
| 1/2" | 12.7000 | 100.0% |
| 3/8" | 9.5200 | 100.0% |
| NO. 4 | 4.7600 | 100.0% |
| NO. 10 | 2.0000 | 100.0% |
| NO. 16 | 1.1900 | 99.5% |
| NO. 30 | 0.5900 | 99.1% |
| NO. 50 | 0.2970 | 98.4% |
| NO. 100 | 0.1490 | 95.3% |
| NO. 200 | 0.0740 | 86.7% |
| Hydrometer Range | 0.0285 | 79.6% |
| | 0.0184 | 74.5% |
| | 0.0108 | 69.6% |
| | 0.0078 | 64.6% |
| | 0.0056 | 61.3% |
| | 0.0029 | 50.0% |
| | 0.0012 | 40.5% |

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# TABLE C-14. SOIL PROPERTIES FOR CLAY SAMPLES DA1, NP4, NP6, NP10, NP11, WP4, AND C4

| Sample | Liquid Limit | Plastic Limit | Plasticity Index | Permeability (cm/sec) |
|---|---|---|---|---|
| DA1 | 76 | 25 | 51 | NA |
| NP4 | 73 | 21 | 52 | NA |
| NP6 | 95 | 29 | 66 | $3.2 \times 10^{-8}$ |
| NP11 | 79 | 31 | 48 | $6.5 \times 10^{-8}$ |
| NP10 | 76 | 26 | 50 | NA |
| WP4 | 90 | 30 | 60 | NA |
| C4 | 73 | 29 | 44 | $4.4 \times 10^{-7}$ |

Note: Results from Inber-Miller letter dated September

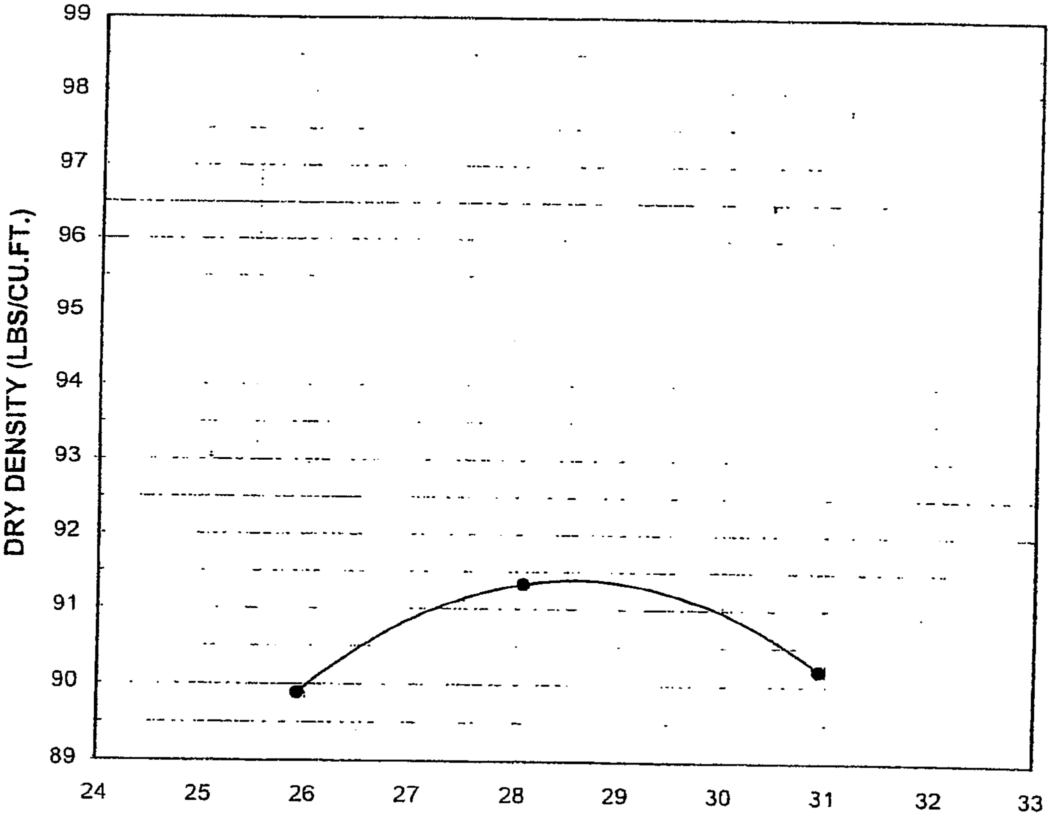
**TABLE C-15. Moisture Density Analysis for NP11**

# MOISTURE-DENSITY ANALYSIS

## INBERG-MILLER ENGINEERS

CLIENT: U.S. Energy
PROJECT: Shootering Canyon
JOB NO. 10223 RM
TEST DATE: 7-8-02
SOURCE: On-site
DESCRIPTION: Weak red clay

SAMPLE NO.: NP-11
SAMPLED BY: Client
TESTED BY : JPM
TEST METHOD: ASTM D 698-method A



$y = -0\ 2125x^2 + 12.144x - 82.151$

OPTIMUM WATER CONTENT (%): 28.6
MAXIMUM DRY DEN. (LBS/CU. FT): 91.4

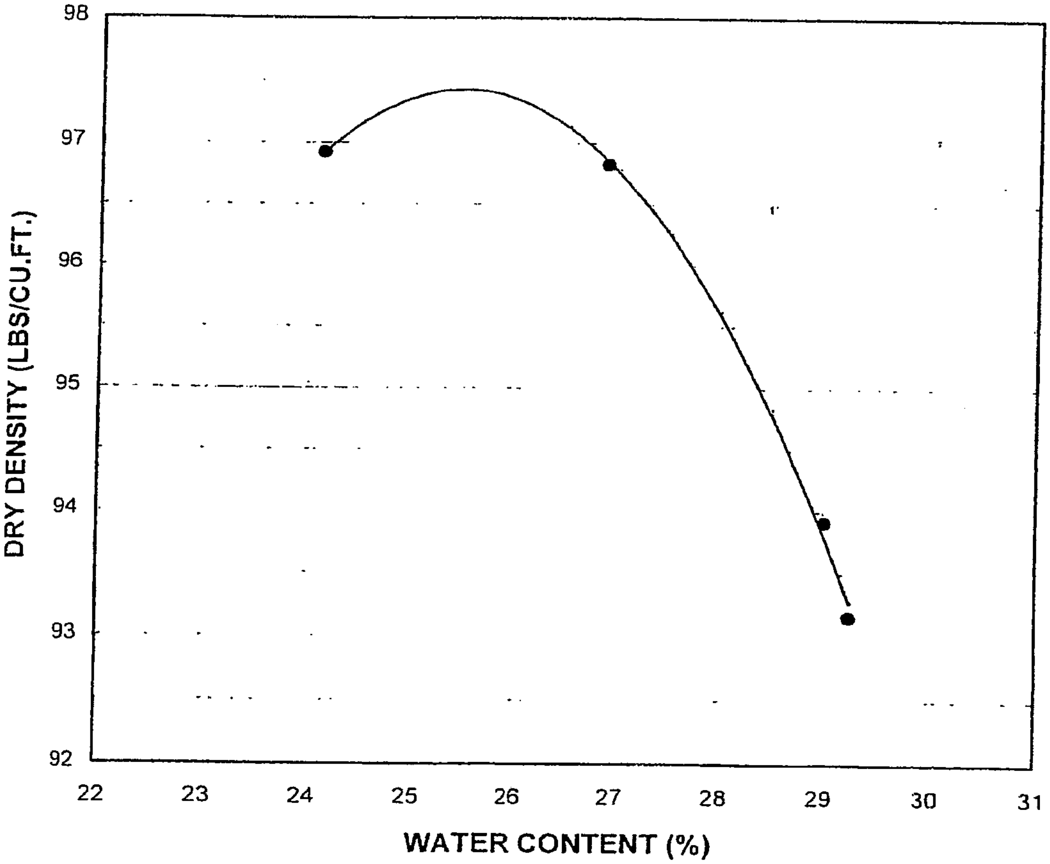
**TABLE C-16. Moisture Density Analysis for NP10**

# MOISTURE-DENSITY ANALYSIS

## INBERG-MILLER ENGINEERS

CLIENT: U.S. Energy
PROJECT: Shootering Canyon
JOB NO. 10223 RM
TEST DATE: 7-1-02
SOURCE: On-site
DESCRIPTION: Weak red clay

SAMPLE NO.: NP-10
SAMPLED BY: Client
TESTED BY : TGE
TEST METHOD: ASTM D 698-method A



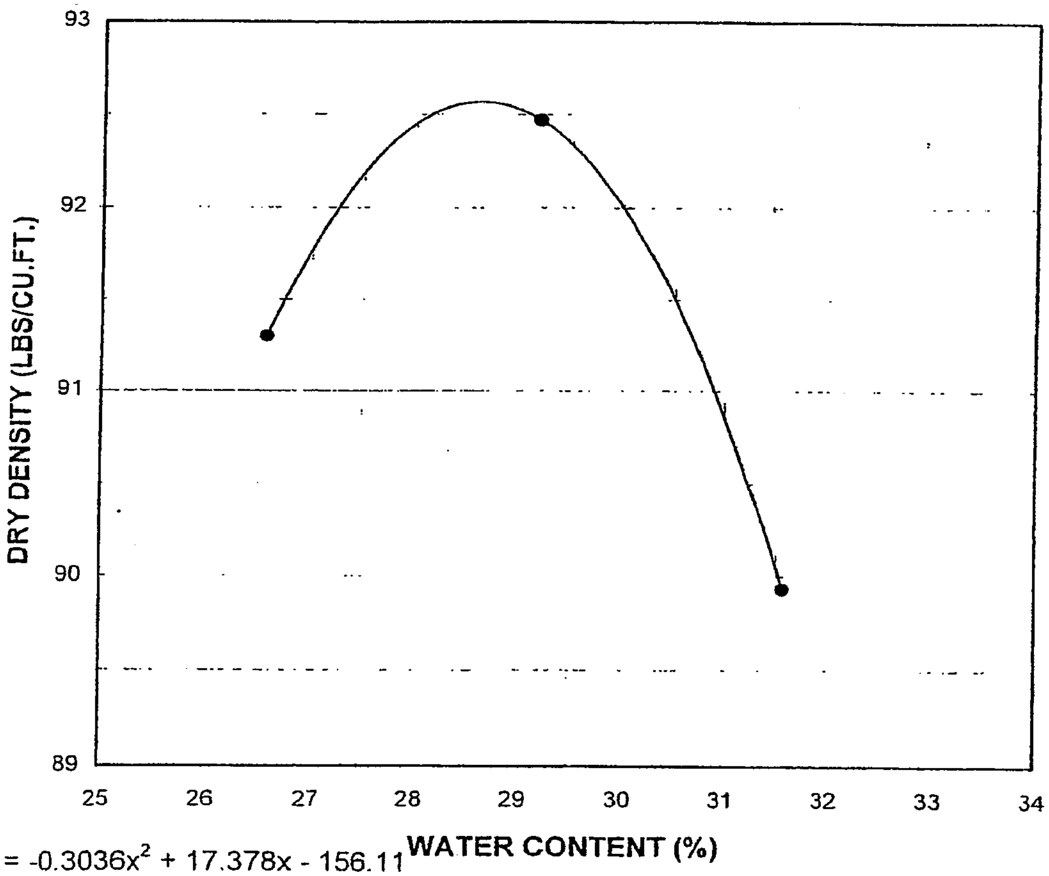
| | |
|---|---|
| OPTIMUM WATER CONTENT (%): | 25.4 |
| MAXIMUM DRY DEN. (LBS/CU. FT): | 97.4 |

**TABLE C-17. Moisture Density Analysis for NP6**

# MOISTURE-DENSITY ANALYSIS

## INBERG-MILLER ENGINEERS

| | | | |
|---|---|---|---|
| CLIENT: | U.S. Energy | SAMPLE NO.: | NP-6 |
| PROJECT: | Shootering Canyon | SAMPLED BY: | Client |
| JOB NO. | 10223 RM | TESTED BY : | TGE |
| TEST DATE: | 7-3-02 | TEST METHOD: | ASTM D 698-method A |
| SOURCE: | On-site | | |
| DESCRIPTION: | Weak red clay | | |



$y = -0.3036x^2 + 17.378x - 156.11$

| | |
|---|---|
| OPTIMUM WATER CONTENT (%): | 28.6 |
| MAXIMUM DRY DEN. (LBS/CU. FT): | 92.5 |

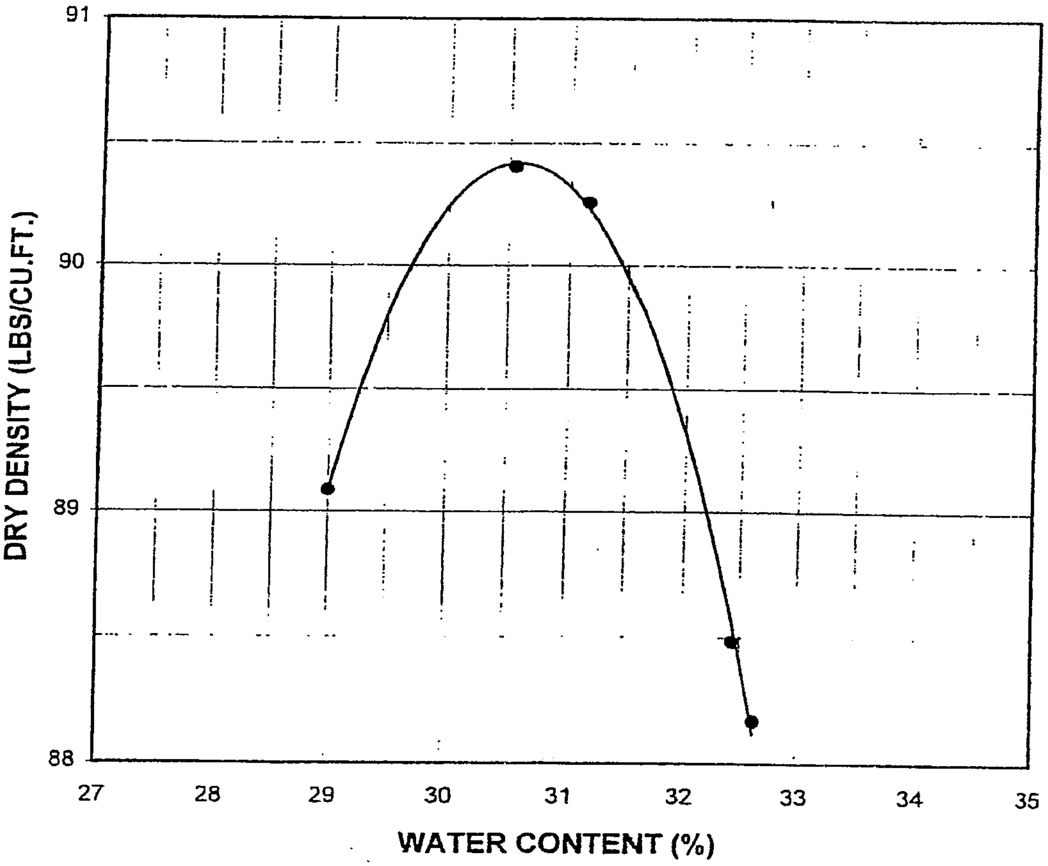
**TABLE C-18. Moisture Density Analysis for C4**

# MOISTURE-DENSITY ANALYSIS

## INBERG-MILLER ENGINEERS

CLIENT: U.S. Energy
PROJECT: Shootering Canyon
JOB NO. 10223 RM
TEST DATE: 8-15-02
SOURCE: On-site
DESCRIPTION: Weak red clay

SAMPLE NO.: C-4
SAMPLED BY: Client
TESTED BY : TGE
TEST METHOD: ASTM D 698-method A



| | |
|---|---|
| OPTIMUM WATER CONTENT (%): | 30.8 |
| MAXIMUM DRY DEN. (LBS/CU. FT): | 90.4 |

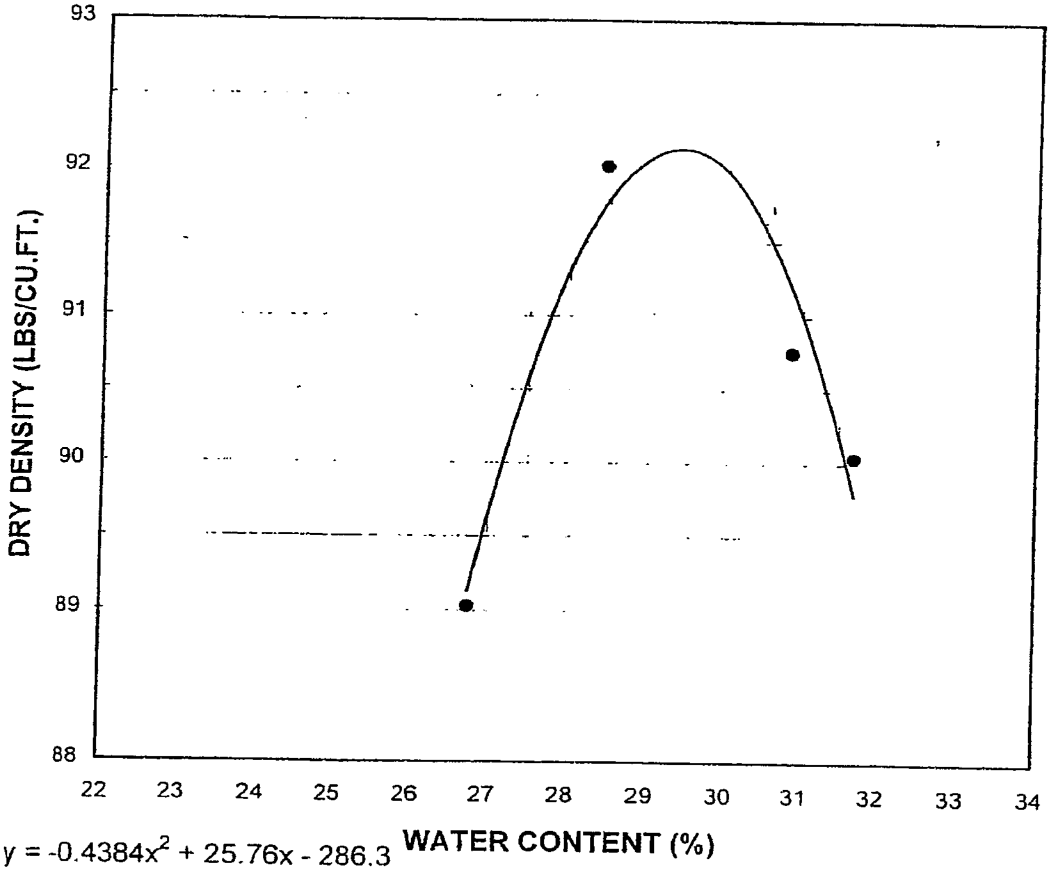
**TABLE C-19. Moisture Density Analysis for DA1**

# MOISTURE-DENSITY ANALYSIS

## INBERG-MILLER ENGINEERS

CLIENT: U.S. Energy
PROJECT: Shootering Canyon
JOB NO. 10223 RM
TEST DATE: 7-3-02
SOURCE: On-site
DESCRIPTION: Weak red clay

SAMPLE NO.: Dam 1-Clay
SAMPLED BY: Client
TESTED BY : TGE
TEST METHOD: ASTM D 698-method A



$y = -0.4384x^2 + 25.76x - 286.3$

| | |
|---|---|
| OPTIMUM WATER CONTENT (%): | 29.4 |
| MAXIMUM DRY DEN. (LBS/CU. FT): | 92.1 |

## C.3 Alternate Clay Source Physical Properties

Two samples were taken from the alternate clay source borrow area. These samples were designated A and C and were taken from the mining face in the borrow area. Attachment C.1 contains the transmittal letter and the testing results for these two samples. The transmittal letter discusses the general properties of the material and the results of the permeability testing. The additional pages in Attachment C.1 include the results of the Atterberg Limits tests, the results of the gradation analyses, and the results of the moisture-density analyses. Attachment C.2 contains a letter from the soil testing laboratory (Inberg-Miller Engineers) discussing the properties of the clay samples.

## C.4 Soil Cover Physical Properties

Two gradations were performed on samples of the soil cover. Figures C-9 and C-10 present the results of the gradations performed on samples RSC1 and RSC2, respectively. Both RSC1 and RSC2 were taken from the soil cover placed in the north cell.

## C.5 Rock Physical Properties

Gradations were performed on rock samples from the quarry area and the face of the Shootaring Canyon Dam. Rock durability analysis were also performed on the rock from the quarry, the dam face, as well as the rock soil cover material. Figures C-11, C-12, and C-13 present the results of the gradations of quarry samples QU1, QU2, and QU3, respectively. A gradation was also performed on the fines from sample QU3. The results of this test are presented on Table C-20. The results for the gradation on dam rock sample DS1 are presented in Figure C-14. The results for the gradation on dam rock sample DS2 are presented in Figure C-15.

Rock durability analyses were performed on a rock sample from each of the potential sources; the quarry, the dam face, and the rock soil cover. The results of these durability tests are presented in Table C-21. Table C-22 presents rock durability tests that were conducted in 1997 which yield similar results. Petrographic analysis results are presented in Table C-23.

# TABLE C-20. Gradation Results for QU-3 Sand

## INBERG-MILLER ENGINEERS

### PARTICLE SIZE ANALYSIS

| | |
|---|---|
| CLIENT: | U.S. Energy |
| PROJECT: | Shootering Canyon |
| JOB NO.: | 10223RM |
| TEST DATE | 6-18-02 |
| TESTED BY | TGE |
| TEST METHOD | ASTM D422 |
| SAMPLE NO | QU-3 Sand |
| SAMPLED BY: | Client |
| SOURCE: | On-site |
| SAMPLE DESCRIPTION: | Reddish silty fine sand |
| DESCRIPTION CONT.: | |
| GRADATION DESCRIPTION. | |

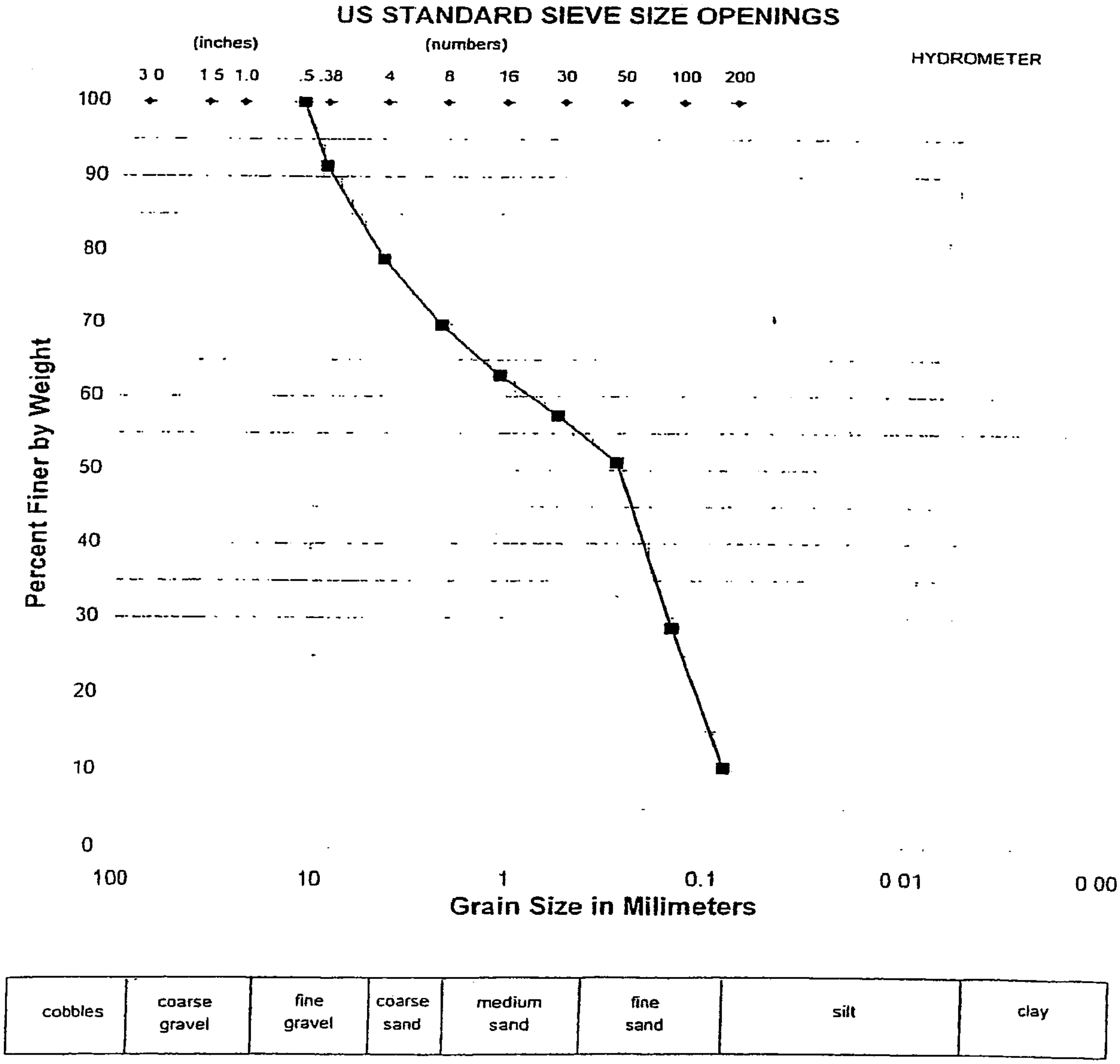
| Sieve No. | Sieve Size (mm) | Wt. Retained (g) | Percent Retained | Percent Finer | Gradation Envelope Limits | |
|---|---|---|---|---|---|---|
| | | | | | Lower | Upper |
| 6.0 | 152.40 | | | | | |
| 5.0 | 127.00 | | | | | |
| 4.0 | 101.60 | | | | | |
| 3.5 | 88.90 | | | | | |
| 3.0 | 76.20 | | | | | |
| 2.5 | 63.50 | | | | | |
| 2.0 | 50.80 | | | | | |
| 1.5 | 38.10 | | | | | |
| 1.0 | 25.40 | | | | | |
| 0.75 | 19.05 | | | | | |
| 0.50 | 12.70 | 0 00 | 0.00 | 100.00 | | |
| 0.375 | 9.53 | 41 75 | 8.54 | 91.46 | | |
| 4 | 4.75 | 61.78 | 12.64 | 78.82 | | |
| 8 | 2.36 | 44.07 | 9.02 | 69.81 | | |
| 10 | 2.00 | | | | | |
| 16 | 1.18 | 34.09 | 6 97 | 62.83 | | |
| 30 | 0.60 | 26.75 | 5.47 | 57.36 | | |
| 40 | 0.43 | | | | | |
| 50 | 0 30 | 31 16 | 6 37 | 50.99 | | |
| 100 | 0 15 | 109 45 | 22 39 | 28 60 | | |
| 200 | 0 08 | 89.45 | 18.30 | 10 30 | | |

**TABLE C-20. Gradation Results for QU-3 Sand (continued)**

# PARTICLE SIZE ANALYSIS

## INBERG-MILLER ENGINEERS

| | | | |
|---|---|---|---|
| CLIENT: | U.S. Energy | SAMPLE NO.: | QU-3 Sand |
| PROJECT: | Shootering Canyon | SAMPLED BY: | Client |
| JOB NO.: | 10223RM | SOURCE: | On-site |
| TEST DATE: | 6-18-02 | SAMPLE DESCRIPTION: | Reddish silty fine sand with some gravel |
| TESTED BY: | TGE | | |
| TEST METHOD: | ASTM C136 | GRADATION DESCRIPTION: | |



Unified Soil Classification System (ASTM D2487)

## TABLE C-21. ROCK DURABILITY TEST RESULTS, JUNE 2002

### Loss LA Abrasion, Specific Gravity and Absorption Results

| Sample Identification | % Loss LA Abrasion | Apparent Sp. G. | Bulk Sp. G. | Bulk SSD Sp.G. | Absoption % | Composite Sodium Sulphate Soundness % Loss |
|---|---|---|---|---|---|---|
| QU - Igneous | 3.7 | 2.638 | 2.532 | 2.572 | 1.6 | 1.90 |
| QU - Sandstone | 5.1 | 2.579 | 2.445 | 2.497 | 2.13 | 4.35 |
| RSC - Igneous | 5.5 | 2.615 | 2.475 | 2.528 | 2.16 | 8.45 |
| RSC - Sandstone | 9.9 | 2.542 | 2.356 | 2.429 | 3.1 | 13.50 |
| DS - Igneous | 3.9 | 2.637 | 2.529 | 2.57 | 1.63 | 4.20 |
| DS - Sandstone | 7.7 | 2.528 | 2.392 | 2.446 | 2.25 | 12.85 |

### Sodium Sulfate Soundness Tests

| Sample Identification | 1-1/2" to 2" Percent Loss | 2" to 2-1/2" Percent Loss |
|---|---|---|
| QU - Igneous | 1.7 | 2.1 |
| QU - Sandstone | 3 | 5.7 |
| RSC - Igneous | 12 | 4.9 |
| RSC - Sandstone | 12.3 | 14.7 |
| DS - Igneous | 1.1 | 7.3 |
| DS - Sandstone | 12.3 | 13.4 |

### Rock Proportions in Samples

| Sample Identification | Percentage Igneous | Percentage Sandstone | Size Range |
|---|---|---|---|
| QU1 | 42 | 58 | 2"-5" |
| QU2 | 32 | 68 | 3"-5" |
| QU3 | 31 | 69 | 2"-8" |
| DS1 | 34 | 66 | 2"-6" |
| DS2 | 39 | 61 | 2"-5.5" |
| RSC1 | 41 | 59 | 2"-6.5" |
| RSC2 | 31 | 69 | 2"-5.5" |

Note: Results from Inber-Miller letter dated September 17, 2002

**TABLE C-22. Rock Durability Test Results April, 1997**

## ROCK DURABILITY TEST RESULTS

U. S. Energy
Shootering Canyon, Utah
IME Job No. 7664-RM
April 4, 1997

| Test | Tan Sandstone | Igneous Rock |
|---|---|---|
| Los Angeles Abrasion - % Loss[1] | 7.8 | 2.3 |
| Apparent Bulk Specific Gravity | 2.556 | 2.676 |
| Bulk Specific Gravity | 2.409 | 2.548 |
| SSD Bulk Specific Gravity | 2.467 | 2.596 |
| Absorption (%) | 2.39 | 1.88 |
| $NaSO_4$ Soundness[2] % Loss 2½ to 2" | 5.29 | 1.37 |
| $NaSO_4$ Soundness[2] % Loss 2" to 1-1/2" | 3.44 | 0.98 |
| $NaSO_4$ Soundness[2] % Loss 1-1/2" to 1" | 2.22 | 2.25 |
| $NaSO_4$ Soundness[2] % Loss 1" to 3/4" | 14.55 | 5.94 |
| $NaSO_4$ Soundness[2] % Loss 3/4" to 1/2" | 13.75 | 4.41 |
| $NaSO_4$ Soundness[2] % Loss 1/2" to 3/8" | 24.96 | 8.60 |
| $NaSO_4$ Soundness[2] % Loss 3/8" to #4 | 16.74 | 9.39 |
| Rebound No. | 43 | 52 |

Notes:

1. Modified for 100 revolutions
2. Actual percent loss - not weighted for "original gradation." As requested, $NaSO_4$ Soundness samples were crushed to generate sufficient material of practical test size.

## TABLE C-23. Petrographic Analysis of Erosion Protection Rocks

**THEODORE P. PASTER, Ph.D.**
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August 19, 2002

Thomas G. Michel
Hydro-Engineering, LLC
4685 South Magnolia
Casper, WY 826042

**RE: Petrographic Analyses of Andesite and Sandstone to be Used as Erosion Protection for a Reclaimed Uranium Tailings Facility.**

**SUMMARY**

The petrographic analyses of the two rock types in the riprap source yields the following parameters:

| ROCK NAME | NRC GROUP (Table 6.1) | EXPANDABLE SMECTITE CONTENT |
|---|---|---|
| Andesite porphyry & Porphyritic andesite | 2 | Nil |
| Fine-grained sandstone | ? (parameters not in Table 6.1) | Nil |

The minimum fracture spacing is estimated to be greater than 2" to 4" based on the particles sizes. The particles are equant and rounded with no weathering rinds.

Respectfully submitted:

(1)

## TABLE C-23. Petrographic Analysis of Erosion Protection Rocks (continued)

### INTRODUCTION

An aggregate source in Utah is petrographically analyzed for a source of erosion protection rock mulch or riprap to be used in a reclaimed uranium tailings facility.

The aggregate is characterized by two primary rock types:

1) An andesite porphyry and porphyritic andesite.
2) A fine-grained porous sandstone.

### PETROGRAPHIC ANALYSES

**Megascopic Description of Andesite**

Six andesite samples were received. They are rounded particles measuring 2" to 3" in average diameter and contain no visible weathering rind when broken open. Samples 1a, 1b and 1c are andesite porphyry containing more than 50% phenocrysts of plagioclase (Pl) and hornblende (Hb). Samples 1d, 1e and 1f are porphyritic andesites containing less than 50% phenocrysts of Pl and Hb. Two particles of each type of andesite were sectioned for petrographic analysis and the measured percentages of the four samples are given in **TABLE 1**.

**TABLE 1**
**MINERAL PERCENTAGES IN FOUR ANDESITE SAMPLES**
**UTAH RIPRAP**

Sample No.

| Phase | QU-1a | | QU-1c | | QU-1d | | QU-1e | |
|---|---|---|---|---|---|---|---|---|
| | cts | % | cts | % | cts | % | cts | % |
| Groundmass | 209 | 43.4 ±4.5 | 254 | 41.1 ±4.0 | 346 | 59.6 ±4.1 | 265 | 45.4 ±4.1 |
| Plagioclase(Pl) | 98 | 20.3 ±3.7 | 180 | 29.1 ±3.7 | 61 | 10.5 ±2.5 | 116 | 19.8 ±3.3 |
| Carbonate inPl | 22 | 4.6 ±1.9 | 11 | 1.8 ±1.1 | 5 | 0.9 ±0.8 | 47 | 8.0 ±2.2 |
| " in HB | 33 | 6.8 ±2.3 | 30 | 4.9 ±1.7 | 12 | 2.1 ±1.2 | 33 | 5.6 ±1.9 |
| Goethite | 0 | 0 | 0 | 0 | 49 | 8.4 ±2.3 | 0 | 0 |
| Kaolinite | 35 | 7.3 ±2.4 | 1 | 0.2 ±0.2 | 0 | 0 | 0 | 0 |
| Chlorite | 38 | 7.9 ±2.5 | 56 | 9.1 ±2.3 | 8 | 1.4 ±1.0 | 18 | 3.1 ±1.4 |
| Magnetite | 5 | 1.0 ±0.9 | 5 | 0.8 ±0.7 | 4 | 0.7 ±0.7 | 14 | 2.4 ±1.3 |
| Vnlts/Fracs* | 2 | 0.4 ±0.4 | 0 | 0 | 2 | 0.3 ±0.3 | tr | tr |
| Ht/Lx** | 12 | 2.5 ±1.4 | 10 | 1.6 ±1.0 | 11 | 1.9 ±1.1 | 7 | 1.2 ±0.9 |
| Apatite | 1 | 0.2 ±0.2 | 0 | 0 | 1 | 0.2 ±0.2 | 2 | 0.3 ±0.3 |
| Illite | 7 | 1.5 ±1.1 | 42 | 6.8 ±2.0 | 17 | 2.9 ±1.4 | 8 | 1.4 ±1.0 |
| Pores in gdms | 5 | 1.0 ±0.9 | 0 | 0 | 57 | 9.8 ±2.5 | 6 | 1.0 ±0.8 |
| Voids,Fracs/Ves | 11 | 2.3 ±1.4 | 7 | 1.1 ±0.8 | 4 | 0.7 ±0.7 | 5 | 0.9 ±0.8 |
| Biotite | 3 | 0.6 ±0.6 | 1 | 0.2 ±0.2 | 1 | 0.2 ±0.2 | 0 | 0 |
| Sphene/Rutile | 0 | 0 | 2 | 0.3 ±0.3 | 0 | 0 | 0 | 0 |
| Quartz | 1 | 0.2 ±0.2 | 6 | 1.0 ±0.8 | 0 | 0 | 5 | 0.9 ±0.8 |
| Carb in gdms*** | 0 | 0 | 4 | 0.6 ±0.6 | 1 | 0.2 ±0.2 | 23 | 3.9 ±1.6 |
| Carb in Ves**** | 0 | 0 | 9 | 1.4 ±0.9 | 1 | 0.2 ±0.2 | 2 | 0.3 ±0.3 |
| Gdms, pore-free | 0 | 0 | 0 | 0 | 0 | 0 | 30 | 5.1 ±1.8 |
| Quartz Phenos | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 0.7 ±0.7 |
| Totals | 482 | 100.0 | 618 | 100.0 | 580 | 100.0 | 585 | 100.0 |

Legend:

Vnlts/Fracs* = Veinlets/Fractures

Ht/Lx** = Hematite/Leucoxene

Carb in gdms*** = Carbonate

Carb in Ves**** = Carbonate in Vesicles

## TABLE C-23. Petrographic Analysis of Erosion Protection Rocks (continued)

The phenocrysts of Pl are up to 6 mm in size in the andesite porphyry and up to 14 mm in size in the porphyritic andesite samples.

**Microscopic Description of Andesite**
Due to deuteric or low grade metasomatism (Not weathering.) the phenocrysts are replaced by secondary minerals as shown in **TABLE 2.**

### TABLE 2
### SECONDARY MINERALOGY OF PLAGIOCLASE AND HORNBLENDE IN UTAH ANDESITE

| | | Constituent Minerals* | | | |
|---|---|---|---|---|---|
| Phenocryst | Sample: | 1a | 1c | 1d | 1e |
| Pl = Pl + Pl Carb + Kaol + Ill** | | 34.0 | 37.9 | 14.3 | 29.2 |
| Hb = Hb Carb + Chl + Ht/Lx + Q** | | 15.6 | 15.6 | 13.8 | 10.8 |

Legend:
* = from Table 1.
**: Pl = plagioclase
Pl Carb = Carbonate in Pl.
Kaol = kaolinite
Ill = illite
Hb Carb = Carbonate in hornblende.
Chl = chlorite
Ht/Lx = hematite and leucoxene
Q = quartz
Hb = hornblende

Note that the Hb is totally altered leaving only relict outlines of the original phenos.

**Andesite Rating**
The group in Table 6.1 of Nelson et al.* into which the andesite would fit is 2.

**Fractures in Andesite**
The fractures trend in one direction in samples a and d and more than 1 direction in e. The density of fractures more than 4 mm long are listed in **TABLE 3.**

### TABLE 3
### FRACTURE DENSITY IN ANDESITE SECTIONS
### (Fractures larger than 4 mm.)

| Sample No. | Avg fracture spacing (in mm) |
|---|---|
| QU - 1a | 3 |
| QU - 1c | >22 |
| QU - 1d | 8 |
| QU - 1e | 17 |

Evidently the through-going fractures that determine particle size are spaced 2" to 3" as judged by the particle sizes.

---

* = 1986; Nelson, J.D. et al.; Methodology for Evaluating Long Term Stabilization Designs of Uranium Mill Tailings Impoundments; NUREG/CR-4620.

## TABLE C-23. Petrographic Analysis of Erosion Protection Rocks (continued)

### Clays in Andesite

The clay and clay-size minerals identified in the andesite are kaolinite, illite and chlorite as shown in **TABLE 1**.

X-ray diffraction on QU-1c confirmed the presence of kaolinite and chlorite and no detectable smectite. Based on the x-ray and sample parameters the detection limit is 0.3% of the sample.

### Megascopic Description of Sandstone

Six sandstone samples were received. They measure 2" to 4" average diameter with no weathering rinds and are rounded to broken with sharp edges. They are briefly described below in three types:

| Sample No. | Description |
|---|---|
| QU-$s_1$ | Thinly laminated (1-4mm thick laminae) shown by reddish-brown Fe-staining, fine-grained sandstone* Grayish-orange**. Also contains 4-9mm thick cross-bedded layers. |
| QU-$S_2$, $S_4$ | Fine-grained sandstone is a very pale orange color** with $\leq$ 1mm Fe-oxide stained blebs. Non-laminated. |
| QU-$S_3$, $S_5$, $S_6$ | Fine-grained, very pale orange** sandstone with little or no iron staining and no laminae. |

* = Average grain size is 0.1 to 0.2mm. Fine sand size is 0.06mm to 0.2mm.
**= Color on Geological Society of America Rock Color Chart, 1991.

### Microscopic Description of Sandstone

The mineralogical components of the sandstone are given in **TABLE 4** and **APPENDIX I**.

**TABLE 4**
**MINERAL PERCENTAGES IN THREE SANDSTONE SAMPLES**
**UTAH RIPRAP**

| | Sample No. | | | | | |
|---|---|---|---|---|---|---|
| | QU-1a | | QU-1c | | QU-1d | |
| Phase | cts | % | cts | % | cts | % |
| Clasts: | | | | | | |
| Q + K-Spar* | 440 | 69.7 | 491 | 75.3 | 444 | 76.0 |
| Microcline | 7 | 1.1 | 14 | 2.1 | 17 | 2.9 |
| Other | 1 | 0.1 | 0 | 0 | 3 | 0.5 |
| Interstitial voids: | 149 | 23.6 | 74 | 11.4 | 99 | 17.0 |
| Cement: | | | | | | |
| Carbonate | 1 | 0.2 | 37 | 5.7 | 4 | 0.7 |
| Clay | 8 | 1.3 | 8 | 1.2 | 16 | 2.7 |
| Goethite | 25 | 4.0 | 27 | 4.1 | 1 | 0.2 |
| Fracture: | 0 | 0 | 1 | 0.2 | 0 | 0 |
| Totals | 631 | 100.0 | 651 | 100.0 | 584 | 100.0 |

Legend:
Q + K-Spar = Quartz + Orthoclase

## TABLE C-23. Petrographic Analysis of Erosion Protection Rocks (continued)

The average clast percentage is approximately 76%, pore space is 17% and cement is 7%. The cement is composed of goethite, carbonate and clay.

**Sandstone Rating**
The references at hand and information supplied by Hydro-Engineering are not complete enough to rate the sandstone.

**Fractures in Sandstone**
No fractures were seen in thin section. Joints/fractures comprise some surfaces of the particles and these are estimated to be greater than 2" spacing.

**Clay in Sandstone**
The total clay content of the sandstone is estimated to be less than 2.&% and average 1.7%. No expandable smectite was found by x-ray diffraction. The limit is 0.2% of the sample.

August 19, 2002

## TABLE C-23. Petrographic Analysis of Erosion Protection Rocks (continued)

### APPENDIX I
### PETROGRAPHIC DESCRIPTIONS

**QU-1a; Andesite Porphyry**

**Phenos (52.6%):**

| | | |
|---|---|---|
| 34.0% Plagioclase (Pl, $An_{16}$) | 0.06-6.0mm | Oligoclase centers. Euhedra with oscillatory zoning. 8-90% replaced with carbonate, illite and kaolinite. Alteration is generally in layers corresponding to compositional zoning. |
| 17.4% [Hornblende] (Hb) | <0.08-3.6mm | Relict euhedra. 100% replaced by chlorite >carbonate. Contains inclusions of hematite (Ht) + leucoxene (Lx). Occasionally partly replaced by quartz (Q). |
| 1.0% Magnetite (Mt) | <0.04-0.3mm | Eu-anhedra. Partly replaced by Ht/Lx. Notably in relict Hb. |
| 0.2% Apatite | 0.05-0.15mm | Stubby prisms. |

**Groundmass (43.4%):**

| | | |
|---|---|---|
| 43.4% Feldspar(F)/Ferromagnesian(FM) | <0.01-0.01mm | Indistinctly bounded anhedral patches of incipient, sub-variolitic inter-growths of F and FM. |

**Fractures (0.4%):**

| | | |
|---|---|---|
| 0.4% Carbonate | 0.04mm thick<br>0.04x<1.0mm | Anhedral blebs in groundmass that are probably relict FM. |

Illite is approximately 1.5 % of rock

No weathering rinds.

Alteration is late stage metasomatism common in volcanic rocks. The metasomatism is propylitic/deuteric that has altered the Hb and partially altered the Pl and Mt.

**QU-S; Medium-Grained, Quartz Sandstone with Little Cement.**

**Clastics (79.4%):**

| | | |
|---|---|---|
| 76.0% Quartz(Q)> Orthoclase(K-Spar) | 0.05-0.3mm | Equant clastics. Rounded in voids and and straight edges where in contact due to load compression. |
| 2.9% Microcline | 0.12-0.35mm | Same description as Q and K-Spar. |
| 0.5% Other | <0.01-0.06mm | Predominately eu-subhedral rutile and chert. Very rare volcanic (andesite?). |

## TABLE C-23. Petrographic Analysis of Erosion Protection Rocks (continued)

**Interstices (20.6%):**

| | | |
|---|---|---|
| 17.0% Voids | <0.01–0.3mm | Irregular shapes interstitial to clastics. |
| 2.&% Clay | <<0.01mm | In ragged clumps or dispersed in voids. |
| 0.7% Carbonate | <0.01mm | Subhedral in aggregates. |
| 0.2% Goethite | <0.01–0.12mm | Predominately anhedra to euhedra. |

## C.6 Entrada Sand Physical Properties

Gradations were performed on three samples of the Entrada Sandstone at the site. The gradation results for samples CV4, NP10, and NP6 are presented in Tables C-24, C-25, and C-26, respectively. Sample CV4 was taken from the cross valley berm at a depth of 1.5' to 2.5'. Samples NP10 and NP6 were taken from the red sand in backhoe pits in the north cell.

# TABLE C-24. Gradation Results for Entrada Sand CV4, 1.5' – 2.5'

ENERGY LABORATORIES, INC. • 2393 Salt Creek Highway (82601) • P.O. Box 3258 • Casper, WY 82602
Toll Free 888.235.0515 • 307.235.0515 • Fax 307.234.1639 • casper@energylab.com • www.energylab.com

## LABORATORY ANALYTICAL REPORT

**Client:** US Energy
**Project:** Plateau Resources Shootaring Canyon
**Lab ID:** C02060335-011
**Client Sample ID:** CV4 1 5-2.5

**Report Date:** 07/08/02
**Collection Date:** 06/04/02
**Date Received:** 06/10/02
**Matrix:** SOIL

| Analyses | Result | Units | Qual | RL | MCL/ QCL | Method | Analysis Date / By |
|---|---|---|---|---|---|---|---|
| **PHYSICAL PROPERTIES** | | | | | | | |
| Moisture | 1.8 | % | | 0.1 | | USDA26 | 06/12/02 10:27 / vh |
| **RADIONUCLIDES - TOTAL** | | | | | | | |
| Radium 226 | 0.2 | pCi/g-dry | | 0.1 | | E903.0 | 06/27/02 04:31 / rs |
| Radium 226 precision | 0.1 | ± | | | | E903.0 | 06/27/02 04:31 / rs |
| Thorium 230 | 0.3 | pCi/g-dry | | 0.1 | | E907.0 | 06/21/02 10:30 / ph |
| Thorium 230 precision | 0 | ± | | | | E907.0 | 06/21/02 10:30 / ph |
| Uranium | 2.75 | mg/kg-dry | | 0.02 | | SW6020 | 06/23/02 03:16 / smd |
| **SIEVES** | | | | | | | |
| 0.125 Inch Sieve, Passed | 99.9 | % | | 1.0 | | ASA15-2 | 06/26/02 07:00 / lmh |
| 0.125 Inch Sieve, Retained | ND | % | | 1.0 | | ASA15-2 | 06/26/02 07:00 / lmh |
| 0.185 Inch Sieve, Passed | 99.9 | % | | 1.0 | | ASA15-2 | 06/26/02 07:00 / lmh |
| 0.185 Inch Sieve, Retained | ND | % | | 1.0 | | ASA15-2 | 06/26/02 07:00 / lmh |
| No. 12 Sieve, Passed | 99.7 | % | | 1.0 | | ASA15-2 | 06/26/02 07:00 / lmh |
| No. 12 Sieve, Retained | ND | % | | 1.0 | | ASA15-2 | 06/26/02 07:00 / lmh |
| No. 20 Sieve, Passed | 99.2 | % | | 1.0 | | ASA15-2 | 06/26/02 07:00 / lmh |
| No. 20 Sieve, Retained | ND | % | | 1.0 | | ASA15-2 | 06/26/02 07:00 / lmh |
| No. 60 Sieve, Passed | 79.9 | % | | 1.0 | | ASA15-2 | 06/26/02 07:00 / lmh |
| No. 60 Sieve, Retained | 19.3 | % | | 1.0 | | ASA15-2 | 06/26/02 07:00 / lmh |
| No. 100 Sieve, Passed | 25.6 | % | | 1.0 | | ASA15-2 | 06/26/02 07:00 / lmh |
| No. 100 Sieve, Retained | 54.3 | % | | 1.0 | | ASA15-2 | 06/26/02 07:00 / lmh |
| No. 200 Sieve, Passed | 3.1 | % | | 1.0 | | ASA15-2 | 06/26/02 07:00 / lmh |
| No. 200 Sieve, Retained | 22.5 | % | | 1.0 | | ASA15-2 | 06/26/02 07:00 / lmh |

**Report Definitions:**
RL - Analyte reporting limit.
QCL - Quality control limit.
MCL - Maximum contaminant level
ND - Not detected at the reporting limit.

## TABLE C-25. Gradation Results for Entrada Sand NP10

### INBERG-MILLER ENGINEERS

PARTICLE SIZE ANALYSIS

| | |
|---|---|
| CLIENT: | U.S. Energy |
| PROJECT: | Shootering Canyon |
| JOB NO.: | 10223RM |
| TEST DATE | 8-21-02 |
| TESTED BY | GLM |
| TEST METHOD | ASTM D422 |
| SAMPLE NO. | NP-10 Sand |
| SAMPLED BY: | Client |
| SOURCE: | On-site |
| SAMPLE DESCRIPTION: | Reddish silty fine sand |
| DESCRIPTION CONT.: | |
| GRADATION DESCRIPTION: | |

| Sieve No. | Sieve Size (mm) | Wt. Retained (g) | Percent Retained | Percent Finer | Gradation Envelope Limits Lower | Upper |
|---|---|---|---|---|---|---|
| 6 0 | 152.40 | | | | | |
| 5.0 | 127.00 | | | | | |
| 4.0 | 101.60 | | | | | |
| 3.5 | 88.90 | | | | | |
| 3 0 | 76.20 | | | | | |
| 2.5 | 63.50 | | | | | |
| 2.0 | 50 80 | | | | | |
| 1.5 | 38.10 | | | | | |
| 1.0 | 25 40 | | | | | |
| 0 75 | 19 05 | | | | | |
| 0 50 | 12.70 | | | | | |
| 0 375 | 9.53 | | | | | |
| 4 | 4.75 | 0.00 | 0.00 | 100.00 | | |
| 8 | 2.36 | 0 73 | 0.25 | 99.75 | | |
| 10 | 2.00 | | | | | |
| 16 | 1 18 | 0.26 | 0.09 | 99.66 | | |
| 30 | 0.60 | 0.26 | 0.09 | 99.57 | | |
| 40 | 0.43 | | | | | |
| 50 | 0.30 | 7 14 | 2 47 | 97.10 | | |
| 100 | 0.15 | 157.43 | 54 51 | 42 59 | | |
| 200 | 0.08 | 96.70 | 33.48 | 9 11 | | |

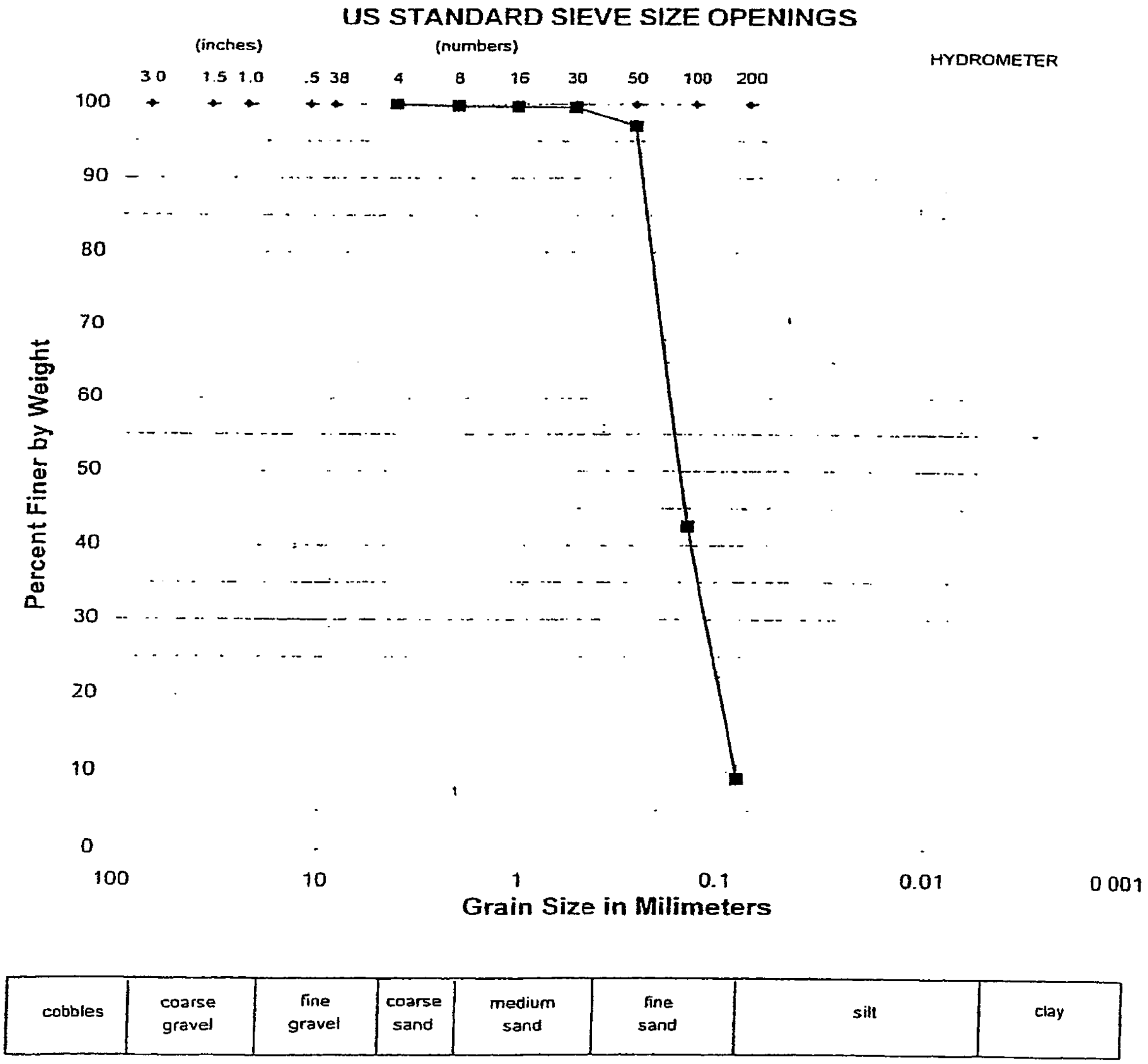
## TABLE C-25. Gradation Results for Entrada Sand NP10 (continued)

# PARTICLE SIZE ANALYSIS

## INBERG-MILLER ENGINEERS

CLIENT: U.S. Energy
PROJECT: Shootering Canyon
JOB NO.: 10223RM
TEST DATE: 8-21-02
TESTED BY: GLM
TEST METHOD: ASTM C136

SAMPLE NO.: NP-10 Sand
SAMPLED BY: Client
SOURCE: On-site
SAMPLE DESCRIPTION: Reddish silty fine sand
GRADATION DESCRIPTION:



Unified Soil Classification System (ASTM D2487)

## TABLE C-26. Gradation Results for Entrada Sand NP6

### INBERG-MILLER ENGINEERS

PARTICLE SIZE ANALYSIS

| | |
|---|---|
| CLIENT. | U.S. Energy |
| PROJECT: | Shootering Canyon |
| JOB NO.. | 10223RM |
| TEST DATE. | 8-21-02 |
| TESTED BY | GLM |
| TEST METHOD | ASTM D422 |
| SAMPLE NO.: | NP-6 Sand |
| SAMPLED BY: | Client |
| SOURCE: | On-site |
| SAMPLE DESCRIPTION: | Reddish silty fine sand |
| DESCRIPTION CONT.: | |
| GRADATION DESCRIPTION: | |

| Sieve No. | Sieve Size (mm) | Wt. Retained (g) | Percent Retained | Percent Finer | Gradation Envelope Limits | |
|---|---|---|---|---|---|---|
| | | | | | Lower | Upper |
| 6.0 | 152.40 | | | | | |
| 5.0 | 127 00 | | | | | |
| 4.0 | 101.60 | | | | | |
| 3.5 | 88.90 | | | | | |
| 3 0 | 76 20 | | | | | |
| 2.5 | 63.50 | | | | | |
| 2.0 | 50.80 | | | | | |
| 1.5 | 38.10 | | | | | |
| 1.0 | 25.40 | | | | | |
| 0.75 | 19.05 | | | | | |
| 0.50 | 12.70 | | | | | |
| 0 375 | 9.53 | | | | | |
| 4 | 4.75 | 0.00 | 0.00 | 100.00 | | |
| 8 | 2.36 | 0.05 | 0.02 | 99.98 | | |
| 10 | 2.00 | | | | | |
| 16 | 1.18 | 0.20 | 0.08 | 99.90 | | |
| 30 | 0.60 | 4.28 | 1.65 | 98 26 | | |
| 40 | 0.43 | | | | | |
| 50 | 0 30 | 4 40 | 1.69 | 96.57 | | |
| 100 | 0 15 | 122.33 | 47 05 | 49.52 | | |
| 200 | 0.08 | 95.26 | 36.64 | 12.88 | | |

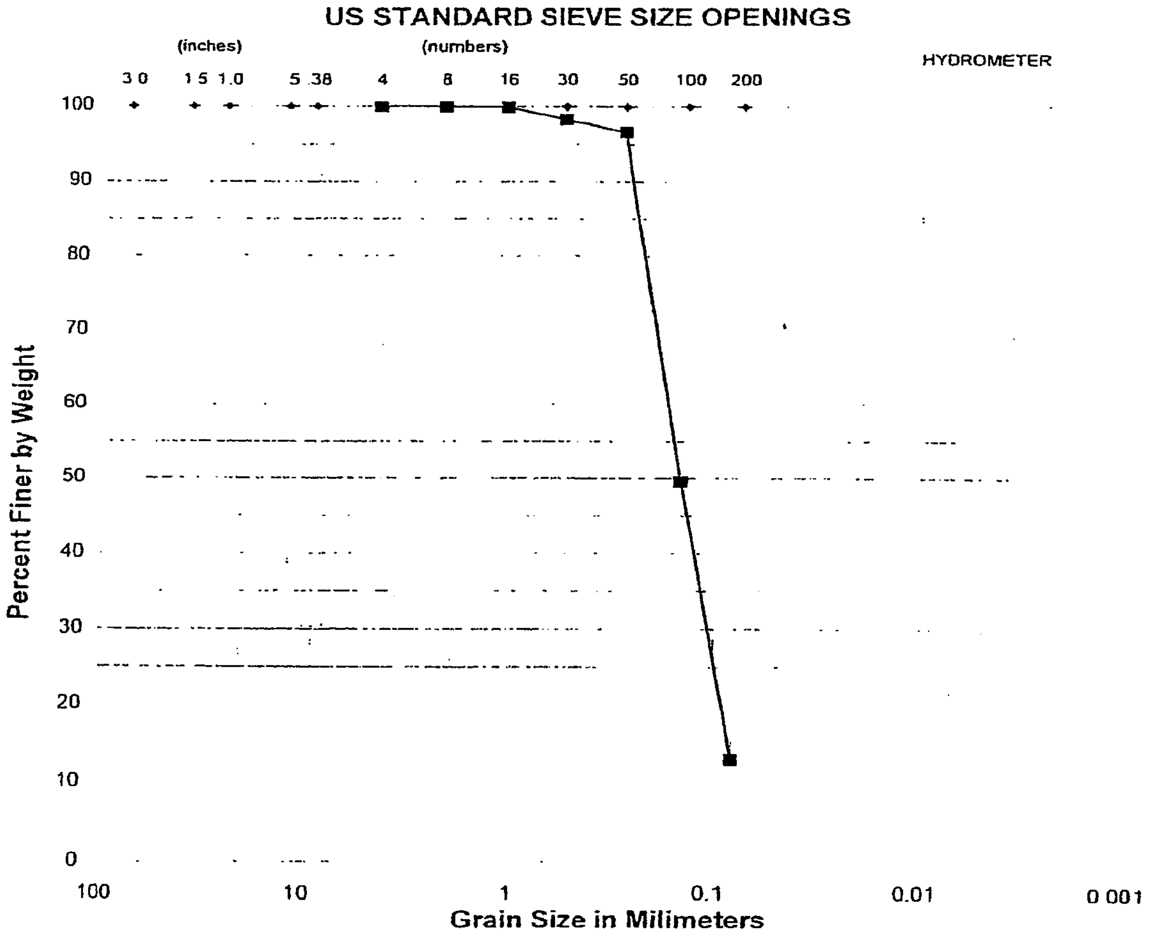
**TABLE C-26. Gradation Results for Entrada Sand NP6 (continued)**

# PARTICLE SIZE ANALYSIS

## INBERG-MILLER ENGINEERS

CLIENT: U.S. Energy
PROJECT: Shootering Canyon
JOB NO.: 10223RM
TEST DATE: 8-21-02
TESTED BY: GLM
TEST METHOD: ASTM C136

SAMPLE NO.: NP-6 Sand
SAMPLED BY: Client
SOURCE: On-site
SAMPLE DESCRIPTION: Reddish silty fine sand
GRADATION DESCRIPTION:



| | | | | | | | |
|---|---|---|---|---|---|---|---|
| cobbles | coarse gravel | fine gravel | coarse sand | medium sand | fine sand | silt | clay |

Unified Soil Classification System (ASTM D2487)

## C.7 Shootaring Dam Large Rock Classification

Two 20 foot by 20 foot test areas were selected on the upstream face of the Shootaring Canyon Dam. Within each test area, the visible rocks were classified into three size categories (9 inch to 15 inch, 15 inch to 24 inch, and larger than 24 inch), and also classified by rock type. The number of smaller rocks (<9 inch) was also determined. The rock types included sandstone, andesite porphyry, and a third category currently designated as "other". An approximate weight was assumed for the average rock within each size category, and the proportion of each rock type by weight was estimated. The results of the rock classification are included in Table C-27.

# TABLE C-27. Shootaring Dam Large Rock Classification

## AREA 1

| Rock Classification | < 9" Diameter Assume 25 pounds per rock | | | | 9" to 15" Diameter Assume 100 pounds per rock | | | |
|---|---|---|---|---|---|---|---|---|
| | # of Rocks | % of each type in size bracket by # of rocks | Total Weight of each type in size bracket | % of total sample by weight | # of Rocks | % of each type in size bracket by # of rocks | Total Weight of each type in size bracket | % of total sample by weight |
| Sandstone | - | - | - | - | 69 | 48.6% | 6900 | 15.3% |
| Porphyry | - | - | - | - | 49 | 34.5% | 4900 | 10.9% |
| Other | - | - | - | - | 24 | 16.9% | 2400 | 5.3% |
| Total | 399 | - | 9975 | 22.2% | 142 | - | 14200 | 31.6% |

| Rock Classification | 15" to 24" Diameter Assume 400 pounds per rock | | | | > 24" Diameter Assume 800 pounds per rock | | | |
|---|---|---|---|---|---|---|---|---|
| | # of Rocks | % of each type in size bracket by # of rocks | Total Weight of each type in size bracket | % of total sample by weight | # of Rocks | % of each type in size bracket by # of rocks | Total Weight of each type in size bracket | % of total sample by weight |
| Sandstone | 19 | 47.5% | 7600 | 16.9% | 4 | 66.7% | 3200 | 7.1% |
| Porphyry | 15 | 37.5% | 6000 | 13.3% | 1 | 16.7% | 800 | 1.8% |
| Other | 6 | 15.0% | 2400 | 5.3% | 1 | 16.7% | 100 | 0.2% |
| Total | 40 | - | 16000 | 35.6% | 6 | - | 4800 | 10.7% |

## AREA 2

| Rock Classification | < 9" Diameter Assume 25 pounds per rock | | | | 9" to 15" Diameter Assume 100 pounds per rock | | | |
|---|---|---|---|---|---|---|---|---|
| | # of Rocks | % of each type in size bracket | Total Weight of each type in size bracket | % of total sample by weight | # of Rocks | % of each type in size bracket by # of rocks | Total Weight of each type in size bracket | % of total sample by weight |
| Sandstone | - | - | - | - | 28 | 27.2% | 2800 | 7.4% |
| Porphyry | - | - | - | - | 32 | 31.1% | 3200 | 8.5% |
| Other | - | - | - | - | 43 | 41.7% | 4300 | 9.6% |
| Total | 500 | - | 12500 | 33.2% | 103 | - | 10300 | 27.4% |

| Rock Classification | 15" to 24" Diameter Assume 400 pounds per rock | | | | > 24" Diameter Assume 800 pounds per rock | | | |
|---|---|---|---|---|---|---|---|---|
| | # of Rocks | % of each type in size bracket | Total Weight of each type in size bracket | % of total sample by weight | # of Rocks | % of each type in size bracket by # of rocks | Total Weight of each type in size bracket | % of total sample by weight |
| Sandstone | 7 | 33.3% | 2800 | 7.4% | 3 | 37.5% | 2400 | 6.4% |
| Porphyry | 9 | 42.9% | 3600 | 9.6% | 2 | 25.0% | 1600 | 4.3% |
| Other | 5 | 23.8% | 2000 | 4.4% | 3 | 37.5% | 300 | 0.7% |
| Total | 21 | - | 8400 | 22.3% | 8 | - | 6400 | 17.0% |

## COMBINATION OF AREAS 1 AND 2

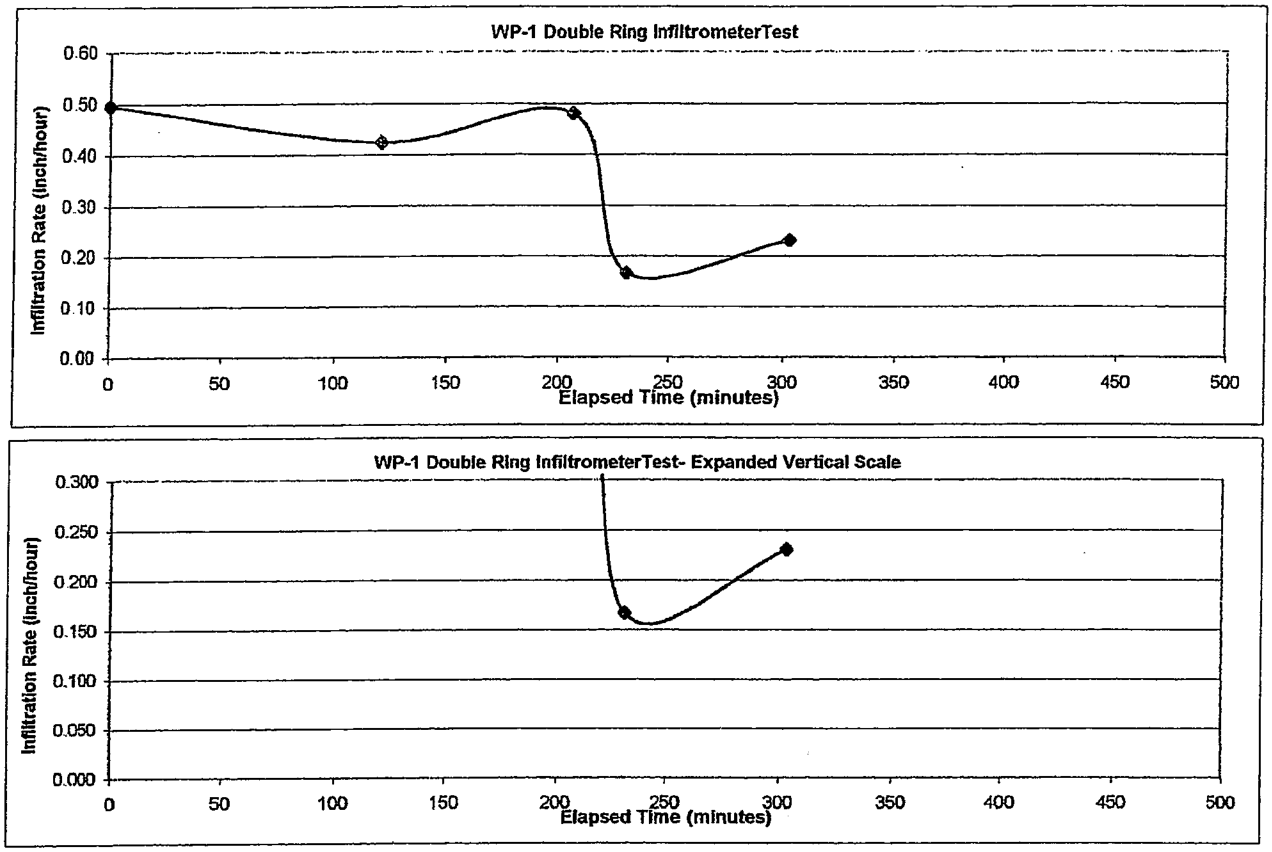
| Rock Classification | < 9" Diameter Assume 25 pounds per rock | | | | 9" to 15" Diameter Assume 100 pounds per rock | | | |
|---|---|---|---|---|---|---|---|---|
| | # of Rocks | % of each type in size bracket | Total Weight of each type in size bracket | % of total sample by weight | # of Rocks | % of each type in size bracket by # of rocks | Total Weight of each type in size bracket | % of total sample by weight |
| Sandstone | - | - | - | - | 97 | 39.6% | 9700 | 11.7% |
| Porphyry | - | - | - | - | 81 | 33.1% | 8100 | 9.8% |
| Other | - | - | - | - | 67 | 27.3% | 6700 | 14.9% |
| Total | 899 | - | 22475 | 27.2% | 245 | - | 24500 | 29.7% |

| Rock Classification | 15" to 24" Diameter Assume 400 pounds per rock | | | | > 24" Diameter Assume 800 pounds per rock | | | |
|---|---|---|---|---|---|---|---|---|
| | # of Rocks | % of each type in size bracket | Total Weight of each type in size bracket | % of total sample by weight | # of Rocks | % of each type in size bracket by # of rocks | Total Weight of each type in size bracket | % of total sample by weight |
| Sandstone | 26 | 42.6% | 10400 | 12.6% | 7 | 50.0% | 5600 | 6.8% |
| Porphyry | 24 | 39.3% | 9600 | 11.6% | 3 | 21.4% | 2400 | 2.9% |
| Other | 11 | 18.0% | 4400 | 9.8% | 4 | 28.6% | 400 | 0.9% |
| Total | 61 | - | 24400 | 29.5% | 14 | - | 11200 | 13.6% |

NOTE:

Percent Sandstone > 9" By Weight = 42.8%
Percent Porphyry > 9" By Weight = 33.4%
Percent Other > 9" By Weight = 23.8%

FIGURE C-1. INFILTROMETER TEST RESULTS FOR WP1

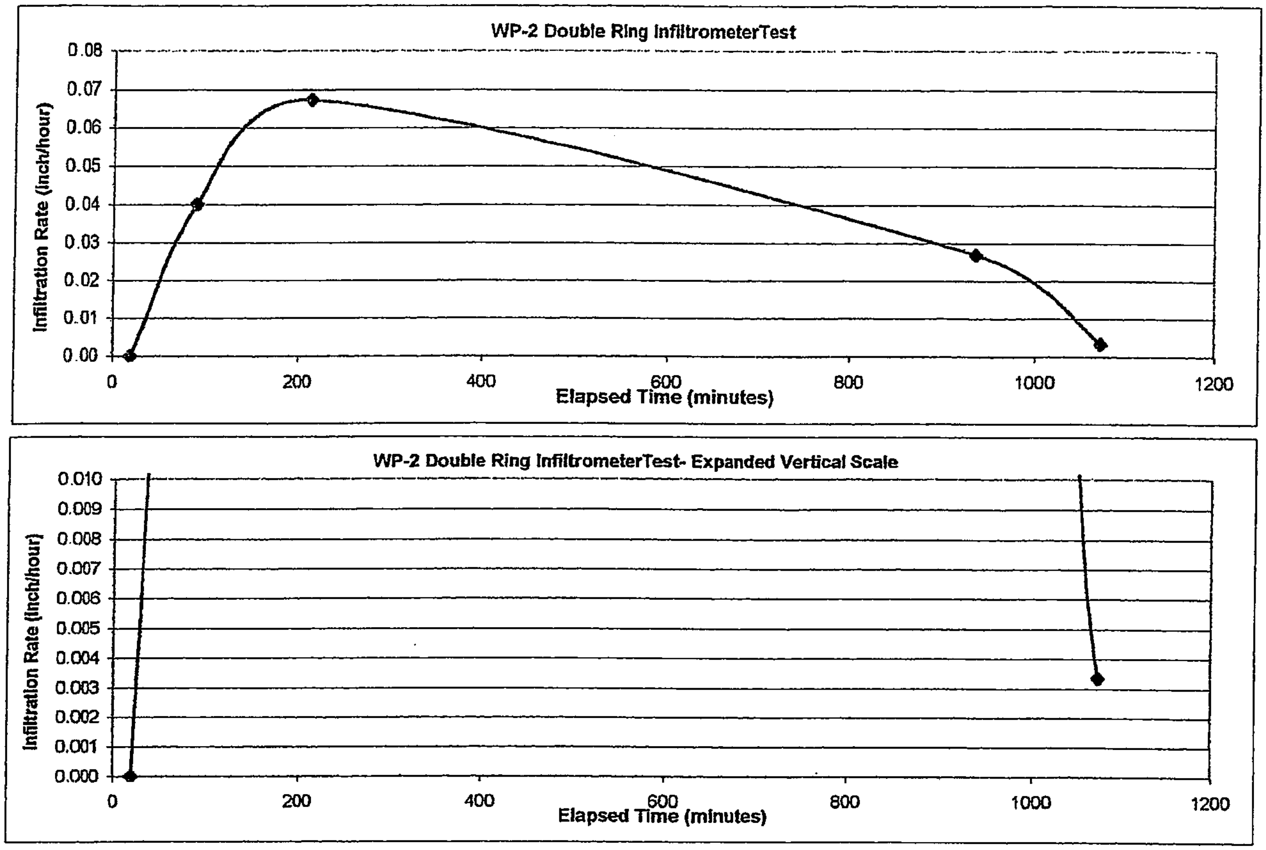


**INFILTRATION TEST #1**
**ON CLAY IN BACKHOE PIT WP-1**
**INNER RING = 12-1/8" DIAMETER**

| DATE | TIME | VOLUME IN JUG (GAL.) | RUN TIME (MIN.) | INCREMENT ELAPSED TIME (MIN.) | INCREMENT VOLUME (GAL.) | INFILTRATION RATE (FT/DAY) | INFILTRATION RATE (IN/HR) | INFILTRATION RATE (CM/SEC) |
|---|---|---|---|---|---|---|---|---|
| 6/3/02 | 11:21 | | FILLED OUTER RING | | | | | |
| | 11:24 | | FIILLED INNER RING | | | | | |
| | 11:45 | HAVING PROBLEMS WITH GLUG JUG | | | | | | |
| | 11:48 | 2.75 | 0 | | | | | |
| | 13:49 | 2.25 | 121 | 121 | 0.5 | **0.99191** | **0.49595** | **3.50E-04** |
| | 15:14 | 1.95 | 206 | 85 | 0.3 | **0.84721** | **0.42360** | **2.99E-04** |
| | 15:36 | 1.85 | 231 | 25 | 0.1 | **0.96017** | **0.48008** | **3.39E-04** |
| | 16:51 | 1.75 | 303 | 72 | 0.1 | **0.33339** | **0.16670** | **1.18E-04** |
| | 19:01 | 1.5 | 433 | 130 | 0.25 | **0.46162** | **0.23081** | **1.63E-04** |
| | 19:10 | REFILL INNER RING TO 2.3 GAL | | | | | | |
| 6/4/02 | 7:03 | GLUG JUG FAILED OVER NIGHT 0.22' FROM TOP | | | | | | |
| | 9:29 | | 0.22' FROM TOP | | | | | |

*Note - The failure of the supply system rendered the test results unusable.
No average infiltration rate is calculated.

## FIGURE C-2. INFILTROMETER TEST RESULTS FOR WP2

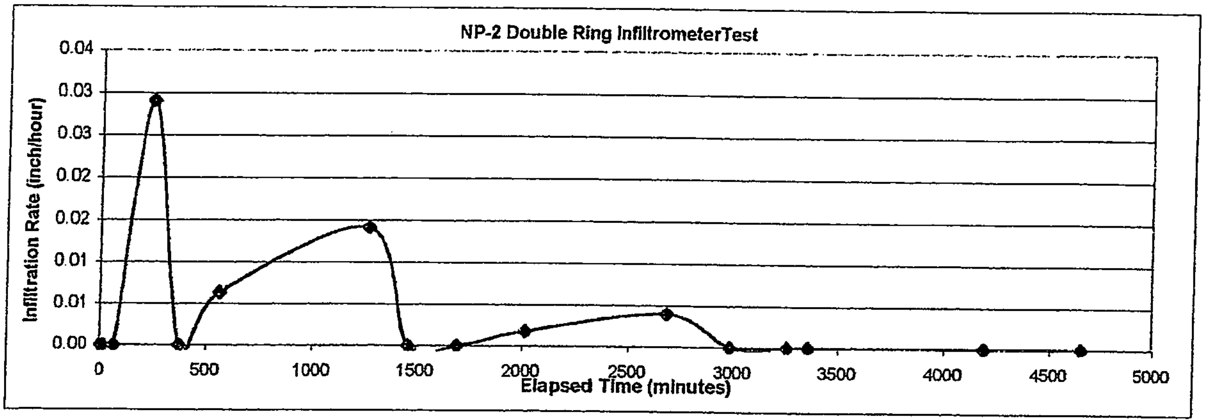


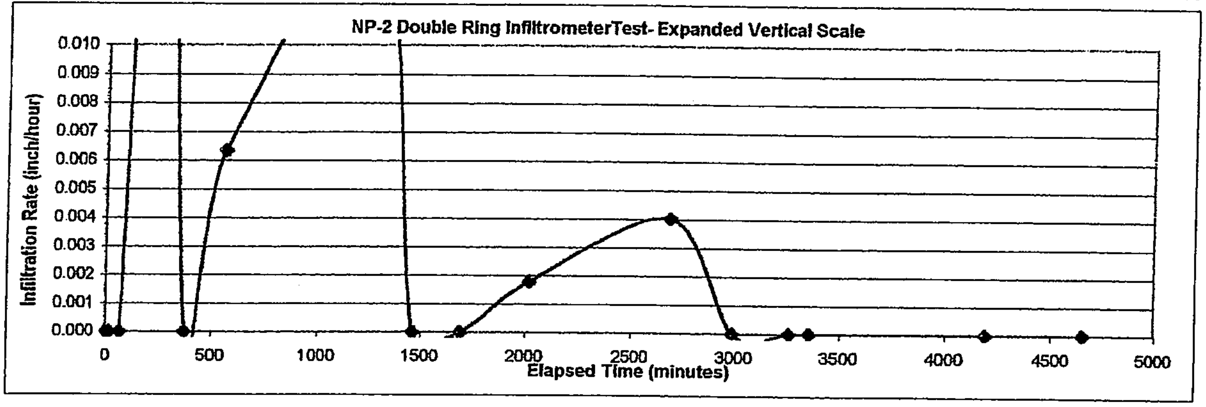
### INFILTRATION TEST #2
### ON CLAY IN BACKHOE PIT WP-2

| DATE | TIME | DEPTH TO WATER IN INNER RING (FT.) | INCREMENT WATER DEPTH (FT.) | RUN TIME (MIN.) | INCREMENT ELAPSED TIME (MIN.) | INFILTRATION RATE (FT/DAY) | INFILTRATION RATE (IN/HR) | INFILTRATION RATE (CM/SEC) |
|---|---|---|---|---|---|---|---|---|
| 6/3/02 | 14:27 | | | FILLED OUTER RING | | | | |
| | 14:39 | | | FILLED INNER RING | | | | |
| | 15:06 | | | HAVING PROBLEMS WITH GLUG JUG | | | | |
| | 15:10 | | | HAVING PROBLEMS WITH GLUG JUG | | | | |
| | 15:20 | | | HAVING PROBLEMS WITH GLUG JUG | | | | |
| | 15:24 | 0.415 | 0 | 0 | | | | |
| | 15:44 | 0.415 | 0 | 20 | 20 | **0.00000** | **0.00000** | 0.00E+00 |
| | 16:54 | 0.42 | 0.005 | 90 | 70 | **0.08000** | **0.04000** | 2.82E-05 |
| | 18:58 | 0.44 | 0.02 | 214 | 124 | **0.13458** | **0.06729** | 4.75E-05 |
| 6/4/02 | 7:01 | 0.475 | 0.035 | 937 | 723 | **0.05379** | **0.02689** | 1.90E-05 |
| | 9:17 | 0.48 | 0.005 | 1073 | 136 | **0.00671** | **0.00336** | 2.37E-06 |

Average Infiltration Rate after 1000 minutes 0.00336 2.367E-06

## FIGURE C-3. INFILTROMETER TEST RESULTS FOR NP2

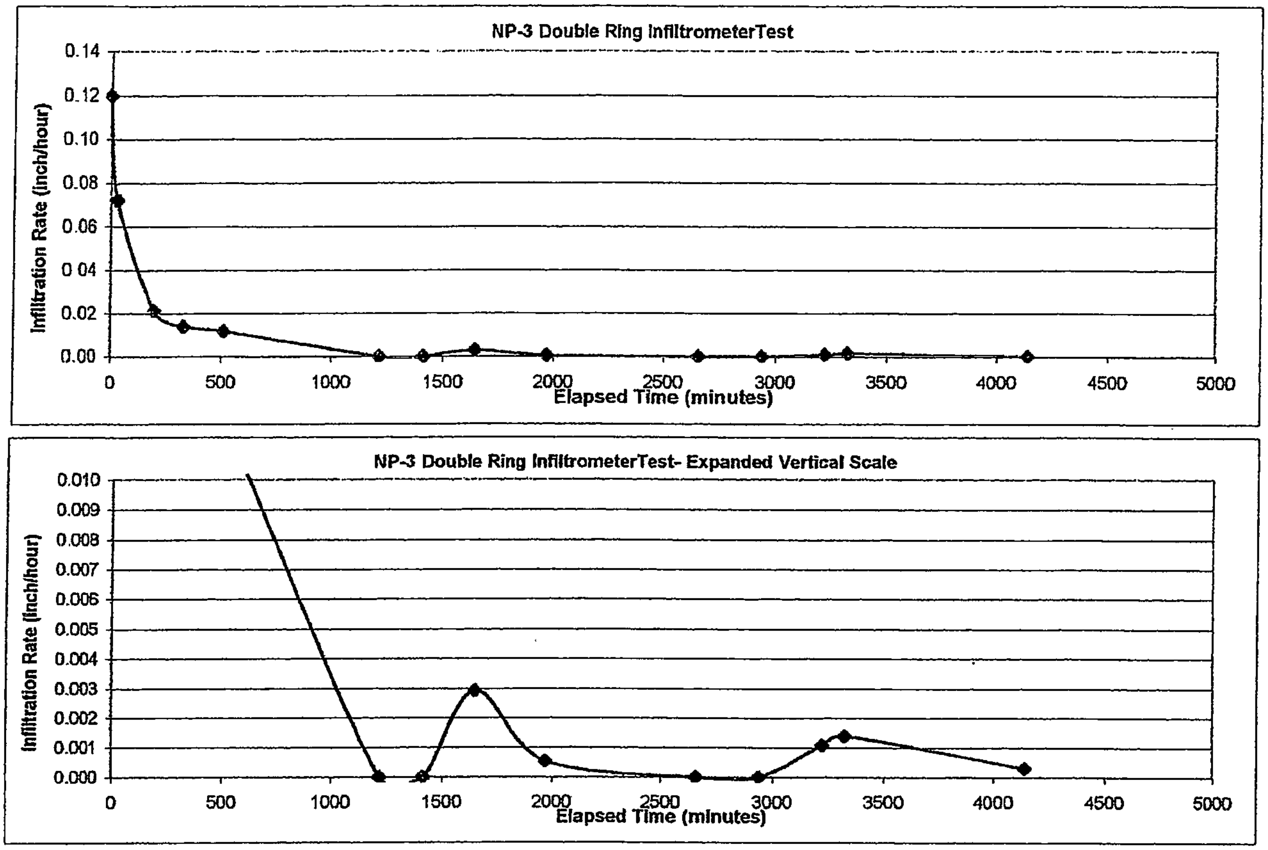




### INFILTRATION TEST #3
### ON CLAY IN BACKHOE PIT NP-2

| DATE | TIME | DEPTH TO WATER IN INNER RING (FT.) | INCREMENT WATER DEPTH (FT.) | RUN TIME (MIN.) | INCREMENT ELAPSED TIME (MIN.) | INFILTRATION RATE (FT/DAY) | INFILTRATION RATE (IN/HR) | INFILTRATION RATE (CM/SEC) |
|---|---|---|---|---|---|---|---|---|
| 6/4/02 | 9:43 | | | SETTING RINGS | | | | |
| | 9:50 | | | FILLED OUTER RING | | | | |
| | 9:54 | | | FILLED INNER RING | | | | |
| | 9:56 | 0.59 | 0 | 0 | | | | |
| | 10:00 | 0.59 | 0 | 4 | 4 | 0.00000 | 0.00000 | 0.00E+00 |
| | 10:17 | 0.59 | 0 | 21 | 17 | 0.00000 | 0.00000 | 0.00E+00 |
| | 11:09 | 0.59 | 0 | 73 | 52 | 0.00000 | 0.00000 | 0.00E+00 |
| | 14:03 | 0.6 | 0.01 | 247 | 174 | 0.05830 | 0.02915 | 2.06E-05 |
| | 16:16 | 0.6 | 0 | 380 | 133 | 0.00000 | 0.00000 | 0.00E+00 |
| | 19:22 | 0.605 | 0.005 | 566 | 186 | 0.01272 | 0.00636 | 4.49E-06 |
| 6/5/02 | 7:08 | 0.63 | 0.025 | 1272 | 706 | 0.02830 | 0.01415 | 9.98E-06 |
| | 10:23 | 0.63 | 0 | 1467 | 195 | 0.00000 | 0.00000 | 0.00E+00 |
| | 14:15 | 0.63 | 0 | 1699 | 232 | 0.00000 | 0.00000 | 0.00E+00 |
| | 19:37 | 0.635 | 0.005 | 2021 | 322 | 0.00356 | 0.00178 | 1.26E-06 |
| 6/6/02 | 6:50 | 0.65 | 0.015 | 2694 | 673 | 0.00802 | 0.00401 | 2.83E-06 |
| | 11:48 | 0.65 | 0 | 2992 | 298 | 0.00000 | 0.00000 | 0.00E+00 |
| | 16:20 | 0.65 | 0 | 3264 | 272 | 0.00000 | 0.00000 | 0.00E+00 |
| | 18:01 | 0.65 | 0 | 3365 | 101 | 0.00000 | 0.00000 | 0.00E+00 |
| 6/7/02 | 7:48 | 0.65 | 0 | 4192.2 | 827.2 | 0.00000 | 0.00000 | 0.00E+00 |
| | 15:36 | 0.65 | 0 | 4660 | 467.8 | 0.00000 | 0.00000 | 0.00E+00 |
| | | | | Average Infiltration Rate after 1500 minutes | | | 0.00072 | 5.107E-07 |

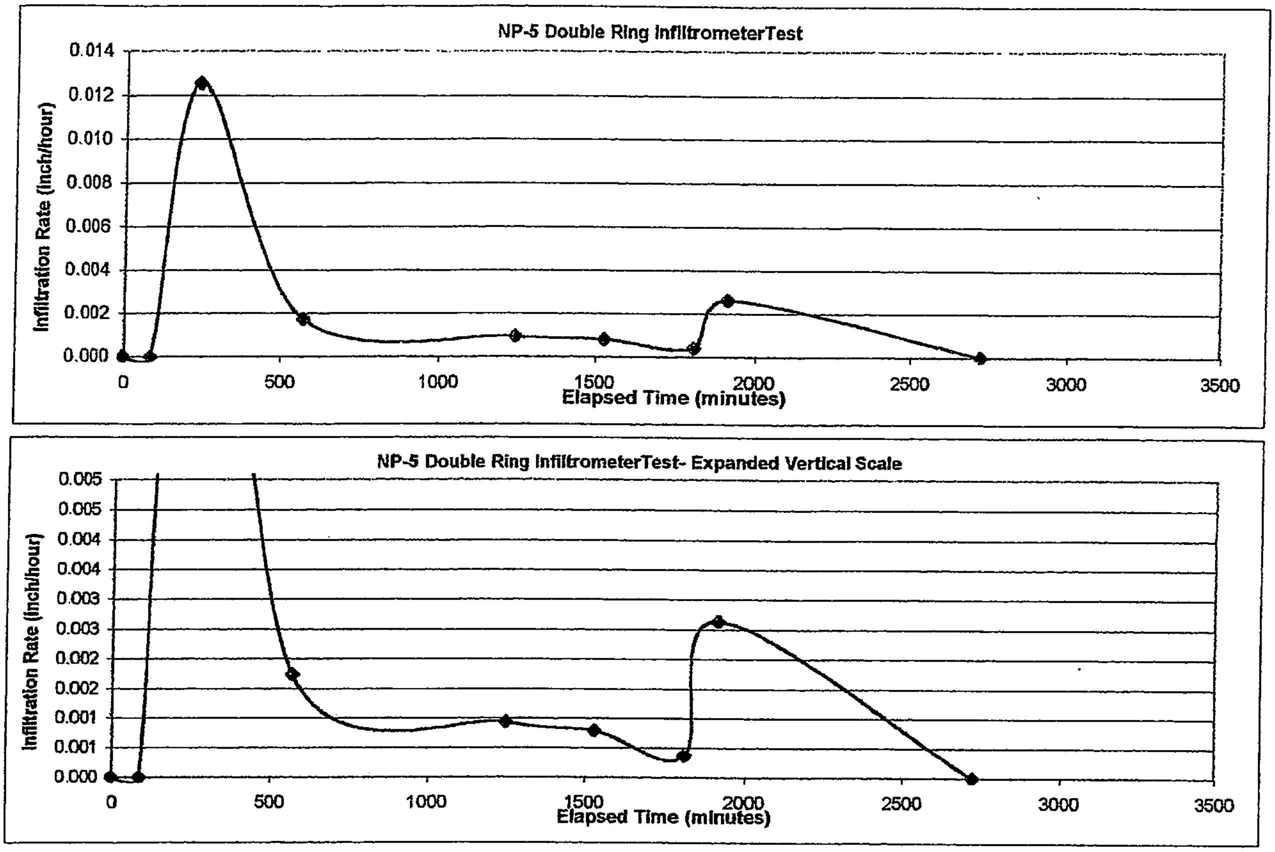
## FIGURE C-4. INFILTROMETER TEST RESULTS FOR NP3



**INFILTRATION TEST #4**
**ON CLAY IN BACKHOE PIT NP-3**

| DATE | TIME | DEPTH TO WATER IN INNER RING (FT.) | INCREMENT WATER DEPTH (FT.) | RUN TIME (MIN.) | INCREMENT ELAPSED TIME (MIN.) | INFILTRATION RATE (FT/DAY) | INFILTRATION RATE (IN/HR) | INFILTRATION RATE (CM/SEC) |
|---|---|---|---|---|---|---|---|---|
| 6/4/02 | 10:24 | | | | SETTING RINGS | | | |
| | 10:40 | | | | FILLED INNER RING | | | |
| | 10:43 | 0.495 | 0 | 0 | | | | |
| | 11:13 | 0.5 | 0.005 | 30 | 30 | 0.24000 | 0.12000 | 8.47E-05 |
| | 14:02 | 0.52 | 0.02 | 199 | 169 | 0.14472 | 0.07236 | 5.11E-05 |
| | 16:18 | 0.53 | 0.01 | 335 | 136 | 0.04299 | 0.02149 | 1.52E-05 |
| | 19:20 | 0 54 | 0.01 | 517 | 182 | 0.02785 | 0.01393 | 9.83E-06 |
| 6/5/02 | 7:04 | 0.56 | 0.02 | 1221 | 704 | 0.02359 | 0.01179 | 8.32E-06 |
| | 10:21 | 0 56 | 0 | 1418 | 197 | 0.00000 | 0.00000 | 0.00E+00 |
| | 14:12 | 0.56 | 0 | 1649 | 231 | 0.00000 | 0.00000 | 0.00E+00 |
| | 19:35 | 0.568 | 0.008 | 1972 | 323 | 0.00584 | 0.00292 | 2.06E-06 |
| 6/6/02 | 7:04 | 0.57 | 0.002 | 2661 | 689 | 0.00108 | 0.00054 | 3.82E-07 |
| | 11:47 | 0 57 | 0 | 2944 | 283 | 0.00000 | 0.00000 | 0.00E+00 |
| | 16:32 | 0.57 | 0 | 3229 | 285 | 0.00000 | 0.00000 | 0.00E+00 |
| | 18:12 | 0.575 | 0.005 | 3329 | 100 | 0.00216 | 0.00108 | 7.63E-07 |
| 6/7/02 | 7:46 | 0.583 | 0.008 | 4143 | 814 | 0.00278 | 0.00139 | 9.81E-07 |
| | 15:29 | 0.585 | 0.002 | 4606 | 463 | 0.00063 | 0.00031 | 2.21E-07 |
| | | | | Average Infiltration Rate after 1200 minutes | | | 0.00069 | 4.897E-07 |

## FIGURE C-5. INFILTROMETER TEST RESULTS FOR NP5

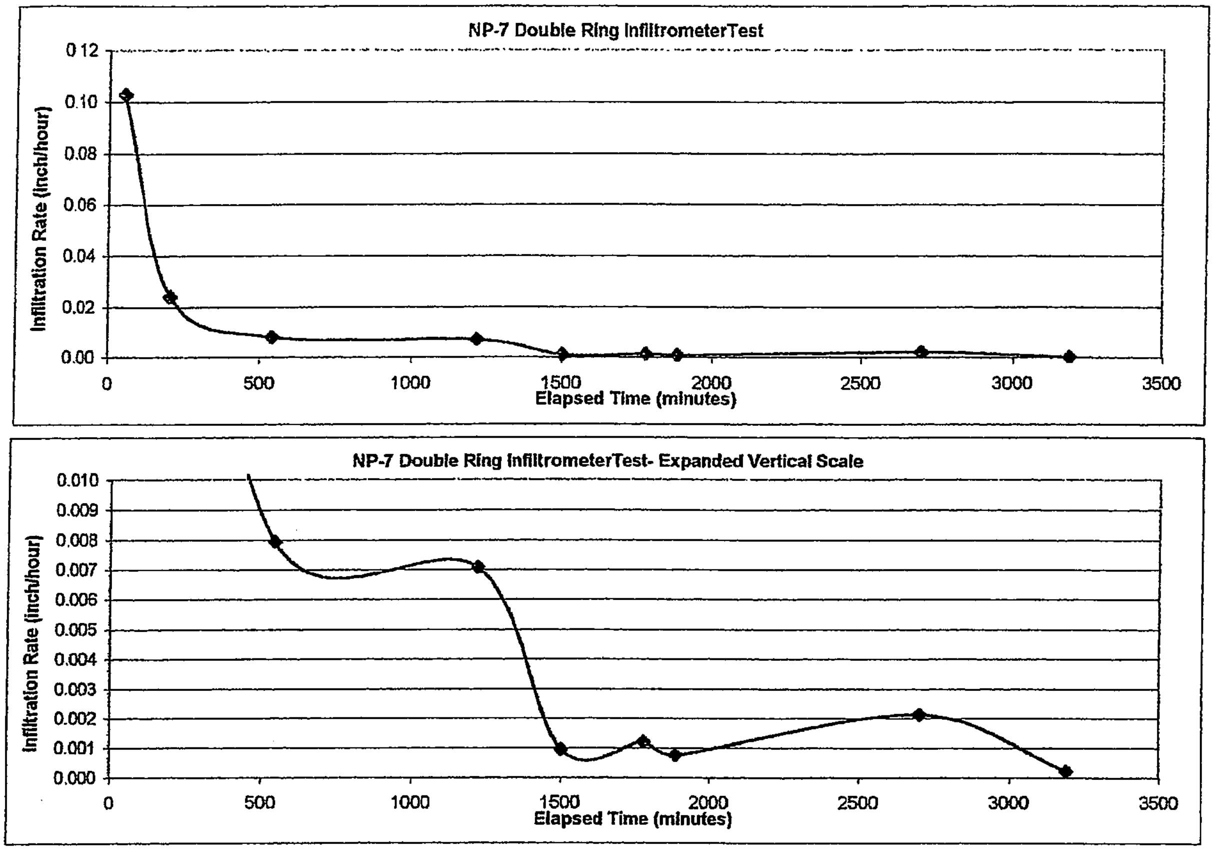


### INFILTRATION TEST #5
### ON CLAY IN BACKHOE PIT NP-5

| DATE | TIME | DEPTH TO WATER IN INNER RING (FT.) | INCREMENT WATER DEPTH (FT.) | RUN TIME (MIN.) | INCREMENT ELAPSED TIME (MIN.) | INFILTRATION RATE (FT/DAY) | INFILTRATION RATE (IN/HR) | INFILTRATION RATE (CM/SEC) |
|---|---|---|---|---|---|---|---|---|
| 6/5/02 | 9:55 | | | SETTING RINGS | | | | |
| | 10:00 | | | FILLED INNER RING | | | | |
| | 10:07 | 0.135 | 0 | 0 | | | | |
| | 11:34 | 0.135 | 0 | 87 | 87 | **0.00000** | **0.00000** | 0.00E+00 |
| | 14:03 | 0.135 | 0 | 236 | 149 | **0.00000** | **0.00000** | 0.00E+00 |
| | 19:40 | 0.145 | 0.01 | 573 | 337 | **0.02513** | **0.01257** | 8.87E-06 |
| 6/6/02 | 6:55 | 0.148 | 0.003 | 1248 | 675 | **0.00346** | **0.00173** | 1.22E-06 |
| | 11:40 | 0.15 | 0.002 | 1533 | 285 | **0.00188** | **0.00094** | 6.63E-07 |
| | 16:24 | 0.152 | 0.002 | 1817 | 284 | **0.00159** | **0.00079** | 5.59E-07 |
| | 18:04 | 0.153 | 0.001 | 1917 | 100 | **0.00075** | **0.00038** | 2.65E-07 |
| 6/7/02 | 7:36 | 0.163 | 0.01 | 2729 | 812 | **0.00528** | **0.00264** | 1.86E-06 |
| | 15:45 | 0.163 | 0 | 3218 | 489 | **0.00000** | **0.00000** | 0.00E+00 |

Average Infiltration Rate after 1000 minutes 0.00108 7.616E-07

## FIGURE C-6. INFILTROMETER TEST RESULTS FOR NP7

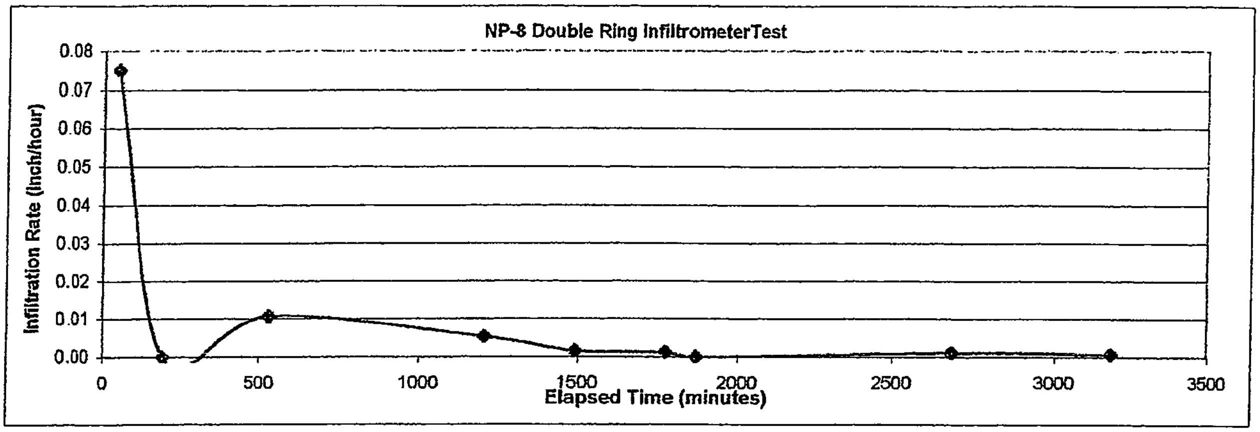


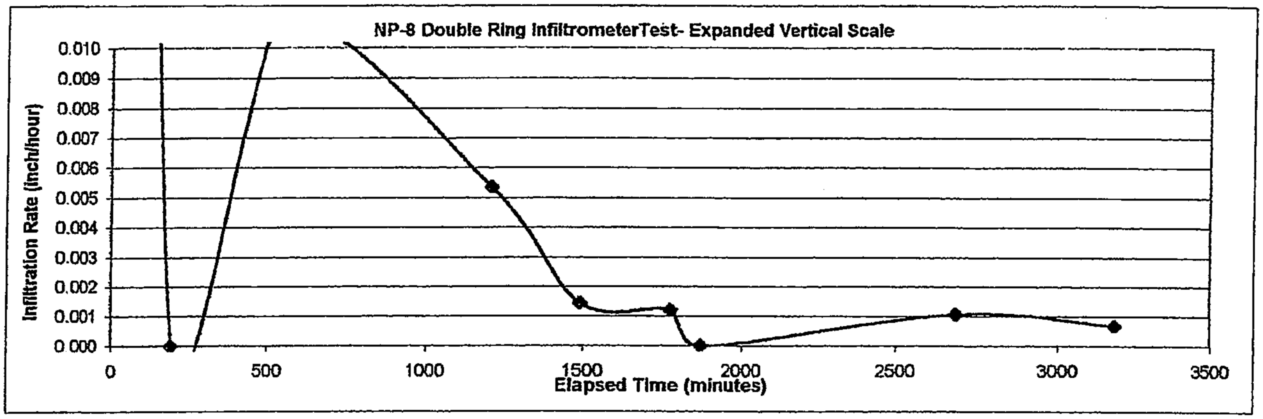
### INFILTRATION TEST #6
### ON CLAY IN BACKHOE PIT NP-7

| DATE | TIME | DEPTH TO WATER IN INNER RING (FT.) | INCREMENT WATER DEPTH (FT.) | RUN TIME (MIN.) | INCREMENT ELAPSED TIME (MIN.) | INFILTRATION RATE (FT/DAY) | INFILTRATION RATE (IN/HR) | INFILTRATION RATE (CM/SEC) |
|---|---|---|---|---|---|---|---|---|
| 6/5/02 | 10:35 | | | SETTING RINGS | | | | |
| | 10:39 | | | FILLED INNER RING | | | | |
| | 10:40 | 0.155 | 0 | 0 | | | | |
| | 11:36 | 0.163 | 0.008 | 56 | 56 | **0.20571** | **0.10286** | **7.26E-05** |
| | 14:09 | 0.17 | 0.007 | 209 | 153 | **0.04823** | **0.02411** | **1.70E-05** |
| | 19:44 | 0.176 | 0.006 | 544 | 335 | **0.01588** | **0.00794** | **5.60E-06** |
| 6/6/02 | 7:02 | 0.188 | 0.012 | 1222 | 678 | **0.01414** | **0.00707** | **4.99E-06** |
| | 11:45 | 0.19 | 0.002 | 1505 | 283 | **0.00191** | **0.00096** | **6.75E-07** |
| | 16:25 | 0.193 | 0.003 | 1785 | 280 | **0.00242** | **0.00121** | **8.54E-07** |
| | 18:10 | 0.195 | 0.002 | 1890 | 105 | **0.00152** | **0.00076** | **5.38E-07** |
| 6/7/02 | 7:43 | 0.203 | 0.008 | 2703 | 813 | **0.00426** | **0.00213** | **1.50E-06** |
| | 15:50 | 0.204 | 0.001 | 3190 | 487 | **0.00045** | **0.00023** | **1.59E-07** |

Average Infiltration Rate after 1500 minutes 0.00106 7.458E-07

## FIGURE C-7. INFILTROMETER TEST RESULTS FOR NP8



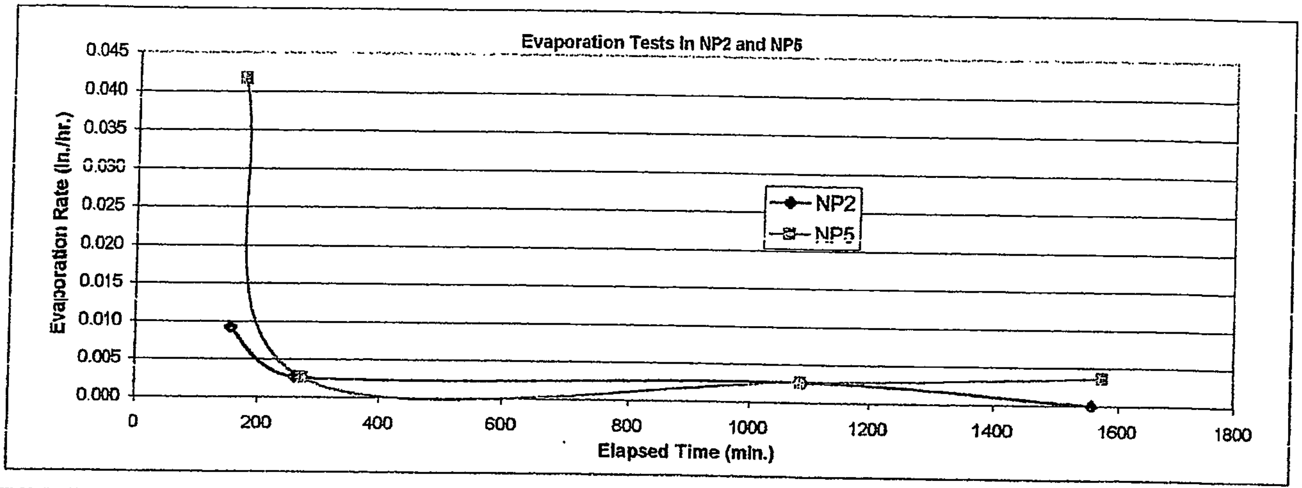


### INFILTRATION TEST #7
### ON CLAY IN BACKHOE PIT NP-8

| DATE | TIME | DEPTH TO WATER IN INNER RING (FT.) | INCREMENT WATER DEPTH (FT.) | RUN TIME (MIN.) | INCREMENT ELAPSED TIME (MIN.) | INFILTRATION RATE (FT/DAY) | INFILTRATION RATE (IN/HR) | INFILTRATION RATE (CM/SEC) |
|---|---|---|---|---|---|---|---|---|
| 6/5/02 | 10:40 | | | SETTING RINGS | | | | |
| | 10:46 | | | FILLED INNER RING | | | | |
| | 10:50 | 0.14 | 0 | 0 | | | | |
| | 11:38 | 0.145 | 0.005 | 48 | 48 | **0.15000** | **0.07500** | 5.29E-05 |
| | 14:07 | 0.145 | 0 | 197 | 149 | **0.00000** | **0.00000** | 0.00E+00 |
| | 19:43 | 0.153 | 0.008 | 533 | 336 | **0.02161** | **0.01081** | 7.62E-06 |
| 6/6/02 | 7:00 | 0.162 | 0.009 | 1210 | 677 | **0.01071** | **0.00536** | 3.78E-06 |
| | 11:44 | 0.165 | 0.003 | 1494 | 284 | **0.00289** | **0.00145** | 1.02E-06 |
| | 16:27 | 0.168 | 0.003 | 1777 | 283 | **0.00243** | **0.00122** | 8.58E-07 |
| | 18:03 | 0.168 | 0 | 1873 | 96 | **0.00000** | **0.00000** | 0.00E+00 |
| 6/7/02 | 7:41 | 0.172 | 0.004 | 2691 | 818 | **0.00214** | **0.00107** | 7.55E-07 |
| | 15:55 | 0.175 | 0.003 | 3185 | 494 | **0.00136** | **0.00068** | 4.78E-07 |

Average Infiltration Rate after 1400 minutes 0.00088 6.223E-07

FIGURE C-8. EVAPORATION TEST RESULTS FOR NP2 AND NP5



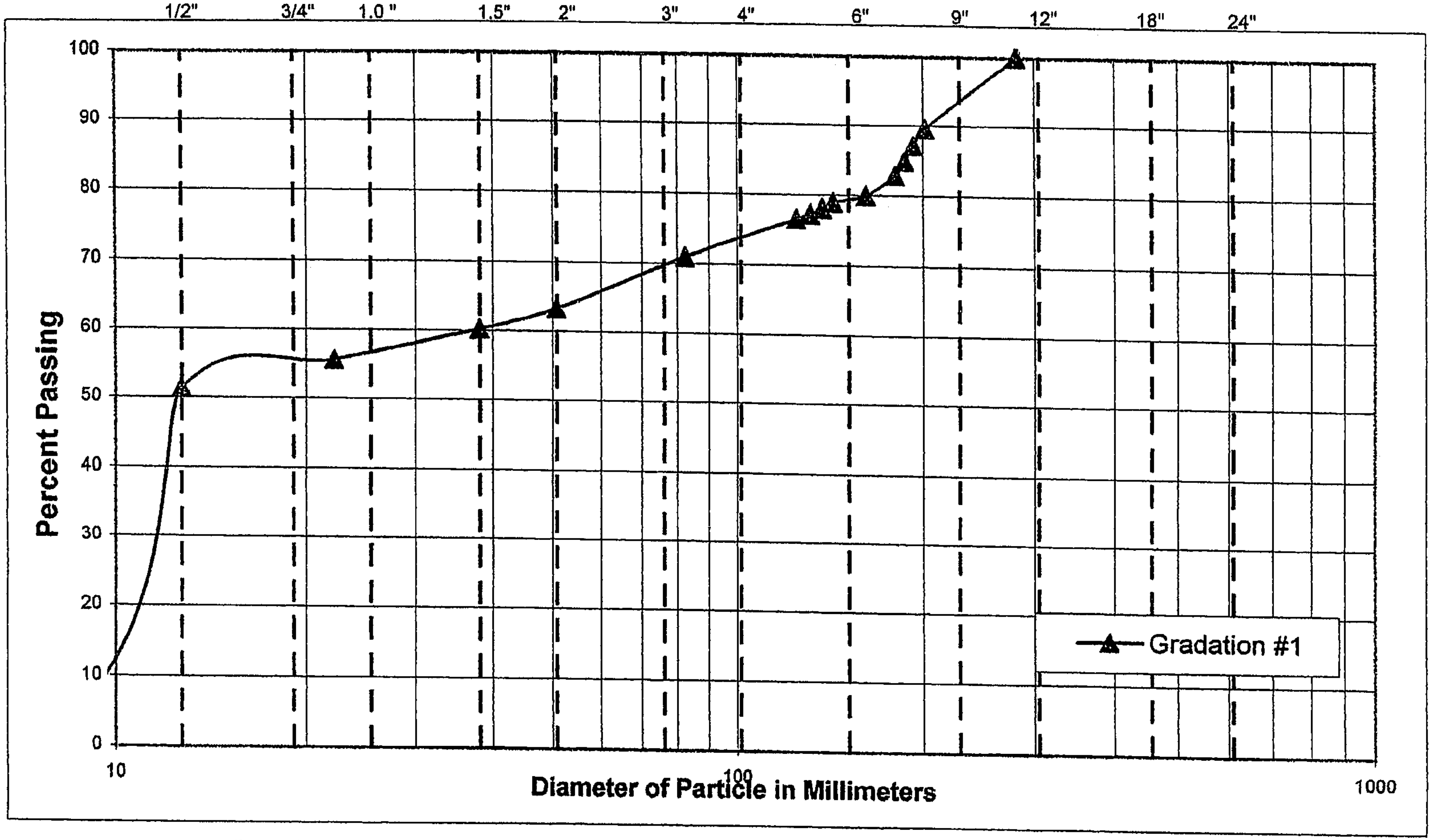
**EVAPORATION TEST #1**
**IN BACKHOE PIT NP-2**

| DATE | TIME | DEPTH TO WATER RING (FT.) | INCREMENT WATER DEPTH (FT.) | RUN TIME (MIN.) | INCREMENT ELAPSED TIME (MIN.) | EVAPORATION RATE (FT/DAY) | EVAPORATION RATE (IN/HR) | EVAPORATION RATE (CM/SEC) |
|---|---|---|---|---|---|---|---|---|
| 6/6/02 | 13:38 | 0.145 | 0 | 0 | | | | |
| | 16:14 | 0.147 | 0.002 | 156 | 156 | **0.01846** | **0.00923** | **6.51E-06** |
| | 18:00 | 0.148 | 0.001 | 262 | 106 | **0.00550** | **0.00275** | **1.94E-06** |
| 6/7/02 | 7:48 | 0.152 | 0.004 | 1090 | 828 | **0.00528** | **0.00264** | **1.86E-06** |
| | 15:35 | 0.152 | 0 | 1557 | 467 | **0.00000** | **0.00000** | **0.00E+00** |
| | | | | | Average Evaporation Rate - | | **0.00366** | **2.579E-06** |

**EVAPORATION TEST #2**
**IN BACKHOE PIT NP-5**

| DATE | TIME | DEPTH TO WATER RING (FT.) | INCREMENT WATER DEPTH (FT.) | RUN TIME (MIN.) | INCREMENT ELAPSED TIME (MIN.) | EVAPORATION RATE (FT/DAY) | EVAPORATION RATE (IN/HR) | EVAPORATION RATE (CM/SEC) |
|---|---|---|---|---|---|---|---|---|
| 6/6/02 | 13:30 | 0.152 | 0 | 0 | | | | |
| | 16:23 | 0.162 | 0.01 | 173 | 173 | **0.08324** | **0.04162** | **2.94E-05** |
| | 18:03 | 0.163 | 0.001 | 273 | 100 | **0.00527** | **0.00264** | **1.86E-06** |
| 6/7/02 | 7:36 | 0.167 | 0.004 | 1086 | 813 | **0.00530** | **0.00265** | **1.87E-06** |
| | 15:44 | 0.175 | 0.008 | 1574 | 488 | **0.00732** | **0.00366** | **2.58E-06** |
| | | | | | Average Evaporation Rate - | | **0.01264** | **8.920E-06** |

# FIGURE C-9. GRADATION TEST RESULTS FOR SOIL COVER SAMPLE RSC1

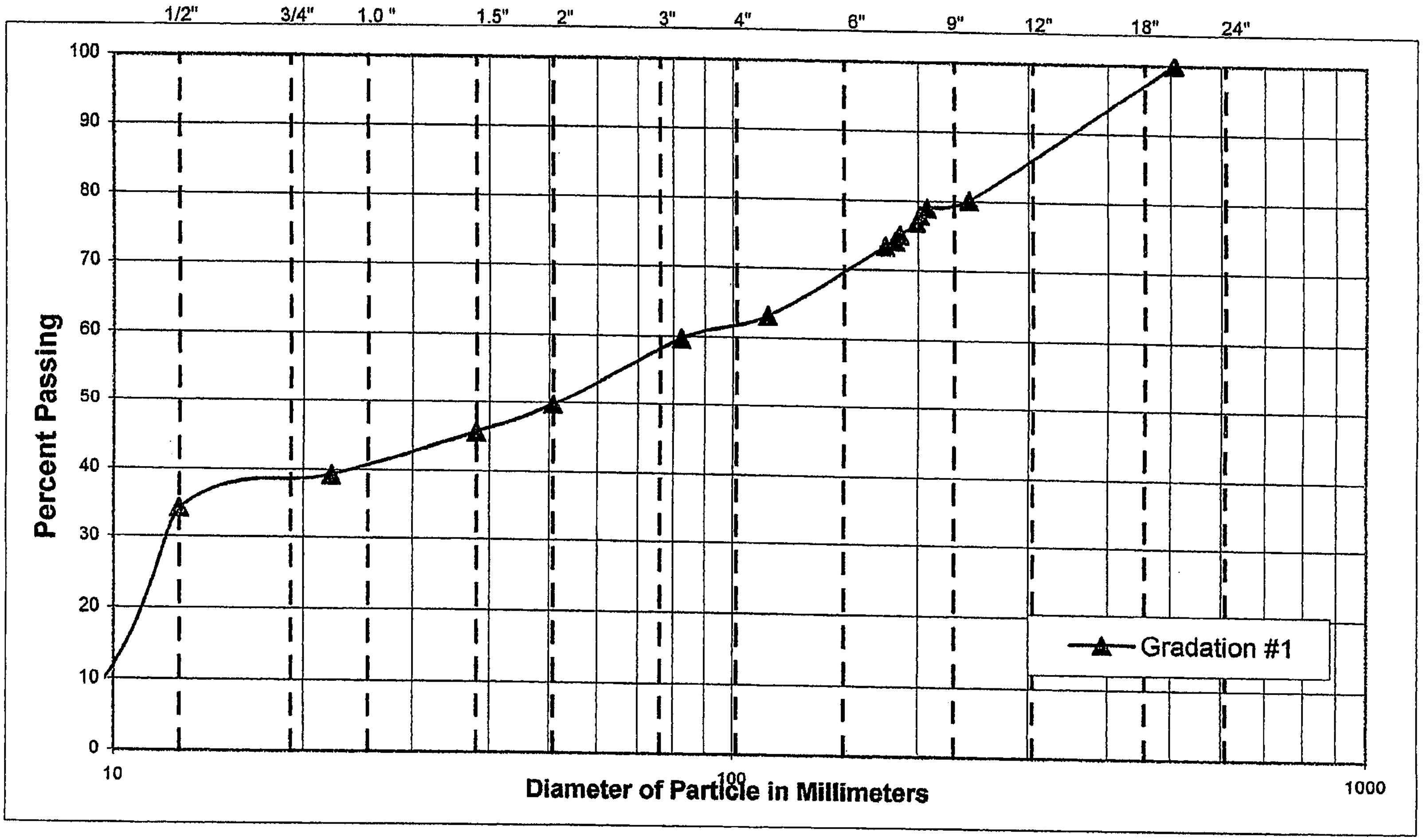


| | D15 (inch) | D25 (inch) | D50 (inch) | D75 (inch) | D100 (inch) |
|---|---|---|---|---|---|
| Gradation Results | 0.323 | 0.37 | 0.49 | 4.45 | 11.08 |

Shape Factor 1.00 Assumed Sp. Wt.
165

Gradation D50- 0.493
Sample Weight 894

# FIGURE C-10. GRADATION TEST RESULTS FOR SOIL COVER SAMPLE RSC2



| | D15 (inch) | D25 (inch) | D50 (inch) | D75 (inch) | D100 (inch) |
|---|---|---|---|---|---|
| Gradation Results | 0.359 | 0.43 | 2.04 | 7.37 | 20.00 |

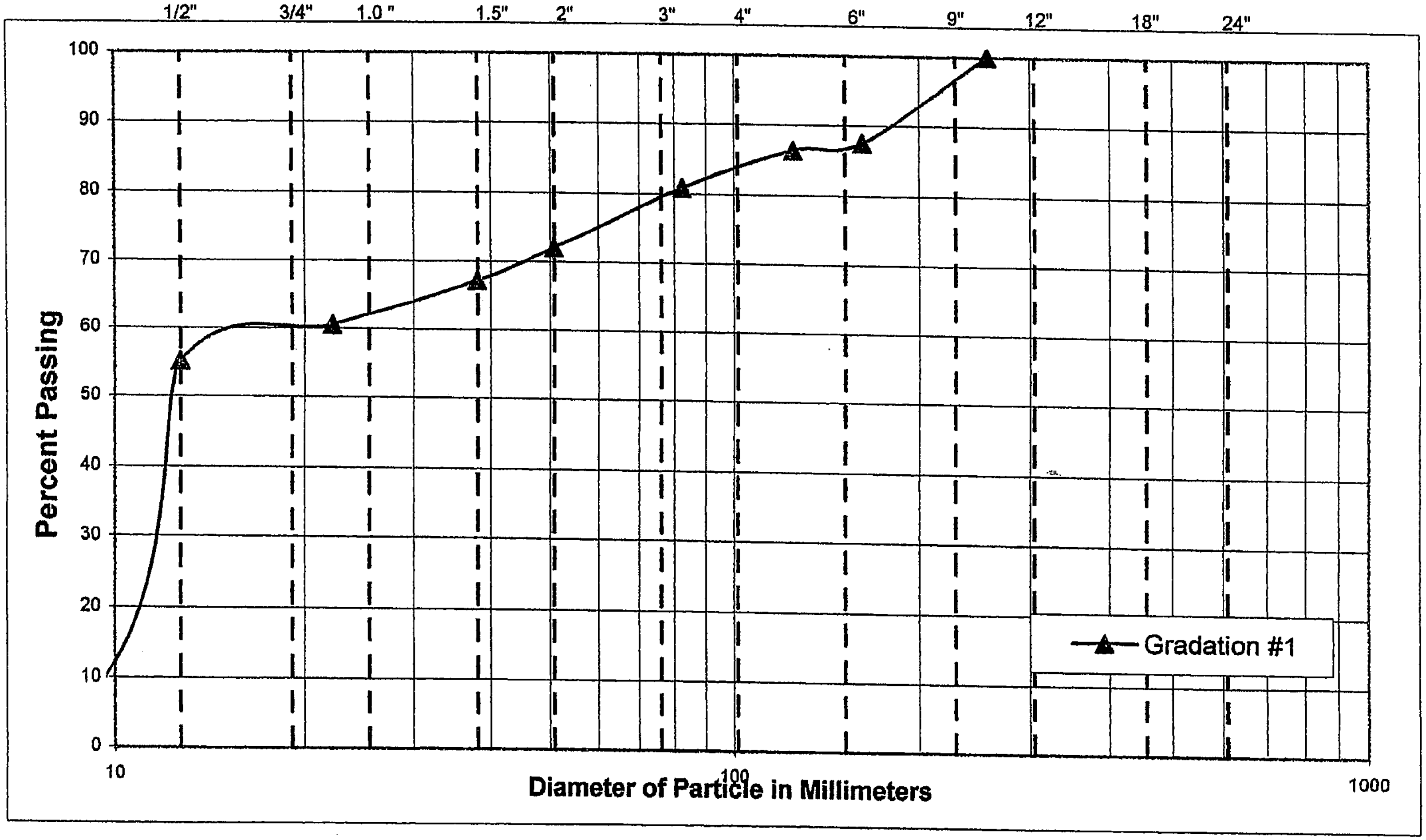
Shape Factor 1.00

Assumed Sp. Wt. 165

Gradation D50- 2.036

Sample Weight 2235

# FIGURE C-11. GRADATION TEST RESULTS FOR QUARRY ROCK SAMPLE QU1



| | D15 (inch) | D25 (inch) | D50 (inch) | D75 (inch) | D100 (inch) |
|---|---|---|---|---|---|
| Gradation Results | 0.318 | 0.36 | 0.48 | 2.41 | 10.13 |

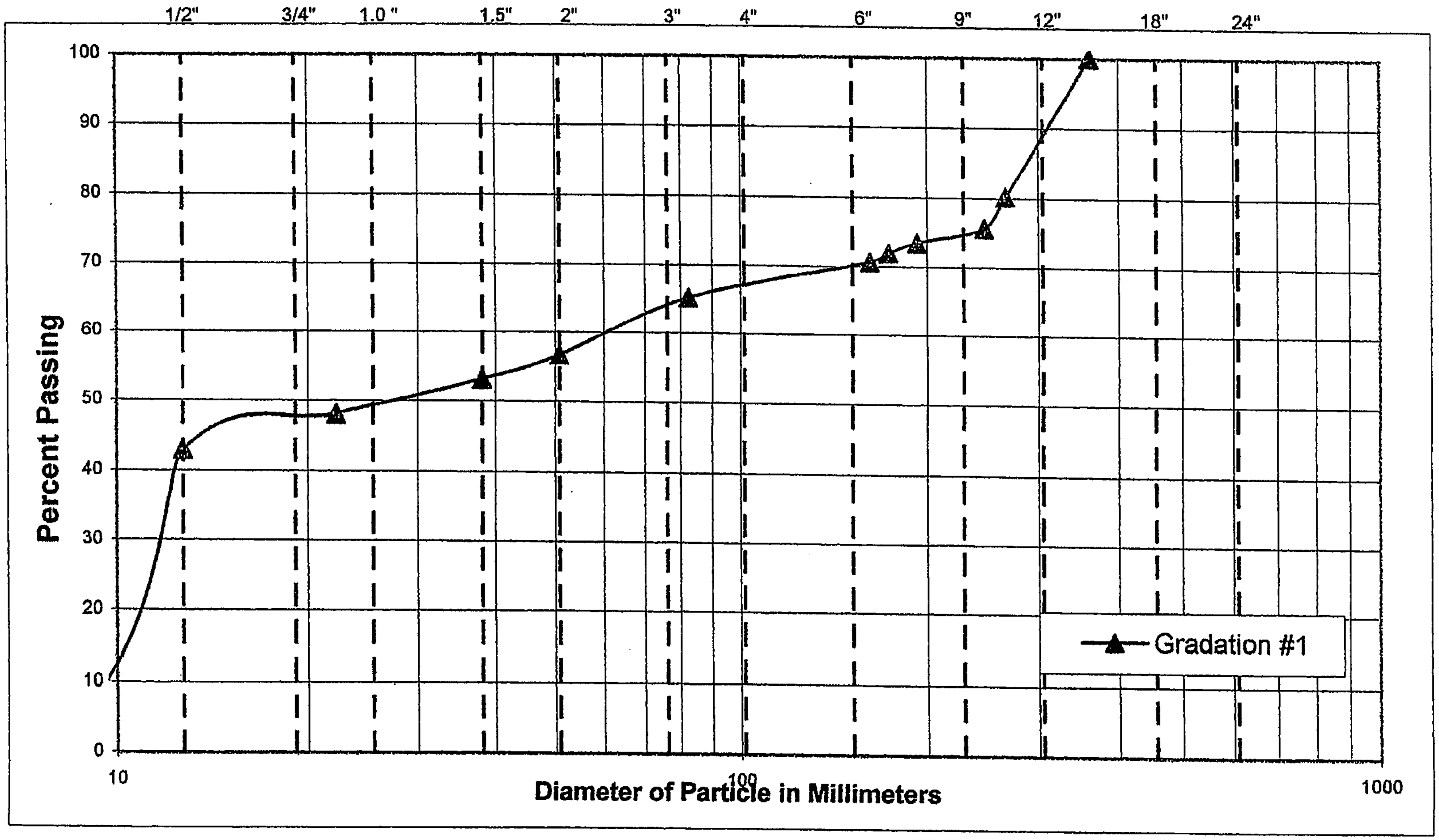
Shape Factor 1.00

Assumed Sp. Wt. 165

Gradation D50- 0.476

Sample Weight 523

# FIGURE C-12. GRADATION TEST RESULTS FOR QUARRY ROCK SAMPLE QU2



| | D15 (inch) | D25 (inch) | D50 (inch) | D75 (inch) | D100 (inch) |
|---|---|---|---|---|---|
| Gradation Results | 0.337 | 0.40 | 1.11 | 9.05 | 14.23 |

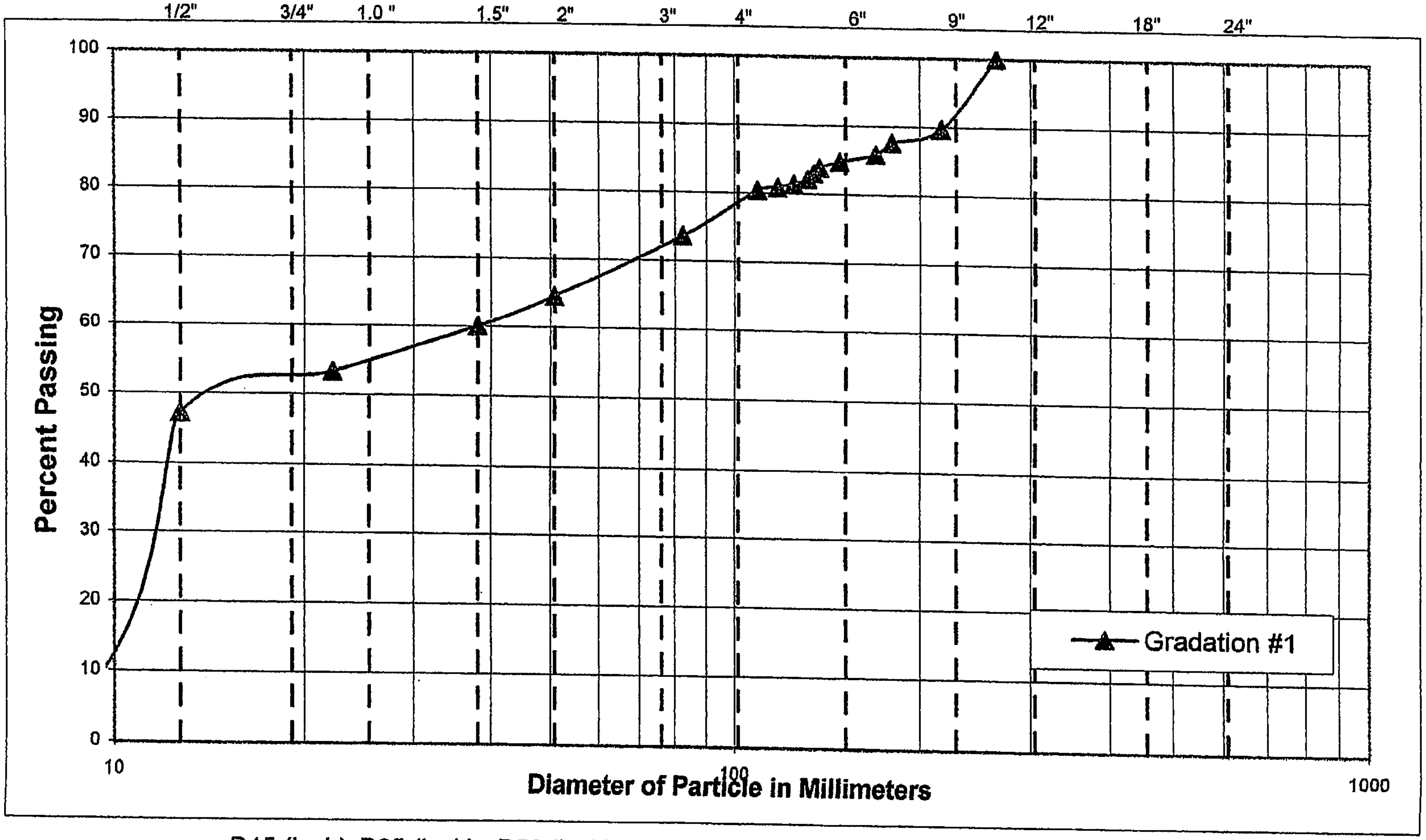
Shape Factor 1.00

Assumed Sp. Wt.
165

Gradation D50- 1.111

Sample Weight 1020

# FIGURE C-13. GRADATION TEST RESULTS FOR QUARRY ROCK SAMPLE QU3



| | D15 (inch) | D25 (inch) | D50 (inch) | D75 (inch) | D100 (inch) |
|---|---|---|---|---|---|
| Gradation Results | 0.330 | 0.38 | 0.68 | 3.47 | 10.45 |

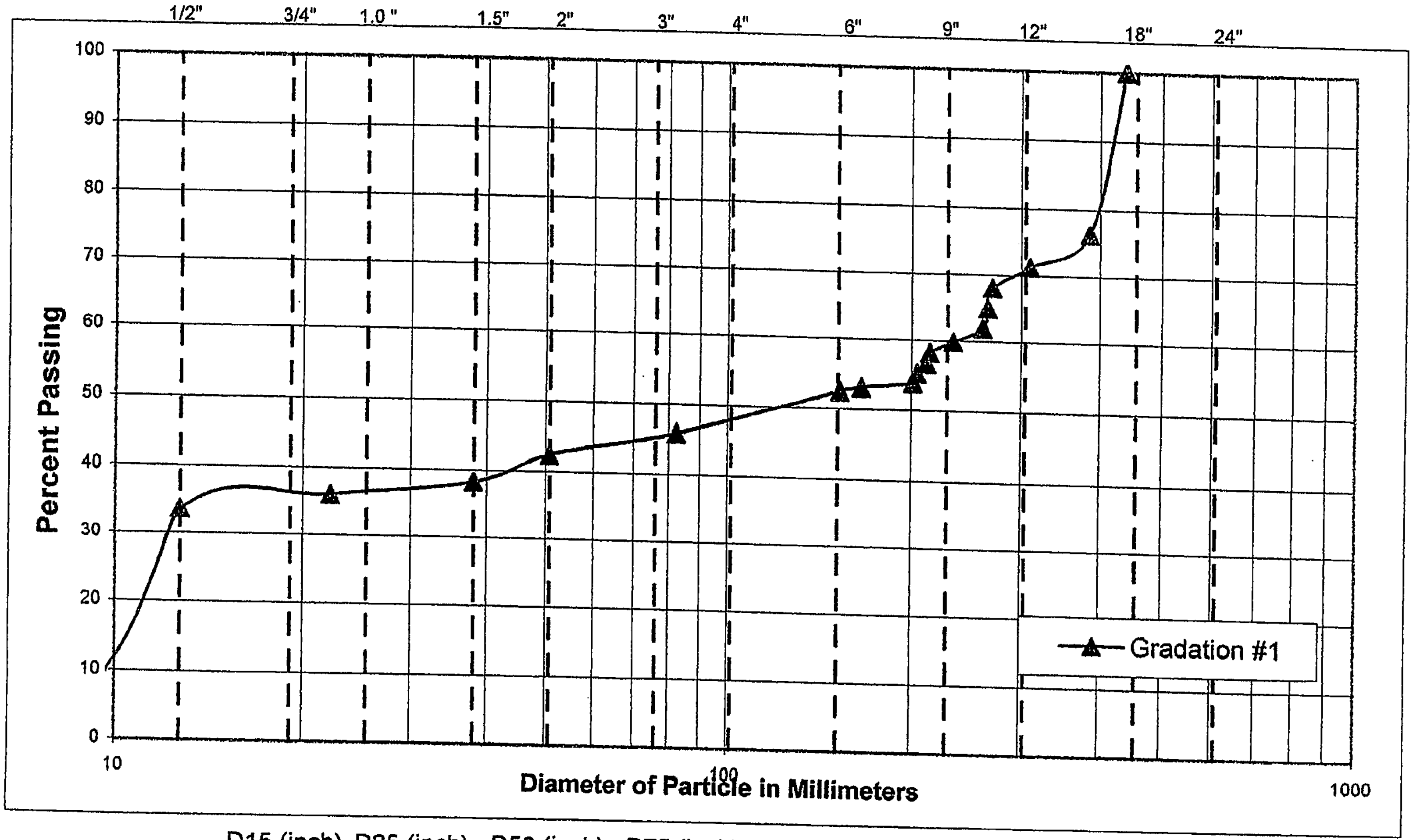
Shape Factor 1.00

Assumed Sp. Wt. 165

Gradation D50- 0.675

Sample Weight 858.5

# FIGURE C-14. GRADATION TEST RESULTS FOR TAILINGS DAM ROCK SAMPLE DS1



| | D15 (inch) | D25 (inch) | D50 (inch) | D75 (inch) | D100 (inch) |
|---|---|---|---|---|---|
| Gradation Results | 0.361 | 0.44 | 4.99 | 14.42 | 17.33 |

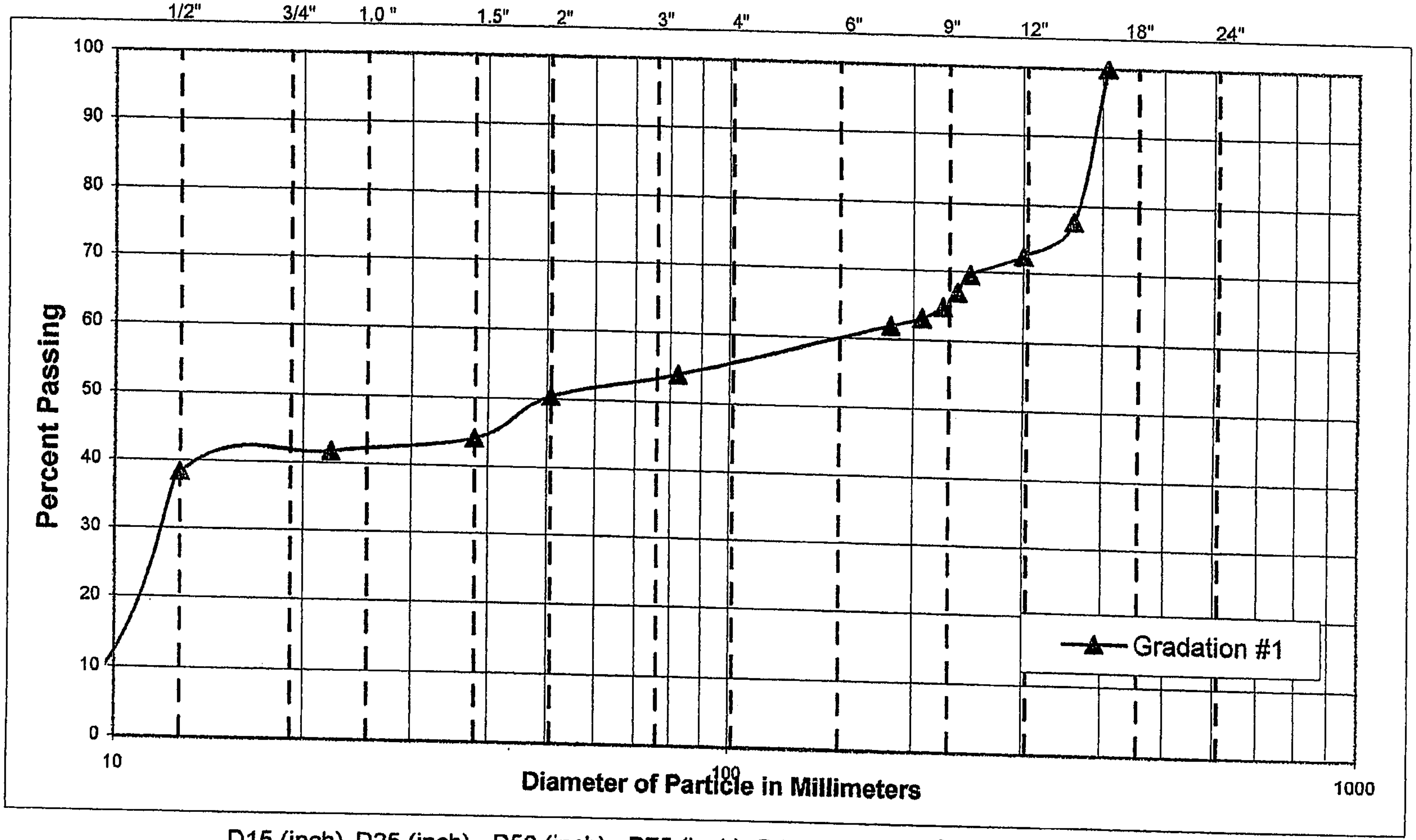
Shape Factor 1.00

Assumed Sp. Wt. 165

Gradation D50- 4.989

Sample Weight 1833

# FIGURE C-15. GRADATION TEST RESULTS FOR TAILINGS DAM ROCK SAMPLE DS2



|  | D15 (inch) | D25 (inch) | D50 (inch) | D75 (inch) | D100 (inch) |
|---|---|---|---|---|---|
| Gradation Results | 0.348 | 0.41 | 1.97 | 12.99 | 16.08 |

Shape Factor 1.00 Assumed Sp. Wt. 165

Gradation D50- 1.965

Sample Weight 1580

# ATTACHMENT C

## ALTERNATE CLAY SOURCE PHYSICAL PROPERTIES

# ATTACHMENT C

## TABLE OF CONTENTS

## *C.1 Permeability, Atterbert Limits, Gradation and Moisture-Density for the Alternate Clay Source*

**by Inberg-Miller Engineers, September 20, 2005**

RIVERTON . CASPER . CHEYENNE
POWELL . GREEN RIVER

**INBERG-MILLER ENGINEERS**

*QUALITY SOLUTIONS THROUGH TEAMWORK*

September 20, 2005

10223-RM

RECEIVED
SEP 21 2005

Mr. Fred Craft
U.S. Energy Corporation
877 North 8th West
Riverton, WY 82501

RE: SOIL TEST RESULTS
SHOOTERING CANYON MILL PROJECT

Dear Fred:

This letter transmits the results of laboratory testing that we performed on a sample of claystone that you submitted to our Riverton, Wyoming laboratory.

Specifically, you requested that we perform classification tests consisting of Moisture-Density Relationship (Standard Proctor), Atterberg-Limits, and Particle Size Analysis on 2 sub-samples of the claystone that you submitted. Further, you requested permeability testing on 3 specimens re-molded from the claystone.

The claystone as submitted was hard, dry, and shale-like. The claystone rapidly softened when submerged in water. The tests were performed on the claystone after it was softened to a soil-like consistency.

Refer to the attached test results. Note that the progress of permeability testing was slow due to the low permeability of the remolded claystone (which had been remolded to 95 percent of the ASTM D698 maximum dry density). The permeability tests were terminated when the volume of water measured passing through the sample was determined to represent permeability on the order of $10^{-8}$ centimeters/second or less.

Please call if you have any questions or require further information.

Sincerely,

INBERG-MILLER ENGINEERS

Glen M. Bobnick

Glen M. Bobnick, P.E.
Geotechnical Engineer
Riverton Office

Enclosures as stated

124 East Main Street
Riverton, WY 82501
307-856-8136
307-856-3851 (fax)
riverton@inberg-miller.com

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307-472-4402 (fax)
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307-635-2713 (fax)
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428 Alan Road
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307-754-7170
307-754-7088 (fax)
powell@inberg-miller.com

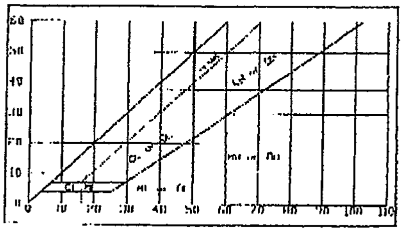
520 Wilkes Drive, Suite 13
Green River, WY 82935
307-875-4394
307 875 4395 (fax)
greenriver@inberg-miller.com

# ATTERBERG LIMITS TEST

INBERG-MILLER ENGINEERS

ASTM D4318

| | |
|---|---|
| CLIENT: | U.S. Energy |
| PROJECT: | Shootering Canyon Mill |
| JOB NO.: | 10223 RM |
| TEST DATE: | 6-3-05 |
| TESTED BY: | DAL |
| SAMPLE NOS: | Sec. 16, A & C |
| SAMPLED BY: | Client |
| SOURCE: | Site Soil |



SAMPLE NO. A — Plastic (Y/N)? Y

| PLASTIC LIMIT INFORMATION | | | LIQUID LIMIT INFORMATION | | | TEST RESULTS | |
|---|---|---|---|---|---|---|---|
| TRIAL NO.: | 1 | 2 | 1 | 2 | 3 | LIQUID LIMIT: | 90 |
| Tare (Pan) No.: | 2P | | 3L | | | PLASTIC LIMIT: | 29 |
| Tare (Pan) Wt.: | 13.83 | | 23.58 | | | PLASTIC INDEX: | 61 |
| Tare + Wet Soil Wt.: | 17.81 | | 45.5 | | | USCS CLASSIFICATION: | CH |
| Tare + Dry Soil Wt.: | 16.92 | | 35.14 | | | ERROR MESSAGES | |
| No. of Blows: | ▨ | ▨ | 25 | | | | |
| PERCENT MOISTURE: | 28.80% | | 89.62% | | | | |
| AVERAGE MOISTURE: | 28.80% | | 89.62% | | | | |

SAMPLE NO. C — Plastic (Y/N)? Y

| PLASTIC LIMIT INFORMATION | | | LIQUID LIMIT INFORMATION | | | TEST RESULTS | |
|---|---|---|---|---|---|---|---|
| TRIAL NO.: | 1 | 2 | 1 | 2 | 3 | LIQUID LIMIT: | 90 |
| Tare (Pan) No.: | 6 | | 6L | | | PLASTIC LIMIT: | 28 |
| Tare (Pan) Wt.: | 14.35 | | 23.76 | | | PLASTIC INDEX: | 62 |
| Tare + Wet Soil Wt.: | 17.51 | | 48.1 | | | USCS CLASSIFICATION: | CH |
| Tare + Dry Soil Wt.: | 16.82 | | 36.64 | | | ERROR MESSAGES | |
| No. of Blows: | ▨ | ▨ | 28 | | | | |
| PERCENT MOISTURE: | 27.94% | | 90.20% | | | | |
| AVERAGE MOISTURE: | 27.94% | | 90.20% | | | | |

SAMPLE NO. — Plastic (Y/N)?

| PLASTIC LIMIT INFORMATION | | | LIQUID LIMIT INFORMATION | | | TEST RESULTS | |
|---|---|---|---|---|---|---|---|
| TRIAL NO.: | 1 | 2 | 1 | 2 | 3 | LIQUID LIMIT: | |
| Tare (Pan) No.: | | | | | | PLASTIC LIMIT: | |
| Tare (Pan) Wt.: | | | | | | PLASTIC INDEX: | |
| Tare + Wet Soil Wt.: | | | | | | USCS CLASSIFICATION: | |
| Tare + Dry Soil Wt.: | | | | | | ERROR MESSAGES | |
| No. of Blows: | ▨ | ▨ | | | | | |
| PERCENT MOISTURE: | | | | | | | |
| AVERAGE MOISTURE: | | | | | | | |

SAMPLE NO. — Plastic (Y/N)?

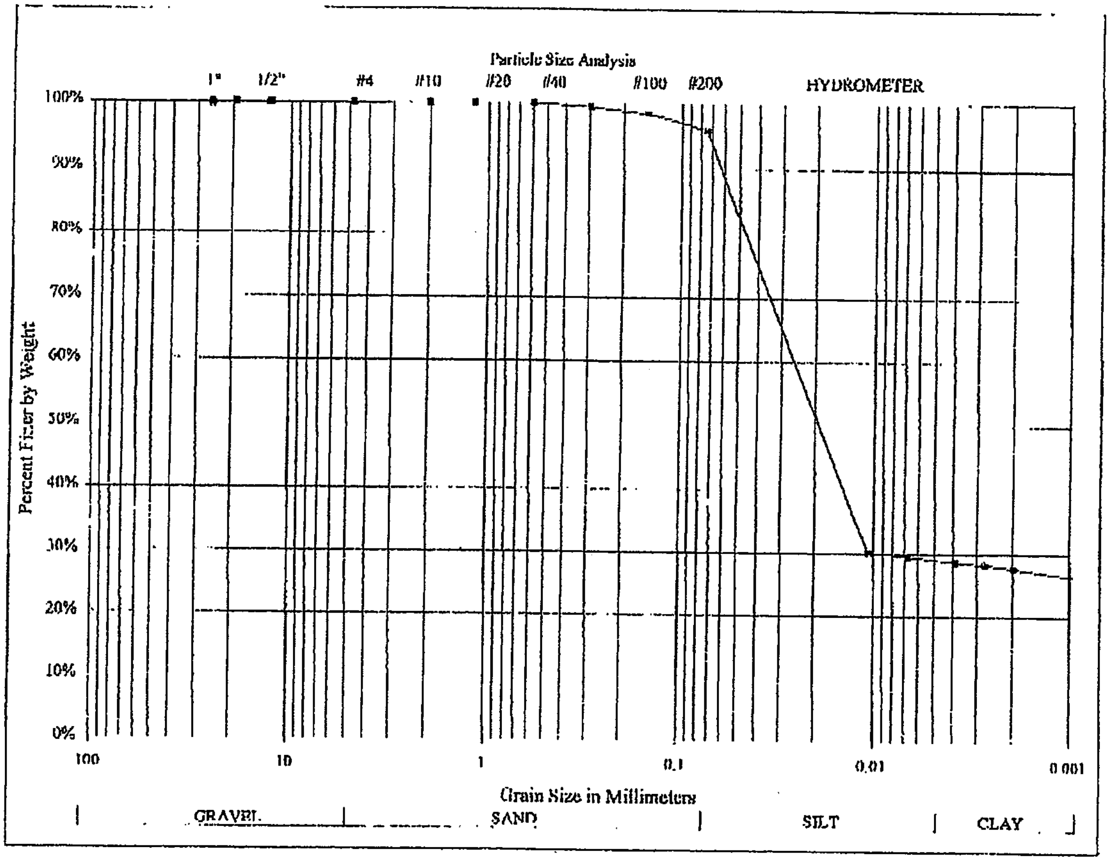
| PLASTIC LIMIT INFORMATION | | | LIQUID LIMIT INFORMATION | | | TEST RESULTS | |
|---|---|---|---|---|---|---|---|
| TRIAL NO.: | 1 | 2 | 1 | 2 | 3 | LIQUID LIMIT: | |
| Tare (Pan) No.: | | | | | | PLASTIC LIMIT: | |
| Tare (Pan) Wt.: | | | | | | PLASTIC INDEX: | |
| Tare + Wet Soil Wt.: | | | | | | USCS CLASSIFICATION: | |
| Tare + Dry Soil Wt.: | | | | | | ERROR MESSAGES | |
| No. of Blows: | ▨ | ▨ | | | | | |
| PERCENT MOISTURE: | | | | | | | |
| AVERAGE MOISTURE: | | | | | | | |

SAMPLE NO. — Plastic (Y/N)?

| PLASTIC LIMIT INFORMATION | | | LIQUID LIMIT INFORMATION | | | TEST RESULTS | |
|---|---|---|---|---|---|---|---|
| TRIAL NO.: | 1 | 2 | 1 | 2 | 3 | LIQUID LIMIT: | |
| Tare (Pan) No.: | | | | | | PLASTIC LIMIT: | |
| Tare (Pan) Wt.: | | | | | | PLASTIC INDEX: | |
| Tare + Wet Soil Wt.: | | | | | | USCS CLASSIFICATION: | |
| Tare + Dry Soil Wt.: | | | | | | ERROR MESSAGES | |
| No. of Blows: | ▨ | ▨ | | | | | |
| PERCENT MOISTURE: | | | | | | | |
| AVERAGE MOISTURE: | | | | | | | |

## SIEVE & HYDROMETER TEST ASTM D422

| | | | |
|---|---|---|---|
| IME SAMPLE NO : | C | DATE RECEIVED: | 5/6/1998 |
| CLIENT: | U.S. Energy | TYPE OF SAMPLE | Bulk |
| CLIENT SAMPLE NO.: | Sec. 16 Site Soil | | |
| SOIL DESCRIPTION: | Shale/Clay | | |

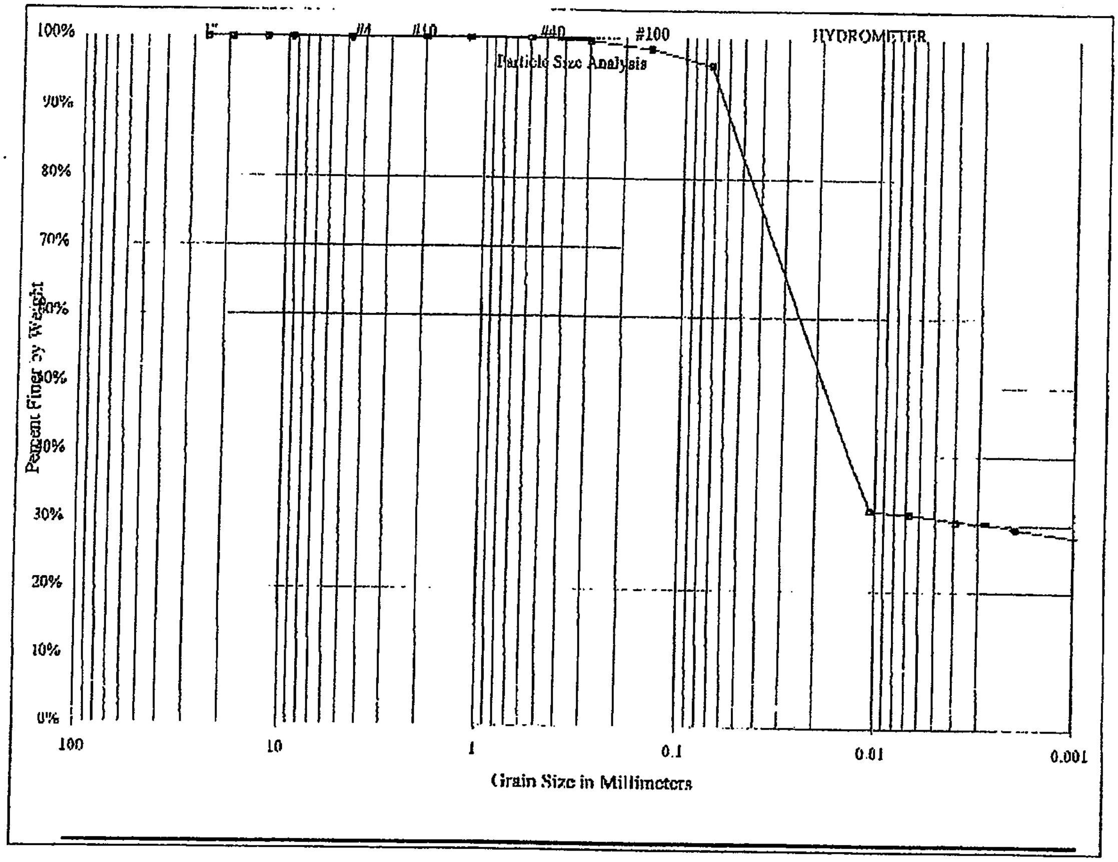


| Sieve Size | PARTICLE SIZE (mm) | PERCENT FINER |
|---|---|---|
| 1" | 25.4000 | 100.0% |
| 3/4" | 19.1000 | 100.0% |
| 1/2" | 12.7000 | 100.0% |
| 3/8" | 9.5200 | 100.0% |
| NO. 4 | 4.7600 | 100.0% |
| NO.10 | 2.0000 | 100.0% |
| NO. 16 | 1.1900 | 100.0% |
| NO. 30 | 0.5900 | 100.0% |
| NO. 50 | 0.2970 | 99.4% |
| NO. 100 | 0.1490 | 98.4% |
| NO. 200 | 0.0740 | 95.9% |
| Hydrometer Range | 0.0106 | 30.2% |
| | 0,0087 | 29.5% |
| | 0.0039 | 28.7% |
| | 0.0028 | 28.3% |
| | 0.0020 | 27.7% |
| | 0.0010 | 26.4% |
| | 0.0004 | 26.0% |

Inberg-Miller Engineers
270 North American Road
Cheyenne, WY 82007

## SIEVE & HYDROMETER TEST ASTM D422

| | | | |
|---|---|---|---|
| IME SAMPLE NO.: | A | DATE RECEIVED: | 5/6/1998 |
| CLIENT: | U.S. Energy | TYPE OF SAMPLE | Bulk |
| CLIENT SAMPLE NO : | Sec. 16 Site Soil | | |
| SOIL DESCRIPTION: | Shale/Clay | | |



| Sieve Size | PARTICLE SIZE (mm) | PERCENT FINER |
|---|---|---|
| 1" | 25.4000 | 100.0% |
| 3/4" | 19.1000 | 100.0% |
| 1/2" | 12.7000 | 100.0% |
| 3/8" | 9.5200 | 100.0% |
| NO. 4 | 4.7600 | 100.0% |
| NO.10 | 2.0000 | 100.0% |
| NO. 16 | 1.1000 | 100.0% |
| NO. 30 | 0.5900 | 100.0% |
| NO. 50 | 0.2970 | 99.6% |
| NO. 100 | 0.1490 | 98.5% |
| NO. 200 | 0.0740 | 96.0% |
| Hydrometer Range | 0.0106 | 31.8% |
| | 0.0067 | 31.5% |
| | 0.0039 | 30.5% |
| | 0,0028 | 30,3% |
| | 0 0020 | 29.4% |
| | 0.0010 | 28.1% |
| | 0.0004 | 27.5% |

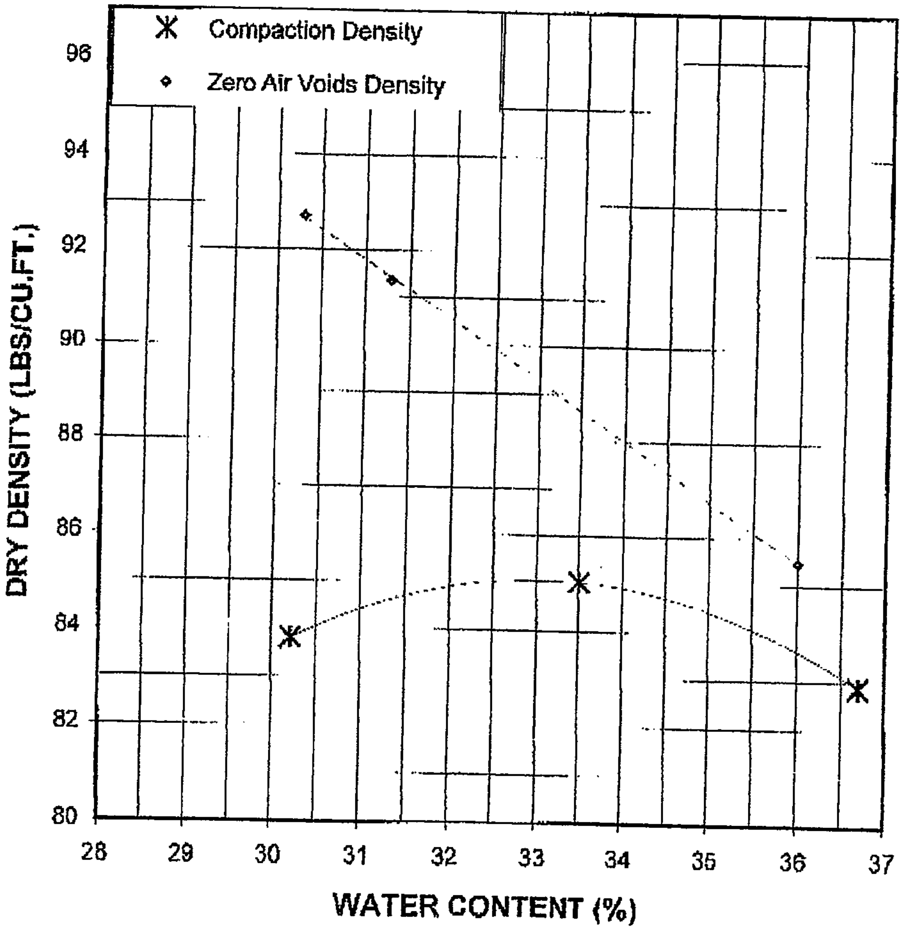
Inberg Miller Engineers
270 North American Road
Cheyenne, WY 82007

# MOISTURE-DENSITY ANALYSIS

## INBERG-MILLER ENGINEERS

CLIENT: U.S. Energy
PROJECT: Shootering Canyon Mill
JOB NO. 10223 RM
TEST DATE: 6-3-05
SOURCE: Site Soil
DESCRIPTION: Shale/Clay

SAMPLE NO.: Sec. 16, #C
SAMPLED BY: Client
TESTED BY : BJC
TEST METHOD: D 698-A



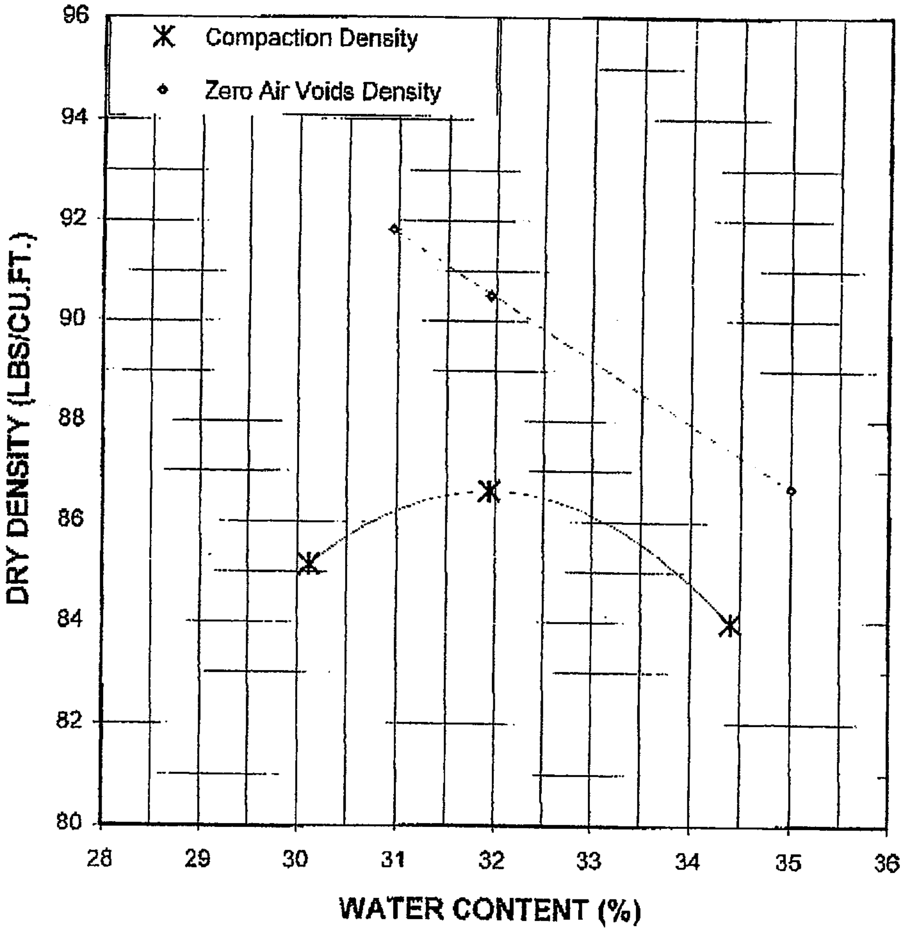
OPTIMUM WATER CONTENT (%): 31.3
MAXIMUM DRY DEN. (LBS/CU. FT): 85.7

# MOISTURE-DENSITY ANALYSIS

## INBERG-MILLER ENGINEERS

CLIENT: U.S. Energy
PROJECT: Shootering Canyon Mill
JOB NO. 10223 RM
TEST DATE: 6-3-05
SOURCE: Site Soil
DESCRIPTION: Shale/Clay

SAMPLE NO.: Sec. 16, #A
SAMPLED BY: Client
TESTED BY : BJC
TEST METHOD: D 698-A



OPTIMUM WATER CONTENT (%): 32.0
MAXIMUM DRY DEN. (LBS/CU. FT): 86.6

## *C.2 Discussion of Alternate Source Clay Properties*
## by Inberg-Miller Engineers, December 7, 2005

IME
RIVERTON . CASPER . CHEYENNE
POWELL . GREEN RIVER

**INBERG-MILLER ENGINEERS**

December 7, 2005 10223-RM

Mr. Fred Craft
U.S. Energy
877 North 8th West
Riverton, WY 82501

RECEIVED
DEC - 8 2005

RE: SEPTEMBER 19, 2005 SOIL TESTING
SHOOTERING CANYON MILL PROJECT

Dear Fred:

This letter summarizes our observations of the claystone soil sample you submitted for laboratory testing, the results of which were reported on September 19, 2005.

As mentioned in our test report, the sample (as originally submitted) appeared shale-like, but softened rapidly upon inundation with water. Subsequently, moisture-density relationship, particle size analysis including hydrometer analysis, Atterberg Limits and permeability tests were performed. You and your consultant, Hydro Engineers, noted that the particle size analysis test indicated the fine fraction (minus 200 sieve) appeared to be substantially silt-size particles, and that the particle size analysis does not corroborate the relatively low permeability for the sample which was more representative of clay.

There are two observations that we make with regard to your note as presented above:

1. As stated, the sample was processed from hard shale-rock fragments to an apparent relatively soft soil through the addition of water. While the majority of the sample was soil when tested, the disintegration from silt to clay was likely incomplete based on visual and manual observations of variable texture.

2. Hydraulic permeability is controlled by pore size and pore volume of the soil mass through which water flows. Although a substantial portion of a certain soil may include silt through gravel-sized particles, if the soil particles are well graded and there is sufficient clay-sized particles to close the pore space of the larger soil particle fraction (soil matrix), soil pore size and pore volume may be reduced to that of the clay and render clay-like permeability test results.

Based on the above observations, it is our opinion the hydrometer analysis is not a good indicator of hydraulic permeability for the subject sample.

Please feel free to call if you have questions or require further information.

Sincerely,

INBERG-MILLER ENGINEERS

Glen M. Bobnick, P.E.
Geotechnical Engineer
Riverton Office

GMB:bjh:10223/10223 test observ. Ltr 12-07-05

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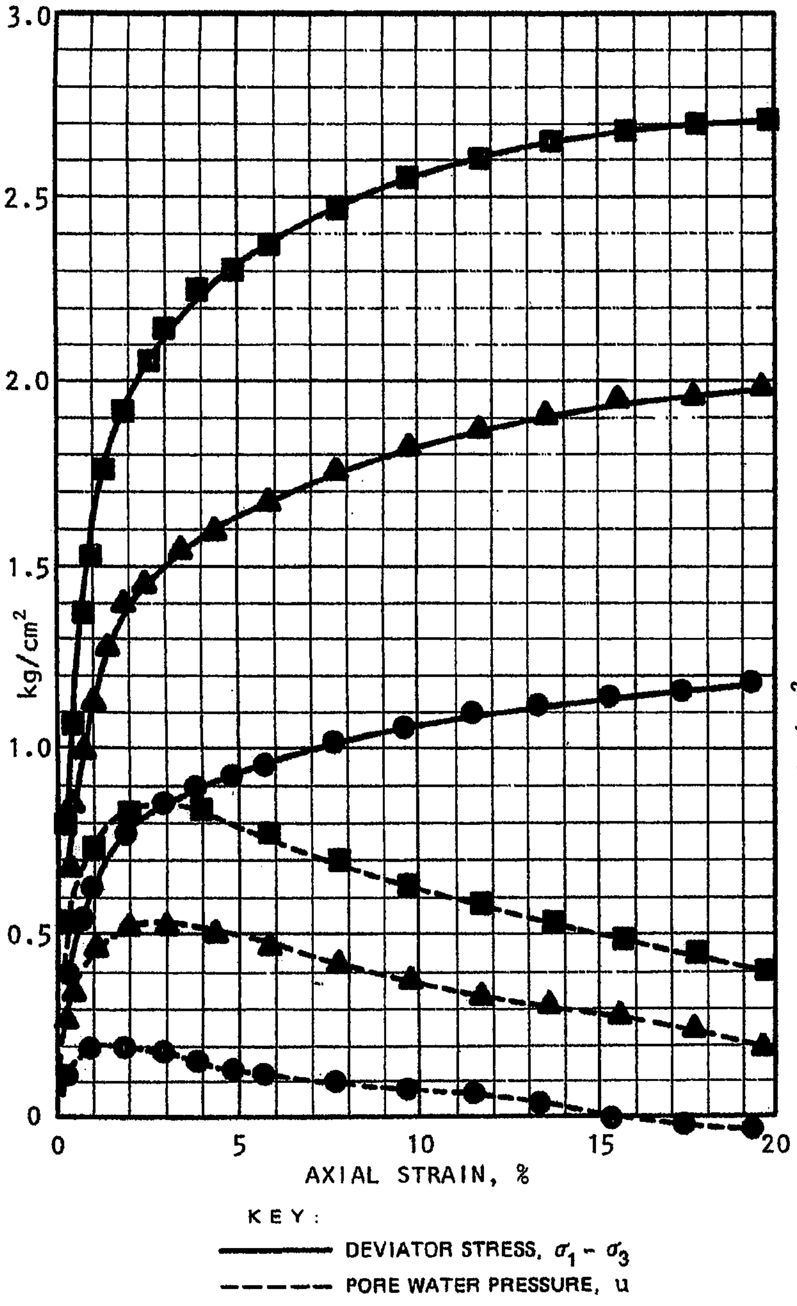
307-754-7066 (fax)
powell@inberg-miller.com

520 Wilkes Drive, Suite 13
Green River, WY 82935
307-875-4394
307-875-4395 (fax)
greenriver@inberg-miller.com

# APPENDIX C.2.3
# LABORATORY TEST RESULTS
# HYDRO-ENGINEERING 2005 ANALYSES
# (HYDRO-ENGINEERING, 2005A)

# APPENDIX A

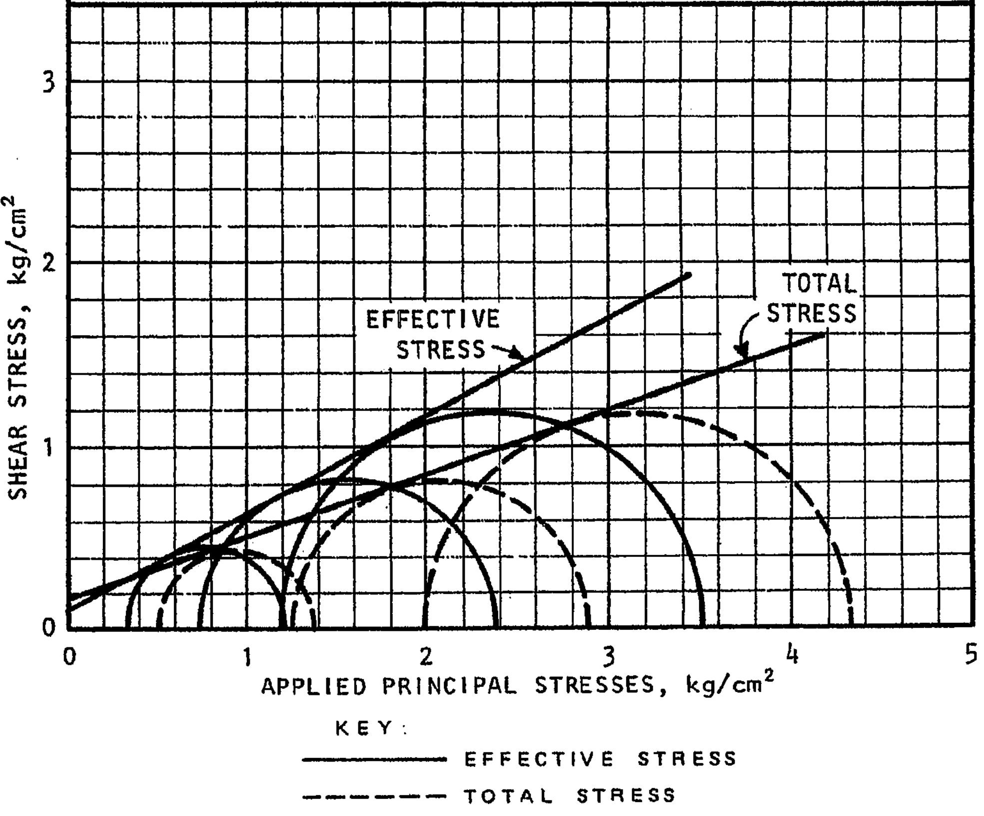
## TAILINGS STABILITY AND DEFORMATION ANALYSES



**SPECIMEN:** BORROW AREA GA - Sample No. 1
**TYPE OF SPECIMEN:** REMOLDED
**TYPE OF TEST:** CONSOLIDATED - UNDRAINED

| SPECIMEN AND SYMBOL | INITIAL MOISTURE CONTENT (%) | INITIAL DRY DENSITY (pcf) | CONFINING PRESSURE (tsf) | DEVIATOR STRESS AT FAILURE (tsf) | PORE PRESSURE AT FAILURE (tsf) |
|---|---|---|---|---|---|
| ( ● ) | 27.5 | 93.5 | 0.50 | 0.87 | 0.16 |
| ( ▲ ) | 27.5 | 93.5 | 1.25 | 1.63 | 0.48 |
| ( ■ ) | 27.5 | 93.5 | 2.00 | 2.31 | 0.80 |

$c' = 0.10$ tsf  $\phi' = 27.1°$  $c_T = 0.19$ tsf  $\phi_T = 21.2°$



Project No. 60255N
**Woodward-Clyde Consultants**

## TRIAXIAL COMPRESSION TEST

PRL - SHOOTERING CANYON URANIUM PROJECT

Figure

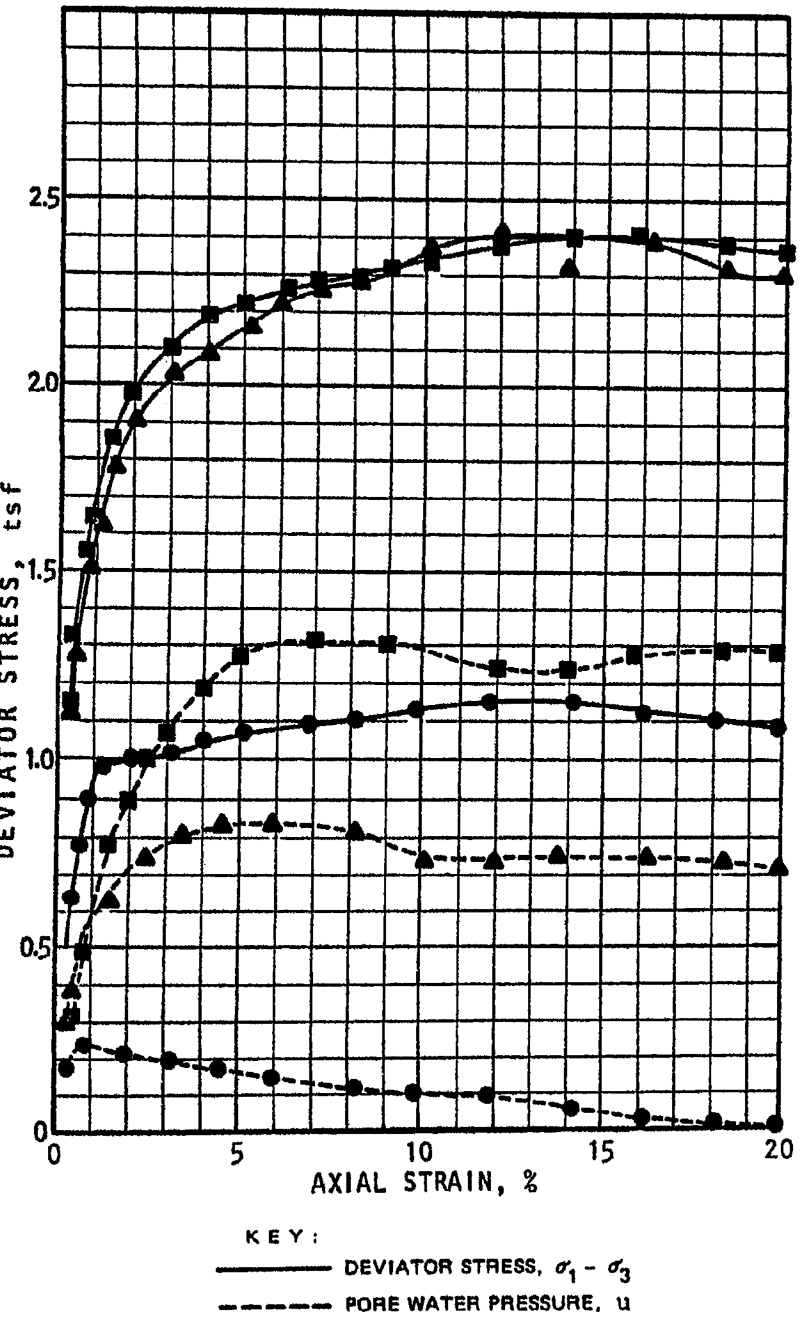
Project No. 60255J

**Woodward-Clyde Consultants**

## TRIAXIAL COMPRESSION TEST

PRL - SHOOTERING CANYON URANIUM PROJECT

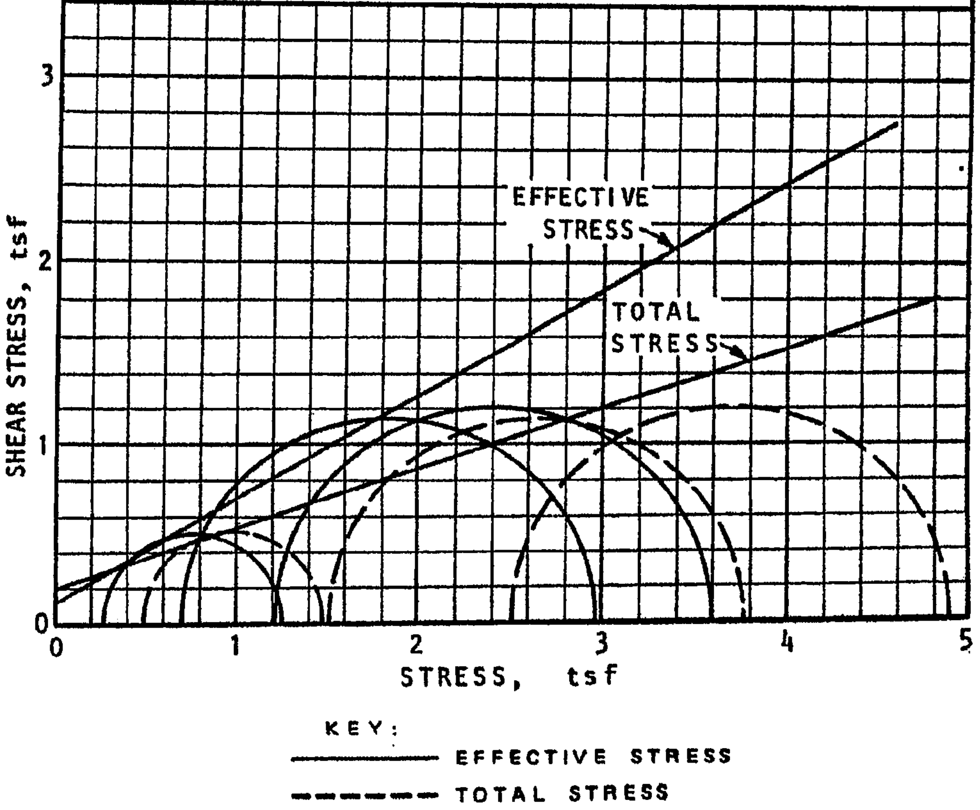
Figure 3



**SPECIMEN:** Borrow Area H - Sample #1
**TYPE OF SPECIMEN:** Remolded
**TYPE OF TEST:** Consolidated-Undrained

| SPECIMEN AND SYMBOL | INITIAL MOISTURE CONTENT (%) | INITIAL DRY DENSITY (pcf) | CONFINING PRESSURE (tsf) | DEVIATOR STRESS AT FAILURE (tsf) | PORE PRESSURE AT FAILURE (tsf) |
|---|---|---|---|---|---|
| 1 (●) | 35 | 83 | 0:5 | 0.97 | 0.23 |
| 2 (▲) | 35 | 83 | 1.5 | 2.28 | 0.81 |
| 3 (■) | 35 | 83 | 2.5 | 2.39 | 1.28 |

$c' = 0.10$ tsf $\phi' = 29.7°$ $c_T = 0.2$ tsf $\phi_T = 18.4°$

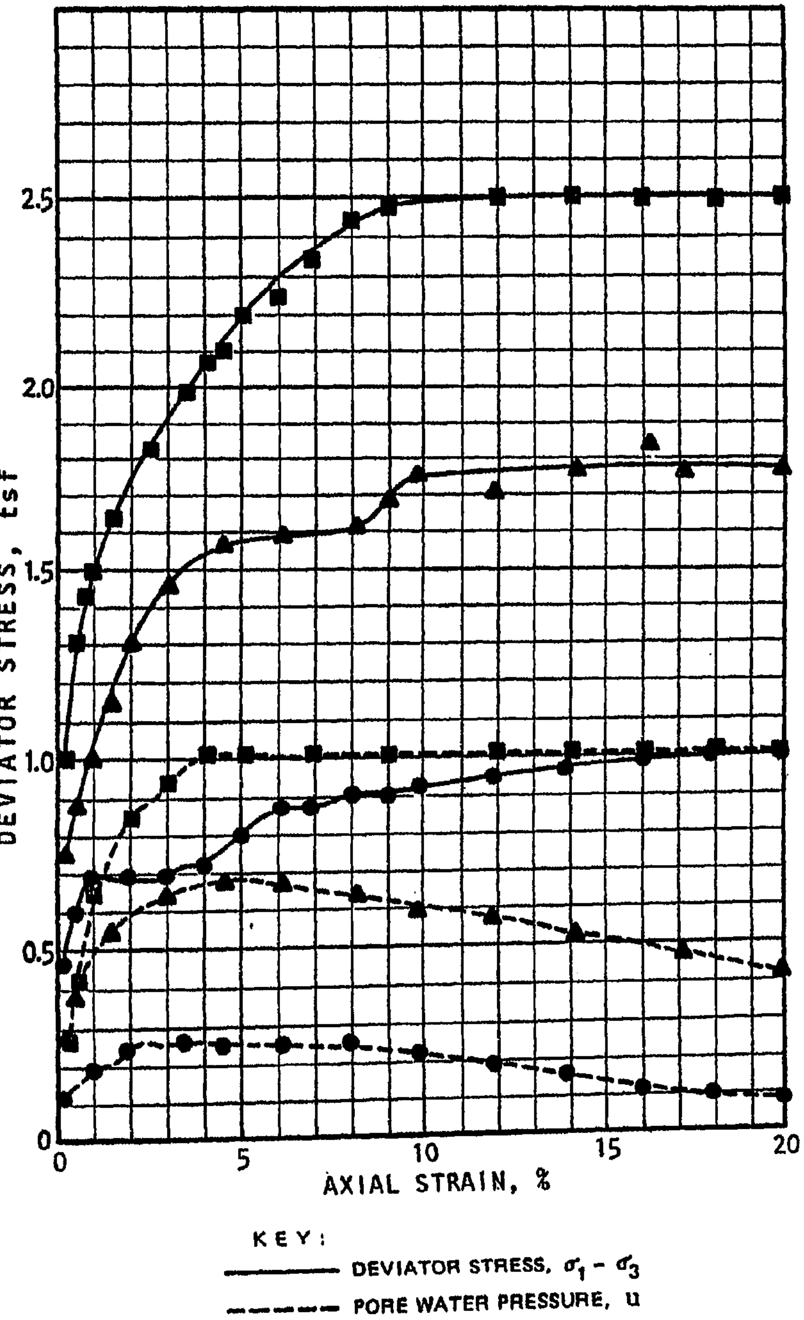


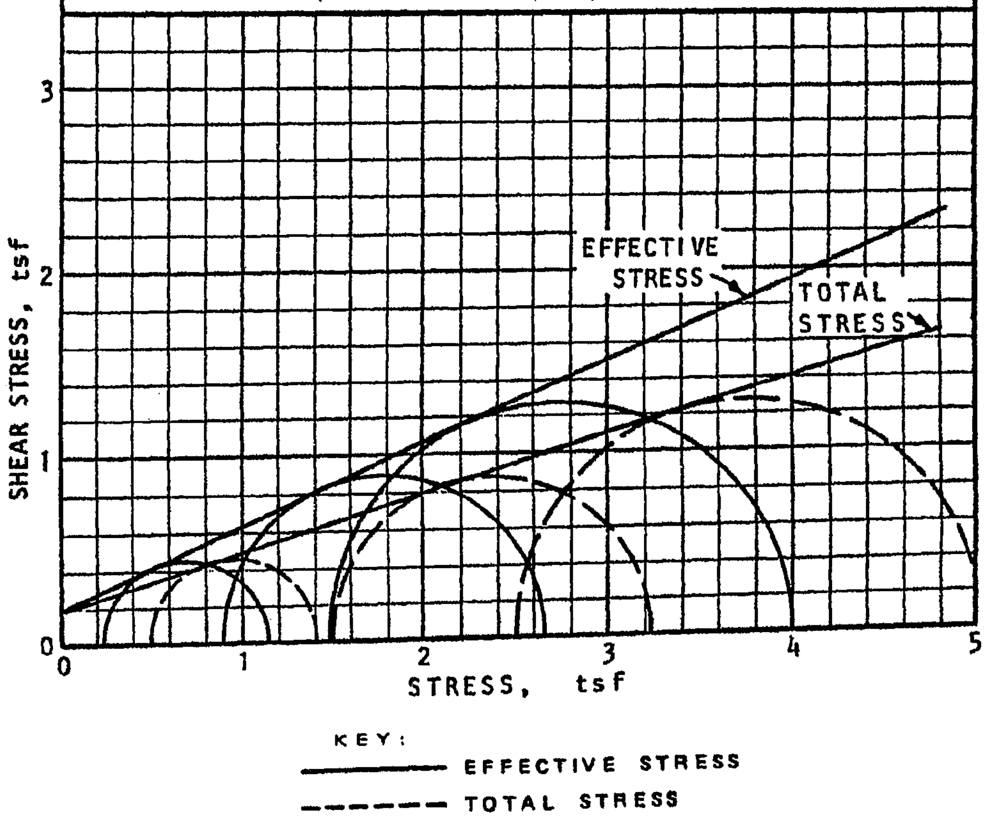
C:\Projects\2005-50\mgmt plan\TailsMgmtPlanAPPEND-A.pdf
December 2005

**SPECIMEN:** Borrow Area I - Sample #1
**TYPE OF SPECIMEN:** Remolded
**TYPE OF TEST:** Consolidated-Undrained

| SPECIMEN AND SYMBOL | INITIAL MOISTURE CONTENT (%) | INITIAL DRY DENSITY (pcf) | CONFINING PRESSURE (tsf) | DEVIATOR STRESS AT FAILURE (tsf) | PORE PRESSURE AT FAILURE (tsf) |
|---|---|---|---|---|---|
| 1 (●) | 22 | 98 | 0.25 | 0.91 | 0.25 |
| 2 (▲) | 22 | 98 | 0.91 | 1.74 | 0.59 |
| 3 (■) | 22 | 98 | 1.48 | 2.52 | 1.02 |

$c' = 0.2$ tsf  $\phi' = 23.6°$  $c_T = 0.2$ tsf  $\phi_T = 16.7°$





Project No. 60255J
**Woodward-Clyde Consultants**

## TRIAXIAL COMPRESSION TEST

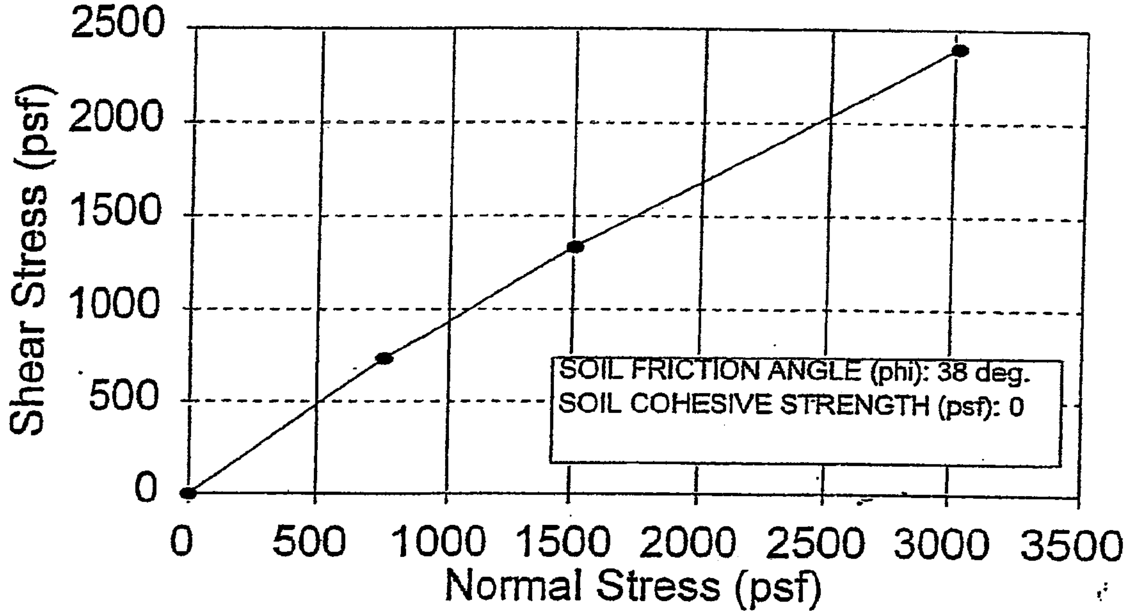
PRL - SHOOTERING CANYON URANIUM PROJECT

Figure 4

PROJECT: Shootering Canyon Dam

CLIENT: U.S. Energy Corporation

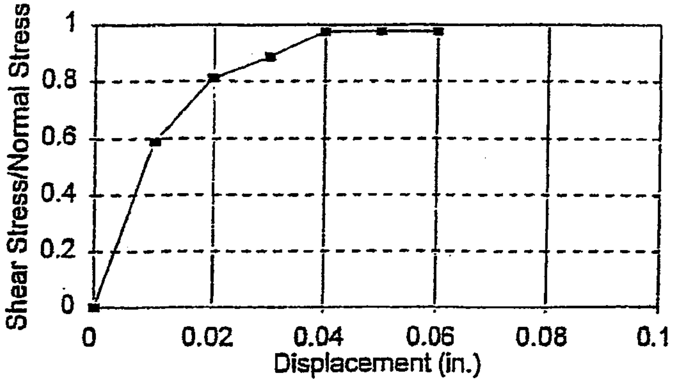
## Shear Stress Versus Normal Stress



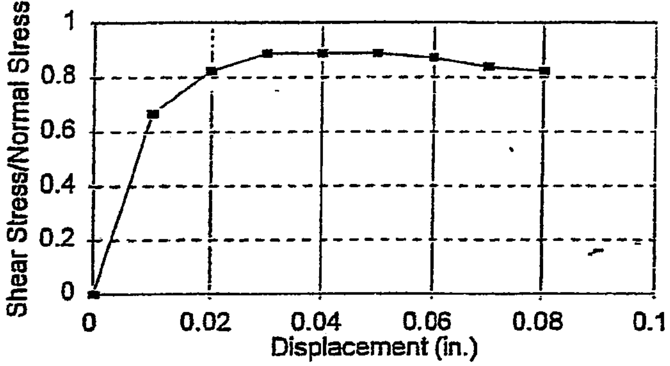
TEST DATE: 4/17/97
SAMPLE DESCRIPTION: Light Brown Fine Grained Sand
SOURCE: Cross Valley Berm

TECHNICIAN: DSD/GLM

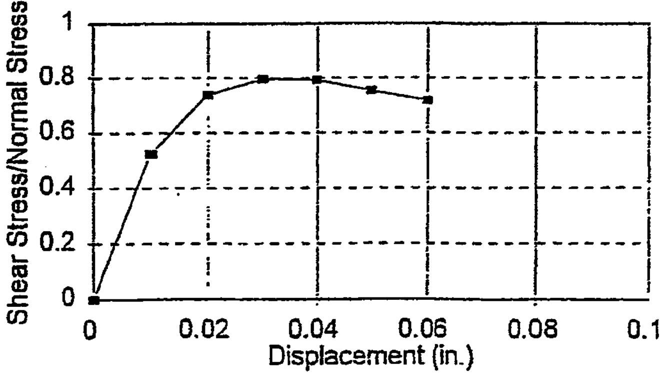
PROJECT: Shootering Canyon Dam CLIENT: U.S. Energy Corporati



Displacement / Stress Relationship
5.23 PSI Normal Load



Displacement / Stress Relationship
10.47 PSI Normal Load



Displacement / Stress Relationship
20.94 PSI Normal Load

TEST DATE: 4/17/97 TECHNICIAN: DSD/GLM

SAMPLE DESCRIPTION: Light Brown Fine Grained Sand

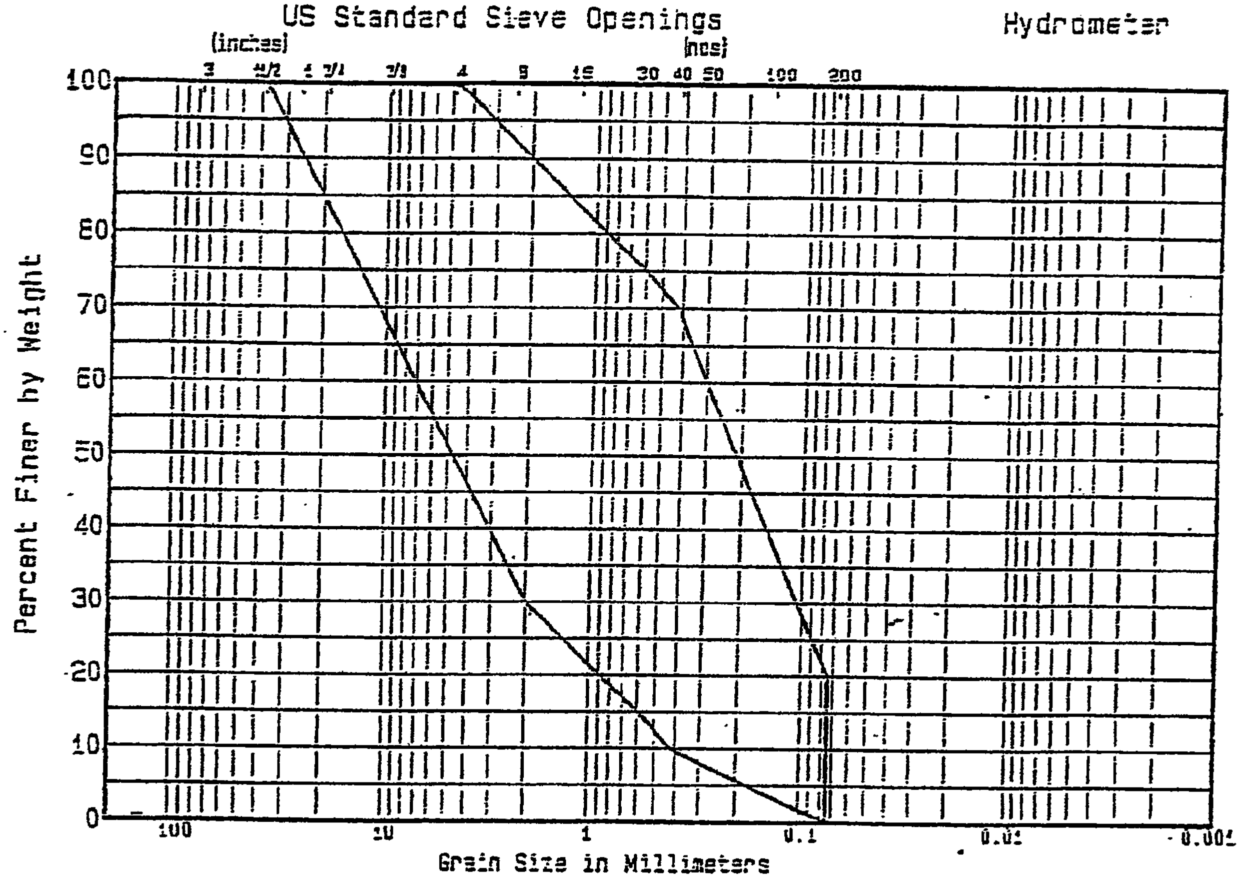
SOURCE: Cross Valley Berm

# GRADATION ENVELOPE A

Project: Shootering Canyon

Client: U.S. Energy Corp.

Job No.: 7664 RX



| Cobbles | Coarse Gravel | Fine Gravel | Coarse Sand | Medium Sand | Fine Sand | Silt | Clay |
|---|---|---|---|---|---|---|---|

Unified Soil Classification System (ASTM D2487)

Material Description ( Envelope A ): GRANULAR FILL

Recommended Gradation :

| Sieve Size | % Passing |
|---|---|
| 1.5 in. | 100 |
| # 4 | 50 - 100 |
| # 10 | 30 - 90 |
| # 30 | 15 - 75 |
| # 40 | 10 - 70 |
| # 200 | 0 - 20 |

INBERG - MILLER ENGINEERS

# APPENDIX B

## DRAINAGE FILTER ANALYSIS

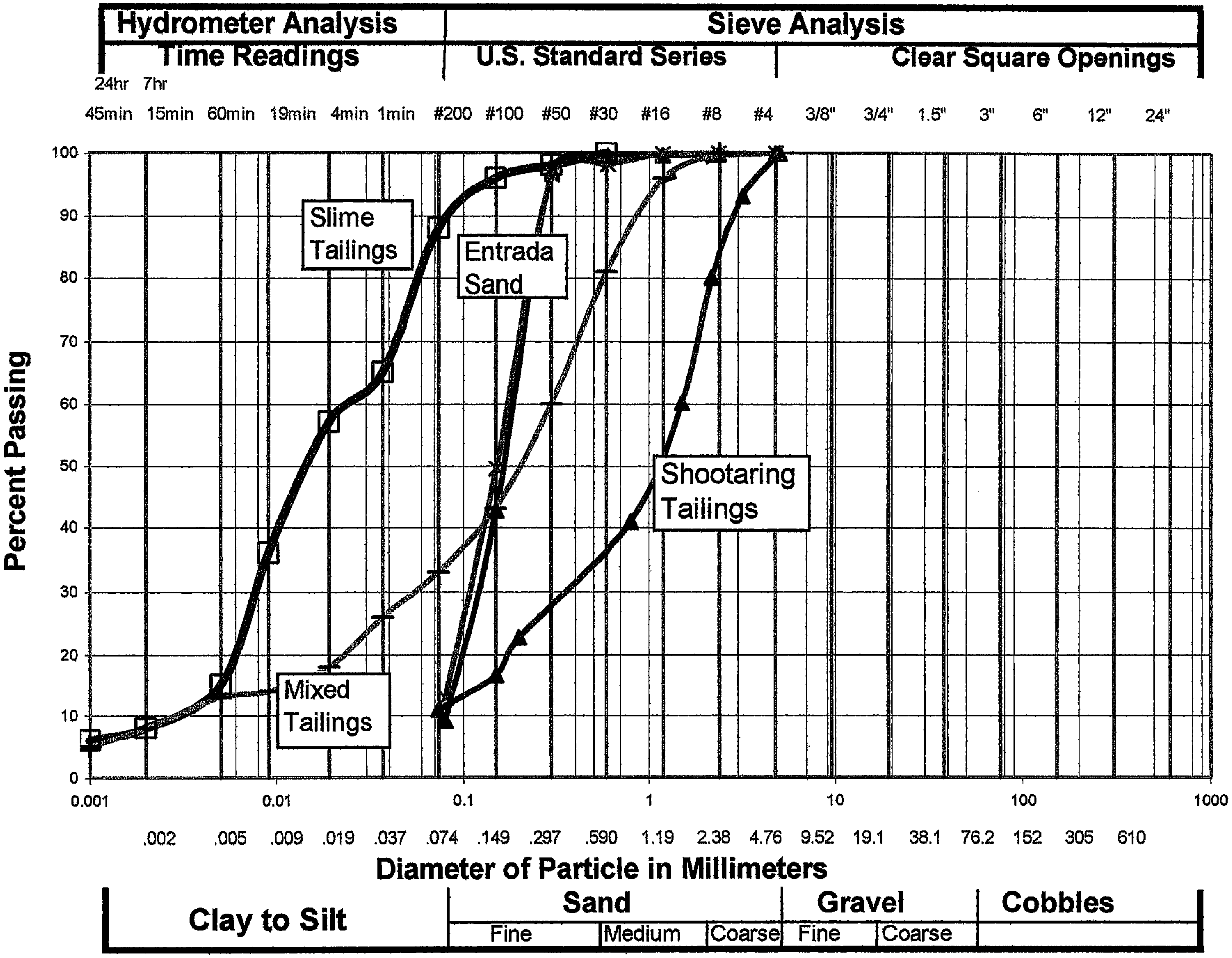


FIGURE B-1. ENTRADA SAND AND TAILINGS GRADATIONS

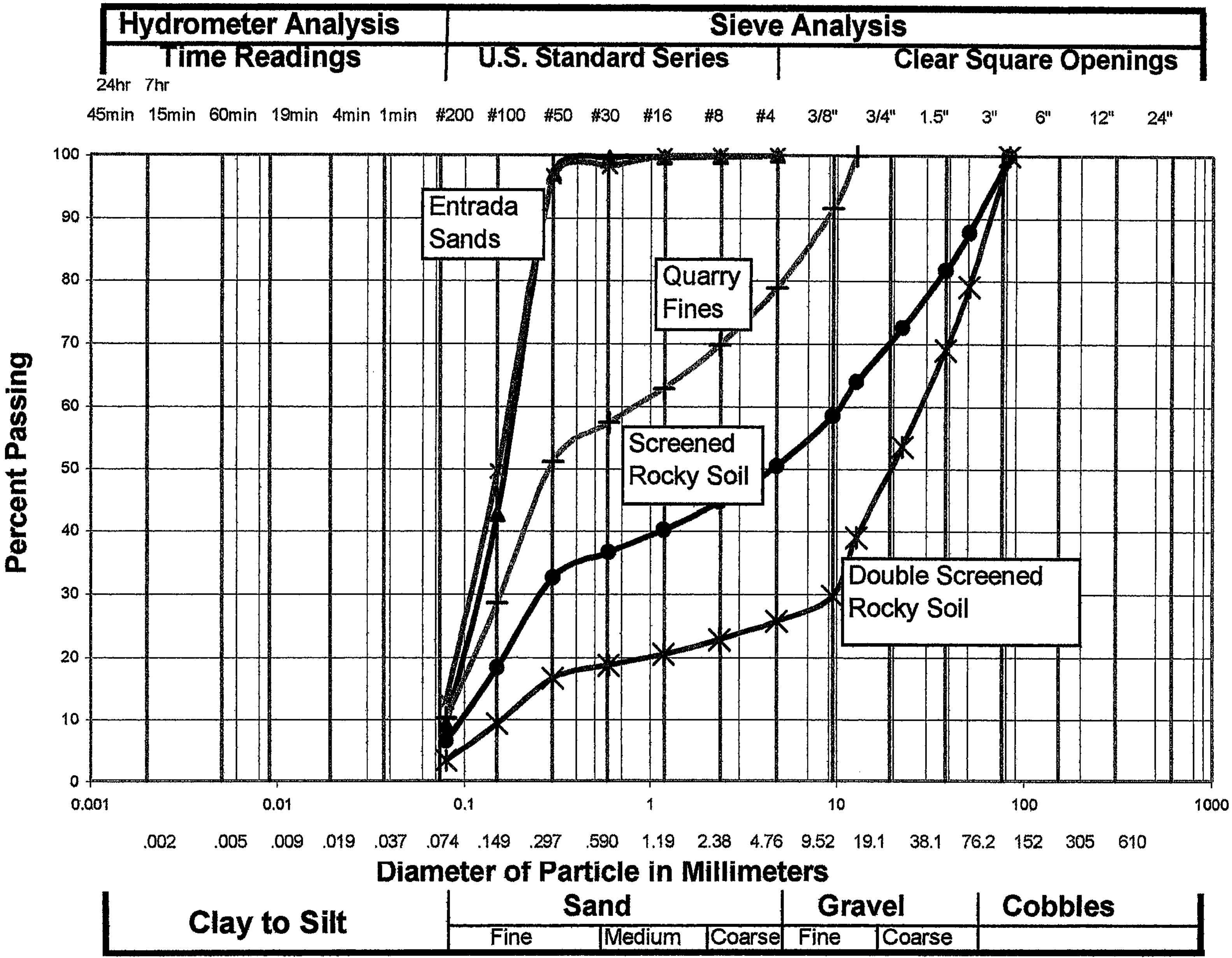


FIGURE B-2. ENTRADA SAND AND SAND AND GRAVEL FILTER GRADATIONS

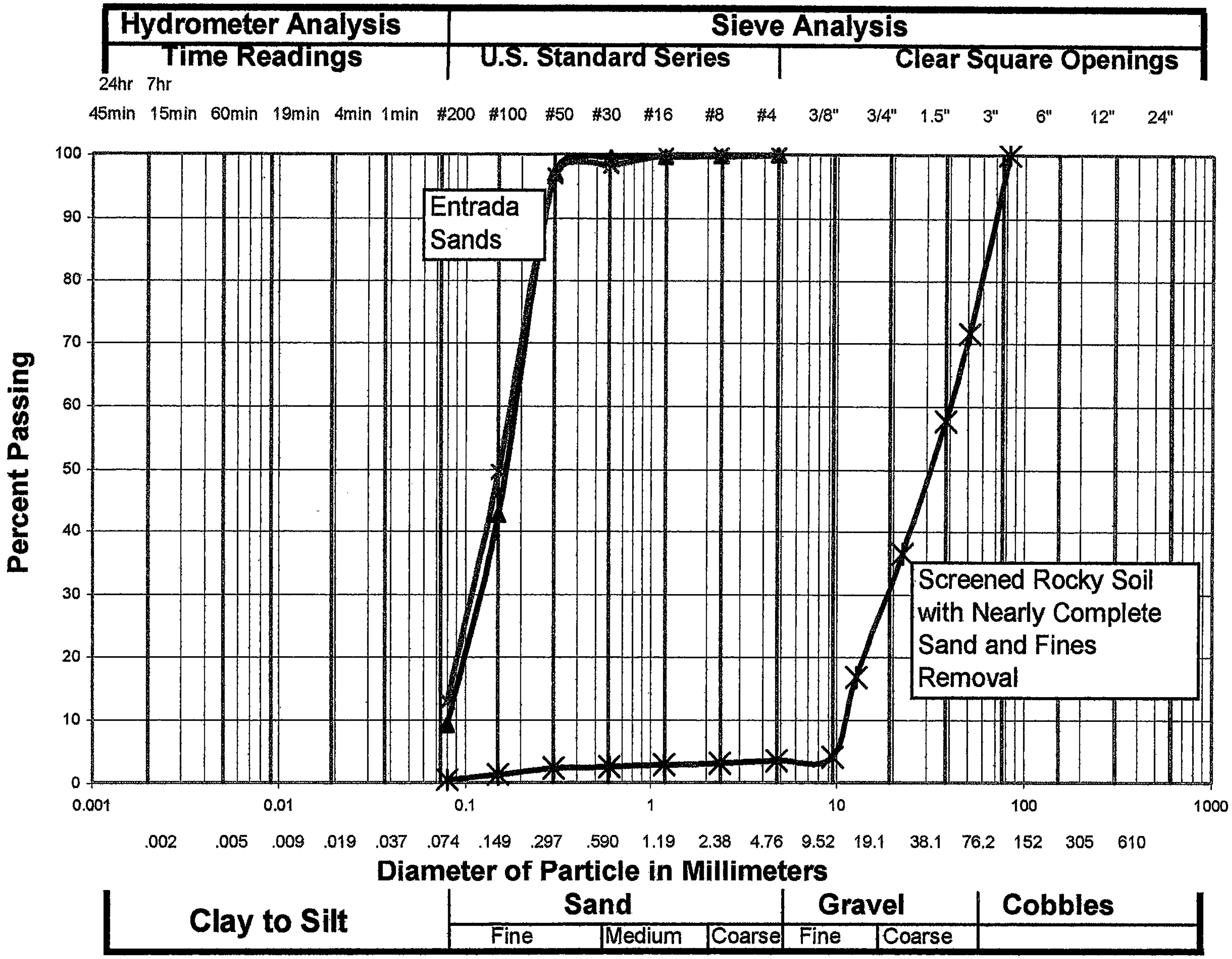


FIGURE B-3. HIGHLY PROCESSED SAND AND GRAVEL FILTER GRADATION

# APPENDIX E

## ORE PAD LINER

# MOISTURE-DENSITY ANALYSIS

PROJECT: SHOOTERING DAM

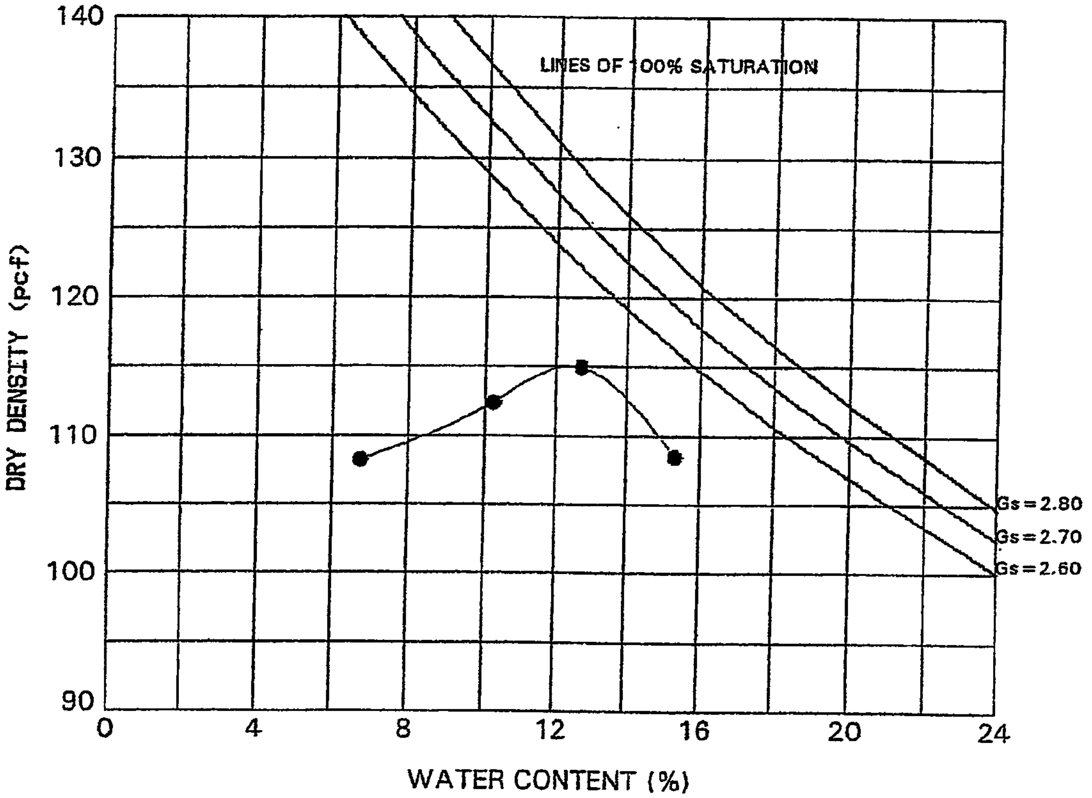
TEST DATE: 9-28-98

JOB NO.: 7664 RX

TESTED BY: JMR

CLIENT: U.S. ENERGY

TEST METHOD: STANDARD PROCTOR



SAMPLE NO.: 1

SOIL DESCRIPTION: Red to Brown, Silty, Fine Sand

SAMPLED BY: CLNT

DEPTH: 0.00

SOURCE: On Site

PASSING #200 SIEVE: %

LIQUID LIMIT:

OPTIMUM WATER CONTENT: 12.5 %

PLASTICITY INDEX:

MAXIMUM DRY DENSITY: 115.0 pcf

INBERG-MILLER ENGINEERS

# APPENDIX F

## CLAY BORROW MATERIAL

IME
RIVERTON . CASPER . CHEYENNE
POWELL . GREEN RIVER

**INBERG-MILLER ENGINEERS**

*QUALITY SOLUTIONS THROUGH TEAMWORK*

September 20, 2005

10223-RM

RECEIVED
SEP 21 2005

Mr. Fred Craft
U.S. Energy Corporation
877 North 8th West
Riverton, WY 82501

RE: SOIL TEST RESULTS
SHOOTERING CANYON MILL PROJECT

Dear Fred:

This letter transmits the results of laboratory testing that we performed on a sample of claystone that you submitted to our Riverton, Wyoming laboratory.

Specifically, you requested that we perform classification tests consisting of Moisture-Density Relationship (Standard Proctor), Atterberg-Limits, and Particle Size Analysis on 2 sub-samples of the claystone that you submitted. Further, you requested permeability testing on 3 specimens re-molded from the claystone.

The claystone as submitted was hard, dry, and shale-like. The claystone rapidly softened when submerged in water. The tests were performed on the claystone after it was softened to a soil-like consistency.

Refer to the attached test results. Note that the progress of permeability testing was slow due to the low permeability of the remolded claystone (which had been remolded to 95 percent of the ASTM D698 maximum dry density). The permeability tests were terminated when the volume of water measured passing through the sample was determined to represent permeability on the order of $10^{-8}$ centimeters/second or less.

Please call if you have any questions or require further information.

Sincerely,

INBERG-MILLER ENGINEERS

Glenn M Bobnick

Glenn M. Bobnick, P.E.
Geotechnical Engineer
Riverton Office

Enclosures as stated

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riverton@inberg-miller.com

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307-472-4402 (fax)
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Cheyenne, WY 82007
307 635 6827
307-635-2713 (fax)
cheyenne@inberg-miller.com

426 Alan Road
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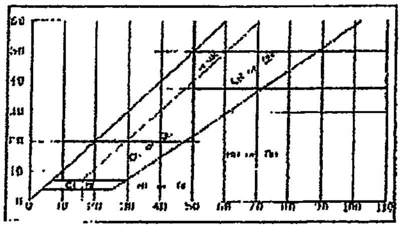
307-754-7170
307-754-7088 (fax)
powell@inberg-miller.com

520 Wilkes Drive, Suite 13
Green River, WY 82935
307-875-4394
307 875 4395 (fax)
greenriver@inberg-miller.com

# ATTERBERG LIMITS TEST
## INBERG-MILLER ENGINEERS
ASTM D4318

CLIENT: U.S. Energy
PROJECT: Shootering Canyon Mill
JOB NO.: 10223 RM
TEST DATE: 8-3-05
TESTED BY: DAL
SAMPLE NOS: Sec. 16, A & C
SAMPLED BY: Client
SOURCE: Site Soil



| SAMPLE NO. A | Plastic (Y/N)? | Y |
|---|---|---|

| PLASTIC LIMIT INFORMATION | | | LIQUID LIMIT INFORMATION | | | TEST RESULTS | |
|---|---|---|---|---|---|---|---|
| TRIAL NO.: | 1 | 2 | 1 | 2 | 3 | LIQUID LIMIT: | 90 |
| Tare (Pan) No.: | 2P | | 3L | | | PLASTIC LIMIT: | 29 |
| Tare (Pan) Wt.: | 13.83 | | 23.58 | | - | PLASTIC INDEX: | 61 |
| Tare + Wet Soil Wt.: | 17.81 | | 45.5 | | | USCS CLASSIFICATION: | CH |
| Tare + Dry Soil Wt.: | 16.92 | | 35.14 | | | ERROR MESSAGES | |
| No. of Blows: | ▨ | ▨ | 25 | | | | |
| PERCENT MOISTURE: | 28.80% | | 89.62% | | | | |
| AVERAGE MOISTURE: | 28.80% | | 89.62% | | | | |

| SAMPLE NO. C | Plastic (Y/N)? | Y |
|---|---|---|

| PLASTIC LIMIT INFORMATION | | | LIQUID LIMIT INFORMATION | | | TEST RESULTS | |
|---|---|---|---|---|---|---|---|
| TRIAL NO.: | 1 | 2 | 1 | 2 | 3 | LIQUID LIMIT: | 90 |
| Tare (Pan) No.: | 6 | | 8L | | | PLASTIC LIMIT: | 28 |
| Tare (Pan) Wt.: | 14.35 | | 23.76 | | | PLASTIC INDEX: | 62 |
| Tare + Wet Soil Wt.: | 17.51 | | 48.1 | | | USCS CLASSIFICATION: | CH |
| Tare + Dry Soil Wt.: | 16.82 | | 36.64 | | | ERROR MESSAGES | |
| No. of Blows: | ▨ | ▨ | 28 | | | | |
| PERCENT MOISTURE: | 27.94% | | 90.20% | | | | |
| AVERAGE MOISTURE: | 27.94% | | 90.20% | | | | |

| SAMPLE NO. | Plastic (Y/N)? | |
|---|---|---|

| PLASTIC LIMIT INFORMATION | | | LIQUID LIMIT INFORMATION | | | TEST RESULTS | |
|---|---|---|---|---|---|---|---|
| TRIAL NO.: | 1 | 2 | 1 | 2 | 3 | LIQUID LIMIT: | |
| Tare (Pan) No.: | | | | | | PLASTIC LIMIT: | |
| Tare (Pan) Wt.: | | | | | | PLASTIC INDEX: | |
| Tare + Wet Soil Wt.: | | | | | | USCS CLASSIFICATION: | |
| Tare + Dry Soil Wt.: | | | | | | ERROR MESSAGES | |
| No. of Blows: | ▨ | ▨ | | | | | |
| PERCENT MOISTURE: | | | | | | | |
| AVERAGE MOISTURE: | | | | | | | |

| SAMPLE NO. | Plastic (Y/N)? | |
|---|---|---|

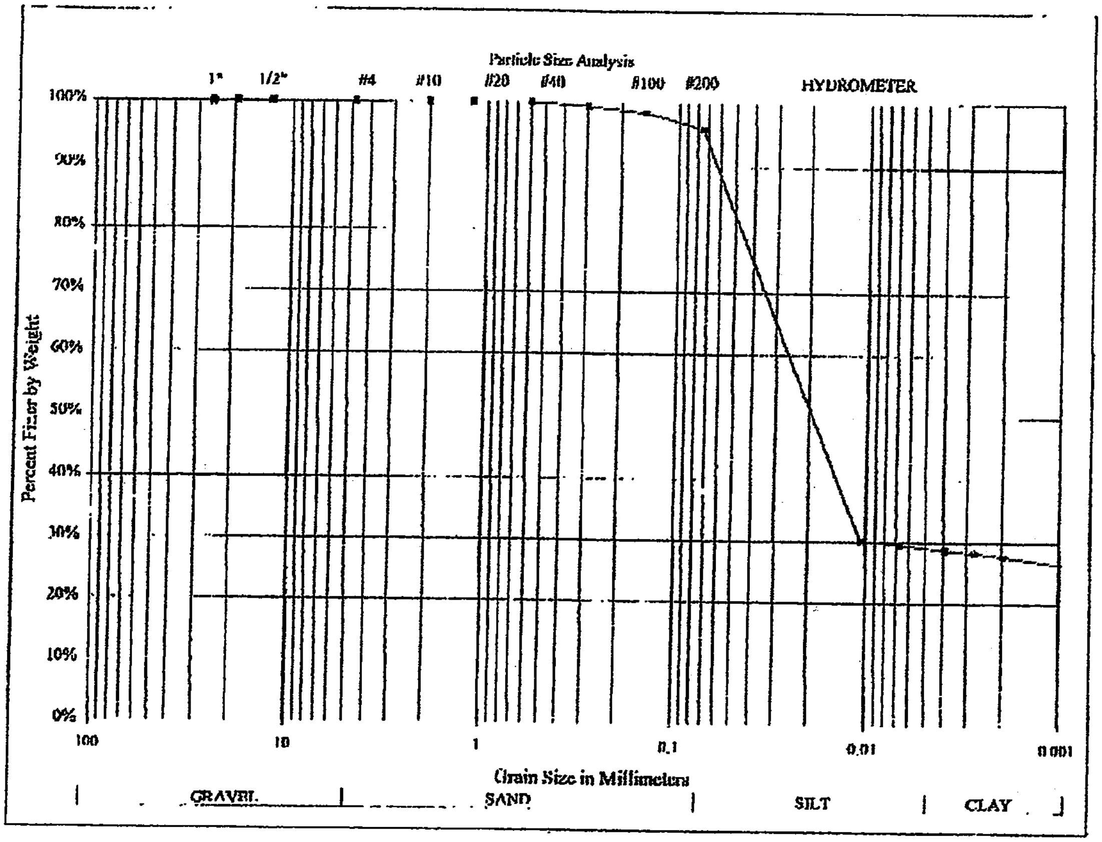
| PLASTIC LIMIT INFORMATION | | | LIQUID LIMIT INFORMATION | | | TEST RESULTS | |
|---|---|---|---|---|---|---|---|
| TRIAL NO.: | 1 | 2 | 1 | 2 | 3 | LIQUID LIMIT: | |
| Tare (Pan) No.: | | | | | | PLASTIC LIMIT: | |
| Tare (Pan) Wt.: | | | | | | PLASTIC INDEX: | |
| Tare + Wet Soil Wt.: | | | | | | USCS CLASSIFICATION: | |
| Tare + Dry Soil Wt.: | | | | | | ERROR MESSAGES | |
| No. of Blows: | ▨ | ▨ | | | | | |
| PERCENT MOISTURE: | | | | | | | |
| AVERAGE MOISTURE: | | | | | | | |

| SAMPLE NO. | Plastic (Y/N)? | |
|---|---|---|

| PLASTIC LIMIT INFORMATION | | | LIQUID LIMIT INFORMATION | | | TEST RESULTS | |
|---|---|---|---|---|---|---|---|
| TRIAL NO.: | 1 | 2 | 1 | 2 | 3 | LIQUID LIMIT: | |
| Tare (Pan) No.: | | | | | | PLASTIC LIMIT: | |
| Tare (Pan) Wt.: | | | | | | PLASTIC INDEX: | |
| Tare + Wet Soil Wt.: | | | | | | USCS CLASSIFICATION: | |
| Tare + Dry Soil Wt.: | | | | | | ERROR MESSAGES | |
| No. of Blows: | ▨ | ▨ | | | | | |
| PERCENT MOISTURE: | | | | | | | |
| AVERAGE MOISTURE: | | | | | | | |

## SIEVE & HYDROMETER TEST ASTM D422

| | | | |
|---|---|---|---|
| IME SAMPLE NO : | C | DATE RECEIVED: | 5/6/1998 |
| CLIENT: | U.S. Energy | TYPE OF SAMPLE | Bulk |
| CLIENT SAMPLE NO.: | Sec. 16 Site Soil | | |
| SOIL DESCRIPTION: | Shale/Clay | | |

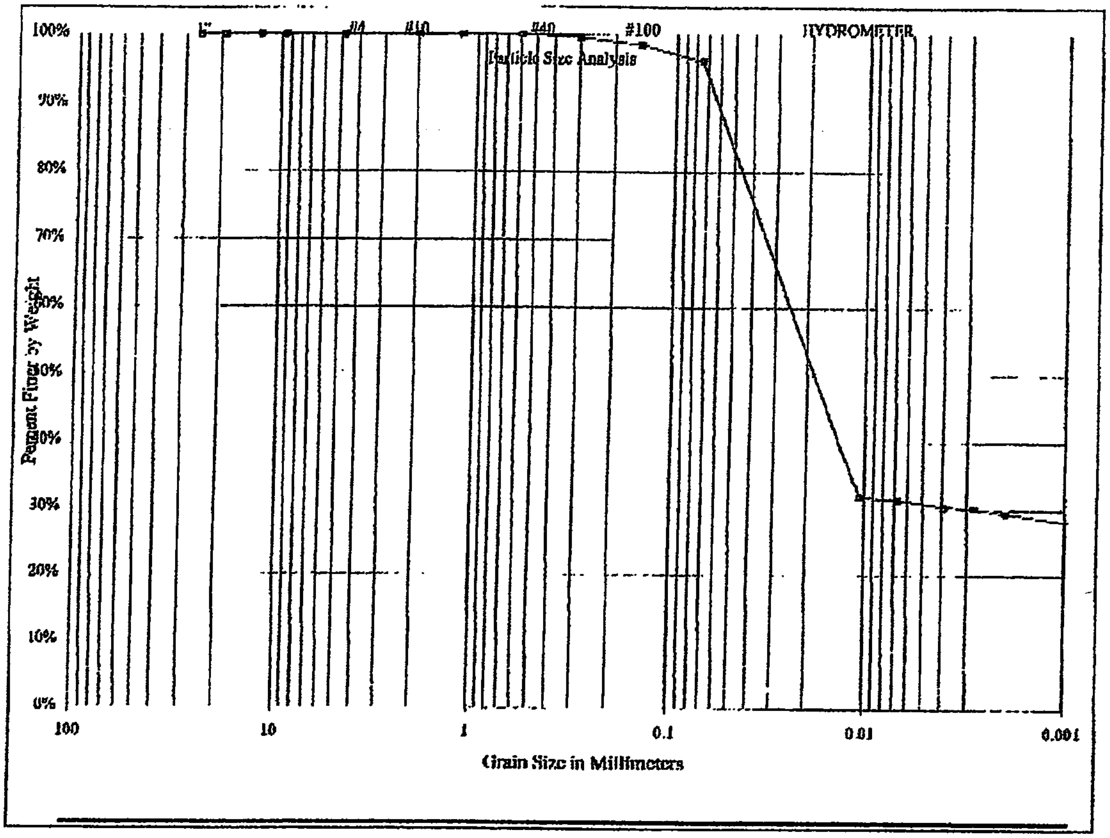


| Sieve Size | PARTICLE SIZE (mm) | PERCENT FINER |
|---|---|---|
| 1" | 25.4000 | 100.0% |
| 3/4" | 19.1000 | 100.0% |
| 1/2" | 12.7000 | 100.0% |
| 3/8" | 9.5200 | 100.0% |
| NO. 4 | 4.7600 | 100.0% |
| NO.10 | 2.0000 | 100.0% |
| NO. 16 | 1.1900 | 100.0% |
| NO. 30 | 0.5900 | 100.0% |
| NO. 50 | 0.2970 | 99.4% |
| NO. 100 | 0.1490 | 98.4% |
| NO. 200 | 0.0740 | 95.9% |
| Hydrometer Range | 0.0106 | 30.2% |
| | 0.0067 | 29.5% |
| | 0.0039 | 28.7% |
| | 0.0028 | 28.3% |
| | 0.0020 | 27.7% |
| | 0.0010 | 26.4% |
| | 0.0004 | 26.0% |

Inberg-Miller Engineers
270 North American Road
Cheyenne, WY 82007

# SIEVE & HYDROMETER TEST ASTM D422

| | | | |
|---|---|---|---|
| IME SAMPLE NO.: | A | DATE RECEIVED: | 5/6/1998 |
| CLIENT: | U.S. Energy | TYPE OF SAMPLE | Bulk |
| CLIENT SAMPLE NO : | Sec. 16 Site Soil | | |
| SOIL DESCRIPTION: | Shale/Clay | | |



| Sieve Size | PARTICLE SIZE (mm) | PERCENT FINER |
|---|---|---|
| 1" | 25.4000 | 100.0% |
| 3/4" | 19.1000 | 100.0% |
| 1/2" | 12.7000 | 100.0% |
| 3/8" | 9.5200 | 100.0% |
| NO. 4 | 4.7600 | 100.0% |
| NO.10 | 2.0000 | 100.0% |
| NO. 16 | 1.1900 | 100.0% |
| NO. 30 | 0.5900 | 100.0% |
| NO. 50 | 0.2970 | 99.6% |
| NO. 100 | 0.1490 | 98.5% |
| NO. 200 | 0.0740 | 96.0% |
| Hydrometer Range | 0.0105 | 31.8% |
| | 0.0067 | 31.5% |
| | 0.0039 | 30.5% |
| | 0,0028 | 30.3% |
| | 0 0020 | 29.4% |
| | 0.0010 | 28.1% |
| | 0.0004 | 27.5% |

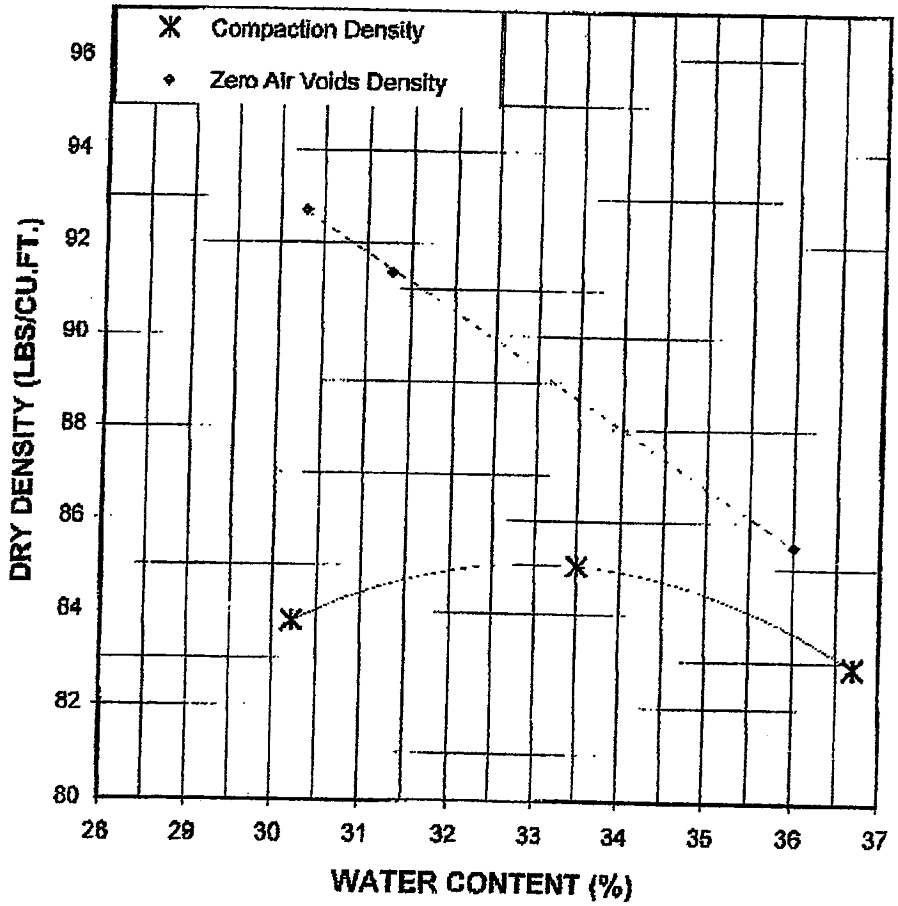
Inberg Miller Engineers
270 North American Road
Cheyenne, WY 82007

# MOISTURE-DENSITY ANALYSIS

## INBERG-MILLER ENGINEERS

CLIENT: U.S. Energy
PROJECT: Shootering Canyon Mill
JOB NO. 10223 RM
TEST DATE: 6-3-05
SOURCE: Site Soil
DESCRIPTION: Shale/Clay

SAMPLE NO.: Sec. 16, #C
SAMPLED BY: Client
TESTED BY : BJC
TEST METHOD: D 698-A

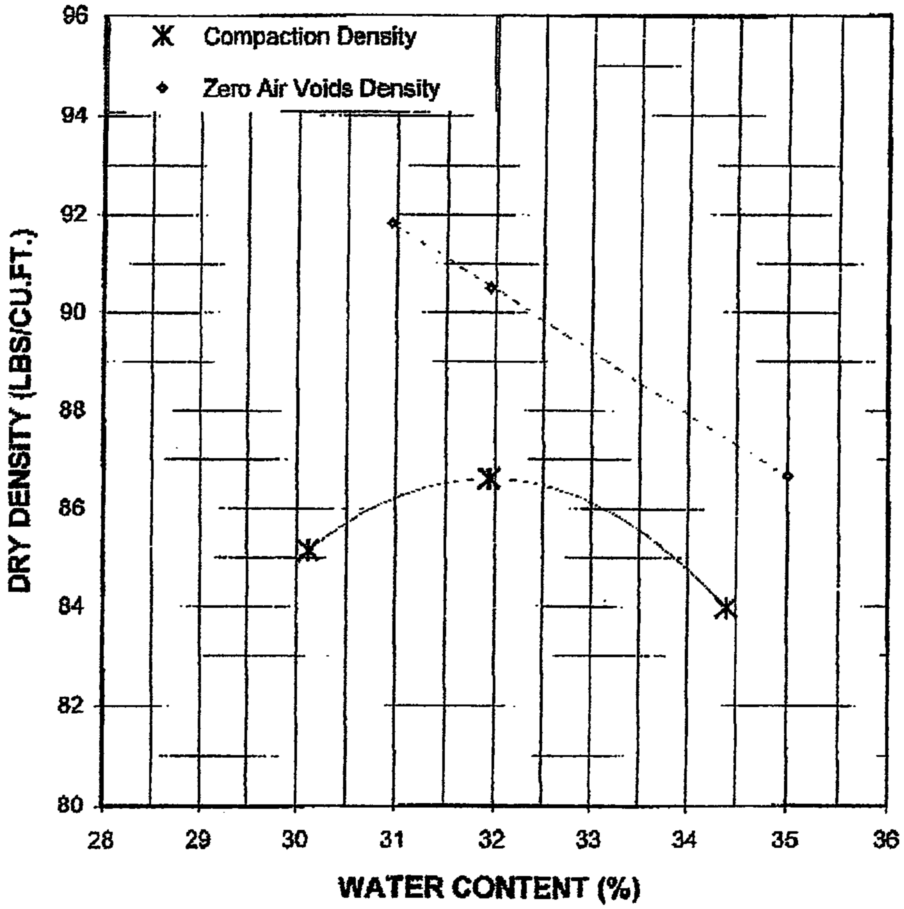


| | |
|---|---|
| OPTIMUM WATER CONTENT (%): | 31.3 |
| MAXIMUM DRY DEN. (LBS/CU. FT): | 85.7 |

# MOISTURE-DENSITY ANALYSIS

## INBERG-MILLER ENGINEERS

| | | | |
|---|---|---|---|
| CLIENT: | U.S. Energy | SAMPLE NO.: | Sec. 16, #A |
| PROJECT: | Shootering Canyon Mill | SAMPLED BY: | Client |
| JOB NO. | 10223 RM | TESTED BY : | BJC |
| TEST DATE: | 6-3-05 | TEST METHOD: | D 698-A |
| SOURCE: | Site Soil | | |
| DESCRIPTION: | Shale/Clay | | |



OPTIMUM WATER CONTENT (%): 32.0

MAXIMUM DRY DEN. (LBS/CU. FT): 86.6

# APPENDIX I

## ENTRADA SAND PROCTOR TEST RESULTS

# APPENDIX I

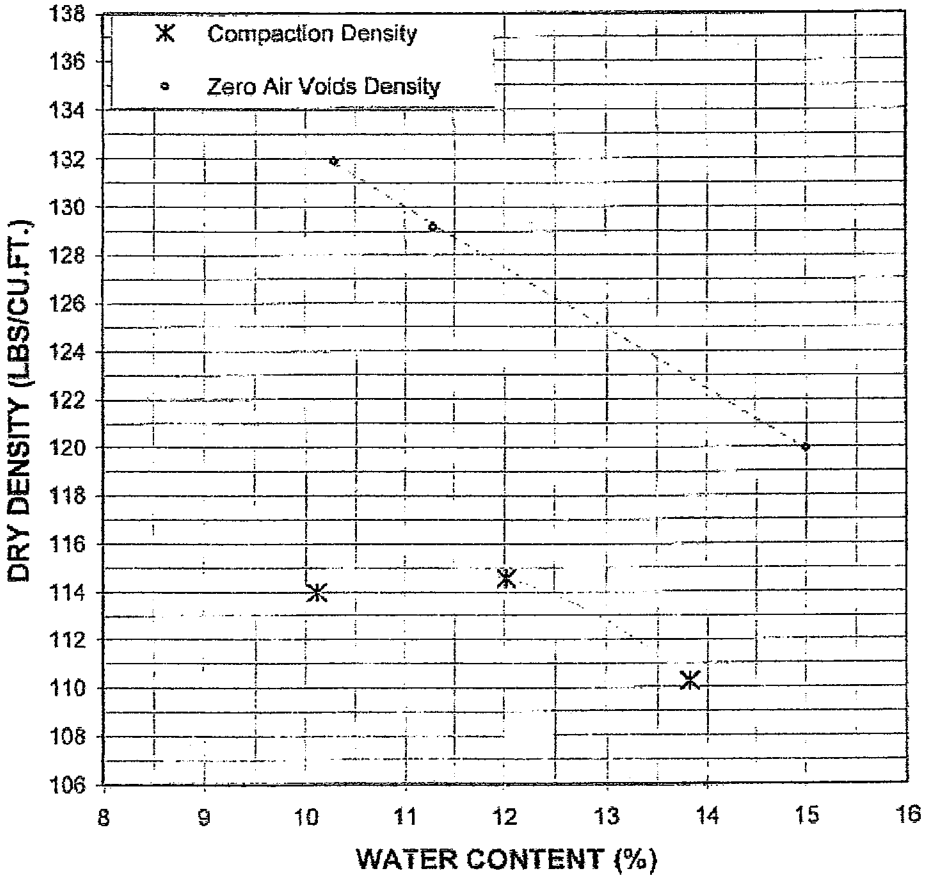
## TABLE OF CONTENTS

# MOISTURE-DENSITY ANALYSIS

## INBERG-MILLER ENGINEERS

CLIENT: U.S. Energy
PROJECT: General Testing
JOB NO. 12870-RM
TEST DATE: 12-1-06
SOURCE: Site Material
DESCRIPTION: Red Silty Fine Sand

SAMPLE NO.: 1
SAMPLED BY: Client
TESTED BY : TEG
TEST METHOD: ASTM D1557



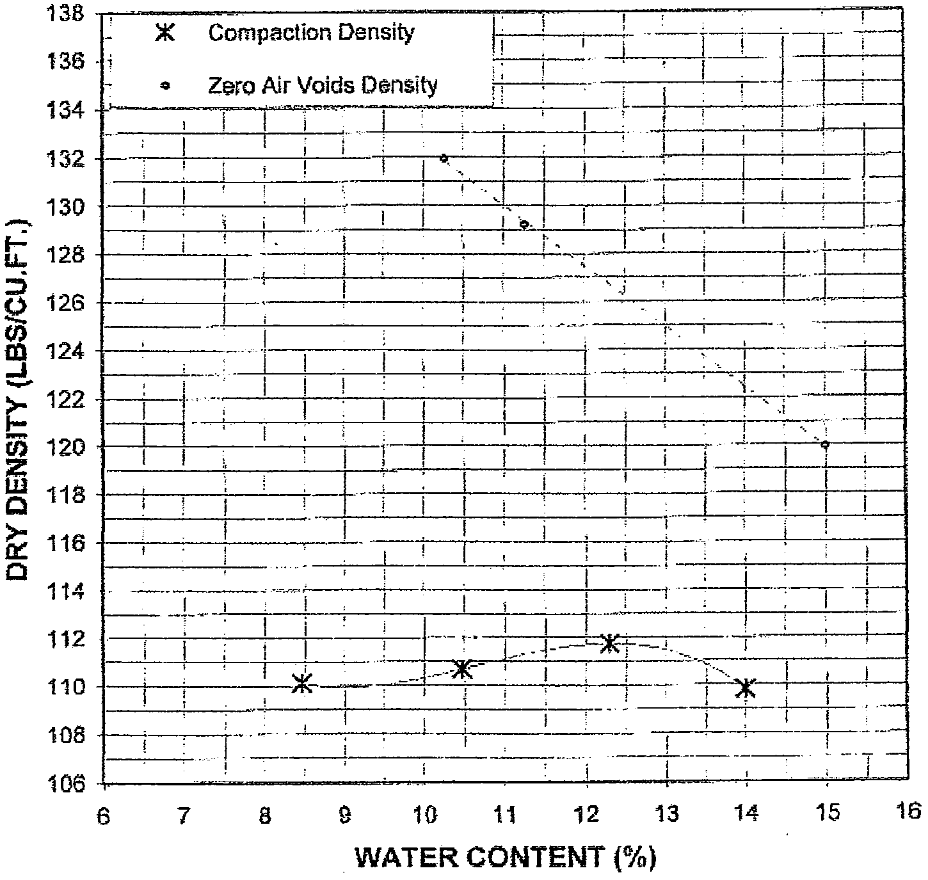
OPTIMUM WATER CONTENT (%): 11.3
MAXIMUM DRY DEN. (LBS/CU. FT): 115.0

# MOISTURE-DENSITY ANALYSIS

## INBERG-MILLER ENGINEERS

CLIENT: U.S. Energy
PROJECT: General Testing
JOB NO. 12870-RM
TEST DATE: 12-1-06
SOURCE: Site Material
DESCRIPTION: Red Silty Fine Sand

SAMPLE NO.: 1
SAMPLED BY: Client
TESTED BY : TEG
TEST METHOD: ASTM D698



OPTIMUM WATER CONTENT (%): 12.3
MAXIMUM DRY DEN. (LBS/CU. FT): 111.7

# APPENDIX C.3
# TETRA TECH FIELD INVESTIGATION (2008)

# APPENDIX C.3.1
# TETRA TECH FIELD INVESTIGATION
# MARCH 10-11, 2008
# BOREHOLE LOGS

# BOREHOLE LOG

**PAGE:** 1 OF 2

**DATE:** 3/10/08

**BOREHOLE NO.:** Tt-1

## PROJECT INFORMATION

**PROJECT:** SHOOTARING CANYON

**PROJECT NO.:** 181692

**CLIENT:** URANIUM ONE

**OWNER:** URANIUM ONE

**LOCATION:** SOUTH CELL

## BOREHOLE LOCATION

**SEE FIGURE 2-15 FOR LOCATION**

## FIELD INFORMATION

**DATE & TIME ARRIVED:** 3/10/08

**BOREHOLE LOGGED BY:** G. SMITH

**VISITORS:** NONE

**WEATHER:** CLEAR, ~60°, SLIGHT BREEZE

## DRILLING INFORMATION

**DRILLING COMPANY:** D. A. SMITH

**START TIME:** 3:20PM

**BORING DEPTH:** 16' **BORING DIA.:** 4.5" ID, 8" OD

**DRILLING METHOD:** HSA

**SAMPLING METHOD:** SPLIT BARREL, 2" ID, CALIFORNIA

**TIME DRILLING COMPLETE:** 4:40PM

## BOREHOLE COMPLETION / ABANDONMENT INFORMATION

**START TIME:** * **COMPLETE TIME:** *

**INSTRUMENTATION:** NONE **BACKFILL:** *

**ELEVATION - TOP OF BORING:** * **RELATIVE TO:** *

## GROUNDWATER CONDITIONS

GROUNDWATER WAS NOT ENCOUNTERED DURING DRILLING.

## FOLLOWING FIELD WORK

**TIME OF CLEAN-UP COMPLETE:** * **TIME LEFT SITE:** *

**NOTES:** N 37°42.317', W 110°41.846'

# BOREHOLE LOG

PROJECT: *SHOOTARING CANYON*
PAGE: *2 OF 2*
PROJECT NO.: *181692*
DATE: *3/10/08*

BOREHOLE NO.: **Tt-1**

| DEPTH (FT) | CORE RECOV. | DRIVE SAMPLES | | | ADD'L SAMPLES | LITHOLOGY GRAPHIC | SOIL DESCRIPTION |
|---|---|---|---|---|---|---|---|
| | | SAMPLE TYPE | BLOWS (PER 6") | RECOV. | | | |
| 0 | | | | | | | **SAND (0 TO 7')**<br>SP, PREDOMINANTLY, VERY FINE TO FINE, SA, POORLY GRADED, NP, APPROX. 10% FINES, LIGHT REDDISH BROWN. |
| 1 | | | | | | | |
| 2 | | | | | | | |
| 3 | | | | | | | |
| 4 | | | | | | | |
| 5 | ☒ | CA | 4<br>4<br>5 | | | | |
| 6 | | | | | | | |
| 7 | | | | | | | **ENTRADA SANDSTONE (7' TO E.O.B.)**<br>VERY FINE, MASSIVE, SOME CALCIUM CARBONATE, LIGHT REDDISH BROWN. |
| 8 | | | | | | | |
| 9 | | | | | | | |
| 10 | | | | | | | |
| 11 | ☒ | | 50/4" | | | | |
| 12 | | | | | | | |
| 13 | | | | | | | |
| 14 | | | | | | | NON-CEMENTED. |
| 15 | | | | | | | NO SAMPLE ATTEMPTED AT 15'. |
| 16 | | | | | | | E.O.B. = 16.0'<br>AUGER REFUSAL AT 16'. |
| 17 | | | | | | | |
| 18 | | | | | | | |
| 19 | | | | | | | |
| 20 | | | | | | | |

# BOREHOLE LOG

PAGE: 1 OF 2

DATE: 3/10/08

BOREHOLE NO.: **Tt-2**

## PROJECT INFORMATION

PROJECT: SHOOTARING CANYON

PROJECT NO.: 181692

CLIENT: URANIUM ONE

OWNER: URANIUM ONE

LOCATION: SOUTH CELL

## BOREHOLE LOCATION

**SEE FIGURE 2-15 FOR LOCATION**

## FIELD INFORMATION

DATE & TIME ARRIVED: 3/10/08 2:00PM

BOREHOLE LOGGED BY: G. SMITH

VISITORS: NONE

WEATHER: CLEAR, ~60°

## DRILLING INFORMATION

DRILLING COMPANY: D. A. SMITH, DIETRICH D-50

START TIME: 2:15PM

BORING DEPTH: 9.75'

BORING DIA.: 4.5" ID, 8" OD

DRILLING METHOD: HSA

SAMPLING METHOD: SPLIT BARREL, 2" ID, CALIFORNIA

TIME DRILLING COMPLETE: 3:15PM

## BOREHOLE COMPLETION / ABANDONMENT INFORMATION

START TIME: *

COMPLETE TIME: *

INSTRUMENTATION: NONE

BACKFILL: *

ELEVATION - TOP OF BORING: *

RELATIVE TO: *

## GROUNDWATER CONDITIONS

GROUNDWATER WAS NOT ENCOUNTERED DURING DRILLING.

## FOLLOWING FIELD WORK

TIME OF CLEAN-UP COMPLETE: *

TIME LEFT SITE: *

## NOTES: N 37°42.842', W 110°41.791'

# BOREHOLE LOG

**PROJECT:** *SHOOTARING CANYON* **PAGE:** *2 OF 2*

**PROJECT NO.:** *181692* **DATE:** *3/10/08*

**BOREHOLE NO.:** **Tt-2**

| DEPTH (FT) | CORE RECOV. | DRIVE SAMPLES |  |  | ADD'L SAMPLES | LITHOLOGY GRAPHIC | SOIL DESCRIPTION |
|---|---|---|---|---|---|---|---|
|  |  | SAMPLE TYPE | BLOWS (PER 6") | RECOV. |  |  |  |
| 0 |  |  |  |  |  |  | **SAND (0 TO 1.5')**<br>SP, PREDOMINANTLY FINE, SOME MEDIUM, TRACE FINES (10%), ANGULAR, LIGHT REDDISH. |
| 1 |  |  |  |  |  |  |  |
| 2 |  |  |  |  |  |  | **ENTRADA SANDSTONE (1.5' TO E.O.B.)**<br>MASSIVE FINE GRAINED. |
| 3 |  |  |  |  |  |  |  |
| 4 |  |  |  |  |  |  |  |
| 5 | ☒ | CA | 50/5" |  |  |  | SAMPLE AT 5' - 5.25', 5.25' - 5.5'. |
| 6 |  |  |  |  |  |  |  |
| 7 |  |  |  |  |  |  | 7' - COLOR CHANGE TO REDDISH PURPLE. |
| 8 |  |  |  |  |  |  | 8.5' - HARD. |
| 9 |  |  |  |  |  |  | E.O.B. = 9.75' |
| 10 |  |  |  |  |  |  | AUGER REFUSAL AT 9.75'. NO SAMPLE ATTEMPTED. |
| 11 |  |  |  |  |  |  |  |
| 12 |  |  |  |  |  |  |  |
| 13 |  |  |  |  |  |  |  |
| 14 |  |  |  |  |  |  |  |
| 15 |  |  |  |  |  |  |  |
| 16 |  |  |  |  |  |  |  |
| 17 |  |  |  |  |  |  |  |
| 18 |  |  |  |  |  |  |  |
| 19 |  |  |  |  |  |  |  |
| 20 |  |  |  |  |  |  |  |

# BOREHOLE LOG

PAGE: 1 OF 2

DATE: 3/10/08

BOREHOLE NO.: Tt-3

## PROJECT INFORMATION

PROJECT: SHOOTARING CANYON

PROJECT NO.: 181692

CLIENT: URANIUM ONE

OWNER: URANIUM ONE

LOCATION: SOUTH CELL

## BOREHOLE LOCATION

SEE FIGURE 2-15 FOR LOCATION

## FIELD INFORMATION

DATE & TIME ARRIVED: 3/10/08 4:30PM

BOREHOLE LOGGED BY: G. SMITH

VISITORS: NONE

WEATHER: CLEAR, ~55°

## DRILLING INFORMATION

DRILLING COMPANY: D. A. SMITH, DIETRICH D-50

START TIME: 4:30PM

BORING DEPTH: 3' BORING DIA.: 4.5" ID, 8" OD

DRILLING METHOD: HSA

SAMPLING METHOD: SPLIT BARREL, 2" ID, CALIFORNIA

TIME DRILLING COMPLETE: 4:50PM

## BOREHOLE COMPLETION / ABANDONMENT INFORMATION

START TIME: * COMPLETE TIME: *

INSTRUMENTATION: NONE BACKFILL: *

ELEVATION - TOP OF BORING: * RELATIVE TO: *

## GROUNDWATER CONDITIONS

GROUNDWATER WAS NOT ENCOUNTERED DURING DRILLING.

## FOLLOWING FIELD WORK

TIME OF CLEAN-UP COMPLETE: * TIME LEFT SITE: *

**NOTES:** N 37°42.713', W 110°41.789'

# BOREHOLE LOG

**PROJECT:** *SHOOTARING CANYON* **PAGE:** *2 OF 2*

**PROJECT NO.:** *181692* **DATE:** *3/10/08*

**BOREHOLE NO.:** **Tt-3**

| DEPTH (FT) | CORE RECOV. | DRIVE SAMPLES | | | ADD'L SAMPLES | LITHOLOGY GRAPHIC | SOIL DESCRIPTION |
|---|---|---|---|---|---|---|---|
| | | SAMPLE TYPE | BLOWS (PER 6") | RECOV. | | | |
| 0 | | | | | | | **SAND (0 TO 1.5')**<br>SP, PREDOMINANTLY VERY FINE, NP, POORLY GRADED, SA, MEDIUM, REDDISH BROWN. |
| 1 | | | | | | | |
| 2 | | | | | | | **ENTRADA SANDSTONE (1.5' TO E.O.B.)**<br>MASSIVE, NON-CEMENTED, WEAK, REDDISH BROWN. |
| 3 | | | | | | | E.O.B. = 3.0'<br>AUGER REFUSAL AT 3'. |
| 4 | | | | | | | |
| 5 | | | | | | | |
| 6 | | | | | | | |
| 7 | | | | | | | |
| 8 | | | | | | | |
| 9 | | | | | | | |
| 10 | | | | | | | |
| 11 | | | | | | | |
| 12 | | | | | | | |
| 13 | | | | | | | |
| 14 | | | | | | | |
| 15 | | | | | | | |
| 16 | | | | | | | |
| 17 | | | | | | | |
| 18 | | | | | | | |
| 19 | | | | | | | |
| 20 | | | | | | | |

# BOREHOLE LOG

PAGE: 1 OF 4
DATE: 3/11/08

BOREHOLE NO.: **Tt-4**

## PROJECT INFORMATION

PROJECT: SHOOTARING CANYON
PROJECT NO.: 181692
CLIENT: URANIUM ONE
OWNER: URANIUM ONE
LOCATION: SOUTH CELL, GEOPHYSICAL LINE

## BOREHOLE LOCATION

SEE FIGURE 2-15 FOR LOCATION

## FIELD INFORMATION

DATE & TIME ARRIVED: 3/11/08
BOREHOLE LOGGED BY: G. SMITH
VISITORS: DON POULTER
WEATHER: CLEAR, ~40°

## DRILLING INFORMATION

DRILLING COMPANY: D. A. SMITH
START TIME: 7:30AM
BORING DEPTH: 60' BORING DIA.: HQ
DRILLING METHOD: WIRELINE CORE, WATER USED FOR DRILLING FLUID
SAMPLING METHOD: CORE
TIME DRILLING COMPLETE: 11:45AM

## BOREHOLE COMPLETION / ABANDONMENT INFORMATION

START TIME: * COMPLETE TIME: *
INSTRUMENTATION: NONE BACKFILL: *
ELEVATION - TOP OF BORING: * RELATIVE TO: *

## GROUNDWATER CONDITIONS

GROUNDWATER WAS NOT ENCOUNTERED DURING DRILLING.

## FOLLOWING FIELD WORK

TIME OF CLEAN-UP COMPLETE: * TIME LEFT SITE: *

NOTES: N 37°42.761', W 110°41.742'

# BOREHOLE LOG

BOREHOLE NO.: Tt-4

PROJECT: SHOOTARING CANYON

PAGE: 2 OF 4

PROJECT NO.: 181692

DATE: 3/11/08

| DEPTH (FT) | CORE RECOV. | DRIVE SAMPLES |  |  | ADD'L SAMPLES | LITHOLOGY GRAPHIC | SOIL DESCRIPTION |
|---|---|---|---|---|---|---|---|
|  |  | SAMPLE TYPE | BLOWS (PER 6") | RECOV. |  |  |  |
| 0 |  |  |  |  |  |  | **ENTRADA SANDSTONE**<br>FINE-GRAINED, SOFT TO MEDIUM HARD, WEAKLY CEMENTED, LIGHT RED. |
| 1 | NR |  |  |  |  |  |  |
| 2 | 80% |  |  |  |  |  |  |
| 3 | NR |  |  |  |  |  |  |
| 4 |  |  |  |  |  |  |  |
| 5 |  |  |  |  |  |  |  |
| 6 |  |  |  |  |  |  |  |
| 7 | 80% |  |  |  |  |  |  |
| 8 |  |  |  |  |  |  |  |
| 9 | NR |  |  |  |  |  | WHITE, MEDIUM TO FINE SAND BEDDING. |
| 10 |  |  |  |  |  |  |  |
| 11 |  |  |  |  |  |  | SANDSTONE WASHING OUT OF HOLE DURING CORING OPERATIONS. |
| 12 | 60% |  |  |  |  |  |  |
| 13 |  |  |  |  |  |  |  |
| 14 |  |  |  |  |  |  |  |
| 15 |  |  |  |  |  |  |  |
| 16 |  |  |  |  |  |  |  |
| 17 | 70% |  |  |  |  |  |  |
| 18 |  |  |  |  |  |  |  |
| 19 |  |  |  |  |  |  |  |
| 20 |  |  |  |  |  |  |  |

# BOREHOLE LOG

**PROJECT:** *SHOOTARING CANYON* **PAGE:** *3 OF 4*

**PROJECT NO.:** *181692* **DATE:** *3/11/08*

**BOREHOLE NO.:** **Tt-4**

| DEPTH (FT) | CORE RECOV. | DRIVE SAMPLES | | | ADD'L SAMPLES | LITHOLOGY GRAPHIC | SOIL DESCRIPTION |
|---|---|---|---|---|---|---|---|
| | | SAMPLE TYPE | BLOWS (PER 6") | RECOV. | | | |
| 20 | | | | | | | **ENTRADA SANDSTONE**<br>FINE TO MEDIUM GRAINED, THINLY BEDDED, DRILLER ENDURED FRACTURES ON BEDDING PLANES. |
| 21 | | | | | | | |
| 22 | 90% | | | | | | LOSSES DUE TO WASH OUT. |
| 23 | | | | | | | |
| 24 | | | | | | | |
| 25 | | | | | | | |
| 26 | | | | | | | |
| 27 | 100% | | | | | | FRACTURES 4" TO 6" SPACING, ALONG HORIZONTAL BEDDING PLANES. |
| 28 | | | | | | | |
| 29 | | | | | | | |
| 30 | | | | | | | |
| 31 | | | | | | | |
| 32 | 0% | | | | | | DROPPED CORE, LOST ON SECONDARY RECOVERY ATTEMPT, DESTROYED. |
| 33 | | | | | | | |
| 34 | | | | | | | |
| 35 | | | | | | | |
| 36 | | | | | | | |
| 37 | 50% | | | | | | |
| 38 | | | | | | | |
| 39 | | | | | | | |
| 40 | | | | | | | |

# BOREHOLE LOG

**PROJECT:** SHOOTARING CANYON
**PAGE:** 4 OF 4
**PROJECT NO.:** 181692
**DATE:** 3/11/08

**BOREHOLE NO.:** Tt-4

| DEPTH (FT) | CORE RECOV. | DRIVE SAMPLES | | | ADD'L SAMPLES | LITHOLOGY GRAPHIC | SOIL DESCRIPTION |
|---|---|---|---|---|---|---|---|
| | | SAMPLE TYPE | BLOWS (PER 6") | RECOV. | | | |
| 40 | | | | | | | **ENTRADA SANDSTONE**<br>FINE TO MEDIUM GRAINED, THINLY BEDDED, MEDIUM HARD, WEAKLY CEMENTED, REDDISH BROWN. |
| 41 | | | | | | | |
| 42 | 55% | | | | | | |
| 43 | | | | | | | |
| 44 | | | | | | | |
| 45 | | | | | | | |
| 46 | | | | | | | |
| 47 | 100% | | | | | | |
| 48 | | | | | | | |
| 49 | | | | | | | |
| 50 | | | | | | | |
| 51 | NR | | | | | | 50.5' - 52' - THINLY BEDDED, WASHED OUT CORE. |
| 52 | | | | | | | |
| 53 | 95% | | | | | | |
| 54 | | | | | | | |
| 55 | | | | | | | |
| 56 | | | | | | | |
| 57 | 65% | | | | | | THIN MUDSTONE BED WITH 2 cm CORE LOSS WASHING OUT. |
| 58 | | | | | | | |
| 59 | | | | | | | |
| 60 | | | | | | | E.O.B. = 60.0' |

# BOREHOLE LOG

PAGE: 1 OF 3

DATE: 3/11/08

BOREHOLE NO.: Tt-5

## PROJECT INFORMATION

PROJECT: SHOOTARING CANYON

PROJECT NO.: 181692

CLIENT: URANIUM ONE

OWNER: URANIUM ONE

LOCATION: SOUTH DAM

## BOREHOLE LOCATION

SEE FIGURE 2-15 FOR LOCATION

## FIELD INFORMATION

DATE & TIME ARRIVED: 3/11/08

BOREHOLE LOGGED BY: G. SMITH

VISITORS: DON POULTER

WEATHER: CLEAR, ~55°

## DRILLING INFORMATION

DRILLING COMPANY: D. A. SMITH

START TIME: 12:15PM

BORING DEPTH: 26' BORING DIA.: 4.5" ID, 8" OD

DRILLING METHOD: HSA

SAMPLING METHOD: SPLIT BARREL, 2" ID CALIFORNIA, 3" SHELBY TUBE.

TIME DRILLING COMPLETE: 2:15PM

## BOREHOLE COMPLETION / ABANDONMENT INFORMATION

START TIME: * COMPLETE TIME: *

INSTRUMENTATION: NONE BACKFILL: *

ELEVATION - TOP OF BORING: * RELATIVE TO: *

## GROUNDWATER CONDITIONS

GROUNDWATER WAS NOT ENCOUNTERED DURING DRILLING.

## FOLLOWING FIELD WORK

TIME OF CLEAN-UP COMPLETE: * TIME LEFT SITE: *

**NOTES:** N 37°42.639', W 110°41.851'

# BOREHOLE LOG

**PROJECT:** *SHOOTARING CANYON*
**PAGE:** *2 OF 3*
**PROJECT NO.:** *181692*
**DATE:** *3/11/08*

**BOREHOLE NO.:** **Tt-5**

| DEPTH (FT) | CORE RECOV. | DRIVE SAMPLES | | | ADD'L SAMPLES | LITHOLOGY GRAPHIC | SOIL DESCRIPTION |
|---|---|---|---|---|---|---|---|
| | | SAMPLE TYPE | BLOWS (PER 6") | RECOV. | | | |
| 0 | | | | | | | **SANDY GRAVEL (0 TO 2')**<br>GP/SP, SANDY GRAVEL WITH COBBLES, DIORITES, SANDSTONE, DAM SHELL. |
| 1 | | | | | | | |
| 2 | | | | | | | **SAND (2' TO 11.25')**<br>SP, FINE TO VERY FINE GRAINED, SOME SMALL COBBLES AND GRAVELS, NP, RED. |
| 3 | | | | | | | |
| 4 | | | | | | | |
| 5 | ☒ | CA | 17<br>33<br>45 | | | | |
| 6 | | | | | | | |
| 7 | | | | | | | |
| 8 | | | | | | | |
| 9 | | | | | | | |
| 10 | | | | | | | |
| 11 | ☒ | CA | 8<br>10<br>12 | | | | **CLAY (11.25' TO E.O.B.)**<br>STIFF, SOME COARSE SAND, MEDIUM TO HIGH PLASTICITY, PURPLISH RED. |
| 12 | | | | | | | |
| 13 | | | | | | | |
| 14 | | | | | | | |
| 15 | ☒ | ST | | | | | 1.25' PUSH WITH SHELBY TUBE, 1' RECOVERY. |
| 16 | | | | | | | |
| 17 | | | | | | | |
| 18 | | | | | | | |
| 19 | | | | | | | |
| 20 | | | | | | | |

# BOREHOLE LOG

**PROJECT:** *SHOOTARING CANYON*
**PAGE:** *3 OF 3*
**PROJECT NO.:** *181692*
**DATE:** *3/11/08*
**BOREHOLE NO.:** **Tt-5**

| DEPTH (FT) | CORE RECOV. | DRIVE SAMPLES | | | ADD'L SAMPLES | LITHOLOGY GRAPHIC | SOIL DESCRIPTION |
|---|---|---|---|---|---|---|---|
| | | SAMPLE TYPE | BLOWS (PER 6") | RECOV. | | | |
| 20 | | | | | | | **CLAY (11.25' TO E.O.B.)** |
| 21 | ☒ | ST | 8<br>14<br>17 | | | | STIFF, MEDIUM TO HIGH PLASTICITY, TRACE ROCK FRAGMENTS AND COARSE SAND, MOTTLED, PURPLISH RED WITH WHITE, DAM CORE IN MATERIAL.<br>SAMPLE 20.75' - 21.25' |
| 22 | | | | | | | |
| 23 | | | | | | | |
| 24 | | | | | | | |
| 25 | ☒ | ST | 10<br>13 | | | | SAMPLE 25.5' - 25.75' AND 25.75' - 26' |
| 26 | | | | | | | E.O.B. = 26.0'<br>DRILL RIG OUT OF SERVICE, AUTOMATIC DRIVE HAMMER BROKEN, HOLE STOPPED AT 26' AND BACKFILLED TO SURFACE WITH BENTONITE CHIPS. |
| 27 | | | | | | | |
| 28 | | | | | | | |
| 29 | | | | | | | |
| 30 | | | | | | | |
| 31 | | | | | | | |
| 32 | | | | | | | |
| 33 | | | | | | | |
| 34 | | | | | | | |
| 35 | | | | | | | |
| 36 | | | | | | | |
| 37 | | | | | | | |
| 38 | | | | | | | |
| 39 | | | | | | | |
| 40 | | | | | | | |

# APPENDIX C.3.2
# TETRA TECH FIELD INVESTIGATION
# MARCH 17-19, 2008
# TEST PIT LOGS

# TEST PIT LOG

**TEST PIT NO.:** TP-1

**PAGE:** 1 OF 2

**DATE:** 3/19/08

## PROJECT INFORMATION

**PROJECT:** SHOOTARING CANYON

**PROJECT NO.:** 181692

**CLIENT:** URANIUM ONE

**OWNER:** URANIUM ONE

**LOCATION:** SOUTH CELL

...

## TEST PIT LOCATION

**SEE FIGURE 2-15 FOR LOCATION**

## FIELD INFORMATION

**DATE & TIME ARRIVED:** 3/19/08 10:20AM

**TEST PIT LOGGED BY:** GREG SMITH, GEO-SMITH

**VISITORS:** NONE

**WEATHER:** CLEAR, SUNNY, ~60°

## EXCAVATION INFORMATION

**EXCAVATION COMPANY:** KIRK JACKSON

**START TIME:** 10:20AM

**TEST PIT DEPTH:** 3' **TEST PIT DIA.:** 2'

**EXCAVATION METHOD:** TRACTOR MOUNTED BACKHOE - CAT 420D

**SAMPLING METHOD:** NONE

**TIME EXCAVATION COMPLETE:** 10:40AM

## TEST PIT COMPLETION / ABANDONMENT INFORMATION

**START TIME:** 10:40AM **COMPLETE TIME:** 10:45AM

**INSTRUMENTATION:** NONE **BACKFILL:** CUTTINGS

## GROUNDWATER CONDITIONS

NO GROUNDWATER WAS ENCOUNTERED AT THE TIME OF EXCAVATION.

## FOLLOWING FIELD WORK

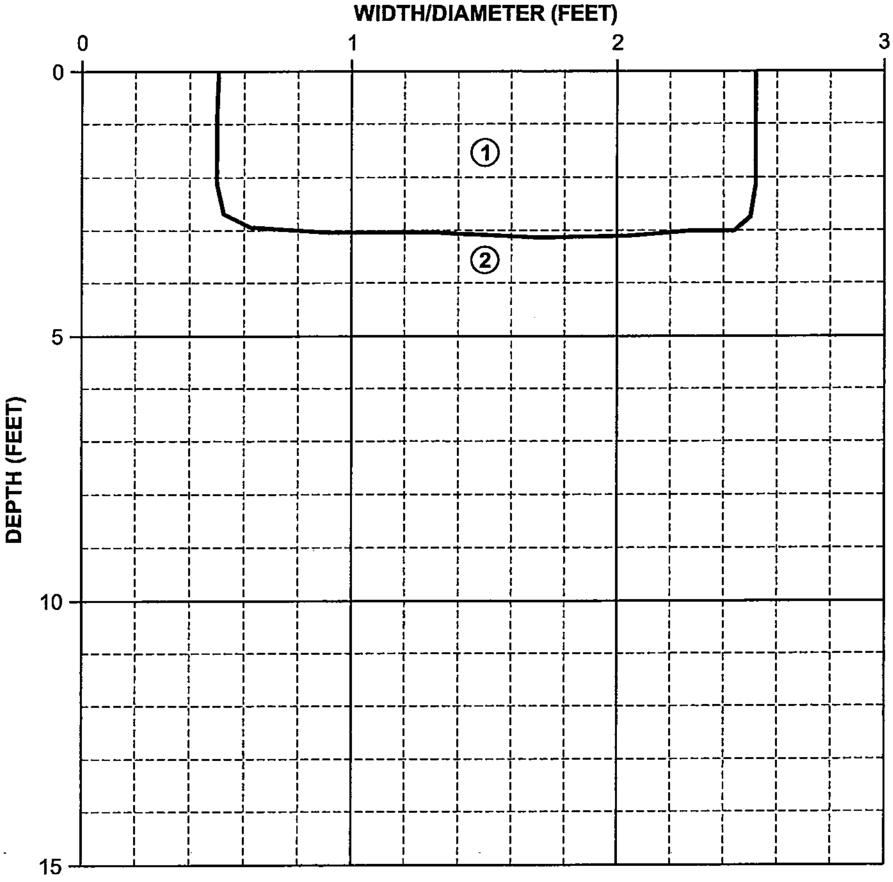
**TIME OF CLEAN-UP COMPLETE:** ... **TIME LEFT SITE:** ...

**NOTES:** EL. 4361'. N 37°42.668', W 110°41.774'.

# TEST PIT LOG

**PROJECT:** SHOOTARING CANYON
**PAGE:** 2 OF 2
**PROJECT NO.:** 181692
**DATE:** 3/19/08

**TEST PIT NO.:** TP-1



| DEPTH | SAMPLE I.D. | SAMPLE TYPE |
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| SOIL TYPE | SOIL DEPTH | SOIL DESCRIPTION AND EXCAVATION NOTES |
|---|---|---|
| ① | 0 - 3' | **FILL**<br>SAND, SP, PREDOMINANTLY FINE, TRACE FINE, NON-PLASTIC, RED. |
| ② | 3' + | **ENTRADA SANDSTONE**<br>FINE TO MEDIUM GRAINED, MODERATELY HARD, LIGHT RED. |

**NOTES:**

# TEST PIT LOG

**TEST PIT NO.:** TP-1A

**PAGE:** 1 OF 2

**DATE:** 3/19/08

## PROJECT INFORMATION

**PROJECT:** SHOOTARING CANYON

**PROJECT NO.:** 181692

**CLIENT:** URANIUM ONE

**OWNER:** URANIUM ONE

**LOCATION:** SOUTH CELL

...

## TEST PIT LOCATION

SEE FIGURE 2-15 FOR LOCATION

## FIELD INFORMATION

**DATE & TIME ARRIVED:** 3/19/08 10:20AM

**TEST PIT LOGGED BY:** GREG SMITH, GEO-SMITH

**VISITORS:** NONE

**WEATHER:** CLEAR, SUNNY, ~60°

## EXCAVATION INFORMATION

**EXCAVATION COMPANY:** KIRK JACKSON

**START TIME:** 10:20AM

**TEST PIT DEPTH:** 9' **TEST PIT DIA.:** 2'

**EXCAVATION METHOD:** TRACTOR MOUNTED BACKHOE - CAT 420D

**SAMPLING METHOD:** NONE

**TIME EXCAVATION COMPLETE:** 10:40AM

## TEST PIT COMPLETION / ABANDONMENT INFORMATION

**START TIME:** 10:40AM **COMPLETE TIME:** 10:45AM

**INSTRUMENTATION:** NONE **BACKFILL:** CUTTINGS

## GROUNDWATER CONDITIONS

NO GROUNDWATER WAS ENCOUNTERED AT THE TIME OF EXCAVATION.

## FOLLOWING FIELD WORK

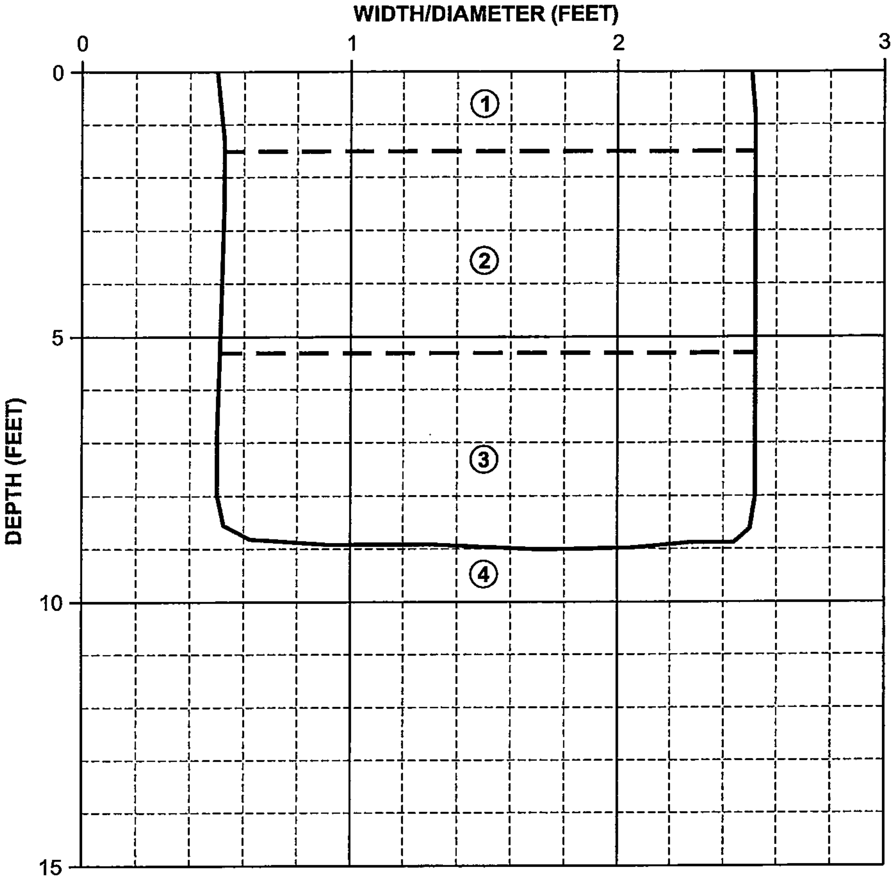
**TIME OF CLEAN-UP COMPLETE:** ... **TIME LEFT SITE:** ...

**NOTES:** EL. 4361'. N 37°42.668', W 110°41.774'.

# TEST PIT LOG

**PROJECT:** *SHOOTARING CANYON*
**PAGE:** *2 OF 2*
**PROJECT NO.:** *181692*
**DATE:** *3/19/08*

**TEST PIT NO.:**
**TP-1A**



| DEPTH | SAMPLE I.D. | SAMPLE TYPE |
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| SOIL TYPE | SOIL DEPTH | SOIL DESCRIPTION AND EXCAVATION NOTES |
|---|---|---|
| ① | 0 - 1.5' | **FILL**<br>SAND, SP, PREDOMINANTLY FINE, TRACE FINE, NON-PLASTIC, RED. |
| ② | 1.5' - 5.25' | **SHELL FILL**<br>SAND, SP-SW, SOME GRAVEL, ROUNDED, OCCASIONAL COBBLES, LOW PLASTICITY, MEDIUM BROWN. |
| ③ | 5.25' - 9' | **CLAY**<br>CH, MEDIUM TO HIGH PLASTICITY, SOME SAND AND ROCK FRAGMENTS, PURPLISH RED WITH GREEN-GRAY MOTTLES. |
| ④ | 9' + | **ENTRADA SANDSTONE**<br>FINE TO MEDIUM GRAINED, MODERATELY HARD, LIGHT RED. |

**NOTES:**

# TEST PIT LOG

PAGE: 1 OF 2

DATE: 3/19/08

TEST PIT NO.: **TP-2**

## PROJECT INFORMATION

PROJECT: SHOOTARING CANYON

PROJECT NO.: 181692

CLIENT: URANIUM ONE

OWNER: URANIUM ONE

LOCATION: SOUTH CELL

...

## TEST PIT LOCATION

**SEE FIGURE 2-15 FOR LOCATION**

## FIELD INFORMATION

DATE & TIME ARRIVED: 3/19/08 9:32AM

TEST PIT LOGGED BY: GREG SMITH, GEO-SMITH

VISITORS: NONE

WEATHER: CLEAR, CALM, ~55°

## EXCAVATION INFORMATION

EXCAVATION COMPANY: KIRK JACKSON

START TIME: 9:32AM

TEST PIT DEPTH: 13.75' TEST PIT DIA.: 2'

EXCAVATION METHOD: TRACTOR MOUNTED BACKHOE - CAT 420D

SAMPLING METHOD: BULK

TIME EXCAVATION COMPLETE: 10:05AM

## TEST PIT COMPLETION / ABANDONMENT INFORMATION

START TIME: 10:07AM COMPLETE TIME: 10:18AM

INSTRUMENTATION: NONE BACKFILL: CUTTINGS

## GROUNDWATER CONDITIONS

NO GROUNDWATER WAS ENCOUNTERED AT THE TIME OF EXCAVATION.

## FOLLOWING FIELD WORK

TIME OF CLEAN-UP COMPLETE: ... TIME LEFT SITE: ...

## NOTES:

EL. 4365'. N 37°42.667', W 110°41.807'.

# TEST PIT LOG

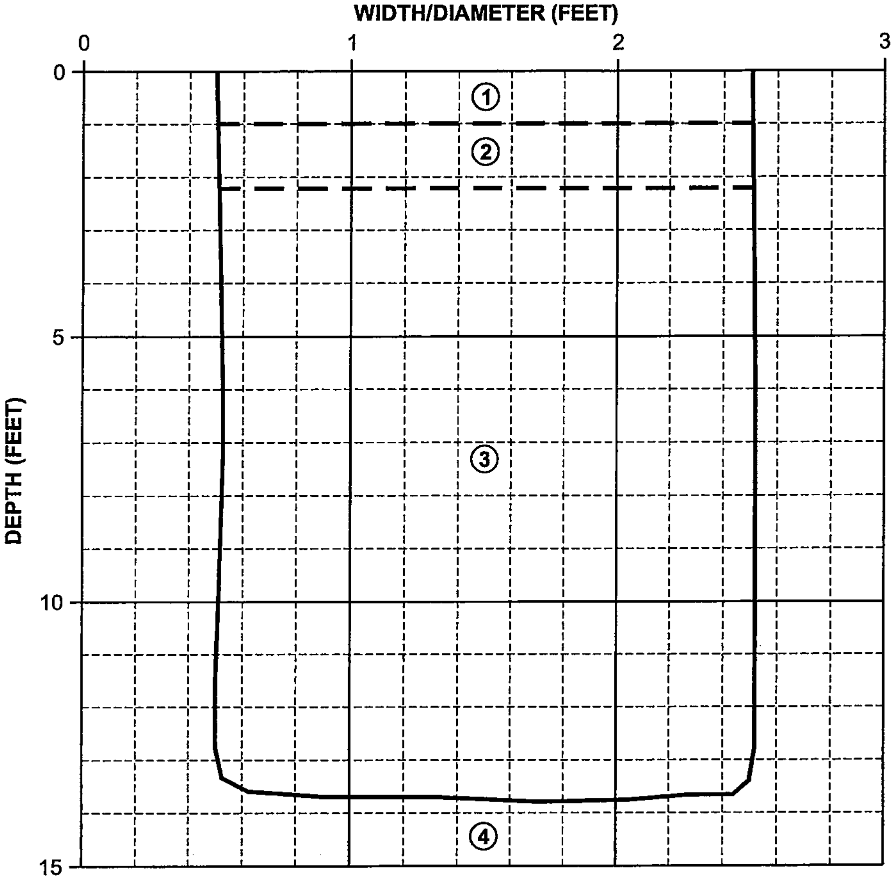
**TEST PIT NO.:** TP-2

**PROJECT:** SHOOTARING CANYON

**PAGE:** 2 OF 2

**PROJECT NO.:** 181692

**DATE:** 3/19/08



| DEPTH | SAMPLE I.D. | SAMPLE TYPE |
|---|---|---|
| 5' - 8' | 5' - 8' | BULK |
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| SOIL TYPE | SOIL DEPTH | SOIL DESCRIPTION AND EXCAVATION NOTES |
|---|---|---|
| ① | 0 - 1' | **ROAD ARMOR**<br>SW, SAND, WELL GRADED, TRACE GRAVEL TO 1", LOW PLASTICITY, BROWN. |
| ② | 1' - 2.25' | **FILL**<br>SAND, SP, PREDOMINANTLY FINE, TRACE FINES, NON-PLASTIC, MOIST, RED. |
| ③ | 2.25' - 13.75' | **CLAY**<br>CH, MEDIUM TO HIGH PLASTICITY, STIFF, BLOCKY, MOIST, PURPLISH RED WITH GREEN-GRAY MOTTLES, ORE ROCK FRAGMENTS TO 4", ANGULAR. |
| ④ | 13.75' + | **ENTRADA SANDSTONE**<br>FINE TO MEDIUM GRAINED, MODERATELY HARD, LIGHT RED. |

**NOTES:**

# TEST PIT LOG

PAGE: 1 OF 2

DATE: 3/19/08

TEST PIT NO.: **TP-3**

## PROJECT INFORMATION

PROJECT: SHOOTARING CANYON

PROJECT NO.: 181692

CLIENT: URANIUM ONE

OWNER: URANIUM ONE

LOCATION: SOUTH CELL

...

## TEST PIT LOCATION

**SEE FIGURE 2-15 FOR LOCATION**

## FIELD INFORMATION

DATE & TIME ARRIVED: 3/19/08 9:04AM

TEST PIT LOGGED BY: GREG SMITH, GEO-SMITH

VISITORS: NONE

WEATHER: CLEAR, CALM, ~50°

## EXCAVATION INFORMATION

EXCAVATION COMPANY: KIRK JACKSON

START TIME: 9:04AM

TEST PIT DEPTH: 9.5' TEST PIT DIA.: 2'

EXCAVATION METHOD: TRACTOR MOUNTED BACKHOE - CAT 420D

SAMPLING METHOD: BULK

TIME EXCAVATION COMPLETE: 9:18AM

## TEST PIT COMPLETION / ABANDONMENT INFORMATION

START TIME: 9:18AM COMPLETE TIME: 9:25AM

INSTRUMENTATION: NONE BACKFILL: CUTTINGS

## GROUNDWATER CONDITIONS

NO GROUNDWATER WAS ENCOUNTERED AT THE TIME OF EXCAVATION.

## FOLLOWING FIELD WORK

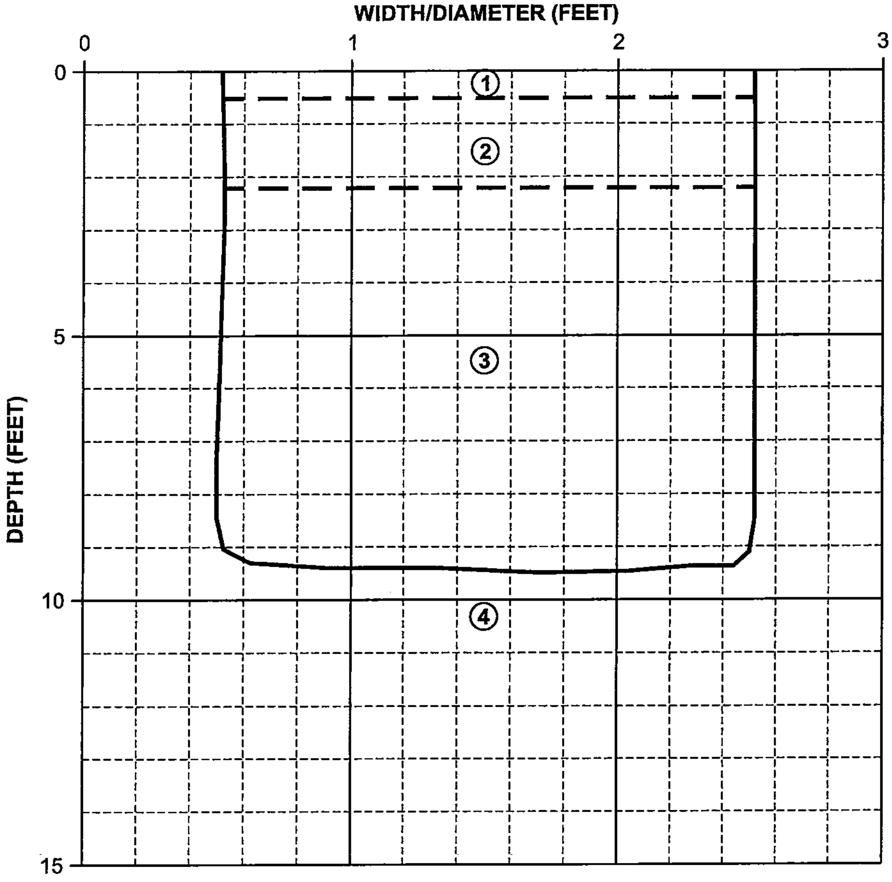
TIME OF CLEAN-UP COMPLETE: ... TIME LEFT SITE: ...

**NOTES:** EL. 4365'. N 37°42.675', W 110°41.838'.

# TEST PIT LOG

**PROJECT:** *SHOOTARING CANYON*
**PAGE:** *2 OF 2*
**PROJECT NO.:** *181692*
**DATE:** *3/19/08*

**TEST PIT NO.:** **TP-3**



| DEPTH | SAMPLE I.D. | SAMPLE TYPE |
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| SOIL TYPE | SOIL DEPTH | SOIL DESCRIPTION AND EXCAVATION NOTES |
|---|---|---|
| ① | 0 - 0.5' | **ROAD ARMOR**<br>SAND, SP, COARSE, SOME GRAVEL TO 1", SR, BROWN. |
| ② | 0.5' - 2.2' | **FILL**<br>SAND, SP, PREDOMINANTLY FINE, TRACE FINES, NON-PLASTIC, MOIST, RED. |
| ③ | 2.2' - 9.5' | **CLAY**<br>CH, MEDIUM TO HIGH PLASTICITY, STIFF, BLOCKY, MOIST, PURPLISH RED WITH GREEN-GRAY MOTTLES, ORE ROCK FRAGMENTS TO 4", ANGULAR. |
| ④ | 9.5' + | **ENTRADA SANDSTONE**<br>BACKHOE REFUSAL. |

**NOTES:**

# TEST PIT LOG

**PAGE:** 1 OF 2

**DATE:** 3/19/08

**TEST PIT NO.:** TP-4

## PROJECT INFORMATION

**PROJECT:** SHOOTARING CANYON

**PROJECT NO.:** 181692

**CLIENT:** URANIUM ONE

**OWNER:** URANIUM ONE

**LOCATION:** SOUTH CELL

...

## TEST PIT LOCATION

SEE FIGURE 2-15 FOR LOCATION

## FIELD INFORMATION

**DATE & TIME ARRIVED:** 3/19/08 8:05AM

**TEST PIT LOGGED BY:** GREG SMITH, GEO-SMITH

**VISITORS:** NONE

**WEATHER:** CLEAR, CALM, ~45°

## EXCAVATION INFORMATION

**EXCAVATION COMPANY:** KIRK JACKSON

**START TIME:** 8:05AM

**TEST PIT DEPTH:** 11.75' **TEST PIT DIA.:** 2'

**EXCAVATION METHOD:** TRACTOR MOUNTED BACKHOE - CAT 420D

**SAMPLING METHOD:** BULK

**TIME EXCAVATION COMPLETE:** 8:52AM

## TEST PIT COMPLETION / ABANDONMENT INFORMATION

**START TIME:** 8:52AM **COMPLETE TIME:** 9:02AM

**INSTRUMENTATION:** NONE **BACKFILL:** CUTTINGS

## GROUNDWATER CONDITIONS

NO GROUNDWATER WAS ENCOUNTERED AT THE TIME OF EXCAVATION.

## FOLLOWING FIELD WORK

**TIME OF CLEAN-UP COMPLETE:** ... **TIME LEFT SITE:** ...

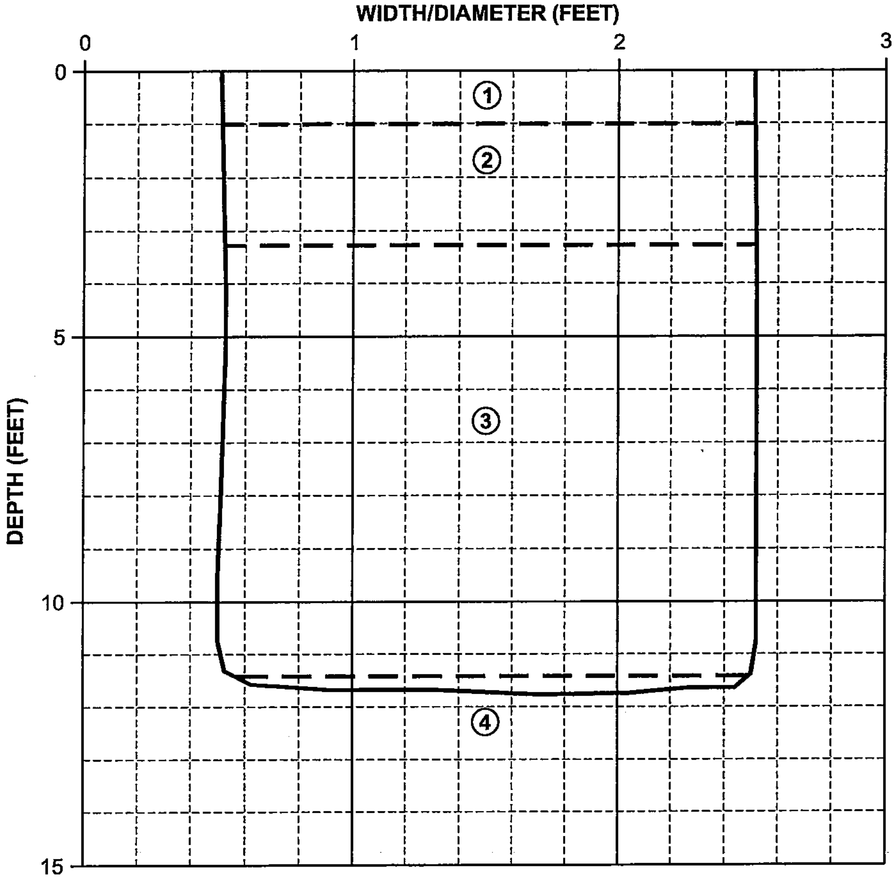
**NOTES:** EL. 4347'. N 37°42.673', W 110°41.869'.

# TEST PIT LOG

**PROJECT:** SHOOTARING CANYON **PAGE:** 2 OF 2

**PROJECT NO.:** 181692 **DATE:** 3/19/08

**TEST PIT NO.:** TP-4



| DEPTH | SAMPLE I.D. | SAMPLE TYPE |
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| SOIL TYPE | SOIL DEPTH | SOIL DESCRIPTION AND EXCAVATION NOTES |
|---|---|---|
| ① | 0 - 1.0' | **FILL**<br>SAND, SP, PREDOMINANTLY FINE, NON-PLASTIC, RED. |
| ② | 1.0' - 3.2' | **SHELL FILL**<br>SAND, GW, PREDOMINANTLY MEDIUM, GRAVEL, COARSE TO FINE SAND, WELL, GRADED, TRACE FINES, MEDIUM BROWN. |
| ③ | 3.2' - 11.5' | **CLAY**<br>CH, MEDIUM TO HIGH PLASTICITY, TRACE SAND, SOME ROCK FRAGMENTS, BLOCKY, MOIST, PURPLISH RED WITH GREEN-GRAY MOTTLES TO 1/2" DIA., VERY STIFF WITH DEPTH. |
| ④ | 11.5' - 11.75' | **ENTRADA SANDSTONE**<br>FINE GRAINED, MEDIUM HARD, LIGHT RED. |

NOTES:

# TEST PIT LOG

PAGE: 1 OF 2

DATE: 3/19/08

TEST PIT NO.: **TP-5**

## PROJECT INFORMATION

PROJECT: SHOOTARING CANYON

PROJECT NO.: 181692

CLIENT: URANIUM ONE

OWNER: URANIUM ONE

LOCATION: SOUTH CELL

...

## TEST PIT LOCATION

**SEE FIGURE 2-15 FOR LOCATION**

## FIELD INFORMATION

DATE & TIME ARRIVED: 3/19/08 7:35AM

TEST PIT LOGGED BY: GREG SMITH, GEO-SMITH

VISITORS: NONE

WEATHER: CLEAR, COOL, ~40°

## EXCAVATION INFORMATION

EXCAVATION COMPANY: KIRK JACKSON

START TIME: 7:50AM

TEST PIT DEPTH: 7.0'    TEST PIT DIA.: 2'

EXCAVATION METHOD: TRACTOR MOUNTED BACKHOE - CAT 420D

SAMPLING METHOD: BULK

TIME EXCAVATION COMPLETE: 8:05AM

## TEST PIT COMPLETION / ABANDONMENT INFORMATION

START TIME: 8:00AM    COMPLETE TIME: 8:05AM

INSTRUMENTATION: NONE    BACKFILL: CUTTINGS

## GROUNDWATER CONDITIONS

NO GROUNDWATER WAS ENCOUNTERED AT THE TIME OF EXCAVATION.

## FOLLOWING FIELD WORK

TIME OF CLEAN-UP COMPLETE: ...    TIME LEFT SITE: ...

**NOTES:** EL. 4332'. N 37°42.675', W 110°41.916'.

# TEST PIT LOG

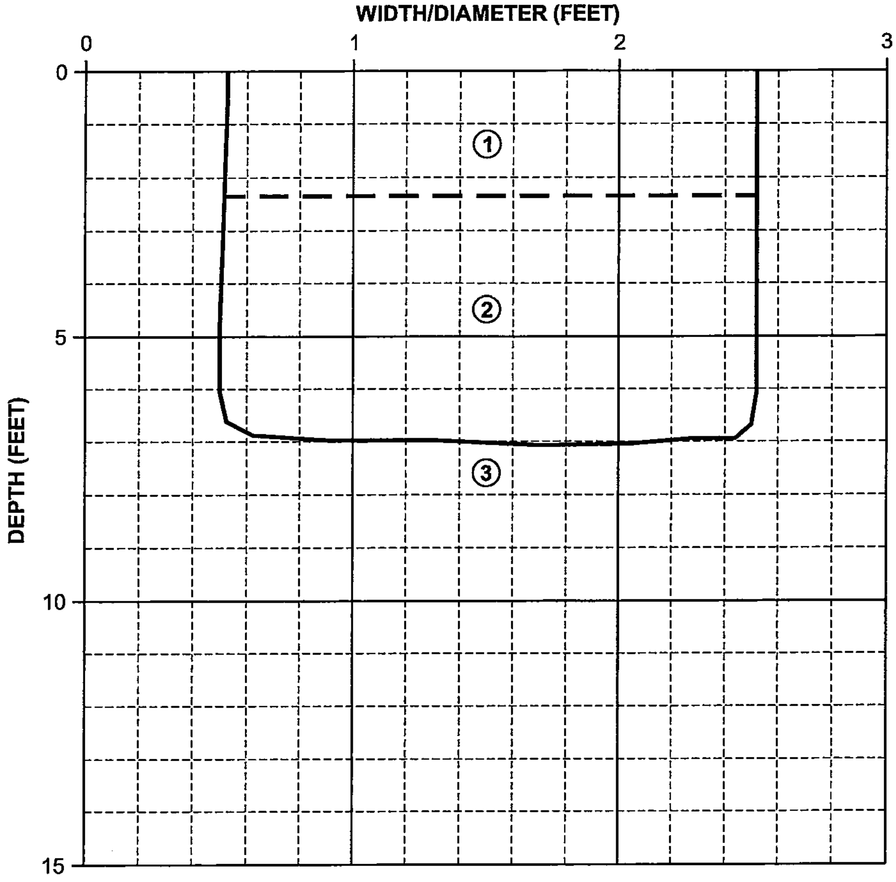
**TEST PIT NO.:** TP-5

**PROJECT:** SHOOTARING CANYON

**PAGE:** 2 OF 2

**PROJECT NO.:** 181692

**DATE:** 3/19/08



| DEPTH | SAMPLE I.D. | SAMPLE TYPE |
|---|---|---|
| 3' - 5' | 3' - 5' | BULK |
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| SOIL TYPE | SOIL DEPTH | SOIL DESCRIPTION AND EXCAVATION NOTES |
|---|---|---|
| ① | 0 - 2.2' | **FILL**<br>SAND, SP, PREDOMINANTLY FINE, TRACE FINES, NON-PLASTIC, RED. |
| ② | 2.2' - 7.0' | **CLAY**<br>CH, MEDIUM TO HIGH PLASTICITY, MOTTLED PURPLISH RED TO GREEN-GRAY, SOME ROCK FRAGMENTS, SOME SAND. |
| ③ | 7.0 + | **ENTRADA SANDSTONE**<br>FINE TO MEDIUM HARD, RED. |

NOTES:

# TEST PIT LOG

PAGE: 1 OF 1
DATE: 3/19/08

TEST PIT NO.: **TP-6**

## PROJECT INFORMATION

PROJECT: SHOOTARING CANYON
PROJECT NO.: 181692
CLIENT: URANIUM ONE
OWNER: URANIUM ONE
LOCATION:

## TEST PIT LOCATION

TEST PIT NOT EXCAVATED

## FIELD INFORMATION

DATE & TIME ARRIVED:
TEST PIT LOGGED BY:
VISITORS:
WEATHER:

## EXCAVATION INFORMATION

EXCAVATION COMPANY:
START TIME:
TEST PIT DEPTH:
TEST PIT DIA.:
EXCAVATION METHOD:
SAMPLING METHOD:
TIME EXCAVATION COMPLETE:

## TEST PIT COMPLETION / ABANDONMENT INFORMATION

START TIME:
COMPLETE TIME:
INSTRUMENTATION:
BACKFILL:

## GROUNDWATER CONDITIONS

## FOLLOWING FIELD WORK

TIME OF CLEAN-UP COMPLETE:
TIME LEFT SITE:

**NOTES:** TEST PIT NOT EXCAVATED.

# TEST PIT LOG

PAGE: 1 OF 1

DATE: 3/19/08

TEST PIT NO.: **TP-7**

## PROJECT INFORMATION

PROJECT: SHOOTARING CANYON

PROJECT NO.: 181692

CLIENT: URANIUM ONE

OWNER: URANIUM ONE

LOCATION:

## TEST PIT LOCATION

TEST PIT NOT EXCAVATED

## FIELD INFORMATION

DATE & TIME ARRIVED:

TEST PIT LOGGED BY:

VISITORS:

WEATHER:

## EXCAVATION INFORMATION

EXCAVATION COMPANY:

START TIME:

TEST PIT DEPTH:

TEST PIT DIA.:

EXCAVATION METHOD:

SAMPLING METHOD:

TIME EXCAVATION COMPLETE:

## TEST PIT COMPLETION / ABANDONMENT INFORMATION

START TIME:

COMPLETE TIME:

INSTRUMENTATION:

BACKFILL:

## GROUNDWATER CONDITIONS

## FOLLOWING FIELD WORK

TIME OF CLEAN-UP COMPLETE:

TIME LEFT SITE:

NOTES: TEST PIT NOT EXCAVATED.

# TEST PIT LOG

PAGE: 1 OF 2

DATE: 3/18/08

TEST PIT NO.: TP-8

## PROJECT INFORMATION

PROJECT: SHOOTARING CANYON

PROJECT NO.: 181692

CLIENT: URANIUM ONE

OWNER: URANIUM ONE

LOCATION: SOUTH CELL

...

## TEST PIT LOCATION

SEE FIGURE 2-15 FOR LOCATION

## FIELD INFORMATION

DATE & TIME ARRIVED: 3/18/08 3:55PM

TEST PIT LOGGED BY: GREG SMITH, GEO-SMITH

VISITORS: NONE

WEATHER: CLEAR, BREEZY, ~55°

## EXCAVATION INFORMATION

EXCAVATION COMPANY: KIRK JACKSON

START TIME: 3:55PM

TEST PIT DEPTH: 4'

TEST PIT DIA.: 2'

EXCAVATION METHOD: TRACTOR MOUNTED BACKHOE - CAT 420D

SAMPLING METHOD: NONE

TIME EXCAVATION COMPLETE: 4:00PM

## TEST PIT COMPLETION / ABANDONMENT INFORMATION

START TIME: 4:00PM

COMPLETE TIME: 4:30PM

INSTRUMENTATION: NONE

BACKFILL: CUTTINGS

## GROUNDWATER CONDITIONS

NO GROUNDWATER WAS ENCOUNTERED AT THE TIME OF EXCAVATION.

## FOLLOWING FIELD WORK

TIME OF CLEAN-UP COMPLETE: ...

TIME LEFT SITE: ...

## NOTES:

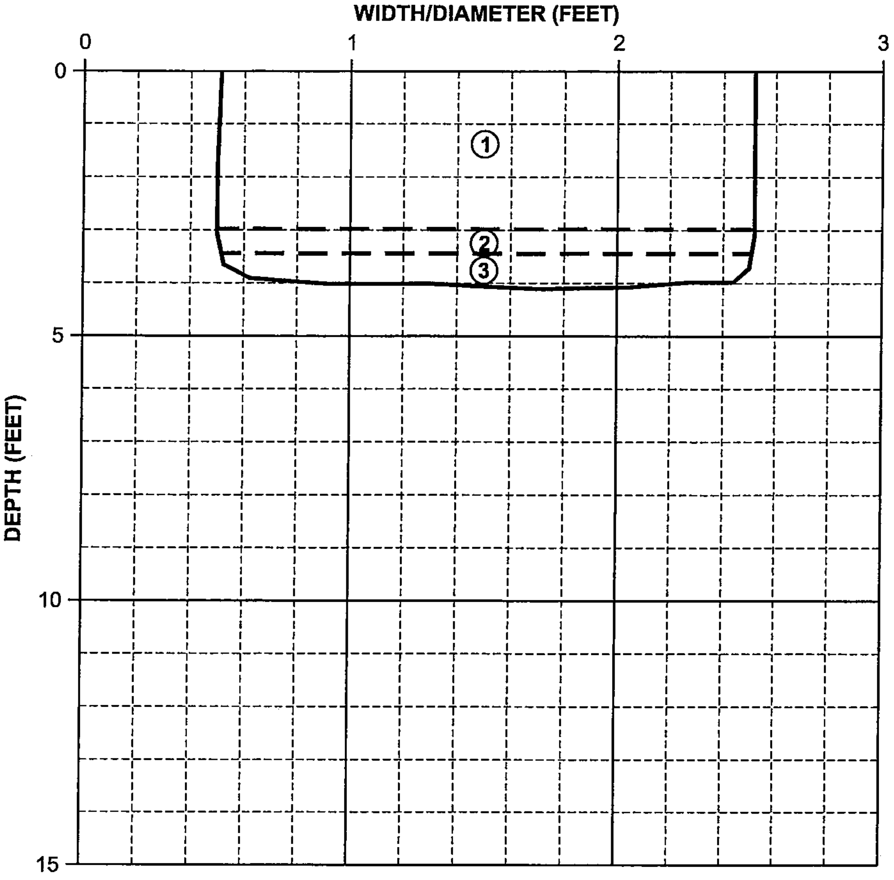
EL. 4355'. N 37°42.703', W 110°41.827'.

# TEST PIT LOG

**PROJECT:** *SHOOTARING CANYON* **PAGE:** *2 OF 2*

**PROJECT NO.:** *181692* **DATE:** *3/18/08*

**TEST PIT NO.:** TP-8



| DEPTH | SAMPLE I.D. | SAMPLE TYPE |
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| SOIL TYPE | SOIL DEPTH | SOIL DESCRIPTION AND EXCAVATION NOTES |
|---|---|---|
| ① | 0 - 3' | **FILL**<br>SP, FINE TO MEDIUM, NON-PLASTIC, MEDIUM RED. |
| ② | 3' - 3.5' | **CLAY**<br>MEDIUM PLASTICITY, DARK RED (NATIVE). |
| ③ | 3.5' + | **ENTRADA SANDSTONE**<br>FINE TO MEDIUM HARD, WEAKLY CEMENTED, WITH WHITE CALCIUM CARBONATE. |

**NOTES:** ____________________

# TEST PIT LOG

TEST PIT NO.: **TP-9**

PAGE: 1 OF 2

DATE: 3/18/08

## PROJECT INFORMATION

PROJECT: SHOOTARING CANYON

PROJECT NO.: 181692

CLIENT: URANIUM ONE

OWNER: URANIUM ONE

LOCATION: SOUTH CELL

...

## TEST PIT LOCATION

**SEE FIGURE 2-15 FOR LOCATION**

## FIELD INFORMATION

DATE & TIME ARRIVED: 3/18/08 3:35PM

TEST PIT LOGGED BY: GREG SMITH, GEO-SMITH

VISITORS: NONE

WEATHER: CLEAR, CLEAR, BREEZY, ~55°

## EXCAVATION INFORMATION

EXCAVATION COMPANY: KIRK JACKSON

START TIME: 3:35PM

TEST PIT DEPTH: 9.25'    TEST PIT DIA.: 2'

EXCAVATION METHOD: TRACTOR MOUNTED BACKHOE - CAT 420D

SAMPLING METHOD: NONE

TIME EXCAVATION COMPLETE: 3:43PM

## TEST PIT COMPLETION / ABANDONMENT INFORMATION

START TIME: 3:50PM    COMPLETE TIME: 3:55PM

INSTRUMENTATION: NONE    BACKFILL: CUTTINGS

## GROUNDWATER CONDITIONS

NO GROUNDWATER WAS ENCOUNTERED AT THE TIME OF EXCAVATION.

## FOLLOWING FIELD WORK

TIME OF CLEAN-UP COMPLETE: ...    TIME LEFT SITE: ...

**NOTES:** EL. 4384'. N 37°42.760', W 110°41.759'.

# TEST PIT LOG

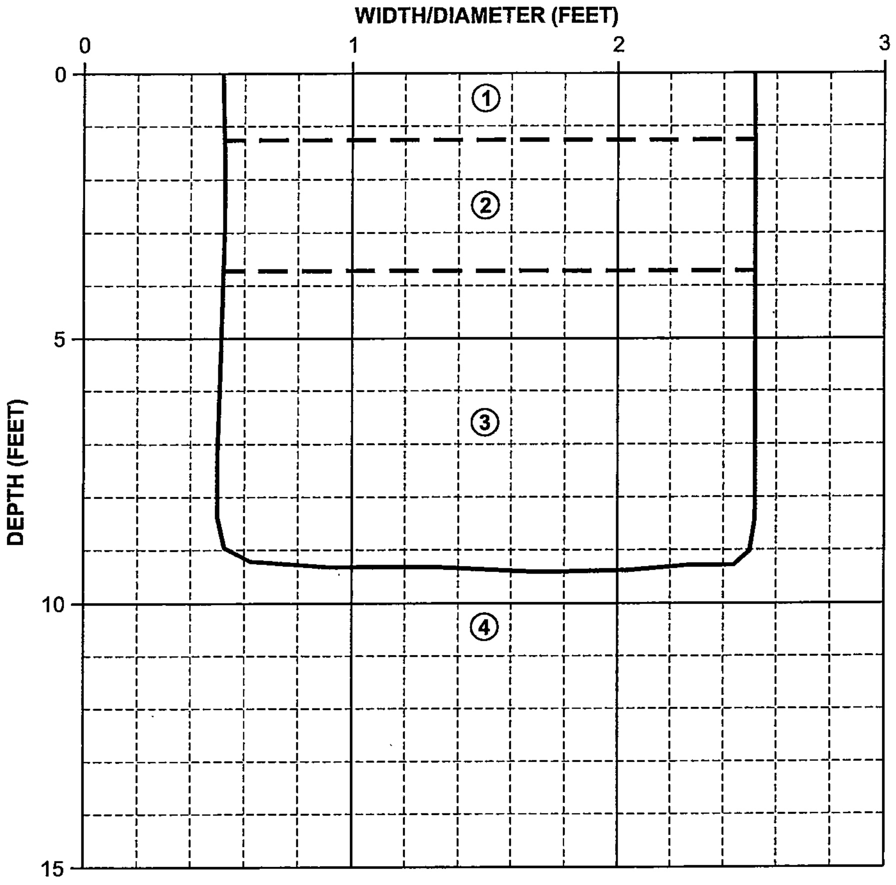
**TEST PIT NO.:** TP-9

**PROJECT:** SHOOTARING CANYON

**PAGE:** 2 OF 2

**PROJECT NO.:** 181692

**DATE:** 3/18/08



| DEPTH | SAMPLE I.D. | SAMPLE TYPE |
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| SOIL TYPE | SOIL DEPTH | SOIL DESCRIPTION AND EXCAVATION NOTES |
|---|---|---|
| ① | 0 - 1.25' | **SAND**<br>SP, PREDOMINANTLY FINE, EOLIAN, NON-PLASTIC, RED. |
| ② | 1.25' - 3.75' | **SANDY GRAVEL**<br>SP-GP, SANDY GRAVELS, MEDIUM TO COARSE GRAVEL, NON-PLASTIC, SA, CALCIUM CARBONATE, LIGHT RED, OCCASIONAL COBBLES TO 12", (DEBRIS FLOW?). |
| ③ | 3.75' - 9.25' | **SAND**<br>SAND, SP, FINE TO VERY FINE, NON-PLASTIC, LIGHT RED, (WEATHERED SANDSTONE). |
| ④ | 9.25' + | **ENTRADA SANDSTONE**<br>FINE GRAINED, MEDIUM HARD TO HARD, LIGHT RED. |

NOTES:

# TEST PIT LOG

PAGE: 1 OF 2

DATE: 3/18/08

TEST PIT NO.:

**TP-10**

## PROJECT INFORMATION

PROJECT: SHOOTARING CANYON

PROJECT NO.: 181692

CLIENT: URANIUM ONE

OWNER: URANIUM ONE

LOCATION: SOUTH CELL

...

## TEST PIT LOCATION

SEE FIGURE 2-15 FOR LOCATION

## FIELD INFORMATION

DATE & TIME ARRIVED: 3/18/08 3:15PM

TEST PIT LOGGED BY: GREG SMITH, GEO-SMITH

VISITORS: NONE

WEATHER: CLEAR, CLEAR, BREEZY, ~55°

## EXCAVATION INFORMATION

EXCAVATION COMPANY: KIRK JACKSON

START TIME: 3:16PM

TEST PIT DEPTH: 5'

TEST PIT DIA.: 2'

EXCAVATION METHOD: TRACTOR MOUNTED BACKHOE - CAT 420D

SAMPLING METHOD: NONE

TIME EXCAVATION COMPLETE: 3:20PM

## TEST PIT COMPLETION / ABANDONMENT INFORMATION

START TIME: 3:23PM

COMPLETE TIME: 3:25PM

INSTRUMENTATION: NONE

BACKFILL: CUTTINGS

## GROUNDWATER CONDITIONS

NO GROUNDWATER WAS ENCOUNTERED AT THE TIME OF EXCAVATION.

## FOLLOWING FIELD WORK

TIME OF CLEAN-UP COMPLETE: ...

TIME LEFT SITE: ...

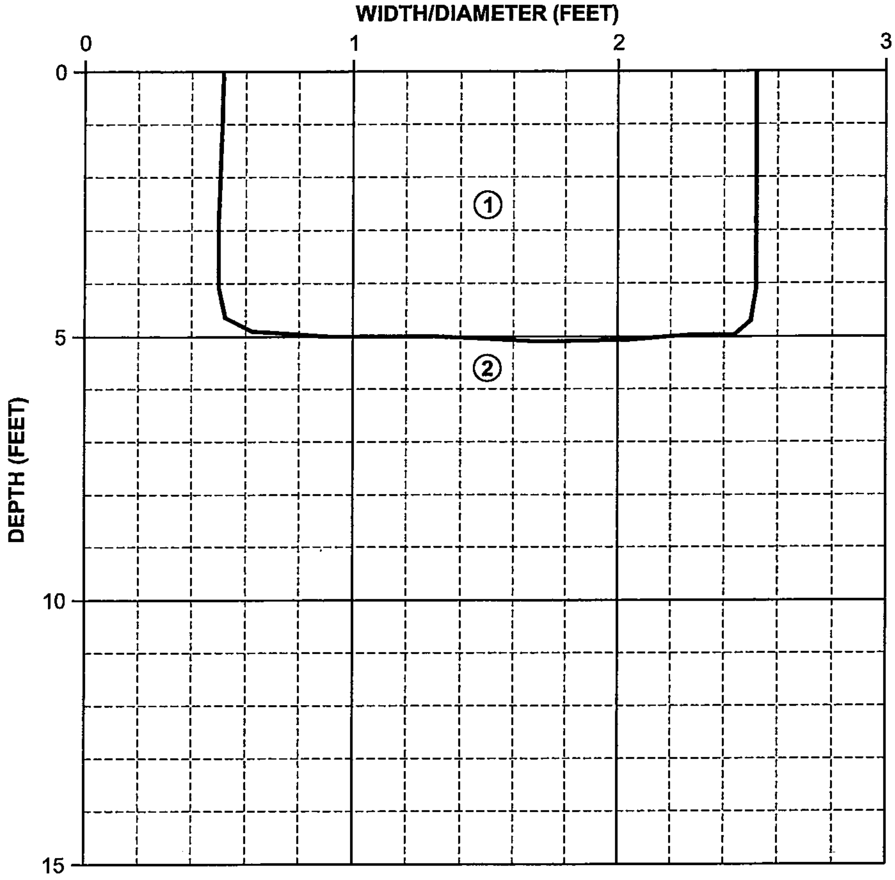
## NOTES:

EL. 4359'. N 37°42.823', W 110°41.867'.

# TEST PIT LOG

**PROJECT:** SHOOTARING CANYON
**PAGE:** 2 OF 2
**PROJECT NO.:** 181692
**DATE:** 3/18/08

**TEST PIT NO.:** TP-10



| DEPTH | SAMPLE I.D. | SAMPLE TYPE |
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| SOIL TYPE | SOIL DEPTH | SOIL DESCRIPTION AND EXCAVATION NOTES |
|---|---|---|
| ① | 0 - 5' | **SAND**<br>SP, FINE, NON-PLASTIC, RED, EOLIAN, (LOOSE TO 3', HOLE CAVING). |
| ② | 5' + | **ENTRADA SANDSTONE**<br>FINE GRAINED, MEDIUM HARD, LIGHT RED. |

**NOTES:**

# TEST PIT LOG

PAGE: 1 OF 2

DATE: 3/18/08

TEST PIT NO.: **TP-11**

## PROJECT INFORMATION

PROJECT: SHOOTARING CANYON

PROJECT NO.: 181692

CLIENT: URANIUM ONE

OWNER: URANIUM ONE

LOCATION: SOUTH CELL

...

## TEST PIT LOCATION

**SEE FIGURE 2-15 FOR LOCATION**

## FIELD INFORMATION

DATE & TIME ARRIVED: 3/18/08 11:35AM

TEST PIT LOGGED BY: GREG SMITH, GEO-SMITH

VISITORS: NONE

WEATHER: CLEAR, BREEZY, ~55°

## EXCAVATION INFORMATION

EXCAVATION COMPANY: KIRK JACKSON

START TIME: 11:36AM

TEST PIT DEPTH: 2.5'

TEST PIT DIA.: 2'

EXCAVATION METHOD: TRACTOR MOUNTED BACKHOE - CAT 420D

SAMPLING METHOD: NONE

TIME EXCAVATION COMPLETE: 11:40AM

## TEST PIT COMPLETION / ABANDONMENT INFORMATION

START TIME: 11:40AM

COMPLETE TIME: 11:42AM

INSTRUMENTATION: NONE

BACKFILL: CUTTINGS

## GROUNDWATER CONDITIONS

NO GROUNDWATER WAS ENCOUNTERED AT THE TIME OF EXCAVATION.

## FOLLOWING FIELD WORK

TIME OF CLEAN-UP COMPLETE: ...

TIME LEFT SITE: ...

## NOTES:

EL. 4332'. N 37°42.843', W 110°41.818'.

# TEST PIT LOG

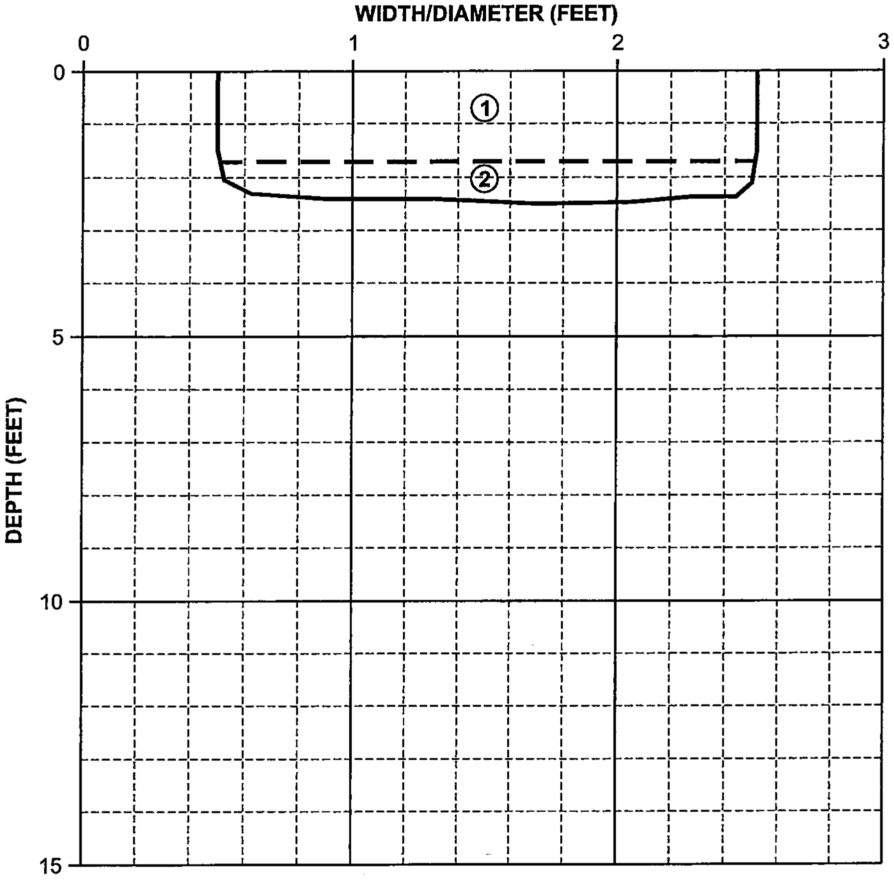
**PROJECT:** *SHOOTARING CANYON*

**PAGE:** *2 OF 2*

**PROJECT NO.:** *181692*

**DATE:** *3/18/08*

**TEST PIT NO.:** **TP-11**



| DEPTH | SAMPLE I.D. | SAMPLE TYPE |
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| SOIL TYPE | SOIL DEPTH | SOIL DESCRIPTION AND EXCAVATION NOTES |
|---|---|---|
| ① | 0 - 1.8' | **SAND**<br>SP, PREDOMINANTLY FINE TO MEDIUM, WITH HARD ENTRADA SANDSTONE, BROWNISH RED. |
| ② | 1.8' - 2.5' | **ENTRADA SANDSTONE**<br>MEDIUM TO FINE, MODERATELY HARD TO HARD, BROWNISH RED.<br>BACKHOE REFUSAL AT 2.5'. |

**NOTES:** ____________________

# TEST PIT LOG

PAGE: 1 OF 2
DATE: 3/18/08

TEST PIT NO.: **TP-12**

## PROJECT INFORMATION

PROJECT: SHOOTARING CANYON
PROJECT NO.: 181692
CLIENT: URANIUM ONE
OWNER: URANIUM ONE
LOCATION: SOUTH CELL
...

## TEST PIT LOCATION

**SEE FIGURE 2-15 FOR LOCATION**

## FIELD INFORMATION

DATE & TIME ARRIVED: 3/18/08 3:00PM
TEST PIT LOGGED BY: GREG SMITH, GEO-SMITH
VISITORS: NONE
WEATHER: CLEAR, BREEZY, ~55°

## EXCAVATION INFORMATION

EXCAVATION COMPANY: KIRK JACKSON
START TIME: 3:00PM
TEST PIT DEPTH: 4'
TEST PIT DIA.: 2'
EXCAVATION METHOD: TRACTOR MOUNTED BACKHOE - CAT 420D
SAMPLING METHOD: NONE
TIME EXCAVATION COMPLETE: 3:05PM

## TEST PIT COMPLETION / ABANDONMENT INFORMATION

START TIME: 3:10PM
COMPLETE TIME: 3:12PM
INSTRUMENTATION: NONE
BACKFILL: CUTTINGS

## GROUNDWATER CONDITIONS

NO GROUNDWATER WAS ENCOUNTERED AT THE TIME OF EXCAVATION.

## FOLLOWING FIELD WORK

TIME OF CLEAN-UP COMPLETE: ...
TIME LEFT SITE: ...

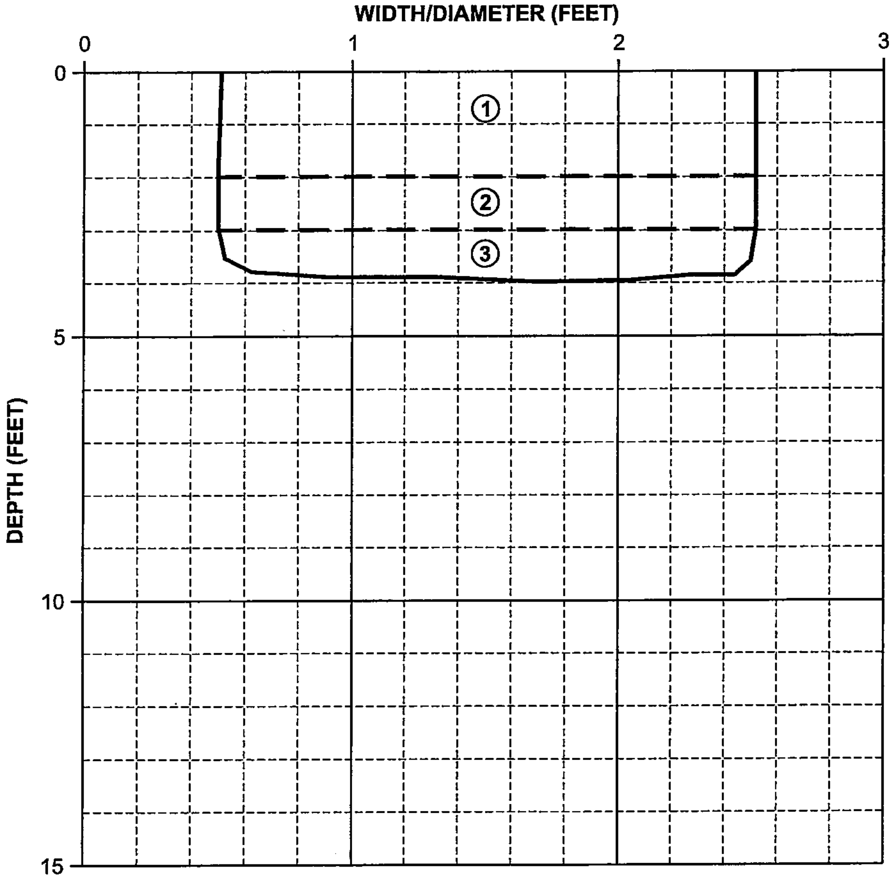
**NOTES:** EL. 4369'. N 37°42.821', W 110°41.771'.

# TEST PIT LOG

**PROJECT:** SHOOTARING CANYON **PAGE:** 2 OF 2

**PROJECT NO.:** 181692 **DATE:** 3/18/08

**TEST PIT NO.:** TP-12



| DEPTH | SAMPLE I.D. | SAMPLE TYPE |
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| SOIL TYPE | SOIL DEPTH | SOIL DESCRIPTION AND EXCAVATION NOTES |
|---|---|---|
| ① | 0 - 2' | **SAND**<br>SP, ELOIN/FLUVIAL, POORLY GRADED, MEDIUM FINE, NON-PLASTIC LIGHT RED. |
| ② | 2' - 3' | **SAND GRAVEL/COBBLES**<br>MEDIUM GRAVEL, COBBLES TO 12", SR, CHANNEL DEPOSIT. |
| ③ | 3' - 4' | **ENTRADA SANDSTONE**<br>MEDIUM, MODERATELY HARD, BROWNISH RED. |

**NOTES:**

# TEST PIT LOG

PAGE: 1 OF 1

DATE: 3/19/08

TEST PIT NO.:

TP-13

## PROJECT INFORMATION

PROJECT: SHOOTARING CANYON

PROJECT NO.: 181692

CLIENT: URANIUM ONE

OWNER: URANIUM ONE

LOCATION:

## TEST PIT LOCATION

TEST PIT NOT EXCAVATED

## FIELD INFORMATION

DATE & TIME ARRIVED:

TEST PIT LOGGED BY:

VISITORS:

WEATHER:

## EXCAVATION INFORMATION

EXCAVATION COMPANY:

START TIME:

TEST PIT DEPTH:

TEST PIT DIA.:

EXCAVATION METHOD:

SAMPLING METHOD:

TIME EXCAVATION COMPLETE:

## TEST PIT COMPLETION / ABANDONMENT INFORMATION

START TIME:

COMPLETE TIME:

INSTRUMENTATION:

BACKFILL:

## GROUNDWATER CONDITIONS

## FOLLOWING FIELD WORK

TIME OF CLEAN-UP COMPLETE:

TIME LEFT SITE:

**NOTES:** TEST PIT NOT EXCAVATED.

# TEST PIT LOG

PAGE: 1 OF 2
DATE: 3/18/08

TEST PIT NO.: **TP-14**

## PROJECT INFORMATION

PROJECT: SHOOTARING CANYON
PROJECT NO.: 181692
CLIENT: URANIUM ONE
OWNER: URANIUM ONE
LOCATION: NORTH CELL
...

## TEST PIT LOCATION

SEE FIGURE 2-15 FOR LOCATION

## FIELD INFORMATION

DATE & TIME ARRIVED: 3/18/08 10:43AM
TEST PIT LOGGED BY: GREG SMITH, GEO-SMITH
VISITORS: NONE
WEATHER: CLEAR, BREEZY, ~50°

## EXCAVATION INFORMATION

EXCAVATION COMPANY: KIRK JACKSON
START TIME: 10:43AM
TEST PIT DEPTH: 8.25'
TEST PIT DIA.: 2'
EXCAVATION METHOD: TRACTOR MOUNTED BACKHOE - CAT 420D
SAMPLING METHOD: NONE
TIME EXCAVATION COMPLETE: 10:52AM

## TEST PIT COMPLETION / ABANDONMENT INFORMATION

START TIME: 10:50AM
COMPLETE TIME: 10:52AM
INSTRUMENTATION: NONE
BACKFILL: CUTTINGS

## GROUNDWATER CONDITIONS

NO GROUNDWATER WAS ENCOUNTERED AT THE TIME OF EXCAVATION.

## FOLLOWING FIELD WORK

TIME OF CLEAN-UP COMPLETE: ...
TIME LEFT SITE: ...

## NOTES:

EL. 4442'. N 37°42.822', W 110°41.696'.

# TEST PIT LOG

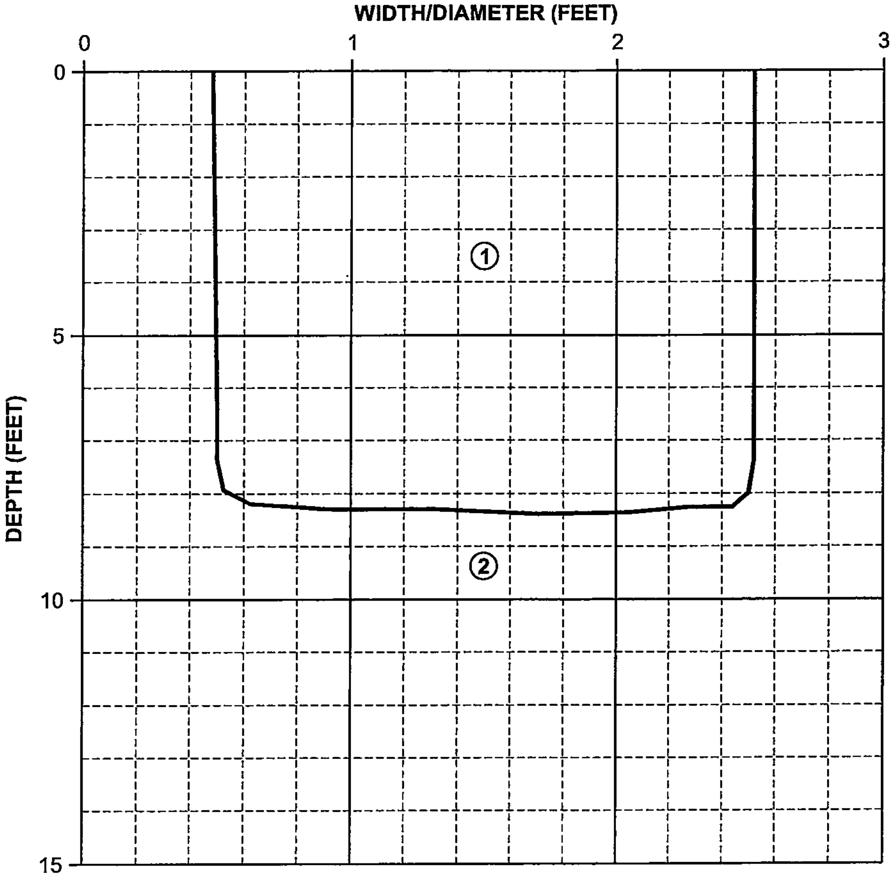
**TEST PIT NO.:** TP-14

**PROJECT:** SHOOTARING CANYON

**PAGE:** 2 OF 2

**PROJECT NO.:** 181692

**DATE:** 3/18/08



| DEPTH | SAMPLE I.D. | SAMPLE TYPE |
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| SOIL TYPE | SOIL DEPTH | SOIL DESCRIPTION AND EXCAVATION NOTES |
|---|---|---|
| ① | 0 - 8.25' | **SAND**<br>SP, PREDOMINANTLY FINE, NON-PLASTIC, RED. |
| ② | 8.25' + | **ENTRADA SANDSTAONE**<br>BACKHOE REFUSAL AT 8.25' ON ENTRADA SANDSTONE. |

NOTES:

# TEST PIT LOG

PAGE: 1 OF 2

DATE: 3/18/08

TEST PIT NO.: **TP-15**

## PROJECT INFORMATION

PROJECT: SHOOTARING CANYON

PROJECT NO.: 181692

CLIENT: URANIUM ONE

OWNER: URANIUM ONE

LOCATION: NORTH CELL

...

## TEST PIT LOCATION

**SEE FIGURE 2-15 FOR LOCATION**

## FIELD INFORMATION

DATE & TIME ARRIVED: 3/18/08 11:00AM

TEST PIT LOGGED BY: GREG SMITH, GEO-SMITH

VISITORS: NONE

WEATHER: CLEAR, BREEZY, ~50°

## EXCAVATION INFORMATION

EXCAVATION COMPANY: KIRK JACKSON

START TIME: 11:00AM

TEST PIT DEPTH: 0.5'

TEST PIT DIA.: 2'

EXCAVATION METHOD: TRACTOR MOUNTED BACKHOE - CAT 420D

SAMPLING METHOD: BULK

TIME EXCAVATION COMPLETE: 11:05AM

## TEST PIT COMPLETION / ABANDONMENT INFORMATION

START TIME: 11:05AM

COMPLETE TIME: 11:06AM

INSTRUMENTATION: NONE

BACKFILL: CUTTINGS

## GROUNDWATER CONDITIONS

NO GROUNDWATER WAS ENCOUNTERED AT THE TIME OF EXCAVATION.

## FOLLOWING FIELD WORK

TIME OF CLEAN-UP COMPLETE: ...

TIME LEFT SITE: ...

**NOTES:** EL. 4356'. N 37°42.850', W 110°41.800'.

# TEST PIT LOG

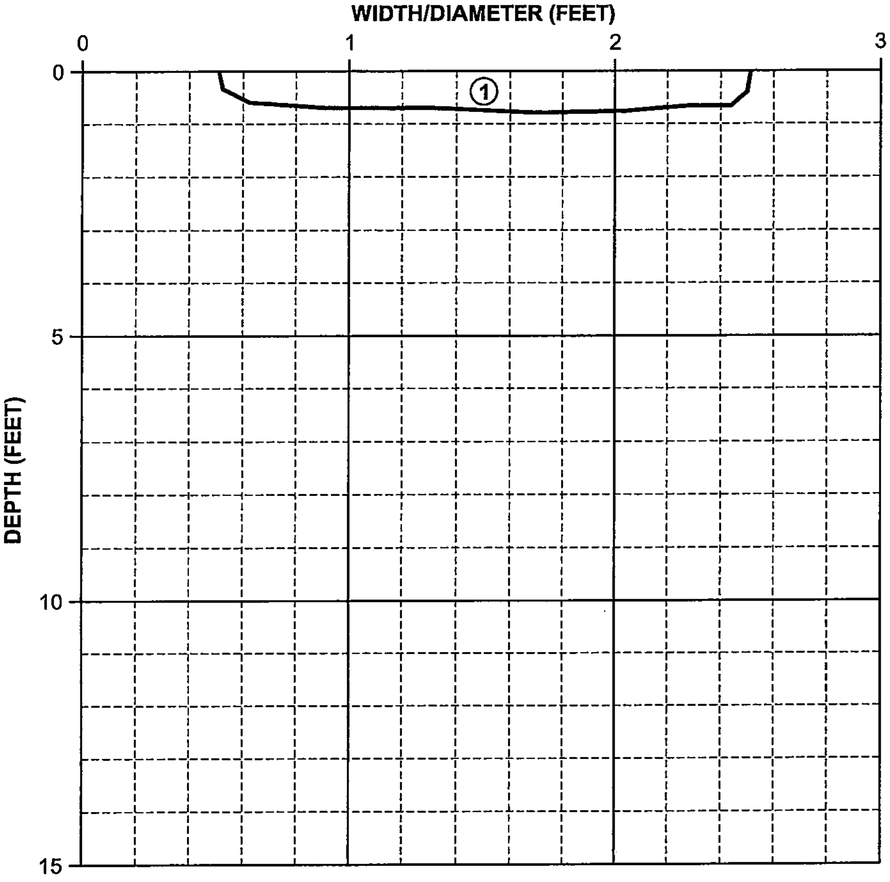
**PROJECT:** *SHOOTARING CANYON*

**PAGE:** *2 OF 2*

**PROJECT NO.:** *181692*

**DATE:** *3/18/08*

**TEST PIT NO.:** **TP-15**



| DEPTH | SAMPLE I.D. | SAMPLE TYPE |
|---|---|---|
| 0 - 0.5' | 0' | BULK |
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| SOIL TYPE | SOIL DEPTH | SOIL DESCRIPTION AND EXCAVATION NOTES |
|---|---|---|
| ① | 0 - 0.5' | **ENTRADA SANDSTONE**<br>MODERATELY HARD TO HARD, MEDIUM TO FINE GRAINED, MEDIUM RED.<br>BACKHOE REFUSAL AT 0.5'. |

NOTES:

# TEST PIT LOG

TEST PIT NO.: **TP-16**

PAGE: 1 OF 2

DATE: 3/18/08

## PROJECT INFORMATION

PROJECT: SHOOTARING CANYON

PROJECT NO.: 181692

CLIENT: URANIUM ONE

OWNER: URANIUM ONE

LOCATION: NORTH CELL

...

## TEST PIT LOCATION

SEE FIGURE 2-15 FOR LOCATION

## FIELD INFORMATION

DATE & TIME ARRIVED: 3/18/08 11:18AM

TEST PIT LOGGED BY: GREG SMITH, GEO-SMITH

VISITORS: NONE

WEATHER: CLEAR, BREEZY, ~55°

## EXCAVATION INFORMATION

EXCAVATION COMPANY: KIRK JACKSON

START TIME: 11:18AM

TEST PIT DEPTH: 1.25' TEST PIT DIA.: 2'

EXCAVATION METHOD: TRACTOR MOUNTED BACKHOE - CAT 420D

SAMPLING METHOD: NONE

TIME EXCAVATION COMPLETE: 11:23AM

## TEST PIT COMPLETION / ABANDONMENT INFORMATION

START TIME: 11:23AM COMPLETE TIME: 11:25AM

INSTRUMENTATION: NONE BACKFILL: CUTTINGS

## GROUNDWATER CONDITIONS

NO GROUNDWATER WAS ENCOUNTERED AT THE TIME OF EXCAVATION.

## FOLLOWING FIELD WORK

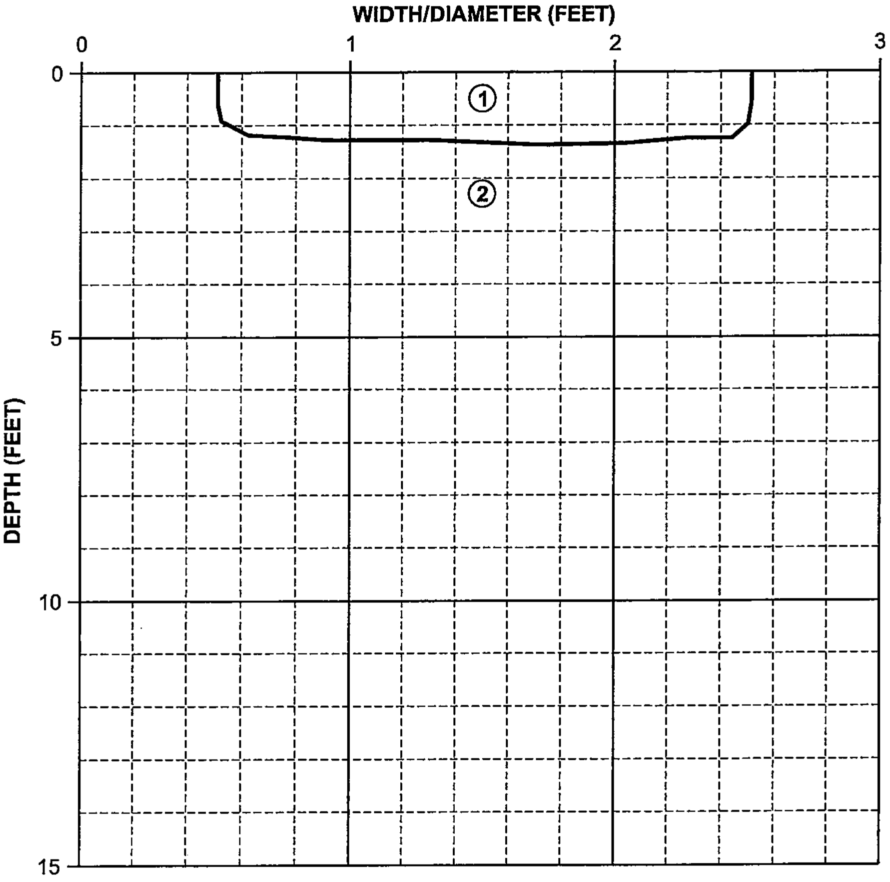
TIME OF CLEAN-UP COMPLETE: ... TIME LEFT SITE: ...

**NOTES:** EL. 4397'. N 37°42.906', W 110°41.844'.

# TEST PIT LOG

**PROJECT:** *SHOOTARING CANYON*
**PAGE:** *2 OF 2*
**PROJECT NO.:** *181692*
**DATE:** *3/18/08*

**TEST PIT NO.:**
**TP-16**



| DEPTH | SAMPLE I.D. | SAMPLE TYPE |
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| SOIL TYPE | SOIL DEPTH | SOIL DESCRIPTION AND EXCAVATION NOTES |
|---|---|---|
| ① | 0 - 1.25' | **SAND**<br>SP, PREDOMINANTLY FINE, ORE ROCK FRAGMENTS TO 1". |
| ② | 1.25' + | **ENTRADA SANDSTONE**<br>HARD, FINE TO MEDIUM, SOME MODERATE, LIGHT REDDISH TAN.<br>BACKHOE REFUSAL AT 1.25'. |

**NOTES:** ______________________________

# TEST PIT LOG

**TEST PIT NO.:** TP-17

**PAGE:** 1 OF 2

**DATE:** 3/18/08

## PROJECT INFORMATION

**PROJECT:** SHOOTARING CANYON

**PROJECT NO.:** 181692

**CLIENT:** URANIUM ONE

**OWNER:** URANIUM ONE

**LOCATION:** NORTH CELL, FORMER CLAY PROCESSING AREA

...

## TEST PIT LOCATION

SEE FIGURE 2-15 FOR LOCATION

## FIELD INFORMATION

**DATE & TIME ARRIVED:** 3/18/08 9:03AM

**TEST PIT LOGGED BY:** GREG SMITH, GEO-SMITH

**VISITORS:** NONE

**WEATHER:** CLEAR, COOL, ~45°

## EXCAVATION INFORMATION

**EXCAVATION COMPANY:** KIRK JACKSON

**START TIME:** 9:05AM

**TEST PIT DEPTH:** 5' **TEST PIT DIA.:** 2'

**EXCAVATION METHOD:** TRACTOR MOUNTED BACKHOE - CAT 420D

**SAMPLING METHOD:** NONE

**TIME EXCAVATION COMPLETE:** 9:10AM

## TEST PIT COMPLETION / ABANDONMENT INFORMATION

**START TIME:** 9:10AM **COMPLETE TIME:** 9:13AM

**INSTRUMENTATION:** NONE **BACKFILL:** CUTTINGS

## GROUNDWATER CONDITIONS

NO GROUNDWATER WAS ENCOUNTERED AT THE TIME OF EXCAVATION.

## FOLLOWING FIELD WORK

**TIME OF CLEAN-UP COMPLETE:** ... **TIME LEFT SITE:** ...

**NOTES:** EL. 4425'. N 37°42.880', W 110°41.615'.

# TEST PIT LOG

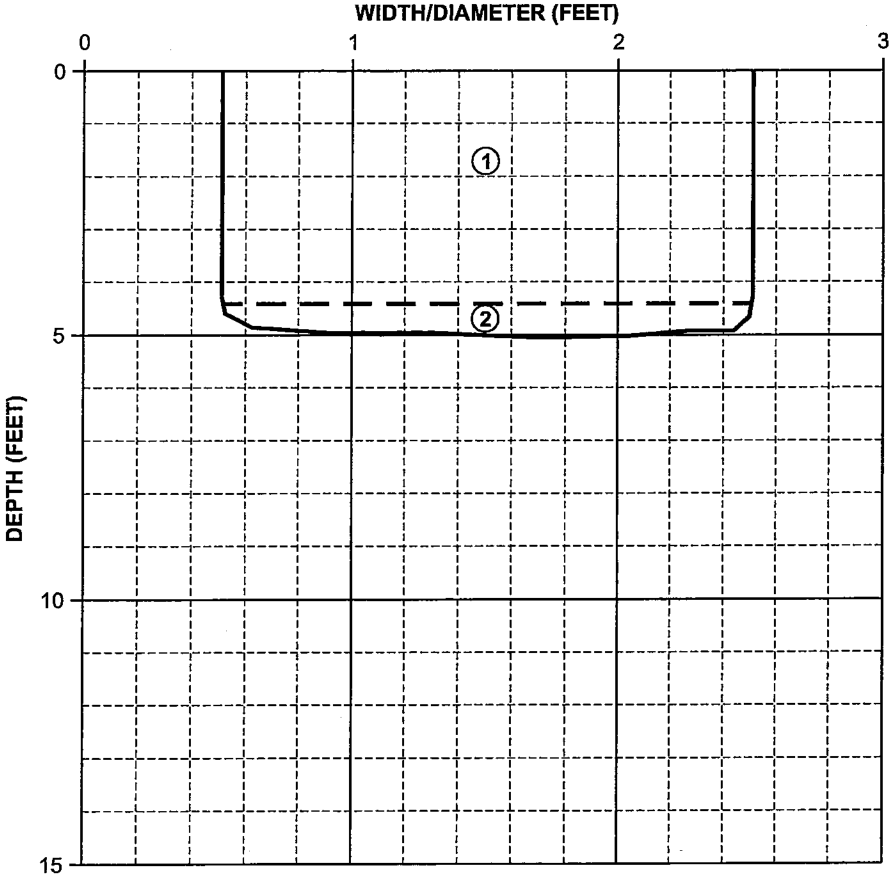
**PROJECT:** *SHOOTARING CANYON*

**PAGE:** *2 OF 2*

**PROJECT NO.:** *181692*

**DATE:** *3/18/08*

**TEST PIT NO.:** **TP-17**



| DEPTH | SAMPLE I.D. | SAMPLE TYPE |
|---|---|---|
| | | |

| SOIL TYPE | SOIL DEPTH | SOIL DESCRIPTION AND EXCAVATION NOTES |
|---|---|---|
| ① | 0 - 4.3' | **CLAY**<br>CH, MEDIUM TO HIGH PLASTICITY, TRACE SAND AND ROCK FRAGMENTS, BLOCKY, PURPLISH RED MOTTLED WITH GREEN-GRAY.<br>MOIST AT 2.4'. |
| ② | 4.3 + | **ENTRADA SANDSTONE**<br>FINE GRAINED, SOFT TO MODERATELY HARD, RED.<br>STOPPED TEST PIT AT 5'. |

**NOTES:**

# TEST PIT LOG

**TEST PIT NO.:** TP-18

**PAGE:** 1 OF 2

**DATE:** 3/18/08

## PROJECT INFORMATION

**PROJECT:** SHOOTARING CANYON

**PROJECT NO.:** 181692

**CLIENT:** URANIUM ONE

**OWNER:** URANIUM ONE

**LOCATION:** NORTH CELL, FORMER CLAY PROCESSING AREA

...

## TEST PIT LOCATION

**SEE FIGURE 2-15 FOR LOCATION**

## FIELD INFORMATION

**DATE & TIME ARRIVED:** 3/18/08 8:50AM

**TEST PIT LOGGED BY:** GREG SMITH, GEO-SMITH

**VISITORS:** NONE

**WEATHER:** CLEAR, COOL, ~45°

## EXCAVATION INFORMATION

**EXCAVATION COMPANY:** KIRK JACKSON

**START TIME:** 8:50AM

**TEST PIT DEPTH:** 2.5' **TEST PIT DIA.:** 2'

**EXCAVATION METHOD:** TRACTOR MOUNTED BACKHOE - CAT 420D

**SAMPLING METHOD:** BULK

**TIME EXCAVATION COMPLETE:** 8:52AM

## TEST PIT COMPLETION / ABANDONMENT INFORMATION

**START TIME:** 8:52AM **COMPLETE TIME:** 9:00AM

**INSTRUMENTATION:** NONE **BACKFILL:** CUTTINGS

## GROUNDWATER CONDITIONS

NO GROUNDWATER WAS ENCOUNTERED AT THE TIME OF EXCAVATION.

## FOLLOWING FIELD WORK

**TIME OF CLEAN-UP COMPLETE:** ... **TIME LEFT SITE:** ...

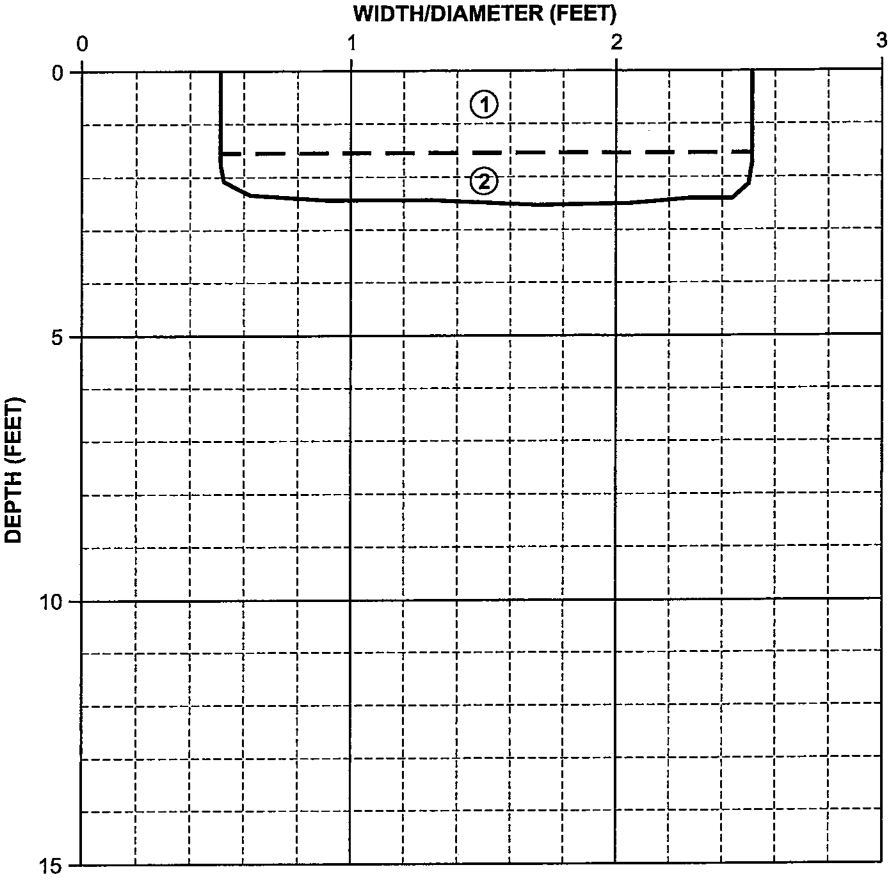
**NOTES:** EL. 4440'. N 37°42.888', W 110°41.661'.

# TEST PIT LOG

**PROJECT:** *SHOOTARING CANYON* **PAGE:** *2 OF 2*

**PROJECT NO.:** *181692* **DATE:** *3/18/08*

**TEST PIT NO.:** **TP-18**



| DEPTH | SAMPLE I.D. | SAMPLE TYPE |
|---|---|---|
| 0.5' - 1.5' | 0' | BULK |
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| SOIL TYPE | SOIL DEPTH | SOIL DESCRIPTION AND EXCAVATION NOTES |
|---|---|---|
| ① | 0 - 1.6' | **CLAY**<br>CH, MEDIUM TO HIGH PLASTICITY, TRACE SAND, BLOCKY, DRY, PURPLISH RED MOTTLED WITH GREEN-GRAY. |
| ② | 1.6' - 2.5' | **ENTRADA SANDSTONE**<br>FINE GRAINED, SOFT TO MODERATELY HARD, WEATHERED, RED.<br>STOPPED TEST PIT AT 2.5'. |

**NOTES:**

# TEST PIT LOG

PAGE: 1 OF 2

DATE: 3/18/08

TEST PIT NO.: **TP-19**

## PROJECT INFORMATION

PROJECT: SHOOTARING CANYON

PROJECT NO.: 181692

CLIENT: URANIUM ONE

OWNER: URANIUM ONE

LOCATION: NORTH CELL, FORMER CLAY PROCESSING AREA

...

## TEST PIT LOCATION

**SEE FIGURE 2-15 FOR LOCATION**

## FIELD INFORMATION

DATE & TIME ARRIVED: 3/18/08 9:15AM

TEST PIT LOGGED BY: GREG SMITH, GEO-SMITH

VISITORS: NONE

WEATHER: CLEAR, BREEZY, ~45°

## EXCAVATION INFORMATION

EXCAVATION COMPANY: KIRK JACKSON

START TIME: 9:20AM

TEST PIT DEPTH: 1.5' TEST PIT DIA.: 2'

EXCAVATION METHOD: TRACTOR MOUNTED BACKHOE - CAT 420D

SAMPLING METHOD: NONE

TIME EXCAVATION COMPLETE: 9:25AM

## TEST PIT COMPLETION / ABANDONMENT INFORMATION

START TIME: 9:25AM COMPLETE TIME: 9:27AM

INSTRUMENTATION: NONE BACKFILL: CUTTINGS

## GROUNDWATER CONDITIONS

NO GROUNDWATER WAS ENCOUNTERED AT THE TIME OF EXCAVATION.

## FOLLOWING FIELD WORK

TIME OF CLEAN-UP COMPLETE: ... TIME LEFT SITE: ...

**NOTES:** TP-19 - EL. 4450'. N 37°42.930', W 110°41.567'.

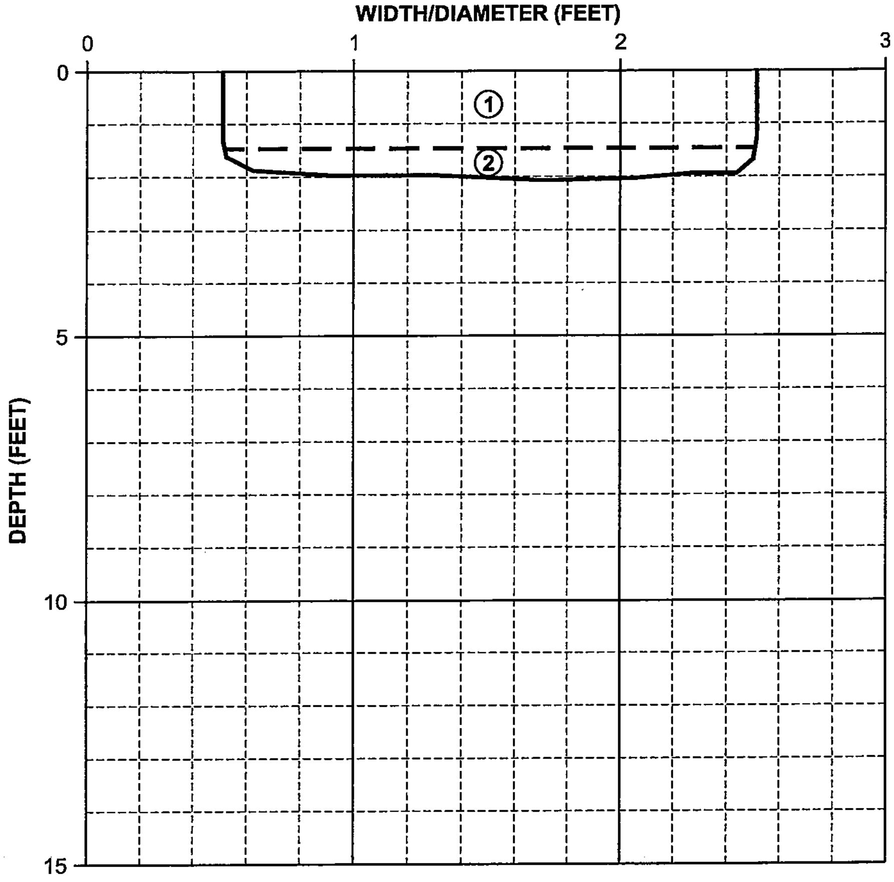
TP-19A - EL. 4449'. N 37°42.929', W 110°41.550'.

# TEST PIT LOG

**PROJECT:** SHOOTARING CANYON **PAGE:** 2 OF 2

**PROJECT NO.:** 181692 **DATE:** 3/18/08

**TEST PIT NO.:** TP-19



| DEPTH | SAMPLE I.D. | SAMPLE TYPE |
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| SOIL TYPE | SOIL DEPTH | SOIL DESCRIPTION AND EXCAVATION NOTES |
|---|---|---|
| ① | 0 - 1.5' | **CLAY**<br>CH, MEDIUM TO HIGH PLASTICITY, TRACE SAND AND ROCK FRAGMENTS, PURPLISH RED MOTTLED WITH GREEN-GRAY. |
| ② | 1.5' + | **ENTRADA SANDSTONE**<br>FINE GRAINED, MODERATELY HARD, RED.<br>STOPPED TEST PIT AT 2'. |

**NOTES:**

# TEST PIT LOG

**TEST PIT NO.:** TP-20

**PAGE:** 1 OF 2

**DATE:** 3/18/08

## PROJECT INFORMATION

**PROJECT:** SHOOTARING CANYON

**PROJECT NO.:** 181692

**CLIENT:** URANIUM ONE

**OWNER:** URANIUM ONE

**LOCATION:** NORTH CELL

...

## TEST PIT LOCATION

**SEE FIGURE 2-15 FOR LOCATION**

## FIELD INFORMATION

**DATE & TIME ARRIVED:** 3/18/08 8:35AM

**TEST PIT LOGGED BY:** GREG SMITH, GEO-SMITH

**VISITORS:** NONE

**WEATHER:** CLEAR, COOL, ~40°

## EXCAVATION INFORMATION

**EXCAVATION COMPANY:** KIRK JACKSON

**START TIME:** 8:35AM

**TEST PIT DEPTH:** 1.5' **TEST PIT DIA.:** 2'

**EXCAVATION METHOD:** TRACTOR MOUNTED BACKHOE - CAT 420D

**SAMPLING METHOD:** NONE

**TIME EXCAVATION COMPLETE:** 8:40AM

## TEST PIT COMPLETION / ABANDONMENT INFORMATION

**START TIME:** 8:40AM **COMPLETE TIME:** 8:42 AM

**INSTRUMENTATION:** NONE **BACKFILL:** CUTTINGS

## GROUNDWATER CONDITIONS

NO GROUNDWATER WAS ENCOUNTERED AT THE TIME OF EXCAVATION.

## FOLLOWING FIELD WORK

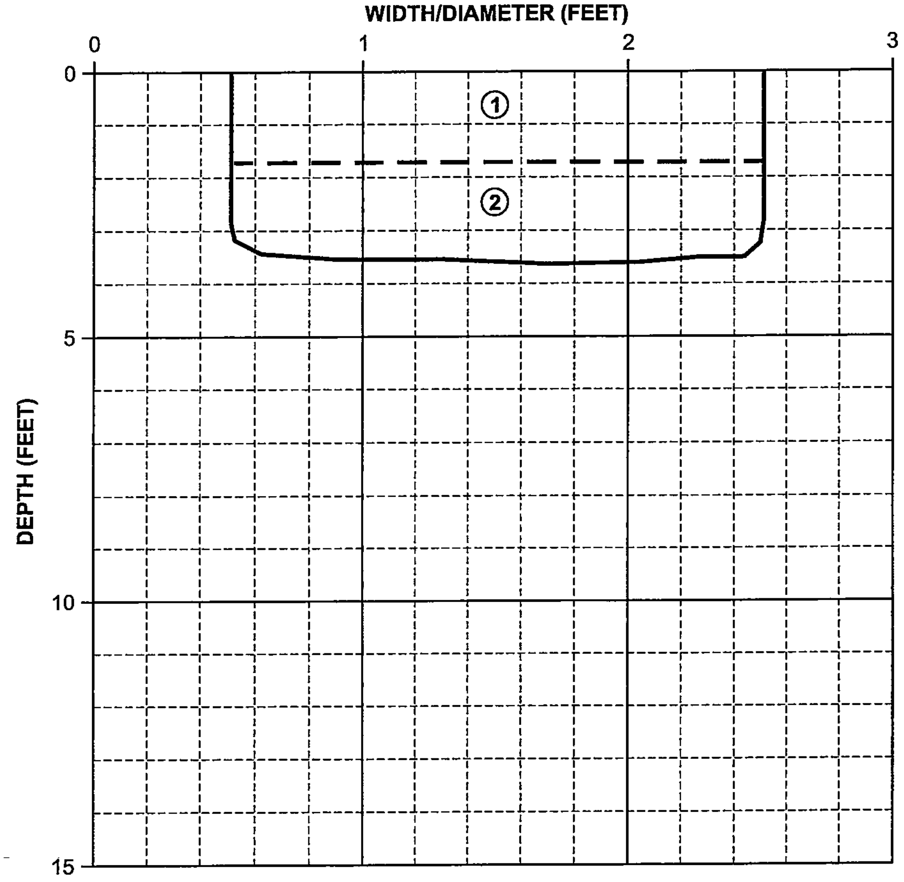
**TIME OF CLEAN-UP COMPLETE:** ... **TIME LEFT SITE:** ...

**NOTES:** EL. 4439'. N 37°43.054', W 110°41.668'.

# TEST PIT LOG

**PROJECT:** *SHOOTARING CANYON*
**PAGE:** 2 OF 2
**PROJECT NO.:** *181692*
**DATE:** 3/18/08

**TEST PIT NO.:** **TP-20**



| DEPTH | SAMPLE I.D. | SAMPLE TYPE |
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| SOIL TYPE | SOIL DEPTH | SOIL DESCRIPTION AND EXCAVATION NOTES |
|---|---|---|
| ① | 0 - 1.75' | **CLAY**<br>CH, MEDIUM TO HIGH PLASTICITY, TRACE SAND, DRY, BLOCKY, PURPLISH RED MOTTLED WITH GREEN-GRAY. |
| ② | 1.75' - 3.5' | **ENTRADA SANDSTONE**<br>FINE GRAINED, MODERATELY HARD TO SOFT, FINE GRAINED, RED.<br>STOPPED TEST PIT AT 3.5'. |

**NOTES:**

# TEST PIT LOG

PAGE: 1 OF 2

DATE: 3/18/08

TEST PIT NO.: **TP-21**

## PROJECT INFORMATION

PROJECT: SHOOTARING CANYON

PROJECT NO.: 181692

CLIENT: URANIUM ONE

OWNER: URANIUM ONE

LOCATION: NORTH CELL, NORTH DIKE AREA

...

## TEST PIT LOCATION

SEE FIGURE 2-15 FOR LOCATION

## FIELD INFORMATION

DATE & TIME ARRIVED: 3/18/08 10:20AM

TEST PIT LOGGED BY: GREG SMITH, GEO-SMITH

VISITORS: NONE

WEATHER: CLEAR, BREEZY, ~50°

## EXCAVATION INFORMATION

EXCAVATION COMPANY: KIRK JACKSON

START TIME: 10:20AM

TEST PIT DEPTH: 4.6' TEST PIT DIA.: 2'

EXCAVATION METHOD: TRACTOR MOUNTED BACKHOE - CAT 420D

SAMPLING METHOD: BULK

TIME EXCAVATION COMPLETE: 10:35AM

## TEST PIT COMPLETION / ABANDONMENT INFORMATION

START TIME: 10:35AM COMPLETE TIME: 10:40AM

INSTRUMENTATION: NONE BACKFILL: CUTTINGS

## GROUNDWATER CONDITIONS

NO GROUNDWATER WAS ENCOUNTERED AT THE TIME OF EXCAVATION.

## FOLLOWING FIELD WORK

TIME OF CLEAN-UP COMPLETE: ... TIME LEFT SITE: ...

**NOTES:** EL. 4433'. N 37°42.944', W 110°41.688'.

# TEST PIT LOG

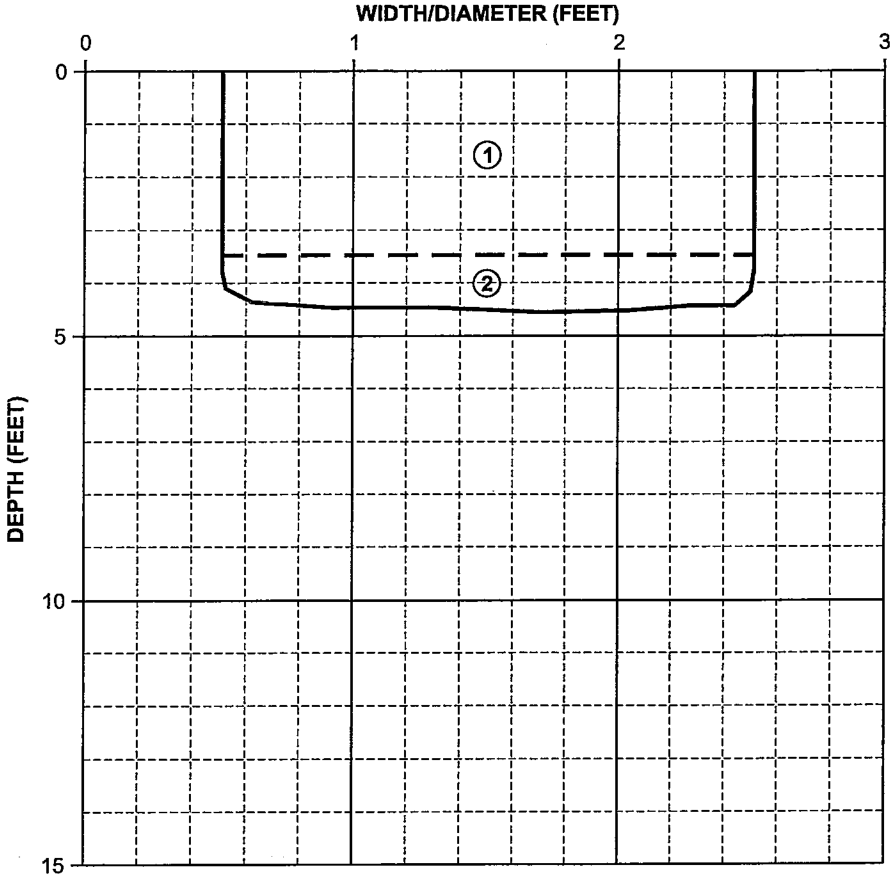
**TEST PIT NO.:** TP-21

**PROJECT:** SHOOTARING CANYON

**PAGE:** 2 OF 2

**PROJECT NO.:** 181692

**DATE:** 3/18/08



| DEPTH | SAMPLE I.D. | SAMPLE TYPE |
|---|---|---|
| 0.5' - 1.5' | 0' | BULK |

| SOIL TYPE | SOIL DEPTH | SOIL DESCRIPTION AND EXCAVATION NOTES |
|---|---|---|
| ① | 0 - 3.4' | **FILL**<br>SAND, SP, PREDOMINANTLY FINE, TRACE VERY FINE, TRACE TO SOME FINES, NON-PLASTIC, RED. |
| ② | 3.4' + | **SAND**<br>TAILINGS.<br>STOPPED TEST PIT WHEN TAILINGS WERE ENCOUNTERED. |

**NOTES:**

# TEST PIT LOG

PAGE: 1 OF 2

DATE: 3/18/08

TEST PIT NO.: **TP-22**

## PROJECT INFORMATION

PROJECT: SHOOTARING CANYON

PROJECT NO.: 181692

CLIENT: URANIUM ONE

OWNER: URANIUM ONE

LOCATION: NORTH CELL

...

## TEST PIT LOCATION

**SEE FIGURE 2-15 FOR LOCATION**

## FIELD INFORMATION

DATE & TIME ARRIVED: 3/18/08 8:00AM

TEST PIT LOGGED BY: GREG SMITH, GEO-SMITH

VISITORS: NONE

WEATHER: CLEAR, COOL, ~40°

## EXCAVATION INFORMATION

EXCAVATION COMPANY: KIRK JACKSON

START TIME: 8:05AM

TEST PIT DEPTH: 6.5'

TEST PIT DIA.: 2'

EXCAVATION METHOD: TRACTOR MOUNTED BACKHOE - CAT 420D

SAMPLING METHOD: NONE

TIME EXCAVATION COMPLETE: 8:15AM

## TEST PIT COMPLETION / ABANDONMENT INFORMATION

START TIME: 8:15AM

COMPLETE TIME: 8:20AM

INSTRUMENTATION: NONE

BACKFILL: CUTTINGS

## GROUNDWATER CONDITIONS

NO GROUNDWATER WAS ENCOUNTERED AT THE TIME OF EXCAVATION.

## FOLLOWING FIELD WORK

TIME OF CLEAN-UP COMPLETE: ...

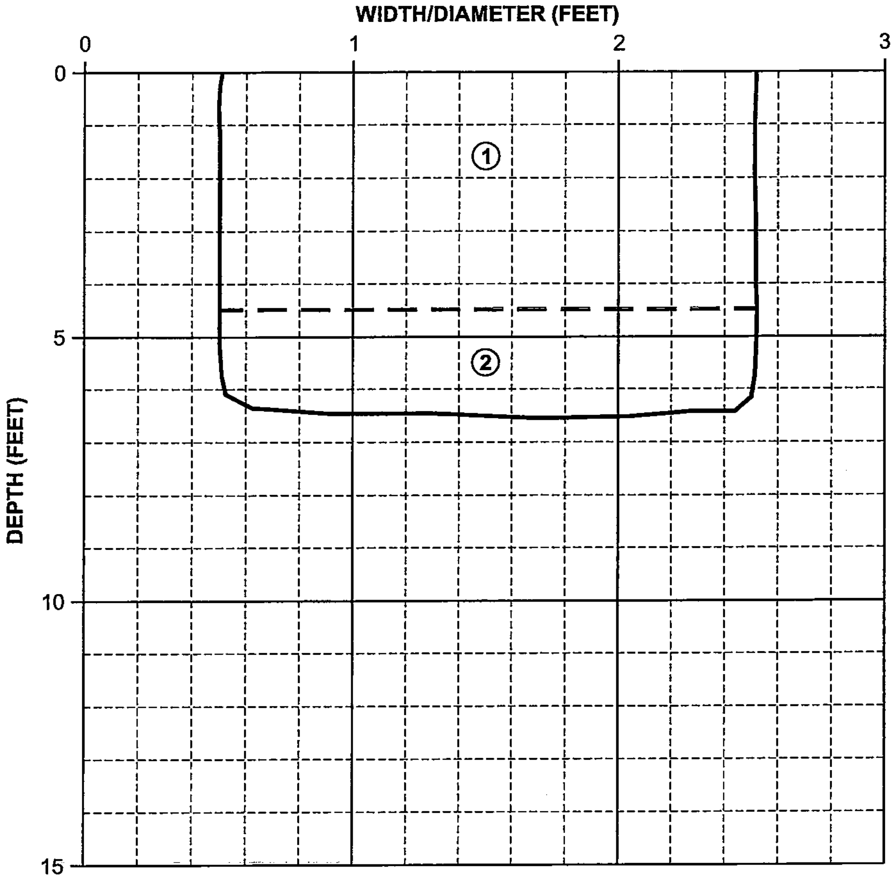
TIME LEFT SITE: ...

**NOTES:** EL. 4436'. N 37°43.029', W 110°41.713'.

# TEST PIT LOG

**PROJECT:** *SHOOTARING CANYON*
**PAGE:** *2 OF 2*
**PROJECT NO.:** *181692*
**DATE:** *3/18/08*

**TEST PIT NO.:** **TP-22**



| DEPTH | SAMPLE I.D. | SAMPLE TYPE |
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| SOIL TYPE | SOIL DEPTH | SOIL DESCRIPTION AND EXCAVATION NOTES |
|---|---|---|
| ① | 0 - 4.5' | **CLAY**<br>CH, MEDIUM TO HIGH PLASTICITY, PURPLISH RED MOTTLES WITH GREEN-GRAY, TRACE SAND. |
| ② | 4.5' - 6.5' | **ENTRADA SANDSTONE**<br>WEATHERED, FINE, SOFT, RED.<br>STOPPED TEST PIT AT 6.5'. |

NOTES:

# TEST PIT LOG

PAGE: 1 OF 2
DATE: 3/18/08

TEST PIT NO.: **TP-23**

## PROJECT INFORMATION

PROJECT: SHOOTARING CANYON
PROJECT NO.: 181692
CLIENT: URANIUM ONE
OWNER: URANIUM ONE
LOCATION: NORTH CELL
...

## FIELD INFORMATION

DATE & TIME ARRIVED: 3/18/08 8:22AM
TEST PIT LOGGED BY: GREG SMITH, GEO-SMITH
VISITORS: NONE
WEATHER: CLEAR, COOL, ~40°

## TEST PIT LOCATION

**SEE FIGURE 2-15 FOR LOCATION**

## EXCAVATION INFORMATION

EXCAVATION COMPANY: KIRK JACKSON
START TIME: 8:22AM
TEST PIT DEPTH: 6.5'
TEST PIT DIA.: 2'
EXCAVATION METHOD: TRACTOR MOUNTED BACKHOE - CAT 420D
SAMPLING METHOD: NONE
TIME EXCAVATION COMPLETE: 8:30AM

## TEST PIT COMPLETION / ABANDONMENT INFORMATION

START TIME: 8:30AM
COMPLETE TIME: 8:35AM
INSTRUMENTATION: NONE
BACKFILL: CUTTINGS

## GROUNDWATER CONDITIONS

NO GROUNDWATER WAS ENCOUNTERED AT THE TIME OF EXCAVATION.

## FOLLOWING FIELD WORK

TIME OF CLEAN-UP COMPLETE: ...
TIME LEFT SITE: ...

## NOTES:

EL. 4441'. N 37°43.042', W 110°41.688'.

# TEST PIT LOG

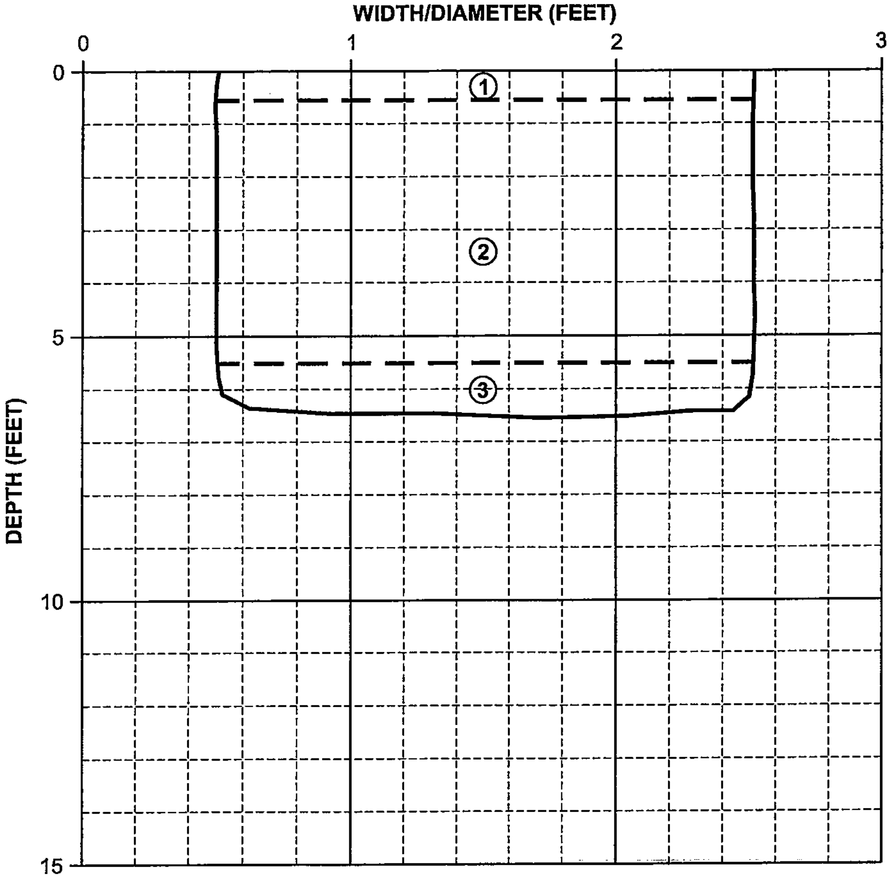
**TEST PIT NO.:** TP-23

**PROJECT:** SHOOTARING CANYON

**PAGE:** 2 OF 2

**PROJECT NO.:** 181692

**DATE:** 3/18/08



| DEPTH | SAMPLE I.D. | SAMPLE TYPE |
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| SOIL TYPE | SOIL DEPTH | SOIL DESCRIPTION AND EXCAVATION NOTES |
|---|---|---|
| ① | 0 - 0.5' | **SAND**<br>SP, PREDOMINANTLY FINE, NON-PLASTIC, RED. |
| ② | 0.5' - 5.5' | **CLAY**<br>CH, MEDIUM TO HIGH PLASTICITY TRACE SAND, BLOCKY, DRY, PURPLE MOTTLED WITH GREEN-GRAY. |
| ③ | 5.5' - 6.5' | **ENTRADA SANDSTONE**<br>FINE, SOFT TO MEDIUM HARD, WEATHERED, RED.<br>STOPPED TEST PIT AT 6.5'. |

NOTES:

# TEST PIT LOG

TEST PIT NO.: **TP-24**

PAGE: 1 OF 1

DATE: 3/19/08

## PROJECT INFORMATION

PROJECT: SHOOTARING CANYON

PROJECT NO.: 181692

CLIENT: URANIUM ONE

OWNER: URANIUM ONE

LOCATION:

## TEST PIT LOCATION

TEST PIT NOT EXCAVATED

## FIELD INFORMATION

DATE & TIME ARRIVED:

TEST PIT LOGGED BY:

VISITORS:

WEATHER:

## EXCAVATION INFORMATION

EXCAVATION COMPANY:

START TIME:

TEST PIT DEPTH: TEST PIT DIA.:

EXCAVATION METHOD:

SAMPLING METHOD:

TIME EXCAVATION COMPLETE:

## TEST PIT COMPLETION / ABANDONMENT INFORMATION

START TIME: COMPLETE TIME:

INSTRUMENTATION: BACKFILL:

## GROUNDWATER CONDITIONS

## FOLLOWING FIELD WORK

TIME OF CLEAN-UP COMPLETE: TIME LEFT SITE:

**NOTES:** TEST PIT NOT EXCAVATED.

# TEST PIT LOG

PAGE: 1 OF 2

DATE: 3/17/08

TEST PIT NO.:

**TP-25**

## PROJECT INFORMATION

PROJECT: SHOOTARING CANYON

PROJECT NO.: 181692

CLIENT: URANIUM ONE

OWNER: URANIUM ONE

LOCATION: NORTH CELL

...

## TEST PIT LOCATION

SEE FIGURE 2-15 FOR LOCATION

## FIELD INFORMATION

DATE & TIME ARRIVED: 3/17/08 4:03PM

TEST PIT LOGGED BY: GREG SMITH, GEO-SMITH

VISITORS: NONE

WEATHER: PARTLY CLOUDY, COOL, ~45°

## EXCAVATION INFORMATION

EXCAVATION COMPANY: KIRK JACKSON

START TIME: 4:03PM

TEST PIT DEPTH: 5.75'

TEST PIT DIA.: 2'

EXCAVATION METHOD: TRACTOR MOUNTED BACKHOE - CAT 420D

SAMPLING METHOD: BULK

TIME EXCAVATION COMPLETE: 4:15PM

## TEST PIT COMPLETION / ABANDONMENT INFORMATION

START TIME: 4:15PM

COMPLETE TIME: 4:18PM

INSTRUMENTATION: NONE

BACKFILL: CUTTINGS

## GROUNDWATER CONDITIONS

NO GROUNDWATER WAS ENCOUNTERED AT THE TIME OF EXCAVATION.

## FOLLOWING FIELD WORK

TIME OF CLEAN-UP COMPLETE: ...

TIME LEFT SITE: ...

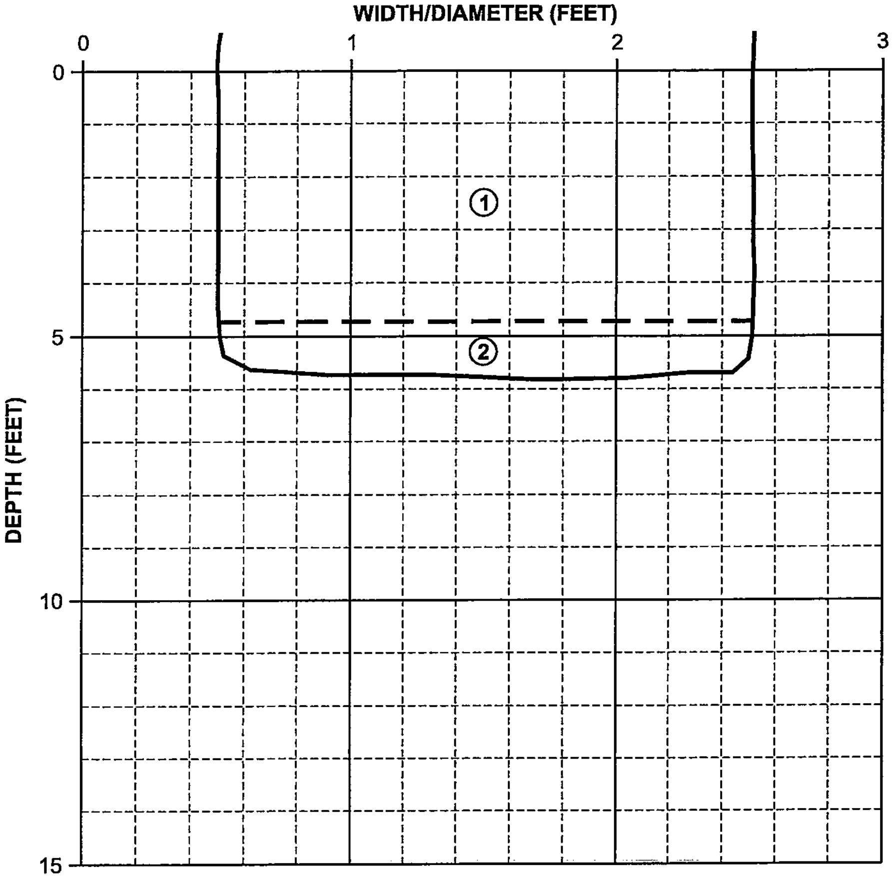
**NOTES:** EL. 4425'. N 37°43.015', W 110°41.725'.

# TEST PIT LOG

**PROJECT:** *SHOOTARING CANYON* **PAGE:** *2 OF 2*

**PROJECT NO.:** *181692* **DATE:** *3/17/08*

**TEST PIT NO.:** **TP-25**



| DEPTH | SAMPLE I.D. | SAMPLE TYPE |
|---|---|---|
| 3' - 4' | 0' | BULK |
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| SOIL TYPE | SOIL DEPTH | SOIL DESCRIPTION AND EXCAVATION NOTES |
|---|---|---|
| ① | 0 - 4.75' | **CLAY**<br>CH, MOTTLED WHITE/PURPLE, SOME SAND, OCCASIONAL GRAVEL SIZED FRAGMENTS, (PARENT MATERIAL), BLOCKY, MOIST WITH DEPTH (4' - 4.75'). |
| ② | 4.75' - 5.75' | **ENTRADA SANDSTONE**<br>FINE TO MEDIUM, HARD.<br>BACKHOE REFUSAL AT 5.75'. |

**NOTES:**

# TEST PIT LOG

PAGE: 1 OF 2

DATE: 3/17/08

TEST PIT NO.: **TP-25A**

## PROJECT INFORMATION

PROJECT: SHOOTARING CANYON

PROJECT NO.: 181692

CLIENT: URANIUM ONE

OWNER: URANIUM ONE

LOCATION: NORTH CELL

...

## TEST PIT LOCATION

**SEE FIGURE 2-15 FOR LOCATION**

## FIELD INFORMATION

DATE & TIME ARRIVED: 3/17/08 4:25PM

TEST PIT LOGGED BY: GREG SMITH, GEO-SMITH

VISITORS: NONE

WEATHER: PARTLY CLOUDY, COOL, ~45°

## EXCAVATION INFORMATION

EXCAVATION COMPANY: KIRK JACKSON

START TIME: 4:25PM

TEST PIT DEPTH: 1' TEST PIT DIA.: 2'

EXCAVATION METHOD: TRACTOR MOUNTED BACKHOE - CAT 420D

SAMPLING METHOD: BULK

TIME EXCAVATION COMPLETE: 4:35PM

## TEST PIT COMPLETION / ABANDONMENT INFORMATION

START TIME: 4:35PM COMPLETE TIME: 4:37PM

INSTRUMENTATION: NONE BACKFILL: CUTTINGS

## GROUNDWATER CONDITIONS

NO GROUNDWATER WAS ENCOUNTERED AT THE TIME OF EXCAVATION.

## FOLLOWING FIELD WORK

TIME OF CLEAN-UP COMPLETE: ... TIME LEFT SITE: ...

**NOTES:** EL. 4449'. N 37°43.024', W 110°41.737'.

# TEST PIT LOG

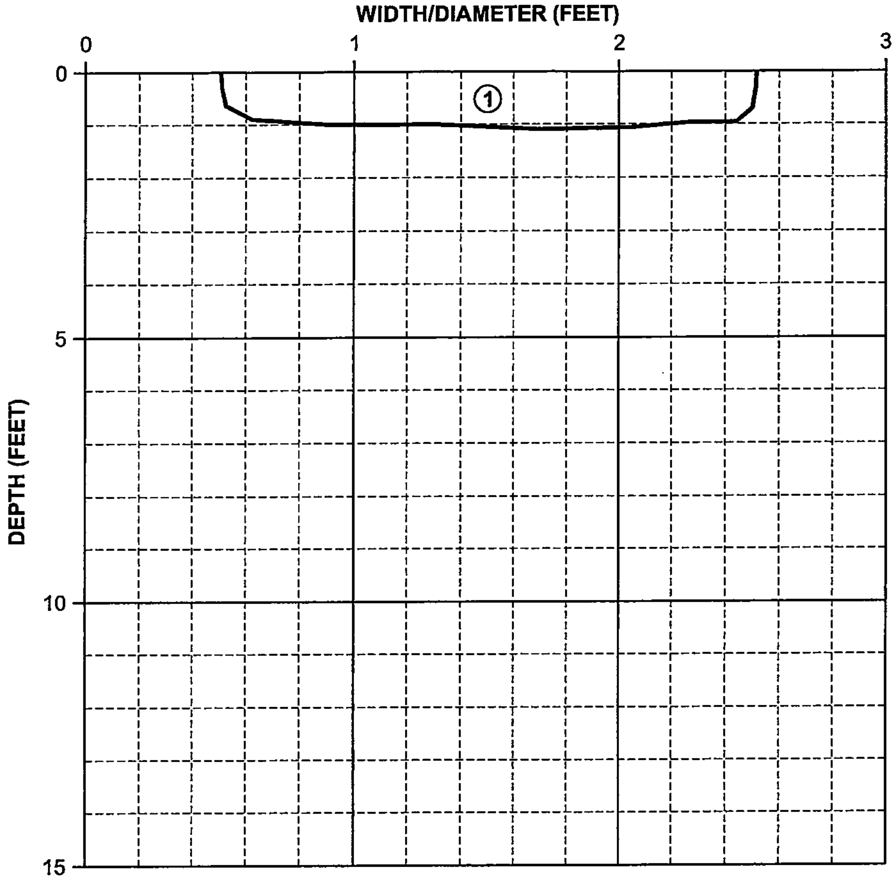
**PROJECT:** *SHOOTARING CANYON*

**PAGE:** *2 OF 2*

**PROJECT NO.:** *181692*

**DATE:** *3/17/08*

**TEST PIT NO.:** **TP-25A**



| DEPTH | SAMPLE I.D. | SAMPLE TYPE |
|---|---|---|
| 0 - 1' | 0' | BULK |
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| SOIL TYPE | SOIL DEPTH | SOIL DESCRIPTION AND EXCAVATION NOTES |
|---|---|---|
| ① | 0 - 4.75' | **ENTRADA SANDSTONE**<br>FINE GRAINED, BLOCKY FRAGMENTS TO SAND, WEATHERED ZONE.<br>BACKHOE REFUSAL AT 1'. |

**NOTES:**

# TEST PIT LOG

PAGE: 1 OF 2

DATE: 3/17/08

TEST PIT NO.: **TP-26**

## PROJECT INFORMATION

PROJECT: SHOOTARING CANYON

PROJECT NO.: 181692

CLIENT: URANIUM ONE

OWNER: URANIUM ONE

LOCATION: NORTH CELL

...

## TEST PIT LOCATION

**SEE FIGURE 2-15 FOR LOCATION**

## FIELD INFORMATION

DATE & TIME ARRIVED: 3/17/08 2:25PM

TEST PIT LOGGED BY: GREG SMITH, GEO-SMITH

VISITORS: NONE

WEATHER: PARTLY CLOUDY, COOL, BREEZY, ~45°

## EXCAVATION INFORMATION

EXCAVATION COMPANY: KIRK JACKSON

START TIME: 2:25PM

TEST PIT DEPTH: 6,5'

TEST PIT DIA.: 2'

EXCAVATION METHOD: TRACTOR MOUNTED BACKHOE - CAT 420D

SAMPLING METHOD: NONE

TIME EXCAVATION COMPLETE: 2:23PM

## TEST PIT COMPLETION / ABANDONMENT INFORMATION

START TIME: 2:35PM

COMPLETE TIME: 2:37PM

INSTRUMENTATION: NONE

BACKFILL: CUTTINGS

## GROUNDWATER CONDITIONS

NO GROUNDWATER WAS ENCOUNTERED AT THE TIME OF EXCAVATION.

## FOLLOWING FIELD WORK

TIME OF CLEAN-UP COMPLETE: ...

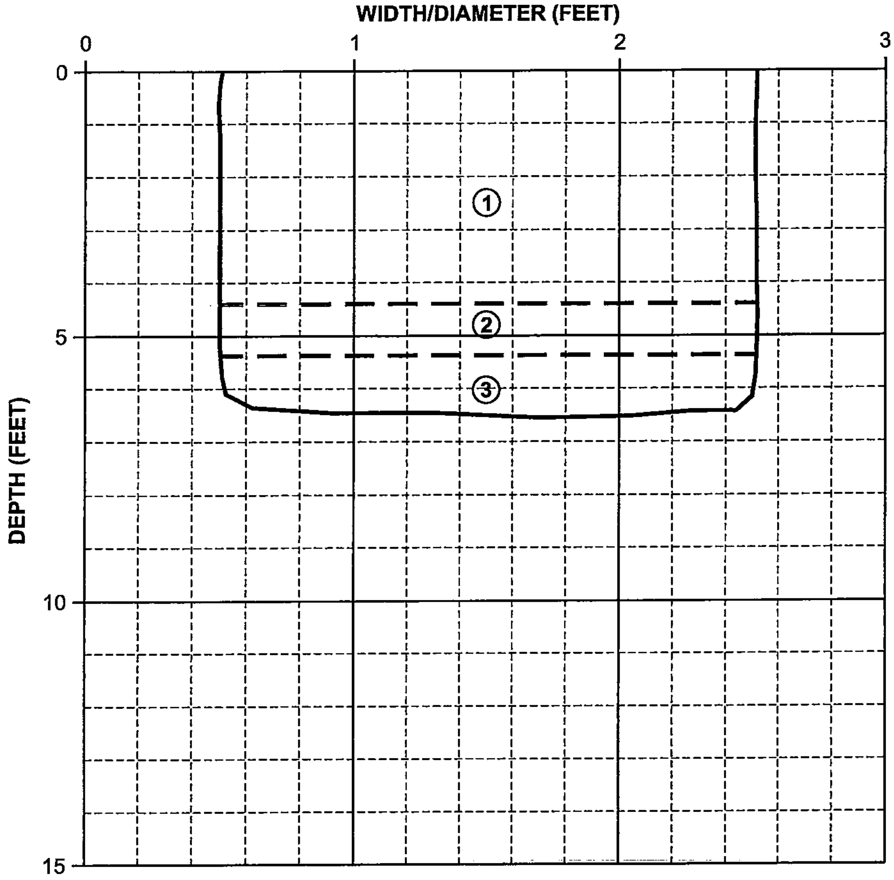
TIME LEFT SITE: ...

## NOTES: ....

# TEST PIT LOG

**TEST PIT NO.:** TP-26

**PROJECT:** SHOOTARING CANYON
**PAGE:** 2 OF 2
**PROJECT NO.:** 181692
**DATE:** 3/17/08



| DEPTH | SAMPLE I.D. | SAMPLE TYPE |
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| SOIL TYPE | SOIL DEPTH | SOIL DESCRIPTION AND EXCAVATION NOTES |
|---|---|---|
| ① | 0 - 4.25' | **SAND**<br>SP, PREDOMINANTLY FINE TO VERY FINE, TRACE FINES, NON-PLASTIC, RED. |
| ② | 4.25' - 5.25' | **ENTRADA SANDSTONE**<br>FINE GRAINED, BUFF TO LIGHT RED, WEATHERED, NON-PLASTIC, SOFT. |
| ③ | 5.25' - 6.5' | **ENTRADA SANDSTONE**<br>FINE GRAINED, SOFT, WEAKLY CEMENTED, BECOMING HARDER WITH DEPTH, SOME CALCITE.<br>BACKHOE REFUSAL AT 6.5'. |

NOTES:

# TEST PIT LOG

PAGE: 1 OF 2

DATE: 3/17/08

TEST PIT NO.: **TP-27**

## PROJECT INFORMATION

PROJECT: SHOOTARING CANYON

PROJECT NO.: 181692

CLIENT: URANIUM ONE

OWNER: URANIUM ONE

LOCATION: MILL PROCESS POND AREA

...

## TEST PIT LOCATION

**SEE FIGURE 2-15 FOR LOCATION**

## FIELD INFORMATION

DATE & TIME ARRIVED: 3/17/08 2:40PM

TEST PIT LOGGED BY: GREG SMITH, GEO-SMITH

VISITORS: NONE

WEATHER: PARTLY CLOUDY, COOL, ~45°

## EXCAVATION INFORMATION

EXCAVATION COMPANY: KIRK JACKSON

START TIME: 2:40PM

TEST PIT DEPTH: 14' TEST PIT DIA.: 2'

EXCAVATION METHOD: TRACTOR MOUNTED BACKHOE - CAT 420D

SAMPLING METHOD: BULK

TIME EXCAVATION COMPLETE: 2:55PM

## TEST PIT COMPLETION / ABANDONMENT INFORMATION

START TIME: 2:55PM COMPLETE TIME: 2:55PM

INSTRUMENTATION: NONE BACKFILL: CUTTINGS

## GROUNDWATER CONDITIONS

NO GROUNDWATER WAS ENCOUNTERED AT THE TIME OF EXCAVATION.

## FOLLOWING FIELD WORK

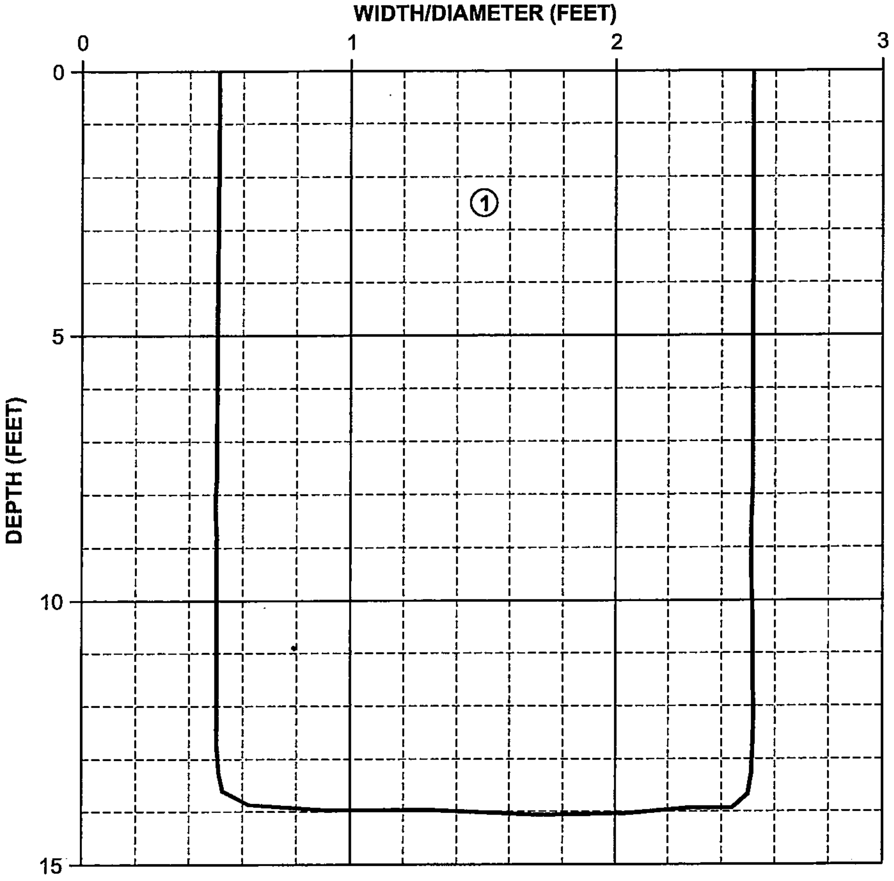
TIME OF CLEAN-UP COMPLETE: ... TIME LEFT SITE: ...

**NOTES:** EL, 4471', N 37°42.880', W 110°41.503'.

# TEST PIT LOG

**TEST PIT NO.:** TP-27

**PROJECT:** SHOOTARING CANYON
**PAGE:** 2 OF 2
**PROJECT NO.:** 181692
**DATE:** 3/17/08



| DEPTH | SAMPLE I.D. | SAMPLE TYPE |
|---|---|---|
| 10' | 0' | BULK |
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| SOIL TYPE | SOIL DEPTH | SOIL DESCRIPTION AND EXCAVATION NOTES |
|---|---|---|
| ① | 0 - 14' | **SAND**<br>SP, PREDOMINANTLY FINE TO VERY FINE, POORLY GRADED, NON-PLASTIC, EOLIAN, RED.<br>BACKHOE STOPPED AT 14' (EXTENT OF BACKHOE). |

**NOTES:**

# TEST PIT LOG

**TEST PIT NO.:** TP-28

**PAGE:** 1 OF 2

**DATE:** 3/17/08

## PROJECT INFORMATION

**PROJECT:** SHOOTARING CANYON

**PROJECT NO.:** 181692

**CLIENT:** URANIUM ONE

**OWNER:** URANIUM ONE

**LOCATION:** MILL PROCESS POND AREA

...

## TEST PIT LOCATION

SEE FIGURE 2-15 FOR LOCATION

## FIELD INFORMATION

**DATE & TIME ARRIVED:** 3/17/08 3:43PM

**TEST PIT LOGGED BY:** GREG SMITH, GEO-SMITH

**VISITORS:** NONE

**WEATHER:** PARTLY CLOUDY, COOL, ~45°

## EXCAVATION INFORMATION

**EXCAVATION COMPANY:** KIRK JACKSON

**START TIME:** 3:43PM

**TEST PIT DEPTH:** 10' **TEST PIT DIA.:** 2'

**EXCAVATION METHOD:** TRACTOR MOUNTED BACKHOE - CAT 420D

**SAMPLING METHOD:** NONE

**TIME EXCAVATION COMPLETE:** 3:55PM

## TEST PIT COMPLETION / ABANDONMENT INFORMATION

**START TIME:** 3:55PM **COMPLETE TIME:** 3:58PM

**INSTRUMENTATION:** NONE **BACKFILL:** CUTTINGS

## GROUNDWATER CONDITIONS

NO GROUNDWATER WAS ENCOUNTERED AT THE TIME OF EXCAVATION.

## FOLLOWING FIELD WORK

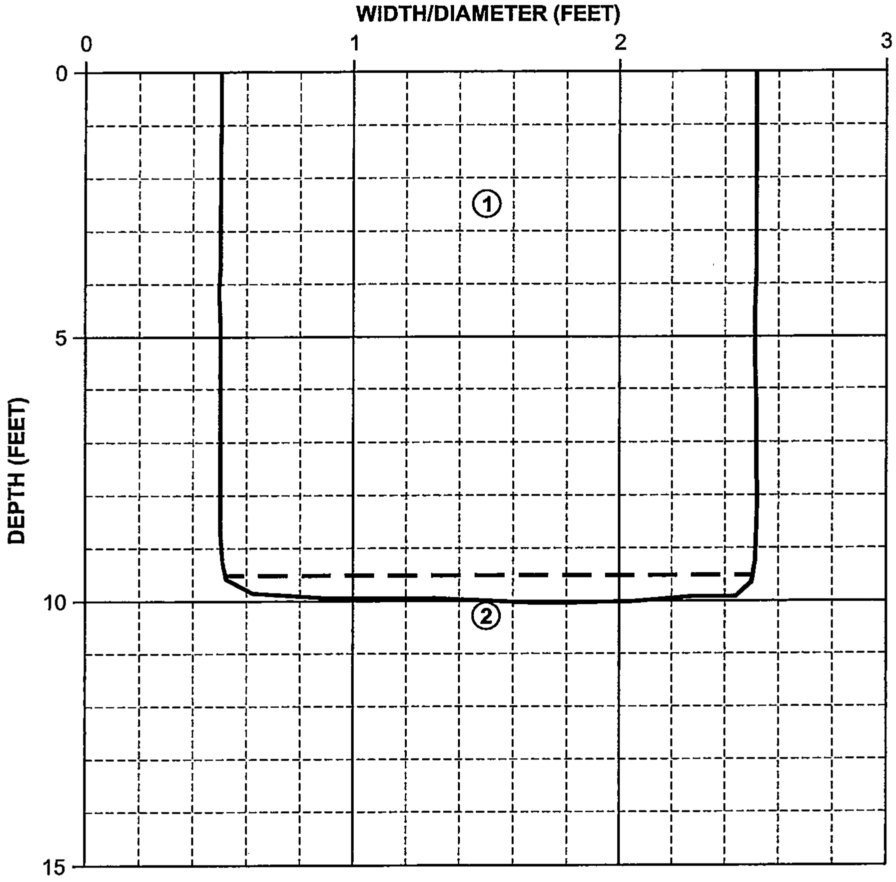
**TIME OF CLEAN-UP COMPLETE:** ... **TIME LEFT SITE:** ...

**NOTES:** EL, 4480', N 37°42.974', W 110°41.445'.

# TEST PIT LOG

**PROJECT:** *SHOOTARING CANYON*
**PAGE:** 2 OF 2
**PROJECT NO.:** 181692
**DATE:** 3/17/08

**TEST PIT NO.:** **TP-28**



| DEPTH | SAMPLE I.D. | SAMPLE TYPE |
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| SOIL TYPE | SOIL DEPTH | SOIL DESCRIPTION AND EXCAVATION NOTES |
|---|---|---|
| ① | 0 - 9.5' | **SAND**<br>SP, PREDOMINANTLY FINE, SOME MEDIUM, MOIST, NON-PLASTIC, SOME CALCIUM CARBONATE LENSES AT 3' - 6', MEDIUM HARD, MEDIUM RED.<br>DRIER AT 6', LIGHTER. |
| ② | 9.5 + | **ENTRADA SANDSTONE**<br>FINE TO MEDIUM, WITH WHITE CALCIUM CARBONATE, MODERATELY HARD, WEAK WHEN UNCONFIRMED.<br>BACKHOE REFUSAL AT 10'. |

NOTES:

# TEST PIT LOG

PAGE: 1 OF 2

DATE: 3/17/08

TEST PIT NO.: **TP-29**

## PROJECT INFORMATION

PROJECT: SHOOTARING CANYON

PROJECT NO.: 181692

CLIENT: URANIUM ONE

OWNER: URANIUM ONE

LOCATION: MILL PROCESS POND AREA

...

## TEST PIT LOCATION

**SEE FIGURE 2-15 FOR LOCATION**

## FIELD INFORMATION

DATE & TIME ARRIVED: 3/17/08 3:05PM

TEST PIT LOGGED BY: GREG SMITH, GEO-SMITH

VISITORS: NONE

WEATHER: PARTLY CLOUDY, COOL, ~45°

## EXCAVATION INFORMATION

EXCAVATION COMPANY: KIRK JACKSON

START TIME: 3:05PM

TEST PIT DEPTH: 7.5' TEST PIT DIA.: 2'

EXCAVATION METHOD: TRACTOR MOUNTED BACKHOE - CAT 420D

SAMPLING METHOD: BULK

TIME EXCAVATION COMPLETE: 3:15PM

## TEST PIT COMPLETION / ABANDONMENT INFORMATION

START TIME: 3:15PM COMPLETE TIME: 3:18PM

INSTRUMENTATION: NONE BACKFILL: CUTTINGS

## GROUNDWATER CONDITIONS

NO GROUNDWATER WAS ENCOUNTERED AT THE TIME OF EXCAVATION.

## FOLLOWING FIELD WORK

TIME OF CLEAN-UP COMPLETE: ... TIME LEFT SITE: ...

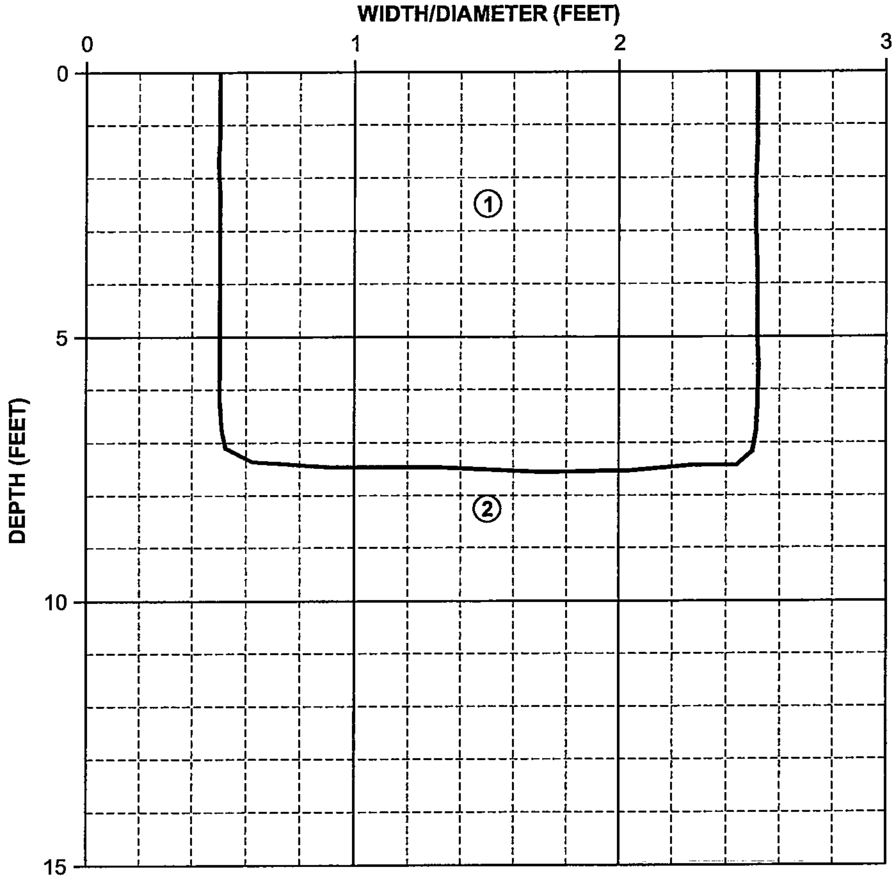
**NOTES:** EL, 4476', N 37°43.018', W 110°41.417'.

# TEST PIT LOG

PROJECT: *SHOOTARING CANYON* PAGE: *2 OF 2*

PROJECT NO.: *181692* DATE: *3/17/08*

TEST PIT NO.: **TP-29**



| DEPTH | SAMPLE I.D. | SAMPLE TYPE |
|---|---|---|
| 1' - 2' | 0' | BULK |

| SOIL TYPE | SOIL DEPTH | SOIL DESCRIPTION AND EXCAVATION NOTES |
|---|---|---|
| ① | 0 - 7.5' | **SAND**<br>SP, PREDOMINANTLY FINE TO VERY FINE, TRACE FINES, POORLY GRADED, SOME ROOTS TO 5', SOME CALCIUM CARBONATE IN UPPER 1' - 2', NON-PLASTIC, LIGHT REDDISH BROWN. |
| ② | 7.5' + | **ENTRADA SAND**<br>BACKHOE REFUSAL. |

NOTES:

# TEST PIT LOG

PAGE: 1 OF 2

DATE: 3/17/08

TEST PIT NO.: **TP-30**

## PROJECT INFORMATION

PROJECT: SHOOTARING CANYON

PROJECT NO.: 181692

CLIENT: URANIUM ONE

OWNER: URANIUM ONE

LOCATION: MILL PROCESS CELL AREA

...

## TEST PIT LOCATION

**SEE FIGURE 2-15 FOR LOCATION**

## FIELD INFORMATION

DATE & TIME ARRIVED: 3/17/08 3:20PM

TEST PIT LOGGED BY: GREG SMITH, GEO-SMITH

VISITORS: NONE

WEATHER: PARTLY CLOUDY, COOL, ~45°

## EXCAVATION INFORMATION

EXCAVATION COMPANY: KIRK JACKSON

START TIME: 3:20PM

TEST PIT DEPTH: 12.5'

TEST PIT DIA.: 2'

EXCAVATION METHOD: TRACTOR MOUNTED BACKHOE - CAT 420D

SAMPLING METHOD: NONE

TIME EXCAVATION COMPLETE: 3:35PM

## TEST PIT COMPLETION / ABANDONMENT INFORMATION

START TIME: 3:35PM

COMPLETE TIME: 3:40PM

INSTRUMENTATION: NONE

BACKFILL: CUTTINGS

## GROUNDWATER CONDITIONS

NO GROUNDWATER WAS ENCOUNTERED AT THE TIME OF EXCAVATION.

## FOLLOWING FIELD WORK

TIME OF CLEAN-UP COMPLETE: ...

TIME LEFT SITE: ...

## NOTES:

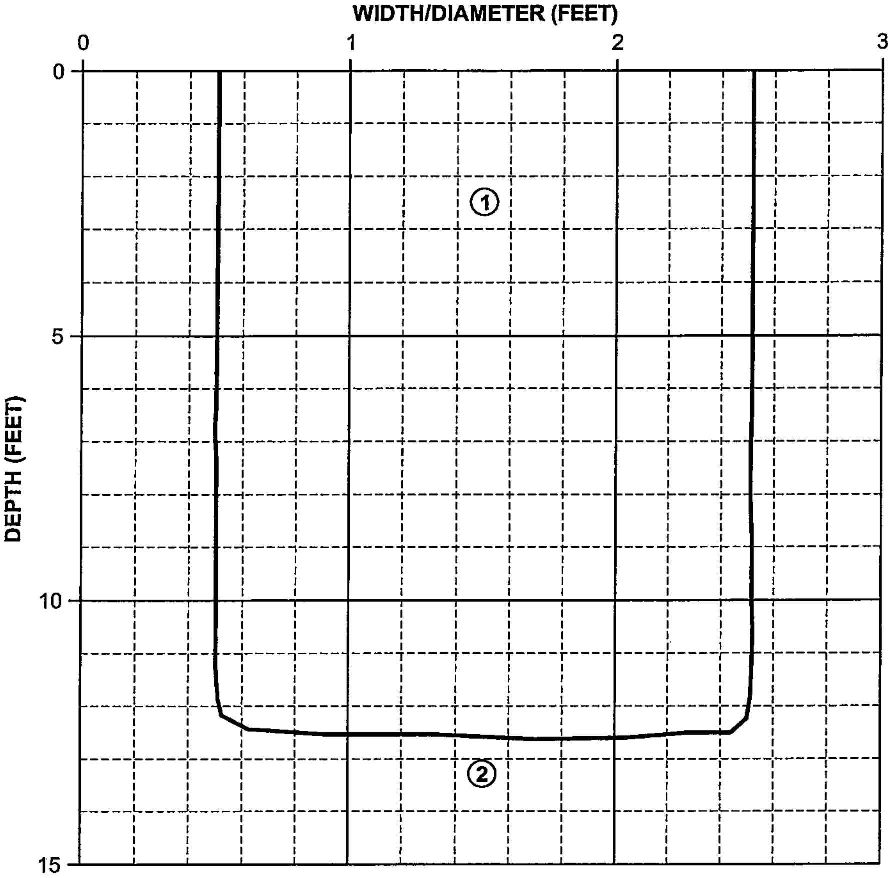
EL, 4537', N 37°43.045', W 110°41.352'.

# TEST PIT LOG

**PROJECT:** *SHOOTARING CANYON* **PAGE:** *2 OF 2*

**PROJECT NO.:** *181692* **DATE:** *3/17/08*

**TEST PIT NO.:** **TP-30**



| DEPTH | SAMPLE I.D. | SAMPLE TYPE |
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| SOIL TYPE | SOIL DEPTH | SOIL DESCRIPTION AND EXCAVATION NOTES |
|---|---|---|
| ① | 0 - 11.75' | **SAND**<br>SP, PREDOMINANTLY FINE TO VERY FINE, SOME FINES, ROOTS IN UPPER 2' - 3'. MOIST TO 0.5', EOLIAN, LIGHT REDDISH BROWN.<br>11.75' - HARD, MOTTLED WITH WHITE CALCIUM CARBONATE, DIFFICULT DIGGING FOR HOE. |
| ② | 12.5' + | **ENTRADA SANDSTONE**<br>BACKHOE REFUSAL. |

**NOTES:**

# TEST PIT LOG

PAGE: 1 OF 2
DATE: 3/18/08

TEST PIT NO.: **TP-31**

## PROJECT INFORMATION

PROJECT: SHOOTARING CANYON
PROJECT NO.: 181692
CLIENT: URANIUM ONE
OWNER: URANIUM ONE
LOCATION: NORTH CELL
...

## TEST PIT LOCATION

**SEE FIGURE 2-15 FOR LOCATION**

## FIELD INFORMATION

DATE & TIME ARRIVED: 3/18/08 1:25PM
TEST PIT LOGGED BY: GREG SMITH, GEO-SMITH
VISITORS: NONE
WEATHER: CLEAR, WINDY, ~55°

## EXCAVATION INFORMATION

EXCAVATION COMPANY: KIRK JACKSON
START TIME: 1:15PM
TEST PIT DEPTH: 5.75' TEST PIT DIA.: 2'
EXCAVATION METHOD: TRACTOR MOUNTED BACKHOE - CAT 420D
SAMPLING METHOD: NONE
TIME EXCAVATION COMPLETE: 1:35PM

## TEST PIT COMPLETION / ABANDONMENT INFORMATION

START TIME: 1:35PM COMPLETE TIME: 1:40PM
INSTRUMENTATION: NONE BACKFILL: CUTTINGS

## GROUNDWATER CONDITIONS

NO GROUNDWATER WAS ENCOUNTERED AT THE TIME OF EXCAVATION.

## FOLLOWING FIELD WORK

TIME OF CLEAN-UP COMPLETE: ... TIME LEFT SITE: ...

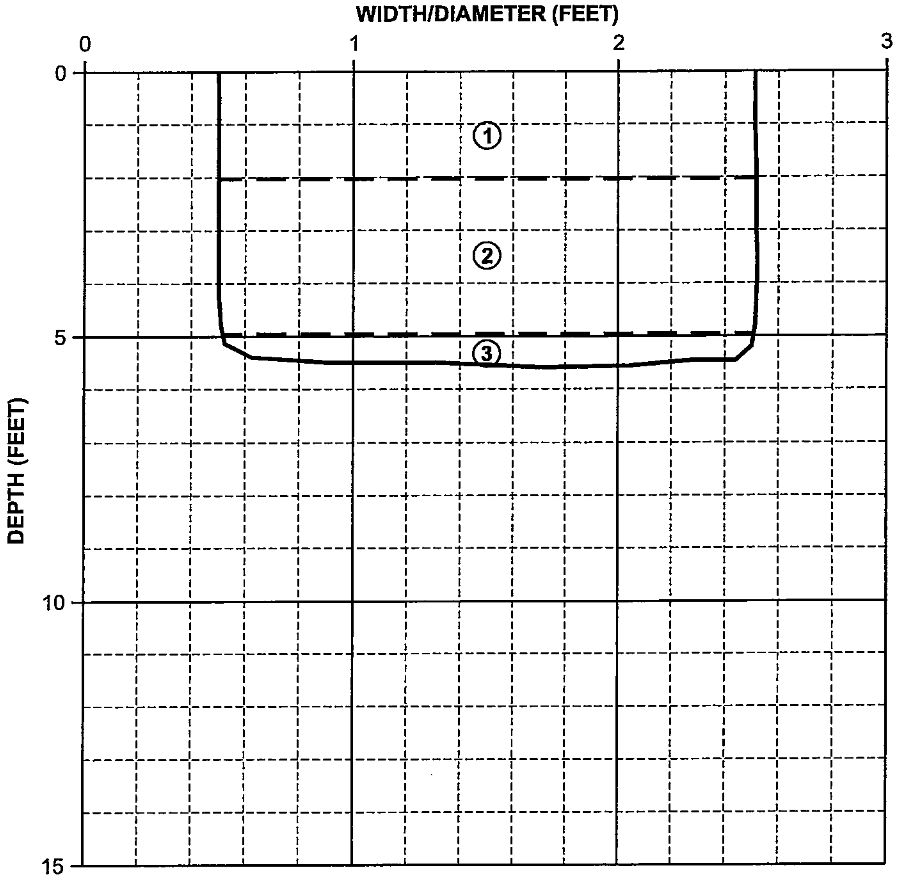
## NOTES:

EL, 4428', N 37°42.996', W 110°41.692'.

# TEST PIT LOG

**PROJECT:** *SHOOTARING CANYON*
**PAGE:** *2 OF 2*
**PROJECT NO.:** *181692*
**DATE:** *3/18/08*

**TEST PIT NO.:** **TP-31**



| DEPTH | SAMPLE I.D. | SAMPLE TYPE |
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| SOIL TYPE | SOIL DEPTH | SOIL DESCRIPTION AND EXCAVATION NOTES |
|---|---|---|
| ① | 0 - 2' | **FILL**<br>SAND AND GRAVEL, SAND MATRIX, FINE TO MEDIUM, GRAVEL WITH SOME COBBLE (DIORITE). |
| ② | 2' - 5' | **CLAY**<br>CH, MEDIUM TO HIGH PLASTICITY, TRACE SAND, PURPLISH RED. |
| ③ | 5' - 5.75' | **ENTRADA SANDSTONE**<br>MODERATELY HARD, FINE.<br>BACKHOE STOPPED AT 5.75'. |

**NOTES:**

# TEST PIT LOG

**PAGE:** 1 OF 2

**DATE:** 3/18/08

**TEST PIT NO.:** TP-32

## PROJECT INFORMATION

**PROJECT:** SHOOTARING CANYON

**PROJECT NO.:** 181692

**CLIENT:** URANIUM ONE

**OWNER:** URANIUM ONE

**LOCATION:** NORTH CELL

...

## TEST PIT LOCATION

SEE FIGURE 2-15 FOR LOCATION

## FIELD INFORMATION

**DATE & TIME ARRIVED:** 3/18/08 1:43PM

**TEST PIT LOGGED BY:** GREG SMITH, GEO-SMITH

**VISITORS:** NONE

**WEATHER:** CLEAR, WINDY, ~55°

## EXCAVATION INFORMATION

**EXCAVATION COMPANY:** KIRK JACKSON

**START TIME:** 1:43M

**TEST PIT DEPTH:** 4.5' **TEST PIT DIA.:** 2'

**EXCAVATION METHOD:** TRACTOR MOUNTED BACKHOE - CAT 420D

**SAMPLING METHOD:** NONE

**TIME EXCAVATION COMPLETE:** 1:50PM

## TEST PIT COMPLETION / ABANDONMENT INFORMATION

**START TIME:** 1:50PM **COMPLETE TIME:** 1:55PM

**INSTRUMENTATION:** NONE **BACKFILL:** CUTTINGS

## GROUNDWATER CONDITIONS

NO GROUNDWATER WAS ENCOUNTERED AT THE TIME OF EXCAVATION.

## FOLLOWING FIELD WORK

**TIME OF CLEAN-UP COMPLETE:** ... **TIME LEFT SITE:** ...

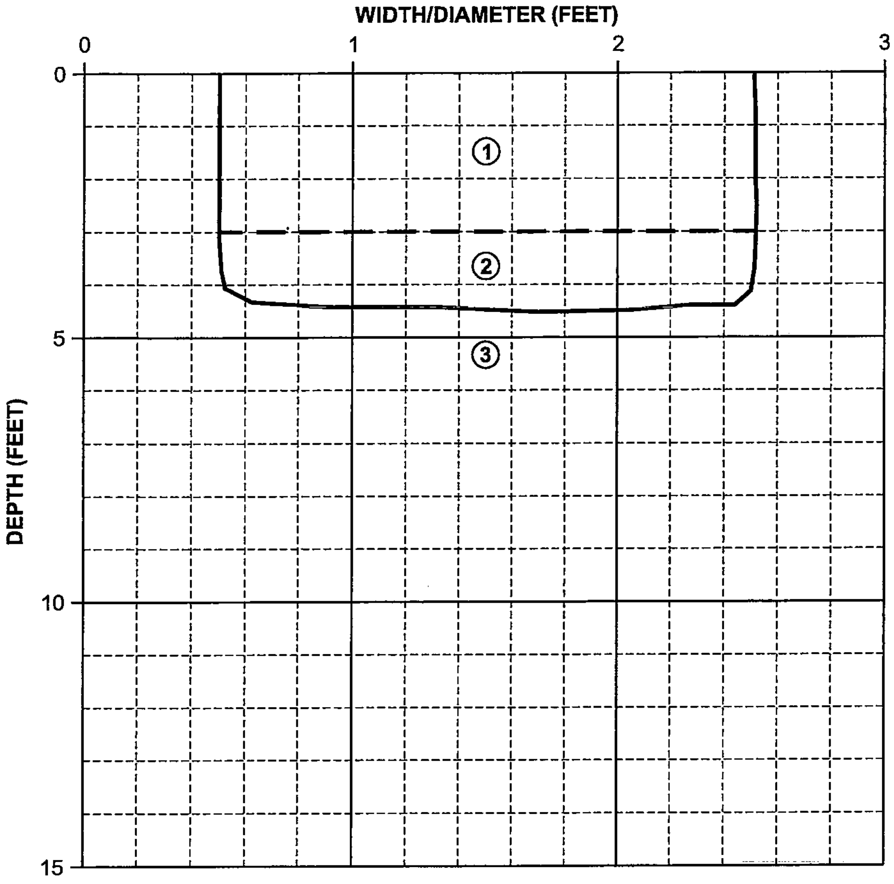
**NOTES:** EL, 4425', N 37°43.019', W 110°41.637'.

# TEST PIT LOG

**PROJECT:** *SHOOTARING CANYON* **PAGE:** 2 OF 2

**PROJECT NO.:** *181692* **DATE:** 3/18/08

**TEST PIT NO.:** **TP-32**



| DEPTH | SAMPLE I.D. | SAMPLE TYPE |
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| SOIL TYPE | SOIL DEPTH | SOIL DESCRIPTION AND EXCAVATION NOTES |
|---|---|---|
| ① | 0 - 3' | **FILL**<br>SAND, SP, PREDOMINANTLY FINE, NON-PLASTIC, TRACE FINES, RED. |
| ② | 3' - 4.5' | **CLAY**<br>CH, MEDIUM TO HIGH PLASTICITY, TRACE SAND, PURPLISH RED MOTTLED WITH GREEN-GRAY. |
| ③ | 4.5' + | **ENTRADA SANDSTONE**<br>MODERATELY HARD, FINE GRAINED, LIGHT RED. |

**NOTES:**

# TEST PIT LOG

PAGE: 1 OF 2

DATE: 3/18/08

TEST PIT NO.: **TP-33**

## PROJECT INFORMATION

PROJECT: SHOOTARING CANYON

PROJECT NO.: 181692

CLIENT: URANIUM ONE

OWNER: URANIUM ONE

LOCATION: NORTH CELL

...

## TEST PIT LOCATION

**SEE FIGURE 2-15 FOR LOCATION**

## FIELD INFORMATION

DATE & TIME ARRIVED: 3/18/08 1:55PM

TEST PIT LOGGED BY: GREG SMITH, GEO-SMITH

VISITORS: NONE

WEATHER: CLEAR, BREEZY, ~55°

## EXCAVATION INFORMATION

EXCAVATION COMPANY: KIRK JACKSON

START TIME: 1:57PM

TEST PIT DEPTH: 5.5' TEST PIT DIA.: 2'

EXCAVATION METHOD: TRACTOR MOUNTED BACKHOE - CAT 420D

SAMPLING METHOD: NONE

TIME EXCAVATION COMPLETE: 2:05PM

## TEST PIT COMPLETION / ABANDONMENT INFORMATION

START TIME: 2:05PM COMPLETE TIME: 2:07PM

INSTRUMENTATION: NONE BACKFILL: CUTTINGS

## GROUNDWATER CONDITIONS

NO GROUNDWATER WAS ENCOUNTERED AT THE TIME OF EXCAVATION.

## FOLLOWING FIELD WORK

TIME OF CLEAN-UP COMPLETE: ... TIME LEFT SITE: ...

**NOTES:** EL, 4439', N 37°43.002', W 110°41.607'.

# TEST PIT LOG

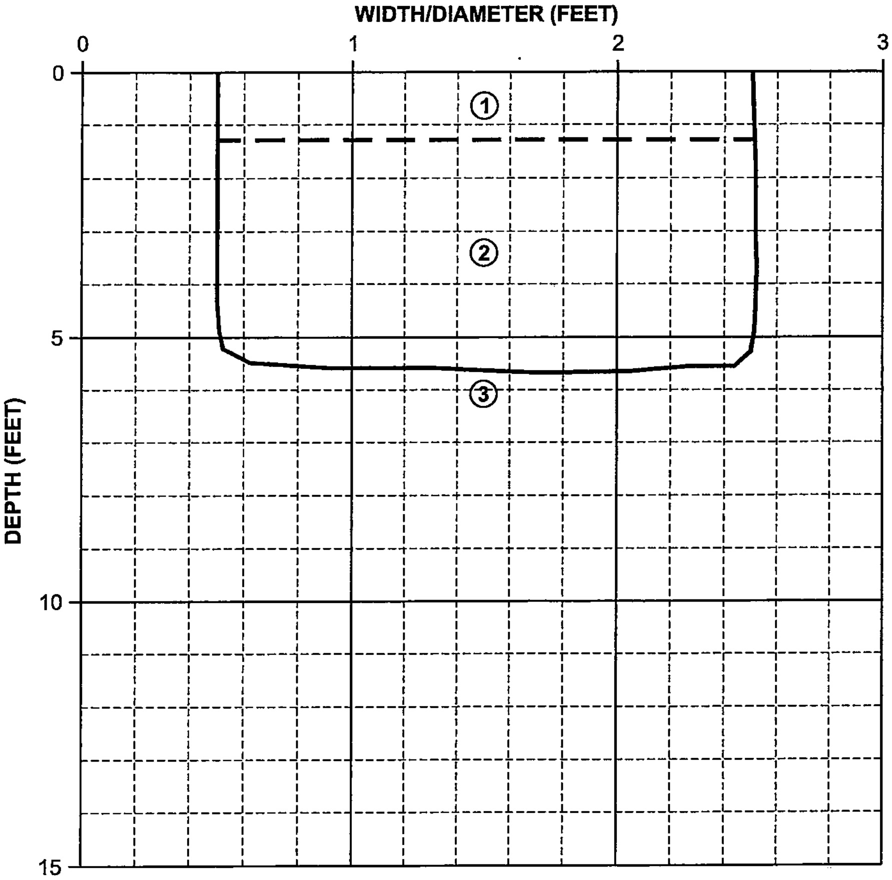
PROJECT: *SHOOTARING CANYON*

PAGE: *2 OF 2*

PROJECT NO.: *181692*

DATE: *3/18/08*

TEST PIT NO.: **TP-33**



| DEPTH | SAMPLE I.D. | SAMPLE TYPE |
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| SOIL TYPE | SOIL DEPTH | SOIL DESCRIPTION AND EXCAVATION NOTES |
|---|---|---|
| ① | 0 - 1.25' | **FILL**<br>SAND, SP, PREDOMINANTLY FINE, NON-PLASTIC, RED. |
| ② | 1.25' - 5.5' | **CLAY**<br>CH, MEDIUM TO HIGH PLASTICITY, TRACE SAND, DRY, PURPLISH RED MOTTLED WITH GREEN-GRAY. |
| ③ | 5.5' + | **ENTRADA SANDSTONE**<br>MODERATELY HARD, FINE GRAINED. |

NOTES:

# TEST PIT LOG

PAGE: 1 OF 2

DATE: 3/18/08

TEST PIT NO.: **TP-34**

## PROJECT INFORMATION

PROJECT: SHOOTARING CANYON
PROJECT NO.: 181692
CLIENT: URANIUM ONE
OWNER: URANIUM ONE
LOCATION: NORTH CELL
...

## TEST PIT LOCATION

**SEE FIGURE 2-15 FOR LOCATION**

## FIELD INFORMATION

DATE & TIME ARRIVED: 3/18/08 2:10PM
TEST PIT LOGGED BY: GREG SMITH, GEO-SMITH
VISITORS: NONE
WEATHER: CLEAR, BREEZY, ~55°

## EXCAVATION INFORMATION

EXCAVATION COMPANY: KIRK JACKSON
START TIME: 2:10PM
TEST PIT DEPTH: 4'
TEST PIT DIA.: 2'
EXCAVATION METHOD: TRACTOR MOUNTED BACKHOE - CAT 420D
SAMPLING METHOD: NONE
TIME EXCAVATION COMPLETE: 2:15PM

## TEST PIT COMPLETION / ABANDONMENT INFORMATION

START TIME: 2:15PM
COMPLETE TIME: 2:17PM
INSTRUMENTATION: NONE
BACKFILL: CUTTINGS

## GROUNDWATER CONDITIONS

NO GROUNDWATER WAS ENCOUNTERED AT THE TIME OF EXCAVATION.

## FOLLOWING FIELD WORK

TIME OF CLEAN-UP COMPLETE: ...
TIME LEFT SITE: ...

**NOTES:** EL, 4425', N 37°42.985', W 110°41.612'.

# TEST PIT LOG

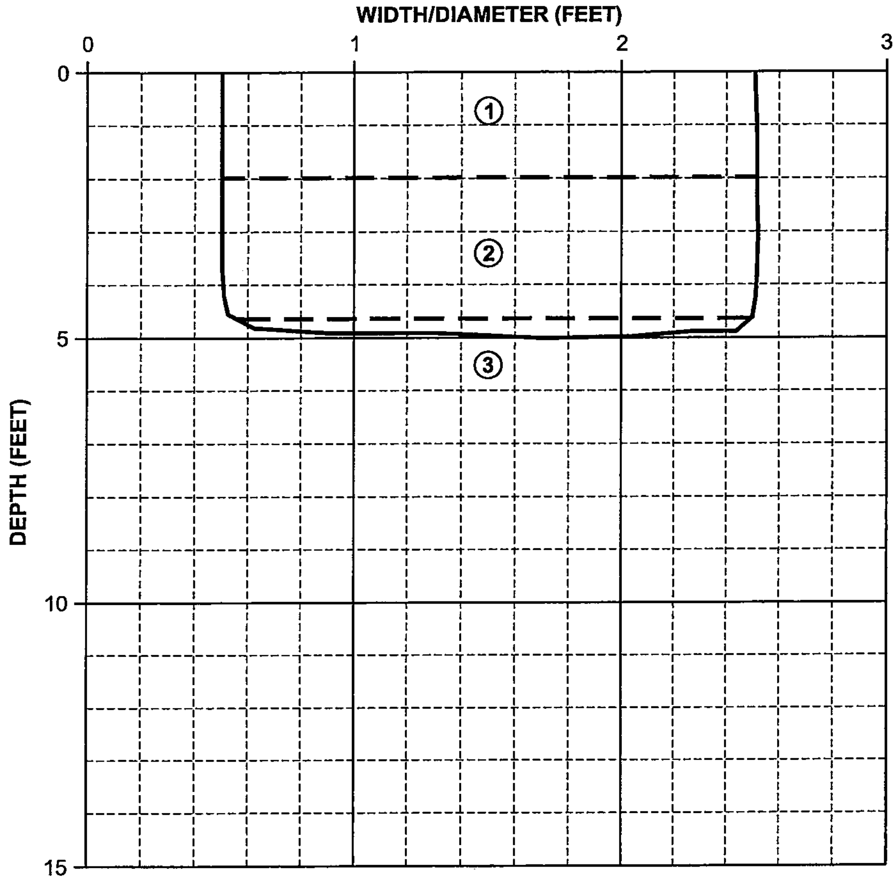
PROJECT: *SHOOTARING CANYON*

PAGE: *2 OF 2*

PROJECT NO.: *181692*

DATE: *3/18/08*

TEST PIT NO.: **TP-34**



| DEPTH | SAMPLE I.D. | SAMPLE TYPE |
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| SOIL TYPE | SOIL DEPTH | SOIL DESCRIPTION AND EXCAVATION NOTES |
|---|---|---|
| ① | 0 - 2' | **FILL**<br>SAND, SP, FINE, SOME GRAVEL, NON-PLASTIC, RED. |
| ② | 2' - 3.75' | **CLAY**<br>CH, MEDIUM TO HIGH PLASTICITY, PURPLISH RED MOTTLED WITH GREEN-GRAY. |
| ③ | 3.75' - 4' | **ENTRADA SANDSTONE**<br>FINE TO MODERATELY HARD, LIGHT RED. |

NOTES:

# TEST PIT LOG

PAGE: 1 OF 2

DATE: 3/18/08

TEST PIT NO.: **TP-35**

## PROJECT INFORMATION

PROJECT: SHOOTARING CANYON

PROJECT NO.: 181692

CLIENT: URANIUM ONE

OWNER: URANIUM ONE

LOCATION: NORTH CELL

...

## TEST PIT LOCATION

**SEE FIGURE 2-15 FOR LOCATION**

## FIELD INFORMATION

DATE & TIME ARRIVED: 3/18/08 2:20PM

TEST PIT LOGGED BY: GREG SMITH, GEO-SMITH

VISITORS: NONE

WEATHER: CLEAR, BREEZY, ~55°

## EXCAVATION INFORMATION

EXCAVATION COMPANY: KIRK JACKSON

START TIME: 2:20PM

TEST PIT DEPTH: 7'

TEST PIT DIA.: 2'

EXCAVATION METHOD: TRACTOR MOUNTED BACKHOE - CAT 420D

SAMPLING METHOD: NONE

TIME EXCAVATION COMPLETE: 2:28PM

## TEST PIT COMPLETION / ABANDONMENT INFORMATION

START TIME: 2:28PM

COMPLETE TIME: 2:35PM

INSTRUMENTATION: NONE

BACKFILL: CUTTINGS

## GROUNDWATER CONDITIONS

NO GROUNDWATER WAS ENCOUNTERED AT THE TIME OF EXCAVATION.

## FOLLOWING FIELD WORK

TIME OF CLEAN-UP COMPLETE: ...

TIME LEFT SITE: ...

## NOTES:

EL, 4428', N 37°42.964', W 110°41.592'.

# TEST PIT LOG

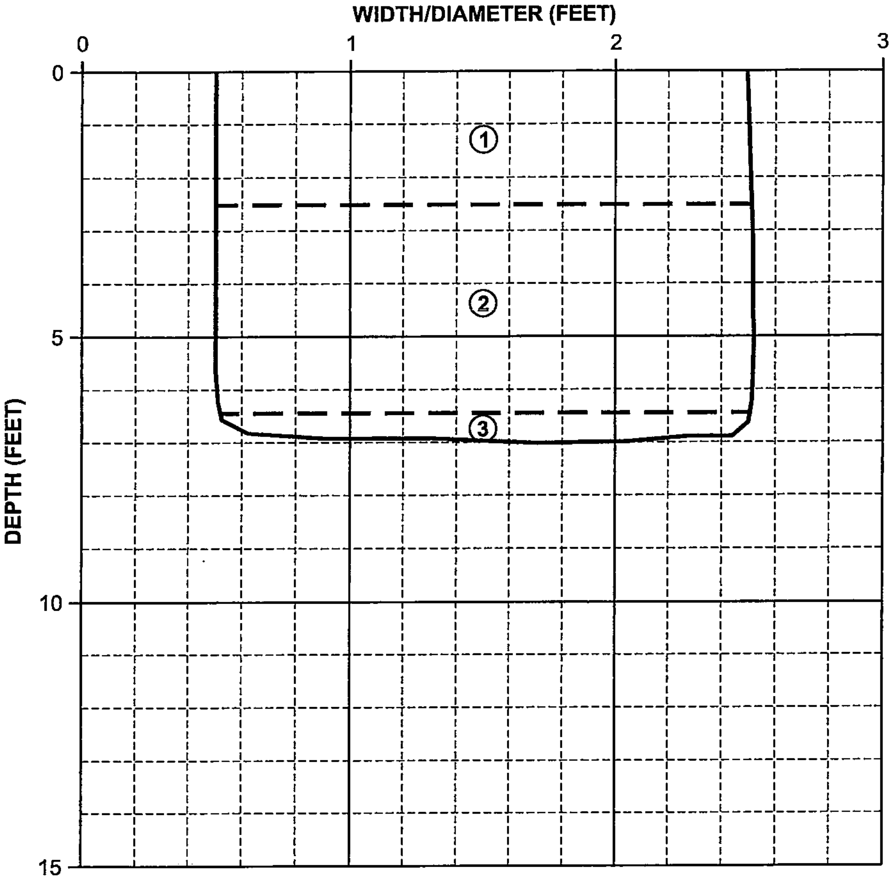
**PROJECT:** *SHOOTARING CANYON*

**PAGE:** *2 OF 2*

**PROJECT NO.:** *181692*

**DATE:** *3/18/08*

**TEST PIT NO.:** **TP-35**



| DEPTH | SAMPLE I.D. | SAMPLE TYPE |
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| SOIL TYPE | SOIL DEPTH | SOIL DESCRIPTION AND EXCAVATION NOTES |
|---|---|---|
| ① | 0 - 2.5' | **FILL**<br>SAND, SP, PREDOMINANTLY FINE, TRACE FINES, OCCASIONAL GRAVEL, NON-PLASTIC, RED. |
| ② | 2.5' - 6.5' | **CLAY**<br>CH, MEDIUM TO HIGH PLASTICITY, TRACE SAND, DRY, PURPLISH RED MOTTLED WITH GREEN-GRAY. |
| ③ | 6.5' - 7' | **ENTRADA SANDSTONE**<br>MODERATELY HARD, FINE GRAINED, LIGHT RED.<br>BACKHOE REFUSAL AT 7'. |

**NOTES:**

# TEST PIT LOG

PAGE: 1 OF 2

DATE: 3/18/08

TEST PIT NO.:

**TP-36**

## PROJECT INFORMATION

PROJECT: SHOOTARING CANYON

PROJECT NO.: 181692

CLIENT: URANIUM ONE

OWNER: URANIUM ONE

LOCATION: NORTH CELL

...

## TEST PIT LOCATION

SEE FIGURE 2-15 FOR LOCATION

## FIELD INFORMATION

DATE & TIME ARRIVED: 3/18/08 2:30PM

TEST PIT LOGGED BY: GREG SMITH, GEO-SMITH

VISITORS: NONE

WEATHER: CLEAR, BREEZY, ~55°

## EXCAVATION INFORMATION

EXCAVATION COMPANY: KIRK JACKSON

START TIME: 2:30PM

TEST PIT DEPTH: 8.5' TEST PIT DIA.: 2'

EXCAVATION METHOD: TRACTOR MOUNTED BACKHOE - CAT 420D

SAMPLING METHOD: NONE

TIME EXCAVATION COMPLETE: 2:43PM

## TEST PIT COMPLETION / ABANDONMENT INFORMATION

START TIME: 2:43PM COMPLETE TIME: 2:45PM

INSTRUMENTATION: NONE BACKFILL: CUTTINGS

## GROUNDWATER CONDITIONS

NO GROUNDWATER WAS ENCOUNTERED AT THE TIME OF EXCAVATION.

## FOLLOWING FIELD WORK

TIME OF CLEAN-UP COMPLETE: ... TIME LEFT SITE: ...

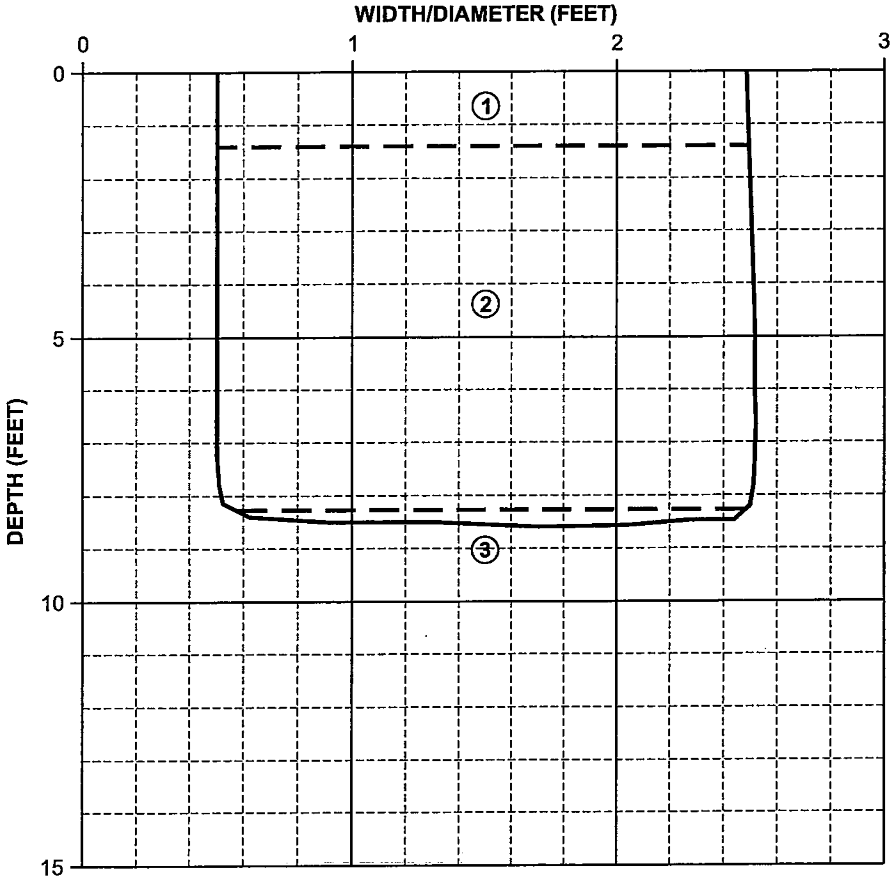
NOTES: EL, 4422', N 37°42.971', W 110°41.650'.

# TEST PIT LOG

**PROJECT:** *SHOOTARING CANYON* **PAGE:** 2 OF 2

**PROJECT NO.:** *181692* **DATE:** 3/18/08

**TEST PIT NO.:** **TP-36**



| DEPTH | SAMPLE I.D. | SAMPLE TYPE |
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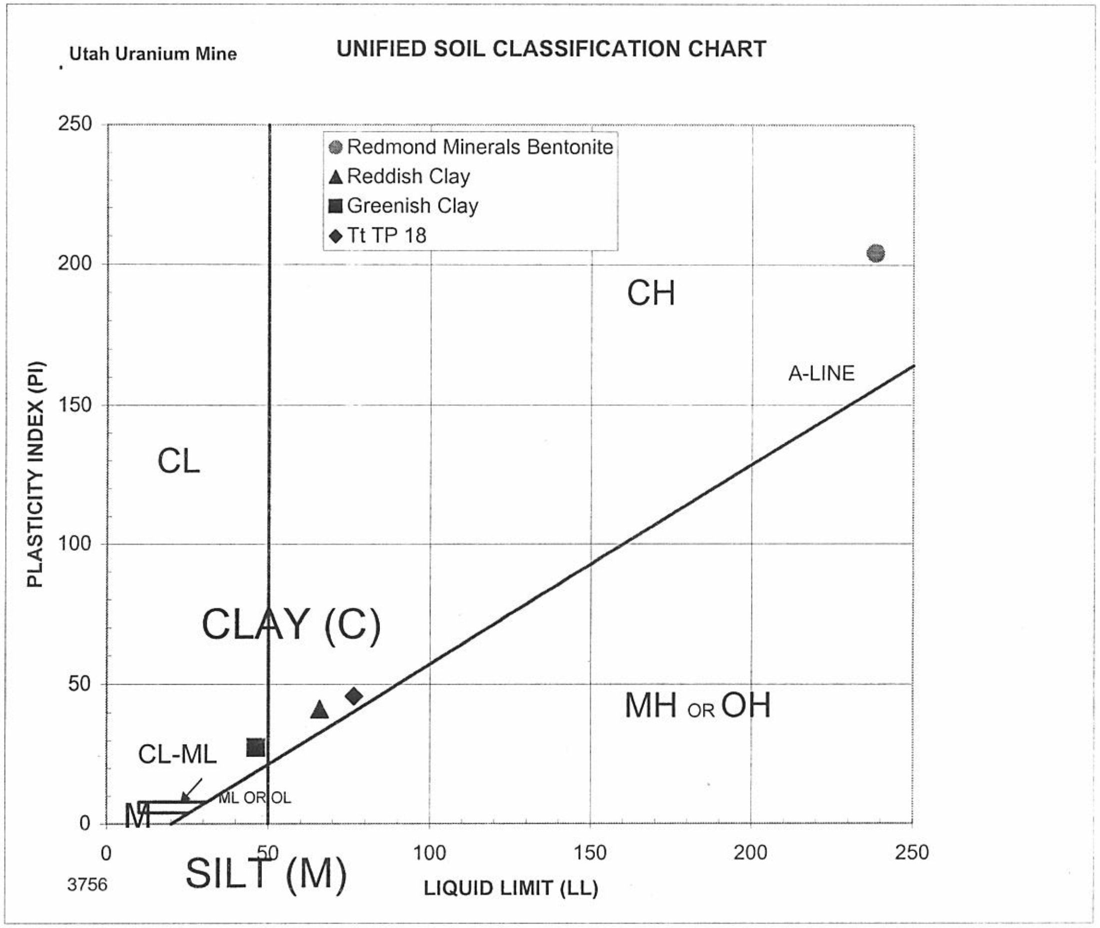
| SOIL TYPE | SOIL DEPTH | SOIL DESCRIPTION AND EXCAVATION NOTES |
|---|---|---|
| ① | 0 - 1.4' | **FILL**<br>SAND, SP, PREDOMINANTLY FINE, NON-PLASTIC, RED. |
| ② | 1.4' - 8.2' | **CLAY**<br>CH, MEDIUM TO HIGH PLASTICITY, DRY TO MOIST WITH DEPTH, SOME SAND AND ROCK FRAGMENTS, PURPLISH RED MOTTLED WITH GREEN-GRAY. |
| ③ | 8.2' - 8.5' | **ENTRADA SANDSTONE**<br>MODERATELY HARD, FINE, LIGHT RED. |

**NOTES:**

# APPENDIX C.3.3
# LABORATORY TESTING RESULTS

# APPENDIX C.3.3.1
# CAPSTONE ENTERPRISES WEST, LLC
# LABORATORY TESTING RESULTS

|  | LL | PL | PI |
|---|---|---|---|
| Redmond Minerals Bentonite | 238 | 34 | 204 |
| Reddish Clay | 66 | 25 | 41 |
| Greenish Clay | 46 | 19 | 27 |
| Tt TP 18 | 77 | 31 | 46 |
| Tt Tp 6 | 23 | NP | NP |
| Tt Tp 27 | NV | NP | NP |



Utah Uranium Mine

UNIFIED SOIL CLASSIFICATION CHART

CAPSTONE
ENTERPRISES WEST, LLC
GEOTECHNICAL AND MINING ENGINEERING
TESTING AND INSPECTION SERVICES

618 PARTEE DRIVE
GRAND JUNCTION, CO 81504
PHONE (970) 250-3331 FAX (970) 241-9721
capstonewest@juno.com

# Particle Size Analysis of Soils

**CLIENT** Geosmith Engineering

**PROJECT** Utah Uranium Mine

**SAMPLE DESCRIPTION** 15% Bentonite composite of 1,2,3,4

| U.S. Standard Sieve Size | WEIGHT RETAINED | TOTAL WEIGHT RETAINED | TOTAL WEIGHT PASSING | PERCENT PASSING |
|---|---|---|---|---|
| | | | | |
| # 4 | | 0 | 845.2 | 100.0% |
| # 8 | | 0.7 | 844.5 | 99.9% |
| # 10 | | 0.8 | 844.4 | 99.9% |
| # 16 | | 1.3 | 843.9 | 99.8% |
| # 30 | | 2.6 | 842.6 | 99.7% |
| # 40 | | 4.7 | 840.5 | 99.4% |
| # 50 | | 18.6 | 826.6 | 97.8% |
| # 100 | | 439.2 | 406.0 | 48.0% |
| # 200 | | 666.5 | 178.7 | 21.1% |
| PAN | | 678.4 | 166.8 | |
| TOTAL PAN | | 845.2 | 0.0 | 0% |

| U.S. Standard Sieve Size | PERCENT PASSING |
|---|---|
| # 4 | 100% |
| # 8 | 100% |
| # 10 | 100% |
| # 16 | 100% |
| # 30 | 100% |
| # 40 | 99% |
| # 50 | 98% |
| # 100 | 48% |
| # 200 | 21% |

| Particle Size mm | PERCENT PASSING |
|---|---|
| 0.0271 | 20% |
| 0.0172 | 20% |
| 0.0097 | 18% |
| 0.0073 | 17% |
| 0.0040 | 16% |
| 0.0032 | 16% |
| 0.0027 | 15% |
| 0.0022 | 15% |
| 0.0011 | 12% |

**CLIENT** GeoSmith

**PROJECT** Utah Uranium Mine

**SAMPLE DESCRIPTION** Composite of Samples 2, 3, and 4

| U.S. Standard Sieve Size | WEIGHT RETAINED | TOTAL WEIGHT RETAINED | TOTAL WEIGHT PASSING | PERCENT PASSING | SPEC |
|---|---|---|---|---|---|
| 3/8" | | | | | |
| #4 | | | | | |
| #8 | | | | | |
| #10 | | | 978.5 | 100% | |
| #16 | | 0.0 | 978.5 | 100% | |
| #30 | | 0.9 | 977.6 | 100% | |
| #40 | | 2.9 | 975.6 | 100% | |
| #50 | | 22.7 | 955.8 | 98% | |
| # 100 | | 636.9 | 341.6 | 35% | |
| # 200 | | 912.4 | 66.1 | 6.8% | |
| PAN | | 922.3 | 56.2 | | |
| TOTAL PAN | | 978.5 | 0.0 | 0% | |

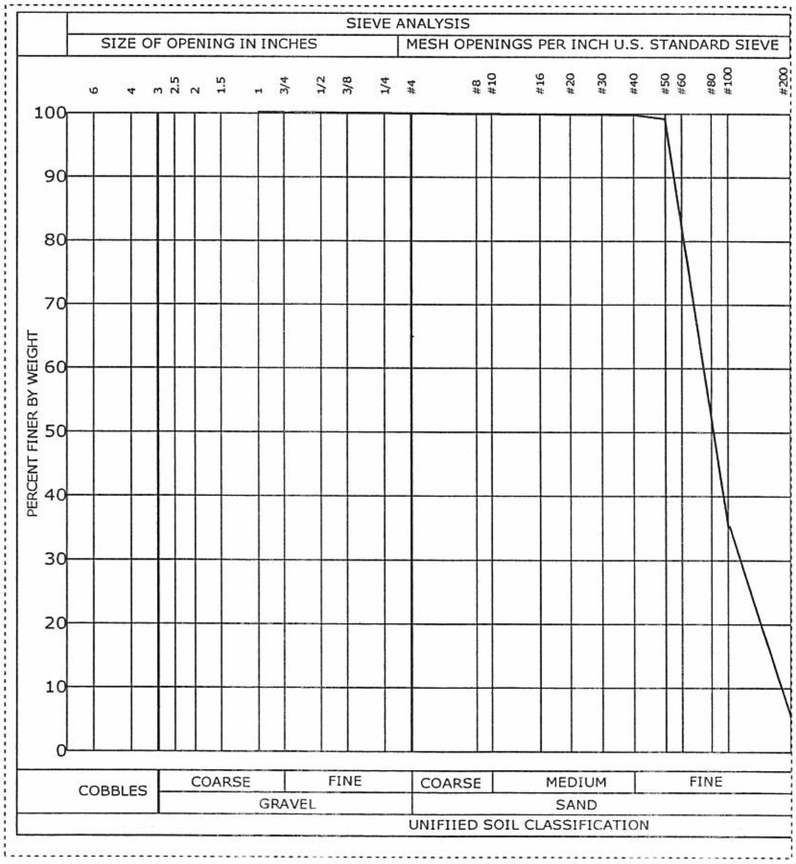
**MOISTURE CONTENT**

| | |
|---|---|
| WET WT + CONTAINER | 1932.5 |
| DRY WT + CONTAINER | 1914.2 |
| CONTAINER WT | 934.9 |
| MOISTURE CONTENT | 1.9% |

**PAN FRACTION**

| | |
|---|---|
| WET WT + CONTAINER | |
| CONTAINER WT | |
| WET WT | |
| | |
| DRY WT | 979.3 |
| | |
| WASHED DRY WT | 923.1 |
| | |
| FINES BY WASHING | 56.2 |
| FINES BY SIEVING | 9.9 |
| | |
| TOTAL FINES | 66.1 |

**NOTES**



**CLIENT** GeoSmith

**PROJECT** Utah Uranium Mine

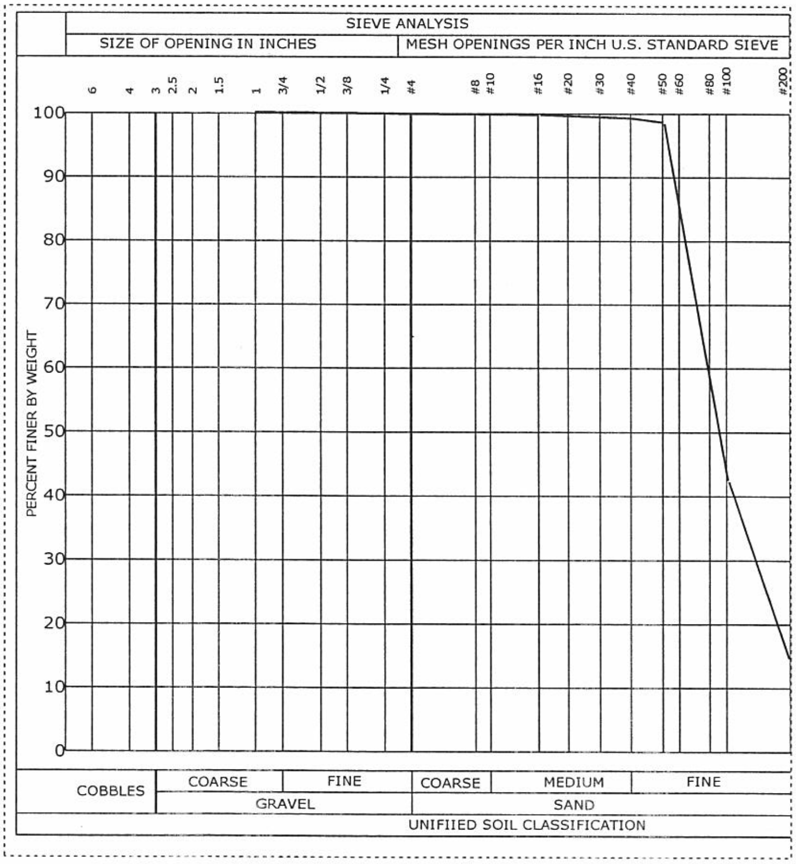
**SAMPLE DESCRIPTION** Sample 1 with Ca CO3

| U.S. Standard Sieve Size | WEIGHT RETAINED | TOTAL WEIGHT RETAINED | TOTAL WEIGHT PASSING | PERCENT PASSING | SPEC |
|---|---|---|---|---|---|
| 3/8" | | | | | |
| #4 | | 0 | 1422.5 | 100% | |
| #8 | | 2.2 | 1420.3 | 100% | |
| #10 | | 2.9 | 1419.6 | 100% | |
| #16 | | 6.0 | 1416.5 | 100% | |
| #30 | | 13.8 | 1408.7 | 99% | |
| #40 | | 21.3 | 1401.2 | 99% | |
| #50 | | 49.1 | 1373.4 | 97% | |
| # 100 | | 810.6 | 611.9 | 43% | |
| # 200 | | 1222.5 | 200.0 | 14.1% | |
| PAN | | 1242.2 | 180.3 | | |
| TOTAL PAN | | 1422.5 | 0.0 | 0% | |

| **MOISTURE CONTENT** | |
|---|---|
| WET WT + CONTAINER | 2403.3 |
| DRY WT + CONTAINER | 2389.7 |
| CONTAINER WT | 966.9 |
| MOISTURE CONTENT | 1.0% |

| **PAN FRACTION** | |
|---|---|
| WET WT + CONTAINER | |
| CONTAINER WT | |
| WET WT | |
| | |
| DRY WT | 1422.8 |
| | |
| WASHED DRY WT | 1242.5 |
| | |
| FINES BY WASHING | 180.3 |
| FINES BY SIEVING | 19.7 |
| | |
| TOTAL FINES | 200.0 |

**NOTES**



**CLIENT** GeoSmith

**PROJECT** Utah Uranium Mine

**SAMPLE DESCRIPTION** 15 % Bentonite

| U.S. Standard Sieve Size | WEIGHT RETAINED | TOTAL WEIGHT RETAINED | TOTAL WEIGHT PASSING | PERCENT PASSING | SPEC |
|---|---|---|---|---|---|
| 3/8" | | | | | |
| #4 | | | | | |
| #8 | | 0.7 | 844.5 | 100% | |
| #10 | | 0.8 | 844.4 | 100% | |
| #16 | | 1.3 | 843.9 | 100% | |
| #30 | | 2.6 | 842.6 | 100% | |
| #40 | | 4.7 | 840.5 | 99% | |
| #50 | | 18.6 | 826.6 | 98% | |
| # 100 | | 439.2 | 406.0 | 48% | |
| # 200 | | 666.5 | 178.7 | 21.1% | |
| PAN | | 678.4 | 166.8 | | |
| TOTAL PAN | | 845.2 | 0.0 | 0% | |

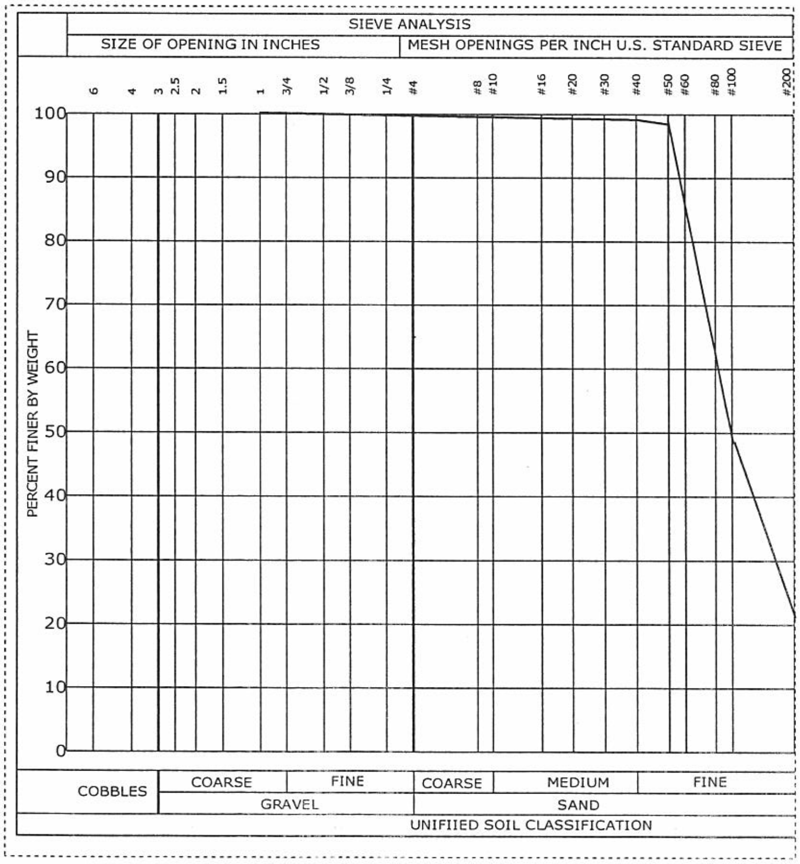
**MOISTURE CONTENT**

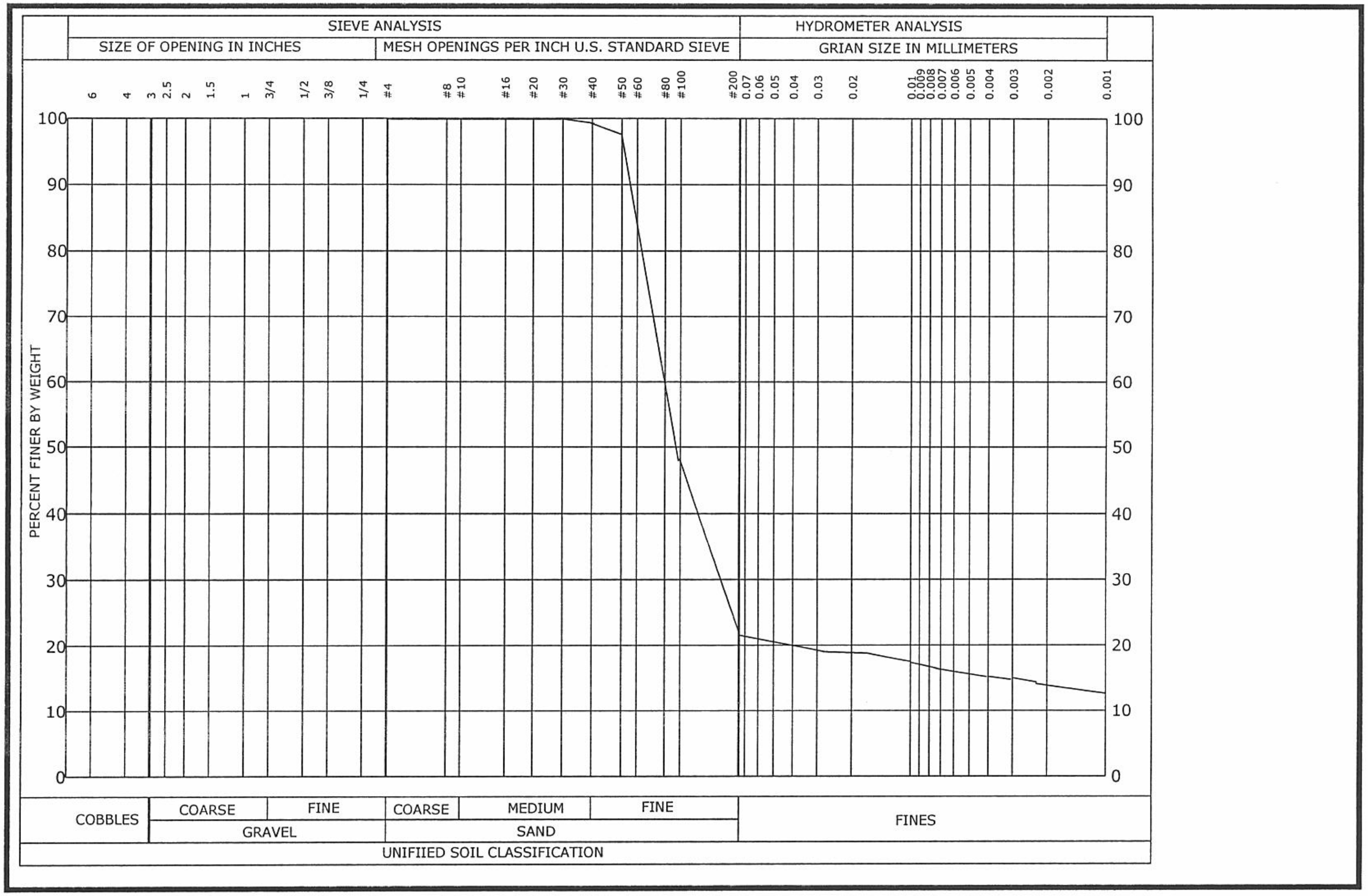
| | |
|---|---|
| WET WT + CONTAINER | 894.3 |
| DRY WT + CONTAINER | 891.1 |
| CONTAINER WT | 186.2 |
| MOISTURE CONTENT | 0.5% |

**PAN FRACTION**

| | |
|---|---|
| WET WT + CONTAINER | 849.7 |
| CONTAINER WT | 0 |
| WET WT | 849.7 |
| | |
| DRY WT | 845.9 |
| | |
| WASHED DRY WT | 679.1 |
| | |
| FINES BY WASHING | 166.8 |
| FINES BY SIEVING | 11.9 |
| | |
| TOTAL FINES | 178.7 |

**NOTES**





15% BENTONITE BLEND

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capstonewest@juno.com

# Particle Size Analysis of Soils

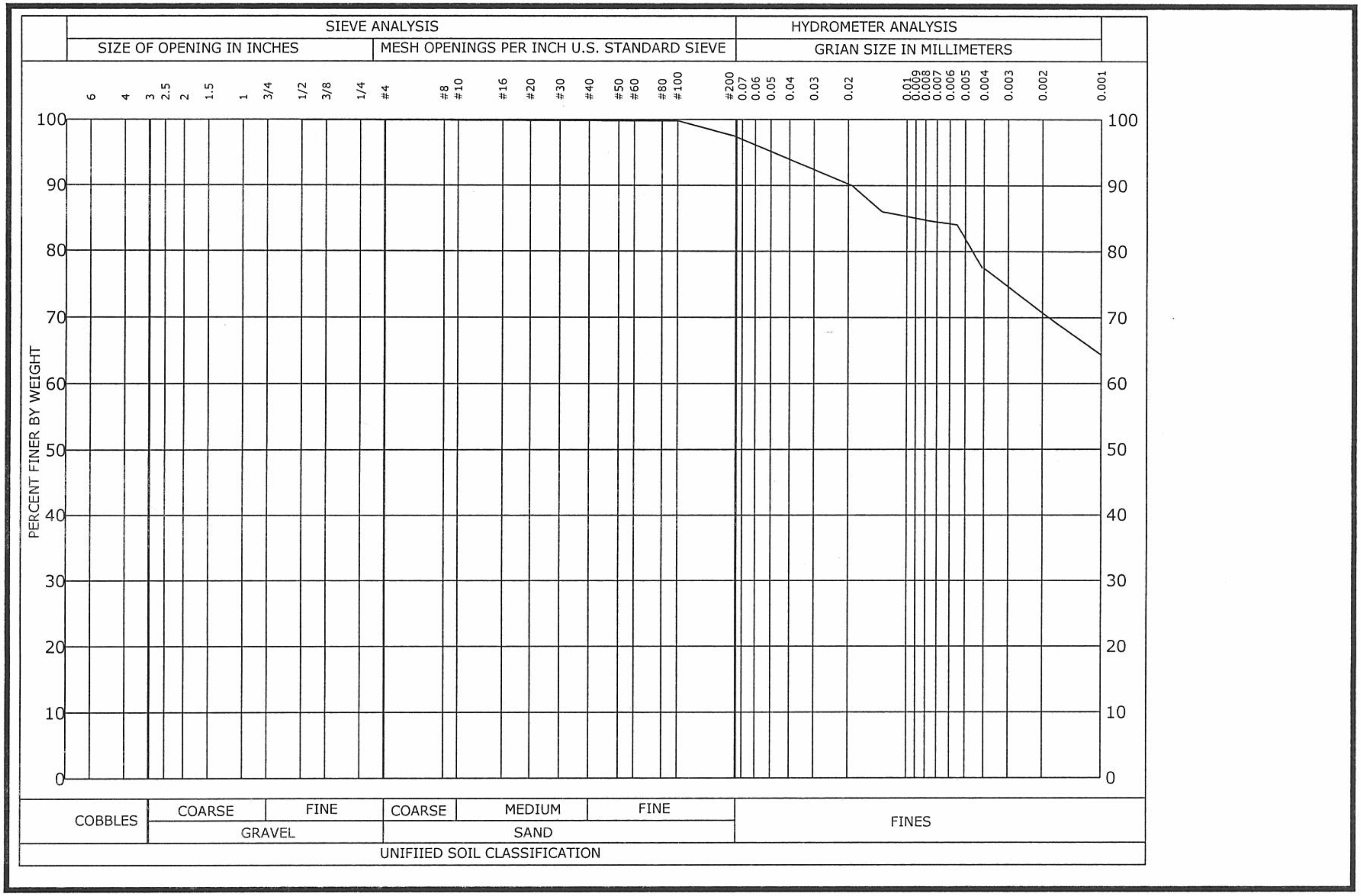
**CLIENT** Geosmith Engineering

**PROJECT** Utah Uranium Mine

**SAMPLE DESCRIPTION** Bentonite

| U.S. Standard Sieve Size | WEIGHT RETAINED | TOTAL WEIGHT RETAINED | TOTAL WEIGHT PASSING | PERCENT PASSING |
|---|---|---|---|---|
| 3/8" | | | 51.4 | 100.0% |
| # 4 | | | 51.4 | 100.0% |
| # 8 | | | 51.4 | 100.0% |
| # 10 | | | 51.4 | 100.0% |
| # 16 | | | 51.4 | 100.0% |
| # 30 | | | 51.4 | 100.0% |
| # 40 | | | 51.4 | 100.0% |
| # 50 | | | 51.4 | 100.0% |
| # 100 | | 0.0 | 51.4 | 100.0% |
| # 200 | | 1.3 | 50.1 | 97.5% |
| PAN | | 3.9 | 47.5 | |
| TOTAL PAN | | 51.4 | 0.0 | 0% |

| U.S. Standard Sieve Size | PERCENT PASSING |
|---|---|
| 1/2" | 100% |
| 3/8" | 100% |
| # 4 | 100% |
| # 8 | 100% |
| # 10 | 100% |
| # 16 | 100% |
| # 30 | 100% |
| # 40 | 100% |
| # 50 | 100% |
| # 100 | 100% |
| # 200 | 98% |
| **Particle Size mm** | **PERCENT PASSING** |
| 0.0198 | 90% |
| 0.0130 | 85% |
| 0.0076 | 84% |
| 0.0053 | 83% |
| 0.0040 | 78% |
| 0.0017 | 70% |
| 0.0008 | 64% |
| | |
| | |


SIEVE ANALYSIS
HYDROMETER ANALYSIS
SIZE OF OPENING IN INCHES
MESH OPENINGS PER INCH U.S. STANDARD SIEVE
GRIAN SIZE IN MILLIMETERS
6
4
3
2.5
2
1.5
1
3/4
1/2
3/8
1/4
#4
#8
#10
#16
#20
#30
#40
#50
#60
#80
#100
#200
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0.009
0.008
0.007
0.006
0.005
0.004
0.003
0.002
0.001
PERCENT FINER BY WEIGHT
100
90
80
70
60
50
40
30
20
10
0
COBBLES
COARSE
FINE
GRAVEL
COARSE
MEDIUM
FINE
SAND
FINES
UNIFIIED SOIL CLASSIFICATION

Bentonite

**CLIENT** GeoSmith

**PROJECT** Utah Uranium Mine

**SAMPLE DESCRIPTION** Redmonds Materials Bentonite

dry sieve method

| U.S. Standard Sieve Size | WEIGHT RETAINED | TOTAL WEIGHT RETAINED | TOTAL WEIGHT PASSING | PERCENT PASSING | SPEC |
|---|---|---|---|---|---|
| 3/8" | | | | | |
| #4 | | 0 | 203.3 | 100% | |
| #8 | | 0 | 203.3 | 100% | |
| #10 | | 0.0 | 203.3 | 100% | |
| #16 | | 0.0 | 203.3 | 100% | |
| #30 | | 0.0 | 203.3 | 100% | |
| #40 | | 0.0 | 203.3 | 100% | |
| #50 | | 1.1 | 202.2 | 99% | |
| # 100 | | 16.1 | 187.2 | 92% | |
| # 200 | | 67.1 | 136.2 | 67.0% | |
| PAN | | 203.3 | 0.0 | | |
| TOTAL PAN | | 203.3 | 0.0 | 0% | |

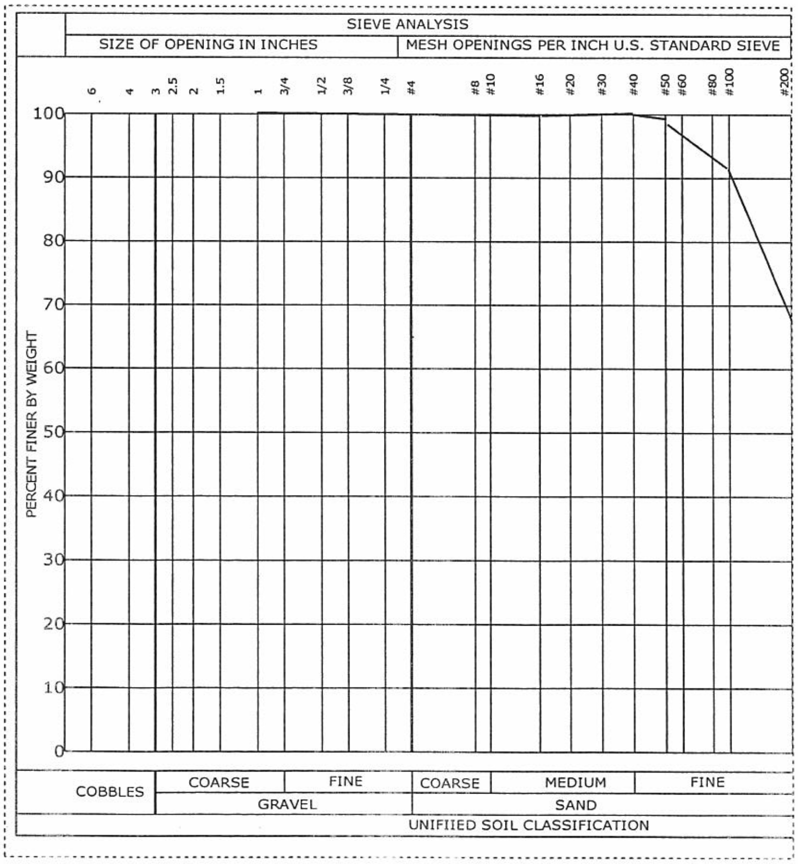
**MOISTURE CONTENT**

| | |
|---|---|
| WET WT + CONTAINER | |
| DRY WT + CONTAINER | |
| CONTAINER WT | |
| MOISTURE CONTENT | |

**PAN FRACTION**

| | |
|---|---|
| WET WT + CONTAINER | |
| CONTAINER WT | |
| WET WT | |
| | |
| DRY WT | 203.3 |
| | |
| WASHED DRY WT | 203.3 |
| | |
| FINES BY WASHING | 0.0 |
| FINES BY SIEVING | 136.2 |
| | |
| TOTAL FINES | 136.2 |

**NOTES**



Geosmith

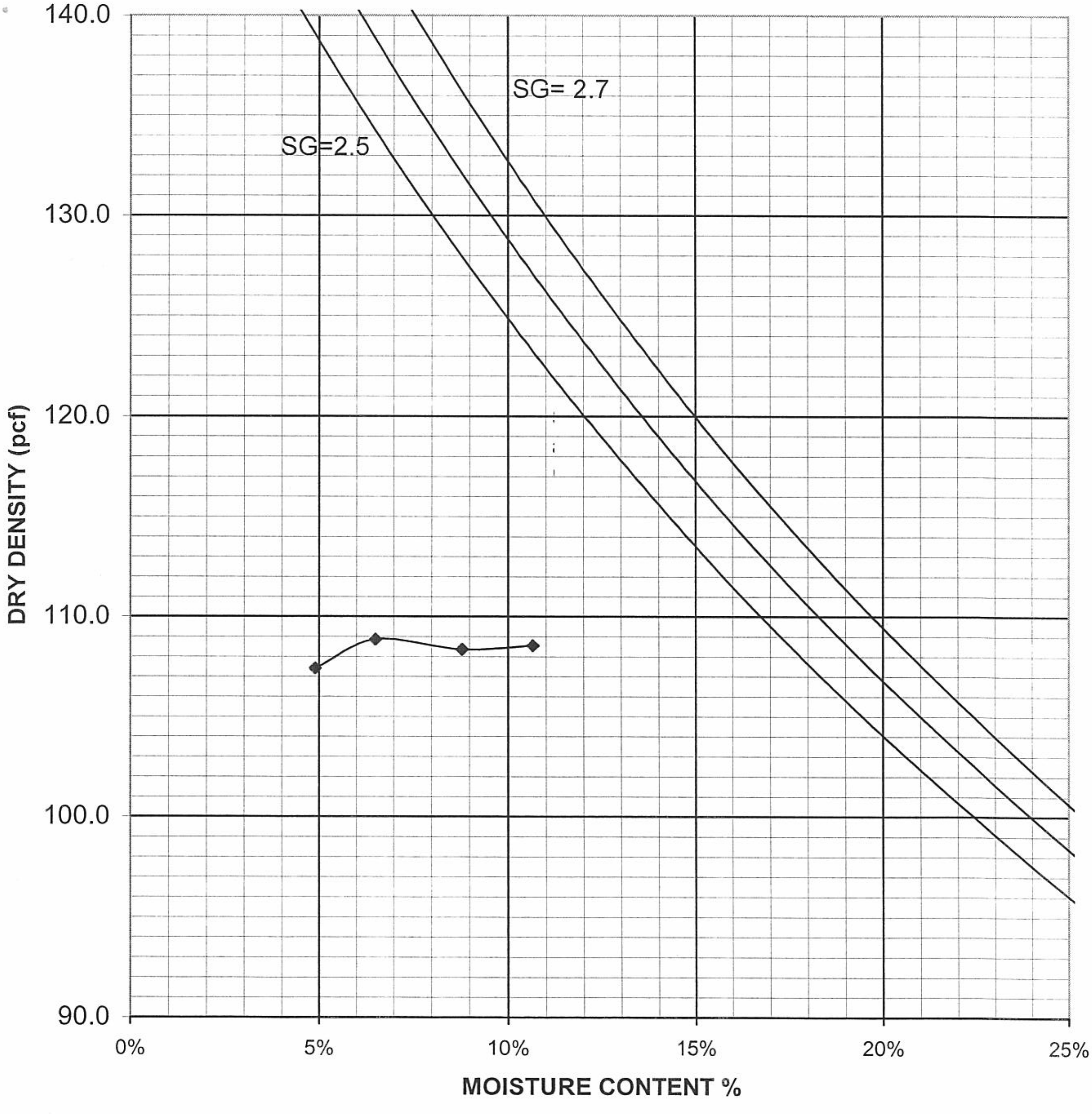
# MOISTURE-DENSITY RELATION (ASTM D-698)

Utah Uranium
Mine

3756

Sand with 0% Bentonite

108.9 pcf @ 6.5% MOISTURE



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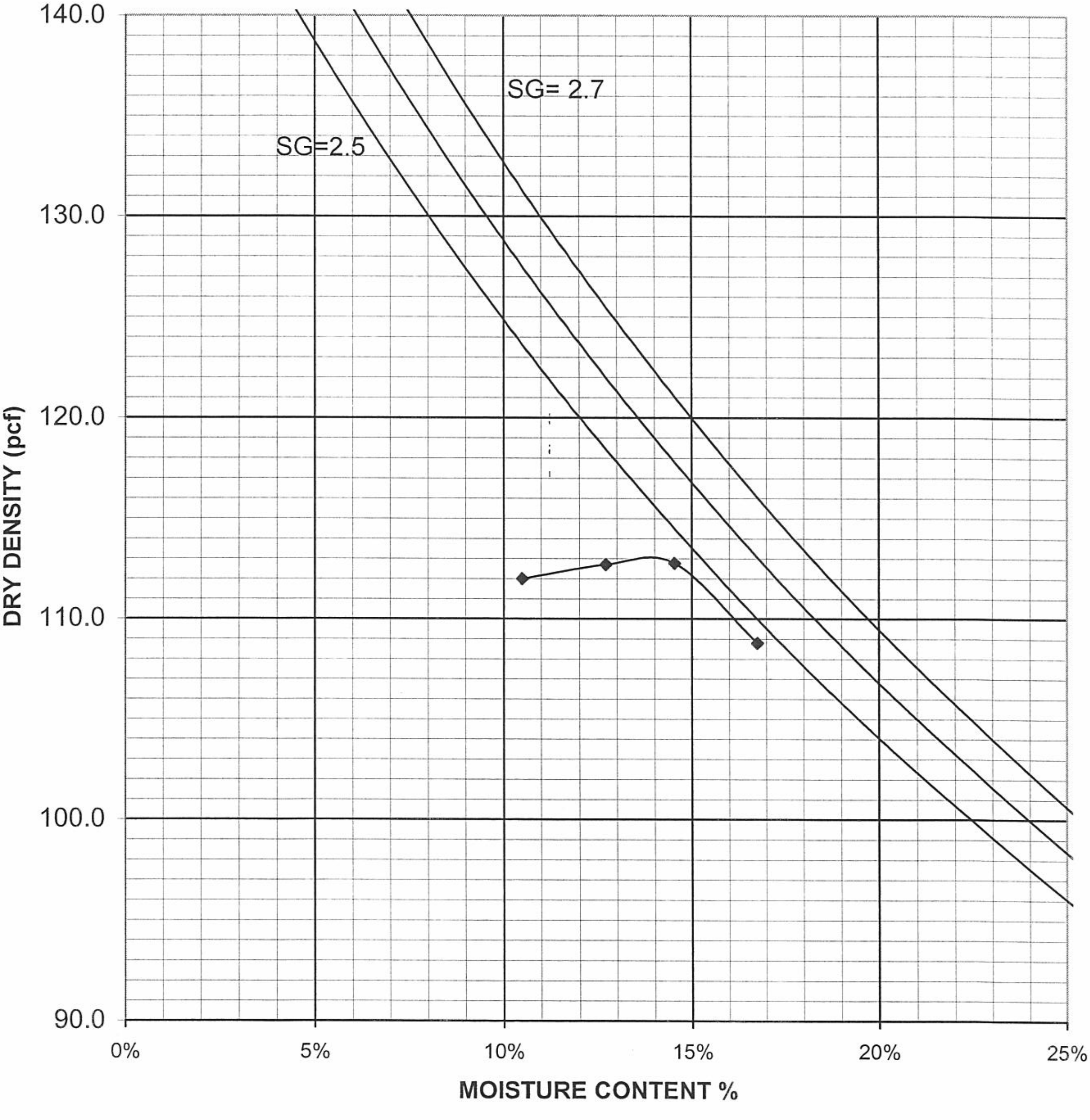
Utah Uranium
Mine

3756

# MOISTURE-DENSITY RELATION (ASTM D-698)

Sand with 5% Bentonite

113.0 pcf @ 13.6



Geosmith

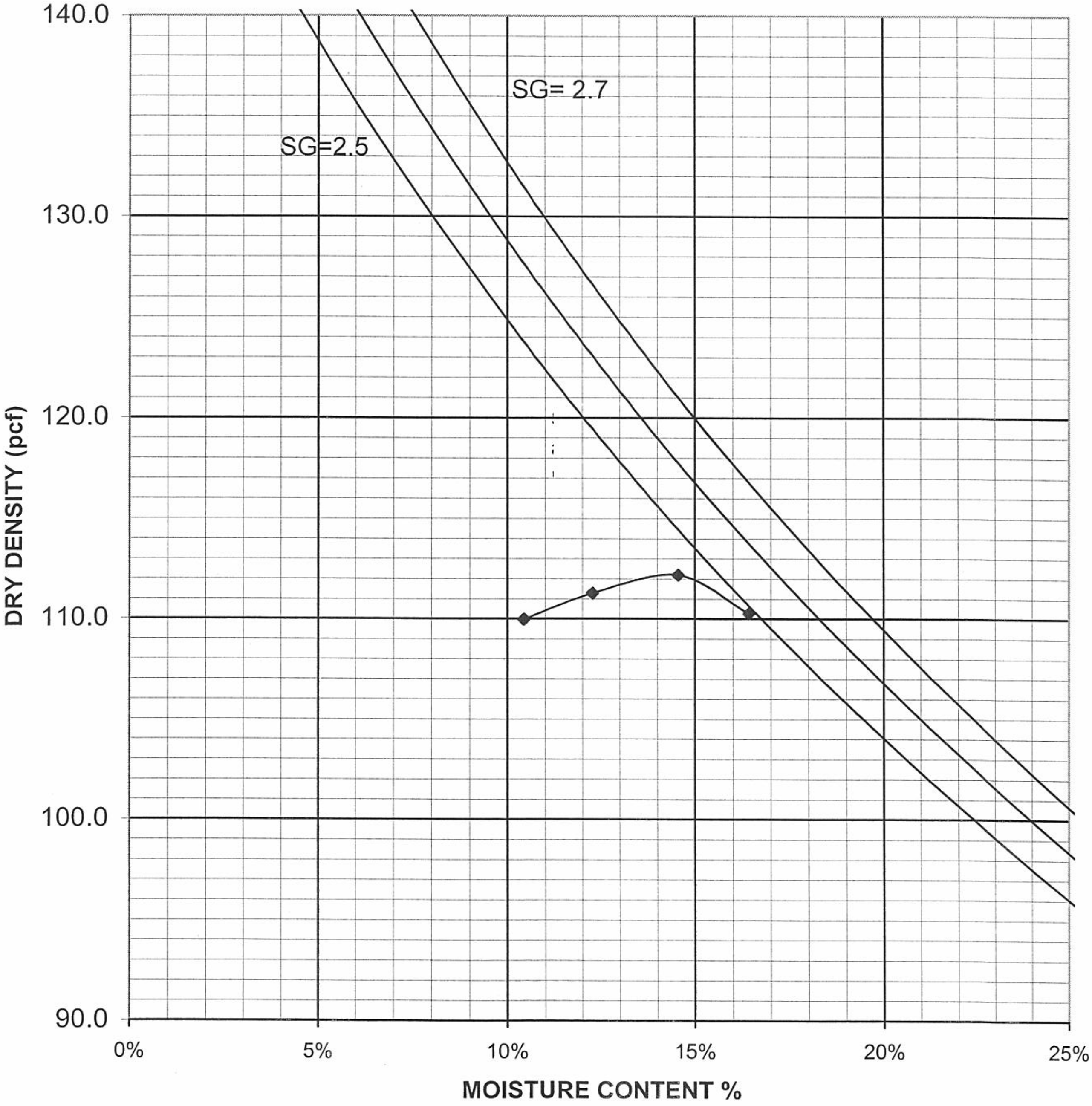
## MOISTURE-DENSITY RELATION (ASTM D-698)

Utah Uranium
Mine

Sand with 10% Bentonite

3756

112.2 pcf @ 14.0



Geosmith

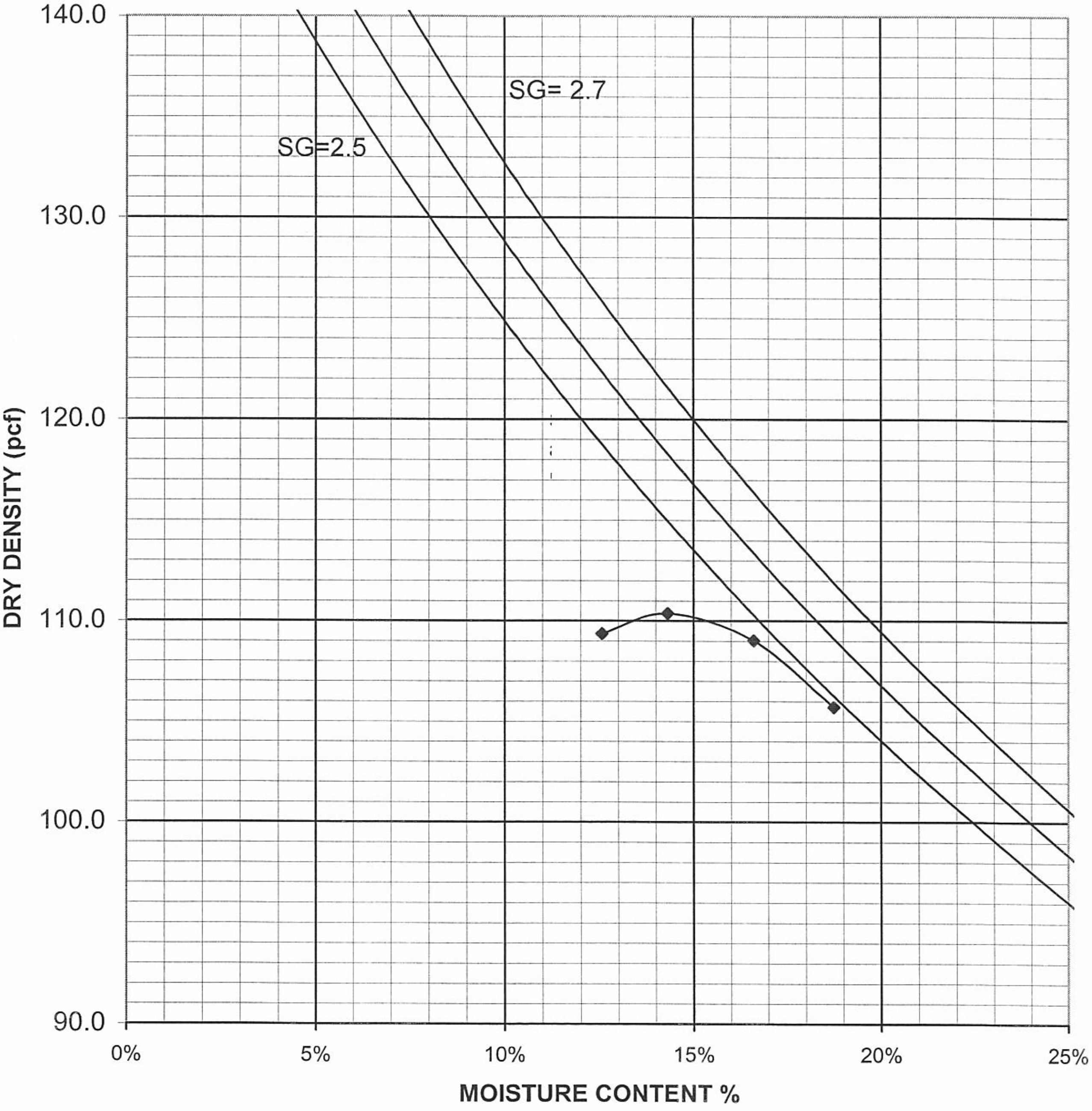
Utah Uranium
Mine

3756

# MOISTURE-DENSITY RELATION (ASTM D-698)

Sand with 15% Bentonite

110.5 pcf @14.5



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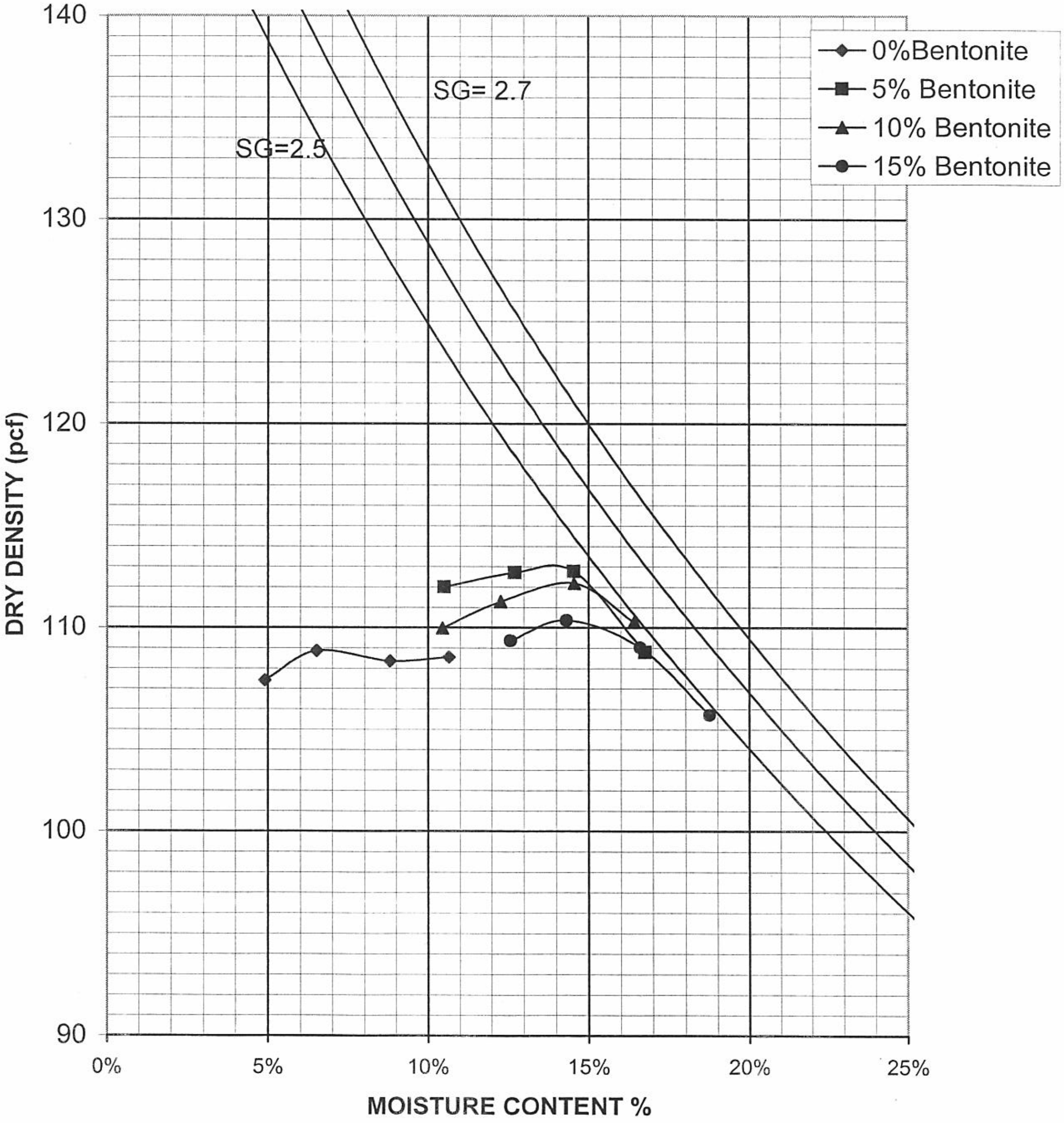
# MOISTURE-DENSITY RELATION (ASTM D-698)

Utah Uranium Mine

Sand and Bentonite Blends

3756



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# Particle Size Analysis of Soils

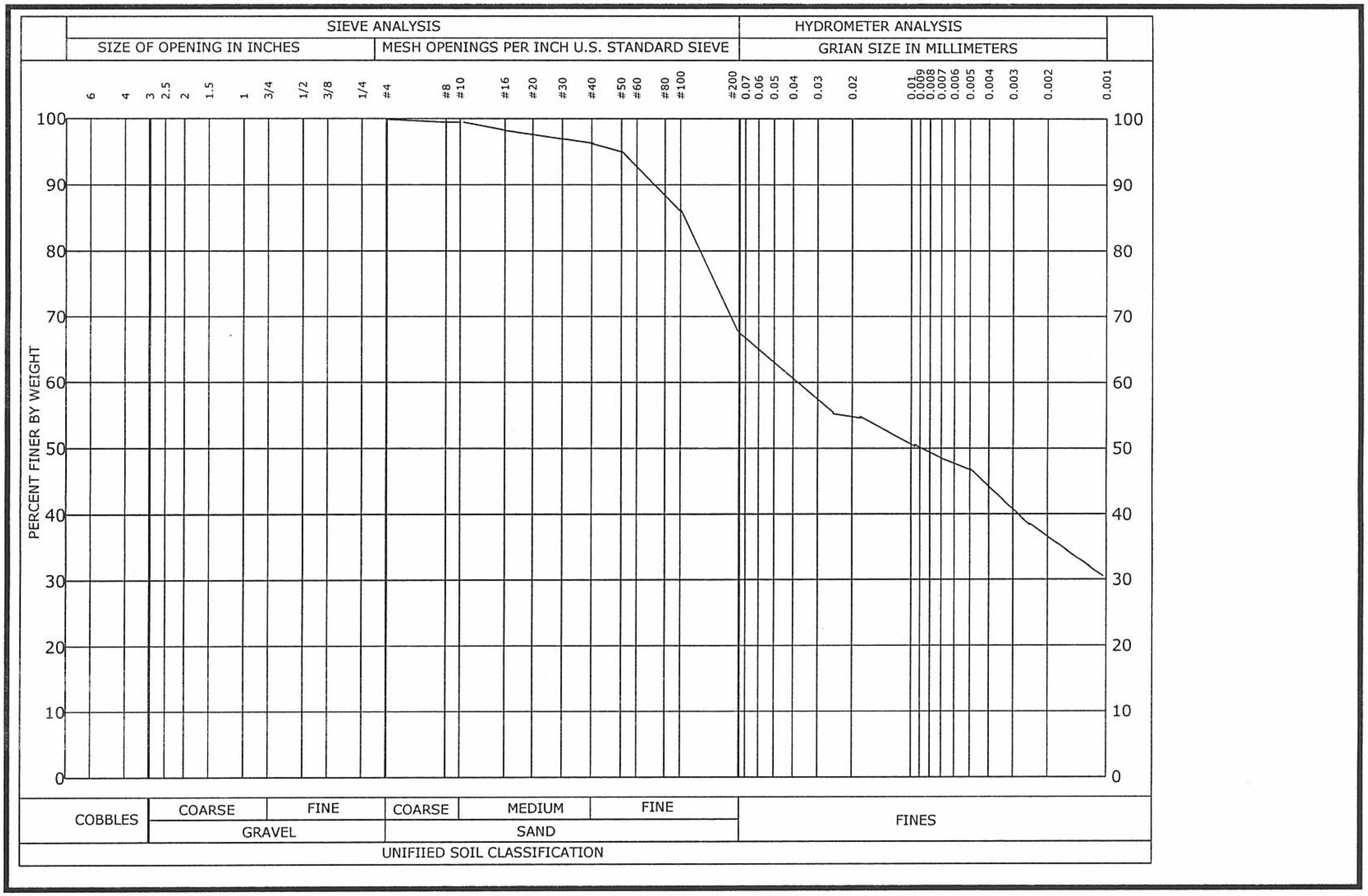
**CLIENT** Geosmith Engineering

**PROJECT** Utah Uranium Mine

**SAMPLE DESCRIPTION** Greenish clay

| U.S. Standard Sieve Size | WEIGHT RETAINED | TOTAL WEIGHT RETAINED | TOTAL WEIGHT PASSING | PERCENT PASSING |
|---|---|---|---|---|
| | | | | |
| # 4 | | 0 | 535.2 | 100.0% |
| # 8 | | 6.1 | 529.1 | 98.9% |
| # 10 | | 7.3 | 527.9 | 98.6% |
| # 16 | | 10.7 | 524.5 | 98.0% |
| # 30 | | 16.2 | 519.0 | 97.0% |
| # 40 | | 19.9 | 515.3 | 96.3% |
| # 50 | | 25.7 | 509.5 | 95.2% |
| # 100 | | 74.1 | 461.1 | 86.2% |
| # 200 | | 169.2 | 366.0 | 68.4% |
| PAN | | 176.2 | 359.0 | |
| TOTAL PAN | | 535.2 | 0.0 | 0% |

| U.S. Standard Sieve Size | PERCENT PASSING |
|---|---|
| # 4 | 100% |
| # 8 | 99% |
| # 10 | 99% |
| # 16 | 98% |
| # 30 | 97% |
| # 40 | 96% |
| # 50 | 95% |
| # 100 | 86% |
| # 200 | 68% |
| **Particle Size mm** | **PERCENT PASSING** |
| 0.0254 | 56% |
| 0.0162 | 54% |
| 0.0095 | 50% |
| 0.0068 | 48% |
| 0.0049 | 45% |
| 0.0022 | 38% |
| 0.0011 | 30% |
| 0.0010 | 30% |
| | |



Greenish clay

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# Particle Size Analysis of Soils

**CLIENT** Geosmith Engineering

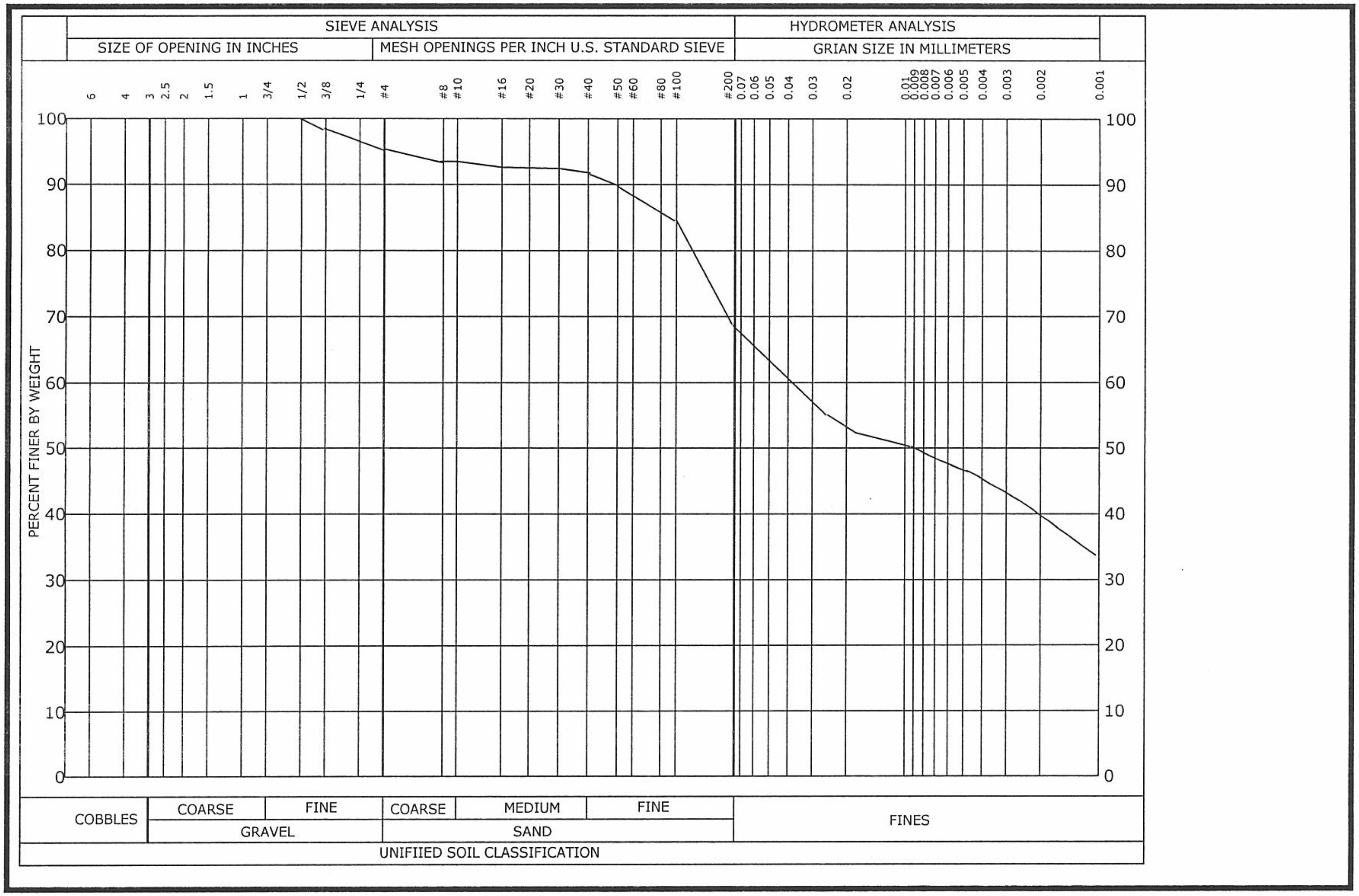
**PROJECT** Utah Uranium Mine

**SAMPLE DESCRIPTION** Reddish clay

| U.S. Standard Sieve Size | WEIGHT RETAINED | TOTAL WEIGHT RETAINED | TOTAL WEIGHT PASSING | PERCENT PASSING |
|---|---|---|---|---|
| 3/8" | | 11.6 | **519.2** | 97.8% |
| # 4 | | 32.3 | 498.5 | 93.9% |
| # 8 | | 37 | 493.8 | 93.0% |
| # 10 | | 38.3 | 492.5 | 92.8% |
| # 16 | | 41.0 | 489.8 | 92.3% |
| # 30 | | 43.9 | 486.9 | 91.7% |
| # 40 | | 46.6 | 484.2 | 91.2% |
| # 50 | | 52.7 | 478.1 | 90.1% |
| # 100 | | 83.5 | 447.3 | 84.3% |
| # 200 | | 163.7 | 367.1 | 69.2% |
| PAN | | 182.8 | 348.0 | |
| TOTAL PAN | | 530.8 | 0.0 | 0% |

| U.S. Standard Sieve Size | PERCENT PASSING |
|---|---|
| 1/2" | 100% |
| 3/8" | 98% |
| # 4 | 94% |
| # 8 | 93% |
| # 10 | 93% |
| # 16 | 92% |
| # 30 | 92% |
| # 40 | 91% |
| # 50 | 90% |
| # 100 | 84% |
| # 200 | 69% |

| Particle Size mm | PERCENT PASSING |
|---|---|
| 0.0255 | 54% |
| 0.0163 | 52% |
| 0.0095 | 50% |
| 0.0067 | 48% |
| 0.0048 | 46% |
| 0.0025 | 42% |
| 0.0011 | 33% |
| 0.0010 | 33% |
| | |



Reddish clay

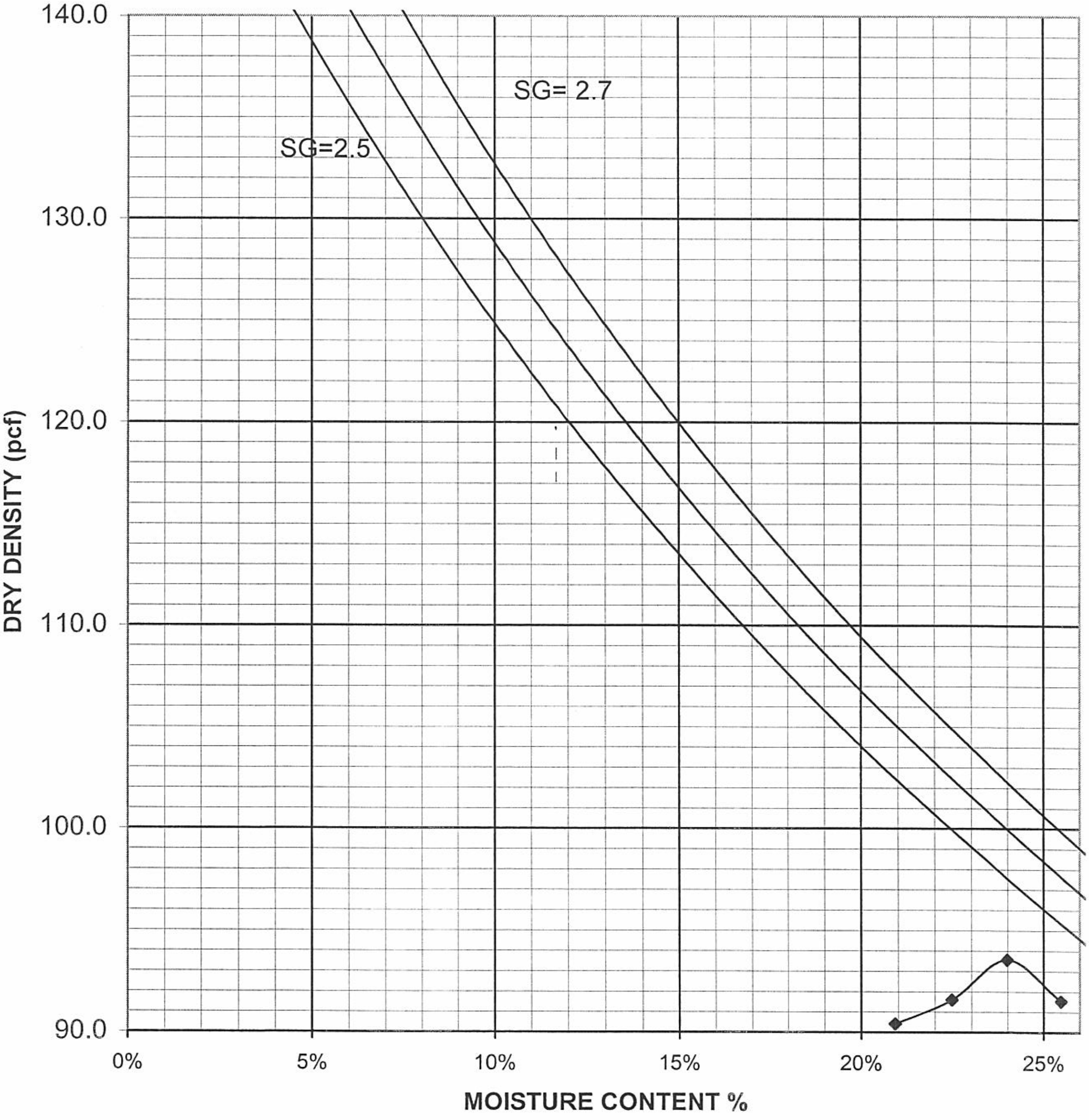
GeoSmith
Engineering
Utah Uranium
Mine

3756

# MOISTURE-DENSITY RELATION (ASTM D-698)

Jmb red clay

93.6 pcf @ 24.0% MOISTURE



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# Particle Size Analysis of Soils

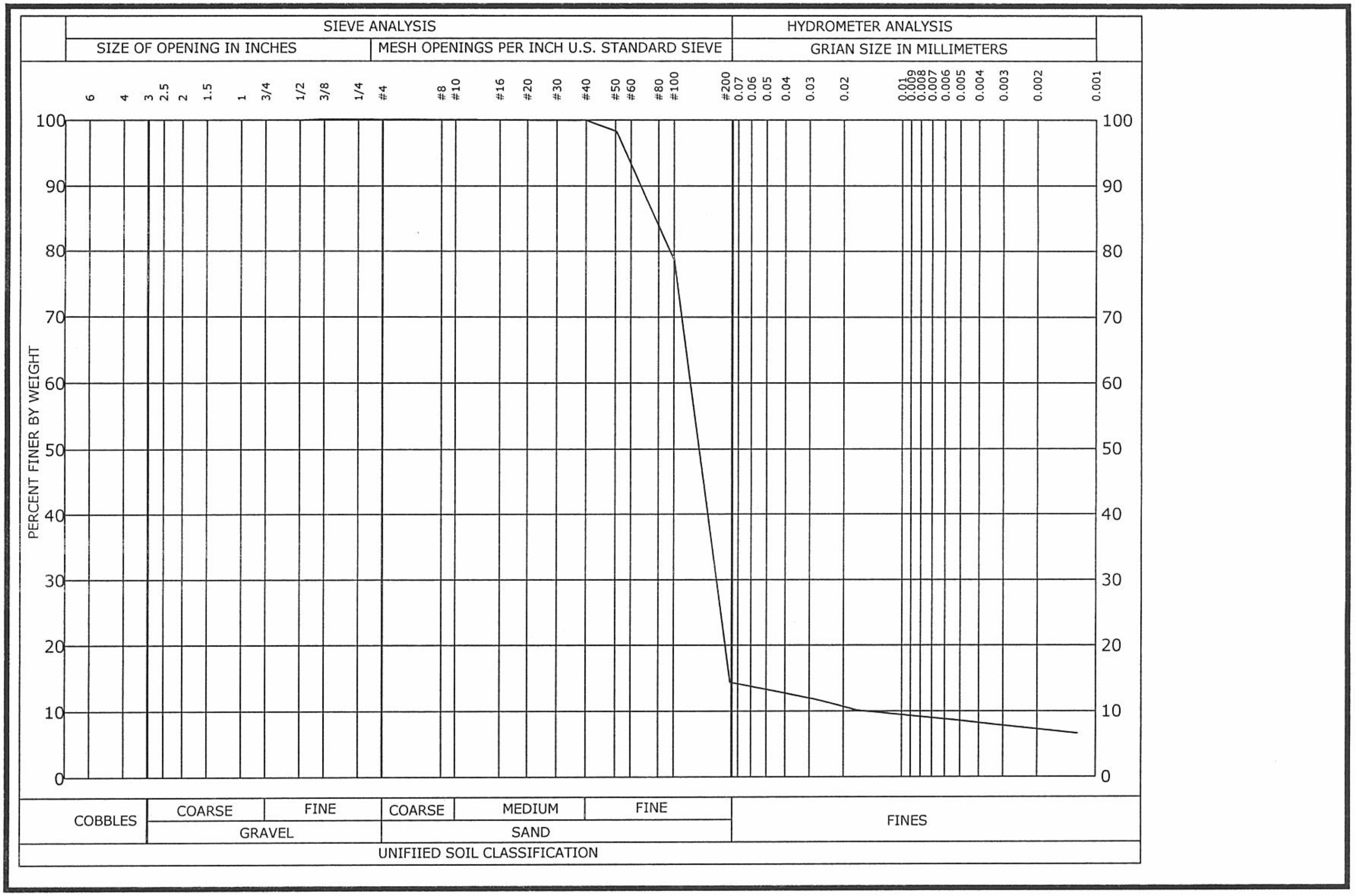
**CLIENT** Geosmith Engineering

**PROJECT** Utah Uranium Mine

**SAMPLE DESCRIPTION** Tt Tp 6

| U.S. Standard Sieve Size | WEIGHT RETAINED | TOTAL WEIGHT RETAINED | TOTAL WEIGHT PASSING | PERCENT PASSING |
|---|---|---|---|---|
| 3/8" | | 0 | 542.1 | 100.0% |
| # 4 | | 0 | 542.1 | 100.0% |
| # 8 | | 0 | 542.1 | 100.0% |
| # 10 | | 0.0 | 542.1 | 100.0% |
| # 16 | | 0.0 | 542.1 | 100.0% |
| # 30 | | 0.0 | 542.1 | 100.0% |
| # 40 | | 0.1 | 542.0 | 100.0% |
| # 50 | | 6.6 | 535.5 | 98.8% |
| # 100 | | 115.7 | 426.4 | 78.7% |
| # 200 | | 469.5 | 72.6 | 13.4% |
| PAN | | 502.4 | 39.7 | |
| TOTAL PAN | | 542.1 | 0.0 | 0% |

| U.S. Standard Sieve Size | PERCENT PASSING |
|---|---|
| 1/2" | 100% |
| 3/8" | 100% |
| # 4 | 100% |
| # 8 | 100% |
| # 10 | 100% |
| # 16 | 100% |
| # 30 | 100% |
| # 40 | 100% |
| # 50 | 99% |
| # 100 | 79% |
| # 200 | 13% |
| Particle Size mm | PERCENT PASSING |
| 0.0290 | 12% |
| 0.0187 | 10% |
| 0.0108 | 10% |
| 0.0072 | 9% |
| 0.0047 | 9% |
| 0.0025 | 7% |
| 0.0011 | 7% |
| | |
| | |


SIEVE ANALYSIS
HYDROMETER ANALYSIS
SIZE OF OPENING IN INCHES
MESH OPENINGS PER INCH U.S. STANDARD SIEVE
GRIAN SIZE IN MILLIMETERS
6
4
3
2.5
2
1.5
1
3/4
1/2
3/8
1/4
#4
#8
#10
#16
#20
#30
#40
#50
#60
#80
#100
#200
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0.009
0.008
0.007
0.006
0.005
0.004
0.003
0.002
0.001
PERCENT FINER BY WEIGHT
100
90
80
70
60
50
40
30
20
10
0
COBBLES
COARSE
FINE
GRAVEL
COARSE
MEDIUM
FINE
SAND
FINES
UNIFIIED SOIL CLASSIFICATION

Tt Tp 6

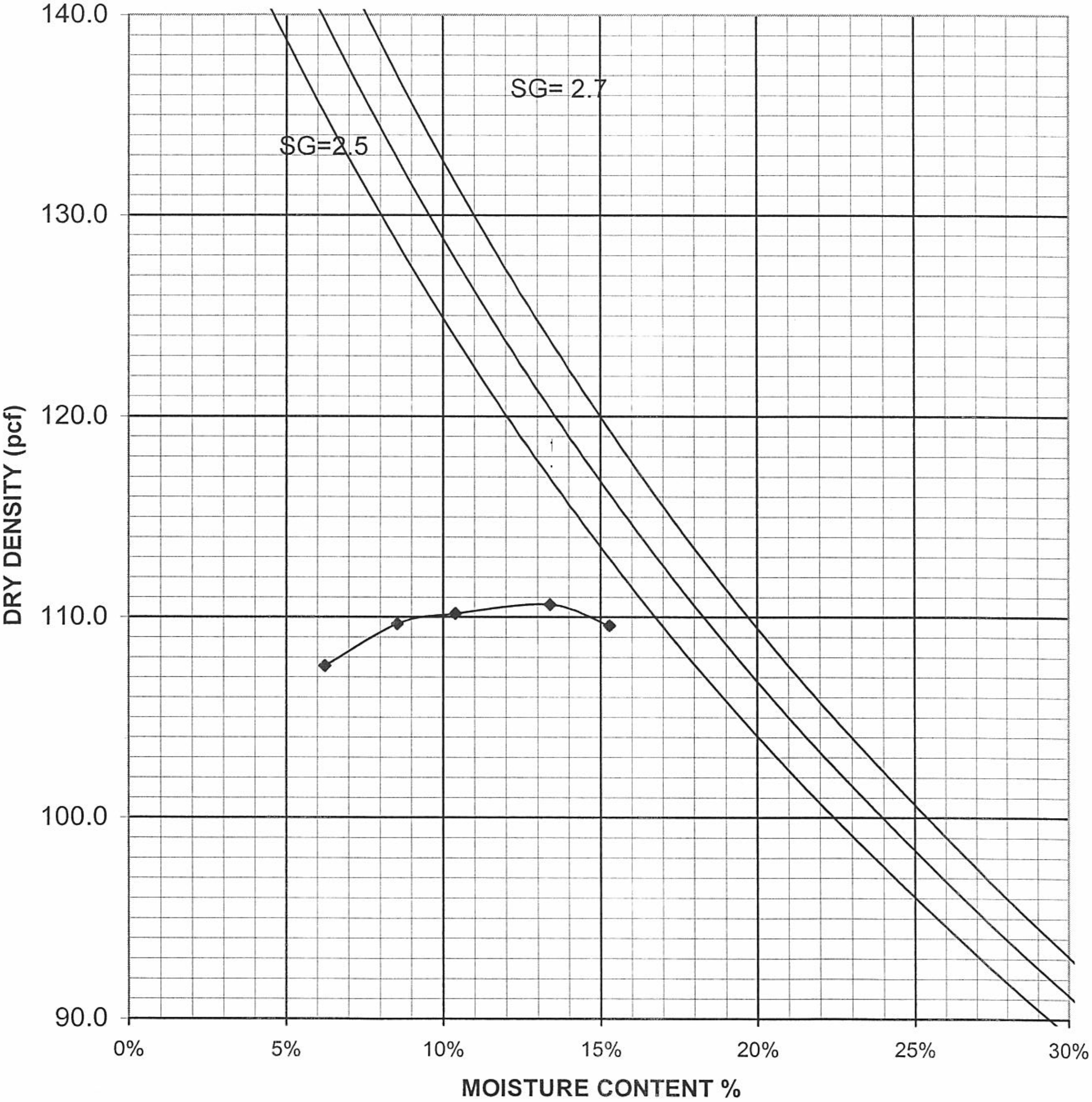
GeoSmith
Engineering
Utah Uranium
Mine

3756

# MOISTURE-DENSITY RELATION (ASTM D-698)

Tt Tp 6

110.6 pcf @ 13.4% MOISTURE



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# Particle Size Analysis of Soils

**CLIENT** Geosmith Engineering

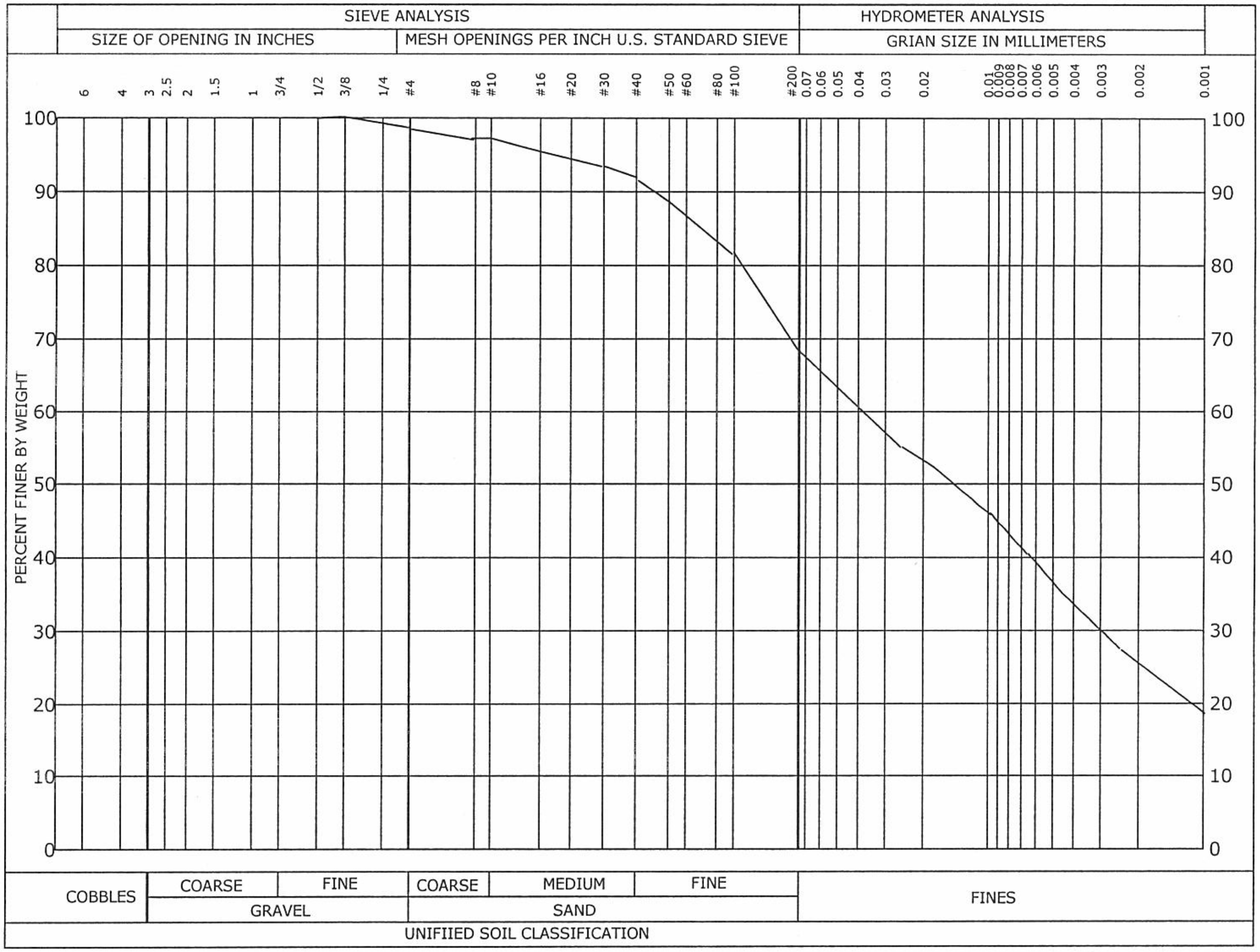
**PROJECT** Utah Uranium Mine

**SAMPLE DESCRIPTION** Tt Tp 18

| U.S. Standard Sieve Size | WEIGHT RETAINED | TOTAL WEIGHT RETAINED | TOTAL WEIGHT PASSING | PERCENT PASSING |
|---|---|---|---|---|
| 3/8" | | 4.6 | **1477.5** | 99.7% |
| # 4 | | 12.4 | 1469.7 | 99.2% |
| # 8 | | 25.8 | 1456.3 | 98.3% |
| # 10 | | 33.2 | 1448.9 | 97.8% |
| # 16 | | 61.4 | 1420.7 | 95.9% |
| # 30 | | 108.0 | 1374.1 | 92.7% |
| # 40 | | 133.9 | 1348.2 | 91.0% |
| # 50 | | 161.0 | 1321.1 | 89.1% |
| # 100 | | 283.7 | 1198.4 | 80.9% |
| # 200 | | 490.6 | 991.5 | 66.9% |
| PAN | | 593.7 | 888.4 | |
| TOTAL PAN | | 1482.1 | 0.0 | 0% |

| U.S. Standard Sieve Size | PERCENT PASSING |
|---|---|
| 1/2" | 100% |
| 3/8" | 100% |
| # 4 | 99% |
| # 8 | 98% |
| # 10 | 98% |
| # 16 | 96% |
| # 30 | 93% |
| # 40 | 91% |
| # 50 | 89% |
| # 100 | 81% |
| # 200 | 67% |

| Particle Size mm | PERCENT PASSING |
|---|---|
| 0.0244 | 55% |
| 0.0159 | 51% |
| 0.0095 | 45% |
| 0.0068 | 40% |
| 0.0047 | 35% |
| 0.0021 | 27% |
| 0.0011 | 19% |
| | |
| | |


SIEVE ANALYSIS
HYDROMETER ANALYSIS
SIZE OF OPENING IN INCHES
MESH OPENINGS PER INCH U.S. STANDARD SIEVE
GRIAN SIZE IN MILLIMETERS
6
4
3
2.5
2
1.5
1
3/4
1/2
3/8
1/4
#4
#8
#10
#16
#20
#30
#40
#50
#60
#80
#100
#200
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0.009
0.008
0.007
0.006
0.005
0.004
0.003
0.002
0.001
PERCENT FINER BY WEIGHT
100
90
80
70
60
50
40
30
20
10
0
COBBLES
COARSE
FINE
GRAVEL
COARSE
MEDIUM
FINE
SAND
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UNIFIIED SOIL CLASSIFICATION

Tt Tp 18

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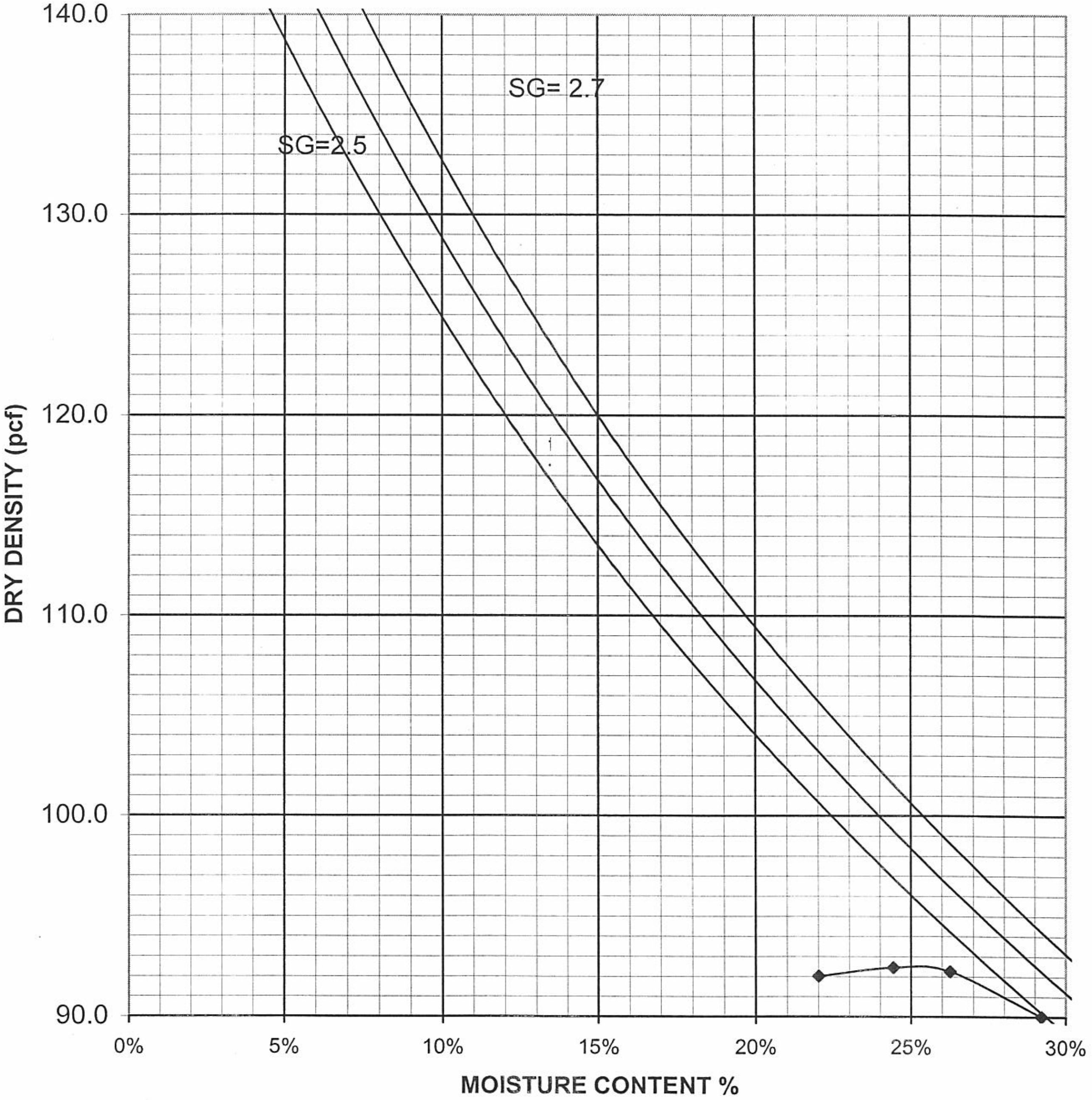
# MOISTURE-DENSITY RELATION (ASTM D-698)

Tt Tp 18

92.5 pcf @ 24.4% MOISTURE



CAPSTONE
ENTERPRISES WEST, LLC
GEOTECHNICAL AND MINING ENGINEERING
TESTING AND INSPECTION SERVICES

618 PARTEE DRIVE
GRAND JUNCTION, CO 81504
PHONE (970) 250-3331 FAX (970) 241-9721
capstonewest@juno.com

# Particle Size Analysis of Soils

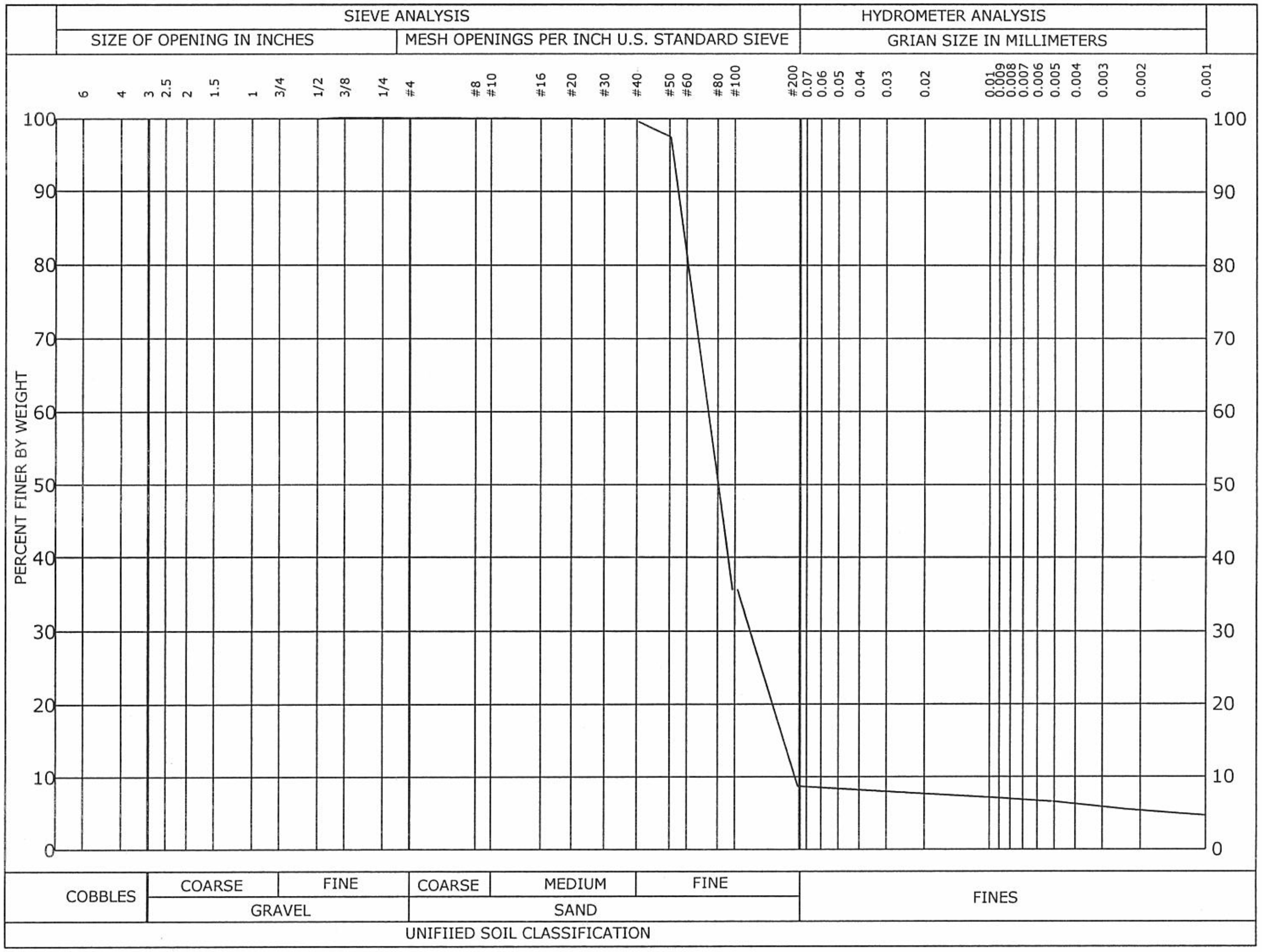
**CLIENT** Geosmith Engineering

**PROJECT** Utah Uranium Mine

**SAMPLE DESCRIPTION** Tt Tp 27

| U.S. Standard Sieve Size | WEIGHT RETAINED | TOTAL WEIGHT RETAINED | TOTAL WEIGHT PASSING | PERCENT PASSING |
|---|---|---|---|---|
| 3/8" | | 0 | 811.4 | 100.0% |
| # 4 | | 0 | 811.4 | 100.0% |
| # 8 | | 0 | 811.4 | 100.0% |
| # 10 | | 0.2 | 811.2 | 100.0% |
| # 16 | | 0.2 | 811.2 | 100.0% |
| # 30 | | 0.4 | 811.0 | 100.0% |
| # 40 | | 1.5 | 809.9 | 99.8% |
| # 50 | | 16.1 | 795.3 | 98.0% |
| # 100 | | 529.9 | 281.5 | 34.7% |
| # 200 | | 739.2 | 72.2 | 8.9% |
| PAN | | 751.9 | 59.5 | |
| TOTAL PAN | | 811.4 | 0.0 | 0% |

| U.S. Standard Sieve Size | PERCENT PASSING |
|---|---|
| 1/2" | 100% |
| 3/8" | 100% |
| # 4 | 100% |
| # 8 | 100% |
| # 10 | 100% |
| # 16 | 100% |
| # 30 | 100% |
| # 40 | 100% |
| # 50 | 98% |
| # 100 | 35% |
| # 200 | 9% |
| Particle Size mm | PERCENT PASSING |
| 0.0301 | 7% |
| 0.0191 | 7% |
| 0.0080 | 7% |
| 0.0052 | 6% |
| 0.0024 | 5% |
| 0.0011 | 4% |
| | |
| | |
| | |


SIEVE ANALYSIS
HYDROMETER ANALYSIS
SIZE OF OPENING IN INCHES
MESH OPENINGS PER INCH U.S. STANDARD SIEVE
GRIAN SIZE IN MILLIMETERS
6
4
3
2.5
2
1.5
1
3/4
1/2
3/8
1/4
#4
#8
#10
#16
#20
#30
#40
#50
#60
#80
#100
#200
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0.009
0.008
0.007
0.006
0.005
0.004
0.003
0.002
0.001
PERCENT FINER BY WEIGHT
100
90
80
70
60
50
40
30
20
10
0
COBBLES
COARSE
FINE
GRAVEL
COARSE
MEDIUM
FINE
SAND
FINES
UNIFIIED SOIL CLASSIFICATION

Tt Tp 27

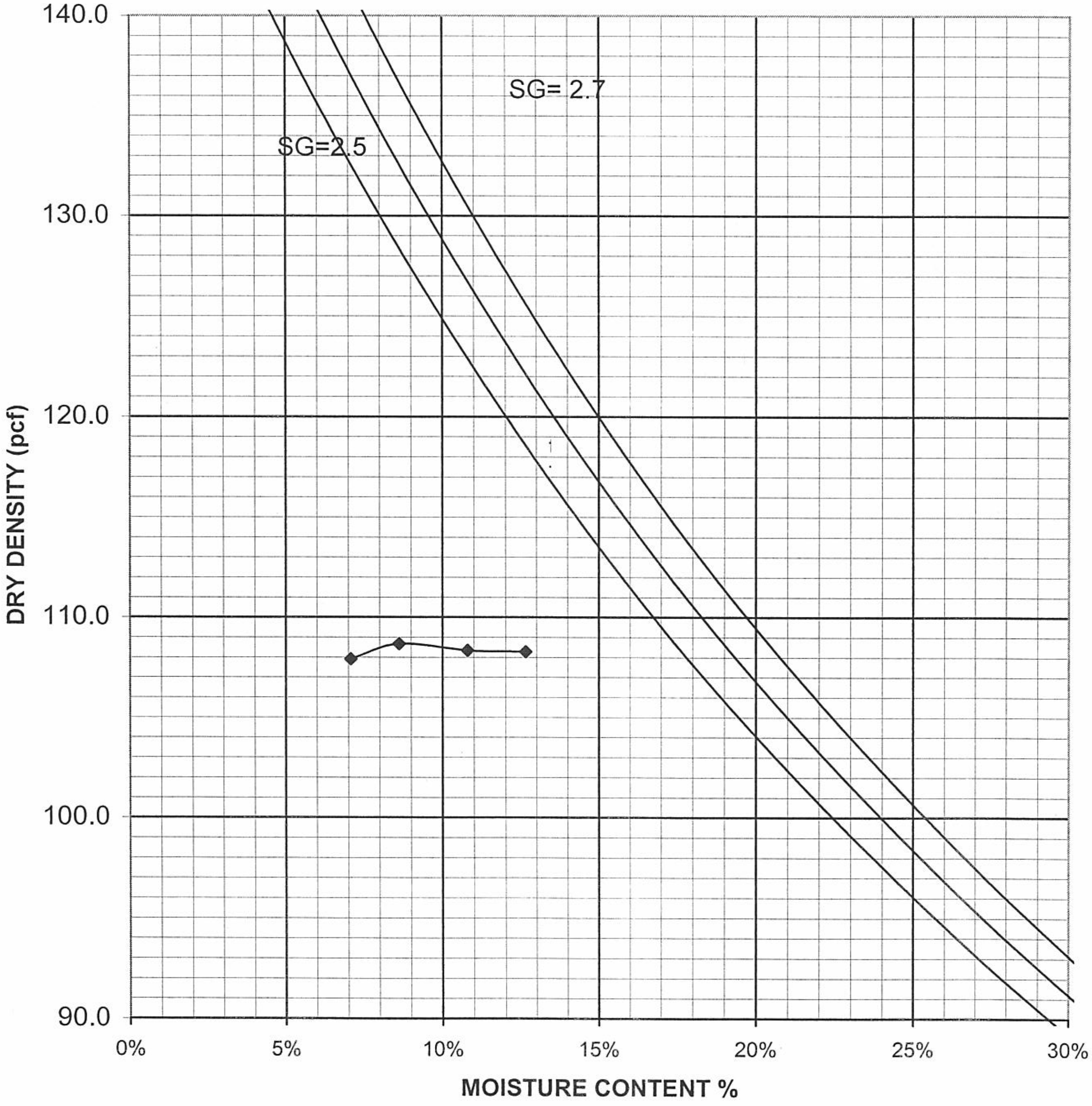
GeoSmith
Engineering
Utah Uranium
Mine

3756

## MOISTURE-DENSITY RELATION (ASTM D-698)

Tt Tp 27

~108.7 pcf @ ~8.6 MOISTURE



# APPENDIX C.3.3.2
# TETRA TECH
# LABORATORY TESTING RESULTS

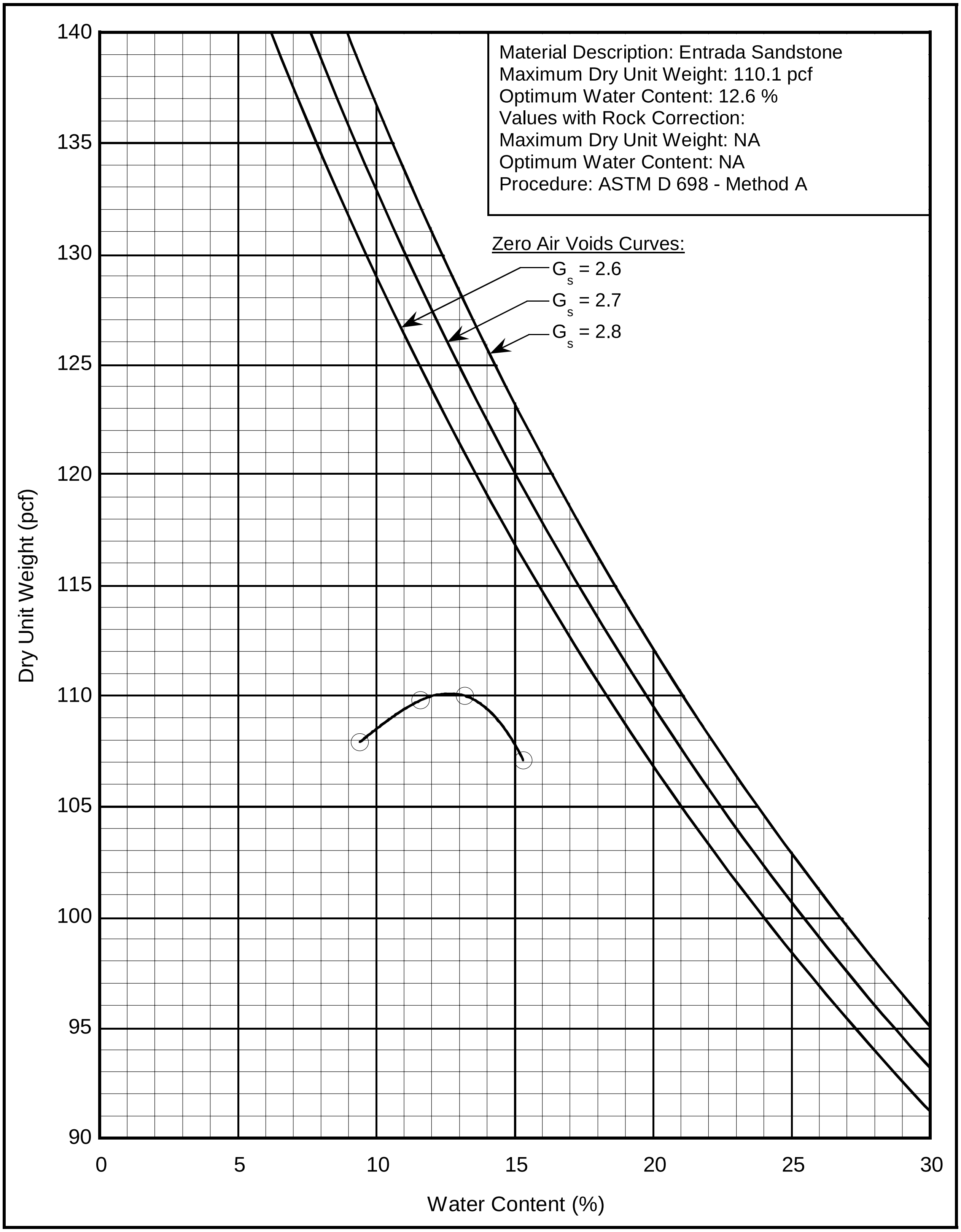
## Summary of Geotechnical Laboratory Test Results

| Sample Location | Sample Description/Classification[1] | | Atterberg Limits (%) LL/PL/PI[2] | Particle Sizes (%)[3] | | | Standard Laboratory Compaction | |
|---|---|---|---|---|---|---|---|---|
| | | | | Gravel | Sand | Fines | Maximum Dry Unit Weight (pcf) | Optimum Water Content (%) |
| Bulk sample from supplier (Redmond Minerals) | Pond Seal (Bentonite) | CH | 133/16/117 | | 41.0 | 59.0 | | |
| Bulk sample from site | Silty Sand (Entrada Sand) | SM | Non-Plastic | | 85.1 | 14.9 | 110.1 | 12.6 |

[1] ASTM D 2437 (Unified Soil Classification System, USCS) used for classification.

[2] LL = Liquid Limit, PL = Plastic Limit, PI = Plasticity Index (PI = LL - PL).

[3] Gravel = 4.75 mm to 75 mm, Sand = 0.074 mm to 4.758 mm, Fines (silt and clay) = less than 0.074 mm.



**Laboratory Compaction Curve for Silty Sand (Entrada Sandstone) Uranium One – Shootaring Canyon**

# PERMEABILITY TEST REPORT

**TEST DATA:**

Specimen Height (cm): 7.50
Specimen Diameter (cm): 7.07
Dry Unit Weight (pcf): 93.5
Moisture Before Test (%): 24.0
Moisture After Test (%): 0.0
Run Number: 1 ● 2 ▲
Cell Pressure (psi): 65.0

Sat. Pressure (psi): 60.0
Diff. Head (psi): 2.7

Perm. (cm/sec): 5.08 x 10^-9

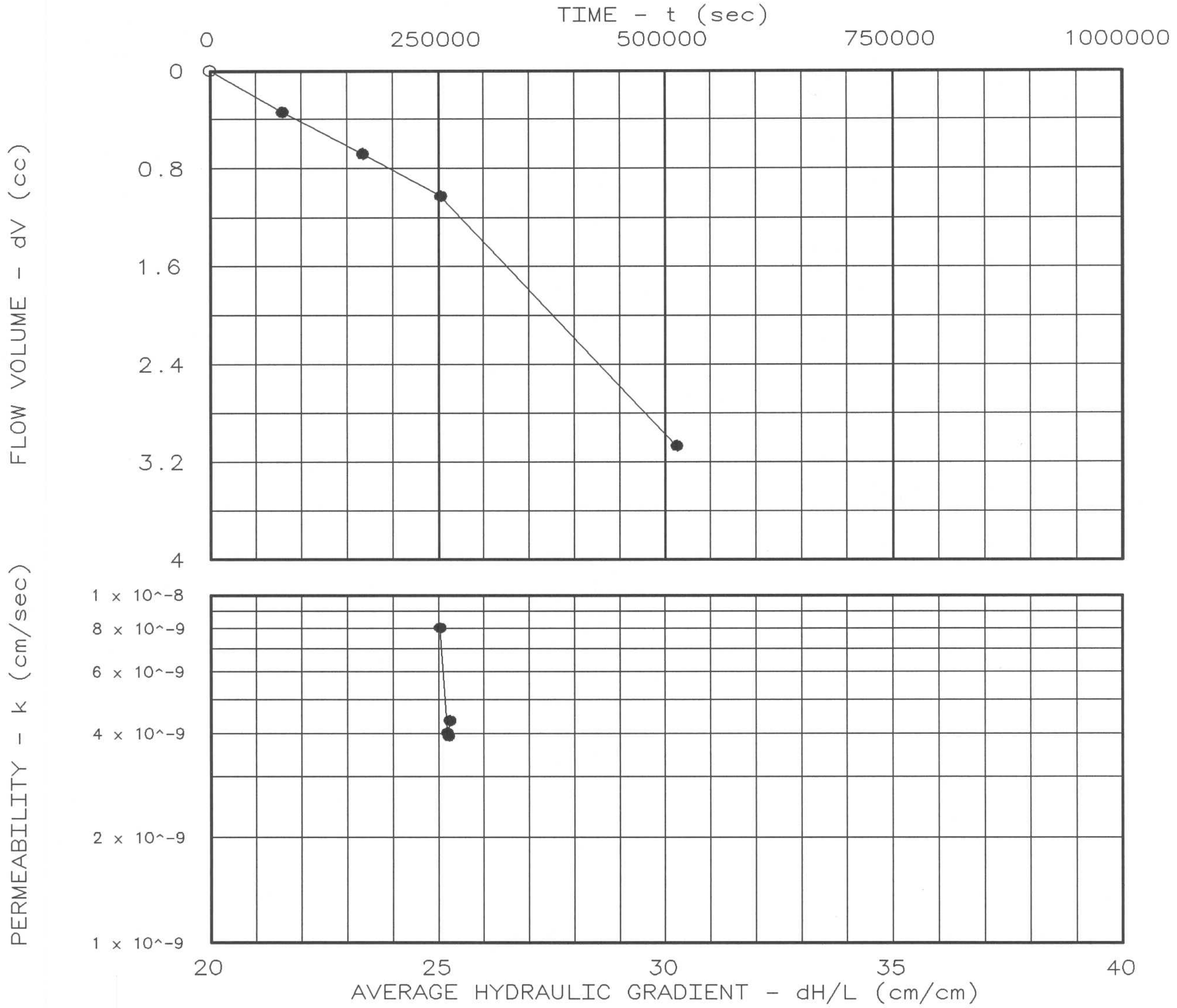
**SAMPLE DATA:**

Sample Identification: Jmb Red

Visual Description: Fat Clay

Remarks:

Maximum Dry Density (pcf): 93.6
Optimum Moisture Content (%): 24.0
ASTM(D698)
Percent Compaction: 99.9%
Permeameter type: Flexwall
Sample type: Remolded



Project: SHOOTARING CANYON URANIUM
Location:
Date: 4/21/08

PERMEABILITY TEST REPORT

**TETRA TECH**

Project No.:
File No.: 10
Lab No.:
Tested by:
Checked by:
Test: FH - Falling head C

# PERMEABILITY TEST DATA

## PROJECT DATA

Project Name: SHOOTARING CANYON URANIUM
File No.: 10
Project Location:
Project No.:
Sample Identification: Jmb Red

Lab No.:
Description: Fat Clay

Sample Type: Remolded
Max. Dry Dens.: 93.6
Method (D1557/D698): D698
Opt. Water Content: 24.0
Date: 4/21/08
Remarks:

Permeameter Type: Flexwall
Tested by:
Checked by:
Test type: FH - Falling head C

---

## PERMEABILITY TEST SPECIMEN DATA

| | Before test: | | After test: | |
|---|---|---|---|---|
| Diameter: | 1 | 2 | 1 | 2 |
| Top: | 2.784 in | in | in | in |
| Middle: | in | in | in | in |
| Bottom: | in | in | in | in |
| Average: | 2.78 in | 7.07 cm | 0.00 in | 0.00 cm |

| | Before test: | | | After test: | | |
|---|---|---|---|---|---|---|
| Length: | 1 | 2 | 3 | 1 | 2 | 3 |
| | 2.954 in | in | in | in | in | in |
| Average: | 2.95 in | 7.50 cm | | 0.00 in | 0.00 cm | |

Moisture, Density and Sample Parameters:

| | Before test: | | After test: |
|---|---|---|---|
| Specific Gravity: | 2.75 | | |
| Wet Wt. & Tare: | 547.31 | | 0.00 |
| Dry Wt. & Tare: | 441.38 | | 0.00 |
| Tare Wt.: | 0.00 | | 0.00 |
| Moisture Content: | 24.0 % | | 0.0 % |
| Dry Unit Weight: | 93.5 pcf | 99.9 % of max | 0.0 pcf |
| Porosity: | 0.4553 | | 0.0000 |
| Saturation: | 79.0 % | | 0.0 % |

# PERMEABILITY TEST REPORT

TEST DATA:

Specimen Height (cm): 7.50

Specimen Diameter (cm): 7.07

Dry Unit Weight (pcf): 92.5

Moisture Before Test (%): 24.4

Moisture After Test (%): 0.0

Run Number: 1 ● 2 ▲

Cell Pressure (psi): 65.0

Sat. Pressure (psi): 60.0

Diff. Head (psi): 2.7

Perm. (cm/sec): 1.83 x 10^-9

SAMPLE DATA:

Sample Identification: Poulter Clay

Visual Description: Fat Clay

Remarks:

Maximum Dry Density (pcf): 92.5

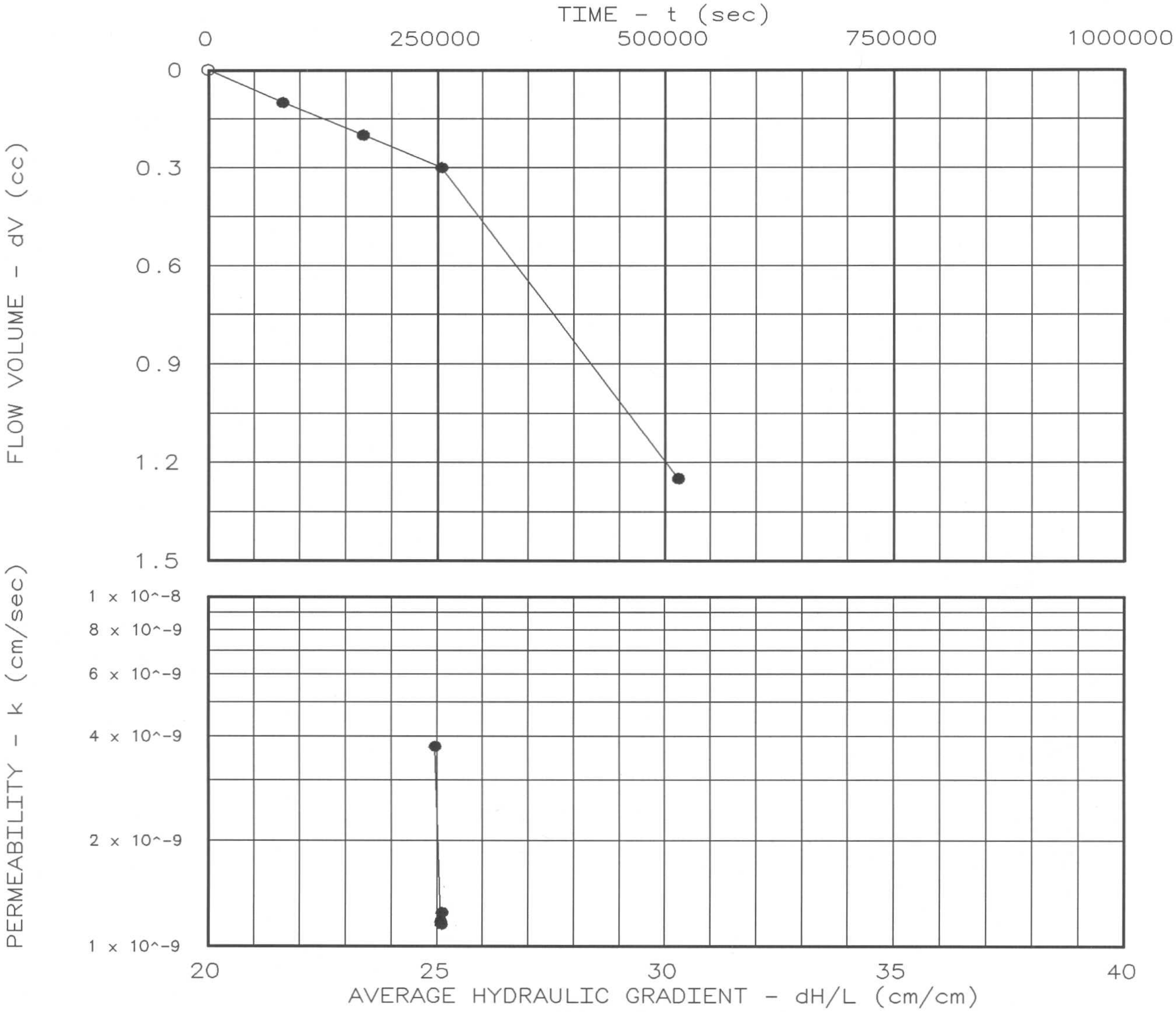
Optimum Moisture Content (%): 24.4

ASTM(D698)

Percent Compaction: 100.0%

Permeameter type: Flexwall

Sample type: Remolded



Project: SHOOTARING CANYON URANUM

Location:

Date: 4/21/08

Project No.:

File No.: 11

Lab No.:

Tested by:

Checked by:

Test: FH - Falling head C

PERMEABILITY TEST REPORT

TETRA TECH

```
==============================================================================
                             PERMEABILITY TEST DATA
==============================================================================

                                  PROJECT DATA

Project Name:           SHOOTARING CANYON URANUM
File No.:               11
Project Location:
Project No.:
Sample Identification:  Poulter Clay

Lab No.:
Description:            Fat Clay

Sample Type:            Remolded
Max. Dry Dens.:         92.5
Method (D1557/D698):    D698
Opt. Water Content:     24.4
Date:                   4/21/08
Remarks:

Permeameter Type:       Flexwall
Tested by:
Checked by:
Test type:              FH - Falling head C

------------------------------------------------------------------------------
                      PERMEABILITY TEST SPECIMEN DATA

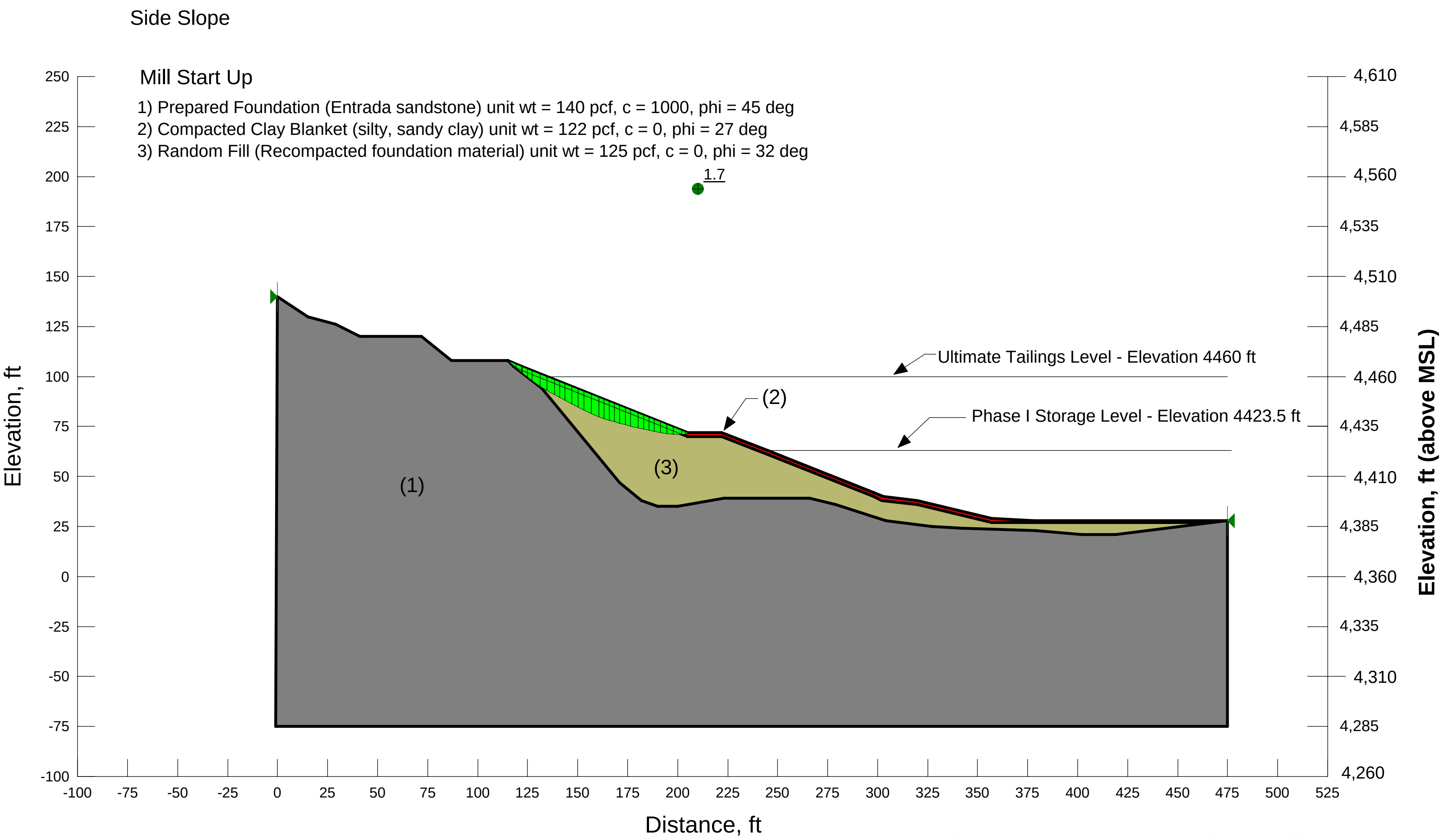

                       Before test:                     After test:

 Diameter:      1          2                      1          2
   Top:       2.784 in         in                     in         in
   Middle:          in         in                     in         in
   Bottom:          in         in                     in         in
   Average:   2.78 in    7.07 cm                0.00 in    0.00 cm

 Length:        1          2          3           1          2          3
              2.954 in         in         in          in         in         in
   Average:   2.95 in    7.50 cm                0.00 in    0.00 cm

 Moisture, Density and Sample Parameters:
   Specific Gravity:    2.75
   Wet Wt. & Tare:       543.39                              0.00
   Dry Wt. & Tare:       436.81                              0.00
   Tare Wt.:               0.00                              0.00
   Moisture Content:     24.4 %                             0.0 %
   Dry Unit Weight:      92.5 pcf   100.0 % of max          0.0 pcf
   Porosity:            0.4610                            0.0000
   Saturation:           78.5 %                             0.0 %
```

# APPENDIX D
# RESULTS OF SEEPAGE AND SLOPE STABILITY ANALYSES



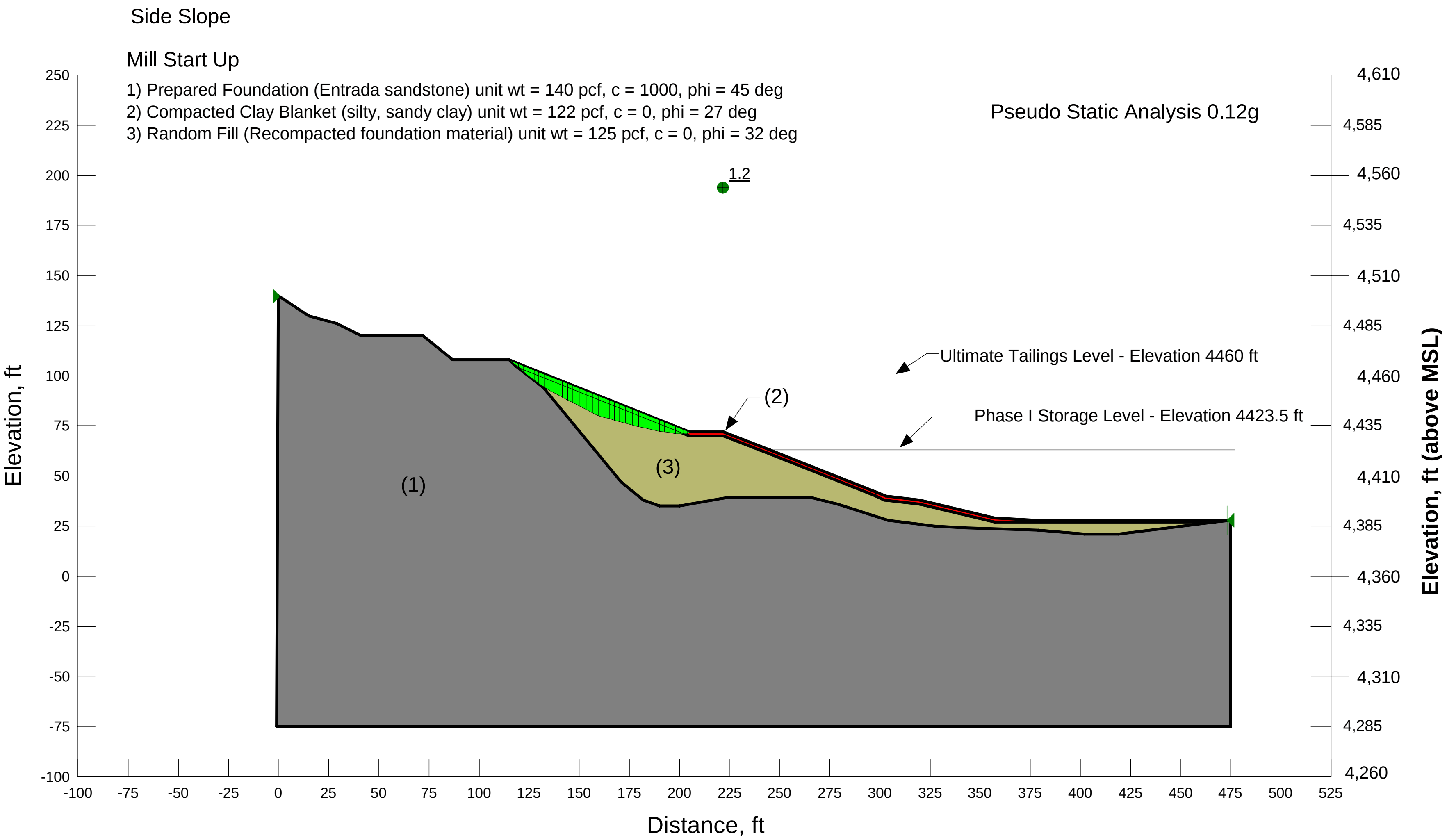
File Name: West Berm - South Cell_Side Slopes EOC HT.gsz
Date: 4/24/2008

Project No: 181692

April 2008

**West Side Slope**
**End of Construction**
**Static Stability Analysis**
**Figure D-1**

P\181627\Report\Slope Figures.ppt

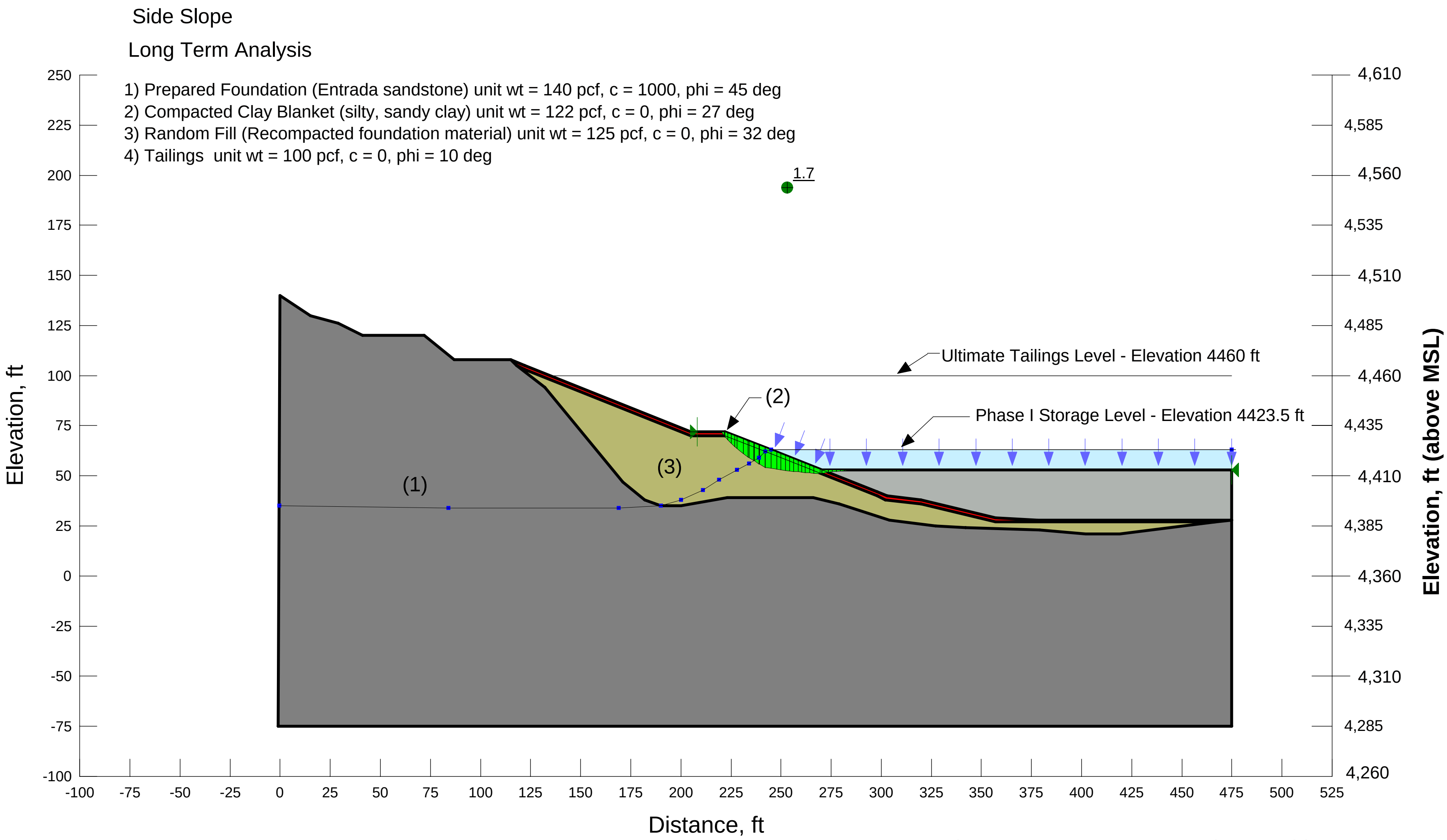


File Name: West Berm - South Cell_Side Slopes EOC HT.gsz
Date: 4/24/2008

Project No: 181692

April 2008

**West Side Slope**
**End of Construction**
**Pseudostatic Stability Analysis**
**Figure D-2**

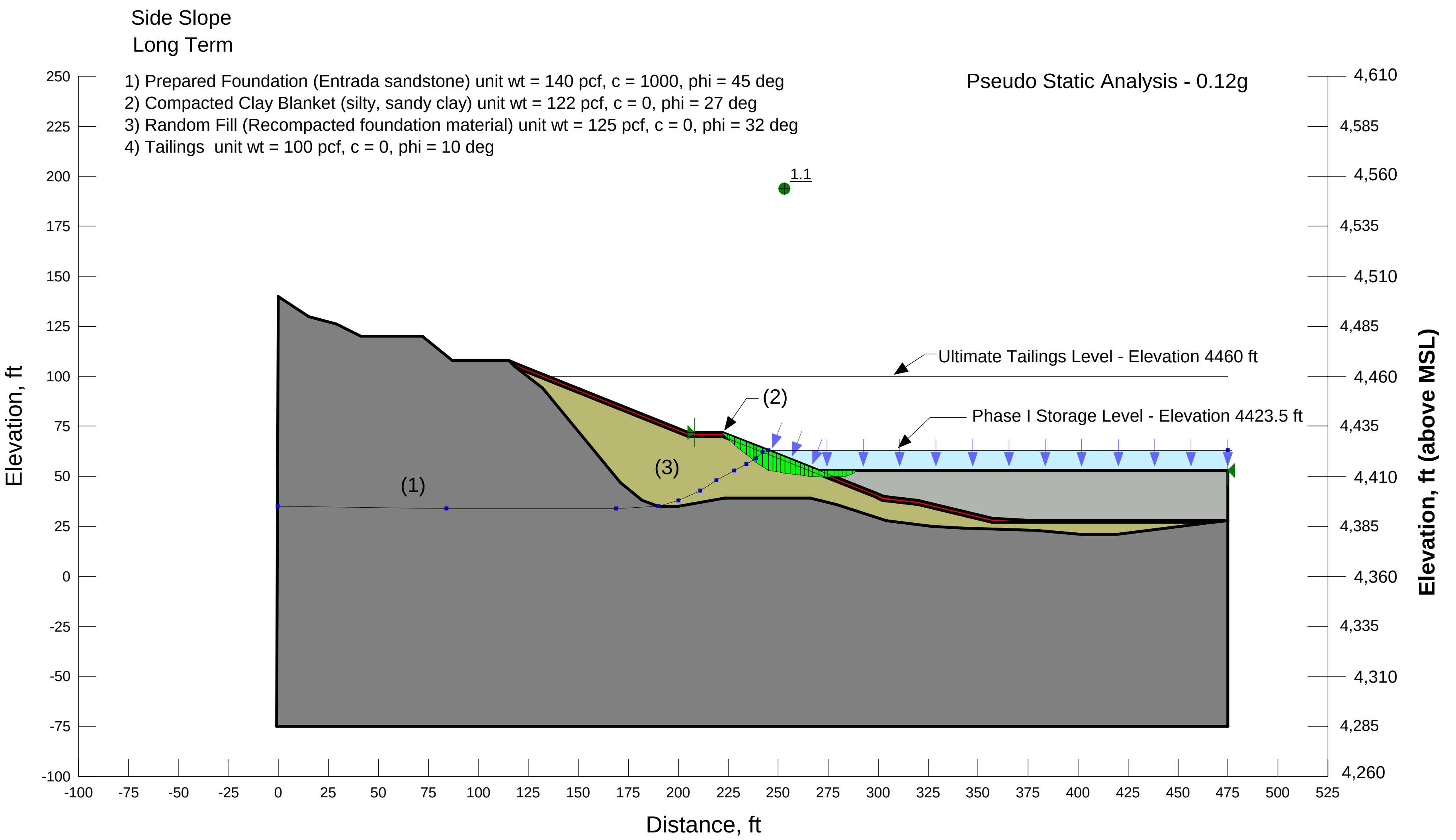


File Name: West Berm - South Cell_Side Slopes HT.gsz
Date: 4/23/2008

Project No: 181692

April 2008

**West Side Slope**
**End of Phase I Deposition**
**Static Stability Analysis**
**Figure D-3**



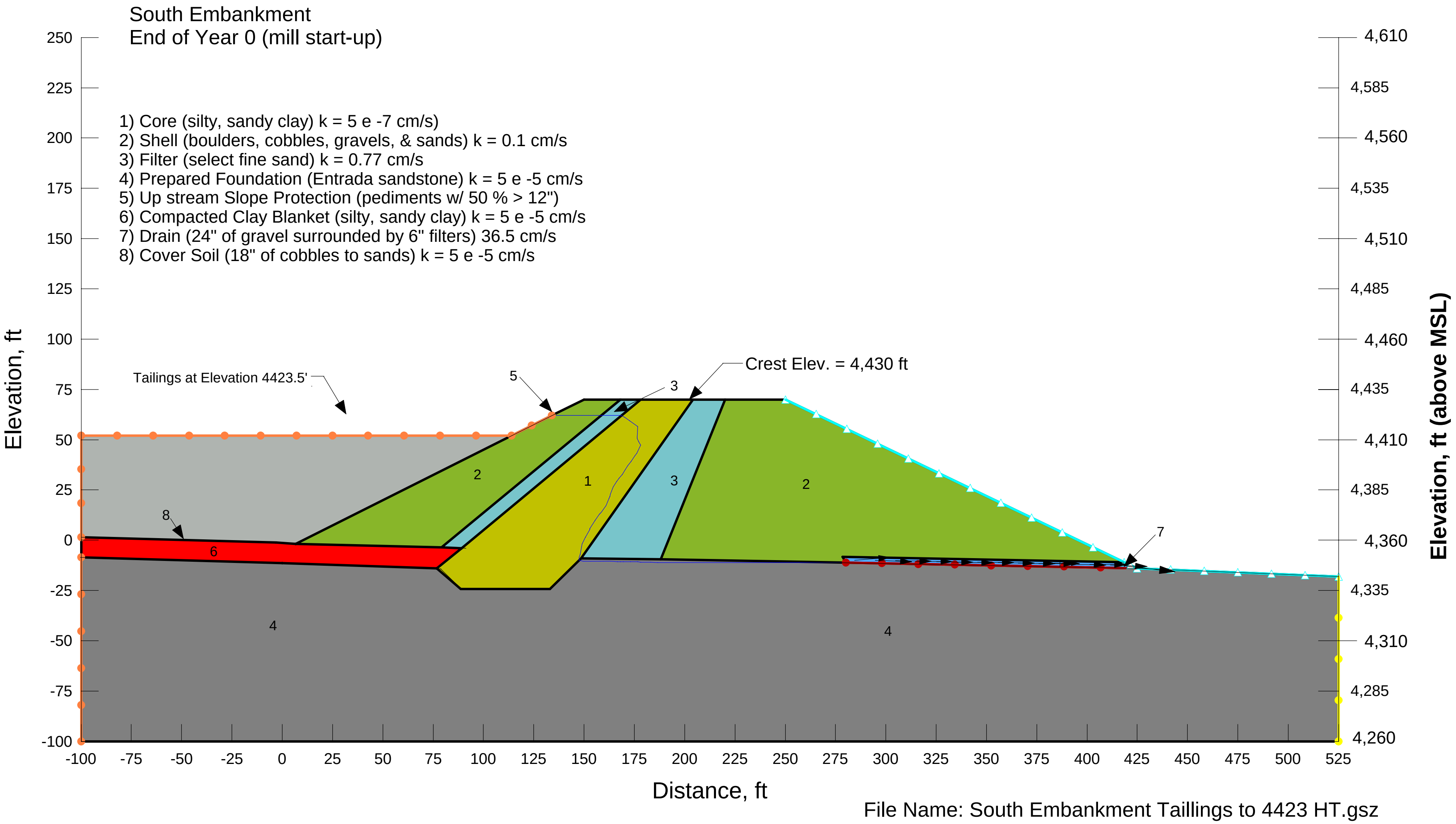
File Name: West Berm - South Cell_Side Slopes HT.gsz
Date: 4/23/2008

Project No: 181692

April 2008

**West Side Slope**
**End of Phase I Deposition**
**Pseudostatic Stability Analysis**
**Figure D-4**

P\181627\Report\Slope Figures.ppt

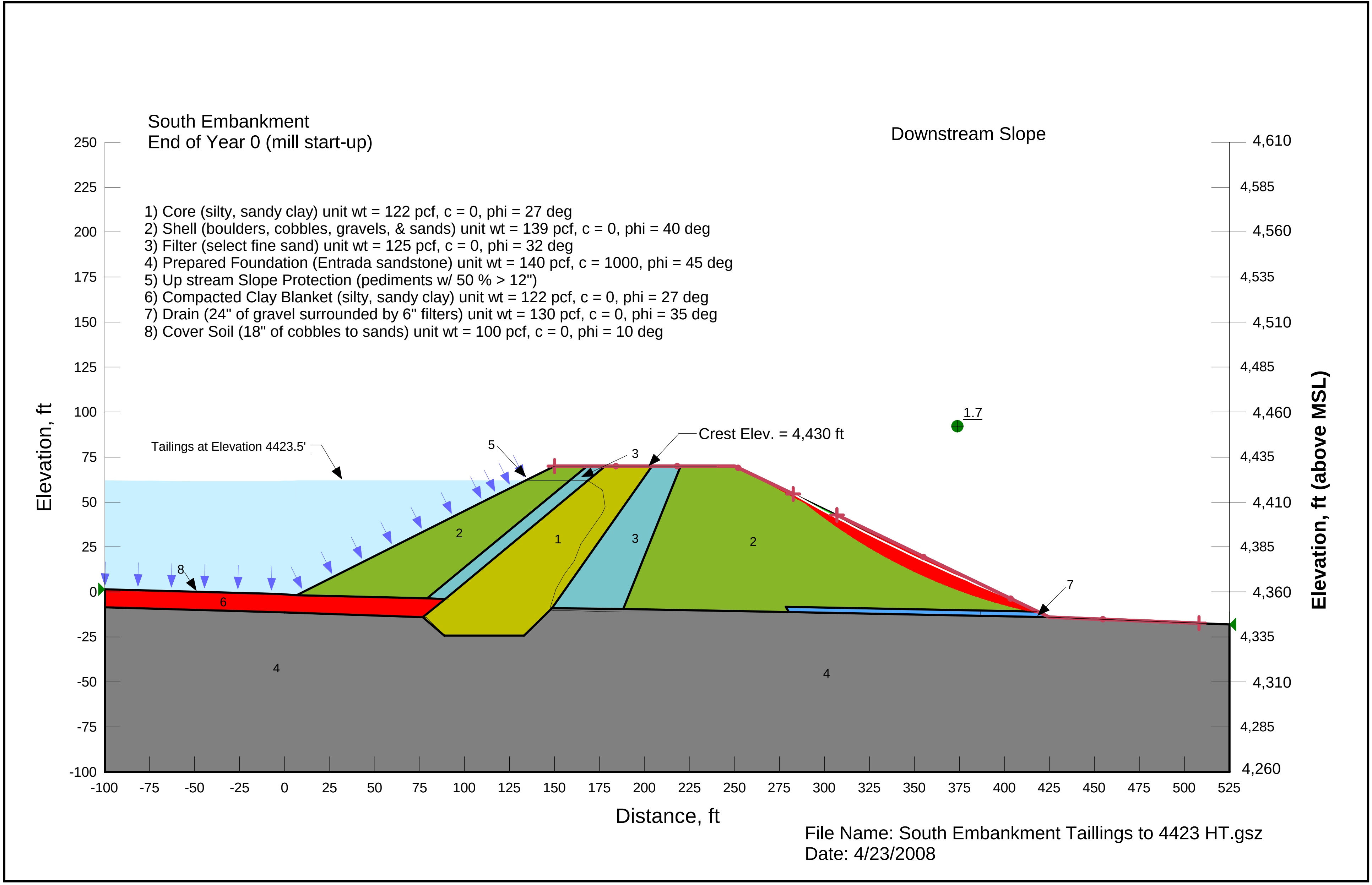


File Name: South Embankment Taillings to 4423 HT.gsz
Date: 4/17/2008

Project No: 181692

April 2008

**South Dam – Phase I**
**End of Phase I Deposition**
**Steady State Seepage Analysis**
**Figure D-5**



South Embankment
End of Year 0 (mill start-up)

1) Core (silty, sandy clay) unit wt = 122 pcf, c = 0, phi = 27 deg
2) Shell (boulders, cobbles, gravels, & sands) unit wt = 139 pcf, c = 0, phi = 40 deg
3) Filter (select fine sand) unit wt = 125 pcf, c = 0, phi = 32 deg
4) Prepared Foundation (Entrada sandstone) unit wt = 140 pcf, c = 1000, phi = 45 deg
5) Up stream Slope Protection (pediments w/ 50 % > 12")
6) Compacted Clay Blanket (silty, sandy clay) unit wt = 122 pcf, c = 0, phi = 27 deg
7) Drain (24" of gravel surrounded by 6" filters) unit wt = 130 pcf, c = 0, phi = 35 deg
8) Cover Soil (18" of cobbles to sands) unit wt = 100 pcf, c = 0, phi = 10 deg

File Name: South Embankment Taillings to 4423 HT.gsz
Date: 4/23/2008

Project No: 181692

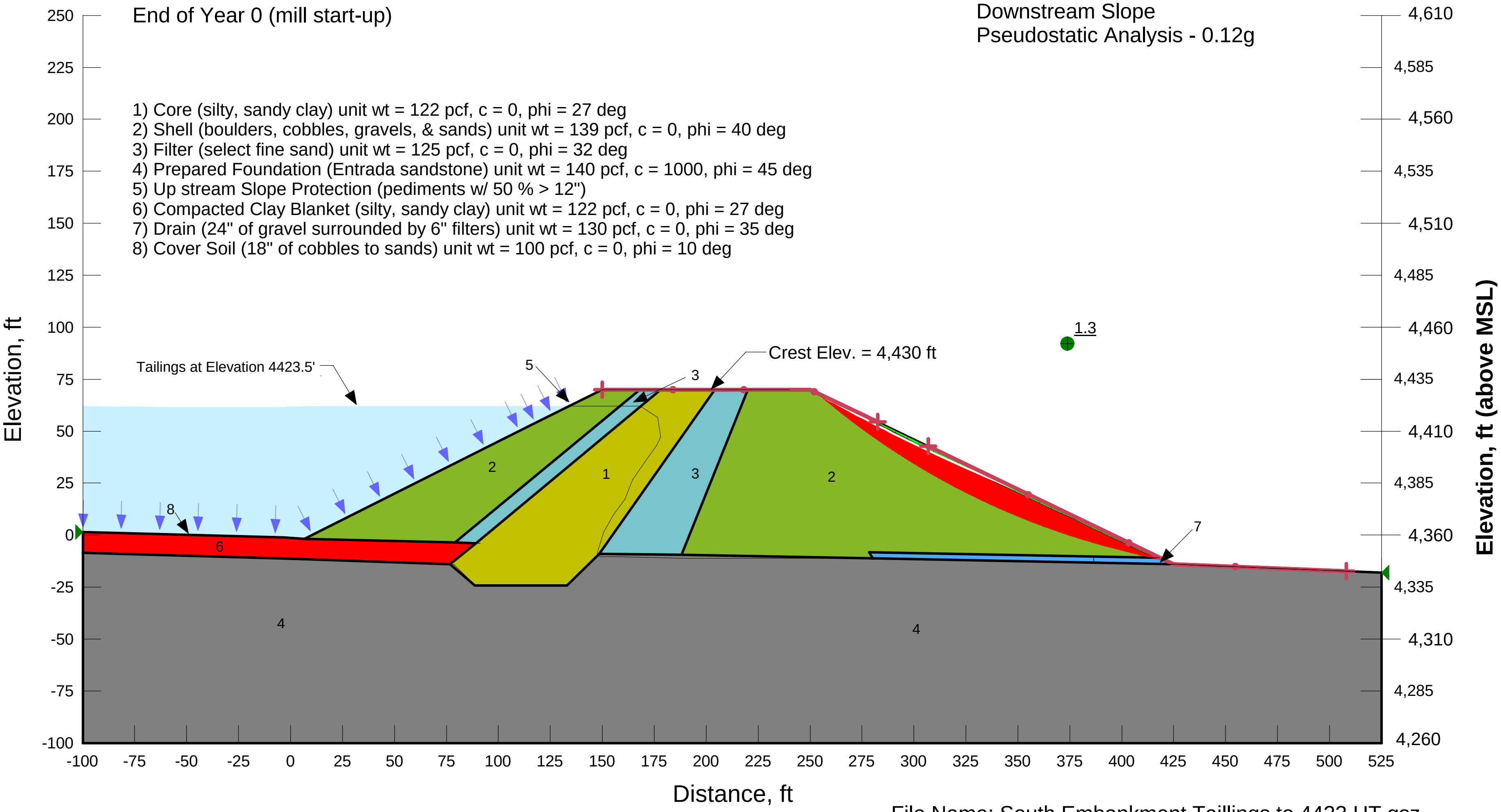
April 2008

**South Dam – Phase I**
**End of Phase I Deposition**
**Static Downstream Slope Stability Analysis**
**Figure D-6**

South Embankment
End of Year 0 (mill start-up)

Downstream Slope
Pseudostatic Analysis - 0.12g

1) Core (silty, sandy clay) unit wt = 122 pcf, c = 0, phi = 27 deg
2) Shell (boulders, cobbles, gravels, & sands) unit wt = 139 pcf, c = 0, phi = 40 deg
3) Filter (select fine sand) unit wt = 125 pcf, c = 0, phi = 32 deg
4) Prepared Foundation (Entrada sandstone) unit wt = 140 pcf, c = 1000, phi = 45 deg
5) Up stream Slope Protection (pediments w/ 50 % > 12")
6) Compacted Clay Blanket (silty, sandy clay) unit wt = 122 pcf, c = 0, phi = 27 deg
7) Drain (24" of gravel surrounded by 6" filters) unit wt = 130 pcf, c = 0, phi = 35 deg
8) Cover Soil (18" of cobbles to sands) unit wt = 100 pcf, c = 0, phi = 10 deg

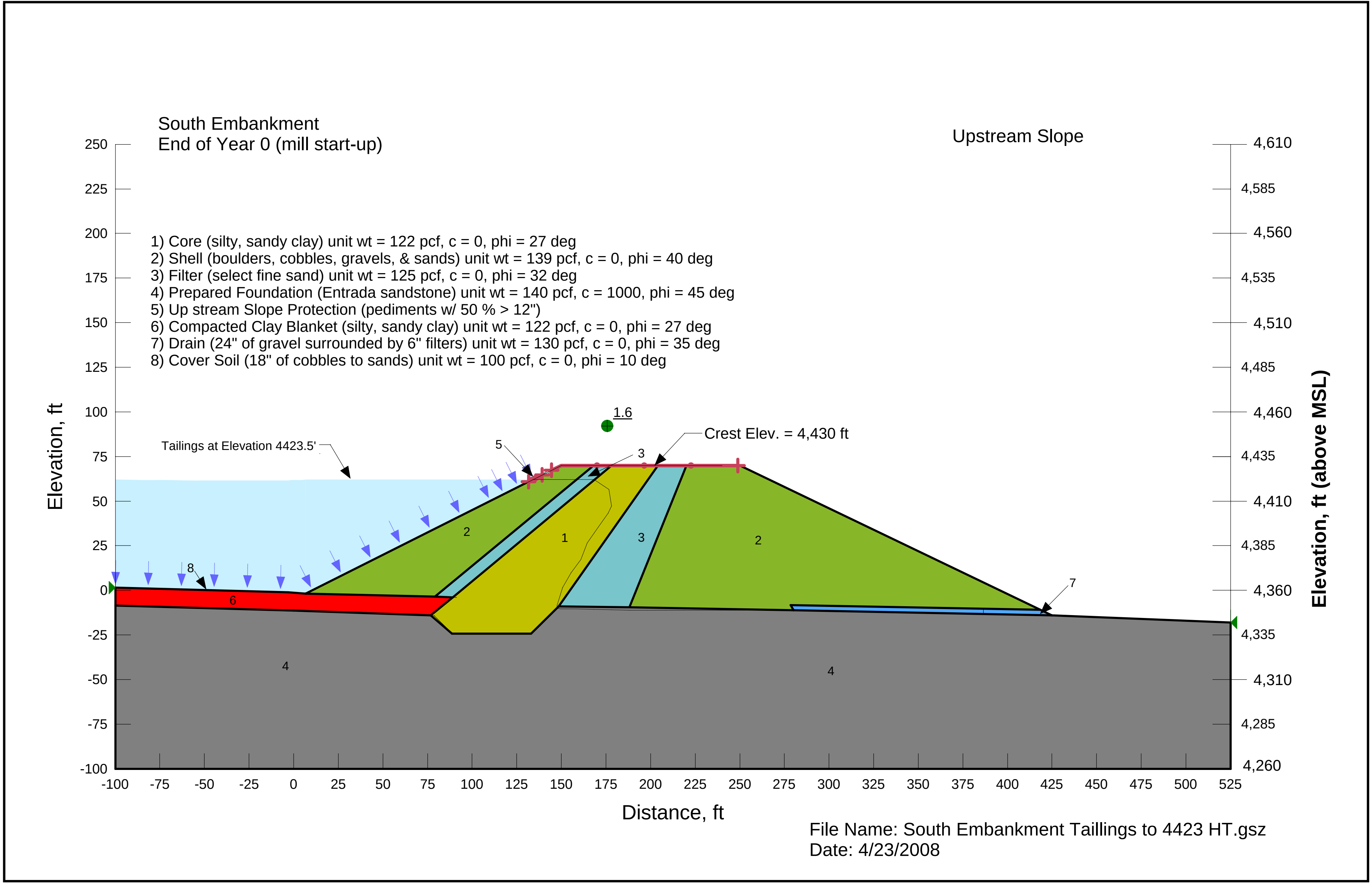


File Name: South Embankment Taillings to 4423 HT.gsz
Date: 4/23/2008

Project No: 181692

April 2008

**South Dam – Phase I**
**End of Phase I Deposition**
**Pseudostatic Downstream Slope Stability Analysis**
**Figure D-7**



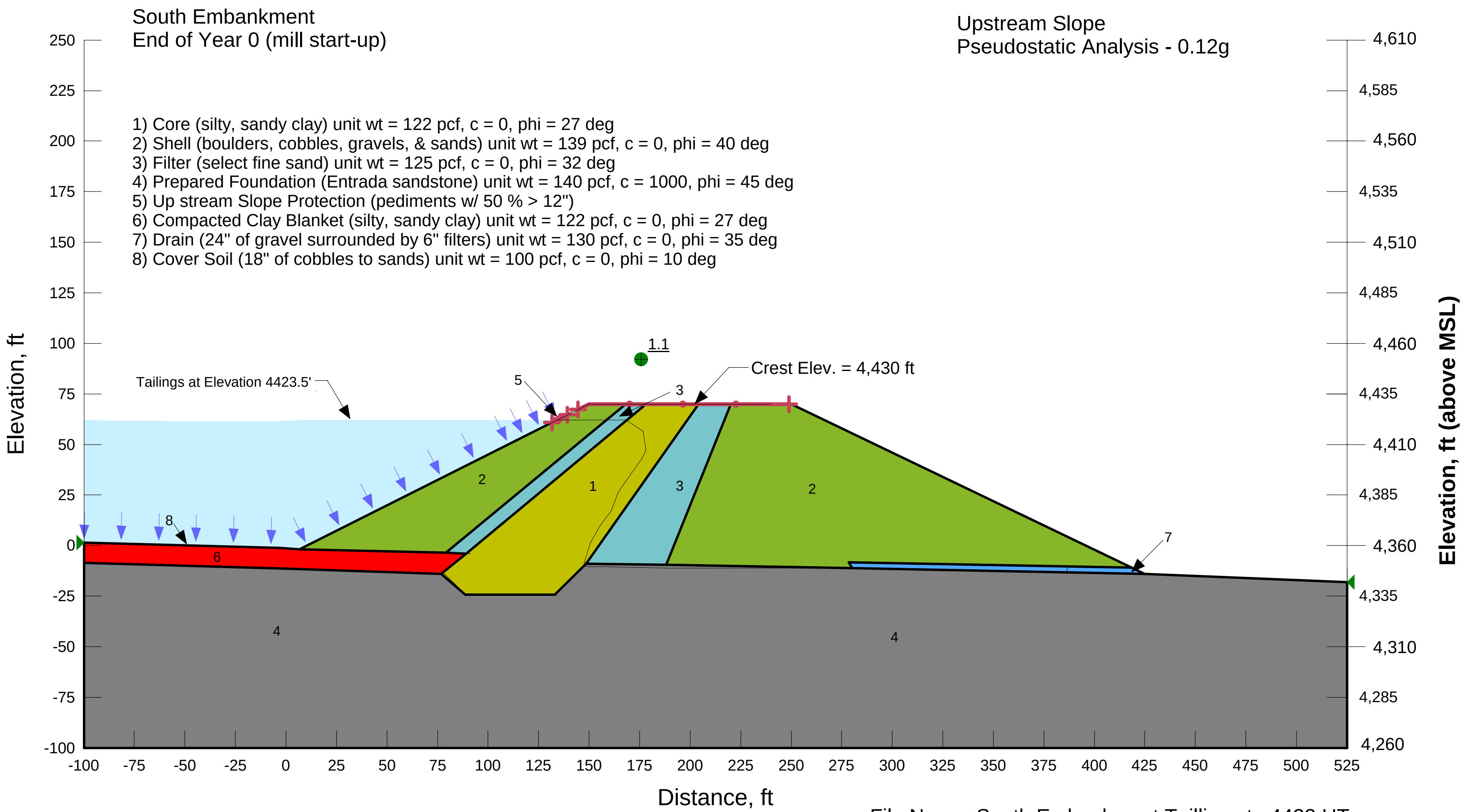
1) Core (silty, sandy clay) unit wt = 122 pcf, c = 0, phi = 27 deg
2) Shell (boulders, cobbles, gravels, & sands) unit wt = 139 pcf, c = 0, phi = 40 deg
3) Filter (select fine sand) unit wt = 125 pcf, c = 0, phi = 32 deg
4) Prepared Foundation (Entrada sandstone) unit wt = 140 pcf, c = 1000, phi = 45 deg
5) Up stream Slope Protection (pediments w/ 50 % > 12")
6) Compacted Clay Blanket (silty, sandy clay) unit wt = 122 pcf, c = 0, phi = 27 deg
7) Drain (24" of gravel surrounded by 6" filters) unit wt = 130 pcf, c = 0, phi = 35 deg
8) Cover Soil (18" of cobbles to sands) unit wt = 100 pcf, c = 0, phi = 10 deg

File Name: South Embankment Taillings to 4423 HT.gsz
Date: 4/23/2008

Project No: 181692

April 2008

**South Dam – Phase I**
**End of Phase I Deposition**
**Static Upstream Slope Stability Analysis**
**Figure D-8**



South Embankment
End of Year 0 (mill start-up)

Upstream Slope
Pseudostatic Analysis - 0.12g

1) Core (silty, sandy clay) unit wt = 122 pcf, c = 0, phi = 27 deg
2) Shell (boulders, cobbles, gravels, & sands) unit wt = 139 pcf, c = 0, phi = 40 deg
3) Filter (select fine sand) unit wt = 125 pcf, c = 0, phi = 32 deg
4) Prepared Foundation (Entrada sandstone) unit wt = 140 pcf, c = 1000, phi = 45 deg
5) Up stream Slope Protection (pediments w/ 50 % > 12")
6) Compacted Clay Blanket (silty, sandy clay) unit wt = 122 pcf, c = 0, phi = 27 deg
7) Drain (24" of gravel surrounded by 6" filters) unit wt = 130 pcf, c = 0, phi = 35 deg
8) Cover Soil (18" of cobbles to sands) unit wt = 100 pcf, c = 0, phi = 10 deg

Tailings at Elevation 4423.5'

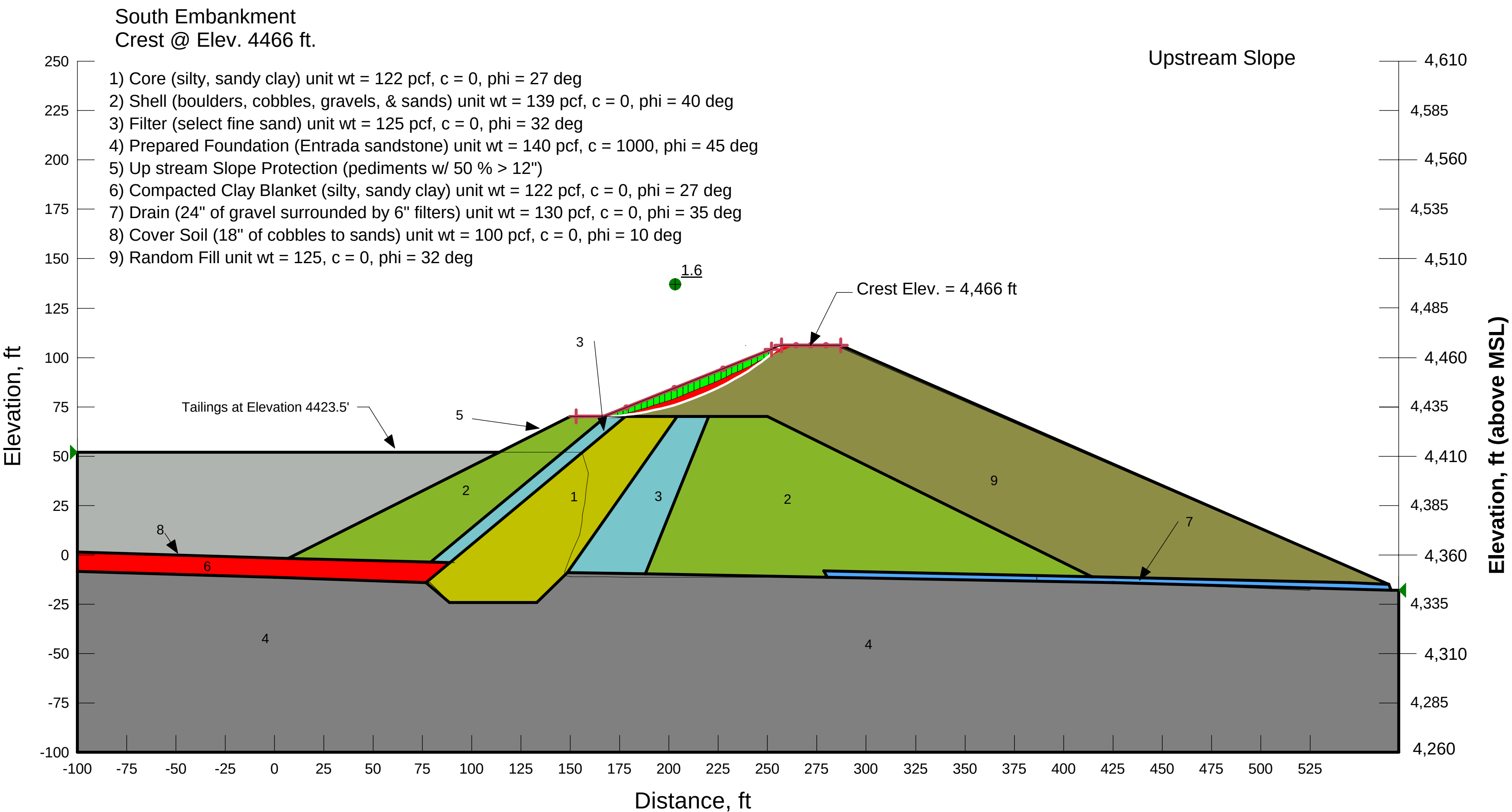
Crest Elev. = 4,430 ft

File Name: South Embankment Taillings to 4423 HT.gsz
Date: 4/23/2008

Project No: 181692

April 2008

**South Dam – Phase I**
**End of Phase I Deposition**
**Pseudostatic Upstream Slope Stability Analysis**
**Figure D-9**

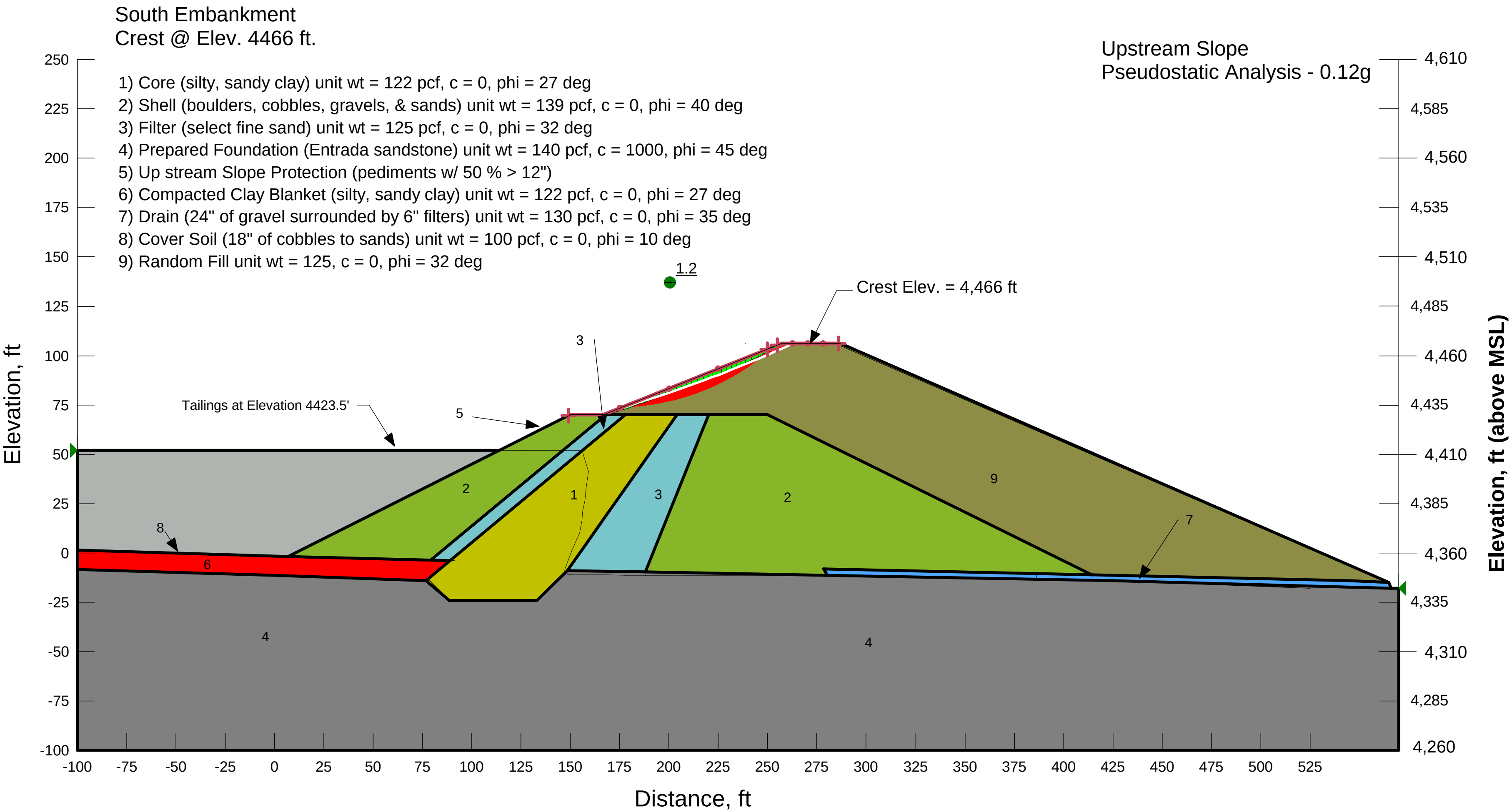


File Name: South Embankment Taillings to 4460 EOC HT.gsz
Date: 4/24/2008

Project No: 181692

April 2008

**South Dam – Phase II**
**End of Phase II Construction**
**Static Upstream Slope Stability Analysis**
**Figure D-10**


South Embankment
Crest @ Elev. 4466 ft.

1) Core (silty, sandy clay) unit wt = 122 pcf, c = 0, phi = 27 deg
2) Shell (boulders, cobbles, gravels, & sands) unit wt = 139 pcf, c = 0, phi = 40 deg
3) Filter (select fine sand) unit wt = 125 pcf, c = 0, phi = 32 deg
4) Prepared Foundation (Entrada sandstone) unit wt = 140 pcf, c = 1000, phi = 45 deg
5) Up stream Slope Protection (pediments w/ 50 % > 12")
6) Compacted Clay Blanket (silty, sandy clay) unit wt = 122 pcf, c = 0, phi = 27 deg
7) Drain (24" of gravel surrounded by 6" filters) unit wt = 130 pcf, c = 0, phi = 35 deg
8) Cover Soil (18" of cobbles to sands) unit wt = 100 pcf, c = 0, phi = 10 deg
9) Random Fill unit wt = 125, c = 0, phi = 32 deg

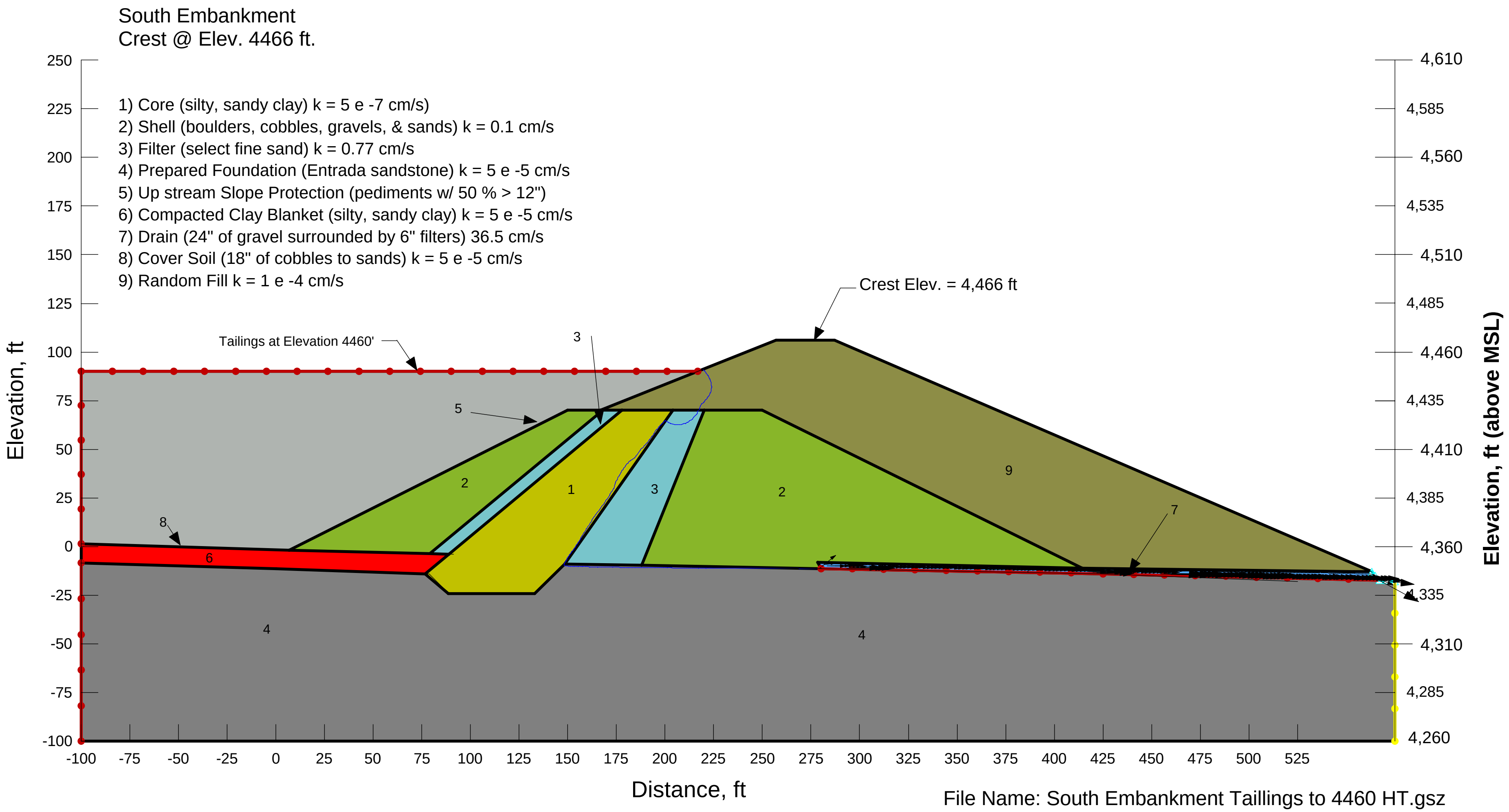
Upstream Slope
Pseudostatic Analysis - 0.12g

File Name: South Embankment Taillings to 4460 EOC HT.gsz
Date: 4/24/2008

Project No: 181692

April 2008

**South Dam – Phase II**
**End of Phase II Construction**
**Pseudostatic Upstream Slope Stability Analysis**
**Figure D-11**

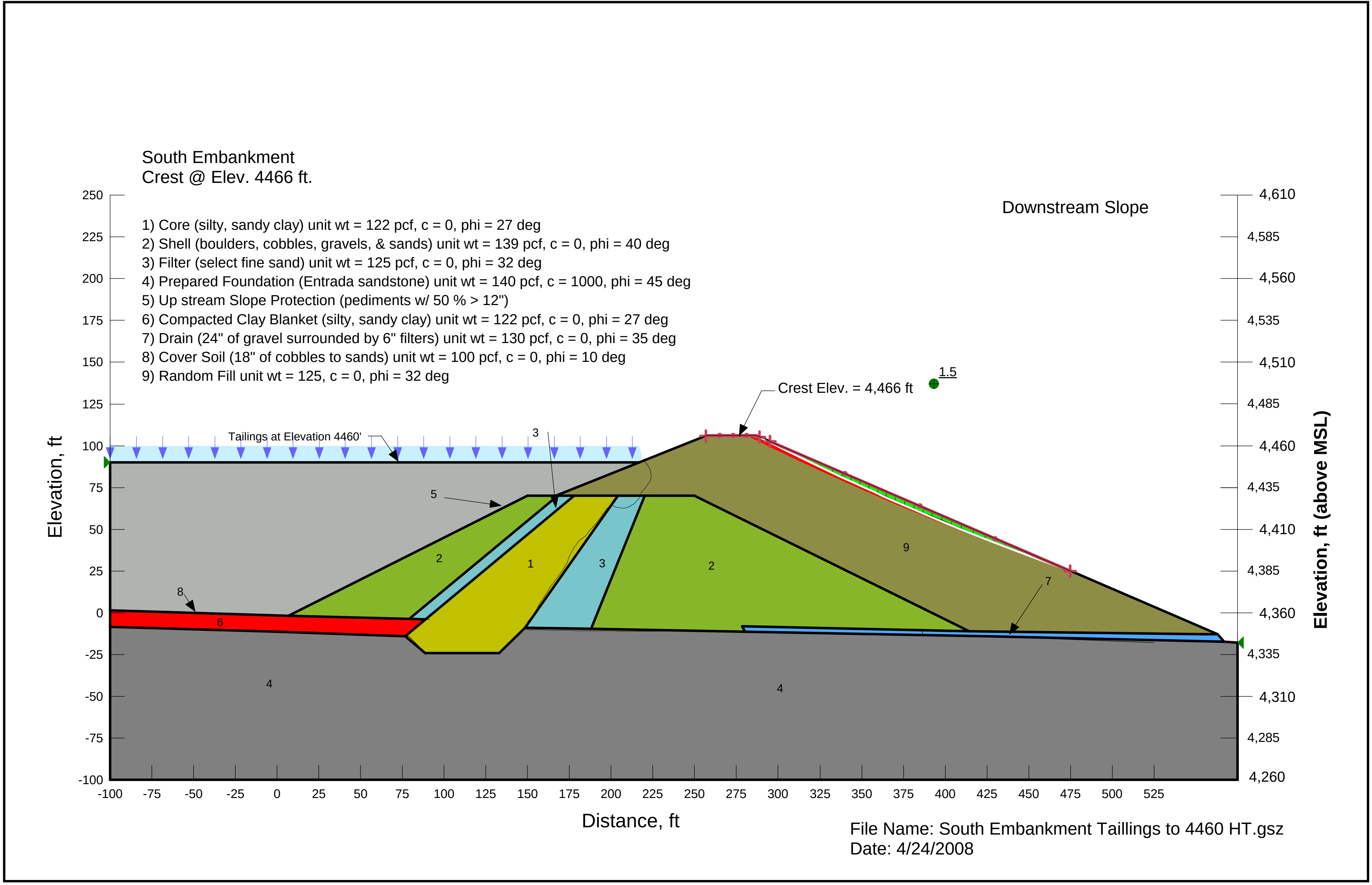


File Name: South Embankment Taillings to 4460 HT.gsz
Date: 4/24/2008

Project No: 181692

April 2008

**South Dam – Phase II**
**End of Phase II Deposition**
**Steady State Seepage Analysis**
**Figure D-12**



Project No: 181692

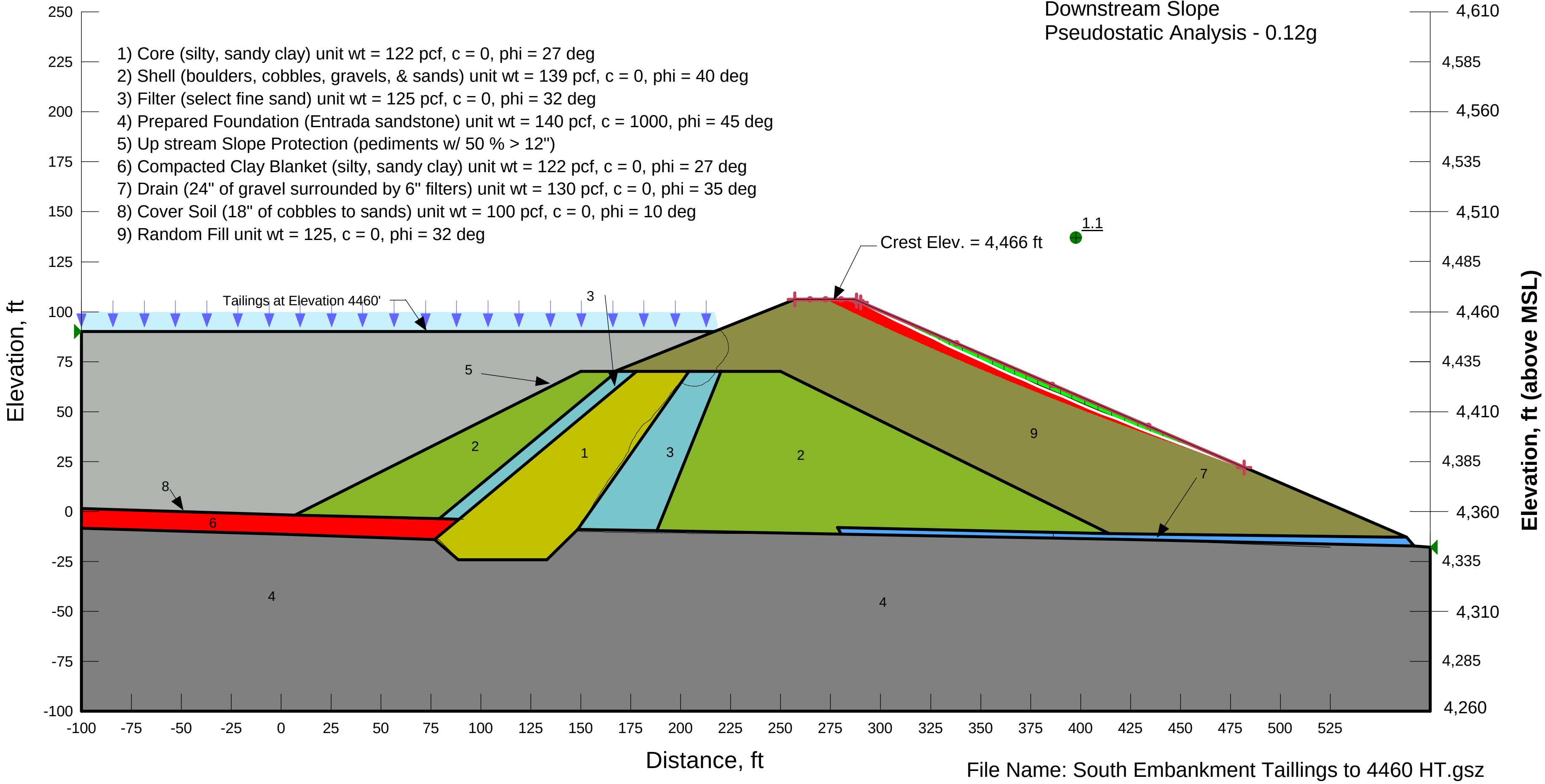
April 2008

**South Dam – Phase II**
**End of Phase II Deposition**
**Static Downstream Slope Stability Analysis**
**Figure D-13**

South Embankment
Crest @ Elev. 4466 ft.

Downstream Slope
Pseudostatic Analysis - 0.12g

1) Core (silty, sandy clay) unit wt = 122 pcf, c = 0, phi = 27 deg
2) Shell (boulders, cobbles, gravels, & sands) unit wt = 139 pcf, c = 0, phi = 40 deg
3) Filter (select fine sand) unit wt = 125 pcf, c = 0, phi = 32 deg
4) Prepared Foundation (Entrada sandstone) unit wt = 140 pcf, c = 1000, phi = 45 deg
5) Up stream Slope Protection (pediments w/ 50 % > 12")
6) Compacted Clay Blanket (silty, sandy clay) unit wt = 122 pcf, c = 0, phi = 27 deg
7) Drain (24" of gravel surrounded by 6" filters) unit wt = 130 pcf, c = 0, phi = 35 deg
8) Cover Soil (18" of cobbles to sands) unit wt = 100 pcf, c = 0, phi = 10 deg
9) Random Fill unit wt = 125, c = 0, phi = 32 deg



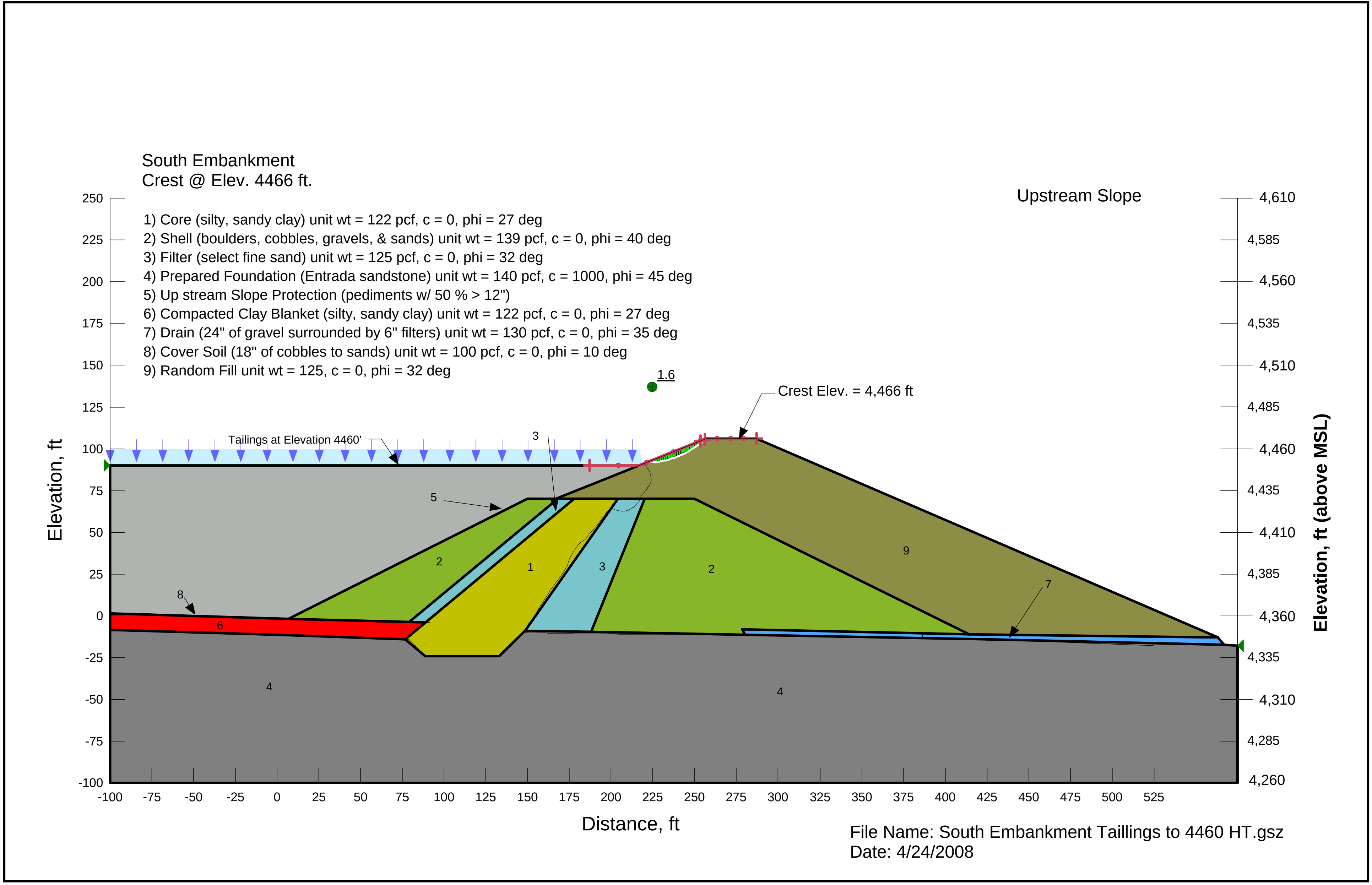
File Name: South Embankment Taillings to 4460 HT.gsz
Date: 4/24/2008

Project No: 181692

April 2008

**South Dam – Phase II**
**End of Phase II Deposition**
**Pseudostatic Downstream Slope Stability Analysis**
**Figure D-14**

P\181627\Report\Slope Figures.ppt



South Embankment
Crest @ Elev. 4466 ft.

1) Core (silty, sandy clay) unit wt = 122 pcf, c = 0, phi = 27 deg
2) Shell (boulders, cobbles, gravels, & sands) unit wt = 139 pcf, c = 0, phi = 40 deg
3) Filter (select fine sand) unit wt = 125 pcf, c = 0, phi = 32 deg
4) Prepared Foundation (Entrada sandstone) unit wt = 140 pcf, c = 1000, phi = 45 deg
5) Up stream Slope Protection (pediments w/ 50 % > 12")
6) Compacted Clay Blanket (silty, sandy clay) unit wt = 122 pcf, c = 0, phi = 27 deg
7) Drain (24" of gravel surrounded by 6" filters) unit wt = 130 pcf, c = 0, phi = 35 deg
8) Cover Soil (18" of cobbles to sands) unit wt = 100 pcf, c = 0, phi = 10 deg
9) Random Fill unit wt = 125, c = 0, phi = 32 deg

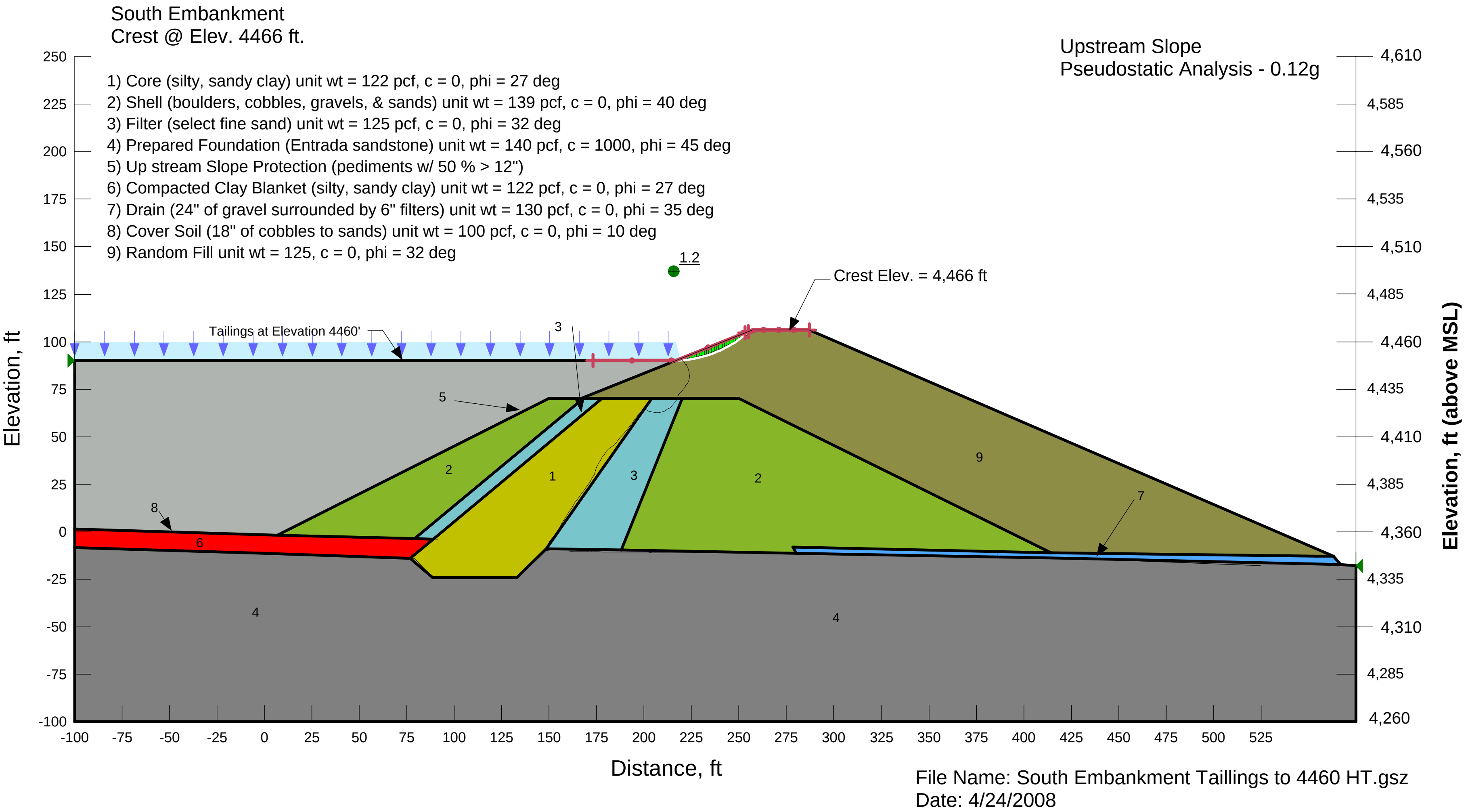
File Name: South Embankment Taillings to 4460 HT.gsz
Date: 4/24/2008

Project No: 181692

April 2008

**South Dam – Phase II**
**End of Phase II Deposition**
**Static Upstream Slope Stability Analysis**
**Figure D-15**

P\181627\Report\Slope Figures.ppt



Project No: 181692

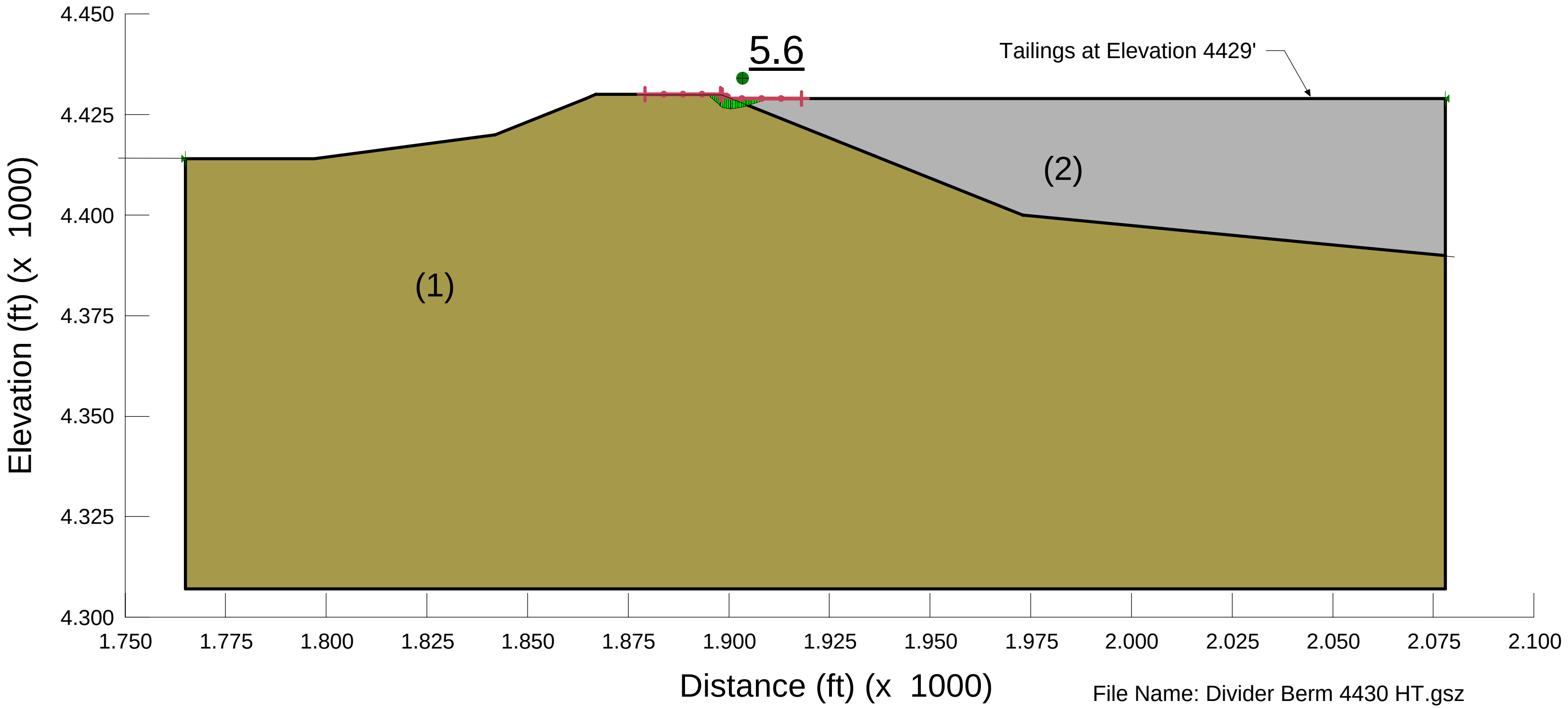
April 2008

**South Dam – Phase II**
**End of Phase II Deposition**
**Pseudostatic Upstream Slope Stability Analysis**
**Figure D-16**

Divider Berm
Crest Elevation 4430 feet

(1) Random Fill  unit wt = 125 pcf, c = 0, phi = 32 deg
(2) Tailings  unit wt = 100 pcf, c = 0, phi = 10 deg

Downstream Berm Stability



File Name: Divider Berm 4430 HT.gsz
Date: 4/24/2008

Project No: 181692

April 2008

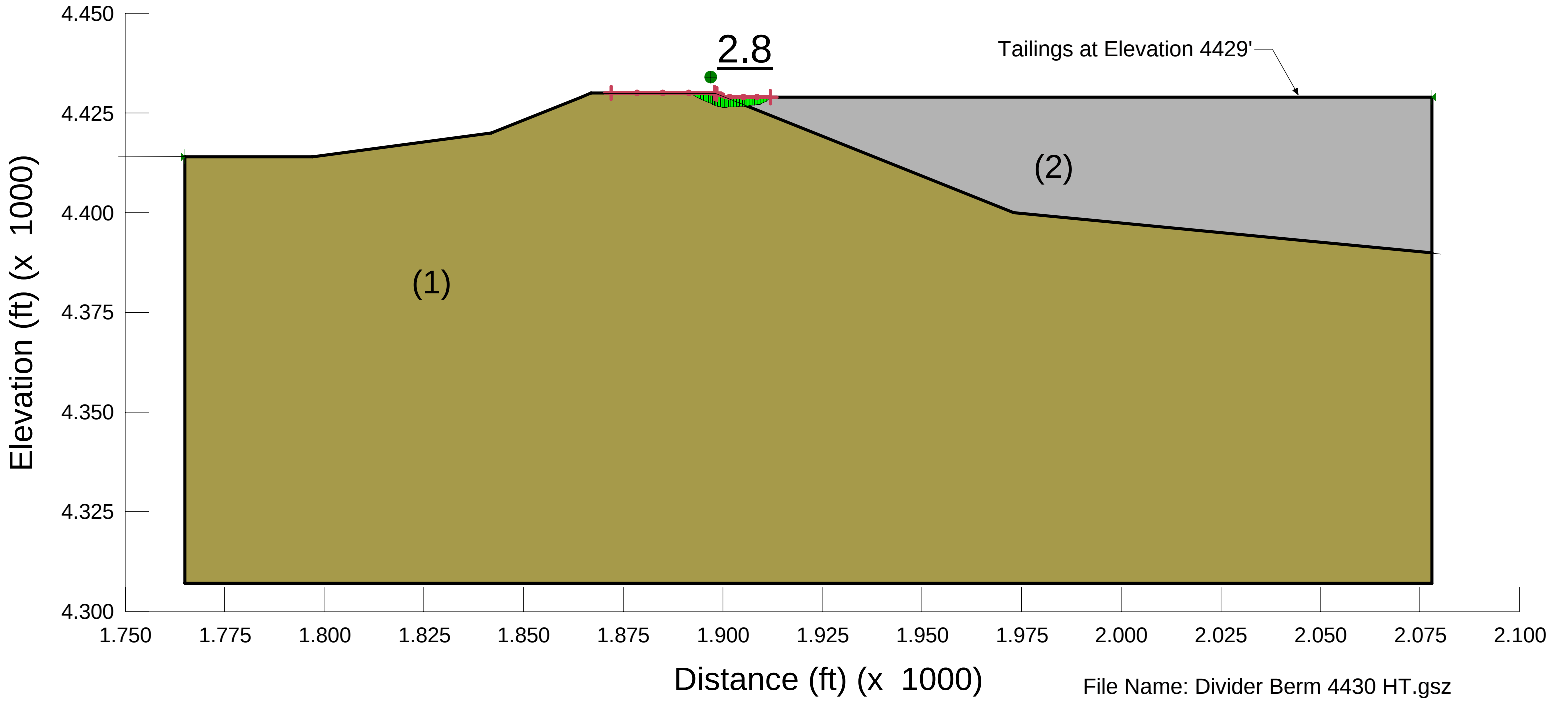
**Divider Berm**
**End of Stage I Deposition**
**Static Downstream Slope Stability Analysis**
**Figure D-17**

Divider Berm
Crest Elevation 4430 feet

(1) Random Fill unit wt = 125 pcf, c = 0, phi = 32 deg
(2) Tailings unit wt = 100 pcf, c = 0, phi = 10 deg

Downstream Berm Stability

Pseudostatic Analysis 0.12g

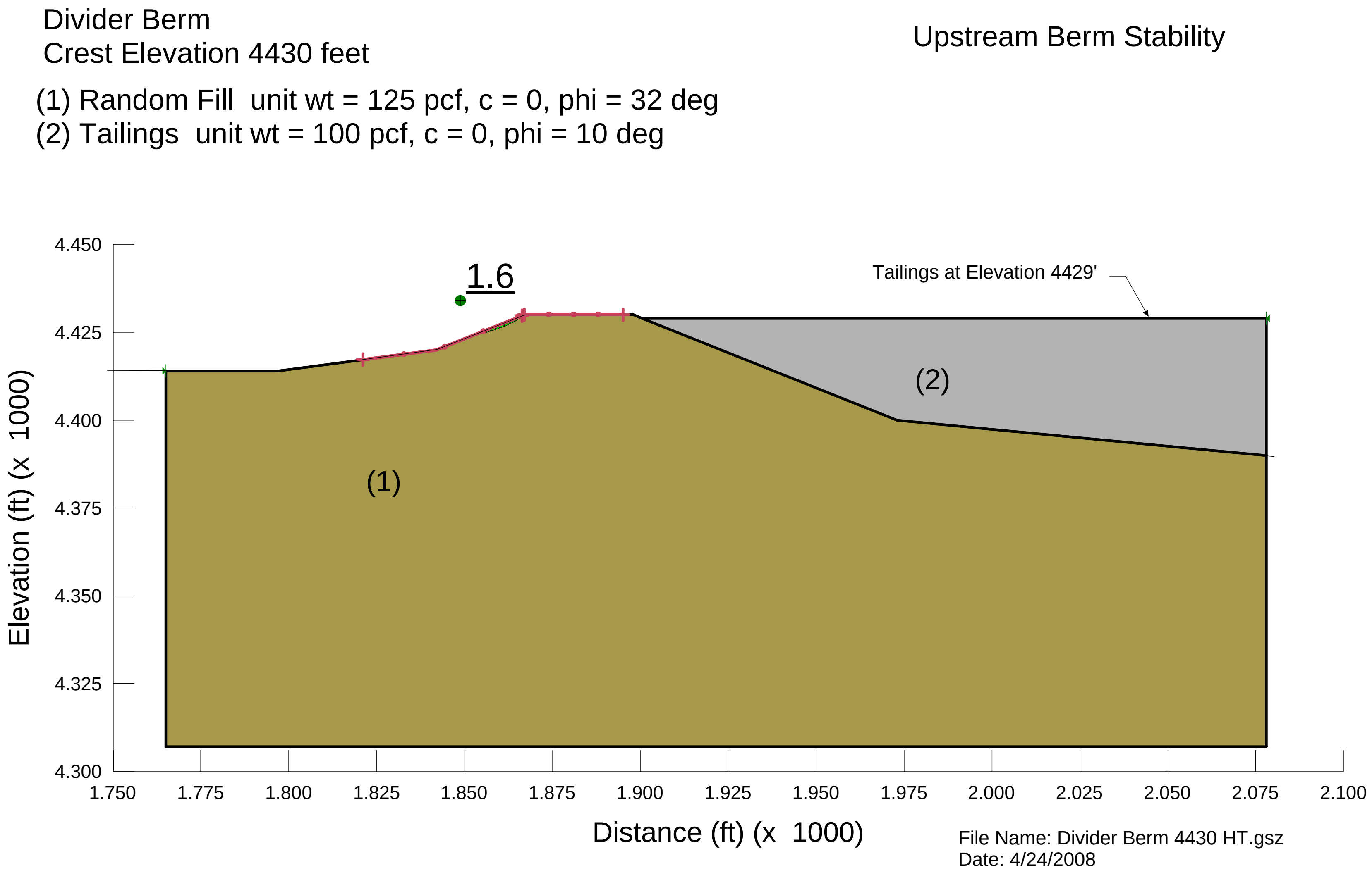


File Name: Divider Berm 4430 HT.gsz
Date: 4/24/2008

Project No: 181692

April 2008

**Divider Berm**
**End of Stage I Deposition**
**Pseudostatic Downstream Slope Stability Analysis**
**Figure D-18**



File Name: Divider Berm 4430 HT.gsz
Date: 4/24/2008

Project No: 181692

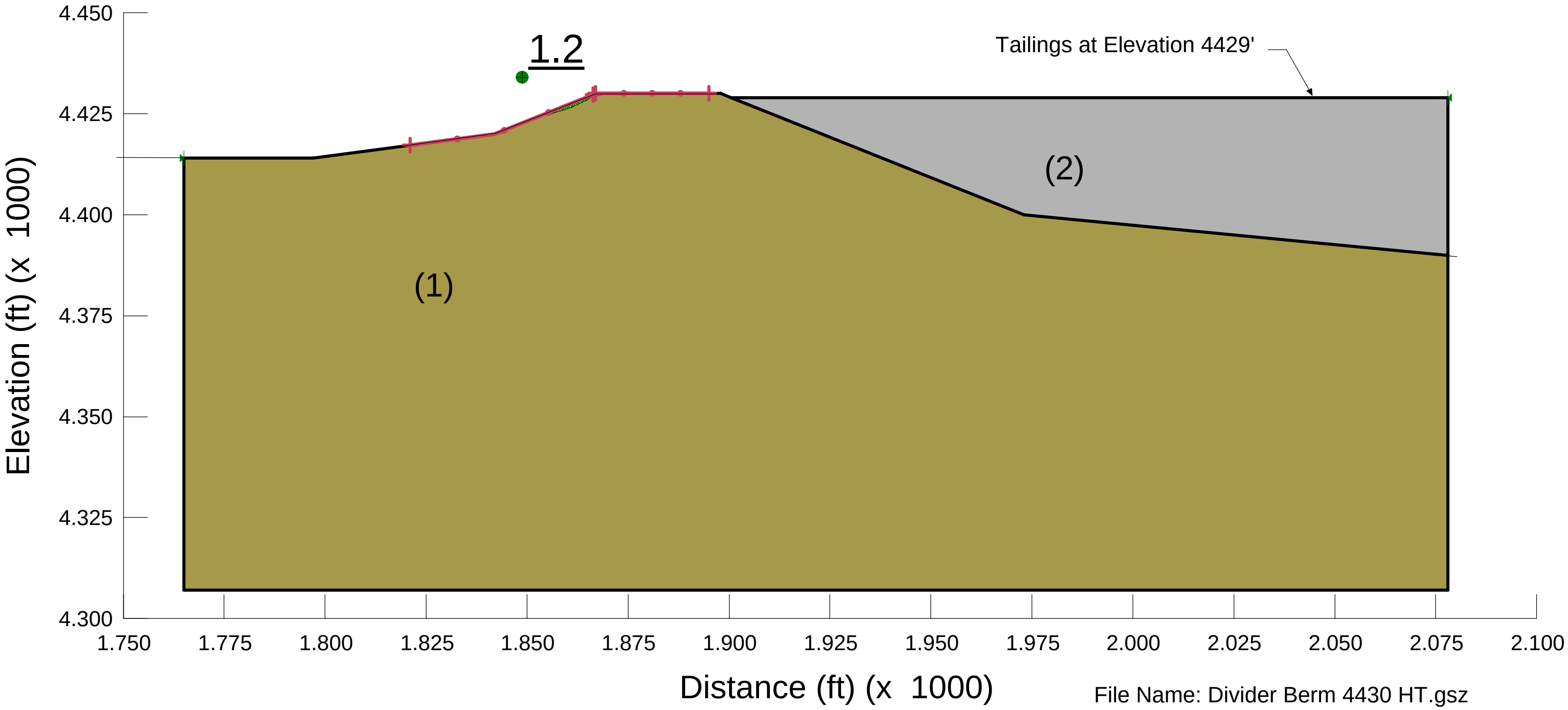
April  2008

**Divider Berm**
**End of Stage I Deposition**
**Static Upstream Slope Stability Analysis**
**Figure D-19**

Divider Berm
Crest Elevation 4430 feet

Upstream Berm Stability

(1) Random Fill  unit wt = 125 pcf, c = 0, phi = 32 deg
(2) Tailings  unit wt = 100 pcf, c = 0, phi = 10 deg



File Name: Divider Berm 4430 HT.gsz
Date: 4/24/2008

Project No: 181692

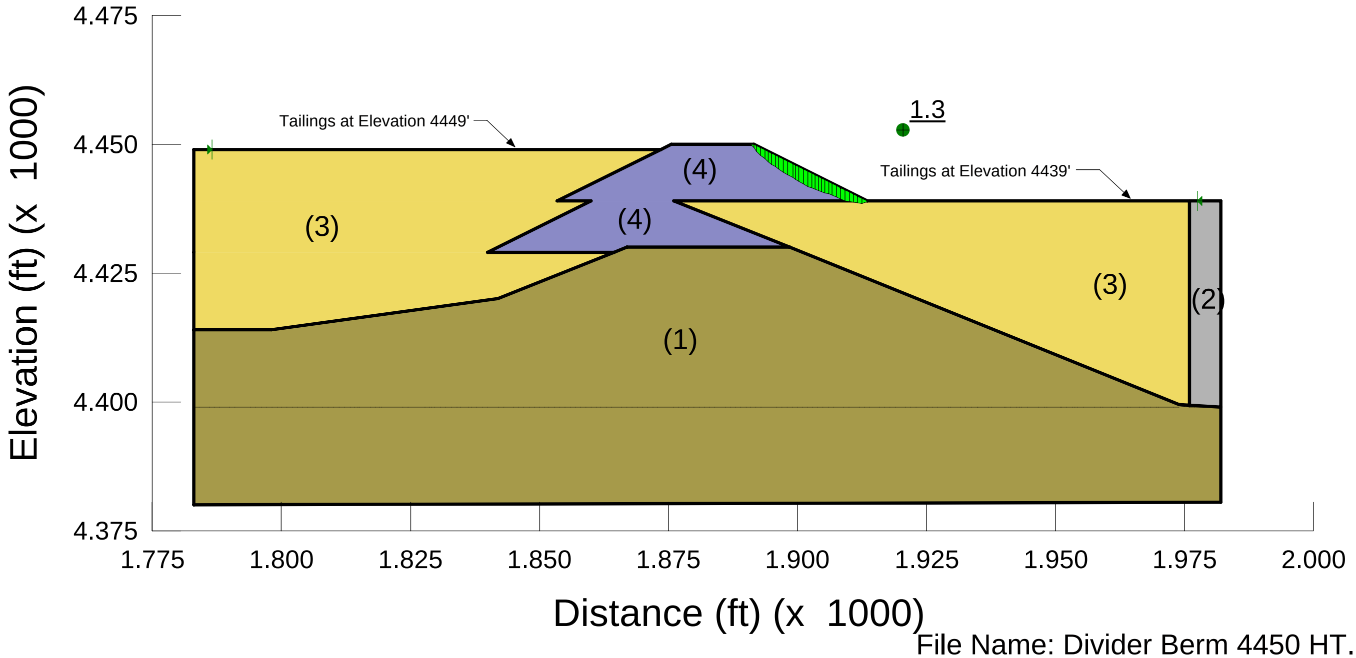
April 2008

**Divider Berm**
**End of Stage I Deposition**
**Pseudostatic Upstream Slope Stability Analysis**
**Figure D-20**

Divider Berm - Stage 3
Crest Elevation 4450 feet

Downstream Berm Stability

(1) Random Fill unit wt = 125 pcf, c = 0, phi = 32 deg
(2) Tailings  unit wt = 100 pcf, c = 0, phi = 10 deg
(3) Beach Sand unit wt = 115 pcf, c = 0, phi = 28 deg
(4) Compacted Tailings unit wt = 125 pcf, c = 0, phi = 32 deg



File Name: Divider Berm 4450 HT.gsz
Date: 4/24/2008

Project No: 181692

April  2008

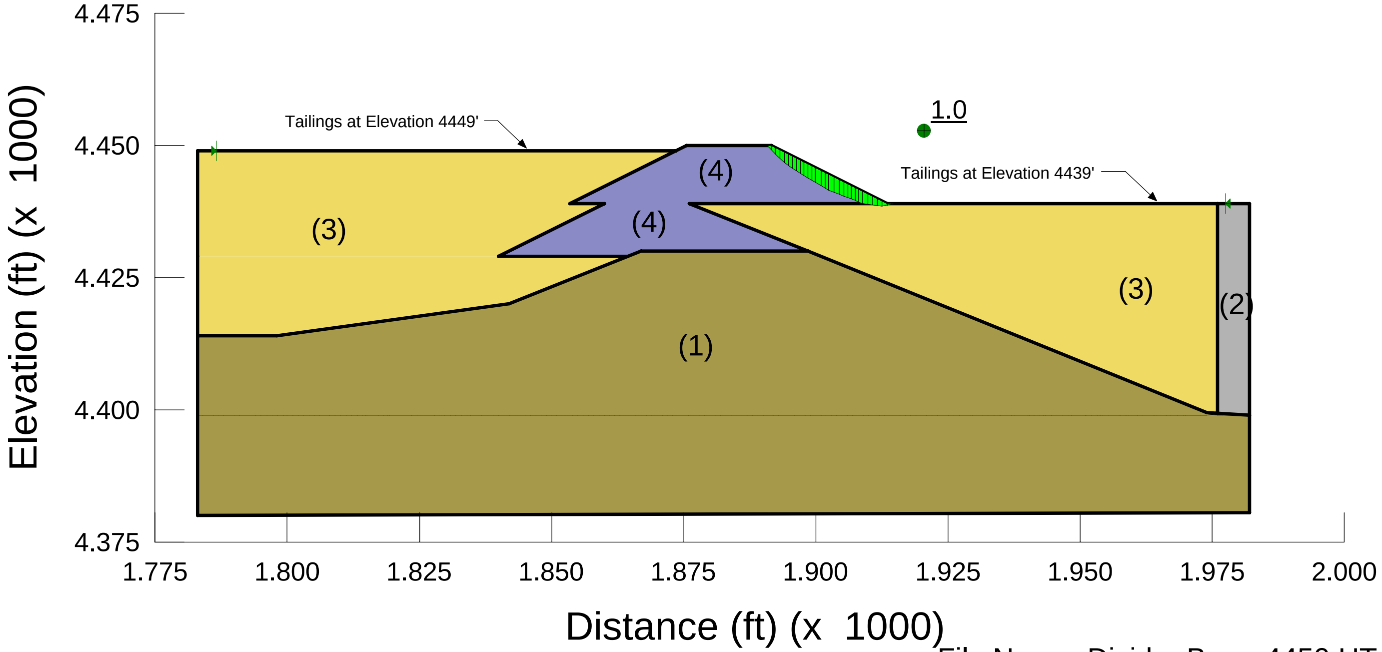
**Divider Berm**
**End of Stage 3 Deposition**
**Static Downstream Slope Stability Analysis**
**Figure D-21**

Divider Berm - Stage 3
Crest Elevation 4450 feet

Downstream Berm Stability

Pseudostatic Analysis 0.12g

(1) Random Fill unit wt = 125 pcf, c = 0, phi = 32 deg
(2) Tailings  unit wt = 100 pcf, c = 0, phi = 10 deg
(3) Beach Sand unit wt = 115 pcf, c = 0, phi = 28 deg
(4) Compacted Tailings unit wt = 125 pcf, c = 0, phi = 32 deg



File Name: Divider Berm 4450 HT.gsz
Date: 4/24/2008

Project No: 181692

April  2008

**Divider Berm**
**End of Stage 3 Deposition**
**Pseudostatic Downstream Slope Stability Analysis**
**Figure D-22**

# APPENDIX E
# TAILINGS STORAGE FACILITY WATER BALANCE

# APPENDIX E.1
# GOLDSIM MODEL

# APPENDIX E.1
# GoldSim Model

A detailed water and tailings mass balance computer model was developed for the Shootaring Mill using the dynamic modeling platform called GoldSim (V. 9.6. GoldSim Technology Group, LLC. Copyright 1998-2007). GoldSim is a Windows-based computer program used to simulate engineering systems and is highly suited to work with the system variability of a mine site as it is being constructed and/or operated. The model simulates the key inflows and outflows to the system that contribute to changes in pond volume during the life of the mill as well as tracking the total volume of solids deposited in each cell.

GoldSim is a powerful and flexible platform for visualizing and numerically simulating physical systems such as a water balance. In a sense, GoldSim is like a “visual spreadsheet” that allows you to visually create and manipulate data and equations (See Glossary for a description of the GoldSim building blocks). Unlike spreadsheets, however, GoldSim allows you to readily evaluate how a system evolves over time and predict future behavior. This simulation environment is highly graphical and offers an array of built-in building blocks suited for building a simulation model of the mill system.

The primary building block for a water balance model is called a “Stock”. This is the model component that allows for the storage and release of material. In this case each of the tailings pools (North and South) was represented by as individual stock (Figure 1).

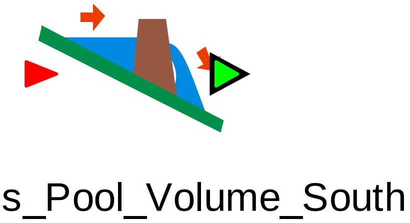


**Figure 1 GoldSim Stock Component**

The rate of change in total volume of water in the stock is dictated by the rate of withdrawal and the rate of addiction. The rate of change in volume in the stock is governed by the equation:

$$\frac{d(V)}{dt} = Q_{in} - Q_{out}$$

Where:

$Q_{in}$ = flow rate into system (volume/time)
$Q_{out}$ = flow rate out of system (volume/time)
V = volume of tailings pond (volume)

Which can be solved in a step-wise fashion by the following equations:

$$V_{i+1} = V_i + (Q_{in} - Q_{out})\Delta t$$

Thus, the volume contained in the stock at any given time can be calculated based on the rates of inflow and outflow and the given time step. Both a spreadsheet water balance model and a water balance built in

GoldSim use this same equation to evaluate the change in volume as a function of time. A spreadsheet model is typically set up with each row in the spreadsheet representing point in time defining the inflows and outflow to the system. The final volume is determined by connection back to the prior volume and adding summing inflows and outflow at each time stop. GoldSim works in much the same way. The model's inflow and outflows would use the same equations and relationships as described in the first row of a spreadsheet model. However, the remaining rows are calculated by setting the model's start time, time step, and a total run time.

GoldSim models can be built in a hierarchical and modular manner by creating and linking together subsystems. The building block for creating a modular based GoldSim model is the container (Figure 2). The container shown in Figure 2 from the water balance model contains the components that are used to calculate the outflow from the South Cell (i.e. evaporation and entrained water).

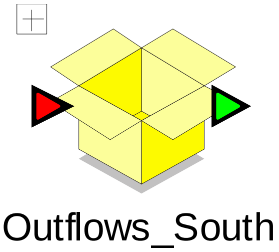


**Figure 2 Container where Outflows are Calculated**

Opening the "Outflows_South" container reveals the components and relationships used to calculate outflow from the South Cell. Evaporative losses from the impoundment are calculated in the expression "Pool_Evaporation" and, as shown in Figure 3, is a function of the pan factor (Pool_Pan_Factor), monthly evaporation rate (Current_Evap_Mean), and pond surface area (Total_Pond_Area_South). (See Glossary for a description of the GoldSim building blocks).

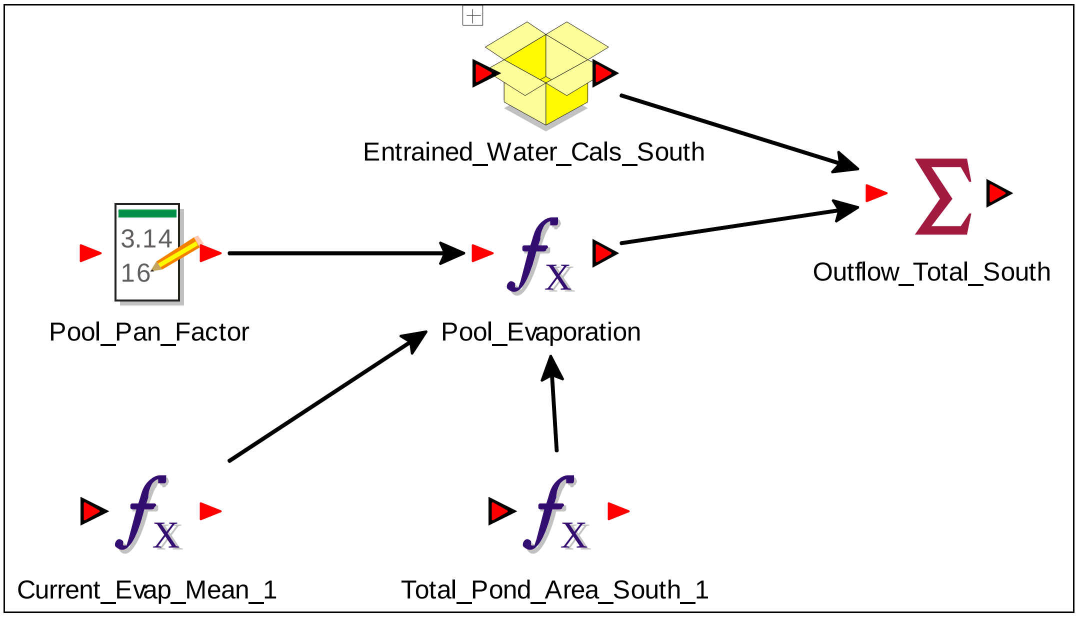


**Figure 3 Components included in the Container "Outflows_South" which Calculates System Evaporative Losses**

By putting the components together one can see how each component of a model is influenced by the other components. As is show in Figure 4, the volume of water in the south pond is influenced by "Outflow_South", which contains the equations used to calculate the total outflow pond, "Inflows_South", which calculates the amount of water inflow to the pond. As is shown one can also see which components are influenced by the pond volume such as the "PondArea_South" and other components contained in the container "TailsGeometry_South". Also show in this model is that total pond area (PondArea_South) is a function of the pond volume (this relationship is defined in the lookup table VolumeArea) and the pond volume is a function of Outflow, which in turn is a function of pond area. This circular relationship between components is called a feed back loop and would be expected since evaporation is a function pond area and pond area is a function the total volume in the pond.

The series of components called LastPondVolume, VolumeChange, PercentWaterCover, and WaterWellFlow create another feedback loop which defines the amount of make-up water need to be added to the tailings in order to maintain a water radon barrier. The differential volume between time-steps is used to estimate the amount of water required to maintain a water cover.

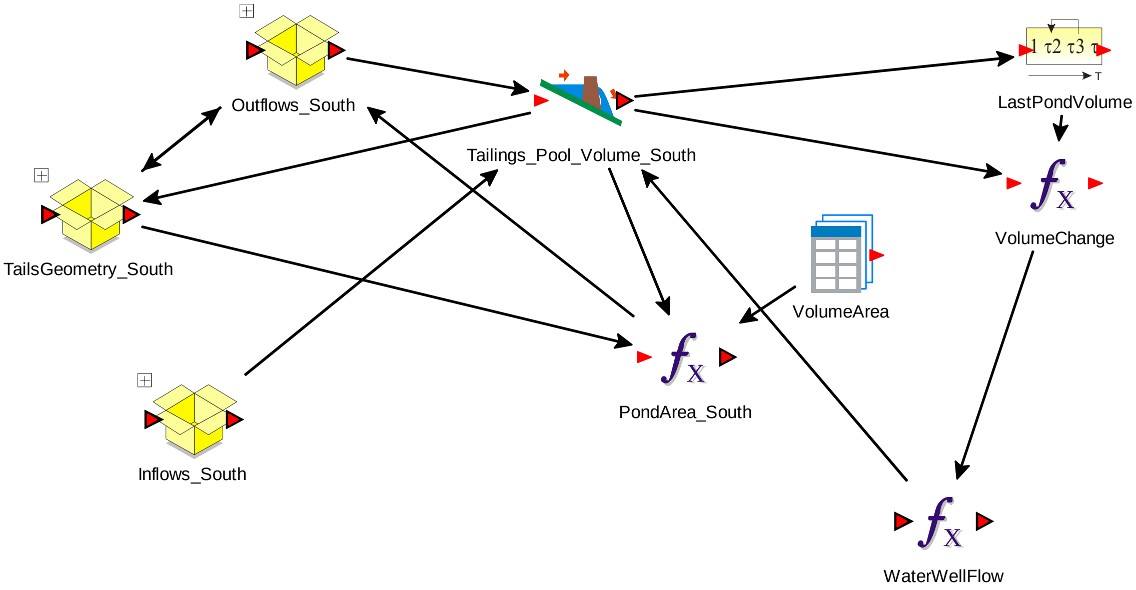


**Figure 4 Water Balance Sub-model for the South Pond**

Another important container in the model is TailsGeometry_South. As indicated by the name this component holds the elements necessary to calculate the geometry of the tailings as they are being filled (Figure 6). The container handles the tracking of tails volumes and calculates the area and volumes based on the Volume-Elevation and Volume-Area relationships that were developed for the model.

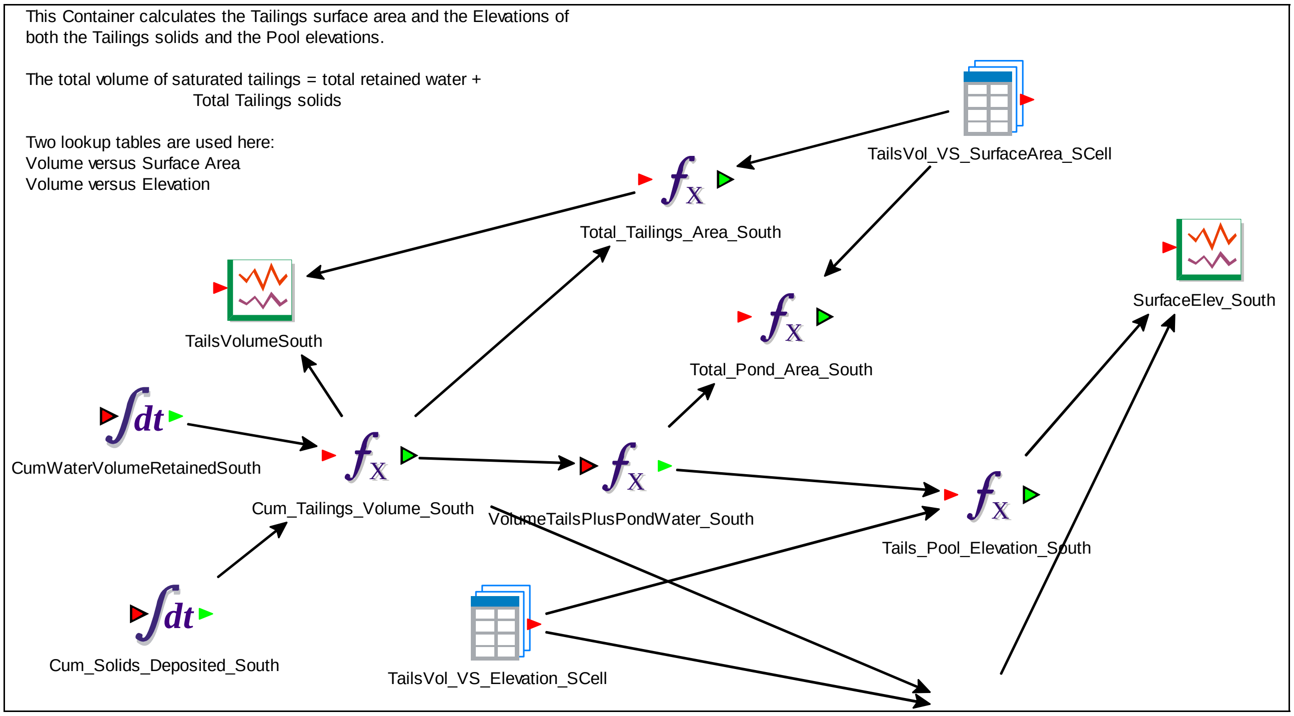


**Figure 5  Tailings Geometry Calculations**

## Tailings Staging

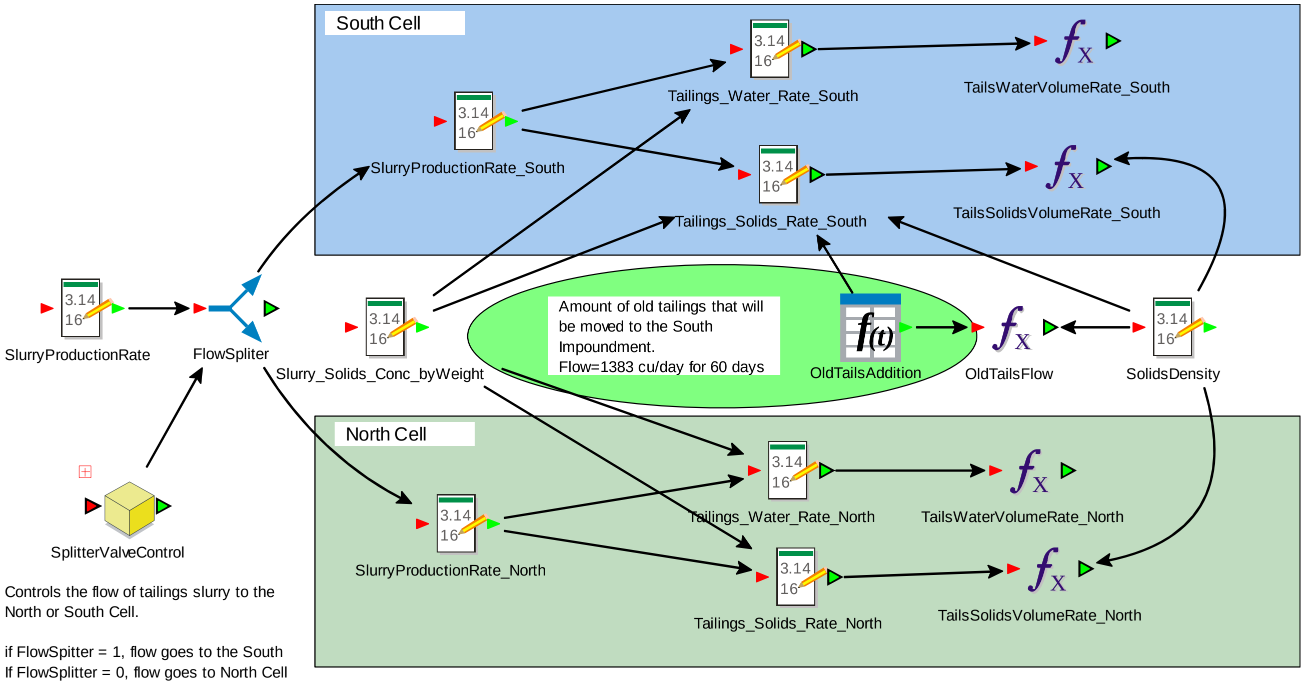
A powerful feature of GoldSim is the ability to add events, or triggers, to a model.  For this model a trigger was set-up to change tailings deposition from one cell to the other.  The model was set-up with tailings flow either going to the North or the South Cells based on elevation criteria between the cells.  Tailings deposition was initially to the South Cell while Phase II was being constructed.  Tailings could be deposited in the cell until an elevation of 4429 was reached and then deposition would be directed to the North Cell.  After that point in time the pond surface elevation between the cells was not to exceed 10 feet.

To model this behavior in GoldSim a lookup tables was used to hold the elevation criteria and the direction of flow.  At each time step the model would checked to see if the elevation criteria was satisfied and then, based on the lookup table, would redirect the flow to the other cell.

## Model Inflows

**Tailings Slurry** – In the model, tailings slurry is produced at a rate of 63.6 tons/hr over the entire life of the mill.  This is based on a production rate of 750 dry tons of ore per day over 350 days per year.  The tailings slurry is 49.2 percent solids by weight with a solids density of 97 lb/ft$^2$.  An additional 100,000 cubic yards of existing tailings currently within the TSF limits which will be excavated and added to the South Cell after it is complete.  The rate of excavation is assumed to be approximately 1,380 yds$^3$/day for 60 days.

This is represented by the sub-model shown in Figure 5.  The container labeled “SplitterValveControl” is where the calculations are made determine to which cell the tailings is directed.  Also depicted in the Figure 5 is the rate of addition of the old tailings excavated from North Cell and deposited in the South Cell.



Amount of old tailings that will be moved to the South Impoundment.
Flow=1383 cu/day for 60 days

Controls the flow of tailings slurry to the North or South Cell.

if FlowSpitter = 1, flow goes to the South
If FlowSplitter = 0, flow goes to North Cell

**Figure 6 GoldSim Representation of the Mill**

**Precipitation** – Average monthly rainfall values were used to determine the precipitation contribution to the tailings water pool. In GoldSim this was represented using a lookup table containing monthly precipitation values. Therefore, at each month in the model the lookup table is used to get the precipitation rate. This rate was then applied to the contributing surface area to calculate a flow rate.

**Runoff** - Precipitation in the catchment areas above each of the cells can produce runoff which can contribute to the pond size. The amount of runoff produced will be different depending on if the precipitation falls on primarily rock cliffs or the sandy soils and eroded sandstone soils in the valley. To more accurately model these two distinct regions within the catchment areas each basin was divided in to two areas of possible runoff: “cliffs” and “Other”. The cliffs include the west bluff, consisting of Dakota and Entrada sandstone, slope varying 1.5:1 to vertical, and some talus, and the other areas included the mill site, wind-eroded sandstone, wind-deposited sandy soils in valley, and residual soils on the east bluff. Each of these areas was assigned a runoff coefficient based on the month and the topography (see Section 8 and Appendix G.3).

In GoldSim this was represented by a series of lookup tables and constants representing the calculations (Figure 6).

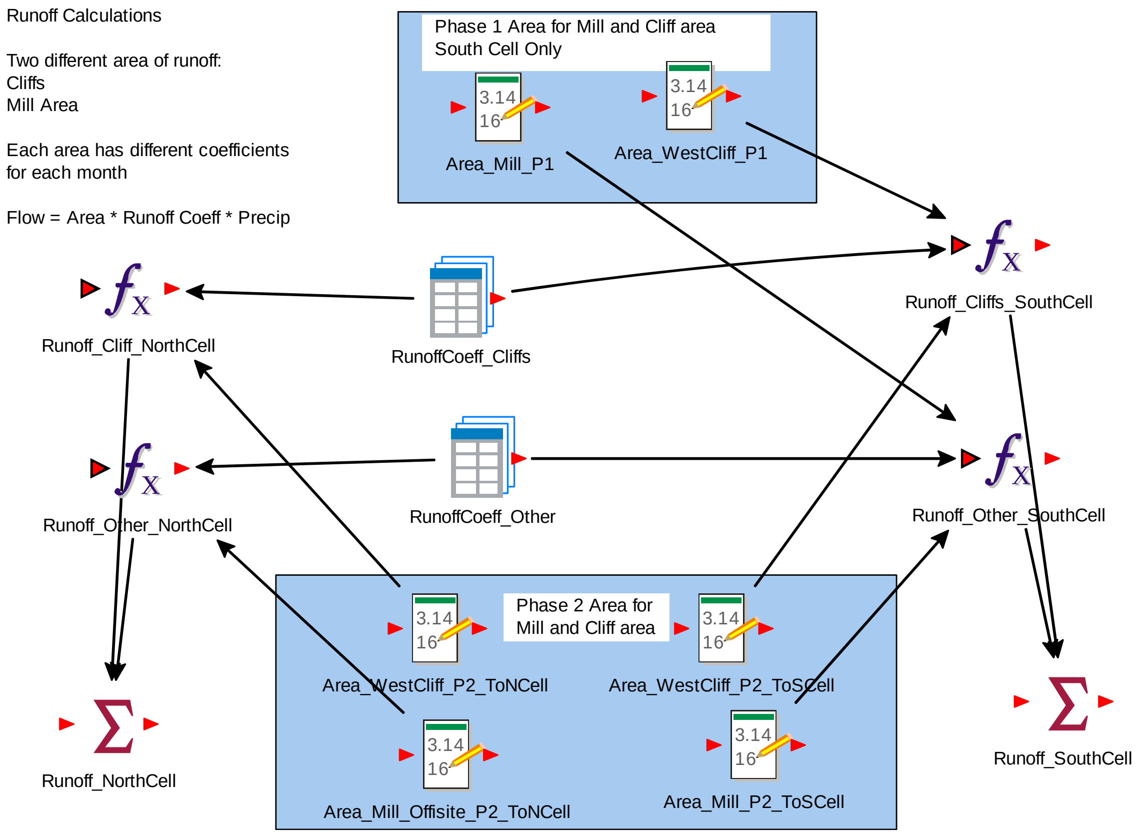


**Figure 7 Runoff Calculations**

## Model Outflows

The outflow from the TSF includes evaporation from the open water surface and water that becomes permanently entrained in the tailings mass. It was assumed in the modeling that no water is removed from the decant pond. The impoundment will be lined with a double 60 mil HDPE liner, so no seepage or deep infiltration losses were incorporated into the water balance model.

**Evaporation –** Evaporative losses from the water pool were modeled by multiplying the impoundment water pool area by the monthly evaporation rate. The evaporation rates (Table 1) used were estimated from the water balance conducted for the Tony M. Mine (Tetra Tech, 2006). See Appendix E.3 for discussion of estimation of the evaporation rates. This model was discussed in the above text (see Figure 3).

**Table 1 Net Evaporation Rates (in inches)**

| Month | Department of Interior | Weather Station Location | | | | | Estimated Evap. for Tony M Mine Site |
|---|---|---|---|---|---|---|---|
| | | Wahweap | Page | Mexican Hat | Moab | Piute Dam | |
| **Station Number** | | **29114** | **26180** | **425582** | **425733** | **426897** | |
| January | 2.54 | | | | | | 2.5 |
| February | 2.72 | | | | | | 2.7 |
| March | 3.10 | 4.29 | 3.58 | | | | 3.2 |
| April | 4.24 | 6.39 | 5.79 | 5.80 | 4.53 | | 4.8 |
| May | 5.10 | 9.26 | 7.71 | 8.02 | 6.59 | 5.52 | 7.1 |
| June | 6.89 | 10.91 | 9.64 | 9.84 | 8.02 | 7.11 | 8.8 |
| July | 7.71 | 11.01 | 9.36 | 9.62 | 8.26 | 6.56 | 8.8 |
| August | 8.37 | 10.05 | 7.78 | 7.77 | 6.77 | 5.23 | 7.3 |
| September | 7.47 | 7.20 | 5.50 | 5.67 | 4.53 | 4.23 | 5.0 |
| October | 5.25 | 4.96 | 3.00 | 3.17 | | 2.91 | 3.1 |
| November | 3.42 | 2.56 | 1.13 | 0.89 | | | 2.5 |
| December | 3.31 | | | | | | 2.4 |
| **Annual** | **60.12** | **66.63** | **53.49** | **50.77** | **38.70** | **31.55** | **58.2** |

Note: Evaporation rate data from surrounding weather stations was derived from a Class A pan evaporation data using a evaporation pan factor of 0.70.

The surface area was calculated based on a volume versus surface area relationship developed for each of the cells. The total volume of material (solids and water) contained in the cell at any given time was input into this relationship to calculate the surface area available for evaporation. The total volume in the cell at each time step was calculated by summing the total solids, the volume of entrained water, and the volume of water pool at each point in time.

**Entrained Water** – Entrained water is the residual portion of the input water that is assumed to be held within the pore spaces of the tailings and is not available as free water. The model assumes the placed tailings remain saturated and that 20 percent of the discharged water is entrained within the solids. This volumetric flow was calculated in the model by multiplying the discharge rate of water to the cell by 20 percent.

**Reclaimed Water** – It was assumed that no water will be reclaimed and returned back to the mill.

### Results

Tailings are discharged into the North Cell and South Cell during the life of the impoundment (Table 2) (See Appendix E.2, Table 1, for a full listing of pond and surface elevations over time). Tailings are first deposited in the South Cell while Phase II is being constructed. In order to maintain an adequate freeboard in the South Cell of 6 feet, Phase II needs to be completed by the time the free water elevation reaches 4423.5 ft, which occurs at 3.9 years (Mar 2013). At this point, the new embankment resulting from construction of Phase 2 allows for continued deposition of tailings to the South Cell until a pond elevation of 4429 is reached (Feb 2014). Tailings discharge is then switched to the North Cell until a water elevation of 4439 (Mar 2015) and then back to the South Cell until 4449 is reached (Dec 2019). Discharge is then switched back to the North Cell until it reaches capacity at a pool elevation of 4458 (Aug 2023), which results in a freeboard of 8 feet. Discharge is then switch back to the South Cell until it reaches capacity at a pool elevation of 4461 (Nov 2026), which results in a freeboard of 5 feet in the South Cell.

A water cover must be maintained on the tailings surface of each of the cell as a radon barrier. As each of the cell's surface areas increase the losses due to evaporation also increase. Starting in August, 2016 through Dec, 2019, while tailings is actively being discharged to the South Cell, additional make-up water must be added to the North Cell in order to maintain a water cover on the tailings surface (Table 3). Additional water must be added to the North Cell again from Dec, 2023 through Nov, 2026. South cell make-up water is required from Aug, 2020 through Nov, 2023 and then again for three separate three-month periods in 2024, 2025, and 2026.

**Table 2. Summary of Tailings Staging**

| Discharge to | Milestone | Date | Comment |
|---|---|---|---|
| South Cell | 4423.5 | Mar 2013 | Phase 2 completed |
| South Cell | 4429 | Feb 2014 | Switch to the North Cell |
| North Cell | 4439 | Mar 2015 | Switch to the South Cell |
| South Cell | 4449 | Dec 2019 | Switch to the North Cell |
| North Cell | 4458 | Aug 2023 | North Cell full, switch to the South Cell |
| South Cell | 4461 | Nov 2026 | South Cell full |

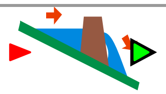
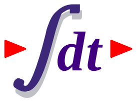
**Table 3. Make-up water flows to North and South Cells**

| South Cell make-up water flows | | North Cell make-up water flows | |
|---|---|---|---|
| Period | Flow Range | Period | Flow Range |
| 8/2020 – 11/2023 | 6-175 gpm<br>97 gpm average | 9/2016 – 12/2019 | 10-80 gpm<br>39 gpm average |
| 9/2024 – 11/2024 | 12-50 gpm<br>32 gpm average | 12/2023 – 11/2026 | 27-167 gpm<br>97 gpm average |
| 9/2025 – 11/2025 | 13-60 gpm<br>44 gpm average | | |
| 9/2026 – 11/2026 | 50-148 gpm<br>76 gpm average | | |

## GLOSSARY:

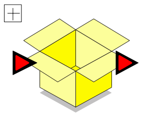
### GoldSim Building Blocks

**Stock Elements**: A class of elements that numerically integrate inputs, and hence are responsible for internally generating the dynamic behavior of many systems. Stocks elements are elements which impart inertia and memory to a system. These kinds of elements are responsible for internally generating the dynamic behavior of a system. At any point in time in a simulation, the outputs of stock elements are computed based on the historical values of their inputs. Mathematically, stocks represent integrals. This element accepts inflow and outflows as a function of time, and stores the change of volume.

| **Element** | **Default Symbol** | **Function** |
|---|---|---|
| Reservoir | <br>Tailings_Pool_Volume_South | Integrates (and conserves) flows of materials, allowing for upper and lower bounds to be specified. |
| Integrator | <br>Cum_WaterVolRetained_South | Integrates values. Often used for running totals. |

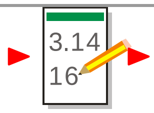
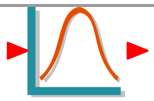
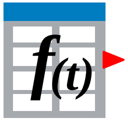
**Container**: A complex model may consist of many hundreds or thousands of individual elements. In order to manage, organize and view such a model it is useful (in fact, essential) to create separate sub-groups or collections of elements.

Such sub-groups are created in GoldSim by placing elements into Containers. A Container is simply a "box" into which other elements have been placed. In a sense, it is like a directory folder on your computer. Containers can be placed inside other Containers, and any number of levels of containment can be created.

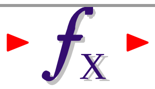
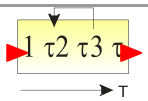
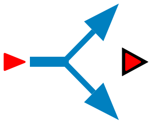
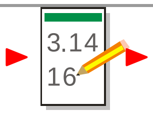


Entrained_Water_Cals_South

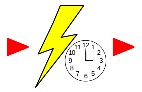
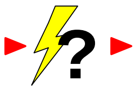
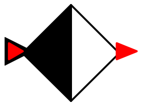
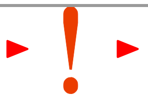
**Input elements:** Used to create inputs that subsequently define the properties of other elements. For examples the Pool_Pan_Factor is a constant used in the calculation of evaporation and the Time Series OldTailsAddtion is a table of data defining the amount of excavated tails added to the South Cell each month.

| **Element** | **Default Symbol** | **Function** |
|---|---|---|
| Data | <br>Pool_Pan_Factor | Defines scalar, vector or matrix data. |
| Stochastic | <br>Stochastic1 | Defines uncertain data as probability distributions. |
| Time Series | <br>OldTailsAddition | Accepts time histories of data and converts them to an appropriate form for use in the model. |

Function elements are elements that manipulate and transform information or material. At any point in time in a simulation, the outputs of these elements are computed based on the current values of their inputs.

| **Element** | **Default Symbol** | **Function** |
|---|---|---|
| Expression | <br>VolumeChange | Defines mathematical or logical expressions. |
| Previous Value | <br>LastPondVolume | Returns the value of its input from the previous model update. |
| Extrema | <br>MaxElevation | Computes the highest (peak) or lowest (valley) value achieved by its input. |
| Splitter | <br>FlowSpliter | Splits an incoming signal into multiple outputs based on specified fractions. |
| Sum | <br>Outflow_Total_South | Facilities the addition of multiple values. |
| Lookup Table | <br>PercentWaterLossInTails | Defines a one, tow or three dimensional lookup table (response surface). |

**Events**:  Another category of elements allows you to superimpose the occurrence and effects of discrete events onto continuously varying systems.  A descrete event was used to initiae when to move the tailings discharge line.

| **Element** | **Default Symbol** | **Function** |
|---|---|---|
| Timed Event | <br>StartPhase2 | Generates discrete event signals based on a specified rate of occurrence, regularly or according to a specified distribution (i.e., randomly). |
| Triggered Event | <br>MoveSpigot | Generates discrete event signals based on one or more specified conditions. |
| Status | <br>S_Over4449_Done | Generates a condition (True/False) in response to particular events or specified conditions. |
| Discrete Change | <br>S_Over4449 | Generates a discrete change signal (a value) that can subsequently discretely modify the values of other elements (e.g., Integrators and Reservoirs).(why a smaller font?) |

# APPENDIX E.2
# WATER BALANCE CAPACITY TABLES

**Appendix E**

**Table 1  Tailings and Pond Elevations for North and South Cells**

| | Year | North Cell | | | South Cell | | |
|---|---|---|---|---|---|---|---|
| Date | Fraction | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) |
| 5/1/09 | 0.00 | 4407.00 | 4407.00 | 59.00 | 4363.0 | 4363.0 | 103.00 |
| 5/2/09 | 0.00 | 4407.00 | 4407.00 | 59.00 | 4363.7 | 4363.3 | 102.32 |
| 5/3/09 | 0.01 | 4407.00 | 4407.00 | 59.00 | 4365.0 | 4364.3 | 101.00 |
| 5/4/09 | 0.01 | 4407.00 | 4407.00 | 59.00 | 4366.3 | 4365.3 | 99.68 |
| 5/5/09 | 0.01 | 4407.00 | 4407.00 | 59.00 | 4367.6 | 4366.3 | 98.36 |
| 5/6/09 | 0.01 | 4407.00 | 4407.00 | 59.00 | 4368.9 | 4367.3 | 97.05 |
| 5/7/09 | 0.02 | 4407.00 | 4407.00 | 59.00 | 4370.1 | 4368.2 | 95.93 |
| 5/8/09 | 0.02 | 4407.00 | 4407.00 | 59.00 | 4370.4 | 4369.2 | 95.60 |
| 5/9/09 | 0.02 | 4407.00 | 4407.00 | 59.00 | 4370.7 | 4370.1 | 95.27 |
| 5/10/09 | 0.02 | 4407.00 | 4407.00 | 59.00 | 4371.1 | 4370.3 | 94.94 |
| 5/11/09 | 0.03 | 4407.00 | 4407.00 | 59.00 | 4371.4 | 4370.6 | 94.61 |
| 5/12/09 | 0.03 | 4407.00 | 4407.00 | 59.00 | 4371.7 | 4370.8 | 94.28 |
| 5/13/09 | 0.03 | 4407.00 | 4407.00 | 59.00 | 4372.1 | 4371.1 | 93.95 |
| 5/14/09 | 0.04 | 4407.00 | 4407.00 | 59.00 | 4372.4 | 4371.3 | 93.62 |
| 5/15/09 | 0.04 | 4407.00 | 4407.00 | 59.00 | 4372.7 | 4371.6 | 93.29 |
| 5/16/09 | 0.04 | 4407.00 | 4407.00 | 59.00 | 4373.0 | 4371.8 | 92.96 |
| 5/17/09 | 0.04 | 4407.00 | 4407.00 | 59.00 | 4373.4 | 4372.1 | 92.63 |
| 5/18/09 | 0.05 | 4407.00 | 4407.00 | 59.00 | 4373.7 | 4372.3 | 92.30 |
| 5/19/09 | 0.05 | 4407.00 | 4407.00 | 59.00 | 4374.0 | 4372.6 | 91.97 |
| 5/20/09 | 0.05 | 4407.00 | 4407.00 | 59.00 | 4374.4 | 4372.8 | 91.64 |
| 5/21/09 | 0.05 | 4407.00 | 4407.00 | 59.00 | 4374.7 | 4373.1 | 91.31 |
| 5/22/09 | 0.06 | 4407.00 | 4407.00 | 59.00 | 4375.0 | 4373.3 | 90.99 |
| 5/23/09 | 0.06 | 4407.00 | 4407.00 | 59.00 | 4375.3 | 4373.6 | 90.66 |
| 5/24/09 | 0.06 | 4407.00 | 4407.00 | 59.00 | 4375.7 | 4373.8 | 90.33 |
| 5/25/09 | 0.07 | 4407.00 | 4407.00 | 59.00 | 4376.0 | 4374.1 | 90.00 |
| 5/26/09 | 0.07 | 4407.00 | 4407.00 | 59.00 | 4376.3 | 4374.3 | 89.68 |
| 5/27/09 | 0.07 | 4407.00 | 4407.00 | 59.00 | 4376.6 | 4374.6 | 89.35 |
| 5/28/09 | 0.07 | 4407.00 | 4407.00 | 59.00 | 4377.0 | 4374.8 | 89.03 |
| 5/29/09 | 0.08 | 4407.00 | 4407.00 | 59.00 | 4377.3 | 4375.1 | 88.70 |
| 5/30/09 | 0.08 | 4407.00 | 4407.00 | 59.00 | 4377.6 | 4375.3 | 88.38 |
| 5/31/09 | 0.08 | 4407.00 | 4407.00 | 59.00 | 4377.9 | 4375.6 | 88.05 |
| 6/1/09 | 0.08 | 4407.00 | 4407.00 | 59.00 | 4378.3 | 4375.8 | 87.73 |
| 6/2/09 | 0.09 | 4407.00 | 4407.00 | 59.00 | 4378.6 | 4376.1 | 87.41 |
| 6/3/09 | 0.09 | 4407.00 | 4407.00 | 59.00 | 4378.9 | 4376.3 | 87.09 |
| 6/4/09 | 0.09 | 4407.00 | 4407.00 | 59.00 | 4379.2 | 4376.6 | 86.77 |
| 6/5/09 | 0.10 | 4407.00 | 4407.00 | 59.00 | 4379.5 | 4376.8 | 86.45 |
| 6/6/09 | 0.10 | 4407.00 | 4407.00 | 59.00 | 4379.9 | 4377.1 | 86.13 |
| 6/7/09 | 0.10 | 4407.00 | 4407.00 | 59.00 | 4380.1 | 4377.3 | 85.91 |
| 6/8/09 | 0.10 | 4407.00 | 4407.00 | 59.00 | 4380.2 | 4377.5 | 85.76 |
| 6/9/09 | 0.11 | 4407.00 | 4407.00 | 59.00 | 4380.4 | 4377.8 | 85.61 |
| 6/10/09 | 0.11 | 4407.00 | 4407.00 | 59.00 | 4380.5 | 4378.0 | 85.46 |
| 6/11/09 | 0.11 | 4407.00 | 4407.00 | 59.00 | 4380.7 | 4378.3 | 85.31 |
| 6/12/09 | 0.11 | 4407.00 | 4407.00 | 59.00 | 4380.8 | 4378.5 | 85.16 |
| 6/13/09 | 0.12 | 4407.00 | 4407.00 | 59.00 | 4381.0 | 4378.8 | 85.02 |
| 6/14/09 | 0.12 | 4407.00 | 4407.00 | 59.00 | 4381.1 | 4379.0 | 84.87 |
| 6/15/09 | 0.12 | 4407.00 | 4407.00 | 59.00 | 4381.3 | 4379.3 | 84.72 |
| 6/16/09 | 0.13 | 4407.00 | 4407.00 | 59.00 | 4381.4 | 4379.5 | 84.57 |
| 6/17/09 | 0.13 | 4407.00 | 4407.00 | 59.00 | 4381.6 | 4379.8 | 84.42 |
| 6/18/09 | 0.13 | 4407.00 | 4407.00 | 59.00 | 4381.7 | 4380.0 | 84.27 |
| 6/19/09 | 0.13 | 4407.00 | 4407.00 | 59.00 | 4381.9 | 4380.1 | 84.12 |
| 6/20/09 | 0.14 | 4407.00 | 4407.00 | 59.00 | 4382.0 | 4380.3 | 83.97 |
| 6/21/09 | 0.14 | 4407.00 | 4407.00 | 59.00 | 4382.2 | 4380.4 | 83.83 |
| 6/22/09 | 0.14 | 4407.00 | 4407.00 | 59.00 | 4382.3 | 4380.5 | 83.68 |
| 6/23/09 | 0.15 | 4407.00 | 4407.00 | 59.00 | 4382.5 | 4380.6 | 83.53 |
| 6/24/09 | 0.15 | 4407.00 | 4407.00 | 59.00 | 4382.6 | 4380.7 | 83.38 |

## Appendix E

## Table 1 Tailings and Pond Elevations for North and South Cells

| | Year | North Cell | | | South Cell | | |
|---|---|---|---|---|---|---|---|
| Date | Fraction | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) |
| 6/25/09 | 0.15 | 4407.00 | 4407.00 | 59.00 | 4382.8 | 4380.8 | 83.23 |
| 6/26/09 | 0.15 | 4407.00 | 4407.00 | 59.00 | 4382.9 | 4381.0 | 83.09 |
| 6/27/09 | 0.16 | 4407.00 | 4407.00 | 59.00 | 4383.1 | 4381.1 | 82.94 |
| 6/28/09 | 0.16 | 4407.00 | 4407.00 | 59.00 | 4383.2 | 4381.2 | 82.79 |
| 6/29/09 | 0.16 | 4407.00 | 4407.00 | 59.00 | 4383.4 | 4381.3 | 82.64 |
| 6/30/09 | 0.16 | 4407.00 | 4407.00 | 59.00 | 4383.5 | 4381.4 | 82.50 |
| 7/1/09 | 0.17 | 4407.00 | 4407.00 | 59.00 | 4383.7 | 4381.6 | 82.35 |
| 7/2/09 | 0.17 | 4407.00 | 4407.00 | 59.00 | 4383.7 | 4381.6 | 82.29 |
| 7/3/09 | 0.17 | 4407.00 | 4407.00 | 59.00 | 4383.8 | 4381.6 | 82.22 |
| 7/4/09 | 0.18 | 4407.00 | 4407.00 | 59.00 | 4383.8 | 4381.7 | 82.16 |
| 7/5/09 | 0.18 | 4407.00 | 4407.00 | 59.00 | 4383.9 | 4381.7 | 82.10 |
| 7/6/09 | 0.18 | 4407.00 | 4407.00 | 59.00 | 4384.0 | 4381.8 | 82.03 |
| 7/7/09 | 0.18 | 4407.00 | 4407.00 | 59.00 | 4384.0 | 4381.8 | 81.97 |
| 7/8/09 | 0.19 | 4407.00 | 4407.00 | 59.00 | 4384.1 | 4381.8 | 81.91 |
| 7/9/09 | 0.19 | 4407.00 | 4407.00 | 59.00 | 4384.2 | 4381.9 | 81.84 |
| 7/10/09 | 0.19 | 4407.00 | 4407.00 | 59.00 | 4384.2 | 4381.9 | 81.78 |
| 7/11/09 | 0.19 | 4407.00 | 4407.00 | 59.00 | 4384.3 | 4382.0 | 81.72 |
| 7/12/09 | 0.20 | 4407.00 | 4407.00 | 59.00 | 4384.3 | 4382.0 | 81.65 |
| 7/13/09 | 0.20 | 4407.00 | 4407.00 | 59.00 | 4384.4 | 4382.0 | 81.59 |
| 7/14/09 | 0.20 | 4407.00 | 4407.00 | 59.00 | 4384.5 | 4382.1 | 81.53 |
| 7/15/09 | 0.21 | 4407.00 | 4407.00 | 59.00 | 4384.5 | 4382.1 | 81.47 |
| 7/16/09 | 0.21 | 4407.00 | 4407.00 | 59.00 | 4384.6 | 4382.2 | 81.40 |
| 7/17/09 | 0.21 | 4407.00 | 4407.00 | 59.00 | 4384.7 | 4382.2 | 81.34 |
| 7/18/09 | 0.21 | 4407.00 | 4407.00 | 59.00 | 4384.7 | 4382.2 | 81.28 |
| 7/19/09 | 0.22 | 4407.00 | 4407.00 | 59.00 | 4384.8 | 4382.3 | 81.22 |
| 7/20/09 | 0.22 | 4407.00 | 4407.00 | 59.00 | 4384.8 | 4382.3 | 81.15 |
| 7/21/09 | 0.22 | 4407.00 | 4407.00 | 59.00 | 4384.9 | 4382.4 | 81.09 |
| 7/22/09 | 0.22 | 4407.00 | 4407.00 | 59.00 | 4385.0 | 4382.4 | 81.03 |
| 7/23/09 | 0.23 | 4407.00 | 4407.00 | 59.00 | 4385.0 | 4382.4 | 80.97 |
| 7/24/09 | 0.23 | 4407.00 | 4407.00 | 59.00 | 4385.1 | 4382.5 | 80.90 |
| 7/25/09 | 0.23 | 4407.00 | 4407.00 | 59.00 | 4385.2 | 4382.5 | 80.84 |
| 7/26/09 | 0.24 | 4407.00 | 4407.00 | 59.00 | 4385.2 | 4382.6 | 80.78 |
| 7/27/09 | 0.24 | 4407.00 | 4407.00 | 59.00 | 4385.3 | 4382.6 | 80.72 |
| 7/28/09 | 0.24 | 4407.00 | 4407.00 | 59.00 | 4385.3 | 4382.7 | 80.66 |
| 7/29/09 | 0.24 | 4407.00 | 4407.00 | 59.00 | 4385.4 | 4382.7 | 80.60 |
| 7/30/09 | 0.25 | 4407.00 | 4407.00 | 59.00 | 4385.5 | 4382.7 | 80.53 |
| 7/31/09 | 0.25 | 4407.00 | 4407.00 | 59.00 | 4385.5 | 4382.8 | 80.47 |
| 8/1/09 | 0.25 | 4407.00 | 4407.00 | 59.00 | 4385.6 | 4382.8 | 80.41 |
| 8/2/09 | 0.25 | 4407.00 | 4407.00 | 59.00 | 4385.7 | 4382.9 | 80.34 |
| 8/3/09 | 0.26 | 4407.00 | 4407.00 | 59.00 | 4385.7 | 4382.9 | 80.27 |
| 8/4/09 | 0.26 | 4407.00 | 4407.00 | 59.00 | 4385.8 | 4382.9 | 80.21 |
| 8/5/09 | 0.26 | 4407.00 | 4407.00 | 59.00 | 4385.9 | 4383.0 | 80.14 |
| 8/6/09 | 0.27 | 4407.00 | 4407.00 | 59.00 | 4385.9 | 4383.0 | 80.07 |
| 8/7/09 | 0.27 | 4407.00 | 4407.00 | 59.00 | 4386.0 | 4383.1 | 80.00 |
| 8/8/09 | 0.27 | 4407.00 | 4407.00 | 59.00 | 4386.1 | 4383.1 | 79.93 |
| 8/9/09 | 0.27 | 4407.00 | 4407.00 | 59.00 | 4386.1 | 4383.1 | 79.87 |
| 8/10/09 | 0.28 | 4407.00 | 4407.00 | 59.00 | 4386.2 | 4383.2 | 79.80 |
| 8/11/09 | 0.28 | 4407.00 | 4407.00 | 59.00 | 4386.3 | 4383.2 | 79.73 |
| 8/12/09 | 0.28 | 4407.00 | 4407.00 | 59.00 | 4386.3 | 4383.3 | 79.66 |
| 8/13/09 | 0.28 | 4407.00 | 4407.00 | 59.00 | 4386.4 | 4383.3 | 79.60 |
| 8/14/09 | 0.29 | 4407.00 | 4407.00 | 59.00 | 4386.5 | 4383.3 | 79.53 |
| 8/15/09 | 0.29 | 4407.00 | 4407.00 | 59.00 | 4386.5 | 4383.4 | 79.46 |
| 8/16/09 | 0.29 | 4407.00 | 4407.00 | 59.00 | 4386.6 | 4383.4 | 79.39 |
| 8/17/09 | 0.30 | 4407.00 | 4407.00 | 59.00 | 4386.7 | 4383.5 | 79.33 |
| 8/18/09 | 0.30 | 4407.00 | 4407.00 | 59.00 | 4386.7 | 4383.5 | 79.26 |

**Appendix E**

**Table 1  Tailings and Pond Elevations for North and South Cells**

| Date | Year Fraction | North Cell | | | South Cell | | |
|---|---|---|---|---|---|---|---|
| | | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) |
| 8/19/09 | 0.30 | 4407.00 | 4407.00 | 59.00 | 4386.8 | 4383.5 | 79.19 |
| 8/20/09 | 0.30 | 4407.00 | 4407.00 | 59.00 | 4386.9 | 4383.6 | 79.13 |
| 8/21/09 | 0.31 | 4407.00 | 4407.00 | 59.00 | 4386.9 | 4383.6 | 79.06 |
| 8/22/09 | 0.31 | 4407.00 | 4407.00 | 59.00 | 4387.0 | 4383.7 | 78.99 |
| 8/23/09 | 0.31 | 4407.00 | 4407.00 | 59.00 | 4387.1 | 4383.7 | 78.93 |
| 8/24/09 | 0.31 | 4407.00 | 4407.00 | 59.00 | 4387.1 | 4383.7 | 78.86 |
| 8/25/09 | 0.32 | 4407.00 | 4407.00 | 59.00 | 4387.2 | 4383.8 | 78.79 |
| 8/26/09 | 0.32 | 4407.00 | 4407.00 | 59.00 | 4387.3 | 4383.8 | 78.73 |
| 8/27/09 | 0.32 | 4407.00 | 4407.00 | 59.00 | 4387.3 | 4383.9 | 78.66 |
| 8/28/09 | 0.33 | 4407.00 | 4407.00 | 59.00 | 4387.4 | 4383.9 | 78.60 |
| 8/29/09 | 0.33 | 4407.00 | 4407.00 | 59.00 | 4387.5 | 4384.0 | 78.53 |
| 8/30/09 | 0.33 | 4407.00 | 4407.00 | 59.00 | 4387.5 | 4384.0 | 78.46 |
| 8/31/09 | 0.33 | 4407.00 | 4407.00 | 59.00 | 4387.6 | 4384.0 | 78.40 |
| 9/1/09 | 0.34 | 4407.00 | 4407.00 | 59.00 | 4387.7 | 4384.1 | 78.33 |
| 9/2/09 | 0.34 | 4407.00 | 4407.00 | 59.00 | 4387.7 | 4384.1 | 78.27 |
| 9/3/09 | 0.34 | 4407.00 | 4407.00 | 59.00 | 4387.8 | 4384.2 | 78.20 |
| 9/4/09 | 0.34 | 4407.00 | 4407.00 | 59.00 | 4387.9 | 4384.2 | 78.14 |
| 9/5/09 | 0.35 | 4407.00 | 4407.00 | 59.00 | 4387.9 | 4384.2 | 78.07 |
| 9/6/09 | 0.35 | 4407.00 | 4407.00 | 59.00 | 4388.0 | 4384.3 | 78.00 |
| 9/7/09 | 0.35 | 4407.00 | 4407.00 | 59.00 | 4388.1 | 4384.3 | 77.94 |
| 9/8/09 | 0.36 | 4407.00 | 4407.00 | 59.00 | 4388.1 | 4384.4 | 77.87 |
| 9/9/09 | 0.36 | 4407.00 | 4407.00 | 59.00 | 4388.2 | 4384.4 | 77.81 |
| 9/10/09 | 0.36 | 4407.00 | 4407.00 | 59.00 | 4388.3 | 4384.4 | 77.74 |
| 9/11/09 | 0.36 | 4407.00 | 4407.00 | 59.00 | 4388.3 | 4384.5 | 77.68 |
| 9/12/09 | 0.37 | 4407.00 | 4407.00 | 59.00 | 4388.4 | 4384.5 | 77.61 |
| 9/13/09 | 0.37 | 4407.00 | 4407.00 | 59.00 | 4388.5 | 4384.6 | 77.55 |
| 9/14/09 | 0.37 | 4407.00 | 4407.00 | 59.00 | 4388.5 | 4384.6 | 77.48 |
| 9/15/09 | 0.38 | 4407.00 | 4407.00 | 59.00 | 4388.6 | 4384.6 | 77.42 |
| 9/16/09 | 0.38 | 4407.00 | 4407.00 | 59.00 | 4388.6 | 4384.7 | 77.35 |
| 9/17/09 | 0.38 | 4407.00 | 4407.00 | 59.00 | 4388.7 | 4384.7 | 77.29 |
| 9/18/09 | 0.38 | 4407.00 | 4407.00 | 59.00 | 4388.8 | 4384.8 | 77.22 |
| 9/19/09 | 0.39 | 4407.00 | 4407.00 | 59.00 | 4388.8 | 4384.8 | 77.16 |
| 9/20/09 | 0.39 | 4407.00 | 4407.00 | 59.00 | 4388.9 | 4384.8 | 77.10 |
| 9/21/09 | 0.39 | 4407.00 | 4407.00 | 59.00 | 4389.0 | 4384.9 | 77.03 |
| 9/22/09 | 0.39 | 4407.00 | 4407.00 | 59.00 | 4389.0 | 4384.9 | 76.97 |
| 9/23/09 | 0.40 | 4407.00 | 4407.00 | 59.00 | 4389.1 | 4385.0 | 76.90 |
| 9/24/09 | 0.40 | 4407.00 | 4407.00 | 59.00 | 4389.2 | 4385.0 | 76.84 |
| 9/25/09 | 0.40 | 4407.00 | 4407.00 | 59.00 | 4389.2 | 4385.0 | 76.78 |
| 9/26/09 | 0.41 | 4407.00 | 4407.00 | 59.00 | 4389.3 | 4385.1 | 76.71 |
| 9/27/09 | 0.41 | 4407.00 | 4407.00 | 59.00 | 4389.4 | 4385.1 | 76.65 |
| 9/28/09 | 0.41 | 4407.00 | 4407.00 | 59.00 | 4389.4 | 4385.2 | 76.58 |
| 9/29/09 | 0.41 | 4407.00 | 4407.00 | 59.00 | 4389.5 | 4385.2 | 76.52 |
| 9/30/09 | 0.42 | 4407.00 | 4407.00 | 59.00 | 4389.5 | 4385.3 | 76.46 |
| 10/1/09 | 0.42 | 4407.00 | 4407.00 | 59.00 | 4389.6 | 4385.3 | 76.39 |
| 10/2/09 | 0.42 | 4407.00 | 4407.00 | 59.00 | 4389.7 | 4385.3 | 76.33 |
| 10/3/09 | 0.42 | 4407.00 | 4407.00 | 59.00 | 4389.7 | 4385.4 | 76.26 |
| 10/4/09 | 0.43 | 4407.00 | 4407.00 | 59.00 | 4389.8 | 4385.4 | 76.20 |
| 10/5/09 | 0.43 | 4407.00 | 4407.00 | 59.00 | 4389.9 | 4385.5 | 76.13 |
| 10/6/09 | 0.43 | 4407.00 | 4407.00 | 59.00 | 4389.9 | 4385.5 | 76.07 |
| 10/7/09 | 0.44 | 4407.00 | 4407.00 | 59.00 | 4390.0 | 4385.5 | 76.00 |
| 10/8/09 | 0.44 | 4407.00 | 4407.00 | 59.00 | 4390.0 | 4385.6 | 75.96 |
| 10/9/09 | 0.44 | 4407.00 | 4407.00 | 59.00 | 4390.1 | 4385.6 | 75.92 |
| 10/10/09 | 0.44 | 4407.00 | 4407.00 | 59.00 | 4390.1 | 4385.7 | 75.88 |
| 10/11/09 | 0.45 | 4407.00 | 4407.00 | 59.00 | 4390.2 | 4385.7 | 75.84 |
| 10/12/09 | 0.45 | 4407.00 | 4407.00 | 59.00 | 4390.2 | 4385.7 | 75.79 |

**Appendix E**
**Table 1  Tailings and Pond Elevations for North and South Cells**

| | Year | North Cell | | | South Cell | | |
|---|---|---|---|---|---|---|---|
| Date | Fraction | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) |
| 10/13/09 | 0.45 | 4407.00 | 4407.00 | 59.00 | 4390.2 | 4385.8 | 75.75 |
| 10/14/09 | 0.45 | 4407.00 | 4407.00 | 59.00 | 4390.3 | 4385.8 | 75.71 |
| 10/15/09 | 0.46 | 4407.00 | 4407.00 | 59.00 | 4390.3 | 4385.9 | 75.67 |
| 10/16/09 | 0.46 | 4407.00 | 4407.00 | 59.00 | 4390.4 | 4385.9 | 75.63 |
| 10/17/09 | 0.46 | 4407.00 | 4407.00 | 59.00 | 4390.4 | 4385.9 | 75.59 |
| 10/18/09 | 0.47 | 4407.00 | 4407.00 | 59.00 | 4390.5 | 4386.0 | 75.55 |
| 10/19/09 | 0.47 | 4407.00 | 4407.00 | 59.00 | 4390.5 | 4386.0 | 75.51 |
| 10/20/09 | 0.47 | 4407.00 | 4407.00 | 59.00 | 4390.5 | 4386.1 | 75.46 |
| 10/21/09 | 0.47 | 4407.00 | 4407.00 | 59.00 | 4390.6 | 4386.1 | 75.42 |
| 10/22/09 | 0.48 | 4407.00 | 4407.00 | 59.00 | 4390.6 | 4386.1 | 75.38 |
| 10/23/09 | 0.48 | 4407.00 | 4407.00 | 59.00 | 4390.7 | 4386.2 | 75.34 |
| 10/24/09 | 0.48 | 4407.00 | 4407.00 | 59.00 | 4390.7 | 4386.2 | 75.30 |
| 10/25/09 | 0.48 | 4407.00 | 4407.00 | 59.00 | 4390.7 | 4386.3 | 75.26 |
| 10/26/09 | 0.49 | 4407.00 | 4407.00 | 59.00 | 4390.8 | 4386.3 | 75.22 |
| 10/27/09 | 0.49 | 4407.00 | 4407.00 | 59.00 | 4390.8 | 4386.3 | 75.18 |
| 10/28/09 | 0.49 | 4407.00 | 4407.00 | 59.00 | 4390.9 | 4386.4 | 75.14 |
| 10/29/09 | 0.50 | 4407.00 | 4407.00 | 59.00 | 4390.9 | 4386.4 | 75.10 |
| 10/30/09 | 0.50 | 4407.00 | 4407.00 | 59.00 | 4390.9 | 4386.5 | 75.06 |
| 10/31/09 | 0.50 | 4407.00 | 4407.00 | 59.00 | 4391.0 | 4386.5 | 75.01 |
| 11/1/09 | 0.50 | 4407.00 | 4407.00 | 59.00 | 4391.0 | 4386.5 | 74.97 |
| 11/2/09 | 0.51 | 4407.00 | 4407.00 | 59.00 | 4391.1 | 4386.6 | 74.93 |
| 11/3/09 | 0.51 | 4407.00 | 4407.00 | 59.00 | 4391.1 | 4386.6 | 74.89 |
| 11/4/09 | 0.51 | 4407.00 | 4407.00 | 59.00 | 4391.2 | 4386.7 | 74.85 |
| 11/5/09 | 0.51 | 4407.00 | 4407.00 | 59.00 | 4391.2 | 4386.7 | 74.81 |
| 11/6/09 | 0.52 | 4407.00 | 4407.00 | 59.00 | 4391.2 | 4386.8 | 74.76 |
| 11/7/09 | 0.52 | 4407.00 | 4407.00 | 59.00 | 4391.3 | 4386.8 | 74.72 |
| 11/8/09 | 0.52 | 4407.00 | 4407.00 | 59.00 | 4391.3 | 4386.8 | 74.68 |
| 11/9/09 | 0.53 | 4407.00 | 4407.00 | 59.00 | 4391.4 | 4386.9 | 74.64 |
| 11/10/09 | 0.53 | 4407.00 | 4407.00 | 59.00 | 4391.4 | 4386.9 | 74.60 |
| 11/11/09 | 0.53 | 4407.00 | 4407.00 | 59.00 | 4391.4 | 4387.0 | 74.55 |
| 11/12/09 | 0.53 | 4407.00 | 4407.00 | 59.00 | 4391.5 | 4387.0 | 74.51 |
| 11/13/09 | 0.54 | 4407.00 | 4407.00 | 59.00 | 4391.5 | 4387.0 | 74.47 |
| 11/14/09 | 0.54 | 4407.00 | 4407.00 | 59.00 | 4391.6 | 4387.1 | 74.43 |
| 11/15/09 | 0.54 | 4407.00 | 4407.00 | 59.00 | 4391.6 | 4387.1 | 74.39 |
| 11/16/09 | 0.54 | 4407.00 | 4407.00 | 59.00 | 4391.7 | 4387.2 | 74.34 |
| 11/17/09 | 0.55 | 4407.00 | 4407.00 | 59.00 | 4391.7 | 4387.2 | 74.30 |
| 11/18/09 | 0.55 | 4407.00 | 4407.00 | 59.00 | 4391.7 | 4387.2 | 74.26 |
| 11/19/09 | 0.55 | 4407.00 | 4407.00 | 59.00 | 4391.8 | 4387.3 | 74.22 |
| 11/20/09 | 0.56 | 4407.00 | 4407.00 | 59.00 | 4391.8 | 4387.3 | 74.18 |
| 11/21/09 | 0.56 | 4407.00 | 4407.00 | 59.00 | 4391.9 | 4387.4 | 74.14 |
| 11/22/09 | 0.56 | 4407.00 | 4407.00 | 59.00 | 4391.9 | 4387.4 | 74.09 |
| 11/23/09 | 0.56 | 4407.00 | 4407.00 | 59.00 | 4391.9 | 4387.4 | 74.05 |
| 11/24/09 | 0.57 | 4407.00 | 4407.00 | 59.00 | 4392.0 | 4387.5 | 74.01 |
| 11/25/09 | 0.57 | 4407.00 | 4407.00 | 59.00 | 4392.0 | 4387.5 | 73.97 |
| 11/26/09 | 0.57 | 4407.00 | 4407.00 | 59.00 | 4392.1 | 4387.6 | 73.93 |
| 11/27/09 | 0.57 | 4407.00 | 4407.00 | 59.00 | 4392.1 | 4387.6 | 73.89 |
| 11/28/09 | 0.58 | 4407.00 | 4407.00 | 59.00 | 4392.2 | 4387.6 | 73.85 |
| 11/29/09 | 0.58 | 4407.00 | 4407.00 | 59.00 | 4392.2 | 4387.7 | 73.80 |
| 11/30/09 | 0.58 | 4407.00 | 4407.00 | 59.00 | 4392.2 | 4387.7 | 73.76 |
| 12/1/09 | 0.59 | 4407.00 | 4407.00 | 59.00 | 4392.3 | 4387.8 | 73.72 |
| 12/2/09 | 0.59 | 4407.00 | 4407.00 | 59.00 | 4392.3 | 4387.8 | 73.68 |
| 12/3/09 | 0.59 | 4407.00 | 4407.00 | 59.00 | 4392.4 | 4387.8 | 73.63 |
| 12/4/09 | 0.59 | 4407.00 | 4407.00 | 59.00 | 4392.4 | 4387.9 | 73.59 |
| 12/5/09 | 0.60 | 4407.00 | 4407.00 | 59.00 | 4392.5 | 4387.9 | 73.54 |
| 12/6/09 | 0.60 | 4407.00 | 4407.00 | 59.00 | 4392.5 | 4388.0 | 73.50 |

**Appendix E**
**Table 1  Tailings and Pond Elevations for North and South Cells**

| | Year | North Cell | | | South Cell | | |
|---|---|---|---|---|---|---|---|
| Date | Fraction | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) |
| 12/7/09 | 0.60 | 4407.00 | 4407.00 | 59.00 | 4392.5 | 4388.0 | 73.46 |
| 12/8/09 | 0.61 | 4407.00 | 4407.00 | 59.00 | 4392.6 | 4388.1 | 73.41 |
| 12/9/09 | 0.61 | 4407.00 | 4407.00 | 59.00 | 4392.6 | 4388.1 | 73.37 |
| 12/10/09 | 0.61 | 4407.00 | 4407.00 | 59.00 | 4392.7 | 4388.1 | 73.32 |
| 12/11/09 | 0.61 | 4407.00 | 4407.00 | 59.00 | 4392.7 | 4388.2 | 73.28 |
| 12/12/09 | 0.62 | 4407.00 | 4407.00 | 59.00 | 4392.8 | 4388.2 | 73.24 |
| 12/13/09 | 0.62 | 4407.00 | 4407.00 | 59.00 | 4392.8 | 4388.3 | 73.19 |
| 12/14/09 | 0.62 | 4407.00 | 4407.00 | 59.00 | 4392.9 | 4388.3 | 73.15 |
| 12/15/09 | 0.62 | 4407.00 | 4407.00 | 59.00 | 4392.9 | 4388.3 | 73.10 |
| 12/16/09 | 0.63 | 4407.00 | 4407.00 | 59.00 | 4392.9 | 4388.4 | 73.06 |
| 12/17/09 | 0.63 | 4407.00 | 4407.00 | 59.00 | 4393.0 | 4388.4 | 73.02 |
| 12/18/09 | 0.63 | 4407.00 | 4407.00 | 59.00 | 4393.0 | 4388.5 | 72.97 |
| 12/19/09 | 0.64 | 4407.00 | 4407.00 | 59.00 | 4393.1 | 4388.5 | 72.93 |
| 12/20/09 | 0.64 | 4407.00 | 4407.00 | 59.00 | 4393.1 | 4388.5 | 72.88 |
| 12/21/09 | 0.64 | 4407.00 | 4407.00 | 59.00 | 4393.2 | 4388.6 | 72.84 |
| 12/22/09 | 0.64 | 4407.00 | 4407.00 | 59.00 | 4393.2 | 4388.6 | 72.80 |
| 12/23/09 | 0.65 | 4407.00 | 4407.00 | 59.00 | 4393.2 | 4388.7 | 72.75 |
| 12/24/09 | 0.65 | 4407.00 | 4407.00 | 59.00 | 4393.3 | 4388.7 | 72.71 |
| 12/25/09 | 0.65 | 4407.00 | 4407.00 | 59.00 | 4393.3 | 4388.7 | 72.67 |
| 12/26/09 | 0.65 | 4407.00 | 4407.00 | 59.00 | 4393.4 | 4388.8 | 72.62 |
| 12/27/09 | 0.66 | 4407.00 | 4407.00 | 59.00 | 4393.4 | 4388.8 | 72.58 |
| 12/28/09 | 0.66 | 4407.00 | 4407.00 | 59.00 | 4393.5 | 4388.9 | 72.53 |
| 12/29/09 | 0.66 | 4407.00 | 4407.00 | 59.00 | 4393.5 | 4388.9 | 72.49 |
| 12/30/09 | 0.67 | 4407.00 | 4407.00 | 59.00 | 4393.6 | 4388.9 | 72.45 |
| 12/31/09 | 0.67 | 4407.00 | 4407.00 | 59.00 | 4393.6 | 4389.0 | 72.40 |
| 1/1/10 | 0.67 | 4407.00 | 4407.00 | 59.00 | 4393.6 | 4389.0 | 72.36 |
| 1/2/10 | 0.67 | 4407.00 | 4407.00 | 59.00 | 4393.7 | 4389.1 | 72.31 |
| 1/3/10 | 0.68 | 4407.00 | 4407.00 | 59.00 | 4393.7 | 4389.1 | 72.27 |
| 1/4/10 | 0.68 | 4407.00 | 4407.00 | 59.00 | 4393.8 | 4389.1 | 72.22 |
| 1/5/10 | 0.68 | 4407.00 | 4407.00 | 59.00 | 4393.8 | 4389.2 | 72.18 |
| 1/6/10 | 0.68 | 4407.00 | 4407.00 | 59.00 | 4393.9 | 4389.2 | 72.13 |
| 1/7/10 | 0.69 | 4407.00 | 4407.00 | 59.00 | 4393.9 | 4389.3 | 72.08 |
| 1/8/10 | 0.69 | 4407.00 | 4407.00 | 59.00 | 4394.0 | 4389.3 | 72.04 |
| 1/9/10 | 0.69 | 4407.00 | 4407.00 | 59.00 | 4394.0 | 4389.4 | 71.99 |
| 1/10/10 | 0.70 | 4407.00 | 4407.00 | 59.00 | 4394.1 | 4389.4 | 71.95 |
| 1/11/10 | 0.70 | 4407.00 | 4407.00 | 59.00 | 4394.1 | 4389.4 | 71.90 |
| 1/12/10 | 0.70 | 4407.00 | 4407.00 | 59.00 | 4394.1 | 4389.5 | 71.85 |
| 1/13/10 | 0.70 | 4407.00 | 4407.00 | 59.00 | 4394.2 | 4389.5 | 71.81 |
| 1/14/10 | 0.71 | 4407.00 | 4407.00 | 59.00 | 4394.2 | 4389.6 | 71.76 |
| 1/15/10 | 0.71 | 4407.00 | 4407.00 | 59.00 | 4394.3 | 4389.6 | 71.72 |
| 1/16/10 | 0.71 | 4407.00 | 4407.00 | 59.00 | 4394.3 | 4389.6 | 71.67 |
| 1/17/10 | 0.71 | 4407.00 | 4407.00 | 59.00 | 4394.4 | 4389.7 | 71.63 |
| 1/18/10 | 0.72 | 4407.00 | 4407.00 | 59.00 | 4394.4 | 4389.7 | 71.58 |
| 1/19/10 | 0.72 | 4407.00 | 4407.00 | 59.00 | 4394.5 | 4389.8 | 71.53 |
| 1/20/10 | 0.72 | 4407.00 | 4407.00 | 59.00 | 4394.5 | 4389.8 | 71.49 |
| 1/21/10 | 0.73 | 4407.00 | 4407.00 | 59.00 | 4394.6 | 4389.8 | 71.44 |
| 1/22/10 | 0.73 | 4407.00 | 4407.00 | 59.00 | 4394.6 | 4389.9 | 71.40 |
| 1/23/10 | 0.73 | 4407.00 | 4407.00 | 59.00 | 4394.6 | 4389.9 | 71.35 |
| 1/24/10 | 0.73 | 4407.00 | 4407.00 | 59.00 | 4394.7 | 4390.0 | 71.31 |
| 1/25/10 | 0.74 | 4407.00 | 4407.00 | 59.00 | 4394.7 | 4390.0 | 71.26 |
| 1/26/10 | 0.74 | 4407.00 | 4407.00 | 59.00 | 4394.8 | 4390.0 | 71.21 |
| 1/27/10 | 0.74 | 4407.00 | 4407.00 | 59.00 | 4394.8 | 4390.1 | 71.17 |
| 1/28/10 | 0.74 | 4407.00 | 4407.00 | 59.00 | 4394.9 | 4390.1 | 71.12 |
| 1/29/10 | 0.75 | 4407.00 | 4407.00 | 59.00 | 4394.9 | 4390.1 | 71.08 |
| 1/30/10 | 0.75 | 4407.00 | 4407.00 | 59.00 | 4395.0 | 4390.1 | 71.03 |

**Appendix E**

**Table 1  Tailings and Pond Elevations for North and South Cells**

|  | Year | North Cell |  |  | South Cell |  |  |
|---|---|---|---|---|---|---|---|
| Date | Fraction | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) |
| 1/31/10 | 0.75 | 4407.00 | 4407.00 | 59.00 | 4395.0 | 4390.2 | 70.99 |
| 2/1/10 | 0.76 | 4407.00 | 4407.00 | 59.00 | 4395.1 | 4390.2 | 70.94 |
| 2/2/10 | 0.76 | 4407.00 | 4407.00 | 59.00 | 4395.1 | 4390.2 | 70.90 |
| 2/3/10 | 0.76 | 4407.00 | 4407.00 | 59.00 | 4395.2 | 4390.2 | 70.85 |
| 2/4/10 | 0.76 | 4407.00 | 4407.00 | 59.00 | 4395.2 | 4390.3 | 70.80 |
| 2/5/10 | 0.77 | 4407.00 | 4407.00 | 59.00 | 4395.2 | 4390.3 | 70.76 |
| 2/6/10 | 0.77 | 4407.00 | 4407.00 | 59.00 | 4395.3 | 4390.3 | 70.71 |
| 2/7/10 | 0.77 | 4407.00 | 4407.00 | 59.00 | 4395.3 | 4390.3 | 70.67 |
| 2/8/10 | 0.77 | 4407.00 | 4407.00 | 59.00 | 4395.4 | 4390.4 | 70.62 |
| 2/9/10 | 0.78 | 4407.00 | 4407.00 | 59.00 | 4395.4 | 4390.4 | 70.58 |
| 2/10/10 | 0.78 | 4407.00 | 4407.00 | 59.00 | 4395.5 | 4390.4 | 70.53 |
| 2/11/10 | 0.78 | 4407.00 | 4407.00 | 59.00 | 4395.5 | 4390.4 | 70.48 |
| 2/12/10 | 0.79 | 4407.00 | 4407.00 | 59.00 | 4395.6 | 4390.5 | 70.44 |
| 2/13/10 | 0.79 | 4407.00 | 4407.00 | 59.00 | 4395.6 | 4390.5 | 70.39 |
| 2/14/10 | 0.79 | 4407.00 | 4407.00 | 59.00 | 4395.7 | 4390.5 | 70.35 |
| 2/15/10 | 0.79 | 4407.00 | 4407.00 | 59.00 | 4395.7 | 4390.5 | 70.30 |
| 2/16/10 | 0.80 | 4407.00 | 4407.00 | 59.00 | 4395.7 | 4390.6 | 70.26 |
| 2/17/10 | 0.80 | 4407.00 | 4407.00 | 59.00 | 4395.8 | 4390.6 | 70.21 |
| 2/18/10 | 0.80 | 4407.00 | 4407.00 | 59.00 | 4395.8 | 4390.6 | 70.17 |
| 2/19/10 | 0.80 | 4407.00 | 4407.00 | 59.00 | 4395.9 | 4390.6 | 70.12 |
| 2/20/10 | 0.81 | 4407.00 | 4407.00 | 59.00 | 4395.9 | 4390.7 | 70.07 |
| 2/21/10 | 0.81 | 4407.00 | 4407.00 | 59.00 | 4396.0 | 4390.7 | 70.03 |
| 2/22/10 | 0.81 | 4407.00 | 4407.00 | 59.00 | 4396.0 | 4390.7 | 69.98 |
| 2/23/10 | 0.82 | 4407.00 | 4407.00 | 59.00 | 4396.1 | 4390.7 | 69.94 |
| 2/24/10 | 0.82 | 4407.00 | 4407.00 | 59.00 | 4396.1 | 4390.8 | 69.89 |
| 2/25/10 | 0.82 | 4407.00 | 4407.00 | 59.00 | 4396.2 | 4390.8 | 69.85 |
| 2/26/10 | 0.82 | 4407.00 | 4407.00 | 59.00 | 4396.2 | 4390.8 | 69.80 |
| 2/27/10 | 0.83 | 4407.00 | 4407.00 | 59.00 | 4396.2 | 4390.9 | 69.76 |
| 2/28/10 | 0.83 | 4407.00 | 4407.00 | 59.00 | 4396.3 | 4390.9 | 69.71 |
| 3/1/10 | 0.83 | 4407.00 | 4407.00 | 59.00 | 4396.3 | 4390.9 | 69.67 |
| 3/2/10 | 0.84 | 4407.00 | 4407.00 | 59.00 | 4396.4 | 4390.9 | 69.62 |
| 3/3/10 | 0.84 | 4407.00 | 4407.00 | 59.00 | 4396.4 | 4391.0 | 69.57 |
| 3/4/10 | 0.84 | 4407.00 | 4407.00 | 59.00 | 4396.5 | 4391.0 | 69.52 |
| 3/5/10 | 0.84 | 4407.00 | 4407.00 | 59.00 | 4396.5 | 4391.0 | 69.48 |
| 3/6/10 | 0.85 | 4407.00 | 4407.00 | 59.00 | 4396.6 | 4391.0 | 69.43 |
| 3/7/10 | 0.85 | 4407.00 | 4407.00 | 59.00 | 4396.6 | 4391.1 | 69.38 |
| 3/8/10 | 0.85 | 4407.00 | 4407.00 | 59.00 | 4396.7 | 4391.1 | 69.34 |
| 3/9/10 | 0.85 | 4407.00 | 4407.00 | 59.00 | 4396.7 | 4391.1 | 69.29 |
| 3/10/10 | 0.86 | 4407.00 | 4407.00 | 59.00 | 4396.8 | 4391.1 | 69.24 |
| 3/11/10 | 0.86 | 4407.00 | 4407.00 | 59.00 | 4396.8 | 4391.2 | 69.19 |
| 3/12/10 | 0.86 | 4407.00 | 4407.00 | 59.00 | 4396.9 | 4391.2 | 69.15 |
| 3/13/10 | 0.87 | 4407.00 | 4407.00 | 59.00 | 4396.9 | 4391.2 | 69.10 |
| 3/14/10 | 0.87 | 4407.00 | 4407.00 | 59.00 | 4396.9 | 4391.2 | 69.05 |
| 3/15/10 | 0.87 | 4407.00 | 4407.00 | 59.00 | 4397.0 | 4391.3 | 69.01 |
| 3/16/10 | 0.87 | 4407.00 | 4407.00 | 59.00 | 4397.0 | 4391.3 | 68.96 |
| 3/17/10 | 0.88 | 4407.00 | 4407.00 | 59.00 | 4397.1 | 4391.3 | 68.91 |
| 3/18/10 | 0.88 | 4407.00 | 4407.00 | 59.00 | 4397.1 | 4391.3 | 68.86 |
| 3/19/10 | 0.88 | 4407.00 | 4407.00 | 59.00 | 4397.2 | 4391.4 | 68.82 |
| 3/20/10 | 0.88 | 4407.00 | 4407.00 | 59.00 | 4397.2 | 4391.4 | 68.77 |
| 3/21/10 | 0.89 | 4407.00 | 4407.00 | 59.00 | 4397.3 | 4391.4 | 68.72 |
| 3/22/10 | 0.89 | 4407.00 | 4407.00 | 59.00 | 4397.3 | 4391.4 | 68.68 |
| 3/23/10 | 0.89 | 4407.00 | 4407.00 | 59.00 | 4397.4 | 4391.5 | 68.63 |
| 3/24/10 | 0.90 | 4407.00 | 4407.00 | 59.00 | 4397.4 | 4391.5 | 68.58 |
| 3/25/10 | 0.90 | 4407.00 | 4407.00 | 59.00 | 4397.5 | 4391.5 | 68.54 |
| 3/26/10 | 0.90 | 4407.00 | 4407.00 | 59.00 | 4397.5 | 4391.5 | 68.49 |

**Appendix E**
**Table 1  Tailings and Pond Elevations for North and South Cells**

| | Year | North Cell | | | South Cell | | |
|---|---|---|---|---|---|---|---|
| Date | Fraction | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) |
| 3/27/10 | 0.90 | 4407.00 | 4407.00 | 59.00 | 4397.6 | 4391.6 | 68.44 |
| 3/28/10 | 0.91 | 4407.00 | 4407.00 | 59.00 | 4397.6 | 4391.6 | 68.40 |
| 3/29/10 | 0.91 | 4407.00 | 4407.00 | 59.00 | 4397.7 | 4391.6 | 68.35 |
| 3/30/10 | 0.91 | 4407.00 | 4407.00 | 59.00 | 4397.7 | 4391.7 | 68.30 |
| 3/31/10 | 0.91 | 4407.00 | 4407.00 | 59.00 | 4397.7 | 4391.7 | 68.25 |
| 4/1/10 | 0.92 | 4407.00 | 4407.00 | 59.00 | 4397.8 | 4391.7 | 68.21 |
| 4/2/10 | 0.92 | 4407.00 | 4407.00 | 59.00 | 4397.8 | 4391.7 | 68.17 |
| 4/3/10 | 0.92 | 4407.00 | 4407.00 | 59.00 | 4397.9 | 4391.8 | 68.12 |
| 4/4/10 | 0.93 | 4407.00 | 4407.00 | 59.00 | 4397.9 | 4391.8 | 68.08 |
| 4/5/10 | 0.93 | 4407.00 | 4407.00 | 59.00 | 4398.0 | 4391.8 | 68.04 |
| 4/6/10 | 0.93 | 4407.00 | 4407.00 | 59.00 | 4398.0 | 4391.8 | 68.00 |
| 4/7/10 | 0.93 | 4407.00 | 4407.00 | 59.00 | 4398.0 | 4391.9 | 67.96 |
| 4/8/10 | 0.94 | 4407.00 | 4407.00 | 59.00 | 4398.1 | 4391.9 | 67.92 |
| 4/9/10 | 0.94 | 4407.00 | 4407.00 | 59.00 | 4398.1 | 4391.9 | 67.87 |
| 4/10/10 | 0.94 | 4407.00 | 4407.00 | 59.00 | 4398.2 | 4391.9 | 67.83 |
| 4/11/10 | 0.94 | 4407.00 | 4407.00 | 59.00 | 4398.2 | 4392.0 | 67.79 |
| 4/12/10 | 0.95 | 4407.00 | 4407.00 | 59.00 | 4398.3 | 4392.0 | 67.75 |
| 4/13/10 | 0.95 | 4407.00 | 4407.00 | 59.00 | 4398.3 | 4392.0 | 67.71 |
| 4/14/10 | 0.95 | 4407.00 | 4407.00 | 59.00 | 4398.3 | 4392.0 | 67.66 |
| 4/15/10 | 0.96 | 4407.00 | 4407.00 | 59.00 | 4398.4 | 4392.1 | 67.62 |
| 4/16/10 | 0.96 | 4407.00 | 4407.00 | 59.00 | 4398.4 | 4392.1 | 67.58 |
| 4/17/10 | 0.96 | 4407.00 | 4407.00 | 59.00 | 4398.5 | 4392.1 | 67.54 |
| 4/18/10 | 0.96 | 4407.00 | 4407.00 | 59.00 | 4398.5 | 4392.1 | 67.50 |
| 4/19/10 | 0.97 | 4407.00 | 4407.00 | 59.00 | 4398.5 | 4392.2 | 67.46 |
| 4/20/10 | 0.97 | 4407.00 | 4407.00 | 59.00 | 4398.6 | 4392.2 | 67.42 |
| 4/21/10 | 0.97 | 4407.00 | 4407.00 | 59.00 | 4398.6 | 4392.2 | 67.37 |
| 4/22/10 | 0.97 | 4407.00 | 4407.00 | 59.00 | 4398.7 | 4392.2 | 67.33 |
| 4/23/10 | 0.98 | 4407.00 | 4407.00 | 59.00 | 4398.7 | 4392.3 | 67.29 |
| 4/24/10 | 0.98 | 4407.00 | 4407.00 | 59.00 | 4398.8 | 4392.3 | 67.25 |
| 4/25/10 | 0.98 | 4407.00 | 4407.00 | 59.00 | 4398.8 | 4392.3 | 67.21 |
| 4/26/10 | 0.99 | 4407.00 | 4407.00 | 59.00 | 4398.8 | 4392.3 | 67.17 |
| 4/27/10 | 0.99 | 4407.00 | 4407.00 | 59.00 | 4398.9 | 4392.4 | 67.12 |
| 4/28/10 | 0.99 | 4407.00 | 4407.00 | 59.00 | 4398.9 | 4392.4 | 67.08 |
| 4/29/10 | 0.99 | 4407.00 | 4407.00 | 59.00 | 4399.0 | 4392.4 | 67.04 |
| 4/30/10 | 1.00 | 4407.00 | 4407.00 | 59.00 | 4399.0 | 4392.4 | 67.00 |
| 5/1/10 | 1.00 | 4407.00 | 4407.00 | 59.00 | 4399.0 | 4392.5 | 66.96 |
| 5/2/10 | 1.00 | 4407.00 | 4407.00 | 59.00 | 4399.1 | 4392.5 | 66.92 |
| 5/3/10 | 1.00 | 4407.00 | 4407.00 | 59.00 | 4399.1 | 4392.5 | 66.88 |
| 5/4/10 | 1.01 | 4407.00 | 4407.00 | 59.00 | 4399.2 | 4392.6 | 66.84 |
| 5/5/10 | 1.01 | 4407.00 | 4407.00 | 59.00 | 4399.2 | 4392.6 | 66.80 |
| 5/6/10 | 1.01 | 4407.00 | 4407.00 | 59.00 | 4399.2 | 4392.6 | 66.76 |
| 5/7/10 | 1.02 | 4407.00 | 4407.00 | 59.00 | 4399.3 | 4392.6 | 66.72 |
| 5/8/10 | 1.02 | 4407.00 | 4407.00 | 59.00 | 4399.3 | 4392.7 | 66.68 |
| 5/9/10 | 1.02 | 4407.00 | 4407.00 | 59.00 | 4399.4 | 4392.7 | 66.64 |
| 5/10/10 | 1.02 | 4407.00 | 4407.00 | 59.00 | 4399.4 | 4392.7 | 66.60 |
| 5/11/10 | 1.03 | 4407.00 | 4407.00 | 59.00 | 4399.4 | 4392.7 | 66.56 |
| 5/12/10 | 1.03 | 4407.00 | 4407.00 | 59.00 | 4399.5 | 4392.8 | 66.52 |
| 5/13/10 | 1.03 | 4407.00 | 4407.00 | 59.00 | 4399.5 | 4392.8 | 66.48 |
| 5/14/10 | 1.03 | 4407.00 | 4407.00 | 59.00 | 4399.6 | 4392.8 | 66.44 |
| 5/15/10 | 1.04 | 4407.00 | 4407.00 | 59.00 | 4399.6 | 4392.8 | 66.39 |
| 5/16/10 | 1.04 | 4407.00 | 4407.00 | 59.00 | 4399.6 | 4392.9 | 66.35 |
| 5/17/10 | 1.04 | 4407.00 | 4407.00 | 59.00 | 4399.7 | 4392.9 | 66.31 |
| 5/18/10 | 1.05 | 4407.00 | 4407.00 | 59.00 | 4399.7 | 4392.9 | 66.27 |
| 5/19/10 | 1.05 | 4407.00 | 4407.00 | 59.00 | 4399.8 | 4392.9 | 66.23 |
| 5/20/10 | 1.05 | 4407.00 | 4407.00 | 59.00 | 4399.8 | 4393.0 | 66.19 |

**Appendix E**
**Table 1  Tailings and Pond Elevations for North and South Cells**

| | Year | North Cell | | | South Cell | | |
|---|---|---|---|---|---|---|---|
| Date | Fraction | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) |
| 5/21/10 | 1.05 | 4407.00 | 4407.00 | 59.00 | 4399.8 | 4393.0 | 66.15 |
| 5/22/10 | 1.06 | 4407.00 | 4407.00 | 59.00 | 4399.9 | 4393.0 | 66.11 |
| 5/23/10 | 1.06 | 4407.00 | 4407.00 | 59.00 | 4399.9 | 4393.0 | 66.07 |
| 5/24/10 | 1.06 | 4407.00 | 4407.00 | 59.00 | 4400.0 | 4393.1 | 66.03 |
| 5/25/10 | 1.07 | 4407.00 | 4407.00 | 59.00 | 4400.0 | 4393.1 | 66.00 |
| 5/26/10 | 1.07 | 4407.00 | 4407.00 | 59.00 | 4400.0 | 4393.1 | 65.97 |
| 5/27/10 | 1.07 | 4407.00 | 4407.00 | 59.00 | 4400.1 | 4393.1 | 65.93 |
| 5/28/10 | 1.07 | 4407.00 | 4407.00 | 59.00 | 4400.1 | 4393.2 | 65.90 |
| 5/29/10 | 1.08 | 4407.00 | 4407.00 | 59.00 | 4400.1 | 4393.2 | 65.87 |
| 5/30/10 | 1.08 | 4407.00 | 4407.00 | 59.00 | 4400.2 | 4393.2 | 65.84 |
| 5/31/10 | 1.08 | 4407.00 | 4407.00 | 59.00 | 4400.2 | 4393.2 | 65.81 |
| 6/1/10 | 1.08 | 4407.00 | 4407.00 | 59.00 | 4400.2 | 4393.3 | 65.78 |
| 6/2/10 | 1.09 | 4407.00 | 4407.00 | 59.00 | 4400.2 | 4393.3 | 65.76 |
| 6/3/10 | 1.09 | 4407.00 | 4407.00 | 59.00 | 4400.3 | 4393.3 | 65.73 |
| 6/4/10 | 1.09 | 4407.00 | 4407.00 | 59.00 | 4400.3 | 4393.4 | 65.70 |
| 6/5/10 | 1.10 | 4407.00 | 4407.00 | 59.00 | 4400.3 | 4393.4 | 65.68 |
| 6/6/10 | 1.10 | 4407.00 | 4407.00 | 59.00 | 4400.4 | 4393.4 | 65.65 |
| 6/7/10 | 1.10 | 4407.00 | 4407.00 | 59.00 | 4400.4 | 4393.4 | 65.62 |
| 6/8/10 | 1.10 | 4407.00 | 4407.00 | 59.00 | 4400.4 | 4393.5 | 65.59 |
| 6/9/10 | 1.11 | 4407.00 | 4407.00 | 59.00 | 4400.4 | 4393.5 | 65.57 |
| 6/10/10 | 1.11 | 4407.00 | 4407.00 | 59.00 | 4400.5 | 4393.5 | 65.54 |
| 6/11/10 | 1.11 | 4407.00 | 4407.00 | 59.00 | 4400.5 | 4393.5 | 65.51 |
| 6/12/10 | 1.11 | 4407.00 | 4407.00 | 59.00 | 4400.5 | 4393.6 | 65.49 |
| 6/13/10 | 1.12 | 4407.00 | 4407.00 | 59.00 | 4400.5 | 4393.6 | 65.46 |
| 6/14/10 | 1.12 | 4407.00 | 4407.00 | 59.00 | 4400.6 | 4393.6 | 65.43 |
| 6/15/10 | 1.12 | 4407.00 | 4407.00 | 59.00 | 4400.6 | 4393.6 | 65.40 |
| 6/16/10 | 1.13 | 4407.00 | 4407.00 | 59.00 | 4400.6 | 4393.7 | 65.38 |
| 6/17/10 | 1.13 | 4407.00 | 4407.00 | 59.00 | 4400.6 | 4393.7 | 65.35 |
| 6/18/10 | 1.13 | 4407.00 | 4407.00 | 59.00 | 4400.7 | 4393.7 | 65.32 |
| 6/19/10 | 1.13 | 4407.00 | 4407.00 | 59.00 | 4400.7 | 4393.7 | 65.30 |
| 6/20/10 | 1.14 | 4407.00 | 4407.00 | 59.00 | 4400.7 | 4393.8 | 65.27 |
| 6/21/10 | 1.14 | 4407.00 | 4407.00 | 59.00 | 4400.8 | 4393.8 | 65.24 |
| 6/22/10 | 1.14 | 4407.00 | 4407.00 | 59.00 | 4400.8 | 4393.8 | 65.22 |
| 6/23/10 | 1.14 | 4407.00 | 4407.00 | 59.00 | 4400.8 | 4393.8 | 65.19 |
| 6/24/10 | 1.15 | 4407.00 | 4407.00 | 59.00 | 4400.8 | 4393.9 | 65.16 |
| 6/25/10 | 1.15 | 4407.00 | 4407.00 | 59.00 | 4400.9 | 4393.9 | 65.13 |
| 6/26/10 | 1.15 | 4407.00 | 4407.00 | 59.00 | 4400.9 | 4393.9 | 65.11 |
| 6/27/10 | 1.16 | 4407.00 | 4407.00 | 59.00 | 4400.9 | 4393.9 | 65.08 |
| 6/28/10 | 1.16 | 4407.00 | 4407.00 | 59.00 | 4400.9 | 4394.0 | 65.05 |
| 6/29/10 | 1.16 | 4407.00 | 4407.00 | 59.00 | 4401.0 | 4394.0 | 65.03 |
| 6/30/10 | 1.16 | 4407.00 | 4407.00 | 59.00 | 4401.0 | 4394.0 | 65.00 |
| 7/1/10 | 1.17 | 4407.00 | 4407.00 | 59.00 | 4401.0 | 4394.0 | 64.97 |
| 7/2/10 | 1.17 | 4407.00 | 4407.00 | 59.00 | 4401.0 | 4394.1 | 64.95 |
| 7/3/10 | 1.17 | 4407.00 | 4407.00 | 59.00 | 4401.1 | 4394.1 | 64.93 |
| 7/4/10 | 1.17 | 4407.00 | 4407.00 | 59.00 | 4401.1 | 4394.1 | 64.91 |
| 7/5/10 | 1.18 | 4407.00 | 4407.00 | 59.00 | 4401.1 | 4394.2 | 64.89 |
| 7/6/10 | 1.18 | 4407.00 | 4407.00 | 59.00 | 4401.1 | 4394.2 | 64.87 |
| 7/7/10 | 1.18 | 4407.00 | 4407.00 | 59.00 | 4401.2 | 4394.2 | 64.85 |
| 7/8/10 | 1.19 | 4407.00 | 4407.00 | 59.00 | 4401.2 | 4394.2 | 64.83 |
| 7/9/10 | 1.19 | 4407.00 | 4407.00 | 59.00 | 4401.2 | 4394.3 | 64.81 |
| 7/10/10 | 1.19 | 4407.00 | 4407.00 | 59.00 | 4401.2 | 4394.3 | 64.79 |
| 7/11/10 | 1.19 | 4407.00 | 4407.00 | 59.00 | 4401.2 | 4394.3 | 64.77 |
| 7/12/10 | 1.20 | 4407.00 | 4407.00 | 59.00 | 4401.3 | 4394.3 | 64.75 |
| 7/13/10 | 1.20 | 4407.00 | 4407.00 | 59.00 | 4401.3 | 4394.4 | 64.73 |
| 7/14/10 | 1.20 | 4407.00 | 4407.00 | 59.00 | 4401.3 | 4394.4 | 64.71 |

**Appendix E**

**Table 1 Tailings and Pond Elevations for North and South Cells**

| | Year | North Cell | | | South Cell | | |
|---|---|---|---|---|---|---|---|
| Date | Fraction | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) |
| 7/15/10 | 1.20 | 4407.00 | 4407.00 | 59.00 | 4401.3 | 4394.4 | 64.69 |
| 7/16/10 | 1.21 | 4407.00 | 4407.00 | 59.00 | 4401.3 | 4394.4 | 64.67 |
| 7/17/10 | 1.21 | 4407.00 | 4407.00 | 59.00 | 4401.4 | 4394.5 | 64.65 |
| 7/18/10 | 1.21 | 4407.00 | 4407.00 | 59.00 | 4401.4 | 4394.5 | 64.63 |
| 7/19/10 | 1.22 | 4407.00 | 4407.00 | 59.00 | 4401.4 | 4394.5 | 64.61 |
| 7/20/10 | 1.22 | 4407.00 | 4407.00 | 59.00 | 4401.4 | 4394.5 | 64.59 |
| 7/21/10 | 1.22 | 4407.00 | 4407.00 | 59.00 | 4401.4 | 4394.6 | 64.56 |
| 7/22/10 | 1.22 | 4407.00 | 4407.00 | 59.00 | 4401.5 | 4394.6 | 64.54 |
| 7/23/10 | 1.23 | 4407.00 | 4407.00 | 59.00 | 4401.5 | 4394.6 | 64.52 |
| 7/24/10 | 1.23 | 4407.00 | 4407.00 | 59.00 | 4401.5 | 4394.6 | 64.50 |
| 7/25/10 | 1.23 | 4407.00 | 4407.00 | 59.00 | 4401.5 | 4394.7 | 64.48 |
| 7/26/10 | 1.23 | 4407.00 | 4407.00 | 59.00 | 4401.5 | 4394.7 | 64.46 |
| 7/27/10 | 1.24 | 4407.00 | 4407.00 | 59.00 | 4401.6 | 4394.7 | 64.44 |
| 7/28/10 | 1.24 | 4407.00 | 4407.00 | 59.00 | 4401.6 | 4394.7 | 64.42 |
| 7/29/10 | 1.24 | 4407.00 | 4407.00 | 59.00 | 4401.6 | 4394.8 | 64.40 |
| 7/30/10 | 1.25 | 4407.00 | 4407.00 | 59.00 | 4401.6 | 4394.8 | 64.38 |
| 7/31/10 | 1.25 | 4407.00 | 4407.00 | 59.00 | 4401.6 | 4394.8 | 64.36 |
| 8/1/10 | 1.25 | 4407.00 | 4407.00 | 59.00 | 4401.7 | 4394.8 | 64.34 |
| 8/2/10 | 1.25 | 4407.00 | 4407.00 | 59.00 | 4401.7 | 4394.9 | 64.32 |
| 8/3/10 | 1.26 | 4407.00 | 4407.00 | 59.00 | 4401.7 | 4394.9 | 64.30 |
| 8/4/10 | 1.26 | 4407.00 | 4407.00 | 59.00 | 4401.7 | 4394.9 | 64.28 |
| 8/5/10 | 1.26 | 4407.00 | 4407.00 | 59.00 | 4401.7 | 4395.0 | 64.26 |
| 8/6/10 | 1.26 | 4407.00 | 4407.00 | 59.00 | 4401.8 | 4395.0 | 64.23 |
| 8/7/10 | 1.27 | 4407.00 | 4407.00 | 59.00 | 4401.8 | 4395.0 | 64.21 |
| 8/8/10 | 1.27 | 4407.00 | 4407.00 | 59.00 | 4401.8 | 4395.0 | 64.19 |
| 8/9/10 | 1.27 | 4407.00 | 4407.00 | 59.00 | 4401.8 | 4395.1 | 64.17 |
| 8/10/10 | 1.28 | 4407.00 | 4407.00 | 59.00 | 4401.9 | 4395.1 | 64.15 |
| 8/11/10 | 1.28 | 4407.00 | 4407.00 | 59.00 | 4401.9 | 4395.1 | 64.13 |
| 8/12/10 | 1.28 | 4407.00 | 4407.00 | 59.00 | 4401.9 | 4395.1 | 64.11 |
| 8/13/10 | 1.28 | 4407.00 | 4407.00 | 59.00 | 4401.9 | 4395.2 | 64.08 |
| 8/14/10 | 1.29 | 4407.00 | 4407.00 | 59.00 | 4401.9 | 4395.2 | 64.06 |
| 8/15/10 | 1.29 | 4407.00 | 4407.00 | 59.00 | 4402.0 | 4395.2 | 64.04 |
| 8/16/10 | 1.29 | 4407.00 | 4407.00 | 59.00 | 4402.0 | 4395.2 | 64.02 |
| 8/17/10 | 1.30 | 4407.00 | 4407.00 | 59.00 | 4402.0 | 4395.3 | 64.00 |
| 8/18/10 | 1.30 | 4407.00 | 4407.00 | 59.00 | 4402.0 | 4395.3 | 63.98 |
| 8/19/10 | 1.30 | 4407.00 | 4407.00 | 59.00 | 4402.0 | 4395.3 | 63.96 |
| 8/20/10 | 1.30 | 4407.00 | 4407.00 | 59.00 | 4402.1 | 4395.3 | 63.93 |
| 8/21/10 | 1.31 | 4407.00 | 4407.00 | 59.00 | 4402.1 | 4395.4 | 63.91 |
| 8/22/10 | 1.31 | 4407.00 | 4407.00 | 59.00 | 4402.1 | 4395.4 | 63.89 |
| 8/23/10 | 1.31 | 4407.00 | 4407.00 | 59.00 | 4402.1 | 4395.4 | 63.87 |
| 8/24/10 | 1.31 | 4407.00 | 4407.00 | 59.00 | 4402.2 | 4395.4 | 63.85 |
| 8/25/10 | 1.32 | 4407.00 | 4407.00 | 59.00 | 4402.2 | 4395.5 | 63.83 |
| 8/26/10 | 1.32 | 4407.00 | 4407.00 | 59.00 | 4402.2 | 4395.5 | 63.81 |
| 8/27/10 | 1.32 | 4407.00 | 4407.00 | 59.00 | 4402.2 | 4395.5 | 63.78 |
| 8/28/10 | 1.33 | 4407.00 | 4407.00 | 59.00 | 4402.2 | 4395.5 | 63.76 |
| 8/29/10 | 1.33 | 4407.00 | 4407.00 | 59.00 | 4402.3 | 4395.6 | 63.74 |
| 8/30/10 | 1.33 | 4407.00 | 4407.00 | 59.00 | 4402.3 | 4395.6 | 63.72 |
| 8/31/10 | 1.33 | 4407.00 | 4407.00 | 59.00 | 4402.3 | 4395.6 | 63.70 |
| 9/1/10 | 1.34 | 4407.00 | 4407.00 | 59.00 | 4402.3 | 4395.6 | 63.68 |
| 9/2/10 | 1.34 | 4407.00 | 4407.00 | 59.00 | 4402.3 | 4395.7 | 63.66 |
| 9/3/10 | 1.34 | 4407.00 | 4407.00 | 59.00 | 4402.4 | 4395.7 | 63.64 |
| 9/4/10 | 1.34 | 4407.00 | 4407.00 | 59.00 | 4402.4 | 4395.7 | 63.61 |
| 9/5/10 | 1.35 | 4407.00 | 4407.00 | 59.00 | 4402.4 | 4395.8 | 63.59 |
| 9/6/10 | 1.35 | 4407.00 | 4407.00 | 59.00 | 4402.4 | 4395.8 | 63.57 |
| 9/7/10 | 1.35 | 4407.00 | 4407.00 | 59.00 | 4402.5 | 4395.8 | 63.55 |

**Appendix E**
**Table 1  Tailings and Pond Elevations for North and South Cells**

| | | North Cell | | | South Cell | | |
|---|---|---|---|---|---|---|---|
| Date | Year Fraction | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) |
| 9/8/10 | 1.36 | 4407.00 | 4407.00 | 59.00 | 4402.5 | 4395.8 | 63.53 |
| 9/9/10 | 1.36 | 4407.00 | 4407.00 | 59.00 | 4402.5 | 4395.9 | 63.51 |
| 9/10/10 | 1.36 | 4407.00 | 4407.00 | 59.00 | 4402.5 | 4395.9 | 63.49 |
| 9/11/10 | 1.36 | 4407.00 | 4407.00 | 59.00 | 4402.5 | 4395.9 | 63.46 |
| 9/12/10 | 1.37 | 4407.00 | 4407.00 | 59.00 | 4402.6 | 4395.9 | 63.44 |
| 9/13/10 | 1.37 | 4407.00 | 4407.00 | 59.00 | 4402.6 | 4396.0 | 63.42 |
| 9/14/10 | 1.37 | 4407.00 | 4407.00 | 59.00 | 4402.6 | 4396.0 | 63.40 |
| 9/15/10 | 1.37 | 4407.00 | 4407.00 | 59.00 | 4402.6 | 4396.0 | 63.38 |
| 9/16/10 | 1.38 | 4407.00 | 4407.00 | 59.00 | 4402.6 | 4396.0 | 63.36 |
| 9/17/10 | 1.38 | 4407.00 | 4407.00 | 59.00 | 4402.7 | 4396.1 | 63.34 |
| 9/18/10 | 1.38 | 4407.00 | 4407.00 | 59.00 | 4402.7 | 4396.1 | 63.31 |
| 9/19/10 | 1.39 | 4407.00 | 4407.00 | 59.00 | 4402.7 | 4396.1 | 63.29 |
| 9/20/10 | 1.39 | 4407.00 | 4407.00 | 59.00 | 4402.7 | 4396.1 | 63.27 |
| 9/21/10 | 1.39 | 4407.00 | 4407.00 | 59.00 | 4402.7 | 4396.2 | 63.25 |
| 9/22/10 | 1.39 | 4407.00 | 4407.00 | 59.00 | 4402.8 | 4396.2 | 63.23 |
| 9/23/10 | 1.40 | 4407.00 | 4407.00 | 59.00 | 4402.8 | 4396.2 | 63.21 |
| 9/24/10 | 1.40 | 4407.00 | 4407.00 | 59.00 | 4402.8 | 4396.2 | 63.19 |
| 9/25/10 | 1.40 | 4407.00 | 4407.00 | 59.00 | 4402.8 | 4396.3 | 63.17 |
| 9/26/10 | 1.40 | 4407.00 | 4407.00 | 59.00 | 4402.9 | 4396.3 | 63.15 |
| 9/27/10 | 1.41 | 4407.00 | 4407.00 | 59.00 | 4402.9 | 4396.3 | 63.12 |
| 9/28/10 | 1.41 | 4407.00 | 4407.00 | 59.00 | 4402.9 | 4396.3 | 63.10 |
| 9/29/10 | 1.41 | 4407.00 | 4407.00 | 59.00 | 4402.9 | 4396.4 | 63.08 |
| 9/30/10 | 1.42 | 4407.00 | 4407.00 | 59.00 | 4402.9 | 4396.4 | 63.06 |
| 10/1/10 | 1.42 | 4407.00 | 4407.00 | 59.00 | 4403.0 | 4396.4 | 63.04 |
| 10/2/10 | 1.42 | 4407.00 | 4407.00 | 59.00 | 4403.0 | 4396.4 | 63.02 |
| 10/3/10 | 1.42 | 4407.00 | 4407.00 | 59.00 | 4403.0 | 4396.5 | 62.99 |
| 10/4/10 | 1.43 | 4407.00 | 4407.00 | 59.00 | 4403.0 | 4396.5 | 62.97 |
| 10/5/10 | 1.43 | 4407.00 | 4407.00 | 59.00 | 4403.1 | 4396.5 | 62.94 |
| 10/6/10 | 1.43 | 4407.00 | 4407.00 | 59.00 | 4403.1 | 4396.6 | 62.92 |
| 10/7/10 | 1.43 | 4407.00 | 4407.00 | 59.00 | 4403.1 | 4396.6 | 62.90 |
| 10/8/10 | 1.44 | 4407.00 | 4407.00 | 59.00 | 4403.1 | 4396.6 | 62.87 |
| 10/9/10 | 1.44 | 4407.00 | 4407.00 | 59.00 | 4403.2 | 4396.6 | 62.85 |
| 10/10/10 | 1.44 | 4407.00 | 4407.00 | 59.00 | 4403.2 | 4396.7 | 62.82 |
| 10/11/10 | 1.45 | 4407.00 | 4407.00 | 59.00 | 4403.2 | 4396.7 | 62.80 |
| 10/12/10 | 1.45 | 4407.00 | 4407.00 | 59.00 | 4403.2 | 4396.7 | 62.78 |
| 10/13/10 | 1.45 | 4407.00 | 4407.00 | 59.00 | 4403.2 | 4396.7 | 62.75 |
| 10/14/10 | 1.45 | 4407.00 | 4407.00 | 59.00 | 4403.3 | 4396.8 | 62.73 |
| 10/15/10 | 1.46 | 4407.00 | 4407.00 | 59.00 | 4403.3 | 4396.8 | 62.71 |
| 10/16/10 | 1.46 | 4407.00 | 4407.00 | 59.00 | 4403.3 | 4396.8 | 62.68 |
| 10/17/10 | 1.46 | 4407.00 | 4407.00 | 59.00 | 4403.3 | 4396.8 | 62.66 |
| 10/18/10 | 1.46 | 4407.00 | 4407.00 | 59.00 | 4403.4 | 4396.9 | 62.64 |
| 10/19/10 | 1.47 | 4407.00 | 4407.00 | 59.00 | 4403.4 | 4396.9 | 62.61 |
| 10/20/10 | 1.47 | 4407.00 | 4407.00 | 59.00 | 4403.4 | 4396.9 | 62.59 |
| 10/21/10 | 1.47 | 4407.00 | 4407.00 | 59.00 | 4403.4 | 4396.9 | 62.56 |
| 10/22/10 | 1.48 | 4407.00 | 4407.00 | 59.00 | 4403.5 | 4397.0 | 62.54 |
| 10/23/10 | 1.48 | 4407.00 | 4407.00 | 59.00 | 4403.5 | 4397.0 | 62.52 |
| 10/24/10 | 1.48 | 4407.00 | 4407.00 | 59.00 | 4403.5 | 4397.0 | 62.49 |
| 10/25/10 | 1.48 | 4407.00 | 4407.00 | 59.00 | 4403.5 | 4397.0 | 62.47 |
| 10/26/10 | 1.49 | 4407.00 | 4407.00 | 59.00 | 4403.6 | 4397.1 | 62.45 |
| 10/27/10 | 1.49 | 4407.00 | 4407.00 | 59.00 | 4403.6 | 4397.1 | 62.42 |
| 10/28/10 | 1.49 | 4407.00 | 4407.00 | 59.00 | 4403.6 | 4397.1 | 62.40 |
| 10/29/10 | 1.49 | 4407.00 | 4407.00 | 59.00 | 4403.6 | 4397.1 | 62.38 |
| 10/30/10 | 1.50 | 4407.00 | 4407.00 | 59.00 | 4403.6 | 4397.2 | 62.35 |
| 10/31/10 | 1.50 | 4407.00 | 4407.00 | 59.00 | 4403.7 | 4397.2 | 62.33 |
| 11/1/10 | 1.50 | 4407.00 | 4407.00 | 59.00 | 4403.7 | 4397.2 | 62.30 |

**Appendix E**
**Table 1  Tailings and Pond Elevations for North and South Cells**

| Date | Year Fraction | North Cell | | | South Cell | | |
|---|---|---|---|---|---|---|---|
| | | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) |
| 11/2/10 | 1.51 | 4407.00 | 4407.00 | 59.00 | 4403.7 | 4397.2 | 62.28 |
| 11/3/10 | 1.51 | 4407.00 | 4407.00 | 59.00 | 4403.7 | 4397.3 | 62.25 |
| 11/4/10 | 1.51 | 4407.00 | 4407.00 | 59.00 | 4403.8 | 4397.3 | 62.22 |
| 11/5/10 | 1.51 | 4407.00 | 4407.00 | 59.00 | 4403.8 | 4397.3 | 62.20 |
| 11/6/10 | 1.52 | 4407.00 | 4407.00 | 59.00 | 4403.8 | 4397.4 | 62.17 |
| 11/7/10 | 1.52 | 4407.00 | 4407.00 | 59.00 | 4403.9 | 4397.4 | 62.14 |
| 11/8/10 | 1.52 | 4407.00 | 4407.00 | 59.00 | 4403.9 | 4397.4 | 62.12 |
| 11/9/10 | 1.53 | 4407.00 | 4407.00 | 59.00 | 4403.9 | 4397.4 | 62.09 |
| 11/10/10 | 1.53 | 4407.00 | 4407.00 | 59.00 | 4403.9 | 4397.5 | 62.06 |
| 11/11/10 | 1.53 | 4407.00 | 4407.00 | 59.00 | 4404.0 | 4397.5 | 62.04 |
| 11/12/10 | 1.53 | 4407.00 | 4407.00 | 59.00 | 4404.0 | 4397.5 | 62.01 |
| 11/13/10 | 1.54 | 4407.00 | 4407.00 | 59.00 | 4404.0 | 4397.5 | 61.98 |
| 11/14/10 | 1.54 | 4407.00 | 4407.00 | 59.00 | 4404.0 | 4397.6 | 61.96 |
| 11/15/10 | 1.54 | 4407.00 | 4407.00 | 59.00 | 4404.1 | 4397.6 | 61.93 |
| 11/16/10 | 1.54 | 4407.00 | 4407.00 | 59.00 | 4404.1 | 4397.6 | 61.90 |
| 11/17/10 | 1.55 | 4407.00 | 4407.00 | 59.00 | 4404.1 | 4397.6 | 61.88 |
| 11/18/10 | 1.55 | 4407.00 | 4407.00 | 59.00 | 4404.2 | 4397.7 | 61.85 |
| 11/19/10 | 1.55 | 4407.00 | 4407.00 | 59.00 | 4404.2 | 4397.7 | 61.82 |
| 11/20/10 | 1.56 | 4407.00 | 4407.00 | 59.00 | 4404.2 | 4397.7 | 61.80 |
| 11/21/10 | 1.56 | 4407.00 | 4407.00 | 59.00 | 4404.2 | 4397.7 | 61.77 |
| 11/22/10 | 1.56 | 4407.00 | 4407.00 | 59.00 | 4404.3 | 4397.8 | 61.74 |
| 11/23/10 | 1.56 | 4407.00 | 4407.00 | 59.00 | 4404.3 | 4397.8 | 61.72 |
| 11/24/10 | 1.57 | 4407.00 | 4407.00 | 59.00 | 4404.3 | 4397.8 | 61.69 |
| 11/25/10 | 1.57 | 4407.00 | 4407.00 | 59.00 | 4404.3 | 4397.8 | 61.66 |
| 11/26/10 | 1.57 | 4407.00 | 4407.00 | 59.00 | 4404.4 | 4397.9 | 61.64 |
| 11/27/10 | 1.57 | 4407.00 | 4407.00 | 59.00 | 4404.4 | 4397.9 | 61.61 |
| 11/28/10 | 1.58 | 4407.00 | 4407.00 | 59.00 | 4404.4 | 4397.9 | 61.58 |
| 11/29/10 | 1.58 | 4407.00 | 4407.00 | 59.00 | 4404.4 | 4397.9 | 61.56 |
| 11/30/10 | 1.58 | 4407.00 | 4407.00 | 59.00 | 4404.5 | 4398.0 | 61.53 |
| 12/1/10 | 1.59 | 4407.00 | 4407.00 | 59.00 | 4404.5 | 4398.0 | 61.50 |
| 12/2/10 | 1.59 | 4407.00 | 4407.00 | 59.00 | 4404.5 | 4398.0 | 61.47 |
| 12/3/10 | 1.59 | 4407.00 | 4407.00 | 59.00 | 4404.6 | 4398.0 | 61.44 |
| 12/4/10 | 1.59 | 4407.00 | 4407.00 | 59.00 | 4404.6 | 4398.1 | 61.41 |
| 12/5/10 | 1.60 | 4407.00 | 4407.00 | 59.00 | 4404.6 | 4398.1 | 61.38 |
| 12/6/10 | 1.60 | 4407.00 | 4407.00 | 59.00 | 4404.6 | 4398.1 | 61.35 |
| 12/7/10 | 1.60 | 4407.00 | 4407.00 | 59.00 | 4404.7 | 4398.1 | 61.32 |
| 12/8/10 | 1.60 | 4407.00 | 4407.00 | 59.00 | 4404.7 | 4398.2 | 61.29 |
| 12/9/10 | 1.61 | 4407.00 | 4407.00 | 59.00 | 4404.7 | 4398.2 | 61.26 |
| 12/10/10 | 1.61 | 4407.00 | 4407.00 | 59.00 | 4404.8 | 4398.2 | 61.23 |
| 12/11/10 | 1.61 | 4407.00 | 4407.00 | 59.00 | 4404.8 | 4398.3 | 61.20 |
| 12/12/10 | 1.62 | 4407.00 | 4407.00 | 59.00 | 4404.8 | 4398.3 | 61.17 |
| 12/13/10 | 1.62 | 4407.00 | 4407.00 | 59.00 | 4404.9 | 4398.3 | 61.14 |
| 12/14/10 | 1.62 | 4407.00 | 4407.00 | 59.00 | 4404.9 | 4398.3 | 61.11 |
| 12/15/10 | 1.62 | 4407.00 | 4407.00 | 59.00 | 4404.9 | 4398.4 | 61.08 |
| 12/16/10 | 1.63 | 4407.00 | 4407.00 | 59.00 | 4405.0 | 4398.4 | 61.05 |
| 12/17/10 | 1.63 | 4407.00 | 4407.00 | 59.00 | 4405.0 | 4398.4 | 61.02 |
| 12/18/10 | 1.63 | 4407.00 | 4407.00 | 59.00 | 4405.0 | 4398.4 | 60.99 |
| 12/19/10 | 1.63 | 4407.00 | 4407.00 | 59.00 | 4405.0 | 4398.5 | 60.96 |
| 12/20/10 | 1.64 | 4407.00 | 4407.00 | 59.00 | 4405.1 | 4398.5 | 60.93 |
| 12/21/10 | 1.64 | 4407.00 | 4407.00 | 59.00 | 4405.1 | 4398.5 | 60.90 |
| 12/22/10 | 1.64 | 4407.00 | 4407.00 | 59.00 | 4405.1 | 4398.5 | 60.87 |
| 12/23/10 | 1.65 | 4407.00 | 4407.00 | 59.00 | 4405.2 | 4398.6 | 60.84 |
| 12/24/10 | 1.65 | 4407.00 | 4407.00 | 59.00 | 4405.2 | 4398.6 | 60.81 |
| 12/25/10 | 1.65 | 4407.00 | 4407.00 | 59.00 | 4405.2 | 4398.6 | 60.78 |
| 12/26/10 | 1.65 | 4407.00 | 4407.00 | 59.00 | 4405.3 | 4398.6 | 60.75 |

**Appendix E**
**Table 1  Tailings and Pond Elevations for North and South Cells**

| Date | Year Fraction | North Cell | | | South Cell | | |
|---|---|---|---|---|---|---|---|
| | | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) |
| 12/27/10 | 1.66 | 4407.00 | 4407.00 | 59.00 | 4405.3 | 4398.7 | 60.72 |
| 12/28/10 | 1.66 | 4407.00 | 4407.00 | 59.00 | 4405.3 | 4398.7 | 60.69 |
| 12/29/10 | 1.66 | 4407.00 | 4407.00 | 59.00 | 4405.3 | 4398.7 | 60.66 |
| 12/30/10 | 1.66 | 4407.00 | 4407.00 | 59.00 | 4405.4 | 4398.7 | 60.63 |
| 12/31/10 | 1.67 | 4407.00 | 4407.00 | 59.00 | 4405.4 | 4398.8 | 60.60 |
| 1/1/11 | 1.67 | 4407.00 | 4407.00 | 59.00 | 4405.4 | 4398.8 | 60.57 |
| 1/2/11 | 1.67 | 4407.00 | 4407.00 | 59.00 | 4405.5 | 4398.8 | 60.53 |
| 1/3/11 | 1.68 | 4407.00 | 4407.00 | 59.00 | 4405.5 | 4398.8 | 60.50 |
| 1/4/11 | 1.68 | 4407.00 | 4407.00 | 59.00 | 4405.5 | 4398.9 | 60.47 |
| 1/5/11 | 1.68 | 4407.00 | 4407.00 | 59.00 | 4405.6 | 4398.9 | 60.44 |
| 1/6/11 | 1.68 | 4407.00 | 4407.00 | 59.00 | 4405.6 | 4398.9 | 60.40 |
| 1/7/11 | 1.69 | 4407.00 | 4407.00 | 59.00 | 4405.6 | 4398.9 | 60.37 |
| 1/8/11 | 1.69 | 4407.00 | 4407.00 | 59.00 | 4405.7 | 4399.0 | 60.34 |
| 1/9/11 | 1.69 | 4407.00 | 4407.00 | 59.00 | 4405.7 | 4399.0 | 60.31 |
| 1/10/11 | 1.69 | 4407.00 | 4407.00 | 59.00 | 4405.7 | 4399.0 | 60.28 |
| 1/11/11 | 1.70 | 4407.00 | 4407.00 | 59.00 | 4405.8 | 4399.1 | 60.24 |
| 1/12/11 | 1.70 | 4407.00 | 4407.00 | 59.00 | 4405.8 | 4399.1 | 60.21 |
| 1/13/11 | 1.70 | 4407.00 | 4407.00 | 59.00 | 4405.8 | 4399.1 | 60.18 |
| 1/14/11 | 1.71 | 4407.00 | 4407.00 | 59.00 | 4405.9 | 4399.1 | 60.15 |
| 1/15/11 | 1.71 | 4407.00 | 4407.00 | 59.00 | 4405.9 | 4399.2 | 60.11 |
| 1/16/11 | 1.71 | 4407.00 | 4407.00 | 59.00 | 4405.9 | 4399.2 | 60.08 |
| 1/17/11 | 1.71 | 4407.00 | 4407.00 | 59.00 | 4406.0 | 4399.2 | 60.05 |
| 1/18/11 | 1.72 | 4407.00 | 4407.00 | 59.00 | 4406.0 | 4399.2 | 60.02 |
| 1/19/11 | 1.72 | 4407.00 | 4407.00 | 59.00 | 4406.0 | 4399.3 | 59.98 |
| 1/20/11 | 1.72 | 4407.00 | 4407.00 | 59.00 | 4406.0 | 4399.3 | 59.95 |
| 1/21/11 | 1.72 | 4407.00 | 4407.00 | 59.00 | 4406.1 | 4399.3 | 59.92 |
| 1/22/11 | 1.73 | 4407.00 | 4407.00 | 59.00 | 4406.1 | 4399.3 | 59.89 |
| 1/23/11 | 1.73 | 4407.00 | 4407.00 | 59.00 | 4406.1 | 4399.4 | 59.86 |
| 1/24/11 | 1.73 | 4407.00 | 4407.00 | 59.00 | 4406.2 | 4399.4 | 59.82 |
| 1/25/11 | 1.74 | 4407.00 | 4407.00 | 59.00 | 4406.2 | 4399.4 | 59.79 |
| 1/26/11 | 1.74 | 4407.00 | 4407.00 | 59.00 | 4406.2 | 4399.4 | 59.76 |
| 1/27/11 | 1.74 | 4407.00 | 4407.00 | 59.00 | 4406.3 | 4399.5 | 59.73 |
| 1/28/11 | 1.74 | 4407.00 | 4407.00 | 59.00 | 4406.3 | 4399.5 | 59.69 |
| 1/29/11 | 1.75 | 4407.00 | 4407.00 | 59.00 | 4406.3 | 4399.5 | 59.66 |
| 1/30/11 | 1.75 | 4407.00 | 4407.00 | 59.00 | 4406.4 | 4399.5 | 59.63 |
| 1/31/11 | 1.75 | 4407.00 | 4407.00 | 59.00 | 4406.4 | 4399.6 | 59.60 |
| 2/1/11 | 1.76 | 4407.00 | 4407.00 | 59.00 | 4406.4 | 4399.6 | 59.57 |
| 2/2/11 | 1.76 | 4407.00 | 4407.00 | 59.00 | 4406.5 | 4399.6 | 59.53 |
| 2/3/11 | 1.76 | 4407.00 | 4407.00 | 59.00 | 4406.5 | 4399.6 | 59.50 |
| 2/4/11 | 1.76 | 4407.00 | 4407.00 | 59.00 | 4406.5 | 4399.7 | 59.47 |
| 2/5/11 | 1.77 | 4407.00 | 4407.00 | 59.00 | 4406.6 | 4399.7 | 59.44 |
| 2/6/11 | 1.77 | 4407.00 | 4407.00 | 59.00 | 4406.6 | 4399.7 | 59.40 |
| 2/7/11 | 1.77 | 4407.00 | 4407.00 | 59.00 | 4406.6 | 4399.7 | 59.37 |
| 2/8/11 | 1.77 | 4407.00 | 4407.00 | 59.00 | 4406.7 | 4399.8 | 59.34 |
| 2/9/11 | 1.78 | 4407.00 | 4407.00 | 59.00 | 4406.7 | 4399.8 | 59.31 |
| 2/10/11 | 1.78 | 4407.00 | 4407.00 | 59.00 | 4406.7 | 4399.8 | 59.27 |
| 2/11/11 | 1.78 | 4407.00 | 4407.00 | 59.00 | 4406.8 | 4399.9 | 59.24 |
| 2/12/11 | 1.79 | 4407.00 | 4407.00 | 59.00 | 4406.8 | 4399.9 | 59.21 |
| 2/13/11 | 1.79 | 4407.00 | 4407.00 | 59.00 | 4406.8 | 4399.9 | 59.18 |
| 2/14/11 | 1.79 | 4407.00 | 4407.00 | 59.00 | 4406.9 | 4399.9 | 59.14 |
| 2/15/11 | 1.79 | 4407.00 | 4407.00 | 59.00 | 4406.9 | 4400.0 | 59.11 |
| 2/16/11 | 1.80 | 4407.00 | 4407.00 | 59.00 | 4406.9 | 4400.0 | 59.08 |
| 2/17/11 | 1.80 | 4407.00 | 4407.00 | 59.00 | 4407.0 | 4400.0 | 59.05 |
| 2/18/11 | 1.80 | 4407.00 | 4407.00 | 59.00 | 4407.0 | 4400.0 | 59.01 |
| 2/19/11 | 1.80 | 4407.00 | 4407.00 | 59.00 | 4407.0 | 4400.0 | 58.98 |

**Appendix E**

**Table 1  Tailings and Pond Elevations for North and South Cells**

| Date | Year Fraction | North Cell | | | South Cell | | |
|---|---|---|---|---|---|---|---|
| | | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) |
| 2/20/11 | 1.81 | 4407.00 | 4407.00 | 59.00 | 4407.1 | 4400.1 | 58.95 |
| 2/21/11 | 1.81 | 4407.00 | 4407.00 | 59.00 | 4407.1 | 4400.1 | 58.92 |
| 2/22/11 | 1.81 | 4407.00 | 4407.00 | 59.00 | 4407.1 | 4400.1 | 58.89 |
| 2/23/11 | 1.82 | 4407.00 | 4407.00 | 59.00 | 4407.1 | 4400.1 | 58.85 |
| 2/24/11 | 1.82 | 4407.00 | 4407.00 | 59.00 | 4407.2 | 4400.1 | 58.82 |
| 2/25/11 | 1.82 | 4407.00 | 4407.00 | 59.00 | 4407.2 | 4400.2 | 58.79 |
| 2/26/11 | 1.82 | 4407.00 | 4407.00 | 59.00 | 4407.2 | 4400.2 | 58.76 |
| 2/27/11 | 1.83 | 4407.00 | 4407.00 | 59.00 | 4407.3 | 4400.2 | 58.72 |
| 2/28/11 | 1.83 | 4407.00 | 4407.00 | 59.00 | 4407.3 | 4400.2 | 58.69 |
| 3/1/11 | 1.83 | 4407.00 | 4407.00 | 59.00 | 4407.3 | 4400.2 | 58.66 |
| 3/2/11 | 1.83 | 4407.00 | 4407.00 | 59.00 | 4407.4 | 4400.3 | 58.63 |
| 3/3/11 | 1.84 | 4407.00 | 4407.00 | 59.00 | 4407.4 | 4400.3 | 58.59 |
| 3/4/11 | 1.84 | 4407.00 | 4407.00 | 59.00 | 4407.4 | 4400.3 | 58.56 |
| 3/5/11 | 1.84 | 4407.00 | 4407.00 | 59.00 | 4407.5 | 4400.3 | 58.52 |
| 3/6/11 | 1.85 | 4407.00 | 4407.00 | 59.00 | 4407.5 | 4400.3 | 58.49 |
| 3/7/11 | 1.85 | 4407.00 | 4407.00 | 59.00 | 4407.5 | 4400.4 | 58.46 |
| 3/8/11 | 1.85 | 4407.00 | 4407.00 | 59.00 | 4407.6 | 4400.4 | 58.42 |
| 3/9/11 | 1.85 | 4407.00 | 4407.00 | 59.00 | 4407.6 | 4400.4 | 58.39 |
| 3/10/11 | 1.86 | 4407.00 | 4407.00 | 59.00 | 4407.6 | 4400.4 | 58.36 |
| 3/11/11 | 1.86 | 4407.00 | 4407.00 | 59.00 | 4407.7 | 4400.4 | 58.32 |
| 3/12/11 | 1.86 | 4407.00 | 4407.00 | 59.00 | 4407.7 | 4400.5 | 58.29 |
| 3/13/11 | 1.86 | 4407.00 | 4407.00 | 59.00 | 4407.7 | 4400.5 | 58.26 |
| 3/14/11 | 1.87 | 4407.00 | 4407.00 | 59.00 | 4407.8 | 4400.5 | 58.22 |
| 3/15/11 | 1.87 | 4407.00 | 4407.00 | 59.00 | 4407.8 | 4400.5 | 58.19 |
| 3/16/11 | 1.87 | 4407.00 | 4407.00 | 59.00 | 4407.8 | 4400.5 | 58.16 |
| 3/17/11 | 1.88 | 4407.00 | 4407.00 | 59.00 | 4407.9 | 4400.6 | 58.12 |
| 3/18/11 | 1.88 | 4407.00 | 4407.00 | 59.00 | 4407.9 | 4400.6 | 58.09 |
| 3/19/11 | 1.88 | 4407.00 | 4407.00 | 59.00 | 4407.9 | 4400.6 | 58.05 |
| 3/20/11 | 1.88 | 4407.00 | 4407.00 | 59.00 | 4408.0 | 4400.6 | 58.02 |
| 3/21/11 | 1.89 | 4407.00 | 4407.00 | 59.00 | 4408.0 | 4400.6 | 57.99 |
| 3/22/11 | 1.89 | 4407.00 | 4407.00 | 59.00 | 4408.0 | 4400.6 | 57.95 |
| 3/23/11 | 1.89 | 4407.00 | 4407.00 | 59.00 | 4408.1 | 4400.7 | 57.92 |
| 3/24/11 | 1.89 | 4407.00 | 4407.00 | 59.00 | 4408.1 | 4400.7 | 57.89 |
| 3/25/11 | 1.90 | 4407.00 | 4407.00 | 59.00 | 4408.1 | 4400.7 | 57.85 |
| 3/26/11 | 1.90 | 4407.00 | 4407.00 | 59.00 | 4408.2 | 4400.7 | 57.82 |
| 3/27/11 | 1.90 | 4407.00 | 4407.00 | 59.00 | 4408.2 | 4400.7 | 57.79 |
| 3/28/11 | 1.91 | 4407.00 | 4407.00 | 59.00 | 4408.2 | 4400.8 | 57.75 |
| 3/29/11 | 1.91 | 4407.00 | 4407.00 | 59.00 | 4408.3 | 4400.8 | 57.72 |
| 3/30/11 | 1.91 | 4407.00 | 4407.00 | 59.00 | 4408.3 | 4400.8 | 57.69 |
| 3/31/11 | 1.91 | 4407.00 | 4407.00 | 59.00 | 4408.3 | 4400.8 | 57.65 |
| 4/1/11 | 1.92 | 4407.00 | 4407.00 | 59.00 | 4408.4 | 4400.8 | 57.62 |
| 4/2/11 | 1.92 | 4407.00 | 4407.00 | 59.00 | 4408.4 | 4400.9 | 57.59 |
| 4/3/11 | 1.92 | 4407.00 | 4407.00 | 59.00 | 4408.4 | 4400.9 | 57.56 |
| 4/4/11 | 1.92 | 4407.00 | 4407.00 | 59.00 | 4408.5 | 4400.9 | 57.53 |
| 4/5/11 | 1.93 | 4407.00 | 4407.00 | 59.00 | 4408.5 | 4400.9 | 57.50 |
| 4/6/11 | 1.93 | 4407.00 | 4407.00 | 59.00 | 4408.5 | 4400.9 | 57.47 |
| 4/7/11 | 1.93 | 4407.00 | 4407.00 | 59.00 | 4408.6 | 4401.0 | 57.44 |
| 4/8/11 | 1.94 | 4407.00 | 4407.00 | 59.00 | 4408.6 | 4401.0 | 57.41 |
| 4/9/11 | 1.94 | 4407.00 | 4407.00 | 59.00 | 4408.6 | 4401.0 | 57.38 |
| 4/10/11 | 1.94 | 4407.00 | 4407.00 | 59.00 | 4408.6 | 4401.0 | 57.35 |
| 4/11/11 | 1.94 | 4407.00 | 4407.00 | 59.00 | 4408.7 | 4401.0 | 57.32 |
| 4/12/11 | 1.95 | 4407.00 | 4407.00 | 59.00 | 4408.7 | 4401.1 | 57.29 |
| 4/13/11 | 1.95 | 4407.00 | 4407.00 | 59.00 | 4408.7 | 4401.1 | 57.26 |
| 4/14/11 | 1.95 | 4407.00 | 4407.00 | 59.00 | 4408.8 | 4401.1 | 57.23 |
| 4/15/11 | 1.95 | 4407.00 | 4407.00 | 59.00 | 4408.8 | 4401.1 | 57.21 |

**Appendix E**
**Table 1 Tailings and Pond Elevations for North and South Cells**

| | Year | North Cell | | | South Cell | | |
|---|---|---|---|---|---|---|---|
| Date | Fraction | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) |
| 4/16/11 | 1.96 | 4407.00 | 4407.00 | 59.00 | 4408.8 | 4401.1 | 57.18 |
| 4/17/11 | 1.96 | 4407.00 | 4407.00 | 59.00 | 4408.9 | 4401.2 | 57.15 |
| 4/18/11 | 1.96 | 4407.00 | 4407.00 | 59.00 | 4408.9 | 4401.2 | 57.12 |
| 4/19/11 | 1.97 | 4407.00 | 4407.00 | 59.00 | 4408.9 | 4401.2 | 57.09 |
| 4/20/11 | 1.97 | 4407.00 | 4407.00 | 59.00 | 4408.9 | 4401.2 | 57.06 |
| 4/21/11 | 1.97 | 4407.00 | 4407.00 | 59.00 | 4409.0 | 4401.2 | 57.03 |
| 4/22/11 | 1.97 | 4407.00 | 4407.00 | 59.00 | 4409.0 | 4401.3 | 57.00 |
| 4/23/11 | 1.98 | 4407.00 | 4407.00 | 59.00 | 4409.0 | 4401.3 | 56.97 |
| 4/24/11 | 1.98 | 4407.00 | 4407.00 | 59.00 | 4409.1 | 4401.3 | 56.94 |
| 4/25/11 | 1.98 | 4407.00 | 4407.00 | 59.00 | 4409.1 | 4401.3 | 56.91 |
| 4/26/11 | 1.98 | 4407.00 | 4407.00 | 59.00 | 4409.1 | 4401.3 | 56.88 |
| 4/27/11 | 1.99 | 4407.00 | 4407.00 | 59.00 | 4409.1 | 4401.4 | 56.85 |
| 4/28/11 | 1.99 | 4407.00 | 4407.00 | 59.00 | 4409.2 | 4401.4 | 56.82 |
| 4/29/11 | 1.99 | 4407.00 | 4407.00 | 59.00 | 4409.2 | 4401.4 | 56.79 |
| 4/30/11 | 2.00 | 4407.00 | 4407.00 | 59.00 | 4409.2 | 4401.4 | 56.76 |
| 5/1/11 | 2.00 | 4407.00 | 4407.00 | 59.00 | 4409.3 | 4401.4 | 56.73 |
| 5/2/11 | 2.00 | 4407.00 | 4407.00 | 59.00 | 4409.3 | 4401.4 | 56.70 |
| 5/3/11 | 2.00 | 4407.00 | 4407.00 | 59.00 | 4409.3 | 4401.5 | 56.68 |
| 5/4/11 | 2.01 | 4407.00 | 4407.00 | 59.00 | 4409.4 | 4401.5 | 56.65 |
| 5/5/11 | 2.01 | 4407.00 | 4407.00 | 59.00 | 4409.4 | 4401.5 | 56.62 |
| 5/6/11 | 2.01 | 4407.00 | 4407.00 | 59.00 | 4409.4 | 4401.5 | 56.59 |
| 5/7/11 | 2.02 | 4407.00 | 4407.00 | 59.00 | 4409.4 | 4401.5 | 56.56 |
| 5/8/11 | 2.02 | 4407.00 | 4407.00 | 59.00 | 4409.5 | 4401.6 | 56.53 |
| 5/9/11 | 2.02 | 4407.00 | 4407.00 | 59.00 | 4409.5 | 4401.6 | 56.51 |
| 5/10/11 | 2.02 | 4407.00 | 4407.00 | 59.00 | 4409.5 | 4401.6 | 56.48 |
| 5/11/11 | 2.03 | 4407.00 | 4407.00 | 59.00 | 4409.6 | 4401.6 | 56.45 |
| 5/12/11 | 2.03 | 4407.00 | 4407.00 | 59.00 | 4409.6 | 4401.6 | 56.42 |
| 5/13/11 | 2.03 | 4407.00 | 4407.00 | 59.00 | 4409.6 | 4401.7 | 56.39 |
| 5/14/11 | 2.03 | 4407.00 | 4407.00 | 59.00 | 4409.6 | 4401.7 | 56.37 |
| 5/15/11 | 2.04 | 4407.00 | 4407.00 | 59.00 | 4409.7 | 4401.7 | 56.34 |
| 5/16/11 | 2.04 | 4407.00 | 4407.00 | 59.00 | 4409.7 | 4401.7 | 56.31 |
| 5/17/11 | 2.04 | 4407.00 | 4407.00 | 59.00 | 4409.7 | 4401.7 | 56.28 |
| 5/18/11 | 2.05 | 4407.00 | 4407.00 | 59.00 | 4409.7 | 4401.8 | 56.25 |
| 5/19/11 | 2.05 | 4407.00 | 4407.00 | 59.00 | 4409.8 | 4401.8 | 56.22 |
| 5/20/11 | 2.05 | 4407.00 | 4407.00 | 59.00 | 4409.8 | 4401.8 | 56.20 |
| 5/21/11 | 2.05 | 4407.00 | 4407.00 | 59.00 | 4409.8 | 4401.8 | 56.17 |
| 5/22/11 | 2.06 | 4407.00 | 4407.00 | 59.00 | 4409.9 | 4401.8 | 56.14 |
| 5/23/11 | 2.06 | 4407.00 | 4407.00 | 59.00 | 4409.9 | 4401.9 | 56.11 |
| 5/24/11 | 2.06 | 4407.00 | 4407.00 | 59.00 | 4409.9 | 4401.9 | 56.08 |
| 5/25/11 | 2.06 | 4407.00 | 4407.00 | 59.00 | 4409.9 | 4401.9 | 56.05 |
| 5/26/11 | 2.07 | 4407.00 | 4407.00 | 59.00 | 4410.0 | 4401.9 | 56.03 |
| 5/27/11 | 2.07 | 4407.00 | 4407.00 | 59.00 | 4410.0 | 4401.9 | 56.00 |
| 5/28/11 | 2.07 | 4407.00 | 4407.00 | 59.00 | 4410.0 | 4402.0 | 55.97 |
| 5/29/11 | 2.08 | 4407.00 | 4407.00 | 59.00 | 4410.1 | 4402.0 | 55.95 |
| 5/30/11 | 2.08 | 4407.00 | 4407.00 | 59.00 | 4410.1 | 4402.0 | 55.92 |
| 5/31/11 | 2.08 | 4407.00 | 4407.00 | 59.00 | 4410.1 | 4402.0 | 55.90 |
| 6/1/11 | 2.08 | 4407.00 | 4407.00 | 59.00 | 4410.1 | 4402.0 | 55.88 |
| 6/2/11 | 2.09 | 4407.00 | 4407.00 | 59.00 | 4410.1 | 4402.1 | 55.85 |
| 6/3/11 | 2.09 | 4407.00 | 4407.00 | 59.00 | 4410.2 | 4402.1 | 55.83 |
| 6/4/11 | 2.09 | 4407.00 | 4407.00 | 59.00 | 4410.2 | 4402.1 | 55.81 |
| 6/5/11 | 2.09 | 4407.00 | 4407.00 | 59.00 | 4410.2 | 4402.1 | 55.79 |
| 6/6/11 | 2.10 | 4407.00 | 4407.00 | 59.00 | 4410.2 | 4402.1 | 55.77 |
| 6/7/11 | 2.10 | 4407.00 | 4407.00 | 59.00 | 4410.3 | 4402.2 | 55.75 |
| 6/8/11 | 2.10 | 4407.00 | 4407.00 | 59.00 | 4410.3 | 4402.2 | 55.73 |
| 6/9/11 | 2.11 | 4407.00 | 4407.00 | 59.00 | 4410.3 | 4402.2 | 55.71 |

**Appendix E**
**Table 1 Tailings and Pond Elevations for North and South Cells**

| | Year | North Cell | | | South Cell | | |
|---|---|---|---|---|---|---|---|
| Date | Fraction | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) |
| 6/10/11 | 2.11 | 4407.00 | 4407.00 | 59.00 | 4410.3 | 4402.2 | 55.69 |
| 6/11/11 | 2.11 | 4407.00 | 4407.00 | 59.00 | 4410.3 | 4402.2 | 55.67 |
| 6/12/11 | 2.11 | 4407.00 | 4407.00 | 59.00 | 4410.4 | 4402.3 | 55.64 |
| 6/13/11 | 2.12 | 4407.00 | 4407.00 | 59.00 | 4410.4 | 4402.3 | 55.62 |
| 6/14/11 | 2.12 | 4407.00 | 4407.00 | 59.00 | 4410.4 | 4402.3 | 55.60 |
| 6/15/11 | 2.12 | 4407.00 | 4407.00 | 59.00 | 4410.4 | 4402.3 | 55.58 |
| 6/16/11 | 2.12 | 4407.00 | 4407.00 | 59.00 | 4410.4 | 4402.3 | 55.56 |
| 6/17/11 | 2.13 | 4407.00 | 4407.00 | 59.00 | 4410.5 | 4402.3 | 55.54 |
| 6/18/11 | 2.13 | 4407.00 | 4407.00 | 59.00 | 4410.5 | 4402.4 | 55.52 |
| 6/19/11 | 2.13 | 4407.00 | 4407.00 | 59.00 | 4410.5 | 4402.4 | 55.50 |
| 6/20/11 | 2.14 | 4407.00 | 4407.00 | 59.00 | 4410.5 | 4402.4 | 55.48 |
| 6/21/11 | 2.14 | 4407.00 | 4407.00 | 59.00 | 4410.5 | 4402.4 | 55.46 |
| 6/22/11 | 2.14 | 4407.00 | 4407.00 | 59.00 | 4410.6 | 4402.4 | 55.43 |
| 6/23/11 | 2.14 | 4407.00 | 4407.00 | 59.00 | 4410.6 | 4402.5 | 55.41 |
| 6/24/11 | 2.15 | 4407.00 | 4407.00 | 59.00 | 4410.6 | 4402.5 | 55.39 |
| 6/25/11 | 2.15 | 4407.00 | 4407.00 | 59.00 | 4410.6 | 4402.5 | 55.37 |
| 6/26/11 | 2.15 | 4407.00 | 4407.00 | 59.00 | 4410.7 | 4402.5 | 55.35 |
| 6/27/11 | 2.15 | 4407.00 | 4407.00 | 59.00 | 4410.7 | 4402.5 | 55.33 |
| 6/28/11 | 2.16 | 4407.00 | 4407.00 | 59.00 | 4410.7 | 4402.6 | 55.31 |
| 6/29/11 | 2.16 | 4407.00 | 4407.00 | 59.00 | 4410.7 | 4402.6 | 55.29 |
| 6/30/11 | 2.16 | 4407.00 | 4407.00 | 59.00 | 4410.7 | 4402.6 | 55.27 |
| 7/1/11 | 2.17 | 4407.00 | 4407.00 | 59.00 | 4410.8 | 4402.6 | 55.25 |
| 7/2/11 | 2.17 | 4407.00 | 4407.00 | 59.00 | 4410.8 | 4402.6 | 55.23 |
| 7/3/11 | 2.17 | 4407.00 | 4407.00 | 59.00 | 4410.8 | 4402.7 | 55.22 |
| 7/4/11 | 2.17 | 4407.00 | 4407.00 | 59.00 | 4410.8 | 4402.7 | 55.20 |
| 7/5/11 | 2.18 | 4407.00 | 4407.00 | 59.00 | 4410.8 | 4402.7 | 55.19 |
| 7/6/11 | 2.18 | 4407.00 | 4407.00 | 59.00 | 4410.8 | 4402.7 | 55.17 |
| 7/7/11 | 2.18 | 4407.00 | 4407.00 | 59.00 | 4410.8 | 4402.7 | 55.16 |
| 7/8/11 | 2.18 | 4407.00 | 4407.00 | 59.00 | 4410.9 | 4402.8 | 55.15 |
| 7/9/11 | 2.19 | 4407.00 | 4407.00 | 59.00 | 4410.9 | 4402.8 | 55.13 |
| 7/10/11 | 2.19 | 4407.00 | 4407.00 | 59.00 | 4410.9 | 4402.8 | 55.12 |
| 7/11/11 | 2.19 | 4407.00 | 4407.00 | 59.00 | 4410.9 | 4402.8 | 55.10 |
| 7/12/11 | 2.20 | 4407.00 | 4407.00 | 59.00 | 4410.9 | 4402.8 | 55.09 |
| 7/13/11 | 2.20 | 4407.00 | 4407.00 | 59.00 | 4410.9 | 4402.9 | 55.08 |
| 7/14/11 | 2.20 | 4407.00 | 4407.00 | 59.00 | 4410.9 | 4402.9 | 55.06 |
| 7/15/11 | 2.20 | 4407.00 | 4407.00 | 59.00 | 4411.0 | 4402.9 | 55.05 |
| 7/16/11 | 2.21 | 4407.00 | 4407.00 | 59.00 | 4411.0 | 4402.9 | 55.03 |
| 7/17/11 | 2.21 | 4407.00 | 4407.00 | 59.00 | 4411.0 | 4402.9 | 55.02 |
| 7/18/11 | 2.21 | 4407.00 | 4407.00 | 59.00 | 4411.0 | 4403.0 | 55.00 |
| 7/19/11 | 2.21 | 4407.00 | 4407.00 | 59.00 | 4411.0 | 4403.0 | 54.99 |
| 7/20/11 | 2.22 | 4407.00 | 4407.00 | 59.00 | 4411.0 | 4403.0 | 54.98 |
| 7/21/11 | 2.22 | 4407.00 | 4407.00 | 59.00 | 4411.0 | 4403.0 | 54.96 |
| 7/22/11 | 2.22 | 4407.00 | 4407.00 | 59.00 | 4411.1 | 4403.0 | 54.95 |
| 7/23/11 | 2.23 | 4407.00 | 4407.00 | 59.00 | 4411.1 | 4403.1 | 54.93 |
| 7/24/11 | 2.23 | 4407.00 | 4407.00 | 59.00 | 4411.1 | 4403.1 | 54.92 |
| 7/25/11 | 2.23 | 4407.00 | 4407.00 | 59.00 | 4411.1 | 4403.1 | 54.91 |
| 7/26/11 | 2.23 | 4407.00 | 4407.00 | 59.00 | 4411.1 | 4403.1 | 54.89 |
| 7/27/11 | 2.24 | 4407.00 | 4407.00 | 59.00 | 4411.1 | 4403.1 | 54.88 |
| 7/28/11 | 2.24 | 4407.00 | 4407.00 | 59.00 | 4411.1 | 4403.1 | 54.86 |
| 7/29/11 | 2.24 | 4407.00 | 4407.00 | 59.00 | 4411.2 | 4403.2 | 54.85 |
| 7/30/11 | 2.25 | 4407.00 | 4407.00 | 59.00 | 4411.2 | 4403.2 | 54.83 |
| 7/31/11 | 2.25 | 4407.00 | 4407.00 | 59.00 | 4411.2 | 4403.2 | 54.82 |
| 8/1/11 | 2.25 | 4407.00 | 4407.00 | 59.00 | 4411.2 | 4403.2 | 54.81 |
| 8/2/11 | 2.25 | 4407.00 | 4407.00 | 59.00 | 4411.2 | 4403.2 | 54.79 |
| 8/3/11 | 2.26 | 4407.00 | 4407.00 | 59.00 | 4411.2 | 4403.3 | 54.78 |

**Appendix E**
**Table 1 Tailings and Pond Elevations for North and South Cells**

| | Year | North Cell | | | South Cell | | |
|---|---|---|---|---|---|---|---|
| Date | Fraction | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) |
| 8/4/11 | 2.26 | 4407.00 | 4407.00 | 59.00 | 4411.2 | 4403.3 | 54.76 |
| 8/5/11 | 2.26 | 4407.00 | 4407.00 | 59.00 | 4411.3 | 4403.3 | 54.75 |
| 8/6/11 | 2.26 | 4407.00 | 4407.00 | 59.00 | 4411.3 | 4403.3 | 54.73 |
| 8/7/11 | 2.27 | 4407.00 | 4407.00 | 59.00 | 4411.3 | 4403.3 | 54.72 |
| 8/8/11 | 2.27 | 4407.00 | 4407.00 | 59.00 | 4411.3 | 4403.4 | 54.70 |
| 8/9/11 | 2.27 | 4407.00 | 4407.00 | 59.00 | 4411.3 | 4403.4 | 54.69 |
| 8/10/11 | 2.28 | 4407.00 | 4407.00 | 59.00 | 4411.3 | 4403.4 | 54.68 |
| 8/11/11 | 2.28 | 4407.00 | 4407.00 | 59.00 | 4411.3 | 4403.4 | 54.66 |
| 8/12/11 | 2.28 | 4407.00 | 4407.00 | 59.00 | 4411.4 | 4403.4 | 54.65 |
| 8/13/11 | 2.28 | 4407.00 | 4407.00 | 59.00 | 4411.4 | 4403.5 | 54.63 |
| 8/14/11 | 2.29 | 4407.00 | 4407.00 | 59.00 | 4411.4 | 4403.5 | 54.62 |
| 8/15/11 | 2.29 | 4407.00 | 4407.00 | 59.00 | 4411.4 | 4403.5 | 54.60 |
| 8/16/11 | 2.29 | 4407.00 | 4407.00 | 59.00 | 4411.4 | 4403.5 | 54.59 |
| 8/17/11 | 2.29 | 4407.00 | 4407.00 | 59.00 | 4411.4 | 4403.5 | 54.57 |
| 8/18/11 | 2.30 | 4407.00 | 4407.00 | 59.00 | 4411.4 | 4403.6 | 54.56 |
| 8/19/11 | 2.30 | 4407.00 | 4407.00 | 59.00 | 4411.5 | 4403.6 | 54.55 |
| 8/20/11 | 2.30 | 4407.00 | 4407.00 | 59.00 | 4411.5 | 4403.6 | 54.53 |
| 8/21/11 | 2.31 | 4407.00 | 4407.00 | 59.00 | 4411.5 | 4403.6 | 54.52 |
| 8/22/11 | 2.31 | 4407.00 | 4407.00 | 59.00 | 4411.5 | 4403.6 | 54.50 |
| 8/23/11 | 2.31 | 4407.00 | 4407.00 | 59.00 | 4411.5 | 4403.7 | 54.49 |
| 8/24/11 | 2.31 | 4407.00 | 4407.00 | 59.00 | 4411.5 | 4403.7 | 54.47 |
| 8/25/11 | 2.32 | 4407.00 | 4407.00 | 59.00 | 4411.5 | 4403.7 | 54.46 |
| 8/26/11 | 2.32 | 4407.00 | 4407.00 | 59.00 | 4411.6 | 4403.7 | 54.44 |
| 8/27/11 | 2.32 | 4407.00 | 4407.00 | 59.00 | 4411.6 | 4403.7 | 54.43 |
| 8/28/11 | 2.32 | 4407.00 | 4407.00 | 59.00 | 4411.6 | 4403.8 | 54.42 |
| 8/29/11 | 2.33 | 4407.00 | 4407.00 | 59.00 | 4411.6 | 4403.8 | 54.40 |
| 8/30/11 | 2.33 | 4407.00 | 4407.00 | 59.00 | 4411.6 | 4403.8 | 54.39 |
| 8/31/11 | 2.33 | 4407.00 | 4407.00 | 59.00 | 4411.6 | 4403.8 | 54.37 |
| 9/1/11 | 2.34 | 4407.00 | 4407.00 | 59.00 | 4411.6 | 4403.8 | 54.36 |
| 9/2/11 | 2.34 | 4407.00 | 4407.00 | 59.00 | 4411.7 | 4403.9 | 54.34 |
| 9/3/11 | 2.34 | 4407.00 | 4407.00 | 59.00 | 4411.7 | 4403.9 | 54.33 |
| 9/4/11 | 2.34 | 4407.00 | 4407.00 | 59.00 | 4411.7 | 4403.9 | 54.31 |
| 9/5/11 | 2.35 | 4407.00 | 4407.00 | 59.00 | 4411.7 | 4403.9 | 54.30 |
| 9/6/11 | 2.35 | 4407.00 | 4407.00 | 59.00 | 4411.7 | 4403.9 | 54.29 |
| 9/7/11 | 2.35 | 4407.00 | 4407.00 | 59.00 | 4411.7 | 4403.9 | 54.27 |
| 9/8/11 | 2.35 | 4407.00 | 4407.00 | 59.00 | 4411.7 | 4404.0 | 54.26 |
| 9/9/11 | 2.36 | 4407.00 | 4407.00 | 59.00 | 4411.8 | 4404.0 | 54.24 |
| 9/10/11 | 2.36 | 4407.00 | 4407.00 | 59.00 | 4411.8 | 4404.0 | 54.23 |
| 9/11/11 | 2.36 | 4407.00 | 4407.00 | 59.00 | 4411.8 | 4404.0 | 54.21 |
| 9/12/11 | 2.37 | 4407.00 | 4407.00 | 59.00 | 4411.8 | 4404.0 | 54.20 |
| 9/13/11 | 2.37 | 4407.00 | 4407.00 | 59.00 | 4411.8 | 4404.1 | 54.18 |
| 9/14/11 | 2.37 | 4407.00 | 4407.00 | 59.00 | 4411.8 | 4404.1 | 54.17 |
| 9/15/11 | 2.37 | 4407.00 | 4407.00 | 59.00 | 4411.8 | 4404.1 | 54.15 |
| 9/16/11 | 2.38 | 4407.00 | 4407.00 | 59.00 | 4411.9 | 4404.1 | 54.14 |
| 9/17/11 | 2.38 | 4407.00 | 4407.00 | 59.00 | 4411.9 | 4404.1 | 54.12 |
| 9/18/11 | 2.38 | 4407.00 | 4407.00 | 59.00 | 4411.9 | 4404.2 | 54.11 |
| 9/19/11 | 2.38 | 4407.00 | 4407.00 | 59.00 | 4411.9 | 4404.2 | 54.10 |
| 9/20/11 | 2.39 | 4407.00 | 4407.00 | 59.00 | 4411.9 | 4404.2 | 54.08 |
| 9/21/11 | 2.39 | 4407.00 | 4407.00 | 59.00 | 4411.9 | 4404.2 | 54.07 |
| 9/22/11 | 2.39 | 4407.00 | 4407.00 | 59.00 | 4411.9 | 4404.2 | 54.05 |
| 9/23/11 | 2.40 | 4407.00 | 4407.00 | 59.00 | 4412.0 | 4404.3 | 54.04 |
| 9/24/11 | 2.40 | 4407.00 | 4407.00 | 59.00 | 4412.0 | 4404.3 | 54.02 |
| 9/25/11 | 2.40 | 4407.00 | 4407.00 | 59.00 | 4412.0 | 4404.3 | 54.01 |
| 9/26/11 | 2.40 | 4407.00 | 4407.00 | 59.00 | 4412.0 | 4404.3 | 53.99 |
| 9/27/11 | 2.41 | 4407.00 | 4407.00 | 59.00 | 4412.0 | 4404.3 | 53.98 |

## Appendix E
## Table 1  Tailings and Pond Elevations for North and South Cells

| | Year | North Cell | | | South Cell | | |
|---|---|---|---|---|---|---|---|
| Date | Fraction | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) |
| 9/28/11 | 2.41 | 4407.00 | 4407.00 | 59.00 | 4412.0 | 4404.4 | 53.96 |
| 9/29/11 | 2.41 | 4407.00 | 4407.00 | 59.00 | 4412.1 | 4404.4 | 53.95 |
| 9/30/11 | 2.41 | 4407.00 | 4407.00 | 59.00 | 4412.1 | 4404.4 | 53.94 |
| 10/1/11 | 2.42 | 4407.00 | 4407.00 | 59.00 | 4412.1 | 4404.4 | 53.92 |
| 10/2/11 | 2.42 | 4407.00 | 4407.00 | 59.00 | 4412.1 | 4404.4 | 53.90 |
| 10/3/11 | 2.42 | 4407.00 | 4407.00 | 59.00 | 4412.1 | 4404.5 | 53.89 |
| 10/4/11 | 2.43 | 4407.00 | 4407.00 | 59.00 | 4412.1 | 4404.5 | 53.87 |
| 10/5/11 | 2.43 | 4407.00 | 4407.00 | 59.00 | 4412.1 | 4404.5 | 53.85 |
| 10/6/11 | 2.43 | 4407.00 | 4407.00 | 59.00 | 4412.2 | 4404.5 | 53.83 |
| 10/7/11 | 2.43 | 4407.00 | 4407.00 | 59.00 | 4412.2 | 4404.5 | 53.82 |
| 10/8/11 | 2.44 | 4407.00 | 4407.00 | 59.00 | 4412.2 | 4404.6 | 53.80 |
| 10/9/11 | 2.44 | 4407.00 | 4407.00 | 59.00 | 4412.2 | 4404.6 | 53.78 |
| 10/10/11 | 2.44 | 4407.00 | 4407.00 | 59.00 | 4412.2 | 4404.6 | 53.76 |
| 10/11/11 | 2.44 | 4407.00 | 4407.00 | 59.00 | 4412.3 | 4404.6 | 53.75 |
| 10/12/11 | 2.45 | 4407.00 | 4407.00 | 59.00 | 4412.3 | 4404.6 | 53.73 |
| 10/13/11 | 2.45 | 4407.00 | 4407.00 | 59.00 | 4412.3 | 4404.7 | 53.71 |
| 10/14/11 | 2.45 | 4407.00 | 4407.00 | 59.00 | 4412.3 | 4404.7 | 53.69 |
| 10/15/11 | 2.46 | 4407.00 | 4407.00 | 59.00 | 4412.3 | 4404.7 | 53.68 |
| 10/16/11 | 2.46 | 4407.00 | 4407.00 | 59.00 | 4412.3 | 4404.7 | 53.66 |
| 10/17/11 | 2.46 | 4407.00 | 4407.00 | 59.00 | 4412.4 | 4404.7 | 53.64 |
| 10/18/11 | 2.46 | 4407.00 | 4407.00 | 59.00 | 4412.4 | 4404.8 | 53.62 |
| 10/19/11 | 2.47 | 4407.00 | 4407.00 | 59.00 | 4412.4 | 4404.8 | 53.61 |
| 10/20/11 | 2.47 | 4407.00 | 4407.00 | 59.00 | 4412.4 | 4404.8 | 53.59 |
| 10/21/11 | 2.47 | 4407.00 | 4407.00 | 59.00 | 4412.4 | 4404.8 | 53.57 |
| 10/22/11 | 2.48 | 4407.00 | 4407.00 | 59.00 | 4412.4 | 4404.8 | 53.55 |
| 10/23/11 | 2.48 | 4407.00 | 4407.00 | 59.00 | 4412.5 | 4404.8 | 53.54 |
| 10/24/11 | 2.48 | 4407.00 | 4407.00 | 59.00 | 4412.5 | 4404.9 | 53.52 |
| 10/25/11 | 2.48 | 4407.00 | 4407.00 | 59.00 | 4412.5 | 4404.9 | 53.50 |
| 10/26/11 | 2.49 | 4407.00 | 4407.00 | 59.00 | 4412.5 | 4404.9 | 53.48 |
| 10/27/11 | 2.49 | 4407.00 | 4407.00 | 59.00 | 4412.5 | 4404.9 | 53.47 |
| 10/28/11 | 2.49 | 4407.00 | 4407.00 | 59.00 | 4412.6 | 4404.9 | 53.45 |
| 10/29/11 | 2.49 | 4407.00 | 4407.00 | 59.00 | 4412.6 | 4405.0 | 53.43 |
| 10/30/11 | 2.50 | 4407.00 | 4407.00 | 59.00 | 4412.6 | 4405.0 | 53.42 |
| 10/31/11 | 2.50 | 4407.00 | 4407.00 | 59.00 | 4412.6 | 4405.0 | 53.40 |
| 11/1/11 | 2.50 | 4407.00 | 4407.00 | 59.00 | 4412.6 | 4405.0 | 53.38 |
| 11/2/11 | 2.51 | 4407.00 | 4407.00 | 59.00 | 4412.6 | 4405.0 | 53.36 |
| 11/3/11 | 2.51 | 4407.00 | 4407.00 | 59.00 | 4412.7 | 4405.1 | 53.34 |
| 11/4/11 | 2.51 | 4407.00 | 4407.00 | 59.00 | 4412.7 | 4405.1 | 53.32 |
| 11/5/11 | 2.51 | 4407.00 | 4407.00 | 59.00 | 4412.7 | 4405.1 | 53.30 |
| 11/6/11 | 2.52 | 4407.00 | 4407.00 | 59.00 | 4412.7 | 4405.1 | 53.27 |
| 11/7/11 | 2.52 | 4407.00 | 4407.00 | 59.00 | 4412.7 | 4405.1 | 53.25 |
| 11/8/11 | 2.52 | 4407.00 | 4407.00 | 59.00 | 4412.8 | 4405.2 | 53.23 |
| 11/9/11 | 2.52 | 4407.00 | 4407.00 | 59.00 | 4412.8 | 4405.2 | 53.21 |
| 11/10/11 | 2.53 | 4407.00 | 4407.00 | 59.00 | 4412.8 | 4405.2 | 53.19 |
| 11/11/11 | 2.53 | 4407.00 | 4407.00 | 59.00 | 4412.8 | 4405.2 | 53.17 |
| 11/12/11 | 2.53 | 4407.00 | 4407.00 | 59.00 | 4412.9 | 4405.2 | 53.15 |
| 11/13/11 | 2.54 | 4407.00 | 4407.00 | 59.00 | 4412.9 | 4405.3 | 53.13 |
| 11/14/11 | 2.54 | 4407.00 | 4407.00 | 59.00 | 4412.9 | 4405.3 | 53.11 |
| 11/15/11 | 2.54 | 4407.00 | 4407.00 | 59.00 | 4412.9 | 4405.3 | 53.08 |
| 11/16/11 | 2.54 | 4407.00 | 4407.00 | 59.00 | 4412.9 | 4405.3 | 53.06 |
| 11/17/11 | 2.55 | 4407.00 | 4407.00 | 59.00 | 4413.0 | 4405.3 | 53.04 |
| 11/18/11 | 2.55 | 4407.00 | 4407.00 | 59.00 | 4413.0 | 4405.4 | 53.02 |
| 11/19/11 | 2.55 | 4407.00 | 4407.00 | 59.00 | 4413.0 | 4405.4 | 53.00 |
| 11/20/11 | 2.55 | 4407.00 | 4407.00 | 59.00 | 4413.0 | 4405.4 | 52.98 |
| 11/21/11 | 2.56 | 4407.00 | 4407.00 | 59.00 | 4413.0 | 4405.4 | 52.96 |

**Appendix E**

**Table 1  Tailings and Pond Elevations for North and South Cells**

| Date | Year Fraction | North Cell | | | South Cell | | |
|---|---|---|---|---|---|---|---|
| | | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) |
| 11/22/11 | 2.56 | 4407.00 | 4407.00 | 59.00 | 4413.1 | 4405.4 | 52.94 |
| 11/23/11 | 2.56 | 4407.00 | 4407.00 | 59.00 | 4413.1 | 4405.5 | 52.92 |
| 11/24/11 | 2.57 | 4407.00 | 4407.00 | 59.00 | 4413.1 | 4405.5 | 52.89 |
| 11/25/11 | 2.57 | 4407.00 | 4407.00 | 59.00 | 4413.1 | 4405.5 | 52.87 |
| 11/26/11 | 2.57 | 4407.00 | 4407.00 | 59.00 | 4413.1 | 4405.5 | 52.85 |
| 11/27/11 | 2.57 | 4407.00 | 4407.00 | 59.00 | 4413.2 | 4405.5 | 52.83 |
| 11/28/11 | 2.58 | 4407.00 | 4407.00 | 59.00 | 4413.2 | 4405.6 | 52.81 |
| 11/29/11 | 2.58 | 4407.00 | 4407.00 | 59.00 | 4413.2 | 4405.6 | 52.79 |
| 11/30/11 | 2.58 | 4407.00 | 4407.00 | 59.00 | 4413.2 | 4405.6 | 52.77 |
| 12/1/11 | 2.58 | 4407.00 | 4407.00 | 59.00 | 4413.3 | 4405.6 | 52.75 |
| 12/2/11 | 2.59 | 4407.00 | 4407.00 | 59.00 | 4413.3 | 4405.6 | 52.72 |
| 12/3/11 | 2.59 | 4407.00 | 4407.00 | 59.00 | 4413.3 | 4405.6 | 52.70 |
| 12/4/11 | 2.59 | 4407.00 | 4407.00 | 59.00 | 4413.3 | 4405.7 | 52.67 |
| 12/5/11 | 2.60 | 4407.00 | 4407.00 | 59.00 | 4413.4 | 4405.7 | 52.65 |
| 12/6/11 | 2.60 | 4407.00 | 4407.00 | 59.00 | 4413.4 | 4405.7 | 52.62 |
| 12/7/11 | 2.60 | 4407.00 | 4407.00 | 59.00 | 4413.4 | 4405.7 | 52.60 |
| 12/8/11 | 2.60 | 4407.00 | 4407.00 | 59.00 | 4413.4 | 4405.7 | 52.57 |
| 12/9/11 | 2.61 | 4407.00 | 4407.00 | 59.00 | 4413.5 | 4405.8 | 52.55 |
| 12/10/11 | 2.61 | 4407.00 | 4407.00 | 59.00 | 4413.5 | 4405.8 | 52.52 |
| 12/11/11 | 2.61 | 4407.00 | 4407.00 | 59.00 | 4413.5 | 4405.8 | 52.50 |
| 12/12/11 | 2.61 | 4407.00 | 4407.00 | 59.00 | 4413.5 | 4405.8 | 52.47 |
| 12/13/11 | 2.62 | 4407.00 | 4407.00 | 59.00 | 4413.6 | 4405.8 | 52.45 |
| 12/14/11 | 2.62 | 4407.00 | 4407.00 | 59.00 | 4413.6 | 4405.9 | 52.42 |
| 12/15/11 | 2.62 | 4407.00 | 4407.00 | 59.00 | 4413.6 | 4405.9 | 52.40 |
| 12/16/11 | 2.63 | 4407.00 | 4407.00 | 59.00 | 4413.6 | 4405.9 | 52.37 |
| 12/17/11 | 2.63 | 4407.00 | 4407.00 | 59.00 | 4413.7 | 4405.9 | 52.35 |
| 12/18/11 | 2.63 | 4407.00 | 4407.00 | 59.00 | 4413.7 | 4405.9 | 52.32 |
| 12/19/11 | 2.63 | 4407.00 | 4407.00 | 59.00 | 4413.7 | 4406.0 | 52.30 |
| 12/20/11 | 2.64 | 4407.00 | 4407.00 | 59.00 | 4413.7 | 4406.0 | 52.27 |
| 12/21/11 | 2.64 | 4407.00 | 4407.00 | 59.00 | 4413.8 | 4406.0 | 52.25 |
| 12/22/11 | 2.64 | 4407.00 | 4407.00 | 59.00 | 4413.8 | 4406.0 | 52.22 |
| 12/23/11 | 2.64 | 4407.00 | 4407.00 | 59.00 | 4413.8 | 4406.0 | 52.20 |
| 12/24/11 | 2.65 | 4407.00 | 4407.00 | 59.00 | 4413.8 | 4406.1 | 52.17 |
| 12/25/11 | 2.65 | 4407.00 | 4407.00 | 59.00 | 4413.9 | 4406.1 | 52.15 |
| 12/26/11 | 2.65 | 4407.00 | 4407.00 | 59.00 | 4413.9 | 4406.1 | 52.12 |
| 12/27/11 | 2.66 | 4407.00 | 4407.00 | 59.00 | 4413.9 | 4406.1 | 52.10 |
| 12/28/11 | 2.66 | 4407.00 | 4407.00 | 59.00 | 4413.9 | 4406.1 | 52.07 |
| 12/29/11 | 2.66 | 4407.00 | 4407.00 | 59.00 | 4414.0 | 4406.2 | 52.05 |
| 12/30/11 | 2.66 | 4407.00 | 4407.00 | 59.00 | 4414.0 | 4406.2 | 52.02 |
| 12/31/11 | 2.67 | 4407.00 | 4407.00 | 59.00 | 4414.0 | 4406.2 | 52.00 |
| 1/1/12 | 2.67 | 4407.00 | 4407.00 | 59.00 | 4414.0 | 4406.2 | 51.97 |
| 1/2/12 | 2.67 | 4407.00 | 4407.00 | 59.00 | 4414.1 | 4406.2 | 51.95 |
| 1/3/12 | 2.67 | 4407.00 | 4407.00 | 59.00 | 4414.1 | 4406.3 | 51.92 |
| 1/4/12 | 2.68 | 4407.00 | 4407.00 | 59.00 | 4414.1 | 4406.3 | 51.89 |
| 1/5/12 | 2.68 | 4407.00 | 4407.00 | 59.00 | 4414.1 | 4406.3 | 51.86 |
| 1/6/12 | 2.68 | 4407.00 | 4407.00 | 59.00 | 4414.2 | 4406.3 | 51.84 |
| 1/7/12 | 2.69 | 4407.00 | 4407.00 | 59.00 | 4414.2 | 4406.3 | 51.81 |
| 1/8/12 | 2.69 | 4407.00 | 4407.00 | 59.00 | 4414.2 | 4406.4 | 51.78 |
| 1/9/12 | 2.69 | 4407.00 | 4407.00 | 59.00 | 4414.2 | 4406.4 | 51.76 |
| 1/10/12 | 2.69 | 4407.00 | 4407.00 | 59.00 | 4414.3 | 4406.4 | 51.73 |
| 1/11/12 | 2.70 | 4407.00 | 4407.00 | 59.00 | 4414.3 | 4406.4 | 51.70 |
| 1/12/12 | 2.70 | 4407.00 | 4407.00 | 59.00 | 4414.3 | 4406.4 | 51.68 |
| 1/13/12 | 2.70 | 4407.00 | 4407.00 | 59.00 | 4414.4 | 4406.4 | 51.65 |
| 1/14/12 | 2.71 | 4407.00 | 4407.00 | 59.00 | 4414.4 | 4406.5 | 51.62 |
| 1/15/12 | 2.71 | 4407.00 | 4407.00 | 59.00 | 4414.4 | 4406.5 | 51.59 |

**Appendix E**
**Table 1  Tailings and Pond Elevations for North and South Cells**

| | Year | North Cell | | | South Cell | | |
|---|---|---|---|---|---|---|---|
| Date | Fraction | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) |
| 1/16/12 | 2.71 | 4407.00 | 4407.00 | 59.00 | 4414.4 | 4406.5 | 51.57 |
| 1/17/12 | 2.71 | 4407.00 | 4407.00 | 59.00 | 4414.5 | 4406.5 | 51.54 |
| 1/18/12 | 2.72 | 4407.00 | 4407.00 | 59.00 | 4414.5 | 4406.5 | 51.51 |
| 1/19/12 | 2.72 | 4407.00 | 4407.00 | 59.00 | 4414.5 | 4406.6 | 51.49 |
| 1/20/12 | 2.72 | 4407.00 | 4407.00 | 59.00 | 4414.5 | 4406.6 | 51.46 |
| 1/21/12 | 2.72 | 4407.00 | 4407.00 | 59.00 | 4414.6 | 4406.6 | 51.43 |
| 1/22/12 | 2.73 | 4407.00 | 4407.00 | 59.00 | 4414.6 | 4406.6 | 51.41 |
| 1/23/12 | 2.73 | 4407.00 | 4407.00 | 59.00 | 4414.6 | 4406.6 | 51.38 |
| 1/24/12 | 2.73 | 4407.00 | 4407.00 | 59.00 | 4414.6 | 4406.7 | 51.35 |
| 1/25/12 | 2.74 | 4407.00 | 4407.00 | 59.00 | 4414.7 | 4406.7 | 51.32 |
| 1/26/12 | 2.74 | 4407.00 | 4407.00 | 59.00 | 4414.7 | 4406.7 | 51.30 |
| 1/27/12 | 2.74 | 4407.00 | 4407.00 | 59.00 | 4414.7 | 4406.7 | 51.27 |
| 1/28/12 | 2.74 | 4407.00 | 4407.00 | 59.00 | 4414.8 | 4406.7 | 51.24 |
| 1/29/12 | 2.75 | 4407.00 | 4407.00 | 59.00 | 4414.8 | 4406.8 | 51.22 |
| 1/30/12 | 2.75 | 4407.00 | 4407.00 | 59.00 | 4414.8 | 4406.8 | 51.19 |
| 1/31/12 | 2.75 | 4407.00 | 4407.00 | 59.00 | 4414.8 | 4406.8 | 51.16 |
| 2/1/12 | 2.75 | 4407.00 | 4407.00 | 59.00 | 4414.9 | 4406.8 | 51.14 |
| 2/2/12 | 2.76 | 4407.00 | 4407.00 | 59.00 | 4414.9 | 4406.8 | 51.11 |
| 2/3/12 | 2.76 | 4407.00 | 4407.00 | 59.00 | 4414.9 | 4406.9 | 51.08 |
| 2/4/12 | 2.76 | 4407.00 | 4407.00 | 59.00 | 4414.9 | 4406.9 | 51.05 |
| 2/5/12 | 2.77 | 4407.00 | 4407.00 | 59.00 | 4415.0 | 4406.9 | 51.03 |
| 2/6/12 | 2.77 | 4407.00 | 4407.00 | 59.00 | 4415.0 | 4406.9 | 51.00 |
| 2/7/12 | 2.77 | 4407.00 | 4407.00 | 59.00 | 4415.0 | 4406.9 | 50.97 |
| 2/8/12 | 2.77 | 4407.00 | 4407.00 | 59.00 | 4415.1 | 4407.0 | 50.94 |
| 2/9/12 | 2.78 | 4407.00 | 4407.00 | 59.00 | 4415.1 | 4407.0 | 50.92 |
| 2/10/12 | 2.78 | 4407.00 | 4407.00 | 59.00 | 4415.1 | 4407.0 | 50.89 |
| 2/11/12 | 2.78 | 4407.00 | 4407.00 | 59.00 | 4415.1 | 4407.0 | 50.86 |
| 2/12/12 | 2.78 | 4407.00 | 4407.00 | 59.00 | 4415.2 | 4407.0 | 50.83 |
| 2/13/12 | 2.79 | 4407.00 | 4407.00 | 59.00 | 4415.2 | 4407.1 | 50.81 |
| 2/14/12 | 2.79 | 4407.00 | 4407.00 | 59.00 | 4415.2 | 4407.1 | 50.78 |
| 2/15/12 | 2.79 | 4407.00 | 4407.00 | 59.00 | 4415.2 | 4407.1 | 50.75 |
| 2/16/12 | 2.80 | 4407.00 | 4407.00 | 59.00 | 4415.3 | 4407.1 | 50.73 |
| 2/17/12 | 2.80 | 4407.00 | 4407.00 | 59.00 | 4415.3 | 4407.1 | 50.70 |
| 2/18/12 | 2.80 | 4407.00 | 4407.00 | 59.00 | 4415.3 | 4407.2 | 50.67 |
| 2/19/12 | 2.80 | 4407.00 | 4407.00 | 59.00 | 4415.4 | 4407.2 | 50.64 |
| 2/20/12 | 2.81 | 4407.00 | 4407.00 | 59.00 | 4415.4 | 4407.2 | 50.62 |
| 2/21/12 | 2.81 | 4407.00 | 4407.00 | 59.00 | 4415.4 | 4407.2 | 50.59 |
| 2/22/12 | 2.81 | 4407.00 | 4407.00 | 59.00 | 4415.4 | 4407.2 | 50.56 |
| 2/23/12 | 2.81 | 4407.00 | 4407.00 | 59.00 | 4415.5 | 4407.2 | 50.54 |
| 2/24/12 | 2.82 | 4407.00 | 4407.00 | 59.00 | 4415.5 | 4407.3 | 50.51 |
| 2/25/12 | 2.82 | 4407.00 | 4407.00 | 59.00 | 4415.5 | 4407.3 | 50.48 |
| 2/26/12 | 2.82 | 4407.00 | 4407.00 | 59.00 | 4415.5 | 4407.3 | 50.45 |
| 2/27/12 | 2.83 | 4407.00 | 4407.00 | 59.00 | 4415.6 | 4407.3 | 50.43 |
| 2/28/12 | 2.83 | 4407.00 | 4407.00 | 59.00 | 4415.6 | 4407.3 | 50.40 |
| 2/29/12 | 2.83 | 4407.00 | 4407.00 | 59.00 | 4415.6 | 4407.4 | 50.37 |
| 3/1/12 | 2.83 | 4407.00 | 4407.00 | 59.00 | 4415.7 | 4407.4 | 50.34 |
| 3/2/12 | 2.84 | 4407.00 | 4407.00 | 59.00 | 4415.7 | 4407.4 | 50.32 |
| 3/3/12 | 2.84 | 4407.00 | 4407.00 | 59.00 | 4415.7 | 4407.4 | 50.29 |
| 3/4/12 | 2.84 | 4407.00 | 4407.00 | 59.00 | 4415.7 | 4407.4 | 50.26 |
| 3/5/12 | 2.84 | 4407.00 | 4407.00 | 59.00 | 4415.8 | 4407.5 | 50.23 |
| 3/6/12 | 2.85 | 4407.00 | 4407.00 | 59.00 | 4415.8 | 4407.5 | 50.20 |
| 3/7/12 | 2.85 | 4407.00 | 4407.00 | 59.00 | 4415.8 | 4407.5 | 50.17 |
| 3/8/12 | 2.85 | 4407.00 | 4407.00 | 59.00 | 4415.9 | 4407.5 | 50.15 |
| 3/9/12 | 2.86 | 4407.00 | 4407.00 | 59.00 | 4415.9 | 4407.5 | 50.12 |
| 3/10/12 | 2.86 | 4407.00 | 4407.00 | 59.00 | 4415.9 | 4407.6 | 50.09 |

**Appendix E**
**Table 1  Tailings and Pond Elevations for North and South Cells**

| Date | Year Fraction | North Cell | | | South Cell | | |
|---|---|---|---|---|---|---|---|
| | | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) |
| 3/11/12 | 2.86 | 4407.00 | 4407.00 | 59.00 | 4415.9 | 4407.6 | 50.06 |
| 3/12/12 | 2.86 | 4407.00 | 4407.00 | 59.00 | 4416.0 | 4407.6 | 50.03 |
| 3/13/12 | 2.87 | 4407.00 | 4407.00 | 59.00 | 4416.0 | 4407.6 | 50.00 |
| 3/14/12 | 2.87 | 4407.00 | 4407.00 | 59.00 | 4416.0 | 4407.6 | 49.98 |
| 3/15/12 | 2.87 | 4407.00 | 4407.00 | 59.00 | 4416.1 | 4407.7 | 49.95 |
| 3/16/12 | 2.87 | 4407.00 | 4407.00 | 59.00 | 4416.1 | 4407.7 | 49.92 |
| 3/17/12 | 2.88 | 4407.00 | 4407.00 | 59.00 | 4416.1 | 4407.7 | 49.89 |
| 3/18/12 | 2.88 | 4407.00 | 4407.00 | 59.00 | 4416.1 | 4407.7 | 49.86 |
| 3/19/12 | 2.88 | 4407.00 | 4407.00 | 59.00 | 4416.2 | 4407.7 | 49.83 |
| 3/20/12 | 2.89 | 4407.00 | 4407.00 | 59.00 | 4416.2 | 4407.8 | 49.81 |
| 3/21/12 | 2.89 | 4407.00 | 4407.00 | 59.00 | 4416.2 | 4407.8 | 49.78 |
| 3/22/12 | 2.89 | 4407.00 | 4407.00 | 59.00 | 4416.3 | 4407.8 | 49.75 |
| 3/23/12 | 2.89 | 4407.00 | 4407.00 | 59.00 | 4416.3 | 4407.8 | 49.72 |
| 3/24/12 | 2.90 | 4407.00 | 4407.00 | 59.00 | 4416.3 | 4407.8 | 49.69 |
| 3/25/12 | 2.90 | 4407.00 | 4407.00 | 59.00 | 4416.3 | 4407.9 | 49.67 |
| 3/26/12 | 2.90 | 4407.00 | 4407.00 | 59.00 | 4416.4 | 4407.9 | 49.64 |
| 3/27/12 | 2.90 | 4407.00 | 4407.00 | 59.00 | 4416.4 | 4407.9 | 49.61 |
| 3/28/12 | 2.91 | 4407.00 | 4407.00 | 59.00 | 4416.4 | 4407.9 | 49.58 |
| 3/29/12 | 2.91 | 4407.00 | 4407.00 | 59.00 | 4416.4 | 4407.9 | 49.55 |
| 3/30/12 | 2.91 | 4407.00 | 4407.00 | 59.00 | 4416.5 | 4408.0 | 49.52 |
| 3/31/12 | 2.92 | 4407.00 | 4407.00 | 59.00 | 4416.5 | 4408.0 | 49.50 |
| 4/1/12 | 2.92 | 4407.00 | 4407.00 | 59.00 | 4416.5 | 4408.0 | 49.47 |
| 4/2/12 | 2.92 | 4407.00 | 4407.00 | 59.00 | 4416.6 | 4408.0 | 49.44 |
| 4/3/12 | 2.92 | 4407.00 | 4407.00 | 59.00 | 4416.6 | 4408.0 | 49.42 |
| 4/4/12 | 2.93 | 4407.00 | 4407.00 | 59.00 | 4416.6 | 4408.0 | 49.39 |
| 4/5/12 | 2.93 | 4407.00 | 4407.00 | 59.00 | 4416.6 | 4408.1 | 49.37 |
| 4/6/12 | 2.93 | 4407.00 | 4407.00 | 59.00 | 4416.7 | 4408.1 | 49.34 |
| 4/7/12 | 2.94 | 4407.00 | 4407.00 | 59.00 | 4416.7 | 4408.1 | 49.32 |
| 4/8/12 | 2.94 | 4407.00 | 4407.00 | 59.00 | 4416.7 | 4408.1 | 49.29 |
| 4/9/12 | 2.94 | 4407.00 | 4407.00 | 59.00 | 4416.7 | 4408.1 | 49.27 |
| 4/10/12 | 2.94 | 4407.00 | 4407.00 | 59.00 | 4416.8 | 4408.2 | 49.24 |
| 4/11/12 | 2.95 | 4407.00 | 4407.00 | 59.00 | 4416.8 | 4408.2 | 49.22 |
| 4/12/12 | 2.95 | 4407.00 | 4407.00 | 59.00 | 4416.8 | 4408.2 | 49.19 |
| 4/13/12 | 2.95 | 4407.00 | 4407.00 | 59.00 | 4416.8 | 4408.2 | 49.17 |
| 4/14/12 | 2.95 | 4407.00 | 4407.00 | 59.00 | 4416.9 | 4408.2 | 49.14 |
| 4/15/12 | 2.96 | 4407.00 | 4407.00 | 59.00 | 4416.9 | 4408.3 | 49.12 |
| 4/16/12 | 2.96 | 4407.00 | 4407.00 | 59.00 | 4416.9 | 4408.3 | 49.09 |
| 4/17/12 | 2.96 | 4407.00 | 4407.00 | 59.00 | 4416.9 | 4408.3 | 49.07 |
| 4/18/12 | 2.97 | 4407.00 | 4407.00 | 59.00 | 4417.0 | 4408.3 | 49.04 |
| 4/19/12 | 2.97 | 4407.00 | 4407.00 | 59.00 | 4417.0 | 4408.3 | 49.02 |
| 4/20/12 | 2.97 | 4407.00 | 4407.00 | 59.00 | 4417.0 | 4408.4 | 48.99 |
| 4/21/12 | 2.97 | 4407.00 | 4407.00 | 59.00 | 4417.0 | 4408.4 | 48.97 |
| 4/22/12 | 2.98 | 4407.00 | 4407.00 | 59.00 | 4417.1 | 4408.4 | 48.94 |
| 4/23/12 | 2.98 | 4407.00 | 4407.00 | 59.00 | 4417.1 | 4408.4 | 48.92 |
| 4/24/12 | 2.98 | 4407.00 | 4407.00 | 59.00 | 4417.1 | 4408.4 | 48.89 |
| 4/25/12 | 2.98 | 4407.00 | 4407.00 | 59.00 | 4417.1 | 4408.5 | 48.87 |
| 4/26/12 | 2.99 | 4407.00 | 4407.00 | 59.00 | 4417.2 | 4408.5 | 48.85 |
| 4/27/12 | 2.99 | 4407.00 | 4407.00 | 59.00 | 4417.2 | 4408.5 | 48.82 |
| 4/28/12 | 2.99 | 4407.00 | 4407.00 | 59.00 | 4417.2 | 4408.5 | 48.80 |
| 4/29/12 | 3.00 | 4407.00 | 4407.00 | 59.00 | 4417.2 | 4408.5 | 48.77 |
| 4/30/12 | 3.00 | 4407.00 | 4407.00 | 59.00 | 4417.3 | 4408.6 | 48.75 |
| 5/1/12 | 3.00 | 4407.00 | 4407.00 | 59.00 | 4417.3 | 4408.6 | 48.72 |
| 5/2/12 | 3.00 | 4407.00 | 4407.00 | 59.00 | 4417.3 | 4408.6 | 48.70 |
| 5/3/12 | 3.01 | 4407.00 | 4407.00 | 59.00 | 4417.3 | 4408.6 | 48.67 |
| 5/4/12 | 3.01 | 4407.00 | 4407.00 | 59.00 | 4417.4 | 4408.6 | 48.65 |

**Appendix E**
**Table 1  Tailings and Pond Elevations for North and South Cells**

| Date | Year Fraction | North Cell | | | South Cell | | |
|---|---|---|---|---|---|---|---|
| | | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) |
| 5/5/12 | 3.01 | 4407.00 | 4407.00 | 59.00 | 4417.4 | 4408.7 | 48.63 |
| 5/6/12 | 3.01 | 4407.00 | 4407.00 | 59.00 | 4417.4 | 4408.7 | 48.60 |
| 5/7/12 | 3.02 | 4407.00 | 4407.00 | 59.00 | 4417.4 | 4408.7 | 48.58 |
| 5/8/12 | 3.02 | 4407.00 | 4407.00 | 59.00 | 4417.4 | 4408.7 | 48.55 |
| 5/9/12 | 3.02 | 4407.00 | 4407.00 | 59.00 | 4417.5 | 4408.7 | 48.53 |
| 5/10/12 | 3.03 | 4407.00 | 4407.00 | 59.00 | 4417.5 | 4408.8 | 48.51 |
| 5/11/12 | 3.03 | 4407.00 | 4407.00 | 59.00 | 4417.5 | 4408.8 | 48.48 |
| 5/12/12 | 3.03 | 4407.00 | 4407.00 | 59.00 | 4417.5 | 4408.8 | 48.46 |
| 5/13/12 | 3.03 | 4407.00 | 4407.00 | 59.00 | 4417.6 | 4408.8 | 48.44 |
| 5/14/12 | 3.04 | 4407.00 | 4407.00 | 59.00 | 4417.6 | 4408.8 | 48.41 |
| 5/15/12 | 3.04 | 4407.00 | 4407.00 | 59.00 | 4417.6 | 4408.9 | 48.39 |
| 5/16/12 | 3.04 | 4407.00 | 4407.00 | 59.00 | 4417.6 | 4408.9 | 48.36 |
| 5/17/12 | 3.04 | 4407.00 | 4407.00 | 59.00 | 4417.7 | 4408.9 | 48.34 |
| 5/18/12 | 3.05 | 4407.00 | 4407.00 | 59.00 | 4417.7 | 4408.9 | 48.32 |
| 5/19/12 | 3.05 | 4407.00 | 4407.00 | 59.00 | 4417.7 | 4408.9 | 48.29 |
| 5/20/12 | 3.05 | 4407.00 | 4407.00 | 59.00 | 4417.7 | 4408.9 | 48.27 |
| 5/21/12 | 3.06 | 4407.00 | 4407.00 | 59.00 | 4417.8 | 4409.0 | 48.25 |
| 5/22/12 | 3.06 | 4407.00 | 4407.00 | 59.00 | 4417.8 | 4409.0 | 48.22 |
| 5/23/12 | 3.06 | 4407.00 | 4407.00 | 59.00 | 4417.8 | 4409.0 | 48.20 |
| 5/24/12 | 3.06 | 4407.00 | 4407.00 | 59.00 | 4417.8 | 4409.0 | 48.17 |
| 5/25/12 | 3.07 | 4407.00 | 4407.00 | 59.00 | 4417.9 | 4409.0 | 48.15 |
| 5/26/12 | 3.07 | 4407.00 | 4407.00 | 59.00 | 4417.9 | 4409.1 | 48.13 |
| 5/27/12 | 3.07 | 4407.00 | 4407.00 | 59.00 | 4417.9 | 4409.1 | 48.10 |
| 5/28/12 | 3.07 | 4407.00 | 4407.00 | 59.00 | 4417.9 | 4409.1 | 48.08 |
| 5/29/12 | 3.08 | 4407.00 | 4407.00 | 59.00 | 4417.9 | 4409.1 | 48.06 |
| 5/30/12 | 3.08 | 4407.00 | 4407.00 | 59.00 | 4418.0 | 4409.1 | 48.03 |
| 5/31/12 | 3.08 | 4407.00 | 4407.00 | 59.00 | 4418.0 | 4409.2 | 48.01 |
| 6/1/12 | 3.09 | 4407.00 | 4407.00 | 59.00 | 4418.0 | 4409.2 | 47.98 |
| 6/2/12 | 3.09 | 4407.00 | 4407.00 | 59.00 | 4418.0 | 4409.2 | 47.96 |
| 6/3/12 | 3.09 | 4407.00 | 4407.00 | 59.00 | 4418.1 | 4409.2 | 47.94 |
| 6/4/12 | 3.09 | 4407.00 | 4407.00 | 59.00 | 4418.1 | 4409.2 | 47.92 |
| 6/5/12 | 3.10 | 4407.00 | 4407.00 | 59.00 | 4418.1 | 4409.3 | 47.90 |
| 6/6/12 | 3.10 | 4407.00 | 4407.00 | 59.00 | 4418.1 | 4409.3 | 47.88 |
| 6/7/12 | 3.10 | 4407.00 | 4407.00 | 59.00 | 4418.1 | 4409.3 | 47.86 |
| 6/8/12 | 3.10 | 4407.00 | 4407.00 | 59.00 | 4418.2 | 4409.3 | 47.84 |
| 6/9/12 | 3.11 | 4407.00 | 4407.00 | 59.00 | 4418.2 | 4409.3 | 47.82 |
| 6/10/12 | 3.11 | 4407.00 | 4407.00 | 59.00 | 4418.2 | 4409.4 | 47.80 |
| 6/11/12 | 3.11 | 4407.00 | 4407.00 | 59.00 | 4418.2 | 4409.4 | 47.78 |
| 6/12/12 | 3.12 | 4407.00 | 4407.00 | 59.00 | 4418.2 | 4409.4 | 47.76 |
| 6/13/12 | 3.12 | 4407.00 | 4407.00 | 59.00 | 4418.3 | 4409.4 | 47.74 |
| 6/14/12 | 3.12 | 4407.00 | 4407.00 | 59.00 | 4418.3 | 4409.4 | 47.72 |
| 6/15/12 | 3.12 | 4407.00 | 4407.00 | 59.00 | 4418.3 | 4409.5 | 47.70 |
| 6/16/12 | 3.13 | 4407.00 | 4407.00 | 59.00 | 4418.3 | 4409.5 | 47.68 |
| 6/17/12 | 3.13 | 4407.00 | 4407.00 | 59.00 | 4418.3 | 4409.5 | 47.66 |
| 6/18/12 | 3.13 | 4407.00 | 4407.00 | 59.00 | 4418.4 | 4409.5 | 47.64 |
| 6/19/12 | 3.13 | 4407.00 | 4407.00 | 59.00 | 4418.4 | 4409.5 | 47.62 |
| 6/20/12 | 3.14 | 4407.00 | 4407.00 | 59.00 | 4418.4 | 4409.6 | 47.60 |
| 6/21/12 | 3.14 | 4407.00 | 4407.00 | 59.00 | 4418.4 | 4409.6 | 47.58 |
| 6/22/12 | 3.14 | 4407.00 | 4407.00 | 59.00 | 4418.4 | 4409.6 | 47.56 |
| 6/23/12 | 3.15 | 4407.00 | 4407.00 | 59.00 | 4418.5 | 4409.6 | 47.54 |
| 6/24/12 | 3.15 | 4407.00 | 4407.00 | 59.00 | 4418.5 | 4409.6 | 47.52 |
| 6/25/12 | 3.15 | 4407.00 | 4407.00 | 59.00 | 4418.5 | 4409.7 | 47.50 |
| 6/26/12 | 3.15 | 4407.00 | 4407.00 | 59.00 | 4418.5 | 4409.7 | 47.48 |
| 6/27/12 | 3.16 | 4407.00 | 4407.00 | 59.00 | 4418.5 | 4409.7 | 47.46 |
| 6/28/12 | 3.16 | 4407.00 | 4407.00 | 59.00 | 4418.6 | 4409.7 | 47.44 |

**Appendix E**
**Table 1 Tailings and Pond Elevations for North and South Cells**

| | Year | North Cell | | | South Cell | | |
|---|---|---|---|---|---|---|---|
| Date | Fraction | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) |
| 6/29/12 | 3.16 | 4407.00 | 4407.00 | 59.00 | 4418.6 | 4409.7 | 47.42 |
| 6/30/12 | 3.17 | 4407.00 | 4407.00 | 59.00 | 4418.6 | 4409.7 | 47.40 |
| 7/1/12 | 3.17 | 4407.00 | 4407.00 | 59.00 | 4418.6 | 4409.8 | 47.38 |
| 7/2/12 | 3.17 | 4407.00 | 4407.00 | 59.00 | 4418.6 | 4409.8 | 47.37 |
| 7/3/12 | 3.17 | 4407.00 | 4407.00 | 59.00 | 4418.6 | 4409.8 | 47.36 |
| 7/4/12 | 3.18 | 4407.00 | 4407.00 | 59.00 | 4418.7 | 4409.8 | 47.34 |
| 7/5/12 | 3.18 | 4407.00 | 4407.00 | 59.00 | 4418.7 | 4409.8 | 47.33 |
| 7/6/12 | 3.18 | 4407.00 | 4407.00 | 59.00 | 4418.7 | 4409.9 | 47.32 |
| 7/7/12 | 3.18 | 4407.00 | 4407.00 | 59.00 | 4418.7 | 4409.9 | 47.31 |
| 7/8/12 | 3.19 | 4407.00 | 4407.00 | 59.00 | 4418.7 | 4409.9 | 47.29 |
| 7/9/12 | 3.19 | 4407.00 | 4407.00 | 59.00 | 4418.7 | 4409.9 | 47.28 |
| 7/10/12 | 3.19 | 4407.00 | 4407.00 | 59.00 | 4418.7 | 4409.9 | 47.27 |
| 7/11/12 | 3.20 | 4407.00 | 4407.00 | 59.00 | 4418.7 | 4410.0 | 47.26 |
| 7/12/12 | 3.20 | 4407.00 | 4407.00 | 59.00 | 4418.8 | 4410.0 | 47.24 |
| 7/13/12 | 3.20 | 4407.00 | 4407.00 | 59.00 | 4418.8 | 4410.0 | 47.23 |
| 7/14/12 | 3.20 | 4407.00 | 4407.00 | 59.00 | 4418.8 | 4410.0 | 47.22 |
| 7/15/12 | 3.21 | 4407.00 | 4407.00 | 59.00 | 4418.8 | 4410.0 | 47.20 |
| 7/16/12 | 3.21 | 4407.00 | 4407.00 | 59.00 | 4418.8 | 4410.1 | 47.19 |
| 7/17/12 | 3.21 | 4407.00 | 4407.00 | 59.00 | 4418.8 | 4410.1 | 47.18 |
| 7/18/12 | 3.21 | 4407.00 | 4407.00 | 59.00 | 4418.8 | 4410.1 | 47.17 |
| 7/19/12 | 3.22 | 4407.00 | 4407.00 | 59.00 | 4418.8 | 4410.1 | 47.15 |
| 7/20/12 | 3.22 | 4407.00 | 4407.00 | 59.00 | 4418.9 | 4410.1 | 47.14 |
| 7/21/12 | 3.22 | 4407.00 | 4407.00 | 59.00 | 4418.9 | 4410.1 | 47.13 |
| 7/22/12 | 3.23 | 4407.00 | 4407.00 | 59.00 | 4418.9 | 4410.2 | 47.12 |
| 7/23/12 | 3.23 | 4407.00 | 4407.00 | 59.00 | 4418.9 | 4410.2 | 47.10 |
| 7/24/12 | 3.23 | 4407.00 | 4407.00 | 59.00 | 4418.9 | 4410.2 | 47.09 |
| 7/25/12 | 3.23 | 4407.00 | 4407.00 | 59.00 | 4418.9 | 4410.2 | 47.08 |
| 7/26/12 | 3.24 | 4407.00 | 4407.00 | 59.00 | 4418.9 | 4410.2 | 47.06 |
| 7/27/12 | 3.24 | 4407.00 | 4407.00 | 59.00 | 4418.9 | 4410.2 | 47.05 |
| 7/28/12 | 3.24 | 4407.00 | 4407.00 | 59.00 | 4419.0 | 4410.3 | 47.04 |
| 7/29/12 | 3.24 | 4407.00 | 4407.00 | 59.00 | 4419.0 | 4410.3 | 47.03 |
| 7/30/12 | 3.25 | 4407.00 | 4407.00 | 59.00 | 4419.0 | 4410.3 | 47.01 |
| 7/31/12 | 3.25 | 4407.00 | 4407.00 | 59.00 | 4419.0 | 4410.3 | 47.00 |
| 8/1/12 | 3.25 | 4407.00 | 4407.00 | 59.00 | 4419.0 | 4410.3 | 46.99 |
| 8/2/12 | 3.26 | 4407.00 | 4407.00 | 59.00 | 4419.0 | 4410.3 | 46.98 |
| 8/3/12 | 3.26 | 4407.00 | 4407.00 | 59.00 | 4419.0 | 4410.4 | 46.96 |
| 8/4/12 | 3.26 | 4407.00 | 4407.00 | 59.00 | 4419.0 | 4410.4 | 46.95 |
| 8/5/12 | 3.26 | 4407.00 | 4407.00 | 59.00 | 4419.1 | 4410.4 | 46.94 |
| 8/6/12 | 3.27 | 4407.00 | 4407.00 | 59.00 | 4419.1 | 4410.4 | 46.93 |
| 8/7/12 | 3.27 | 4407.00 | 4407.00 | 59.00 | 4419.1 | 4410.4 | 46.91 |
| 8/8/12 | 3.27 | 4407.00 | 4407.00 | 59.00 | 4419.1 | 4410.4 | 46.90 |
| 8/9/12 | 3.27 | 4407.00 | 4407.00 | 59.00 | 4419.1 | 4410.5 | 46.89 |
| 8/10/12 | 3.28 | 4407.00 | 4407.00 | 59.00 | 4419.1 | 4410.5 | 46.87 |
| 8/11/12 | 3.28 | 4407.00 | 4407.00 | 59.00 | 4419.1 | 4410.5 | 46.86 |
| 8/12/12 | 3.28 | 4407.00 | 4407.00 | 59.00 | 4419.2 | 4410.5 | 46.85 |
| 8/13/12 | 3.29 | 4407.00 | 4407.00 | 59.00 | 4419.2 | 4410.5 | 46.84 |
| 8/14/12 | 3.29 | 4407.00 | 4407.00 | 59.00 | 4419.2 | 4410.5 | 46.82 |
| 8/15/12 | 3.29 | 4407.00 | 4407.00 | 59.00 | 4419.2 | 4410.6 | 46.81 |
| 8/16/12 | 3.29 | 4407.00 | 4407.00 | 59.00 | 4419.2 | 4410.6 | 46.80 |
| 8/17/12 | 3.30 | 4407.00 | 4407.00 | 59.00 | 4419.2 | 4410.6 | 46.79 |
| 8/18/12 | 3.30 | 4407.00 | 4407.00 | 59.00 | 4419.2 | 4410.6 | 46.77 |
| 8/19/12 | 3.30 | 4407.00 | 4407.00 | 59.00 | 4419.2 | 4410.6 | 46.76 |
| 8/20/12 | 3.30 | 4407.00 | 4407.00 | 59.00 | 4419.3 | 4410.6 | 46.75 |
| 8/21/12 | 3.31 | 4407.00 | 4407.00 | 59.00 | 4419.3 | 4410.7 | 46.74 |
| 8/22/12 | 3.31 | 4407.00 | 4407.00 | 59.00 | 4419.3 | 4410.7 | 46.72 |

**Appendix E**
**Table 1  Tailings and Pond Elevations for North and South Cells**

| | Year | North Cell | | | South Cell | | |
|---|---|---|---|---|---|---|---|
| Date | Fraction | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) |
| 8/23/12 | 3.31 | 4407.00 | 4407.00 | 59.00 | 4419.3 | 4410.7 | 46.71 |
| 8/24/12 | 3.32 | 4407.00 | 4407.00 | 59.00 | 4419.3 | 4410.7 | 46.70 |
| 8/25/12 | 3.32 | 4407.00 | 4407.00 | 59.00 | 4419.3 | 4410.7 | 46.68 |
| 8/26/12 | 3.32 | 4407.00 | 4407.00 | 59.00 | 4419.3 | 4410.7 | 46.67 |
| 8/27/12 | 3.32 | 4407.00 | 4407.00 | 59.00 | 4419.3 | 4410.8 | 46.66 |
| 8/28/12 | 3.33 | 4407.00 | 4407.00 | 59.00 | 4419.4 | 4410.8 | 46.65 |
| 8/29/12 | 3.33 | 4407.00 | 4407.00 | 59.00 | 4419.4 | 4410.8 | 46.63 |
| 8/30/12 | 3.33 | 4407.00 | 4407.00 | 59.00 | 4419.4 | 4410.8 | 46.62 |
| 8/31/12 | 3.33 | 4407.00 | 4407.00 | 59.00 | 4419.4 | 4410.8 | 46.61 |
| 9/1/12 | 3.34 | 4407.00 | 4407.00 | 59.00 | 4419.4 | 4410.8 | 46.60 |
| 9/2/12 | 3.34 | 4407.00 | 4407.00 | 59.00 | 4419.4 | 4410.9 | 46.58 |
| 9/3/12 | 3.34 | 4407.00 | 4407.00 | 59.00 | 4419.4 | 4410.9 | 46.57 |
| 9/4/12 | 3.35 | 4407.00 | 4407.00 | 59.00 | 4419.4 | 4410.9 | 46.56 |
| 9/5/12 | 3.35 | 4407.00 | 4407.00 | 59.00 | 4419.5 | 4410.9 | 46.55 |
| 9/6/12 | 3.35 | 4407.00 | 4407.00 | 59.00 | 4419.5 | 4410.9 | 46.53 |
| 9/7/12 | 3.35 | 4407.00 | 4407.00 | 59.00 | 4419.5 | 4410.9 | 46.52 |
| 9/8/12 | 3.36 | 4407.00 | 4407.00 | 59.00 | 4419.5 | 4411.0 | 46.51 |
| 9/9/12 | 3.36 | 4407.00 | 4407.00 | 59.00 | 4419.5 | 4411.0 | 46.49 |
| 9/10/12 | 3.36 | 4407.00 | 4407.00 | 59.00 | 4419.5 | 4411.0 | 46.48 |
| 9/11/12 | 3.36 | 4407.00 | 4407.00 | 59.00 | 4419.5 | 4411.0 | 46.47 |
| 9/12/12 | 3.37 | 4407.00 | 4407.00 | 59.00 | 4419.5 | 4411.0 | 46.46 |
| 9/13/12 | 3.37 | 4407.00 | 4407.00 | 59.00 | 4419.6 | 4411.1 | 46.44 |
| 9/14/12 | 3.37 | 4407.00 | 4407.00 | 59.00 | 4419.6 | 4411.1 | 46.43 |
| 9/15/12 | 3.38 | 4407.00 | 4407.00 | 59.00 | 4419.6 | 4411.1 | 46.42 |
| 9/16/12 | 3.38 | 4407.00 | 4407.00 | 59.00 | 4419.6 | 4411.1 | 46.40 |
| 9/17/12 | 3.38 | 4407.00 | 4407.00 | 59.00 | 4419.6 | 4411.1 | 46.39 |
| 9/18/12 | 3.38 | 4407.00 | 4407.00 | 59.00 | 4419.6 | 4411.1 | 46.38 |
| 9/19/12 | 3.39 | 4407.00 | 4407.00 | 59.00 | 4419.6 | 4411.2 | 46.37 |
| 9/20/12 | 3.39 | 4407.00 | 4407.00 | 59.00 | 4419.6 | 4411.2 | 46.35 |
| 9/21/12 | 3.39 | 4407.00 | 4407.00 | 59.00 | 4419.7 | 4411.2 | 46.34 |
| 9/22/12 | 3.39 | 4407.00 | 4407.00 | 59.00 | 4419.7 | 4411.2 | 46.33 |
| 9/23/12 | 3.40 | 4407.00 | 4407.00 | 59.00 | 4419.7 | 4411.2 | 46.31 |
| 9/24/12 | 3.40 | 4407.00 | 4407.00 | 59.00 | 4419.7 | 4411.2 | 46.30 |
| 9/25/12 | 3.40 | 4407.00 | 4407.00 | 59.00 | 4419.7 | 4411.3 | 46.29 |
| 9/26/12 | 3.41 | 4407.00 | 4407.00 | 59.00 | 4419.7 | 4411.3 | 46.28 |
| 9/27/12 | 3.41 | 4407.00 | 4407.00 | 59.00 | 4419.7 | 4411.3 | 46.26 |
| 9/28/12 | 3.41 | 4407.00 | 4407.00 | 59.00 | 4419.7 | 4411.3 | 46.25 |
| 9/29/12 | 3.41 | 4407.00 | 4407.00 | 59.00 | 4419.8 | 4411.3 | 46.24 |
| 9/30/12 | 3.42 | 4407.00 | 4407.00 | 59.00 | 4419.8 | 4411.3 | 46.23 |
| 10/1/12 | 3.42 | 4407.00 | 4407.00 | 59.00 | 4419.8 | 4411.4 | 46.21 |
| 10/2/12 | 3.42 | 4407.00 | 4407.00 | 59.00 | 4419.8 | 4411.4 | 46.20 |
| 10/3/12 | 3.43 | 4407.00 | 4407.00 | 59.00 | 4419.8 | 4411.4 | 46.18 |
| 10/4/12 | 3.43 | 4407.00 | 4407.00 | 59.00 | 4419.8 | 4411.4 | 46.16 |
| 10/5/12 | 3.43 | 4407.00 | 4407.00 | 59.00 | 4419.9 | 4411.4 | 46.15 |
| 10/6/12 | 3.43 | 4407.00 | 4407.00 | 59.00 | 4419.9 | 4411.4 | 46.13 |
| 10/7/12 | 3.44 | 4407.00 | 4407.00 | 59.00 | 4419.9 | 4411.5 | 46.12 |
| 10/8/12 | 3.44 | 4407.00 | 4407.00 | 59.00 | 4419.9 | 4411.5 | 46.10 |
| 10/9/12 | 3.44 | 4407.00 | 4407.00 | 59.00 | 4419.9 | 4411.5 | 46.08 |
| 10/10/12 | 3.44 | 4407.00 | 4407.00 | 59.00 | 4419.9 | 4411.5 | 46.07 |
| 10/11/12 | 3.45 | 4407.00 | 4407.00 | 59.00 | 4419.9 | 4411.5 | 46.05 |
| 10/12/12 | 3.45 | 4407.00 | 4407.00 | 59.00 | 4420.0 | 4411.5 | 46.04 |
| 10/13/12 | 3.45 | 4407.00 | 4407.00 | 59.00 | 4420.0 | 4411.6 | 46.02 |
| 10/14/12 | 3.46 | 4407.00 | 4407.00 | 59.00 | 4420.0 | 4411.6 | 46.01 |
| 10/15/12 | 3.46 | 4407.00 | 4407.00 | 59.00 | 4420.0 | 4411.6 | 45.99 |
| 10/16/12 | 3.46 | 4407.00 | 4407.00 | 59.00 | 4420.0 | 4411.6 | 45.98 |

**Appendix E**
**Table 1  Tailings and Pond Elevations for North and South Cells**

| Date | Year Fraction | North Cell | | | South Cell | | |
|---|---|---|---|---|---|---|---|
| | | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) |
| 10/17/12 | 3.46 | 4407.00 | 4407.00 | 59.00 | 4420.0 | 4411.6 | 45.96 |
| 10/18/12 | 3.47 | 4407.00 | 4407.00 | 59.00 | 4420.1 | 4411.6 | 45.95 |
| 10/19/12 | 3.47 | 4407.00 | 4407.00 | 59.00 | 4420.1 | 4411.7 | 45.93 |
| 10/20/12 | 3.47 | 4407.00 | 4407.00 | 59.00 | 4420.1 | 4411.7 | 45.92 |
| 10/21/12 | 3.47 | 4407.00 | 4407.00 | 59.00 | 4420.1 | 4411.7 | 45.90 |
| 10/22/12 | 3.48 | 4407.00 | 4407.00 | 59.00 | 4420.1 | 4411.7 | 45.89 |
| 10/23/12 | 3.48 | 4407.00 | 4407.00 | 59.00 | 4420.1 | 4411.7 | 45.87 |
| 10/24/12 | 3.48 | 4407.00 | 4407.00 | 59.00 | 4420.1 | 4411.7 | 45.86 |
| 10/25/12 | 3.49 | 4407.00 | 4407.00 | 59.00 | 4420.2 | 4411.8 | 45.84 |
| 10/26/12 | 3.49 | 4407.00 | 4407.00 | 59.00 | 4420.2 | 4411.8 | 45.83 |
| 10/27/12 | 3.49 | 4407.00 | 4407.00 | 59.00 | 4420.2 | 4411.8 | 45.81 |
| 10/28/12 | 3.49 | 4407.00 | 4407.00 | 59.00 | 4420.2 | 4411.8 | 45.80 |
| 10/29/12 | 3.50 | 4407.00 | 4407.00 | 59.00 | 4420.2 | 4411.8 | 45.79 |
| 10/30/12 | 3.50 | 4407.00 | 4407.00 | 59.00 | 4420.2 | 4411.8 | 45.77 |
| 10/31/12 | 3.50 | 4407.00 | 4407.00 | 59.00 | 4420.2 | 4411.9 | 45.76 |
| 11/1/12 | 3.50 | 4407.00 | 4407.00 | 59.00 | 4420.3 | 4411.9 | 45.74 |
| 11/2/12 | 3.51 | 4407.00 | 4407.00 | 59.00 | 4420.3 | 4411.9 | 45.72 |
| 11/3/12 | 3.51 | 4407.00 | 4407.00 | 59.00 | 4420.3 | 4411.9 | 45.70 |
| 11/4/12 | 3.51 | 4407.00 | 4407.00 | 59.00 | 4420.3 | 4411.9 | 45.69 |
| 11/5/12 | 3.52 | 4407.00 | 4407.00 | 59.00 | 4420.3 | 4411.9 | 45.67 |
| 11/6/12 | 3.52 | 4407.00 | 4407.00 | 59.00 | 4420.4 | 4412.0 | 45.65 |
| 11/7/12 | 3.52 | 4407.00 | 4407.00 | 59.00 | 4420.4 | 4412.0 | 45.63 |
| 11/8/12 | 3.52 | 4407.00 | 4407.00 | 59.00 | 4420.4 | 4412.0 | 45.61 |
| 11/9/12 | 3.53 | 4407.00 | 4407.00 | 59.00 | 4420.4 | 4412.0 | 45.59 |
| 11/10/12 | 3.53 | 4407.00 | 4407.00 | 59.00 | 4420.4 | 4412.0 | 45.58 |
| 11/11/12 | 3.53 | 4407.00 | 4407.00 | 59.00 | 4420.4 | 4412.0 | 45.56 |
| 11/12/12 | 3.53 | 4407.00 | 4407.00 | 59.00 | 4420.5 | 4412.1 | 45.54 |
| 11/13/12 | 3.54 | 4407.00 | 4407.00 | 59.00 | 4420.5 | 4412.1 | 45.52 |
| 11/14/12 | 3.54 | 4407.00 | 4407.00 | 59.00 | 4420.5 | 4412.1 | 45.50 |
| 11/15/12 | 3.54 | 4407.00 | 4407.00 | 59.00 | 4420.5 | 4412.1 | 45.48 |
| 11/16/12 | 3.55 | 4407.00 | 4407.00 | 59.00 | 4420.5 | 4412.1 | 45.46 |
| 11/17/12 | 3.55 | 4407.00 | 4407.00 | 59.00 | 4420.6 | 4412.2 | 45.45 |
| 11/18/12 | 3.55 | 4407.00 | 4407.00 | 59.00 | 4420.6 | 4412.2 | 45.43 |
| 11/19/12 | 3.55 | 4407.00 | 4407.00 | 59.00 | 4420.6 | 4412.2 | 45.41 |
| 11/20/12 | 3.56 | 4407.00 | 4407.00 | 59.00 | 4420.6 | 4412.2 | 45.39 |
| 11/21/12 | 3.56 | 4407.00 | 4407.00 | 59.00 | 4420.6 | 4412.2 | 45.37 |
| 11/22/12 | 3.56 | 4407.00 | 4407.00 | 59.00 | 4420.6 | 4412.2 | 45.35 |
| 11/23/12 | 3.56 | 4407.00 | 4407.00 | 59.00 | 4420.7 | 4412.3 | 45.34 |
| 11/24/12 | 3.57 | 4407.00 | 4407.00 | 59.00 | 4420.7 | 4412.3 | 45.32 |
| 11/25/12 | 3.57 | 4407.00 | 4407.00 | 59.00 | 4420.7 | 4412.3 | 45.30 |
| 11/26/12 | 3.57 | 4407.00 | 4407.00 | 59.00 | 4420.7 | 4412.3 | 45.28 |
| 11/27/12 | 3.58 | 4407.00 | 4407.00 | 59.00 | 4420.7 | 4412.3 | 45.26 |
| 11/28/12 | 3.58 | 4407.00 | 4407.00 | 59.00 | 4420.8 | 4412.3 | 45.24 |
| 11/29/12 | 3.58 | 4407.00 | 4407.00 | 59.00 | 4420.8 | 4412.4 | 45.22 |
| 11/30/12 | 3.58 | 4407.00 | 4407.00 | 59.00 | 4420.8 | 4412.4 | 45.21 |
| 12/1/12 | 3.59 | 4407.00 | 4407.00 | 59.00 | 4420.8 | 4412.4 | 45.19 |
| 12/2/12 | 3.59 | 4407.00 | 4407.00 | 59.00 | 4420.8 | 4412.4 | 45.17 |
| 12/3/12 | 3.59 | 4407.00 | 4407.00 | 59.00 | 4420.9 | 4412.4 | 45.14 |
| 12/4/12 | 3.59 | 4407.00 | 4407.00 | 59.00 | 4420.9 | 4412.4 | 45.12 |
| 12/5/12 | 3.60 | 4407.00 | 4407.00 | 59.00 | 4420.9 | 4412.5 | 45.10 |
| 12/6/12 | 3.60 | 4407.00 | 4407.00 | 59.00 | 4420.9 | 4412.5 | 45.08 |
| 12/7/12 | 3.60 | 4407.00 | 4407.00 | 59.00 | 4420.9 | 4412.5 | 45.05 |
| 12/8/12 | 3.61 | 4407.00 | 4407.00 | 59.00 | 4421.0 | 4412.5 | 45.03 |
| 12/9/12 | 3.61 | 4407.00 | 4407.00 | 59.00 | 4421.0 | 4412.5 | 45.01 |
| 12/10/12 | 3.61 | 4407.00 | 4407.00 | 59.00 | 4421.0 | 4412.5 | 44.99 |

## Appendix E
## Table 1  Tailings and Pond Elevations for North and South Cells

| Date | Year Fraction | North Cell | | | South Cell | | |
|---|---|---|---|---|---|---|---|
| | | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) |
| 12/11/12 | 3.61 | 4407.00 | 4407.00 | 59.00 | 4421.0 | 4412.6 | 44.96 |
| 12/12/12 | 3.62 | 4407.00 | 4407.00 | 59.00 | 4421.1 | 4412.6 | 44.94 |
| 12/13/12 | 3.62 | 4407.00 | 4407.00 | 59.00 | 4421.1 | 4412.6 | 44.92 |
| 12/14/12 | 3.62 | 4407.00 | 4407.00 | 59.00 | 4421.1 | 4412.6 | 44.90 |
| 12/15/12 | 3.62 | 4407.00 | 4407.00 | 59.00 | 4421.1 | 4412.6 | 44.88 |
| 12/16/12 | 3.63 | 4407.00 | 4407.00 | 59.00 | 4421.1 | 4412.6 | 44.85 |
| 12/17/12 | 3.63 | 4407.00 | 4407.00 | 59.00 | 4421.2 | 4412.7 | 44.83 |
| 12/18/12 | 3.63 | 4407.00 | 4407.00 | 59.00 | 4421.2 | 4412.7 | 44.81 |
| 12/19/12 | 3.64 | 4407.00 | 4407.00 | 59.00 | 4421.2 | 4412.7 | 44.79 |
| 12/20/12 | 3.64 | 4407.00 | 4407.00 | 59.00 | 4421.2 | 4412.7 | 44.76 |
| 12/21/12 | 3.64 | 4407.00 | 4407.00 | 59.00 | 4421.3 | 4412.7 | 44.74 |
| 12/22/12 | 3.64 | 4407.00 | 4407.00 | 59.00 | 4421.3 | 4412.7 | 44.72 |
| 12/23/12 | 3.65 | 4407.00 | 4407.00 | 59.00 | 4421.3 | 4412.8 | 44.70 |
| 12/24/12 | 3.65 | 4407.00 | 4407.00 | 59.00 | 4421.3 | 4412.8 | 44.67 |
| 12/25/12 | 3.65 | 4407.00 | 4407.00 | 59.00 | 4421.3 | 4412.8 | 44.65 |
| 12/26/12 | 3.66 | 4407.00 | 4407.00 | 59.00 | 4421.4 | 4412.8 | 44.63 |
| 12/27/12 | 3.66 | 4407.00 | 4407.00 | 59.00 | 4421.4 | 4412.8 | 44.61 |
| 12/28/12 | 3.66 | 4407.00 | 4407.00 | 59.00 | 4421.4 | 4412.8 | 44.59 |
| 12/29/12 | 3.66 | 4407.00 | 4407.00 | 59.00 | 4421.4 | 4412.9 | 44.56 |
| 12/30/12 | 3.67 | 4407.00 | 4407.00 | 59.00 | 4421.5 | 4412.9 | 44.54 |
| 12/31/12 | 3.67 | 4407.00 | 4407.00 | 59.00 | 4421.5 | 4412.9 | 44.52 |
| 1/1/13 | 3.67 | 4407.00 | 4407.00 | 59.00 | 4421.5 | 4412.9 | 44.50 |
| 1/2/13 | 3.67 | 4407.00 | 4407.00 | 59.00 | 4421.5 | 4412.9 | 44.47 |
| 1/3/13 | 3.68 | 4407.00 | 4407.00 | 59.00 | 4421.6 | 4412.9 | 44.45 |
| 1/4/13 | 3.68 | 4407.00 | 4407.00 | 59.00 | 4421.6 | 4413.0 | 44.42 |
| 1/5/13 | 3.68 | 4407.00 | 4407.00 | 59.00 | 4421.6 | 4413.0 | 44.40 |
| 1/6/13 | 3.69 | 4407.00 | 4407.00 | 59.00 | 4421.6 | 4413.0 | 44.38 |
| 1/7/13 | 3.69 | 4407.00 | 4407.00 | 59.00 | 4421.6 | 4413.0 | 44.35 |
| 1/8/13 | 3.69 | 4407.00 | 4407.00 | 59.00 | 4421.7 | 4413.0 | 44.33 |
| 1/9/13 | 3.69 | 4407.00 | 4407.00 | 59.00 | 4421.7 | 4413.0 | 44.30 |
| 1/10/13 | 3.70 | 4407.00 | 4407.00 | 59.00 | 4421.7 | 4413.1 | 44.28 |
| 1/11/13 | 3.70 | 4407.00 | 4407.00 | 59.00 | 4421.7 | 4413.1 | 44.25 |
| 1/12/13 | 3.70 | 4407.00 | 4407.00 | 59.00 | 4421.8 | 4413.1 | 44.23 |
| 1/13/13 | 3.70 | 4407.00 | 4407.00 | 59.00 | 4421.8 | 4413.1 | 44.21 |
| 1/14/13 | 3.71 | 4407.00 | 4407.00 | 59.00 | 4421.8 | 4413.1 | 44.18 |
| 1/15/13 | 3.71 | 4407.00 | 4407.00 | 59.00 | 4421.8 | 4413.1 | 44.16 |
| 1/16/13 | 3.71 | 4407.00 | 4407.00 | 59.00 | 4421.9 | 4413.2 | 44.13 |
| 1/17/13 | 3.72 | 4407.00 | 4407.00 | 59.00 | 4421.9 | 4413.2 | 44.11 |
| 1/18/13 | 3.72 | 4407.00 | 4407.00 | 59.00 | 4421.9 | 4413.2 | 44.08 |
| 1/19/13 | 3.72 | 4407.00 | 4407.00 | 59.00 | 4421.9 | 4413.2 | 44.06 |
| 1/20/13 | 3.72 | 4407.00 | 4407.00 | 59.00 | 4422.0 | 4413.2 | 44.04 |
| 1/21/13 | 3.73 | 4407.00 | 4407.00 | 59.00 | 4422.0 | 4413.3 | 44.01 |
| 1/22/13 | 3.73 | 4407.00 | 4407.00 | 59.00 | 4422.0 | 4413.3 | 43.99 |
| 1/23/13 | 3.73 | 4407.00 | 4407.00 | 59.00 | 4422.0 | 4413.3 | 43.96 |
| 1/24/13 | 3.73 | 4407.00 | 4407.00 | 59.00 | 4422.1 | 4413.3 | 43.94 |
| 1/25/13 | 3.74 | 4407.00 | 4407.00 | 59.00 | 4422.1 | 4413.3 | 43.91 |
| 1/26/13 | 3.74 | 4407.00 | 4407.00 | 59.00 | 4422.1 | 4413.3 | 43.89 |
| 1/27/13 | 3.74 | 4407.00 | 4407.00 | 59.00 | 4422.1 | 4413.4 | 43.87 |
| 1/28/13 | 3.75 | 4407.00 | 4407.00 | 59.00 | 4422.2 | 4413.4 | 43.84 |
| 1/29/13 | 3.75 | 4407.00 | 4407.00 | 59.00 | 4422.2 | 4413.4 | 43.82 |
| 1/30/13 | 3.75 | 4407.00 | 4407.00 | 59.00 | 4422.2 | 4413.4 | 43.79 |
| 1/31/13 | 3.75 | 4407.00 | 4407.00 | 59.00 | 4422.2 | 4413.4 | 43.77 |
| 2/1/13 | 3.76 | 4407.00 | 4407.00 | 59.00 | 4422.3 | 4413.4 | 43.74 |
| 2/2/13 | 3.76 | 4407.00 | 4407.00 | 59.00 | 4422.3 | 4413.5 | 43.72 |
| 2/3/13 | 3.76 | 4407.00 | 4407.00 | 59.00 | 4422.3 | 4413.5 | 43.70 |

**Appendix E**
**Table 1  Tailings and Pond Elevations for North and South Cells**

|  | Year | North Cell |  |  | South Cell |  |  |
|---|---|---|---|---|---|---|---|
| Date | Fraction | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) |
| 2/4/13 | 3.76 | 4407.00 | 4407.00 | 59.00 | 4422.3 | 4413.5 | 43.67 |
| 2/5/13 | 3.77 | 4407.00 | 4407.00 | 59.00 | 4422.4 | 4413.5 | 43.65 |
| 2/6/13 | 3.77 | 4407.00 | 4407.00 | 59.00 | 4422.4 | 4413.5 | 43.62 |
| 2/7/13 | 3.77 | 4407.00 | 4407.00 | 59.00 | 4422.4 | 4413.5 | 43.60 |
| 2/8/13 | 3.78 | 4407.00 | 4407.00 | 59.00 | 4422.4 | 4413.6 | 43.57 |
| 2/9/13 | 3.78 | 4407.00 | 4407.00 | 59.00 | 4422.5 | 4413.6 | 43.55 |
| 2/10/13 | 3.78 | 4407.00 | 4407.00 | 59.00 | 4422.5 | 4413.6 | 43.52 |
| 2/11/13 | 3.78 | 4407.00 | 4407.00 | 59.00 | 4422.5 | 4413.6 | 43.50 |
| 2/12/13 | 3.79 | 4407.00 | 4407.00 | 59.00 | 4422.5 | 4413.6 | 43.47 |
| 2/13/13 | 3.79 | 4407.00 | 4407.00 | 59.00 | 4422.6 | 4413.6 | 43.45 |
| 2/14/13 | 3.79 | 4407.00 | 4407.00 | 59.00 | 4422.6 | 4413.7 | 43.42 |
| 2/15/13 | 3.79 | 4407.00 | 4407.00 | 59.00 | 4422.6 | 4413.7 | 43.40 |
| 2/16/13 | 3.80 | 4407.00 | 4407.00 | 59.00 | 4422.6 | 4413.7 | 43.38 |
| 2/17/13 | 3.80 | 4407.00 | 4407.00 | 59.00 | 4422.6 | 4413.7 | 43.35 |
| 2/18/13 | 3.80 | 4407.00 | 4407.00 | 59.00 | 4422.7 | 4413.7 | 43.33 |
| 2/19/13 | 3.81 | 4407.00 | 4407.00 | 59.00 | 4422.7 | 4413.7 | 43.30 |
| 2/20/13 | 3.81 | 4407.00 | 4407.00 | 59.00 | 4422.7 | 4413.8 | 43.28 |
| 2/21/13 | 3.81 | 4407.00 | 4407.00 | 59.00 | 4422.7 | 4413.8 | 43.25 |
| 2/22/13 | 3.81 | 4407.00 | 4407.00 | 59.00 | 4422.8 | 4413.8 | 43.23 |
| 2/23/13 | 3.82 | 4407.00 | 4407.00 | 59.00 | 4422.8 | 4413.8 | 43.20 |
| 2/24/13 | 3.82 | 4407.00 | 4407.00 | 59.00 | 4422.8 | 4413.8 | 43.18 |
| 2/25/13 | 3.82 | 4407.00 | 4407.00 | 59.00 | 4422.8 | 4413.8 | 43.15 |
| 2/26/13 | 3.82 | 4407.00 | 4407.00 | 59.00 | 4422.9 | 4413.9 | 43.13 |
| 2/27/13 | 3.83 | 4407.00 | 4407.00 | 59.00 | 4422.9 | 4413.9 | 43.11 |
| 2/28/13 | 3.83 | 4407.00 | 4407.00 | 59.00 | 4422.9 | 4413.9 | 43.08 |
| 3/1/13 | 3.83 | 4407.00 | 4407.00 | 59.00 | 4422.9 | 4413.9 | 43.06 |
| 3/2/13 | 3.84 | 4407.00 | 4407.00 | 59.00 | 4423.0 | 4413.9 | 43.03 |
| 3/3/13 | 3.84 | 4407.00 | 4407.00 | 59.00 | 4423.0 | 4413.9 | 43.01 |
| 3/4/13 | 3.84 | 4407.00 | 4407.00 | 59.00 | 4423.0 | 4414.0 | 42.98 |
| 3/5/13 | 3.84 | 4407.00 | 4407.00 | 59.00 | 4423.0 | 4414.0 | 42.95 |
| 3/6/13 | 3.85 | 4407.00 | 4407.00 | 59.00 | 4423.1 | 4414.0 | 42.93 |
| 3/7/13 | 3.85 | 4407.00 | 4407.00 | 59.00 | 4423.1 | 4414.0 | 42.90 |
| 3/8/13 | 3.85 | 4407.00 | 4407.00 | 59.00 | 4423.1 | 4414.0 | 42.88 |
| 3/9/13 | 3.85 | 4407.00 | 4407.00 | 59.00 | 4423.1 | 4414.0 | 42.85 |
| 3/10/13 | 3.86 | 4407.00 | 4407.00 | 59.00 | 4423.2 | 4414.1 | 42.83 |
| 3/11/13 | 3.86 | 4407.00 | 4407.00 | 59.00 | 4423.2 | 4414.1 | 42.80 |
| 3/12/13 | 3.86 | 4407.00 | 4407.00 | 59.00 | 4423.2 | 4414.1 | 42.78 |
| 3/13/13 | 3.87 | 4407.00 | 4407.00 | 59.00 | 4423.3 | 4414.1 | 42.75 |
| 3/14/13 | 3.87 | 4407.00 | 4407.00 | 59.00 | 4423.3 | 4414.1 | 42.73 |
| 3/15/13 | 3.87 | 4407.00 | 4407.00 | 59.00 | 4423.3 | 4414.1 | 42.70 |
| 3/16/13 | 3.87 | 4407.00 | 4407.00 | 59.00 | 4423.3 | 4414.2 | 42.67 |
| 3/17/13 | 3.88 | 4407.00 | 4407.00 | 59.00 | 4423.4 | 4414.2 | 42.65 |
| 3/18/13 | 3.88 | 4407.00 | 4407.00 | 59.00 | 4423.4 | 4414.2 | 42.62 |
| 3/19/13 | 3.88 | 4407.00 | 4407.00 | 59.00 | 4423.4 | 4414.2 | 42.60 |
| 3/20/13 | 3.89 | 4407.00 | 4407.00 | 59.00 | 4423.4 | 4414.2 | 42.57 |
| 3/21/13 | 3.89 | 4407.00 | 4407.00 | 59.00 | 4423.5 | 4414.3 | 42.55 |
| 3/22/13 | 3.89 | 4407.00 | 4407.00 | 59.00 | 4423.5 | 4414.3 | 42.52 |
| 3/23/13 | 3.89 | 4407.00 | 4407.00 | 59.00 | 4423.5 | 4414.3 | 42.50 |
| 3/24/13 | 3.90 | 4407.20 | 4407.00 | 58.82 | 4423.5 | 4414.3 | 42.47 |
| 3/25/13 | 3.90 | 4407.40 | 4407.00 | 58.65 | 4423.6 | 4414.3 | 42.44 |
| 3/26/13 | 3.90 | 4407.50 | 4407.00 | 58.48 | 4423.6 | 4414.3 | 42.42 |
| 3/27/13 | 3.90 | 4407.70 | 4407.00 | 58.30 | 4423.6 | 4414.4 | 42.39 |
| 3/28/13 | 3.91 | 4407.90 | 4407.00 | 58.13 | 4423.6 | 4414.4 | 42.37 |
| 3/29/13 | 3.91 | 4408.00 | 4407.00 | 57.96 | 4423.7 | 4414.4 | 42.34 |
| 3/30/13 | 3.91 | 4408.20 | 4407.00 | 57.79 | 4423.7 | 4414.4 | 42.32 |

## Appendix E
## Table 1  Tailings and Pond Elevations for North and South Cells

| Date | Year Fraction | North Cell | | | South Cell | | |
|---|---|---|---|---|---|---|---|
| | | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) |
| 3/31/13 | 3.92 | 4408.40 | 4407.00 | 57.62 | 4423.7 | 4414.4 | 42.29 |
| 4/1/13 | 3.92 | 4408.60 | 4407.00 | 57.45 | 4423.7 | 4414.4 | 42.26 |
| 4/2/13 | 3.92 | 4408.60 | 4407.00 | 57.44 | 4423.8 | 4414.5 | 42.24 |
| 4/3/13 | 3.92 | 4408.60 | 4407.00 | 57.43 | 4423.8 | 4414.5 | 42.22 |
| 4/4/13 | 3.93 | 4408.60 | 4407.00 | 57.42 | 4423.8 | 4414.5 | 42.20 |
| 4/5/13 | 3.93 | 4408.60 | 4407.00 | 57.40 | 4423.8 | 4414.5 | 42.17 |
| 4/6/13 | 3.93 | 4408.60 | 4407.00 | 57.39 | 4423.8 | 4414.5 | 42.15 |
| 4/7/13 | 3.93 | 4408.60 | 4407.00 | 57.38 | 4423.9 | 4414.5 | 42.13 |
| 4/8/13 | 3.94 | 4408.60 | 4407.00 | 57.37 | 4423.9 | 4414.6 | 42.11 |
| 4/9/13 | 3.94 | 4408.60 | 4407.00 | 57.36 | 4423.9 | 4414.6 | 42.09 |
| 4/10/13 | 3.94 | 4408.70 | 4407.00 | 57.35 | 4423.9 | 4414.6 | 42.06 |
| 4/11/13 | 3.95 | 4408.70 | 4407.00 | 57.34 | 4424.0 | 4414.6 | 42.04 |
| 4/12/13 | 3.95 | 4408.70 | 4407.00 | 57.33 | 4424.0 | 4414.6 | 42.02 |
| 4/13/13 | 3.95 | 4408.70 | 4407.00 | 57.32 | 4424.0 | 4414.6 | 42.00 |
| 4/14/13 | 3.95 | 4408.70 | 4407.00 | 57.31 | 4424.0 | 4414.7 | 41.97 |
| 4/15/13 | 3.96 | 4408.70 | 4407.00 | 57.29 | 4424.0 | 4414.7 | 41.95 |
| 4/16/13 | 3.96 | 4408.70 | 4407.00 | 57.28 | 4424.1 | 4414.7 | 41.93 |
| 4/17/13 | 3.96 | 4408.70 | 4407.00 | 57.27 | 4424.1 | 4414.7 | 41.91 |
| 4/18/13 | 3.96 | 4408.70 | 4407.00 | 57.26 | 4424.1 | 4414.7 | 41.88 |
| 4/19/13 | 3.97 | 4408.70 | 4407.00 | 57.25 | 4424.1 | 4414.7 | 41.86 |
| 4/20/13 | 3.97 | 4408.80 | 4407.00 | 57.24 | 4424.2 | 4414.8 | 41.84 |
| 4/21/13 | 3.97 | 4408.80 | 4407.00 | 57.23 | 4424.2 | 4414.8 | 41.82 |
| 4/22/13 | 3.98 | 4408.80 | 4407.00 | 57.22 | 4424.2 | 4414.8 | 41.79 |
| 4/23/13 | 3.98 | 4408.80 | 4407.00 | 57.21 | 4424.2 | 4414.8 | 41.77 |
| 4/24/13 | 3.98 | 4408.80 | 4407.00 | 57.20 | 4424.3 | 4414.8 | 41.75 |
| 4/25/13 | 3.98 | 4408.80 | 4407.00 | 57.19 | 4424.3 | 4414.8 | 41.73 |
| 4/26/13 | 3.99 | 4408.80 | 4407.00 | 57.18 | 4424.3 | 4414.9 | 41.70 |
| 4/27/13 | 3.99 | 4408.80 | 4407.00 | 57.17 | 4424.3 | 4414.9 | 41.68 |
| 4/28/13 | 3.99 | 4408.80 | 4407.00 | 57.16 | 4424.3 | 4414.9 | 41.66 |
| 4/29/13 | 3.99 | 4408.90 | 4407.00 | 57.15 | 4424.4 | 4414.9 | 41.64 |
| 4/30/13 | 4.00 | 4408.90 | 4407.00 | 57.14 | 4424.4 | 4414.9 | 41.62 |
| 5/1/13 | 4.00 | 4408.90 | 4407.00 | 57.13 | 4424.4 | 4414.9 | 41.59 |
| 5/2/13 | 4.00 | 4408.90 | 4407.00 | 57.10 | 4424.4 | 4415.0 | 41.57 |
| 5/3/13 | 4.01 | 4408.90 | 4407.00 | 57.08 | 4424.5 | 4415.0 | 41.55 |
| 5/4/13 | 4.01 | 4408.90 | 4407.00 | 57.05 | 4424.5 | 4415.0 | 41.53 |
| 5/5/13 | 4.01 | 4409.00 | 4407.00 | 57.03 | 4424.5 | 4415.0 | 41.51 |
| 5/6/13 | 4.01 | 4409.00 | 4407.00 | 57.01 | 4424.5 | 4415.0 | 41.49 |
| 5/7/13 | 4.02 | 4409.00 | 4407.00 | 56.98 | 4424.5 | 4415.0 | 41.46 |
| 5/8/13 | 4.02 | 4409.00 | 4407.00 | 56.96 | 4424.6 | 4415.1 | 41.44 |
| 5/9/13 | 4.02 | 4409.10 | 4407.00 | 56.93 | 4424.6 | 4415.1 | 41.42 |
| 5/10/13 | 4.02 | 4409.10 | 4407.00 | 56.91 | 4424.6 | 4415.1 | 41.40 |
| 5/11/13 | 4.03 | 4409.10 | 4407.00 | 56.89 | 4424.6 | 4415.1 | 41.38 |
| 5/12/13 | 4.03 | 4409.10 | 4407.00 | 56.86 | 4424.6 | 4415.1 | 41.36 |
| 5/13/13 | 4.03 | 4409.20 | 4407.00 | 56.84 | 4424.7 | 4415.1 | 41.34 |
| 5/14/13 | 4.04 | 4409.20 | 4407.00 | 56.82 | 4424.7 | 4415.2 | 41.32 |
| 5/15/13 | 4.04 | 4409.20 | 4407.00 | 56.79 | 4424.7 | 4415.2 | 41.29 |
| 5/16/13 | 4.04 | 4409.20 | 4407.00 | 56.77 | 4424.7 | 4415.2 | 41.27 |
| 5/17/13 | 4.04 | 4409.30 | 4407.00 | 56.75 | 4424.7 | 4415.2 | 41.25 |
| 5/18/13 | 4.05 | 4409.30 | 4407.00 | 56.72 | 4424.8 | 4415.2 | 41.23 |
| 5/19/13 | 4.05 | 4409.30 | 4407.00 | 56.70 | 4424.8 | 4415.2 | 41.21 |
| 5/20/13 | 4.05 | 4409.30 | 4407.00 | 56.68 | 4424.8 | 4415.3 | 41.19 |
| 5/21/13 | 4.05 | 4409.30 | 4407.00 | 56.66 | 4424.8 | 4415.3 | 41.17 |
| 5/22/13 | 4.06 | 4409.40 | 4407.00 | 56.63 | 4424.9 | 4415.3 | 41.14 |
| 5/23/13 | 4.06 | 4409.40 | 4407.00 | 56.61 | 4424.9 | 4415.3 | 41.12 |
| 5/24/13 | 4.06 | 4409.40 | 4407.00 | 56.59 | 4424.9 | 4415.3 | 41.10 |

**Appendix E**
**Table 1  Tailings and Pond Elevations for North and South Cells**

| | | North Cell | | | South Cell | | |
|---|---|---|---|---|---|---|---|
| Date | Year Fraction | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) |
| 5/25/13 | 4.07 | 4409.40 | 4407.00 | 56.57 | 4424.9 | 4415.3 | 41.08 |
| 5/26/13 | 4.07 | 4409.50 | 4407.00 | 56.55 | 4424.9 | 4415.4 | 41.06 |
| 5/27/13 | 4.07 | 4409.50 | 4407.00 | 56.53 | 4425.0 | 4415.4 | 41.04 |
| 5/28/13 | 4.07 | 4409.50 | 4407.00 | 56.50 | 4425.0 | 4415.4 | 41.02 |
| 5/29/13 | 4.08 | 4409.50 | 4407.00 | 56.48 | 4425.0 | 4415.4 | 41.00 |
| 5/30/13 | 4.08 | 4409.50 | 4407.00 | 56.46 | 4425.0 | 4415.4 | 40.97 |
| 5/31/13 | 4.08 | 4409.60 | 4407.00 | 56.44 | 4425.0 | 4415.5 | 40.95 |
| 6/1/13 | 4.08 | 4409.60 | 4407.00 | 56.42 | 4425.1 | 4415.5 | 40.93 |
| 6/2/13 | 4.09 | 4409.60 | 4407.00 | 56.39 | 4425.1 | 4415.5 | 40.91 |
| 6/3/13 | 4.09 | 4409.60 | 4407.00 | 56.36 | 4425.1 | 4415.5 | 40.90 |
| 6/4/13 | 4.09 | 4409.70 | 4407.00 | 56.33 | 4425.1 | 4415.5 | 40.88 |
| 6/5/13 | 4.10 | 4409.70 | 4407.00 | 56.30 | 4425.1 | 4415.5 | 40.86 |
| 6/6/13 | 4.10 | 4409.70 | 4407.00 | 56.27 | 4425.2 | 4415.6 | 40.84 |
| 6/7/13 | 4.10 | 4409.80 | 4407.00 | 56.24 | 4425.2 | 4415.6 | 40.83 |
| 6/8/13 | 4.10 | 4409.80 | 4407.00 | 56.22 | 4425.2 | 4415.6 | 40.81 |
| 6/9/13 | 4.11 | 4409.80 | 4407.00 | 56.19 | 4425.2 | 4415.6 | 40.79 |
| 6/10/13 | 4.11 | 4409.80 | 4407.00 | 56.16 | 4425.2 | 4415.6 | 40.77 |
| 6/11/13 | 4.11 | 4409.90 | 4407.00 | 56.13 | 4425.2 | 4415.6 | 40.75 |
| 6/12/13 | 4.12 | 4409.90 | 4407.00 | 56.10 | 4425.3 | 4415.7 | 40.74 |
| 6/13/13 | 4.12 | 4409.90 | 4407.00 | 56.08 | 4425.3 | 4415.7 | 40.72 |
| 6/14/13 | 4.12 | 4410.00 | 4407.00 | 56.05 | 4425.3 | 4415.7 | 40.70 |
| 6/15/13 | 4.12 | 4410.00 | 4407.00 | 56.02 | 4425.3 | 4415.7 | 40.68 |
| 6/16/13 | 4.13 | 4410.00 | 4407.00 | 56.00 | 4425.3 | 4415.7 | 40.67 |
| 6/17/13 | 4.13 | 4410.00 | 4407.00 | 55.99 | 4425.4 | 4415.7 | 40.65 |
| 6/18/13 | 4.13 | 4410.00 | 4407.00 | 55.99 | 4425.4 | 4415.8 | 40.63 |
| 6/19/13 | 4.13 | 4410.00 | 4407.00 | 55.99 | 4425.4 | 4415.8 | 40.61 |
| 6/20/13 | 4.14 | 4410.00 | 4407.00 | 55.98 | 4425.4 | 4415.8 | 40.59 |
| 6/21/13 | 4.14 | 4410.00 | 4407.00 | 55.98 | 4425.4 | 4415.8 | 40.58 |
| 6/22/13 | 4.14 | 4410.00 | 4407.00 | 55.97 | 4425.4 | 4415.8 | 40.56 |
| 6/23/13 | 4.15 | 4410.00 | 4407.00 | 55.97 | 4425.5 | 4415.8 | 40.54 |
| 6/24/13 | 4.15 | 4410.00 | 4407.00 | 55.96 | 4425.5 | 4415.9 | 40.52 |
| 6/25/13 | 4.15 | 4410.00 | 4407.00 | 55.96 | 4425.5 | 4415.9 | 40.51 |
| 6/26/13 | 4.15 | 4410.00 | 4407.00 | 55.95 | 4425.5 | 4415.9 | 40.49 |
| 6/27/13 | 4.16 | 4410.10 | 4407.00 | 55.95 | 4425.5 | 4415.9 | 40.47 |
| 6/28/13 | 4.16 | 4410.10 | 4407.00 | 55.94 | 4425.5 | 4415.9 | 40.45 |
| 6/29/13 | 4.16 | 4410.10 | 4407.00 | 55.94 | 4425.6 | 4415.9 | 40.44 |
| 6/30/13 | 4.16 | 4410.10 | 4407.00 | 55.93 | 4425.6 | 4416.0 | 40.42 |
| 7/1/13 | 4.17 | 4410.10 | 4407.00 | 55.93 | 4425.6 | 4416.0 | 40.40 |
| 7/2/13 | 4.17 | 4410.10 | 4407.00 | 55.92 | 4425.6 | 4416.0 | 40.39 |
| 7/3/13 | 4.17 | 4410.10 | 4407.00 | 55.92 | 4425.6 | 4416.0 | 40.38 |
| 7/4/13 | 4.18 | 4410.10 | 4407.00 | 55.91 | 4425.6 | 4416.0 | 40.37 |
| 7/5/13 | 4.18 | 4410.10 | 4407.00 | 55.91 | 4425.6 | 4416.0 | 40.36 |
| 7/6/13 | 4.18 | 4410.10 | 4407.00 | 55.90 | 4425.7 | 4416.1 | 40.35 |
| 7/7/13 | 4.18 | 4410.10 | 4407.00 | 55.90 | 4425.7 | 4416.1 | 40.34 |
| 7/8/13 | 4.19 | 4410.10 | 4407.00 | 55.89 | 4425.7 | 4416.1 | 40.33 |
| 7/9/13 | 4.19 | 4410.10 | 4407.00 | 55.89 | 4425.7 | 4416.1 | 40.32 |
| 7/10/13 | 4.19 | 4410.10 | 4407.00 | 55.88 | 4425.7 | 4416.1 | 40.30 |
| 7/11/13 | 4.19 | 4410.10 | 4407.00 | 55.88 | 4425.7 | 4416.1 | 40.29 |
| 7/12/13 | 4.20 | 4410.10 | 4407.00 | 55.87 | 4425.7 | 4416.2 | 40.28 |
| 7/13/13 | 4.20 | 4410.10 | 4407.00 | 55.87 | 4425.7 | 4416.2 | 40.27 |
| 7/14/13 | 4.20 | 4410.10 | 4407.00 | 55.86 | 4425.7 | 4416.2 | 40.26 |
| 7/15/13 | 4.21 | 4410.10 | 4407.00 | 55.86 | 4425.7 | 4416.2 | 40.25 |
| 7/16/13 | 4.21 | 4410.10 | 4407.00 | 55.85 | 4425.8 | 4416.2 | 40.24 |
| 7/17/13 | 4.21 | 4410.20 | 4407.00 | 55.85 | 4425.8 | 4416.2 | 40.23 |
| 7/18/13 | 4.21 | 4410.20 | 4407.00 | 55.84 | 4425.8 | 4416.3 | 40.22 |

**Appendix E**
**Table 1  Tailings and Pond Elevations for North and South Cells**

| Date | Year Fraction | North Cell | | | South Cell | | |
|---|---|---|---|---|---|---|---|
| | | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) |
| 7/19/13 | 4.22 | 4410.20 | 4407.00 | 55.84 | 4425.8 | 4416.3 | 40.21 |
| 7/20/13 | 4.22 | 4410.20 | 4407.00 | 55.83 | 4425.8 | 4416.3 | 40.20 |
| 7/21/13 | 4.22 | 4410.20 | 4407.00 | 55.83 | 4425.8 | 4416.3 | 40.19 |
| 7/22/13 | 4.22 | 4410.20 | 4407.00 | 55.82 | 4425.8 | 4416.3 | 40.18 |
| 7/23/13 | 4.23 | 4410.20 | 4407.00 | 55.82 | 4425.8 | 4416.3 | 40.17 |
| 7/24/13 | 4.23 | 4410.20 | 4407.00 | 55.81 | 4425.8 | 4416.4 | 40.16 |
| 7/25/13 | 4.23 | 4410.20 | 4407.00 | 55.81 | 4425.9 | 4416.4 | 40.15 |
| 7/26/13 | 4.24 | 4410.20 | 4407.00 | 55.80 | 4425.9 | 4416.4 | 40.13 |
| 7/27/13 | 4.24 | 4410.20 | 4407.00 | 55.80 | 4425.9 | 4416.4 | 40.12 |
| 7/28/13 | 4.24 | 4410.20 | 4407.00 | 55.79 | 4425.9 | 4416.4 | 40.11 |
| 7/29/13 | 4.24 | 4410.20 | 4407.00 | 55.79 | 4425.9 | 4416.4 | 40.10 |
| 7/30/13 | 4.25 | 4410.20 | 4407.00 | 55.78 | 4425.9 | 4416.5 | 40.09 |
| 7/31/13 | 4.25 | 4410.20 | 4407.00 | 55.78 | 4425.9 | 4416.5 | 40.08 |
| 8/1/13 | 4.25 | 4410.20 | 4407.00 | 55.77 | 4425.9 | 4416.5 | 40.07 |
| 8/2/13 | 4.25 | 4410.30 | 4407.00 | 55.72 | 4425.9 | 4416.5 | 40.06 |
| 8/3/13 | 4.26 | 4410.30 | 4407.00 | 55.66 | 4425.9 | 4416.5 | 40.05 |
| 8/4/13 | 4.26 | 4410.40 | 4407.00 | 55.61 | 4426.0 | 4416.6 | 40.04 |
| 8/5/13 | 4.26 | 4410.40 | 4407.00 | 55.55 | 4426.0 | 4416.6 | 40.03 |
| 8/6/13 | 4.27 | 4410.50 | 4407.00 | 55.50 | 4426.0 | 4416.6 | 40.02 |
| 8/7/13 | 4.27 | 4410.60 | 4407.00 | 55.44 | 4426.0 | 4416.6 | 40.01 |
| 8/8/13 | 4.27 | 4410.60 | 4407.00 | 55.39 | 4426.0 | 4416.6 | 40.00 |
| 8/9/13 | 4.27 | 4410.70 | 4407.00 | 55.34 | 4426.0 | 4416.6 | 39.99 |
| 8/10/13 | 4.28 | 4410.70 | 4407.00 | 55.28 | 4426.0 | 4416.7 | 39.98 |
| 8/11/13 | 4.28 | 4410.80 | 4407.00 | 55.23 | 4426.0 | 4416.7 | 39.97 |
| 8/12/13 | 4.28 | 4410.80 | 4407.00 | 55.17 | 4426.0 | 4416.7 | 39.96 |
| 8/13/13 | 4.28 | 4410.90 | 4407.00 | 55.12 | 4426.1 | 4416.7 | 39.95 |
| 8/14/13 | 4.29 | 4410.90 | 4407.00 | 55.07 | 4426.1 | 4416.7 | 39.94 |
| 8/15/13 | 4.29 | 4411.00 | 4407.00 | 55.02 | 4426.1 | 4416.7 | 39.93 |
| 8/16/13 | 4.29 | 4411.00 | 4407.00 | 54.96 | 4426.1 | 4416.8 | 39.92 |
| 8/17/13 | 4.30 | 4411.10 | 4407.00 | 54.91 | 4426.1 | 4416.8 | 39.91 |
| 8/18/13 | 4.30 | 4411.10 | 4407.00 | 54.86 | 4426.1 | 4416.8 | 39.89 |
| 8/19/13 | 4.30 | 4411.20 | 4407.00 | 54.81 | 4426.1 | 4416.8 | 39.88 |
| 8/20/13 | 4.30 | 4411.20 | 4407.00 | 54.75 | 4426.1 | 4416.8 | 39.87 |
| 8/21/13 | 4.31 | 4411.30 | 4407.00 | 54.70 | 4426.1 | 4416.8 | 39.86 |
| 8/22/13 | 4.31 | 4411.40 | 4407.00 | 54.65 | 4426.1 | 4416.9 | 39.85 |
| 8/23/13 | 4.31 | 4411.40 | 4407.00 | 54.60 | 4426.2 | 4416.9 | 39.84 |
| 8/24/13 | 4.31 | 4411.50 | 4407.00 | 54.55 | 4426.2 | 4416.9 | 39.83 |
| 8/25/13 | 4.32 | 4411.50 | 4407.00 | 54.50 | 4426.2 | 4416.9 | 39.82 |
| 8/26/13 | 4.32 | 4411.60 | 4407.00 | 54.45 | 4426.2 | 4416.9 | 39.81 |
| 8/27/13 | 4.32 | 4411.60 | 4407.00 | 54.39 | 4426.2 | 4416.9 | 39.80 |
| 8/28/13 | 4.33 | 4411.70 | 4407.00 | 54.34 | 4426.2 | 4417.0 | 39.79 |
| 8/29/13 | 4.33 | 4411.70 | 4407.00 | 54.29 | 4426.2 | 4417.0 | 39.78 |
| 8/30/13 | 4.33 | 4411.80 | 4407.00 | 54.24 | 4426.2 | 4417.0 | 39.77 |
| 8/31/13 | 4.33 | 4411.80 | 4407.00 | 54.19 | 4426.2 | 4417.0 | 39.76 |
| 9/1/13 | 4.34 | 4411.90 | 4407.00 | 54.14 | 4426.3 | 4417.0 | 39.75 |
| 9/2/13 | 4.34 | 4411.90 | 4407.00 | 54.09 | 4426.3 | 4417.0 | 39.74 |
| 9/3/13 | 4.34 | 4412.00 | 4407.00 | 54.04 | 4426.3 | 4417.1 | 39.73 |
| 9/4/13 | 4.35 | 4412.00 | 4407.00 | 53.99 | 4426.3 | 4417.1 | 39.72 |
| 9/5/13 | 4.35 | 4412.10 | 4407.00 | 53.94 | 4426.3 | 4417.1 | 39.71 |
| 9/6/13 | 4.35 | 4412.10 | 4407.00 | 53.89 | 4426.3 | 4417.1 | 39.70 |
| 9/7/13 | 4.35 | 4412.20 | 4407.00 | 53.84 | 4426.3 | 4417.1 | 39.69 |
| 9/8/13 | 4.36 | 4412.20 | 4407.00 | 53.78 | 4426.3 | 4417.1 | 39.68 |
| 9/9/13 | 4.36 | 4412.30 | 4407.00 | 53.73 | 4426.3 | 4417.2 | 39.66 |
| 9/10/13 | 4.36 | 4412.30 | 4407.00 | 53.68 | 4426.3 | 4417.2 | 39.65 |
| 9/11/13 | 4.36 | 4412.40 | 4407.00 | 53.63 | 4426.4 | 4417.2 | 39.64 |

**Appendix E**
**Table 1  Tailings and Pond Elevations for North and South Cells**

| | Year | North Cell | | | South Cell | | |
|---|---|---|---|---|---|---|---|
| Date | Fraction | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) |
| 9/12/13 | 4.37 | 4412.40 | 4407.00 | 53.58 | 4426.4 | 4417.2 | 39.63 |
| 9/13/13 | 4.37 | 4412.50 | 4407.00 | 53.53 | 4426.4 | 4417.2 | 39.62 |
| 9/14/13 | 4.37 | 4412.50 | 4407.00 | 53.48 | 4426.4 | 4417.2 | 39.61 |
| 9/15/13 | 4.38 | 4412.60 | 4407.00 | 53.43 | 4426.4 | 4417.3 | 39.60 |
| 9/16/13 | 4.38 | 4412.60 | 4407.00 | 53.38 | 4426.4 | 4417.3 | 39.59 |
| 9/17/13 | 4.38 | 4412.70 | 4407.00 | 53.34 | 4426.4 | 4417.3 | 39.58 |
| 9/18/13 | 4.38 | 4412.70 | 4407.00 | 53.29 | 4426.4 | 4417.3 | 39.57 |
| 9/19/13 | 4.39 | 4412.80 | 4407.00 | 53.24 | 4426.4 | 4417.3 | 39.56 |
| 9/20/13 | 4.39 | 4412.80 | 4407.00 | 53.19 | 4426.5 | 4417.3 | 39.55 |
| 9/21/13 | 4.39 | 4412.90 | 4407.00 | 53.14 | 4426.5 | 4417.4 | 39.54 |
| 9/22/13 | 4.39 | 4412.90 | 4407.00 | 53.09 | 4426.5 | 4417.4 | 39.53 |
| 9/23/13 | 4.40 | 4413.00 | 4407.00 | 53.04 | 4426.5 | 4417.4 | 39.52 |
| 9/24/13 | 4.40 | 4413.00 | 4407.00 | 53.00 | 4426.5 | 4417.4 | 39.51 |
| 9/25/13 | 4.40 | 4413.10 | 4407.00 | 52.95 | 4426.5 | 4417.4 | 39.50 |
| 9/26/13 | 4.41 | 4413.10 | 4407.00 | 52.90 | 4426.5 | 4417.4 | 39.49 |
| 9/27/13 | 4.41 | 4413.10 | 4407.00 | 52.85 | 4426.5 | 4417.5 | 39.48 |
| 9/28/13 | 4.41 | 4413.20 | 4407.00 | 52.81 | 4426.5 | 4417.5 | 39.46 |
| 9/29/13 | 4.41 | 4413.20 | 4407.00 | 52.76 | 4426.5 | 4417.5 | 39.45 |
| 9/30/13 | 4.42 | 4413.30 | 4407.00 | 52.71 | 4426.6 | 4417.5 | 39.44 |
| 10/1/13 | 4.42 | 4413.30 | 4407.00 | 52.67 | 4426.6 | 4417.5 | 39.43 |
| 10/2/13 | 4.42 | 4413.40 | 4407.00 | 52.63 | 4426.6 | 4417.5 | 39.42 |
| 10/3/13 | 4.42 | 4413.40 | 4407.00 | 52.59 | 4426.6 | 4417.6 | 39.41 |
| 10/4/13 | 4.43 | 4413.50 | 4407.00 | 52.55 | 4426.6 | 4417.6 | 39.39 |
| 10/5/13 | 4.43 | 4413.50 | 4407.00 | 52.51 | 4426.6 | 4417.6 | 39.38 |
| 10/6/13 | 4.43 | 4413.50 | 4407.00 | 52.47 | 4426.6 | 4417.6 | 39.36 |
| 10/7/13 | 4.44 | 4413.60 | 4407.00 | 52.43 | 4426.6 | 4417.6 | 39.35 |
| 10/8/13 | 4.44 | 4413.60 | 4407.00 | 52.39 | 4426.7 | 4417.7 | 39.34 |
| 10/9/13 | 4.44 | 4413.60 | 4407.00 | 52.35 | 4426.7 | 4417.7 | 39.32 |
| 10/10/13 | 4.44 | 4413.70 | 4407.00 | 52.32 | 4426.7 | 4417.7 | 39.31 |
| 10/11/13 | 4.45 | 4413.70 | 4407.00 | 52.28 | 4426.7 | 4417.7 | 39.30 |
| 10/12/13 | 4.45 | 4413.80 | 4407.00 | 52.24 | 4426.7 | 4417.7 | 39.28 |
| 10/13/13 | 4.45 | 4413.80 | 4407.00 | 52.20 | 4426.7 | 4417.7 | 39.27 |
| 10/14/13 | 4.45 | 4413.80 | 4407.00 | 52.16 | 4426.7 | 4417.8 | 39.26 |
| 10/15/13 | 4.46 | 4413.90 | 4407.00 | 52.12 | 4426.8 | 4417.8 | 39.24 |
| 10/16/13 | 4.46 | 4413.90 | 4407.00 | 52.09 | 4426.8 | 4417.8 | 39.23 |
| 10/17/13 | 4.46 | 4414.00 | 4407.00 | 52.05 | 4426.8 | 4417.8 | 39.21 |
| 10/18/13 | 4.47 | 4414.00 | 4407.00 | 52.01 | 4426.8 | 4417.8 | 39.20 |
| 10/19/13 | 4.47 | 4414.00 | 4407.00 | 51.97 | 4426.8 | 4417.8 | 39.19 |
| 10/20/13 | 4.47 | 4414.10 | 4407.00 | 51.94 | 4426.8 | 4417.9 | 39.17 |
| 10/21/13 | 4.47 | 4414.10 | 4407.00 | 51.90 | 4426.8 | 4417.9 | 39.16 |
| 10/22/13 | 4.48 | 4414.10 | 4407.00 | 51.86 | 4426.9 | 4417.9 | 39.15 |
| 10/23/13 | 4.48 | 4414.20 | 4407.00 | 51.83 | 4426.9 | 4417.9 | 39.13 |
| 10/24/13 | 4.48 | 4414.20 | 4407.00 | 51.79 | 4426.9 | 4417.9 | 39.12 |
| 10/25/13 | 4.48 | 4414.20 | 4407.00 | 51.75 | 4426.9 | 4417.9 | 39.11 |
| 10/26/13 | 4.49 | 4414.30 | 4407.00 | 51.72 | 4426.9 | 4418.0 | 39.09 |
| 10/27/13 | 4.49 | 4414.30 | 4407.00 | 51.68 | 4426.9 | 4418.0 | 39.08 |
| 10/28/13 | 4.49 | 4414.40 | 4407.00 | 51.64 | 4426.9 | 4418.0 | 39.07 |
| 10/29/13 | 4.50 | 4414.40 | 4407.00 | 51.61 | 4426.9 | 4418.0 | 39.05 |
| 10/30/13 | 4.50 | 4414.40 | 4407.00 | 51.57 | 4427.0 | 4418.0 | 39.04 |
| 10/31/13 | 4.50 | 4414.50 | 4407.00 | 51.53 | 4427.0 | 4418.0 | 39.02 |
| 11/1/13 | 4.50 | 4414.50 | 4407.00 | 51.50 | 4427.0 | 4418.1 | 39.01 |
| 11/2/13 | 4.51 | 4414.50 | 4407.00 | 51.49 | 4427.0 | 4418.1 | 38.99 |
| 11/3/13 | 4.51 | 4414.50 | 4407.00 | 51.48 | 4427.0 | 4418.1 | 38.97 |
| 11/4/13 | 4.51 | 4414.50 | 4407.00 | 51.46 | 4427.0 | 4418.1 | 38.96 |
| 11/5/13 | 4.51 | 4414.50 | 4407.00 | 51.45 | 4427.1 | 4418.1 | 38.94 |

**Appendix E**
**Table 1  Tailings and Pond Elevations for North and South Cells**

| | Year | North Cell | | | South Cell | | |
|---|---|---|---|---|---|---|---|
| Date | Fraction | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) |
| 11/6/13 | 4.52 | 4414.60 | 4407.00 | 51.44 | 4427.1 | 4418.1 | 38.92 |
| 11/7/13 | 4.52 | 4414.60 | 4407.00 | 51.43 | 4427.1 | 4418.2 | 38.90 |
| 11/8/13 | 4.52 | 4414.60 | 4407.00 | 51.42 | 4427.1 | 4418.2 | 38.89 |
| 11/9/13 | 4.53 | 4414.60 | 4407.00 | 51.41 | 4427.1 | 4418.2 | 38.87 |
| 11/10/13 | 4.53 | 4414.60 | 4407.00 | 51.39 | 4427.2 | 4418.2 | 38.85 |
| 11/11/13 | 4.53 | 4414.60 | 4407.00 | 51.38 | 4427.2 | 4418.2 | 38.83 |
| 11/12/13 | 4.53 | 4414.60 | 4407.00 | 51.37 | 4427.2 | 4418.2 | 38.81 |
| 11/13/13 | 4.54 | 4414.60 | 4407.00 | 51.36 | 4427.2 | 4418.3 | 38.80 |
| 11/14/13 | 4.54 | 4414.70 | 4407.00 | 51.35 | 4427.2 | 4418.3 | 38.78 |
| 11/15/13 | 4.54 | 4414.70 | 4407.00 | 51.34 | 4427.2 | 4418.3 | 38.76 |
| 11/16/13 | 4.54 | 4414.70 | 4407.00 | 51.33 | 4427.3 | 4418.3 | 38.74 |
| 11/17/13 | 4.55 | 4414.70 | 4407.00 | 51.31 | 4427.3 | 4418.3 | 38.72 |
| 11/18/13 | 4.55 | 4414.70 | 4407.00 | 51.30 | 4427.3 | 4418.3 | 38.71 |
| 11/19/13 | 4.55 | 4414.70 | 4407.00 | 51.29 | 4427.3 | 4418.4 | 38.69 |
| 11/20/13 | 4.56 | 4414.70 | 4407.00 | 51.28 | 4427.3 | 4418.4 | 38.67 |
| 11/21/13 | 4.56 | 4414.70 | 4407.00 | 51.27 | 4427.3 | 4418.4 | 38.65 |
| 11/22/13 | 4.56 | 4414.70 | 4407.00 | 51.26 | 4427.4 | 4418.4 | 38.63 |
| 11/23/13 | 4.56 | 4414.80 | 4407.00 | 51.25 | 4427.4 | 4418.4 | 38.62 |
| 11/24/13 | 4.57 | 4414.80 | 4407.00 | 51.24 | 4427.4 | 4418.4 | 38.60 |
| 11/25/13 | 4.57 | 4414.80 | 4407.00 | 51.22 | 4427.4 | 4418.5 | 38.58 |
| 11/26/13 | 4.57 | 4414.80 | 4407.00 | 51.21 | 4427.4 | 4418.5 | 38.56 |
| 11/27/13 | 4.57 | 4414.80 | 4407.00 | 51.20 | 4427.5 | 4418.5 | 38.55 |
| 11/28/13 | 4.58 | 4414.80 | 4407.00 | 51.19 | 4427.5 | 4418.5 | 38.53 |
| 11/29/13 | 4.58 | 4414.80 | 4407.00 | 51.18 | 4427.5 | 4418.5 | 38.51 |
| 11/30/13 | 4.58 | 4414.80 | 4407.00 | 51.17 | 4427.5 | 4418.5 | 38.49 |
| 12/1/13 | 4.59 | 4414.80 | 4407.00 | 51.16 | 4427.5 | 4418.6 | 38.47 |
| 12/2/13 | 4.59 | 4414.80 | 4407.00 | 51.15 | 4427.5 | 4418.6 | 38.45 |
| 12/3/13 | 4.59 | 4414.90 | 4407.00 | 51.15 | 4427.6 | 4418.6 | 38.43 |
| 12/4/13 | 4.59 | 4414.90 | 4407.00 | 51.14 | 4427.6 | 4418.6 | 38.41 |
| 12/5/13 | 4.60 | 4414.90 | 4407.00 | 51.14 | 4427.6 | 4418.6 | 38.39 |
| 12/6/13 | 4.60 | 4414.90 | 4407.00 | 51.14 | 4427.6 | 4418.7 | 38.36 |
| 12/7/13 | 4.60 | 4414.90 | 4407.00 | 51.13 | 4427.7 | 4418.7 | 38.34 |
| 12/8/13 | 4.61 | 4414.90 | 4407.00 | 51.13 | 4427.7 | 4418.7 | 38.32 |
| 12/9/13 | 4.61 | 4414.90 | 4407.00 | 51.12 | 4427.7 | 4418.7 | 38.30 |
| 12/10/13 | 4.61 | 4414.90 | 4407.00 | 51.12 | 4427.7 | 4418.7 | 38.28 |
| 12/11/13 | 4.61 | 4414.90 | 4407.00 | 51.11 | 4427.7 | 4418.7 | 38.25 |
| 12/12/13 | 4.62 | 4414.90 | 4407.00 | 51.11 | 4427.8 | 4418.8 | 38.23 |
| 12/13/13 | 4.62 | 4414.90 | 4407.00 | 51.10 | 4427.8 | 4418.8 | 38.21 |
| 12/14/13 | 4.62 | 4414.90 | 4407.00 | 51.10 | 4427.8 | 4418.8 | 38.19 |
| 12/15/13 | 4.62 | 4414.90 | 4407.00 | 51.09 | 4427.8 | 4418.8 | 38.17 |
| 12/16/13 | 4.63 | 4414.90 | 4407.00 | 51.09 | 4427.9 | 4418.8 | 38.14 |
| 12/17/13 | 4.63 | 4414.90 | 4407.00 | 51.09 | 4427.9 | 4418.8 | 38.12 |
| 12/18/13 | 4.63 | 4414.90 | 4407.00 | 51.08 | 4427.9 | 4418.9 | 38.10 |
| 12/19/13 | 4.64 | 4414.90 | 4407.00 | 51.08 | 4427.9 | 4418.9 | 38.08 |
| 12/20/13 | 4.64 | 4414.90 | 4407.00 | 51.07 | 4427.9 | 4418.9 | 38.06 |
| 12/21/13 | 4.64 | 4414.90 | 4407.00 | 51.07 | 4428.0 | 4418.9 | 38.04 |
| 12/22/13 | 4.64 | 4414.90 | 4407.00 | 51.06 | 4428.0 | 4418.9 | 38.01 |
| 12/23/13 | 4.65 | 4414.90 | 4407.00 | 51.06 | 4428.0 | 4418.9 | 37.99 |
| 12/24/13 | 4.65 | 4414.90 | 4407.00 | 51.05 | 4428.0 | 4419.0 | 37.97 |
| 12/25/13 | 4.65 | 4415.00 | 4407.00 | 51.05 | 4428.1 | 4419.0 | 37.95 |
| 12/26/13 | 4.65 | 4415.00 | 4407.00 | 51.05 | 4428.1 | 4419.0 | 37.93 |
| 12/27/13 | 4.66 | 4415.00 | 4407.00 | 51.04 | 4428.1 | 4419.0 | 37.90 |
| 12/28/13 | 4.66 | 4415.00 | 4407.00 | 51.04 | 4428.1 | 4419.0 | 37.88 |
| 12/29/13 | 4.66 | 4415.00 | 4407.00 | 51.03 | 4428.1 | 4419.0 | 37.86 |
| 12/30/13 | 4.67 | 4415.00 | 4407.00 | 51.03 | 4428.2 | 4419.1 | 37.84 |

**Appendix E**

**Table 1  Tailings and Pond Elevations for North and South Cells**

| | Year | North Cell | | | South Cell | | |
|---|---|---|---|---|---|---|---|
| Date | Fraction | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) |
| 12/31/13 | 4.67 | 4415.00 | 4407.00 | 51.02 | 4428.2 | 4419.1 | 37.82 |
| 1/1/14 | 4.67 | 4415.00 | 4407.00 | 51.02 | 4428.2 | 4419.1 | 37.79 |
| 1/2/14 | 4.67 | 4415.00 | 4407.00 | 51.01 | 4428.2 | 4419.1 | 37.77 |
| 1/3/14 | 4.68 | 4415.00 | 4407.00 | 51.00 | 4428.3 | 4419.1 | 37.75 |
| 1/4/14 | 4.68 | 4415.00 | 4407.00 | 50.99 | 4428.3 | 4419.1 | 37.72 |
| 1/5/14 | 4.68 | 4415.00 | 4407.00 | 50.98 | 4428.3 | 4419.2 | 37.70 |
| 1/6/14 | 4.68 | 4415.00 | 4407.00 | 50.97 | 4428.3 | 4419.2 | 37.67 |
| 1/7/14 | 4.69 | 4415.00 | 4407.00 | 50.96 | 4428.4 | 4419.2 | 37.65 |
| 1/8/14 | 4.69 | 4415.10 | 4407.00 | 50.95 | 4428.4 | 4419.2 | 37.63 |
| 1/9/14 | 4.69 | 4415.10 | 4407.00 | 50.94 | 4428.4 | 4419.2 | 37.60 |
| 1/10/14 | 4.70 | 4415.10 | 4407.00 | 50.93 | 4428.4 | 4419.2 | 37.58 |
| 1/11/14 | 4.70 | 4415.10 | 4407.00 | 50.92 | 4428.4 | 4419.3 | 37.55 |
| 1/12/14 | 4.70 | 4415.10 | 4407.00 | 50.91 | 4428.5 | 4419.3 | 37.53 |
| 1/13/14 | 4.70 | 4415.10 | 4407.00 | 50.90 | 4428.5 | 4419.3 | 37.51 |
| 1/14/14 | 4.71 | 4415.10 | 4407.00 | 50.89 | 4428.5 | 4419.3 | 37.48 |
| 1/15/14 | 4.71 | 4415.10 | 4407.00 | 50.88 | 4428.5 | 4419.3 | 37.46 |
| 1/16/14 | 4.71 | 4415.10 | 4407.00 | 50.87 | 4428.6 | 4419.3 | 37.43 |
| 1/17/14 | 4.71 | 4415.10 | 4407.00 | 50.86 | 4428.6 | 4419.4 | 37.41 |
| 1/18/14 | 4.72 | 4415.20 | 4407.00 | 50.85 | 4428.6 | 4419.4 | 37.39 |
| 1/19/14 | 4.72 | 4415.20 | 4407.00 | 50.84 | 4428.6 | 4419.4 | 37.36 |
| 1/20/14 | 4.72 | 4415.20 | 4407.00 | 50.83 | 4428.7 | 4419.4 | 37.34 |
| 1/21/14 | 4.73 | 4415.20 | 4407.00 | 50.82 | 4428.7 | 4419.4 | 37.31 |
| 1/22/14 | 4.73 | 4415.20 | 4407.00 | 50.81 | 4428.7 | 4419.4 | 37.29 |
| 1/23/14 | 4.73 | 4415.20 | 4407.00 | 50.80 | 4428.7 | 4419.5 | 37.27 |
| 1/24/14 | 4.73 | 4415.20 | 4407.00 | 50.79 | 4428.8 | 4419.5 | 37.24 |
| 1/25/14 | 4.74 | 4415.20 | 4407.00 | 50.78 | 4428.8 | 4419.5 | 37.22 |
| 1/26/14 | 4.74 | 4415.20 | 4407.00 | 50.77 | 4428.8 | 4419.5 | 37.19 |
| 1/27/14 | 4.74 | 4415.20 | 4407.00 | 50.76 | 4428.8 | 4419.5 | 37.17 |
| 1/28/14 | 4.74 | 4415.30 | 4407.00 | 50.75 | 4428.9 | 4419.5 | 37.15 |
| 1/29/14 | 4.75 | 4415.30 | 4407.00 | 50.74 | 4428.9 | 4419.6 | 37.12 |
| 1/30/14 | 4.75 | 4415.30 | 4407.00 | 50.73 | 4428.9 | 4419.6 | 37.10 |
| 1/31/14 | 4.75 | 4415.30 | 4407.00 | 50.72 | 4428.9 | 4419.6 | 37.07 |
| 2/1/14 | 4.76 | 4415.30 | 4407.00 | 50.71 | 4429.0 | 4419.6 | 37.05 |
| 2/2/14 | 4.76 | 4415.30 | 4407.00 | 50.70 | 4429.0 | 4419.6 | 37.02 |
| 2/3/14 | 4.76 | 4415.30 | 4407.00 | 50.69 | 4429.0 | 4419.6 | 37.00 |
| 2/4/14 | 4.76 | 4415.30 | 4407.00 | 50.68 | 4429.0 | 4419.7 | 36.98 |
| 2/5/14 | 4.77 | 4415.30 | 4407.00 | 50.68 | 4429.0 | 4419.7 | 36.95 |
| 2/6/14 | 4.77 | 4415.60 | 4407.70 | 50.43 | 4429.0 | 4419.7 | 36.96 |
| 2/7/14 | 4.77 | 4415.80 | 4408.40 | 50.18 | 4429.0 | 4419.7 | 36.96 |
| 2/8/14 | 4.77 | 4416.10 | 4409.00 | 49.93 | 4429.0 | 4419.7 | 36.97 |
| 2/9/14 | 4.78 | 4416.30 | 4409.70 | 49.68 | 4429.0 | 4419.7 | 36.98 |
| 2/10/14 | 4.78 | 4416.60 | 4410.10 | 49.43 | 4429.0 | 4419.7 | 36.98 |
| 2/11/14 | 4.78 | 4416.80 | 4410.20 | 49.18 | 4429.0 | 4419.7 | 36.99 |
| 2/12/14 | 4.79 | 4417.10 | 4410.30 | 48.93 | 4429.0 | 4419.7 | 37.00 |
| 2/13/14 | 4.79 | 4417.30 | 4410.40 | 48.68 | 4429.0 | 4419.7 | 37.00 |
| 2/14/14 | 4.79 | 4417.60 | 4410.60 | 48.44 | 4429.0 | 4419.7 | 37.01 |
| 2/15/14 | 4.79 | 4417.80 | 4410.70 | 48.19 | 4429.0 | 4419.7 | 37.01 |
| 2/16/14 | 4.80 | 4418.10 | 4410.80 | 47.94 | 4429.0 | 4419.7 | 37.02 |
| 2/17/14 | 4.80 | 4418.30 | 4410.90 | 47.70 | 4429.0 | 4419.7 | 37.03 |
| 2/18/14 | 4.80 | 4418.60 | 4411.10 | 47.45 | 4429.0 | 4419.7 | 37.03 |
| 2/19/14 | 4.80 | 4418.80 | 4411.20 | 47.20 | 4429.0 | 4419.7 | 37.04 |
| 2/20/14 | 4.81 | 4419.00 | 4411.30 | 46.96 | 4429.0 | 4419.7 | 37.05 |
| 2/21/14 | 4.81 | 4419.30 | 4411.40 | 46.71 | 4428.9 | 4419.7 | 37.05 |
| 2/22/14 | 4.81 | 4419.50 | 4411.50 | 46.47 | 4428.9 | 4419.7 | 37.06 |
| 2/23/14 | 4.82 | 4419.80 | 4411.70 | 46.22 | 4428.9 | 4419.7 | 37.06 |

**Appendix E**
**Table 1  Tailings and Pond Elevations for North and South Cells**

| | Year | North Cell | | | South Cell | | |
|---|---|---|---|---|---|---|---|
| Date | Fraction | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) |
| 2/24/14 | 4.82 | 4420.00 | 4411.80 | 45.99 | 4428.9 | 4419.7 | 37.07 |
| 2/25/14 | 4.82 | 4420.10 | 4411.90 | 45.91 | 4428.9 | 4419.7 | 37.08 |
| 2/26/14 | 4.82 | 4420.20 | 4412.00 | 45.83 | 4428.9 | 4419.7 | 37.08 |
| 2/27/14 | 4.83 | 4420.30 | 4412.20 | 45.75 | 4428.9 | 4419.7 | 37.09 |
| 2/28/14 | 4.83 | 4420.30 | 4412.30 | 45.66 | 4428.9 | 4419.7 | 37.10 |
| 3/1/14 | 4.83 | 4420.40 | 4412.40 | 45.58 | 4428.9 | 4419.7 | 37.10 |
| 3/2/14 | 4.84 | 4420.50 | 4412.50 | 45.49 | 4428.9 | 4419.7 | 37.11 |
| 3/3/14 | 4.84 | 4420.60 | 4412.60 | 45.41 | 4428.9 | 4419.7 | 37.11 |
| 3/4/14 | 4.84 | 4420.70 | 4412.80 | 45.32 | 4428.9 | 4419.7 | 37.12 |
| 3/5/14 | 4.84 | 4420.80 | 4412.90 | 45.23 | 4428.9 | 4419.7 | 37.12 |
| 3/6/14 | 4.85 | 4420.90 | 4413.00 | 45.15 | 4428.9 | 4419.7 | 37.13 |
| 3/7/14 | 4.85 | 4420.90 | 4413.10 | 45.06 | 4428.9 | 4419.7 | 37.13 |
| 3/8/14 | 4.85 | 4421.00 | 4413.30 | 44.97 | 4428.9 | 4419.7 | 37.14 |
| 3/9/14 | 4.85 | 4421.10 | 4413.40 | 44.89 | 4428.9 | 4419.7 | 37.14 |
| 3/10/14 | 4.86 | 4421.20 | 4413.50 | 44.80 | 4428.9 | 4419.7 | 37.15 |
| 3/11/14 | 4.86 | 4421.30 | 4413.60 | 44.71 | 4428.8 | 4419.7 | 37.15 |
| 3/12/14 | 4.86 | 4421.40 | 4413.70 | 44.63 | 4428.8 | 4419.7 | 37.16 |
| 3/13/14 | 4.87 | 4421.50 | 4413.90 | 44.54 | 4428.8 | 4419.7 | 37.17 |
| 3/14/14 | 4.87 | 4421.50 | 4414.00 | 44.46 | 4428.8 | 4419.7 | 37.17 |
| 3/15/14 | 4.87 | 4421.60 | 4414.10 | 44.37 | 4428.8 | 4419.7 | 37.18 |
| 3/16/14 | 4.87 | 4421.70 | 4414.20 | 44.28 | 4428.8 | 4419.7 | 37.18 |
| 3/17/14 | 4.88 | 4421.80 | 4414.40 | 44.20 | 4428.8 | 4419.7 | 37.19 |
| 3/18/14 | 4.88 | 4421.90 | 4414.50 | 44.11 | 4428.8 | 4419.7 | 37.19 |
| 3/19/14 | 4.88 | 4422.00 | 4414.60 | 44.02 | 4428.8 | 4419.7 | 37.20 |
| 3/20/14 | 4.88 | 4422.10 | 4414.70 | 43.94 | 4428.8 | 4419.7 | 37.20 |
| 3/21/14 | 4.89 | 4422.10 | 4414.80 | 43.85 | 4428.8 | 4419.7 | 37.21 |
| 3/22/14 | 4.89 | 4422.20 | 4415.00 | 43.77 | 4428.8 | 4419.7 | 37.21 |
| 3/23/14 | 4.89 | 4422.30 | 4415.10 | 43.68 | 4428.8 | 4419.7 | 37.22 |
| 3/24/14 | 4.90 | 4422.40 | 4415.20 | 43.60 | 4428.8 | 4419.7 | 37.22 |
| 3/25/14 | 4.90 | 4422.50 | 4415.30 | 43.51 | 4428.8 | 4419.7 | 37.23 |
| 3/26/14 | 4.90 | 4422.60 | 4415.50 | 43.43 | 4428.8 | 4419.7 | 37.23 |
| 3/27/14 | 4.90 | 4422.70 | 4415.60 | 43.34 | 4428.8 | 4419.7 | 37.24 |
| 3/28/14 | 4.91 | 4422.70 | 4415.70 | 43.25 | 4428.8 | 4419.7 | 37.24 |
| 3/29/14 | 4.91 | 4422.80 | 4415.80 | 43.17 | 4428.8 | 4419.7 | 37.25 |
| 3/30/14 | 4.91 | 4422.90 | 4415.90 | 43.08 | 4428.7 | 4419.7 | 37.25 |
| 3/31/14 | 4.91 | 4423.00 | 4416.10 | 43.00 | 4428.7 | 4419.7 | 37.26 |
| 4/1/14 | 4.92 | 4423.10 | 4416.20 | 42.91 | 4428.7 | 4419.7 | 37.26 |
| 4/2/14 | 4.92 | 4423.20 | 4416.30 | 42.84 | 4428.7 | 4419.7 | 37.27 |
| 4/3/14 | 4.92 | 4423.20 | 4416.40 | 42.76 | 4428.7 | 4419.7 | 37.28 |
| 4/4/14 | 4.93 | 4423.30 | 4416.60 | 42.69 | 4428.7 | 4419.7 | 37.29 |
| 4/5/14 | 4.93 | 4423.40 | 4416.70 | 42.61 | 4428.7 | 4419.7 | 37.30 |
| 4/6/14 | 4.93 | 4423.50 | 4416.80 | 42.54 | 4428.7 | 4419.7 | 37.31 |
| 4/7/14 | 4.93 | 4423.50 | 4416.90 | 42.46 | 4428.7 | 4419.7 | 37.32 |
| 4/8/14 | 4.94 | 4423.60 | 4417.00 | 42.39 | 4428.7 | 4419.7 | 37.32 |
| 4/9/14 | 4.94 | 4423.70 | 4417.20 | 42.31 | 4428.7 | 4419.7 | 37.33 |
| 4/10/14 | 4.94 | 4423.80 | 4417.30 | 42.24 | 4428.7 | 4419.7 | 37.34 |
| 4/11/14 | 4.94 | 4423.80 | 4417.40 | 42.16 | 4428.7 | 4419.7 | 37.35 |
| 4/12/14 | 4.95 | 4423.90 | 4417.50 | 42.09 | 4428.6 | 4419.7 | 37.36 |
| 4/13/14 | 4.95 | 4424.00 | 4417.70 | 42.01 | 4428.6 | 4419.7 | 37.37 |
| 4/14/14 | 4.95 | 4424.10 | 4417.80 | 41.94 | 4428.6 | 4419.7 | 37.38 |
| 4/15/14 | 4.96 | 4424.10 | 4417.90 | 41.87 | 4428.6 | 4419.7 | 37.38 |
| 4/16/14 | 4.96 | 4424.20 | 4418.00 | 41.79 | 4428.6 | 4419.7 | 37.39 |
| 4/17/14 | 4.96 | 4424.30 | 4418.20 | 41.72 | 4428.6 | 4419.7 | 37.40 |
| 4/18/14 | 4.96 | 4424.40 | 4418.30 | 41.64 | 4428.6 | 4419.7 | 37.41 |
| 4/19/14 | 4.97 | 4424.40 | 4418.40 | 41.57 | 4428.6 | 4419.7 | 37.42 |

**Appendix E**
**Table 1  Tailings and Pond Elevations for North and South Cells**

| | Year | North Cell | | | South Cell | | |
|---|---|---|---|---|---|---|---|
| Date | Fraction | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) |
| 4/20/14 | 4.97 | 4424.50 | 4418.50 | 41.49 | 4428.6 | 4419.7 | 37.43 |
| 4/21/14 | 4.97 | 4424.60 | 4418.60 | 41.42 | 4428.6 | 4419.7 | 37.44 |
| 4/22/14 | 4.97 | 4424.70 | 4418.80 | 41.35 | 4428.6 | 4419.7 | 37.44 |
| 4/23/14 | 4.98 | 4424.70 | 4418.90 | 41.27 | 4428.5 | 4419.7 | 37.45 |
| 4/24/14 | 4.98 | 4424.80 | 4419.00 | 41.20 | 4428.5 | 4419.7 | 37.46 |
| 4/25/14 | 4.98 | 4424.90 | 4419.10 | 41.12 | 4428.5 | 4419.7 | 37.47 |
| 4/26/14 | 4.99 | 4425.00 | 4419.30 | 41.05 | 4428.5 | 4419.7 | 37.48 |
| 4/27/14 | 4.99 | 4425.00 | 4419.40 | 40.98 | 4428.5 | 4419.7 | 37.49 |
| 4/28/14 | 4.99 | 4425.10 | 4419.50 | 40.90 | 4428.5 | 4419.7 | 37.50 |
| 4/29/14 | 4.99 | 4425.20 | 4419.60 | 40.83 | 4428.5 | 4419.7 | 37.50 |
| 4/30/14 | 5.00 | 4425.20 | 4419.70 | 40.75 | 4428.5 | 4419.7 | 37.51 |
| 5/1/14 | 5.00 | 4425.30 | 4419.90 | 40.68 | 4428.5 | 4419.7 | 37.52 |
| 5/2/14 | 5.00 | 4425.40 | 4420.00 | 40.61 | 4428.5 | 4419.7 | 37.53 |
| 5/3/14 | 5.00 | 4425.50 | 4420.00 | 40.53 | 4428.5 | 4419.7 | 37.54 |
| 5/4/14 | 5.01 | 4425.50 | 4420.10 | 40.46 | 4428.5 | 4419.7 | 37.55 |
| 5/5/14 | 5.01 | 4425.60 | 4420.10 | 40.39 | 4428.4 | 4419.7 | 37.56 |
| 5/6/14 | 5.01 | 4425.70 | 4420.20 | 40.32 | 4428.4 | 4419.7 | 37.57 |
| 5/7/14 | 5.02 | 4425.80 | 4420.20 | 40.24 | 4428.4 | 4419.7 | 37.58 |
| 5/8/14 | 5.02 | 4425.80 | 4420.20 | 40.17 | 4428.4 | 4419.7 | 37.59 |
| 5/9/14 | 5.02 | 4425.90 | 4420.30 | 40.10 | 4428.4 | 4419.7 | 37.60 |
| 5/10/14 | 5.02 | 4426.00 | 4420.30 | 40.02 | 4428.4 | 4419.7 | 37.61 |
| 5/11/14 | 5.03 | 4426.00 | 4420.40 | 39.95 | 4428.4 | 4419.7 | 37.62 |
| 5/12/14 | 5.03 | 4426.10 | 4420.40 | 39.88 | 4428.4 | 4419.7 | 37.63 |
| 5/13/14 | 5.03 | 4426.20 | 4420.40 | 39.81 | 4428.4 | 4419.7 | 37.64 |
| 5/14/14 | 5.03 | 4426.30 | 4420.50 | 39.73 | 4428.4 | 4419.7 | 37.65 |
| 5/15/14 | 5.04 | 4426.30 | 4420.50 | 39.66 | 4428.3 | 4419.7 | 37.66 |
| 5/16/14 | 5.04 | 4426.40 | 4420.60 | 39.59 | 4428.3 | 4419.7 | 37.67 |
| 5/17/14 | 5.04 | 4426.50 | 4420.60 | 39.52 | 4428.3 | 4419.7 | 37.68 |
| 5/18/14 | 5.05 | 4426.60 | 4420.70 | 39.45 | 4428.3 | 4419.7 | 37.69 |
| 5/19/14 | 5.05 | 4426.60 | 4420.70 | 39.37 | 4428.3 | 4419.7 | 37.69 |
| 5/20/14 | 5.05 | 4426.70 | 4420.70 | 39.30 | 4428.3 | 4419.7 | 37.70 |
| 5/21/14 | 5.05 | 4426.80 | 4420.80 | 39.23 | 4428.3 | 4419.7 | 37.71 |
| 5/22/14 | 5.06 | 4426.80 | 4420.80 | 39.16 | 4428.3 | 4419.7 | 37.72 |
| 5/23/14 | 5.06 | 4426.90 | 4420.90 | 39.09 | 4428.3 | 4419.7 | 37.73 |
| 5/24/14 | 5.06 | 4427.00 | 4420.90 | 39.01 | 4428.3 | 4419.7 | 37.74 |
| 5/25/14 | 5.07 | 4427.10 | 4420.90 | 38.94 | 4428.2 | 4419.7 | 37.75 |
| 5/26/14 | 5.07 | 4427.10 | 4421.00 | 38.87 | 4428.2 | 4419.7 | 37.76 |
| 5/27/14 | 5.07 | 4427.20 | 4421.00 | 38.80 | 4428.2 | 4419.7 | 37.77 |
| 5/28/14 | 5.07 | 4427.30 | 4421.10 | 38.73 | 4428.2 | 4419.7 | 37.78 |
| 5/29/14 | 5.08 | 4427.30 | 4421.10 | 38.66 | 4428.2 | 4419.7 | 37.79 |
| 5/30/14 | 5.08 | 4427.40 | 4421.20 | 38.58 | 4428.2 | 4419.7 | 37.80 |
| 5/31/14 | 5.08 | 4427.50 | 4421.20 | 38.51 | 4428.2 | 4419.7 | 37.81 |
| 6/1/14 | 5.08 | 4427.60 | 4421.20 | 38.44 | 4428.2 | 4419.7 | 37.82 |
| 6/2/14 | 5.09 | 4427.60 | 4421.30 | 38.37 | 4428.2 | 4419.7 | 37.83 |
| 6/3/14 | 5.09 | 4427.70 | 4421.30 | 38.31 | 4428.2 | 4419.7 | 37.85 |
| 6/4/14 | 5.09 | 4427.80 | 4421.40 | 38.24 | 4428.1 | 4419.7 | 37.86 |
| 6/5/14 | 5.10 | 4427.80 | 4421.40 | 38.17 | 4428.1 | 4419.7 | 37.87 |
| 6/6/14 | 5.10 | 4427.90 | 4421.40 | 38.11 | 4428.1 | 4419.7 | 37.89 |
| 6/7/14 | 5.10 | 4428.00 | 4421.50 | 38.04 | 4428.1 | 4419.7 | 37.90 |
| 6/8/14 | 5.10 | 4428.00 | 4421.50 | 37.97 | 4428.1 | 4419.7 | 37.91 |
| 6/9/14 | 5.11 | 4428.10 | 4421.60 | 37.90 | 4428.1 | 4419.7 | 37.93 |
| 6/10/14 | 5.11 | 4428.20 | 4421.60 | 37.84 | 4428.1 | 4419.7 | 37.94 |
| 6/11/14 | 5.11 | 4428.20 | 4421.60 | 37.77 | 4428.0 | 4419.7 | 37.95 |
| 6/12/14 | 5.11 | 4428.30 | 4421.70 | 37.70 | 4428.0 | 4419.7 | 37.97 |
| 6/13/14 | 5.12 | 4428.40 | 4421.70 | 37.64 | 4428.0 | 4419.7 | 37.98 |

**Appendix E**

**Table 1 Tailings and Pond Elevations for North and South Cells**

| Date | Year Fraction | North Cell | | | South Cell | | |
|---|---|---|---|---|---|---|---|
| | | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) |
| 6/14/14 | 5.12 | 4428.40 | 4421.80 | 37.57 | 4428.0 | 4419.7 | 37.99 |
| 6/15/14 | 5.12 | 4428.50 | 4421.80 | 37.51 | 4428.0 | 4419.7 | 38.00 |
| 6/16/14 | 5.13 | 4428.60 | 4421.90 | 37.44 | 4428.0 | 4419.7 | 38.02 |
| 6/17/14 | 5.13 | 4428.60 | 4421.90 | 37.37 | 4428.0 | 4419.7 | 38.03 |
| 6/18/14 | 5.13 | 4428.70 | 4421.90 | 37.31 | 4428.0 | 4419.7 | 38.04 |
| 6/19/14 | 5.13 | 4428.80 | 4422.00 | 37.24 | 4427.9 | 4419.7 | 38.06 |
| 6/20/14 | 5.14 | 4428.80 | 4422.00 | 37.18 | 4427.9 | 4419.7 | 38.07 |
| 6/21/14 | 5.14 | 4428.90 | 4422.10 | 37.11 | 4427.9 | 4419.7 | 38.08 |
| 6/22/14 | 5.14 | 4429.00 | 4422.10 | 37.04 | 4427.9 | 4419.7 | 38.10 |
| 6/23/14 | 5.14 | 4429.00 | 4422.10 | 36.98 | 4427.9 | 4419.7 | 38.11 |
| 6/24/14 | 5.15 | 4429.10 | 4422.20 | 36.91 | 4427.9 | 4419.7 | 38.12 |
| 6/25/14 | 5.15 | 4429.20 | 4422.20 | 36.85 | 4427.9 | 4419.7 | 38.14 |
| 6/26/14 | 5.15 | 4429.20 | 4422.30 | 36.78 | 4427.9 | 4419.7 | 38.15 |
| 6/27/14 | 5.16 | 4429.30 | 4422.30 | 36.72 | 4427.8 | 4419.7 | 38.16 |
| 6/28/14 | 5.16 | 4429.40 | 4422.30 | 36.65 | 4427.8 | 4419.7 | 38.18 |
| 6/29/14 | 5.16 | 4429.40 | 4422.40 | 36.59 | 4427.8 | 4419.7 | 38.19 |
| 6/30/14 | 5.16 | 4429.50 | 4422.40 | 36.52 | 4427.8 | 4419.7 | 38.20 |
| 7/1/14 | 5.17 | 4429.50 | 4422.50 | 36.45 | 4427.8 | 4419.7 | 38.22 |
| 7/2/14 | 5.17 | 4429.60 | 4422.50 | 36.40 | 4427.8 | 4419.7 | 38.24 |
| 7/3/14 | 5.17 | 4429.70 | 4422.60 | 36.34 | 4427.7 | 4419.7 | 38.26 |
| 7/4/14 | 5.17 | 4429.70 | 4422.60 | 36.29 | 4427.7 | 4419.7 | 38.28 |
| 7/5/14 | 5.18 | 4429.80 | 4422.60 | 36.23 | 4427.7 | 4419.7 | 38.30 |
| 7/6/14 | 5.18 | 4429.80 | 4422.70 | 36.18 | 4427.7 | 4419.7 | 38.32 |
| 7/7/14 | 5.18 | 4429.90 | 4422.70 | 36.12 | 4427.7 | 4419.7 | 38.34 |
| 7/8/14 | 5.19 | 4429.90 | 4422.80 | 36.07 | 4427.6 | 4419.7 | 38.36 |
| 7/9/14 | 5.19 | 4430.00 | 4422.80 | 36.01 | 4427.6 | 4419.7 | 38.38 |
| 7/10/14 | 5.19 | 4430.00 | 4422.80 | 35.98 | 4427.6 | 4419.7 | 38.40 |
| 7/11/14 | 5.19 | 4430.10 | 4422.90 | 35.95 | 4427.6 | 4419.7 | 38.42 |
| 7/12/14 | 5.20 | 4430.10 | 4422.90 | 35.92 | 4427.6 | 4419.7 | 38.44 |
| 7/13/14 | 5.20 | 4430.10 | 4423.00 | 35.89 | 4427.5 | 4419.7 | 38.46 |
| 7/14/14 | 5.20 | 4430.10 | 4423.00 | 35.86 | 4427.5 | 4419.7 | 38.48 |
| 7/15/14 | 5.20 | 4430.20 | 4423.00 | 35.83 | 4427.5 | 4419.7 | 38.50 |
| 7/16/14 | 5.21 | 4430.20 | 4423.10 | 35.80 | 4427.5 | 4419.7 | 38.52 |
| 7/17/14 | 5.21 | 4430.20 | 4423.10 | 35.77 | 4427.5 | 4419.7 | 38.54 |
| 7/18/14 | 5.21 | 4430.30 | 4423.20 | 35.74 | 4427.4 | 4419.7 | 38.56 |
| 7/19/14 | 5.22 | 4430.30 | 4423.20 | 35.71 | 4427.4 | 4419.7 | 38.58 |
| 7/20/14 | 5.22 | 4430.30 | 4423.30 | 35.68 | 4427.4 | 4419.7 | 38.60 |
| 7/21/14 | 5.22 | 4430.30 | 4423.30 | 35.65 | 4427.4 | 4419.7 | 38.62 |
| 7/22/14 | 5.22 | 4430.40 | 4423.30 | 35.62 | 4427.4 | 4419.7 | 38.64 |
| 7/23/14 | 5.23 | 4430.40 | 4423.40 | 35.59 | 4427.3 | 4419.7 | 38.66 |
| 7/24/14 | 5.23 | 4430.40 | 4423.40 | 35.57 | 4427.3 | 4419.7 | 38.68 |
| 7/25/14 | 5.23 | 4430.50 | 4423.50 | 35.54 | 4427.3 | 4419.7 | 38.70 |
| 7/26/14 | 5.23 | 4430.50 | 4423.50 | 35.51 | 4427.3 | 4419.7 | 38.72 |
| 7/27/14 | 5.24 | 4430.50 | 4423.50 | 35.48 | 4427.3 | 4419.7 | 38.74 |
| 7/28/14 | 5.24 | 4430.60 | 4423.60 | 35.45 | 4427.2 | 4419.7 | 38.77 |
| 7/29/14 | 5.24 | 4430.60 | 4423.60 | 35.42 | 4427.2 | 4419.7 | 38.79 |
| 7/30/14 | 5.25 | 4430.60 | 4423.70 | 35.39 | 4427.2 | 4419.7 | 38.81 |
| 7/31/14 | 5.25 | 4430.60 | 4423.70 | 35.36 | 4427.2 | 4419.7 | 38.83 |
| 8/1/14 | 5.25 | 4430.70 | 4423.70 | 35.33 | 4427.2 | 4419.7 | 38.85 |
| 8/2/14 | 5.25 | 4430.70 | 4423.80 | 35.30 | 4427.1 | 4419.7 | 38.87 |
| 8/3/14 | 5.26 | 4430.70 | 4423.80 | 35.26 | 4427.1 | 4419.7 | 38.89 |
| 8/4/14 | 5.26 | 4430.80 | 4423.90 | 35.23 | 4427.1 | 4419.7 | 38.91 |
| 8/5/14 | 5.26 | 4430.80 | 4423.90 | 35.19 | 4427.1 | 4419.7 | 38.93 |
| 8/6/14 | 5.26 | 4430.80 | 4424.00 | 35.16 | 4427.1 | 4419.7 | 38.95 |
| 8/7/14 | 5.27 | 4430.90 | 4424.00 | 35.13 | 4427.0 | 4419.7 | 38.97 |

## Appendix E

## Table 1  Tailings and Pond Elevations for North and South Cells

| Date | Year Fraction | North Cell | | | South Cell | | |
|---|---|---|---|---|---|---|---|
| | | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) |
| 8/8/14 | 5.27 | 4430.90 | 4424.00 | 35.09 | 4427.0 | 4419.7 | 38.99 |
| 8/9/14 | 5.27 | 4430.90 | 4424.10 | 35.06 | 4427.0 | 4419.7 | 39.01 |
| 8/10/14 | 5.28 | 4431.00 | 4424.10 | 35.02 | 4427.0 | 4419.7 | 39.03 |
| 8/11/14 | 5.28 | 4431.00 | 4424.20 | 34.99 | 4426.9 | 4419.7 | 39.05 |
| 8/12/14 | 5.28 | 4431.00 | 4424.20 | 34.95 | 4426.9 | 4419.7 | 39.07 |
| 8/13/14 | 5.28 | 4431.10 | 4424.20 | 34.92 | 4426.9 | 4419.7 | 39.09 |
| 8/14/14 | 5.29 | 4431.10 | 4424.30 | 34.89 | 4426.9 | 4419.7 | 39.11 |
| 8/15/14 | 5.29 | 4431.10 | 4424.30 | 34.85 | 4426.9 | 4419.7 | 39.13 |
| 8/16/14 | 5.29 | 4431.20 | 4424.40 | 34.82 | 4426.8 | 4419.7 | 39.15 |
| 8/17/14 | 5.30 | 4431.20 | 4424.40 | 34.78 | 4426.8 | 4419.7 | 39.17 |
| 8/18/14 | 5.30 | 4431.30 | 4424.50 | 34.75 | 4426.8 | 4419.7 | 39.19 |
| 8/19/14 | 5.30 | 4431.30 | 4424.50 | 34.72 | 4426.8 | 4419.7 | 39.21 |
| 8/20/14 | 5.30 | 4431.30 | 4424.50 | 34.68 | 4426.8 | 4419.7 | 39.23 |
| 8/21/14 | 5.31 | 4431.40 | 4424.60 | 34.65 | 4426.7 | 4419.7 | 39.25 |
| 8/22/14 | 5.31 | 4431.40 | 4424.60 | 34.61 | 4426.7 | 4419.7 | 39.28 |
| 8/23/14 | 5.31 | 4431.40 | 4424.70 | 34.58 | 4426.7 | 4419.7 | 39.30 |
| 8/24/14 | 5.31 | 4431.50 | 4424.70 | 34.55 | 4426.7 | 4419.7 | 39.32 |
| 8/25/14 | 5.32 | 4431.50 | 4424.70 | 34.51 | 4426.7 | 4419.7 | 39.34 |
| 8/26/14 | 5.32 | 4431.50 | 4424.80 | 34.48 | 4426.6 | 4419.7 | 39.36 |
| 8/27/14 | 5.32 | 4431.60 | 4424.80 | 34.45 | 4426.6 | 4419.7 | 39.38 |
| 8/28/14 | 5.33 | 4431.60 | 4424.90 | 34.41 | 4426.6 | 4419.7 | 39.40 |
| 8/29/14 | 5.33 | 4431.60 | 4424.90 | 34.38 | 4426.6 | 4419.7 | 39.42 |
| 8/30/14 | 5.33 | 4431.70 | 4424.90 | 34.35 | 4426.6 | 4419.7 | 39.44 |
| 8/31/14 | 5.33 | 4431.70 | 4425.00 | 34.31 | 4426.5 | 4419.7 | 39.46 |
| 9/1/14 | 5.34 | 4431.70 | 4425.00 | 34.28 | 4426.5 | 4419.7 | 39.48 |
| 9/2/14 | 5.34 | 4431.80 | 4425.10 | 34.24 | 4426.5 | 4419.7 | 39.50 |
| 9/3/14 | 5.34 | 4431.80 | 4425.10 | 34.21 | 4426.5 | 4419.7 | 39.52 |
| 9/4/14 | 5.34 | 4431.80 | 4425.20 | 34.18 | 4426.5 | 4419.7 | 39.54 |
| 9/5/14 | 5.35 | 4431.90 | 4425.20 | 34.14 | 4426.4 | 4419.7 | 39.56 |
| 9/6/14 | 5.35 | 4431.90 | 4425.20 | 34.11 | 4426.4 | 4419.7 | 39.58 |
| 9/7/14 | 5.35 | 4431.90 | 4425.30 | 34.08 | 4426.4 | 4419.7 | 39.60 |
| 9/8/14 | 5.36 | 4432.00 | 4425.30 | 34.04 | 4426.4 | 4419.7 | 39.62 |
| 9/9/14 | 5.36 | 4432.00 | 4425.40 | 34.01 | 4426.4 | 4419.7 | 39.64 |
| 9/10/14 | 5.36 | 4432.00 | 4425.40 | 33.98 | 4426.3 | 4419.7 | 39.66 |
| 9/11/14 | 5.36 | 4432.10 | 4425.40 | 33.94 | 4426.3 | 4419.7 | 39.68 |
| 9/12/14 | 5.37 | 4432.10 | 4425.50 | 33.91 | 4426.3 | 4419.7 | 39.70 |
| 9/13/14 | 5.37 | 4432.10 | 4425.50 | 33.88 | 4426.3 | 4419.7 | 39.72 |
| 9/14/14 | 5.37 | 4432.20 | 4425.60 | 33.84 | 4426.3 | 4419.7 | 39.74 |
| 9/15/14 | 5.37 | 4432.20 | 4425.60 | 33.81 | 4426.2 | 4419.7 | 39.76 |
| 9/16/14 | 5.38 | 4432.20 | 4425.60 | 33.78 | 4426.2 | 4419.7 | 39.78 |
| 9/17/14 | 5.38 | 4432.30 | 4425.70 | 33.74 | 4426.2 | 4419.7 | 39.80 |
| 9/18/14 | 5.38 | 4432.30 | 4425.70 | 33.71 | 4426.2 | 4419.7 | 39.82 |
| 9/19/14 | 5.39 | 4432.30 | 4425.80 | 33.68 | 4426.2 | 4419.7 | 39.84 |
| 9/20/14 | 5.39 | 4432.40 | 4425.80 | 33.64 | 4426.1 | 4419.7 | 39.86 |
| 9/21/14 | 5.39 | 4432.40 | 4425.90 | 33.61 | 4426.1 | 4419.7 | 39.88 |
| 9/22/14 | 5.39 | 4432.40 | 4425.90 | 33.58 | 4426.1 | 4419.7 | 39.90 |
| 9/23/14 | 5.40 | 4432.50 | 4425.90 | 33.55 | 4426.1 | 4419.7 | 39.92 |
| 9/24/14 | 5.40 | 4432.50 | 4426.00 | 33.51 | 4426.1 | 4419.7 | 39.94 |
| 9/25/14 | 5.40 | 4432.50 | 4426.00 | 33.48 | 4426.0 | 4419.7 | 39.96 |
| 9/26/14 | 5.40 | 4432.60 | 4426.10 | 33.45 | 4426.0 | 4419.7 | 39.98 |
| 9/27/14 | 5.41 | 4432.60 | 4426.10 | 33.41 | 4426.0 | 4419.7 | 40.00 |
| 9/28/14 | 5.41 | 4432.60 | 4426.10 | 33.38 | 4426.0 | 4419.7 | 40.02 |
| 9/29/14 | 5.41 | 4432.70 | 4426.20 | 33.35 | 4426.0 | 4419.7 | 40.04 |
| 9/30/14 | 5.42 | 4432.70 | 4426.20 | 33.32 | 4425.9 | 4419.7 | 40.06 |
| 10/1/14 | 5.42 | 4432.70 | 4426.30 | 33.28 | 4425.9 | 4419.7 | 40.08 |

## Appendix E
## Table 1  Tailings and Pond Elevations for North and South Cells

| Date | Year Fraction | North Cell | | | South Cell | | |
|---|---|---|---|---|---|---|---|
| | | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) |
| 10/2/14 | 5.42 | 4432.80 | 4426.30 | 33.25 | 4425.9 | 4419.7 | 40.10 |
| 10/3/14 | 5.42 | 4432.80 | 4426.30 | 33.21 | 4425.9 | 4419.7 | 40.11 |
| 10/4/14 | 5.43 | 4432.80 | 4426.40 | 33.18 | 4425.9 | 4419.7 | 40.13 |
| 10/5/14 | 5.43 | 4432.90 | 4426.40 | 33.15 | 4425.9 | 4419.7 | 40.15 |
| 10/6/14 | 5.43 | 4432.90 | 4426.50 | 33.11 | 4425.8 | 4419.7 | 40.16 |
| 10/7/14 | 5.43 | 4432.90 | 4426.50 | 33.08 | 4425.8 | 4419.7 | 40.18 |
| 10/8/14 | 5.44 | 4433.00 | 4426.60 | 33.04 | 4425.8 | 4419.7 | 40.20 |
| 10/9/14 | 5.44 | 4433.00 | 4426.60 | 33.01 | 4425.8 | 4419.7 | 40.21 |
| 10/10/14 | 5.44 | 4433.00 | 4426.60 | 32.97 | 4425.8 | 4419.7 | 40.23 |
| 10/11/14 | 5.45 | 4433.10 | 4426.70 | 32.94 | 4425.8 | 4419.7 | 40.25 |
| 10/12/14 | 5.45 | 4433.10 | 4426.70 | 32.91 | 4425.7 | 4419.7 | 40.27 |
| 10/13/14 | 5.45 | 4433.10 | 4426.80 | 32.87 | 4425.7 | 4419.7 | 40.28 |
| 10/14/14 | 5.45 | 4433.20 | 4426.80 | 32.84 | 4425.7 | 4419.7 | 40.30 |
| 10/15/14 | 5.46 | 4433.20 | 4426.80 | 32.81 | 4425.7 | 4419.7 | 40.32 |
| 10/16/14 | 5.46 | 4433.20 | 4426.90 | 32.77 | 4425.7 | 4419.7 | 40.33 |
| 10/17/14 | 5.46 | 4433.30 | 4426.90 | 32.74 | 4425.7 | 4419.7 | 40.35 |
| 10/18/14 | 5.46 | 4433.30 | 4427.00 | 32.70 | 4425.6 | 4419.7 | 40.37 |
| 10/19/14 | 5.47 | 4433.30 | 4427.00 | 32.67 | 4425.6 | 4419.7 | 40.38 |
| 10/20/14 | 5.47 | 4433.40 | 4427.10 | 32.64 | 4425.6 | 4419.7 | 40.40 |
| 10/21/14 | 5.47 | 4433.40 | 4427.10 | 32.60 | 4425.6 | 4419.7 | 40.42 |
| 10/22/14 | 5.48 | 4433.40 | 4427.10 | 32.57 | 4425.6 | 4419.7 | 40.43 |
| 10/23/14 | 5.48 | 4433.50 | 4427.20 | 32.53 | 4425.6 | 4419.7 | 40.45 |
| 10/24/14 | 5.48 | 4433.50 | 4427.20 | 32.50 | 4425.5 | 4419.7 | 40.47 |
| 10/25/14 | 5.48 | 4433.50 | 4427.30 | 32.47 | 4425.5 | 4419.7 | 40.48 |
| 10/26/14 | 5.49 | 4433.60 | 4427.30 | 32.43 | 4425.5 | 4419.7 | 40.50 |
| 10/27/14 | 5.49 | 4433.60 | 4427.30 | 32.40 | 4425.5 | 4419.7 | 40.52 |
| 10/28/14 | 5.49 | 4433.60 | 4427.40 | 32.37 | 4425.5 | 4419.7 | 40.53 |
| 10/29/14 | 5.49 | 4433.70 | 4427.40 | 32.33 | 4425.4 | 4419.7 | 40.55 |
| 10/30/14 | 5.50 | 4433.70 | 4427.50 | 32.30 | 4425.4 | 4419.7 | 40.57 |
| 10/31/14 | 5.50 | 4433.70 | 4427.50 | 32.27 | 4425.4 | 4419.7 | 40.58 |
| 11/1/14 | 5.50 | 4433.80 | 4427.50 | 32.23 | 4425.4 | 4419.7 | 40.60 |
| 11/2/14 | 5.51 | 4433.80 | 4427.60 | 32.20 | 4425.4 | 4419.7 | 40.61 |
| 11/3/14 | 5.51 | 4433.80 | 4427.60 | 32.17 | 4425.4 | 4419.7 | 40.63 |
| 11/4/14 | 5.51 | 4433.90 | 4427.70 | 32.13 | 4425.4 | 4419.7 | 40.64 |
| 11/5/14 | 5.51 | 4433.90 | 4427.70 | 32.10 | 4425.3 | 4419.7 | 40.65 |
| 11/6/14 | 5.52 | 4433.90 | 4427.80 | 32.06 | 4425.3 | 4419.7 | 40.66 |
| 11/7/14 | 5.52 | 4434.00 | 4427.80 | 32.03 | 4425.3 | 4419.7 | 40.68 |
| 11/8/14 | 5.52 | 4434.00 | 4427.80 | 31.99 | 4425.3 | 4419.7 | 40.69 |
| 11/9/14 | 5.53 | 4434.00 | 4427.90 | 31.96 | 4425.3 | 4419.7 | 40.70 |
| 11/10/14 | 5.53 | 4434.10 | 4427.90 | 31.93 | 4425.3 | 4419.7 | 40.71 |
| 11/11/14 | 5.53 | 4434.10 | 4428.00 | 31.89 | 4425.3 | 4419.7 | 40.73 |
| 11/12/14 | 5.53 | 4434.10 | 4428.00 | 31.86 | 4425.3 | 4419.7 | 40.74 |
| 11/13/14 | 5.54 | 4434.20 | 4428.00 | 31.82 | 4425.2 | 4419.7 | 40.75 |
| 11/14/14 | 5.54 | 4434.20 | 4428.10 | 31.79 | 4425.2 | 4419.7 | 40.76 |
| 11/15/14 | 5.54 | 4434.20 | 4428.10 | 31.76 | 4425.2 | 4419.7 | 40.78 |
| 11/16/14 | 5.54 | 4434.30 | 4428.20 | 31.72 | 4425.2 | 4419.7 | 40.79 |
| 11/17/14 | 5.55 | 4434.30 | 4428.20 | 31.69 | 4425.2 | 4419.7 | 40.80 |
| 11/18/14 | 5.55 | 4434.30 | 4428.20 | 31.65 | 4425.2 | 4419.7 | 40.81 |
| 11/19/14 | 5.55 | 4434.40 | 4428.30 | 31.62 | 4425.2 | 4419.7 | 40.83 |
| 11/20/14 | 5.56 | 4434.40 | 4428.30 | 31.59 | 4425.2 | 4419.7 | 40.84 |
| 11/21/14 | 5.56 | 4434.40 | 4428.40 | 31.55 | 4425.1 | 4419.7 | 40.85 |
| 11/22/14 | 5.56 | 4434.50 | 4428.40 | 31.52 | 4425.1 | 4419.7 | 40.86 |
| 11/23/14 | 5.56 | 4434.50 | 4428.50 | 31.49 | 4425.1 | 4419.7 | 40.88 |
| 11/24/14 | 5.57 | 4434.50 | 4428.50 | 31.45 | 4425.1 | 4419.7 | 40.89 |
| 11/25/14 | 5.57 | 4434.60 | 4428.50 | 31.42 | 4425.1 | 4419.7 | 40.90 |

## Appendix E
## Table 1 Tailings and Pond Elevations for North and South Cells

| | | North Cell | | | South Cell | | |
|---|---|---|---|---|---|---|---|
| Date | Year Fraction | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) |
| 11/26/14 | 5.57 | 4434.60 | 4428.60 | 31.39 | 4425.1 | 4419.7 | 40.91 |
| 11/27/14 | 5.57 | 4434.60 | 4428.60 | 31.35 | 4425.1 | 4419.7 | 40.93 |
| 11/28/14 | 5.58 | 4434.70 | 4428.70 | 31.32 | 4425.1 | 4419.7 | 40.94 |
| 11/29/14 | 5.58 | 4434.70 | 4428.70 | 31.28 | 4425.0 | 4419.7 | 40.95 |
| 11/30/14 | 5.58 | 4434.80 | 4428.70 | 31.25 | 4425.0 | 4419.7 | 40.96 |
| 12/1/14 | 5.59 | 4434.80 | 4428.80 | 31.22 | 4425.0 | 4419.7 | 40.98 |
| 12/2/14 | 5.59 | 4434.80 | 4428.80 | 31.18 | 4425.0 | 4419.7 | 40.98 |
| 12/3/14 | 5.59 | 4434.90 | 4428.90 | 31.14 | 4425.0 | 4419.7 | 40.99 |
| 12/4/14 | 5.59 | 4434.90 | 4428.90 | 31.11 | 4425.0 | 4419.7 | 41.00 |
| 12/5/14 | 5.60 | 4434.90 | 4428.90 | 31.07 | 4425.0 | 4419.7 | 41.01 |
| 12/6/14 | 5.60 | 4435.00 | 4429.00 | 31.03 | 4425.0 | 4419.7 | 41.02 |
| 12/7/14 | 5.60 | 4435.00 | 4429.00 | 31.00 | 4425.0 | 4419.7 | 41.03 |
| 12/8/14 | 5.60 | 4435.00 | 4429.10 | 30.96 | 4425.0 | 4419.7 | 41.03 |
| 12/9/14 | 5.61 | 4435.10 | 4429.10 | 30.93 | 4425.0 | 4419.7 | 41.04 |
| 12/10/14 | 5.61 | 4435.10 | 4429.20 | 30.89 | 4424.9 | 4419.7 | 41.05 |
| 12/11/14 | 5.61 | 4435.10 | 4429.20 | 30.85 | 4424.9 | 4419.7 | 41.06 |
| 12/12/14 | 5.62 | 4435.20 | 4429.20 | 30.82 | 4424.9 | 4419.7 | 41.07 |
| 12/13/14 | 5.62 | 4435.20 | 4429.30 | 30.78 | 4424.9 | 4419.7 | 41.08 |
| 12/14/14 | 5.62 | 4435.30 | 4429.30 | 30.74 | 4424.9 | 4419.7 | 41.09 |
| 12/15/14 | 5.62 | 4435.30 | 4429.40 | 30.71 | 4424.9 | 4419.7 | 41.09 |
| 12/16/14 | 5.63 | 4435.30 | 4429.40 | 30.67 | 4424.9 | 4419.7 | 41.10 |
| 12/17/14 | 5.63 | 4435.40 | 4429.40 | 30.63 | 4424.9 | 4419.7 | 41.11 |
| 12/18/14 | 5.63 | 4435.40 | 4429.50 | 30.60 | 4424.9 | 4419.7 | 41.12 |
| 12/19/14 | 5.63 | 4435.40 | 4429.50 | 30.56 | 4424.9 | 4419.7 | 41.13 |
| 12/20/14 | 5.64 | 4435.50 | 4429.60 | 30.53 | 4424.9 | 4419.7 | 41.14 |
| 12/21/14 | 5.64 | 4435.50 | 4429.60 | 30.49 | 4424.9 | 4419.7 | 41.14 |
| 12/22/14 | 5.64 | 4435.50 | 4429.60 | 30.45 | 4424.8 | 4419.7 | 41.15 |
| 12/23/14 | 5.65 | 4435.60 | 4429.70 | 30.42 | 4424.8 | 4419.7 | 41.16 |
| 12/24/14 | 5.65 | 4435.60 | 4429.70 | 30.38 | 4424.8 | 4419.7 | 41.17 |
| 12/25/14 | 5.65 | 4435.70 | 4429.80 | 30.34 | 4424.8 | 4419.7 | 41.18 |
| 12/26/14 | 5.65 | 4435.70 | 4429.80 | 30.31 | 4424.8 | 4419.7 | 41.19 |
| 12/27/14 | 5.66 | 4435.70 | 4429.90 | 30.27 | 4424.8 | 4419.7 | 41.20 |
| 12/28/14 | 5.66 | 4435.80 | 4429.90 | 30.24 | 4424.8 | 4419.7 | 41.20 |
| 12/29/14 | 5.66 | 4435.80 | 4429.90 | 30.20 | 4424.8 | 4419.7 | 41.21 |
| 12/30/14 | 5.66 | 4435.80 | 4430.00 | 30.16 | 4424.8 | 4419.7 | 41.22 |
| 12/31/14 | 5.67 | 4435.90 | 4430.00 | 30.13 | 4424.8 | 4419.7 | 41.23 |
| 1/1/15 | 5.67 | 4435.90 | 4430.00 | 30.09 | 4424.8 | 4419.7 | 41.24 |
| 1/2/15 | 5.67 | 4435.90 | 4430.10 | 30.05 | 4424.8 | 4419.7 | 41.24 |
| 1/3/15 | 5.68 | 4436.00 | 4430.10 | 30.01 | 4424.8 | 4419.7 | 41.25 |
| 1/4/15 | 5.68 | 4436.00 | 4430.10 | 29.98 | 4424.7 | 4419.7 | 41.26 |
| 1/5/15 | 5.68 | 4436.10 | 4430.10 | 29.94 | 4424.7 | 4419.7 | 41.26 |
| 1/6/15 | 5.68 | 4436.10 | 4430.10 | 29.90 | 4424.7 | 4419.7 | 41.27 |
| 1/7/15 | 5.69 | 4436.10 | 4430.20 | 29.86 | 4424.7 | 4419.7 | 41.28 |
| 1/8/15 | 5.69 | 4436.20 | 4430.20 | 29.82 | 4424.7 | 4419.7 | 41.28 |
| 1/9/15 | 5.69 | 4436.20 | 4430.20 | 29.78 | 4424.7 | 4419.7 | 41.29 |
| 1/10/15 | 5.69 | 4436.30 | 4430.20 | 29.74 | 4424.7 | 4419.7 | 41.29 |
| 1/11/15 | 5.70 | 4436.30 | 4430.30 | 29.71 | 4424.7 | 4419.7 | 41.30 |
| 1/12/15 | 5.70 | 4436.30 | 4430.30 | 29.67 | 4424.7 | 4419.7 | 41.31 |
| 1/13/15 | 5.70 | 4436.40 | 4430.30 | 29.63 | 4424.7 | 4419.7 | 41.31 |
| 1/14/15 | 5.71 | 4436.40 | 4430.30 | 29.59 | 4424.7 | 4419.7 | 41.32 |
| 1/15/15 | 5.71 | 4436.40 | 4430.30 | 29.55 | 4424.7 | 4419.7 | 41.33 |
| 1/16/15 | 5.71 | 4436.50 | 4430.40 | 29.51 | 4424.7 | 4419.7 | 41.33 |
| 1/17/15 | 5.71 | 4436.50 | 4430.40 | 29.48 | 4424.7 | 4419.7 | 41.34 |
| 1/18/15 | 5.72 | 4436.60 | 4430.40 | 29.44 | 4424.7 | 4419.7 | 41.34 |
| 1/19/15 | 5.72 | 4436.60 | 4430.40 | 29.40 | 4424.6 | 4419.7 | 41.35 |

**Appendix E**
**Table 1  Tailings and Pond Elevations for North and South Cells**

| | Year | North Cell | | | South Cell | | |
|---|---|---|---|---|---|---|---|
| Date | Fraction | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) |
| 1/20/15 | 5.72 | 4436.60 | 4430.50 | 29.36 | 4424.6 | 4419.7 | 41.36 |
| 1/21/15 | 5.72 | 4436.70 | 4430.50 | 29.32 | 4424.6 | 4419.7 | 41.36 |
| 1/22/15 | 5.73 | 4436.70 | 4430.50 | 29.29 | 4424.6 | 4419.7 | 41.37 |
| 1/23/15 | 5.73 | 4436.80 | 4430.50 | 29.25 | 4424.6 | 4419.7 | 41.38 |
| 1/24/15 | 5.73 | 4436.80 | 4430.50 | 29.21 | 4424.6 | 4419.7 | 41.38 |
| 1/25/15 | 5.74 | 4436.80 | 4430.60 | 29.17 | 4424.6 | 4419.7 | 41.39 |
| 1/26/15 | 5.74 | 4436.90 | 4430.60 | 29.13 | 4424.6 | 4419.7 | 41.40 |
| 1/27/15 | 5.74 | 4436.90 | 4430.60 | 29.09 | 4424.6 | 4419.7 | 41.40 |
| 1/28/15 | 5.74 | 4436.90 | 4430.60 | 29.06 | 4424.6 | 4419.7 | 41.41 |
| 1/29/15 | 5.75 | 4437.00 | 4430.70 | 29.02 | 4424.6 | 4419.7 | 41.41 |
| 1/30/15 | 5.75 | 4437.00 | 4430.70 | 28.98 | 4424.6 | 4419.7 | 41.42 |
| 1/31/15 | 5.75 | 4437.10 | 4430.70 | 28.94 | 4424.6 | 4419.7 | 41.43 |
| 2/1/15 | 5.76 | 4437.10 | 4430.70 | 28.90 | 4424.6 | 4419.7 | 41.43 |
| 2/2/15 | 5.76 | 4437.10 | 4430.70 | 28.87 | 4424.6 | 4419.7 | 41.44 |
| 2/3/15 | 5.76 | 4437.20 | 4430.80 | 28.83 | 4424.6 | 4419.7 | 41.45 |
| 2/4/15 | 5.76 | 4437.20 | 4430.80 | 28.79 | 4424.5 | 4419.7 | 41.45 |
| 2/5/15 | 5.77 | 4437.30 | 4430.80 | 28.75 | 4424.5 | 4419.7 | 41.46 |
| 2/6/15 | 5.77 | 4437.30 | 4430.80 | 28.71 | 4424.5 | 4419.7 | 41.46 |
| 2/7/15 | 5.77 | 4437.30 | 4430.90 | 28.67 | 4424.5 | 4419.7 | 41.47 |
| 2/8/15 | 5.77 | 4437.40 | 4430.90 | 28.64 | 4424.5 | 4419.7 | 41.47 |
| 2/9/15 | 5.78 | 4437.40 | 4430.90 | 28.60 | 4424.5 | 4419.7 | 41.48 |
| 2/10/15 | 5.78 | 4437.40 | 4430.90 | 28.56 | 4424.5 | 4419.7 | 41.49 |
| 2/11/15 | 5.78 | 4437.50 | 4430.90 | 28.52 | 4424.5 | 4419.7 | 41.49 |
| 2/12/15 | 5.79 | 4437.50 | 4431.00 | 28.48 | 4424.5 | 4419.7 | 41.50 |
| 2/13/15 | 5.79 | 4437.60 | 4431.00 | 28.44 | 4424.5 | 4419.7 | 41.50 |
| 2/14/15 | 5.79 | 4437.60 | 4431.00 | 28.41 | 4424.5 | 4419.7 | 41.51 |
| 2/15/15 | 5.79 | 4437.60 | 4431.00 | 28.37 | 4424.5 | 4419.7 | 41.52 |
| 2/16/15 | 5.80 | 4437.70 | 4431.10 | 28.33 | 4424.5 | 4419.7 | 41.52 |
| 2/17/15 | 5.80 | 4437.70 | 4431.10 | 28.29 | 4424.5 | 4419.7 | 41.53 |
| 2/18/15 | 5.80 | 4437.70 | 4431.10 | 28.25 | 4424.5 | 4419.7 | 41.53 |
| 2/19/15 | 5.80 | 4437.80 | 4431.10 | 28.22 | 4424.5 | 4419.7 | 41.54 |
| 2/20/15 | 5.81 | 4437.80 | 4431.10 | 28.18 | 4424.5 | 4419.7 | 41.55 |
| 2/21/15 | 5.81 | 4437.90 | 4431.20 | 28.14 | 4424.4 | 4419.7 | 41.55 |
| 2/22/15 | 5.81 | 4437.90 | 4431.20 | 28.10 | 4424.4 | 4419.7 | 41.56 |
| 2/23/15 | 5.82 | 4437.90 | 4431.20 | 28.06 | 4424.4 | 4419.7 | 41.56 |
| 2/24/15 | 5.82 | 4438.00 | 4431.20 | 28.03 | 4424.4 | 4419.7 | 41.57 |
| 2/25/15 | 5.82 | 4438.00 | 4431.30 | 27.99 | 4424.4 | 4419.7 | 41.58 |
| 2/26/15 | 5.82 | 4438.10 | 4431.30 | 27.95 | 4424.4 | 4419.7 | 41.58 |
| 2/27/15 | 5.83 | 4438.10 | 4431.30 | 27.91 | 4424.4 | 4419.7 | 41.59 |
| 2/28/15 | 5.83 | 4438.10 | 4431.30 | 27.87 | 4424.4 | 4419.7 | 41.59 |
| 3/1/15 | 5.83 | 4438.20 | 4431.30 | 27.84 | 4424.4 | 4419.7 | 41.60 |
| 3/2/15 | 5.83 | 4438.20 | 4431.40 | 27.80 | 4424.4 | 4419.7 | 41.61 |
| 3/3/15 | 5.84 | 4438.20 | 4431.40 | 27.76 | 4424.4 | 4419.7 | 41.61 |
| 3/4/15 | 5.84 | 4438.30 | 4431.40 | 27.72 | 4424.4 | 4419.7 | 41.62 |
| 3/5/15 | 5.84 | 4438.30 | 4431.40 | 27.68 | 4424.4 | 4419.7 | 41.62 |
| 3/6/15 | 5.85 | 4438.40 | 4431.50 | 27.64 | 4424.4 | 4419.7 | 41.63 |
| 3/7/15 | 5.85 | 4438.40 | 4431.50 | 27.60 | 4424.4 | 4419.7 | 41.63 |
| 3/8/15 | 5.85 | 4438.40 | 4431.50 | 27.56 | 4424.4 | 4419.7 | 41.63 |
| 3/9/15 | 5.85 | 4438.50 | 4431.50 | 27.52 | 4424.4 | 4419.7 | 41.64 |
| 3/10/15 | 5.86 | 4438.50 | 4431.50 | 27.48 | 4424.4 | 4419.7 | 41.64 |
| 3/11/15 | 5.86 | 4438.60 | 4431.60 | 27.44 | 4424.4 | 4419.7 | 41.65 |
| 3/12/15 | 5.86 | 4438.60 | 4431.60 | 27.40 | 4424.3 | 4419.7 | 41.65 |
| 3/13/15 | 5.86 | 4438.60 | 4431.60 | 27.36 | 4424.3 | 4419.7 | 41.66 |
| 3/14/15 | 5.87 | 4438.70 | 4431.60 | 27.32 | 4424.3 | 4419.7 | 41.66 |
| 3/15/15 | 5.87 | 4438.70 | 4431.70 | 27.28 | 4424.3 | 4419.7 | 41.67 |

## Appendix E
## Table 1  Tailings and Pond Elevations for North and South Cells

| Date | Year Fraction | North Cell | | | South Cell | | |
|---|---|---|---|---|---|---|---|
| | | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) |
| 3/16/15 | 5.87 | 4438.80 | 4431.70 | 27.24 | 4424.3 | 4419.7 | 41.67 |
| 3/17/15 | 5.88 | 4438.80 | 4431.70 | 27.20 | 4424.3 | 4419.7 | 41.68 |
| 3/18/15 | 5.88 | 4438.80 | 4431.70 | 27.16 | 4424.3 | 4419.7 | 41.68 |
| 3/19/15 | 5.88 | 4438.90 | 4431.80 | 27.12 | 4424.3 | 4419.7 | 41.69 |
| 3/20/15 | 5.88 | 4438.90 | 4431.80 | 27.08 | 4424.3 | 4419.7 | 41.69 |
| 3/21/15 | 5.89 | 4439.00 | 4431.80 | 27.04 | 4424.3 | 4419.7 | 41.70 |
| 3/22/15 | 5.89 | 4439.00 | 4431.80 | 27.00 | 4424.3 | 4419.7 | 41.70 |
| 3/23/15 | 5.89 | 4439.00 | 4431.80 | 26.96 | 4424.3 | 4419.7 | 41.71 |
| 3/24/15 | 5.89 | 4439.00 | 4431.80 | 26.96 | 4424.3 | 4419.7 | 41.68 |
| 3/25/15 | 5.90 | 4439.00 | 4431.80 | 26.97 | 4424.3 | 4419.7 | 41.66 |
| 3/26/15 | 5.90 | 4439.00 | 4431.80 | 26.97 | 4424.4 | 4419.7 | 41.63 |
| 3/27/15 | 5.90 | 4439.00 | 4431.80 | 26.97 | 4424.4 | 4419.8 | 41.61 |
| 3/28/15 | 5.91 | 4439.00 | 4431.80 | 26.98 | 4424.4 | 4419.8 | 41.58 |
| 3/29/15 | 5.91 | 4439.00 | 4431.80 | 26.98 | 4424.4 | 4419.8 | 41.55 |
| 3/30/15 | 5.91 | 4439.00 | 4431.80 | 26.99 | 4424.5 | 4419.8 | 41.53 |
| 3/31/15 | 5.91 | 4439.00 | 4431.80 | 26.99 | 4424.5 | 4419.8 | 41.50 |
| 4/1/15 | 5.92 | 4439.00 | 4431.80 | 27.00 | 4424.5 | 4419.8 | 41.48 |
| 4/2/15 | 5.92 | 4439.00 | 4431.80 | 27.01 | 4424.5 | 4419.9 | 41.45 |
| 4/3/15 | 5.92 | 4439.00 | 4431.80 | 27.02 | 4424.6 | 4419.9 | 41.43 |
| 4/4/15 | 5.92 | 4439.00 | 4431.80 | 27.02 | 4424.6 | 4419.9 | 41.41 |
| 4/5/15 | 5.93 | 4439.00 | 4431.80 | 27.03 | 4424.6 | 4419.9 | 41.39 |
| 4/6/15 | 5.93 | 4439.00 | 4431.80 | 27.04 | 4424.6 | 4419.9 | 41.36 |
| 4/7/15 | 5.93 | 4438.90 | 4431.80 | 27.05 | 4424.7 | 4419.9 | 41.34 |
| 4/8/15 | 5.94 | 4438.90 | 4431.80 | 27.06 | 4424.7 | 4420.0 | 41.32 |
| 4/9/15 | 5.94 | 4438.90 | 4431.80 | 27.07 | 4424.7 | 4420.0 | 41.30 |
| 4/10/15 | 5.94 | 4438.90 | 4431.80 | 27.08 | 4424.7 | 4420.0 | 41.28 |
| 4/11/15 | 5.94 | 4438.90 | 4431.80 | 27.09 | 4424.7 | 4420.0 | 41.25 |
| 4/12/15 | 5.95 | 4438.90 | 4431.80 | 27.10 | 4424.8 | 4420.0 | 41.23 |
| 4/13/15 | 5.95 | 4438.90 | 4431.80 | 27.11 | 4424.8 | 4420.0 | 41.21 |
| 4/14/15 | 5.95 | 4438.90 | 4431.80 | 27.12 | 4424.8 | 4420.1 | 41.19 |
| 4/15/15 | 5.95 | 4438.90 | 4431.80 | 27.13 | 4424.8 | 4420.1 | 41.16 |
| 4/16/15 | 5.96 | 4438.90 | 4431.80 | 27.14 | 4424.9 | 4420.1 | 41.14 |
| 4/17/15 | 5.96 | 4438.90 | 4431.80 | 27.15 | 4424.9 | 4420.1 | 41.12 |
| 4/18/15 | 5.96 | 4438.80 | 4431.80 | 27.16 | 4424.9 | 4420.1 | 41.10 |
| 4/19/15 | 5.97 | 4438.80 | 4431.80 | 27.17 | 4424.9 | 4420.1 | 41.07 |
| 4/20/15 | 5.97 | 4438.80 | 4431.80 | 27.18 | 4424.9 | 4420.1 | 41.05 |
| 4/21/15 | 5.97 | 4438.80 | 4431.80 | 27.19 | 4425.0 | 4420.2 | 41.03 |
| 4/22/15 | 5.97 | 4438.80 | 4431.80 | 27.20 | 4425.0 | 4420.2 | 41.01 |
| 4/23/15 | 5.98 | 4438.80 | 4431.80 | 27.21 | 4425.0 | 4420.2 | 40.99 |
| 4/24/15 | 5.98 | 4438.80 | 4431.80 | 27.22 | 4425.0 | 4420.2 | 40.96 |
| 4/25/15 | 5.98 | 4438.80 | 4431.80 | 27.23 | 4425.1 | 4420.2 | 40.94 |
| 4/26/15 | 5.98 | 4438.80 | 4431.80 | 27.24 | 4425.1 | 4420.2 | 40.92 |
| 4/27/15 | 5.99 | 4438.80 | 4431.80 | 27.25 | 4425.1 | 4420.3 | 40.90 |
| 4/28/15 | 5.99 | 4438.70 | 4431.80 | 27.26 | 4425.1 | 4420.3 | 40.87 |
| 4/29/15 | 5.99 | 4438.70 | 4431.80 | 27.27 | 4425.1 | 4420.3 | 40.85 |
| 4/30/15 | 6.00 | 4438.70 | 4431.80 | 27.28 | 4425.2 | 4420.3 | 40.83 |
| 5/1/15 | 6.00 | 4438.70 | 4431.80 | 27.28 | 4425.2 | 4420.3 | 40.81 |
| 5/2/15 | 6.00 | 4438.70 | 4431.80 | 27.30 | 4425.2 | 4420.3 | 40.79 |
| 5/3/15 | 6.00 | 4438.70 | 4431.80 | 27.31 | 4425.2 | 4420.3 | 40.76 |
| 5/4/15 | 6.01 | 4438.70 | 4431.80 | 27.32 | 4425.3 | 4420.4 | 40.74 |
| 5/5/15 | 6.01 | 4438.70 | 4431.80 | 27.33 | 4425.3 | 4420.4 | 40.72 |
| 5/6/15 | 6.01 | 4438.70 | 4431.80 | 27.34 | 4425.3 | 4420.4 | 40.70 |
| 5/7/15 | 6.02 | 4438.70 | 4431.80 | 27.35 | 4425.3 | 4420.4 | 40.68 |
| 5/8/15 | 6.02 | 4438.60 | 4431.80 | 27.36 | 4425.3 | 4420.4 | 40.66 |
| 5/9/15 | 6.02 | 4438.60 | 4431.80 | 27.37 | 4425.4 | 4420.4 | 40.64 |

**Appendix E**

**Table 1 Tailings and Pond Elevations for North and South Cells**

| | | North Cell | | | South Cell | | |
|---|---|---|---|---|---|---|---|
| Date | Year Fraction | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) |
| 5/10/15 | 6.02 | 4438.60 | 4431.80 | 27.38 | 4425.4 | 4420.5 | 40.62 |
| 5/11/15 | 6.03 | 4438.60 | 4431.80 | 27.39 | 4425.4 | 4420.5 | 40.59 |
| 5/12/15 | 6.03 | 4438.60 | 4431.80 | 27.40 | 4425.4 | 4420.5 | 40.57 |
| 5/13/15 | 6.03 | 4438.60 | 4431.80 | 27.41 | 4425.4 | 4420.5 | 40.55 |
| 5/14/15 | 6.03 | 4438.60 | 4431.80 | 27.42 | 4425.5 | 4420.5 | 40.53 |
| 5/15/15 | 6.04 | 4438.60 | 4431.80 | 27.43 | 4425.5 | 4420.5 | 40.51 |
| 5/16/15 | 6.04 | 4438.60 | 4431.80 | 27.44 | 4425.5 | 4420.5 | 40.49 |
| 5/17/15 | 6.04 | 4438.50 | 4431.80 | 27.45 | 4425.5 | 4420.6 | 40.47 |
| 5/18/15 | 6.05 | 4438.50 | 4431.80 | 27.46 | 4425.6 | 4420.6 | 40.45 |
| 5/19/15 | 6.05 | 4438.50 | 4431.80 | 27.48 | 4425.6 | 4420.6 | 40.42 |
| 5/20/15 | 6.05 | 4438.50 | 4431.80 | 27.49 | 4425.6 | 4420.6 | 40.40 |
| 5/21/15 | 6.05 | 4438.50 | 4431.80 | 27.50 | 4425.6 | 4420.6 | 40.38 |
| 5/22/15 | 6.06 | 4438.50 | 4431.80 | 27.51 | 4425.6 | 4420.6 | 40.36 |
| 5/23/15 | 6.06 | 4438.50 | 4431.80 | 27.52 | 4425.7 | 4420.7 | 40.34 |
| 5/24/15 | 6.06 | 4438.50 | 4431.80 | 27.53 | 4425.7 | 4420.7 | 40.32 |
| 5/25/15 | 6.06 | 4438.50 | 4431.80 | 27.54 | 4425.7 | 4420.7 | 40.30 |
| 5/26/15 | 6.07 | 4438.50 | 4431.80 | 27.55 | 4425.7 | 4420.7 | 40.28 |
| 5/27/15 | 6.07 | 4438.40 | 4431.80 | 27.56 | 4425.7 | 4420.7 | 40.25 |
| 5/28/15 | 6.07 | 4438.40 | 4431.80 | 27.57 | 4425.8 | 4420.7 | 40.23 |
| 5/29/15 | 6.08 | 4438.40 | 4431.80 | 27.58 | 4425.8 | 4420.7 | 40.21 |
| 5/30/15 | 6.08 | 4438.40 | 4431.80 | 27.59 | 4425.8 | 4420.8 | 40.19 |
| 5/31/15 | 6.08 | 4438.40 | 4431.80 | 27.60 | 4425.8 | 4420.8 | 40.17 |
| 6/1/15 | 6.08 | 4438.40 | 4431.80 | 27.61 | 4425.9 | 4420.8 | 40.15 |
| 6/2/15 | 6.09 | 4438.40 | 4431.80 | 27.63 | 4425.9 | 4420.8 | 40.13 |
| 6/3/15 | 6.09 | 4438.40 | 4431.80 | 27.64 | 4425.9 | 4420.8 | 40.11 |
| 6/4/15 | 6.09 | 4438.30 | 4431.80 | 27.66 | 4425.9 | 4420.8 | 40.10 |
| 6/5/15 | 6.09 | 4438.30 | 4431.80 | 27.67 | 4425.9 | 4420.9 | 40.08 |
| 6/6/15 | 6.10 | 4438.30 | 4431.80 | 27.68 | 4425.9 | 4420.9 | 40.06 |
| 6/7/15 | 6.10 | 4438.30 | 4431.80 | 27.70 | 4426.0 | 4420.9 | 40.04 |
| 6/8/15 | 6.10 | 4438.30 | 4431.80 | 27.71 | 4426.0 | 4420.9 | 40.02 |
| 6/9/15 | 6.11 | 4438.30 | 4431.80 | 27.73 | 4426.0 | 4420.9 | 40.01 |
| 6/10/15 | 6.11 | 4438.30 | 4431.80 | 27.74 | 4426.0 | 4420.9 | 39.99 |
| 6/11/15 | 6.11 | 4438.20 | 4431.80 | 27.76 | 4426.0 | 4421.0 | 39.97 |
| 6/12/15 | 6.11 | 4438.20 | 4431.80 | 27.77 | 4426.0 | 4421.0 | 39.95 |
| 6/13/15 | 6.12 | 4438.20 | 4431.80 | 27.78 | 4426.1 | 4421.0 | 39.94 |
| 6/14/15 | 6.12 | 4438.20 | 4431.80 | 27.80 | 4426.1 | 4421.0 | 39.92 |
| 6/15/15 | 6.12 | 4438.20 | 4431.80 | 27.81 | 4426.1 | 4421.0 | 39.90 |
| 6/16/15 | 6.12 | 4438.20 | 4431.80 | 27.83 | 4426.1 | 4421.0 | 39.88 |
| 6/17/15 | 6.13 | 4438.20 | 4431.80 | 27.84 | 4426.1 | 4421.0 | 39.87 |
| 6/18/15 | 6.13 | 4438.10 | 4431.80 | 27.86 | 4426.2 | 4421.1 | 39.85 |
| 6/19/15 | 6.13 | 4438.10 | 4431.80 | 27.87 | 4426.2 | 4421.1 | 39.83 |
| 6/20/15 | 6.14 | 4438.10 | 4431.80 | 27.88 | 4426.2 | 4421.1 | 39.81 |
| 6/21/15 | 6.14 | 4438.10 | 4431.80 | 27.90 | 4426.2 | 4421.1 | 39.80 |
| 6/22/15 | 6.14 | 4438.10 | 4431.80 | 27.91 | 4426.2 | 4421.1 | 39.78 |
| 6/23/15 | 6.14 | 4438.10 | 4431.80 | 27.93 | 4426.2 | 4421.1 | 39.76 |
| 6/24/15 | 6.15 | 4438.10 | 4431.80 | 27.94 | 4426.3 | 4421.2 | 39.74 |
| 6/25/15 | 6.15 | 4438.00 | 4431.80 | 27.96 | 4426.3 | 4421.2 | 39.72 |
| 6/26/15 | 6.15 | 4438.00 | 4431.80 | 27.97 | 4426.3 | 4421.2 | 39.71 |
| 6/27/15 | 6.15 | 4438.00 | 4431.80 | 27.98 | 4426.3 | 4421.2 | 39.69 |
| 6/28/15 | 6.16 | 4438.00 | 4431.80 | 28.00 | 4426.3 | 4421.2 | 39.67 |
| 6/29/15 | 6.16 | 4438.00 | 4431.80 | 28.01 | 4426.3 | 4421.2 | 39.65 |
| 6/30/15 | 6.16 | 4438.00 | 4431.80 | 28.03 | 4426.4 | 4421.2 | 39.64 |
| 7/1/15 | 6.17 | 4438.00 | 4431.80 | 28.04 | 4426.4 | 4421.3 | 39.62 |
| 7/2/15 | 6.17 | 4437.90 | 4431.80 | 28.06 | 4426.4 | 4421.3 | 39.61 |
| 7/3/15 | 6.17 | 4437.90 | 4431.80 | 28.08 | 4426.4 | 4421.3 | 39.60 |

**Appendix E**
**Table 1  Tailings and Pond Elevations for North and South Cells**

| | Year | North Cell | | | South Cell | | |
|---|---|---|---|---|---|---|---|
| Date | Fraction | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) |
| 7/4/15 | 6.17 | 4437.90 | 4431.80 | 28.11 | 4426.4 | 4421.3 | 39.59 |
| 7/5/15 | 6.18 | 4437.90 | 4431.80 | 28.13 | 4426.4 | 4421.3 | 39.58 |
| 7/6/15 | 6.18 | 4437.80 | 4431.80 | 28.15 | 4426.4 | 4421.3 | 39.57 |
| 7/7/15 | 6.18 | 4437.80 | 4431.80 | 28.17 | 4426.4 | 4421.4 | 39.56 |
| 7/8/15 | 6.18 | 4437.80 | 4431.80 | 28.19 | 4426.5 | 4421.4 | 39.55 |
| 7/9/15 | 6.19 | 4437.80 | 4431.80 | 28.22 | 4426.5 | 4421.4 | 39.54 |
| 7/10/15 | 6.19 | 4437.80 | 4431.80 | 28.24 | 4426.5 | 4421.4 | 39.52 |
| 7/11/15 | 6.19 | 4437.70 | 4431.80 | 28.26 | 4426.5 | 4421.4 | 39.51 |
| 7/12/15 | 6.20 | 4437.70 | 4431.80 | 28.28 | 4426.5 | 4421.4 | 39.50 |
| 7/13/15 | 6.20 | 4437.70 | 4431.80 | 28.30 | 4426.5 | 4421.4 | 39.49 |
| 7/14/15 | 6.20 | 4437.70 | 4431.80 | 28.33 | 4426.5 | 4421.5 | 39.48 |
| 7/15/15 | 6.20 | 4437.70 | 4431.80 | 28.35 | 4426.5 | 4421.5 | 39.47 |
| 7/16/15 | 6.21 | 4437.60 | 4431.80 | 28.37 | 4426.5 | 4421.5 | 39.46 |
| 7/17/15 | 6.21 | 4437.60 | 4431.80 | 28.39 | 4426.5 | 4421.5 | 39.45 |
| 7/18/15 | 6.21 | 4437.60 | 4431.80 | 28.41 | 4426.6 | 4421.5 | 39.44 |
| 7/19/15 | 6.21 | 4437.60 | 4431.80 | 28.43 | 4426.6 | 4421.5 | 39.43 |
| 7/20/15 | 6.22 | 4437.50 | 4431.80 | 28.46 | 4426.6 | 4421.6 | 39.42 |
| 7/21/15 | 6.22 | 4437.50 | 4431.80 | 28.48 | 4426.6 | 4421.6 | 39.41 |
| 7/22/15 | 6.22 | 4437.50 | 4431.80 | 28.50 | 4426.6 | 4421.6 | 39.40 |
| 7/23/15 | 6.23 | 4437.50 | 4431.80 | 28.52 | 4426.6 | 4421.6 | 39.39 |
| 7/24/15 | 6.23 | 4437.50 | 4431.80 | 28.54 | 4426.6 | 4421.6 | 39.38 |
| 7/25/15 | 6.23 | 4437.40 | 4431.80 | 28.56 | 4426.6 | 4421.6 | 39.37 |
| 7/26/15 | 6.23 | 4437.40 | 4431.80 | 28.58 | 4426.6 | 4421.7 | 39.36 |
| 7/27/15 | 6.24 | 4437.40 | 4431.80 | 28.61 | 4426.7 | 4421.7 | 39.35 |
| 7/28/15 | 6.24 | 4437.40 | 4431.80 | 28.63 | 4426.7 | 4421.7 | 39.34 |
| 7/29/15 | 6.24 | 4437.40 | 4431.80 | 28.65 | 4426.7 | 4421.7 | 39.33 |
| 7/30/15 | 6.25 | 4437.30 | 4431.80 | 28.67 | 4426.7 | 4421.7 | 39.32 |
| 7/31/15 | 6.25 | 4437.30 | 4431.80 | 28.69 | 4426.7 | 4421.7 | 39.31 |
| 8/1/15 | 6.25 | 4437.30 | 4431.80 | 28.71 | 4426.7 | 4421.7 | 39.29 |
| 8/2/15 | 6.25 | 4437.30 | 4431.80 | 28.73 | 4426.7 | 4421.8 | 39.28 |
| 8/3/15 | 6.26 | 4437.30 | 4431.80 | 28.75 | 4426.7 | 4421.8 | 39.27 |
| 8/4/15 | 6.26 | 4437.20 | 4431.80 | 28.76 | 4426.7 | 4421.8 | 39.26 |
| 8/5/15 | 6.26 | 4437.20 | 4431.80 | 28.78 | 4426.7 | 4421.8 | 39.25 |
| 8/6/15 | 6.26 | 4437.20 | 4431.80 | 28.80 | 4426.8 | 4421.8 | 39.24 |
| 8/7/15 | 6.27 | 4437.20 | 4431.80 | 28.82 | 4426.8 | 4421.8 | 39.23 |
| 8/8/15 | 6.27 | 4437.20 | 4431.80 | 28.83 | 4426.8 | 4421.9 | 39.22 |
| 8/9/15 | 6.27 | 4437.10 | 4431.80 | 28.85 | 4426.8 | 4421.9 | 39.21 |
| 8/10/15 | 6.28 | 4437.10 | 4431.80 | 28.87 | 4426.8 | 4421.9 | 39.20 |
| 8/11/15 | 6.28 | 4437.10 | 4431.80 | 28.88 | 4426.8 | 4421.9 | 39.19 |
| 8/12/15 | 6.28 | 4437.10 | 4431.80 | 28.90 | 4426.8 | 4421.9 | 39.18 |
| 8/13/15 | 6.28 | 4437.10 | 4431.80 | 28.92 | 4426.8 | 4421.9 | 39.17 |
| 8/14/15 | 6.29 | 4437.10 | 4431.80 | 28.94 | 4426.8 | 4421.9 | 39.16 |
| 8/15/15 | 6.29 | 4437.00 | 4431.80 | 28.95 | 4426.8 | 4422.0 | 39.15 |
| 8/16/15 | 6.29 | 4437.00 | 4431.80 | 28.97 | 4426.9 | 4422.0 | 39.14 |
| 8/17/15 | 6.29 | 4437.00 | 4431.80 | 28.99 | 4426.9 | 4422.0 | 39.13 |
| 8/18/15 | 6.30 | 4437.00 | 4431.80 | 29.00 | 4426.9 | 4422.0 | 39.12 |
| 8/19/15 | 6.30 | 4437.00 | 4431.80 | 29.02 | 4426.9 | 4422.0 | 39.11 |
| 8/20/15 | 6.30 | 4437.00 | 4431.80 | 29.04 | 4426.9 | 4422.0 | 39.10 |
| 8/21/15 | 6.31 | 4436.90 | 4431.80 | 29.05 | 4426.9 | 4422.1 | 39.09 |
| 8/22/15 | 6.31 | 4436.90 | 4431.80 | 29.07 | 4426.9 | 4422.1 | 39.08 |
| 8/23/15 | 6.31 | 4436.90 | 4431.80 | 29.09 | 4426.9 | 4422.1 | 39.07 |
| 8/24/15 | 6.31 | 4436.90 | 4431.80 | 29.10 | 4426.9 | 4422.1 | 39.06 |
| 8/25/15 | 6.32 | 4436.90 | 4431.80 | 29.12 | 4427.0 | 4422.1 | 39.05 |
| 8/26/15 | 6.32 | 4436.90 | 4431.80 | 29.14 | 4427.0 | 4422.1 | 39.04 |
| 8/27/15 | 6.32 | 4436.80 | 4431.80 | 29.15 | 4427.0 | 4422.1 | 39.03 |

**Appendix E**
**Table 1  Tailings and Pond Elevations for North and South Cells**

| | Year | North Cell | | | South Cell | | |
|---|---|---|---|---|---|---|---|
| Date | Fraction | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) |
| 8/28/15 | 6.32 | 4436.80 | 4431.80 | 29.17 | 4427.0 | 4422.2 | 39.02 |
| 8/29/15 | 6.33 | 4436.80 | 4431.80 | 29.19 | 4427.0 | 4422.2 | 39.01 |
| 8/30/15 | 6.33 | 4436.80 | 4431.80 | 29.21 | 4427.0 | 4422.2 | 39.00 |
| 8/31/15 | 6.33 | 4436.80 | 4431.80 | 29.22 | 4427.0 | 4422.2 | 38.99 |
| 9/1/15 | 6.34 | 4436.80 | 4431.80 | 29.24 | 4427.0 | 4422.2 | 38.98 |
| 9/2/15 | 6.34 | 4436.70 | 4431.80 | 29.25 | 4427.0 | 4422.2 | 38.97 |
| 9/3/15 | 6.34 | 4436.70 | 4431.80 | 29.27 | 4427.0 | 4422.3 | 38.96 |
| 9/4/15 | 6.34 | 4436.70 | 4431.80 | 29.29 | 4427.1 | 4422.3 | 38.95 |
| 9/5/15 | 6.35 | 4436.70 | 4431.80 | 29.30 | 4427.1 | 4422.3 | 38.94 |
| 9/6/15 | 6.35 | 4436.70 | 4431.80 | 29.32 | 4427.1 | 4422.3 | 38.93 |
| 9/7/15 | 6.35 | 4436.70 | 4431.80 | 29.34 | 4427.1 | 4422.3 | 38.92 |
| 9/8/15 | 6.35 | 4436.60 | 4431.80 | 29.35 | 4427.1 | 4422.3 | 38.91 |
| 9/9/15 | 6.36 | 4436.60 | 4431.80 | 29.37 | 4427.1 | 4422.3 | 38.89 |
| 9/10/15 | 6.36 | 4436.60 | 4431.80 | 29.38 | 4427.1 | 4422.4 | 38.88 |
| 9/11/15 | 6.36 | 4436.60 | 4431.80 | 29.40 | 4427.1 | 4422.4 | 38.87 |
| 9/12/15 | 6.37 | 4436.60 | 4431.80 | 29.42 | 4427.1 | 4422.4 | 38.86 |
| 9/13/15 | 6.37 | 4436.60 | 4431.80 | 29.43 | 4427.1 | 4422.4 | 38.85 |
| 9/14/15 | 6.37 | 4436.60 | 4431.80 | 29.45 | 4427.2 | 4422.4 | 38.84 |
| 9/15/15 | 6.37 | 4436.50 | 4431.80 | 29.46 | 4427.2 | 4422.4 | 38.83 |
| 9/16/15 | 6.38 | 4436.50 | 4431.80 | 29.48 | 4427.2 | 4422.5 | 38.82 |
| 9/17/15 | 6.38 | 4436.50 | 4431.80 | 29.50 | 4427.2 | 4422.5 | 38.81 |
| 9/18/15 | 6.38 | 4436.50 | 4431.80 | 29.51 | 4427.2 | 4422.5 | 38.80 |
| 9/19/15 | 6.38 | 4436.50 | 4431.80 | 29.53 | 4427.2 | 4422.5 | 38.79 |
| 9/20/15 | 6.39 | 4436.50 | 4431.80 | 29.54 | 4427.2 | 4422.5 | 38.78 |
| 9/21/15 | 6.39 | 4436.40 | 4431.80 | 29.56 | 4427.2 | 4422.5 | 38.77 |
| 9/22/15 | 6.39 | 4436.40 | 4431.80 | 29.57 | 4427.2 | 4422.6 | 38.76 |
| 9/23/15 | 6.40 | 4436.40 | 4431.80 | 29.59 | 4427.3 | 4422.6 | 38.75 |
| 9/24/15 | 6.40 | 4436.40 | 4431.80 | 29.61 | 4427.3 | 4422.6 | 38.74 |
| 9/25/15 | 6.40 | 4436.40 | 4431.80 | 29.62 | 4427.3 | 4422.6 | 38.73 |
| 9/26/15 | 6.40 | 4436.40 | 4431.80 | 29.64 | 4427.3 | 4422.6 | 38.72 |
| 9/27/15 | 6.41 | 4436.30 | 4431.80 | 29.65 | 4427.3 | 4422.6 | 38.71 |
| 9/28/15 | 6.41 | 4436.30 | 4431.80 | 29.67 | 4427.3 | 4422.6 | 38.70 |
| 9/29/15 | 6.41 | 4436.30 | 4431.80 | 29.68 | 4427.3 | 4422.7 | 38.69 |
| 9/30/15 | 6.41 | 4436.30 | 4431.80 | 29.70 | 4427.3 | 4422.7 | 38.68 |
| 10/1/15 | 6.42 | 4436.30 | 4431.80 | 29.72 | 4427.3 | 4422.7 | 38.67 |
| 10/2/15 | 6.42 | 4436.30 | 4431.80 | 29.73 | 4427.3 | 4422.7 | 38.65 |
| 10/3/15 | 6.42 | 4436.30 | 4431.80 | 29.74 | 4427.4 | 4422.7 | 38.64 |
| 10/4/15 | 6.43 | 4436.20 | 4431.80 | 29.76 | 4427.4 | 4422.7 | 38.63 |
| 10/5/15 | 6.43 | 4436.20 | 4431.80 | 29.77 | 4427.4 | 4422.8 | 38.61 |
| 10/6/15 | 6.43 | 4436.20 | 4431.80 | 29.78 | 4427.4 | 4422.8 | 38.60 |
| 10/7/15 | 6.43 | 4436.20 | 4431.80 | 29.79 | 4427.4 | 4422.8 | 38.59 |
| 10/8/15 | 6.44 | 4436.20 | 4431.80 | 29.81 | 4427.4 | 4422.8 | 38.57 |
| 10/9/15 | 6.44 | 4436.20 | 4431.80 | 29.82 | 4427.4 | 4422.8 | 38.56 |
| 10/10/15 | 6.44 | 4436.20 | 4431.80 | 29.83 | 4427.5 | 4422.8 | 38.55 |
| 10/11/15 | 6.44 | 4436.20 | 4431.80 | 29.85 | 4427.5 | 4422.8 | 38.53 |
| 10/12/15 | 6.45 | 4436.10 | 4431.80 | 29.86 | 4427.5 | 4422.9 | 38.52 |
| 10/13/15 | 6.45 | 4436.10 | 4431.80 | 29.87 | 4427.5 | 4422.9 | 38.50 |
| 10/14/15 | 6.45 | 4436.10 | 4431.80 | 29.89 | 4427.5 | 4422.9 | 38.49 |
| 10/15/15 | 6.46 | 4436.10 | 4431.80 | 29.90 | 4427.5 | 4422.9 | 38.48 |
| 10/16/15 | 6.46 | 4436.10 | 4431.80 | 29.91 | 4427.5 | 4422.9 | 38.46 |
| 10/17/15 | 6.46 | 4436.10 | 4431.80 | 29.93 | 4427.5 | 4422.9 | 38.45 |
| 10/18/15 | 6.46 | 4436.10 | 4431.80 | 29.94 | 4427.6 | 4423.0 | 38.44 |
| 10/19/15 | 6.47 | 4436.00 | 4431.80 | 29.95 | 4427.6 | 4423.0 | 38.42 |
| 10/20/15 | 6.47 | 4436.00 | 4431.80 | 29.96 | 4427.6 | 4423.0 | 38.41 |
| 10/21/15 | 6.47 | 4436.00 | 4431.80 | 29.98 | 4427.6 | 4423.0 | 38.40 |

**Appendix E**
**Table 1  Tailings and Pond Elevations for North and South Cells**

| | Year | North Cell | | | South Cell | | |
|---|---|---|---|---|---|---|---|
| Date | Fraction | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) |
| 10/22/15 | 6.48 | 4436.00 | 4431.80 | 29.99 | 4427.6 | 4423.0 | 38.38 |
| 10/23/15 | 6.48 | 4436.00 | 4431.80 | 30.00 | 4427.6 | 4423.0 | 38.37 |
| 10/24/15 | 6.48 | 4436.00 | 4431.80 | 30.02 | 4427.6 | 4423.0 | 38.36 |
| 10/25/15 | 6.48 | 4436.00 | 4431.80 | 30.03 | 4427.7 | 4423.1 | 38.34 |
| 10/26/15 | 6.49 | 4436.00 | 4431.80 | 30.04 | 4427.7 | 4423.1 | 38.33 |
| 10/27/15 | 6.49 | 4435.90 | 4431.80 | 30.05 | 4427.7 | 4423.1 | 38.32 |
| 10/28/15 | 6.49 | 4435.90 | 4431.80 | 30.07 | 4427.7 | 4423.1 | 38.30 |
| 10/29/15 | 6.49 | 4435.90 | 4431.80 | 30.08 | 4427.7 | 4423.1 | 38.29 |
| 10/30/15 | 6.50 | 4435.90 | 4431.80 | 30.09 | 4427.7 | 4423.1 | 38.28 |
| 10/31/15 | 6.50 | 4435.90 | 4431.80 | 30.11 | 4427.7 | 4423.2 | 38.26 |
| 11/1/15 | 6.50 | 4435.90 | 4431.80 | 30.12 | 4427.8 | 4423.2 | 38.25 |
| 11/2/15 | 6.51 | 4435.90 | 4431.80 | 30.13 | 4427.8 | 4423.2 | 38.23 |
| 11/3/15 | 6.51 | 4435.90 | 4431.80 | 30.14 | 4427.8 | 4423.2 | 38.21 |
| 11/4/15 | 6.51 | 4435.80 | 4431.80 | 30.15 | 4427.8 | 4423.2 | 38.20 |
| 11/5/15 | 6.51 | 4435.80 | 4431.80 | 30.16 | 4427.8 | 4423.2 | 38.18 |
| 11/6/15 | 6.52 | 4435.80 | 4431.80 | 30.17 | 4427.8 | 4423.3 | 38.16 |
| 11/7/15 | 6.52 | 4435.80 | 4431.80 | 30.19 | 4427.9 | 4423.3 | 38.14 |
| 11/8/15 | 6.52 | 4435.80 | 4431.80 | 30.20 | 4427.9 | 4423.3 | 38.12 |
| 11/9/15 | 6.52 | 4435.80 | 4431.80 | 30.21 | 4427.9 | 4423.3 | 38.11 |
| 11/10/15 | 6.53 | 4435.80 | 4431.80 | 30.22 | 4427.9 | 4423.3 | 38.09 |
| 11/11/15 | 6.53 | 4435.80 | 4431.80 | 30.23 | 4427.9 | 4423.3 | 38.07 |
| 11/12/15 | 6.53 | 4435.80 | 4431.80 | 30.24 | 4427.9 | 4423.3 | 38.05 |
| 11/13/15 | 6.54 | 4435.70 | 4431.80 | 30.25 | 4428.0 | 4423.4 | 38.03 |
| 11/14/15 | 6.54 | 4435.70 | 4431.80 | 30.26 | 4428.0 | 4423.4 | 38.02 |
| 11/15/15 | 6.54 | 4435.70 | 4431.80 | 30.27 | 4428.0 | 4423.4 | 38.00 |
| 11/16/15 | 6.54 | 4435.70 | 4431.80 | 30.29 | 4428.0 | 4423.4 | 37.98 |
| 11/17/15 | 6.55 | 4435.70 | 4431.80 | 30.30 | 4428.0 | 4423.4 | 37.96 |
| 11/18/15 | 6.55 | 4435.70 | 4431.80 | 30.31 | 4428.1 | 4423.4 | 37.95 |
| 11/19/15 | 6.55 | 4435.70 | 4431.80 | 30.32 | 4428.1 | 4423.5 | 37.93 |
| 11/20/15 | 6.55 | 4435.70 | 4431.80 | 30.33 | 4428.1 | 4423.5 | 37.91 |
| 11/21/15 | 6.56 | 4435.70 | 4431.80 | 30.34 | 4428.1 | 4423.5 | 37.89 |
| 11/22/15 | 6.56 | 4435.60 | 4431.80 | 30.35 | 4428.1 | 4423.5 | 37.87 |
| 11/23/15 | 6.56 | 4435.60 | 4431.80 | 30.36 | 4428.1 | 4423.5 | 37.86 |
| 11/24/15 | 6.57 | 4435.60 | 4431.80 | 30.37 | 4428.2 | 4423.5 | 37.84 |
| 11/25/15 | 6.57 | 4435.60 | 4431.80 | 30.39 | 4428.2 | 4423.5 | 37.82 |
| 11/26/15 | 6.57 | 4435.60 | 4431.80 | 30.40 | 4428.2 | 4423.6 | 37.80 |
| 11/27/15 | 6.57 | 4435.60 | 4431.80 | 30.41 | 4428.2 | 4423.6 | 37.79 |
| 11/28/15 | 6.58 | 4435.60 | 4431.80 | 30.42 | 4428.2 | 4423.6 | 37.77 |
| 11/29/15 | 6.58 | 4435.60 | 4431.80 | 30.43 | 4428.3 | 4423.6 | 37.75 |
| 11/30/15 | 6.58 | 4435.60 | 4431.80 | 30.44 | 4428.3 | 4423.6 | 37.73 |
| 12/1/15 | 6.58 | 4435.50 | 4431.80 | 30.45 | 4428.3 | 4423.6 | 37.71 |
| 12/2/15 | 6.59 | 4435.50 | 4431.80 | 30.46 | 4428.3 | 4423.7 | 37.69 |
| 12/3/15 | 6.59 | 4435.50 | 4431.80 | 30.47 | 4428.3 | 4423.7 | 37.67 |
| 12/4/15 | 6.59 | 4435.50 | 4431.80 | 30.47 | 4428.4 | 4423.7 | 37.65 |
| 12/5/15 | 6.60 | 4435.50 | 4431.80 | 30.48 | 4428.4 | 4423.7 | 37.63 |
| 12/6/15 | 6.60 | 4435.50 | 4431.80 | 30.49 | 4428.4 | 4423.7 | 37.61 |
| 12/7/15 | 6.60 | 4435.50 | 4431.80 | 30.50 | 4428.4 | 4423.7 | 37.58 |
| 12/8/15 | 6.60 | 4435.50 | 4431.80 | 30.51 | 4428.4 | 4423.7 | 37.56 |
| 12/9/15 | 6.61 | 4435.50 | 4431.80 | 30.51 | 4428.5 | 4423.8 | 37.54 |
| 12/10/15 | 6.61 | 4435.50 | 4431.80 | 30.52 | 4428.5 | 4423.8 | 37.52 |
| 12/11/15 | 6.61 | 4435.50 | 4431.80 | 30.53 | 4428.5 | 4423.8 | 37.50 |
| 12/12/15 | 6.61 | 4435.50 | 4431.80 | 30.54 | 4428.5 | 4423.8 | 37.47 |
| 12/13/15 | 6.62 | 4435.50 | 4431.80 | 30.54 | 4428.5 | 4423.8 | 37.45 |
| 12/14/15 | 6.62 | 4435.40 | 4431.80 | 30.55 | 4428.6 | 4423.8 | 37.43 |
| 12/15/15 | 6.62 | 4435.40 | 4431.80 | 30.56 | 4428.6 | 4423.9 | 37.41 |

**Appendix E**

**Table 1 Tailings and Pond Elevations for North and South Cells**

| | Year | North Cell | | | South Cell | | |
|---|---|---|---|---|---|---|---|
| Date | Fraction | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) |
| 12/16/15 | 6.63 | 4435.40 | 4431.80 | 30.57 | 4428.6 | 4423.9 | 37.39 |
| 12/17/15 | 6.63 | 4435.40 | 4431.80 | 30.57 | 4428.6 | 4423.9 | 37.36 |
| 12/18/15 | 6.63 | 4435.40 | 4431.80 | 30.58 | 4428.7 | 4423.9 | 37.34 |
| 12/19/15 | 6.63 | 4435.40 | 4431.80 | 30.59 | 4428.7 | 4423.9 | 37.32 |
| 12/20/15 | 6.64 | 4435.40 | 4431.80 | 30.60 | 4428.7 | 4423.9 | 37.30 |
| 12/21/15 | 6.64 | 4435.40 | 4431.80 | 30.61 | 4428.7 | 4423.9 | 37.28 |
| 12/22/15 | 6.64 | 4435.40 | 4431.80 | 30.61 | 4428.7 | 4424.0 | 37.26 |
| 12/23/15 | 6.64 | 4435.40 | 4431.80 | 30.62 | 4428.8 | 4424.0 | 37.23 |
| 12/24/15 | 6.65 | 4435.40 | 4431.80 | 30.63 | 4428.8 | 4424.0 | 37.21 |
| 12/25/15 | 6.65 | 4435.40 | 4431.80 | 30.64 | 4428.8 | 4424.0 | 37.19 |
| 12/26/15 | 6.65 | 4435.40 | 4431.80 | 30.64 | 4428.8 | 4424.0 | 37.17 |
| 12/27/15 | 6.66 | 4435.30 | 4431.80 | 30.65 | 4428.9 | 4424.0 | 37.15 |
| 12/28/15 | 6.66 | 4435.30 | 4431.80 | 30.66 | 4428.9 | 4424.1 | 37.12 |
| 12/29/15 | 6.66 | 4435.30 | 4431.80 | 30.67 | 4428.9 | 4424.1 | 37.10 |
| 12/30/15 | 6.66 | 4435.30 | 4431.80 | 30.67 | 4428.9 | 4424.1 | 37.08 |
| 12/31/15 | 6.67 | 4435.30 | 4431.80 | 30.68 | 4428.9 | 4424.1 | 37.06 |
| 1/1/16 | 6.67 | 4435.30 | 4431.80 | 30.69 | 4429.0 | 4424.1 | 37.04 |
| 1/2/16 | 6.67 | 4435.30 | 4431.80 | 30.69 | 4429.0 | 4424.1 | 37.01 |
| 1/3/16 | 6.67 | 4435.30 | 4431.80 | 30.70 | 4429.0 | 4424.2 | 36.99 |
| 1/4/16 | 6.68 | 4435.30 | 4431.80 | 30.71 | 4429.0 | 4424.2 | 36.97 |
| 1/5/16 | 6.68 | 4435.30 | 4431.80 | 30.71 | 4429.1 | 4424.2 | 36.94 |
| 1/6/16 | 6.68 | 4435.30 | 4431.80 | 30.72 | 4429.1 | 4424.2 | 36.92 |
| 1/7/16 | 6.69 | 4435.30 | 4431.80 | 30.72 | 4429.1 | 4424.2 | 36.89 |
| 1/8/16 | 6.69 | 4435.30 | 4431.80 | 30.73 | 4429.1 | 4424.2 | 36.87 |
| 1/9/16 | 6.69 | 4435.30 | 4431.80 | 30.73 | 4429.2 | 4424.2 | 36.85 |
| 1/10/16 | 6.69 | 4435.30 | 4431.80 | 30.74 | 4429.2 | 4424.3 | 36.82 |
| 1/11/16 | 6.70 | 4435.30 | 4431.80 | 30.74 | 4429.2 | 4424.3 | 36.80 |
| 1/12/16 | 6.70 | 4435.30 | 4431.80 | 30.75 | 4429.2 | 4424.3 | 36.77 |
| 1/13/16 | 6.70 | 4435.20 | 4431.80 | 30.75 | 4429.3 | 4424.3 | 36.75 |
| 1/14/16 | 6.71 | 4435.20 | 4431.80 | 30.76 | 4429.3 | 4424.3 | 36.73 |
| 1/15/16 | 6.71 | 4435.20 | 4431.80 | 30.76 | 4429.3 | 4424.3 | 36.70 |
| 1/16/16 | 6.71 | 4435.20 | 4431.80 | 30.77 | 4429.3 | 4424.4 | 36.68 |
| 1/17/16 | 6.71 | 4435.20 | 4431.80 | 30.77 | 4429.3 | 4424.4 | 36.65 |
| 1/18/16 | 6.72 | 4435.20 | 4431.80 | 30.78 | 4429.4 | 4424.4 | 36.63 |
| 1/19/16 | 6.72 | 4435.20 | 4431.80 | 30.78 | 4429.4 | 4424.4 | 36.61 |
| 1/20/16 | 6.72 | 4435.20 | 4431.80 | 30.79 | 4429.4 | 4424.4 | 36.58 |
| 1/21/16 | 6.72 | 4435.20 | 4431.80 | 30.79 | 4429.4 | 4424.4 | 36.56 |
| 1/22/16 | 6.73 | 4435.20 | 4431.80 | 30.80 | 4429.5 | 4424.4 | 36.53 |
| 1/23/16 | 6.73 | 4435.20 | 4431.80 | 30.80 | 4429.5 | 4424.5 | 36.51 |
| 1/24/16 | 6.73 | 4435.20 | 4431.80 | 30.81 | 4429.5 | 4424.5 | 36.49 |
| 1/25/16 | 6.74 | 4435.20 | 4431.80 | 30.81 | 4429.5 | 4424.5 | 36.46 |
| 1/26/16 | 6.74 | 4435.20 | 4431.80 | 30.82 | 4429.6 | 4424.5 | 36.44 |
| 1/27/16 | 6.74 | 4435.20 | 4431.80 | 30.82 | 4429.6 | 4424.5 | 36.41 |
| 1/28/16 | 6.74 | 4435.20 | 4431.80 | 30.83 | 4429.6 | 4424.5 | 36.39 |
| 1/29/16 | 6.75 | 4435.20 | 4431.80 | 30.83 | 4429.6 | 4424.6 | 36.37 |
| 1/30/16 | 6.75 | 4435.20 | 4431.80 | 30.84 | 4429.7 | 4424.6 | 36.34 |
| 1/31/16 | 6.75 | 4435.20 | 4431.80 | 30.84 | 4429.7 | 4424.6 | 36.32 |
| 2/1/16 | 6.75 | 4435.20 | 4431.80 | 30.85 | 4429.7 | 4424.6 | 36.29 |
| 2/2/16 | 6.76 | 4435.10 | 4431.80 | 30.86 | 4429.7 | 4424.6 | 36.27 |
| 2/3/16 | 6.76 | 4435.10 | 4431.80 | 30.86 | 4429.8 | 4424.6 | 36.25 |
| 2/4/16 | 6.76 | 4435.10 | 4431.80 | 30.87 | 4429.8 | 4424.6 | 36.22 |
| 2/5/16 | 6.77 | 4435.10 | 4431.80 | 30.87 | 4429.8 | 4424.7 | 36.20 |
| 2/6/16 | 6.77 | 4435.10 | 4431.80 | 30.87 | 4429.8 | 4424.7 | 36.17 |
| 2/7/16 | 6.77 | 4435.10 | 4431.80 | 30.88 | 4429.9 | 4424.7 | 36.15 |
| 2/8/16 | 6.77 | 4435.10 | 4431.80 | 30.88 | 4429.9 | 4424.7 | 36.12 |

**Appendix E**
**Table 1  Tailings and Pond Elevations for North and South Cells**

| | Year | North Cell | | | South Cell | | |
|---|---|---|---|---|---|---|---|
| Date | Fraction | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) |
| 2/9/16 | 6.78 | 4435.10 | 4431.80 | 30.89 | 4429.9 | 4424.7 | 36.10 |
| 2/10/16 | 6.78 | 4435.10 | 4431.80 | 30.89 | 4429.9 | 4424.7 | 36.08 |
| 2/11/16 | 6.78 | 4435.10 | 4431.80 | 30.90 | 4429.9 | 4424.8 | 36.05 |
| 2/12/16 | 6.78 | 4435.10 | 4431.80 | 30.90 | 4430.0 | 4424.8 | 36.03 |
| 2/13/16 | 6.79 | 4435.10 | 4431.80 | 30.91 | 4430.0 | 4424.8 | 36.00 |
| 2/14/16 | 6.79 | 4435.10 | 4431.80 | 30.91 | 4430.0 | 4424.8 | 35.98 |
| 2/15/16 | 6.79 | 4435.10 | 4431.80 | 30.92 | 4430.0 | 4424.8 | 35.96 |
| 2/16/16 | 6.80 | 4435.10 | 4431.80 | 30.92 | 4430.1 | 4424.8 | 35.94 |
| 2/17/16 | 6.80 | 4435.10 | 4431.80 | 30.93 | 4430.1 | 4424.9 | 35.91 |
| 2/18/16 | 6.80 | 4435.10 | 4431.80 | 30.93 | 4430.1 | 4424.9 | 35.89 |
| 2/19/16 | 6.80 | 4435.10 | 4431.80 | 30.94 | 4430.1 | 4424.9 | 35.87 |
| 2/20/16 | 6.81 | 4435.10 | 4431.80 | 30.94 | 4430.2 | 4424.9 | 35.85 |
| 2/21/16 | 6.81 | 4435.10 | 4431.80 | 30.95 | 4430.2 | 4424.9 | 35.83 |
| 2/22/16 | 6.81 | 4435.00 | 4431.80 | 30.95 | 4430.2 | 4424.9 | 35.81 |
| 2/23/16 | 6.81 | 4435.00 | 4431.80 | 30.96 | 4430.2 | 4424.9 | 35.78 |
| 2/24/16 | 6.82 | 4435.00 | 4431.80 | 30.96 | 4430.2 | 4425.0 | 35.76 |
| 2/25/16 | 6.82 | 4435.00 | 4431.80 | 30.97 | 4430.3 | 4425.0 | 35.74 |
| 2/26/16 | 6.82 | 4435.00 | 4431.80 | 30.97 | 4430.3 | 4425.0 | 35.72 |
| 2/27/16 | 6.83 | 4435.00 | 4431.80 | 30.98 | 4430.3 | 4425.0 | 35.70 |
| 2/28/16 | 6.83 | 4435.00 | 4431.80 | 30.98 | 4430.3 | 4425.0 | 35.67 |
| 2/29/16 | 6.83 | 4435.00 | 4431.80 | 30.99 | 4430.3 | 4425.0 | 35.65 |
| 3/1/16 | 6.83 | 4435.00 | 4431.80 | 30.99 | 4430.4 | 4425.1 | 35.63 |
| 3/2/16 | 6.84 | 4435.00 | 4431.80 | 31.00 | 4430.4 | 4425.1 | 35.61 |
| 3/3/16 | 6.84 | 4435.00 | 4431.80 | 31.00 | 4430.4 | 4425.1 | 35.59 |
| 3/4/16 | 6.84 | 4435.00 | 4431.80 | 31.00 | 4430.4 | 4425.1 | 35.56 |
| 3/5/16 | 6.84 | 4435.00 | 4431.80 | 31.00 | 4430.5 | 4425.1 | 35.54 |
| 3/6/16 | 6.85 | 4435.00 | 4431.80 | 31.01 | 4430.5 | 4425.1 | 35.52 |
| 3/7/16 | 6.85 | 4435.00 | 4431.80 | 31.01 | 4430.5 | 4425.1 | 35.49 |
| 3/8/16 | 6.85 | 4435.00 | 4431.80 | 31.01 | 4430.5 | 4425.2 | 35.47 |
| 3/9/16 | 6.86 | 4435.00 | 4431.80 | 31.01 | 4430.6 | 4425.2 | 35.45 |
| 3/10/16 | 6.86 | 4435.00 | 4431.80 | 31.02 | 4430.6 | 4425.2 | 35.43 |
| 3/11/16 | 6.86 | 4435.00 | 4431.80 | 31.02 | 4430.6 | 4425.2 | 35.40 |
| 3/12/16 | 6.86 | 4435.00 | 4431.80 | 31.02 | 4430.6 | 4425.2 | 35.38 |
| 3/13/16 | 6.87 | 4435.00 | 4431.80 | 31.03 | 4430.6 | 4425.2 | 35.36 |
| 3/14/16 | 6.87 | 4435.00 | 4431.80 | 31.03 | 4430.7 | 4425.3 | 35.34 |
| 3/15/16 | 6.87 | 4435.00 | 4431.80 | 31.03 | 4430.7 | 4425.3 | 35.31 |
| 3/16/16 | 6.87 | 4435.00 | 4431.80 | 31.03 | 4430.7 | 4425.3 | 35.29 |
| 3/17/16 | 6.88 | 4435.00 | 4431.80 | 31.04 | 4430.7 | 4425.3 | 35.27 |
| 3/18/16 | 6.88 | 4435.00 | 4431.80 | 31.04 | 4430.8 | 4425.3 | 35.24 |
| 3/19/16 | 6.88 | 4435.00 | 4431.80 | 31.04 | 4430.8 | 4425.3 | 35.22 |
| 3/20/16 | 6.89 | 4435.00 | 4431.80 | 31.04 | 4430.8 | 4425.3 | 35.20 |
| 3/21/16 | 6.89 | 4435.00 | 4431.80 | 31.05 | 4430.8 | 4425.4 | 35.18 |
| 3/22/16 | 6.89 | 4435.00 | 4431.80 | 31.05 | 4430.8 | 4425.4 | 35.15 |
| 3/23/16 | 6.89 | 4434.90 | 4431.80 | 31.05 | 4430.9 | 4425.4 | 35.13 |
| 3/24/16 | 6.90 | 4434.90 | 4431.80 | 31.05 | 4430.9 | 4425.4 | 35.11 |
| 3/25/16 | 6.90 | 4434.90 | 4431.80 | 31.06 | 4430.9 | 4425.4 | 35.09 |
| 3/26/16 | 6.90 | 4434.90 | 4431.80 | 31.06 | 4430.9 | 4425.4 | 35.06 |
| 3/27/16 | 6.90 | 4434.90 | 4431.80 | 31.06 | 4431.0 | 4425.5 | 35.04 |
| 3/28/16 | 6.91 | 4434.90 | 4431.80 | 31.07 | 4431.0 | 4425.5 | 35.02 |
| 3/29/16 | 6.91 | 4434.90 | 4431.80 | 31.07 | 4431.0 | 4425.5 | 34.99 |
| 3/30/16 | 6.91 | 4434.90 | 4431.80 | 31.07 | 4431.0 | 4425.5 | 34.97 |
| 3/31/16 | 6.92 | 4434.90 | 4431.80 | 31.07 | 4431.1 | 4425.5 | 34.95 |
| 4/1/16 | 6.92 | 4434.90 | 4431.80 | 31.08 | 4431.1 | 4425.5 | 34.93 |
| 4/2/16 | 6.92 | 4434.90 | 4431.80 | 31.08 | 4431.1 | 4425.5 | 34.91 |
| 4/3/16 | 6.92 | 4434.90 | 4431.80 | 31.09 | 4431.1 | 4425.6 | 34.89 |

## Appendix E
## Table 1 Tailings and Pond Elevations for North and South Cells

| Date | Year Fraction | North Cell | | | South Cell | | |
|---|---|---|---|---|---|---|---|
| | | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) |
| 4/4/16 | 6.93 | 4434.90 | 4431.80 | 31.10 | 4431.1 | 4425.6 | 34.87 |
| 4/5/16 | 6.93 | 4434.90 | 4431.80 | 31.11 | 4431.2 | 4425.6 | 34.85 |
| 4/6/16 | 6.93 | 4434.90 | 4431.80 | 31.12 | 4431.2 | 4425.6 | 34.83 |
| 4/7/16 | 6.94 | 4434.90 | 4431.80 | 31.12 | 4431.2 | 4425.6 | 34.81 |
| 4/8/16 | 6.94 | 4434.90 | 4431.80 | 31.13 | 4431.2 | 4425.6 | 34.79 |
| 4/9/16 | 6.94 | 4434.90 | 4431.80 | 31.14 | 4431.2 | 4425.7 | 34.77 |
| 4/10/16 | 6.94 | 4434.90 | 4431.80 | 31.15 | 4431.3 | 4425.7 | 34.75 |
| 4/11/16 | 6.95 | 4434.80 | 4431.80 | 31.16 | 4431.3 | 4425.7 | 34.73 |
| 4/12/16 | 6.95 | 4434.80 | 4431.80 | 31.16 | 4431.3 | 4425.7 | 34.71 |
| 4/13/16 | 6.95 | 4434.80 | 4431.80 | 31.17 | 4431.3 | 4425.7 | 34.69 |
| 4/14/16 | 6.95 | 4434.80 | 4431.80 | 31.18 | 4431.3 | 4425.7 | 34.67 |
| 4/15/16 | 6.96 | 4434.80 | 4431.80 | 31.19 | 4431.3 | 4425.8 | 34.65 |
| 4/16/16 | 6.96 | 4434.80 | 4431.80 | 31.20 | 4431.4 | 4425.8 | 34.63 |
| 4/17/16 | 6.96 | 4434.80 | 4431.80 | 31.20 | 4431.4 | 4425.8 | 34.61 |
| 4/18/16 | 6.97 | 4434.80 | 4431.80 | 31.21 | 4431.4 | 4425.8 | 34.59 |
| 4/19/16 | 6.97 | 4434.80 | 4431.80 | 31.22 | 4431.4 | 4425.8 | 34.57 |
| 4/20/16 | 6.97 | 4434.80 | 4431.80 | 31.23 | 4431.4 | 4425.8 | 34.55 |
| 4/21/16 | 6.97 | 4434.80 | 4431.80 | 31.24 | 4431.5 | 4425.8 | 34.53 |
| 4/22/16 | 6.98 | 4434.80 | 4431.80 | 31.24 | 4431.5 | 4425.9 | 34.51 |
| 4/23/16 | 6.98 | 4434.70 | 4431.80 | 31.25 | 4431.5 | 4425.9 | 34.49 |
| 4/24/16 | 6.98 | 4434.70 | 4431.80 | 31.26 | 4431.5 | 4425.9 | 34.48 |
| 4/25/16 | 6.98 | 4434.70 | 4431.80 | 31.27 | 4431.5 | 4425.9 | 34.46 |
| 4/26/16 | 6.99 | 4434.70 | 4431.80 | 31.28 | 4431.6 | 4425.9 | 34.44 |
| 4/27/16 | 6.99 | 4434.70 | 4431.80 | 31.28 | 4431.6 | 4425.9 | 34.42 |
| 4/28/16 | 6.99 | 4434.70 | 4431.80 | 31.29 | 4431.6 | 4426.0 | 34.40 |
| 4/29/16 | 7.00 | 4434.70 | 4431.80 | 31.30 | 4431.6 | 4426.0 | 34.38 |
| 4/30/16 | 7.00 | 4434.70 | 4431.80 | 31.31 | 4431.6 | 4426.0 | 34.36 |
| 5/1/16 | 7.00 | 4434.70 | 4431.80 | 31.32 | 4431.7 | 4426.0 | 34.34 |
| 5/2/16 | 7.00 | 4434.70 | 4431.80 | 31.32 | 4431.7 | 4426.0 | 34.32 |
| 5/3/16 | 7.01 | 4434.70 | 4431.80 | 31.33 | 4431.7 | 4426.0 | 34.30 |
| 5/4/16 | 7.01 | 4434.70 | 4431.80 | 31.34 | 4431.7 | 4426.0 | 34.28 |
| 5/5/16 | 7.01 | 4434.60 | 4431.80 | 31.35 | 4431.7 | 4426.1 | 34.26 |
| 5/6/16 | 7.01 | 4434.60 | 4431.80 | 31.36 | 4431.8 | 4426.1 | 34.25 |
| 5/7/16 | 7.02 | 4434.60 | 4431.80 | 31.37 | 4431.8 | 4426.1 | 34.23 |
| 5/8/16 | 7.02 | 4434.60 | 4431.80 | 31.38 | 4431.8 | 4426.1 | 34.21 |
| 5/9/16 | 7.02 | 4434.60 | 4431.80 | 31.39 | 4431.8 | 4426.1 | 34.19 |
| 5/10/16 | 7.03 | 4434.60 | 4431.80 | 31.39 | 4431.8 | 4426.1 | 34.17 |
| 5/11/16 | 7.03 | 4434.60 | 4431.80 | 31.40 | 4431.8 | 4426.2 | 34.15 |
| 5/12/16 | 7.03 | 4434.60 | 4431.80 | 31.41 | 4431.9 | 4426.2 | 34.13 |
| 5/13/16 | 7.03 | 4434.60 | 4431.80 | 31.42 | 4431.9 | 4426.2 | 34.12 |
| 5/14/16 | 7.04 | 4434.60 | 4431.80 | 31.43 | 4431.9 | 4426.2 | 34.10 |
| 5/15/16 | 7.04 | 4434.60 | 4431.80 | 31.44 | 4431.9 | 4426.2 | 34.08 |
| 5/16/16 | 7.04 | 4434.60 | 4431.80 | 31.45 | 4431.9 | 4426.2 | 34.06 |
| 5/17/16 | 7.04 | 4434.50 | 4431.80 | 31.46 | 4432.0 | 4426.2 | 34.04 |
| 5/18/16 | 7.05 | 4434.50 | 4431.80 | 31.46 | 4432.0 | 4426.3 | 34.02 |
| 5/19/16 | 7.05 | 4434.50 | 4431.80 | 31.47 | 4432.0 | 4426.3 | 34.00 |
| 5/20/16 | 7.05 | 4434.50 | 4431.80 | 31.48 | 4432.0 | 4426.3 | 33.99 |
| 5/21/16 | 7.06 | 4434.50 | 4431.80 | 31.49 | 4432.0 | 4426.3 | 33.97 |
| 5/22/16 | 7.06 | 4434.50 | 4431.80 | 31.50 | 4432.1 | 4426.3 | 33.95 |
| 5/23/16 | 7.06 | 4434.50 | 4431.80 | 31.51 | 4432.1 | 4426.3 | 33.93 |
| 5/24/16 | 7.06 | 4434.50 | 4431.80 | 31.52 | 4432.1 | 4426.4 | 33.91 |
| 5/25/16 | 7.07 | 4434.50 | 4431.80 | 31.53 | 4432.1 | 4426.4 | 33.89 |
| 5/26/16 | 7.07 | 4434.50 | 4431.80 | 31.53 | 4432.1 | 4426.4 | 33.87 |
| 5/27/16 | 7.07 | 4434.50 | 4431.80 | 31.54 | 4432.1 | 4426.4 | 33.86 |
| 5/28/16 | 7.07 | 4434.40 | 4431.80 | 31.55 | 4432.2 | 4426.4 | 33.84 |

**Appendix E**
**Table 1 Tailings and Pond Elevations for North and South Cells**

| Date | Year Fraction | North Cell | | | South Cell | | |
|---|---|---|---|---|---|---|---|
| | | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) |
| 5/29/16 | 7.08 | 4434.40 | 4431.80 | 31.56 | 4432.2 | 4426.4 | 33.82 |
| 5/30/16 | 7.08 | 4434.40 | 4431.80 | 31.57 | 4432.2 | 4426.4 | 33.80 |
| 5/31/16 | 7.08 | 4434.40 | 4431.80 | 31.58 | 4432.2 | 4426.5 | 33.78 |
| 6/1/16 | 7.09 | 4434.40 | 4431.80 | 31.59 | 4432.2 | 4426.5 | 33.76 |
| 6/2/16 | 7.09 | 4434.40 | 4431.80 | 31.60 | 4432.3 | 4426.5 | 33.75 |
| 6/3/16 | 7.09 | 4434.40 | 4431.80 | 31.61 | 4432.3 | 4426.5 | 33.73 |
| 6/4/16 | 7.09 | 4434.40 | 4431.80 | 31.62 | 4432.3 | 4426.5 | 33.72 |
| 6/5/16 | 7.10 | 4434.40 | 4431.80 | 31.63 | 4432.3 | 4426.5 | 33.70 |
| 6/6/16 | 7.10 | 4434.40 | 4431.80 | 31.65 | 4432.3 | 4426.6 | 33.69 |
| 6/7/16 | 7.10 | 4434.30 | 4431.80 | 31.66 | 4432.3 | 4426.6 | 33.67 |
| 6/8/16 | 7.10 | 4434.30 | 4431.80 | 31.67 | 4432.3 | 4426.6 | 33.66 |
| 6/9/16 | 7.11 | 4434.30 | 4431.80 | 31.68 | 4432.4 | 4426.6 | 33.64 |
| 6/10/16 | 7.11 | 4434.30 | 4431.80 | 31.69 | 4432.4 | 4426.6 | 33.63 |
| 6/11/16 | 7.11 | 4434.30 | 4431.80 | 31.71 | 4432.4 | 4426.6 | 33.61 |
| 6/12/16 | 7.12 | 4434.30 | 4431.80 | 31.72 | 4432.4 | 4426.7 | 33.60 |
| 6/13/16 | 7.12 | 4434.30 | 4431.80 | 31.73 | 4432.4 | 4426.7 | 33.58 |
| 6/14/16 | 7.12 | 4434.30 | 4431.80 | 31.74 | 4432.4 | 4426.7 | 33.57 |
| 6/15/16 | 7.12 | 4434.20 | 4431.80 | 31.75 | 4432.4 | 4426.7 | 33.55 |
| 6/16/16 | 7.13 | 4434.20 | 4431.80 | 31.76 | 4432.5 | 4426.7 | 33.54 |
| 6/17/16 | 7.13 | 4434.20 | 4431.80 | 31.78 | 4432.5 | 4426.7 | 33.52 |
| 6/18/16 | 7.13 | 4434.20 | 4431.80 | 31.79 | 4432.5 | 4426.7 | 33.51 |
| 6/19/16 | 7.13 | 4434.20 | 4431.80 | 31.80 | 4432.5 | 4426.8 | 33.49 |
| 6/20/16 | 7.14 | 4434.20 | 4431.80 | 31.81 | 4432.5 | 4426.8 | 33.48 |
| 6/21/16 | 7.14 | 4434.20 | 4431.80 | 31.82 | 4432.5 | 4426.8 | 33.46 |
| 6/22/16 | 7.14 | 4434.20 | 4431.80 | 31.84 | 4432.6 | 4426.8 | 33.45 |
| 6/23/16 | 7.15 | 4434.20 | 4431.80 | 31.85 | 4432.6 | 4426.8 | 33.43 |
| 6/24/16 | 7.15 | 4434.10 | 4431.80 | 31.86 | 4432.6 | 4426.8 | 33.42 |
| 6/25/16 | 7.15 | 4434.10 | 4431.80 | 31.87 | 4432.6 | 4426.9 | 33.40 |
| 6/26/16 | 7.15 | 4434.10 | 4431.80 | 31.88 | 4432.6 | 4426.9 | 33.39 |
| 6/27/16 | 7.16 | 4434.10 | 4431.80 | 31.89 | 4432.6 | 4426.9 | 33.37 |
| 6/28/16 | 7.16 | 4434.10 | 4431.80 | 31.91 | 4432.6 | 4426.9 | 33.36 |
| 6/29/16 | 7.16 | 4434.10 | 4431.80 | 31.92 | 4432.7 | 4426.9 | 33.34 |
| 6/30/16 | 7.17 | 4434.10 | 4431.80 | 31.93 | 4432.7 | 4426.9 | 33.33 |
| 7/1/16 | 7.17 | 4434.10 | 4431.80 | 31.94 | 4432.7 | 4426.9 | 33.31 |
| 7/2/16 | 7.17 | 4434.00 | 4431.80 | 31.96 | 4432.7 | 4427.0 | 33.30 |
| 7/3/16 | 7.17 | 4434.00 | 4431.80 | 31.98 | 4432.7 | 4427.0 | 33.30 |
| 7/4/16 | 7.18 | 4434.00 | 4431.80 | 32.00 | 4432.7 | 4427.0 | 33.29 |
| 7/5/16 | 7.18 | 4434.00 | 4431.80 | 32.01 | 4432.7 | 4427.0 | 33.28 |
| 7/6/16 | 7.18 | 4434.00 | 4431.80 | 32.03 | 4432.7 | 4427.0 | 33.27 |
| 7/7/16 | 7.18 | 4434.00 | 4431.80 | 32.05 | 4432.7 | 4427.0 | 33.26 |
| 7/8/16 | 7.19 | 4433.90 | 4431.80 | 32.07 | 4432.7 | 4427.1 | 33.26 |
| 7/9/16 | 7.19 | 4433.90 | 4431.80 | 32.09 | 4432.8 | 4427.1 | 33.25 |
| 7/10/16 | 7.19 | 4433.90 | 4431.80 | 32.10 | 4432.8 | 4427.1 | 33.24 |
| 7/11/16 | 7.20 | 4433.90 | 4431.80 | 32.12 | 4432.8 | 4427.1 | 33.23 |
| 7/12/16 | 7.20 | 4433.90 | 4431.80 | 32.14 | 4432.8 | 4427.1 | 33.22 |
| 7/13/16 | 7.20 | 4433.80 | 4431.80 | 32.16 | 4432.8 | 4427.1 | 33.21 |
| 7/14/16 | 7.20 | 4433.80 | 4431.80 | 32.18 | 4432.8 | 4427.1 | 33.21 |
| 7/15/16 | 7.21 | 4433.80 | 4431.80 | 32.19 | 4432.8 | 4427.2 | 33.20 |
| 7/16/16 | 7.21 | 4433.80 | 4431.80 | 32.21 | 4432.8 | 4427.2 | 33.19 |
| 7/17/16 | 7.21 | 4433.80 | 4431.80 | 32.23 | 4432.8 | 4427.2 | 33.18 |
| 7/18/16 | 7.21 | 4433.80 | 4431.80 | 32.25 | 4432.8 | 4427.2 | 33.17 |
| 7/19/16 | 7.22 | 4433.70 | 4431.80 | 32.27 | 4432.8 | 4427.2 | 33.17 |
| 7/20/16 | 7.22 | 4433.70 | 4431.80 | 32.28 | 4432.8 | 4427.2 | 33.16 |
| 7/21/16 | 7.22 | 4433.70 | 4431.80 | 32.30 | 4432.9 | 4427.3 | 33.15 |
| 7/22/16 | 7.23 | 4433.70 | 4431.80 | 32.32 | 4432.9 | 4427.3 | 33.14 |

**Appendix E**
**Table 1  Tailings and Pond Elevations for North and South Cells**

| | Year | North Cell | | | South Cell | | |
|---|---|---|---|---|---|---|---|
| Date | Fraction | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) |
| 7/23/16 | 7.23 | 4433.70 | 4431.80 | 32.34 | 4432.9 | 4427.3 | 33.13 |
| 7/24/16 | 7.23 | 4433.60 | 4431.80 | 32.36 | 4432.9 | 4427.3 | 33.13 |
| 7/25/16 | 7.23 | 4433.60 | 4431.80 | 32.37 | 4432.9 | 4427.3 | 33.12 |
| 7/26/16 | 7.24 | 4433.60 | 4431.80 | 32.39 | 4432.9 | 4427.3 | 33.11 |
| 7/27/16 | 7.24 | 4433.60 | 4431.80 | 32.41 | 4432.9 | 4427.4 | 33.10 |
| 7/28/16 | 7.24 | 4433.60 | 4431.80 | 32.43 | 4432.9 | 4427.4 | 33.09 |
| 7/29/16 | 7.24 | 4433.60 | 4431.80 | 32.44 | 4432.9 | 4427.4 | 33.09 |
| 7/30/16 | 7.25 | 4433.50 | 4431.80 | 32.46 | 4432.9 | 4427.4 | 33.08 |
| 7/31/16 | 7.25 | 4433.50 | 4431.80 | 32.48 | 4432.9 | 4427.4 | 33.07 |
| 8/1/16 | 7.25 | 4433.50 | 4431.80 | 32.50 | 4432.9 | 4427.4 | 33.06 |
| 8/2/16 | 7.26 | 4433.50 | 4431.80 | 32.51 | 4432.9 | 4427.4 | 33.05 |
| 8/3/16 | 7.26 | 4433.50 | 4431.80 | 32.52 | 4433.0 | 4427.5 | 33.05 |
| 8/4/16 | 7.26 | 4433.50 | 4431.80 | 32.54 | 4433.0 | 4427.5 | 33.04 |
| 8/5/16 | 7.26 | 4433.50 | 4431.80 | 32.55 | 4433.0 | 4427.5 | 33.03 |
| 8/6/16 | 7.27 | 4433.40 | 4431.80 | 32.56 | 4433.0 | 4427.5 | 33.02 |
| 8/7/16 | 7.27 | 4433.40 | 4431.80 | 32.57 | 4433.0 | 4427.5 | 33.02 |
| 8/8/16 | 7.27 | 4433.40 | 4431.80 | 32.59 | 4433.0 | 4427.5 | 33.01 |
| 8/9/16 | 7.27 | 4433.40 | 4431.80 | 32.60 | 4433.0 | 4427.6 | 33.00 |
| 8/10/16 | 7.28 | 4433.40 | 4431.80 | 32.61 | 4433.0 | 4427.6 | 32.99 |
| 8/11/16 | 7.28 | 4433.40 | 4431.80 | 32.62 | 4433.0 | 4427.6 | 32.99 |
| 8/12/16 | 7.28 | 4433.40 | 4431.80 | 32.64 | 4433.0 | 4427.6 | 32.98 |
| 8/13/16 | 7.29 | 4433.40 | 4431.80 | 32.65 | 4433.0 | 4427.6 | 32.97 |
| 8/14/16 | 7.29 | 4433.30 | 4431.80 | 32.66 | 4433.0 | 4427.6 | 32.96 |
| 8/15/16 | 7.29 | 4433.30 | 4431.80 | 32.68 | 4433.0 | 4427.6 | 32.95 |
| 8/16/16 | 7.29 | 4433.30 | 4431.80 | 32.69 | 4433.1 | 4427.7 | 32.95 |
| 8/17/16 | 7.30 | 4433.30 | 4431.80 | 32.70 | 4433.1 | 4427.7 | 32.94 |
| 8/18/16 | 7.30 | 4433.30 | 4431.80 | 32.71 | 4433.1 | 4427.7 | 32.93 |
| 8/19/16 | 7.30 | 4433.30 | 4431.80 | 32.73 | 4433.1 | 4427.7 | 32.92 |
| 8/20/16 | 7.30 | 4433.30 | 4431.80 | 32.74 | 4433.1 | 4427.7 | 32.92 |
| 8/21/16 | 7.31 | 4433.30 | 4431.80 | 32.75 | 4433.1 | 4427.7 | 32.91 |
| 8/22/16 | 7.31 | 4433.20 | 4431.80 | 32.76 | 4433.1 | 4427.8 | 32.90 |
| 8/23/16 | 7.31 | 4433.20 | 4431.80 | 32.77 | 4433.1 | 4427.8 | 32.89 |
| 8/24/16 | 7.32 | 4433.20 | 4431.80 | 32.79 | 4433.1 | 4427.8 | 32.89 |
| 8/25/16 | 7.32 | 4433.20 | 4431.80 | 32.80 | 4433.1 | 4427.8 | 32.88 |
| 8/26/16 | 7.32 | 4433.20 | 4431.80 | 32.81 | 4433.1 | 4427.8 | 32.87 |
| 8/27/16 | 7.32 | 4433.20 | 4431.80 | 32.82 | 4433.1 | 4427.8 | 32.86 |
| 8/28/16 | 7.33 | 4433.20 | 4431.80 | 32.84 | 4433.1 | 4427.8 | 32.86 |
| 8/29/16 | 7.33 | 4433.20 | 4431.80 | 32.85 | 4433.2 | 4427.9 | 32.85 |
| 8/30/16 | 7.33 | 4433.10 | 4431.80 | 32.86 | 4433.2 | 4427.9 | 32.84 |
| 8/31/16 | 7.33 | 4433.10 | 4431.80 | 32.87 | 4433.2 | 4427.9 | 32.83 |
| 9/1/16 | 7.34 | 4433.10 | 4431.80 | 32.89 | 4433.2 | 4427.9 | 32.83 |
| 9/2/16 | 7.34 | 4433.10 | 4431.80 | 32.90 | 4433.2 | 4427.9 | 32.82 |
| 9/3/16 | 7.34 | 4433.10 | 4431.80 | 32.91 | 4433.2 | 4427.9 | 32.81 |
| 9/4/16 | 7.35 | 4433.10 | 4431.80 | 32.92 | 4433.2 | 4428.0 | 32.80 |
| 9/5/16 | 7.35 | 4433.10 | 4431.80 | 32.93 | 4433.2 | 4428.0 | 32.80 |
| 9/6/16 | 7.35 | 4433.10 | 4431.80 | 32.95 | 4433.2 | 4428.0 | 32.79 |
| 9/7/16 | 7.35 | 4433.00 | 4431.80 | 32.96 | 4433.2 | 4428.0 | 32.78 |
| 9/8/16 | 7.36 | 4433.10 | 4431.80 | 32.95 | 4433.2 | 4428.0 | 32.77 |
| 9/9/16 | 7.36 | 4433.00 | 4431.80 | 32.96 | 4433.2 | 4428.0 | 32.76 |
| 9/10/16 | 7.36 | 4433.10 | 4431.80 | 32.95 | 4433.2 | 4428.0 | 32.76 |
| 9/11/16 | 7.36 | 4433.00 | 4431.80 | 32.96 | 4433.3 | 4428.1 | 32.75 |
| 9/12/16 | 7.37 | 4433.10 | 4431.80 | 32.95 | 4433.3 | 4428.1 | 32.74 |
| 9/13/16 | 7.37 | 4433.00 | 4431.80 | 32.96 | 4433.3 | 4428.1 | 32.73 |
| 9/14/16 | 7.37 | 4433.10 | 4431.80 | 32.95 | 4433.3 | 4428.1 | 32.73 |
| 9/15/16 | 7.38 | 4433.00 | 4431.80 | 32.96 | 4433.3 | 4428.1 | 32.72 |

**Appendix E**
**Table 1  Tailings and Pond Elevations for North and South Cells**

| | Year | North Cell | | | South Cell | | |
|---|---|---|---|---|---|---|---|
| Date | Fraction | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) |
| 9/16/16 | 7.38 | 4433.10 | 4431.80 | 32.95 | 4433.3 | 4428.1 | 32.71 |
| 9/17/16 | 7.38 | 4433.00 | 4431.80 | 32.96 | 4433.3 | 4428.2 | 32.70 |
| 9/18/16 | 7.38 | 4433.10 | 4431.80 | 32.95 | 4433.3 | 4428.2 | 32.70 |
| 9/19/16 | 7.39 | 4433.00 | 4431.80 | 32.96 | 4433.3 | 4428.2 | 32.69 |
| 9/20/16 | 7.39 | 4433.10 | 4431.80 | 32.95 | 4433.3 | 4428.2 | 32.68 |
| 9/21/16 | 7.39 | 4433.00 | 4431.80 | 32.96 | 4433.3 | 4428.2 | 32.67 |
| 9/22/16 | 7.39 | 4433.10 | 4431.80 | 32.95 | 4433.3 | 4428.2 | 32.66 |
| 9/23/16 | 7.40 | 4433.00 | 4431.80 | 32.96 | 4433.3 | 4428.3 | 32.66 |
| 9/24/16 | 7.40 | 4433.10 | 4431.80 | 32.95 | 4433.4 | 4428.3 | 32.65 |
| 9/25/16 | 7.40 | 4433.00 | 4431.80 | 32.96 | 4433.4 | 4428.3 | 32.64 |
| 9/26/16 | 7.41 | 4433.10 | 4431.80 | 32.95 | 4433.4 | 4428.3 | 32.63 |
| 9/27/16 | 7.41 | 4433.00 | 4431.80 | 32.96 | 4433.4 | 4428.3 | 32.63 |
| 9/28/16 | 7.41 | 4433.10 | 4431.80 | 32.95 | 4433.4 | 4428.3 | 32.62 |
| 9/29/16 | 7.41 | 4433.00 | 4431.80 | 32.96 | 4433.4 | 4428.3 | 32.61 |
| 9/30/16 | 7.42 | 4433.10 | 4431.80 | 32.95 | 4433.4 | 4428.4 | 32.60 |
| 10/1/16 | 7.42 | 4433.00 | 4431.80 | 32.96 | 4433.4 | 4428.4 | 32.60 |
| 10/2/16 | 7.42 | 4433.10 | 4431.80 | 32.94 | 4433.4 | 4428.4 | 32.58 |
| 10/3/16 | 7.43 | 4433.00 | 4431.80 | 32.95 | 4433.4 | 4428.4 | 32.57 |
| 10/4/16 | 7.43 | 4433.10 | 4431.80 | 32.94 | 4433.4 | 4428.4 | 32.56 |
| 10/5/16 | 7.43 | 4433.00 | 4431.80 | 32.95 | 4433.4 | 4428.4 | 32.55 |
| 10/6/16 | 7.43 | 4433.10 | 4431.80 | 32.94 | 4433.5 | 4428.5 | 32.54 |
| 10/7/16 | 7.44 | 4433.00 | 4431.80 | 32.95 | 4433.5 | 4428.5 | 32.53 |
| 10/8/16 | 7.44 | 4433.10 | 4431.80 | 32.94 | 4433.5 | 4428.5 | 32.52 |
| 10/9/16 | 7.44 | 4433.00 | 4431.80 | 32.95 | 4433.5 | 4428.5 | 32.51 |
| 10/10/16 | 7.44 | 4433.10 | 4431.80 | 32.94 | 4433.5 | 4428.5 | 32.50 |
| 10/11/16 | 7.45 | 4433.00 | 4431.80 | 32.95 | 4433.5 | 4428.5 | 32.49 |
| 10/12/16 | 7.45 | 4433.10 | 4431.80 | 32.94 | 4433.5 | 4428.5 | 32.48 |
| 10/13/16 | 7.45 | 4433.00 | 4431.80 | 32.95 | 4433.5 | 4428.6 | 32.47 |
| 10/14/16 | 7.46 | 4433.10 | 4431.80 | 32.94 | 4433.5 | 4428.6 | 32.46 |
| 10/15/16 | 7.46 | 4433.00 | 4431.80 | 32.95 | 4433.6 | 4428.6 | 32.44 |
| 10/16/16 | 7.46 | 4433.10 | 4431.80 | 32.94 | 4433.6 | 4428.6 | 32.43 |
| 10/17/16 | 7.46 | 4433.00 | 4431.80 | 32.95 | 4433.6 | 4428.6 | 32.42 |
| 10/18/16 | 7.47 | 4433.10 | 4431.80 | 32.94 | 4433.6 | 4428.6 | 32.41 |
| 10/19/16 | 7.47 | 4433.00 | 4431.80 | 32.95 | 4433.6 | 4428.7 | 32.40 |
| 10/20/16 | 7.47 | 4433.10 | 4431.80 | 32.94 | 4433.6 | 4428.7 | 32.39 |
| 10/21/16 | 7.47 | 4433.00 | 4431.80 | 32.95 | 4433.6 | 4428.7 | 32.38 |
| 10/22/16 | 7.48 | 4433.10 | 4431.80 | 32.94 | 4433.6 | 4428.7 | 32.37 |
| 10/23/16 | 7.48 | 4433.00 | 4431.80 | 32.95 | 4433.6 | 4428.7 | 32.36 |
| 10/24/16 | 7.48 | 4433.10 | 4431.80 | 32.94 | 4433.7 | 4428.7 | 32.35 |
| 10/25/16 | 7.49 | 4433.00 | 4431.80 | 32.95 | 4433.7 | 4428.7 | 32.34 |
| 10/26/16 | 7.49 | 4433.10 | 4431.80 | 32.94 | 4433.7 | 4428.8 | 32.33 |
| 10/27/16 | 7.49 | 4433.00 | 4431.80 | 32.95 | 4433.7 | 4428.8 | 32.32 |
| 10/28/16 | 7.49 | 4433.10 | 4431.80 | 32.94 | 4433.7 | 4428.8 | 32.31 |
| 10/29/16 | 7.50 | 4433.00 | 4431.80 | 32.95 | 4433.7 | 4428.8 | 32.29 |
| 10/30/16 | 7.50 | 4433.10 | 4431.80 | 32.94 | 4433.7 | 4428.8 | 32.28 |
| 10/31/16 | 7.50 | 4433.00 | 4431.80 | 32.95 | 4433.7 | 4428.8 | 32.27 |
| 11/1/16 | 7.50 | 4433.10 | 4431.80 | 32.94 | 4433.7 | 4428.9 | 32.26 |
| 11/2/16 | 7.51 | 4433.00 | 4431.80 | 32.95 | 4433.8 | 4428.9 | 32.25 |
| 11/3/16 | 7.51 | 4433.10 | 4431.80 | 32.94 | 4433.8 | 4428.9 | 32.23 |
| 11/4/16 | 7.51 | 4433.00 | 4431.80 | 32.95 | 4433.8 | 4428.9 | 32.22 |
| 11/5/16 | 7.52 | 4433.10 | 4431.80 | 32.94 | 4433.8 | 4428.9 | 32.20 |
| 11/6/16 | 7.52 | 4433.00 | 4431.80 | 32.95 | 4433.8 | 4428.9 | 32.19 |
| 11/7/16 | 7.52 | 4433.10 | 4431.80 | 32.94 | 4433.8 | 4429.0 | 32.17 |
| 11/8/16 | 7.52 | 4433.00 | 4431.80 | 32.95 | 4433.8 | 4429.0 | 32.16 |
| 11/9/16 | 7.53 | 4433.10 | 4431.80 | 32.94 | 4433.9 | 4429.0 | 32.14 |

**Appendix E**
**Table 1  Tailings and Pond Elevations for North and South Cells**

| Date | Year Fraction | North Cell | | | South Cell | | |
|---|---|---|---|---|---|---|---|
| | | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) |
| 11/10/16 | 7.53 | 4433.00 | 4431.80 | 32.95 | 4433.9 | 4429.0 | 32.13 |
| 11/11/16 | 7.53 | 4433.10 | 4431.80 | 32.94 | 4433.9 | 4429.0 | 32.11 |
| 11/12/16 | 7.53 | 4433.00 | 4431.80 | 32.95 | 4433.9 | 4429.0 | 32.10 |
| 11/13/16 | 7.54 | 4433.10 | 4431.80 | 32.94 | 4433.9 | 4429.0 | 32.08 |
| 11/14/16 | 7.54 | 4433.00 | 4431.80 | 32.95 | 4433.9 | 4429.1 | 32.07 |
| 11/15/16 | 7.54 | 4433.10 | 4431.80 | 32.94 | 4433.9 | 4429.1 | 32.05 |
| 11/16/16 | 7.55 | 4433.00 | 4431.80 | 32.95 | 4434.0 | 4429.1 | 32.04 |
| 11/17/16 | 7.55 | 4433.10 | 4431.80 | 32.94 | 4434.0 | 4429.1 | 32.02 |
| 11/18/16 | 7.55 | 4433.00 | 4431.80 | 32.95 | 4434.0 | 4429.1 | 32.01 |
| 11/19/16 | 7.55 | 4433.10 | 4431.80 | 32.94 | 4434.0 | 4429.1 | 31.99 |
| 11/20/16 | 7.56 | 4433.00 | 4431.80 | 32.95 | 4434.0 | 4429.2 | 31.98 |
| 11/21/16 | 7.56 | 4433.10 | 4431.80 | 32.94 | 4434.0 | 4429.2 | 31.96 |
| 11/22/16 | 7.56 | 4433.00 | 4431.80 | 32.95 | 4434.1 | 4429.2 | 31.95 |
| 11/23/16 | 7.56 | 4433.10 | 4431.80 | 32.94 | 4434.1 | 4429.2 | 31.93 |
| 11/24/16 | 7.57 | 4433.00 | 4431.80 | 32.95 | 4434.1 | 4429.2 | 31.92 |
| 11/25/16 | 7.57 | 4433.10 | 4431.80 | 32.94 | 4434.1 | 4429.2 | 31.90 |
| 11/26/16 | 7.57 | 4433.00 | 4431.80 | 32.95 | 4434.1 | 4429.2 | 31.89 |
| 11/27/16 | 7.58 | 4433.10 | 4431.80 | 32.94 | 4434.1 | 4429.3 | 31.87 |
| 11/28/16 | 7.58 | 4433.00 | 4431.80 | 32.95 | 4434.1 | 4429.3 | 31.86 |
| 11/29/16 | 7.58 | 4433.10 | 4431.80 | 32.94 | 4434.2 | 4429.3 | 31.84 |
| 11/30/16 | 7.58 | 4433.00 | 4431.80 | 32.95 | 4434.2 | 4429.3 | 31.83 |
| 12/1/16 | 7.59 | 4433.10 | 4431.80 | 32.94 | 4434.2 | 4429.3 | 31.81 |
| 12/2/16 | 7.59 | 4433.10 | 4431.80 | 32.95 | 4434.2 | 4429.3 | 31.79 |
| 12/3/16 | 7.59 | 4433.10 | 4431.80 | 32.94 | 4434.2 | 4429.4 | 31.77 |
| 12/4/16 | 7.59 | 4433.10 | 4431.80 | 32.95 | 4434.2 | 4429.4 | 31.75 |
| 12/5/16 | 7.60 | 4433.10 | 4431.80 | 32.94 | 4434.3 | 4429.4 | 31.74 |
| 12/6/16 | 7.60 | 4433.10 | 4431.80 | 32.95 | 4434.3 | 4429.4 | 31.72 |
| 12/7/16 | 7.60 | 4433.10 | 4431.80 | 32.94 | 4434.3 | 4429.4 | 31.70 |
| 12/8/16 | 7.61 | 4433.10 | 4431.80 | 32.95 | 4434.3 | 4429.4 | 31.68 |
| 12/9/16 | 7.61 | 4433.10 | 4431.80 | 32.94 | 4434.3 | 4429.4 | 31.66 |
| 12/10/16 | 7.61 | 4433.10 | 4431.80 | 32.95 | 4434.4 | 4429.5 | 31.64 |
| 12/11/16 | 7.61 | 4433.10 | 4431.80 | 32.94 | 4434.4 | 4429.5 | 31.62 |
| 12/12/16 | 7.62 | 4433.10 | 4431.80 | 32.95 | 4434.4 | 4429.5 | 31.60 |
| 12/13/16 | 7.62 | 4433.10 | 4431.80 | 32.94 | 4434.4 | 4429.5 | 31.58 |
| 12/14/16 | 7.62 | 4433.10 | 4431.80 | 32.95 | 4434.4 | 4429.5 | 31.56 |
| 12/15/16 | 7.62 | 4433.10 | 4431.80 | 32.94 | 4434.5 | 4429.5 | 31.55 |
| 12/16/16 | 7.63 | 4433.10 | 4431.80 | 32.95 | 4434.5 | 4429.6 | 31.53 |
| 12/17/16 | 7.63 | 4433.10 | 4431.80 | 32.94 | 4434.5 | 4429.6 | 31.51 |
| 12/18/16 | 7.63 | 4433.10 | 4431.80 | 32.95 | 4434.5 | 4429.6 | 31.49 |
| 12/19/16 | 7.64 | 4433.10 | 4431.80 | 32.94 | 4434.5 | 4429.6 | 31.47 |
| 12/20/16 | 7.64 | 4433.10 | 4431.80 | 32.95 | 4434.6 | 4429.6 | 31.45 |
| 12/21/16 | 7.64 | 4433.10 | 4431.80 | 32.94 | 4434.6 | 4429.6 | 31.43 |
| 12/22/16 | 7.64 | 4433.10 | 4431.80 | 32.95 | 4434.6 | 4429.6 | 31.41 |
| 12/23/16 | 7.65 | 4433.10 | 4431.80 | 32.94 | 4434.6 | 4429.7 | 31.39 |
| 12/24/16 | 7.65 | 4433.10 | 4431.80 | 32.95 | 4434.6 | 4429.7 | 31.37 |
| 12/25/16 | 7.65 | 4433.10 | 4431.80 | 32.94 | 4434.6 | 4429.7 | 31.36 |
| 12/26/16 | 7.66 | 4433.10 | 4431.80 | 32.95 | 4434.7 | 4429.7 | 31.34 |
| 12/27/16 | 7.66 | 4433.10 | 4431.80 | 32.94 | 4434.7 | 4429.7 | 31.32 |
| 12/28/16 | 7.66 | 4433.10 | 4431.80 | 32.95 | 4434.7 | 4429.7 | 31.30 |
| 12/29/16 | 7.66 | 4433.10 | 4431.80 | 32.94 | 4434.7 | 4429.8 | 31.28 |
| 12/30/16 | 7.67 | 4433.10 | 4431.80 | 32.95 | 4434.7 | 4429.8 | 31.26 |
| 12/31/16 | 7.67 | 4433.10 | 4431.80 | 32.94 | 4434.8 | 4429.8 | 31.24 |
| 1/1/17 | 7.67 | 4433.10 | 4431.80 | 32.95 | 4434.8 | 4429.8 | 31.22 |
| 1/2/17 | 7.67 | 4433.10 | 4431.80 | 32.94 | 4434.8 | 4429.8 | 31.20 |
| 1/3/17 | 7.68 | 4433.10 | 4431.80 | 32.95 | 4434.8 | 4429.8 | 31.18 |

**Appendix E**

**Table 1  Tailings and Pond Elevations for North and South Cells**

| | Year | North Cell | | | South Cell | | |
|---|---|---|---|---|---|---|---|
| Date | Fraction | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) |
| 1/4/17 | 7.68 | 4433.10 | 4431.80 | 32.95 | 4434.8 | 4429.9 | 31.16 |
| 1/5/17 | 7.68 | 4433.10 | 4431.80 | 32.95 | 4434.9 | 4429.9 | 31.14 |
| 1/6/17 | 7.69 | 4433.10 | 4431.80 | 32.95 | 4434.9 | 4429.9 | 31.12 |
| 1/7/17 | 7.69 | 4433.10 | 4431.80 | 32.95 | 4434.9 | 4429.9 | 31.10 |
| 1/8/17 | 7.69 | 4433.10 | 4431.80 | 32.95 | 4434.9 | 4429.9 | 31.08 |
| 1/9/17 | 7.69 | 4433.10 | 4431.80 | 32.95 | 4434.9 | 4429.9 | 31.05 |
| 1/10/17 | 7.70 | 4433.10 | 4431.80 | 32.95 | 4435.0 | 4429.9 | 31.03 |
| 1/11/17 | 7.70 | 4433.10 | 4431.80 | 32.95 | 4435.0 | 4430.0 | 31.01 |
| 1/12/17 | 7.70 | 4433.10 | 4431.80 | 32.95 | 4435.0 | 4430.0 | 30.99 |
| 1/13/17 | 7.70 | 4433.10 | 4431.80 | 32.95 | 4435.0 | 4430.0 | 30.97 |
| 1/14/17 | 7.71 | 4433.10 | 4431.80 | 32.95 | 4435.1 | 4430.0 | 30.95 |
| 1/15/17 | 7.71 | 4433.10 | 4431.80 | 32.95 | 4435.1 | 4430.0 | 30.93 |
| 1/16/17 | 7.71 | 4433.10 | 4431.80 | 32.95 | 4435.1 | 4430.0 | 30.91 |
| 1/17/17 | 7.72 | 4433.10 | 4431.80 | 32.95 | 4435.1 | 4430.0 | 30.89 |
| 1/18/17 | 7.72 | 4433.10 | 4431.80 | 32.95 | 4435.1 | 4430.1 | 30.87 |
| 1/19/17 | 7.72 | 4433.10 | 4431.80 | 32.95 | 4435.2 | 4430.1 | 30.84 |
| 1/20/17 | 7.72 | 4433.10 | 4431.80 | 32.95 | 4435.2 | 4430.1 | 30.82 |
| 1/21/17 | 7.73 | 4433.10 | 4431.80 | 32.95 | 4435.2 | 4430.1 | 30.80 |
| 1/22/17 | 7.73 | 4433.10 | 4431.80 | 32.95 | 4435.2 | 4430.1 | 30.78 |
| 1/23/17 | 7.73 | 4433.10 | 4431.80 | 32.95 | 4435.2 | 4430.1 | 30.76 |
| 1/24/17 | 7.73 | 4433.10 | 4431.80 | 32.95 | 4435.3 | 4430.1 | 30.74 |
| 1/25/17 | 7.74 | 4433.10 | 4431.80 | 32.95 | 4435.3 | 4430.2 | 30.72 |
| 1/26/17 | 7.74 | 4433.10 | 4431.80 | 32.95 | 4435.3 | 4430.2 | 30.70 |
| 1/27/17 | 7.74 | 4433.10 | 4431.80 | 32.95 | 4435.3 | 4430.2 | 30.68 |
| 1/28/17 | 7.75 | 4433.10 | 4431.80 | 32.95 | 4435.3 | 4430.2 | 30.66 |
| 1/29/17 | 7.75 | 4433.10 | 4431.80 | 32.95 | 4435.4 | 4430.2 | 30.63 |
| 1/30/17 | 7.75 | 4433.10 | 4431.80 | 32.95 | 4435.4 | 4430.2 | 30.61 |
| 1/31/17 | 7.75 | 4433.10 | 4431.80 | 32.95 | 4435.4 | 4430.2 | 30.59 |
| 2/1/17 | 7.76 | 4433.10 | 4431.80 | 32.95 | 4435.4 | 4430.3 | 30.57 |
| 2/2/17 | 7.76 | 4433.10 | 4431.80 | 32.94 | 4435.5 | 4430.3 | 30.55 |
| 2/3/17 | 7.76 | 4433.10 | 4431.80 | 32.95 | 4435.5 | 4430.3 | 30.53 |
| 2/4/17 | 7.76 | 4433.10 | 4431.80 | 32.94 | 4435.5 | 4430.3 | 30.51 |
| 2/5/17 | 7.77 | 4433.10 | 4431.80 | 32.95 | 4435.5 | 4430.3 | 30.49 |
| 2/6/17 | 7.77 | 4433.10 | 4431.80 | 32.94 | 4435.5 | 4430.3 | 30.46 |
| 2/7/17 | 7.77 | 4433.10 | 4431.80 | 32.95 | 4435.6 | 4430.3 | 30.44 |
| 2/8/17 | 7.78 | 4433.10 | 4431.80 | 32.94 | 4435.6 | 4430.4 | 30.42 |
| 2/9/17 | 7.78 | 4433.10 | 4431.80 | 32.95 | 4435.6 | 4430.4 | 30.40 |
| 2/10/17 | 7.78 | 4433.10 | 4431.80 | 32.94 | 4435.6 | 4430.4 | 30.38 |
| 2/11/17 | 7.78 | 4433.10 | 4431.80 | 32.95 | 4435.6 | 4430.4 | 30.36 |
| 2/12/17 | 7.79 | 4433.10 | 4431.80 | 32.94 | 4435.7 | 4430.4 | 30.34 |
| 2/13/17 | 7.79 | 4433.10 | 4431.80 | 32.95 | 4435.7 | 4430.4 | 30.32 |
| 2/14/17 | 7.79 | 4433.10 | 4431.80 | 32.94 | 4435.7 | 4430.4 | 30.29 |
| 2/15/17 | 7.79 | 4433.10 | 4431.80 | 32.95 | 4435.7 | 4430.5 | 30.27 |
| 2/16/17 | 7.80 | 4433.10 | 4431.80 | 32.94 | 4435.7 | 4430.5 | 30.25 |
| 2/17/17 | 7.80 | 4433.10 | 4431.80 | 32.95 | 4435.8 | 4430.5 | 30.23 |
| 2/18/17 | 7.80 | 4433.10 | 4431.80 | 32.94 | 4435.8 | 4430.5 | 30.21 |
| 2/19/17 | 7.81 | 4433.10 | 4431.80 | 32.95 | 4435.8 | 4430.5 | 30.19 |
| 2/20/17 | 7.81 | 4433.10 | 4431.80 | 32.94 | 4435.8 | 4430.5 | 30.17 |
| 2/21/17 | 7.81 | 4433.10 | 4431.80 | 32.95 | 4435.9 | 4430.5 | 30.15 |
| 2/22/17 | 7.81 | 4433.10 | 4431.80 | 32.94 | 4435.9 | 4430.6 | 30.12 |
| 2/23/17 | 7.82 | 4433.10 | 4431.80 | 32.95 | 4435.9 | 4430.6 | 30.10 |
| 2/24/17 | 7.82 | 4433.10 | 4431.80 | 32.94 | 4435.9 | 4430.6 | 30.08 |
| 2/25/17 | 7.82 | 4433.10 | 4431.80 | 32.95 | 4435.9 | 4430.6 | 30.06 |
| 2/26/17 | 7.82 | 4433.10 | 4431.80 | 32.94 | 4436.0 | 4430.6 | 30.04 |
| 2/27/17 | 7.83 | 4433.10 | 4431.80 | 32.95 | 4436.0 | 4430.6 | 30.02 |

**Appendix E**
**Table 1  Tailings and Pond Elevations for North and South Cells**

| | Year | North Cell | | | South Cell | | |
|---|---|---|---|---|---|---|---|
| Date | Fraction | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) |
| 2/28/17 | 7.83 | 4433.10 | 4431.80 | 32.94 | 4436.0 | 4430.6 | 30.00 |
| 3/1/17 | 7.83 | 4433.10 | 4431.80 | 32.95 | 4436.0 | 4430.6 | 29.98 |
| 3/2/17 | 7.84 | 4433.10 | 4431.80 | 32.94 | 4436.0 | 4430.7 | 29.95 |
| 3/3/17 | 7.84 | 4433.10 | 4431.80 | 32.94 | 4436.1 | 4430.7 | 29.93 |
| 3/4/17 | 7.84 | 4433.10 | 4431.80 | 32.95 | 4436.1 | 4430.7 | 29.91 |
| 3/5/17 | 7.84 | 4433.10 | 4431.80 | 32.95 | 4436.1 | 4430.7 | 29.89 |
| 3/6/17 | 7.85 | 4433.10 | 4431.80 | 32.95 | 4436.1 | 4430.7 | 29.86 |
| 3/7/17 | 7.85 | 4433.10 | 4431.80 | 32.95 | 4436.2 | 4430.7 | 29.84 |
| 3/8/17 | 7.85 | 4433.10 | 4431.80 | 32.95 | 4436.2 | 4430.7 | 29.82 |
| 3/9/17 | 7.85 | 4433.10 | 4431.80 | 32.95 | 4436.2 | 4430.8 | 29.80 |
| 3/10/17 | 7.86 | 4433.10 | 4431.80 | 32.95 | 4436.2 | 4430.8 | 29.78 |
| 3/11/17 | 7.86 | 4433.10 | 4431.80 | 32.95 | 4436.2 | 4430.8 | 29.75 |
| 3/12/17 | 7.86 | 4433.10 | 4431.80 | 32.95 | 4436.3 | 4430.8 | 29.73 |
| 3/13/17 | 7.87 | 4433.10 | 4431.80 | 32.95 | 4436.3 | 4430.8 | 29.71 |
| 3/14/17 | 7.87 | 4433.10 | 4431.80 | 32.95 | 4436.3 | 4430.8 | 29.69 |
| 3/15/17 | 7.87 | 4433.10 | 4431.80 | 32.95 | 4436.3 | 4430.8 | 29.67 |
| 3/16/17 | 7.87 | 4433.10 | 4431.80 | 32.95 | 4436.4 | 4430.9 | 29.64 |
| 3/17/17 | 7.88 | 4433.10 | 4431.80 | 32.95 | 4436.4 | 4430.9 | 29.62 |
| 3/18/17 | 7.88 | 4433.10 | 4431.80 | 32.95 | 4436.4 | 4430.9 | 29.60 |
| 3/19/17 | 7.88 | 4433.10 | 4431.80 | 32.95 | 4436.4 | 4430.9 | 29.58 |
| 3/20/17 | 7.89 | 4433.10 | 4431.80 | 32.95 | 4436.4 | 4430.9 | 29.55 |
| 3/21/17 | 7.89 | 4433.10 | 4431.80 | 32.95 | 4436.5 | 4430.9 | 29.53 |
| 3/22/17 | 7.89 | 4433.10 | 4431.80 | 32.95 | 4436.5 | 4430.9 | 29.51 |
| 3/23/17 | 7.89 | 4433.10 | 4431.80 | 32.95 | 4436.5 | 4431.0 | 29.49 |
| 3/24/17 | 7.90 | 4433.10 | 4431.80 | 32.95 | 4436.5 | 4431.0 | 29.47 |
| 3/25/17 | 7.90 | 4433.10 | 4431.80 | 32.95 | 4436.6 | 4431.0 | 29.44 |
| 3/26/17 | 7.90 | 4433.10 | 4431.80 | 32.95 | 4436.6 | 4431.0 | 29.42 |
| 3/27/17 | 7.90 | 4433.10 | 4431.80 | 32.95 | 4436.6 | 4431.0 | 29.40 |
| 3/28/17 | 7.91 | 4433.10 | 4431.80 | 32.95 | 4436.6 | 4431.0 | 29.38 |
| 3/29/17 | 7.91 | 4433.10 | 4431.80 | 32.95 | 4436.6 | 4431.0 | 29.36 |
| 3/30/17 | 7.91 | 4433.10 | 4431.80 | 32.95 | 4436.7 | 4431.1 | 29.33 |
| 3/31/17 | 7.92 | 4433.10 | 4431.80 | 32.95 | 4436.7 | 4431.1 | 29.31 |
| 4/1/17 | 7.92 | 4433.10 | 4431.80 | 32.95 | 4436.7 | 4431.1 | 29.29 |
| 4/2/17 | 7.92 | 4433.00 | 4431.80 | 32.95 | 4436.7 | 4431.1 | 29.27 |
| 4/3/17 | 7.92 | 4433.10 | 4431.80 | 32.95 | 4436.7 | 4431.1 | 29.25 |
| 4/4/17 | 7.93 | 4433.00 | 4431.80 | 32.95 | 4436.8 | 4431.1 | 29.23 |
| 4/5/17 | 7.93 | 4433.10 | 4431.80 | 32.95 | 4436.8 | 4431.1 | 29.21 |
| 4/6/17 | 7.93 | 4433.00 | 4431.80 | 32.95 | 4436.8 | 4431.2 | 29.19 |
| 4/7/17 | 7.93 | 4433.10 | 4431.80 | 32.95 | 4436.8 | 4431.2 | 29.18 |
| 4/8/17 | 7.94 | 4433.00 | 4431.80 | 32.95 | 4436.8 | 4431.2 | 29.16 |
| 4/9/17 | 7.94 | 4433.10 | 4431.80 | 32.95 | 4436.9 | 4431.2 | 29.14 |
| 4/10/17 | 7.94 | 4433.00 | 4431.80 | 32.95 | 4436.9 | 4431.2 | 29.12 |
| 4/11/17 | 7.95 | 4433.10 | 4431.80 | 32.95 | 4436.9 | 4431.2 | 29.10 |
| 4/12/17 | 7.95 | 4433.00 | 4431.80 | 32.95 | 4436.9 | 4431.2 | 29.08 |
| 4/13/17 | 7.95 | 4433.10 | 4431.80 | 32.95 | 4436.9 | 4431.3 | 29.06 |
| 4/14/17 | 7.95 | 4433.00 | 4431.80 | 32.95 | 4437.0 | 4431.3 | 29.04 |
| 4/15/17 | 7.96 | 4433.10 | 4431.80 | 32.95 | 4437.0 | 4431.3 | 29.02 |
| 4/16/17 | 7.96 | 4433.00 | 4431.80 | 32.95 | 4437.0 | 4431.3 | 29.00 |
| 4/17/17 | 7.96 | 4433.10 | 4431.80 | 32.95 | 4437.0 | 4431.3 | 28.99 |
| 4/18/17 | 7.96 | 4433.00 | 4431.80 | 32.95 | 4437.0 | 4431.3 | 28.97 |
| 4/19/17 | 7.97 | 4433.10 | 4431.80 | 32.95 | 4437.1 | 4431.3 | 28.95 |
| 4/20/17 | 7.97 | 4433.00 | 4431.80 | 32.95 | 4437.1 | 4431.3 | 28.93 |
| 4/21/17 | 7.97 | 4433.10 | 4431.80 | 32.95 | 4437.1 | 4431.4 | 28.91 |
| 4/22/17 | 7.98 | 4433.00 | 4431.80 | 32.95 | 4437.1 | 4431.4 | 28.89 |
| 4/23/17 | 7.98 | 4433.10 | 4431.80 | 32.95 | 4437.1 | 4431.4 | 28.87 |

## Appendix E
## Table 1 Tailings and Pond Elevations for North and South Cells

| | Year | North Cell | | | South Cell | | |
|---|---|---|---|---|---|---|---|
| Date | Fraction | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) |
| 4/24/17 | 7.98 | 4433.00 | 4431.80 | 32.95 | 4437.1 | 4431.4 | 28.85 |
| 4/25/17 | 7.98 | 4433.10 | 4431.80 | 32.95 | 4437.2 | 4431.4 | 28.83 |
| 4/26/17 | 7.99 | 4433.00 | 4431.80 | 32.95 | 4437.2 | 4431.4 | 28.81 |
| 4/27/17 | 7.99 | 4433.10 | 4431.80 | 32.95 | 4437.2 | 4431.4 | 28.80 |
| 4/28/17 | 7.99 | 4433.00 | 4431.80 | 32.95 | 4437.2 | 4431.5 | 28.78 |
| 4/29/17 | 7.99 | 4433.10 | 4431.80 | 32.95 | 4437.2 | 4431.5 | 28.76 |
| 4/30/17 | 8.00 | 4433.00 | 4431.80 | 32.95 | 4437.3 | 4431.5 | 28.74 |
| 5/1/17 | 8.00 | 4433.10 | 4431.80 | 32.95 | 4437.3 | 4431.5 | 28.72 |
| 5/2/17 | 8.00 | 4433.00 | 4431.80 | 32.95 | 4437.3 | 4431.5 | 28.70 |
| 5/3/17 | 8.01 | 4433.10 | 4431.80 | 32.95 | 4437.3 | 4431.5 | 28.68 |
| 5/4/17 | 8.01 | 4433.00 | 4431.80 | 32.95 | 4437.3 | 4431.5 | 28.67 |
| 5/5/17 | 8.01 | 4433.10 | 4431.80 | 32.95 | 4437.4 | 4431.6 | 28.65 |
| 5/6/17 | 8.01 | 4433.00 | 4431.80 | 32.95 | 4437.4 | 4431.6 | 28.63 |
| 5/7/17 | 8.02 | 4433.10 | 4431.80 | 32.95 | 4437.4 | 4431.6 | 28.61 |
| 5/8/17 | 8.02 | 4433.00 | 4431.80 | 32.95 | 4437.4 | 4431.6 | 28.59 |
| 5/9/17 | 8.02 | 4433.10 | 4431.80 | 32.95 | 4437.4 | 4431.6 | 28.58 |
| 5/10/17 | 8.02 | 4433.00 | 4431.80 | 32.95 | 4437.4 | 4431.6 | 28.56 |
| 5/11/17 | 8.03 | 4433.10 | 4431.80 | 32.95 | 4437.5 | 4431.6 | 28.54 |
| 5/12/17 | 8.03 | 4433.00 | 4431.80 | 32.95 | 4437.5 | 4431.7 | 28.52 |
| 5/13/17 | 8.03 | 4433.10 | 4431.80 | 32.95 | 4437.5 | 4431.7 | 28.51 |
| 5/14/17 | 8.04 | 4433.00 | 4431.80 | 32.95 | 4437.5 | 4431.7 | 28.49 |
| 5/15/17 | 8.04 | 4433.10 | 4431.80 | 32.95 | 4437.5 | 4431.7 | 28.47 |
| 5/16/17 | 8.04 | 4433.00 | 4431.80 | 32.95 | 4437.5 | 4431.7 | 28.45 |
| 5/17/17 | 8.04 | 4433.10 | 4431.80 | 32.95 | 4437.6 | 4431.7 | 28.43 |
| 5/18/17 | 8.05 | 4433.00 | 4431.80 | 32.95 | 4437.6 | 4431.7 | 28.42 |
| 5/19/17 | 8.05 | 4433.10 | 4431.80 | 32.95 | 4437.6 | 4431.8 | 28.40 |
| 5/20/17 | 8.05 | 4433.00 | 4431.80 | 32.95 | 4437.6 | 4431.8 | 28.38 |
| 5/21/17 | 8.05 | 4433.10 | 4431.80 | 32.95 | 4437.6 | 4431.8 | 28.36 |
| 5/22/17 | 8.06 | 4433.00 | 4431.80 | 32.95 | 4437.7 | 4431.8 | 28.35 |
| 5/23/17 | 8.06 | 4433.10 | 4431.80 | 32.95 | 4437.7 | 4431.8 | 28.33 |
| 5/24/17 | 8.06 | 4433.00 | 4431.80 | 32.95 | 4437.7 | 4431.8 | 28.31 |
| 5/25/17 | 8.07 | 4433.10 | 4431.80 | 32.95 | 4437.7 | 4431.8 | 28.29 |
| 5/26/17 | 8.07 | 4433.00 | 4431.80 | 32.95 | 4437.7 | 4431.9 | 28.27 |
| 5/27/17 | 8.07 | 4433.10 | 4431.80 | 32.95 | 4437.7 | 4431.9 | 28.26 |
| 5/28/17 | 8.07 | 4433.00 | 4431.80 | 32.95 | 4437.8 | 4431.9 | 28.24 |
| 5/29/17 | 8.08 | 4433.10 | 4431.80 | 32.95 | 4437.8 | 4431.9 | 28.22 |
| 5/30/17 | 8.08 | 4433.00 | 4431.80 | 32.95 | 4437.8 | 4431.9 | 28.20 |
| 5/31/17 | 8.08 | 4433.10 | 4431.80 | 32.95 | 4437.8 | 4431.9 | 28.18 |
| 6/1/17 | 8.08 | 4433.00 | 4431.80 | 32.95 | 4437.8 | 4431.9 | 28.17 |
| 6/2/17 | 8.09 | 4433.10 | 4431.80 | 32.95 | 4437.8 | 4431.9 | 28.15 |
| 6/3/17 | 8.09 | 4433.00 | 4431.80 | 32.96 | 4437.9 | 4432.0 | 28.14 |
| 6/4/17 | 8.09 | 4433.10 | 4431.80 | 32.95 | 4437.9 | 4432.0 | 28.12 |
| 6/5/17 | 8.10 | 4433.00 | 4431.80 | 32.96 | 4437.9 | 4432.0 | 28.11 |
| 6/6/17 | 8.10 | 4433.10 | 4431.80 | 32.95 | 4437.9 | 4432.0 | 28.10 |
| 6/7/17 | 8.10 | 4433.00 | 4431.80 | 32.96 | 4437.9 | 4432.0 | 28.08 |
| 6/8/17 | 8.10 | 4433.10 | 4431.80 | 32.95 | 4437.9 | 4432.0 | 28.07 |
| 6/9/17 | 8.11 | 4433.00 | 4431.80 | 32.96 | 4437.9 | 4432.0 | 28.05 |
| 6/10/17 | 8.11 | 4433.10 | 4431.80 | 32.95 | 4438.0 | 4432.1 | 28.04 |
| 6/11/17 | 8.11 | 4433.00 | 4431.80 | 32.96 | 4438.0 | 4432.1 | 28.03 |
| 6/12/17 | 8.12 | 4433.10 | 4431.80 | 32.95 | 4438.0 | 4432.1 | 28.01 |
| 6/13/17 | 8.12 | 4433.00 | 4431.80 | 32.96 | 4438.0 | 4432.1 | 28.00 |
| 6/14/17 | 8.12 | 4433.10 | 4431.80 | 32.95 | 4438.0 | 4432.1 | 27.98 |
| 6/15/17 | 8.12 | 4433.00 | 4431.80 | 32.96 | 4438.0 | 4432.1 | 27.97 |
| 6/16/17 | 8.13 | 4433.10 | 4431.80 | 32.95 | 4438.0 | 4432.1 | 27.96 |
| 6/17/17 | 8.13 | 4433.00 | 4431.80 | 32.96 | 4438.1 | 4432.2 | 27.94 |

**Appendix E**
**Table 1 Tailings and Pond Elevations for North and South Cells**

| Date | Year Fraction | North Cell | | | South Cell | | |
|---|---|---|---|---|---|---|---|
| | | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) |
| 6/18/17 | 8.13 | 4433.10 | 4431.80 | 32.95 | 4438.1 | 4432.2 | 27.93 |
| 6/19/17 | 8.13 | 4433.00 | 4431.80 | 32.96 | 4438.1 | 4432.2 | 27.91 |
| 6/20/17 | 8.14 | 4433.10 | 4431.80 | 32.95 | 4438.1 | 4432.2 | 27.90 |
| 6/21/17 | 8.14 | 4433.00 | 4431.80 | 32.96 | 4438.1 | 4432.2 | 27.89 |
| 6/22/17 | 8.14 | 4433.10 | 4431.80 | 32.95 | 4438.1 | 4432.2 | 27.87 |
| 6/23/17 | 8.15 | 4433.00 | 4431.80 | 32.96 | 4438.1 | 4432.2 | 27.86 |
| 6/24/17 | 8.15 | 4433.10 | 4431.80 | 32.95 | 4438.2 | 4432.3 | 27.84 |
| 6/25/17 | 8.15 | 4433.00 | 4431.80 | 32.96 | 4438.2 | 4432.3 | 27.83 |
| 6/26/17 | 8.15 | 4433.10 | 4431.80 | 32.95 | 4438.2 | 4432.3 | 27.82 |
| 6/27/17 | 8.16 | 4433.00 | 4431.80 | 32.96 | 4438.2 | 4432.3 | 27.80 |
| 6/28/17 | 8.16 | 4433.10 | 4431.80 | 32.95 | 4438.2 | 4432.3 | 27.79 |
| 6/29/17 | 8.16 | 4433.00 | 4431.80 | 32.96 | 4438.2 | 4432.3 | 27.77 |
| 6/30/17 | 8.16 | 4433.10 | 4431.80 | 32.95 | 4438.2 | 4432.3 | 27.76 |
| 7/1/17 | 8.17 | 4433.00 | 4431.80 | 32.96 | 4438.3 | 4432.4 | 27.75 |
| 7/2/17 | 8.17 | 4433.00 | 4431.80 | 32.96 | 4438.3 | 4432.4 | 27.74 |
| 7/3/17 | 8.17 | 4433.00 | 4431.80 | 32.97 | 4438.3 | 4432.4 | 27.73 |
| 7/4/17 | 8.18 | 4433.00 | 4431.80 | 32.96 | 4438.3 | 4432.4 | 27.73 |
| 7/5/17 | 8.18 | 4433.00 | 4431.80 | 32.97 | 4438.3 | 4432.4 | 27.72 |
| 7/6/17 | 8.18 | 4433.00 | 4431.80 | 32.96 | 4438.3 | 4432.4 | 27.71 |
| 7/7/17 | 8.18 | 4433.00 | 4431.80 | 32.97 | 4438.3 | 4432.4 | 27.71 |
| 7/8/17 | 8.19 | 4433.00 | 4431.80 | 32.96 | 4438.3 | 4432.5 | 27.70 |
| 7/9/17 | 8.19 | 4433.00 | 4431.80 | 32.97 | 4438.3 | 4432.5 | 27.69 |
| 7/10/17 | 8.19 | 4433.00 | 4431.80 | 32.96 | 4438.3 | 4432.5 | 27.69 |
| 7/11/17 | 8.19 | 4433.00 | 4431.80 | 32.97 | 4438.3 | 4432.5 | 27.68 |
| 7/12/17 | 8.20 | 4433.00 | 4431.80 | 32.96 | 4438.3 | 4432.5 | 27.67 |
| 7/13/17 | 8.20 | 4433.00 | 4431.80 | 32.97 | 4438.3 | 4432.5 | 27.67 |
| 7/14/17 | 8.20 | 4433.00 | 4431.80 | 32.96 | 4438.3 | 4432.5 | 27.66 |
| 7/15/17 | 8.21 | 4433.00 | 4431.80 | 32.97 | 4438.3 | 4432.6 | 27.65 |
| 7/16/17 | 8.21 | 4433.00 | 4431.80 | 32.96 | 4438.4 | 4432.6 | 27.65 |
| 7/17/17 | 8.21 | 4433.00 | 4431.80 | 32.97 | 4438.4 | 4432.6 | 27.64 |
| 7/18/17 | 8.21 | 4433.00 | 4431.80 | 32.96 | 4438.4 | 4432.6 | 27.63 |
| 7/19/17 | 8.22 | 4433.00 | 4431.80 | 32.97 | 4438.4 | 4432.6 | 27.63 |
| 7/20/17 | 8.22 | 4433.00 | 4431.80 | 32.96 | 4438.4 | 4432.6 | 27.62 |
| 7/21/17 | 8.22 | 4433.00 | 4431.80 | 32.97 | 4438.4 | 4432.6 | 27.61 |
| 7/22/17 | 8.22 | 4433.00 | 4431.80 | 32.96 | 4438.4 | 4432.6 | 27.61 |
| 7/23/17 | 8.23 | 4433.00 | 4431.80 | 32.97 | 4438.4 | 4432.7 | 27.60 |
| 7/24/17 | 8.23 | 4433.00 | 4431.80 | 32.96 | 4438.4 | 4432.7 | 27.59 |
| 7/25/17 | 8.23 | 4433.00 | 4431.80 | 32.97 | 4438.4 | 4432.7 | 27.59 |
| 7/26/17 | 8.24 | 4433.00 | 4431.80 | 32.96 | 4438.4 | 4432.7 | 27.58 |
| 7/27/17 | 8.24 | 4433.00 | 4431.80 | 32.97 | 4438.4 | 4432.7 | 27.57 |
| 7/28/17 | 8.24 | 4433.00 | 4431.80 | 32.96 | 4438.4 | 4432.7 | 27.57 |
| 7/29/17 | 8.24 | 4433.00 | 4431.80 | 32.97 | 4438.4 | 4432.7 | 27.56 |
| 7/30/17 | 8.25 | 4433.00 | 4431.80 | 32.96 | 4438.4 | 4432.8 | 27.55 |
| 7/31/17 | 8.25 | 4433.00 | 4431.80 | 32.97 | 4438.5 | 4432.8 | 27.55 |
| 8/1/17 | 8.25 | 4433.00 | 4431.80 | 32.96 | 4438.5 | 4432.8 | 27.54 |
| 8/2/17 | 8.25 | 4433.00 | 4431.80 | 32.97 | 4438.5 | 4432.8 | 27.53 |
| 8/3/17 | 8.26 | 4433.00 | 4431.80 | 32.96 | 4438.5 | 4432.8 | 27.53 |
| 8/4/17 | 8.26 | 4433.00 | 4431.80 | 32.97 | 4438.5 | 4432.8 | 27.52 |
| 8/5/17 | 8.26 | 4433.00 | 4431.80 | 32.96 | 4438.5 | 4432.8 | 27.52 |
| 8/6/17 | 8.27 | 4433.00 | 4431.80 | 32.97 | 4438.5 | 4432.9 | 27.51 |
| 8/7/17 | 8.27 | 4433.00 | 4431.80 | 32.96 | 4438.5 | 4432.9 | 27.50 |
| 8/8/17 | 8.27 | 4433.00 | 4431.80 | 32.97 | 4438.5 | 4432.9 | 27.50 |
| 8/9/17 | 8.27 | 4433.00 | 4431.80 | 32.96 | 4438.5 | 4432.9 | 27.49 |
| 8/10/17 | 8.28 | 4433.00 | 4431.80 | 32.97 | 4438.5 | 4432.9 | 27.49 |
| 8/11/17 | 8.28 | 4433.00 | 4431.80 | 32.96 | 4438.5 | 4432.9 | 27.48 |

## Appendix E
## Table 1  Tailings and Pond Elevations for North and South Cells

| | Year | North Cell | | | South Cell | | |
|---|---|---|---|---|---|---|---|
| Date | Fraction | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) |
| 8/12/17 | 8.28 | 4433.00 | 4431.80 | 32.97 | 4438.5 | 4432.9 | 27.48 |
| 8/13/17 | 8.28 | 4433.00 | 4431.80 | 32.96 | 4438.5 | 4433.0 | 27.47 |
| 8/14/17 | 8.29 | 4433.00 | 4431.80 | 32.97 | 4438.5 | 4433.0 | 27.46 |
| 8/15/17 | 8.29 | 4433.00 | 4431.80 | 32.96 | 4438.5 | 4433.0 | 27.46 |
| 8/16/17 | 8.29 | 4433.00 | 4431.80 | 32.97 | 4438.5 | 4433.0 | 27.45 |
| 8/17/17 | 8.30 | 4433.00 | 4431.80 | 32.96 | 4438.6 | 4433.0 | 27.45 |
| 8/18/17 | 8.30 | 4433.00 | 4431.80 | 32.97 | 4438.6 | 4433.0 | 27.44 |
| 8/19/17 | 8.30 | 4433.00 | 4431.80 | 32.96 | 4438.6 | 4433.0 | 27.44 |
| 8/20/17 | 8.30 | 4433.00 | 4431.80 | 32.97 | 4438.6 | 4433.1 | 27.43 |
| 8/21/17 | 8.31 | 4433.00 | 4431.80 | 32.96 | 4438.6 | 4433.1 | 27.42 |
| 8/22/17 | 8.31 | 4433.00 | 4431.80 | 32.97 | 4438.6 | 4433.1 | 27.42 |
| 8/23/17 | 8.31 | 4433.00 | 4431.80 | 32.96 | 4438.6 | 4433.1 | 27.41 |
| 8/24/17 | 8.31 | 4433.00 | 4431.80 | 32.97 | 4438.6 | 4433.1 | 27.41 |
| 8/25/17 | 8.32 | 4433.00 | 4431.80 | 32.96 | 4438.6 | 4433.1 | 27.40 |
| 8/26/17 | 8.32 | 4433.00 | 4431.80 | 32.97 | 4438.6 | 4433.1 | 27.39 |
| 8/27/17 | 8.32 | 4433.00 | 4431.80 | 32.95 | 4438.6 | 4433.2 | 27.39 |
| 8/28/17 | 8.33 | 4433.00 | 4431.80 | 32.97 | 4438.6 | 4433.2 | 27.38 |
| 8/29/17 | 8.33 | 4433.00 | 4431.80 | 32.95 | 4438.6 | 4433.2 | 27.38 |
| 8/30/17 | 8.33 | 4433.00 | 4431.80 | 32.97 | 4438.6 | 4433.2 | 27.37 |
| 8/31/17 | 8.33 | 4433.00 | 4431.80 | 32.95 | 4438.6 | 4433.2 | 27.37 |
| 9/1/17 | 8.34 | 4433.00 | 4431.80 | 32.97 | 4438.6 | 4433.2 | 27.36 |
| 9/2/17 | 8.34 | 4433.00 | 4431.80 | 32.95 | 4438.6 | 4433.2 | 27.35 |
| 9/3/17 | 8.34 | 4433.00 | 4431.80 | 32.97 | 4438.7 | 4433.2 | 27.35 |
| 9/4/17 | 8.35 | 4433.00 | 4431.80 | 32.95 | 4438.7 | 4433.3 | 27.34 |
| 9/5/17 | 8.35 | 4433.00 | 4431.80 | 32.97 | 4438.7 | 4433.3 | 27.34 |
| 9/6/17 | 8.35 | 4433.00 | 4431.80 | 32.95 | 4438.7 | 4433.3 | 27.33 |
| 9/7/17 | 8.35 | 4433.00 | 4431.80 | 32.97 | 4438.7 | 4433.3 | 27.32 |
| 9/8/17 | 8.36 | 4433.00 | 4431.80 | 32.95 | 4438.7 | 4433.3 | 27.32 |
| 9/9/17 | 8.36 | 4433.00 | 4431.80 | 32.97 | 4438.7 | 4433.3 | 27.31 |
| 9/10/17 | 8.36 | 4433.00 | 4431.80 | 32.95 | 4438.7 | 4433.3 | 27.31 |
| 9/11/17 | 8.36 | 4433.00 | 4431.80 | 32.97 | 4438.7 | 4433.4 | 27.30 |
| 9/12/17 | 8.37 | 4433.00 | 4431.80 | 32.95 | 4438.7 | 4433.4 | 27.30 |
| 9/13/17 | 8.37 | 4433.00 | 4431.80 | 32.97 | 4438.7 | 4433.4 | 27.29 |
| 9/14/17 | 8.37 | 4433.00 | 4431.80 | 32.95 | 4438.7 | 4433.4 | 27.28 |
| 9/15/17 | 8.38 | 4433.00 | 4431.80 | 32.97 | 4438.7 | 4433.4 | 27.28 |
| 9/16/17 | 8.38 | 4433.00 | 4431.80 | 32.95 | 4438.7 | 4433.4 | 27.27 |
| 9/17/17 | 8.38 | 4433.00 | 4431.80 | 32.97 | 4438.7 | 4433.4 | 27.27 |
| 9/18/17 | 8.38 | 4433.00 | 4431.80 | 32.95 | 4438.7 | 4433.5 | 27.26 |
| 9/19/17 | 8.39 | 4433.00 | 4431.80 | 32.97 | 4438.7 | 4433.5 | 27.25 |
| 9/20/17 | 8.39 | 4433.00 | 4431.80 | 32.95 | 4438.8 | 4433.5 | 27.25 |
| 9/21/17 | 8.39 | 4433.00 | 4431.80 | 32.97 | 4438.8 | 4433.5 | 27.24 |
| 9/22/17 | 8.39 | 4433.00 | 4431.80 | 32.95 | 4438.8 | 4433.5 | 27.24 |
| 9/23/17 | 8.40 | 4433.00 | 4431.80 | 32.97 | 4438.8 | 4433.5 | 27.23 |
| 9/24/17 | 8.40 | 4433.00 | 4431.80 | 32.95 | 4438.8 | 4433.5 | 27.22 |
| 9/25/17 | 8.40 | 4433.00 | 4431.80 | 32.97 | 4438.8 | 4433.6 | 27.22 |
| 9/26/17 | 8.41 | 4433.00 | 4431.80 | 32.95 | 4438.8 | 4433.6 | 27.21 |
| 9/27/17 | 8.41 | 4433.00 | 4431.80 | 32.97 | 4438.8 | 4433.6 | 27.21 |
| 9/28/17 | 8.41 | 4433.00 | 4431.80 | 32.95 | 4438.8 | 4433.6 | 27.20 |
| 9/29/17 | 8.41 | 4433.00 | 4431.80 | 32.97 | 4438.8 | 4433.6 | 27.19 |
| 9/30/17 | 8.42 | 4433.00 | 4431.80 | 32.95 | 4438.8 | 4433.6 | 27.19 |
| 10/1/17 | 8.42 | 4433.00 | 4431.80 | 32.97 | 4438.8 | 4433.6 | 27.18 |
| 10/2/17 | 8.42 | 4433.00 | 4431.80 | 32.95 | 4438.8 | 4433.7 | 27.17 |
| 10/3/17 | 8.42 | 4433.00 | 4431.80 | 32.96 | 4438.8 | 4433.7 | 27.16 |
| 10/4/17 | 8.43 | 4433.00 | 4431.80 | 32.95 | 4438.8 | 4433.7 | 27.16 |
| 10/5/17 | 8.43 | 4433.00 | 4431.80 | 32.96 | 4438.9 | 4433.7 | 27.15 |

**Appendix E**
**Table 1  Tailings and Pond Elevations for North and South Cells**

| | Year | North Cell | | | South Cell | | |
|---|---|---|---|---|---|---|---|
| Date | Fraction | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) |
| 10/6/17 | 8.43 | 4433.00 | 4431.80 | 32.95 | 4438.9 | 4433.7 | 27.14 |
| 10/7/17 | 8.44 | 4433.00 | 4431.80 | 32.96 | 4438.9 | 4433.7 | 27.13 |
| 10/8/17 | 8.44 | 4433.00 | 4431.80 | 32.95 | 4438.9 | 4433.7 | 27.12 |
| 10/9/17 | 8.44 | 4433.00 | 4431.80 | 32.96 | 4438.9 | 4433.8 | 27.11 |
| 10/10/17 | 8.44 | 4433.00 | 4431.80 | 32.95 | 4438.9 | 4433.8 | 27.10 |
| 10/11/17 | 8.45 | 4433.00 | 4431.80 | 32.96 | 4438.9 | 4433.8 | 27.09 |
| 10/12/17 | 8.45 | 4433.00 | 4431.80 | 32.95 | 4438.9 | 4433.8 | 27.08 |
| 10/13/17 | 8.45 | 4433.00 | 4431.80 | 32.96 | 4438.9 | 4433.8 | 27.07 |
| 10/14/17 | 8.45 | 4433.00 | 4431.80 | 32.95 | 4438.9 | 4433.8 | 27.06 |
| 10/15/17 | 8.46 | 4433.00 | 4431.80 | 32.96 | 4438.9 | 4433.8 | 27.05 |
| 10/16/17 | 8.46 | 4433.00 | 4431.80 | 32.95 | 4439.0 | 4433.9 | 27.04 |
| 10/17/17 | 8.46 | 4433.00 | 4431.80 | 32.96 | 4439.0 | 4433.9 | 27.03 |
| 10/18/17 | 8.47 | 4433.00 | 4431.80 | 32.95 | 4439.0 | 4433.9 | 27.03 |
| 10/19/17 | 8.47 | 4433.00 | 4431.80 | 32.96 | 4439.0 | 4433.9 | 27.02 |
| 10/20/17 | 8.47 | 4433.00 | 4431.80 | 32.95 | 4439.0 | 4433.9 | 27.01 |
| 10/21/17 | 8.47 | 4433.00 | 4431.80 | 32.96 | 4439.0 | 4433.9 | 27.00 |
| 10/22/17 | 8.48 | 4433.00 | 4431.80 | 32.95 | 4439.0 | 4433.9 | 26.99 |
| 10/23/17 | 8.48 | 4433.00 | 4431.80 | 32.96 | 4439.0 | 4433.9 | 26.98 |
| 10/24/17 | 8.48 | 4433.00 | 4431.80 | 32.95 | 4439.0 | 4434.0 | 26.97 |
| 10/25/17 | 8.48 | 4433.00 | 4431.80 | 32.96 | 4439.0 | 4434.0 | 26.96 |
| 10/26/17 | 8.49 | 4433.00 | 4431.80 | 32.95 | 4439.0 | 4434.0 | 26.95 |
| 10/27/17 | 8.49 | 4433.00 | 4431.80 | 32.96 | 4439.1 | 4434.0 | 26.94 |
| 10/28/17 | 8.49 | 4433.00 | 4431.80 | 32.95 | 4439.1 | 4434.0 | 26.93 |
| 10/29/17 | 8.50 | 4433.00 | 4431.80 | 32.96 | 4439.1 | 4434.0 | 26.92 |
| 10/30/17 | 8.50 | 4433.00 | 4431.80 | 32.95 | 4439.1 | 4434.0 | 26.91 |
| 10/31/17 | 8.50 | 4433.00 | 4431.80 | 32.96 | 4439.1 | 4434.1 | 26.91 |
| 11/1/17 | 8.50 | 4433.00 | 4431.80 | 32.95 | 4439.1 | 4434.1 | 26.90 |
| 11/2/17 | 8.51 | 4433.00 | 4431.80 | 32.96 | 4439.1 | 4434.1 | 26.88 |
| 11/3/17 | 8.51 | 4433.00 | 4431.80 | 32.95 | 4439.1 | 4434.1 | 26.87 |
| 11/4/17 | 8.51 | 4433.00 | 4431.80 | 32.96 | 4439.1 | 4434.1 | 26.85 |
| 11/5/17 | 8.51 | 4433.00 | 4431.80 | 32.95 | 4439.2 | 4434.1 | 26.84 |
| 11/6/17 | 8.52 | 4433.00 | 4431.80 | 32.96 | 4439.2 | 4434.1 | 26.83 |
| 11/7/17 | 8.52 | 4433.00 | 4431.80 | 32.95 | 4439.2 | 4434.2 | 26.81 |
| 11/8/17 | 8.52 | 4433.00 | 4431.80 | 32.96 | 4439.2 | 4434.2 | 26.80 |
| 11/9/17 | 8.53 | 4433.00 | 4431.80 | 32.95 | 4439.2 | 4434.2 | 26.78 |
| 11/10/17 | 8.53 | 4433.00 | 4431.80 | 32.96 | 4439.2 | 4434.2 | 26.77 |
| 11/11/17 | 8.53 | 4433.00 | 4431.80 | 32.95 | 4439.2 | 4434.2 | 26.76 |
| 11/12/17 | 8.53 | 4433.00 | 4431.80 | 32.96 | 4439.3 | 4434.2 | 26.74 |
| 11/13/17 | 8.54 | 4433.00 | 4431.80 | 32.95 | 4439.3 | 4434.2 | 26.73 |
| 11/14/17 | 8.54 | 4433.00 | 4431.80 | 32.96 | 4439.3 | 4434.3 | 26.71 |
| 11/15/17 | 8.54 | 4433.00 | 4431.80 | 32.95 | 4439.3 | 4434.3 | 26.70 |
| 11/16/17 | 8.54 | 4433.00 | 4431.80 | 32.96 | 4439.3 | 4434.3 | 26.69 |
| 11/17/17 | 8.55 | 4433.00 | 4431.80 | 32.95 | 4439.3 | 4434.3 | 26.67 |
| 11/18/17 | 8.55 | 4433.00 | 4431.80 | 32.96 | 4439.3 | 4434.3 | 26.66 |
| 11/19/17 | 8.55 | 4433.00 | 4431.80 | 32.95 | 4439.4 | 4434.3 | 26.64 |
| 11/20/17 | 8.56 | 4433.00 | 4431.80 | 32.96 | 4439.4 | 4434.3 | 26.63 |
| 11/21/17 | 8.56 | 4433.00 | 4431.80 | 32.95 | 4439.4 | 4434.4 | 26.62 |
| 11/22/17 | 8.56 | 4433.00 | 4431.80 | 32.96 | 4439.4 | 4434.4 | 26.60 |
| 11/23/17 | 8.56 | 4433.00 | 4431.80 | 32.95 | 4439.4 | 4434.4 | 26.59 |
| 11/24/17 | 8.57 | 4433.00 | 4431.80 | 32.96 | 4439.4 | 4434.4 | 26.57 |
| 11/25/17 | 8.57 | 4433.00 | 4431.80 | 32.95 | 4439.4 | 4434.4 | 26.56 |
| 11/26/17 | 8.57 | 4433.00 | 4431.80 | 32.96 | 4439.5 | 4434.4 | 26.55 |
| 11/27/17 | 8.57 | 4433.00 | 4431.80 | 32.95 | 4439.5 | 4434.4 | 26.53 |
| 11/28/17 | 8.58 | 4433.00 | 4431.80 | 32.96 | 4439.5 | 4434.5 | 26.52 |
| 11/29/17 | 8.58 | 4433.00 | 4431.80 | 32.95 | 4439.5 | 4434.5 | 26.50 |

**Appendix E**
**Table 1 Tailings and Pond Elevations for North and South Cells**

| | Year | North Cell | | | South Cell | | |
|---|---|---|---|---|---|---|---|
| Date | Fraction | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) |
| 11/30/17 | 8.58 | 4433.00 | 4431.80 | 32.96 | 4439.5 | 4434.5 | 26.49 |
| 12/1/17 | 8.59 | 4433.00 | 4431.80 | 32.95 | 4439.5 | 4434.5 | 26.48 |
| 12/2/17 | 8.59 | 4433.00 | 4431.80 | 32.96 | 4439.5 | 4434.5 | 26.46 |
| 12/3/17 | 8.59 | 4433.00 | 4431.80 | 32.95 | 4439.6 | 4434.5 | 26.44 |
| 12/4/17 | 8.59 | 4433.00 | 4431.80 | 32.96 | 4439.6 | 4434.5 | 26.42 |
| 12/5/17 | 8.60 | 4433.00 | 4431.80 | 32.95 | 4439.6 | 4434.6 | 26.40 |
| 12/6/17 | 8.60 | 4433.00 | 4431.80 | 32.96 | 4439.6 | 4434.6 | 26.38 |
| 12/7/17 | 8.60 | 4433.00 | 4431.80 | 32.95 | 4439.6 | 4434.6 | 26.37 |
| 12/8/17 | 8.61 | 4433.00 | 4431.80 | 32.96 | 4439.7 | 4434.6 | 26.35 |
| 12/9/17 | 8.61 | 4433.00 | 4431.80 | 32.95 | 4439.7 | 4434.6 | 26.33 |
| 12/10/17 | 8.61 | 4433.00 | 4431.80 | 32.96 | 4439.7 | 4434.6 | 26.31 |
| 12/11/17 | 8.61 | 4433.00 | 4431.80 | 32.95 | 4439.7 | 4434.6 | 26.29 |
| 12/12/17 | 8.62 | 4433.00 | 4431.80 | 32.96 | 4439.7 | 4434.6 | 26.27 |
| 12/13/17 | 8.62 | 4433.00 | 4431.80 | 32.95 | 4439.7 | 4434.7 | 26.26 |
| 12/14/17 | 8.62 | 4433.00 | 4431.80 | 32.96 | 4439.8 | 4434.7 | 26.24 |
| 12/15/17 | 8.62 | 4433.00 | 4431.80 | 32.95 | 4439.8 | 4434.7 | 26.22 |
| 12/16/17 | 8.63 | 4433.00 | 4431.80 | 32.96 | 4439.8 | 4434.7 | 26.20 |
| 12/17/17 | 8.63 | 4433.00 | 4431.80 | 32.95 | 4439.8 | 4434.7 | 26.18 |
| 12/18/17 | 8.63 | 4433.00 | 4431.80 | 32.96 | 4439.8 | 4434.7 | 26.16 |
| 12/19/17 | 8.64 | 4433.00 | 4431.80 | 32.95 | 4439.9 | 4434.7 | 26.15 |
| 12/20/17 | 8.64 | 4433.00 | 4431.80 | 32.96 | 4439.9 | 4434.8 | 26.13 |
| 12/21/17 | 8.64 | 4433.00 | 4431.80 | 32.95 | 4439.9 | 4434.8 | 26.11 |
| 12/22/17 | 8.64 | 4433.00 | 4431.80 | 32.96 | 4439.9 | 4434.8 | 26.09 |
| 12/23/17 | 8.65 | 4433.00 | 4431.80 | 32.95 | 4439.9 | 4434.8 | 26.07 |
| 12/24/17 | 8.65 | 4433.00 | 4431.80 | 32.96 | 4439.9 | 4434.8 | 26.05 |
| 12/25/17 | 8.65 | 4433.00 | 4431.80 | 32.95 | 4440.0 | 4434.8 | 26.04 |
| 12/26/17 | 8.65 | 4433.00 | 4431.80 | 32.96 | 4440.0 | 4434.8 | 26.02 |
| 12/27/17 | 8.66 | 4433.00 | 4431.80 | 32.95 | 4440.0 | 4434.9 | 26.00 |
| 12/28/17 | 8.66 | 4433.00 | 4431.80 | 32.96 | 4440.0 | 4434.9 | 25.98 |
| 12/29/17 | 8.66 | 4433.00 | 4431.80 | 32.95 | 4440.0 | 4434.9 | 25.97 |
| 12/30/17 | 8.67 | 4433.00 | 4431.80 | 32.96 | 4440.1 | 4434.9 | 25.95 |
| 12/31/17 | 8.67 | 4433.00 | 4431.80 | 32.95 | 4440.1 | 4434.9 | 25.93 |
| 1/1/18 | 8.67 | 4433.00 | 4431.80 | 32.96 | 4440.1 | 4434.9 | 25.92 |
| 1/2/18 | 8.67 | 4433.10 | 4431.80 | 32.95 | 4440.1 | 4434.9 | 25.90 |
| 1/3/18 | 8.68 | 4433.00 | 4431.80 | 32.95 | 4440.1 | 4435.0 | 25.88 |
| 1/4/18 | 8.68 | 4433.10 | 4431.80 | 32.95 | 4440.1 | 4435.0 | 25.86 |
| 1/5/18 | 8.68 | 4433.00 | 4431.80 | 32.95 | 4440.2 | 4435.0 | 25.84 |
| 1/6/18 | 8.68 | 4433.10 | 4431.80 | 32.95 | 4440.2 | 4435.0 | 25.82 |
| 1/7/18 | 8.69 | 4433.00 | 4431.80 | 32.95 | 4440.2 | 4435.0 | 25.80 |
| 1/8/18 | 8.69 | 4433.10 | 4431.80 | 32.95 | 4440.2 | 4435.0 | 25.79 |
| 1/9/18 | 8.69 | 4433.00 | 4431.80 | 32.95 | 4440.2 | 4435.0 | 25.77 |
| 1/10/18 | 8.70 | 4433.10 | 4431.80 | 32.95 | 4440.3 | 4435.1 | 25.75 |
| 1/11/18 | 8.70 | 4433.00 | 4431.80 | 32.95 | 4440.3 | 4435.1 | 25.73 |
| 1/12/18 | 8.70 | 4433.10 | 4431.80 | 32.95 | 4440.3 | 4435.1 | 25.71 |
| 1/13/18 | 8.70 | 4433.00 | 4431.80 | 32.95 | 4440.3 | 4435.1 | 25.69 |
| 1/14/18 | 8.71 | 4433.10 | 4431.80 | 32.95 | 4440.3 | 4435.1 | 25.67 |
| 1/15/18 | 8.71 | 4433.00 | 4431.80 | 32.95 | 4440.3 | 4435.1 | 25.65 |
| 1/16/18 | 8.71 | 4433.10 | 4431.80 | 32.95 | 4440.4 | 4435.1 | 25.64 |
| 1/17/18 | 8.71 | 4433.00 | 4431.80 | 32.95 | 4440.4 | 4435.2 | 25.62 |
| 1/18/18 | 8.72 | 4433.10 | 4431.80 | 32.95 | 4440.4 | 4435.2 | 25.60 |
| 1/19/18 | 8.72 | 4433.00 | 4431.80 | 32.95 | 4440.4 | 4435.2 | 25.58 |
| 1/20/18 | 8.72 | 4433.10 | 4431.80 | 32.95 | 4440.4 | 4435.2 | 25.56 |
| 1/21/18 | 8.73 | 4433.00 | 4431.80 | 32.95 | 4440.5 | 4435.2 | 25.54 |
| 1/22/18 | 8.73 | 4433.10 | 4431.80 | 32.95 | 4440.5 | 4435.2 | 25.52 |
| 1/23/18 | 8.73 | 4433.00 | 4431.80 | 32.95 | 4440.5 | 4435.2 | 25.50 |

## Appendix E
## Table 1  Tailings and Pond Elevations for North and South Cells

| Date | Year Fraction | North Cell | | | South Cell | | |
|---|---|---|---|---|---|---|---|
| | | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) |
| 1/24/18 | 8.73 | 4433.10 | 4431.80 | 32.95 | 4440.5 | 4435.2 | 25.49 |
| 1/25/18 | 8.74 | 4433.00 | 4431.80 | 32.95 | 4440.5 | 4435.3 | 25.47 |
| 1/26/18 | 8.74 | 4433.10 | 4431.80 | 32.95 | 4440.6 | 4435.3 | 25.45 |
| 1/27/18 | 8.74 | 4433.00 | 4431.80 | 32.95 | 4440.6 | 4435.3 | 25.43 |
| 1/28/18 | 8.74 | 4433.10 | 4431.80 | 32.95 | 4440.6 | 4435.3 | 25.41 |
| 1/29/18 | 8.75 | 4433.00 | 4431.80 | 32.95 | 4440.6 | 4435.3 | 25.39 |
| 1/30/18 | 8.75 | 4433.10 | 4431.80 | 32.95 | 4440.6 | 4435.3 | 25.37 |
| 1/31/18 | 8.75 | 4433.00 | 4431.80 | 32.95 | 4440.6 | 4435.3 | 25.36 |
| 2/1/18 | 8.76 | 4433.10 | 4431.80 | 32.95 | 4440.7 | 4435.4 | 25.34 |
| 2/2/18 | 8.76 | 4433.00 | 4431.80 | 32.95 | 4440.7 | 4435.4 | 25.32 |
| 2/3/18 | 8.76 | 4433.10 | 4431.80 | 32.95 | 4440.7 | 4435.4 | 25.30 |
| 2/4/18 | 8.76 | 4433.00 | 4431.80 | 32.95 | 4440.7 | 4435.4 | 25.28 |
| 2/5/18 | 8.77 | 4433.10 | 4431.80 | 32.95 | 4440.7 | 4435.4 | 25.26 |
| 2/6/18 | 8.77 | 4433.00 | 4431.80 | 32.95 | 4440.8 | 4435.4 | 25.24 |
| 2/7/18 | 8.77 | 4433.10 | 4431.80 | 32.95 | 4440.8 | 4435.4 | 25.22 |
| 2/8/18 | 8.77 | 4433.00 | 4431.80 | 32.95 | 4440.8 | 4435.5 | 25.20 |
| 2/9/18 | 8.78 | 4433.10 | 4431.80 | 32.95 | 4440.8 | 4435.5 | 25.18 |
| 2/10/18 | 8.78 | 4433.00 | 4431.80 | 32.95 | 4440.8 | 4435.5 | 25.17 |
| 2/11/18 | 8.78 | 4433.10 | 4431.80 | 32.95 | 4440.9 | 4435.5 | 25.15 |
| 2/12/18 | 8.79 | 4433.00 | 4431.80 | 32.95 | 4440.9 | 4435.5 | 25.13 |
| 2/13/18 | 8.79 | 4433.10 | 4431.80 | 32.95 | 4440.9 | 4435.5 | 25.11 |
| 2/14/18 | 8.79 | 4433.00 | 4431.80 | 32.95 | 4440.9 | 4435.5 | 25.09 |
| 2/15/18 | 8.79 | 4433.10 | 4431.80 | 32.95 | 4440.9 | 4435.6 | 25.07 |
| 2/16/18 | 8.80 | 4433.00 | 4431.80 | 32.95 | 4440.9 | 4435.6 | 25.05 |
| 2/17/18 | 8.80 | 4433.10 | 4431.80 | 32.95 | 4441.0 | 4435.6 | 25.03 |
| 2/18/18 | 8.80 | 4433.00 | 4431.80 | 32.95 | 4441.0 | 4435.6 | 25.01 |
| 2/19/18 | 8.80 | 4433.10 | 4431.80 | 32.95 | 4441.0 | 4435.6 | 24.99 |
| 2/20/18 | 8.81 | 4433.00 | 4431.80 | 32.95 | 4441.0 | 4435.6 | 24.98 |
| 2/21/18 | 8.81 | 4433.10 | 4431.80 | 32.95 | 4441.0 | 4435.6 | 24.96 |
| 2/22/18 | 8.81 | 4433.00 | 4431.80 | 32.95 | 4441.1 | 4435.7 | 24.94 |
| 2/23/18 | 8.82 | 4433.10 | 4431.80 | 32.95 | 4441.1 | 4435.7 | 24.92 |
| 2/24/18 | 8.82 | 4433.00 | 4431.80 | 32.95 | 4441.1 | 4435.7 | 24.90 |
| 2/25/18 | 8.82 | 4433.10 | 4431.80 | 32.95 | 4441.1 | 4435.7 | 24.88 |
| 2/26/18 | 8.82 | 4433.00 | 4431.80 | 32.95 | 4441.1 | 4435.7 | 24.86 |
| 2/27/18 | 8.83 | 4433.10 | 4431.80 | 32.95 | 4441.2 | 4435.7 | 24.84 |
| 2/28/18 | 8.83 | 4433.00 | 4431.80 | 32.95 | 4441.2 | 4435.7 | 24.82 |
| 3/1/18 | 8.83 | 4433.10 | 4431.80 | 32.95 | 4441.2 | 4435.8 | 24.80 |
| 3/2/18 | 8.84 | 4433.00 | 4431.80 | 32.95 | 4441.2 | 4435.8 | 24.79 |
| 3/3/18 | 8.84 | 4433.10 | 4431.80 | 32.95 | 4441.2 | 4435.8 | 24.77 |
| 3/4/18 | 8.84 | 4433.00 | 4431.80 | 32.95 | 4441.3 | 4435.8 | 24.75 |
| 3/5/18 | 8.84 | 4433.10 | 4431.80 | 32.95 | 4441.3 | 4435.8 | 24.73 |
| 3/6/18 | 8.85 | 4433.00 | 4431.80 | 32.95 | 4441.3 | 4435.8 | 24.71 |
| 3/7/18 | 8.85 | 4433.10 | 4431.80 | 32.95 | 4441.3 | 4435.8 | 24.69 |
| 3/8/18 | 8.85 | 4433.00 | 4431.80 | 32.95 | 4441.3 | 4435.9 | 24.67 |
| 3/9/18 | 8.85 | 4433.10 | 4431.80 | 32.95 | 4441.4 | 4435.9 | 24.65 |
| 3/10/18 | 8.86 | 4433.00 | 4431.80 | 32.95 | 4441.4 | 4435.9 | 24.63 |
| 3/11/18 | 8.86 | 4433.10 | 4431.80 | 32.95 | 4441.4 | 4435.9 | 24.61 |
| 3/12/18 | 8.86 | 4433.00 | 4431.80 | 32.95 | 4441.4 | 4435.9 | 24.59 |
| 3/13/18 | 8.87 | 4433.10 | 4431.80 | 32.95 | 4441.4 | 4435.9 | 24.57 |
| 3/14/18 | 8.87 | 4433.00 | 4431.80 | 32.95 | 4441.5 | 4435.9 | 24.55 |
| 3/15/18 | 8.87 | 4433.10 | 4431.80 | 32.95 | 4441.5 | 4435.9 | 24.53 |
| 3/16/18 | 8.87 | 4433.00 | 4431.80 | 32.95 | 4441.5 | 4436.0 | 24.51 |
| 3/17/18 | 8.88 | 4433.10 | 4431.80 | 32.95 | 4441.5 | 4436.0 | 24.49 |
| 3/18/18 | 8.88 | 4433.00 | 4431.80 | 32.95 | 4441.5 | 4436.0 | 24.47 |
| 3/19/18 | 8.88 | 4433.10 | 4431.80 | 32.95 | 4441.6 | 4436.0 | 24.45 |

## Appendix E
## Table 1  Tailings and Pond Elevations for North and South Cells

| Date | Year Fraction | North Cell | | | South Cell | | |
|---|---|---|---|---|---|---|---|
| | | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) |
| 3/20/18 | 8.88 | 4433.00 | 4431.80 | 32.95 | 4441.6 | 4436.0 | 24.43 |
| 3/21/18 | 8.89 | 4433.10 | 4431.80 | 32.95 | 4441.6 | 4436.0 | 24.41 |
| 3/22/18 | 8.89 | 4433.00 | 4431.80 | 32.95 | 4441.6 | 4436.0 | 24.39 |
| 3/23/18 | 8.89 | 4433.10 | 4431.80 | 32.95 | 4441.6 | 4436.1 | 24.37 |
| 3/24/18 | 8.90 | 4433.00 | 4431.80 | 32.95 | 4441.7 | 4436.1 | 24.35 |
| 3/25/18 | 8.90 | 4433.10 | 4431.80 | 32.95 | 4441.7 | 4436.1 | 24.33 |
| 3/26/18 | 8.90 | 4433.00 | 4431.80 | 32.95 | 4441.7 | 4436.1 | 24.31 |
| 3/27/18 | 8.90 | 4433.10 | 4431.80 | 32.95 | 4441.7 | 4436.1 | 24.29 |
| 3/28/18 | 8.91 | 4433.00 | 4431.80 | 32.95 | 4441.7 | 4436.1 | 24.27 |
| 3/29/18 | 8.91 | 4433.10 | 4431.80 | 32.95 | 4441.7 | 4436.1 | 24.25 |
| 3/30/18 | 8.91 | 4433.00 | 4431.80 | 32.95 | 4441.8 | 4436.2 | 24.23 |
| 3/31/18 | 8.91 | 4433.10 | 4431.80 | 32.95 | 4441.8 | 4436.2 | 24.21 |
| 4/1/18 | 8.92 | 4433.00 | 4431.80 | 32.95 | 4441.8 | 4436.2 | 24.19 |
| 4/2/18 | 8.92 | 4433.00 | 4431.80 | 32.96 | 4441.8 | 4436.2 | 24.17 |
| 4/3/18 | 8.92 | 4433.00 | 4431.80 | 32.96 | 4441.8 | 4436.2 | 24.16 |
| 4/4/18 | 8.93 | 4433.00 | 4431.80 | 32.96 | 4441.9 | 4436.2 | 24.14 |
| 4/5/18 | 8.93 | 4433.00 | 4431.80 | 32.96 | 4441.9 | 4436.2 | 24.12 |
| 4/6/18 | 8.93 | 4433.00 | 4431.80 | 32.96 | 4441.9 | 4436.3 | 24.11 |
| 4/7/18 | 8.93 | 4433.00 | 4431.80 | 32.96 | 4441.9 | 4436.3 | 24.09 |
| 4/8/18 | 8.94 | 4433.00 | 4431.80 | 32.96 | 4441.9 | 4436.3 | 24.07 |
| 4/9/18 | 8.94 | 4433.00 | 4431.80 | 32.96 | 4441.9 | 4436.3 | 24.06 |
| 4/10/18 | 8.94 | 4433.00 | 4431.80 | 32.96 | 4442.0 | 4436.3 | 24.04 |
| 4/11/18 | 8.94 | 4433.00 | 4431.80 | 32.96 | 4442.0 | 4436.3 | 24.02 |
| 4/12/18 | 8.95 | 4433.00 | 4431.80 | 32.96 | 4442.0 | 4436.3 | 24.01 |
| 4/13/18 | 8.95 | 4433.00 | 4431.80 | 32.96 | 4442.0 | 4436.4 | 23.99 |
| 4/14/18 | 8.95 | 4433.00 | 4431.80 | 32.96 | 4442.0 | 4436.4 | 23.97 |
| 4/15/18 | 8.96 | 4433.00 | 4431.80 | 32.96 | 4442.0 | 4436.4 | 23.95 |
| 4/16/18 | 8.96 | 4433.00 | 4431.80 | 32.96 | 4442.1 | 4436.4 | 23.94 |
| 4/17/18 | 8.96 | 4433.00 | 4431.80 | 32.96 | 4442.1 | 4436.4 | 23.92 |
| 4/18/18 | 8.96 | 4433.00 | 4431.80 | 32.96 | 4442.1 | 4436.4 | 23.90 |
| 4/19/18 | 8.97 | 4433.00 | 4431.80 | 32.96 | 4442.1 | 4436.4 | 23.89 |
| 4/20/18 | 8.97 | 4433.00 | 4431.80 | 32.96 | 4442.1 | 4436.5 | 23.87 |
| 4/21/18 | 8.97 | 4433.00 | 4431.80 | 32.96 | 4442.1 | 4436.5 | 23.85 |
| 4/22/18 | 8.97 | 4433.00 | 4431.80 | 32.96 | 4442.2 | 4436.5 | 23.84 |
| 4/23/18 | 8.98 | 4433.00 | 4431.80 | 32.96 | 4442.2 | 4436.5 | 23.82 |
| 4/24/18 | 8.98 | 4433.00 | 4431.80 | 32.96 | 4442.2 | 4436.5 | 23.80 |
| 4/25/18 | 8.98 | 4433.00 | 4431.80 | 32.96 | 4442.2 | 4436.5 | 23.79 |
| 4/26/18 | 8.99 | 4433.00 | 4431.80 | 32.96 | 4442.2 | 4436.5 | 23.77 |
| 4/27/18 | 8.99 | 4433.00 | 4431.80 | 32.96 | 4442.2 | 4436.5 | 23.75 |
| 4/28/18 | 8.99 | 4433.00 | 4431.80 | 32.96 | 4442.3 | 4436.6 | 23.73 |
| 4/29/18 | 8.99 | 4433.00 | 4431.80 | 32.96 | 4442.3 | 4436.6 | 23.72 |
| 4/30/18 | 9.00 | 4433.00 | 4431.80 | 32.96 | 4442.3 | 4436.6 | 23.70 |
| 5/1/18 | 9.00 | 4433.00 | 4431.80 | 32.96 | 4442.3 | 4436.6 | 23.68 |
| 5/2/18 | 9.00 | 4433.00 | 4431.80 | 32.96 | 4442.3 | 4436.6 | 23.67 |
| 5/3/18 | 9.00 | 4433.00 | 4431.80 | 32.96 | 4442.3 | 4436.6 | 23.65 |
| 5/4/18 | 9.01 | 4433.00 | 4431.80 | 32.96 | 4442.4 | 4436.6 | 23.64 |
| 5/5/18 | 9.01 | 4433.00 | 4431.80 | 32.96 | 4442.4 | 4436.7 | 23.62 |
| 5/6/18 | 9.01 | 4433.00 | 4431.80 | 32.96 | 4442.4 | 4436.7 | 23.60 |
| 5/7/18 | 9.02 | 4433.00 | 4431.80 | 32.96 | 4442.4 | 4436.7 | 23.59 |
| 5/8/18 | 9.02 | 4433.00 | 4431.80 | 32.96 | 4442.4 | 4436.7 | 23.57 |
| 5/9/18 | 9.02 | 4433.00 | 4431.80 | 32.96 | 4442.4 | 4436.7 | 23.56 |
| 5/10/18 | 9.02 | 4433.00 | 4431.80 | 32.96 | 4442.5 | 4436.7 | 23.54 |
| 5/11/18 | 9.03 | 4433.00 | 4431.80 | 32.96 | 4442.5 | 4436.7 | 23.53 |
| 5/12/18 | 9.03 | 4433.00 | 4431.80 | 32.96 | 4442.5 | 4436.8 | 23.51 |
| 5/13/18 | 9.03 | 4433.00 | 4431.80 | 32.96 | 4442.5 | 4436.8 | 23.49 |

**Appendix E**
**Table 1  Tailings and Pond Elevations for North and South Cells**

| | Year | North Cell | | | South Cell | | |
|---|---|---|---|---|---|---|---|
| Date | Fraction | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) |
| 5/14/18 | 9.03 | 4433.00 | 4431.80 | 32.96 | 4442.5 | 4436.8 | 23.48 |
| 5/15/18 | 9.04 | 4433.00 | 4431.80 | 32.96 | 4442.5 | 4436.8 | 23.46 |
| 5/16/18 | 9.04 | 4433.00 | 4431.80 | 32.96 | 4442.6 | 4436.8 | 23.45 |
| 5/17/18 | 9.04 | 4433.00 | 4431.80 | 32.96 | 4442.6 | 4436.8 | 23.43 |
| 5/18/18 | 9.05 | 4433.00 | 4431.80 | 32.96 | 4442.6 | 4436.8 | 23.41 |
| 5/19/18 | 9.05 | 4433.00 | 4431.80 | 32.96 | 4442.6 | 4436.9 | 23.40 |
| 5/20/18 | 9.05 | 4433.00 | 4431.80 | 32.96 | 4442.6 | 4436.9 | 23.38 |
| 5/21/18 | 9.05 | 4433.00 | 4431.80 | 32.96 | 4442.6 | 4436.9 | 23.37 |
| 5/22/18 | 9.06 | 4433.00 | 4431.80 | 32.96 | 4442.6 | 4436.9 | 23.35 |
| 5/23/18 | 9.06 | 4433.00 | 4431.80 | 32.96 | 4442.7 | 4436.9 | 23.34 |
| 5/24/18 | 9.06 | 4433.00 | 4431.80 | 32.96 | 4442.7 | 4436.9 | 23.32 |
| 5/25/18 | 9.07 | 4433.00 | 4431.80 | 32.96 | 4442.7 | 4436.9 | 23.30 |
| 5/26/18 | 9.07 | 4433.00 | 4431.80 | 32.96 | 4442.7 | 4437.0 | 23.29 |
| 5/27/18 | 9.07 | 4433.00 | 4431.80 | 32.96 | 4442.7 | 4437.0 | 23.27 |
| 5/28/18 | 9.07 | 4433.00 | 4431.80 | 32.96 | 4442.7 | 4437.0 | 23.26 |
| 5/29/18 | 9.08 | 4433.00 | 4431.80 | 32.96 | 4442.8 | 4437.0 | 23.24 |
| 5/30/18 | 9.08 | 4433.00 | 4431.80 | 32.96 | 4442.8 | 4437.0 | 23.22 |
| 5/31/18 | 9.08 | 4433.00 | 4431.80 | 32.96 | 4442.8 | 4437.0 | 23.21 |
| 6/1/18 | 9.08 | 4433.00 | 4431.80 | 32.96 | 4442.8 | 4437.0 | 23.19 |
| 6/2/18 | 9.09 | 4433.00 | 4431.80 | 32.96 | 4442.8 | 4437.1 | 23.18 |
| 6/3/18 | 9.09 | 4433.00 | 4431.80 | 32.97 | 4442.8 | 4437.1 | 23.17 |
| 6/4/18 | 9.09 | 4433.00 | 4431.80 | 32.96 | 4442.8 | 4437.1 | 23.16 |
| 6/5/18 | 9.10 | 4433.00 | 4431.80 | 32.97 | 4442.9 | 4437.1 | 23.14 |
| 6/6/18 | 9.10 | 4433.00 | 4431.80 | 32.96 | 4442.9 | 4437.1 | 23.13 |
| 6/7/18 | 9.10 | 4433.00 | 4431.80 | 32.97 | 4442.9 | 4437.1 | 23.12 |
| 6/8/18 | 9.10 | 4433.00 | 4431.80 | 32.96 | 4442.9 | 4437.1 | 23.11 |
| 6/9/18 | 9.11 | 4433.00 | 4431.80 | 32.97 | 4442.9 | 4437.1 | 23.09 |
| 6/10/18 | 9.11 | 4433.00 | 4431.80 | 32.96 | 4442.9 | 4437.2 | 23.08 |
| 6/11/18 | 9.11 | 4433.00 | 4431.80 | 32.97 | 4442.9 | 4437.2 | 23.07 |
| 6/12/18 | 9.11 | 4433.00 | 4431.80 | 32.96 | 4442.9 | 4437.2 | 23.06 |
| 6/13/18 | 9.12 | 4433.00 | 4431.80 | 32.97 | 4443.0 | 4437.2 | 23.05 |
| 6/14/18 | 9.12 | 4433.00 | 4431.80 | 32.96 | 4443.0 | 4437.2 | 23.03 |
| 6/15/18 | 9.12 | 4433.00 | 4431.80 | 32.97 | 4443.0 | 4437.2 | 23.02 |
| 6/16/18 | 9.13 | 4433.00 | 4431.80 | 32.96 | 4443.0 | 4437.2 | 23.01 |
| 6/17/18 | 9.13 | 4433.00 | 4431.80 | 32.97 | 4443.0 | 4437.3 | 23.00 |
| 6/18/18 | 9.13 | 4433.00 | 4431.80 | 32.96 | 4443.0 | 4437.3 | 22.98 |
| 6/19/18 | 9.13 | 4433.00 | 4431.80 | 32.97 | 4443.0 | 4437.3 | 22.97 |
| 6/20/18 | 9.14 | 4433.00 | 4431.80 | 32.96 | 4443.0 | 4437.3 | 22.96 |
| 6/21/18 | 9.14 | 4433.00 | 4431.80 | 32.97 | 4443.1 | 4437.3 | 22.95 |
| 6/22/18 | 9.14 | 4433.00 | 4431.80 | 32.96 | 4443.1 | 4437.3 | 22.94 |
| 6/23/18 | 9.14 | 4433.00 | 4431.80 | 32.97 | 4443.1 | 4437.3 | 22.92 |
| 6/24/18 | 9.15 | 4433.00 | 4431.80 | 32.96 | 4443.1 | 4437.4 | 22.91 |
| 6/25/18 | 9.15 | 4433.00 | 4431.80 | 32.97 | 4443.1 | 4437.4 | 22.90 |
| 6/26/18 | 9.15 | 4433.00 | 4431.80 | 32.96 | 4443.1 | 4437.4 | 22.89 |
| 6/27/18 | 9.16 | 4433.00 | 4431.80 | 32.97 | 4443.1 | 4437.4 | 22.87 |
| 6/28/18 | 9.16 | 4433.00 | 4431.80 | 32.96 | 4443.1 | 4437.4 | 22.86 |
| 6/29/18 | 9.16 | 4433.00 | 4431.80 | 32.97 | 4443.2 | 4437.4 | 22.85 |
| 6/30/18 | 9.16 | 4433.00 | 4431.80 | 32.96 | 4443.2 | 4437.4 | 22.84 |
| 7/1/18 | 9.17 | 4433.00 | 4431.80 | 32.97 | 4443.2 | 4437.5 | 22.82 |
| 7/2/18 | 9.17 | 4433.00 | 4431.80 | 32.97 | 4443.2 | 4437.5 | 22.82 |
| 7/3/18 | 9.17 | 4433.00 | 4431.80 | 32.98 | 4443.2 | 4437.5 | 22.81 |
| 7/4/18 | 9.17 | 4433.00 | 4431.80 | 32.97 | 4443.2 | 4437.5 | 22.81 |
| 7/5/18 | 9.18 | 4433.00 | 4431.80 | 32.98 | 4443.2 | 4437.5 | 22.80 |
| 7/6/18 | 9.18 | 4433.00 | 4431.80 | 32.97 | 4443.2 | 4437.5 | 22.80 |
| 7/7/18 | 9.18 | 4433.00 | 4431.80 | 32.98 | 4443.2 | 4437.5 | 22.79 |

**Appendix E**
**Table 1  Tailings and Pond Elevations for North and South Cells**

| Date | Year Fraction | North Cell | | | South Cell | | |
|---|---|---|---|---|---|---|---|
| | | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) |
| 7/8/18 | 9.19 | 4433.00 | 4431.80 | 32.97 | 4443.2 | 4437.6 | 22.79 |
| 7/9/18 | 9.19 | 4433.00 | 4431.80 | 32.98 | 4443.2 | 4437.6 | 22.78 |
| 7/10/18 | 9.19 | 4433.00 | 4431.80 | 32.97 | 4443.2 | 4437.6 | 22.78 |
| 7/11/18 | 9.19 | 4433.00 | 4431.80 | 32.98 | 4443.2 | 4437.6 | 22.77 |
| 7/12/18 | 9.20 | 4433.00 | 4431.80 | 32.97 | 4443.2 | 4437.6 | 22.77 |
| 7/13/18 | 9.20 | 4433.00 | 4431.80 | 32.98 | 4443.2 | 4437.6 | 22.76 |
| 7/14/18 | 9.20 | 4433.00 | 4431.80 | 32.97 | 4443.2 | 4437.6 | 22.76 |
| 7/15/18 | 9.20 | 4433.00 | 4431.80 | 32.98 | 4443.2 | 4437.7 | 22.75 |
| 7/16/18 | 9.21 | 4433.00 | 4431.80 | 32.97 | 4443.3 | 4437.7 | 22.75 |
| 7/17/18 | 9.21 | 4433.00 | 4431.80 | 32.98 | 4443.3 | 4437.7 | 22.74 |
| 7/18/18 | 9.21 | 4433.00 | 4431.80 | 32.97 | 4443.3 | 4437.7 | 22.74 |
| 7/19/18 | 9.22 | 4433.00 | 4431.80 | 32.98 | 4443.3 | 4437.7 | 22.73 |
| 7/20/18 | 9.22 | 4433.00 | 4431.80 | 32.97 | 4443.3 | 4437.7 | 22.73 |
| 7/21/18 | 9.22 | 4433.00 | 4431.80 | 32.98 | 4443.3 | 4437.7 | 22.72 |
| 7/22/18 | 9.22 | 4433.00 | 4431.80 | 32.97 | 4443.3 | 4437.8 | 22.71 |
| 7/23/18 | 9.23 | 4433.00 | 4431.80 | 32.98 | 4443.3 | 4437.8 | 22.71 |
| 7/24/18 | 9.23 | 4433.00 | 4431.80 | 32.97 | 4443.3 | 4437.8 | 22.70 |
| 7/25/18 | 9.23 | 4433.00 | 4431.80 | 32.98 | 4443.3 | 4437.8 | 22.70 |
| 7/26/18 | 9.23 | 4433.00 | 4431.80 | 32.97 | 4443.3 | 4437.8 | 22.69 |
| 7/27/18 | 9.24 | 4433.00 | 4431.80 | 32.98 | 4443.3 | 4437.8 | 22.69 |
| 7/28/18 | 9.24 | 4433.00 | 4431.80 | 32.97 | 4443.3 | 4437.8 | 22.68 |
| 7/29/18 | 9.24 | 4433.00 | 4431.80 | 32.98 | 4443.3 | 4437.8 | 22.68 |
| 7/30/18 | 9.25 | 4433.00 | 4431.80 | 32.97 | 4443.3 | 4437.9 | 22.67 |
| 7/31/18 | 9.25 | 4433.00 | 4431.80 | 32.98 | 4443.3 | 4437.9 | 22.67 |
| 8/1/18 | 9.25 | 4433.00 | 4431.80 | 32.97 | 4443.3 | 4437.9 | 22.66 |
| 8/2/18 | 9.25 | 4433.00 | 4431.80 | 32.98 | 4443.3 | 4437.9 | 22.66 |
| 8/3/18 | 9.26 | 4433.00 | 4431.80 | 32.97 | 4443.3 | 4437.9 | 22.65 |
| 8/4/18 | 9.26 | 4433.00 | 4431.80 | 32.98 | 4443.4 | 4437.9 | 22.65 |
| 8/5/18 | 9.26 | 4433.00 | 4431.80 | 32.97 | 4443.4 | 4437.9 | 22.65 |
| 8/6/18 | 9.26 | 4433.00 | 4431.80 | 32.98 | 4443.4 | 4438.0 | 22.64 |
| 8/7/18 | 9.27 | 4433.00 | 4431.80 | 32.97 | 4443.4 | 4438.0 | 22.64 |
| 8/8/18 | 9.27 | 4433.00 | 4431.80 | 32.98 | 4443.4 | 4438.0 | 22.63 |
| 8/9/18 | 9.27 | 4433.00 | 4431.80 | 32.97 | 4443.4 | 4438.0 | 22.63 |
| 8/10/18 | 9.28 | 4433.00 | 4431.80 | 32.98 | 4443.4 | 4438.0 | 22.62 |
| 8/11/18 | 9.28 | 4433.00 | 4431.80 | 32.97 | 4443.4 | 4438.0 | 22.62 |
| 8/12/18 | 9.28 | 4433.00 | 4431.80 | 32.98 | 4443.4 | 4438.0 | 22.62 |
| 8/13/18 | 9.28 | 4433.00 | 4431.80 | 32.97 | 4443.4 | 4438.1 | 22.61 |
| 8/14/18 | 9.29 | 4433.00 | 4431.80 | 32.98 | 4443.4 | 4438.1 | 22.61 |
| 8/15/18 | 9.29 | 4433.00 | 4431.80 | 32.97 | 4443.4 | 4438.1 | 22.60 |
| 8/16/18 | 9.29 | 4433.00 | 4431.80 | 32.98 | 4443.4 | 4438.1 | 22.60 |
| 8/17/18 | 9.30 | 4433.00 | 4431.80 | 32.97 | 4443.4 | 4438.1 | 22.59 |
| 8/18/18 | 9.30 | 4433.00 | 4431.80 | 32.98 | 4443.4 | 4438.1 | 22.59 |
| 8/19/18 | 9.30 | 4433.00 | 4431.80 | 32.96 | 4443.4 | 4438.1 | 22.59 |
| 8/20/18 | 9.30 | 4433.00 | 4431.80 | 32.98 | 4443.4 | 4438.2 | 22.58 |
| 8/21/18 | 9.31 | 4433.00 | 4431.80 | 32.96 | 4443.4 | 4438.2 | 22.58 |
| 8/22/18 | 9.31 | 4433.00 | 4431.80 | 32.98 | 4443.4 | 4438.2 | 22.57 |
| 8/23/18 | 9.31 | 4433.00 | 4431.80 | 32.96 | 4443.4 | 4438.2 | 22.57 |
| 8/24/18 | 9.31 | 4433.00 | 4431.80 | 32.98 | 4443.4 | 4438.2 | 22.56 |
| 8/25/18 | 9.32 | 4433.00 | 4431.80 | 32.96 | 4443.4 | 4438.2 | 22.56 |
| 8/26/18 | 9.32 | 4433.00 | 4431.80 | 32.98 | 4443.4 | 4438.2 | 22.56 |
| 8/27/18 | 9.32 | 4433.00 | 4431.80 | 32.96 | 4443.4 | 4438.3 | 22.55 |
| 8/28/18 | 9.33 | 4433.00 | 4431.80 | 32.98 | 4443.5 | 4438.3 | 22.55 |
| 8/29/18 | 9.33 | 4433.00 | 4431.80 | 32.96 | 4443.5 | 4438.3 | 22.54 |
| 8/30/18 | 9.33 | 4433.00 | 4431.80 | 32.98 | 4443.5 | 4438.3 | 22.54 |
| 8/31/18 | 9.33 | 4433.00 | 4431.80 | 32.96 | 4443.5 | 4438.3 | 22.53 |

**Appendix E**
**Table 1  Tailings and Pond Elevations for North and South Cells**

| Date | Year Fraction | North Cell | | | South Cell | | |
|---|---|---|---|---|---|---|---|
| | | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) |
| 9/1/18 | 9.34 | 4433.00 | 4431.80 | 32.98 | 4443.5 | 4438.3 | 22.53 |
| 9/2/18 | 9.34 | 4433.00 | 4431.80 | 32.96 | 4443.5 | 4438.3 | 22.52 |
| 9/3/18 | 9.34 | 4433.00 | 4431.80 | 32.98 | 4443.5 | 4438.4 | 22.52 |
| 9/4/18 | 9.34 | 4433.00 | 4431.80 | 32.96 | 4443.5 | 4438.4 | 22.52 |
| 9/5/18 | 9.35 | 4433.00 | 4431.80 | 32.98 | 4443.5 | 4438.4 | 22.51 |
| 9/6/18 | 9.35 | 4433.00 | 4431.80 | 32.96 | 4443.5 | 4438.4 | 22.51 |
| 9/7/18 | 9.35 | 4433.00 | 4431.80 | 32.98 | 4443.5 | 4438.4 | 22.50 |
| 9/8/18 | 9.36 | 4433.00 | 4431.80 | 32.96 | 4443.5 | 4438.4 | 22.50 |
| 9/9/18 | 9.36 | 4433.00 | 4431.80 | 32.98 | 4443.5 | 4438.4 | 22.49 |
| 9/10/18 | 9.36 | 4433.00 | 4431.80 | 32.96 | 4443.5 | 4438.5 | 22.49 |
| 9/11/18 | 9.36 | 4433.00 | 4431.80 | 32.98 | 4443.5 | 4438.5 | 22.48 |
| 9/12/18 | 9.37 | 4433.00 | 4431.80 | 32.96 | 4443.5 | 4438.5 | 22.48 |
| 9/13/18 | 9.37 | 4433.00 | 4431.80 | 32.98 | 4443.5 | 4438.5 | 22.48 |
| 9/14/18 | 9.37 | 4433.00 | 4431.80 | 32.96 | 4443.5 | 4438.5 | 22.47 |
| 9/15/18 | 9.37 | 4433.00 | 4431.80 | 32.98 | 4443.5 | 4438.5 | 22.47 |
| 9/16/18 | 9.38 | 4433.00 | 4431.80 | 32.96 | 4443.5 | 4438.5 | 22.46 |
| 9/17/18 | 9.38 | 4433.00 | 4431.80 | 32.98 | 4443.5 | 4438.5 | 22.46 |
| 9/18/18 | 9.38 | 4433.00 | 4431.80 | 32.96 | 4443.5 | 4438.6 | 22.45 |
| 9/19/18 | 9.39 | 4433.00 | 4431.80 | 32.98 | 4443.6 | 4438.6 | 22.45 |
| 9/20/18 | 9.39 | 4433.00 | 4431.80 | 32.96 | 4443.6 | 4438.6 | 22.44 |
| 9/21/18 | 9.39 | 4433.00 | 4431.80 | 32.98 | 4443.6 | 4438.6 | 22.44 |
| 9/22/18 | 9.39 | 4433.00 | 4431.80 | 32.96 | 4443.6 | 4438.6 | 22.44 |
| 9/23/18 | 9.40 | 4433.00 | 4431.80 | 32.98 | 4443.6 | 4438.6 | 22.43 |
| 9/24/18 | 9.40 | 4433.00 | 4431.80 | 32.96 | 4443.6 | 4438.6 | 22.43 |
| 9/25/18 | 9.40 | 4433.00 | 4431.80 | 32.98 | 4443.6 | 4438.7 | 22.42 |
| 9/26/18 | 9.40 | 4433.00 | 4431.80 | 32.96 | 4443.6 | 4438.7 | 22.42 |
| 9/27/18 | 9.41 | 4433.00 | 4431.80 | 32.98 | 4443.6 | 4438.7 | 22.41 |
| 9/28/18 | 9.41 | 4433.00 | 4431.80 | 32.96 | 4443.6 | 4438.7 | 22.41 |
| 9/29/18 | 9.41 | 4433.00 | 4431.80 | 32.98 | 4443.6 | 4438.7 | 22.40 |
| 9/30/18 | 9.42 | 4433.00 | 4431.80 | 32.96 | 4443.6 | 4438.7 | 22.40 |
| 10/1/18 | 9.42 | 4433.00 | 4431.80 | 32.98 | 4443.6 | 4438.7 | 22.40 |
| 10/2/18 | 9.42 | 4433.00 | 4431.80 | 32.96 | 4443.6 | 4438.8 | 22.39 |
| 10/3/18 | 9.42 | 4433.00 | 4431.80 | 32.97 | 4443.6 | 4438.8 | 22.38 |
| 10/4/18 | 9.43 | 4433.00 | 4431.80 | 32.96 | 4443.6 | 4438.8 | 22.37 |
| 10/5/18 | 9.43 | 4433.00 | 4431.80 | 32.97 | 4443.6 | 4438.8 | 22.36 |
| 10/6/18 | 9.43 | 4433.00 | 4431.80 | 32.96 | 4443.6 | 4438.8 | 22.36 |
| 10/7/18 | 9.43 | 4433.00 | 4431.80 | 32.97 | 4443.7 | 4438.8 | 22.35 |
| 10/8/18 | 9.44 | 4433.00 | 4431.80 | 32.96 | 4443.7 | 4438.8 | 22.34 |
| 10/9/18 | 9.44 | 4433.00 | 4431.80 | 32.97 | 4443.7 | 4438.9 | 22.33 |
| 10/10/18 | 9.44 | 4433.00 | 4431.80 | 32.96 | 4443.7 | 4438.9 | 22.33 |
| 10/11/18 | 9.45 | 4433.00 | 4431.80 | 32.97 | 4443.7 | 4438.9 | 22.32 |
| 10/12/18 | 9.45 | 4433.00 | 4431.80 | 32.96 | 4443.7 | 4438.9 | 22.31 |
| 10/13/18 | 9.45 | 4433.00 | 4431.80 | 32.97 | 4443.7 | 4438.9 | 22.30 |
| 10/14/18 | 9.45 | 4433.00 | 4431.80 | 32.96 | 4443.7 | 4438.9 | 22.30 |
| 10/15/18 | 9.46 | 4433.00 | 4431.80 | 32.97 | 4443.7 | 4438.9 | 22.29 |
| 10/16/18 | 9.46 | 4433.00 | 4431.80 | 32.96 | 4443.7 | 4439.0 | 22.28 |
| 10/17/18 | 9.46 | 4433.00 | 4431.80 | 32.97 | 4443.7 | 4439.0 | 22.27 |
| 10/18/18 | 9.46 | 4433.00 | 4431.80 | 32.96 | 4443.7 | 4439.0 | 22.26 |
| 10/19/18 | 9.47 | 4433.00 | 4431.80 | 32.97 | 4443.7 | 4439.0 | 22.26 |
| 10/20/18 | 9.47 | 4433.00 | 4431.80 | 32.96 | 4443.8 | 4439.0 | 22.25 |
| 10/21/18 | 9.47 | 4433.00 | 4431.80 | 32.97 | 4443.8 | 4439.0 | 22.24 |
| 10/22/18 | 9.48 | 4433.00 | 4431.80 | 32.96 | 4443.8 | 4439.0 | 22.23 |
| 10/23/18 | 9.48 | 4433.00 | 4431.80 | 32.97 | 4443.8 | 4439.1 | 22.23 |
| 10/24/18 | 9.48 | 4433.00 | 4431.80 | 32.96 | 4443.8 | 4439.1 | 22.22 |
| 10/25/18 | 9.48 | 4433.00 | 4431.80 | 32.97 | 4443.8 | 4439.1 | 22.21 |

**Appendix E**
**Table 1  Tailings and Pond Elevations for North and South Cells**

| | Year | North Cell | | | South Cell | | |
|---|---|---|---|---|---|---|---|
| Date | Fraction | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) |
| 10/26/18 | 9.49 | 4433.00 | 4431.80 | 32.96 | 4443.8 | 4439.1 | 22.20 |
| 10/27/18 | 9.49 | 4433.00 | 4431.80 | 32.97 | 4443.8 | 4439.1 | 22.20 |
| 10/28/18 | 9.49 | 4433.00 | 4431.80 | 32.96 | 4443.8 | 4439.1 | 22.19 |
| 10/29/18 | 9.49 | 4433.00 | 4431.80 | 32.97 | 4443.8 | 4439.1 | 22.18 |
| 10/30/18 | 9.50 | 4433.00 | 4431.80 | 32.96 | 4443.8 | 4439.1 | 22.17 |
| 10/31/18 | 9.50 | 4433.00 | 4431.80 | 32.97 | 4443.8 | 4439.2 | 22.17 |
| 11/1/18 | 9.50 | 4433.00 | 4431.80 | 32.96 | 4443.8 | 4439.2 | 22.16 |
| 11/2/18 | 9.51 | 4433.00 | 4431.80 | 32.97 | 4443.9 | 4439.2 | 22.15 |
| 11/3/18 | 9.51 | 4433.00 | 4431.80 | 32.96 | 4443.9 | 4439.2 | 22.13 |
| 11/4/18 | 9.51 | 4433.00 | 4431.80 | 32.97 | 4443.9 | 4439.2 | 22.12 |
| 11/5/18 | 9.51 | 4433.00 | 4431.80 | 32.96 | 4443.9 | 4439.2 | 22.11 |
| 11/6/18 | 9.52 | 4433.00 | 4431.80 | 32.97 | 4443.9 | 4439.2 | 22.10 |
| 11/7/18 | 9.52 | 4433.00 | 4431.80 | 32.96 | 4443.9 | 4439.3 | 22.08 |
| 11/8/18 | 9.52 | 4433.00 | 4431.80 | 32.97 | 4443.9 | 4439.3 | 22.07 |
| 11/9/18 | 9.53 | 4433.00 | 4431.80 | 32.96 | 4443.9 | 4439.3 | 22.06 |
| 11/10/18 | 9.53 | 4433.00 | 4431.80 | 32.97 | 4444.0 | 4439.3 | 22.05 |
| 11/11/18 | 9.53 | 4433.00 | 4431.80 | 32.96 | 4444.0 | 4439.3 | 22.03 |
| 11/12/18 | 9.53 | 4433.00 | 4431.80 | 32.97 | 4444.0 | 4439.3 | 22.02 |
| 11/13/18 | 9.54 | 4433.00 | 4431.80 | 32.96 | 4444.0 | 4439.3 | 22.01 |
| 11/14/18 | 9.54 | 4433.00 | 4431.80 | 32.97 | 4444.0 | 4439.4 | 22.00 |
| 11/15/18 | 9.54 | 4433.00 | 4431.80 | 32.96 | 4444.0 | 4439.4 | 21.99 |
| 11/16/18 | 9.54 | 4433.00 | 4431.80 | 32.97 | 4444.0 | 4439.4 | 21.97 |
| 11/17/18 | 9.55 | 4433.00 | 4431.80 | 32.96 | 4444.0 | 4439.4 | 21.96 |
| 11/18/18 | 9.55 | 4433.00 | 4431.80 | 32.97 | 4444.1 | 4439.4 | 21.95 |
| 11/19/18 | 9.55 | 4433.00 | 4431.80 | 32.96 | 4444.1 | 4439.4 | 21.94 |
| 11/20/18 | 9.56 | 4433.00 | 4431.80 | 32.97 | 4444.1 | 4439.4 | 21.92 |
| 11/21/18 | 9.56 | 4433.00 | 4431.80 | 32.96 | 4444.1 | 4439.5 | 21.91 |
| 11/22/18 | 9.56 | 4433.00 | 4431.80 | 32.97 | 4444.1 | 4439.5 | 21.90 |
| 11/23/18 | 9.56 | 4433.00 | 4431.80 | 32.96 | 4444.1 | 4439.5 | 21.89 |
| 11/24/18 | 9.57 | 4433.00 | 4431.80 | 32.97 | 4444.1 | 4439.5 | 21.87 |
| 11/25/18 | 9.57 | 4433.00 | 4431.80 | 32.96 | 4444.1 | 4439.5 | 21.86 |
| 11/26/18 | 9.57 | 4433.00 | 4431.80 | 32.97 | 4444.2 | 4439.5 | 21.85 |
| 11/27/18 | 9.57 | 4433.00 | 4431.80 | 32.96 | 4444.2 | 4439.5 | 21.84 |
| 11/28/18 | 9.58 | 4433.00 | 4431.80 | 32.97 | 4444.2 | 4439.6 | 21.83 |
| 11/29/18 | 9.58 | 4433.00 | 4431.80 | 32.96 | 4444.2 | 4439.6 | 21.81 |
| 11/30/18 | 9.58 | 4433.00 | 4431.80 | 32.97 | 4444.2 | 4439.6 | 21.80 |
| 12/1/18 | 9.59 | 4433.00 | 4431.80 | 32.96 | 4444.2 | 4439.6 | 21.79 |
| 12/2/18 | 9.59 | 4433.00 | 4431.80 | 32.97 | 4444.2 | 4439.6 | 21.77 |
| 12/3/18 | 9.59 | 4433.00 | 4431.80 | 32.96 | 4444.2 | 4439.6 | 21.76 |
| 12/4/18 | 9.59 | 4433.00 | 4431.80 | 32.97 | 4444.3 | 4439.6 | 21.74 |
| 12/5/18 | 9.60 | 4433.00 | 4431.80 | 32.96 | 4444.3 | 4439.7 | 21.72 |
| 12/6/18 | 9.60 | 4433.00 | 4431.80 | 32.97 | 4444.3 | 4439.7 | 21.71 |
| 12/7/18 | 9.60 | 4433.00 | 4431.80 | 32.96 | 4444.3 | 4439.7 | 21.69 |
| 12/8/18 | 9.60 | 4433.00 | 4431.80 | 32.97 | 4444.3 | 4439.7 | 21.67 |
| 12/9/18 | 9.61 | 4433.00 | 4431.80 | 32.96 | 4444.3 | 4439.7 | 21.66 |
| 12/10/18 | 9.61 | 4433.00 | 4431.80 | 32.97 | 4444.4 | 4439.7 | 21.64 |
| 12/11/18 | 9.61 | 4433.00 | 4431.80 | 32.96 | 4444.4 | 4439.7 | 21.62 |
| 12/12/18 | 9.62 | 4433.00 | 4431.80 | 32.97 | 4444.4 | 4439.8 | 21.61 |
| 12/13/18 | 9.62 | 4433.00 | 4431.80 | 32.96 | 4444.4 | 4439.8 | 21.59 |
| 12/14/18 | 9.62 | 4433.00 | 4431.80 | 32.97 | 4444.4 | 4439.8 | 21.57 |
| 12/15/18 | 9.62 | 4433.00 | 4431.80 | 32.96 | 4444.4 | 4439.8 | 21.56 |
| 12/16/18 | 9.63 | 4433.00 | 4431.80 | 32.97 | 4444.5 | 4439.8 | 21.54 |
| 12/17/18 | 9.63 | 4433.00 | 4431.80 | 32.96 | 4444.5 | 4439.8 | 21.53 |
| 12/18/18 | 9.63 | 4433.00 | 4431.80 | 32.97 | 4444.5 | 4439.8 | 21.51 |
| 12/19/18 | 9.63 | 4433.00 | 4431.80 | 32.96 | 4444.5 | 4439.8 | 21.49 |

## Appendix E

## Table 1  Tailings and Pond Elevations for North and South Cells

| Date | Year Fraction | North Cell | | | South Cell | | |
|---|---|---|---|---|---|---|---|
| | | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) |
| 12/20/18 | 9.64 | 4433.00 | 4431.80 | 32.97 | 4444.5 | 4439.9 | 21.48 |
| 12/21/18 | 9.64 | 4433.00 | 4431.80 | 32.96 | 4444.5 | 4439.9 | 21.46 |
| 12/22/18 | 9.64 | 4433.00 | 4431.80 | 32.97 | 4444.6 | 4439.9 | 21.44 |
| 12/23/18 | 9.65 | 4433.00 | 4431.80 | 32.96 | 4444.6 | 4439.9 | 21.43 |
| 12/24/18 | 9.65 | 4433.00 | 4431.80 | 32.97 | 4444.6 | 4439.9 | 21.41 |
| 12/25/18 | 9.65 | 4433.00 | 4431.80 | 32.96 | 4444.6 | 4439.9 | 21.39 |
| 12/26/18 | 9.65 | 4433.00 | 4431.80 | 32.97 | 4444.6 | 4439.9 | 21.38 |
| 12/27/18 | 9.66 | 4433.00 | 4431.80 | 32.96 | 4444.6 | 4440.0 | 21.36 |
| 12/28/18 | 9.66 | 4433.00 | 4431.80 | 32.97 | 4444.7 | 4440.0 | 21.34 |
| 12/29/18 | 9.66 | 4433.00 | 4431.80 | 32.96 | 4444.7 | 4440.0 | 21.33 |
| 12/30/18 | 9.66 | 4433.00 | 4431.80 | 32.97 | 4444.7 | 4440.0 | 21.31 |
| 12/31/18 | 9.67 | 4433.00 | 4431.80 | 32.96 | 4444.7 | 4440.0 | 21.30 |
| 1/1/19 | 9.67 | 4433.00 | 4431.80 | 32.97 | 4444.7 | 4440.0 | 21.28 |
| 1/2/19 | 9.67 | 4433.00 | 4431.80 | 32.96 | 4444.7 | 4440.0 | 21.26 |
| 1/3/19 | 9.68 | 4433.00 | 4431.80 | 32.96 | 4444.8 | 4440.1 | 21.24 |
| 1/4/19 | 9.68 | 4433.00 | 4431.80 | 32.96 | 4444.8 | 4440.1 | 21.22 |
| 1/5/19 | 9.68 | 4433.00 | 4431.80 | 32.96 | 4444.8 | 4440.1 | 21.21 |
| 1/6/19 | 9.68 | 4433.00 | 4431.80 | 32.96 | 4444.8 | 4440.1 | 21.19 |
| 1/7/19 | 9.69 | 4433.00 | 4431.80 | 32.96 | 4444.8 | 4440.1 | 21.17 |
| 1/8/19 | 9.69 | 4433.00 | 4431.80 | 32.96 | 4444.9 | 4440.1 | 21.15 |
| 1/9/19 | 9.69 | 4433.00 | 4431.80 | 32.96 | 4444.9 | 4440.1 | 21.13 |
| 1/10/19 | 9.69 | 4433.00 | 4431.80 | 32.96 | 4444.9 | 4440.1 | 21.11 |
| 1/11/19 | 9.70 | 4433.00 | 4431.80 | 32.96 | 4444.9 | 4440.2 | 21.09 |
| 1/12/19 | 9.70 | 4433.00 | 4431.80 | 32.96 | 4444.9 | 4440.2 | 21.08 |
| 1/13/19 | 9.70 | 4433.00 | 4431.80 | 32.96 | 4444.9 | 4440.2 | 21.06 |
| 1/14/19 | 9.71 | 4433.00 | 4431.80 | 32.96 | 4445.0 | 4440.2 | 21.04 |
| 1/15/19 | 9.71 | 4433.00 | 4431.80 | 32.96 | 4445.0 | 4440.2 | 21.02 |
| 1/16/19 | 9.71 | 4433.00 | 4431.80 | 32.96 | 4445.0 | 4440.2 | 21.00 |
| 1/17/19 | 9.71 | 4433.00 | 4431.80 | 32.96 | 4445.0 | 4440.2 | 20.98 |
| 1/18/19 | 9.72 | 4433.00 | 4431.80 | 32.96 | 4445.0 | 4440.2 | 20.97 |
| 1/19/19 | 9.72 | 4433.00 | 4431.80 | 32.96 | 4445.1 | 4440.3 | 20.95 |
| 1/20/19 | 9.72 | 4433.00 | 4431.80 | 32.96 | 4445.1 | 4440.3 | 20.93 |
| 1/21/19 | 9.72 | 4433.00 | 4431.80 | 32.96 | 4445.1 | 4440.3 | 20.91 |
| 1/22/19 | 9.73 | 4433.00 | 4431.80 | 32.96 | 4445.1 | 4440.3 | 20.89 |
| 1/23/19 | 9.73 | 4433.00 | 4431.80 | 32.96 | 4445.1 | 4440.3 | 20.87 |
| 1/24/19 | 9.73 | 4433.00 | 4431.80 | 32.96 | 4445.1 | 4440.3 | 20.85 |
| 1/25/19 | 9.74 | 4433.00 | 4431.80 | 32.96 | 4445.2 | 4440.3 | 20.84 |
| 1/26/19 | 9.74 | 4433.00 | 4431.80 | 32.96 | 4445.2 | 4440.3 | 20.82 |
| 1/27/19 | 9.74 | 4433.00 | 4431.80 | 32.96 | 4445.2 | 4440.4 | 20.80 |
| 1/28/19 | 9.74 | 4433.00 | 4431.80 | 32.96 | 4445.2 | 4440.4 | 20.78 |
| 1/29/19 | 9.75 | 4433.00 | 4431.80 | 32.96 | 4445.2 | 4440.4 | 20.76 |
| 1/30/19 | 9.75 | 4433.00 | 4431.80 | 32.96 | 4445.3 | 4440.4 | 20.74 |
| 1/31/19 | 9.75 | 4433.00 | 4431.80 | 32.96 | 4445.3 | 4440.4 | 20.73 |
| 2/1/19 | 9.76 | 4433.00 | 4431.80 | 32.96 | 4445.3 | 4440.4 | 20.71 |
| 2/2/19 | 9.76 | 4433.00 | 4431.80 | 32.96 | 4445.3 | 4440.4 | 20.69 |
| 2/3/19 | 9.76 | 4433.00 | 4431.80 | 32.96 | 4445.3 | 4440.4 | 20.67 |
| 2/4/19 | 9.76 | 4433.00 | 4431.80 | 32.96 | 4445.3 | 4440.5 | 20.65 |
| 2/5/19 | 9.77 | 4433.00 | 4431.80 | 32.96 | 4445.4 | 4440.5 | 20.63 |
| 2/6/19 | 9.77 | 4433.00 | 4431.80 | 32.96 | 4445.4 | 4440.5 | 20.61 |
| 2/7/19 | 9.77 | 4433.00 | 4431.80 | 32.96 | 4445.4 | 4440.5 | 20.59 |
| 2/8/19 | 9.77 | 4433.00 | 4431.80 | 32.96 | 4445.4 | 4440.5 | 20.58 |
| 2/9/19 | 9.78 | 4433.00 | 4431.80 | 32.96 | 4445.4 | 4440.5 | 20.56 |
| 2/10/19 | 9.78 | 4433.00 | 4431.80 | 32.96 | 4445.5 | 4440.5 | 20.54 |
| 2/11/19 | 9.78 | 4433.00 | 4431.80 | 32.96 | 4445.5 | 4440.6 | 20.52 |
| 2/12/19 | 9.79 | 4433.00 | 4431.80 | 32.96 | 4445.5 | 4440.6 | 20.50 |

## Appendix E
## Table 1 Tailings and Pond Elevations for North and South Cells

|  | Year | North Cell |  |  | South Cell |  |  |
|---|---|---|---|---|---|---|---|
| Date | Fraction | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) |
| 2/13/19 | 9.79 | 4433.00 | 4431.80 | 32.96 | 4445.5 | 4440.6 | 20.48 |
| 2/14/19 | 9.79 | 4433.00 | 4431.80 | 32.96 | 4445.5 | 4440.6 | 20.46 |
| 2/15/19 | 9.79 | 4433.00 | 4431.80 | 32.96 | 4445.6 | 4440.6 | 20.44 |
| 2/16/19 | 9.80 | 4433.00 | 4431.80 | 32.96 | 4445.6 | 4440.6 | 20.43 |
| 2/17/19 | 9.80 | 4433.00 | 4431.80 | 32.96 | 4445.6 | 4440.6 | 20.41 |
| 2/18/19 | 9.80 | 4433.00 | 4431.80 | 32.96 | 4445.6 | 4440.6 | 20.39 |
| 2/19/19 | 9.80 | 4433.00 | 4431.80 | 32.96 | 4445.6 | 4440.7 | 20.37 |
| 2/20/19 | 9.81 | 4433.00 | 4431.80 | 32.96 | 4445.6 | 4440.7 | 20.35 |
| 2/21/19 | 9.81 | 4433.00 | 4431.80 | 32.96 | 4445.7 | 4440.7 | 20.33 |
| 2/22/19 | 9.81 | 4433.00 | 4431.80 | 32.96 | 4445.7 | 4440.7 | 20.31 |
| 2/23/19 | 9.82 | 4433.00 | 4431.80 | 32.96 | 4445.7 | 4440.7 | 20.29 |
| 2/24/19 | 9.82 | 4433.00 | 4431.80 | 32.96 | 4445.7 | 4440.7 | 20.28 |
| 2/25/19 | 9.82 | 4433.00 | 4431.80 | 32.96 | 4445.7 | 4440.7 | 20.26 |
| 2/26/19 | 9.82 | 4433.00 | 4431.80 | 32.96 | 4445.8 | 4440.7 | 20.24 |
| 2/27/19 | 9.83 | 4433.00 | 4431.80 | 32.96 | 4445.8 | 4440.8 | 20.22 |
| 2/28/19 | 9.83 | 4433.00 | 4431.80 | 32.96 | 4445.8 | 4440.8 | 20.20 |
| 3/1/19 | 9.83 | 4433.00 | 4431.80 | 32.96 | 4445.8 | 4440.8 | 20.18 |
| 3/2/19 | 9.83 | 4433.00 | 4431.80 | 32.96 | 4445.8 | 4440.8 | 20.16 |
| 3/3/19 | 9.84 | 4433.00 | 4431.80 | 32.96 | 4445.9 | 4440.8 | 20.14 |
| 3/4/19 | 9.84 | 4433.00 | 4431.80 | 32.96 | 4445.9 | 4440.8 | 20.12 |
| 3/5/19 | 9.84 | 4433.00 | 4431.80 | 32.96 | 4445.9 | 4440.8 | 20.10 |
| 3/6/19 | 9.85 | 4433.00 | 4431.80 | 32.96 | 4445.9 | 4440.8 | 20.08 |
| 3/7/19 | 9.85 | 4433.00 | 4431.80 | 32.96 | 4445.9 | 4440.9 | 20.06 |
| 3/8/19 | 9.85 | 4433.00 | 4431.80 | 32.96 | 4446.0 | 4440.9 | 20.04 |
| 3/9/19 | 9.85 | 4433.00 | 4431.80 | 32.96 | 4446.0 | 4440.9 | 20.03 |
| 3/10/19 | 9.86 | 4433.00 | 4431.80 | 32.96 | 4446.0 | 4440.9 | 20.01 |
| 3/11/19 | 9.86 | 4433.00 | 4431.80 | 32.96 | 4446.0 | 4440.9 | 19.99 |
| 3/12/19 | 9.86 | 4433.00 | 4431.80 | 32.96 | 4446.0 | 4440.9 | 19.97 |
| 3/13/19 | 9.86 | 4433.00 | 4431.80 | 32.96 | 4446.1 | 4440.9 | 19.95 |
| 3/14/19 | 9.87 | 4433.00 | 4431.80 | 32.96 | 4446.1 | 4440.9 | 19.93 |
| 3/15/19 | 9.87 | 4433.00 | 4431.80 | 32.96 | 4446.1 | 4441.0 | 19.91 |
| 3/16/19 | 9.87 | 4433.00 | 4431.80 | 32.96 | 4446.1 | 4441.0 | 19.89 |
| 3/17/19 | 9.88 | 4433.00 | 4431.80 | 32.96 | 4446.1 | 4441.0 | 19.87 |
| 3/18/19 | 9.88 | 4433.00 | 4431.80 | 32.96 | 4446.2 | 4441.0 | 19.85 |
| 3/19/19 | 9.88 | 4433.00 | 4431.80 | 32.96 | 4446.2 | 4441.0 | 19.83 |
| 3/20/19 | 9.88 | 4433.00 | 4431.80 | 32.96 | 4446.2 | 4441.0 | 19.81 |
| 3/21/19 | 9.89 | 4433.00 | 4431.80 | 32.96 | 4446.2 | 4441.0 | 19.79 |
| 3/22/19 | 9.89 | 4433.00 | 4431.80 | 32.96 | 4446.2 | 4441.0 | 19.77 |
| 3/23/19 | 9.89 | 4433.00 | 4431.80 | 32.96 | 4446.2 | 4441.1 | 19.75 |
| 3/24/19 | 9.89 | 4433.00 | 4431.80 | 32.96 | 4446.3 | 4441.1 | 19.73 |
| 3/25/19 | 9.90 | 4433.00 | 4431.80 | 32.96 | 4446.3 | 4441.1 | 19.71 |
| 3/26/19 | 9.90 | 4433.00 | 4431.80 | 32.96 | 4446.3 | 4441.1 | 19.69 |
| 3/27/19 | 9.90 | 4433.00 | 4431.80 | 32.96 | 4446.3 | 4441.1 | 19.67 |
| 3/28/19 | 9.91 | 4433.00 | 4431.80 | 32.96 | 4446.3 | 4441.1 | 19.65 |
| 3/29/19 | 9.91 | 4433.00 | 4431.80 | 32.96 | 4446.4 | 4441.1 | 19.63 |
| 3/30/19 | 9.91 | 4433.00 | 4431.80 | 32.96 | 4446.4 | 4441.2 | 19.62 |
| 3/31/19 | 9.91 | 4433.00 | 4431.80 | 32.96 | 4446.4 | 4441.2 | 19.60 |
| 4/1/19 | 9.92 | 4433.00 | 4431.80 | 32.96 | 4446.4 | 4441.2 | 19.58 |
| 4/2/19 | 9.92 | 4433.00 | 4431.80 | 32.97 | 4446.4 | 4441.2 | 19.56 |
| 4/3/19 | 9.92 | 4433.00 | 4431.80 | 32.97 | 4446.5 | 4441.2 | 19.54 |
| 4/4/19 | 9.92 | 4433.00 | 4431.80 | 32.97 | 4446.5 | 4441.2 | 19.53 |
| 4/5/19 | 9.93 | 4433.00 | 4431.80 | 32.97 | 4446.5 | 4441.2 | 19.51 |
| 4/6/19 | 9.93 | 4433.00 | 4431.80 | 32.97 | 4446.5 | 4441.2 | 19.49 |
| 4/7/19 | 9.93 | 4433.00 | 4431.80 | 32.97 | 4446.5 | 4441.3 | 19.48 |
| 4/8/19 | 9.94 | 4433.00 | 4431.80 | 32.97 | 4446.5 | 4441.3 | 19.46 |

**Appendix E**
**Table 1 Tailings and Pond Elevations for North and South Cells**

| Date | Year Fraction | North Cell | | | South Cell | | |
|---|---|---|---|---|---|---|---|
| | | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) |
| 4/9/19 | 9.94 | 4433.00 | 4431.80 | 32.97 | 4446.6 | 4441.3 | 19.44 |
| 4/10/19 | 9.94 | 4433.00 | 4431.80 | 32.97 | 4446.6 | 4441.3 | 19.43 |
| 4/11/19 | 9.94 | 4433.00 | 4431.80 | 32.97 | 4446.6 | 4441.3 | 19.41 |
| 4/12/19 | 9.95 | 4433.00 | 4431.80 | 32.97 | 4446.6 | 4441.3 | 19.39 |
| 4/13/19 | 9.95 | 4433.00 | 4431.80 | 32.97 | 4446.6 | 4441.3 | 19.38 |
| 4/14/19 | 9.95 | 4433.00 | 4431.80 | 32.97 | 4446.6 | 4441.3 | 19.36 |
| 4/15/19 | 9.95 | 4433.00 | 4431.80 | 32.97 | 4446.7 | 4441.4 | 19.34 |
| 4/16/19 | 9.96 | 4433.00 | 4431.80 | 32.97 | 4446.7 | 4441.4 | 19.33 |
| 4/17/19 | 9.96 | 4433.00 | 4431.80 | 32.97 | 4446.7 | 4441.4 | 19.31 |
| 4/18/19 | 9.96 | 4433.00 | 4431.80 | 32.97 | 4446.7 | 4441.4 | 19.29 |
| 4/19/19 | 9.97 | 4433.00 | 4431.80 | 32.97 | 4446.7 | 4441.4 | 19.28 |
| 4/20/19 | 9.97 | 4433.00 | 4431.80 | 32.97 | 4446.7 | 4441.4 | 19.26 |
| 4/21/19 | 9.97 | 4433.00 | 4431.80 | 32.97 | 4446.8 | 4441.4 | 19.24 |
| 4/22/19 | 9.97 | 4433.00 | 4431.80 | 32.97 | 4446.8 | 4441.4 | 19.23 |
| 4/23/19 | 9.98 | 4433.00 | 4431.80 | 32.97 | 4446.8 | 4441.5 | 19.21 |
| 4/24/19 | 9.98 | 4433.00 | 4431.80 | 32.97 | 4446.8 | 4441.5 | 19.19 |
| 4/25/19 | 9.98 | 4433.00 | 4431.80 | 32.97 | 4446.8 | 4441.5 | 19.18 |
| 4/26/19 | 9.98 | 4433.00 | 4431.80 | 32.97 | 4446.8 | 4441.5 | 19.16 |
| 4/27/19 | 9.99 | 4433.00 | 4431.80 | 32.97 | 4446.9 | 4441.5 | 19.14 |
| 4/28/19 | 9.99 | 4433.00 | 4431.80 | 32.97 | 4446.9 | 4441.5 | 19.13 |
| 4/29/19 | 9.99 | 4433.00 | 4431.80 | 32.97 | 4446.9 | 4441.5 | 19.11 |
| 4/30/19 | 10.00 | 4433.00 | 4431.80 | 32.97 | 4446.9 | 4441.5 | 19.09 |
| 5/1/19 | 10.00 | 4433.00 | 4431.80 | 32.97 | 4446.9 | 4441.6 | 19.08 |
| 5/2/19 | 10.00 | 4433.00 | 4431.80 | 32.97 | 4446.9 | 4441.6 | 19.06 |
| 5/3/19 | 10.00 | 4433.00 | 4431.80 | 32.97 | 4447.0 | 4441.6 | 19.04 |
| 5/4/19 | 10.01 | 4433.00 | 4431.80 | 32.97 | 4447.0 | 4441.6 | 19.03 |
| 5/5/19 | 10.01 | 4433.00 | 4431.80 | 32.97 | 4447.0 | 4441.6 | 19.01 |
| 5/6/19 | 10.01 | 4433.00 | 4431.80 | 32.97 | 4447.0 | 4441.6 | 19.00 |
| 5/7/19 | 10.02 | 4433.00 | 4431.80 | 32.97 | 4447.0 | 4441.6 | 18.98 |
| 5/8/19 | 10.02 | 4433.00 | 4431.80 | 32.97 | 4447.0 | 4441.6 | 18.97 |
| 5/9/19 | 10.02 | 4433.00 | 4431.80 | 32.97 | 4447.0 | 4441.7 | 18.95 |
| 5/10/19 | 10.02 | 4433.00 | 4431.80 | 32.97 | 4447.1 | 4441.7 | 18.94 |
| 5/11/19 | 10.03 | 4433.00 | 4431.80 | 32.97 | 4447.1 | 4441.7 | 18.92 |
| 5/12/19 | 10.03 | 4433.00 | 4431.80 | 32.97 | 4447.1 | 4441.7 | 18.90 |
| 5/13/19 | 10.03 | 4433.00 | 4431.80 | 32.97 | 4447.1 | 4441.7 | 18.89 |
| 5/14/19 | 10.03 | 4433.00 | 4431.80 | 32.97 | 4447.1 | 4441.7 | 18.87 |
| 5/15/19 | 10.04 | 4433.00 | 4431.80 | 32.97 | 4447.1 | 4441.7 | 18.86 |
| 5/16/19 | 10.04 | 4433.00 | 4431.80 | 32.97 | 4447.2 | 4441.8 | 18.84 |
| 5/17/19 | 10.04 | 4433.00 | 4431.80 | 32.97 | 4447.2 | 4441.8 | 18.83 |
| 5/18/19 | 10.05 | 4433.00 | 4431.80 | 32.97 | 4447.2 | 4441.8 | 18.81 |
| 5/19/19 | 10.05 | 4433.00 | 4431.80 | 32.97 | 4447.2 | 4441.8 | 18.80 |
| 5/20/19 | 10.05 | 4433.00 | 4431.80 | 32.97 | 4447.2 | 4441.8 | 18.78 |
| 5/21/19 | 10.05 | 4433.00 | 4431.80 | 32.97 | 4447.2 | 4441.8 | 18.76 |
| 5/22/19 | 10.06 | 4433.00 | 4431.80 | 32.97 | 4447.3 | 4441.8 | 18.75 |
| 5/23/19 | 10.06 | 4433.00 | 4431.80 | 32.97 | 4447.3 | 4441.8 | 18.73 |
| 5/24/19 | 10.06 | 4433.00 | 4431.80 | 32.97 | 4447.3 | 4441.9 | 18.72 |
| 5/25/19 | 10.06 | 4433.00 | 4431.80 | 32.97 | 4447.3 | 4441.9 | 18.70 |
| 5/26/19 | 10.07 | 4433.00 | 4431.80 | 32.97 | 4447.3 | 4441.9 | 18.69 |
| 5/27/19 | 10.07 | 4433.00 | 4431.80 | 32.97 | 4447.3 | 4441.9 | 18.67 |
| 5/28/19 | 10.07 | 4433.00 | 4431.80 | 32.97 | 4447.3 | 4441.9 | 18.66 |
| 5/29/19 | 10.08 | 4433.00 | 4431.80 | 32.97 | 4447.4 | 4441.9 | 18.64 |
| 5/30/19 | 10.08 | 4433.00 | 4431.80 | 32.97 | 4447.4 | 4441.9 | 18.62 |
| 5/31/19 | 10.08 | 4433.00 | 4431.80 | 32.97 | 4447.4 | 4441.9 | 18.61 |
| 6/1/19 | 10.08 | 4433.00 | 4431.80 | 32.97 | 4447.4 | 4442.0 | 18.59 |
| 6/2/19 | 10.09 | 4433.00 | 4431.80 | 32.97 | 4447.4 | 4442.0 | 18.58 |

## Appendix E
## Table 1  Tailings and Pond Elevations for North and South Cells

| | Year | North Cell | | | South Cell | | |
|---|---|---|---|---|---|---|---|
| Date | Fraction | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) |
| 6/3/19 | 10.09 | 4433.00 | 4431.80 | 32.98 | 4447.4 | 4442.0 | 18.57 |
| 6/4/19 | 10.09 | 4433.00 | 4431.80 | 32.97 | 4447.4 | 4442.0 | 18.56 |
| 6/5/19 | 10.09 | 4433.00 | 4431.80 | 32.98 | 4447.5 | 4442.0 | 18.55 |
| 6/6/19 | 10.10 | 4433.00 | 4431.80 | 32.97 | 4447.5 | 4442.0 | 18.53 |
| 6/7/19 | 10.10 | 4433.00 | 4431.80 | 32.98 | 4447.5 | 4442.0 | 18.52 |
| 6/8/19 | 10.10 | 4433.00 | 4431.80 | 32.97 | 4447.5 | 4442.0 | 18.51 |
| 6/9/19 | 10.11 | 4433.00 | 4431.80 | 32.98 | 4447.5 | 4442.1 | 18.50 |
| 6/10/19 | 10.11 | 4433.00 | 4431.80 | 32.97 | 4447.5 | 4442.1 | 18.49 |
| 6/11/19 | 10.11 | 4433.00 | 4431.80 | 32.98 | 4447.5 | 4442.1 | 18.47 |
| 6/12/19 | 10.11 | 4433.00 | 4431.80 | 32.97 | 4447.5 | 4442.1 | 18.46 |
| 6/13/19 | 10.12 | 4433.00 | 4431.80 | 32.98 | 4447.5 | 4442.1 | 18.45 |
| 6/14/19 | 10.12 | 4433.00 | 4431.80 | 32.97 | 4447.6 | 4442.1 | 18.44 |
| 6/15/19 | 10.12 | 4433.00 | 4431.80 | 32.98 | 4447.6 | 4442.1 | 18.43 |
| 6/16/19 | 10.13 | 4433.00 | 4431.80 | 32.97 | 4447.6 | 4442.1 | 18.41 |
| 6/17/19 | 10.13 | 4433.00 | 4431.80 | 32.98 | 4447.6 | 4442.2 | 18.40 |
| 6/18/19 | 10.13 | 4433.00 | 4431.80 | 32.97 | 4447.6 | 4442.2 | 18.39 |
| 6/19/19 | 10.13 | 4433.00 | 4431.80 | 32.98 | 4447.6 | 4442.2 | 18.38 |
| 6/20/19 | 10.14 | 4433.00 | 4431.80 | 32.97 | 4447.6 | 4442.2 | 18.37 |
| 6/21/19 | 10.14 | 4433.00 | 4431.80 | 32.98 | 4447.6 | 4442.2 | 18.36 |
| 6/22/19 | 10.14 | 4433.00 | 4431.80 | 32.97 | 4447.7 | 4442.2 | 18.34 |
| 6/23/19 | 10.14 | 4433.00 | 4431.80 | 32.98 | 4447.7 | 4442.2 | 18.33 |
| 6/24/19 | 10.15 | 4433.00 | 4431.80 | 32.97 | 4447.7 | 4442.2 | 18.32 |
| 6/25/19 | 10.15 | 4433.00 | 4431.80 | 32.98 | 4447.7 | 4442.3 | 18.31 |
| 6/26/19 | 10.15 | 4433.00 | 4431.80 | 32.97 | 4447.7 | 4442.3 | 18.30 |
| 6/27/19 | 10.16 | 4433.00 | 4431.80 | 32.98 | 4447.7 | 4442.3 | 18.28 |
| 6/28/19 | 10.16 | 4433.00 | 4431.80 | 32.97 | 4447.7 | 4442.3 | 18.27 |
| 6/29/19 | 10.16 | 4433.00 | 4431.80 | 32.98 | 4447.7 | 4442.3 | 18.26 |
| 6/30/19 | 10.16 | 4433.00 | 4431.80 | 32.97 | 4447.8 | 4442.3 | 18.25 |
| 7/1/19 | 10.17 | 4433.00 | 4431.80 | 32.98 | 4447.8 | 4442.3 | 18.24 |
| 7/2/19 | 10.17 | 4433.00 | 4431.80 | 32.98 | 4447.8 | 4442.4 | 18.23 |
| 7/3/19 | 10.17 | 4433.00 | 4431.80 | 32.99 | 4447.8 | 4442.4 | 18.23 |
| 7/4/19 | 10.17 | 4433.00 | 4431.80 | 32.98 | 4447.8 | 4442.4 | 18.22 |
| 7/5/19 | 10.18 | 4433.00 | 4431.80 | 32.99 | 4447.8 | 4442.4 | 18.22 |
| 7/6/19 | 10.18 | 4433.00 | 4431.80 | 32.98 | 4447.8 | 4442.4 | 18.21 |
| 7/7/19 | 10.18 | 4433.00 | 4431.80 | 32.99 | 4447.8 | 4442.4 | 18.21 |
| 7/8/19 | 10.19 | 4433.00 | 4431.80 | 32.98 | 4447.8 | 4442.4 | 18.20 |
| 7/9/19 | 10.19 | 4433.00 | 4431.80 | 32.99 | 4447.8 | 4442.4 | 18.20 |
| 7/10/19 | 10.19 | 4433.00 | 4431.80 | 32.98 | 4447.8 | 4442.5 | 18.19 |
| 7/11/19 | 10.19 | 4433.00 | 4431.80 | 32.99 | 4447.8 | 4442.5 | 18.19 |
| 7/12/19 | 10.20 | 4433.00 | 4431.80 | 32.98 | 4447.8 | 4442.5 | 18.19 |
| 7/13/19 | 10.20 | 4433.00 | 4431.80 | 32.99 | 4447.8 | 4442.5 | 18.18 |
| 7/14/19 | 10.20 | 4433.00 | 4431.80 | 32.98 | 4447.8 | 4442.5 | 18.18 |
| 7/15/19 | 10.20 | 4433.00 | 4431.80 | 32.99 | 4447.8 | 4442.5 | 18.17 |
| 7/16/19 | 10.21 | 4433.00 | 4431.80 | 32.98 | 4447.8 | 4442.5 | 18.17 |
| 7/17/19 | 10.21 | 4433.00 | 4431.80 | 32.99 | 4447.8 | 4442.5 | 18.16 |
| 7/18/19 | 10.21 | 4433.00 | 4431.80 | 32.98 | 4447.8 | 4442.6 | 18.16 |
| 7/19/19 | 10.22 | 4433.00 | 4431.80 | 32.99 | 4447.8 | 4442.6 | 18.15 |
| 7/20/19 | 10.22 | 4433.00 | 4431.80 | 32.98 | 4447.9 | 4442.6 | 18.15 |
| 7/21/19 | 10.22 | 4433.00 | 4431.80 | 32.99 | 4447.9 | 4442.6 | 18.14 |
| 7/22/19 | 10.22 | 4433.00 | 4431.80 | 32.98 | 4447.9 | 4442.6 | 18.14 |
| 7/23/19 | 10.23 | 4433.00 | 4431.80 | 32.99 | 4447.9 | 4442.6 | 18.13 |
| 7/24/19 | 10.23 | 4433.00 | 4431.80 | 32.98 | 4447.9 | 4442.6 | 18.13 |
| 7/25/19 | 10.23 | 4433.00 | 4431.80 | 32.99 | 4447.9 | 4442.6 | 18.13 |
| 7/26/19 | 10.23 | 4433.00 | 4431.80 | 32.98 | 4447.9 | 4442.7 | 18.12 |
| 7/27/19 | 10.24 | 4433.00 | 4431.80 | 32.99 | 4447.9 | 4442.7 | 18.12 |

## Appendix E
## Table 1  Tailings and Pond Elevations for North and South Cells

| | Year | North Cell | | | South Cell | | |
|---|---|---|---|---|---|---|---|
| Date | Fraction | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) |
| 7/28/19 | 10.24 | 4433.00 | 4431.80 | 32.98 | 4447.9 | 4442.7 | 18.11 |
| 7/29/19 | 10.24 | 4433.00 | 4431.80 | 32.99 | 4447.9 | 4442.7 | 18.11 |
| 7/30/19 | 10.25 | 4433.00 | 4431.80 | 32.98 | 4447.9 | 4442.7 | 18.10 |
| 7/31/19 | 10.25 | 4433.00 | 4431.80 | 32.99 | 4447.9 | 4442.7 | 18.10 |
| 8/1/19 | 10.25 | 4433.00 | 4431.80 | 32.98 | 4447.9 | 4442.7 | 18.09 |
| 8/2/19 | 10.25 | 4433.00 | 4431.80 | 32.99 | 4447.9 | 4442.7 | 18.09 |
| 8/3/19 | 10.26 | 4433.00 | 4431.80 | 32.98 | 4447.9 | 4442.8 | 18.09 |
| 8/4/19 | 10.26 | 4433.00 | 4431.80 | 32.99 | 4447.9 | 4442.8 | 18.08 |
| 8/5/19 | 10.26 | 4433.00 | 4431.80 | 32.98 | 4447.9 | 4442.8 | 18.08 |
| 8/6/19 | 10.26 | 4433.00 | 4431.80 | 32.99 | 4447.9 | 4442.8 | 18.07 |
| 8/7/19 | 10.27 | 4433.00 | 4431.80 | 32.97 | 4447.9 | 4442.8 | 18.07 |
| 8/8/19 | 10.27 | 4433.00 | 4431.80 | 32.99 | 4447.9 | 4442.8 | 18.07 |
| 8/9/19 | 10.27 | 4433.00 | 4431.80 | 32.97 | 4447.9 | 4442.8 | 18.06 |
| 8/10/19 | 10.28 | 4433.00 | 4431.80 | 32.99 | 4447.9 | 4442.8 | 18.06 |
| 8/11/19 | 10.28 | 4433.00 | 4431.80 | 32.97 | 4447.9 | 4442.9 | 18.06 |
| 8/12/19 | 10.28 | 4433.00 | 4431.80 | 32.99 | 4447.9 | 4442.9 | 18.05 |
| 8/13/19 | 10.28 | 4433.00 | 4431.80 | 32.97 | 4448.0 | 4442.9 | 18.05 |
| 8/14/19 | 10.29 | 4433.00 | 4431.80 | 32.99 | 4448.0 | 4442.9 | 18.05 |
| 8/15/19 | 10.29 | 4433.00 | 4431.80 | 32.97 | 4448.0 | 4442.9 | 18.04 |
| 8/16/19 | 10.29 | 4433.00 | 4431.80 | 32.99 | 4448.0 | 4442.9 | 18.04 |
| 8/17/19 | 10.29 | 4433.00 | 4431.80 | 32.97 | 4448.0 | 4442.9 | 18.04 |
| 8/18/19 | 10.30 | 4433.00 | 4431.80 | 32.99 | 4448.0 | 4443.0 | 18.03 |
| 8/19/19 | 10.30 | 4433.00 | 4431.80 | 32.97 | 4448.0 | 4443.0 | 18.03 |
| 8/20/19 | 10.30 | 4433.00 | 4431.80 | 32.99 | 4448.0 | 4443.0 | 18.02 |
| 8/21/19 | 10.31 | 4433.00 | 4431.80 | 32.97 | 4448.0 | 4443.0 | 18.02 |
| 8/22/19 | 10.31 | 4433.00 | 4431.80 | 32.99 | 4448.0 | 4443.0 | 18.02 |
| 8/23/19 | 10.31 | 4433.00 | 4431.80 | 32.97 | 4448.0 | 4443.0 | 18.01 |
| 8/24/19 | 10.31 | 4433.00 | 4431.80 | 32.99 | 4448.0 | 4443.0 | 18.01 |
| 8/25/19 | 10.32 | 4433.00 | 4431.80 | 32.97 | 4448.0 | 4443.0 | 18.01 |
| 8/26/19 | 10.32 | 4433.00 | 4431.80 | 32.99 | 4448.0 | 4443.1 | 18.00 |
| 8/27/19 | 10.32 | 4433.00 | 4431.80 | 32.97 | 4448.0 | 4443.1 | 18.00 |
| 8/28/19 | 10.32 | 4433.00 | 4431.80 | 32.99 | 4448.0 | 4443.1 | 18.00 |
| 8/29/19 | 10.33 | 4433.00 | 4431.80 | 32.97 | 4448.0 | 4443.1 | 17.99 |
| 8/30/19 | 10.33 | 4433.00 | 4431.80 | 32.99 | 4448.0 | 4443.1 | 17.99 |
| 8/31/19 | 10.33 | 4433.00 | 4431.80 | 32.97 | 4448.0 | 4443.1 | 17.99 |
| 9/1/19 | 10.34 | 4433.00 | 4431.80 | 32.99 | 4448.0 | 4443.1 | 17.98 |
| 9/2/19 | 10.34 | 4433.00 | 4431.80 | 32.97 | 4448.0 | 4443.1 | 17.98 |
| 9/3/19 | 10.34 | 4433.00 | 4431.80 | 32.99 | 4448.0 | 4443.2 | 17.97 |
| 9/4/19 | 10.34 | 4433.00 | 4431.80 | 32.97 | 4448.0 | 4443.2 | 17.97 |
| 9/5/19 | 10.35 | 4433.00 | 4431.80 | 32.99 | 4448.0 | 4443.2 | 17.97 |
| 9/6/19 | 10.35 | 4433.00 | 4431.80 | 32.97 | 4448.0 | 4443.2 | 17.96 |
| 9/7/19 | 10.35 | 4433.00 | 4431.80 | 32.99 | 4448.0 | 4443.2 | 17.96 |
| 9/8/19 | 10.36 | 4433.00 | 4431.80 | 32.97 | 4448.0 | 4443.2 | 17.96 |
| 9/9/19 | 10.36 | 4433.00 | 4431.80 | 32.99 | 4448.0 | 4443.2 | 17.95 |
| 9/10/19 | 10.36 | 4433.00 | 4431.80 | 32.97 | 4448.1 | 4443.2 | 17.95 |
| 9/11/19 | 10.36 | 4433.00 | 4431.80 | 32.99 | 4448.1 | 4443.3 | 17.94 |
| 9/12/19 | 10.37 | 4433.00 | 4431.80 | 32.97 | 4448.1 | 4443.3 | 17.94 |
| 9/13/19 | 10.37 | 4433.00 | 4431.80 | 32.99 | 4448.1 | 4443.3 | 17.94 |
| 9/14/19 | 10.37 | 4433.00 | 4431.80 | 32.97 | 4448.1 | 4443.3 | 17.93 |
| 9/15/19 | 10.37 | 4433.00 | 4431.80 | 32.99 | 4448.1 | 4443.3 | 17.93 |
| 9/16/19 | 10.38 | 4433.00 | 4431.80 | 32.97 | 4448.1 | 4443.3 | 17.93 |
| 9/17/19 | 10.38 | 4433.00 | 4431.80 | 32.99 | 4448.1 | 4443.3 | 17.92 |
| 9/18/19 | 10.38 | 4433.00 | 4431.80 | 32.97 | 4448.1 | 4443.3 | 17.92 |
| 9/19/19 | 10.39 | 4433.00 | 4431.80 | 32.99 | 4448.1 | 4443.4 | 17.91 |
| 9/20/19 | 10.39 | 4433.00 | 4431.80 | 32.97 | 4448.1 | 4443.4 | 17.91 |

**Appendix E**
**Table 1  Tailings and Pond Elevations for North and South Cells**

| Date | Year Fraction | North Cell | | | South Cell | | |
|---|---|---|---|---|---|---|---|
| | | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) |
| 9/21/19 | 10.39 | 4433.00 | 4431.80 | 32.99 | 4448.1 | 4443.4 | 17.91 |
| 9/22/19 | 10.39 | 4433.00 | 4431.80 | 32.97 | 4448.1 | 4443.4 | 17.90 |
| 9/23/19 | 10.40 | 4433.00 | 4431.80 | 32.99 | 4448.1 | 4443.4 | 17.90 |
| 9/24/19 | 10.40 | 4433.00 | 4431.80 | 32.97 | 4448.1 | 4443.4 | 17.90 |
| 9/25/19 | 10.40 | 4433.00 | 4431.80 | 32.99 | 4448.1 | 4443.4 | 17.89 |
| 9/26/19 | 10.40 | 4433.00 | 4431.80 | 32.97 | 4448.1 | 4443.4 | 17.89 |
| 9/27/19 | 10.41 | 4433.00 | 4431.80 | 32.99 | 4448.1 | 4443.5 | 17.88 |
| 9/28/19 | 10.41 | 4433.00 | 4431.80 | 32.97 | 4448.1 | 4443.5 | 17.88 |
| 9/29/19 | 10.41 | 4433.00 | 4431.80 | 32.99 | 4448.1 | 4443.5 | 17.88 |
| 9/30/19 | 10.42 | 4433.00 | 4431.80 | 32.97 | 4448.1 | 4443.5 | 17.87 |
| 10/1/19 | 10.42 | 4433.00 | 4431.80 | 32.99 | 4448.1 | 4443.5 | 17.87 |
| 10/2/19 | 10.42 | 4433.00 | 4431.80 | 32.97 | 4448.1 | 4443.5 | 17.86 |
| 10/3/19 | 10.42 | 4433.00 | 4431.80 | 32.98 | 4448.1 | 4443.5 | 17.86 |
| 10/4/19 | 10.43 | 4433.00 | 4431.80 | 32.97 | 4448.2 | 4443.5 | 17.85 |
| 10/5/19 | 10.43 | 4433.00 | 4431.80 | 32.98 | 4448.2 | 4443.6 | 17.84 |
| 10/6/19 | 10.43 | 4433.00 | 4431.80 | 32.97 | 4448.2 | 4443.6 | 17.83 |
| 10/7/19 | 10.43 | 4433.00 | 4431.80 | 32.98 | 4448.2 | 4443.6 | 17.83 |
| 10/8/19 | 10.44 | 4433.00 | 4431.80 | 32.97 | 4448.2 | 4443.6 | 17.82 |
| 10/9/19 | 10.44 | 4433.00 | 4431.80 | 32.98 | 4448.2 | 4443.6 | 17.81 |
| 10/10/19 | 10.44 | 4433.00 | 4431.80 | 32.97 | 4448.2 | 4443.6 | 17.81 |
| 10/11/19 | 10.45 | 4433.00 | 4431.80 | 32.98 | 4448.2 | 4443.6 | 17.80 |
| 10/12/19 | 10.45 | 4433.00 | 4431.80 | 32.97 | 4448.2 | 4443.7 | 17.79 |
| 10/13/19 | 10.45 | 4433.00 | 4431.80 | 32.98 | 4448.2 | 4443.7 | 17.78 |
| 10/14/19 | 10.45 | 4433.00 | 4431.80 | 32.97 | 4448.2 | 4443.7 | 17.78 |
| 10/15/19 | 10.46 | 4433.00 | 4431.80 | 32.98 | 4448.2 | 4443.7 | 17.77 |
| 10/16/19 | 10.46 | 4433.00 | 4431.80 | 32.97 | 4448.2 | 4443.7 | 17.76 |
| 10/17/19 | 10.46 | 4433.00 | 4431.80 | 32.98 | 4448.2 | 4443.7 | 17.76 |
| 10/18/19 | 10.46 | 4433.00 | 4431.80 | 32.97 | 4448.3 | 4443.7 | 17.75 |
| 10/19/19 | 10.47 | 4433.00 | 4431.80 | 32.98 | 4448.3 | 4443.7 | 17.74 |
| 10/20/19 | 10.47 | 4433.00 | 4431.80 | 32.97 | 4448.3 | 4443.8 | 17.74 |
| 10/21/19 | 10.47 | 4433.00 | 4431.80 | 32.98 | 4448.3 | 4443.8 | 17.73 |
| 10/22/19 | 10.48 | 4433.00 | 4431.80 | 32.97 | 4448.3 | 4443.8 | 17.72 |
| 10/23/19 | 10.48 | 4433.00 | 4431.80 | 32.98 | 4448.3 | 4443.8 | 17.71 |
| 10/24/19 | 10.48 | 4433.00 | 4431.80 | 32.97 | 4448.3 | 4443.8 | 17.71 |
| 10/25/19 | 10.48 | 4433.00 | 4431.80 | 32.98 | 4448.3 | 4443.8 | 17.70 |
| 10/26/19 | 10.49 | 4433.00 | 4431.80 | 32.97 | 4448.3 | 4443.8 | 17.69 |
| 10/27/19 | 10.49 | 4433.00 | 4431.80 | 32.98 | 4448.3 | 4443.8 | 17.69 |
| 10/28/19 | 10.49 | 4433.00 | 4431.80 | 32.97 | 4448.3 | 4443.9 | 17.68 |
| 10/29/19 | 10.49 | 4433.00 | 4431.80 | 32.98 | 4448.3 | 4443.9 | 17.67 |
| 10/30/19 | 10.50 | 4433.00 | 4431.80 | 32.97 | 4448.3 | 4443.9 | 17.66 |
| 10/31/19 | 10.50 | 4433.00 | 4431.80 | 32.98 | 4448.3 | 4443.9 | 17.66 |
| 11/1/19 | 10.50 | 4433.00 | 4431.80 | 32.97 | 4448.4 | 4443.9 | 17.65 |
| 11/2/19 | 10.51 | 4433.00 | 4431.80 | 32.98 | 4448.4 | 4443.9 | 17.64 |
| 11/3/19 | 10.51 | 4433.00 | 4431.80 | 32.97 | 4448.4 | 4443.9 | 17.63 |
| 11/4/19 | 10.51 | 4433.00 | 4431.80 | 32.98 | 4448.4 | 4443.9 | 17.61 |
| 11/5/19 | 10.51 | 4433.00 | 4431.80 | 32.97 | 4448.4 | 4444.0 | 17.60 |
| 11/6/19 | 10.52 | 4433.00 | 4431.80 | 32.98 | 4448.4 | 4444.0 | 17.59 |
| 11/7/19 | 10.52 | 4433.00 | 4431.80 | 32.97 | 4448.4 | 4444.0 | 17.58 |
| 11/8/19 | 10.52 | 4433.00 | 4431.80 | 32.98 | 4448.4 | 4444.0 | 17.57 |
| 11/9/19 | 10.52 | 4433.00 | 4431.80 | 32.97 | 4448.4 | 4444.0 | 17.56 |
| 11/10/19 | 10.53 | 4433.00 | 4431.80 | 32.98 | 4448.5 | 4444.0 | 17.54 |
| 11/11/19 | 10.53 | 4433.00 | 4431.80 | 32.97 | 4448.5 | 4444.0 | 17.53 |
| 11/12/19 | 10.53 | 4433.00 | 4431.80 | 32.98 | 4448.5 | 4444.0 | 17.52 |
| 11/13/19 | 10.54 | 4433.00 | 4431.80 | 32.97 | 4448.5 | 4444.1 | 17.51 |
| 11/14/19 | 10.54 | 4433.00 | 4431.80 | 32.98 | 4448.5 | 4444.1 | 17.50 |

**Appendix E**
**Table 1  Tailings and Pond Elevations for North and South Cells**

| | Year | North Cell | | | South Cell | | |
|---|---|---|---|---|---|---|---|
| Date | Fraction | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) |
| 11/15/19 | 10.54 | 4433.00 | 4431.80 | 32.97 | 4448.5 | 4444.1 | 17.48 |
| 11/16/19 | 10.54 | 4433.00 | 4431.80 | 32.98 | 4448.5 | 4444.1 | 17.47 |
| 11/17/19 | 10.55 | 4433.00 | 4431.80 | 32.97 | 4448.5 | 4444.1 | 17.46 |
| 11/18/19 | 10.55 | 4433.00 | 4431.80 | 32.98 | 4448.6 | 4444.1 | 17.45 |
| 11/19/19 | 10.55 | 4433.00 | 4431.80 | 32.97 | 4448.6 | 4444.1 | 17.44 |
| 11/20/19 | 10.55 | 4433.00 | 4431.80 | 32.98 | 4448.6 | 4444.1 | 17.42 |
| 11/21/19 | 10.56 | 4433.00 | 4431.80 | 32.97 | 4448.6 | 4444.2 | 17.41 |
| 11/22/19 | 10.56 | 4433.00 | 4431.80 | 32.98 | 4448.6 | 4444.2 | 17.40 |
| 11/23/19 | 10.56 | 4433.00 | 4431.80 | 32.97 | 4448.6 | 4444.2 | 17.39 |
| 11/24/19 | 10.57 | 4433.00 | 4431.80 | 32.98 | 4448.6 | 4444.2 | 17.38 |
| 11/25/19 | 10.57 | 4433.00 | 4431.80 | 32.97 | 4448.6 | 4444.2 | 17.37 |
| 11/26/19 | 10.57 | 4433.00 | 4431.80 | 32.98 | 4448.6 | 4444.2 | 17.35 |
| 11/27/19 | 10.57 | 4433.00 | 4431.80 | 32.97 | 4448.7 | 4444.2 | 17.34 |
| 11/28/19 | 10.58 | 4433.00 | 4431.80 | 32.98 | 4448.7 | 4444.3 | 17.33 |
| 11/29/19 | 10.58 | 4433.00 | 4431.80 | 32.97 | 4448.7 | 4444.3 | 17.32 |
| 11/30/19 | 10.58 | 4433.00 | 4431.80 | 32.98 | 4448.7 | 4444.3 | 17.31 |
| 12/1/19 | 10.59 | 4433.00 | 4431.80 | 32.97 | 4448.7 | 4444.3 | 17.29 |
| 12/2/19 | 10.59 | 4433.00 | 4431.80 | 32.98 | 4448.7 | 4444.3 | 17.28 |
| 12/3/19 | 10.59 | 4433.00 | 4431.80 | 32.97 | 4448.7 | 4444.3 | 17.26 |
| 12/4/19 | 10.59 | 4433.00 | 4431.80 | 32.98 | 4448.8 | 4444.3 | 17.25 |
| 12/5/19 | 10.60 | 4433.00 | 4431.80 | 32.97 | 4448.8 | 4444.3 | 17.23 |
| 12/6/19 | 10.60 | 4433.00 | 4431.80 | 32.98 | 4448.8 | 4444.4 | 17.21 |
| 12/7/19 | 10.60 | 4433.00 | 4431.80 | 32.97 | 4448.8 | 4444.4 | 17.20 |
| 12/8/19 | 10.60 | 4433.00 | 4431.80 | 32.98 | 4448.8 | 4444.4 | 17.18 |
| 12/9/19 | 10.61 | 4433.00 | 4431.80 | 32.97 | 4448.8 | 4444.4 | 17.16 |
| 12/10/19 | 10.61 | 4433.00 | 4431.80 | 32.98 | 4448.9 | 4444.4 | 17.15 |
| 12/11/19 | 10.61 | 4433.00 | 4431.80 | 32.97 | 4448.9 | 4444.4 | 17.13 |
| 12/12/19 | 10.62 | 4433.00 | 4431.80 | 32.98 | 4448.9 | 4444.4 | 17.12 |
| 12/13/19 | 10.62 | 4433.00 | 4431.80 | 32.97 | 4448.9 | 4444.4 | 17.10 |
| 12/14/19 | 10.62 | 4433.00 | 4431.80 | 32.98 | 4448.9 | 4444.5 | 17.08 |
| 12/15/19 | 10.62 | 4433.00 | 4431.80 | 32.97 | 4448.9 | 4444.5 | 17.07 |
| 12/16/19 | 10.63 | 4433.00 | 4431.80 | 32.98 | 4448.9 | 4444.5 | 17.05 |
| 12/17/19 | 10.63 | 4433.00 | 4431.80 | 32.97 | 4449.0 | 4444.5 | 17.04 |
| 12/18/19 | 10.63 | 4433.00 | 4431.80 | 32.98 | 4449.0 | 4444.5 | 17.02 |
| 12/19/19 | 10.63 | 4433.00 | 4431.80 | 32.97 | 4449.0 | 4444.5 | 17.00 |
| 12/20/19 | 10.64 | 4433.00 | 4431.80 | 32.98 | 4449.0 | 4444.5 | 16.99 |
| 12/21/19 | 10.64 | 4433.00 | 4431.80 | 32.97 | 4449.0 | 4444.5 | 16.97 |
| 12/22/19 | 10.64 | 4433.10 | 4431.90 | 32.93 | 4449.0 | 4444.5 | 16.98 |
| 12/23/19 | 10.65 | 4433.10 | 4431.90 | 32.90 | 4449.0 | 4444.5 | 16.99 |
| 12/24/19 | 10.65 | 4433.10 | 4431.90 | 32.86 | 4449.0 | 4444.5 | 17.00 |
| 12/25/19 | 10.65 | 4433.20 | 4431.90 | 32.82 | 4449.0 | 4444.5 | 17.01 |
| 12/26/19 | 10.65 | 4433.20 | 4432.00 | 32.79 | 4449.0 | 4444.5 | 17.02 |
| 12/27/19 | 10.66 | 4433.30 | 4432.00 | 32.75 | 4449.0 | 4444.5 | 17.03 |
| 12/28/19 | 10.66 | 4433.30 | 4432.00 | 32.71 | 4449.0 | 4444.5 | 17.03 |
| 12/29/19 | 10.66 | 4433.30 | 4432.00 | 32.67 | 4449.0 | 4444.5 | 17.04 |
| 12/30/19 | 10.66 | 4433.40 | 4432.00 | 32.64 | 4448.9 | 4444.5 | 17.05 |
| 12/31/19 | 10.67 | 4433.40 | 4432.10 | 32.60 | 4448.9 | 4444.5 | 17.06 |
| 1/1/20 | 10.67 | 4433.40 | 4432.10 | 32.56 | 4448.9 | 4444.5 | 17.07 |
| 1/2/20 | 10.67 | 4433.50 | 4432.10 | 32.52 | 4448.9 | 4444.5 | 17.08 |
| 1/3/20 | 10.68 | 4433.50 | 4432.10 | 32.48 | 4448.9 | 4444.5 | 17.08 |
| 1/4/20 | 10.68 | 4433.60 | 4432.20 | 32.44 | 4448.9 | 4444.5 | 17.09 |
| 1/5/20 | 10.68 | 4433.60 | 4432.20 | 32.40 | 4448.9 | 4444.5 | 17.10 |
| 1/6/20 | 10.68 | 4433.60 | 4432.20 | 32.36 | 4448.9 | 4444.5 | 17.10 |
| 1/7/20 | 10.69 | 4433.70 | 4432.20 | 32.33 | 4448.9 | 4444.5 | 17.11 |
| 1/8/20 | 10.69 | 4433.70 | 4432.20 | 32.29 | 4448.9 | 4444.5 | 17.12 |

## Appendix E
## Table 1 Tailings and Pond Elevations for North and South Cells

| | Year | North Cell | | | South Cell | | |
|---|---|---|---|---|---|---|---|
| Date | Fraction | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) |
| 1/9/20 | 10.69 | 4433.80 | 4432.30 | 32.25 | 4448.9 | 4444.5 | 17.13 |
| 1/10/20 | 10.69 | 4433.80 | 4432.30 | 32.21 | 4448.9 | 4444.5 | 17.13 |
| 1/11/20 | 10.70 | 4433.80 | 4432.30 | 32.17 | 4448.9 | 4444.5 | 17.14 |
| 1/12/20 | 10.70 | 4433.90 | 4432.30 | 32.13 | 4448.9 | 4444.5 | 17.15 |
| 1/13/20 | 10.70 | 4433.90 | 4432.40 | 32.09 | 4448.8 | 4444.5 | 17.15 |
| 1/14/20 | 10.71 | 4434.00 | 4432.40 | 32.05 | 4448.8 | 4444.5 | 17.16 |
| 1/15/20 | 10.71 | 4434.00 | 4432.40 | 32.01 | 4448.8 | 4444.5 | 17.17 |
| 1/16/20 | 10.71 | 4434.00 | 4432.40 | 31.97 | 4448.8 | 4444.5 | 17.17 |
| 1/17/20 | 10.71 | 4434.10 | 4432.40 | 31.93 | 4448.8 | 4444.5 | 17.18 |
| 1/18/20 | 10.72 | 4434.10 | 4432.50 | 31.89 | 4448.8 | 4444.5 | 17.19 |
| 1/19/20 | 10.72 | 4434.10 | 4432.50 | 31.85 | 4448.8 | 4444.5 | 17.19 |
| 1/20/20 | 10.72 | 4434.20 | 4432.50 | 31.81 | 4448.8 | 4444.5 | 17.20 |
| 1/21/20 | 10.72 | 4434.20 | 4432.50 | 31.78 | 4448.8 | 4444.5 | 17.21 |
| 1/22/20 | 10.73 | 4434.30 | 4432.60 | 31.74 | 4448.8 | 4444.5 | 17.22 |
| 1/23/20 | 10.73 | 4434.30 | 4432.60 | 31.70 | 4448.8 | 4444.5 | 17.22 |
| 1/24/20 | 10.73 | 4434.30 | 4432.60 | 31.66 | 4448.8 | 4444.5 | 17.23 |
| 1/25/20 | 10.74 | 4434.40 | 4432.60 | 31.62 | 4448.8 | 4444.5 | 17.24 |
| 1/26/20 | 10.74 | 4434.40 | 4432.60 | 31.58 | 4448.8 | 4444.5 | 17.24 |
| 1/27/20 | 10.74 | 4434.50 | 4432.70 | 31.54 | 4448.8 | 4444.5 | 17.25 |
| 1/28/20 | 10.74 | 4434.50 | 4432.70 | 31.50 | 4448.7 | 4444.5 | 17.26 |
| 1/29/20 | 10.75 | 4434.50 | 4432.70 | 31.46 | 4448.7 | 4444.5 | 17.26 |
| 1/30/20 | 10.75 | 4434.60 | 4432.70 | 31.42 | 4448.7 | 4444.5 | 17.27 |
| 1/31/20 | 10.75 | 4434.60 | 4432.80 | 31.38 | 4448.7 | 4444.5 | 17.28 |
| 2/1/20 | 10.75 | 4434.70 | 4432.80 | 31.35 | 4448.7 | 4444.5 | 17.28 |
| 2/2/20 | 10.76 | 4434.70 | 4432.80 | 31.31 | 4448.7 | 4444.5 | 17.29 |
| 2/3/20 | 10.76 | 4434.70 | 4432.80 | 31.27 | 4448.7 | 4444.5 | 17.30 |
| 2/4/20 | 10.76 | 4434.80 | 4432.80 | 31.23 | 4448.7 | 4444.5 | 17.30 |
| 2/5/20 | 10.77 | 4434.80 | 4432.90 | 31.19 | 4448.7 | 4444.5 | 17.31 |
| 2/6/20 | 10.77 | 4434.90 | 4432.90 | 31.15 | 4448.7 | 4444.5 | 17.32 |
| 2/7/20 | 10.77 | 4434.90 | 4432.90 | 31.11 | 4448.7 | 4444.5 | 17.32 |
| 2/8/20 | 10.77 | 4434.90 | 4432.90 | 31.07 | 4448.7 | 4444.5 | 17.33 |
| 2/9/20 | 10.78 | 4435.00 | 4433.00 | 31.03 | 4448.7 | 4444.5 | 17.34 |
| 2/10/20 | 10.78 | 4435.00 | 4433.00 | 30.99 | 4448.7 | 4444.5 | 17.34 |
| 2/11/20 | 10.78 | 4435.00 | 4433.00 | 30.95 | 4448.7 | 4444.5 | 17.35 |
| 2/12/20 | 10.78 | 4435.10 | 4433.00 | 30.91 | 4448.6 | 4444.5 | 17.36 |
| 2/13/20 | 10.79 | 4435.10 | 4433.00 | 30.88 | 4448.6 | 4444.5 | 17.36 |
| 2/14/20 | 10.79 | 4435.20 | 4433.10 | 30.84 | 4448.6 | 4444.5 | 17.37 |
| 2/15/20 | 10.79 | 4435.20 | 4433.10 | 30.80 | 4448.6 | 4444.5 | 17.38 |
| 2/16/20 | 10.80 | 4435.20 | 4433.10 | 30.76 | 4448.6 | 4444.5 | 17.38 |
| 2/17/20 | 10.80 | 4435.30 | 4433.10 | 30.72 | 4448.6 | 4444.5 | 17.39 |
| 2/18/20 | 10.80 | 4435.30 | 4433.20 | 30.68 | 4448.6 | 4444.5 | 17.40 |
| 2/19/20 | 10.80 | 4435.40 | 4433.20 | 30.64 | 4448.6 | 4444.5 | 17.40 |
| 2/20/20 | 10.81 | 4435.40 | 4433.20 | 30.60 | 4448.6 | 4444.5 | 17.41 |
| 2/21/20 | 10.81 | 4435.40 | 4433.20 | 30.56 | 4448.6 | 4444.5 | 17.42 |
| 2/22/20 | 10.81 | 4435.50 | 4433.20 | 30.53 | 4448.6 | 4444.5 | 17.42 |
| 2/23/20 | 10.82 | 4435.50 | 4433.30 | 30.49 | 4448.6 | 4444.5 | 17.43 |
| 2/24/20 | 10.82 | 4435.60 | 4433.30 | 30.45 | 4448.6 | 4444.5 | 17.43 |
| 2/25/20 | 10.82 | 4435.60 | 4433.30 | 30.41 | 4448.6 | 4444.5 | 17.44 |
| 2/26/20 | 10.82 | 4435.60 | 4433.30 | 30.37 | 4448.6 | 4444.5 | 17.45 |
| 2/27/20 | 10.83 | 4435.70 | 4433.40 | 30.33 | 4448.5 | 4444.5 | 17.45 |
| 2/28/20 | 10.83 | 4435.70 | 4433.40 | 30.29 | 4448.5 | 4444.5 | 17.46 |
| 2/29/20 | 10.83 | 4435.70 | 4433.40 | 30.25 | 4448.5 | 4444.5 | 17.47 |
| 3/1/20 | 10.83 | 4435.80 | 4433.40 | 30.21 | 4448.5 | 4444.5 | 17.47 |
| 3/2/20 | 10.84 | 4435.80 | 4433.40 | 30.17 | 4448.5 | 4444.5 | 17.48 |
| 3/3/20 | 10.84 | 4435.90 | 4433.50 | 30.13 | 4448.5 | 4444.5 | 17.49 |

## Appendix E
## Table 1  Tailings and Pond Elevations for North and South Cells

| | Year | North Cell | | | South Cell | | |
|---|---|---|---|---|---|---|---|
| Date | Fraction | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) |
| 3/4/20 | 10.84 | 4435.90 | 4433.50 | 30.09 | 4448.5 | 4444.5 | 17.49 |
| 3/5/20 | 10.85 | 4435.90 | 4433.50 | 30.05 | 4448.5 | 4444.5 | 17.50 |
| 3/6/20 | 10.85 | 4436.00 | 4433.50 | 30.01 | 4448.5 | 4444.5 | 17.50 |
| 3/7/20 | 10.85 | 4436.00 | 4433.60 | 29.97 | 4448.5 | 4444.5 | 17.51 |
| 3/8/20 | 10.85 | 4436.10 | 4433.60 | 29.93 | 4448.5 | 4444.5 | 17.51 |
| 3/9/20 | 10.86 | 4436.10 | 4433.60 | 29.89 | 4448.5 | 4444.5 | 17.52 |
| 3/10/20 | 10.86 | 4436.20 | 4433.60 | 29.85 | 4448.5 | 4444.5 | 17.53 |
| 3/11/20 | 10.86 | 4436.20 | 4433.60 | 29.81 | 4448.5 | 4444.5 | 17.53 |
| 3/12/20 | 10.86 | 4436.20 | 4433.70 | 29.76 | 4448.5 | 4444.5 | 17.54 |
| 3/13/20 | 10.87 | 4436.30 | 4433.70 | 29.72 | 4448.5 | 4444.5 | 17.54 |
| 3/14/20 | 10.87 | 4436.30 | 4433.70 | 29.68 | 4448.5 | 4444.5 | 17.55 |
| 3/15/20 | 10.87 | 4436.40 | 4433.70 | 29.64 | 4448.4 | 4444.5 | 17.55 |
| 3/16/20 | 10.88 | 4436.40 | 4433.80 | 29.60 | 4448.4 | 4444.5 | 17.56 |
| 3/17/20 | 10.88 | 4436.40 | 4433.80 | 29.56 | 4448.4 | 4444.5 | 17.57 |
| 3/18/20 | 10.88 | 4436.50 | 4433.80 | 29.52 | 4448.4 | 4444.5 | 17.57 |
| 3/19/20 | 10.88 | 4436.50 | 4433.80 | 29.48 | 4448.4 | 4444.5 | 17.58 |
| 3/20/20 | 10.89 | 4436.60 | 4433.80 | 29.44 | 4448.4 | 4444.5 | 17.58 |
| 3/21/20 | 10.89 | 4436.60 | 4433.90 | 29.40 | 4448.4 | 4444.5 | 17.59 |
| 3/22/20 | 10.89 | 4436.60 | 4433.90 | 29.36 | 4448.4 | 4444.5 | 17.59 |
| 3/23/20 | 10.89 | 4436.70 | 4433.90 | 29.32 | 4448.4 | 4444.5 | 17.60 |
| 3/24/20 | 10.90 | 4436.70 | 4433.90 | 29.28 | 4448.4 | 4444.5 | 17.61 |
| 3/25/20 | 10.90 | 4436.80 | 4434.00 | 29.24 | 4448.4 | 4444.5 | 17.61 |
| 3/26/20 | 10.90 | 4436.80 | 4434.00 | 29.19 | 4448.4 | 4444.5 | 17.62 |
| 3/27/20 | 10.91 | 4436.80 | 4434.00 | 29.15 | 4448.4 | 4444.5 | 17.62 |
| 3/28/20 | 10.91 | 4436.90 | 4434.00 | 29.11 | 4448.4 | 4444.5 | 17.63 |
| 3/29/20 | 10.91 | 4436.90 | 4434.00 | 29.07 | 4448.4 | 4444.5 | 17.63 |
| 3/30/20 | 10.91 | 4437.00 | 4434.10 | 29.03 | 4448.4 | 4444.5 | 17.64 |
| 3/31/20 | 10.92 | 4437.00 | 4434.10 | 28.99 | 4448.4 | 4444.5 | 17.65 |
| 4/1/20 | 10.92 | 4437.00 | 4434.10 | 28.95 | 4448.3 | 4444.5 | 17.65 |
| 4/2/20 | 10.92 | 4437.10 | 4434.10 | 28.92 | 4448.3 | 4444.5 | 17.66 |
| 4/3/20 | 10.92 | 4437.10 | 4434.20 | 28.88 | 4448.3 | 4444.5 | 17.67 |
| 4/4/20 | 10.93 | 4437.20 | 4434.20 | 28.85 | 4448.3 | 4444.5 | 17.68 |
| 4/5/20 | 10.93 | 4437.20 | 4434.20 | 28.81 | 4448.3 | 4444.5 | 17.69 |
| 4/6/20 | 10.93 | 4437.20 | 4434.20 | 28.78 | 4448.3 | 4444.5 | 17.69 |
| 4/7/20 | 10.94 | 4437.30 | 4434.20 | 28.74 | 4448.3 | 4444.5 | 17.70 |
| 4/8/20 | 10.94 | 4437.30 | 4434.30 | 28.71 | 4448.3 | 4444.5 | 17.71 |
| 4/9/20 | 10.94 | 4437.30 | 4434.30 | 28.67 | 4448.3 | 4444.5 | 17.72 |
| 4/10/20 | 10.94 | 4437.40 | 4434.30 | 28.64 | 4448.3 | 4444.5 | 17.73 |
| 4/11/20 | 10.95 | 4437.40 | 4434.30 | 28.60 | 4448.3 | 4444.5 | 17.74 |
| 4/12/20 | 10.95 | 4437.40 | 4434.40 | 28.57 | 4448.3 | 4444.5 | 17.75 |
| 4/13/20 | 10.95 | 4437.50 | 4434.40 | 28.53 | 4448.2 | 4444.5 | 17.75 |
| 4/14/20 | 10.95 | 4437.50 | 4434.40 | 28.50 | 4448.2 | 4444.5 | 17.76 |
| 4/15/20 | 10.96 | 4437.50 | 4434.40 | 28.46 | 4448.2 | 4444.5 | 17.77 |
| 4/16/20 | 10.96 | 4437.60 | 4434.40 | 28.43 | 4448.2 | 4444.5 | 17.78 |
| 4/17/20 | 10.96 | 4437.60 | 4434.50 | 28.39 | 4448.2 | 4444.5 | 17.79 |
| 4/18/20 | 10.97 | 4437.60 | 4434.50 | 28.36 | 4448.2 | 4444.5 | 17.80 |
| 4/19/20 | 10.97 | 4437.70 | 4434.50 | 28.32 | 4448.2 | 4444.5 | 17.81 |
| 4/20/20 | 10.97 | 4437.70 | 4434.50 | 28.29 | 4448.2 | 4444.5 | 17.81 |
| 4/21/20 | 10.97 | 4437.70 | 4434.60 | 28.25 | 4448.2 | 4444.5 | 17.82 |
| 4/22/20 | 10.98 | 4437.80 | 4434.60 | 28.22 | 4448.2 | 4444.5 | 17.83 |
| 4/23/20 | 10.98 | 4437.80 | 4434.60 | 28.18 | 4448.2 | 4444.5 | 17.84 |
| 4/24/20 | 10.98 | 4437.90 | 4434.60 | 28.15 | 4448.2 | 4444.5 | 17.85 |
| 4/25/20 | 10.98 | 4437.90 | 4434.60 | 28.11 | 4448.1 | 4444.5 | 17.86 |
| 4/26/20 | 10.99 | 4437.90 | 4434.70 | 28.08 | 4448.1 | 4444.5 | 17.87 |
| 4/27/20 | 10.99 | 4438.00 | 4434.70 | 28.04 | 4448.1 | 4444.5 | 17.87 |

**Appendix E**
**Table 1 Tailings and Pond Elevations for North and South Cells**

| | Year | North Cell | | | South Cell | | |
|---|---|---|---|---|---|---|---|
| Date | Fraction | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) |
| 4/28/20 | 10.99 | 4438.00 | 4434.70 | 28.01 | 4448.1 | 4444.5 | 17.88 |
| 4/29/20 | 11.00 | 4438.00 | 4434.70 | 27.97 | 4448.1 | 4444.5 | 17.89 |
| 4/30/20 | 11.00 | 4438.10 | 4434.80 | 27.94 | 4448.1 | 4444.5 | 17.90 |
| 5/1/20 | 11.00 | 4438.10 | 4434.80 | 27.91 | 4448.1 | 4444.5 | 17.91 |
| 5/2/20 | 11.00 | 4438.10 | 4434.80 | 27.87 | 4448.1 | 4444.5 | 17.92 |
| 5/3/20 | 11.01 | 4438.20 | 4434.80 | 27.84 | 4448.1 | 4444.5 | 17.93 |
| 5/4/20 | 11.01 | 4438.20 | 4434.80 | 27.80 | 4448.1 | 4444.5 | 17.94 |
| 5/5/20 | 11.01 | 4438.20 | 4434.90 | 27.77 | 4448.1 | 4444.5 | 17.95 |
| 5/6/20 | 11.01 | 4438.30 | 4434.90 | 27.74 | 4448.0 | 4444.5 | 17.96 |
| 5/7/20 | 11.02 | 4438.30 | 4434.90 | 27.70 | 4448.0 | 4444.5 | 17.97 |
| 5/8/20 | 11.02 | 4438.30 | 4434.90 | 27.67 | 4448.0 | 4444.5 | 17.98 |
| 5/9/20 | 11.02 | 4438.40 | 4435.00 | 27.64 | 4448.0 | 4444.5 | 17.99 |
| 5/10/20 | 11.03 | 4438.40 | 4435.00 | 27.60 | 4448.0 | 4444.5 | 18.00 |
| 5/11/20 | 11.03 | 4438.40 | 4435.00 | 27.57 | 4448.0 | 4444.5 | 18.01 |
| 5/12/20 | 11.03 | 4438.50 | 4435.00 | 27.54 | 4448.0 | 4444.5 | 18.02 |
| 5/13/20 | 11.03 | 4438.50 | 4435.10 | 27.50 | 4448.0 | 4444.5 | 18.03 |
| 5/14/20 | 11.04 | 4438.50 | 4435.10 | 27.47 | 4448.0 | 4444.5 | 18.03 |
| 5/15/20 | 11.04 | 4438.60 | 4435.10 | 27.44 | 4448.0 | 4444.5 | 18.04 |
| 5/16/20 | 11.04 | 4438.60 | 4435.10 | 27.40 | 4447.9 | 4444.5 | 18.05 |
| 5/17/20 | 11.04 | 4438.60 | 4435.10 | 27.37 | 4447.9 | 4444.5 | 18.06 |
| 5/18/20 | 11.05 | 4438.70 | 4435.20 | 27.34 | 4447.9 | 4444.5 | 18.07 |
| 5/19/20 | 11.05 | 4438.70 | 4435.20 | 27.30 | 4447.9 | 4444.5 | 18.08 |
| 5/20/20 | 11.05 | 4438.70 | 4435.20 | 27.27 | 4447.9 | 4444.5 | 18.09 |
| 5/21/20 | 11.06 | 4438.80 | 4435.20 | 27.24 | 4447.9 | 4444.5 | 18.10 |
| 5/22/20 | 11.06 | 4438.80 | 4435.30 | 27.20 | 4447.9 | 4444.5 | 18.11 |
| 5/23/20 | 11.06 | 4438.80 | 4435.30 | 27.17 | 4447.9 | 4444.5 | 18.12 |
| 5/24/20 | 11.06 | 4438.90 | 4435.30 | 27.14 | 4447.9 | 4444.5 | 18.13 |
| 5/25/20 | 11.07 | 4438.90 | 4435.30 | 27.10 | 4447.9 | 4444.5 | 18.14 |
| 5/26/20 | 11.07 | 4438.90 | 4435.30 | 27.07 | 4447.9 | 4444.5 | 18.15 |
| 5/27/20 | 11.07 | 4439.00 | 4435.40 | 27.04 | 4447.8 | 4444.5 | 18.16 |
| 5/28/20 | 11.08 | 4439.00 | 4435.40 | 27.00 | 4447.8 | 4444.5 | 18.17 |
| 5/29/20 | 11.08 | 4439.00 | 4435.40 | 26.97 | 4447.8 | 4444.5 | 18.18 |
| 5/30/20 | 11.08 | 4439.10 | 4435.40 | 26.94 | 4447.8 | 4444.5 | 18.19 |
| 5/31/20 | 11.08 | 4439.10 | 4435.50 | 26.90 | 4447.8 | 4444.5 | 18.20 |
| 6/1/20 | 11.09 | 4439.10 | 4435.50 | 26.87 | 4447.8 | 4444.5 | 18.21 |
| 6/2/20 | 11.09 | 4439.20 | 4435.50 | 26.84 | 4447.8 | 4444.5 | 18.22 |
| 6/3/20 | 11.09 | 4439.20 | 4435.50 | 26.81 | 4447.8 | 4444.5 | 18.24 |
| 6/4/20 | 11.09 | 4439.20 | 4435.50 | 26.78 | 4447.8 | 4444.5 | 18.25 |
| 6/5/20 | 11.10 | 4439.20 | 4435.60 | 26.75 | 4447.7 | 4444.5 | 18.26 |
| 6/6/20 | 11.10 | 4439.30 | 4435.60 | 26.72 | 4447.7 | 4444.5 | 18.27 |
| 6/7/20 | 11.10 | 4439.30 | 4435.60 | 26.70 | 4447.7 | 4444.5 | 18.29 |
| 6/8/20 | 11.11 | 4439.30 | 4435.60 | 26.67 | 4447.7 | 4444.5 | 18.30 |
| 6/9/20 | 11.11 | 4439.40 | 4435.70 | 26.64 | 4447.7 | 4444.5 | 18.31 |
| 6/10/20 | 11.11 | 4439.40 | 4435.70 | 26.61 | 4447.7 | 4444.5 | 18.33 |
| 6/11/20 | 11.11 | 4439.40 | 4435.70 | 26.58 | 4447.7 | 4444.5 | 18.34 |
| 6/12/20 | 11.12 | 4439.40 | 4435.70 | 26.55 | 4447.6 | 4444.5 | 18.35 |
| 6/13/20 | 11.12 | 4439.50 | 4435.70 | 26.52 | 4447.6 | 4444.5 | 18.37 |
| 6/14/20 | 11.12 | 4439.50 | 4435.80 | 26.49 | 4447.6 | 4444.5 | 18.38 |
| 6/15/20 | 11.12 | 4439.50 | 4435.80 | 26.46 | 4447.6 | 4444.5 | 18.39 |
| 6/16/20 | 11.13 | 4439.60 | 4435.80 | 26.44 | 4447.6 | 4444.5 | 18.41 |
| 6/17/20 | 11.13 | 4439.60 | 4435.80 | 26.41 | 4447.6 | 4444.5 | 18.42 |
| 6/18/20 | 11.13 | 4439.60 | 4435.90 | 26.38 | 4447.6 | 4444.5 | 18.43 |
| 6/19/20 | 11.14 | 4439.70 | 4435.90 | 26.35 | 4447.6 | 4444.5 | 18.45 |
| 6/20/20 | 11.14 | 4439.70 | 4435.90 | 26.32 | 4447.5 | 4444.5 | 18.46 |
| 6/21/20 | 11.14 | 4439.70 | 4435.90 | 26.29 | 4447.5 | 4444.5 | 18.47 |

### Appendix E
### Table 1  Tailings and Pond Elevations for North and South Cells

| Date | Year Fraction | North Cell | | | South Cell | | |
|---|---|---|---|---|---|---|---|
| | | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) |
| 6/22/20 | 11.14 | 4439.70 | 4435.90 | 26.26 | 4447.5 | 4444.5 | 18.49 |
| 6/23/20 | 11.15 | 4439.80 | 4436.00 | 26.23 | 4447.5 | 4444.5 | 18.50 |
| 6/24/20 | 11.15 | 4439.80 | 4436.00 | 26.21 | 4447.5 | 4444.5 | 18.51 |
| 6/25/20 | 11.15 | 4439.80 | 4436.00 | 26.18 | 4447.5 | 4444.5 | 18.53 |
| 6/26/20 | 11.15 | 4439.90 | 4436.00 | 26.15 | 4447.5 | 4444.5 | 18.54 |
| 6/27/20 | 11.16 | 4439.90 | 4436.10 | 26.12 | 4447.4 | 4444.5 | 18.55 |
| 6/28/20 | 11.16 | 4439.90 | 4436.10 | 26.09 | 4447.4 | 4444.5 | 18.57 |
| 6/29/20 | 11.16 | 4439.90 | 4436.10 | 26.06 | 4447.4 | 4444.5 | 18.58 |
| 6/30/20 | 11.17 | 4440.00 | 4436.10 | 26.03 | 4447.4 | 4444.5 | 18.59 |
| 7/1/20 | 11.17 | 4440.00 | 4436.10 | 26.01 | 4447.4 | 4444.5 | 18.61 |
| 7/2/20 | 11.17 | 4440.00 | 4436.20 | 25.99 | 4447.4 | 4444.5 | 18.63 |
| 7/3/20 | 11.17 | 4440.00 | 4436.20 | 25.98 | 4447.4 | 4444.5 | 18.65 |
| 7/4/20 | 11.18 | 4440.00 | 4436.20 | 25.96 | 4447.3 | 4444.5 | 18.67 |
| 7/5/20 | 11.18 | 4440.10 | 4436.20 | 25.95 | 4447.3 | 4444.5 | 18.69 |
| 7/6/20 | 11.18 | 4440.10 | 4436.30 | 25.93 | 4447.3 | 4444.5 | 18.71 |
| 7/7/20 | 11.18 | 4440.10 | 4436.30 | 25.92 | 4447.3 | 4444.5 | 18.73 |
| 7/8/20 | 11.19 | 4440.10 | 4436.30 | 25.91 | 4447.3 | 4444.5 | 18.75 |
| 7/9/20 | 11.19 | 4440.10 | 4436.30 | 25.89 | 4447.2 | 4444.5 | 18.77 |
| 7/10/20 | 11.19 | 4440.10 | 4436.30 | 25.88 | 4447.2 | 4444.5 | 18.79 |
| 7/11/20 | 11.20 | 4440.10 | 4436.40 | 25.87 | 4447.2 | 4444.5 | 18.81 |
| 7/12/20 | 11.20 | 4440.10 | 4436.40 | 25.85 | 4447.2 | 4444.5 | 18.83 |
| 7/13/20 | 11.20 | 4440.20 | 4436.40 | 25.84 | 4447.1 | 4444.5 | 18.85 |
| 7/14/20 | 11.20 | 4440.20 | 4436.40 | 25.82 | 4447.1 | 4444.5 | 18.87 |
| 7/15/20 | 11.21 | 4440.20 | 4436.50 | 25.81 | 4447.1 | 4444.5 | 18.89 |
| 7/16/20 | 11.21 | 4440.20 | 4436.50 | 25.80 | 4447.1 | 4444.5 | 18.91 |
| 7/17/20 | 11.21 | 4440.20 | 4436.50 | 25.78 | 4447.1 | 4444.5 | 18.93 |
| 7/18/20 | 11.21 | 4440.20 | 4436.50 | 25.77 | 4447.0 | 4444.5 | 18.95 |
| 7/19/20 | 11.22 | 4440.20 | 4436.50 | 25.75 | 4447.0 | 4444.5 | 18.97 |
| 7/20/20 | 11.22 | 4440.30 | 4436.60 | 25.74 | 4447.0 | 4444.5 | 19.00 |
| 7/21/20 | 11.22 | 4440.30 | 4436.60 | 25.73 | 4447.0 | 4444.5 | 19.02 |
| 7/22/20 | 11.23 | 4440.30 | 4436.60 | 25.71 | 4447.0 | 4444.5 | 19.04 |
| 7/23/20 | 11.23 | 4440.30 | 4436.60 | 25.70 | 4446.9 | 4444.5 | 19.06 |
| 7/24/20 | 11.23 | 4440.30 | 4436.70 | 25.69 | 4446.9 | 4444.5 | 19.08 |
| 7/25/20 | 11.23 | 4440.30 | 4436.70 | 25.67 | 4446.9 | 4444.5 | 19.10 |
| 7/26/20 | 11.24 | 4440.30 | 4436.70 | 25.66 | 4446.9 | 4444.5 | 19.12 |
| 7/27/20 | 11.24 | 4440.40 | 4436.70 | 25.64 | 4446.9 | 4444.5 | 19.14 |
| 7/28/20 | 11.24 | 4440.40 | 4436.70 | 25.63 | 4446.8 | 4444.5 | 19.16 |
| 7/29/20 | 11.24 | 4440.40 | 4436.80 | 25.62 | 4446.8 | 4444.5 | 19.18 |
| 7/30/20 | 11.25 | 4440.40 | 4436.80 | 25.60 | 4446.8 | 4444.5 | 19.20 |
| 7/31/20 | 11.25 | 4440.40 | 4436.80 | 25.59 | 4446.8 | 4444.5 | 19.22 |
| 8/1/20 | 11.25 | 4440.40 | 4436.80 | 25.58 | 4446.8 | 4444.5 | 19.24 |
| 8/2/20 | 11.26 | 4440.40 | 4436.90 | 25.56 | 4446.7 | 4444.5 | 19.26 |
| 8/3/20 | 11.26 | 4440.50 | 4436.90 | 25.54 | 4446.7 | 4444.5 | 19.28 |
| 8/4/20 | 11.26 | 4440.50 | 4436.90 | 25.53 | 4446.7 | 4444.5 | 19.30 |
| 8/5/20 | 11.26 | 4440.50 | 4436.90 | 25.51 | 4446.7 | 4444.5 | 19.33 |
| 8/6/20 | 11.27 | 4440.50 | 4436.90 | 25.50 | 4446.7 | 4444.5 | 19.35 |
| 8/7/20 | 11.27 | 4440.50 | 4437.00 | 25.48 | 4446.6 | 4444.5 | 19.37 |
| 8/8/20 | 11.27 | 4440.50 | 4437.00 | 25.46 | 4446.6 | 4444.5 | 19.39 |
| 8/9/20 | 11.27 | 4440.60 | 4437.00 | 25.45 | 4446.6 | 4444.5 | 19.41 |
| 8/10/20 | 11.28 | 4440.60 | 4437.00 | 25.43 | 4446.6 | 4444.5 | 19.43 |
| 8/11/20 | 11.28 | 4440.60 | 4437.10 | 25.42 | 4446.5 | 4444.5 | 19.45 |
| 8/12/20 | 11.28 | 4440.60 | 4437.10 | 25.40 | 4446.5 | 4444.5 | 19.48 |
| 8/13/20 | 11.29 | 4440.60 | 4437.10 | 25.38 | 4446.5 | 4444.5 | 19.45 |
| 8/14/20 | 11.29 | 4440.60 | 4437.10 | 25.37 | 4446.5 | 4444.5 | 19.48 |
| 8/15/20 | 11.29 | 4440.60 | 4437.10 | 25.35 | 4446.5 | 4444.5 | 19.45 |

**Appendix E**
**Table 1  Tailings and Pond Elevations for North and South Cells**

| Date | Year Fraction | North Cell | | | South Cell | | |
|---|---|---|---|---|---|---|---|
| | | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) |
| 8/16/20 | 11.29 | 4440.70 | 4437.20 | 25.34 | 4446.5 | 4444.5 | 19.48 |
| 8/17/20 | 11.30 | 4440.70 | 4437.20 | 25.32 | 4446.5 | 4444.5 | 19.45 |
| 8/18/20 | 11.30 | 4440.70 | 4437.20 | 25.30 | 4446.5 | 4444.5 | 19.48 |
| 8/19/20 | 11.30 | 4440.70 | 4437.20 | 25.29 | 4446.5 | 4444.5 | 19.45 |
| 8/20/20 | 11.31 | 4440.70 | 4437.30 | 25.27 | 4446.5 | 4444.5 | 19.48 |
| 8/21/20 | 11.31 | 4440.70 | 4437.30 | 25.26 | 4446.5 | 4444.5 | 19.45 |
| 8/22/20 | 11.31 | 4440.80 | 4437.30 | 25.24 | 4446.5 | 4444.5 | 19.48 |
| 8/23/20 | 11.31 | 4440.80 | 4437.30 | 25.23 | 4446.5 | 4444.5 | 19.45 |
| 8/24/20 | 11.32 | 4440.80 | 4437.30 | 25.21 | 4446.5 | 4444.5 | 19.48 |
| 8/25/20 | 11.32 | 4440.80 | 4437.40 | 25.19 | 4446.5 | 4444.5 | 19.45 |
| 8/26/20 | 11.32 | 4440.80 | 4437.40 | 25.18 | 4446.5 | 4444.5 | 19.48 |
| 8/27/20 | 11.32 | 4440.80 | 4437.40 | 25.16 | 4446.5 | 4444.5 | 19.45 |
| 8/28/20 | 11.33 | 4440.90 | 4437.40 | 25.15 | 4446.5 | 4444.5 | 19.48 |
| 8/29/20 | 11.33 | 4440.90 | 4437.50 | 25.13 | 4446.5 | 4444.5 | 19.45 |
| 8/30/20 | 11.33 | 4440.90 | 4437.50 | 25.11 | 4446.5 | 4444.5 | 19.48 |
| 8/31/20 | 11.34 | 4440.90 | 4437.50 | 25.10 | 4446.5 | 4444.5 | 19.45 |
| 9/1/20 | 11.34 | 4440.90 | 4437.50 | 25.08 | 4446.5 | 4444.5 | 19.48 |
| 9/2/20 | 11.34 | 4440.90 | 4437.50 | 25.07 | 4446.5 | 4444.5 | 19.45 |
| 9/3/20 | 11.34 | 4440.90 | 4437.60 | 25.05 | 4446.5 | 4444.5 | 19.47 |
| 9/4/20 | 11.35 | 4441.00 | 4437.60 | 25.04 | 4446.5 | 4444.5 | 19.45 |
| 9/5/20 | 11.35 | 4441.00 | 4437.60 | 25.02 | 4446.5 | 4444.5 | 19.47 |
| 9/6/20 | 11.35 | 4441.00 | 4437.60 | 25.00 | 4446.5 | 4444.5 | 19.45 |
| 9/7/20 | 11.35 | 4441.00 | 4437.70 | 24.99 | 4446.5 | 4444.5 | 19.47 |
| 9/8/20 | 11.36 | 4441.00 | 4437.70 | 24.97 | 4446.5 | 4444.5 | 19.45 |
| 9/9/20 | 11.36 | 4441.00 | 4437.70 | 24.96 | 4446.5 | 4444.5 | 19.47 |
| 9/10/20 | 11.36 | 4441.10 | 4437.70 | 24.94 | 4446.5 | 4444.5 | 19.45 |
| 9/11/20 | 11.37 | 4441.10 | 4437.70 | 24.92 | 4446.5 | 4444.5 | 19.47 |
| 9/12/20 | 11.37 | 4441.10 | 4437.80 | 24.91 | 4446.5 | 4444.5 | 19.45 |
| 9/13/20 | 11.37 | 4441.10 | 4437.80 | 24.89 | 4446.5 | 4444.5 | 19.47 |
| 9/14/20 | 11.37 | 4441.10 | 4437.80 | 24.88 | 4446.5 | 4444.5 | 19.45 |
| 9/15/20 | 11.38 | 4441.10 | 4437.80 | 24.86 | 4446.5 | 4444.5 | 19.47 |
| 9/16/20 | 11.38 | 4441.20 | 4437.90 | 24.85 | 4446.5 | 4444.5 | 19.45 |
| 9/17/20 | 11.38 | 4441.20 | 4437.90 | 24.83 | 4446.5 | 4444.5 | 19.47 |
| 9/18/20 | 11.38 | 4441.20 | 4437.90 | 24.81 | 4446.5 | 4444.5 | 19.45 |
| 9/19/20 | 11.39 | 4441.20 | 4437.90 | 24.80 | 4446.5 | 4444.5 | 19.47 |
| 9/20/20 | 11.39 | 4441.20 | 4437.90 | 24.78 | 4446.5 | 4444.5 | 19.45 |
| 9/21/20 | 11.39 | 4441.20 | 4438.00 | 24.77 | 4446.5 | 4444.5 | 19.47 |
| 9/22/20 | 11.40 | 4441.30 | 4438.00 | 24.75 | 4446.5 | 4444.5 | 19.45 |
| 9/23/20 | 11.40 | 4441.30 | 4438.00 | 24.73 | 4446.5 | 4444.5 | 19.47 |
| 9/24/20 | 11.40 | 4441.30 | 4438.00 | 24.72 | 4446.5 | 4444.5 | 19.45 |
| 9/25/20 | 11.40 | 4441.30 | 4438.10 | 24.70 | 4446.5 | 4444.5 | 19.47 |
| 9/26/20 | 11.41 | 4441.30 | 4438.10 | 24.69 | 4446.5 | 4444.5 | 19.45 |
| 9/27/20 | 11.41 | 4441.30 | 4438.10 | 24.67 | 4446.5 | 4444.5 | 19.47 |
| 9/28/20 | 11.41 | 4441.30 | 4438.10 | 24.66 | 4446.5 | 4444.5 | 19.45 |
| 9/29/20 | 11.41 | 4441.40 | 4438.10 | 24.64 | 4446.5 | 4444.5 | 19.47 |
| 9/30/20 | 11.42 | 4441.40 | 4438.20 | 24.62 | 4446.5 | 4444.5 | 19.45 |
| 10/1/20 | 11.42 | 4441.40 | 4438.20 | 24.61 | 4446.5 | 4444.5 | 19.47 |
| 10/2/20 | 11.42 | 4441.40 | 4438.20 | 24.59 | 4446.6 | 4444.5 | 19.45 |
| 10/3/20 | 11.43 | 4441.40 | 4438.20 | 24.57 | 4446.5 | 4444.5 | 19.47 |
| 10/4/20 | 11.43 | 4441.40 | 4438.30 | 24.56 | 4446.6 | 4444.5 | 19.45 |
| 10/5/20 | 11.43 | 4441.50 | 4438.30 | 24.54 | 4446.5 | 4444.5 | 19.47 |
| 10/6/20 | 11.43 | 4441.50 | 4438.30 | 24.52 | 4446.6 | 4444.5 | 19.45 |
| 10/7/20 | 11.44 | 4441.50 | 4438.30 | 24.50 | 4446.5 | 4444.5 | 19.47 |
| 10/8/20 | 11.44 | 4441.50 | 4438.40 | 24.48 | 4446.6 | 4444.5 | 19.45 |
| 10/9/20 | 11.44 | 4441.50 | 4438.40 | 24.47 | 4446.5 | 4444.5 | 19.47 |

**Appendix E**
**Table 1  Tailings and Pond Elevations for North and South Cells**

| | Year | North Cell | | | South Cell | | |
|---|---|---|---|---|---|---|---|
| Date | Fraction | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) |
| 10/10/20 | 11.44 | 4441.60 | 4438.40 | 24.45 | 4446.6 | 4444.5 | 19.45 |
| 10/11/20 | 11.45 | 4441.60 | 4438.40 | 24.43 | 4446.5 | 4444.5 | 19.47 |
| 10/12/20 | 11.45 | 4441.60 | 4438.40 | 24.41 | 4446.6 | 4444.5 | 19.45 |
| 10/13/20 | 11.45 | 4441.60 | 4438.50 | 24.39 | 4446.5 | 4444.5 | 19.47 |
| 10/14/20 | 11.46 | 4441.60 | 4438.50 | 24.38 | 4446.6 | 4444.5 | 19.45 |
| 10/15/20 | 11.46 | 4441.60 | 4438.50 | 24.36 | 4446.5 | 4444.5 | 19.47 |
| 10/16/20 | 11.46 | 4441.70 | 4438.50 | 24.34 | 4446.6 | 4444.5 | 19.45 |
| 10/17/20 | 11.46 | 4441.70 | 4438.60 | 24.32 | 4446.5 | 4444.5 | 19.47 |
| 10/18/20 | 11.47 | 4441.70 | 4438.60 | 24.31 | 4446.6 | 4444.5 | 19.45 |
| 10/19/20 | 11.47 | 4441.70 | 4438.60 | 24.29 | 4446.5 | 4444.5 | 19.47 |
| 10/20/20 | 11.47 | 4441.70 | 4438.60 | 24.27 | 4446.6 | 4444.5 | 19.45 |
| 10/21/20 | 11.47 | 4441.70 | 4438.60 | 24.25 | 4446.5 | 4444.5 | 19.47 |
| 10/22/20 | 11.48 | 4441.80 | 4438.70 | 24.23 | 4446.6 | 4444.5 | 19.45 |
| 10/23/20 | 11.48 | 4441.80 | 4438.70 | 24.22 | 4446.5 | 4444.5 | 19.47 |
| 10/24/20 | 11.48 | 4441.80 | 4438.70 | 24.20 | 4446.6 | 4444.5 | 19.45 |
| 10/25/20 | 11.49 | 4441.80 | 4438.70 | 24.18 | 4446.5 | 4444.5 | 19.47 |
| 10/26/20 | 11.49 | 4441.80 | 4438.80 | 24.16 | 4446.6 | 4444.5 | 19.45 |
| 10/27/20 | 11.49 | 4441.90 | 4438.80 | 24.15 | 4446.5 | 4444.5 | 19.47 |
| 10/28/20 | 11.49 | 4441.90 | 4438.80 | 24.13 | 4446.6 | 4444.5 | 19.45 |
| 10/29/20 | 11.50 | 4441.90 | 4438.80 | 24.11 | 4446.5 | 4444.5 | 19.47 |
| 10/30/20 | 11.50 | 4441.90 | 4438.80 | 24.09 | 4446.6 | 4444.5 | 19.45 |
| 10/31/20 | 11.50 | 4441.90 | 4438.90 | 24.07 | 4446.5 | 4444.5 | 19.47 |
| 11/1/20 | 11.50 | 4441.90 | 4438.90 | 24.06 | 4446.6 | 4444.5 | 19.45 |
| 11/2/20 | 11.51 | 4442.00 | 4438.90 | 24.04 | 4446.5 | 4444.5 | 19.46 |
| 11/3/20 | 11.51 | 4442.00 | 4438.90 | 24.02 | 4446.6 | 4444.5 | 19.45 |
| 11/4/20 | 11.51 | 4442.00 | 4439.00 | 24.00 | 4446.5 | 4444.5 | 19.46 |
| 11/5/20 | 11.52 | 4442.00 | 4439.00 | 23.98 | 4446.6 | 4444.5 | 19.45 |
| 11/6/20 | 11.52 | 4442.00 | 4439.00 | 23.96 | 4446.5 | 4444.5 | 19.46 |
| 11/7/20 | 11.52 | 4442.10 | 4439.00 | 23.94 | 4446.6 | 4444.5 | 19.45 |
| 11/8/20 | 11.52 | 4442.10 | 4439.00 | 23.92 | 4446.5 | 4444.5 | 19.46 |
| 11/9/20 | 11.53 | 4442.10 | 4439.10 | 23.90 | 4446.6 | 4444.5 | 19.45 |
| 11/10/20 | 11.53 | 4442.10 | 4439.10 | 23.88 | 4446.5 | 4444.5 | 19.46 |
| 11/11/20 | 11.53 | 4442.10 | 4439.10 | 23.86 | 4446.6 | 4444.5 | 19.45 |
| 11/12/20 | 11.54 | 4442.20 | 4439.10 | 23.84 | 4446.5 | 4444.5 | 19.46 |
| 11/13/20 | 11.54 | 4442.20 | 4439.20 | 23.82 | 4446.6 | 4444.5 | 19.45 |
| 11/14/20 | 11.54 | 4442.20 | 4439.20 | 23.80 | 4446.5 | 4444.5 | 19.46 |
| 11/15/20 | 11.54 | 4442.20 | 4439.20 | 23.78 | 4446.6 | 4444.5 | 19.45 |
| 11/16/20 | 11.55 | 4442.20 | 4439.20 | 23.76 | 4446.5 | 4444.5 | 19.46 |
| 11/17/20 | 11.55 | 4442.30 | 4439.20 | 23.74 | 4446.6 | 4444.5 | 19.45 |
| 11/18/20 | 11.55 | 4442.30 | 4439.30 | 23.72 | 4446.5 | 4444.5 | 19.46 |
| 11/19/20 | 11.55 | 4442.30 | 4439.30 | 23.70 | 4446.6 | 4444.5 | 19.45 |
| 11/20/20 | 11.56 | 4442.30 | 4439.30 | 23.68 | 4446.5 | 4444.5 | 19.46 |
| 11/21/20 | 11.56 | 4442.30 | 4439.30 | 23.66 | 4446.6 | 4444.5 | 19.45 |
| 11/22/20 | 11.56 | 4442.40 | 4439.40 | 23.64 | 4446.5 | 4444.5 | 19.46 |
| 11/23/20 | 11.57 | 4442.40 | 4439.40 | 23.62 | 4446.6 | 4444.5 | 19.45 |
| 11/24/20 | 11.57 | 4442.40 | 4439.40 | 23.60 | 4446.5 | 4444.5 | 19.46 |
| 11/25/20 | 11.57 | 4442.40 | 4439.40 | 23.58 | 4446.6 | 4444.5 | 19.45 |
| 11/26/20 | 11.57 | 4442.40 | 4439.40 | 23.56 | 4446.5 | 4444.5 | 19.46 |
| 11/27/20 | 11.58 | 4442.50 | 4439.50 | 23.54 | 4446.6 | 4444.5 | 19.45 |
| 11/28/20 | 11.58 | 4442.50 | 4439.50 | 23.52 | 4446.5 | 4444.5 | 19.46 |
| 11/29/20 | 11.58 | 4442.50 | 4439.50 | 23.50 | 4446.6 | 4444.5 | 19.45 |
| 11/30/20 | 11.58 | 4442.50 | 4439.50 | 23.48 | 4446.5 | 4444.5 | 19.46 |
| 12/1/20 | 11.59 | 4442.50 | 4439.60 | 23.46 | 4446.6 | 4444.5 | 19.45 |
| 12/2/20 | 11.59 | 4442.60 | 4439.60 | 23.44 | 4446.5 | 4444.5 | 19.46 |
| 12/3/20 | 11.59 | 4442.60 | 4439.60 | 23.41 | 4446.6 | 4444.5 | 19.45 |

**Appendix E**
**Table 1 Tailings and Pond Elevations for North and South Cells**

| Date | Year Fraction | North Cell | | | South Cell | | |
|---|---|---|---|---|---|---|---|
| | | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) |
| 12/4/20 | 11.60 | 4442.60 | 4439.60 | 23.39 | 4446.5 | 4444.5 | 19.46 |
| 12/5/20 | 11.60 | 4442.60 | 4439.60 | 23.37 | 4446.6 | 4444.5 | 19.45 |
| 12/6/20 | 11.60 | 4442.70 | 4439.70 | 23.35 | 4446.5 | 4444.5 | 19.46 |
| 12/7/20 | 11.60 | 4442.70 | 4439.70 | 23.32 | 4446.6 | 4444.5 | 19.45 |
| 12/8/20 | 11.61 | 4442.70 | 4439.70 | 23.30 | 4446.5 | 4444.5 | 19.46 |
| 12/9/20 | 11.61 | 4442.70 | 4439.70 | 23.28 | 4446.6 | 4444.5 | 19.45 |
| 12/10/20 | 11.61 | 4442.70 | 4439.80 | 23.25 | 4446.5 | 4444.5 | 19.46 |
| 12/11/20 | 11.61 | 4442.80 | 4439.80 | 23.23 | 4446.6 | 4444.5 | 19.45 |
| 12/12/20 | 11.62 | 4442.80 | 4439.80 | 23.21 | 4446.5 | 4444.5 | 19.46 |
| 12/13/20 | 11.62 | 4442.80 | 4439.80 | 23.18 | 4446.6 | 4444.5 | 19.45 |
| 12/14/20 | 11.62 | 4442.80 | 4439.80 | 23.16 | 4446.5 | 4444.5 | 19.46 |
| 12/15/20 | 11.63 | 4442.90 | 4439.90 | 23.14 | 4446.6 | 4444.5 | 19.45 |
| 12/16/20 | 11.63 | 4442.90 | 4439.90 | 23.12 | 4446.5 | 4444.5 | 19.46 |
| 12/17/20 | 11.63 | 4442.90 | 4439.90 | 23.09 | 4446.6 | 4444.5 | 19.45 |
| 12/18/20 | 11.63 | 4442.90 | 4439.90 | 23.07 | 4446.5 | 4444.5 | 19.46 |
| 12/19/20 | 11.64 | 4443.00 | 4440.00 | 23.05 | 4446.6 | 4444.5 | 19.45 |
| 12/20/20 | 11.64 | 4443.00 | 4440.00 | 23.02 | 4446.5 | 4444.5 | 19.46 |
| 12/21/20 | 11.64 | 4443.00 | 4440.00 | 23.00 | 4446.6 | 4444.5 | 19.45 |
| 12/22/20 | 11.64 | 4443.00 | 4440.00 | 22.98 | 4446.5 | 4444.5 | 19.46 |
| 12/23/20 | 11.65 | 4443.00 | 4440.00 | 22.95 | 4446.6 | 4444.5 | 19.45 |
| 12/24/20 | 11.65 | 4443.10 | 4440.00 | 22.93 | 4446.5 | 4444.5 | 19.46 |
| 12/25/20 | 11.65 | 4443.10 | 4440.10 | 22.91 | 4446.6 | 4444.5 | 19.45 |
| 12/26/20 | 11.66 | 4443.10 | 4440.10 | 22.89 | 4446.5 | 4444.5 | 19.46 |
| 12/27/20 | 11.66 | 4443.10 | 4440.10 | 22.86 | 4446.6 | 4444.5 | 19.45 |
| 12/28/20 | 11.66 | 4443.20 | 4440.10 | 22.84 | 4446.5 | 4444.5 | 19.46 |
| 12/29/20 | 11.66 | 4443.20 | 4440.10 | 22.82 | 4446.6 | 4444.5 | 19.45 |
| 12/30/20 | 11.67 | 4443.20 | 4440.10 | 22.79 | 4446.5 | 4444.5 | 19.46 |
| 12/31/20 | 11.67 | 4443.20 | 4440.20 | 22.77 | 4446.6 | 4444.5 | 19.45 |
| 1/1/21 | 11.67 | 4443.30 | 4440.20 | 22.75 | 4446.5 | 4444.5 | 19.46 |
| 1/2/21 | 11.67 | 4443.30 | 4440.20 | 22.72 | 4446.6 | 4444.5 | 19.45 |
| 1/3/21 | 11.68 | 4443.30 | 4440.20 | 22.70 | 4446.5 | 4444.5 | 19.45 |
| 1/4/21 | 11.68 | 4443.30 | 4440.20 | 22.67 | 4446.5 | 4444.5 | 19.46 |
| 1/5/21 | 11.68 | 4443.40 | 4440.20 | 22.65 | 4446.5 | 4444.5 | 19.45 |
| 1/6/21 | 11.69 | 4443.40 | 4440.20 | 22.62 | 4446.5 | 4444.5 | 19.46 |
| 1/7/21 | 11.69 | 4443.40 | 4440.30 | 22.60 | 4446.5 | 4444.5 | 19.45 |
| 1/8/21 | 11.69 | 4443.40 | 4440.30 | 22.57 | 4446.5 | 4444.5 | 19.46 |
| 1/9/21 | 11.69 | 4443.50 | 4440.30 | 22.55 | 4446.5 | 4444.5 | 19.45 |
| 1/10/21 | 11.70 | 4443.50 | 4440.30 | 22.52 | 4446.5 | 4444.5 | 19.46 |
| 1/11/21 | 11.70 | 4443.50 | 4440.30 | 22.50 | 4446.5 | 4444.5 | 19.45 |
| 1/12/21 | 11.70 | 4443.50 | 4440.30 | 22.47 | 4446.5 | 4444.5 | 19.46 |
| 1/13/21 | 11.70 | 4443.60 | 4440.40 | 22.45 | 4446.5 | 4444.5 | 19.45 |
| 1/14/21 | 11.71 | 4443.60 | 4440.40 | 22.42 | 4446.5 | 4444.5 | 19.46 |
| 1/15/21 | 11.71 | 4443.60 | 4440.40 | 22.40 | 4446.5 | 4444.5 | 19.45 |
| 1/16/21 | 11.71 | 4443.60 | 4440.40 | 22.37 | 4446.5 | 4444.5 | 19.46 |
| 1/17/21 | 11.72 | 4443.70 | 4440.40 | 22.35 | 4446.5 | 4444.5 | 19.45 |
| 1/18/21 | 11.72 | 4443.70 | 4440.40 | 22.32 | 4446.5 | 4444.5 | 19.46 |
| 1/19/21 | 11.72 | 4443.70 | 4440.50 | 22.30 | 4446.5 | 4444.5 | 19.45 |
| 1/20/21 | 11.72 | 4443.70 | 4440.50 | 22.27 | 4446.5 | 4444.5 | 19.46 |
| 1/21/21 | 11.73 | 4443.80 | 4440.50 | 22.25 | 4446.5 | 4444.5 | 19.45 |
| 1/22/21 | 11.73 | 4443.80 | 4440.50 | 22.22 | 4446.5 | 4444.5 | 19.46 |
| 1/23/21 | 11.73 | 4443.80 | 4440.50 | 22.20 | 4446.5 | 4444.5 | 19.45 |
| 1/24/21 | 11.73 | 4443.80 | 4440.50 | 22.17 | 4446.5 | 4444.5 | 19.46 |
| 1/25/21 | 11.74 | 4443.90 | 4440.50 | 22.15 | 4446.5 | 4444.5 | 19.45 |
| 1/26/21 | 11.74 | 4443.90 | 4440.60 | 22.13 | 4446.5 | 4444.5 | 19.46 |
| 1/27/21 | 11.74 | 4443.90 | 4440.60 | 22.10 | 4446.5 | 4444.5 | 19.45 |

**Appendix E**
**Table 1  Tailings and Pond Elevations for North and South Cells**

| Date | Year Fraction | North Cell | | | South Cell | | |
|---|---|---|---|---|---|---|---|
| | | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) |
| 1/28/21 | 11.75 | 4443.90 | 4440.60 | 22.08 | 4446.5 | 4444.5 | 19.46 |
| 1/29/21 | 11.75 | 4443.90 | 4440.60 | 22.05 | 4446.5 | 4444.5 | 19.45 |
| 1/30/21 | 11.75 | 4444.00 | 4440.60 | 22.03 | 4446.5 | 4444.5 | 19.46 |
| 1/31/21 | 11.75 | 4444.00 | 4440.60 | 22.00 | 4446.5 | 4444.5 | 19.45 |
| 2/1/21 | 11.76 | 4444.00 | 4440.70 | 21.98 | 4446.5 | 4444.5 | 19.46 |
| 2/2/21 | 11.76 | 4444.00 | 4440.70 | 21.95 | 4446.5 | 4444.5 | 19.45 |
| 2/3/21 | 11.76 | 4444.10 | 4440.70 | 21.93 | 4446.5 | 4444.5 | 19.46 |
| 2/4/21 | 11.77 | 4444.10 | 4440.70 | 21.90 | 4446.5 | 4444.5 | 19.45 |
| 2/5/21 | 11.77 | 4444.10 | 4440.70 | 21.88 | 4446.5 | 4444.5 | 19.46 |
| 2/6/21 | 11.77 | 4444.10 | 4440.70 | 21.85 | 4446.5 | 4444.5 | 19.45 |
| 2/7/21 | 11.77 | 4444.20 | 4440.70 | 21.83 | 4446.5 | 4444.5 | 19.46 |
| 2/8/21 | 11.78 | 4444.20 | 4440.80 | 21.80 | 4446.5 | 4444.5 | 19.45 |
| 2/9/21 | 11.78 | 4444.20 | 4440.80 | 21.78 | 4446.5 | 4444.5 | 19.46 |
| 2/10/21 | 11.78 | 4444.20 | 4440.80 | 21.75 | 4446.5 | 4444.5 | 19.45 |
| 2/11/21 | 11.78 | 4444.30 | 4440.80 | 21.73 | 4446.5 | 4444.5 | 19.46 |
| 2/12/21 | 11.79 | 4444.30 | 4440.80 | 21.70 | 4446.5 | 4444.5 | 19.45 |
| 2/13/21 | 11.79 | 4444.30 | 4440.80 | 21.68 | 4446.5 | 4444.5 | 19.46 |
| 2/14/21 | 11.79 | 4444.30 | 4440.90 | 21.65 | 4446.5 | 4444.5 | 19.45 |
| 2/15/21 | 11.80 | 4444.40 | 4440.90 | 21.63 | 4446.5 | 4444.5 | 19.46 |
| 2/16/21 | 11.80 | 4444.40 | 4440.90 | 21.60 | 4446.5 | 4444.5 | 19.45 |
| 2/17/21 | 11.80 | 4444.40 | 4440.90 | 21.58 | 4446.5 | 4444.5 | 19.46 |
| 2/18/21 | 11.80 | 4444.40 | 4440.90 | 21.55 | 4446.5 | 4444.5 | 19.45 |
| 2/19/21 | 11.81 | 4444.50 | 4440.90 | 21.53 | 4446.5 | 4444.5 | 19.46 |
| 2/20/21 | 11.81 | 4444.50 | 4440.90 | 21.50 | 4446.5 | 4444.5 | 19.45 |
| 2/21/21 | 11.81 | 4444.50 | 4441.00 | 21.48 | 4446.5 | 4444.5 | 19.46 |
| 2/22/21 | 11.81 | 4444.50 | 4441.00 | 21.45 | 4446.5 | 4444.5 | 19.45 |
| 2/23/21 | 11.82 | 4444.60 | 4441.00 | 21.43 | 4446.5 | 4444.5 | 19.46 |
| 2/24/21 | 11.82 | 4444.60 | 4441.00 | 21.40 | 4446.5 | 4444.5 | 19.45 |
| 2/25/21 | 11.82 | 4444.60 | 4441.00 | 21.38 | 4446.5 | 4444.5 | 19.46 |
| 2/26/21 | 11.83 | 4444.60 | 4441.00 | 21.35 | 4446.5 | 4444.5 | 19.45 |
| 2/27/21 | 11.83 | 4444.70 | 4441.10 | 21.33 | 4446.5 | 4444.5 | 19.46 |
| 2/28/21 | 11.83 | 4444.70 | 4441.10 | 21.30 | 4446.5 | 4444.5 | 19.45 |
| 3/1/21 | 11.83 | 4444.70 | 4441.10 | 21.28 | 4446.5 | 4444.5 | 19.46 |
| 3/2/21 | 11.84 | 4444.80 | 4441.10 | 21.25 | 4446.5 | 4444.5 | 19.45 |
| 3/3/21 | 11.84 | 4444.80 | 4441.10 | 21.22 | 4446.5 | 4444.5 | 19.46 |
| 3/4/21 | 11.84 | 4444.80 | 4441.10 | 21.20 | 4446.5 | 4444.5 | 19.45 |
| 3/5/21 | 11.84 | 4444.80 | 4441.20 | 21.17 | 4446.5 | 4444.5 | 19.46 |
| 3/6/21 | 11.85 | 4444.90 | 4441.20 | 21.15 | 4446.5 | 4444.5 | 19.45 |
| 3/7/21 | 11.85 | 4444.90 | 4441.20 | 21.12 | 4446.5 | 4444.5 | 19.46 |
| 3/8/21 | 11.85 | 4444.90 | 4441.20 | 21.09 | 4446.5 | 4444.5 | 19.45 |
| 3/9/21 | 11.86 | 4444.90 | 4441.20 | 21.07 | 4446.5 | 4444.5 | 19.46 |
| 3/10/21 | 11.86 | 4445.00 | 4441.20 | 21.04 | 4446.5 | 4444.5 | 19.45 |
| 3/11/21 | 11.86 | 4445.00 | 4441.20 | 21.01 | 4446.5 | 4444.5 | 19.46 |
| 3/12/21 | 11.86 | 4445.00 | 4441.30 | 20.99 | 4446.5 | 4444.5 | 19.45 |
| 3/13/21 | 11.87 | 4445.00 | 4441.30 | 20.96 | 4446.5 | 4444.5 | 19.46 |
| 3/14/21 | 11.87 | 4445.10 | 4441.30 | 20.94 | 4446.5 | 4444.5 | 19.45 |
| 3/15/21 | 11.87 | 4445.10 | 4441.30 | 20.91 | 4446.5 | 4444.5 | 19.46 |
| 3/16/21 | 11.87 | 4445.10 | 4441.30 | 20.88 | 4446.5 | 4444.5 | 19.45 |
| 3/17/21 | 11.88 | 4445.10 | 4441.30 | 20.86 | 4446.5 | 4444.5 | 19.46 |
| 3/18/21 | 11.88 | 4445.20 | 4441.40 | 20.83 | 4446.5 | 4444.5 | 19.45 |
| 3/19/21 | 11.88 | 4445.20 | 4441.40 | 20.80 | 4446.5 | 4444.5 | 19.46 |
| 3/20/21 | 11.89 | 4445.20 | 4441.40 | 20.78 | 4446.5 | 4444.5 | 19.45 |
| 3/21/21 | 11.89 | 4445.20 | 4441.40 | 20.75 | 4446.5 | 4444.5 | 19.46 |
| 3/22/21 | 11.89 | 4445.30 | 4441.40 | 20.73 | 4446.5 | 4444.5 | 19.45 |
| 3/23/21 | 11.89 | 4445.30 | 4441.40 | 20.70 | 4446.5 | 4444.5 | 19.46 |

**Appendix E**
**Table 1  Tailings and Pond Elevations for North and South Cells**

| Date | Year Fraction | North Cell | | | South Cell | | |
|---|---|---|---|---|---|---|---|
| | | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) |
| 3/24/21 | 11.90 | 4445.30 | 4441.40 | 20.67 | 4446.5 | 4444.5 | 19.45 |
| 3/25/21 | 11.90 | 4445.40 | 4441.50 | 20.65 | 4446.5 | 4444.5 | 19.46 |
| 3/26/21 | 11.90 | 4445.40 | 4441.50 | 20.62 | 4446.5 | 4444.5 | 19.45 |
| 3/27/21 | 11.90 | 4445.40 | 4441.50 | 20.59 | 4446.5 | 4444.5 | 19.46 |
| 3/28/21 | 11.91 | 4445.40 | 4441.50 | 20.57 | 4446.5 | 4444.5 | 19.45 |
| 3/29/21 | 11.91 | 4445.50 | 4441.50 | 20.54 | 4446.5 | 4444.5 | 19.46 |
| 3/30/21 | 11.91 | 4445.50 | 4441.50 | 20.52 | 4446.5 | 4444.5 | 19.45 |
| 3/31/21 | 11.92 | 4445.50 | 4441.60 | 20.49 | 4446.5 | 4444.5 | 19.46 |
| 4/1/21 | 11.92 | 4445.50 | 4441.60 | 20.46 | 4446.5 | 4444.5 | 19.45 |
| 4/2/21 | 11.92 | 4445.60 | 4441.60 | 20.44 | 4446.5 | 4444.5 | 19.46 |
| 4/3/21 | 11.92 | 4445.60 | 4441.60 | 20.42 | 4446.5 | 4444.5 | 19.45 |
| 4/4/21 | 11.93 | 4445.60 | 4441.60 | 20.40 | 4446.5 | 4444.5 | 19.46 |
| 4/5/21 | 11.93 | 4445.60 | 4441.60 | 20.38 | 4446.5 | 4444.5 | 19.45 |
| 4/6/21 | 11.93 | 4445.60 | 4441.60 | 20.35 | 4446.5 | 4444.5 | 19.46 |
| 4/7/21 | 11.93 | 4445.70 | 4441.70 | 20.33 | 4446.5 | 4444.5 | 19.45 |
| 4/8/21 | 11.94 | 4445.70 | 4441.70 | 20.31 | 4446.5 | 4444.5 | 19.46 |
| 4/9/21 | 11.94 | 4445.70 | 4441.70 | 20.29 | 4446.5 | 4444.5 | 19.45 |
| 4/10/21 | 11.94 | 4445.70 | 4441.70 | 20.26 | 4446.5 | 4444.5 | 19.46 |
| 4/11/21 | 11.95 | 4445.80 | 4441.70 | 20.24 | 4446.5 | 4444.5 | 19.45 |
| 4/12/21 | 11.95 | 4445.80 | 4441.70 | 20.22 | 4446.5 | 4444.5 | 19.46 |
| 4/13/21 | 11.95 | 4445.80 | 4441.80 | 20.20 | 4446.5 | 4444.5 | 19.45 |
| 4/14/21 | 11.95 | 4445.80 | 4441.80 | 20.18 | 4446.5 | 4444.5 | 19.46 |
| 4/15/21 | 11.96 | 4445.80 | 4441.80 | 20.15 | 4446.5 | 4444.5 | 19.45 |
| 4/16/21 | 11.96 | 4445.90 | 4441.80 | 20.13 | 4446.5 | 4444.5 | 19.46 |
| 4/17/21 | 11.96 | 4445.90 | 4441.80 | 20.11 | 4446.5 | 4444.5 | 19.45 |
| 4/18/21 | 11.96 | 4445.90 | 4441.80 | 20.09 | 4446.5 | 4444.5 | 19.46 |
| 4/19/21 | 11.97 | 4445.90 | 4441.90 | 20.06 | 4446.5 | 4444.5 | 19.45 |
| 4/20/21 | 11.97 | 4446.00 | 4441.90 | 20.04 | 4446.5 | 4444.5 | 19.46 |
| 4/21/21 | 11.97 | 4446.00 | 4441.90 | 20.02 | 4446.5 | 4444.5 | 19.45 |
| 4/22/21 | 11.98 | 4446.00 | 4441.90 | 20.00 | 4446.5 | 4444.5 | 19.46 |
| 4/23/21 | 11.98 | 4446.00 | 4441.90 | 19.98 | 4446.5 | 4444.5 | 19.45 |
| 4/24/21 | 11.98 | 4446.00 | 4441.90 | 19.95 | 4446.5 | 4444.5 | 19.46 |
| 4/25/21 | 11.98 | 4446.10 | 4441.90 | 19.93 | 4446.5 | 4444.5 | 19.45 |
| 4/26/21 | 11.99 | 4446.10 | 4442.00 | 19.91 | 4446.5 | 4444.5 | 19.46 |
| 4/27/21 | 11.99 | 4446.10 | 4442.00 | 19.89 | 4446.5 | 4444.5 | 19.45 |
| 4/28/21 | 11.99 | 4446.10 | 4442.00 | 19.87 | 4446.5 | 4444.5 | 19.46 |
| 4/29/21 | 12.00 | 4446.20 | 4442.00 | 19.84 | 4446.5 | 4444.5 | 19.45 |
| 4/30/21 | 12.00 | 4446.20 | 4442.00 | 19.82 | 4446.5 | 4444.5 | 19.46 |
| 5/1/21 | 12.00 | 4446.20 | 4442.00 | 19.80 | 4446.5 | 4444.5 | 19.45 |
| 5/2/21 | 12.00 | 4446.20 | 4442.10 | 19.78 | 4446.5 | 4444.5 | 19.46 |
| 5/3/21 | 12.01 | 4446.20 | 4442.10 | 19.76 | 4446.5 | 4444.5 | 19.45 |
| 5/4/21 | 12.01 | 4446.30 | 4442.10 | 19.74 | 4446.5 | 4444.5 | 19.46 |
| 5/5/21 | 12.01 | 4446.30 | 4442.10 | 19.72 | 4446.5 | 4444.5 | 19.45 |
| 5/6/21 | 12.01 | 4446.30 | 4442.10 | 19.69 | 4446.5 | 4444.5 | 19.46 |
| 5/7/21 | 12.02 | 4446.30 | 4442.10 | 19.67 | 4446.5 | 4444.5 | 19.45 |
| 5/8/21 | 12.02 | 4446.30 | 4442.10 | 19.65 | 4446.5 | 4444.5 | 19.46 |
| 5/9/21 | 12.02 | 4446.40 | 4442.20 | 19.63 | 4446.5 | 4444.5 | 19.45 |
| 5/10/21 | 12.03 | 4446.40 | 4442.20 | 19.61 | 4446.5 | 4444.5 | 19.46 |
| 5/11/21 | 12.03 | 4446.40 | 4442.20 | 19.59 | 4446.5 | 4444.5 | 19.45 |
| 5/12/21 | 12.03 | 4446.40 | 4442.20 | 19.57 | 4446.5 | 4444.5 | 19.46 |
| 5/13/21 | 12.03 | 4446.50 | 4442.20 | 19.55 | 4446.5 | 4444.5 | 19.45 |
| 5/14/21 | 12.04 | 4446.50 | 4442.20 | 19.53 | 4446.5 | 4444.5 | 19.46 |
| 5/15/21 | 12.04 | 4446.50 | 4442.30 | 19.51 | 4446.5 | 4444.5 | 19.45 |
| 5/16/21 | 12.04 | 4446.50 | 4442.30 | 19.48 | 4446.5 | 4444.5 | 19.46 |
| 5/17/21 | 12.04 | 4446.50 | 4442.30 | 19.46 | 4446.5 | 4444.5 | 19.45 |

**Appendix E**
**Table 1  Tailings and Pond Elevations for North and South Cells**

|  | Year | North Cell |  |  | South Cell |  |  |
|---|---|---|---|---|---|---|---|
| Date | Fraction | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) |
| 5/18/21 | 12.05 | 4446.60 | 4442.30 | 19.44 | 4446.5 | 4444.5 | 19.46 |
| 5/19/21 | 12.05 | 4446.60 | 4442.30 | 19.42 | 4446.5 | 4444.5 | 19.45 |
| 5/20/21 | 12.05 | 4446.60 | 4442.30 | 19.40 | 4446.5 | 4444.5 | 19.46 |
| 5/21/21 | 12.06 | 4446.60 | 4442.30 | 19.38 | 4446.5 | 4444.5 | 19.45 |
| 5/22/21 | 12.06 | 4446.60 | 4442.40 | 19.36 | 4446.5 | 4444.5 | 19.46 |
| 5/23/21 | 12.06 | 4446.70 | 4442.40 | 19.34 | 4446.5 | 4444.5 | 19.45 |
| 5/24/21 | 12.06 | 4446.70 | 4442.40 | 19.32 | 4446.5 | 4444.5 | 19.46 |
| 5/25/21 | 12.07 | 4446.70 | 4442.40 | 19.30 | 4446.5 | 4444.5 | 19.45 |
| 5/26/21 | 12.07 | 4446.70 | 4442.40 | 19.28 | 4446.5 | 4444.5 | 19.46 |
| 5/27/21 | 12.07 | 4446.70 | 4442.40 | 19.25 | 4446.5 | 4444.5 | 19.45 |
| 5/28/21 | 12.07 | 4446.80 | 4442.50 | 19.23 | 4446.5 | 4444.5 | 19.46 |
| 5/29/21 | 12.08 | 4446.80 | 4442.50 | 19.21 | 4446.5 | 4444.5 | 19.45 |
| 5/30/21 | 12.08 | 4446.80 | 4442.50 | 19.19 | 4446.5 | 4444.5 | 19.46 |
| 5/31/21 | 12.08 | 4446.80 | 4442.50 | 19.17 | 4446.5 | 4444.5 | 19.45 |
| 6/1/21 | 12.09 | 4446.90 | 4442.50 | 19.15 | 4446.5 | 4444.5 | 19.46 |
| 6/2/21 | 12.09 | 4446.90 | 4442.50 | 19.13 | 4446.5 | 4444.5 | 19.46 |
| 6/3/21 | 12.09 | 4446.90 | 4442.60 | 19.12 | 4446.5 | 4444.5 | 19.47 |
| 6/4/21 | 12.09 | 4446.90 | 4442.60 | 19.10 | 4446.5 | 4444.5 | 19.46 |
| 6/5/21 | 12.10 | 4446.90 | 4442.60 | 19.08 | 4446.5 | 4444.5 | 19.47 |
| 6/6/21 | 12.10 | 4446.90 | 4442.60 | 19.06 | 4446.5 | 4444.5 | 19.46 |
| 6/7/21 | 12.10 | 4447.00 | 4442.60 | 19.05 | 4446.5 | 4444.5 | 19.47 |
| 6/8/21 | 12.10 | 4447.00 | 4442.60 | 19.03 | 4446.5 | 4444.5 | 19.46 |
| 6/9/21 | 12.11 | 4447.00 | 4442.60 | 19.01 | 4446.5 | 4444.5 | 19.47 |
| 6/10/21 | 12.11 | 4447.00 | 4442.70 | 19.00 | 4446.5 | 4444.5 | 19.46 |
| 6/11/21 | 12.11 | 4447.00 | 4442.70 | 18.98 | 4446.5 | 4444.5 | 19.47 |
| 6/12/21 | 12.12 | 4447.00 | 4442.70 | 18.96 | 4446.5 | 4444.5 | 19.46 |
| 6/13/21 | 12.12 | 4447.10 | 4442.70 | 18.95 | 4446.5 | 4444.5 | 19.47 |
| 6/14/21 | 12.12 | 4447.10 | 4442.70 | 18.93 | 4446.5 | 4444.5 | 19.46 |
| 6/15/21 | 12.12 | 4447.10 | 4442.70 | 18.91 | 4446.5 | 4444.5 | 19.47 |
| 6/16/21 | 12.13 | 4447.10 | 4442.80 | 18.89 | 4446.5 | 4444.5 | 19.46 |
| 6/17/21 | 12.13 | 4447.10 | 4442.80 | 18.88 | 4446.5 | 4444.5 | 19.47 |
| 6/18/21 | 12.13 | 4447.10 | 4442.80 | 18.86 | 4446.5 | 4444.5 | 19.46 |
| 6/19/21 | 12.13 | 4447.20 | 4442.80 | 18.84 | 4446.5 | 4444.5 | 19.47 |
| 6/20/21 | 12.14 | 4447.20 | 4442.80 | 18.83 | 4446.5 | 4444.5 | 19.46 |
| 6/21/21 | 12.14 | 4447.20 | 4442.80 | 18.81 | 4446.5 | 4444.5 | 19.47 |
| 6/22/21 | 12.14 | 4447.20 | 4442.80 | 18.79 | 4446.5 | 4444.5 | 19.46 |
| 6/23/21 | 12.15 | 4447.20 | 4442.90 | 18.78 | 4446.5 | 4444.5 | 19.47 |
| 6/24/21 | 12.15 | 4447.20 | 4442.90 | 18.76 | 4446.5 | 4444.5 | 19.46 |
| 6/25/21 | 12.15 | 4447.30 | 4442.90 | 18.74 | 4446.5 | 4444.5 | 19.47 |
| 6/26/21 | 12.15 | 4447.30 | 4442.90 | 18.72 | 4446.5 | 4444.5 | 19.46 |
| 6/27/21 | 12.16 | 4447.30 | 4442.90 | 18.71 | 4446.5 | 4444.5 | 19.47 |
| 6/28/21 | 12.16 | 4447.30 | 4442.90 | 18.69 | 4446.5 | 4444.5 | 19.46 |
| 6/29/21 | 12.16 | 4447.30 | 4443.00 | 18.67 | 4446.5 | 4444.5 | 19.47 |
| 6/30/21 | 12.16 | 4447.30 | 4443.00 | 18.66 | 4446.5 | 4444.5 | 19.46 |
| 7/1/21 | 12.17 | 4447.40 | 4443.00 | 18.64 | 4446.5 | 4444.5 | 19.47 |
| 7/2/21 | 12.17 | 4447.40 | 4443.00 | 18.63 | 4446.5 | 4444.5 | 19.46 |
| 7/3/21 | 12.17 | 4447.40 | 4443.00 | 18.62 | 4446.5 | 4444.5 | 19.48 |
| 7/4/21 | 12.18 | 4447.40 | 4443.00 | 18.61 | 4446.5 | 4444.5 | 19.46 |
| 7/5/21 | 12.18 | 4447.40 | 4443.00 | 18.60 | 4446.5 | 4444.5 | 19.48 |
| 7/6/21 | 12.18 | 4447.40 | 4443.10 | 18.59 | 4446.5 | 4444.5 | 19.46 |
| 7/7/21 | 12.18 | 4447.40 | 4443.10 | 18.58 | 4446.5 | 4444.5 | 19.48 |
| 7/8/21 | 12.19 | 4447.40 | 4443.10 | 18.57 | 4446.5 | 4444.5 | 19.46 |
| 7/9/21 | 12.19 | 4447.40 | 4443.10 | 18.56 | 4446.5 | 4444.5 | 19.48 |
| 7/10/21 | 12.19 | 4447.40 | 4443.10 | 18.56 | 4446.5 | 4444.5 | 19.46 |
| 7/11/21 | 12.19 | 4447.50 | 4443.10 | 18.55 | 4446.5 | 4444.5 | 19.48 |

**Appendix E**
**Table 1  Tailings and Pond Elevations for North and South Cells**

| | Year | North Cell | | | South Cell | | |
|---|---|---|---|---|---|---|---|
| Date | Fraction | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) |
| 7/12/21 | 12.20 | 4447.50 | 4443.20 | 18.54 | 4446.5 | 4444.5 | 19.46 |
| 7/13/21 | 12.20 | 4447.50 | 4443.20 | 18.53 | 4446.5 | 4444.5 | 19.48 |
| 7/14/21 | 12.20 | 4447.50 | 4443.20 | 18.52 | 4446.5 | 4444.5 | 19.46 |
| 7/15/21 | 12.21 | 4447.50 | 4443.20 | 18.51 | 4446.5 | 4444.5 | 19.48 |
| 7/16/21 | 12.21 | 4447.50 | 4443.20 | 18.50 | 4446.5 | 4444.5 | 19.46 |
| 7/17/21 | 12.21 | 4447.50 | 4443.20 | 18.49 | 4446.5 | 4444.5 | 19.48 |
| 7/18/21 | 12.21 | 4447.50 | 4443.30 | 18.48 | 4446.5 | 4444.5 | 19.46 |
| 7/19/21 | 12.22 | 4447.50 | 4443.30 | 18.47 | 4446.5 | 4444.5 | 19.48 |
| 7/20/21 | 12.22 | 4447.50 | 4443.30 | 18.46 | 4446.5 | 4444.5 | 19.46 |
| 7/21/21 | 12.22 | 4447.50 | 4443.30 | 18.45 | 4446.5 | 4444.5 | 19.48 |
| 7/22/21 | 12.23 | 4447.60 | 4443.30 | 18.44 | 4446.5 | 4444.5 | 19.46 |
| 7/23/21 | 12.23 | 4447.60 | 4443.30 | 18.43 | 4446.5 | 4444.5 | 19.48 |
| 7/24/21 | 12.23 | 4447.60 | 4443.30 | 18.43 | 4446.5 | 4444.5 | 19.46 |
| 7/25/21 | 12.23 | 4447.60 | 4443.40 | 18.42 | 4446.5 | 4444.5 | 19.48 |
| 7/26/21 | 12.24 | 4447.60 | 4443.40 | 18.41 | 4446.5 | 4444.5 | 19.46 |
| 7/27/21 | 12.24 | 4447.60 | 4443.40 | 18.40 | 4446.5 | 4444.5 | 19.48 |
| 7/28/21 | 12.24 | 4447.60 | 4443.40 | 18.39 | 4446.5 | 4444.5 | 19.46 |
| 7/29/21 | 12.24 | 4447.60 | 4443.40 | 18.38 | 4446.5 | 4444.5 | 19.48 |
| 7/30/21 | 12.25 | 4447.60 | 4443.40 | 18.37 | 4446.5 | 4444.5 | 19.46 |
| 7/31/21 | 12.25 | 4447.60 | 4443.50 | 18.36 | 4446.5 | 4444.5 | 19.48 |
| 8/1/21 | 12.25 | 4447.60 | 4443.50 | 18.35 | 4446.5 | 4444.5 | 19.46 |
| 8/2/21 | 12.26 | 4447.70 | 4443.50 | 18.34 | 4446.5 | 4444.5 | 19.49 |
| 8/3/21 | 12.26 | 4447.70 | 4443.50 | 18.33 | 4446.5 | 4444.5 | 19.46 |
| 8/4/21 | 12.26 | 4447.70 | 4443.50 | 18.32 | 4446.5 | 4444.5 | 19.49 |
| 8/5/21 | 12.26 | 4447.70 | 4443.50 | 18.31 | 4446.5 | 4444.5 | 19.46 |
| 8/6/21 | 12.27 | 4447.70 | 4443.50 | 18.30 | 4446.5 | 4444.5 | 19.49 |
| 8/7/21 | 12.27 | 4447.70 | 4443.60 | 18.29 | 4446.5 | 4444.5 | 19.46 |
| 8/8/21 | 12.27 | 4447.70 | 4443.60 | 18.28 | 4446.5 | 4444.5 | 19.49 |
| 8/9/21 | 12.27 | 4447.70 | 4443.60 | 18.27 | 4446.5 | 4444.5 | 19.46 |
| 8/10/21 | 12.28 | 4447.70 | 4443.60 | 18.26 | 4446.5 | 4444.5 | 19.49 |
| 8/11/21 | 12.28 | 4447.80 | 4443.60 | 18.25 | 4446.5 | 4444.5 | 19.46 |
| 8/12/21 | 12.28 | 4447.80 | 4443.60 | 18.24 | 4446.5 | 4444.5 | 19.49 |
| 8/13/21 | 12.29 | 4447.80 | 4443.70 | 18.22 | 4446.5 | 4444.5 | 19.46 |
| 8/14/21 | 12.29 | 4447.80 | 4443.70 | 18.21 | 4446.5 | 4444.5 | 19.49 |
| 8/15/21 | 12.29 | 4447.80 | 4443.70 | 18.20 | 4446.5 | 4444.5 | 19.46 |
| 8/16/21 | 12.29 | 4447.80 | 4443.70 | 18.19 | 4446.5 | 4444.5 | 19.49 |
| 8/17/21 | 12.30 | 4447.80 | 4443.70 | 18.18 | 4446.5 | 4444.5 | 19.46 |
| 8/18/21 | 12.30 | 4447.80 | 4443.70 | 18.17 | 4446.5 | 4444.5 | 19.49 |
| 8/19/21 | 12.30 | 4447.80 | 4443.70 | 18.16 | 4446.5 | 4444.5 | 19.46 |
| 8/20/21 | 12.30 | 4447.80 | 4443.80 | 18.15 | 4446.5 | 4444.5 | 19.49 |
| 8/21/21 | 12.31 | 4447.90 | 4443.80 | 18.14 | 4446.5 | 4444.5 | 19.46 |
| 8/22/21 | 12.31 | 4447.90 | 4443.80 | 18.13 | 4446.5 | 4444.5 | 19.49 |
| 8/23/21 | 12.31 | 4447.90 | 4443.80 | 18.12 | 4446.5 | 4444.5 | 19.46 |
| 8/24/21 | 12.32 | 4447.90 | 4443.80 | 18.11 | 4446.5 | 4444.5 | 19.49 |
| 8/25/21 | 12.32 | 4447.90 | 4443.80 | 18.10 | 4446.5 | 4444.5 | 19.46 |
| 8/26/21 | 12.32 | 4447.90 | 4443.90 | 18.09 | 4446.5 | 4444.5 | 19.49 |
| 8/27/21 | 12.32 | 4447.90 | 4443.90 | 18.08 | 4446.5 | 4444.5 | 19.46 |
| 8/28/21 | 12.33 | 4447.90 | 4443.90 | 18.07 | 4446.5 | 4444.5 | 19.49 |
| 8/29/21 | 12.33 | 4447.90 | 4443.90 | 18.06 | 4446.5 | 4444.5 | 19.46 |
| 8/30/21 | 12.33 | 4448.00 | 4443.90 | 18.05 | 4446.5 | 4444.5 | 19.49 |
| 8/31/21 | 12.33 | 4448.00 | 4443.90 | 18.04 | 4446.5 | 4444.5 | 19.46 |
| 9/1/21 | 12.34 | 4448.00 | 4444.00 | 18.03 | 4446.5 | 4444.5 | 19.49 |
| 9/2/21 | 12.34 | 4448.00 | 4444.00 | 18.02 | 4446.5 | 4444.5 | 19.46 |
| 9/3/21 | 12.34 | 4448.00 | 4444.00 | 18.01 | 4446.5 | 4444.5 | 19.49 |
| 9/4/21 | 12.35 | 4448.00 | 4444.00 | 18.00 | 4446.5 | 4444.5 | 19.46 |

**Appendix E**
**Table 1  Tailings and Pond Elevations for North and South Cells**

| | Year | North Cell | | | South Cell | | |
|---|---|---|---|---|---|---|---|
| Date | Fraction | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) |
| 9/5/21 | 12.35 | 4448.00 | 4444.00 | 17.98 | 4446.5 | 4444.5 | 19.49 |
| 9/6/21 | 12.35 | 4448.00 | 4444.00 | 17.97 | 4446.5 | 4444.5 | 19.46 |
| 9/7/21 | 12.35 | 4448.00 | 4444.00 | 17.96 | 4446.5 | 4444.5 | 19.49 |
| 9/8/21 | 12.36 | 4448.00 | 4444.10 | 17.95 | 4446.5 | 4444.5 | 19.46 |
| 9/9/21 | 12.36 | 4448.10 | 4444.10 | 17.94 | 4446.5 | 4444.5 | 19.49 |
| 9/10/21 | 12.36 | 4448.10 | 4444.10 | 17.93 | 4446.5 | 4444.5 | 19.46 |
| 9/11/21 | 12.36 | 4448.10 | 4444.10 | 17.92 | 4446.5 | 4444.5 | 19.49 |
| 9/12/21 | 12.37 | 4448.10 | 4444.10 | 17.91 | 4446.5 | 4444.5 | 19.46 |
| 9/13/21 | 12.37 | 4448.10 | 4444.10 | 17.90 | 4446.5 | 4444.5 | 19.49 |
| 9/14/21 | 12.37 | 4448.10 | 4444.20 | 17.89 | 4446.5 | 4444.5 | 19.46 |
| 9/15/21 | 12.38 | 4448.10 | 4444.20 | 17.88 | 4446.5 | 4444.5 | 19.49 |
| 9/16/21 | 12.38 | 4448.10 | 4444.20 | 17.87 | 4446.5 | 4444.5 | 19.46 |
| 9/17/21 | 12.38 | 4448.10 | 4444.20 | 17.86 | 4446.5 | 4444.5 | 19.49 |
| 9/18/21 | 12.38 | 4448.20 | 4444.20 | 17.85 | 4446.5 | 4444.5 | 19.46 |
| 9/19/21 | 12.39 | 4448.20 | 4444.20 | 17.84 | 4446.5 | 4444.5 | 19.49 |
| 9/20/21 | 12.39 | 4448.20 | 4444.20 | 17.83 | 4446.5 | 4444.5 | 19.46 |
| 9/21/21 | 12.39 | 4448.20 | 4444.30 | 17.82 | 4446.5 | 4444.5 | 19.49 |
| 9/22/21 | 12.39 | 4448.20 | 4444.30 | 17.81 | 4446.5 | 4444.5 | 19.46 |
| 9/23/21 | 12.40 | 4448.20 | 4444.30 | 17.80 | 4446.5 | 4444.5 | 19.49 |
| 9/24/21 | 12.40 | 4448.20 | 4444.30 | 17.78 | 4446.5 | 4444.5 | 19.46 |
| 9/25/21 | 12.40 | 4448.20 | 4444.30 | 17.77 | 4446.5 | 4444.5 | 19.49 |
| 9/26/21 | 12.41 | 4448.20 | 4444.30 | 17.76 | 4446.5 | 4444.5 | 19.46 |
| 9/27/21 | 12.41 | 4448.20 | 4444.40 | 17.75 | 4446.5 | 4444.5 | 19.49 |
| 9/28/21 | 12.41 | 4448.30 | 4444.40 | 17.74 | 4446.5 | 4444.5 | 19.46 |
| 9/29/21 | 12.41 | 4448.30 | 4444.40 | 17.73 | 4446.5 | 4444.5 | 19.49 |
| 9/30/21 | 12.42 | 4448.30 | 4444.40 | 17.72 | 4446.5 | 4444.5 | 19.46 |
| 10/1/21 | 12.42 | 4448.30 | 4444.40 | 17.71 | 4446.5 | 4444.5 | 19.49 |
| 10/2/21 | 12.42 | 4448.30 | 4444.40 | 17.70 | 4446.5 | 4444.5 | 19.46 |
| 10/3/21 | 12.42 | 4448.30 | 4444.40 | 17.68 | 4446.5 | 4444.5 | 19.48 |
| 10/4/21 | 12.43 | 4448.30 | 4444.50 | 17.67 | 4446.5 | 4444.5 | 19.46 |
| 10/5/21 | 12.43 | 4448.30 | 4444.50 | 17.66 | 4446.5 | 4444.5 | 19.48 |
| 10/6/21 | 12.43 | 4448.40 | 4444.50 | 17.64 | 4446.5 | 4444.5 | 19.46 |
| 10/7/21 | 12.44 | 4448.40 | 4444.50 | 17.63 | 4446.5 | 4444.5 | 19.48 |
| 10/8/21 | 12.44 | 4448.40 | 4444.50 | 17.62 | 4446.5 | 4444.5 | 19.46 |
| 10/9/21 | 12.44 | 4448.40 | 4444.50 | 17.60 | 4446.5 | 4444.5 | 19.48 |
| 10/10/21 | 12.44 | 4448.40 | 4444.60 | 17.59 | 4446.5 | 4444.5 | 19.46 |
| 10/11/21 | 12.45 | 4448.40 | 4444.60 | 17.58 | 4446.5 | 4444.5 | 19.48 |
| 10/12/21 | 12.45 | 4448.40 | 4444.60 | 17.56 | 4446.5 | 4444.5 | 19.46 |
| 10/13/21 | 12.45 | 4448.50 | 4444.60 | 17.55 | 4446.5 | 4444.5 | 19.48 |
| 10/14/21 | 12.45 | 4448.50 | 4444.60 | 17.54 | 4446.5 | 4444.5 | 19.46 |
| 10/15/21 | 12.46 | 4448.50 | 4444.60 | 17.52 | 4446.5 | 4444.5 | 19.48 |
| 10/16/21 | 12.46 | 4448.50 | 4444.70 | 17.51 | 4446.5 | 4444.5 | 19.46 |
| 10/17/21 | 12.46 | 4448.50 | 4444.70 | 17.50 | 4446.5 | 4444.5 | 19.48 |
| 10/18/21 | 12.47 | 4448.50 | 4444.70 | 17.48 | 4446.5 | 4444.5 | 19.46 |
| 10/19/21 | 12.47 | 4448.50 | 4444.70 | 17.47 | 4446.5 | 4444.5 | 19.48 |
| 10/20/21 | 12.47 | 4448.50 | 4444.70 | 17.46 | 4446.5 | 4444.5 | 19.46 |
| 10/21/21 | 12.47 | 4448.60 | 4444.70 | 17.44 | 4446.5 | 4444.5 | 19.48 |
| 10/22/21 | 12.48 | 4448.60 | 4444.70 | 17.43 | 4446.5 | 4444.5 | 19.46 |
| 10/23/21 | 12.48 | 4448.60 | 4444.80 | 17.42 | 4446.5 | 4444.5 | 19.48 |
| 10/24/21 | 12.48 | 4448.60 | 4444.80 | 17.40 | 4446.5 | 4444.5 | 19.46 |
| 10/25/21 | 12.49 | 4448.60 | 4444.80 | 17.39 | 4446.5 | 4444.5 | 19.48 |
| 10/26/21 | 12.49 | 4448.60 | 4444.80 | 17.38 | 4446.5 | 4444.5 | 19.46 |
| 10/27/21 | 12.49 | 4448.60 | 4444.80 | 17.36 | 4446.5 | 4444.5 | 19.48 |
| 10/28/21 | 12.49 | 4448.70 | 4444.80 | 17.35 | 4446.5 | 4444.5 | 19.46 |
| 10/29/21 | 12.50 | 4448.70 | 4444.90 | 17.34 | 4446.5 | 4444.5 | 19.48 |

## Appendix E
## Table 1  Tailings and Pond Elevations for North and South Cells

| | Year | North Cell | | | South Cell | | |
|---|---|---|---|---|---|---|---|
| Date | Fraction | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) |
| 10/30/21 | 12.50 | 4448.70 | 4444.90 | 17.32 | 4446.5 | 4444.5 | 19.46 |
| 10/31/21 | 12.50 | 4448.70 | 4444.90 | 17.31 | 4446.5 | 4444.5 | 19.48 |
| 11/1/21 | 12.50 | 4448.70 | 4444.90 | 17.30 | 4446.5 | 4444.5 | 19.46 |
| 11/2/21 | 12.51 | 4448.70 | 4444.90 | 17.28 | 4446.5 | 4444.5 | 19.47 |
| 11/3/21 | 12.51 | 4448.70 | 4444.90 | 17.26 | 4446.5 | 4444.5 | 19.46 |
| 11/4/21 | 12.51 | 4448.80 | 4444.90 | 17.24 | 4446.5 | 4444.5 | 19.47 |
| 11/5/21 | 12.52 | 4448.80 | 4445.00 | 17.23 | 4446.5 | 4444.5 | 19.46 |
| 11/6/21 | 12.52 | 4448.80 | 4445.00 | 17.21 | 4446.5 | 4444.5 | 19.47 |
| 11/7/21 | 12.52 | 4448.80 | 4445.00 | 17.19 | 4446.5 | 4444.5 | 19.46 |
| 11/8/21 | 12.52 | 4448.80 | 4445.00 | 17.18 | 4446.5 | 4444.5 | 19.47 |
| 11/9/21 | 12.53 | 4448.80 | 4445.00 | 17.16 | 4446.5 | 4444.5 | 19.46 |
| 11/10/21 | 12.53 | 4448.90 | 4445.00 | 17.14 | 4446.5 | 4444.5 | 19.47 |
| 11/11/21 | 12.53 | 4448.90 | 4445.10 | 17.13 | 4446.5 | 4444.5 | 19.46 |
| 11/12/21 | 12.53 | 4448.90 | 4445.10 | 17.11 | 4446.5 | 4444.5 | 19.47 |
| 11/13/21 | 12.54 | 4448.90 | 4445.10 | 17.09 | 4446.5 | 4444.5 | 19.46 |
| 11/14/21 | 12.54 | 4448.90 | 4445.10 | 17.08 | 4446.5 | 4444.5 | 19.47 |
| 11/15/21 | 12.54 | 4448.90 | 4445.10 | 17.06 | 4446.5 | 4444.5 | 19.46 |
| 11/16/21 | 12.55 | 4449.00 | 4445.10 | 17.04 | 4446.5 | 4444.5 | 19.47 |
| 11/17/21 | 12.55 | 4449.00 | 4445.10 | 17.02 | 4446.5 | 4444.5 | 19.46 |
| 11/18/21 | 12.55 | 4449.00 | 4445.20 | 17.01 | 4446.5 | 4444.5 | 19.47 |
| 11/19/21 | 12.55 | 4449.00 | 4445.20 | 16.99 | 4446.5 | 4444.5 | 19.46 |
| 11/20/21 | 12.56 | 4449.00 | 4445.20 | 16.97 | 4446.5 | 4444.5 | 19.47 |
| 11/21/21 | 12.56 | 4449.00 | 4445.20 | 16.96 | 4446.5 | 4444.5 | 19.46 |
| 11/22/21 | 12.56 | 4449.10 | 4445.20 | 16.94 | 4446.5 | 4444.5 | 19.47 |
| 11/23/21 | 12.56 | 4449.10 | 4445.20 | 16.92 | 4446.5 | 4444.5 | 19.46 |
| 11/24/21 | 12.57 | 4449.10 | 4445.30 | 16.91 | 4446.5 | 4444.5 | 19.47 |
| 11/25/21 | 12.57 | 4449.10 | 4445.30 | 16.89 | 4446.5 | 4444.5 | 19.46 |
| 11/26/21 | 12.57 | 4449.10 | 4445.30 | 16.87 | 4446.5 | 4444.5 | 19.47 |
| 11/27/21 | 12.58 | 4449.10 | 4445.30 | 16.86 | 4446.5 | 4444.5 | 19.46 |
| 11/28/21 | 12.58 | 4449.20 | 4445.30 | 16.84 | 4446.5 | 4444.5 | 19.47 |
| 11/29/21 | 12.58 | 4449.20 | 4445.30 | 16.82 | 4446.5 | 4444.5 | 19.46 |
| 11/30/21 | 12.58 | 4449.20 | 4445.40 | 16.81 | 4446.5 | 4444.5 | 19.47 |
| 12/1/21 | 12.59 | 4449.20 | 4445.40 | 16.79 | 4446.5 | 4444.5 | 19.46 |
| 12/2/21 | 12.59 | 4449.20 | 4445.40 | 16.77 | 4446.5 | 4444.5 | 19.47 |
| 12/3/21 | 12.59 | 4449.30 | 4445.40 | 16.75 | 4446.5 | 4444.5 | 19.46 |
| 12/4/21 | 12.59 | 4449.30 | 4445.40 | 16.73 | 4446.5 | 4444.5 | 19.47 |
| 12/5/21 | 12.60 | 4449.30 | 4445.40 | 16.70 | 4446.5 | 4444.5 | 19.46 |
| 12/6/21 | 12.60 | 4449.30 | 4445.40 | 16.68 | 4446.5 | 4444.5 | 19.47 |
| 12/7/21 | 12.60 | 4449.30 | 4445.50 | 16.66 | 4446.5 | 4444.5 | 19.46 |
| 12/8/21 | 12.61 | 4449.40 | 4445.50 | 16.64 | 4446.5 | 4444.5 | 19.47 |
| 12/9/21 | 12.61 | 4449.40 | 4445.50 | 16.62 | 4446.5 | 4444.5 | 19.46 |
| 12/10/21 | 12.61 | 4449.40 | 4445.50 | 16.60 | 4446.5 | 4444.5 | 19.47 |
| 12/11/21 | 12.61 | 4449.40 | 4445.50 | 16.58 | 4446.5 | 4444.5 | 19.46 |
| 12/12/21 | 12.62 | 4449.40 | 4445.50 | 16.56 | 4446.5 | 4444.5 | 19.47 |
| 12/13/21 | 12.62 | 4449.50 | 4445.60 | 16.54 | 4446.5 | 4444.5 | 19.46 |
| 12/14/21 | 12.62 | 4449.50 | 4445.60 | 16.51 | 4446.5 | 4444.5 | 19.47 |
| 12/15/21 | 12.62 | 4449.50 | 4445.60 | 16.49 | 4446.5 | 4444.5 | 19.46 |
| 12/16/21 | 12.63 | 4449.50 | 4445.60 | 16.47 | 4446.5 | 4444.5 | 19.47 |
| 12/17/21 | 12.63 | 4449.50 | 4445.60 | 16.45 | 4446.5 | 4444.5 | 19.46 |
| 12/18/21 | 12.63 | 4449.60 | 4445.60 | 16.43 | 4446.5 | 4444.5 | 19.47 |
| 12/19/21 | 12.64 | 4449.60 | 4445.60 | 16.41 | 4446.5 | 4444.5 | 19.46 |
| 12/20/21 | 12.64 | 4449.60 | 4445.70 | 16.39 | 4446.5 | 4444.5 | 19.47 |
| 12/21/21 | 12.64 | 4449.60 | 4445.70 | 16.37 | 4446.5 | 4444.5 | 19.46 |
| 12/22/21 | 12.64 | 4449.70 | 4445.70 | 16.35 | 4446.5 | 4444.5 | 19.47 |
| 12/23/21 | 12.65 | 4449.70 | 4445.70 | 16.33 | 4446.5 | 4444.5 | 19.46 |

## Appendix E
## Table 1 Tailings and Pond Elevations for North and South Cells

| | Year | North Cell | | | South Cell | | |
|---|---|---|---|---|---|---|---|
| Date | Fraction | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) |
| 12/24/21 | 12.65 | 4449.70 | 4445.70 | 16.30 | 4446.5 | 4444.5 | 19.47 |
| 12/25/21 | 12.65 | 4449.70 | 4445.70 | 16.28 | 4446.5 | 4444.5 | 19.46 |
| 12/26/21 | 12.65 | 4449.70 | 4445.80 | 16.26 | 4446.5 | 4444.5 | 19.47 |
| 12/27/21 | 12.66 | 4449.80 | 4445.80 | 16.24 | 4446.5 | 4444.5 | 19.46 |
| 12/28/21 | 12.66 | 4449.80 | 4445.80 | 16.22 | 4446.5 | 4444.5 | 19.47 |
| 12/29/21 | 12.66 | 4449.80 | 4445.80 | 16.20 | 4446.5 | 4444.5 | 19.46 |
| 12/30/21 | 12.67 | 4449.80 | 4445.80 | 16.18 | 4446.5 | 4444.5 | 19.47 |
| 12/31/21 | 12.67 | 4449.80 | 4445.80 | 16.16 | 4446.5 | 4444.5 | 19.46 |
| 1/1/22 | 12.67 | 4449.90 | 4445.80 | 16.14 | 4446.5 | 4444.5 | 19.47 |
| 1/2/22 | 12.67 | 4449.90 | 4445.90 | 16.11 | 4446.5 | 4444.5 | 19.46 |
| 1/3/22 | 12.68 | 4449.90 | 4445.90 | 16.09 | 4446.5 | 4444.5 | 19.47 |
| 1/4/22 | 12.68 | 4449.90 | 4445.90 | 16.07 | 4446.5 | 4444.5 | 19.46 |
| 1/5/22 | 12.68 | 4450.00 | 4445.90 | 16.04 | 4446.5 | 4444.5 | 19.47 |
| 1/6/22 | 12.68 | 4450.00 | 4445.90 | 16.02 | 4446.5 | 4444.5 | 19.46 |
| 1/7/22 | 12.69 | 4450.00 | 4445.90 | 16.00 | 4446.5 | 4444.5 | 19.47 |
| 1/8/22 | 12.69 | 4450.00 | 4446.00 | 15.98 | 4446.5 | 4444.5 | 19.46 |
| 1/9/22 | 12.69 | 4450.00 | 4446.00 | 15.96 | 4446.5 | 4444.5 | 19.47 |
| 1/10/22 | 12.70 | 4450.10 | 4446.00 | 15.94 | 4446.5 | 4444.5 | 19.46 |
| 1/11/22 | 12.70 | 4450.10 | 4446.00 | 15.92 | 4446.5 | 4444.5 | 19.47 |
| 1/12/22 | 12.70 | 4450.10 | 4446.00 | 15.90 | 4446.5 | 4444.5 | 19.46 |
| 1/13/22 | 12.70 | 4450.10 | 4446.00 | 15.88 | 4446.5 | 4444.5 | 19.47 |
| 1/14/22 | 12.71 | 4450.10 | 4446.10 | 15.86 | 4446.5 | 4444.5 | 19.46 |
| 1/15/22 | 12.71 | 4450.20 | 4446.10 | 15.84 | 4446.5 | 4444.5 | 19.47 |
| 1/16/22 | 12.71 | 4450.20 | 4446.10 | 15.83 | 4446.5 | 4444.5 | 19.46 |
| 1/17/22 | 12.72 | 4450.20 | 4446.10 | 15.81 | 4446.5 | 4444.5 | 19.47 |
| 1/18/22 | 12.72 | 4450.20 | 4446.10 | 15.79 | 4446.5 | 4444.5 | 19.46 |
| 1/19/22 | 12.72 | 4450.20 | 4446.10 | 15.77 | 4446.5 | 4444.5 | 19.47 |
| 1/20/22 | 12.72 | 4450.30 | 4446.10 | 15.75 | 4446.5 | 4444.5 | 19.46 |
| 1/21/22 | 12.73 | 4450.30 | 4446.20 | 15.73 | 4446.5 | 4444.5 | 19.47 |
| 1/22/22 | 12.73 | 4450.30 | 4446.20 | 15.71 | 4446.5 | 4444.5 | 19.46 |
| 1/23/22 | 12.73 | 4450.30 | 4446.20 | 15.69 | 4446.5 | 4444.5 | 19.47 |
| 1/24/22 | 12.73 | 4450.30 | 4446.20 | 15.67 | 4446.5 | 4444.5 | 19.46 |
| 1/25/22 | 12.74 | 4450.30 | 4446.20 | 15.66 | 4446.5 | 4444.5 | 19.47 |
| 1/26/22 | 12.74 | 4450.40 | 4446.20 | 15.64 | 4446.5 | 4444.5 | 19.46 |
| 1/27/22 | 12.74 | 4450.40 | 4446.30 | 15.62 | 4446.5 | 4444.5 | 19.47 |
| 1/28/22 | 12.75 | 4450.40 | 4446.30 | 15.60 | 4446.5 | 4444.5 | 19.46 |
| 1/29/22 | 12.75 | 4450.40 | 4446.30 | 15.58 | 4446.5 | 4444.5 | 19.47 |
| 1/30/22 | 12.75 | 4450.40 | 4446.30 | 15.56 | 4446.5 | 4444.5 | 19.46 |
| 1/31/22 | 12.75 | 4450.50 | 4446.30 | 15.54 | 4446.5 | 4444.5 | 19.47 |
| 2/1/22 | 12.76 | 4450.50 | 4446.30 | 15.52 | 4446.5 | 4444.5 | 19.46 |
| 2/2/22 | 12.76 | 4450.50 | 4446.30 | 15.50 | 4446.5 | 4444.5 | 19.47 |
| 2/3/22 | 12.76 | 4450.50 | 4446.40 | 15.48 | 4446.5 | 4444.5 | 19.46 |
| 2/4/22 | 12.76 | 4450.50 | 4446.40 | 15.46 | 4446.5 | 4444.5 | 19.47 |
| 2/5/22 | 12.77 | 4450.60 | 4446.40 | 15.45 | 4446.5 | 4444.5 | 19.46 |
| 2/6/22 | 12.77 | 4450.60 | 4446.40 | 15.43 | 4446.5 | 4444.5 | 19.47 |
| 2/7/22 | 12.77 | 4450.60 | 4446.40 | 15.41 | 4446.5 | 4444.5 | 19.46 |
| 2/8/22 | 12.78 | 4450.60 | 4446.40 | 15.39 | 4446.5 | 4444.5 | 19.47 |
| 2/9/22 | 12.78 | 4450.60 | 4446.50 | 15.37 | 4446.5 | 4444.5 | 19.46 |
| 2/10/22 | 12.78 | 4450.70 | 4446.50 | 15.35 | 4446.5 | 4444.5 | 19.47 |
| 2/11/22 | 12.78 | 4450.70 | 4446.50 | 15.33 | 4446.5 | 4444.5 | 19.46 |
| 2/12/22 | 12.79 | 4450.70 | 4446.50 | 15.31 | 4446.5 | 4444.5 | 19.47 |
| 2/13/22 | 12.79 | 4450.70 | 4446.50 | 15.29 | 4446.5 | 4444.5 | 19.46 |
| 2/14/22 | 12.79 | 4450.70 | 4446.50 | 15.27 | 4446.5 | 4444.5 | 19.47 |
| 2/15/22 | 12.79 | 4450.70 | 4446.50 | 15.25 | 4446.5 | 4444.5 | 19.46 |
| 2/16/22 | 12.80 | 4450.80 | 4446.60 | 15.23 | 4446.5 | 4444.5 | 19.47 |

**Appendix E**
**Table 1  Tailings and Pond Elevations for North and South Cells**

| Date | Year Fraction | North Cell | | | South Cell | | |
|---|---|---|---|---|---|---|---|
| | | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) |
| 2/17/22 | 12.80 | 4450.80 | 4446.60 | 15.21 | 4446.5 | 4444.5 | 19.46 |
| 2/18/22 | 12.80 | 4450.80 | 4446.60 | 15.19 | 4446.5 | 4444.5 | 19.47 |
| 2/19/22 | 12.81 | 4450.80 | 4446.60 | 15.18 | 4446.5 | 4444.5 | 19.46 |
| 2/20/22 | 12.81 | 4450.80 | 4446.60 | 15.16 | 4446.5 | 4444.5 | 19.47 |
| 2/21/22 | 12.81 | 4450.90 | 4446.60 | 15.14 | 4446.5 | 4444.5 | 19.46 |
| 2/22/22 | 12.81 | 4450.90 | 4446.70 | 15.12 | 4446.5 | 4444.5 | 19.47 |
| 2/23/22 | 12.82 | 4450.90 | 4446.70 | 15.10 | 4446.5 | 4444.5 | 19.46 |
| 2/24/22 | 12.82 | 4450.90 | 4446.70 | 15.08 | 4446.5 | 4444.5 | 19.47 |
| 2/25/22 | 12.82 | 4450.90 | 4446.70 | 15.06 | 4446.5 | 4444.5 | 19.46 |
| 2/26/22 | 12.82 | 4451.00 | 4446.70 | 15.04 | 4446.5 | 4444.5 | 19.47 |
| 2/27/22 | 12.83 | 4451.00 | 4446.70 | 15.02 | 4446.5 | 4444.5 | 19.46 |
| 2/28/22 | 12.83 | 4451.00 | 4446.80 | 15.00 | 4446.5 | 4444.5 | 19.47 |
| 3/1/22 | 12.83 | 4451.00 | 4446.80 | 14.98 | 4446.5 | 4444.5 | 19.46 |
| 3/2/22 | 12.84 | 4451.00 | 4446.80 | 14.96 | 4446.5 | 4444.5 | 19.46 |
| 3/3/22 | 12.84 | 4451.10 | 4446.80 | 14.94 | 4446.5 | 4444.5 | 19.46 |
| 3/4/22 | 12.84 | 4451.10 | 4446.80 | 14.92 | 4446.5 | 4444.5 | 19.46 |
| 3/5/22 | 12.84 | 4451.10 | 4446.80 | 14.90 | 4446.5 | 4444.5 | 19.46 |
| 3/6/22 | 12.85 | 4451.10 | 4446.80 | 14.88 | 4446.5 | 4444.5 | 19.46 |
| 3/7/22 | 12.85 | 4451.10 | 4446.90 | 14.86 | 4446.5 | 4444.5 | 19.46 |
| 3/8/22 | 12.85 | 4451.20 | 4446.90 | 14.84 | 4446.5 | 4444.5 | 19.46 |
| 3/9/22 | 12.85 | 4451.20 | 4446.90 | 14.82 | 4446.5 | 4444.5 | 19.46 |
| 3/10/22 | 12.86 | 4451.20 | 4446.90 | 14.80 | 4446.5 | 4444.5 | 19.46 |
| 3/11/22 | 12.86 | 4451.20 | 4446.90 | 14.78 | 4446.5 | 4444.5 | 19.46 |
| 3/12/22 | 12.86 | 4451.20 | 4446.90 | 14.76 | 4446.5 | 4444.5 | 19.46 |
| 3/13/22 | 12.87 | 4451.30 | 4447.00 | 14.74 | 4446.5 | 4444.5 | 19.46 |
| 3/14/22 | 12.87 | 4451.30 | 4447.00 | 14.72 | 4446.5 | 4444.5 | 19.46 |
| 3/15/22 | 12.87 | 4451.30 | 4447.00 | 14.70 | 4446.5 | 4444.5 | 19.46 |
| 3/16/22 | 12.87 | 4451.30 | 4447.00 | 14.68 | 4446.5 | 4444.5 | 19.46 |
| 3/17/22 | 12.88 | 4451.30 | 4447.00 | 14.66 | 4446.5 | 4444.5 | 19.46 |
| 3/18/22 | 12.88 | 4451.40 | 4447.00 | 14.64 | 4446.5 | 4444.5 | 19.46 |
| 3/19/22 | 12.88 | 4451.40 | 4447.00 | 14.62 | 4446.5 | 4444.5 | 19.46 |
| 3/20/22 | 12.88 | 4451.40 | 4447.10 | 14.60 | 4446.5 | 4444.5 | 19.46 |
| 3/21/22 | 12.89 | 4451.40 | 4447.10 | 14.58 | 4446.5 | 4444.5 | 19.46 |
| 3/22/22 | 12.89 | 4451.40 | 4447.10 | 14.56 | 4446.5 | 4444.5 | 19.46 |
| 3/23/22 | 12.89 | 4451.50 | 4447.10 | 14.54 | 4446.5 | 4444.5 | 19.46 |
| 3/24/22 | 12.90 | 4451.50 | 4447.10 | 14.52 | 4446.5 | 4444.5 | 19.46 |
| 3/25/22 | 12.90 | 4451.50 | 4447.10 | 14.50 | 4446.5 | 4444.5 | 19.46 |
| 3/26/22 | 12.90 | 4451.50 | 4447.20 | 14.48 | 4446.5 | 4444.5 | 19.46 |
| 3/27/22 | 12.90 | 4451.50 | 4447.20 | 14.46 | 4446.5 | 4444.5 | 19.46 |
| 3/28/22 | 12.91 | 4451.60 | 4447.20 | 14.44 | 4446.5 | 4444.5 | 19.46 |
| 3/29/22 | 12.91 | 4451.60 | 4447.20 | 14.42 | 4446.5 | 4444.5 | 19.46 |
| 3/30/22 | 12.91 | 4451.60 | 4447.20 | 14.40 | 4446.5 | 4444.5 | 19.46 |
| 3/31/22 | 12.91 | 4451.60 | 4447.20 | 14.38 | 4446.5 | 4444.5 | 19.46 |
| 4/1/22 | 12.92 | 4451.60 | 4447.20 | 14.36 | 4446.5 | 4444.5 | 19.46 |
| 4/2/22 | 12.92 | 4451.70 | 4447.30 | 14.34 | 4446.5 | 4444.5 | 19.46 |
| 4/3/22 | 12.92 | 4451.70 | 4447.30 | 14.32 | 4446.5 | 4444.5 | 19.47 |
| 4/4/22 | 12.93 | 4451.70 | 4447.30 | 14.30 | 4446.5 | 4444.5 | 19.46 |
| 4/5/22 | 12.93 | 4451.70 | 4447.30 | 14.29 | 4446.5 | 4444.5 | 19.47 |
| 4/6/22 | 12.93 | 4451.70 | 4447.30 | 14.27 | 4446.5 | 4444.5 | 19.46 |
| 4/7/22 | 12.93 | 4451.70 | 4447.30 | 14.25 | 4446.5 | 4444.5 | 19.47 |
| 4/8/22 | 12.94 | 4451.80 | 4447.40 | 14.24 | 4446.5 | 4444.5 | 19.46 |
| 4/9/22 | 12.94 | 4451.80 | 4447.40 | 14.22 | 4446.5 | 4444.5 | 19.47 |
| 4/10/22 | 12.94 | 4451.80 | 4447.40 | 14.20 | 4446.5 | 4444.5 | 19.46 |
| 4/11/22 | 12.95 | 4451.80 | 4447.40 | 14.19 | 4446.5 | 4444.5 | 19.47 |
| 4/12/22 | 12.95 | 4451.80 | 4447.40 | 14.17 | 4446.5 | 4444.5 | 19.46 |

**Appendix E**
**Table 1  Tailings and Pond Elevations for North and South Cells**

| Date | Year Fraction | North Cell | | | South Cell | | |
|---|---|---|---|---|---|---|---|
| | | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) |
| 4/13/22 | 12.95 | 4451.80 | 4447.40 | 14.15 | 4446.5 | 4444.5 | 19.47 |
| 4/14/22 | 12.95 | 4451.90 | 4447.50 | 14.13 | 4446.5 | 4444.5 | 19.46 |
| 4/15/22 | 12.96 | 4451.90 | 4447.50 | 14.12 | 4446.5 | 4444.5 | 19.47 |
| 4/16/22 | 12.96 | 4451.90 | 4447.50 | 14.10 | 4446.5 | 4444.5 | 19.46 |
| 4/17/22 | 12.96 | 4451.90 | 4447.50 | 14.08 | 4446.5 | 4444.5 | 19.47 |
| 4/18/22 | 12.96 | 4451.90 | 4447.50 | 14.07 | 4446.5 | 4444.5 | 19.46 |
| 4/19/22 | 12.97 | 4452.00 | 4447.50 | 14.05 | 4446.5 | 4444.5 | 19.47 |
| 4/20/22 | 12.97 | 4452.00 | 4447.50 | 14.03 | 4446.5 | 4444.5 | 19.46 |
| 4/21/22 | 12.97 | 4452.00 | 4447.60 | 14.02 | 4446.5 | 4444.5 | 19.47 |
| 4/22/22 | 12.98 | 4452.00 | 4447.60 | 14.00 | 4446.5 | 4444.5 | 19.46 |
| 4/23/22 | 12.98 | 4452.00 | 4447.60 | 13.98 | 4446.5 | 4444.5 | 19.47 |
| 4/24/22 | 12.98 | 4452.00 | 4447.60 | 13.97 | 4446.5 | 4444.5 | 19.46 |
| 4/25/22 | 12.98 | 4452.10 | 4447.60 | 13.95 | 4446.5 | 4444.5 | 19.47 |
| 4/26/22 | 12.99 | 4452.10 | 4447.60 | 13.93 | 4446.5 | 4444.5 | 19.46 |
| 4/27/22 | 12.99 | 4452.10 | 4447.70 | 13.91 | 4446.5 | 4444.5 | 19.47 |
| 4/28/22 | 12.99 | 4452.10 | 4447.70 | 13.90 | 4446.5 | 4444.5 | 19.46 |
| 4/29/22 | 12.99 | 4452.10 | 4447.70 | 13.88 | 4446.5 | 4444.5 | 19.47 |
| 4/30/22 | 13.00 | 4452.10 | 4447.70 | 13.86 | 4446.5 | 4444.5 | 19.46 |
| 5/1/22 | 13.00 | 4452.20 | 4447.70 | 13.85 | 4446.5 | 4444.5 | 19.47 |
| 5/2/22 | 13.00 | 4452.20 | 4447.70 | 13.83 | 4446.5 | 4444.5 | 19.46 |
| 5/3/22 | 13.01 | 4452.20 | 4447.70 | 13.81 | 4446.5 | 4444.5 | 19.47 |
| 5/4/22 | 13.01 | 4452.20 | 4447.80 | 13.80 | 4446.5 | 4444.5 | 19.46 |
| 5/5/22 | 13.01 | 4452.20 | 4447.80 | 13.78 | 4446.5 | 4444.5 | 19.47 |
| 5/6/22 | 13.01 | 4452.20 | 4447.80 | 13.77 | 4446.5 | 4444.5 | 19.46 |
| 5/7/22 | 13.02 | 4452.20 | 4447.80 | 13.75 | 4446.5 | 4444.5 | 19.47 |
| 5/8/22 | 13.02 | 4452.30 | 4447.80 | 13.73 | 4446.5 | 4444.5 | 19.46 |
| 5/9/22 | 13.02 | 4452.30 | 4447.80 | 13.72 | 4446.5 | 4444.5 | 19.47 |
| 5/10/22 | 13.02 | 4452.30 | 4447.90 | 13.70 | 4446.5 | 4444.5 | 19.46 |
| 5/11/22 | 13.03 | 4452.30 | 4447.90 | 13.69 | 4446.5 | 4444.5 | 19.47 |
| 5/12/22 | 13.03 | 4452.30 | 4447.90 | 13.67 | 4446.5 | 4444.5 | 19.46 |
| 5/13/22 | 13.03 | 4452.30 | 4447.90 | 13.66 | 4446.5 | 4444.5 | 19.47 |
| 5/14/22 | 13.04 | 4452.40 | 4447.90 | 13.64 | 4446.5 | 4444.5 | 19.46 |
| 5/15/22 | 13.04 | 4452.40 | 4447.90 | 13.62 | 4446.5 | 4444.5 | 19.47 |
| 5/16/22 | 13.04 | 4452.40 | 4447.90 | 13.61 | 4446.5 | 4444.5 | 19.46 |
| 5/17/22 | 13.04 | 4452.40 | 4448.00 | 13.59 | 4446.5 | 4444.5 | 19.47 |
| 5/18/22 | 13.05 | 4452.40 | 4448.00 | 13.58 | 4446.5 | 4444.5 | 19.46 |
| 5/19/22 | 13.05 | 4452.40 | 4448.00 | 13.56 | 4446.5 | 4444.5 | 19.47 |
| 5/20/22 | 13.05 | 4452.50 | 4448.00 | 13.54 | 4446.5 | 4444.5 | 19.46 |
| 5/21/22 | 13.05 | 4452.50 | 4448.00 | 13.53 | 4446.5 | 4444.5 | 19.47 |
| 5/22/22 | 13.06 | 4452.50 | 4448.00 | 13.51 | 4446.5 | 4444.5 | 19.46 |
| 5/23/22 | 13.06 | 4452.50 | 4448.10 | 13.50 | 4446.5 | 4444.5 | 19.47 |
| 5/24/22 | 13.06 | 4452.50 | 4448.10 | 13.48 | 4446.5 | 4444.5 | 19.46 |
| 5/25/22 | 13.07 | 4452.50 | 4448.10 | 13.46 | 4446.5 | 4444.5 | 19.47 |
| 5/26/22 | 13.07 | 4452.60 | 4448.10 | 13.45 | 4446.5 | 4444.5 | 19.46 |
| 5/27/22 | 13.07 | 4452.60 | 4448.10 | 13.43 | 4446.5 | 4444.5 | 19.47 |
| 5/28/22 | 13.07 | 4452.60 | 4448.10 | 13.42 | 4446.5 | 4444.5 | 19.46 |
| 5/29/22 | 13.08 | 4452.60 | 4448.20 | 13.40 | 4446.5 | 4444.5 | 19.47 |
| 5/30/22 | 13.08 | 4452.60 | 4448.20 | 13.38 | 4446.5 | 4444.5 | 19.46 |
| 5/31/22 | 13.08 | 4452.60 | 4448.20 | 13.37 | 4446.5 | 4444.5 | 19.47 |
| 6/1/22 | 13.08 | 4452.60 | 4448.20 | 13.35 | 4446.5 | 4444.5 | 19.46 |
| 6/2/22 | 13.09 | 4452.70 | 4448.20 | 13.34 | 4446.5 | 4444.5 | 19.48 |
| 6/3/22 | 13.09 | 4452.70 | 4448.20 | 13.33 | 4446.5 | 4444.5 | 19.46 |
| 6/4/22 | 13.09 | 4452.70 | 4448.20 | 13.32 | 4446.5 | 4444.5 | 19.48 |
| 6/5/22 | 13.10 | 4452.70 | 4448.30 | 13.30 | 4446.5 | 4444.5 | 19.46 |
| 6/6/22 | 13.10 | 4452.70 | 4448.30 | 13.29 | 4446.5 | 4444.5 | 19.48 |

**Appendix E**
**Table 1  Tailings and Pond Elevations for North and South Cells**

| Date | Year Fraction | North Cell | | | South Cell | | |
|---|---|---|---|---|---|---|---|
| | | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) |
| 6/7/22 | 13.10 | 4452.70 | 4448.30 | 13.28 | 4446.5 | 4444.5 | 19.46 |
| 6/8/22 | 13.10 | 4452.70 | 4448.30 | 13.27 | 4446.5 | 4444.5 | 19.48 |
| 6/9/22 | 13.11 | 4452.70 | 4448.30 | 13.25 | 4446.5 | 4444.5 | 19.46 |
| 6/10/22 | 13.11 | 4452.80 | 4448.30 | 13.24 | 4446.5 | 4444.5 | 19.48 |
| 6/11/22 | 13.11 | 4452.80 | 4448.40 | 13.23 | 4446.5 | 4444.5 | 19.46 |
| 6/12/22 | 13.11 | 4452.80 | 4448.40 | 13.22 | 4446.5 | 4444.5 | 19.48 |
| 6/13/22 | 13.12 | 4452.80 | 4448.40 | 13.20 | 4446.5 | 4444.5 | 19.46 |
| 6/14/22 | 13.12 | 4452.80 | 4448.40 | 13.19 | 4446.5 | 4444.5 | 19.48 |
| 6/15/22 | 13.12 | 4452.80 | 4448.40 | 13.18 | 4446.5 | 4444.5 | 19.46 |
| 6/16/22 | 13.13 | 4452.80 | 4448.40 | 13.17 | 4446.5 | 4444.5 | 19.48 |
| 6/17/22 | 13.13 | 4452.80 | 4448.40 | 13.15 | 4446.5 | 4444.5 | 19.46 |
| 6/18/22 | 13.13 | 4452.90 | 4448.50 | 13.14 | 4446.5 | 4444.5 | 19.48 |
| 6/19/22 | 13.13 | 4452.90 | 4448.50 | 13.13 | 4446.5 | 4444.5 | 19.46 |
| 6/20/22 | 13.14 | 4452.90 | 4448.50 | 13.12 | 4446.5 | 4444.5 | 19.48 |
| 6/21/22 | 13.14 | 4452.90 | 4448.50 | 13.11 | 4446.5 | 4444.5 | 19.46 |
| 6/22/22 | 13.14 | 4452.90 | 4448.50 | 13.09 | 4446.5 | 4444.5 | 19.48 |
| 6/23/22 | 13.14 | 4452.90 | 4448.50 | 13.08 | 4446.5 | 4444.5 | 19.46 |
| 6/24/22 | 13.15 | 4452.90 | 4448.60 | 13.07 | 4446.5 | 4444.5 | 19.48 |
| 6/25/22 | 13.15 | 4452.90 | 4448.60 | 13.06 | 4446.5 | 4444.5 | 19.46 |
| 6/26/22 | 13.15 | 4453.00 | 4448.60 | 13.04 | 4446.5 | 4444.5 | 19.48 |
| 6/27/22 | 13.16 | 4453.00 | 4448.60 | 13.03 | 4446.5 | 4444.5 | 19.46 |
| 6/28/22 | 13.16 | 4453.00 | 4448.60 | 13.02 | 4446.5 | 4444.5 | 19.48 |
| 6/29/22 | 13.16 | 4453.00 | 4448.60 | 13.01 | 4446.5 | 4444.5 | 19.46 |
| 6/30/22 | 13.16 | 4453.00 | 4448.60 | 12.99 | 4446.5 | 4444.5 | 19.48 |
| 7/1/22 | 13.17 | 4453.00 | 4448.70 | 12.98 | 4446.5 | 4444.5 | 19.46 |
| 7/2/22 | 13.17 | 4453.00 | 4448.70 | 12.98 | 4446.5 | 4444.5 | 19.48 |
| 7/3/22 | 13.17 | 4453.00 | 4448.70 | 12.97 | 4446.5 | 4444.5 | 19.46 |
| 7/4/22 | 13.18 | 4453.00 | 4448.70 | 12.96 | 4446.5 | 4444.5 | 19.48 |
| 7/5/22 | 13.18 | 4453.00 | 4448.70 | 12.96 | 4446.5 | 4444.5 | 19.46 |
| 7/6/22 | 13.18 | 4453.00 | 4448.70 | 12.95 | 4446.5 | 4444.5 | 19.48 |
| 7/7/22 | 13.18 | 4453.10 | 4448.80 | 12.95 | 4446.5 | 4444.5 | 19.46 |
| 7/8/22 | 13.19 | 4453.10 | 4448.80 | 12.94 | 4446.5 | 4444.5 | 19.48 |
| 7/9/22 | 13.19 | 4453.10 | 4448.80 | 12.94 | 4446.5 | 4444.5 | 19.46 |
| 7/10/22 | 13.19 | 4453.10 | 4448.80 | 12.93 | 4446.5 | 4444.5 | 19.48 |
| 7/11/22 | 13.19 | 4453.10 | 4448.80 | 12.93 | 4446.5 | 4444.5 | 19.46 |
| 7/12/22 | 13.20 | 4453.10 | 4448.80 | 12.92 | 4446.5 | 4444.5 | 19.48 |
| 7/13/22 | 13.20 | 4453.10 | 4448.90 | 12.92 | 4446.5 | 4444.5 | 19.46 |
| 7/14/22 | 13.20 | 4453.10 | 4448.90 | 12.91 | 4446.5 | 4444.5 | 19.48 |
| 7/15/22 | 13.21 | 4453.10 | 4448.90 | 12.90 | 4446.5 | 4444.5 | 19.46 |
| 7/16/22 | 13.21 | 4453.10 | 4448.90 | 12.90 | 4446.5 | 4444.5 | 19.48 |
| 7/17/22 | 13.21 | 4453.10 | 4448.90 | 12.89 | 4446.5 | 4444.5 | 19.46 |
| 7/18/22 | 13.21 | 4453.10 | 4448.90 | 12.89 | 4446.5 | 4444.5 | 19.48 |
| 7/19/22 | 13.22 | 4453.10 | 4448.90 | 12.88 | 4446.5 | 4444.5 | 19.46 |
| 7/20/22 | 13.22 | 4453.10 | 4449.00 | 12.88 | 4446.5 | 4444.5 | 19.48 |
| 7/21/22 | 13.22 | 4453.10 | 4449.00 | 12.87 | 4446.5 | 4444.5 | 19.46 |
| 7/22/22 | 13.22 | 4453.10 | 4449.00 | 12.87 | 4446.5 | 4444.5 | 19.48 |
| 7/23/22 | 13.23 | 4453.10 | 4449.00 | 12.86 | 4446.5 | 4444.5 | 19.46 |
| 7/24/22 | 13.23 | 4453.10 | 4449.00 | 12.86 | 4446.5 | 4444.5 | 19.48 |
| 7/25/22 | 13.23 | 4453.20 | 4449.00 | 12.85 | 4446.5 | 4444.5 | 19.46 |
| 7/26/22 | 13.24 | 4453.20 | 4449.10 | 12.85 | 4446.5 | 4444.5 | 19.48 |
| 7/27/22 | 13.24 | 4453.20 | 4449.10 | 12.84 | 4446.5 | 4444.5 | 19.46 |
| 7/28/22 | 13.24 | 4453.20 | 4449.10 | 12.83 | 4446.5 | 4444.5 | 19.48 |
| 7/29/22 | 13.24 | 4453.20 | 4449.10 | 12.83 | 4446.5 | 4444.5 | 19.46 |
| 7/30/22 | 13.25 | 4453.20 | 4449.10 | 12.82 | 4446.5 | 4444.5 | 19.48 |
| 7/31/22 | 13.25 | 4453.20 | 4449.10 | 12.82 | 4446.5 | 4444.5 | 19.46 |

## Appendix E
## Table 1  Tailings and Pond Elevations for North and South Cells

| | Year | North Cell | | | South Cell | | |
|---|---|---|---|---|---|---|---|
| Date | Fraction | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) |
| 8/1/22 | 13.25 | 4453.20 | 4449.10 | 12.81 | 4446.5 | 4444.5 | 19.48 |
| 8/2/22 | 13.25 | 4453.20 | 4449.20 | 12.81 | 4446.5 | 4444.5 | 19.46 |
| 8/3/22 | 13.26 | 4453.20 | 4449.20 | 12.80 | 4446.5 | 4444.5 | 19.48 |
| 8/4/22 | 13.26 | 4453.20 | 4449.20 | 12.79 | 4446.5 | 4444.5 | 19.46 |
| 8/5/22 | 13.26 | 4453.20 | 4449.20 | 12.79 | 4446.5 | 4444.5 | 19.48 |
| 8/6/22 | 13.27 | 4453.20 | 4449.20 | 12.78 | 4446.5 | 4444.5 | 19.46 |
| 8/7/22 | 13.27 | 4453.20 | 4449.20 | 12.78 | 4446.5 | 4444.5 | 19.48 |
| 8/8/22 | 13.27 | 4453.20 | 4449.30 | 12.77 | 4446.5 | 4444.5 | 19.46 |
| 8/9/22 | 13.27 | 4453.20 | 4449.30 | 12.76 | 4446.5 | 4444.5 | 19.48 |
| 8/10/22 | 13.28 | 4453.20 | 4449.30 | 12.76 | 4446.5 | 4444.5 | 19.46 |
| 8/11/22 | 13.28 | 4453.20 | 4449.30 | 12.75 | 4446.5 | 4444.5 | 19.48 |
| 8/12/22 | 13.28 | 4453.30 | 4449.30 | 12.75 | 4446.5 | 4444.5 | 19.46 |
| 8/13/22 | 13.28 | 4453.30 | 4449.30 | 12.74 | 4446.5 | 4444.5 | 19.48 |
| 8/14/22 | 13.29 | 4453.30 | 4449.30 | 12.73 | 4446.5 | 4444.5 | 19.46 |
| 8/15/22 | 13.29 | 4453.30 | 4449.40 | 12.73 | 4446.5 | 4444.5 | 19.48 |
| 8/16/22 | 13.29 | 4453.30 | 4449.40 | 12.72 | 4446.5 | 4444.5 | 19.46 |
| 8/17/22 | 13.30 | 4453.30 | 4449.40 | 12.72 | 4446.5 | 4444.5 | 19.48 |
| 8/18/22 | 13.30 | 4453.30 | 4449.40 | 12.71 | 4446.5 | 4444.5 | 19.46 |
| 8/19/22 | 13.30 | 4453.30 | 4449.40 | 12.70 | 4446.5 | 4444.5 | 19.48 |
| 8/20/22 | 13.30 | 4453.30 | 4449.40 | 12.70 | 4446.5 | 4444.5 | 19.46 |
| 8/21/22 | 13.31 | 4453.30 | 4449.50 | 12.69 | 4446.5 | 4444.5 | 19.48 |
| 8/22/22 | 13.31 | 4453.30 | 4449.50 | 12.69 | 4446.5 | 4444.5 | 19.46 |
| 8/23/22 | 13.31 | 4453.30 | 4449.50 | 12.68 | 4446.5 | 4444.5 | 19.48 |
| 8/24/22 | 13.31 | 4453.30 | 4449.50 | 12.67 | 4446.5 | 4444.5 | 19.46 |
| 8/25/22 | 13.32 | 4453.30 | 4449.50 | 12.67 | 4446.5 | 4444.5 | 19.48 |
| 8/26/22 | 13.32 | 4453.30 | 4449.50 | 12.66 | 4446.5 | 4444.5 | 19.46 |
| 8/27/22 | 13.32 | 4453.30 | 4449.60 | 12.66 | 4446.5 | 4444.5 | 19.48 |
| 8/28/22 | 13.33 | 4453.40 | 4449.60 | 12.65 | 4446.5 | 4444.5 | 19.46 |
| 8/29/22 | 13.33 | 4453.40 | 4449.60 | 12.64 | 4446.5 | 4444.5 | 19.48 |
| 8/30/22 | 13.33 | 4453.40 | 4449.60 | 12.64 | 4446.5 | 4444.5 | 19.46 |
| 8/31/22 | 13.33 | 4453.40 | 4449.60 | 12.63 | 4446.5 | 4444.5 | 19.48 |
| 9/1/22 | 13.34 | 4453.40 | 4449.60 | 12.63 | 4446.5 | 4444.5 | 19.46 |
| 9/2/22 | 13.34 | 4453.40 | 4449.60 | 12.62 | 4446.5 | 4444.5 | 19.48 |
| 9/3/22 | 13.34 | 4453.40 | 4449.70 | 12.61 | 4446.5 | 4444.5 | 19.46 |
| 9/4/22 | 13.34 | 4453.40 | 4449.70 | 12.61 | 4446.5 | 4444.5 | 19.48 |
| 9/5/22 | 13.35 | 4453.40 | 4449.70 | 12.60 | 4446.5 | 4444.5 | 19.46 |
| 9/6/22 | 13.35 | 4453.40 | 4449.70 | 12.60 | 4446.5 | 4444.5 | 19.48 |
| 9/7/22 | 13.35 | 4453.40 | 4449.70 | 12.59 | 4446.5 | 4444.5 | 19.46 |
| 9/8/22 | 13.36 | 4453.40 | 4449.70 | 12.58 | 4446.5 | 4444.5 | 19.48 |
| 9/9/22 | 13.36 | 4453.40 | 4449.80 | 12.58 | 4446.5 | 4444.5 | 19.46 |
| 9/10/22 | 13.36 | 4453.40 | 4449.80 | 12.57 | 4446.5 | 4444.5 | 19.48 |
| 9/11/22 | 13.36 | 4453.40 | 4449.80 | 12.56 | 4446.5 | 4444.5 | 19.46 |
| 9/12/22 | 13.37 | 4453.40 | 4449.80 | 12.56 | 4446.5 | 4444.5 | 19.48 |
| 9/13/22 | 13.37 | 4453.40 | 4449.80 | 12.55 | 4446.5 | 4444.5 | 19.46 |
| 9/14/22 | 13.37 | 4453.50 | 4449.80 | 12.55 | 4446.5 | 4444.5 | 19.48 |
| 9/15/22 | 13.37 | 4453.50 | 4449.80 | 12.54 | 4446.5 | 4444.5 | 19.46 |
| 9/16/22 | 13.38 | 4453.50 | 4449.90 | 12.53 | 4446.5 | 4444.5 | 19.48 |
| 9/17/22 | 13.38 | 4453.50 | 4449.90 | 12.53 | 4446.5 | 4444.5 | 19.46 |
| 9/18/22 | 13.38 | 4453.50 | 4449.90 | 12.52 | 4446.5 | 4444.5 | 19.48 |
| 9/19/22 | 13.39 | 4453.50 | 4449.90 | 12.51 | 4446.5 | 4444.5 | 19.46 |
| 9/20/22 | 13.39 | 4453.50 | 4449.90 | 12.51 | 4446.5 | 4444.5 | 19.48 |
| 9/21/22 | 13.39 | 4453.50 | 4449.90 | 12.50 | 4446.5 | 4444.5 | 19.46 |
| 9/22/22 | 13.39 | 4453.50 | 4450.00 | 12.50 | 4446.5 | 4444.5 | 19.48 |
| 9/23/22 | 13.40 | 4453.50 | 4450.00 | 12.49 | 4446.5 | 4444.5 | 19.46 |
| 9/24/22 | 13.40 | 4453.50 | 4450.00 | 12.48 | 4446.5 | 4444.5 | 19.48 |

**Appendix E**
**Table 1  Tailings and Pond Elevations for North and South Cells**

| | Year | North Cell | | | South Cell | | |
|---|---|---|---|---|---|---|---|
| Date | Fraction | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) |
| 9/25/22 | 13.40 | 4453.50 | 4450.00 | 12.48 | 4446.5 | 4444.5 | 19.46 |
| 9/26/22 | 13.41 | 4453.50 | 4450.00 | 12.47 | 4446.5 | 4444.5 | 19.48 |
| 9/27/22 | 13.41 | 4453.50 | 4450.00 | 12.47 | 4446.5 | 4444.5 | 19.46 |
| 9/28/22 | 13.41 | 4453.50 | 4450.00 | 12.46 | 4446.5 | 4444.5 | 19.48 |
| 9/29/22 | 13.41 | 4453.50 | 4450.10 | 12.45 | 4446.5 | 4444.5 | 19.46 |
| 9/30/22 | 13.42 | 4453.60 | 4450.10 | 12.45 | 4446.5 | 4444.5 | 19.48 |
| 10/1/22 | 13.42 | 4453.60 | 4450.10 | 12.44 | 4446.5 | 4444.5 | 19.46 |
| 10/2/22 | 13.42 | 4453.60 | 4450.10 | 12.43 | 4446.5 | 4444.5 | 19.48 |
| 10/3/22 | 13.42 | 4453.60 | 4450.10 | 12.42 | 4446.5 | 4444.5 | 19.46 |
| 10/4/22 | 13.43 | 4453.60 | 4450.10 | 12.41 | 4446.5 | 4444.5 | 19.48 |
| 10/5/22 | 13.43 | 4453.60 | 4450.10 | 12.40 | 4446.5 | 4444.5 | 19.46 |
| 10/6/22 | 13.43 | 4453.60 | 4450.10 | 12.39 | 4446.5 | 4444.5 | 19.48 |
| 10/7/22 | 13.44 | 4453.60 | 4450.20 | 12.39 | 4446.5 | 4444.5 | 19.46 |
| 10/8/22 | 13.44 | 4453.60 | 4450.20 | 12.38 | 4446.5 | 4444.5 | 19.48 |
| 10/9/22 | 13.44 | 4453.60 | 4450.20 | 12.37 | 4446.5 | 4444.5 | 19.46 |
| 10/10/22 | 13.44 | 4453.60 | 4450.20 | 12.36 | 4446.5 | 4444.5 | 19.48 |
| 10/11/22 | 13.45 | 4453.70 | 4450.20 | 12.35 | 4446.5 | 4444.5 | 19.46 |
| 10/12/22 | 13.45 | 4453.70 | 4450.20 | 12.34 | 4446.5 | 4444.5 | 19.48 |
| 10/13/22 | 13.45 | 4453.70 | 4450.20 | 12.33 | 4446.5 | 4444.5 | 19.46 |
| 10/14/22 | 13.45 | 4453.70 | 4450.20 | 12.32 | 4446.5 | 4444.5 | 19.48 |
| 10/15/22 | 13.46 | 4453.70 | 4450.30 | 12.31 | 4446.5 | 4444.5 | 19.46 |
| 10/16/22 | 13.46 | 4453.70 | 4450.30 | 12.30 | 4446.5 | 4444.5 | 19.48 |
| 10/17/22 | 13.46 | 4453.70 | 4450.30 | 12.30 | 4446.5 | 4444.5 | 19.46 |
| 10/18/22 | 13.47 | 4453.70 | 4450.30 | 12.29 | 4446.5 | 4444.5 | 19.48 |
| 10/19/22 | 13.47 | 4453.70 | 4450.30 | 12.28 | 4446.5 | 4444.5 | 19.46 |
| 10/20/22 | 13.47 | 4453.70 | 4450.30 | 12.27 | 4446.5 | 4444.5 | 19.48 |
| 10/21/22 | 13.47 | 4453.70 | 4450.30 | 12.26 | 4446.5 | 4444.5 | 19.46 |
| 10/22/22 | 13.48 | 4453.80 | 4450.30 | 12.25 | 4446.5 | 4444.5 | 19.48 |
| 10/23/22 | 13.48 | 4453.80 | 4450.40 | 12.24 | 4446.5 | 4444.5 | 19.46 |
| 10/24/22 | 13.48 | 4453.80 | 4450.40 | 12.23 | 4446.5 | 4444.5 | 19.48 |
| 10/25/22 | 13.48 | 4453.80 | 4450.40 | 12.22 | 4446.5 | 4444.5 | 19.46 |
| 10/26/22 | 13.49 | 4453.80 | 4450.40 | 12.21 | 4446.5 | 4444.5 | 19.48 |
| 10/27/22 | 13.49 | 4453.80 | 4450.40 | 12.20 | 4446.5 | 4444.5 | 19.46 |
| 10/28/22 | 13.49 | 4453.80 | 4450.40 | 12.20 | 4446.5 | 4444.5 | 19.48 |
| 10/29/22 | 13.50 | 4453.80 | 4450.40 | 12.19 | 4446.5 | 4444.5 | 19.46 |
| 10/30/22 | 13.50 | 4453.80 | 4450.40 | 12.18 | 4446.5 | 4444.5 | 19.48 |
| 10/31/22 | 13.50 | 4453.80 | 4450.50 | 12.17 | 4446.5 | 4444.5 | 19.46 |
| 11/1/22 | 13.50 | 4453.80 | 4450.50 | 12.16 | 4446.5 | 4444.5 | 19.48 |
| 11/2/22 | 13.51 | 4453.90 | 4450.50 | 12.15 | 4446.5 | 4444.5 | 19.46 |
| 11/3/22 | 13.51 | 4453.90 | 4450.50 | 12.13 | 4446.5 | 4444.5 | 19.47 |
| 11/4/22 | 13.51 | 4453.90 | 4450.50 | 12.12 | 4446.5 | 4444.5 | 19.46 |
| 11/5/22 | 13.51 | 4453.90 | 4450.50 | 12.11 | 4446.5 | 4444.5 | 19.47 |
| 11/6/22 | 13.52 | 4453.90 | 4450.50 | 12.10 | 4446.5 | 4444.5 | 19.46 |
| 11/7/22 | 13.52 | 4453.90 | 4450.50 | 12.08 | 4446.5 | 4444.5 | 19.47 |
| 11/8/22 | 13.52 | 4453.90 | 4450.60 | 12.07 | 4446.5 | 4444.5 | 19.46 |
| 11/9/22 | 13.53 | 4453.90 | 4450.60 | 12.06 | 4446.5 | 4444.5 | 19.47 |
| 11/10/22 | 13.53 | 4454.00 | 4450.60 | 12.05 | 4446.5 | 4444.5 | 19.46 |
| 11/11/22 | 13.53 | 4454.00 | 4450.60 | 12.03 | 4446.5 | 4444.5 | 19.47 |
| 11/12/22 | 13.53 | 4454.00 | 4450.60 | 12.02 | 4446.5 | 4444.5 | 19.46 |
| 11/13/22 | 13.54 | 4454.00 | 4450.60 | 12.01 | 4446.5 | 4444.5 | 19.47 |
| 11/14/22 | 13.54 | 4454.00 | 4450.60 | 12.00 | 4446.5 | 4444.5 | 19.46 |
| 11/15/22 | 13.54 | 4454.00 | 4450.60 | 11.98 | 4446.5 | 4444.5 | 19.47 |
| 11/16/22 | 13.54 | 4454.00 | 4450.70 | 11.97 | 4446.5 | 4444.5 | 19.46 |
| 11/17/22 | 13.55 | 4454.00 | 4450.70 | 11.96 | 4446.5 | 4444.5 | 19.47 |
| 11/18/22 | 13.55 | 4454.10 | 4450.70 | 11.95 | 4446.5 | 4444.5 | 19.46 |

## Appendix E
## Table 1  Tailings and Pond Elevations for North and South Cells

| Date | Year Fraction | North Cell | | | South Cell | | |
|---|---|---|---|---|---|---|---|
| | | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) |
| 11/19/22 | 13.55 | 4454.10 | 4450.70 | 11.93 | 4446.5 | 4444.5 | 19.47 |
| 11/20/22 | 13.56 | 4454.10 | 4450.70 | 11.92 | 4446.5 | 4444.5 | 19.46 |
| 11/21/22 | 13.56 | 4454.10 | 4450.70 | 11.91 | 4446.5 | 4444.5 | 19.47 |
| 11/22/22 | 13.56 | 4454.10 | 4450.70 | 11.90 | 4446.5 | 4444.5 | 19.46 |
| 11/23/22 | 13.56 | 4454.10 | 4450.70 | 11.88 | 4446.5 | 4444.5 | 19.47 |
| 11/24/22 | 13.57 | 4454.10 | 4450.80 | 11.87 | 4446.5 | 4444.5 | 19.46 |
| 11/25/22 | 13.57 | 4454.10 | 4450.80 | 11.86 | 4446.5 | 4444.5 | 19.47 |
| 11/26/22 | 13.57 | 4454.20 | 4450.80 | 11.85 | 4446.5 | 4444.5 | 19.46 |
| 11/27/22 | 13.57 | 4454.20 | 4450.80 | 11.83 | 4446.5 | 4444.5 | 19.47 |
| 11/28/22 | 13.58 | 4454.20 | 4450.80 | 11.82 | 4446.5 | 4444.5 | 19.46 |
| 11/29/22 | 13.58 | 4454.20 | 4450.80 | 11.81 | 4446.5 | 4444.5 | 19.47 |
| 11/30/22 | 13.58 | 4454.20 | 4450.80 | 11.80 | 4446.5 | 4444.5 | 19.46 |
| 12/1/22 | 13.59 | 4454.20 | 4450.90 | 11.78 | 4446.5 | 4444.5 | 19.47 |
| 12/2/22 | 13.59 | 4454.20 | 4450.90 | 11.77 | 4446.5 | 4444.5 | 19.45 |
| 12/3/22 | 13.59 | 4454.30 | 4450.90 | 11.75 | 4446.5 | 4444.5 | 19.46 |
| 12/4/22 | 13.59 | 4454.30 | 4450.90 | 11.73 | 4446.5 | 4444.5 | 19.45 |
| 12/5/22 | 13.60 | 4454.30 | 4450.90 | 11.72 | 4446.5 | 4444.5 | 19.46 |
| 12/6/22 | 13.60 | 4454.30 | 4450.90 | 11.70 | 4446.5 | 4444.5 | 19.45 |
| 12/7/22 | 13.60 | 4454.30 | 4450.90 | 11.68 | 4446.5 | 4444.5 | 19.46 |
| 12/8/22 | 13.60 | 4454.30 | 4450.90 | 11.67 | 4446.5 | 4444.5 | 19.45 |
| 12/9/22 | 13.61 | 4454.30 | 4451.00 | 11.65 | 4446.5 | 4444.5 | 19.46 |
| 12/10/22 | 13.61 | 4454.40 | 4451.00 | 11.63 | 4446.5 | 4444.5 | 19.45 |
| 12/11/22 | 13.61 | 4454.40 | 4451.00 | 11.62 | 4446.5 | 4444.5 | 19.46 |
| 12/12/22 | 13.62 | 4454.40 | 4451.00 | 11.60 | 4446.5 | 4444.5 | 19.45 |
| 12/13/22 | 13.62 | 4454.40 | 4451.00 | 11.58 | 4446.5 | 4444.5 | 19.46 |
| 12/14/22 | 13.62 | 4454.40 | 4451.00 | 11.57 | 4446.5 | 4444.5 | 19.45 |
| 12/15/22 | 13.62 | 4454.40 | 4451.00 | 11.55 | 4446.5 | 4444.5 | 19.46 |
| 12/16/22 | 13.63 | 4454.50 | 4451.00 | 11.54 | 4446.5 | 4444.5 | 19.45 |
| 12/17/22 | 13.63 | 4454.50 | 4451.10 | 11.52 | 4446.5 | 4444.5 | 19.46 |
| 12/18/22 | 13.63 | 4454.50 | 4451.10 | 11.50 | 4446.5 | 4444.5 | 19.45 |
| 12/19/22 | 13.63 | 4454.50 | 4451.10 | 11.49 | 4446.5 | 4444.5 | 19.46 |
| 12/20/22 | 13.64 | 4454.50 | 4451.10 | 11.47 | 4446.5 | 4444.5 | 19.45 |
| 12/21/22 | 13.64 | 4454.50 | 4451.10 | 11.45 | 4446.5 | 4444.5 | 19.46 |
| 12/22/22 | 13.64 | 4454.60 | 4451.10 | 11.44 | 4446.5 | 4444.5 | 19.45 |
| 12/23/22 | 13.65 | 4454.60 | 4451.10 | 11.42 | 4446.5 | 4444.5 | 19.46 |
| 12/24/22 | 13.65 | 4454.60 | 4451.10 | 11.40 | 4446.5 | 4444.5 | 19.45 |
| 12/25/22 | 13.65 | 4454.60 | 4451.20 | 11.39 | 4446.5 | 4444.5 | 19.46 |
| 12/26/22 | 13.65 | 4454.60 | 4451.20 | 11.37 | 4446.5 | 4444.5 | 19.45 |
| 12/27/22 | 13.66 | 4454.60 | 4451.20 | 11.35 | 4446.5 | 4444.5 | 19.46 |
| 12/28/22 | 13.66 | 4454.70 | 4451.20 | 11.34 | 4446.5 | 4444.5 | 19.45 |
| 12/29/22 | 13.66 | 4454.70 | 4451.20 | 11.32 | 4446.5 | 4444.5 | 19.46 |
| 12/30/22 | 13.67 | 4454.70 | 4451.20 | 11.31 | 4446.5 | 4444.5 | 19.45 |
| 12/31/22 | 13.67 | 4454.70 | 4451.20 | 11.29 | 4446.5 | 4444.5 | 19.46 |
| 1/1/23 | 13.67 | 4454.70 | 4451.20 | 11.27 | 4446.5 | 4444.5 | 19.45 |
| 1/2/23 | 13.67 | 4454.70 | 4451.30 | 11.25 | 4446.5 | 4444.5 | 19.46 |
| 1/3/23 | 13.68 | 4454.80 | 4451.30 | 11.24 | 4446.5 | 4444.5 | 19.45 |
| 1/4/23 | 13.68 | 4454.80 | 4451.30 | 11.22 | 4446.5 | 4444.5 | 19.46 |
| 1/5/23 | 13.68 | 4454.80 | 4451.30 | 11.20 | 4446.5 | 4444.5 | 19.45 |
| 1/6/23 | 13.68 | 4454.80 | 4451.30 | 11.18 | 4446.5 | 4444.5 | 19.46 |
| 1/7/23 | 13.69 | 4454.80 | 4451.30 | 11.16 | 4446.5 | 4444.5 | 19.45 |
| 1/8/23 | 13.69 | 4454.90 | 4451.30 | 11.14 | 4446.5 | 4444.5 | 19.46 |
| 1/9/23 | 13.69 | 4454.90 | 4451.30 | 11.12 | 4446.5 | 4444.5 | 19.45 |
| 1/10/23 | 13.70 | 4454.90 | 4451.40 | 11.11 | 4446.5 | 4444.5 | 19.46 |
| 1/11/23 | 13.70 | 4454.90 | 4451.40 | 11.09 | 4446.5 | 4444.5 | 19.45 |
| 1/12/23 | 13.70 | 4454.90 | 4451.40 | 11.07 | 4446.5 | 4444.5 | 19.46 |

## Appendix E
## Table 1  Tailings and Pond Elevations for North and South Cells

|  | Year | North Cell |  |  | South Cell |  |  |
|---|---|---|---|---|---|---|---|
| Date | Fraction | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) |
| 1/13/23 | 13.70 | 4454.90 | 4451.40 | 11.05 | 4446.5 | 4444.5 | 19.45 |
| 1/14/23 | 13.71 | 4455.00 | 4451.40 | 11.03 | 4446.5 | 4444.5 | 19.46 |
| 1/15/23 | 13.71 | 4455.00 | 4451.40 | 11.01 | 4446.5 | 4444.5 | 19.45 |
| 1/16/23 | 13.71 | 4455.00 | 4451.40 | 11.00 | 4446.5 | 4444.5 | 19.46 |
| 1/17/23 | 13.71 | 4455.00 | 4451.40 | 10.98 | 4446.5 | 4444.5 | 19.45 |
| 1/18/23 | 13.72 | 4455.00 | 4451.50 | 10.96 | 4446.5 | 4444.5 | 19.46 |
| 1/19/23 | 13.72 | 4455.10 | 4451.50 | 10.94 | 4446.5 | 4444.5 | 19.45 |
| 1/20/23 | 13.72 | 4455.10 | 4451.50 | 10.92 | 4446.5 | 4444.5 | 19.46 |
| 1/21/23 | 13.73 | 4455.10 | 4451.50 | 10.90 | 4446.5 | 4444.5 | 19.45 |
| 1/22/23 | 13.73 | 4455.10 | 4451.50 | 10.89 | 4446.5 | 4444.5 | 19.46 |
| 1/23/23 | 13.73 | 4455.10 | 4451.50 | 10.87 | 4446.5 | 4444.5 | 19.45 |
| 1/24/23 | 13.73 | 4455.20 | 4451.50 | 10.85 | 4446.5 | 4444.5 | 19.46 |
| 1/25/23 | 13.74 | 4455.20 | 4451.50 | 10.83 | 4446.5 | 4444.5 | 19.45 |
| 1/26/23 | 13.74 | 4455.20 | 4451.60 | 10.81 | 4446.5 | 4444.5 | 19.46 |
| 1/27/23 | 13.74 | 4455.20 | 4451.60 | 10.79 | 4446.5 | 4444.5 | 19.45 |
| 1/28/23 | 13.74 | 4455.20 | 4451.60 | 10.77 | 4446.5 | 4444.5 | 19.46 |
| 1/29/23 | 13.75 | 4455.20 | 4451.60 | 10.76 | 4446.5 | 4444.5 | 19.45 |
| 1/30/23 | 13.75 | 4455.30 | 4451.60 | 10.74 | 4446.5 | 4444.5 | 19.46 |
| 1/31/23 | 13.75 | 4455.30 | 4451.60 | 10.72 | 4446.5 | 4444.5 | 19.45 |
| 2/1/23 | 13.76 | 4455.30 | 4451.60 | 10.70 | 4446.5 | 4444.5 | 19.46 |
| 2/2/23 | 13.76 | 4455.30 | 4451.60 | 10.68 | 4446.5 | 4444.5 | 19.45 |
| 2/3/23 | 13.76 | 4455.30 | 4451.70 | 10.66 | 4446.5 | 4444.5 | 19.46 |
| 2/4/23 | 13.76 | 4455.40 | 4451.70 | 10.64 | 4446.5 | 4444.5 | 19.45 |
| 2/5/23 | 13.77 | 4455.40 | 4451.70 | 10.63 | 4446.5 | 4444.5 | 19.46 |
| 2/6/23 | 13.77 | 4455.40 | 4451.70 | 10.61 | 4446.5 | 4444.5 | 19.45 |
| 2/7/23 | 13.77 | 4455.40 | 4451.70 | 10.59 | 4446.5 | 4444.5 | 19.46 |
| 2/8/23 | 13.77 | 4455.40 | 4451.70 | 10.57 | 4446.5 | 4444.5 | 19.45 |
| 2/9/23 | 13.78 | 4455.40 | 4451.70 | 10.55 | 4446.5 | 4444.5 | 19.46 |
| 2/10/23 | 13.78 | 4455.50 | 4451.80 | 10.53 | 4446.5 | 4444.5 | 19.45 |
| 2/11/23 | 13.78 | 4455.50 | 4451.80 | 10.51 | 4446.5 | 4444.5 | 19.46 |
| 2/12/23 | 13.79 | 4455.50 | 4451.80 | 10.49 | 4446.5 | 4444.5 | 19.45 |
| 2/13/23 | 13.79 | 4455.50 | 4451.80 | 10.48 | 4446.5 | 4444.5 | 19.46 |
| 2/14/23 | 13.79 | 4455.50 | 4451.80 | 10.46 | 4446.5 | 4444.5 | 19.45 |
| 2/15/23 | 13.79 | 4455.60 | 4451.80 | 10.44 | 4446.5 | 4444.5 | 19.46 |
| 2/16/23 | 13.80 | 4455.60 | 4451.80 | 10.42 | 4446.5 | 4444.5 | 19.45 |
| 2/17/23 | 13.80 | 4455.60 | 4451.80 | 10.40 | 4446.5 | 4444.5 | 19.46 |
| 2/18/23 | 13.80 | 4455.60 | 4451.90 | 10.38 | 4446.5 | 4444.5 | 19.45 |
| 2/19/23 | 13.80 | 4455.60 | 4451.90 | 10.36 | 4446.5 | 4444.5 | 19.46 |
| 2/20/23 | 13.81 | 4455.70 | 4451.90 | 10.34 | 4446.5 | 4444.5 | 19.45 |
| 2/21/23 | 13.81 | 4455.70 | 4451.90 | 10.33 | 4446.5 | 4444.5 | 19.46 |
| 2/22/23 | 13.81 | 4455.70 | 4451.90 | 10.31 | 4446.5 | 4444.5 | 19.45 |
| 2/23/23 | 13.82 | 4455.70 | 4451.90 | 10.29 | 4446.5 | 4444.5 | 19.46 |
| 2/24/23 | 13.82 | 4455.70 | 4451.90 | 10.27 | 4446.5 | 4444.5 | 19.45 |
| 2/25/23 | 13.82 | 4455.70 | 4451.90 | 10.25 | 4446.5 | 4444.5 | 19.46 |
| 2/26/23 | 13.82 | 4455.80 | 4452.00 | 10.23 | 4446.5 | 4444.5 | 19.45 |
| 2/27/23 | 13.83 | 4455.80 | 4452.00 | 10.21 | 4446.5 | 4444.5 | 19.46 |
| 2/28/23 | 13.83 | 4455.80 | 4452.00 | 10.20 | 4446.5 | 4444.5 | 19.45 |
| 3/1/23 | 13.83 | 4455.80 | 4452.00 | 10.18 | 4446.5 | 4444.5 | 19.46 |
| 3/2/23 | 13.83 | 4455.80 | 4452.00 | 10.16 | 4446.5 | 4444.5 | 19.45 |
| 3/3/23 | 13.84 | 4455.90 | 4452.00 | 10.14 | 4446.5 | 4444.5 | 19.46 |
| 3/4/23 | 13.84 | 4455.90 | 4452.00 | 10.12 | 4446.5 | 4444.5 | 19.45 |
| 3/5/23 | 13.84 | 4455.90 | 4452.00 | 10.10 | 4446.5 | 4444.5 | 19.46 |
| 3/6/23 | 13.85 | 4455.90 | 4452.10 | 10.08 | 4446.5 | 4444.5 | 19.45 |
| 3/7/23 | 13.85 | 4455.90 | 4452.10 | 10.06 | 4446.5 | 4444.5 | 19.46 |
| 3/8/23 | 13.85 | 4456.00 | 4452.10 | 10.04 | 4446.5 | 4444.5 | 19.45 |

**Appendix E**
**Table 1  Tailings and Pond Elevations for North and South Cells**

| Date | Year Fraction | North Cell | | | South Cell | | |
|---|---|---|---|---|---|---|---|
| | | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) |
| 3/9/23 | 13.85 | 4456.00 | 4452.10 | 10.02 | 4446.5 | 4444.5 | 19.46 |
| 3/10/23 | 13.86 | 4456.00 | 4452.10 | 10.00 | 4446.5 | 4444.5 | 19.45 |
| 3/11/23 | 13.86 | 4456.00 | 4452.10 | 9.98 | 4446.5 | 4444.5 | 19.46 |
| 3/12/23 | 13.86 | 4456.00 | 4452.10 | 9.96 | 4446.5 | 4444.5 | 19.45 |
| 3/13/23 | 13.86 | 4456.10 | 4452.10 | 9.94 | 4446.5 | 4444.5 | 19.46 |
| 3/14/23 | 13.87 | 4456.10 | 4452.20 | 9.92 | 4446.5 | 4444.5 | 19.45 |
| 3/15/23 | 13.87 | 4456.10 | 4452.20 | 9.90 | 4446.5 | 4444.5 | 19.46 |
| 3/16/23 | 13.87 | 4456.10 | 4452.20 | 9.88 | 4446.5 | 4444.5 | 19.45 |
| 3/17/23 | 13.88 | 4456.10 | 4452.20 | 9.86 | 4446.5 | 4444.5 | 19.46 |
| 3/18/23 | 13.88 | 4456.20 | 4452.20 | 9.84 | 4446.5 | 4444.5 | 19.45 |
| 3/19/23 | 13.88 | 4456.20 | 4452.20 | 9.82 | 4446.5 | 4444.5 | 19.46 |
| 3/20/23 | 13.88 | 4456.20 | 4452.20 | 9.80 | 4446.5 | 4444.5 | 19.45 |
| 3/21/23 | 13.89 | 4456.20 | 4452.20 | 9.78 | 4446.5 | 4444.5 | 19.46 |
| 3/22/23 | 13.89 | 4456.20 | 4452.30 | 9.76 | 4446.5 | 4444.5 | 19.45 |
| 3/23/23 | 13.89 | 4456.30 | 4452.30 | 9.74 | 4446.5 | 4444.5 | 19.46 |
| 3/24/23 | 13.90 | 4456.30 | 4452.30 | 9.72 | 4446.5 | 4444.5 | 19.45 |
| 3/25/23 | 13.90 | 4456.30 | 4452.30 | 9.70 | 4446.5 | 4444.5 | 19.46 |
| 3/26/23 | 13.90 | 4456.30 | 4452.30 | 9.68 | 4446.5 | 4444.5 | 19.45 |
| 3/27/23 | 13.90 | 4456.30 | 4452.30 | 9.66 | 4446.5 | 4444.5 | 19.46 |
| 3/28/23 | 13.91 | 4456.40 | 4452.30 | 9.64 | 4446.5 | 4444.5 | 19.45 |
| 3/29/23 | 13.91 | 4456.40 | 4452.30 | 9.62 | 4446.5 | 4444.5 | 19.46 |
| 3/30/23 | 13.91 | 4456.40 | 4452.40 | 9.60 | 4446.5 | 4444.5 | 19.45 |
| 3/31/23 | 13.91 | 4456.40 | 4452.40 | 9.58 | 4446.5 | 4444.5 | 19.46 |
| 4/1/23 | 13.92 | 4456.40 | 4452.40 | 9.57 | 4446.5 | 4444.5 | 19.45 |
| 4/2/23 | 13.92 | 4456.50 | 4452.40 | 9.55 | 4446.5 | 4444.5 | 19.46 |
| 4/3/23 | 13.92 | 4456.50 | 4452.40 | 9.53 | 4446.5 | 4444.5 | 19.45 |
| 4/4/23 | 13.93 | 4456.50 | 4452.40 | 9.52 | 4446.5 | 4444.5 | 19.46 |
| 4/5/23 | 13.93 | 4456.50 | 4452.40 | 9.50 | 4446.5 | 4444.5 | 19.45 |
| 4/6/23 | 13.93 | 4456.50 | 4452.40 | 9.48 | 4446.5 | 4444.5 | 19.46 |
| 4/7/23 | 13.93 | 4456.50 | 4452.50 | 9.47 | 4446.5 | 4444.5 | 19.45 |
| 4/8/23 | 13.94 | 4456.50 | 4452.50 | 9.45 | 4446.5 | 4444.5 | 19.46 |
| 4/9/23 | 13.94 | 4456.60 | 4452.50 | 9.43 | 4446.5 | 4444.5 | 19.45 |
| 4/10/23 | 13.94 | 4456.60 | 4452.50 | 9.42 | 4446.5 | 4444.5 | 19.46 |
| 4/11/23 | 13.94 | 4456.60 | 4452.50 | 9.40 | 4446.5 | 4444.5 | 19.45 |
| 4/12/23 | 13.95 | 4456.60 | 4452.50 | 9.38 | 4446.5 | 4444.5 | 19.46 |
| 4/13/23 | 13.95 | 4456.60 | 4452.50 | 9.37 | 4446.5 | 4444.5 | 19.45 |
| 4/14/23 | 13.95 | 4456.60 | 4452.60 | 9.35 | 4446.5 | 4444.5 | 19.46 |
| 4/15/23 | 13.96 | 4456.70 | 4452.60 | 9.34 | 4446.5 | 4444.5 | 19.45 |
| 4/16/23 | 13.96 | 4456.70 | 4452.60 | 9.32 | 4446.5 | 4444.5 | 19.46 |
| 4/17/23 | 13.96 | 4456.70 | 4452.60 | 9.30 | 4446.5 | 4444.5 | 19.45 |
| 4/18/23 | 13.96 | 4456.70 | 4452.60 | 9.29 | 4446.5 | 4444.5 | 19.46 |
| 4/19/23 | 13.97 | 4456.70 | 4452.60 | 9.27 | 4446.5 | 4444.5 | 19.45 |
| 4/20/23 | 13.97 | 4456.70 | 4452.60 | 9.25 | 4446.5 | 4444.5 | 19.46 |
| 4/21/23 | 13.97 | 4456.80 | 4452.60 | 9.24 | 4446.5 | 4444.5 | 19.45 |
| 4/22/23 | 13.97 | 4456.80 | 4452.70 | 9.22 | 4446.5 | 4444.5 | 19.46 |
| 4/23/23 | 13.98 | 4456.80 | 4452.70 | 9.20 | 4446.5 | 4444.5 | 19.45 |
| 4/24/23 | 13.98 | 4456.80 | 4452.70 | 9.19 | 4446.5 | 4444.5 | 19.46 |
| 4/25/23 | 13.98 | 4456.80 | 4452.70 | 9.17 | 4446.5 | 4444.5 | 19.45 |
| 4/26/23 | 13.99 | 4456.80 | 4452.70 | 9.15 | 4446.5 | 4444.5 | 19.46 |
| 4/27/23 | 13.99 | 4456.90 | 4452.70 | 9.14 | 4446.5 | 4444.5 | 19.45 |
| 4/28/23 | 13.99 | 4456.90 | 4452.70 | 9.12 | 4446.5 | 4444.5 | 19.46 |
| 4/29/23 | 13.99 | 4456.90 | 4452.70 | 9.11 | 4446.5 | 4444.5 | 19.45 |
| 4/30/23 | 14.00 | 4456.90 | 4452.80 | 9.09 | 4446.5 | 4444.5 | 19.46 |
| 5/1/23 | 14.00 | 4456.90 | 4452.80 | 9.07 | 4446.5 | 4444.5 | 19.45 |
| 5/2/23 | 14.00 | 4456.90 | 4452.80 | 9.06 | 4446.5 | 4444.5 | 19.46 |

**Appendix E**
**Table 1 Tailings and Pond Elevations for North and South Cells**

| | Year | North Cell | | | South Cell | | |
|---|---|---|---|---|---|---|---|
| Date | Fraction | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) |
| 5/3/23 | 14.00 | 4457.00 | 4452.80 | 9.04 | 4446.5 | 4444.5 | 19.45 |
| 5/4/23 | 14.01 | 4457.00 | 4452.80 | 9.03 | 4446.5 | 4444.5 | 19.46 |
| 5/5/23 | 14.01 | 4457.00 | 4452.80 | 9.01 | 4446.5 | 4444.5 | 19.45 |
| 5/6/23 | 14.01 | 4457.00 | 4452.80 | 9.00 | 4446.5 | 4444.5 | 19.46 |
| 5/7/23 | 14.02 | 4457.00 | 4452.80 | 8.98 | 4446.5 | 4444.5 | 19.45 |
| 5/8/23 | 14.02 | 4457.00 | 4452.90 | 8.97 | 4446.5 | 4444.5 | 19.46 |
| 5/9/23 | 14.02 | 4457.00 | 4452.90 | 8.95 | 4446.5 | 4444.5 | 19.45 |
| 5/10/23 | 14.02 | 4457.10 | 4452.90 | 8.93 | 4446.5 | 4444.5 | 19.46 |
| 5/11/23 | 14.03 | 4457.10 | 4452.90 | 8.92 | 4446.5 | 4444.5 | 19.45 |
| 5/12/23 | 14.03 | 4457.10 | 4452.90 | 8.90 | 4446.5 | 4444.5 | 19.46 |
| 5/13/23 | 14.03 | 4457.10 | 4452.90 | 8.89 | 4446.5 | 4444.5 | 19.45 |
| 5/14/23 | 14.03 | 4457.10 | 4452.90 | 8.87 | 4446.5 | 4444.5 | 19.46 |
| 5/15/23 | 14.04 | 4457.10 | 4452.90 | 8.86 | 4446.5 | 4444.5 | 19.45 |
| 5/16/23 | 14.04 | 4457.20 | 4453.00 | 8.84 | 4446.5 | 4444.5 | 19.46 |
| 5/17/23 | 14.04 | 4457.20 | 4453.00 | 8.83 | 4446.5 | 4444.5 | 19.45 |
| 5/18/23 | 14.05 | 4457.20 | 4453.00 | 8.81 | 4446.5 | 4444.5 | 19.46 |
| 5/19/23 | 14.05 | 4457.20 | 4453.00 | 8.80 | 4446.5 | 4444.5 | 19.45 |
| 5/20/23 | 14.05 | 4457.20 | 4453.00 | 8.78 | 4446.5 | 4444.5 | 19.46 |
| 5/21/23 | 14.05 | 4457.20 | 4453.00 | 8.77 | 4446.5 | 4444.5 | 19.45 |
| 5/22/23 | 14.06 | 4457.20 | 4453.00 | 8.75 | 4446.5 | 4444.5 | 19.46 |
| 5/23/23 | 14.06 | 4457.30 | 4453.00 | 8.74 | 4446.5 | 4444.5 | 19.45 |
| 5/24/23 | 14.06 | 4457.30 | 4453.10 | 8.72 | 4446.5 | 4444.5 | 19.46 |
| 5/25/23 | 14.06 | 4457.30 | 4453.10 | 8.71 | 4446.5 | 4444.5 | 19.45 |
| 5/26/23 | 14.07 | 4457.30 | 4453.10 | 8.69 | 4446.5 | 4444.5 | 19.46 |
| 5/27/23 | 14.07 | 4457.30 | 4453.10 | 8.68 | 4446.5 | 4444.5 | 19.45 |
| 5/28/23 | 14.07 | 4457.30 | 4453.10 | 8.66 | 4446.5 | 4444.5 | 19.46 |
| 5/29/23 | 14.08 | 4457.40 | 4453.10 | 8.64 | 4446.5 | 4444.5 | 19.45 |
| 5/30/23 | 14.08 | 4457.40 | 4453.10 | 8.63 | 4446.5 | 4444.5 | 19.46 |
| 5/31/23 | 14.08 | 4457.40 | 4453.10 | 8.61 | 4446.5 | 4444.5 | 19.45 |
| 6/1/23 | 14.08 | 4457.40 | 4453.20 | 8.60 | 4446.5 | 4444.5 | 19.46 |
| 6/2/23 | 14.09 | 4457.40 | 4453.20 | 8.59 | 4446.5 | 4444.5 | 19.46 |
| 6/3/23 | 14.09 | 4457.40 | 4453.20 | 8.58 | 4446.5 | 4444.5 | 19.47 |
| 6/4/23 | 14.09 | 4457.40 | 4453.20 | 8.56 | 4446.5 | 4444.5 | 19.46 |
| 6/5/23 | 14.09 | 4457.40 | 4453.20 | 8.55 | 4446.5 | 4444.5 | 19.47 |
| 6/6/23 | 14.10 | 4457.50 | 4453.20 | 8.54 | 4446.5 | 4444.5 | 19.46 |
| 6/7/23 | 14.10 | 4457.50 | 4453.20 | 8.53 | 4446.5 | 4444.5 | 19.47 |
| 6/8/23 | 14.10 | 4457.50 | 4453.20 | 8.52 | 4446.5 | 4444.5 | 19.46 |
| 6/9/23 | 14.11 | 4457.50 | 4453.30 | 8.51 | 4446.5 | 4444.5 | 19.47 |
| 6/10/23 | 14.11 | 4457.50 | 4453.30 | 8.50 | 4446.5 | 4444.5 | 19.46 |
| 6/11/23 | 14.11 | 4457.50 | 4453.30 | 8.48 | 4446.5 | 4444.5 | 19.47 |
| 6/12/23 | 14.11 | 4457.50 | 4453.30 | 8.47 | 4446.5 | 4444.5 | 19.46 |
| 6/13/23 | 14.12 | 4457.50 | 4453.30 | 8.46 | 4446.5 | 4444.5 | 19.47 |
| 6/14/23 | 14.12 | 4457.60 | 4453.30 | 8.45 | 4446.5 | 4444.5 | 19.46 |
| 6/15/23 | 14.12 | 4457.60 | 4453.30 | 8.44 | 4446.5 | 4444.5 | 19.47 |
| 6/16/23 | 14.13 | 4457.60 | 4453.30 | 8.43 | 4446.5 | 4444.5 | 19.46 |
| 6/17/23 | 14.13 | 4457.60 | 4453.40 | 8.41 | 4446.5 | 4444.5 | 19.47 |
| 6/18/23 | 14.13 | 4457.60 | 4453.40 | 8.40 | 4446.5 | 4444.5 | 19.46 |
| 6/19/23 | 14.13 | 4457.60 | 4453.40 | 8.39 | 4446.5 | 4444.5 | 19.47 |
| 6/20/23 | 14.14 | 4457.60 | 4453.40 | 8.38 | 4446.5 | 4444.5 | 19.46 |
| 6/21/23 | 14.14 | 4457.60 | 4453.40 | 8.37 | 4446.5 | 4444.5 | 19.47 |
| 6/22/23 | 14.14 | 4457.60 | 4453.40 | 8.36 | 4446.5 | 4444.5 | 19.46 |
| 6/23/23 | 14.14 | 4457.70 | 4453.40 | 8.35 | 4446.5 | 4444.5 | 19.47 |
| 6/24/23 | 14.15 | 4457.70 | 4453.50 | 8.33 | 4446.5 | 4444.5 | 19.46 |
| 6/25/23 | 14.15 | 4457.70 | 4453.50 | 8.32 | 4446.5 | 4444.5 | 19.47 |
| 6/26/23 | 14.15 | 4457.70 | 4453.50 | 8.31 | 4446.5 | 4444.5 | 19.46 |

**Appendix E**
**Table 1  Tailings and Pond Elevations for North and South Cells**

|  | Year | North Cell |  |  | South Cell |  |  |
|---|---|---|---|---|---|---|---|
| Date | Fraction | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) |
| 6/27/23 | 14.16 | 4457.70 | 4453.50 | 8.30 | 4446.5 | 4444.5 | 19.47 |
| 6/28/23 | 14.16 | 4457.70 | 4453.50 | 8.29 | 4446.5 | 4444.5 | 19.46 |
| 6/29/23 | 14.16 | 4457.70 | 4453.50 | 8.28 | 4446.5 | 4444.5 | 19.47 |
| 6/30/23 | 14.16 | 4457.70 | 4453.50 | 8.27 | 4446.5 | 4444.5 | 19.46 |
| 7/1/23 | 14.17 | 4457.70 | 4453.50 | 8.25 | 4446.5 | 4444.5 | 19.47 |
| 7/2/23 | 14.17 | 4457.80 | 4453.60 | 8.25 | 4446.5 | 4444.5 | 19.46 |
| 7/3/23 | 14.17 | 4457.80 | 4453.60 | 8.25 | 4446.5 | 4444.5 | 19.48 |
| 7/4/23 | 14.17 | 4457.80 | 4453.60 | 8.24 | 4446.5 | 4444.5 | 19.46 |
| 7/5/23 | 14.18 | 4457.80 | 4453.60 | 8.24 | 4446.5 | 4444.5 | 19.48 |
| 7/6/23 | 14.18 | 4457.80 | 4453.60 | 8.23 | 4446.5 | 4444.5 | 19.46 |
| 7/7/23 | 14.18 | 4457.80 | 4453.60 | 8.23 | 4446.5 | 4444.5 | 19.48 |
| 7/8/23 | 14.19 | 4457.80 | 4453.60 | 8.23 | 4446.5 | 4444.5 | 19.46 |
| 7/9/23 | 14.19 | 4457.80 | 4453.60 | 8.22 | 4446.5 | 4444.5 | 19.48 |
| 7/10/23 | 14.19 | 4457.80 | 4453.70 | 8.22 | 4446.5 | 4444.5 | 19.46 |
| 7/11/23 | 14.19 | 4457.80 | 4453.70 | 8.21 | 4446.5 | 4444.5 | 19.48 |
| 7/12/23 | 14.20 | 4457.80 | 4453.70 | 8.21 | 4446.5 | 4444.5 | 19.46 |
| 7/13/23 | 14.20 | 4457.80 | 4453.70 | 8.20 | 4446.5 | 4444.5 | 19.48 |
| 7/14/23 | 14.20 | 4457.80 | 4453.70 | 8.20 | 4446.5 | 4444.5 | 19.46 |
| 7/15/23 | 14.20 | 4457.80 | 4453.70 | 8.20 | 4446.5 | 4444.5 | 19.48 |
| 7/16/23 | 14.21 | 4457.80 | 4453.70 | 8.19 | 4446.5 | 4444.5 | 19.46 |
| 7/17/23 | 14.21 | 4457.80 | 4453.70 | 8.19 | 4446.5 | 4444.5 | 19.48 |
| 7/18/23 | 14.21 | 4457.80 | 4453.80 | 8.18 | 4446.5 | 4444.5 | 19.46 |
| 7/19/23 | 14.22 | 4457.80 | 4453.80 | 8.18 | 4446.5 | 4444.5 | 19.48 |
| 7/20/23 | 14.22 | 4457.80 | 4453.80 | 8.18 | 4446.5 | 4444.5 | 19.46 |
| 7/21/23 | 14.22 | 4457.80 | 4453.80 | 8.17 | 4446.5 | 4444.5 | 19.48 |
| 7/22/23 | 14.22 | 4457.80 | 4453.80 | 8.17 | 4446.5 | 4444.5 | 19.46 |
| 7/23/23 | 14.23 | 4457.80 | 4453.80 | 8.16 | 4446.5 | 4444.5 | 19.48 |
| 7/24/23 | 14.23 | 4457.80 | 4453.80 | 8.16 | 4446.5 | 4444.5 | 19.46 |
| 7/25/23 | 14.23 | 4457.80 | 4453.80 | 8.16 | 4446.5 | 4444.5 | 19.48 |
| 7/26/23 | 14.23 | 4457.80 | 4453.90 | 8.15 | 4446.5 | 4444.5 | 19.46 |
| 7/27/23 | 14.24 | 4457.90 | 4453.90 | 8.15 | 4446.5 | 4444.5 | 19.48 |
| 7/28/23 | 14.24 | 4457.90 | 4453.90 | 8.14 | 4446.5 | 4444.5 | 19.46 |
| 7/29/23 | 14.24 | 4457.90 | 4453.90 | 8.14 | 4446.5 | 4444.5 | 19.48 |
| 7/30/23 | 14.25 | 4457.90 | 4453.90 | 8.13 | 4446.5 | 4444.5 | 19.46 |
| 7/31/23 | 14.25 | 4457.90 | 4453.90 | 8.13 | 4446.5 | 4444.5 | 19.48 |
| 8/1/23 | 14.25 | 4457.90 | 4453.90 | 8.13 | 4446.5 | 4444.5 | 19.46 |
| 8/2/23 | 14.25 | 4457.90 | 4453.90 | 8.12 | 4446.5 | 4444.5 | 19.49 |
| 8/3/23 | 14.26 | 4457.90 | 4454.00 | 8.12 | 4446.5 | 4444.5 | 19.46 |
| 8/4/23 | 14.26 | 4457.90 | 4454.00 | 8.11 | 4446.5 | 4444.5 | 19.49 |
| 8/5/23 | 14.26 | 4457.90 | 4454.00 | 8.11 | 4446.5 | 4444.5 | 19.46 |
| 8/6/23 | 14.26 | 4457.90 | 4454.00 | 8.10 | 4446.5 | 4444.5 | 19.49 |
| 8/7/23 | 14.27 | 4457.90 | 4454.00 | 8.10 | 4446.5 | 4444.5 | 19.46 |
| 8/8/23 | 14.27 | 4457.90 | 4454.00 | 8.10 | 4446.5 | 4444.5 | 19.49 |
| 8/9/23 | 14.27 | 4457.90 | 4454.00 | 8.09 | 4446.5 | 4444.5 | 19.46 |
| 8/10/23 | 14.28 | 4457.90 | 4454.00 | 8.09 | 4446.5 | 4444.5 | 19.49 |
| 8/11/23 | 14.28 | 4457.90 | 4454.10 | 8.08 | 4446.5 | 4444.5 | 19.46 |
| 8/12/23 | 14.28 | 4457.90 | 4454.10 | 8.08 | 4446.5 | 4444.5 | 19.49 |
| 8/13/23 | 14.28 | 4457.90 | 4454.10 | 8.07 | 4446.5 | 4444.5 | 19.46 |
| 8/14/23 | 14.29 | 4457.90 | 4454.10 | 8.07 | 4446.5 | 4444.5 | 19.49 |
| 8/15/23 | 14.29 | 4457.90 | 4454.10 | 8.07 | 4446.5 | 4444.5 | 19.46 |
| 8/16/23 | 14.29 | 4457.90 | 4454.10 | 8.06 | 4446.5 | 4444.5 | 19.49 |
| 8/17/23 | 14.29 | 4457.90 | 4454.10 | 8.06 | 4446.5 | 4444.5 | 19.46 |
| 8/18/23 | 14.30 | 4457.90 | 4454.10 | 8.05 | 4446.5 | 4444.5 | 19.49 |
| 8/19/23 | 14.30 | 4458.00 | 4454.20 | 8.05 | 4446.5 | 4444.5 | 19.46 |
| 8/20/23 | 14.30 | 4458.00 | 4454.20 | 8.04 | 4446.5 | 4444.5 | 19.49 |

**Appendix E**

**Table 1  Tailings and Pond Elevations for North and South Cells**

| Date | Year Fraction | North Cell | | | South Cell | | |
|---|---|---|---|---|---|---|---|
| | | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) |
| 8/21/23 | 14.31 | 4458.00 | 4454.20 | 8.04 | 4446.5 | 4444.5 | 19.46 |
| 8/22/23 | 14.31 | 4458.00 | 4454.20 | 8.03 | 4446.5 | 4444.5 | 19.49 |
| 8/23/23 | 14.31 | 4458.00 | 4454.20 | 8.03 | 4446.5 | 4444.5 | 19.46 |
| 8/24/23 | 14.31 | 4458.00 | 4454.20 | 8.03 | 4446.5 | 4444.5 | 19.49 |
| 8/25/23 | 14.32 | 4458.00 | 4454.20 | 8.02 | 4446.5 | 4444.5 | 19.46 |
| 8/26/23 | 14.32 | 4458.00 | 4454.20 | 8.02 | 4446.5 | 4444.5 | 19.49 |
| 8/27/23 | 14.32 | 4458.00 | 4454.30 | 8.01 | 4446.5 | 4444.5 | 19.46 |
| 8/28/23 | 14.32 | 4458.00 | 4454.30 | 8.01 | 4446.5 | 4444.5 | 19.49 |
| 8/29/23 | 14.33 | 4458.00 | 4454.30 | 8.00 | 4446.5 | 4444.5 | 19.46 |
| 8/30/23 | 14.33 | 4458.00 | 4454.30 | 8.00 | 4446.5 | 4444.5 | 19.49 |
| 8/31/23 | 14.33 | 4458.00 | 4454.30 | 8.00 | 4446.5 | 4444.5 | 19.46 |
| 9/1/23 | 14.34 | 4458.00 | 4454.30 | 8.02 | 4446.5 | 4444.6 | 19.46 |
| 9/2/23 | 14.34 | 4458.00 | 4454.30 | 8.04 | 4446.6 | 4444.6 | 19.44 |
| 9/3/23 | 14.34 | 4457.90 | 4454.30 | 8.06 | 4446.6 | 4444.6 | 19.43 |
| 9/4/23 | 14.34 | 4457.90 | 4454.30 | 8.08 | 4446.6 | 4444.6 | 19.41 |
| 9/5/23 | 14.35 | 4457.90 | 4454.30 | 8.10 | 4446.6 | 4444.6 | 19.41 |
| 9/6/23 | 14.35 | 4457.90 | 4454.30 | 8.12 | 4446.6 | 4444.6 | 19.39 |
| 9/7/23 | 14.35 | 4457.90 | 4454.30 | 8.14 | 4446.6 | 4444.6 | 19.38 |
| 9/8/23 | 14.36 | 4457.80 | 4454.30 | 8.16 | 4446.6 | 4444.6 | 19.36 |
| 9/9/23 | 14.36 | 4457.80 | 4454.30 | 8.18 | 4446.6 | 4444.7 | 19.36 |
| 9/10/23 | 14.36 | 4457.80 | 4454.30 | 8.20 | 4446.7 | 4444.7 | 19.34 |
| 9/11/23 | 14.36 | 4457.80 | 4454.30 | 8.22 | 4446.7 | 4444.7 | 19.33 |
| 9/12/23 | 14.37 | 4457.80 | 4454.30 | 8.24 | 4446.7 | 4444.7 | 19.31 |
| 9/13/23 | 14.37 | 4457.70 | 4454.30 | 8.26 | 4446.7 | 4444.7 | 19.31 |
| 9/14/23 | 14.37 | 4457.70 | 4454.30 | 8.28 | 4446.7 | 4444.7 | 19.28 |
| 9/15/23 | 14.37 | 4457.70 | 4454.30 | 8.30 | 4446.7 | 4444.7 | 19.28 |
| 9/16/23 | 14.38 | 4457.70 | 4454.30 | 8.32 | 4446.7 | 4444.7 | 19.26 |
| 9/17/23 | 14.38 | 4457.70 | 4454.30 | 8.34 | 4446.7 | 4444.8 | 19.26 |
| 9/18/23 | 14.38 | 4457.60 | 4454.30 | 8.36 | 4446.8 | 4444.8 | 19.23 |
| 9/19/23 | 14.39 | 4457.60 | 4454.30 | 8.38 | 4446.8 | 4444.8 | 19.23 |
| 9/20/23 | 14.39 | 4457.60 | 4454.30 | 8.40 | 4446.8 | 4444.8 | 19.21 |
| 9/21/23 | 14.39 | 4457.60 | 4454.30 | 8.42 | 4446.8 | 4444.8 | 19.20 |
| 9/22/23 | 14.39 | 4457.60 | 4454.30 | 8.44 | 4446.8 | 4444.8 | 19.18 |
| 9/23/23 | 14.40 | 4457.50 | 4454.30 | 8.46 | 4446.8 | 4444.8 | 19.18 |
| 9/24/23 | 14.40 | 4457.50 | 4454.30 | 8.48 | 4446.8 | 4444.9 | 19.16 |
| 9/25/23 | 14.40 | 4457.50 | 4454.30 | 8.50 | 4446.8 | 4444.9 | 19.15 |
| 9/26/23 | 14.40 | 4457.50 | 4454.30 | 8.52 | 4446.9 | 4444.9 | 19.13 |
| 9/27/23 | 14.41 | 4457.50 | 4454.30 | 8.54 | 4446.9 | 4444.9 | 19.13 |
| 9/28/23 | 14.41 | 4457.40 | 4454.30 | 8.56 | 4446.9 | 4444.9 | 19.11 |
| 9/29/23 | 14.41 | 4457.40 | 4454.30 | 8.58 | 4446.9 | 4444.9 | 19.10 |
| 9/30/23 | 14.42 | 4457.40 | 4454.30 | 8.60 | 4446.9 | 4444.9 | 19.08 |
| 10/1/23 | 14.42 | 4457.40 | 4454.30 | 8.63 | 4446.9 | 4444.9 | 19.08 |
| 10/2/23 | 14.42 | 4457.40 | 4454.30 | 8.64 | 4446.9 | 4445.0 | 19.05 |
| 10/3/23 | 14.42 | 4457.30 | 4454.30 | 8.66 | 4447.0 | 4445.0 | 19.04 |
| 10/4/23 | 14.43 | 4457.30 | 4454.30 | 8.68 | 4447.0 | 4445.0 | 19.03 |
| 10/5/23 | 14.43 | 4457.30 | 4454.30 | 8.69 | 4447.0 | 4445.0 | 19.02 |
| 10/6/23 | 14.43 | 4457.30 | 4454.30 | 8.71 | 4447.0 | 4445.0 | 19.00 |
| 10/7/23 | 14.43 | 4457.30 | 4454.30 | 8.73 | 4447.0 | 4445.0 | 18.99 |
| 10/8/23 | 14.44 | 4457.30 | 4454.30 | 8.74 | 4447.0 | 4445.0 | 18.98 |
| 10/9/23 | 14.44 | 4457.20 | 4454.30 | 8.76 | 4447.0 | 4445.0 | 18.97 |
| 10/10/23 | 14.44 | 4457.20 | 4454.30 | 8.78 | 4447.1 | 4445.1 | 18.95 |
| 10/11/23 | 14.45 | 4457.20 | 4454.30 | 8.80 | 4447.1 | 4445.1 | 18.94 |
| 10/12/23 | 14.45 | 4457.20 | 4454.30 | 8.81 | 4447.1 | 4445.1 | 18.92 |
| 10/13/23 | 14.45 | 4457.20 | 4454.30 | 8.83 | 4447.1 | 4445.1 | 18.92 |
| 10/14/23 | 14.45 | 4457.20 | 4454.30 | 8.85 | 4447.1 | 4445.1 | 18.90 |

**Appendix E**
**Table 1  Tailings and Pond Elevations for North and South Cells**

| Date | Year Fraction | North Cell | | | South Cell | | |
|---|---|---|---|---|---|---|---|
| | | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) |
| 10/15/23 | 14.46 | 4457.10 | 4454.30 | 8.86 | 4447.1 | 4445.1 | 18.89 |
| 10/16/23 | 14.46 | 4457.10 | 4454.30 | 8.88 | 4447.1 | 4445.1 | 18.87 |
| 10/17/23 | 14.46 | 4457.10 | 4454.30 | 8.90 | 4447.1 | 4445.1 | 18.87 |
| 10/18/23 | 14.46 | 4457.10 | 4454.30 | 8.91 | 4447.2 | 4445.2 | 18.85 |
| 10/19/23 | 14.47 | 4457.10 | 4454.30 | 8.93 | 4447.2 | 4445.2 | 18.84 |
| 10/20/23 | 14.47 | 4457.10 | 4454.30 | 8.95 | 4447.2 | 4445.2 | 18.82 |
| 10/21/23 | 14.47 | 4457.00 | 4454.30 | 8.96 | 4447.2 | 4445.2 | 18.81 |
| 10/22/23 | 14.48 | 4457.00 | 4454.30 | 8.98 | 4447.2 | 4445.2 | 18.80 |
| 10/23/23 | 14.48 | 4457.00 | 4454.30 | 9.00 | 4447.2 | 4445.2 | 18.79 |
| 10/24/23 | 14.48 | 4457.00 | 4454.30 | 9.02 | 4447.2 | 4445.2 | 18.77 |
| 10/25/23 | 14.48 | 4457.00 | 4454.30 | 9.03 | 4447.2 | 4445.2 | 18.76 |
| 10/26/23 | 14.49 | 4457.00 | 4454.30 | 9.05 | 4447.3 | 4445.3 | 18.75 |
| 10/27/23 | 14.49 | 4456.90 | 4454.30 | 9.07 | 4447.3 | 4445.3 | 18.74 |
| 10/28/23 | 14.49 | 4456.90 | 4454.30 | 9.08 | 4447.3 | 4445.3 | 18.72 |
| 10/29/23 | 14.49 | 4456.90 | 4454.30 | 9.10 | 4447.3 | 4445.3 | 18.71 |
| 10/30/23 | 14.50 | 4456.90 | 4454.30 | 9.12 | 4447.3 | 4445.3 | 18.69 |
| 10/31/23 | 14.50 | 4456.90 | 4454.30 | 9.13 | 4447.3 | 4445.3 | 18.69 |
| 11/1/23 | 14.50 | 4456.80 | 4454.30 | 9.15 | 4447.3 | 4445.3 | 18.67 |
| 11/2/23 | 14.51 | 4456.80 | 4454.30 | 9.16 | 4447.3 | 4445.3 | 18.66 |
| 11/3/23 | 14.51 | 4456.80 | 4454.30 | 9.18 | 4447.4 | 4445.4 | 18.64 |
| 11/4/23 | 14.51 | 4456.80 | 4454.30 | 9.19 | 4447.4 | 4445.4 | 18.63 |
| 11/5/23 | 14.51 | 4456.80 | 4454.30 | 9.20 | 4447.4 | 4445.4 | 18.62 |
| 11/6/23 | 14.52 | 4456.80 | 4454.30 | 9.22 | 4447.4 | 4445.4 | 18.61 |
| 11/7/23 | 14.52 | 4456.80 | 4454.30 | 9.23 | 4447.4 | 4445.4 | 18.59 |
| 11/8/23 | 14.52 | 4456.80 | 4454.30 | 9.24 | 4447.4 | 4445.4 | 18.58 |
| 11/9/23 | 14.52 | 4456.70 | 4454.30 | 9.25 | 4447.4 | 4445.4 | 18.57 |
| 11/10/23 | 14.53 | 4456.70 | 4454.30 | 9.27 | 4447.4 | 4445.5 | 18.55 |
| 11/11/23 | 14.53 | 4456.70 | 4454.30 | 9.28 | 4447.5 | 4445.5 | 18.54 |
| 11/12/23 | 14.53 | 4456.70 | 4454.30 | 9.29 | 4447.5 | 4445.5 | 18.53 |
| 11/13/23 | 14.54 | 4456.70 | 4454.30 | 9.31 | 4447.5 | 4445.5 | 18.52 |
| 11/14/23 | 14.54 | 4456.70 | 4454.30 | 9.32 | 4447.5 | 4445.5 | 18.50 |
| 11/15/23 | 14.54 | 4456.70 | 4454.30 | 9.33 | 4447.5 | 4445.5 | 18.49 |
| 11/16/23 | 14.54 | 4456.70 | 4454.30 | 9.35 | 4447.5 | 4445.5 | 18.48 |
| 11/17/23 | 14.55 | 4456.60 | 4454.30 | 9.36 | 4447.5 | 4445.5 | 18.46 |
| 11/18/23 | 14.55 | 4456.60 | 4454.30 | 9.37 | 4447.5 | 4445.6 | 18.45 |
| 11/19/23 | 14.55 | 4456.60 | 4454.30 | 9.38 | 4447.6 | 4445.6 | 18.44 |
| 11/20/23 | 14.55 | 4456.60 | 4454.30 | 9.40 | 4447.6 | 4445.6 | 18.43 |
| 11/21/23 | 14.56 | 4456.60 | 4454.30 | 9.41 | 4447.6 | 4445.6 | 18.41 |
| 11/22/23 | 14.56 | 4456.60 | 4454.30 | 9.42 | 4447.6 | 4445.6 | 18.40 |
| 11/23/23 | 14.56 | 4456.60 | 4454.30 | 9.44 | 4447.6 | 4445.6 | 18.39 |
| 11/24/23 | 14.57 | 4456.60 | 4454.30 | 9.45 | 4447.6 | 4445.6 | 18.38 |
| 11/25/23 | 14.57 | 4456.50 | 4454.30 | 9.46 | 4447.6 | 4445.6 | 18.36 |
| 11/26/23 | 14.57 | 4456.50 | 4454.30 | 9.48 | 4447.6 | 4445.7 | 18.35 |
| 11/27/23 | 14.57 | 4456.50 | 4454.30 | 9.49 | 4447.7 | 4445.7 | 18.34 |
| 11/28/23 | 14.58 | 4456.50 | 4454.30 | 9.50 | 4447.7 | 4445.7 | 18.33 |
| 11/29/23 | 14.58 | 4456.50 | 4454.30 | 9.51 | 4447.7 | 4445.7 | 18.31 |
| 11/30/23 | 14.58 | 4456.50 | 4454.30 | 9.53 | 4447.7 | 4445.7 | 18.30 |
| 12/1/23 | 14.59 | 4456.50 | 4454.30 | 9.54 | 4447.7 | 4445.7 | 18.29 |
| 12/2/23 | 14.59 | 4456.50 | 4454.30 | 9.55 | 4447.7 | 4445.7 | 18.27 |
| 12/3/23 | 14.59 | 4456.40 | 4454.30 | 9.56 | 4447.7 | 4445.7 | 18.25 |
| 12/4/23 | 14.59 | 4456.40 | 4454.30 | 9.57 | 4447.8 | 4445.8 | 18.24 |
| 12/5/23 | 14.60 | 4456.40 | 4454.30 | 9.58 | 4447.8 | 4445.8 | 18.22 |
| 12/6/23 | 14.60 | 4456.40 | 4454.30 | 9.58 | 4447.8 | 4445.8 | 18.21 |
| 12/7/23 | 14.60 | 4456.40 | 4454.30 | 9.59 | 4447.8 | 4445.8 | 18.19 |
| 12/8/23 | 14.60 | 4456.40 | 4454.30 | 9.60 | 4447.8 | 4445.8 | 18.17 |

**Appendix E**
**Table 1  Tailings and Pond Elevations for North and South Cells**

| Date | Year Fraction | North Cell | | | South Cell | | |
|---|---|---|---|---|---|---|---|
| | | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) |
| 12/9/23 | 14.61 | 4456.40 | 4454.30 | 9.61 | 4447.8 | 4445.8 | 18.16 |
| 12/10/23 | 14.61 | 4456.40 | 4454.30 | 9.62 | 4447.9 | 4445.8 | 18.14 |
| 12/11/23 | 14.61 | 4456.40 | 4454.30 | 9.63 | 4447.9 | 4445.8 | 18.12 |
| 12/12/23 | 14.62 | 4456.40 | 4454.30 | 9.64 | 4447.9 | 4445.9 | 18.11 |
| 12/13/23 | 14.62 | 4456.40 | 4454.30 | 9.65 | 4447.9 | 4445.9 | 18.09 |
| 12/14/23 | 14.62 | 4456.30 | 4454.30 | 9.65 | 4447.9 | 4445.9 | 18.08 |
| 12/15/23 | 14.62 | 4456.30 | 4454.30 | 9.66 | 4447.9 | 4445.9 | 18.06 |
| 12/16/23 | 14.63 | 4456.30 | 4454.30 | 9.67 | 4448.0 | 4445.9 | 18.04 |
| 12/17/23 | 14.63 | 4456.30 | 4454.30 | 9.68 | 4448.0 | 4445.9 | 18.03 |
| 12/18/23 | 14.63 | 4456.30 | 4454.30 | 9.69 | 4448.0 | 4445.9 | 18.01 |
| 12/19/23 | 14.63 | 4456.30 | 4454.30 | 9.70 | 4448.0 | 4445.9 | 17.99 |
| 12/20/23 | 14.64 | 4456.30 | 4454.30 | 9.71 | 4448.0 | 4446.0 | 17.98 |
| 12/21/23 | 14.64 | 4456.30 | 4454.30 | 9.70 | 4448.0 | 4446.0 | 17.96 |
| 12/22/23 | 14.64 | 4456.30 | 4454.30 | 9.71 | 4448.1 | 4446.0 | 17.95 |
| 12/23/23 | 14.65 | 4456.30 | 4454.30 | 9.70 | 4448.1 | 4446.0 | 17.93 |
| 12/24/23 | 14.65 | 4456.30 | 4454.30 | 9.71 | 4448.1 | 4446.0 | 17.91 |
| 12/25/23 | 14.65 | 4456.30 | 4454.30 | 9.70 | 4448.1 | 4446.0 | 17.90 |
| 12/26/23 | 14.65 | 4456.30 | 4454.30 | 9.71 | 4448.1 | 4446.0 | 17.88 |
| 12/27/23 | 14.66 | 4456.30 | 4454.30 | 9.70 | 4448.1 | 4446.1 | 17.86 |
| 12/28/23 | 14.66 | 4456.30 | 4454.30 | 9.71 | 4448.2 | 4446.1 | 17.85 |
| 12/29/23 | 14.66 | 4456.30 | 4454.30 | 9.70 | 4448.2 | 4446.1 | 17.83 |
| 12/30/23 | 14.66 | 4456.30 | 4454.30 | 9.71 | 4448.2 | 4446.1 | 17.82 |
| 12/31/23 | 14.67 | 4456.30 | 4454.30 | 9.70 | 4448.2 | 4446.1 | 17.80 |
| 1/1/24 | 14.67 | 4456.30 | 4454.30 | 9.71 | 4448.2 | 4446.1 | 17.78 |
| 1/2/24 | 14.67 | 4456.30 | 4454.30 | 9.70 | 4448.2 | 4446.1 | 17.77 |
| 1/3/24 | 14.68 | 4456.30 | 4454.30 | 9.70 | 4448.3 | 4446.1 | 17.75 |
| 1/4/24 | 14.68 | 4456.30 | 4454.30 | 9.70 | 4448.3 | 4446.2 | 17.73 |
| 1/5/24 | 14.68 | 4456.30 | 4454.30 | 9.70 | 4448.3 | 4446.2 | 17.71 |
| 1/6/24 | 14.68 | 4456.30 | 4454.30 | 9.70 | 4448.3 | 4446.2 | 17.69 |
| 1/7/24 | 14.69 | 4456.30 | 4454.30 | 9.70 | 4448.3 | 4446.2 | 17.67 |
| 1/8/24 | 14.69 | 4456.30 | 4454.30 | 9.70 | 4448.3 | 4446.2 | 17.66 |
| 1/9/24 | 14.69 | 4456.30 | 4454.30 | 9.70 | 4448.4 | 4446.2 | 17.64 |
| 1/10/24 | 14.69 | 4456.30 | 4454.30 | 9.70 | 4448.4 | 4446.2 | 17.62 |
| 1/11/24 | 14.70 | 4456.30 | 4454.30 | 9.70 | 4448.4 | 4446.2 | 17.60 |
| 1/12/24 | 14.70 | 4456.30 | 4454.30 | 9.70 | 4448.4 | 4446.3 | 17.58 |
| 1/13/24 | 14.70 | 4456.30 | 4454.30 | 9.70 | 4448.4 | 4446.3 | 17.56 |
| 1/14/24 | 14.71 | 4456.30 | 4454.30 | 9.70 | 4448.5 | 4446.3 | 17.55 |
| 1/15/24 | 14.71 | 4456.30 | 4454.30 | 9.70 | 4448.5 | 4446.3 | 17.53 |
| 1/16/24 | 14.71 | 4456.30 | 4454.30 | 9.70 | 4448.5 | 4446.3 | 17.51 |
| 1/17/24 | 14.71 | 4456.30 | 4454.30 | 9.70 | 4448.5 | 4446.3 | 17.49 |
| 1/18/24 | 14.72 | 4456.30 | 4454.30 | 9.70 | 4448.5 | 4446.3 | 17.47 |
| 1/19/24 | 14.72 | 4456.30 | 4454.30 | 9.70 | 4448.5 | 4446.3 | 17.45 |
| 1/20/24 | 14.72 | 4456.30 | 4454.30 | 9.70 | 4448.6 | 4446.4 | 17.44 |
| 1/21/24 | 14.72 | 4456.30 | 4454.30 | 9.70 | 4448.6 | 4446.4 | 17.42 |
| 1/22/24 | 14.73 | 4456.30 | 4454.30 | 9.70 | 4448.6 | 4446.4 | 17.40 |
| 1/23/24 | 14.73 | 4456.30 | 4454.30 | 9.70 | 4448.6 | 4446.4 | 17.38 |
| 1/24/24 | 14.73 | 4456.30 | 4454.30 | 9.70 | 4448.6 | 4446.4 | 17.36 |
| 1/25/24 | 14.74 | 4456.30 | 4454.30 | 9.70 | 4448.7 | 4446.4 | 17.34 |
| 1/26/24 | 14.74 | 4456.30 | 4454.30 | 9.70 | 4448.7 | 4446.4 | 17.33 |
| 1/27/24 | 14.74 | 4456.30 | 4454.30 | 9.70 | 4448.7 | 4446.4 | 17.31 |
| 1/28/24 | 14.74 | 4456.30 | 4454.30 | 9.70 | 4448.7 | 4446.5 | 17.29 |
| 1/29/24 | 14.75 | 4456.30 | 4454.30 | 9.70 | 4448.7 | 4446.5 | 17.27 |
| 1/30/24 | 14.75 | 4456.30 | 4454.30 | 9.70 | 4448.7 | 4446.5 | 17.25 |
| 1/31/24 | 14.75 | 4456.30 | 4454.30 | 9.70 | 4448.8 | 4446.5 | 17.24 |
| 2/1/24 | 14.75 | 4456.30 | 4454.30 | 9.70 | 4448.8 | 4446.5 | 17.22 |

**Appendix E**
**Table 1 Tailings and Pond Elevations for North and South Cells**

| Date | Year Fraction | North Cell | | | South Cell | | |
|---|---|---|---|---|---|---|---|
| | | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) |
| 2/2/24 | 14.76 | 4456.30 | 4454.30 | 9.70 | 4448.8 | 4446.5 | 17.20 |
| 2/3/24 | 14.76 | 4456.30 | 4454.30 | 9.70 | 4448.8 | 4446.5 | 17.18 |
| 2/4/24 | 14.76 | 4456.30 | 4454.30 | 9.70 | 4448.8 | 4446.5 | 17.16 |
| 2/5/24 | 14.77 | 4456.30 | 4454.30 | 9.70 | 4448.9 | 4446.6 | 17.14 |
| 2/6/24 | 14.77 | 4456.30 | 4454.30 | 9.70 | 4448.9 | 4446.6 | 17.12 |
| 2/7/24 | 14.77 | 4456.30 | 4454.30 | 9.70 | 4448.9 | 4446.6 | 17.11 |
| 2/8/24 | 14.77 | 4456.30 | 4454.30 | 9.70 | 4448.9 | 4446.6 | 17.09 |
| 2/9/24 | 14.78 | 4456.30 | 4454.30 | 9.70 | 4448.9 | 4446.6 | 17.07 |
| 2/10/24 | 14.78 | 4456.30 | 4454.30 | 9.70 | 4449.0 | 4446.6 | 17.05 |
| 2/11/24 | 14.78 | 4456.30 | 4454.30 | 9.70 | 4449.0 | 4446.6 | 17.03 |
| 2/12/24 | 14.78 | 4456.30 | 4454.30 | 9.70 | 4449.0 | 4446.7 | 17.01 |
| 2/13/24 | 14.79 | 4456.30 | 4454.30 | 9.70 | 4449.0 | 4446.7 | 16.99 |
| 2/14/24 | 14.79 | 4456.30 | 4454.30 | 9.70 | 4449.0 | 4446.7 | 16.98 |
| 2/15/24 | 14.79 | 4456.30 | 4454.30 | 9.70 | 4449.0 | 4446.7 | 16.96 |
| 2/16/24 | 14.80 | 4456.30 | 4454.30 | 9.70 | 4449.1 | 4446.7 | 16.94 |
| 2/17/24 | 14.80 | 4456.30 | 4454.30 | 9.70 | 4449.1 | 4446.7 | 16.92 |
| 2/18/24 | 14.80 | 4456.30 | 4454.30 | 9.70 | 4449.1 | 4446.7 | 16.90 |
| 2/19/24 | 14.80 | 4456.30 | 4454.30 | 9.70 | 4449.1 | 4446.7 | 16.88 |
| 2/20/24 | 14.81 | 4456.30 | 4454.30 | 9.70 | 4449.1 | 4446.8 | 16.86 |
| 2/21/24 | 14.81 | 4456.30 | 4454.30 | 9.70 | 4449.2 | 4446.8 | 16.84 |
| 2/22/24 | 14.81 | 4456.30 | 4454.30 | 9.70 | 4449.2 | 4446.8 | 16.83 |
| 2/23/24 | 14.82 | 4456.30 | 4454.30 | 9.70 | 4449.2 | 4446.8 | 16.81 |
| 2/24/24 | 14.82 | 4456.30 | 4454.30 | 9.70 | 4449.2 | 4446.8 | 16.79 |
| 2/25/24 | 14.82 | 4456.30 | 4454.30 | 9.70 | 4449.2 | 4446.8 | 16.77 |
| 2/26/24 | 14.82 | 4456.30 | 4454.30 | 9.70 | 4449.2 | 4446.8 | 16.75 |
| 2/27/24 | 14.83 | 4456.30 | 4454.30 | 9.70 | 4449.3 | 4446.8 | 16.73 |
| 2/28/24 | 14.83 | 4456.30 | 4454.30 | 9.70 | 4449.3 | 4446.9 | 16.71 |
| 2/29/24 | 14.83 | 4456.30 | 4454.30 | 9.70 | 4449.3 | 4446.9 | 16.70 |
| 3/1/24 | 14.83 | 4456.30 | 4454.30 | 9.70 | 4449.3 | 4446.9 | 16.68 |
| 3/2/24 | 14.84 | 4456.30 | 4454.30 | 9.70 | 4449.3 | 4446.9 | 16.66 |
| 3/3/24 | 14.84 | 4456.30 | 4454.30 | 9.70 | 4449.4 | 4446.9 | 16.64 |
| 3/4/24 | 14.84 | 4456.30 | 4454.30 | 9.71 | 4449.4 | 4446.9 | 16.62 |
| 3/5/24 | 14.85 | 4456.30 | 4454.30 | 9.70 | 4449.4 | 4446.9 | 16.60 |
| 3/6/24 | 14.85 | 4456.30 | 4454.30 | 9.71 | 4449.4 | 4446.9 | 16.58 |
| 3/7/24 | 14.85 | 4456.30 | 4454.30 | 9.70 | 4449.4 | 4447.0 | 16.56 |
| 3/8/24 | 14.85 | 4456.30 | 4454.30 | 9.71 | 4449.5 | 4447.0 | 16.54 |
| 3/9/24 | 14.86 | 4456.30 | 4454.30 | 9.70 | 4449.5 | 4447.0 | 16.52 |
| 3/10/24 | 14.86 | 4456.30 | 4454.30 | 9.71 | 4449.5 | 4447.0 | 16.50 |
| 3/11/24 | 14.86 | 4456.30 | 4454.30 | 9.70 | 4449.5 | 4447.0 | 16.48 |
| 3/12/24 | 14.86 | 4456.30 | 4454.30 | 9.71 | 4449.5 | 4447.0 | 16.46 |
| 3/13/24 | 14.87 | 4456.30 | 4454.30 | 9.70 | 4449.6 | 4447.0 | 16.45 |
| 3/14/24 | 14.87 | 4456.30 | 4454.30 | 9.71 | 4449.6 | 4447.0 | 16.43 |
| 3/15/24 | 14.87 | 4456.30 | 4454.30 | 9.70 | 4449.6 | 4447.1 | 16.41 |
| 3/16/24 | 14.88 | 4456.30 | 4454.30 | 9.71 | 4449.6 | 4447.1 | 16.39 |
| 3/17/24 | 14.88 | 4456.30 | 4454.30 | 9.70 | 4449.6 | 4447.1 | 16.37 |
| 3/18/24 | 14.88 | 4456.30 | 4454.30 | 9.71 | 4449.7 | 4447.1 | 16.35 |
| 3/19/24 | 14.88 | 4456.30 | 4454.30 | 9.70 | 4449.7 | 4447.1 | 16.33 |
| 3/20/24 | 14.89 | 4456.30 | 4454.30 | 9.71 | 4449.7 | 4447.1 | 16.31 |
| 3/21/24 | 14.89 | 4456.30 | 4454.30 | 9.70 | 4449.7 | 4447.1 | 16.29 |
| 3/22/24 | 14.89 | 4456.30 | 4454.30 | 9.71 | 4449.7 | 4447.1 | 16.27 |
| 3/23/24 | 14.89 | 4456.30 | 4454.30 | 9.70 | 4449.7 | 4447.2 | 16.25 |
| 3/24/24 | 14.90 | 4456.30 | 4454.30 | 9.71 | 4449.8 | 4447.2 | 16.23 |
| 3/25/24 | 14.90 | 4456.30 | 4454.30 | 9.70 | 4449.8 | 4447.2 | 16.21 |
| 3/26/24 | 14.90 | 4456.30 | 4454.30 | 9.71 | 4449.8 | 4447.2 | 16.19 |
| 3/27/24 | 14.91 | 4456.30 | 4454.30 | 9.70 | 4449.8 | 4447.2 | 16.17 |

**Appendix E**

**Table 1 Tailings and Pond Elevations for North and South Cells**

| Date | Year Fraction | North Cell | | | South Cell | | |
|---|---|---|---|---|---|---|---|
| | | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) |
| 3/28/24 | 14.91 | 4456.30 | 4454.30 | 9.71 | 4449.8 | 4447.2 | 16.15 |
| 3/29/24 | 14.91 | 4456.30 | 4454.30 | 9.70 | 4449.9 | 4447.2 | 16.14 |
| 3/30/24 | 14.91 | 4456.30 | 4454.30 | 9.71 | 4449.9 | 4447.3 | 16.12 |
| 3/31/24 | 14.92 | 4456.30 | 4454.30 | 9.70 | 4449.9 | 4447.3 | 16.10 |
| 4/1/24 | 14.92 | 4456.30 | 4454.30 | 9.71 | 4449.9 | 4447.3 | 16.08 |
| 4/2/24 | 14.92 | 4456.30 | 4454.30 | 9.70 | 4449.9 | 4447.3 | 16.06 |
| 4/3/24 | 14.92 | 4456.30 | 4454.30 | 9.71 | 4450.0 | 4447.3 | 16.04 |
| 4/4/24 | 14.93 | 4456.30 | 4454.30 | 9.70 | 4450.0 | 4447.3 | 16.03 |
| 4/5/24 | 14.93 | 4456.30 | 4454.30 | 9.71 | 4450.0 | 4447.3 | 16.01 |
| 4/6/24 | 14.93 | 4456.30 | 4454.30 | 9.70 | 4450.0 | 4447.3 | 16.00 |
| 4/7/24 | 14.94 | 4456.30 | 4454.30 | 9.71 | 4450.0 | 4447.4 | 15.98 |
| 4/8/24 | 14.94 | 4456.30 | 4454.30 | 9.70 | 4450.0 | 4447.4 | 15.96 |
| 4/9/24 | 14.94 | 4456.30 | 4454.30 | 9.71 | 4450.1 | 4447.4 | 15.95 |
| 4/10/24 | 14.94 | 4456.30 | 4454.30 | 9.70 | 4450.1 | 4447.4 | 15.93 |
| 4/11/24 | 14.95 | 4456.30 | 4454.30 | 9.71 | 4450.1 | 4447.4 | 15.92 |
| 4/12/24 | 14.95 | 4456.30 | 4454.30 | 9.70 | 4450.1 | 4447.4 | 15.90 |
| 4/13/24 | 14.95 | 4456.30 | 4454.30 | 9.71 | 4450.1 | 4447.4 | 15.89 |
| 4/14/24 | 14.95 | 4456.30 | 4454.30 | 9.70 | 4450.1 | 4447.4 | 15.87 |
| 4/15/24 | 14.96 | 4456.30 | 4454.30 | 9.71 | 4450.1 | 4447.5 | 15.86 |
| 4/16/24 | 14.96 | 4456.30 | 4454.30 | 9.70 | 4450.2 | 4447.5 | 15.84 |
| 4/17/24 | 14.96 | 4456.30 | 4454.30 | 9.71 | 4450.2 | 4447.5 | 15.82 |
| 4/18/24 | 14.97 | 4456.30 | 4454.30 | 9.70 | 4450.2 | 4447.5 | 15.81 |
| 4/19/24 | 14.97 | 4456.30 | 4454.30 | 9.71 | 4450.2 | 4447.5 | 15.79 |
| 4/20/24 | 14.97 | 4456.30 | 4454.30 | 9.70 | 4450.2 | 4447.5 | 15.78 |
| 4/21/24 | 14.97 | 4456.30 | 4454.30 | 9.71 | 4450.2 | 4447.5 | 15.76 |
| 4/22/24 | 14.98 | 4456.30 | 4454.30 | 9.70 | 4450.3 | 4447.5 | 15.75 |
| 4/23/24 | 14.98 | 4456.30 | 4454.30 | 9.71 | 4450.3 | 4447.6 | 15.73 |
| 4/24/24 | 14.98 | 4456.30 | 4454.30 | 9.70 | 4450.3 | 4447.6 | 15.72 |
| 4/25/24 | 14.98 | 4456.30 | 4454.30 | 9.71 | 4450.3 | 4447.6 | 15.70 |
| 4/26/24 | 14.99 | 4456.30 | 4454.30 | 9.70 | 4450.3 | 4447.6 | 15.68 |
| 4/27/24 | 14.99 | 4456.30 | 4454.30 | 9.71 | 4450.3 | 4447.6 | 15.67 |
| 4/28/24 | 14.99 | 4456.30 | 4454.30 | 9.70 | 4450.3 | 4447.6 | 15.65 |
| 4/29/24 | 15.00 | 4456.30 | 4454.30 | 9.71 | 4450.4 | 4447.6 | 15.64 |
| 4/30/24 | 15.00 | 4456.30 | 4454.30 | 9.70 | 4450.4 | 4447.6 | 15.62 |
| 5/1/24 | 15.00 | 4456.30 | 4454.30 | 9.71 | 4450.4 | 4447.7 | 15.61 |
| 5/2/24 | 15.00 | 4456.30 | 4454.30 | 9.71 | 4450.4 | 4447.7 | 15.59 |
| 5/3/24 | 15.01 | 4456.30 | 4454.30 | 9.71 | 4450.4 | 4447.7 | 15.58 |
| 5/4/24 | 15.01 | 4456.30 | 4454.30 | 9.71 | 4450.4 | 4447.7 | 15.56 |
| 5/5/24 | 15.01 | 4456.30 | 4454.30 | 9.71 | 4450.5 | 4447.7 | 15.55 |
| 5/6/24 | 15.01 | 4456.30 | 4454.30 | 9.71 | 4450.5 | 4447.7 | 15.53 |
| 5/7/24 | 15.02 | 4456.30 | 4454.30 | 9.71 | 4450.5 | 4447.7 | 15.52 |
| 5/8/24 | 15.02 | 4456.30 | 4454.30 | 9.71 | 4450.5 | 4447.7 | 15.51 |
| 5/9/24 | 15.02 | 4456.30 | 4454.30 | 9.71 | 4450.5 | 4447.8 | 15.49 |
| 5/10/24 | 15.03 | 4456.30 | 4454.30 | 9.71 | 4450.5 | 4447.8 | 15.48 |
| 5/11/24 | 15.03 | 4456.30 | 4454.30 | 9.71 | 4450.5 | 4447.8 | 15.46 |
| 5/12/24 | 15.03 | 4456.30 | 4454.30 | 9.71 | 4450.6 | 4447.8 | 15.45 |
| 5/13/24 | 15.03 | 4456.30 | 4454.30 | 9.71 | 4450.6 | 4447.8 | 15.43 |
| 5/14/24 | 15.04 | 4456.30 | 4454.30 | 9.71 | 4450.6 | 4447.8 | 15.42 |
| 5/15/24 | 15.04 | 4456.30 | 4454.30 | 9.71 | 4450.6 | 4447.8 | 15.40 |
| 5/16/24 | 15.04 | 4456.30 | 4454.30 | 9.71 | 4450.6 | 4447.9 | 15.39 |
| 5/17/24 | 15.04 | 4456.30 | 4454.30 | 9.71 | 4450.6 | 4447.9 | 15.38 |
| 5/18/24 | 15.05 | 4456.30 | 4454.30 | 9.71 | 4450.6 | 4447.9 | 15.36 |
| 5/19/24 | 15.05 | 4456.30 | 4454.30 | 9.71 | 4450.7 | 4447.9 | 15.35 |
| 5/20/24 | 15.05 | 4456.30 | 4454.30 | 9.71 | 4450.7 | 4447.9 | 15.33 |
| 5/21/24 | 15.06 | 4456.30 | 4454.30 | 9.71 | 4450.7 | 4447.9 | 15.32 |

**Appendix E**
**Table 1  Tailings and Pond Elevations for North and South Cells**

| Date | Year Fraction | North Cell | | | South Cell | | |
|---|---|---|---|---|---|---|---|
| | | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) |
| 5/22/24 | 15.06 | 4456.30 | 4454.30 | 9.71 | 4450.7 | 4447.9 | 15.30 |
| 5/23/24 | 15.06 | 4456.30 | 4454.30 | 9.71 | 4450.7 | 4447.9 | 15.29 |
| 5/24/24 | 15.06 | 4456.30 | 4454.30 | 9.71 | 4450.7 | 4448.0 | 15.27 |
| 5/25/24 | 15.07 | 4456.30 | 4454.30 | 9.71 | 4450.7 | 4448.0 | 15.26 |
| 5/26/24 | 15.07 | 4456.30 | 4454.30 | 9.71 | 4450.8 | 4448.0 | 15.25 |
| 5/27/24 | 15.07 | 4456.30 | 4454.30 | 9.71 | 4450.8 | 4448.0 | 15.23 |
| 5/28/24 | 15.08 | 4456.30 | 4454.30 | 9.71 | 4450.8 | 4448.0 | 15.22 |
| 5/29/24 | 15.08 | 4456.30 | 4454.30 | 9.71 | 4450.8 | 4448.0 | 15.20 |
| 5/30/24 | 15.08 | 4456.30 | 4454.30 | 9.71 | 4450.8 | 4448.0 | 15.19 |
| 5/31/24 | 15.08 | 4456.30 | 4454.30 | 9.71 | 4450.8 | 4448.0 | 15.17 |
| 6/1/24 | 15.09 | 4456.30 | 4454.30 | 9.71 | 4450.8 | 4448.1 | 15.16 |
| 6/2/24 | 15.09 | 4456.30 | 4454.30 | 9.72 | 4450.9 | 4448.1 | 15.15 |
| 6/3/24 | 15.09 | 4456.30 | 4454.30 | 9.71 | 4450.9 | 4448.1 | 15.14 |
| 6/4/24 | 15.09 | 4456.30 | 4454.30 | 9.72 | 4450.9 | 4448.1 | 15.13 |
| 6/5/24 | 15.10 | 4456.30 | 4454.30 | 9.71 | 4450.9 | 4448.1 | 15.11 |
| 6/6/24 | 15.10 | 4456.30 | 4454.30 | 9.72 | 4450.9 | 4448.1 | 15.10 |
| 6/7/24 | 15.10 | 4456.30 | 4454.30 | 9.71 | 4450.9 | 4448.1 | 15.09 |
| 6/8/24 | 15.11 | 4456.30 | 4454.30 | 9.72 | 4450.9 | 4448.1 | 15.08 |
| 6/9/24 | 15.11 | 4456.30 | 4454.30 | 9.71 | 4450.9 | 4448.2 | 15.07 |
| 6/10/24 | 15.11 | 4456.30 | 4454.30 | 9.72 | 4450.9 | 4448.2 | 15.06 |
| 6/11/24 | 15.11 | 4456.30 | 4454.30 | 9.71 | 4451.0 | 4448.2 | 15.05 |
| 6/12/24 | 15.12 | 4456.30 | 4454.30 | 9.72 | 4451.0 | 4448.2 | 15.04 |
| 6/13/24 | 15.12 | 4456.30 | 4454.30 | 9.71 | 4451.0 | 4448.2 | 15.03 |
| 6/14/24 | 15.12 | 4456.30 | 4454.30 | 9.72 | 4451.0 | 4448.2 | 15.02 |
| 6/15/24 | 15.12 | 4456.30 | 4454.30 | 9.71 | 4451.0 | 4448.2 | 15.01 |
| 6/16/24 | 15.13 | 4456.30 | 4454.30 | 9.72 | 4451.0 | 4448.2 | 14.99 |
| 6/17/24 | 15.13 | 4456.30 | 4454.30 | 9.71 | 4451.0 | 4448.3 | 14.98 |
| 6/18/24 | 15.13 | 4456.30 | 4454.30 | 9.72 | 4451.0 | 4448.3 | 14.97 |
| 6/19/24 | 15.14 | 4456.30 | 4454.30 | 9.71 | 4451.0 | 4448.3 | 14.96 |
| 6/20/24 | 15.14 | 4456.30 | 4454.30 | 9.72 | 4451.0 | 4448.3 | 14.95 |
| 6/21/24 | 15.14 | 4456.30 | 4454.30 | 9.71 | 4451.1 | 4448.3 | 14.94 |
| 6/22/24 | 15.14 | 4456.30 | 4454.30 | 9.72 | 4451.1 | 4448.3 | 14.93 |
| 6/23/24 | 15.15 | 4456.30 | 4454.30 | 9.71 | 4451.1 | 4448.3 | 14.92 |
| 6/24/24 | 15.15 | 4456.30 | 4454.30 | 9.72 | 4451.1 | 4448.3 | 14.91 |
| 6/25/24 | 15.15 | 4456.30 | 4454.30 | 9.71 | 4451.1 | 4448.4 | 14.90 |
| 6/26/24 | 15.15 | 4456.30 | 4454.30 | 9.72 | 4451.1 | 4448.4 | 14.89 |
| 6/27/24 | 15.16 | 4456.30 | 4454.30 | 9.71 | 4451.1 | 4448.4 | 14.87 |
| 6/28/24 | 15.16 | 4456.30 | 4454.30 | 9.72 | 4451.1 | 4448.4 | 14.86 |
| 6/29/24 | 15.16 | 4456.30 | 4454.30 | 9.71 | 4451.1 | 4448.4 | 14.85 |
| 6/30/24 | 15.17 | 4456.30 | 4454.30 | 9.72 | 4451.2 | 4448.4 | 14.84 |
| 7/1/24 | 15.17 | 4456.30 | 4454.30 | 9.71 | 4451.2 | 4448.4 | 14.83 |
| 7/2/24 | 15.17 | 4456.30 | 4454.30 | 9.73 | 4451.2 | 4448.5 | 14.83 |
| 7/3/24 | 15.17 | 4456.30 | 4454.30 | 9.71 | 4451.2 | 4448.5 | 14.82 |
| 7/4/24 | 15.18 | 4456.30 | 4454.30 | 9.73 | 4451.2 | 4448.5 | 14.82 |
| 7/5/24 | 15.18 | 4456.30 | 4454.30 | 9.71 | 4451.2 | 4448.5 | 14.81 |
| 7/6/24 | 15.18 | 4456.30 | 4454.30 | 9.73 | 4451.2 | 4448.5 | 14.81 |
| 7/7/24 | 15.18 | 4456.30 | 4454.30 | 9.71 | 4451.2 | 4448.5 | 14.81 |
| 7/8/24 | 15.19 | 4456.30 | 4454.30 | 9.73 | 4451.2 | 4448.5 | 14.80 |
| 7/9/24 | 15.19 | 4456.30 | 4454.30 | 9.71 | 4451.2 | 4448.5 | 14.80 |
| 7/10/24 | 15.19 | 4456.30 | 4454.30 | 9.73 | 4451.2 | 4448.6 | 14.80 |
| 7/11/24 | 15.20 | 4456.30 | 4454.30 | 9.71 | 4451.2 | 4448.6 | 14.79 |
| 7/12/24 | 15.20 | 4456.30 | 4454.30 | 9.73 | 4451.2 | 4448.6 | 14.79 |
| 7/13/24 | 15.20 | 4456.30 | 4454.30 | 9.71 | 4451.2 | 4448.6 | 14.78 |
| 7/14/24 | 15.20 | 4456.30 | 4454.30 | 9.73 | 4451.2 | 4448.6 | 14.78 |
| 7/15/24 | 15.21 | 4456.30 | 4454.30 | 9.71 | 4451.2 | 4448.6 | 14.78 |

**Appendix E**
**Table 1  Tailings and Pond Elevations for North and South Cells**

| | Year | North Cell | | | South Cell | | |
|---|---|---|---|---|---|---|---|
| Date | Fraction | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) |
| 7/16/24 | 15.21 | 4456.30 | 4454.30 | 9.73 | 4451.2 | 4448.6 | 14.77 |
| 7/17/24 | 15.21 | 4456.30 | 4454.30 | 9.71 | 4451.2 | 4448.6 | 14.77 |
| 7/18/24 | 15.21 | 4456.30 | 4454.30 | 9.73 | 4451.2 | 4448.7 | 14.76 |
| 7/19/24 | 15.22 | 4456.30 | 4454.30 | 9.70 | 4451.2 | 4448.7 | 14.76 |
| 7/20/24 | 15.22 | 4456.30 | 4454.30 | 9.73 | 4451.2 | 4448.7 | 14.76 |
| 7/21/24 | 15.22 | 4456.30 | 4454.30 | 9.70 | 4451.2 | 4448.7 | 14.75 |
| 7/22/24 | 15.23 | 4456.30 | 4454.30 | 9.73 | 4451.3 | 4448.7 | 14.75 |
| 7/23/24 | 15.23 | 4456.30 | 4454.30 | 9.70 | 4451.3 | 4448.7 | 14.74 |
| 7/24/24 | 15.23 | 4456.30 | 4454.30 | 9.73 | 4451.3 | 4448.7 | 14.74 |
| 7/25/24 | 15.23 | 4456.30 | 4454.30 | 9.70 | 4451.3 | 4448.7 | 14.74 |
| 7/26/24 | 15.24 | 4456.30 | 4454.30 | 9.73 | 4451.3 | 4448.8 | 14.73 |
| 7/27/24 | 15.24 | 4456.30 | 4454.30 | 9.70 | 4451.3 | 4448.8 | 14.73 |
| 7/28/24 | 15.24 | 4456.30 | 4454.30 | 9.73 | 4451.3 | 4448.8 | 14.72 |
| 7/29/24 | 15.24 | 4456.30 | 4454.30 | 9.70 | 4451.3 | 4448.8 | 14.72 |
| 7/30/24 | 15.25 | 4456.30 | 4454.30 | 9.73 | 4451.3 | 4448.8 | 14.72 |
| 7/31/24 | 15.25 | 4456.30 | 4454.30 | 9.70 | 4451.3 | 4448.8 | 14.71 |
| 8/1/24 | 15.25 | 4456.30 | 4454.30 | 9.73 | 4451.3 | 4448.8 | 14.71 |
| 8/2/24 | 15.26 | 4456.30 | 4454.30 | 9.70 | 4451.3 | 4448.8 | 14.71 |
| 8/3/24 | 15.26 | 4456.30 | 4454.30 | 9.72 | 4451.3 | 4448.9 | 14.70 |
| 8/4/24 | 15.26 | 4456.30 | 4454.30 | 9.70 | 4451.3 | 4448.9 | 14.70 |
| 8/5/24 | 15.26 | 4456.30 | 4454.30 | 9.72 | 4451.3 | 4448.9 | 14.70 |
| 8/6/24 | 15.27 | 4456.30 | 4454.30 | 9.70 | 4451.3 | 4448.9 | 14.69 |
| 8/7/24 | 15.27 | 4456.30 | 4454.30 | 9.72 | 4451.3 | 4448.9 | 14.69 |
| 8/8/24 | 15.27 | 4456.30 | 4454.30 | 9.70 | 4451.3 | 4448.9 | 14.69 |
| 8/9/24 | 15.27 | 4456.30 | 4454.30 | 9.72 | 4451.3 | 4448.9 | 14.69 |
| 8/10/24 | 15.28 | 4456.30 | 4454.30 | 9.70 | 4451.3 | 4448.9 | 14.68 |
| 8/11/24 | 15.28 | 4456.30 | 4454.30 | 9.72 | 4451.3 | 4449.0 | 14.68 |
| 8/12/24 | 15.28 | 4456.30 | 4454.30 | 9.70 | 4451.3 | 4449.0 | 14.68 |
| 8/13/24 | 15.29 | 4456.30 | 4454.30 | 9.72 | 4451.3 | 4449.0 | 14.67 |
| 8/14/24 | 15.29 | 4456.30 | 4454.30 | 9.70 | 4451.3 | 4449.0 | 14.67 |
| 8/15/24 | 15.29 | 4456.30 | 4454.30 | 9.72 | 4451.3 | 4449.0 | 14.67 |
| 8/16/24 | 15.29 | 4456.30 | 4454.30 | 9.70 | 4451.3 | 4449.0 | 14.67 |
| 8/17/24 | 15.30 | 4456.30 | 4454.30 | 9.72 | 4451.3 | 4449.0 | 14.66 |
| 8/18/24 | 15.30 | 4456.30 | 4454.30 | 9.70 | 4451.3 | 4449.1 | 14.66 |
| 8/19/24 | 15.30 | 4456.30 | 4454.30 | 9.72 | 4451.3 | 4449.1 | 14.66 |
| 8/20/24 | 15.31 | 4456.30 | 4454.30 | 9.70 | 4451.3 | 4449.1 | 14.65 |
| 8/21/24 | 15.31 | 4456.30 | 4454.30 | 9.72 | 4451.3 | 4449.1 | 14.65 |
| 8/22/24 | 15.31 | 4456.30 | 4454.30 | 9.70 | 4451.4 | 4449.1 | 14.65 |
| 8/23/24 | 15.31 | 4456.30 | 4454.30 | 9.72 | 4451.4 | 4449.1 | 14.65 |
| 8/24/24 | 15.32 | 4456.30 | 4454.30 | 9.70 | 4451.4 | 4449.1 | 14.64 |
| 8/25/24 | 15.32 | 4456.30 | 4454.30 | 9.72 | 4451.4 | 4449.1 | 14.64 |
| 8/26/24 | 15.32 | 4456.30 | 4454.30 | 9.70 | 4451.4 | 4449.2 | 14.64 |
| 8/27/24 | 15.32 | 4456.30 | 4454.30 | 9.72 | 4451.4 | 4449.2 | 14.63 |
| 8/28/24 | 15.33 | 4456.30 | 4454.30 | 9.70 | 4451.4 | 4449.2 | 14.63 |
| 8/29/24 | 15.33 | 4456.30 | 4454.30 | 9.72 | 4451.4 | 4449.2 | 14.63 |
| 8/30/24 | 15.33 | 4456.30 | 4454.30 | 9.70 | 4451.4 | 4449.2 | 14.63 |
| 8/31/24 | 15.34 | 4456.30 | 4454.30 | 9.72 | 4451.4 | 4449.2 | 14.62 |
| 9/1/24 | 15.34 | 4456.30 | 4454.30 | 9.70 | 4451.4 | 4449.2 | 14.62 |
| 9/2/24 | 15.34 | 4456.30 | 4454.30 | 9.72 | 4451.4 | 4449.2 | 14.62 |
| 9/3/24 | 15.34 | 4456.30 | 4454.30 | 9.70 | 4451.4 | 4449.3 | 14.61 |
| 9/4/24 | 15.35 | 4456.30 | 4454.30 | 9.72 | 4451.4 | 4449.3 | 14.61 |
| 9/5/24 | 15.35 | 4456.30 | 4454.30 | 9.70 | 4451.4 | 4449.3 | 14.61 |
| 9/6/24 | 15.35 | 4456.30 | 4454.30 | 9.72 | 4451.4 | 4449.3 | 14.60 |
| 9/7/24 | 15.35 | 4456.30 | 4454.30 | 9.70 | 4451.4 | 4449.3 | 14.60 |
| 9/8/24 | 15.36 | 4456.30 | 4454.30 | 9.72 | 4451.4 | 4449.3 | 14.60 |

**Appendix E**
**Table 1  Tailings and Pond Elevations for North and South Cells**

| | Year | North Cell | | | South Cell | | |
|---|---|---|---|---|---|---|---|
| Date | Fraction | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) |
| 9/9/24 | 15.36 | 4456.30 | 4454.30 | 9.70 | 4451.4 | 4449.3 | 14.60 |
| 9/10/24 | 15.36 | 4456.30 | 4454.30 | 9.72 | 4451.4 | 4449.3 | 14.59 |
| 9/11/24 | 15.37 | 4456.30 | 4454.30 | 9.70 | 4451.4 | 4449.4 | 14.59 |
| 9/12/24 | 15.37 | 4456.30 | 4454.30 | 9.72 | 4451.4 | 4449.4 | 14.59 |
| 9/13/24 | 15.37 | 4456.30 | 4454.30 | 9.70 | 4451.4 | 4449.4 | 14.58 |
| 9/14/24 | 15.37 | 4456.30 | 4454.30 | 9.72 | 4451.4 | 4449.4 | 14.58 |
| 9/15/24 | 15.38 | 4456.30 | 4454.30 | 9.70 | 4451.4 | 4449.4 | 14.58 |
| 9/16/24 | 15.38 | 4456.30 | 4454.30 | 9.72 | 4451.4 | 4449.4 | 14.57 |
| 9/17/24 | 15.38 | 4456.30 | 4454.30 | 9.70 | 4451.4 | 4449.4 | 14.57 |
| 9/18/24 | 15.38 | 4456.30 | 4454.30 | 9.72 | 4451.5 | 4449.4 | 14.55 |
| 9/19/24 | 15.39 | 4456.30 | 4454.30 | 9.70 | 4451.5 | 4449.5 | 14.55 |
| 9/20/24 | 15.39 | 4456.30 | 4454.30 | 9.72 | 4451.5 | 4449.5 | 14.53 |
| 9/21/24 | 15.39 | 4456.30 | 4454.30 | 9.70 | 4451.5 | 4449.5 | 14.52 |
| 9/22/24 | 15.40 | 4456.30 | 4454.30 | 9.72 | 4451.5 | 4449.5 | 14.50 |
| 9/23/24 | 15.40 | 4456.30 | 4454.30 | 9.70 | 4451.5 | 4449.5 | 14.50 |
| 9/24/24 | 15.40 | 4456.30 | 4454.30 | 9.72 | 4451.5 | 4449.5 | 14.48 |
| 9/25/24 | 15.40 | 4456.30 | 4454.30 | 9.70 | 4451.5 | 4449.5 | 14.47 |
| 9/26/24 | 15.41 | 4456.30 | 4454.30 | 9.72 | 4451.5 | 4449.5 | 14.45 |
| 9/27/24 | 15.41 | 4456.30 | 4454.30 | 9.70 | 4451.5 | 4449.6 | 14.45 |
| 9/28/24 | 15.41 | 4456.30 | 4454.30 | 9.72 | 4451.6 | 4449.6 | 14.43 |
| 9/29/24 | 15.41 | 4456.30 | 4454.30 | 9.70 | 4451.6 | 4449.6 | 14.43 |
| 9/30/24 | 15.42 | 4456.30 | 4454.30 | 9.72 | 4451.6 | 4449.6 | 14.41 |
| 10/1/24 | 15.42 | 4456.30 | 4454.30 | 9.70 | 4451.6 | 4449.6 | 14.40 |
| 10/2/24 | 15.42 | 4456.30 | 4454.30 | 9.72 | 4451.6 | 4449.6 | 14.38 |
| 10/3/24 | 15.43 | 4456.30 | 4454.30 | 9.70 | 4451.6 | 4449.6 | 14.37 |
| 10/4/24 | 15.43 | 4456.30 | 4454.30 | 9.72 | 4451.6 | 4449.7 | 14.37 |
| 10/5/24 | 15.43 | 4456.30 | 4454.30 | 9.70 | 4451.7 | 4449.7 | 14.35 |
| 10/6/24 | 15.43 | 4456.30 | 4454.30 | 9.72 | 4451.7 | 4449.7 | 14.34 |
| 10/7/24 | 15.44 | 4456.30 | 4454.30 | 9.70 | 4451.7 | 4449.7 | 14.32 |
| 10/8/24 | 15.44 | 4456.30 | 4454.30 | 9.72 | 4451.7 | 4449.7 | 14.32 |
| 10/9/24 | 15.44 | 4456.30 | 4454.30 | 9.70 | 4451.7 | 4449.7 | 14.30 |
| 10/10/24 | 15.44 | 4456.30 | 4454.30 | 9.72 | 4451.7 | 4449.7 | 14.29 |
| 10/11/24 | 15.45 | 4456.30 | 4454.30 | 9.70 | 4451.7 | 4449.7 | 14.28 |
| 10/12/24 | 15.45 | 4456.30 | 4454.30 | 9.72 | 4451.7 | 4449.8 | 14.27 |
| 10/13/24 | 15.45 | 4456.30 | 4454.30 | 9.70 | 4451.7 | 4449.8 | 14.25 |
| 10/14/24 | 15.46 | 4456.30 | 4454.30 | 9.72 | 4451.8 | 4449.8 | 14.25 |
| 10/15/24 | 15.46 | 4456.30 | 4454.30 | 9.70 | 4451.8 | 4449.8 | 14.23 |
| 10/16/24 | 15.46 | 4456.30 | 4454.30 | 9.72 | 4451.8 | 4449.8 | 14.22 |
| 10/17/24 | 15.46 | 4456.30 | 4454.30 | 9.70 | 4451.8 | 4449.8 | 14.20 |
| 10/18/24 | 15.47 | 4456.30 | 4454.30 | 9.72 | 4451.8 | 4449.8 | 14.20 |
| 10/19/24 | 15.47 | 4456.30 | 4454.30 | 9.70 | 4451.8 | 4449.8 | 14.18 |
| 10/20/24 | 15.47 | 4456.30 | 4454.30 | 9.72 | 4451.8 | 4449.9 | 14.17 |
| 10/21/24 | 15.47 | 4456.30 | 4454.30 | 9.70 | 4451.8 | 4449.9 | 14.16 |
| 10/22/24 | 15.48 | 4456.30 | 4454.30 | 9.72 | 4451.9 | 4449.9 | 14.15 |
| 10/23/24 | 15.48 | 4456.30 | 4454.30 | 9.70 | 4451.9 | 4449.9 | 14.13 |
| 10/24/24 | 15.48 | 4456.30 | 4454.30 | 9.72 | 4451.9 | 4449.9 | 14.13 |
| 10/25/24 | 15.49 | 4456.30 | 4454.30 | 9.70 | 4451.9 | 4449.9 | 14.11 |
| 10/26/24 | 15.49 | 4456.30 | 4454.30 | 9.72 | 4451.9 | 4449.9 | 14.10 |
| 10/27/24 | 15.49 | 4456.30 | 4454.30 | 9.70 | 4451.9 | 4449.9 | 14.08 |
| 10/28/24 | 15.49 | 4456.30 | 4454.30 | 9.72 | 4451.9 | 4450.0 | 14.08 |
| 10/29/24 | 15.50 | 4456.30 | 4454.30 | 9.70 | 4451.9 | 4450.0 | 14.06 |
| 10/30/24 | 15.50 | 4456.30 | 4454.30 | 9.72 | 4451.9 | 4450.0 | 14.05 |
| 10/31/24 | 15.50 | 4456.30 | 4454.30 | 9.70 | 4452.0 | 4450.0 | 14.04 |
| 11/1/24 | 15.50 | 4456.30 | 4454.30 | 9.72 | 4452.0 | 4450.0 | 14.03 |
| 11/2/24 | 15.51 | 4456.30 | 4454.30 | 9.70 | 4452.0 | 4450.0 | 14.01 |

**Appendix E**
**Table 1  Tailings and Pond Elevations for North and South Cells**

| | Year | North Cell | | | South Cell | | |
|---|---|---|---|---|---|---|---|
| Date | Fraction | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) |
| 11/3/24 | 15.51 | 4456.30 | 4454.30 | 9.71 | 4452.0 | 4450.0 | 14.00 |
| 11/4/24 | 15.51 | 4456.30 | 4454.30 | 9.70 | 4452.0 | 4450.0 | 13.98 |
| 11/5/24 | 15.52 | 4456.30 | 4454.30 | 9.71 | 4452.0 | 4450.1 | 13.97 |
| 11/6/24 | 15.52 | 4456.30 | 4454.30 | 9.70 | 4452.0 | 4450.1 | 13.96 |
| 11/7/24 | 15.52 | 4456.30 | 4454.30 | 9.71 | 4452.1 | 4450.1 | 13.95 |
| 11/8/24 | 15.52 | 4456.30 | 4454.30 | 9.70 | 4452.1 | 4450.1 | 13.93 |
| 11/9/24 | 15.53 | 4456.30 | 4454.30 | 9.71 | 4452.1 | 4450.1 | 13.92 |
| 11/10/24 | 15.53 | 4456.30 | 4454.30 | 9.70 | 4452.1 | 4450.1 | 13.91 |
| 11/11/24 | 15.53 | 4456.30 | 4454.30 | 9.71 | 4452.1 | 4450.1 | 13.90 |
| 11/12/24 | 15.54 | 4456.30 | 4454.30 | 9.70 | 4452.1 | 4450.1 | 13.89 |
| 11/13/24 | 15.54 | 4456.30 | 4454.30 | 9.71 | 4452.1 | 4450.2 | 13.88 |
| 11/14/24 | 15.54 | 4456.30 | 4454.30 | 9.70 | 4452.1 | 4450.2 | 13.86 |
| 11/15/24 | 15.54 | 4456.30 | 4454.30 | 9.71 | 4452.1 | 4450.2 | 13.85 |
| 11/16/24 | 15.55 | 4456.30 | 4454.30 | 9.70 | 4452.2 | 4450.2 | 13.84 |
| 11/17/24 | 15.55 | 4456.30 | 4454.30 | 9.71 | 4452.2 | 4450.2 | 13.83 |
| 11/18/24 | 15.55 | 4456.30 | 4454.30 | 9.70 | 4452.2 | 4450.2 | 13.81 |
| 11/19/24 | 15.55 | 4456.30 | 4454.30 | 9.71 | 4452.2 | 4450.2 | 13.80 |
| 11/20/24 | 15.56 | 4456.30 | 4454.30 | 9.70 | 4452.2 | 4450.2 | 13.79 |
| 11/21/24 | 15.56 | 4456.30 | 4454.30 | 9.71 | 4452.2 | 4450.2 | 13.78 |
| 11/22/24 | 15.56 | 4456.30 | 4454.30 | 9.70 | 4452.2 | 4450.3 | 13.77 |
| 11/23/24 | 15.57 | 4456.30 | 4454.30 | 9.71 | 4452.2 | 4450.3 | 13.76 |
| 11/24/24 | 15.57 | 4456.30 | 4454.30 | 9.70 | 4452.3 | 4450.3 | 13.74 |
| 11/25/24 | 15.57 | 4456.30 | 4454.30 | 9.71 | 4452.3 | 4450.3 | 13.73 |
| 11/26/24 | 15.57 | 4456.30 | 4454.30 | 9.70 | 4452.3 | 4450.3 | 13.72 |
| 11/27/24 | 15.58 | 4456.30 | 4454.30 | 9.71 | 4452.3 | 4450.3 | 13.71 |
| 11/28/24 | 15.58 | 4456.30 | 4454.30 | 9.70 | 4452.3 | 4450.3 | 13.69 |
| 11/29/24 | 15.58 | 4456.30 | 4454.30 | 9.71 | 4452.3 | 4450.3 | 13.68 |
| 11/30/24 | 15.58 | 4456.30 | 4454.30 | 9.70 | 4452.3 | 4450.4 | 13.67 |
| 12/1/24 | 15.59 | 4456.30 | 4454.30 | 9.71 | 4452.3 | 4450.4 | 13.66 |
| 12/2/24 | 15.59 | 4456.30 | 4454.30 | 9.70 | 4452.4 | 4450.4 | 13.64 |
| 12/3/24 | 15.59 | 4456.30 | 4454.30 | 9.71 | 4452.4 | 4450.4 | 13.63 |
| 12/4/24 | 15.60 | 4456.30 | 4454.30 | 9.70 | 4452.4 | 4450.4 | 13.61 |
| 12/5/24 | 15.60 | 4456.30 | 4454.30 | 9.71 | 4452.4 | 4450.4 | 13.60 |
| 12/6/24 | 15.60 | 4456.30 | 4454.30 | 9.70 | 4452.4 | 4450.4 | 13.58 |
| 12/7/24 | 15.60 | 4456.30 | 4454.30 | 9.71 | 4452.4 | 4450.4 | 13.57 |
| 12/8/24 | 15.61 | 4456.30 | 4454.30 | 9.70 | 4452.4 | 4450.5 | 13.55 |
| 12/9/24 | 15.61 | 4456.30 | 4454.30 | 9.71 | 4452.5 | 4450.5 | 13.54 |
| 12/10/24 | 15.61 | 4456.30 | 4454.30 | 9.70 | 4452.5 | 4450.5 | 13.52 |
| 12/11/24 | 15.61 | 4456.30 | 4454.30 | 9.71 | 4452.5 | 4450.5 | 13.51 |
| 12/12/24 | 15.62 | 4456.30 | 4454.30 | 9.70 | 4452.5 | 4450.5 | 13.49 |
| 12/13/24 | 15.62 | 4456.30 | 4454.30 | 9.71 | 4452.5 | 4450.5 | 13.48 |
| 12/14/24 | 15.62 | 4456.30 | 4454.30 | 9.70 | 4452.5 | 4450.5 | 13.46 |
| 12/15/24 | 15.63 | 4456.30 | 4454.30 | 9.71 | 4452.6 | 4450.5 | 13.45 |
| 12/16/24 | 15.63 | 4456.30 | 4454.30 | 9.70 | 4452.6 | 4450.5 | 13.43 |
| 12/17/24 | 15.63 | 4456.30 | 4454.30 | 9.71 | 4452.6 | 4450.6 | 13.42 |
| 12/18/24 | 15.63 | 4456.30 | 4454.30 | 9.70 | 4452.6 | 4450.6 | 13.40 |
| 12/19/24 | 15.64 | 4456.30 | 4454.30 | 9.71 | 4452.6 | 4450.6 | 13.39 |
| 12/20/24 | 15.64 | 4456.30 | 4454.30 | 9.70 | 4452.6 | 4450.6 | 13.37 |
| 12/21/24 | 15.64 | 4456.30 | 4454.30 | 9.71 | 4452.6 | 4450.6 | 13.36 |
| 12/22/24 | 15.64 | 4456.30 | 4454.30 | 9.70 | 4452.7 | 4450.6 | 13.34 |
| 12/23/24 | 15.65 | 4456.30 | 4454.30 | 9.71 | 4452.7 | 4450.6 | 13.33 |
| 12/24/24 | 15.65 | 4456.30 | 4454.30 | 9.70 | 4452.7 | 4450.6 | 13.31 |
| 12/25/24 | 15.65 | 4456.30 | 4454.30 | 9.71 | 4452.7 | 4450.7 | 13.30 |
| 12/26/24 | 15.66 | 4456.30 | 4454.30 | 9.70 | 4452.7 | 4450.7 | 13.28 |
| 12/27/24 | 15.66 | 4456.30 | 4454.30 | 9.71 | 4452.7 | 4450.7 | 13.27 |

**Appendix E**
**Table 1 Tailings and Pond Elevations for North and South Cells**

| | Year | North Cell | | | South Cell | | |
|---|---|---|---|---|---|---|---|
| Date | Fraction | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) |
| 12/28/24 | 15.66 | 4456.30 | 4454.30 | 9.70 | 4452.7 | 4450.7 | 13.25 |
| 12/29/24 | 15.66 | 4456.30 | 4454.30 | 9.71 | 4452.8 | 4450.7 | 13.24 |
| 12/30/24 | 15.67 | 4456.30 | 4454.30 | 9.70 | 4452.8 | 4450.7 | 13.22 |
| 12/31/24 | 15.67 | 4456.30 | 4454.30 | 9.71 | 4452.8 | 4450.7 | 13.21 |
| 1/1/25 | 15.67 | 4456.30 | 4454.30 | 9.70 | 4452.8 | 4450.7 | 13.19 |
| 1/2/25 | 15.67 | 4456.30 | 4454.30 | 9.70 | 4452.8 | 4450.8 | 13.17 |
| 1/3/25 | 15.68 | 4456.30 | 4454.30 | 9.70 | 4452.8 | 4450.8 | 13.16 |
| 1/4/25 | 15.68 | 4456.30 | 4454.30 | 9.70 | 4452.9 | 4450.8 | 13.14 |
| 1/5/25 | 15.68 | 4456.30 | 4454.30 | 9.70 | 4452.9 | 4450.8 | 13.12 |
| 1/6/25 | 15.69 | 4456.30 | 4454.30 | 9.70 | 4452.9 | 4450.8 | 13.11 |
| 1/7/25 | 15.69 | 4456.30 | 4454.30 | 9.70 | 4452.9 | 4450.8 | 13.09 |
| 1/8/25 | 15.69 | 4456.30 | 4454.30 | 9.70 | 4452.9 | 4450.8 | 13.07 |
| 1/9/25 | 15.69 | 4456.30 | 4454.30 | 9.70 | 4452.9 | 4450.8 | 13.06 |
| 1/10/25 | 15.70 | 4456.30 | 4454.30 | 9.70 | 4453.0 | 4450.8 | 13.04 |
| 1/11/25 | 15.70 | 4456.30 | 4454.30 | 9.70 | 4453.0 | 4450.9 | 13.02 |
| 1/12/25 | 15.70 | 4456.30 | 4454.30 | 9.70 | 4453.0 | 4450.9 | 13.00 |
| 1/13/25 | 15.70 | 4456.30 | 4454.30 | 9.70 | 4453.0 | 4450.9 | 12.99 |
| 1/14/25 | 15.71 | 4456.30 | 4454.30 | 9.70 | 4453.0 | 4450.9 | 12.97 |
| 1/15/25 | 15.71 | 4456.30 | 4454.30 | 9.70 | 4453.0 | 4450.9 | 12.95 |
| 1/16/25 | 15.71 | 4456.30 | 4454.30 | 9.70 | 4453.1 | 4450.9 | 12.94 |
| 1/17/25 | 15.72 | 4456.30 | 4454.30 | 9.70 | 4453.1 | 4450.9 | 12.92 |
| 1/18/25 | 15.72 | 4456.30 | 4454.30 | 9.70 | 4453.1 | 4450.9 | 12.90 |
| 1/19/25 | 15.72 | 4456.30 | 4454.30 | 9.70 | 4453.1 | 4451.0 | 12.89 |
| 1/20/25 | 15.72 | 4456.30 | 4454.30 | 9.70 | 4453.1 | 4451.0 | 12.87 |
| 1/21/25 | 15.73 | 4456.30 | 4454.30 | 9.70 | 4453.1 | 4451.0 | 12.85 |
| 1/22/25 | 15.73 | 4456.30 | 4454.30 | 9.70 | 4453.2 | 4451.0 | 12.83 |
| 1/23/25 | 15.73 | 4456.30 | 4454.30 | 9.70 | 4453.2 | 4451.0 | 12.82 |
| 1/24/25 | 15.73 | 4456.30 | 4454.30 | 9.70 | 4453.2 | 4451.0 | 12.80 |
| 1/25/25 | 15.74 | 4456.30 | 4454.30 | 9.70 | 4453.2 | 4451.0 | 12.78 |
| 1/26/25 | 15.74 | 4456.30 | 4454.30 | 9.70 | 4453.2 | 4451.0 | 12.77 |
| 1/27/25 | 15.74 | 4456.30 | 4454.30 | 9.70 | 4453.3 | 4451.1 | 12.75 |
| 1/28/25 | 15.75 | 4456.30 | 4454.30 | 9.70 | 4453.3 | 4451.1 | 12.73 |
| 1/29/25 | 15.75 | 4456.30 | 4454.30 | 9.70 | 4453.3 | 4451.1 | 12.72 |
| 1/30/25 | 15.75 | 4456.30 | 4454.30 | 9.70 | 4453.3 | 4451.1 | 12.70 |
| 1/31/25 | 15.75 | 4456.30 | 4454.30 | 9.70 | 4453.3 | 4451.1 | 12.68 |
| 2/1/25 | 15.76 | 4456.30 | 4454.30 | 9.70 | 4453.3 | 4451.1 | 12.67 |
| 2/2/25 | 15.76 | 4456.30 | 4454.30 | 9.70 | 4453.4 | 4451.1 | 12.65 |
| 2/3/25 | 15.76 | 4456.30 | 4454.30 | 9.70 | 4453.4 | 4451.1 | 12.63 |
| 2/4/25 | 15.77 | 4456.30 | 4454.30 | 9.70 | 4453.4 | 4451.1 | 12.61 |
| 2/5/25 | 15.77 | 4456.30 | 4454.30 | 9.70 | 4453.4 | 4451.2 | 12.60 |
| 2/6/25 | 15.77 | 4456.30 | 4454.30 | 9.70 | 4453.4 | 4451.2 | 12.58 |
| 2/7/25 | 15.77 | 4456.30 | 4454.30 | 9.70 | 4453.4 | 4451.2 | 12.56 |
| 2/8/25 | 15.78 | 4456.30 | 4454.30 | 9.70 | 4453.5 | 4451.2 | 12.54 |
| 2/9/25 | 15.78 | 4456.30 | 4454.30 | 9.70 | 4453.5 | 4451.2 | 12.53 |
| 2/10/25 | 15.78 | 4456.30 | 4454.30 | 9.70 | 4453.5 | 4451.2 | 12.51 |
| 2/11/25 | 15.78 | 4456.30 | 4454.30 | 9.70 | 4453.5 | 4451.2 | 12.49 |
| 2/12/25 | 15.79 | 4456.30 | 4454.30 | 9.70 | 4453.5 | 4451.2 | 12.47 |
| 2/13/25 | 15.79 | 4456.30 | 4454.30 | 9.70 | 4453.5 | 4451.3 | 12.46 |
| 2/14/25 | 15.79 | 4456.30 | 4454.30 | 9.70 | 4453.6 | 4451.3 | 12.44 |
| 2/15/25 | 15.80 | 4456.30 | 4454.30 | 9.70 | 4453.6 | 4451.3 | 12.42 |
| 2/16/25 | 15.80 | 4456.30 | 4454.30 | 9.70 | 4453.6 | 4451.3 | 12.41 |
| 2/17/25 | 15.80 | 4456.30 | 4454.30 | 9.70 | 4453.6 | 4451.3 | 12.39 |
| 2/18/25 | 15.80 | 4456.30 | 4454.30 | 9.70 | 4453.6 | 4451.3 | 12.37 |
| 2/19/25 | 15.81 | 4456.30 | 4454.30 | 9.70 | 4453.6 | 4451.3 | 12.35 |
| 2/20/25 | 15.81 | 4456.30 | 4454.30 | 9.70 | 4453.7 | 4451.3 | 12.34 |

## Appendix E
## Table 1  Tailings and Pond Elevations for North and South Cells

| Date | Year Fraction | North Cell | | | South Cell | | |
|---|---|---|---|---|---|---|---|
| | | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) |
| 2/21/25 | 15.81 | 4456.30 | 4454.30 | 9.70 | 4453.7 | 4451.4 | 12.32 |
| 2/22/25 | 15.81 | 4456.30 | 4454.30 | 9.70 | 4453.7 | 4451.4 | 12.30 |
| 2/23/25 | 15.82 | 4456.30 | 4454.30 | 9.70 | 4453.7 | 4451.4 | 12.28 |
| 2/24/25 | 15.82 | 4456.30 | 4454.30 | 9.70 | 4453.7 | 4451.4 | 12.27 |
| 2/25/25 | 15.82 | 4456.30 | 4454.30 | 9.70 | 4453.8 | 4451.4 | 12.25 |
| 2/26/25 | 15.83 | 4456.30 | 4454.30 | 9.70 | 4453.8 | 4451.4 | 12.23 |
| 2/27/25 | 15.83 | 4456.30 | 4454.30 | 9.70 | 4453.8 | 4451.4 | 12.21 |
| 2/28/25 | 15.83 | 4456.30 | 4454.30 | 9.70 | 4453.8 | 4451.4 | 12.20 |
| 3/1/25 | 15.83 | 4456.30 | 4454.30 | 9.70 | 4453.8 | 4451.5 | 12.18 |
| 3/2/25 | 15.84 | 4456.30 | 4454.30 | 9.69 | 4453.8 | 4451.5 | 12.16 |
| 3/3/25 | 15.84 | 4456.30 | 4454.30 | 9.70 | 4453.9 | 4451.5 | 12.14 |
| 3/4/25 | 15.84 | 4456.30 | 4454.30 | 9.71 | 4453.9 | 4451.5 | 12.13 |
| 3/5/25 | 15.84 | 4456.30 | 4454.30 | 9.70 | 4453.9 | 4451.5 | 12.11 |
| 3/6/25 | 15.85 | 4456.30 | 4454.30 | 9.71 | 4453.9 | 4451.5 | 12.09 |
| 3/7/25 | 15.85 | 4456.30 | 4454.30 | 9.70 | 4453.9 | 4451.5 | 12.07 |
| 3/8/25 | 15.85 | 4456.30 | 4454.30 | 9.71 | 4453.9 | 4451.5 | 12.05 |
| 3/9/25 | 15.86 | 4456.30 | 4454.30 | 9.70 | 4454.0 | 4451.5 | 12.04 |
| 3/10/25 | 15.86 | 4456.30 | 4454.30 | 9.71 | 4454.0 | 4451.6 | 12.02 |
| 3/11/25 | 15.86 | 4456.30 | 4454.30 | 9.70 | 4454.0 | 4451.6 | 12.00 |
| 3/12/25 | 15.86 | 4456.30 | 4454.30 | 9.71 | 4454.0 | 4451.6 | 11.98 |
| 3/13/25 | 15.87 | 4456.30 | 4454.30 | 9.70 | 4454.0 | 4451.6 | 11.96 |
| 3/14/25 | 15.87 | 4456.30 | 4454.30 | 9.71 | 4454.1 | 4451.6 | 11.95 |
| 3/15/25 | 15.87 | 4456.30 | 4454.30 | 9.70 | 4454.1 | 4451.6 | 11.93 |
| 3/16/25 | 15.87 | 4456.30 | 4454.30 | 9.71 | 4454.1 | 4451.6 | 11.91 |
| 3/17/25 | 15.88 | 4456.30 | 4454.30 | 9.70 | 4454.1 | 4451.6 | 11.89 |
| 3/18/25 | 15.88 | 4456.30 | 4454.30 | 9.71 | 4454.1 | 4451.7 | 11.87 |
| 3/19/25 | 15.88 | 4456.30 | 4454.30 | 9.70 | 4454.1 | 4451.7 | 11.86 |
| 3/20/25 | 15.89 | 4456.30 | 4454.30 | 9.71 | 4454.2 | 4451.7 | 11.84 |
| 3/21/25 | 15.89 | 4456.30 | 4454.30 | 9.70 | 4454.2 | 4451.7 | 11.82 |
| 3/22/25 | 15.89 | 4456.30 | 4454.30 | 9.71 | 4454.2 | 4451.7 | 11.80 |
| 3/23/25 | 15.89 | 4456.30 | 4454.30 | 9.70 | 4454.2 | 4451.7 | 11.78 |
| 3/24/25 | 15.90 | 4456.30 | 4454.30 | 9.71 | 4454.2 | 4451.7 | 11.77 |
| 3/25/25 | 15.90 | 4456.30 | 4454.30 | 9.70 | 4454.3 | 4451.7 | 11.75 |
| 3/26/25 | 15.90 | 4456.30 | 4454.30 | 9.71 | 4454.3 | 4451.8 | 11.73 |
| 3/27/25 | 15.90 | 4456.30 | 4454.30 | 9.70 | 4454.3 | 4451.8 | 11.71 |
| 3/28/25 | 15.91 | 4456.30 | 4454.30 | 9.71 | 4454.3 | 4451.8 | 11.69 |
| 3/29/25 | 15.91 | 4456.30 | 4454.30 | 9.70 | 4454.3 | 4451.8 | 11.68 |
| 3/30/25 | 15.91 | 4456.30 | 4454.30 | 9.71 | 4454.3 | 4451.8 | 11.66 |
| 3/31/25 | 15.92 | 4456.30 | 4454.30 | 9.70 | 4454.4 | 4451.8 | 11.64 |
| 4/1/25 | 15.92 | 4456.30 | 4454.30 | 9.71 | 4454.4 | 4451.8 | 11.62 |
| 4/2/25 | 15.92 | 4456.30 | 4454.30 | 9.70 | 4454.4 | 4451.8 | 11.61 |
| 4/3/25 | 15.92 | 4456.30 | 4454.30 | 9.71 | 4454.4 | 4451.8 | 11.59 |
| 4/4/25 | 15.93 | 4456.30 | 4454.30 | 9.70 | 4454.4 | 4451.9 | 11.58 |
| 4/5/25 | 15.93 | 4456.30 | 4454.30 | 9.71 | 4454.4 | 4451.9 | 11.56 |
| 4/6/25 | 15.93 | 4456.30 | 4454.30 | 9.70 | 4454.5 | 4451.9 | 11.54 |
| 4/7/25 | 15.93 | 4456.30 | 4454.30 | 9.71 | 4454.5 | 4451.9 | 11.53 |
| 4/8/25 | 15.94 | 4456.30 | 4454.30 | 9.70 | 4454.5 | 4451.9 | 11.51 |
| 4/9/25 | 15.94 | 4456.30 | 4454.30 | 9.71 | 4454.5 | 4451.9 | 11.50 |
| 4/10/25 | 15.94 | 4456.30 | 4454.30 | 9.70 | 4454.5 | 4451.9 | 11.48 |
| 4/11/25 | 15.95 | 4456.30 | 4454.30 | 9.71 | 4454.5 | 4451.9 | 11.47 |
| 4/12/25 | 15.95 | 4456.30 | 4454.30 | 9.70 | 4454.5 | 4452.0 | 11.45 |
| 4/13/25 | 15.95 | 4456.30 | 4454.30 | 9.71 | 4454.6 | 4452.0 | 11.44 |
| 4/14/25 | 15.95 | 4456.30 | 4454.30 | 9.70 | 4454.6 | 4452.0 | 11.42 |
| 4/15/25 | 15.96 | 4456.30 | 4454.30 | 9.71 | 4454.6 | 4452.0 | 11.41 |
| 4/16/25 | 15.96 | 4456.30 | 4454.30 | 9.70 | 4454.6 | 4452.0 | 11.39 |

**Appendix E**
**Table 1  Tailings and Pond Elevations for North and South Cells**

| | Year | North Cell | | | South Cell | | |
|---|---|---|---|---|---|---|---|
| Date | Fraction | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) |
| 4/17/25 | 15.96 | 4456.30 | 4454.30 | 9.71 | 4454.6 | 4452.0 | 11.38 |
| 4/18/25 | 15.96 | 4456.30 | 4454.30 | 9.70 | 4454.6 | 4452.0 | 11.36 |
| 4/19/25 | 15.97 | 4456.30 | 4454.30 | 9.71 | 4454.7 | 4452.0 | 11.35 |
| 4/20/25 | 15.97 | 4456.30 | 4454.30 | 9.70 | 4454.7 | 4452.1 | 11.33 |
| 4/21/25 | 15.97 | 4456.30 | 4454.30 | 9.71 | 4454.7 | 4452.1 | 11.32 |
| 4/22/25 | 15.98 | 4456.30 | 4454.30 | 9.70 | 4454.7 | 4452.1 | 11.30 |
| 4/23/25 | 15.98 | 4456.30 | 4454.30 | 9.71 | 4454.7 | 4452.1 | 11.28 |
| 4/24/25 | 15.98 | 4456.30 | 4454.30 | 9.70 | 4454.7 | 4452.1 | 11.27 |
| 4/25/25 | 15.98 | 4456.30 | 4454.30 | 9.71 | 4454.7 | 4452.1 | 11.25 |
| 4/26/25 | 15.99 | 4456.30 | 4454.30 | 9.70 | 4454.8 | 4452.1 | 11.24 |
| 4/27/25 | 15.99 | 4456.30 | 4454.30 | 9.71 | 4454.8 | 4452.1 | 11.22 |
| 4/28/25 | 15.99 | 4456.30 | 4454.30 | 9.70 | 4454.8 | 4452.1 | 11.21 |
| 4/29/25 | 16.00 | 4456.30 | 4454.30 | 9.71 | 4454.8 | 4452.2 | 11.19 |
| 4/30/25 | 16.00 | 4456.30 | 4454.30 | 9.70 | 4454.8 | 4452.2 | 11.18 |
| 5/1/25 | 16.00 | 4456.30 | 4454.30 | 9.71 | 4454.8 | 4452.2 | 11.16 |
| 5/2/25 | 16.00 | 4456.30 | 4454.30 | 9.70 | 4454.9 | 4452.2 | 11.15 |
| 5/3/25 | 16.01 | 4456.30 | 4454.30 | 9.71 | 4454.9 | 4452.2 | 11.13 |
| 5/4/25 | 16.01 | 4456.30 | 4454.30 | 9.70 | 4454.9 | 4452.2 | 11.12 |
| 5/5/25 | 16.01 | 4456.30 | 4454.30 | 9.71 | 4454.9 | 4452.2 | 11.11 |
| 5/6/25 | 16.01 | 4456.30 | 4454.30 | 9.70 | 4454.9 | 4452.2 | 11.09 |
| 5/7/25 | 16.02 | 4456.30 | 4454.30 | 9.71 | 4454.9 | 4452.3 | 11.08 |
| 5/8/25 | 16.02 | 4456.30 | 4454.30 | 9.70 | 4454.9 | 4452.3 | 11.06 |
| 5/9/25 | 16.02 | 4456.30 | 4454.30 | 9.71 | 4455.0 | 4452.3 | 11.05 |
| 5/10/25 | 16.03 | 4456.30 | 4454.30 | 9.70 | 4455.0 | 4452.3 | 11.03 |
| 5/11/25 | 16.03 | 4456.30 | 4454.30 | 9.71 | 4455.0 | 4452.3 | 11.02 |
| 5/12/25 | 16.03 | 4456.30 | 4454.30 | 9.70 | 4455.0 | 4452.3 | 11.01 |
| 5/13/25 | 16.03 | 4456.30 | 4454.30 | 9.71 | 4455.0 | 4452.3 | 10.99 |
| 5/14/25 | 16.04 | 4456.30 | 4454.30 | 9.70 | 4455.0 | 4452.3 | 10.98 |
| 5/15/25 | 16.04 | 4456.30 | 4454.30 | 9.71 | 4455.0 | 4452.4 | 10.96 |
| 5/16/25 | 16.04 | 4456.30 | 4454.30 | 9.70 | 4455.1 | 4452.4 | 10.95 |
| 5/17/25 | 16.04 | 4456.30 | 4454.30 | 9.71 | 4455.1 | 4452.4 | 10.93 |
| 5/18/25 | 16.05 | 4456.30 | 4454.30 | 9.70 | 4455.1 | 4452.4 | 10.92 |
| 5/19/25 | 16.05 | 4456.30 | 4454.30 | 9.71 | 4455.1 | 4452.4 | 10.91 |
| 5/20/25 | 16.05 | 4456.30 | 4454.30 | 9.70 | 4455.1 | 4452.4 | 10.89 |
| 5/21/25 | 16.06 | 4456.30 | 4454.30 | 9.71 | 4455.1 | 4452.4 | 10.88 |
| 5/22/25 | 16.06 | 4456.30 | 4454.30 | 9.70 | 4455.1 | 4452.4 | 10.86 |
| 5/23/25 | 16.06 | 4456.30 | 4454.30 | 9.71 | 4455.2 | 4452.4 | 10.85 |
| 5/24/25 | 16.06 | 4456.30 | 4454.30 | 9.70 | 4455.2 | 4452.5 | 10.84 |
| 5/25/25 | 16.07 | 4456.30 | 4454.30 | 9.71 | 4455.2 | 4452.5 | 10.82 |
| 5/26/25 | 16.07 | 4456.30 | 4454.30 | 9.70 | 4455.2 | 4452.5 | 10.81 |
| 5/27/25 | 16.07 | 4456.30 | 4454.30 | 9.71 | 4455.2 | 4452.5 | 10.79 |
| 5/28/25 | 16.07 | 4456.30 | 4454.30 | 9.70 | 4455.2 | 4452.5 | 10.78 |
| 5/29/25 | 16.08 | 4456.30 | 4454.30 | 9.71 | 4455.2 | 4452.5 | 10.76 |
| 5/30/25 | 16.08 | 4456.30 | 4454.30 | 9.70 | 4455.3 | 4452.5 | 10.75 |
| 5/31/25 | 16.08 | 4456.30 | 4454.30 | 9.71 | 4455.3 | 4452.5 | 10.74 |
| 6/1/25 | 16.09 | 4456.30 | 4454.30 | 9.70 | 4455.3 | 4452.6 | 10.72 |
| 6/2/25 | 16.09 | 4456.30 | 4454.30 | 9.72 | 4455.3 | 4452.6 | 10.71 |
| 6/3/25 | 16.09 | 4456.30 | 4454.30 | 9.70 | 4455.3 | 4452.6 | 10.70 |
| 6/4/25 | 16.09 | 4456.30 | 4454.30 | 9.72 | 4455.3 | 4452.6 | 10.69 |
| 6/5/25 | 16.10 | 4456.30 | 4454.30 | 9.70 | 4455.3 | 4452.6 | 10.68 |
| 6/6/25 | 16.10 | 4456.30 | 4454.30 | 9.72 | 4455.3 | 4452.6 | 10.67 |
| 6/7/25 | 16.10 | 4456.30 | 4454.30 | 9.70 | 4455.3 | 4452.6 | 10.66 |
| 6/8/25 | 16.10 | 4456.30 | 4454.30 | 9.72 | 4455.4 | 4452.6 | 10.65 |
| 6/9/25 | 16.11 | 4456.30 | 4454.30 | 9.70 | 4455.4 | 4452.7 | 10.64 |
| 6/10/25 | 16.11 | 4456.30 | 4454.30 | 9.72 | 4455.4 | 4452.7 | 10.63 |

**Appendix E**
**Table 1  Tailings and Pond Elevations for North and South Cells**

| | Year | North Cell | | | South Cell | | |
|---|---|---|---|---|---|---|---|
| Date | Fraction | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) |
| 6/11/25 | 16.11 | 4456.30 | 4454.30 | 9.70 | 4455.4 | 4452.7 | 10.62 |
| 6/12/25 | 16.12 | 4456.30 | 4454.30 | 9.72 | 4455.4 | 4452.7 | 10.61 |
| 6/13/25 | 16.12 | 4456.30 | 4454.30 | 9.70 | 4455.4 | 4452.7 | 10.60 |
| 6/14/25 | 16.12 | 4456.30 | 4454.30 | 9.72 | 4455.4 | 4452.7 | 10.58 |
| 6/15/25 | 16.12 | 4456.30 | 4454.30 | 9.70 | 4455.4 | 4452.7 | 10.57 |
| 6/16/25 | 16.13 | 4456.30 | 4454.30 | 9.72 | 4455.4 | 4452.7 | 10.56 |
| 6/17/25 | 16.13 | 4456.30 | 4454.30 | 9.70 | 4455.4 | 4452.7 | 10.55 |
| 6/18/25 | 16.13 | 4456.30 | 4454.30 | 9.72 | 4455.5 | 4452.8 | 10.54 |
| 6/19/25 | 16.13 | 4456.30 | 4454.30 | 9.70 | 4455.5 | 4452.8 | 10.53 |
| 6/20/25 | 16.14 | 4456.30 | 4454.30 | 9.72 | 4455.5 | 4452.8 | 10.52 |
| 6/21/25 | 16.14 | 4456.30 | 4454.30 | 9.70 | 4455.5 | 4452.8 | 10.51 |
| 6/22/25 | 16.14 | 4456.30 | 4454.30 | 9.72 | 4455.5 | 4452.8 | 10.50 |
| 6/23/25 | 16.15 | 4456.30 | 4454.30 | 9.70 | 4455.5 | 4452.8 | 10.49 |
| 6/24/25 | 16.15 | 4456.30 | 4454.30 | 9.72 | 4455.5 | 4452.8 | 10.48 |
| 6/25/25 | 16.15 | 4456.30 | 4454.30 | 9.70 | 4455.5 | 4452.8 | 10.47 |
| 6/26/25 | 16.15 | 4456.30 | 4454.30 | 9.72 | 4455.5 | 4452.9 | 10.46 |
| 6/27/25 | 16.16 | 4456.30 | 4454.30 | 9.70 | 4455.6 | 4452.9 | 10.45 |
| 6/28/25 | 16.16 | 4456.30 | 4454.30 | 9.72 | 4455.6 | 4452.9 | 10.44 |
| 6/29/25 | 16.16 | 4456.30 | 4454.30 | 9.70 | 4455.6 | 4452.9 | 10.43 |
| 6/30/25 | 16.16 | 4456.30 | 4454.30 | 9.72 | 4455.6 | 4452.9 | 10.42 |
| 7/1/25 | 16.17 | 4456.30 | 4454.30 | 9.70 | 4455.6 | 4452.9 | 10.40 |
| 7/2/25 | 16.17 | 4456.30 | 4454.30 | 9.72 | 4455.6 | 4452.9 | 10.40 |
| 7/3/25 | 16.17 | 4456.30 | 4454.30 | 9.70 | 4455.6 | 4452.9 | 10.40 |
| 7/4/25 | 16.18 | 4456.30 | 4454.30 | 9.72 | 4455.6 | 4453.0 | 10.39 |
| 7/5/25 | 16.18 | 4456.30 | 4454.30 | 9.70 | 4455.6 | 4453.0 | 10.39 |
| 7/6/25 | 16.18 | 4456.30 | 4454.30 | 9.72 | 4455.6 | 4453.0 | 10.39 |
| 7/7/25 | 16.18 | 4456.30 | 4454.30 | 9.70 | 4455.6 | 4453.0 | 10.38 |
| 7/8/25 | 16.19 | 4456.30 | 4454.30 | 9.72 | 4455.6 | 4453.0 | 10.38 |
| 7/9/25 | 16.19 | 4456.30 | 4454.30 | 9.70 | 4455.6 | 4453.0 | 10.38 |
| 7/10/25 | 16.19 | 4456.30 | 4454.30 | 9.72 | 4455.6 | 4453.0 | 10.37 |
| 7/11/25 | 16.19 | 4456.30 | 4454.30 | 9.70 | 4455.6 | 4453.0 | 10.37 |
| 7/12/25 | 16.20 | 4456.30 | 4454.30 | 9.72 | 4455.6 | 4453.0 | 10.37 |
| 7/13/25 | 16.20 | 4456.30 | 4454.30 | 9.70 | 4455.6 | 4453.1 | 10.36 |
| 7/14/25 | 16.20 | 4456.30 | 4454.30 | 9.72 | 4455.6 | 4453.1 | 10.36 |
| 7/15/25 | 16.21 | 4456.30 | 4454.30 | 9.70 | 4455.6 | 4453.1 | 10.36 |
| 7/16/25 | 16.21 | 4456.30 | 4454.30 | 9.72 | 4455.6 | 4453.1 | 10.35 |
| 7/17/25 | 16.21 | 4456.30 | 4454.30 | 9.70 | 4455.6 | 4453.1 | 10.35 |
| 7/18/25 | 16.21 | 4456.30 | 4454.30 | 9.72 | 4455.7 | 4453.1 | 10.35 |
| 7/19/25 | 16.22 | 4456.30 | 4454.30 | 9.70 | 4455.7 | 4453.1 | 10.34 |
| 7/20/25 | 16.22 | 4456.30 | 4454.30 | 9.72 | 4455.7 | 4453.1 | 10.34 |
| 7/21/25 | 16.22 | 4456.30 | 4454.30 | 9.70 | 4455.7 | 4453.2 | 10.34 |
| 7/22/25 | 16.23 | 4456.30 | 4454.30 | 9.72 | 4455.7 | 4453.2 | 10.33 |
| 7/23/25 | 16.23 | 4456.30 | 4454.30 | 9.70 | 4455.7 | 4453.2 | 10.33 |
| 7/24/25 | 16.23 | 4456.30 | 4454.30 | 9.72 | 4455.7 | 4453.2 | 10.33 |
| 7/25/25 | 16.23 | 4456.30 | 4454.30 | 9.70 | 4455.7 | 4453.2 | 10.32 |
| 7/26/25 | 16.24 | 4456.30 | 4454.30 | 9.72 | 4455.7 | 4453.2 | 10.32 |
| 7/27/25 | 16.24 | 4456.30 | 4454.30 | 9.70 | 4455.7 | 4453.2 | 10.32 |
| 7/28/25 | 16.24 | 4456.30 | 4454.30 | 9.72 | 4455.7 | 4453.2 | 10.31 |
| 7/29/25 | 16.24 | 4456.30 | 4454.30 | 9.70 | 4455.7 | 4453.3 | 10.31 |
| 7/30/25 | 16.25 | 4456.30 | 4454.30 | 9.72 | 4455.7 | 4453.3 | 10.31 |
| 7/31/25 | 16.25 | 4456.30 | 4454.30 | 9.70 | 4455.7 | 4453.3 | 10.30 |
| 8/1/25 | 16.25 | 4456.30 | 4454.30 | 9.72 | 4455.7 | 4453.3 | 10.30 |
| 8/2/25 | 16.26 | 4456.30 | 4454.30 | 9.70 | 4455.7 | 4453.3 | 10.30 |
| 8/3/25 | 16.26 | 4456.30 | 4454.30 | 9.72 | 4455.7 | 4453.3 | 10.30 |
| 8/4/25 | 16.26 | 4456.30 | 4454.30 | 9.70 | 4455.7 | 4453.3 | 10.29 |

## Appendix E
## Table 1  Tailings and Pond Elevations for North and South Cells

| Date | Year Fraction | North Cell | | | South Cell | | |
|---|---|---|---|---|---|---|---|
| | | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) |
| 8/5/25 | 16.26 | 4456.30 | 4454.30 | 9.72 | 4455.7 | 4453.3 | 10.29 |
| 8/6/25 | 16.27 | 4456.30 | 4454.30 | 9.70 | 4455.7 | 4453.4 | 10.29 |
| 8/7/25 | 16.27 | 4456.30 | 4454.30 | 9.72 | 4455.7 | 4453.4 | 10.29 |
| 8/8/25 | 16.27 | 4456.30 | 4454.30 | 9.70 | 4455.7 | 4453.4 | 10.28 |
| 8/9/25 | 16.27 | 4456.30 | 4454.30 | 9.72 | 4455.7 | 4453.4 | 10.28 |
| 8/10/25 | 16.28 | 4456.30 | 4454.30 | 9.70 | 4455.7 | 4453.4 | 10.28 |
| 8/11/25 | 16.28 | 4456.30 | 4454.30 | 9.72 | 4455.7 | 4453.4 | 10.28 |
| 8/12/25 | 16.28 | 4456.30 | 4454.30 | 9.70 | 4455.7 | 4453.4 | 10.28 |
| 8/13/25 | 16.29 | 4456.30 | 4454.30 | 9.72 | 4455.7 | 4453.4 | 10.27 |
| 8/14/25 | 16.29 | 4456.30 | 4454.30 | 9.70 | 4455.7 | 4453.4 | 10.27 |
| 8/15/25 | 16.29 | 4456.30 | 4454.30 | 9.72 | 4455.7 | 4453.5 | 10.27 |
| 8/16/25 | 16.29 | 4456.30 | 4454.30 | 9.70 | 4455.7 | 4453.5 | 10.27 |
| 8/17/25 | 16.30 | 4456.30 | 4454.30 | 9.72 | 4455.7 | 4453.5 | 10.26 |
| 8/18/25 | 16.30 | 4456.30 | 4454.30 | 9.70 | 4455.7 | 4453.5 | 10.26 |
| 8/19/25 | 16.30 | 4456.30 | 4454.30 | 9.72 | 4455.7 | 4453.5 | 10.26 |
| 8/20/25 | 16.30 | 4456.30 | 4454.30 | 9.70 | 4455.7 | 4453.5 | 10.26 |
| 8/21/25 | 16.31 | 4456.30 | 4454.30 | 9.72 | 4455.7 | 4453.5 | 10.26 |
| 8/22/25 | 16.31 | 4456.30 | 4454.30 | 9.70 | 4455.7 | 4453.5 | 10.25 |
| 8/23/25 | 16.31 | 4456.30 | 4454.30 | 9.72 | 4455.7 | 4453.6 | 10.25 |
| 8/24/25 | 16.32 | 4456.30 | 4454.30 | 9.70 | 4455.8 | 4453.6 | 10.25 |
| 8/25/25 | 16.32 | 4456.30 | 4454.30 | 9.72 | 4455.8 | 4453.6 | 10.25 |
| 8/26/25 | 16.32 | 4456.30 | 4454.30 | 9.70 | 4455.8 | 4453.6 | 10.24 |
| 8/27/25 | 16.32 | 4456.30 | 4454.30 | 9.72 | 4455.8 | 4453.6 | 10.24 |
| 8/28/25 | 16.33 | 4456.30 | 4454.30 | 9.70 | 4455.8 | 4453.6 | 10.24 |
| 8/29/25 | 16.33 | 4456.30 | 4454.30 | 9.72 | 4455.8 | 4453.6 | 10.24 |
| 8/30/25 | 16.33 | 4456.30 | 4454.30 | 9.70 | 4455.8 | 4453.6 | 10.24 |
| 8/31/25 | 16.33 | 4456.30 | 4454.30 | 9.72 | 4455.8 | 4453.7 | 10.23 |
| 9/1/25 | 16.34 | 4456.30 | 4454.30 | 9.70 | 4455.8 | 4453.7 | 10.23 |
| 9/2/25 | 16.34 | 4456.30 | 4454.30 | 9.72 | 4455.8 | 4453.7 | 10.23 |
| 9/3/25 | 16.34 | 4456.30 | 4454.30 | 9.70 | 4455.8 | 4453.7 | 10.23 |
| 9/4/25 | 16.35 | 4456.30 | 4454.30 | 9.72 | 4455.8 | 4453.7 | 10.22 |
| 9/5/25 | 16.35 | 4456.30 | 4454.30 | 9.70 | 4455.8 | 4453.7 | 10.22 |
| 9/6/25 | 16.35 | 4456.30 | 4454.30 | 9.72 | 4455.8 | 4453.7 | 10.22 |
| 9/7/25 | 16.35 | 4456.30 | 4454.30 | 9.70 | 4455.8 | 4453.7 | 10.22 |
| 9/8/25 | 16.36 | 4456.30 | 4454.30 | 9.72 | 4455.8 | 4453.7 | 10.22 |
| 9/9/25 | 16.36 | 4456.30 | 4454.30 | 9.70 | 4455.8 | 4453.8 | 10.21 |
| 9/10/25 | 16.36 | 4456.30 | 4454.30 | 9.72 | 4455.8 | 4453.8 | 10.19 |
| 9/11/25 | 16.36 | 4456.30 | 4454.30 | 9.70 | 4455.8 | 4453.8 | 10.19 |
| 9/12/25 | 16.37 | 4456.30 | 4454.30 | 9.72 | 4455.8 | 4453.8 | 10.17 |
| 9/13/25 | 16.37 | 4456.30 | 4454.30 | 9.70 | 4455.8 | 4453.8 | 10.16 |
| 9/14/25 | 16.37 | 4456.30 | 4454.30 | 9.72 | 4455.9 | 4453.8 | 10.14 |
| 9/15/25 | 16.38 | 4456.30 | 4454.30 | 9.70 | 4455.9 | 4453.8 | 10.14 |
| 9/16/25 | 16.38 | 4456.30 | 4454.30 | 9.72 | 4455.9 | 4453.8 | 10.12 |
| 9/17/25 | 16.38 | 4456.30 | 4454.30 | 9.70 | 4455.9 | 4453.9 | 10.12 |
| 9/18/25 | 16.38 | 4456.30 | 4454.30 | 9.72 | 4455.9 | 4453.9 | 10.10 |
| 9/19/25 | 16.39 | 4456.30 | 4454.30 | 9.70 | 4455.9 | 4453.9 | 10.09 |
| 9/20/25 | 16.39 | 4456.30 | 4454.30 | 9.72 | 4455.9 | 4453.9 | 10.07 |
| 9/21/25 | 16.39 | 4456.30 | 4454.30 | 9.70 | 4455.9 | 4453.9 | 10.07 |
| 9/22/25 | 16.39 | 4456.30 | 4454.30 | 9.72 | 4456.0 | 4453.9 | 10.05 |
| 9/23/25 | 16.40 | 4456.30 | 4454.30 | 9.70 | 4456.0 | 4453.9 | 10.04 |
| 9/24/25 | 16.40 | 4456.30 | 4454.30 | 9.72 | 4456.0 | 4453.9 | 10.02 |
| 9/25/25 | 16.40 | 4456.30 | 4454.30 | 9.70 | 4456.0 | 4454.0 | 10.02 |
| 9/26/25 | 16.41 | 4456.30 | 4454.30 | 9.72 | 4456.0 | 4454.0 | 10.00 |
| 9/27/25 | 16.41 | 4456.30 | 4454.30 | 9.70 | 4456.0 | 4454.0 | 10.00 |
| 9/28/25 | 16.41 | 4456.30 | 4454.30 | 9.72 | 4456.0 | 4454.0 | 9.97 |

**Appendix E**
**Table 1  Tailings and Pond Elevations for North and South Cells**

| Date | Year Fraction | North Cell | | | South Cell | | |
|---|---|---|---|---|---|---|---|
| | | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) |
| 9/29/25 | 16.41 | 4456.30 | 4454.30 | 9.70 | 4456.0 | 4454.0 | 9.97 |
| 9/30/25 | 16.42 | 4456.30 | 4454.30 | 9.72 | 4456.0 | 4454.0 | 9.95 |
| 10/1/25 | 16.42 | 4456.30 | 4454.30 | 9.70 | 4456.1 | 4454.0 | 9.95 |
| 10/2/25 | 16.42 | 4456.30 | 4454.30 | 9.72 | 4456.1 | 4454.0 | 9.92 |
| 10/3/25 | 16.42 | 4456.30 | 4454.30 | 9.70 | 4456.1 | 4454.0 | 9.92 |
| 10/4/25 | 16.43 | 4456.30 | 4454.30 | 9.72 | 4456.1 | 4454.1 | 9.90 |
| 10/5/25 | 16.43 | 4456.30 | 4454.30 | 9.70 | 4456.1 | 4454.1 | 9.89 |
| 10/6/25 | 16.43 | 4456.30 | 4454.30 | 9.72 | 4456.1 | 4454.1 | 9.87 |
| 10/7/25 | 16.44 | 4456.30 | 4454.30 | 9.70 | 4456.1 | 4454.1 | 9.87 |
| 10/8/25 | 16.44 | 4456.30 | 4454.30 | 9.72 | 4456.1 | 4454.1 | 9.85 |
| 10/9/25 | 16.44 | 4456.30 | 4454.30 | 9.70 | 4456.2 | 4454.1 | 9.85 |
| 10/10/25 | 16.44 | 4456.30 | 4454.30 | 9.72 | 4456.2 | 4454.1 | 9.83 |
| 10/11/25 | 16.45 | 4456.30 | 4454.30 | 9.70 | 4456.2 | 4454.1 | 9.82 |
| 10/12/25 | 16.45 | 4456.30 | 4454.30 | 9.72 | 4456.2 | 4454.2 | 9.80 |
| 10/13/25 | 16.45 | 4456.30 | 4454.30 | 9.70 | 4456.2 | 4454.2 | 9.80 |
| 10/14/25 | 16.45 | 4456.30 | 4454.30 | 9.72 | 4456.2 | 4454.2 | 9.78 |
| 10/15/25 | 16.46 | 4456.30 | 4454.30 | 9.70 | 4456.2 | 4454.2 | 9.77 |
| 10/16/25 | 16.46 | 4456.30 | 4454.30 | 9.72 | 4456.2 | 4454.2 | 9.75 |
| 10/17/25 | 16.46 | 4456.30 | 4454.30 | 9.70 | 4456.3 | 4454.2 | 9.75 |
| 10/18/25 | 16.47 | 4456.30 | 4454.30 | 9.72 | 4456.3 | 4454.2 | 9.73 |
| 10/19/25 | 16.47 | 4456.30 | 4454.30 | 9.70 | 4456.3 | 4454.2 | 9.72 |
| 10/20/25 | 16.47 | 4456.30 | 4454.30 | 9.72 | 4456.3 | 4454.3 | 9.71 |
| 10/21/25 | 16.47 | 4456.30 | 4454.30 | 9.70 | 4456.3 | 4454.3 | 9.70 |
| 10/22/25 | 16.48 | 4456.30 | 4454.30 | 9.72 | 4456.3 | 4454.3 | 9.68 |
| 10/23/25 | 16.48 | 4456.30 | 4454.30 | 9.70 | 4456.3 | 4454.3 | 9.68 |
| 10/24/25 | 16.48 | 4456.30 | 4454.30 | 9.72 | 4456.3 | 4454.3 | 9.66 |
| 10/25/25 | 16.49 | 4456.30 | 4454.30 | 9.70 | 4456.3 | 4454.3 | 9.65 |
| 10/26/25 | 16.49 | 4456.30 | 4454.30 | 9.72 | 4456.4 | 4454.3 | 9.63 |
| 10/27/25 | 16.49 | 4456.30 | 4454.30 | 9.70 | 4456.4 | 4454.3 | 9.63 |
| 10/28/25 | 16.49 | 4456.30 | 4454.30 | 9.72 | 4456.4 | 4454.3 | 9.61 |
| 10/29/25 | 16.50 | 4456.30 | 4454.30 | 9.70 | 4456.4 | 4454.4 | 9.60 |
| 10/30/25 | 16.50 | 4456.30 | 4454.30 | 9.72 | 4456.4 | 4454.4 | 9.59 |
| 10/31/25 | 16.50 | 4456.30 | 4454.30 | 9.70 | 4456.4 | 4454.4 | 9.58 |
| 11/1/25 | 16.50 | 4456.30 | 4454.30 | 9.72 | 4456.4 | 4454.4 | 9.56 |
| 11/2/25 | 16.51 | 4456.30 | 4454.30 | 9.70 | 4456.4 | 4454.4 | 9.55 |
| 11/3/25 | 16.51 | 4456.30 | 4454.30 | 9.71 | 4456.5 | 4454.4 | 9.54 |
| 11/4/25 | 16.51 | 4456.30 | 4454.30 | 9.70 | 4456.5 | 4454.4 | 9.53 |
| 11/5/25 | 16.52 | 4456.30 | 4454.30 | 9.71 | 4456.5 | 4454.4 | 9.51 |
| 11/6/25 | 16.52 | 4456.30 | 4454.30 | 9.70 | 4456.5 | 4454.5 | 9.50 |
| 11/7/25 | 16.52 | 4456.30 | 4454.30 | 9.71 | 4456.5 | 4454.5 | 9.49 |
| 11/8/25 | 16.52 | 4456.30 | 4454.30 | 9.70 | 4456.5 | 4454.5 | 9.48 |
| 11/9/25 | 16.53 | 4456.30 | 4454.30 | 9.71 | 4456.5 | 4454.5 | 9.47 |
| 11/10/25 | 16.53 | 4456.30 | 4454.30 | 9.70 | 4456.5 | 4454.5 | 9.46 |
| 11/11/25 | 16.53 | 4456.30 | 4454.30 | 9.71 | 4456.6 | 4454.5 | 9.44 |
| 11/12/25 | 16.53 | 4456.30 | 4454.30 | 9.70 | 4456.6 | 4454.5 | 9.43 |
| 11/13/25 | 16.54 | 4456.30 | 4454.30 | 9.71 | 4456.6 | 4454.5 | 9.42 |
| 11/14/25 | 16.54 | 4456.30 | 4454.30 | 9.70 | 4456.6 | 4454.6 | 9.41 |
| 11/15/25 | 16.54 | 4456.30 | 4454.30 | 9.71 | 4456.6 | 4454.6 | 9.39 |
| 11/16/25 | 16.55 | 4456.30 | 4454.30 | 9.70 | 4456.6 | 4454.6 | 9.38 |
| 11/17/25 | 16.55 | 4456.30 | 4454.30 | 9.71 | 4456.6 | 4454.6 | 9.37 |
| 11/18/25 | 16.55 | 4456.30 | 4454.30 | 9.70 | 4456.6 | 4454.6 | 9.36 |
| 11/19/25 | 16.55 | 4456.30 | 4454.30 | 9.71 | 4456.7 | 4454.6 | 9.35 |
| 11/20/25 | 16.56 | 4456.30 | 4454.30 | 9.70 | 4456.7 | 4454.6 | 9.34 |
| 11/21/25 | 16.56 | 4456.30 | 4454.30 | 9.71 | 4456.7 | 4454.6 | 9.32 |
| 11/22/25 | 16.56 | 4456.30 | 4454.30 | 9.70 | 4456.7 | 4454.6 | 9.31 |

**Appendix E**
**Table 1  Tailings and Pond Elevations for North and South Cells**

| | Year | North Cell | | | South Cell | | |
|---|---|---|---|---|---|---|---|
| Date | Fraction | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) |
| 11/23/25 | 16.56 | 4456.30 | 4454.30 | 9.71 | 4456.7 | 4454.7 | 9.30 |
| 11/24/25 | 16.57 | 4456.30 | 4454.30 | 9.70 | 4456.7 | 4454.7 | 9.29 |
| 11/25/25 | 16.57 | 4456.30 | 4454.30 | 9.71 | 4456.7 | 4454.7 | 9.27 |
| 11/26/25 | 16.57 | 4456.30 | 4454.30 | 9.70 | 4456.7 | 4454.7 | 9.26 |
| 11/27/25 | 16.58 | 4456.30 | 4454.30 | 9.71 | 4456.8 | 4454.7 | 9.25 |
| 11/28/25 | 16.58 | 4456.30 | 4454.30 | 9.70 | 4456.8 | 4454.7 | 9.24 |
| 11/29/25 | 16.58 | 4456.30 | 4454.30 | 9.71 | 4456.8 | 4454.7 | 9.23 |
| 11/30/25 | 16.58 | 4456.30 | 4454.30 | 9.70 | 4456.8 | 4454.7 | 9.22 |
| 12/1/25 | 16.59 | 4456.30 | 4454.30 | 9.71 | 4456.8 | 4454.8 | 9.20 |
| 12/2/25 | 16.59 | 4456.30 | 4454.30 | 9.70 | 4456.8 | 4454.8 | 9.19 |
| 12/3/25 | 16.59 | 4456.30 | 4454.30 | 9.70 | 4456.8 | 4454.8 | 9.17 |
| 12/4/25 | 16.59 | 4456.30 | 4454.30 | 9.70 | 4456.8 | 4454.8 | 9.16 |
| 12/5/25 | 16.60 | 4456.30 | 4454.30 | 9.70 | 4456.9 | 4454.8 | 9.14 |
| 12/6/25 | 16.60 | 4456.30 | 4454.30 | 9.70 | 4456.9 | 4454.8 | 9.13 |
| 12/7/25 | 16.60 | 4456.30 | 4454.30 | 9.70 | 4456.9 | 4454.8 | 9.11 |
| 12/8/25 | 16.61 | 4456.30 | 4454.30 | 9.70 | 4456.9 | 4454.8 | 9.10 |
| 12/9/25 | 16.61 | 4456.30 | 4454.30 | 9.70 | 4456.9 | 4454.9 | 9.08 |
| 12/10/25 | 16.61 | 4456.30 | 4454.30 | 9.70 | 4456.9 | 4454.9 | 9.07 |
| 12/11/25 | 16.61 | 4456.30 | 4454.30 | 9.70 | 4456.9 | 4454.9 | 9.05 |
| 12/12/25 | 16.62 | 4456.30 | 4454.30 | 9.70 | 4457.0 | 4454.9 | 9.04 |
| 12/13/25 | 16.62 | 4456.30 | 4454.30 | 9.70 | 4457.0 | 4454.9 | 9.02 |
| 12/14/25 | 16.62 | 4456.30 | 4454.30 | 9.70 | 4457.0 | 4454.9 | 9.01 |
| 12/15/25 | 16.62 | 4456.30 | 4454.30 | 9.70 | 4457.0 | 4454.9 | 8.99 |
| 12/16/25 | 16.63 | 4456.30 | 4454.30 | 9.70 | 4457.0 | 4454.9 | 8.98 |
| 12/17/25 | 16.63 | 4456.30 | 4454.30 | 9.70 | 4457.0 | 4454.9 | 8.97 |
| 12/18/25 | 16.63 | 4456.30 | 4454.30 | 9.70 | 4457.0 | 4455.0 | 8.95 |
| 12/19/25 | 16.64 | 4456.30 | 4454.30 | 9.70 | 4457.1 | 4455.0 | 8.94 |
| 12/20/25 | 16.64 | 4456.30 | 4454.30 | 9.70 | 4457.1 | 4455.0 | 8.92 |
| 12/21/25 | 16.64 | 4456.30 | 4454.30 | 9.70 | 4457.1 | 4455.0 | 8.91 |
| 12/22/25 | 16.64 | 4456.30 | 4454.30 | 9.70 | 4457.1 | 4455.0 | 8.89 |
| 12/23/25 | 16.65 | 4456.30 | 4454.30 | 9.70 | 4457.1 | 4455.0 | 8.88 |
| 12/24/25 | 16.65 | 4456.30 | 4454.30 | 9.70 | 4457.1 | 4455.0 | 8.86 |
| 12/25/25 | 16.65 | 4456.30 | 4454.30 | 9.70 | 4457.2 | 4455.0 | 8.85 |
| 12/26/25 | 16.65 | 4456.30 | 4454.30 | 9.70 | 4457.2 | 4455.1 | 8.83 |
| 12/27/25 | 16.66 | 4456.30 | 4454.30 | 9.70 | 4457.2 | 4455.1 | 8.82 |
| 12/28/25 | 16.66 | 4456.30 | 4454.30 | 9.70 | 4457.2 | 4455.1 | 8.80 |
| 12/29/25 | 16.66 | 4456.30 | 4454.30 | 9.70 | 4457.2 | 4455.1 | 8.79 |
| 12/30/25 | 16.67 | 4456.30 | 4454.30 | 9.70 | 4457.2 | 4455.1 | 8.77 |
| 12/31/25 | 16.67 | 4456.30 | 4454.30 | 9.70 | 4457.2 | 4455.1 | 8.76 |
| 1/1/26 | 16.67 | 4456.30 | 4454.30 | 9.70 | 4457.3 | 4455.1 | 8.74 |
| 1/2/26 | 16.67 | 4456.30 | 4454.30 | 9.70 | 4457.3 | 4455.1 | 8.73 |
| 1/3/26 | 16.68 | 4456.30 | 4454.30 | 9.70 | 4457.3 | 4455.2 | 8.71 |
| 1/4/26 | 16.68 | 4456.30 | 4454.30 | 9.70 | 4457.3 | 4455.2 | 8.69 |
| 1/5/26 | 16.68 | 4456.30 | 4454.30 | 9.70 | 4457.3 | 4455.2 | 8.68 |
| 1/6/26 | 16.68 | 4456.30 | 4454.30 | 9.70 | 4457.3 | 4455.2 | 8.66 |
| 1/7/26 | 16.69 | 4456.30 | 4454.30 | 9.70 | 4457.4 | 4455.2 | 8.64 |
| 1/8/26 | 16.69 | 4456.30 | 4454.30 | 9.70 | 4457.4 | 4455.2 | 8.63 |
| 1/9/26 | 16.69 | 4456.30 | 4454.30 | 9.70 | 4457.4 | 4455.2 | 8.61 |
| 1/10/26 | 16.70 | 4456.30 | 4454.30 | 9.70 | 4457.4 | 4455.2 | 8.59 |
| 1/11/26 | 16.70 | 4456.30 | 4454.30 | 9.70 | 4457.4 | 4455.3 | 8.58 |
| 1/12/26 | 16.70 | 4456.30 | 4454.30 | 9.70 | 4457.4 | 4455.3 | 8.56 |
| 1/13/26 | 16.70 | 4456.30 | 4454.30 | 9.70 | 4457.5 | 4455.3 | 8.54 |
| 1/14/26 | 16.71 | 4456.30 | 4454.30 | 9.70 | 4457.5 | 4455.3 | 8.53 |
| 1/15/26 | 16.71 | 4456.30 | 4454.30 | 9.70 | 4457.5 | 4455.3 | 8.51 |
| 1/16/26 | 16.71 | 4456.30 | 4454.30 | 9.70 | 4457.5 | 4455.3 | 8.49 |

## Appendix E
## Table 1 Tailings and Pond Elevations for North and South Cells

| | Year | North Cell | | | South Cell | | |
|---|---|---|---|---|---|---|---|
| Date | Fraction | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) |
| 1/17/26 | 16.72 | 4456.30 | 4454.30 | 9.70 | 4457.5 | 4455.3 | 8.48 |
| 1/18/26 | 16.72 | 4456.30 | 4454.30 | 9.70 | 4457.5 | 4455.3 | 8.46 |
| 1/19/26 | 16.72 | 4456.30 | 4454.30 | 9.70 | 4457.6 | 4455.3 | 8.44 |
| 1/20/26 | 16.72 | 4456.30 | 4454.30 | 9.70 | 4457.6 | 4455.4 | 8.43 |
| 1/21/26 | 16.73 | 4456.30 | 4454.30 | 9.70 | 4457.6 | 4455.4 | 8.41 |
| 1/22/26 | 16.73 | 4456.30 | 4454.30 | 9.70 | 4457.6 | 4455.4 | 8.39 |
| 1/23/26 | 16.73 | 4456.30 | 4454.30 | 9.70 | 4457.6 | 4455.4 | 8.38 |
| 1/24/26 | 16.73 | 4456.30 | 4454.30 | 9.70 | 4457.6 | 4455.4 | 8.36 |
| 1/25/26 | 16.74 | 4456.30 | 4454.30 | 9.70 | 4457.7 | 4455.4 | 8.34 |
| 1/26/26 | 16.74 | 4456.30 | 4454.30 | 9.70 | 4457.7 | 4455.4 | 8.33 |
| 1/27/26 | 16.74 | 4456.30 | 4454.30 | 9.70 | 4457.7 | 4455.4 | 8.31 |
| 1/28/26 | 16.75 | 4456.30 | 4454.30 | 9.70 | 4457.7 | 4455.5 | 8.29 |
| 1/29/26 | 16.75 | 4456.30 | 4454.30 | 9.70 | 4457.7 | 4455.5 | 8.27 |
| 1/30/26 | 16.75 | 4456.30 | 4454.30 | 9.70 | 4457.7 | 4455.5 | 8.26 |
| 1/31/26 | 16.75 | 4456.30 | 4454.30 | 9.70 | 4457.8 | 4455.5 | 8.24 |
| 2/1/26 | 16.76 | 4456.30 | 4454.30 | 9.70 | 4457.8 | 4455.5 | 8.22 |
| 2/2/26 | 16.76 | 4456.30 | 4454.30 | 9.70 | 4457.8 | 4455.5 | 8.21 |
| 2/3/26 | 16.76 | 4456.30 | 4454.30 | 9.70 | 4457.8 | 4455.5 | 8.19 |
| 2/4/26 | 16.76 | 4456.30 | 4454.30 | 9.71 | 4457.8 | 4455.5 | 8.17 |
| 2/5/26 | 16.77 | 4456.30 | 4454.30 | 9.70 | 4457.8 | 4455.6 | 8.16 |
| 2/6/26 | 16.77 | 4456.30 | 4454.30 | 9.71 | 4457.9 | 4455.6 | 8.14 |
| 2/7/26 | 16.77 | 4456.30 | 4454.30 | 9.70 | 4457.9 | 4455.6 | 8.12 |
| 2/8/26 | 16.78 | 4456.30 | 4454.30 | 9.71 | 4457.9 | 4455.6 | 8.10 |
| 2/9/26 | 16.78 | 4456.30 | 4454.30 | 9.70 | 4457.9 | 4455.6 | 8.09 |
| 2/10/26 | 16.78 | 4456.30 | 4454.30 | 9.71 | 4457.9 | 4455.6 | 8.07 |
| 2/11/26 | 16.78 | 4456.30 | 4454.30 | 9.70 | 4457.9 | 4455.6 | 8.05 |
| 2/12/26 | 16.79 | 4456.30 | 4454.30 | 9.71 | 4458.0 | 4455.6 | 8.04 |
| 2/13/26 | 16.79 | 4456.30 | 4454.30 | 9.70 | 4458.0 | 4455.6 | 8.02 |
| 2/14/26 | 16.79 | 4456.30 | 4454.30 | 9.71 | 4458.0 | 4455.7 | 8.00 |
| 2/15/26 | 16.79 | 4456.30 | 4454.30 | 9.70 | 4458.0 | 4455.7 | 7.98 |
| 2/16/26 | 16.80 | 4456.30 | 4454.30 | 9.71 | 4458.0 | 4455.7 | 7.97 |
| 2/17/26 | 16.80 | 4456.30 | 4454.30 | 9.70 | 4458.0 | 4455.7 | 7.95 |
| 2/18/26 | 16.80 | 4456.30 | 4454.30 | 9.71 | 4458.1 | 4455.7 | 7.93 |
| 2/19/26 | 16.81 | 4456.30 | 4454.30 | 9.70 | 4458.1 | 4455.7 | 7.92 |
| 2/20/26 | 16.81 | 4456.30 | 4454.30 | 9.71 | 4458.1 | 4455.7 | 7.90 |
| 2/21/26 | 16.81 | 4456.30 | 4454.30 | 9.70 | 4458.1 | 4455.7 | 7.88 |
| 2/22/26 | 16.81 | 4456.30 | 4454.30 | 9.71 | 4458.1 | 4455.8 | 7.87 |
| 2/23/26 | 16.82 | 4456.30 | 4454.30 | 9.70 | 4458.2 | 4455.8 | 7.85 |
| 2/24/26 | 16.82 | 4456.30 | 4454.30 | 9.71 | 4458.2 | 4455.8 | 7.83 |
| 2/25/26 | 16.82 | 4456.30 | 4454.30 | 9.70 | 4458.2 | 4455.8 | 7.81 |
| 2/26/26 | 16.82 | 4456.30 | 4454.30 | 9.71 | 4458.2 | 4455.8 | 7.80 |
| 2/27/26 | 16.83 | 4456.30 | 4454.30 | 9.70 | 4458.2 | 4455.8 | 7.78 |
| 2/28/26 | 16.83 | 4456.30 | 4454.30 | 9.71 | 4458.2 | 4455.8 | 7.76 |
| 3/1/26 | 16.83 | 4456.30 | 4454.30 | 9.70 | 4458.3 | 4455.8 | 7.75 |
| 3/2/26 | 16.84 | 4456.30 | 4454.30 | 9.71 | 4458.3 | 4455.9 | 7.73 |
| 3/3/26 | 16.84 | 4456.30 | 4454.30 | 9.70 | 4458.3 | 4455.9 | 7.71 |
| 3/4/26 | 16.84 | 4456.30 | 4454.30 | 9.71 | 4458.3 | 4455.9 | 7.69 |
| 3/5/26 | 16.84 | 4456.30 | 4454.30 | 9.70 | 4458.3 | 4455.9 | 7.67 |
| 3/6/26 | 16.85 | 4456.30 | 4454.30 | 9.71 | 4458.3 | 4455.9 | 7.66 |
| 3/7/26 | 16.85 | 4456.30 | 4454.30 | 9.70 | 4458.4 | 4455.9 | 7.64 |
| 3/8/26 | 16.85 | 4456.30 | 4454.30 | 9.71 | 4458.4 | 4455.9 | 7.62 |
| 3/9/26 | 16.85 | 4456.30 | 4454.30 | 9.70 | 4458.4 | 4455.9 | 7.60 |
| 3/10/26 | 16.86 | 4456.30 | 4454.30 | 9.71 | 4458.4 | 4455.9 | 7.58 |
| 3/11/26 | 16.86 | 4456.30 | 4454.30 | 9.70 | 4458.4 | 4456.0 | 7.57 |
| 3/12/26 | 16.86 | 4456.30 | 4454.30 | 9.71 | 4458.5 | 4456.0 | 7.55 |

**Appendix E**
**Table 1  Tailings and Pond Elevations for North and South Cells**

| Date | Year Fraction | North Cell |  |  | South Cell |  |  |
|---|---|---|---|---|---|---|---|
|  |  | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) |
| 3/13/26 | 16.87 | 4456.30 | 4454.30 | 9.70 | 4458.5 | 4456.0 | 7.53 |
| 3/14/26 | 16.87 | 4456.30 | 4454.30 | 9.71 | 4458.5 | 4456.0 | 7.51 |
| 3/15/26 | 16.87 | 4456.30 | 4454.30 | 9.70 | 4458.5 | 4456.0 | 7.50 |
| 3/16/26 | 16.87 | 4456.30 | 4454.30 | 9.71 | 4458.5 | 4456.0 | 7.48 |
| 3/17/26 | 16.88 | 4456.30 | 4454.30 | 9.70 | 4458.5 | 4456.0 | 7.46 |
| 3/18/26 | 16.88 | 4456.30 | 4454.30 | 9.71 | 4458.6 | 4456.0 | 7.44 |
| 3/19/26 | 16.88 | 4456.30 | 4454.30 | 9.70 | 4458.6 | 4456.1 | 7.42 |
| 3/20/26 | 16.88 | 4456.30 | 4454.30 | 9.71 | 4458.6 | 4456.1 | 7.41 |
| 3/21/26 | 16.89 | 4456.30 | 4454.30 | 9.70 | 4458.6 | 4456.1 | 7.39 |
| 3/22/26 | 16.89 | 4456.30 | 4454.30 | 9.71 | 4458.6 | 4456.1 | 7.37 |
| 3/23/26 | 16.89 | 4456.30 | 4454.30 | 9.70 | 4458.6 | 4456.1 | 7.35 |
| 3/24/26 | 16.90 | 4456.30 | 4454.30 | 9.71 | 4458.7 | 4456.1 | 7.34 |
| 3/25/26 | 16.90 | 4456.30 | 4454.30 | 9.70 | 4458.7 | 4456.1 | 7.32 |
| 3/26/26 | 16.90 | 4456.30 | 4454.30 | 9.71 | 4458.7 | 4456.1 | 7.30 |
| 3/27/26 | 16.90 | 4456.30 | 4454.30 | 9.70 | 4458.7 | 4456.2 | 7.28 |
| 3/28/26 | 16.91 | 4456.30 | 4454.30 | 9.71 | 4458.7 | 4456.2 | 7.26 |
| 3/29/26 | 16.91 | 4456.30 | 4454.30 | 9.70 | 4458.8 | 4456.2 | 7.25 |
| 3/30/26 | 16.91 | 4456.30 | 4454.30 | 9.71 | 4458.8 | 4456.2 | 7.23 |
| 3/31/26 | 16.91 | 4456.30 | 4454.30 | 9.70 | 4458.8 | 4456.2 | 7.21 |
| 4/1/26 | 16.92 | 4456.30 | 4454.30 | 9.71 | 4458.8 | 4456.2 | 7.19 |
| 4/2/26 | 16.92 | 4456.30 | 4454.30 | 9.70 | 4458.8 | 4456.2 | 7.18 |
| 4/3/26 | 16.92 | 4456.30 | 4454.30 | 9.71 | 4458.8 | 4456.2 | 7.16 |
| 4/4/26 | 16.93 | 4456.30 | 4454.30 | 9.70 | 4458.9 | 4456.2 | 7.15 |
| 4/5/26 | 16.93 | 4456.30 | 4454.30 | 9.71 | 4458.9 | 4456.3 | 7.13 |
| 4/6/26 | 16.93 | 4456.30 | 4454.30 | 9.70 | 4458.9 | 4456.3 | 7.12 |
| 4/7/26 | 16.93 | 4456.30 | 4454.30 | 9.71 | 4458.9 | 4456.3 | 7.10 |
| 4/8/26 | 16.94 | 4456.30 | 4454.30 | 9.70 | 4458.9 | 4456.3 | 7.09 |
| 4/9/26 | 16.94 | 4456.30 | 4454.30 | 9.71 | 4458.9 | 4456.3 | 7.07 |
| 4/10/26 | 16.94 | 4456.30 | 4454.30 | 9.70 | 4458.9 | 4456.3 | 7.06 |
| 4/11/26 | 16.95 | 4456.30 | 4454.30 | 9.71 | 4459.0 | 4456.3 | 7.04 |
| 4/12/26 | 16.95 | 4456.30 | 4454.30 | 9.70 | 4459.0 | 4456.3 | 7.03 |
| 4/13/26 | 16.95 | 4456.30 | 4454.30 | 9.71 | 4459.0 | 4456.4 | 7.01 |
| 4/14/26 | 16.95 | 4456.30 | 4454.30 | 9.70 | 4459.0 | 4456.4 | 7.00 |
| 4/15/26 | 16.96 | 4456.30 | 4454.30 | 9.71 | 4459.0 | 4456.4 | 6.98 |
| 4/16/26 | 16.96 | 4456.30 | 4454.30 | 9.70 | 4459.0 | 4456.4 | 6.97 |
| 4/17/26 | 16.96 | 4456.30 | 4454.30 | 9.71 | 4459.0 | 4456.4 | 6.95 |
| 4/18/26 | 16.96 | 4456.30 | 4454.30 | 9.70 | 4459.1 | 4456.4 | 6.94 |
| 4/19/26 | 16.97 | 4456.30 | 4454.30 | 9.71 | 4459.1 | 4456.4 | 6.92 |
| 4/20/26 | 16.97 | 4456.30 | 4454.30 | 9.70 | 4459.1 | 4456.4 | 6.91 |
| 4/21/26 | 16.97 | 4456.30 | 4454.30 | 9.71 | 4459.1 | 4456.5 | 6.89 |
| 4/22/26 | 16.98 | 4456.30 | 4454.30 | 9.70 | 4459.1 | 4456.5 | 6.88 |
| 4/23/26 | 16.98 | 4456.30 | 4454.30 | 9.71 | 4459.1 | 4456.5 | 6.86 |
| 4/24/26 | 16.98 | 4456.30 | 4454.30 | 9.70 | 4459.2 | 4456.5 | 6.85 |
| 4/25/26 | 16.98 | 4456.30 | 4454.30 | 9.71 | 4459.2 | 4456.5 | 6.83 |
| 4/26/26 | 16.99 | 4456.30 | 4454.30 | 9.70 | 4459.2 | 4456.5 | 6.82 |
| 4/27/26 | 16.99 | 4456.30 | 4454.30 | 9.71 | 4459.2 | 4456.5 | 6.80 |
| 4/28/26 | 16.99 | 4456.30 | 4454.30 | 9.70 | 4459.2 | 4456.5 | 6.79 |
| 4/29/26 | 16.99 | 4456.30 | 4454.30 | 9.71 | 4459.2 | 4456.5 | 6.77 |
| 4/30/26 | 17.00 | 4456.30 | 4454.30 | 9.70 | 4459.2 | 4456.6 | 6.76 |
| 5/1/26 | 17.00 | 4456.30 | 4454.30 | 9.71 | 4459.3 | 4456.6 | 6.74 |
| 5/2/26 | 17.00 | 4456.30 | 4454.30 | 9.71 | 4459.3 | 4456.6 | 6.73 |
| 5/3/26 | 17.01 | 4456.30 | 4454.30 | 9.72 | 4459.3 | 4456.6 | 6.71 |
| 5/4/26 | 17.01 | 4456.30 | 4454.30 | 9.71 | 4459.3 | 4456.6 | 6.70 |
| 5/5/26 | 17.01 | 4456.30 | 4454.30 | 9.72 | 4459.3 | 4456.6 | 6.69 |
| 5/6/26 | 17.01 | 4456.30 | 4454.30 | 9.71 | 4459.3 | 4456.6 | 6.67 |

## Appendix E
## Table 1  Tailings and Pond Elevations for North and South Cells

| | Year | North Cell | | | South Cell | | |
|---|---|---|---|---|---|---|---|
| Date | Fraction | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) |
| 5/7/26 | 17.02 | 4456.30 | 4454.30 | 9.72 | 4459.3 | 4456.6 | 6.66 |
| 5/8/26 | 17.02 | 4456.30 | 4454.30 | 9.71 | 4459.4 | 4456.7 | 6.64 |
| 5/9/26 | 17.02 | 4456.30 | 4454.30 | 9.72 | 4459.4 | 4456.7 | 6.63 |
| 5/10/26 | 17.02 | 4456.30 | 4454.30 | 9.71 | 4459.4 | 4456.7 | 6.62 |
| 5/11/26 | 17.03 | 4456.30 | 4454.30 | 9.72 | 4459.4 | 4456.7 | 6.60 |
| 5/12/26 | 17.03 | 4456.30 | 4454.30 | 9.71 | 4459.4 | 4456.7 | 6.59 |
| 5/13/26 | 17.03 | 4456.30 | 4454.30 | 9.72 | 4459.4 | 4456.7 | 6.57 |
| 5/14/26 | 17.04 | 4456.30 | 4454.30 | 9.71 | 4459.4 | 4456.7 | 6.56 |
| 5/15/26 | 17.04 | 4456.30 | 4454.30 | 9.72 | 4459.5 | 4456.7 | 6.55 |
| 5/16/26 | 17.04 | 4456.30 | 4454.30 | 9.71 | 4459.5 | 4456.8 | 6.53 |
| 5/17/26 | 17.04 | 4456.30 | 4454.30 | 9.72 | 4459.5 | 4456.8 | 6.52 |
| 5/18/26 | 17.05 | 4456.30 | 4454.30 | 9.71 | 4459.5 | 4456.8 | 6.50 |
| 5/19/26 | 17.05 | 4456.30 | 4454.30 | 9.72 | 4459.5 | 4456.8 | 6.49 |
| 5/20/26 | 17.05 | 4456.30 | 4454.30 | 9.71 | 4459.5 | 4456.8 | 6.48 |
| 5/21/26 | 17.05 | 4456.30 | 4454.30 | 9.72 | 4459.5 | 4456.8 | 6.46 |
| 5/22/26 | 17.06 | 4456.30 | 4454.30 | 9.71 | 4459.6 | 4456.8 | 6.45 |
| 5/23/26 | 17.06 | 4456.30 | 4454.30 | 9.72 | 4459.6 | 4456.8 | 6.43 |
| 5/24/26 | 17.06 | 4456.30 | 4454.30 | 9.71 | 4459.6 | 4456.8 | 6.42 |
| 5/25/26 | 17.07 | 4456.30 | 4454.30 | 9.72 | 4459.6 | 4456.9 | 6.41 |
| 5/26/26 | 17.07 | 4456.30 | 4454.30 | 9.71 | 4459.6 | 4456.9 | 6.39 |
| 5/27/26 | 17.07 | 4456.30 | 4454.30 | 9.72 | 4459.6 | 4456.9 | 6.38 |
| 5/28/26 | 17.07 | 4456.30 | 4454.30 | 9.71 | 4459.6 | 4456.9 | 6.36 |
| 5/29/26 | 17.08 | 4456.30 | 4454.30 | 9.72 | 4459.6 | 4456.9 | 6.35 |
| 5/30/26 | 17.08 | 4456.30 | 4454.30 | 9.71 | 4459.7 | 4456.9 | 6.34 |
| 5/31/26 | 17.08 | 4456.30 | 4454.30 | 9.72 | 4459.7 | 4456.9 | 6.32 |
| 6/1/26 | 17.08 | 4456.30 | 4454.30 | 9.71 | 4459.7 | 4456.9 | 6.31 |
| 6/2/26 | 17.09 | 4456.30 | 4454.30 | 9.72 | 4459.7 | 4457.0 | 6.30 |
| 6/3/26 | 17.09 | 4456.30 | 4454.30 | 9.71 | 4459.7 | 4457.0 | 6.29 |
| 6/4/26 | 17.09 | 4456.30 | 4454.30 | 9.72 | 4459.7 | 4457.0 | 6.28 |
| 6/5/26 | 17.10 | 4456.30 | 4454.30 | 9.71 | 4459.7 | 4457.0 | 6.27 |
| 6/6/26 | 17.10 | 4456.30 | 4454.30 | 9.72 | 4459.7 | 4457.0 | 6.26 |
| 6/7/26 | 17.10 | 4456.30 | 4454.30 | 9.71 | 4459.8 | 4457.0 | 6.25 |
| 6/8/26 | 17.10 | 4456.30 | 4454.30 | 9.72 | 4459.8 | 4457.0 | 6.24 |
| 6/9/26 | 17.11 | 4456.30 | 4454.30 | 9.71 | 4459.8 | 4457.0 | 6.23 |
| 6/10/26 | 17.11 | 4456.30 | 4454.30 | 9.72 | 4459.8 | 4457.1 | 6.22 |
| 6/11/26 | 17.11 | 4456.30 | 4454.30 | 9.71 | 4459.8 | 4457.1 | 6.21 |
| 6/12/26 | 17.11 | 4456.30 | 4454.30 | 9.72 | 4459.8 | 4457.1 | 6.20 |
| 6/13/26 | 17.12 | 4456.30 | 4454.30 | 9.71 | 4459.8 | 4457.1 | 6.19 |
| 6/14/26 | 17.12 | 4456.30 | 4454.30 | 9.72 | 4459.8 | 4457.1 | 6.18 |
| 6/15/26 | 17.12 | 4456.30 | 4454.30 | 9.71 | 4459.8 | 4457.1 | 6.17 |
| 6/16/26 | 17.13 | 4456.30 | 4454.30 | 9.72 | 4459.8 | 4457.1 | 6.16 |
| 6/17/26 | 17.13 | 4456.30 | 4454.30 | 9.71 | 4459.9 | 4457.1 | 6.15 |
| 6/18/26 | 17.13 | 4456.30 | 4454.30 | 9.72 | 4459.9 | 4457.2 | 6.14 |
| 6/19/26 | 17.13 | 4456.30 | 4454.30 | 9.71 | 4459.9 | 4457.2 | 6.13 |
| 6/20/26 | 17.14 | 4456.30 | 4454.30 | 9.72 | 4459.9 | 4457.2 | 6.11 |
| 6/21/26 | 17.14 | 4456.30 | 4454.30 | 9.71 | 4459.9 | 4457.2 | 6.10 |
| 6/22/26 | 17.14 | 4456.30 | 4454.30 | 9.72 | 4459.9 | 4457.2 | 6.09 |
| 6/23/26 | 17.14 | 4456.30 | 4454.30 | 9.71 | 4459.9 | 4457.2 | 6.08 |
| 6/24/26 | 17.15 | 4456.30 | 4454.30 | 9.72 | 4459.9 | 4457.2 | 6.07 |
| 6/25/26 | 17.15 | 4456.30 | 4454.30 | 9.71 | 4459.9 | 4457.2 | 6.06 |
| 6/26/26 | 17.15 | 4456.30 | 4454.30 | 9.72 | 4459.9 | 4457.2 | 6.05 |
| 6/27/26 | 17.16 | 4456.30 | 4454.30 | 9.71 | 4460.0 | 4457.3 | 6.04 |
| 6/28/26 | 17.16 | 4456.30 | 4454.30 | 9.72 | 4460.0 | 4457.3 | 6.03 |
| 6/29/26 | 17.16 | 4456.30 | 4454.30 | 9.71 | 4460.0 | 4457.3 | 6.02 |
| 6/30/26 | 17.16 | 4456.30 | 4454.30 | 9.72 | 4460.0 | 4457.3 | 6.01 |

**Appendix E**
**Table 1  Tailings and Pond Elevations for North and South Cells**

| | Year | North Cell | | | South Cell | | |
|---|---|---|---|---|---|---|---|
| Date | Fraction | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) |
| 7/1/26 | 17.17 | 4456.30 | 4454.30 | 9.71 | 4460.0 | 4457.3 | 6.00 |
| 7/2/26 | 17.17 | 4456.30 | 4454.30 | 9.73 | 4460.0 | 4457.3 | 6.00 |
| 7/3/26 | 17.17 | 4456.30 | 4454.30 | 9.71 | 4460.0 | 4457.3 | 6.00 |
| 7/4/26 | 17.18 | 4456.30 | 4454.30 | 9.73 | 4460.0 | 4457.3 | 5.99 |
| 7/5/26 | 17.18 | 4456.30 | 4454.30 | 9.71 | 4460.0 | 4457.4 | 5.99 |
| 7/6/26 | 17.18 | 4456.30 | 4454.30 | 9.73 | 4460.0 | 4457.4 | 5.99 |
| 7/7/26 | 17.18 | 4456.30 | 4454.30 | 9.71 | 4460.0 | 4457.4 | 5.99 |
| 7/8/26 | 17.19 | 4456.30 | 4454.30 | 9.73 | 4460.0 | 4457.4 | 5.98 |
| 7/9/26 | 17.19 | 4456.30 | 4454.30 | 9.71 | 4460.0 | 4457.4 | 5.98 |
| 7/10/26 | 17.19 | 4456.30 | 4454.30 | 9.73 | 4460.0 | 4457.4 | 5.98 |
| 7/11/26 | 17.19 | 4456.30 | 4454.30 | 9.71 | 4460.0 | 4457.4 | 5.98 |
| 7/12/26 | 17.20 | 4456.30 | 4454.30 | 9.73 | 4460.0 | 4457.4 | 5.97 |
| 7/13/26 | 17.20 | 4456.30 | 4454.30 | 9.71 | 4460.0 | 4457.5 | 5.97 |
| 7/14/26 | 17.20 | 4456.30 | 4454.30 | 9.73 | 4460.0 | 4457.5 | 5.97 |
| 7/15/26 | 17.21 | 4456.30 | 4454.30 | 9.71 | 4460.0 | 4457.5 | 5.96 |
| 7/16/26 | 17.21 | 4456.30 | 4454.30 | 9.73 | 4460.0 | 4457.5 | 5.96 |
| 7/17/26 | 17.21 | 4456.30 | 4454.30 | 9.71 | 4460.0 | 4457.5 | 5.96 |
| 7/18/26 | 17.21 | 4456.30 | 4454.30 | 9.73 | 4460.0 | 4457.5 | 5.96 |
| 7/19/26 | 17.22 | 4456.30 | 4454.30 | 9.71 | 4460.0 | 4457.5 | 5.95 |
| 7/20/26 | 17.22 | 4456.30 | 4454.30 | 9.73 | 4460.0 | 4457.5 | 5.95 |
| 7/21/26 | 17.22 | 4456.30 | 4454.30 | 9.71 | 4460.1 | 4457.5 | 5.95 |
| 7/22/26 | 17.22 | 4456.30 | 4454.30 | 9.73 | 4460.1 | 4457.6 | 5.95 |
| 7/23/26 | 17.23 | 4456.30 | 4454.30 | 9.71 | 4460.1 | 4457.6 | 5.94 |
| 7/24/26 | 17.23 | 4456.30 | 4454.30 | 9.73 | 4460.1 | 4457.6 | 5.94 |
| 7/25/26 | 17.23 | 4456.30 | 4454.30 | 9.71 | 4460.1 | 4457.6 | 5.94 |
| 7/26/26 | 17.24 | 4456.30 | 4454.30 | 9.73 | 4460.1 | 4457.6 | 5.93 |
| 7/27/26 | 17.24 | 4456.30 | 4454.30 | 9.71 | 4460.1 | 4457.6 | 5.93 |
| 7/28/26 | 17.24 | 4456.30 | 4454.30 | 9.73 | 4460.1 | 4457.6 | 5.93 |
| 7/29/26 | 17.24 | 4456.30 | 4454.30 | 9.71 | 4460.1 | 4457.6 | 5.93 |
| 7/30/26 | 17.25 | 4456.30 | 4454.30 | 9.73 | 4460.1 | 4457.7 | 5.92 |
| 7/31/26 | 17.25 | 4456.30 | 4454.30 | 9.71 | 4460.1 | 4457.7 | 5.92 |
| 8/1/26 | 17.25 | 4456.30 | 4454.30 | 9.73 | 4460.1 | 4457.7 | 5.92 |
| 8/2/26 | 17.25 | 4456.30 | 4454.30 | 9.71 | 4460.1 | 4457.7 | 5.92 |
| 8/3/26 | 17.26 | 4456.30 | 4454.30 | 9.73 | 4460.1 | 4457.7 | 5.92 |
| 8/4/26 | 17.26 | 4456.30 | 4454.30 | 9.71 | 4460.1 | 4457.7 | 5.91 |
| 8/5/26 | 17.26 | 4456.30 | 4454.30 | 9.73 | 4460.1 | 4457.7 | 5.91 |
| 8/6/26 | 17.27 | 4456.30 | 4454.30 | 9.71 | 4460.1 | 4457.7 | 5.91 |
| 8/7/26 | 17.27 | 4456.30 | 4454.30 | 9.73 | 4460.1 | 4457.8 | 5.91 |
| 8/8/26 | 17.27 | 4456.30 | 4454.30 | 9.71 | 4460.1 | 4457.8 | 5.91 |
| 8/9/26 | 17.27 | 4456.30 | 4454.30 | 9.73 | 4460.1 | 4457.8 | 5.91 |
| 8/10/26 | 17.28 | 4456.30 | 4454.30 | 9.71 | 4460.1 | 4457.8 | 5.91 |
| 8/11/26 | 17.28 | 4456.30 | 4454.30 | 9.73 | 4460.1 | 4457.8 | 5.90 |
| 8/12/26 | 17.28 | 4456.30 | 4454.30 | 9.71 | 4460.1 | 4457.8 | 5.90 |
| 8/13/26 | 17.28 | 4456.30 | 4454.30 | 9.73 | 4460.1 | 4457.8 | 5.90 |
| 8/14/26 | 17.29 | 4456.30 | 4454.30 | 9.71 | 4460.1 | 4457.8 | 5.90 |
| 8/15/26 | 17.29 | 4456.30 | 4454.30 | 9.73 | 4460.1 | 4457.8 | 5.90 |
| 8/16/26 | 17.29 | 4456.30 | 4454.30 | 9.71 | 4460.1 | 4457.9 | 5.90 |
| 8/17/26 | 17.30 | 4456.30 | 4454.30 | 9.73 | 4460.1 | 4457.9 | 5.90 |
| 8/18/26 | 17.30 | 4456.30 | 4454.30 | 9.71 | 4460.1 | 4457.9 | 5.89 |
| 8/19/26 | 17.30 | 4456.30 | 4454.30 | 9.73 | 4460.1 | 4457.9 | 5.89 |
| 8/20/26 | 17.30 | 4456.30 | 4454.30 | 9.71 | 4460.1 | 4457.9 | 5.89 |
| 8/21/26 | 17.31 | 4456.30 | 4454.30 | 9.73 | 4460.1 | 4457.9 | 5.89 |
| 8/22/26 | 17.31 | 4456.30 | 4454.30 | 9.71 | 4460.1 | 4457.9 | 5.89 |
| 8/23/26 | 17.31 | 4456.30 | 4454.30 | 9.73 | 4460.1 | 4457.9 | 5.89 |
| 8/24/26 | 17.31 | 4456.30 | 4454.30 | 9.71 | 4460.1 | 4458.0 | 5.88 |

**Appendix E**
**Table 1  Tailings and Pond Elevations for North and South Cells**

| Date | Year Fraction | North Cell | | | South Cell | | |
|---|---|---|---|---|---|---|---|
| | | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) |
| 8/25/26 | 17.32 | 4456.30 | 4454.30 | 9.73 | 4460.1 | 4458.0 | 5.88 |
| 8/26/26 | 17.32 | 4456.30 | 4454.30 | 9.71 | 4460.1 | 4458.0 | 5.88 |
| 8/27/26 | 17.32 | 4456.30 | 4454.30 | 9.73 | 4460.1 | 4458.0 | 5.88 |
| 8/28/26 | 17.33 | 4456.30 | 4454.30 | 9.71 | 4460.1 | 4458.0 | 5.88 |
| 8/29/26 | 17.33 | 4456.30 | 4454.30 | 9.73 | 4460.1 | 4458.0 | 5.88 |
| 8/30/26 | 17.33 | 4456.30 | 4454.30 | 9.71 | 4460.1 | 4458.0 | 5.88 |
| 8/31/26 | 17.33 | 4456.30 | 4454.30 | 9.73 | 4460.1 | 4458.0 | 5.85 |
| 9/1/26 | 17.34 | 4456.30 | 4454.30 | 9.71 | 4460.1 | 4458.1 | 5.85 |
| 9/2/26 | 17.34 | 4456.30 | 4454.30 | 9.73 | 4460.2 | 4458.1 | 5.83 |
| 9/3/26 | 17.34 | 4456.30 | 4454.30 | 9.71 | 4460.2 | 4458.1 | 5.83 |
| 9/4/26 | 17.34 | 4456.30 | 4454.30 | 9.73 | 4460.2 | 4458.1 | 5.81 |
| 9/5/26 | 17.35 | 4456.30 | 4454.30 | 9.71 | 4460.2 | 4458.1 | 5.81 |
| 9/6/26 | 17.35 | 4456.30 | 4454.30 | 9.73 | 4460.2 | 4458.1 | 5.79 |
| 9/7/26 | 17.35 | 4456.30 | 4454.30 | 9.71 | 4460.2 | 4458.1 | 5.78 |
| 9/8/26 | 17.36 | 4456.30 | 4454.30 | 9.73 | 4460.2 | 4458.1 | 5.76 |
| 9/9/26 | 17.36 | 4456.30 | 4454.30 | 9.71 | 4460.2 | 4458.1 | 5.76 |
| 9/10/26 | 17.36 | 4456.30 | 4454.30 | 9.73 | 4460.3 | 4458.2 | 5.74 |
| 9/11/26 | 17.36 | 4456.30 | 4454.30 | 9.71 | 4460.3 | 4458.2 | 5.74 |
| 9/12/26 | 17.37 | 4456.30 | 4454.30 | 9.73 | 4460.3 | 4458.2 | 5.72 |
| 9/13/26 | 17.37 | 4456.30 | 4454.30 | 9.71 | 4460.3 | 4458.2 | 5.72 |
| 9/14/26 | 17.37 | 4456.30 | 4454.30 | 9.73 | 4460.3 | 4458.2 | 5.69 |
| 9/15/26 | 17.37 | 4456.30 | 4454.30 | 9.71 | 4460.3 | 4458.2 | 5.69 |
| 9/16/26 | 17.38 | 4456.30 | 4454.30 | 9.72 | 4460.3 | 4458.2 | 5.67 |
| 9/17/26 | 17.38 | 4456.30 | 4454.30 | 9.71 | 4460.3 | 4458.2 | 5.67 |
| 9/18/26 | 17.38 | 4456.30 | 4454.30 | 9.72 | 4460.4 | 4458.3 | 5.65 |
| 9/19/26 | 17.39 | 4456.30 | 4454.30 | 9.71 | 4460.4 | 4458.3 | 5.65 |
| 9/20/26 | 17.39 | 4456.30 | 4454.30 | 9.72 | 4460.4 | 4458.3 | 5.62 |
| 9/21/26 | 17.39 | 4456.30 | 4454.30 | 9.71 | 4460.4 | 4458.3 | 5.62 |
| 9/22/26 | 17.39 | 4456.30 | 4454.30 | 9.72 | 4460.4 | 4458.3 | 5.60 |
| 9/23/26 | 17.40 | 4456.30 | 4454.30 | 9.71 | 4460.4 | 4458.3 | 5.60 |
| 9/24/26 | 17.40 | 4456.30 | 4454.30 | 9.72 | 4460.4 | 4458.3 | 5.58 |
| 9/25/26 | 17.40 | 4456.30 | 4454.30 | 9.71 | 4460.4 | 4458.3 | 5.58 |
| 9/26/26 | 17.41 | 4456.30 | 4454.30 | 9.72 | 4460.4 | 4458.4 | 5.56 |
| 9/27/26 | 17.41 | 4456.30 | 4454.30 | 9.71 | 4460.4 | 4458.4 | 5.55 |
| 9/28/26 | 17.41 | 4456.30 | 4454.30 | 9.72 | 4460.5 | 4458.4 | 5.53 |
| 9/29/26 | 17.41 | 4456.30 | 4454.30 | 9.71 | 4460.5 | 4458.4 | 5.53 |
| 9/30/26 | 17.42 | 4456.30 | 4454.30 | 9.72 | 4460.5 | 4458.4 | 5.51 |
| 10/1/26 | 17.42 | 4456.30 | 4454.30 | 9.71 | 4460.5 | 4458.4 | 5.51 |
| 10/2/26 | 17.42 | 4456.30 | 4454.30 | 9.72 | 4460.5 | 4458.4 | 5.48 |
| 10/3/26 | 17.42 | 4456.30 | 4454.30 | 9.71 | 4460.5 | 4458.4 | 5.48 |
| 10/4/26 | 17.43 | 4456.30 | 4454.30 | 9.72 | 4460.5 | 4458.4 | 5.46 |
| 10/5/26 | 17.43 | 4456.30 | 4454.30 | 9.71 | 4460.5 | 4458.5 | 5.46 |
| 10/6/26 | 17.43 | 4456.30 | 4454.30 | 9.72 | 4460.6 | 4458.5 | 5.44 |
| 10/7/26 | 17.44 | 4456.30 | 4454.30 | 9.71 | 4460.6 | 4458.5 | 5.43 |
| 10/8/26 | 17.44 | 4456.30 | 4454.30 | 9.72 | 4460.6 | 4458.5 | 5.41 |
| 10/9/26 | 17.44 | 4456.30 | 4454.30 | 9.71 | 4460.6 | 4458.5 | 5.41 |
| 10/10/26 | 17.44 | 4456.30 | 4454.30 | 9.72 | 4460.6 | 4458.5 | 5.39 |
| 10/11/26 | 17.45 | 4456.30 | 4454.30 | 9.71 | 4460.6 | 4458.5 | 5.39 |
| 10/12/26 | 17.45 | 4456.30 | 4454.30 | 9.72 | 4460.6 | 4458.5 | 5.37 |
| 10/13/26 | 17.45 | 4456.30 | 4454.30 | 9.71 | 4460.6 | 4458.6 | 5.36 |
| 10/14/26 | 17.45 | 4456.30 | 4454.30 | 9.72 | 4460.7 | 4458.6 | 5.35 |
| 10/15/26 | 17.46 | 4456.30 | 4454.30 | 9.71 | 4460.7 | 4458.6 | 5.34 |
| 10/16/26 | 17.46 | 4456.30 | 4454.30 | 9.72 | 4460.7 | 4458.6 | 5.32 |
| 10/17/26 | 17.46 | 4456.30 | 4454.30 | 9.71 | 4460.7 | 4458.6 | 5.32 |
| 10/18/26 | 17.47 | 4456.30 | 4454.30 | 9.72 | 4460.7 | 4458.6 | 5.30 |

**Appendix E**
**Table 1  Tailings and Pond Elevations for North and South Cells**

| | Year | North Cell | | | South Cell | | |
|---|---|---|---|---|---|---|---|
| Date | Fraction | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) |
| 10/19/26 | 17.47 | 4456.30 | 4454.30 | 9.71 | 4460.7 | 4458.6 | 5.30 |
| 10/20/26 | 17.47 | 4456.30 | 4454.30 | 9.72 | 4460.7 | 4458.6 | 5.28 |
| 10/21/26 | 17.47 | 4456.30 | 4454.30 | 9.71 | 4460.7 | 4458.7 | 5.27 |
| 10/22/26 | 17.48 | 4456.30 | 4454.30 | 9.72 | 4460.7 | 4458.7 | 5.25 |
| 10/23/26 | 17.48 | 4456.30 | 4454.30 | 9.71 | 4460.8 | 4458.7 | 5.25 |
| 10/24/26 | 17.48 | 4456.30 | 4454.30 | 9.72 | 4460.8 | 4458.7 | 5.23 |
| 10/25/26 | 17.48 | 4456.30 | 4454.30 | 9.71 | 4460.8 | 4458.7 | 5.23 |
| 10/26/26 | 17.49 | 4456.30 | 4454.30 | 9.72 | 4460.8 | 4458.7 | 5.21 |
| 10/27/26 | 17.49 | 4456.30 | 4454.30 | 9.71 | 4460.8 | 4458.7 | 5.20 |
| 10/28/26 | 17.49 | 4456.30 | 4454.30 | 9.72 | 4460.8 | 4458.7 | 5.19 |
| 10/29/26 | 17.50 | 4456.30 | 4454.30 | 9.71 | 4460.8 | 4458.7 | 5.18 |
| 10/30/26 | 17.50 | 4456.30 | 4454.30 | 9.72 | 4460.8 | 4458.8 | 5.16 |
| 10/31/26 | 17.50 | 4456.30 | 4454.30 | 9.71 | 4460.8 | 4458.8 | 5.16 |
| 11/1/26 | 17.50 | 4456.30 | 4454.30 | 9.72 | 4460.9 | 4458.8 | 5.14 |
| 11/2/26 | 17.51 | 4456.30 | 4454.30 | 9.70 | 4460.9 | 4458.8 | 5.13 |
| 11/3/26 | 17.51 | 4456.30 | 4454.30 | 9.71 | 4460.9 | 4458.8 | 5.12 |
| 11/4/26 | 17.51 | 4456.30 | 4454.30 | 9.70 | 4460.9 | 4458.8 | 5.11 |
| 11/5/26 | 17.51 | 4456.30 | 4454.30 | 9.71 | 4460.9 | 4458.8 | 5.09 |
| 11/6/26 | 17.52 | 4456.30 | 4454.30 | 9.70 | 4460.9 | 4458.8 | 5.08 |
| 11/7/26 | 17.52 | 4456.30 | 4454.30 | 9.71 | 4460.9 | 4458.9 | 5.07 |
| 11/8/26 | 17.52 | 4456.30 | 4454.30 | 9.70 | 4460.9 | 4458.9 | 5.06 |
| 11/9/26 | 17.53 | 4456.30 | 4454.30 | 9.71 | 4461.0 | 4458.9 | 5.05 |
| 11/10/26 | 17.53 | 4456.30 | 4454.30 | 9.70 | 4461.0 | 4458.9 | 5.04 |
| 11/11/26 | 17.53 | 4456.30 | 4454.30 | 9.71 | 4461.0 | 4458.9 | 5.02 |
| 11/12/26 | 17.53 | 4456.30 | 4454.30 | 9.70 | 4461.0 | 4458.9 | 5.01 |
| 11/13/26 | 17.54 | 4456.30 | 4454.30 | 9.71 | 4461.0 | 4458.9 | 5.00 |
| 11/14/26 | 17.54 | 4456.30 | 4454.30 | 9.70 | 4461.0 | 4458.9 | 4.99 |
| 11/15/26 | 17.54 | 4456.30 | 4454.30 | 9.71 | 4461.0 | 4459.0 | 4.98 |
| 11/16/26 | 17.54 | 4456.30 | 4454.30 | 9.68 | 4461.0 | 4459.0 | 4.99 |
| 11/17/26 | 17.55 | 4456.30 | 4454.30 | 9.66 | 4461.0 | 4459.0 | 4.98 |
| 11/18/26 | 17.55 | 4456.30 | 4454.40 | 9.65 | 4461.0 | 4459.0 | 4.99 |
| 11/19/26 | 17.55 | 4456.40 | 4454.40 | 9.64 | 4461.0 | 4459.0 | 4.98 |
| 11/20/26 | 17.56 | 4456.40 | 4454.40 | 9.63 | 4461.0 | 4459.0 | 4.99 |
| 11/21/26 | 17.56 | 4456.40 | 4454.40 | 9.62 | 4461.0 | 4459.0 | 4.98 |
| 11/22/26 | 17.56 | 4456.40 | 4454.40 | 9.60 | 4461.0 | 4459.0 | 4.99 |
| 11/23/26 | 17.56 | 4456.40 | 4454.40 | 9.59 | 4461.0 | 4459.0 | 4.98 |
| 11/24/26 | 17.57 | 4456.40 | 4454.40 | 9.58 | 4461.0 | 4459.0 | 4.99 |
| 11/25/26 | 17.57 | 4456.40 | 4454.40 | 9.57 | 4461.0 | 4459.0 | 4.98 |
| 11/26/26 | 17.57 | 4456.40 | 4454.50 | 9.56 | 4461.0 | 4459.0 | 4.99 |
| 11/27/26 | 17.57 | 4456.50 | 4454.50 | 9.54 | 4461.0 | 4459.0 | 4.98 |
| 11/28/26 | 17.58 | 4456.50 | 4454.50 | 9.53 | 4461.0 | 4459.0 | 4.99 |
| 11/29/26 | 17.58 | 4456.50 | 4454.50 | 9.52 | 4461.0 | 4459.0 | 4.98 |
| 11/30/26 | 17.58 | 4456.50 | 4454.50 | 9.51 | 4461.0 | 4459.0 | 4.99 |
| 12/1/26 | 17.59 | 4456.50 | 4454.50 | 9.49 | 4461.0 | 4459.0 | 4.98 |
| 12/2/26 | 17.59 | 4456.50 | 4454.50 | 9.48 | 4461.0 | 4459.0 | 4.99 |
| 12/3/26 | 17.59 | 4456.50 | 4454.50 | 9.46 | 4461.0 | 4459.0 | 4.98 |
| 12/4/26 | 17.59 | 4456.60 | 4454.60 | 9.44 | 4461.0 | 4459.0 | 4.99 |
| 12/5/26 | 17.60 | 4456.60 | 4454.60 | 9.43 | 4461.0 | 4459.0 | 4.98 |
| 12/6/26 | 17.60 | 4456.60 | 4454.60 | 9.41 | 4461.0 | 4459.0 | 4.99 |
| 12/7/26 | 17.60 | 4456.60 | 4454.60 | 9.40 | 4461.0 | 4459.0 | 4.98 |
| 12/8/26 | 17.60 | 4456.60 | 4454.60 | 9.38 | 4461.0 | 4459.0 | 4.99 |
| 12/9/26 | 17.61 | 4456.60 | 4454.60 | 9.36 | 4461.0 | 4459.0 | 4.98 |
| 12/10/26 | 17.61 | 4456.70 | 4454.60 | 9.35 | 4461.0 | 4459.0 | 4.99 |
| 12/11/26 | 17.61 | 4456.70 | 4454.60 | 9.33 | 4461.0 | 4459.0 | 4.98 |
| 12/12/26 | 17.62 | 4456.70 | 4454.70 | 9.31 | 4461.0 | 4459.0 | 4.99 |

**Appendix E**

**Table 1  Tailings and Pond Elevations for North and South Cells**

| Date | Year Fraction | North Cell | | | South Cell | | |
|---|---|---|---|---|---|---|---|
| | | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) |
| 12/13/26 | 17.62 | 4456.70 | 4454.70 | 9.30 | 4461.0 | 4459.0 | 4.98 |
| 12/14/26 | 17.62 | 4456.70 | 4454.70 | 9.28 | 4461.0 | 4459.0 | 4.99 |
| 12/15/26 | 17.62 | 4456.70 | 4454.70 | 9.27 | 4461.0 | 4459.0 | 4.98 |
| 12/16/26 | 17.63 | 4456.80 | 4454.70 | 9.25 | 4461.0 | 4459.0 | 4.99 |
| 12/17/26 | 17.63 | 4456.80 | 4454.70 | 9.23 | 4461.0 | 4459.0 | 4.98 |
| 12/18/26 | 17.63 | 4456.80 | 4454.70 | 9.22 | 4461.0 | 4459.0 | 4.99 |
| 12/19/26 | 17.63 | 4456.80 | 4454.70 | 9.20 | 4461.0 | 4459.0 | 4.98 |
| 12/20/26 | 17.64 | 4456.80 | 4454.80 | 9.19 | 4461.0 | 4459.0 | 4.99 |
| 12/21/26 | 17.64 | 4456.80 | 4454.80 | 9.17 | 4461.0 | 4459.0 | 4.98 |
| 12/22/26 | 17.64 | 4456.80 | 4454.80 | 9.15 | 4461.0 | 4459.0 | 4.99 |
| 12/23/26 | 17.65 | 4456.90 | 4454.80 | 9.14 | 4461.0 | 4459.0 | 4.98 |
| 12/24/26 | 17.65 | 4456.90 | 4454.80 | 9.12 | 4461.0 | 4459.0 | 4.99 |
| 12/25/26 | 17.65 | 4456.90 | 4454.80 | 9.11 | 4461.0 | 4459.0 | 4.98 |
| 12/26/26 | 17.65 | 4456.90 | 4454.80 | 9.09 | 4461.0 | 4459.0 | 4.99 |
| 12/27/26 | 17.66 | 4456.90 | 4454.80 | 9.07 | 4461.0 | 4459.0 | 4.98 |
| 12/28/26 | 17.66 | 4456.90 | 4454.90 | 9.06 | 4461.0 | 4459.0 | 4.99 |
| 12/29/26 | 17.66 | 4457.00 | 4454.90 | 9.04 | 4461.0 | 4459.0 | 4.98 |
| 12/30/26 | 17.67 | 4457.00 | 4454.90 | 9.02 | 4461.0 | 4459.0 | 4.99 |
| 12/31/26 | 17.67 | 4457.00 | 4454.90 | 9.01 | 4461.0 | 4459.0 | 4.98 |
| 1/1/27 | 17.67 | 4457.00 | 4454.90 | 8.99 | 4461.0 | 4459.0 | 4.99 |
| 1/2/27 | 17.67 | 4457.00 | 4454.90 | 8.97 | 4461.0 | 4459.0 | 4.98 |
| 1/3/27 | 17.68 | 4457.00 | 4454.90 | 8.96 | 4461.0 | 4459.0 | 4.98 |
| 1/4/27 | 17.68 | 4457.10 | 4454.90 | 8.94 | 4461.0 | 4459.0 | 4.98 |
| 1/5/27 | 17.68 | 4457.10 | 4455.00 | 8.92 | 4461.0 | 4459.0 | 4.98 |
| 1/6/27 | 17.68 | 4457.10 | 4455.00 | 8.90 | 4461.0 | 4459.0 | 4.98 |
| 1/7/27 | 17.69 | 4457.10 | 4455.00 | 8.88 | 4461.0 | 4459.0 | 4.98 |
| 1/8/27 | 17.69 | 4457.10 | 4455.00 | 8.86 | 4461.0 | 4459.0 | 4.98 |
| 1/9/27 | 17.69 | 4457.20 | 4455.00 | 8.85 | 4461.0 | 4459.0 | 4.98 |
| 1/10/27 | 17.70 | 4457.20 | 4455.00 | 8.83 | 4461.0 | 4459.0 | 4.98 |
| 1/11/27 | 17.70 | 4457.20 | 4455.00 | 8.81 | 4461.0 | 4459.0 | 4.98 |
| 1/12/27 | 17.70 | 4457.20 | 4455.00 | 8.79 | 4461.0 | 4459.0 | 4.98 |
| 1/13/27 | 17.70 | 4457.20 | 4455.10 | 8.77 | 4461.0 | 4459.0 | 4.98 |
| 1/14/27 | 17.71 | 4457.20 | 4455.10 | 8.76 | 4461.0 | 4459.0 | 4.98 |
| 1/15/27 | 17.71 | 4457.30 | 4455.10 | 8.74 | 4461.0 | 4459.0 | 4.98 |
| 1/16/27 | 17.71 | 4457.30 | 4455.10 | 8.72 | 4461.0 | 4459.0 | 4.98 |
| 1/17/27 | 17.71 | 4457.30 | 4455.10 | 8.70 | 4461.0 | 4459.0 | 4.98 |
| 1/18/27 | 17.72 | 4457.30 | 4455.10 | 8.68 | 4461.0 | 4459.0 | 4.98 |
| 1/19/27 | 17.72 | 4457.30 | 4455.10 | 8.66 | 4461.0 | 4459.0 | 4.98 |
| 1/20/27 | 17.72 | 4457.40 | 4455.10 | 8.65 | 4461.0 | 4459.0 | 4.98 |
| 1/21/27 | 17.73 | 4457.40 | 4455.20 | 8.63 | 4461.0 | 4459.0 | 4.98 |
| 1/22/27 | 17.73 | 4457.40 | 4455.20 | 8.61 | 4461.0 | 4459.0 | 4.98 |
| 1/23/27 | 17.73 | 4457.40 | 4455.20 | 8.59 | 4461.0 | 4459.0 | 4.98 |
| 1/24/27 | 17.73 | 4457.40 | 4455.20 | 8.57 | 4461.0 | 4459.0 | 4.98 |
| 1/25/27 | 17.74 | 4457.40 | 4455.20 | 8.56 | 4461.0 | 4459.0 | 4.98 |
| 1/26/27 | 17.74 | 4457.50 | 4455.20 | 8.54 | 4461.0 | 4459.0 | 4.98 |
| 1/27/27 | 17.74 | 4457.50 | 4455.20 | 8.52 | 4461.0 | 4459.0 | 4.98 |
| 1/28/27 | 17.74 | 4457.50 | 4455.30 | 8.50 | 4461.0 | 4459.0 | 4.98 |
| 1/29/27 | 17.75 | 4457.50 | 4455.30 | 8.48 | 4461.0 | 4459.0 | 4.98 |
| 1/30/27 | 17.75 | 4457.50 | 4455.30 | 8.46 | 4461.0 | 4459.0 | 4.98 |
| 1/31/27 | 17.75 | 4457.60 | 4455.30 | 8.45 | 4461.0 | 4459.0 | 4.98 |
| 2/1/27 | 17.76 | 4457.60 | 4455.30 | 8.43 | 4461.0 | 4459.0 | 4.98 |
| 2/2/27 | 17.76 | 4457.60 | 4455.30 | 8.41 | 4461.0 | 4459.0 | 4.98 |
| 2/3/27 | 17.76 | 4457.60 | 4455.30 | 8.39 | 4461.0 | 4459.0 | 4.98 |
| 2/4/27 | 17.76 | 4457.60 | 4455.30 | 8.37 | 4461.0 | 4459.0 | 4.98 |
| 2/5/27 | 17.77 | 4457.60 | 4455.40 | 8.35 | 4461.0 | 4459.0 | 4.98 |

**Appendix E**
**Table 1  Tailings and Pond Elevations for North and South Cells**

| | Year | North Cell | | | South Cell | | |
|---|---|---|---|---|---|---|---|
| Date | Fraction | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) |
| 2/6/27 | 17.77 | 4457.70 | 4455.40 | 8.34 | 4461.0 | 4459.0 | 4.98 |
| 2/7/27 | 17.77 | 4457.70 | 4455.40 | 8.32 | 4461.0 | 4459.0 | 4.98 |
| 2/8/27 | 17.77 | 4457.70 | 4455.40 | 8.30 | 4461.0 | 4459.0 | 4.98 |
| 2/9/27 | 17.78 | 4457.70 | 4455.40 | 8.28 | 4461.0 | 4459.0 | 4.98 |
| 2/10/27 | 17.78 | 4457.70 | 4455.40 | 8.26 | 4461.0 | 4459.0 | 4.98 |
| 2/11/27 | 17.78 | 4457.80 | 4455.40 | 8.24 | 4461.0 | 4459.0 | 4.98 |
| 2/12/27 | 17.79 | 4457.80 | 4455.40 | 8.22 | 4461.0 | 4459.0 | 4.98 |
| 2/13/27 | 17.79 | 4457.80 | 4455.50 | 8.21 | 4461.0 | 4459.0 | 4.98 |
| 2/14/27 | 17.79 | 4457.80 | 4455.50 | 8.19 | 4461.0 | 4459.0 | 4.98 |
| 2/15/27 | 17.79 | 4457.80 | 4455.50 | 8.17 | 4461.0 | 4459.0 | 4.98 |
| 2/16/27 | 17.80 | 4457.80 | 4455.50 | 8.15 | 4461.0 | 4459.0 | 4.98 |
| 2/17/27 | 17.80 | 4457.90 | 4455.50 | 8.13 | 4461.0 | 4459.0 | 4.98 |
| 2/18/27 | 17.80 | 4457.90 | 4455.50 | 8.11 | 4461.0 | 4459.0 | 4.98 |
| 2/19/27 | 17.80 | 4457.90 | 4455.50 | 8.10 | 4461.0 | 4459.0 | 4.98 |
| 2/20/27 | 17.81 | 4457.90 | 4455.50 | 8.08 | 4461.0 | 4459.0 | 4.98 |
| 2/21/27 | 17.81 | 4457.90 | 4455.60 | 8.06 | 4461.0 | 4459.0 | 4.98 |
| 2/22/27 | 17.81 | 4458.00 | 4455.60 | 8.04 | 4461.0 | 4459.0 | 4.98 |
| 2/23/27 | 17.82 | 4458.00 | 4455.60 | 8.02 | 4461.0 | 4459.0 | 4.98 |
| 2/24/27 | 17.82 | 4458.00 | 4455.60 | 8.00 | 4461.0 | 4459.0 | 4.98 |
| 2/25/27 | 17.82 | 4458.00 | 4455.60 | 7.98 | 4461.0 | 4459.0 | 4.98 |
| 2/26/27 | 17.82 | 4458.00 | 4455.60 | 7.97 | 4461.0 | 4459.0 | 4.98 |
| 2/27/27 | 17.83 | 4458.10 | 4455.60 | 7.95 | 4461.0 | 4459.0 | 4.98 |
| 2/28/27 | 17.83 | 4458.10 | 4455.60 | 7.93 | 4461.0 | 4459.0 | 4.98 |
| 3/1/27 | 17.83 | 4458.10 | 4455.70 | 7.91 | 4461.0 | 4459.0 | 4.98 |
| 3/2/27 | 17.83 | 4458.10 | 4455.70 | 7.89 | 4461.0 | 4459.0 | 4.98 |
| 3/3/27 | 17.84 | 4458.10 | 4455.70 | 7.87 | 4461.0 | 4459.0 | 4.98 |
| 3/4/27 | 17.84 | 4458.10 | 4455.70 | 7.85 | 4461.0 | 4459.0 | 4.98 |
| 3/5/27 | 17.84 | 4458.20 | 4455.70 | 7.83 | 4461.0 | 4459.0 | 4.98 |
| 3/6/27 | 17.85 | 4458.20 | 4455.70 | 7.81 | 4461.0 | 4459.0 | 4.98 |
| 3/7/27 | 17.85 | 4458.20 | 4455.70 | 7.79 | 4461.0 | 4459.0 | 4.98 |
| 3/8/27 | 17.85 | 4458.20 | 4455.70 | 7.77 | 4461.0 | 4459.0 | 4.98 |
| 3/9/27 | 17.85 | 4458.20 | 4455.80 | 7.76 | 4461.0 | 4459.0 | 4.98 |
| 3/10/27 | 17.86 | 4458.30 | 4455.80 | 7.74 | 4461.0 | 4459.0 | 4.98 |
| 3/11/27 | 17.86 | 4458.30 | 4455.80 | 7.72 | 4461.0 | 4459.0 | 4.98 |
| 3/12/27 | 17.86 | 4458.30 | 4455.80 | 7.70 | 4461.0 | 4459.0 | 4.98 |
| 3/13/27 | 17.86 | 4458.30 | 4455.80 | 7.68 | 4461.0 | 4459.0 | 4.98 |
| 3/14/27 | 17.87 | 4458.30 | 4455.80 | 7.66 | 4461.0 | 4459.0 | 4.98 |
| 3/15/27 | 17.87 | 4458.40 | 4455.80 | 7.64 | 4461.0 | 4459.0 | 4.98 |
| 3/16/27 | 17.87 | 4458.40 | 4455.80 | 7.62 | 4461.0 | 4459.0 | 4.98 |
| 3/17/27 | 17.88 | 4458.40 | 4455.90 | 7.60 | 4461.0 | 4459.0 | 4.98 |
| 3/18/27 | 17.88 | 4458.40 | 4455.90 | 7.58 | 4461.0 | 4459.0 | 4.98 |
| 3/19/27 | 17.88 | 4458.40 | 4455.90 | 7.56 | 4461.0 | 4459.0 | 4.98 |
| 3/20/27 | 17.88 | 4458.50 | 4455.90 | 7.54 | 4461.0 | 4459.0 | 4.98 |
| 3/21/27 | 17.89 | 4458.50 | 4455.90 | 7.52 | 4461.0 | 4459.0 | 4.98 |
| 3/22/27 | 17.89 | 4458.50 | 4455.90 | 7.50 | 4461.0 | 4459.0 | 4.98 |
| 3/23/27 | 17.89 | 4458.50 | 4455.90 | 7.48 | 4461.0 | 4459.0 | 4.98 |
| 3/24/27 | 17.90 | 4458.50 | 4455.90 | 7.46 | 4461.0 | 4459.0 | 4.98 |
| 3/25/27 | 17.90 | 4458.60 | 4456.00 | 7.44 | 4461.0 | 4459.0 | 4.98 |
| 3/26/27 | 17.90 | 4458.60 | 4456.00 | 7.42 | 4461.0 | 4459.0 | 4.98 |
| 3/27/27 | 17.90 | 4458.60 | 4456.00 | 7.41 | 4461.0 | 4459.0 | 4.98 |
| 3/28/27 | 17.91 | 4458.60 | 4456.00 | 7.39 | 4461.0 | 4459.0 | 4.98 |
| 3/29/27 | 17.91 | 4458.60 | 4456.00 | 7.37 | 4461.0 | 4459.0 | 4.98 |
| 3/30/27 | 17.91 | 4458.70 | 4456.00 | 7.35 | 4461.0 | 4459.0 | 4.98 |
| 3/31/27 | 17.91 | 4458.70 | 4456.00 | 7.33 | 4461.0 | 4459.0 | 4.98 |
| 4/1/27 | 17.92 | 4458.70 | 4456.10 | 7.31 | 4461.0 | 4459.0 | 4.98 |

**Appendix E**
**Table 1  Tailings and Pond Elevations for North and South Cells**

|  | Year | North Cell |  |  | South Cell |  |  |
|---|---|---|---|---|---|---|---|
| Date | Fraction | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) | Pool Elevation (ft) | Tails Elevation (ft) | Freeboard (ft) |
| 4/2/27 | 17.92 | 4458.70 | 4456.10 | 7.29 | 4461.0 | 4459.0 | 4.98 |
| 4/3/27 | 17.92 | 4458.70 | 4456.10 | 7.28 | 4461.0 | 4459.0 | 4.99 |
| 4/4/27 | 17.93 | 4458.70 | 4456.10 | 7.26 | 4461.0 | 4459.0 | 4.98 |
| 4/5/27 | 17.93 | 4458.80 | 4456.10 | 7.24 | 4461.0 | 4459.0 | 4.99 |
| 4/6/27 | 17.93 | 4458.80 | 4456.10 | 7.23 | 4461.0 | 4459.0 | 4.98 |
| 4/7/27 | 17.93 | 4458.80 | 4456.10 | 7.21 | 4461.0 | 4459.0 | 4.99 |
| 4/8/27 | 17.94 | 4458.80 | 4456.10 | 7.19 | 4461.0 | 4459.0 | 4.98 |
| 4/9/27 | 17.94 | 4458.80 | 4456.20 | 7.18 | 4461.0 | 4459.0 | 4.99 |
| 4/10/27 | 17.94 | 4458.80 | 4456.20 | 7.16 | 4461.0 | 4459.0 | 4.98 |
| 4/11/27 | 17.94 | 4458.90 | 4456.20 | 7.15 | 4461.0 | 4459.0 | 4.99 |
| 4/12/27 | 17.95 | 4458.90 | 4456.20 | 7.13 | 4461.0 | 4459.0 | 4.98 |
| 4/13/27 | 17.95 | 4458.90 | 4456.20 | 7.11 | 4461.0 | 4459.0 | 4.99 |
| 4/14/27 | 17.95 | 4458.90 | 4456.20 | 7.10 | 4461.0 | 4459.0 | 4.98 |
| 4/15/27 | 17.96 | 4458.90 | 4456.20 | 7.08 | 4461.0 | 4459.0 | 4.99 |
| 4/16/27 | 17.96 | 4458.90 | 4456.20 | 7.07 | 4461.0 | 4459.0 | 4.98 |
| 4/17/27 | 17.96 | 4459.00 | 4456.30 | 7.05 | 4461.0 | 4459.0 | 4.99 |
| 4/18/27 | 17.96 | 4459.00 | 4456.30 | 7.03 | 4461.0 | 4459.0 | 4.98 |
| 4/19/27 | 17.97 | 4459.00 | 4456.30 | 7.02 | 4461.0 | 4459.0 | 4.99 |
| 4/20/27 | 17.97 | 4459.00 | 4456.30 | 7.00 | 4461.0 | 4459.0 | 4.98 |
| 4/21/27 | 17.97 | 4459.00 | 4456.30 | 6.98 | 4461.0 | 4459.0 | 4.99 |
| 4/22/27 | 17.97 | 4459.00 | 4456.30 | 6.97 | 4461.0 | 4459.0 | 4.98 |
| 4/23/27 | 17.98 | 4459.00 | 4456.30 | 6.95 | 4461.0 | 4459.0 | 4.99 |
| 4/24/27 | 17.98 | 4459.10 | 4456.30 | 6.94 | 4461.0 | 4459.0 | 4.98 |
| 4/25/27 | 17.98 | 4459.10 | 4456.40 | 6.92 | 4461.0 | 4459.0 | 4.99 |
| 4/26/27 | 17.99 | 4459.10 | 4456.40 | 6.90 | 4461.0 | 4459.0 | 4.98 |
| 4/27/27 | 17.99 | 4459.10 | 4456.40 | 6.89 | 4461.0 | 4459.0 | 4.99 |
| 4/28/27 | 17.99 | 4459.10 | 4456.40 | 6.87 | 4461.0 | 4459.0 | 4.98 |
| 4/29/27 | 17.99 | 4459.10 | 4456.40 | 6.86 | 4461.0 | 4459.0 | 4.99 |
| 4/30/27 | 18.00 | 4459.20 | 4456.40 | 6.84 | 4461.0 | 4459.0 | 4.98 |
| 5/1/27 | 18.00 | 4459.20 | 4456.40 | 6.82 | 4461.0 | 4459.0 | 4.99 |

**Appendix E**
**Table 2 North Cell inflow/outflow rates**

| Month | Year | Solid Flows Ton/hr | Discharge gal/min | Precip gal/min | Evap gal/min | Entrained Water gal/min |
|---|---|---|---|---|---|---|
| 5 | 2009 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 6 | 2009 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 7 | 2009 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 8 | 2009 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 9 | 2009 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 10 | 2009 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 11 | 2009 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 12 | 2009 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 1 | 2010 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 2 | 2010 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 3 | 2010 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 4 | 2010 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 5 | 2010 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 6 | 2010 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 7 | 2010 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 8 | 2010 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 9 | 2010 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 10 | 2010 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 11 | 2010 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 12 | 2010 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 1 | 2011 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 2 | 2011 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 3 | 2011 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 4 | 2011 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 5 | 2011 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 6 | 2011 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 7 | 2011 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 8 | 2011 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 9 | 2011 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 10 | 2011 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 11 | 2011 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 12 | 2011 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 1 | 2012 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 2 | 2012 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 3 | 2012 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 4 | 2012 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 5 | 2012 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 6 | 2012 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 7 | 2012 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 8 | 2012 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 9 | 2012 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 10 | 2012 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 11 | 2012 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 12 | 2012 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 1 | 2013 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 2 | 2013 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 3 | 2013 | 0.00 | 0.00 | 5.44 | 0.21 | 0.00 |
| 4 | 2013 | 0.00 | 0.00 | 2.50 | 1.45 | 0.00 |
| 5 | 2013 | 0.00 | 0.00 | 4.50 | 2.07 | 0.00 |
| 6 | 2013 | 0.00 | 0.00 | 6.24 | 3.57 | 0.00 |
| 7 | 2013 | 0.00 | 0.00 | 8.24 | 5.94 | 0.00 |
| 8 | 2013 | 0.00 | 0.00 | 27.97 | 9.96 | 0.00 |
| 9 | 2013 | 0.00 | 0.00 | 28.97 | 14.63 | 0.00 |
| 10 | 2013 | 0.00 | 0.00 | 24.47 | 15.70 | 0.00 |
| 11 | 2013 | 0.00 | 0.00 | 15.23 | 12.18 | 0.00 |

## Appendix E

## Table 2 North Cell inflow/outflow rates

| Month | Year | Solid Flows Ton/hr | Discharge gal/min | Precip gal/min | Evap gal/min | Entrained Water gal/min |
|---|---|---|---|---|---|---|
| 12 | 2013 | 0.00 | 0.00 | 9.24 | 8.33 | 0.00 |
| 1 | 2014 | 0.00 | 0.00 | 11.74 | 7.19 | 0.00 |
| 2 | 2014 | 25.72 | 106.07 | 10.49 | 9.08 | 21.21 |
| 3 | 2014 | 30.01 | 123.75 | 18.73 | 15.01 | 24.75 |
| 4 | 2014 | 30.01 | 123.75 | 2.50 | 20.09 | 24.75 |
| 5 | 2014 | 30.01 | 123.75 | 4.50 | 28.06 | 24.75 |
| 6 | 2014 | 30.01 | 123.75 | 6.24 | 44.98 | 24.75 |
| 7 | 2014 | 30.01 | 123.75 | 8.24 | 76.24 | 24.75 |
| 8 | 2014 | 30.01 | 123.75 | 27.97 | 99.35 | 24.75 |
| 9 | 2014 | 30.01 | 123.75 | 28.97 | 104.92 | 24.75 |
| 10 | 2014 | 30.01 | 123.75 | 24.47 | 93.21 | 24.75 |
| 11 | 2014 | 30.01 | 123.75 | 15.23 | 67.71 | 24.75 |
| 12 | 2014 | 30.01 | 123.75 | 9.24 | 46.98 | 24.75 |
| 1 | 2015 | 30.01 | 123.75 | 11.74 | 41.39 | 24.75 |
| 2 | 2015 | 30.01 | 123.75 | 10.49 | 40.57 | 24.75 |
| 3 | 2015 | 21.29 | 87.82 | 18.73 | 45.29 | 17.56 |
| 4 | 2015 | 0.00 | 0.00 | 2.50 | 47.03 | 0.00 |
| 5 | 2015 | 0.00 | 0.00 | 4.50 | 53.73 | 0.00 |
| 6 | 2015 | 0.00 | 0.00 | 6.24 | 72.98 | 0.00 |
| 7 | 2015 | 0.00 | 0.00 | 8.24 | 109.19 | 0.00 |
| 8 | 2015 | 0.00 | 0.00 | 27.97 | 131.13 | 0.00 |
| 9 | 2015 | 0.00 | 0.00 | 28.97 | 128.40 | 0.00 |
| 10 | 2015 | 0.00 | 0.00 | 24.47 | 106.32 | 0.00 |
| 11 | 2015 | 0.00 | 0.00 | 15.23 | 72.34 | 0.00 |
| 12 | 2015 | 0.00 | 0.00 | 9.24 | 47.19 | 0.00 |
| 1 | 2016 | 0.00 | 0.00 | 11.74 | 39.19 | 0.00 |
| 2 | 2016 | 0.00 | 0.00 | 10.49 | 36.41 | 0.00 |
| 3 | 2016 | 0.00 | 0.00 | 18.73 | 38.72 | 0.00 |
| 4 | 2016 | 0.00 | 0.00 | 2.50 | 39.68 | 0.00 |
| 5 | 2016 | 0.00 | 0.00 | 4.50 | 45.35 | 0.00 |
| 6 | 2016 | 0.00 | 0.00 | 6.24 | 61.61 | 0.00 |
| 7 | 2016 | 0.00 | 0.00 | 8.24 | 92.23 | 0.00 |
| 8 | 2016 | 0.00 | 0.00 | 27.97 | 110.93 | 0.00 |
| 9 | 2016 | 0.00 | 0.00 | 28.97 | 109.54 | 0.00 |
| 10 | 2016 | 0.00 | 0.00 | 24.47 | 92.40 | 0.00 |
| 11 | 2016 | 0.00 | 0.00 | 15.23 | 63.88 | 0.00 |
| 12 | 2016 | 0.00 | 0.00 | 9.24 | 42.21 | 0.00 |
| 1 | 2017 | 0.00 | 0.00 | 11.74 | 35.37 | 0.00 |
| 2 | 2017 | 0.00 | 0.00 | 10.49 | 33.08 | 0.00 |
| 3 | 2017 | 0.00 | 0.00 | 18.73 | 35.37 | 0.00 |
| 4 | 2017 | 0.00 | 0.00 | 2.50 | 36.50 | 0.00 |
| 5 | 2017 | 0.00 | 0.00 | 4.50 | 42.20 | 0.00 |
| 6 | 2017 | 0.00 | 0.00 | 6.24 | 58.16 | 0.00 |
| 7 | 2017 | 0.00 | 0.00 | 8.24 | 88.91 | 0.00 |
| 8 | 2017 | 0.00 | 0.00 | 27.97 | 109.45 | 0.00 |
| 9 | 2017 | 0.00 | 0.00 | 28.97 | 109.45 | 0.00 |
| 10 | 2017 | 0.00 | 0.00 | 24.47 | 92.36 | 0.00 |
| 11 | 2017 | 0.00 | 0.00 | 15.23 | 63.86 | 0.00 |
| 12 | 2017 | 0.00 | 0.00 | 9.24 | 42.19 | 0.00 |
| 1 | 2018 | 0.00 | 0.00 | 11.74 | 35.36 | 0.00 |
| 2 | 2018 | 0.00 | 0.00 | 10.49 | 33.08 | 0.00 |
| 3 | 2018 | 0.00 | 0.00 | 18.73 | 35.36 | 0.00 |
| 4 | 2018 | 0.00 | 0.00 | 2.50 | 36.48 | 0.00 |
| 5 | 2018 | 0.00 | 0.00 | 4.50 | 42.18 | 0.00 |
| 6 | 2018 | 0.00 | 0.00 | 6.24 | 58.13 | 0.00 |

## Appendix E

## Table 2 North Cell inflow/outflow rates

| Month | Year | Solid Flows Ton/hr | Discharge gal/min | Precip gal/min | Evap gal/min | Entrained Water gal/min |
|---|---|---|---|---|---|---|
| 7 | 2018 | 0.00 | 0.00 | 8.24 | 88.87 | 0.00 |
| 8 | 2018 | 0.00 | 0.00 | 27.97 | 109.39 | 0.00 |
| 9 | 2018 | 0.00 | 0.00 | 28.97 | 109.39 | 0.00 |
| 10 | 2018 | 0.00 | 0.00 | 24.47 | 92.31 | 0.00 |
| 11 | 2018 | 0.00 | 0.00 | 15.23 | 63.82 | 0.00 |
| 12 | 2018 | 0.00 | 0.00 | 9.24 | 42.17 | 0.00 |
| 1 | 2019 | 0.00 | 0.00 | 11.74 | 35.34 | 0.00 |
| 2 | 2019 | 0.00 | 0.00 | 10.49 | 33.06 | 0.00 |
| 3 | 2019 | 0.00 | 0.00 | 18.73 | 35.34 | 0.00 |
| 4 | 2019 | 0.00 | 0.00 | 2.50 | 36.47 | 0.00 |
| 5 | 2019 | 0.00 | 0.00 | 4.50 | 42.16 | 0.00 |
| 6 | 2019 | 0.00 | 0.00 | 6.24 | 58.10 | 0.00 |
| 7 | 2019 | 0.00 | 0.00 | 8.24 | 88.82 | 0.00 |
| 8 | 2019 | 0.00 | 0.00 | 27.97 | 109.34 | 0.00 |
| 9 | 2019 | 0.00 | 0.00 | 28.97 | 109.34 | 0.00 |
| 10 | 2019 | 0.00 | 0.00 | 24.47 | 92.27 | 0.00 |
| 11 | 2019 | 0.00 | 0.00 | 15.23 | 63.79 | 0.00 |
| 12 | 2019 | 10.65 | 43.91 | 9.24 | 42.29 | 8.78 |
| 1 | 2020 | 30.01 | 123.75 | 11.74 | 37.08 | 24.75 |
| 2 | 2020 | 30.01 | 123.75 | 10.49 | 36.61 | 24.75 |
| 3 | 2020 | 30.01 | 123.75 | 18.73 | 41.23 | 24.75 |
| 4 | 2020 | 30.01 | 123.75 | 2.50 | 44.66 | 24.75 |
| 5 | 2020 | 30.01 | 123.75 | 4.50 | 53.82 | 24.75 |
| 6 | 2020 | 30.01 | 123.75 | 6.24 | 76.93 | 24.75 |
| 7 | 2020 | 30.01 | 123.75 | 8.24 | 120.47 | 24.75 |
| 8 | 2020 | 30.01 | 123.75 | 27.97 | 150.56 | 24.75 |
| 9 | 2020 | 30.01 | 123.75 | 28.97 | 152.97 | 24.75 |
| 10 | 2020 | 30.01 | 123.75 | 24.47 | 131.22 | 24.75 |
| 11 | 2020 | 30.01 | 123.75 | 15.23 | 92.38 | 24.75 |
| 12 | 2020 | 30.01 | 123.75 | 9.24 | 62.29 | 24.75 |
| 1 | 2021 | 30.01 | 123.75 | 11.74 | 53.38 | 24.75 |
| 2 | 2021 | 30.01 | 123.75 | 10.49 | 51.05 | 24.75 |
| 3 | 2021 | 30.01 | 123.75 | 18.73 | 55.78 | 24.75 |
| 4 | 2021 | 30.01 | 123.75 | 2.50 | 58.81 | 24.75 |
| 5 | 2021 | 30.01 | 123.75 | 4.50 | 69.26 | 24.75 |
| 6 | 2021 | 30.01 | 123.75 | 6.24 | 97.01 | 24.75 |
| 7 | 2021 | 30.01 | 123.75 | 8.24 | 150.00 | 24.75 |
| 8 | 2021 | 30.01 | 123.75 | 27.97 | 186.14 | 24.75 |
| 9 | 2021 | 30.01 | 123.75 | 28.97 | 187.73 | 24.75 |
| 10 | 2021 | 30.01 | 123.75 | 24.47 | 159.93 | 24.75 |
| 11 | 2021 | 30.01 | 123.75 | 15.23 | 111.90 | 24.75 |
| 12 | 2021 | 30.01 | 123.75 | 9.24 | 75.05 | 24.75 |
| 1 | 2022 | 30.01 | 123.75 | 11.74 | 63.78 | 24.75 |
| 2 | 2022 | 30.01 | 123.75 | 10.49 | 60.16 | 24.75 |
| 3 | 2022 | 30.01 | 123.75 | 18.73 | 64.84 | 24.75 |
| 4 | 2022 | 30.01 | 123.75 | 2.50 | 67.47 | 24.75 |
| 5 | 2022 | 30.01 | 123.75 | 4.50 | 78.55 | 24.75 |
| 6 | 2022 | 30.01 | 123.75 | 6.24 | 108.93 | 24.75 |
| 7 | 2022 | 30.01 | 123.75 | 8.24 | 167.22 | 24.75 |
| 8 | 2022 | 30.01 | 123.75 | 27.97 | 206.31 | 24.75 |
| 9 | 2022 | 30.01 | 123.75 | 28.97 | 206.84 | 24.75 |
| 10 | 2022 | 30.01 | 123.75 | 24.47 | 175.07 | 24.75 |
| 11 | 2022 | 30.01 | 123.75 | 15.23 | 121.57 | 24.75 |
| 12 | 2022 | 30.01 | 123.75 | 9.24 | 80.81 | 24.75 |
| 1 | 2023 | 30.01 | 123.75 | 11.74 | 68.19 | 24.75 |

**Appendix E**

**Table 2 North Cell inflow/outflow rates**

| Month | Year | Solid Flows Ton/hr | Discharge gal/min | Precip gal/min | Evap gal/min | Entrained Water gal/min |
|---|---|---|---|---|---|---|
| 2 | 2023 | 30.01 | 123.75 | 10.49 | 64.26 | 24.75 |
| 3 | 2023 | 30.01 | 123.75 | 18.73 | 69.21 | 24.75 |
| 4 | 2023 | 30.01 | 123.75 | 2.50 | 71.96 | 24.75 |
| 5 | 2023 | 30.01 | 123.75 | 4.50 | 83.73 | 24.75 |
| 6 | 2023 | 30.01 | 123.75 | 6.24 | 116.03 | 24.75 |
| 7 | 2023 | 30.01 | 123.75 | 8.24 | 178.01 | 24.75 |
| 8 | 2023 | 29.04 | 119.76 | 27.97 | 219.46 | 23.95 |
| 9 | 2023 | 0.00 | 0.00 | 28.97 | 218.75 | 0.00 |
| 10 | 2023 | 0.00 | 0.00 | 24.47 | 183.22 | 0.00 |
| 11 | 2023 | 0.00 | 0.00 | 15.23 | 125.92 | 0.00 |
| 12 | 2023 | 0.00 | 0.00 | 9.24 | 82.85 | 0.00 |
| 1 | 2024 | 0.00 | 0.00 | 11.74 | 69.37 | 0.00 |
| 2 | 2024 | 0.00 | 0.00 | 10.49 | 64.90 | 0.00 |
| 3 | 2024 | 0.00 | 0.00 | 18.73 | 69.37 | 0.00 |
| 4 | 2024 | 0.00 | 0.00 | 2.50 | 71.60 | 0.00 |
| 5 | 2024 | 0.00 | 0.00 | 4.50 | 82.79 | 0.00 |
| 6 | 2024 | 0.00 | 0.00 | 6.24 | 114.11 | 0.00 |
| 7 | 2024 | 0.00 | 0.00 | 8.24 | 174.52 | 0.00 |
| 8 | 2024 | 0.00 | 0.00 | 27.97 | 214.79 | 0.00 |
| 9 | 2024 | 0.00 | 0.00 | 28.97 | 214.80 | 0.00 |
| 10 | 2024 | 0.00 | 0.00 | 24.47 | 181.24 | 0.00 |
| 11 | 2024 | 0.00 | 0.00 | 15.23 | 125.31 | 0.00 |
| 12 | 2024 | 0.00 | 0.00 | 9.24 | 82.80 | 0.00 |
| 1 | 2025 | 0.00 | 0.00 | 11.74 | 69.37 | 0.00 |
| 2 | 2025 | 0.00 | 0.00 | 10.49 | 64.90 | 0.00 |
| 3 | 2025 | 0.00 | 0.00 | 18.73 | 69.37 | 0.00 |
| 4 | 2025 | 0.00 | 0.00 | 2.50 | 71.61 | 0.00 |
| 5 | 2025 | 0.00 | 0.00 | 4.50 | 82.79 | 0.00 |
| 6 | 2025 | 0.00 | 0.00 | 6.24 | 114.12 | 0.00 |
| 7 | 2025 | 0.00 | 0.00 | 8.24 | 174.52 | 0.00 |
| 8 | 2025 | 0.00 | 0.00 | 27.97 | 214.80 | 0.00 |
| 9 | 2025 | 0.00 | 0.00 | 28.97 | 214.80 | 0.00 |
| 10 | 2025 | 0.00 | 0.00 | 24.47 | 181.24 | 0.00 |
| 11 | 2025 | 0.00 | 0.00 | 15.23 | 125.31 | 0.00 |
| 12 | 2025 | 0.00 | 0.00 | 9.24 | 82.80 | 0.00 |
| 1 | 2026 | 0.00 | 0.00 | 11.74 | 69.38 | 0.00 |
| 2 | 2026 | 0.00 | 0.00 | 10.49 | 64.89 | 0.00 |
| 3 | 2026 | 0.00 | 0.00 | 18.73 | 69.37 | 0.00 |
| 4 | 2026 | 0.00 | 0.00 | 2.50 | 71.60 | 0.00 |
| 5 | 2026 | 0.00 | 0.00 | 4.50 | 82.79 | 0.00 |
| 6 | 2026 | 0.00 | 0.00 | 6.24 | 114.11 | 0.00 |
| 7 | 2026 | 0.00 | 0.00 | 8.24 | 174.52 | 0.00 |
| 8 | 2026 | 0.00 | 0.00 | 27.97 | 214.79 | 0.00 |
| 9 | 2026 | 0.00 | 0.00 | 28.97 | 214.80 | 0.00 |
| 10 | 2026 | 0.00 | 0.00 | 24.47 | 181.24 | 0.00 |
| 11 | 2026 | 16.00 | 66.00 | 15.23 | 125.40 | 13.20 |
| 12 | 2026 | 30.01 | 123.75 | 9.24 | 83.29 | 24.75 |
| 1 | 2027 | 30.01 | 123.75 | 11.74 | 70.27 | 24.75 |
| 2 | 2027 | 30.01 | 123.75 | 10.49 | 66.19 | 24.75 |
| 3 | 2027 | 30.01 | 123.75 | 18.73 | 71.27 | 24.75 |
| 4 | 2027 | 30.01 | 123.75 | 2.50 | 74.08 | 24.75 |
| 5 | 2027 | 30.01 | 123.75 | 4.50 | 85.93 | 24.75 |

**Appendix E**
**Table 3 South Cell inflow/outflow rates**

| Month | Year | Solid Flows | Old Tailings | Discharge | Precip | Evap | Entrained Water |
|---|---|---|---|---|---|---|---|
| | | Ton/hr | Ton/hr | gal/min | gal/min | gal/min | gal/min |
| 5 | 2009 | 30.00 | 73.04 | 123.75 | 3.85 | 9.17 | 24.75 |
| 6 | 2009 | 30.00 | 75.48 | 123.75 | 5.35 | 27.65 | 24.75 |
| 7 | 2009 | 30.01 | 0.00 | 123.75 | 7.06 | 52.36 | 24.75 |
| 8 | 2009 | 30.01 | 0.00 | 123.75 | 23.95 | 71.95 | 24.75 |
| 9 | 2009 | 30.01 | 0.00 | 123.75 | 24.81 | 79.46 | 24.75 |
| 10 | 2009 | 30.01 | 0.00 | 123.75 | 20.96 | 72.58 | 24.75 |
| 11 | 2009 | 30.01 | 0.00 | 123.75 | 13.05 | 53.04 | 24.75 |
| 12 | 2009 | 30.01 | 0.00 | 123.75 | 7.91 | 36.97 | 24.75 |
| 1 | 2010 | 30.01 | 0.00 | 123.75 | 10.05 | 32.70 | 24.75 |
| 2 | 2010 | 30.01 | 0.00 | 123.75 | 8.98 | 32.15 | 24.75 |
| 3 | 2010 | 30.01 | 0.00 | 123.75 | 16.04 | 36.06 | 24.75 |
| 4 | 2010 | 30.01 | 0.00 | 123.75 | 2.14 | 38.95 | 24.75 |
| 5 | 2010 | 30.01 | 0.00 | 123.75 | 3.85 | 46.86 | 24.75 |
| 6 | 2010 | 30.01 | 0.00 | 123.75 | 5.35 | 66.26 | 24.75 |
| 7 | 2010 | 30.01 | 0.00 | 123.75 | 7.06 | 103.00 | 24.75 |
| 8 | 2010 | 30.01 | 0.00 | 123.75 | 23.95 | 128.60 | 24.75 |
| 9 | 2010 | 30.01 | 0.00 | 123.75 | 24.81 | 130.45 | 24.75 |
| 10 | 2010 | 30.01 | 0.00 | 123.75 | 20.96 | 111.70 | 24.75 |
| 11 | 2010 | 30.01 | 0.00 | 123.75 | 13.05 | 78.49 | 24.75 |
| 12 | 2010 | 30.01 | 0.00 | 123.75 | 7.91 | 52.80 | 24.75 |
| 1 | 2011 | 30.01 | 0.00 | 123.75 | 10.05 | 45.12 | 24.75 |
| 2 | 2011 | 30.01 | 0.00 | 123.75 | 8.98 | 43.03 | 24.75 |
| 3 | 2011 | 30.01 | 0.00 | 123.75 | 16.04 | 46.88 | 24.75 |
| 4 | 2011 | 30.01 | 0.00 | 123.75 | 2.14 | 49.31 | 24.75 |
| 5 | 2011 | 30.01 | 0.00 | 123.75 | 3.85 | 57.97 | 24.75 |
| 6 | 2011 | 30.01 | 0.00 | 123.75 | 5.35 | 80.69 | 24.75 |
| 7 | 2011 | 30.01 | 0.00 | 123.75 | 7.06 | 124.01 | 24.75 |
| 8 | 2011 | 30.01 | 0.00 | 123.75 | 23.95 | 153.24 | 24.75 |
| 9 | 2011 | 30.01 | 0.00 | 123.75 | 24.81 | 153.86 | 24.75 |
| 10 | 2011 | 30.01 | 0.00 | 123.75 | 20.96 | 130.39 | 24.75 |
| 11 | 2011 | 30.01 | 0.00 | 123.75 | 13.05 | 90.62 | 24.75 |
| 12 | 2011 | 30.01 | 0.00 | 123.75 | 7.91 | 60.25 | 24.75 |
| 1 | 2012 | 30.01 | 0.00 | 123.75 | 10.05 | 50.84 | 24.75 |
| 2 | 2012 | 30.01 | 0.00 | 123.75 | 8.98 | 47.90 | 24.75 |
| 3 | 2012 | 30.01 | 0.00 | 123.75 | 16.04 | 51.58 | 24.75 |
| 4 | 2012 | 30.01 | 0.00 | 123.75 | 2.14 | 53.62 | 24.75 |
| 5 | 2012 | 30.01 | 0.00 | 123.75 | 3.85 | 62.39 | 24.75 |
| 6 | 2012 | 30.01 | 0.00 | 123.75 | 5.35 | 86.50 | 24.75 |
| 7 | 2012 | 30.01 | 0.00 | 123.75 | 7.06 | 132.86 | 24.75 |
| 8 | 2012 | 30.01 | 0.00 | 123.75 | 23.95 | 164.06 | 24.75 |
| 9 | 2012 | 30.01 | 0.00 | 123.75 | 24.81 | 164.60 | 24.75 |
| 10 | 2012 | 30.01 | 0.00 | 123.75 | 20.96 | 139.39 | 24.75 |
| 11 | 2012 | 30.01 | 0.00 | 123.75 | 13.05 | 96.79 | 24.75 |
| 12 | 2012 | 30.01 | 0.00 | 123.75 | 7.91 | 64.30 | 24.75 |
| 1 | 2013 | 30.01 | 0.00 | 123.75 | 10.05 | 54.21 | 24.75 |
| 2 | 2013 | 30.01 | 0.00 | 123.75 | 8.98 | 51.02 | 24.75 |
| 3 | 2013 | 30.01 | 0.00 | 123.75 | 16.99 | 54.89 | 24.75 |
| 4 | 2013 | 30.01 | 0.00 | 123.75 | 2.58 | 57.01 | 24.75 |
| 5 | 2013 | 30.01 | 0.00 | 123.75 | 4.64 | 66.29 | 24.75 |
| 6 | 2013 | 30.01 | 0.00 | 123.75 | 6.44 | 91.83 | 24.75 |
| 7 | 2013 | 30.01 | 0.00 | 123.75 | 8.50 | 140.96 | 24.75 |
| 8 | 2013 | 30.01 | 0.00 | 123.75 | 28.85 | 173.96 | 24.75 |
| 9 | 2013 | 30.01 | 0.00 | 123.75 | 29.88 | 174.42 | 24.75 |
| 10 | 2013 | 30.01 | 0.00 | 123.75 | 25.25 | 147.61 | 24.75 |
| 11 | 2013 | 30.01 | 0.00 | 123.75 | 15.71 | 102.46 | 24.75 |

**Appendix E**
**Table 3 South Cell inflow/outflow rates**

| Month | Year | Solid Flows | Old Tailings | Discharge | Precip | Evap | Entrained Water |
|---|---|---|---|---|---|---|---|
| | | Ton/hr | Ton/hr | gal/min | gal/min | gal/min | gal/min |
| 12 | 2013 | 30.01 | 0.00 | 123.75 | 9.53 | 68.03 | 24.75 |
| 1 | 2014 | 30.01 | 0.00 | 123.75 | 12.11 | 57.33 | 24.75 |
| 2 | 2014 | 4.29 | 0.00 | 17.68 | 10.82 | 53.81 | 3.54 |
| 3 | 2014 | 0.00 | 0.00 | 0.00 | 19.32 | 57.45 | 0.00 |
| 4 | 2014 | 0.00 | 0.00 | 0.00 | 2.58 | 59.20 | 0.00 |
| 5 | 2014 | 0.00 | 0.00 | 0.00 | 4.64 | 68.30 | 0.00 |
| 6 | 2014 | 0.00 | 0.00 | 0.00 | 6.44 | 93.88 | 0.00 |
| 7 | 2014 | 0.00 | 0.00 | 0.00 | 8.50 | 142.98 | 0.00 |
| 8 | 2014 | 0.00 | 0.00 | 0.00 | 28.85 | 175.06 | 0.00 |
| 9 | 2014 | 0.00 | 0.00 | 0.00 | 29.88 | 174.17 | 0.00 |
| 10 | 2014 | 0.00 | 0.00 | 0.00 | 25.25 | 146.27 | 0.00 |
| 11 | 2014 | 0.00 | 0.00 | 0.00 | 15.71 | 100.75 | 0.00 |
| 12 | 2014 | 0.00 | 0.00 | 0.00 | 9.53 | 66.39 | 0.00 |
| 1 | 2015 | 0.00 | 0.00 | 0.00 | 12.11 | 55.51 | 0.00 |
| 2 | 2015 | 0.00 | 0.00 | 0.00 | 10.82 | 51.85 | 0.00 |
| 3 | 2015 | 8.71 | 0.00 | 35.93 | 19.32 | 55.37 | 7.19 |
| 4 | 2015 | 30.01 | 0.00 | 123.75 | 2.58 | 57.39 | 24.75 |
| 5 | 2015 | 30.01 | 0.00 | 123.75 | 4.64 | 66.73 | 24.75 |
| 6 | 2015 | 30.01 | 0.00 | 123.75 | 6.44 | 92.43 | 24.75 |
| 7 | 2015 | 30.01 | 0.00 | 123.75 | 8.50 | 141.87 | 24.75 |
| 8 | 2015 | 30.01 | 0.00 | 123.75 | 28.85 | 175.07 | 24.75 |
| 9 | 2015 | 30.01 | 0.00 | 123.75 | 29.88 | 175.53 | 24.75 |
| 10 | 2015 | 30.01 | 0.00 | 123.75 | 25.25 | 148.54 | 24.75 |
| 11 | 2015 | 30.01 | 0.00 | 123.75 | 15.71 | 103.10 | 24.75 |
| 12 | 2015 | 30.01 | 0.00 | 123.75 | 9.53 | 68.45 | 24.75 |
| 1 | 2016 | 30.01 | 0.00 | 123.75 | 12.11 | 57.68 | 24.75 |
| 2 | 2016 | 30.01 | 0.00 | 123.75 | 10.82 | 54.30 | 24.75 |
| 3 | 2016 | 30.01 | 0.00 | 123.75 | 19.32 | 58.55 | 24.75 |
| 4 | 2016 | 30.01 | 0.00 | 123.75 | 2.58 | 60.95 | 24.75 |
| 5 | 2016 | 30.01 | 0.00 | 123.75 | 4.64 | 71.01 | 24.75 |
| 6 | 2016 | 30.01 | 0.00 | 123.75 | 6.44 | 98.53 | 24.75 |
| 7 | 2016 | 30.01 | 0.00 | 123.75 | 8.50 | 151.38 | 24.75 |
| 8 | 2016 | 30.01 | 0.00 | 123.75 | 28.85 | 186.90 | 24.75 |
| 9 | 2016 | 30.01 | 0.00 | 123.75 | 29.88 | 187.45 | 24.75 |
| 10 | 2016 | 30.01 | 0.00 | 123.75 | 25.25 | 158.73 | 24.75 |
| 11 | 2016 | 30.01 | 0.00 | 123.75 | 15.71 | 110.28 | 24.75 |
| 12 | 2016 | 30.01 | 0.00 | 123.75 | 9.53 | 73.34 | 24.75 |
| 1 | 2017 | 30.01 | 0.00 | 123.75 | 12.11 | 61.92 | 24.75 |
| 2 | 2017 | 30.01 | 0.00 | 123.75 | 10.82 | 58.38 | 24.75 |
| 3 | 2017 | 30.01 | 0.00 | 123.75 | 19.32 | 62.90 | 24.75 |
| 4 | 2017 | 30.01 | 0.00 | 123.75 | 2.58 | 65.43 | 24.75 |
| 5 | 2017 | 30.01 | 0.00 | 123.75 | 4.64 | 76.17 | 24.75 |
| 6 | 2017 | 30.01 | 0.00 | 123.75 | 6.44 | 105.61 | 24.75 |
| 7 | 2017 | 30.01 | 0.00 | 123.75 | 8.50 | 162.14 | 24.75 |
| 8 | 2017 | 30.01 | 0.00 | 123.75 | 28.85 | 200.01 | 24.75 |
| 9 | 2017 | 30.01 | 0.00 | 123.75 | 29.88 | 200.44 | 24.75 |
| 10 | 2017 | 30.01 | 0.00 | 123.75 | 25.25 | 169.58 | 24.75 |
| 11 | 2017 | 30.01 | 0.00 | 123.75 | 15.71 | 117.73 | 24.75 |
| 12 | 2017 | 30.01 | 0.00 | 123.75 | 9.53 | 78.24 | 24.75 |
| 1 | 2018 | 30.01 | 0.00 | 123.75 | 12.11 | 65.86 | 24.75 |
| 2 | 2018 | 30.01 | 0.00 | 123.75 | 10.82 | 61.82 | 24.75 |
| 3 | 2018 | 30.01 | 0.00 | 123.75 | 19.32 | 66.32 | 24.75 |
| 4 | 2018 | 30.01 | 0.00 | 123.75 | 2.58 | 68.70 | 24.75 |
| 5 | 2018 | 30.01 | 0.00 | 123.75 | 4.64 | 79.67 | 24.75 |
| 6 | 2018 | 30.01 | 0.00 | 123.75 | 6.44 | 110.11 | 24.75 |

**Appendix E**

**Table 3 South Cell inflow/outflow rates**

| Month | Year | Solid Flows | Old Tailings | Discharge | Precip | Evap | Entrained Water |
|---|---|---|---|---|---|---|---|
| | | Ton/hr | Ton/hr | gal/min | gal/min | gal/min | gal/min |
| 7 | 2018 | 30.01 | 0.00 | 123.75 | 8.50 | 168.68 | 24.75 |
| 8 | 2018 | 30.01 | 0.00 | 123.75 | 28.85 | 207.80 | 24.75 |
| 9 | 2018 | 30.01 | 0.00 | 123.75 | 29.88 | 207.97 | 24.75 |
| 10 | 2018 | 30.01 | 0.00 | 123.75 | 25.25 | 175.67 | 24.75 |
| 11 | 2018 | 30.01 | 0.00 | 123.75 | 15.71 | 121.67 | 24.75 |
| 12 | 2018 | 30.01 | 0.00 | 123.75 | 9.53 | 80.60 | 24.75 |
| 1 | 2019 | 30.01 | 0.00 | 123.75 | 12.11 | 67.75 | 24.75 |
| 2 | 2019 | 30.01 | 0.00 | 123.75 | 10.82 | 63.59 | 24.75 |
| 3 | 2019 | 30.01 | 0.00 | 123.75 | 19.32 | 68.21 | 24.75 |
| 4 | 2019 | 30.01 | 0.00 | 123.75 | 2.58 | 70.65 | 24.75 |
| 5 | 2019 | 30.01 | 0.00 | 123.75 | 4.64 | 81.93 | 24.75 |
| 6 | 2019 | 30.01 | 0.00 | 123.75 | 6.44 | 113.21 | 24.75 |
| 7 | 2019 | 30.01 | 0.00 | 123.75 | 8.50 | 173.40 | 24.75 |
| 8 | 2019 | 30.01 | 0.00 | 123.75 | 28.85 | 213.58 | 24.75 |
| 9 | 2019 | 30.01 | 0.00 | 123.75 | 29.88 | 213.72 | 24.75 |
| 10 | 2019 | 30.01 | 0.00 | 123.75 | 25.25 | 180.50 | 24.75 |
| 11 | 2019 | 30.01 | 0.00 | 123.75 | 15.71 | 125.00 | 24.75 |
| 12 | 2019 | 19.36 | 0.00 | 79.84 | 9.53 | 82.78 | 15.97 |
| 1 | 2020 | 0.00 | 0.00 | 0.00 | 12.11 | 69.32 | 0.00 |
| 2 | 2020 | 0.00 | 0.00 | 0.00 | 10.82 | 64.77 | 0.00 |
| 3 | 2020 | 0.00 | 0.00 | 0.00 | 19.32 | 69.17 | 0.00 |
| 4 | 2020 | 0.00 | 0.00 | 0.00 | 2.58 | 71.31 | 0.00 |
| 5 | 2020 | 0.00 | 0.00 | 0.00 | 4.64 | 82.31 | 0.00 |
| 6 | 2020 | 0.00 | 0.00 | 0.00 | 6.44 | 113.22 | 0.00 |
| 7 | 2020 | 0.00 | 0.00 | 0.00 | 8.50 | 172.63 | 0.00 |
| 8 | 2020 | 0.00 | 0.00 | 0.00 | 28.85 | 211.83 | 0.00 |
| 9 | 2020 | 0.00 | 0.00 | 0.00 | 29.88 | 211.78 | 0.00 |
| 10 | 2020 | 0.00 | 0.00 | 0.00 | 25.25 | 178.69 | 0.00 |
| 11 | 2020 | 0.00 | 0.00 | 0.00 | 15.71 | 123.55 | 0.00 |
| 12 | 2020 | 0.00 | 0.00 | 0.00 | 9.53 | 81.63 | 0.00 |
| 1 | 2021 | 0.00 | 0.00 | 0.00 | 12.11 | 68.39 | 0.00 |
| 2 | 2021 | 0.00 | 0.00 | 0.00 | 10.82 | 63.98 | 0.00 |
| 3 | 2021 | 0.00 | 0.00 | 0.00 | 19.32 | 68.39 | 0.00 |
| 4 | 2021 | 0.00 | 0.00 | 0.00 | 2.58 | 70.59 | 0.00 |
| 5 | 2021 | 0.00 | 0.00 | 0.00 | 4.64 | 81.62 | 0.00 |
| 6 | 2021 | 0.00 | 0.00 | 0.00 | 6.44 | 112.51 | 0.00 |
| 7 | 2021 | 0.00 | 0.00 | 0.00 | 8.50 | 172.06 | 0.00 |
| 8 | 2021 | 0.00 | 0.00 | 0.00 | 28.85 | 211.76 | 0.00 |
| 9 | 2021 | 0.00 | 0.00 | 0.00 | 29.88 | 211.76 | 0.00 |
| 10 | 2021 | 0.00 | 0.00 | 0.00 | 25.25 | 178.68 | 0.00 |
| 11 | 2021 | 0.00 | 0.00 | 0.00 | 15.71 | 123.54 | 0.00 |
| 12 | 2021 | 0.00 | 0.00 | 0.00 | 9.53 | 81.62 | 0.00 |
| 1 | 2022 | 0.00 | 0.00 | 0.00 | 12.11 | 68.39 | 0.00 |
| 2 | 2022 | 0.00 | 0.00 | 0.00 | 10.82 | 63.97 | 0.00 |
| 3 | 2022 | 0.00 | 0.00 | 0.00 | 19.32 | 68.39 | 0.00 |
| 4 | 2022 | 0.00 | 0.00 | 0.00 | 2.58 | 70.59 | 0.00 |
| 5 | 2022 | 0.00 | 0.00 | 0.00 | 4.64 | 81.62 | 0.00 |
| 6 | 2022 | 0.00 | 0.00 | 0.00 | 6.44 | 112.51 | 0.00 |
| 7 | 2022 | 0.00 | 0.00 | 0.00 | 8.50 | 172.06 | 0.00 |
| 8 | 2022 | 0.00 | 0.00 | 0.00 | 28.85 | 211.76 | 0.00 |
| 9 | 2022 | 0.00 | 0.00 | 0.00 | 29.88 | 211.76 | 0.00 |
| 10 | 2022 | 0.00 | 0.00 | 0.00 | 25.25 | 178.68 | 0.00 |
| 11 | 2022 | 0.00 | 0.00 | 0.00 | 15.71 | 123.53 | 0.00 |
| 12 | 2022 | 0.00 | 0.00 | 0.00 | 9.53 | 81.62 | 0.00 |
| 1 | 2023 | 0.00 | 0.00 | 0.00 | 12.11 | 68.39 | 0.00 |

**Appendix E**
**Table 3 South Cell inflow/outflow rates**

| Month | Year | Solid Flows | Old Tailings | Discharge | Precip | Evap | Entrained Water |
|---|---|---|---|---|---|---|---|
| | | Ton/hr | Ton/hr | gal/min | gal/min | gal/min | gal/min |
| 2 | 2023 | 0.00 | 0.00 | 0.00 | 10.82 | 63.98 | 0.00 |
| 3 | 2023 | 0.00 | 0.00 | 0.00 | 19.32 | 68.39 | 0.00 |
| 4 | 2023 | 0.00 | 0.00 | 0.00 | 2.58 | 70.59 | 0.00 |
| 5 | 2023 | 0.00 | 0.00 | 0.00 | 4.64 | 81.62 | 0.00 |
| 6 | 2023 | 0.00 | 0.00 | 0.00 | 6.44 | 112.51 | 0.00 |
| 7 | 2023 | 0.00 | 0.00 | 0.00 | 8.50 | 172.06 | 0.00 |
| 8 | 2023 | 0.97 | 0.00 | 3.99 | 28.85 | 211.76 | 0.80 |
| 9 | 2023 | 30.01 | 0.00 | 123.75 | 29.88 | 212.02 | 24.75 |
| 10 | 2023 | 30.01 | 0.00 | 123.75 | 25.25 | 179.31 | 24.75 |
| 11 | 2023 | 30.01 | 0.00 | 123.75 | 15.71 | 124.26 | 24.75 |
| 12 | 2023 | 30.01 | 0.00 | 123.75 | 9.53 | 82.32 | 24.75 |
| 1 | 2024 | 30.01 | 0.00 | 123.75 | 12.11 | 69.19 | 24.75 |
| 2 | 2024 | 30.01 | 0.00 | 123.75 | 10.82 | 64.93 | 24.75 |
| 3 | 2024 | 30.01 | 0.00 | 123.75 | 19.32 | 69.65 | 24.75 |
| 4 | 2024 | 30.01 | 0.00 | 123.75 | 2.58 | 72.12 | 24.75 |
| 5 | 2024 | 30.01 | 0.00 | 123.75 | 4.64 | 83.62 | 24.75 |
| 6 | 2024 | 30.01 | 0.00 | 123.75 | 6.44 | 115.53 | 24.75 |
| 7 | 2024 | 30.01 | 0.00 | 123.75 | 8.50 | 176.94 | 24.75 |
| 8 | 2024 | 30.01 | 0.00 | 123.75 | 28.85 | 217.91 | 24.75 |
| 9 | 2024 | 30.01 | 0.00 | 123.75 | 29.88 | 218.06 | 24.75 |
| 10 | 2024 | 30.01 | 0.00 | 123.75 | 25.25 | 184.35 | 24.75 |
| 11 | 2024 | 30.01 | 0.00 | 123.75 | 15.71 | 127.74 | 24.75 |
| 12 | 2024 | 30.01 | 0.00 | 123.75 | 9.53 | 84.60 | 24.75 |
| 1 | 2025 | 30.01 | 0.00 | 123.75 | 12.11 | 71.09 | 24.75 |
| 2 | 2025 | 30.01 | 0.00 | 123.75 | 10.82 | 66.71 | 24.75 |
| 3 | 2025 | 30.01 | 0.00 | 123.75 | 19.32 | 71.53 | 24.75 |
| 4 | 2025 | 30.01 | 0.00 | 123.75 | 2.58 | 74.05 | 24.75 |
| 5 | 2025 | 30.01 | 0.00 | 123.75 | 4.64 | 85.85 | 24.75 |
| 6 | 2025 | 30.01 | 0.00 | 123.75 | 6.44 | 118.60 | 24.75 |
| 7 | 2025 | 30.01 | 0.00 | 123.75 | 8.50 | 181.61 | 24.75 |
| 8 | 2025 | 30.01 | 0.00 | 123.75 | 28.85 | 223.64 | 24.75 |
| 9 | 2025 | 30.01 | 0.00 | 123.75 | 29.88 | 223.83 | 24.75 |
| 10 | 2025 | 30.01 | 0.00 | 123.75 | 25.25 | 189.25 | 24.75 |
| 11 | 2025 | 30.01 | 0.00 | 123.75 | 15.71 | 131.12 | 24.75 |
| 12 | 2025 | 30.01 | 0.00 | 123.75 | 9.53 | 86.84 | 24.75 |
| 1 | 2026 | 30.01 | 0.00 | 123.75 | 12.11 | 72.96 | 24.75 |
| 2 | 2026 | 30.01 | 0.00 | 123.75 | 10.82 | 68.45 | 24.75 |
| 3 | 2026 | 30.01 | 0.00 | 123.75 | 19.32 | 73.39 | 24.75 |
| 4 | 2026 | 30.01 | 0.00 | 123.75 | 2.58 | 75.98 | 24.75 |
| 5 | 2026 | 30.01 | 0.00 | 123.75 | 4.64 | 88.07 | 24.75 |
| 6 | 2026 | 30.01 | 0.00 | 123.75 | 6.44 | 121.65 | 24.75 |
| 7 | 2026 | 30.01 | 0.00 | 123.75 | 8.50 | 186.26 | 24.75 |
| 8 | 2026 | 30.01 | 0.00 | 123.75 | 28.85 | 229.33 | 24.75 |
| 9 | 2026 | 30.01 | 0.00 | 123.75 | 29.88 | 229.62 | 24.75 |
| 10 | 2026 | 30.01 | 0.00 | 123.75 | 25.25 | 194.14 | 24.75 |
| 11 | 2026 | 14.00 | 0.00 | 57.75 | 15.71 | 134.46 | 11.55 |
| 12 | 2026 | 0.00 | 0.00 | 0.00 | 9.53 | 88.86 | 0.00 |
| 1 | 2027 | 0.00 | 0.00 | 0.00 | 12.11 | 74.45 | 0.00 |
| 2 | 2027 | 0.00 | 0.00 | 0.00 | 10.82 | 69.65 | 0.00 |
| 3 | 2027 | 0.00 | 0.00 | 0.00 | 19.32 | 74.45 | 0.00 |
| 4 | 2027 | 0.00 | 0.00 | 0.00 | 2.58 | 76.85 | 0.00 |
| 5 | 2027 | 0.00 | 0.00 | 0.00 | 4.64 | 88.85 | 0.00 |

# APPENDIX E.3

# TONY M MINE WATER BALANCE (APPENDIX 2 OF REPORT, TETRA TECH, 2006)

# APPENDIX 2

# TONY M EVAPORATION POND WATER BALANCE MINE DEWATERING AND PHASE I EXPANSION

# TONY M EVAPORATION POND WATER BALANCE
# MINE DEWATERING AND PHASE 1 EXPANSION

A Phase 1 water balance for the Tony M Mine evaporation pond is presented in Table A. The water balance, which has a projected start date of June 1, 2007, is based on pumping an average of 200 gallons per minute (gpm) during the initial two months of operation to dewater the existing workings and then pumping at a lower rate to keep up with water inflowing into the existing mine entries and advancing faces. The initial rate of water inflow (once the mine is fully dewatered) was estimated to be 100 gpm based on historic data. The future inflow rate, which is dependent on the formation characteristics and the rate of mine expansion, is not known at this time.

A breached dam is located on the east side of the pond and will be rebuilt. This dam blocks the primary west to east drainage through the pond area. The current crest of the dam is 4,879 feet; however, the maximum water height will be controlled by a small dike in the southwest corner of the pond that has a height of 4,876.

The water balance was calculated up to an elevation of 4874 feet (i.e., five feet of freeboard at the dam) and a surface area of approximately 18 acres. Given the pumping assumptions described in the first paragraph above and a net annual evaporation rate of 58 inches, the water balance predicted that the pond would reach the 4,874-foot elevation in 31 months. The data and methods used to create the water balance table are described below.

**Evaporation Pond Capacity:** The pond capacity was determined using 2006 topographical maps accurate to one-foot contour elevations. The surface area was determined for each one-foot elevation increment in the area behind the dam starting at 4,843 feet. The average area for each one foot interval was then multiplied by one foot and converted to both gallons and acre feet to develop storage curves for the pond, presented as Graphs A-1 and A-2, respectively. Stripping of the upper four inches of clay liner was not included in the storage curve; this stripping is expected to provide an additional 2 million gallons of storage capacity.

When comparing the new aerial maps to the design drawings for the original dam, we found that the previous maps and storage curves for the pond were consistently low by four feet (i.e., the designs and curves were correct but the elevations shown were four feet lower than the new aerial maps). This is shown on Graph B. Accordingly, this needs to be taken into account when interpreting the previous operation data for the facility. The new storage curve developed for the project is almost identical to the previous storage curve except for the four foot difference in elevation.

**Net Evaporation Rates:** Armstrong Engineers, the original designers of the evaporation pond, used a monthly evaporation/precipitation table with an annual net evaporation rate of 60.12 inches to develop a water balance for the pond in 1980. This information was from Lake Powell and was provided by the Department of Interior, Water and Power

Resources Service. We were unable to verify the source and accuracy of this information; therefore, we analyzed the data available from climate stations located in southern Utah and northern Arizona. This information is presented in tabular and graphical form in Table B and Graphs C-1, C-2, and C-3. The net evaporation for the site was estimated as being about midway between the higher values reported for stations south of the site (Wahweap, Page, and Mexican Hat) and the lower values reported for stations north of the site (Moab and Piute Dam). The resulting curve was similar to the 1980 curve but with a peak evaporation rate occurring in July rather than August. The total annual net evaporation was estimated to be 58.2 inches, which was consistent with the 60.12 inches used previously.

**Inflow Rates:** There are two sources of water inflow into the pond. The first source is precipitation that falls within the 50.8-acre basin in which the evaporation pond is located. This inflow source is relatively minor as the area receives an average of only 7.2 inches of precipitation per year. Precipitation inflow was estimated by multiplying the monthly average precipitation times the pond surface area and also times the remaining acreage in the basin and a runoff coefficient of 30 percent.

The estimated steady-state pumping rate of 100 gpm from the existing workings was determined by evaluating the reported pumping rates and pond elevation data that Plateau Resources submitted to the state agencies and conducting interviews with personnel that previously worked at the mine. The data from the state agencies was presented on the storage curve developed for the original pond. The curve showed that water was first discharged into the pond in February 1981 at a rate of 30 to 50 gpm. A rate of 30 gpm was then reported from June 30, 1981 to June 30, 1982. On October 20, 1982, the pumping rate was reported at 100 gpm. A rate of 115 gpm was reported in December 1982 and February 1983. A rate of 118 gpm was reported in March 1983. The March pumping rate was the last recorded, however, the pond elevation was recorded up until August 29, 1983. This elevation of 4863 (actual of 4867) corresponded to a pond volume of about 64 million gallons.

With the exception of 1,500 tons of ore mined in 1986, mining operations were discontinued in 1983. Therefore, we know that approximately 120 gpm was being pumped from the mine when it shut down. However, we do not know how many hours per day that the pump was running. Several miners that worked there have told IUSA personnel that the pumps ran only intermittently. In order to evaluate the previous pumping rates, the elevation/volume data from October 20, 1982 to August 29, 1983 was input it into our water balance table. Because the 1982 and 1983 years were relatively wet, precipitation was increased by approximately 40 percent above average and the annual evaporation rate was decreased by 20 percent below average in the model to better reflect actual conditions. The water balance model indicated that an average pumping rate of 100 gpm produced storage volumes comparable to those recorded by Plateau Resources during that time period.

The open workings below the water boundary are estimated to have a volume of 2,000,000 cubic feet and contain an estimated 15.4 million gallons of water. The estimated time of two months to dewater is based on pumping an average of 200 gpm with groundwater inflows increasing from 0 to 100 gpm during the dewatering period.

**Future Inflow Rates:** As the main declines are extended further to the north and downdip, ground water inflow rates into the mine could increase. However, review of the mine history reveals that the dewatering rate did not increase substantially as the main decline was developed in a northerly direction. Rather, pumping rates increased when a large number of rooms were developed off the main declines in the area that is currently flooded. IUSA has indicated that it plans to block off many of these rooms to reduce both ventilation and dewatering requirements and concentrate on extending the main declines. Therefore, pumping rates are not expected to increase appreciably during Phase 1.

**Additional Pond Capacity:** If needed, additional pond capacity can be created by raising the emergency overflow dike and the dam with approval of the State Engineer. The pond could also be expanded further to the west if a second dam was installed southwest of the emergency overflow dike. Westerly expansion would create a much larger evaporation pond capable of storing and evaporating water discharges of 300 gpm or more.

# TABLE A

## Phase 1 Water Balance - Tony M Mine

| Month | Pumping Rate (gpm) | Water Into Pond[a] (gallons) | Pond Surface Area (acres) | Net Evaporation[b] (inches) | Net Evaporation (gallons) | Run-off from Pond Watershed[c] (gallons) | Total Volume in Pond (gallons) | Pond Elevation[d] (feet) | Pond Surface Area[e] (acres) |
|---|---|---|---|---|---|---|---|---|---|
| June 2007 | 200 | 8,640,000 | 2.88 | 4.8 | 375,534 | 202,987 | 8,467,453 | 4851.0 | 5.72 |
| July 2007 | 200 | 8,928,000 | 5.72 | 7.1 | 1,102,439 | 195,376 | 16,488,390 | 4854.7 | 7.45 |
| August 2007 | 100 | 4,464,000 | 7.45 | 8.8 | 1,780,610 | 103,113 | 19,274,894 | 4855.8 | 7.99 |
| September 2007 | 100 | 4,320,000 | 7.99 | 8.8 | 1,909,275 | 230,867 | 21,916,486 | 4856.8 | 8.47 |
| October 2007 | 100 | 4,464,000 | 8.47 | 7.3 | 1,679,676 | 283,428 | 24,984,238 | 4857.9 | 9.10 |
| November 2007 | 100 | 4,320,000 | 9.10 | 5.0 | 1,235,362 | 260,897 | 28,329,773 | 4859.0 | 9.72 |
| December 2007 | 100 | 4,464,000 | 9.72 | 3.1 | 817,885 | 271,761 | 32,247,648 | 4860.1 | 10.37 |
| January 2008 | 100 | 4,464,000 | 10.37 | 2.5 | 704,086 | 193,652 | 36,201,214 | 4861.3 | 11.01 |
| February 2008 | 100 | 4,032,000 | 11.01 | 2.4 | 717,322 | 179,588 | 39,695,479 | 4862.2 | 11 43 |
| March 2008 | 100 | 4,464,000 | 11.43 | 2.5 | 776,263 | 177,656 | 43,560,872 | 4863.2 | 11.98 |
| April 2008 | 100 | 4,320,000 | 11.98 | 2.7 | 878,293 | 168,241 | 47,170,820 | 4864.1 | 12.56 |
| May 2008 | 100 | 4,464,000 | 12.56 | 3.2 | 1,091,769 | 189,378 | 50,732,429 | 4865.0 | 13.18 |
| Year 1 Totals | 116 7 | 61,344,000 | 9.06 | 58.2 | 13,068,516 | 2,456,945 | 50,732,429 | 4865 0 | 13.18 |
| June 2008 | 100 | 4,320,000 | 13.18 | 4.8 | 1,717,552 | 159,372 | 53,494,249 | 4865.6 | 13.47 |
| July 2008 | 100 | 4,464,000 | 13.47 | 7.1 | 2,597,829 | 161,762 | 55,522,182 | 4866.1 | 13.72 |
| August 2008 | 100 | 4,464,000 | 13.72 | 8.8 | 3,277,675 | 88,211 | 56,796,717 | 4866.4 | 13.85 |
| September 2008 | 100 | 4,320,000 | 13.85 | 8.8 | 3,309,170 | 199,274 | 58,006,821 | 4866.6 | 13.94 |
| October 2008 | 100 | 4,464,000 | 13.94 | 7.3 | 2,762,525 | 246,849 | 59,955,145 | 4867.1 | 14.16 |
| November 2008 | 100 | 4,320,000 | 14.16 | 5.0 | 1,922,045 | 229,254 | 62,582,354 | 4867.6 | 14.38 |
| December 2008 | 100 | 4,464,000 | 14.38 | 3.1 | 1,210,408 | 240,916 | 66,076,862 | 4868.4 | 14.75 |
| January 2009 | 100 | 4,464,000 | 14.75 | 2.5 | 1,001,649 | 172,656 | 69,711,869 | 4869.1 | 15.11 |
| February 2009 | 100 | 4,032,000 | 15.11 | 2.4 | 984,514 | 161,085 | 72,920,440 | 4869.7 | 15.44 |
| March 2009 | 100 | 4,464,000 | 15.44 | 2.5 | 1,048,039 | 159,589 | 76,495,990 | 4870.4 | 15.87 |
| April 2009 | 100 | 4,320,000 | 15.87 | 2.7 | 1,163,237 | 151,398 | 79,804,151 | 4871.1 | 16.32 |
| May 2009 | 100 | 4,464,000 | 16.32 | 3.2 | 1,418,453 | 170,757 | 83,020,455 | 4871.7 | 16.72 |
| Year 2 Totals | 100.0 | 113,904,000 | 14.51 | 58.2 | 22,413,096 | 2,141,122 | 83,020,455 | 4871 7 | 16.72 |
| June 2009 | 100 | 4,320,000 | 16.72 | 4.8 | 2,178,663 | 144,386 | 85,306,178 | 4872.1 | 16.97 |
| July 2009 | 100 | 4,464,000 | 16.97 | 7.1 | 3,272,519 | 146,596 | 86,644,254 | 4872.3 | 17.10 |
| August 2009 | 100 | 4,464,000 | 17.10 | 8.8 | 4,086,344 | 80,161 | 87,102,071 | 4872.4 | 17.16 |
| September 2009 | 100 | 4,320,000 | 17.16 | 8.8 | 4,101,475 | 181,393 | 87,501,989 | 4872.5 | 17.23 |
| October 2009 | 100 | 4,464,000 | 17.23 | 7.3 | 3,414,913 | 224,810 | 88,775,887 | 4872.7 | 17.35 |
| November 2009 | 100 | 4,320,000 | 17.35 | 5.0 | 2,356,176 | 209,250 | 90,948,960 | 4873.1 | 17.61 |
| December 2009 | 100 | 4,464,000 | 17.61 | 3.1 | 1,482,609 | 219,526 | 94,149,878 | 4873.6 | 17.96 |
| January 2010 | 100 | 4,464,000 | 17.96 | 2.5 | 1,218,990 | 157,321 | 97,552,208 | 4874.2 | 18.35 |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| Year 3 Totals | 100.0 | 149,184,000 | 17.26 | 47 4 | 22,111,689 | 1,363,442 | 97,552,208 | 4874.2 | 18.35 |

**Notes:**

| | |
|---|---|
| a | Before monthly evaporation |
| b | Estimated monthly average net evaporation rate at surrounding weather stations taken from Mean monthly, seasonal, and annual pan evaporation for the United States, U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Weather Service 1983. |
| c | Estimated monthly average precipitation run-off rate based on surrounding weather stations precipitation data from the Western Regional Climate Center (www.wrcc.dri.edu) and a run-off coefficient of 0.30 from Hydrology and Floodplain Analysis, Second Edition. Bedient, Philip B. and Wayne C. Huber. June 1992 |
| d | Pond elevation for 12-month total is after net evaporation |
| e | Pond surface area after evaporation |
| gpm | gallons per minute |

## TABLE B

### Precipitation and Evaporation Data for Surrounding Weather Stations

| | Month | Department of Interior[b] | Station Location | | | | |
|---|---|---|---|---|---|---|---|
| | | | Wahweap, AZ | Page, AZ | Mexican Hat, UT | Moab, UT | Piute Dam, UT |
| Evaporation[a] (inches) | January | 3.20 | | | | | |
| | February | 3.40 | | | | | |
| | March | 3.80 | 4.90 | 4.20 | | | |
| | April | 4.60 | 6.76 | 6.23 | 6.16 | 5.35 | |
| | May | 5.60 | 9.63 | 8.12 | 8.41 | 7.32 | 6.28 |
| | June | 7.20 | 11.10 | 9.80 | 10.05 | 8.44 | 7.59 |
| | July | 8.20 | 11.55 | 9.86 | 10.26 | 9.04 | 7.41 |
| | August | 9.00 | 10.79 | 8.48 | 8.43 | 7.63 | 6.38 |
| | September | 8.20 | 7.84 | 6.19 | 6.37 | 5.38 | 5.19 |
| | October | 6.00 | 5.76 | 3.88 | 4.00 | | 3.44 |
| | November | 4.20 | 3.17 | 1.68 | 1.40 | | |
| | December | 4.00 | | | | | |

| | Month | Department of Interior[b] | Station Location | | | | | Average |
|---|---|---|---|---|---|---|---|---|
| | | | Wahweap, AZ | Page, AZ | Mexican Hat, UT | Moab, UT | Piute Dam, UT | |
| Precipitation (inches) | January | 0.66 | 0.48 | 0.50 | 0.52 | 0.66 | 0.61 | **0.55** |
| | February | 0.68 | 0.54 | 0.48 | 0.47 | 0.61 | 0.56 | **0.53** |
| | March | 0.70 | 0.61 | 0.62 | 0.46 | 0.81 | 0.54 | **0.61** |
| | April | 0.36 | 0.37 | 0.44 | 0.36 | 0.82 | 0.61 | **0.52** |
| | May | 0.50 | 0.37 | 0.41 | 0.39 | 0.73 | 0.76 | **0.53** |
| | June | 0.31 | 0.19 | 0.16 | 0.21 | 0.42 | 0.48 | **0.29** |
| | July | 0.49 | 0.54 | 0.50 | 0.64 | 0.78 | 0.85 | **0.66** |
| | August | 0.63 | 0.74 | 0.70 | 0.66 | 0.86 | 1.15 | **0.82** |
| | September | 0.73 | 0.64 | 0.69 | 0.70 | 0.85 | 0.96 | **0.77** |
| | October | 0.75 | 0.80 | 0.88 | 0.83 | 1.02 | 0.53 | **0.81** |
| | November | 0.78 | 0.61 | 0.55 | 0.51 | 0.70 | 0.57 | **0.59** |
| | December | 0.69 | 0.41 | 0.49 | 0.49 | 0.75 | 0.63 | **0.55** |
| | **Annual** | **7.28** | **6.30** | **6.42** | **6.24** | **9.01** | **8.25** | **7.24** |

| | Month | Department of Interior[b] | Station Location | | | | | Estimated[c] |
|---|---|---|---|---|---|---|---|---|
| | | | Wahweap, AZ | Page, AZ | Mexican Hat, UT | Moab, UT | Piute Dam, UT | |
| Net Evaporation (inches) | January | 2.54 | | | | | | **2.5** |
| | February | 2.72 | | | | | | **2.7** |
| | March | 3.10 | 4.29 | 3.58 | | | | **3.2** |
| | April | 4.24 | 6.39 | 5.79 | 5.80 | 4.53 | | **4.8** |
| | May | 5.10 | 9.26 | 7.71 | 8.02 | 6.59 | 5.52 | **7.1** |
| | June | 6.89 | 10.91 | 9.64 | 9.84 | 8.02 | 7.11 | **8.8** |
| | July | 7.71 | 11.01 | 9.36 | 9.62 | 8.26 | 6.56 | **8.8** |
| | August | 8.37 | 10.05 | 7.78 | 7.77 | 6.77 | 5.23 | **7.3** |
| | September | 7.47 | 7.20 | 5.50 | 5.67 | 4.53 | 4.23 | **5.0** |
| | October | 5.25 | 4.96 | 3.00 | 3.17 | | 2.91 | **3.1** |
| | November | 3.42 | 2.56 | 1.13 | 0.89 | | | **2.5** |
| | December | 3.31 | | | | | | **2.4** |
| | **Annual** | **60.12** | **66.63** | **53.49** | **50.77** | **38.70** | **31.55** | **58.2** |

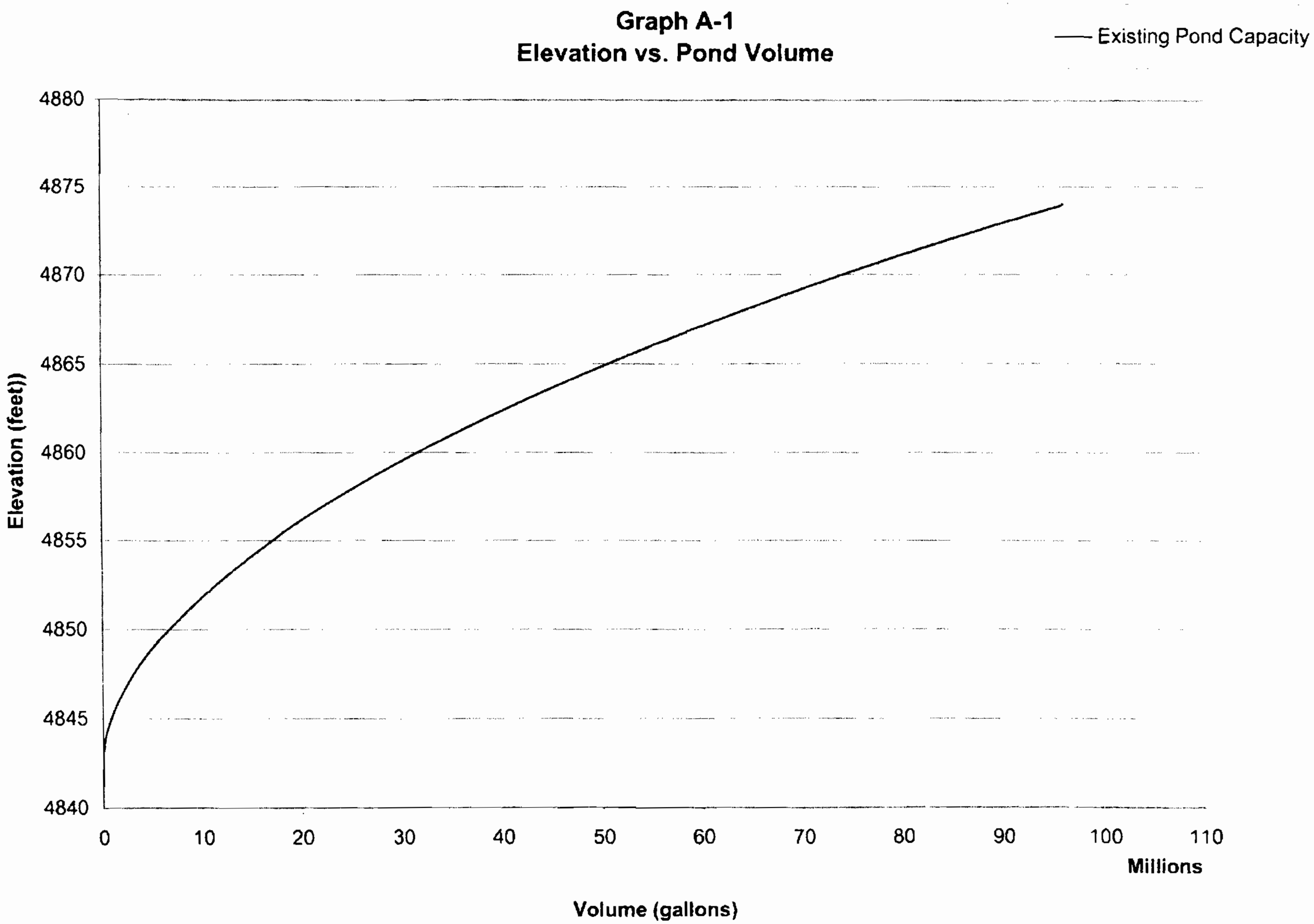
Notes:

a Evaporation rate data from surrounding weather stations was derived from Class A pan evaporation data using a evaporation pan factor of 0.70. The Class A pan evaporation data was taken from Mean monthly, seasonal, and annual pan evaporation for the United States, U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Weather Service. 1983

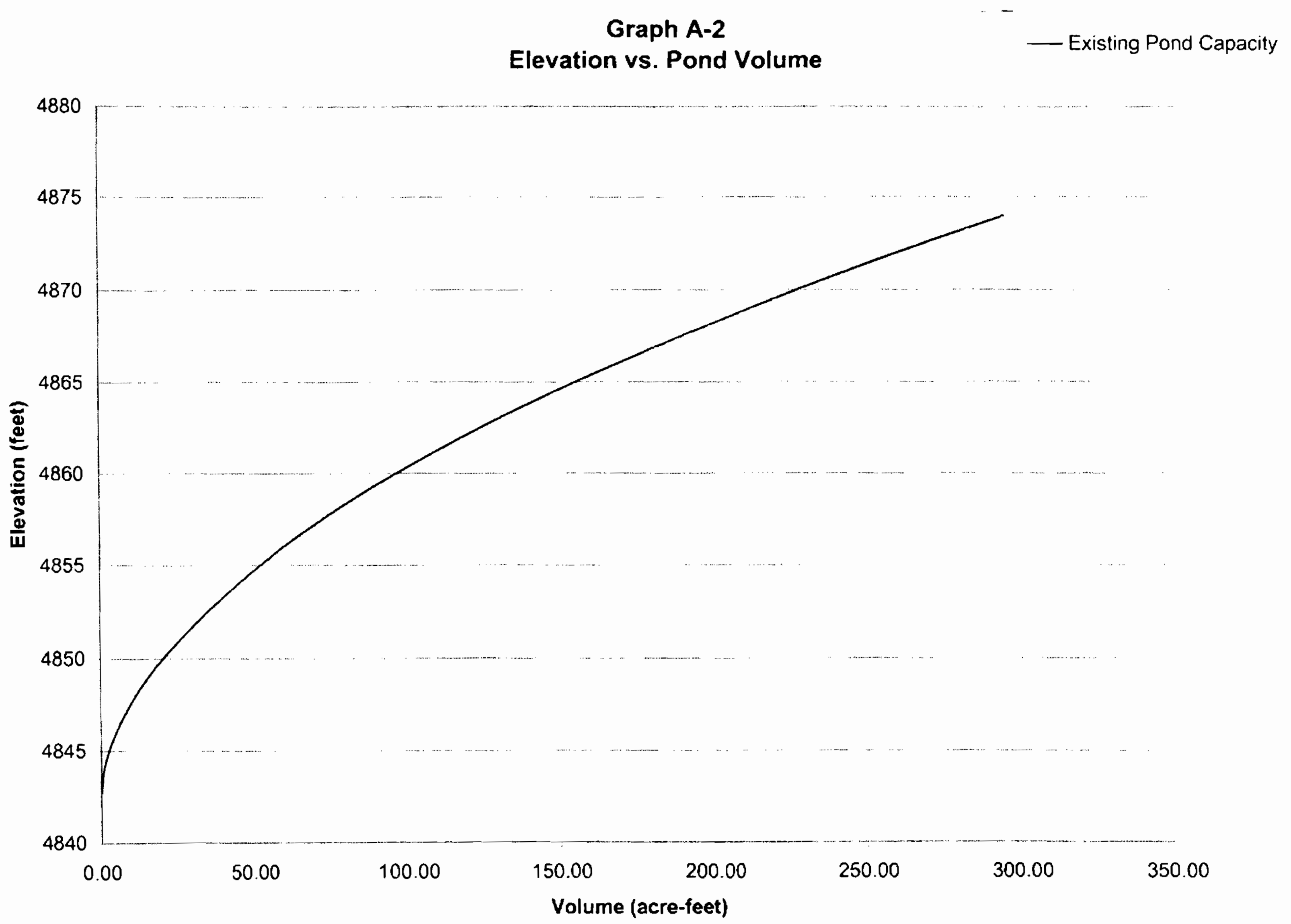
b Department of Interior evaporation data was obtained from the 1980 Armstrong Engineers report.

c Net evaporation rates were estimated based on available evaporation and precipitation rate data Estimates were derived by graphing available data and graphically determining the mean rates. The graph of net evaporation data is presented as Graph A.

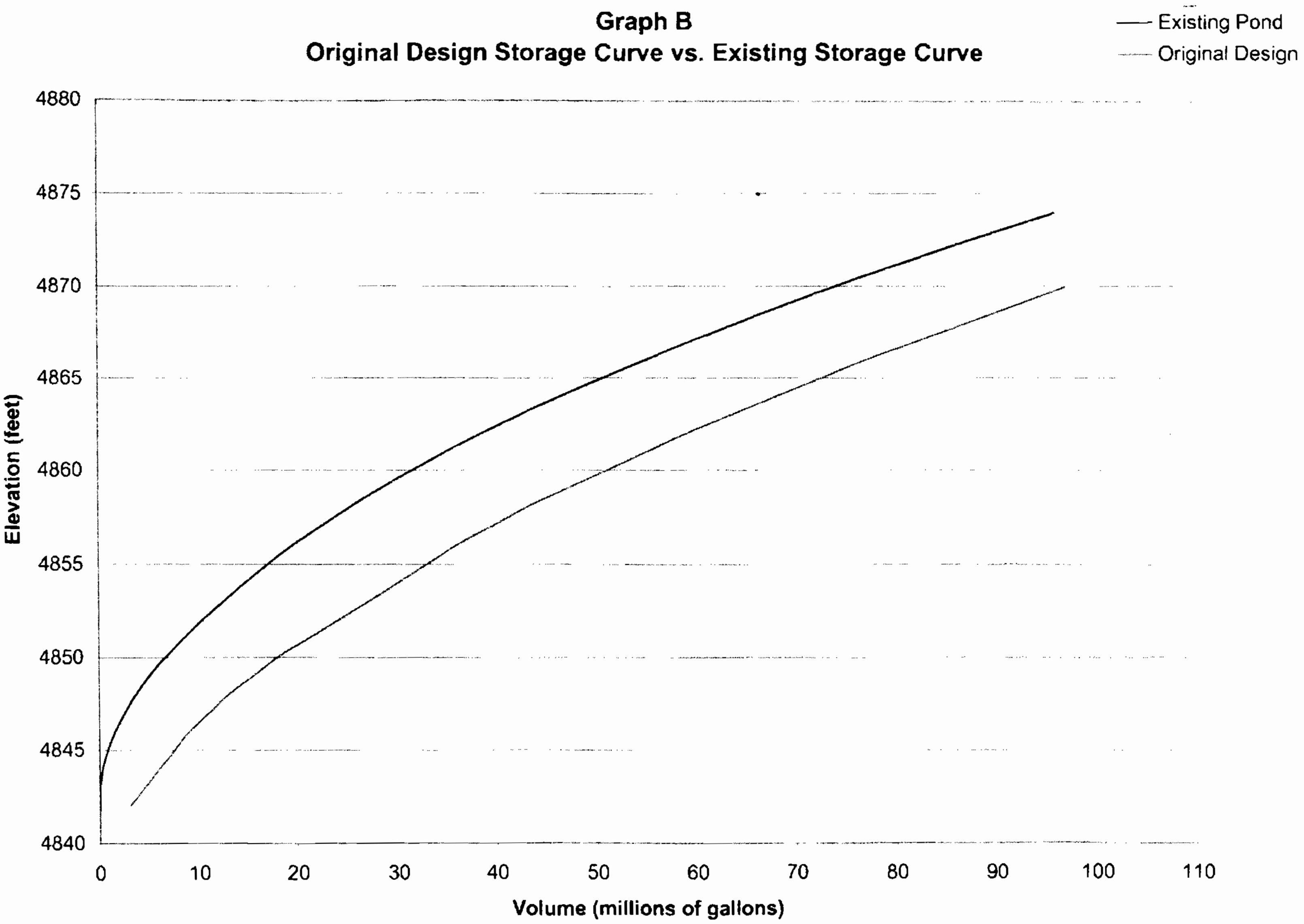
## Graph A-1
## Elevation vs. Pond Volume



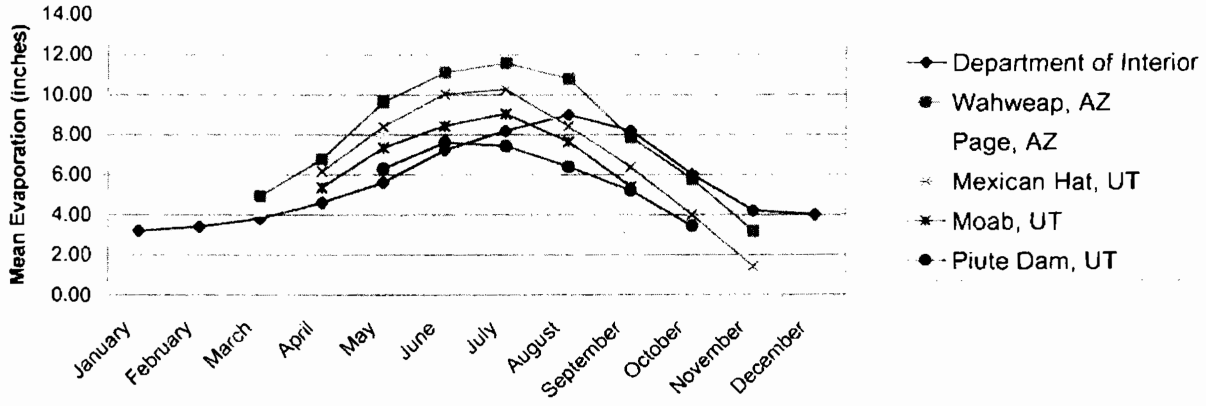
## Graph A-2
## Elevation vs. Pond Volume



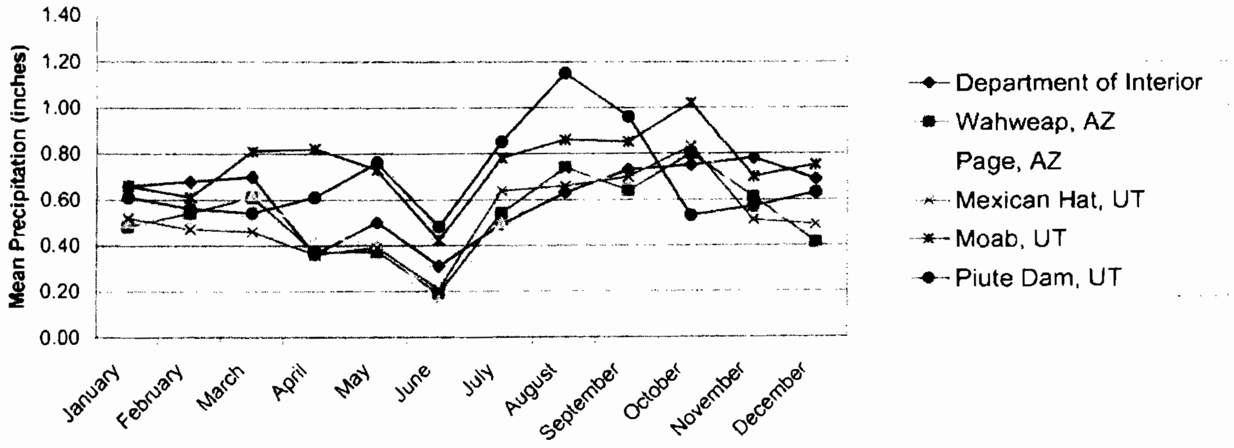
## Graph B
## Original Design Storage Curve vs. Existing Storage Curve



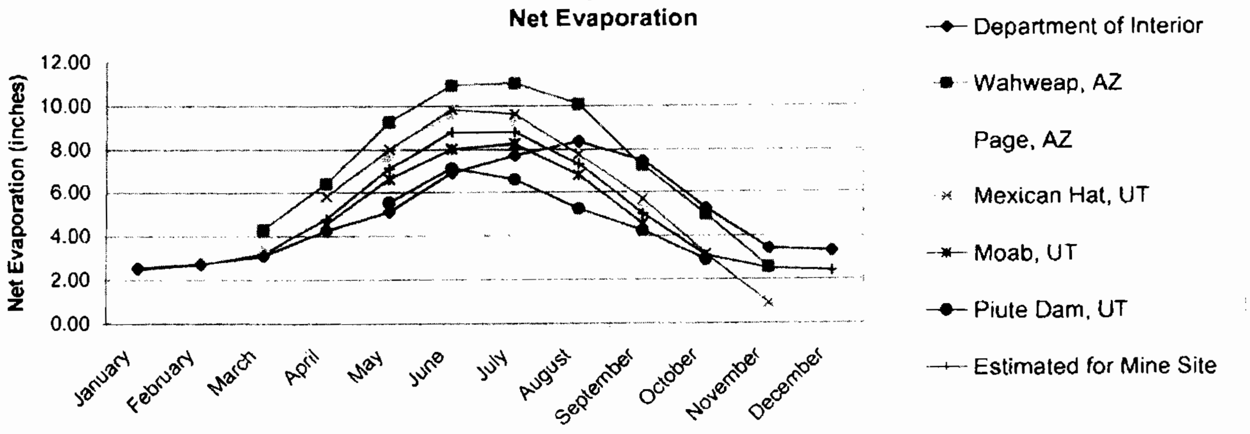
**Graph C-1**
**Evaporation**



**Graph C-2**
**Precipitation**



**Graph C-3**
**Net Evaporation**



# APPENDIX F
# LINER SYSTEM DESIGN

# APPENDIX F.1

# LEACHATE COLLECTION AND LEAK DETECTION DESIGN CALCULATIONS

| | | | |
|---|---|---|---|
| Client: | Uranium One | Date: | 25-Mar-08 |
| Job Title: | Shootaring Canyon | Job No.: | 181692 |
| Subject: | Leachate Collection System | By: | RTS |

Manning's Coefficient (n) = 0.01 (assuming n-12 piping)
Factor of Safety applied to flow capacities (FS) = 2 (design pipes to be flowing approx. half-full)

(1) Calculate the maximum pipe spacing:

| | | | |
|---|---|---|---|
| D10 of Bedding/Drain Material = | 2.65 | mm | Finest gravel that meets filter requirements for 0.125 pipe slots (ADS N-12 pipe) |
| Hydraulic Conductivity of Bedding Material (k) = | 3.0E-02 | cm/s | from Hunt (1984) |
| | 9.8E-04 | ft/s | |
| | 5.9E-02 | ft/min | |
| Max allowable head on liner between pipes (hmax) = | 1.5 | ft | |
| Head at drain (ho) = | 0 | ft | |

| | Mix of Slimes/Sands | | Sands | | |
|---|---|---|---|---|---|
| Saturated hydraulic conductivity | 2.0E-05 | cm/sec | 1.0E-04 | cm/sec | Typical values from Keshian and Rager (1988) |
| | 6.6E-07 | ft/sec | 3.3E-06 | ft/sec | for hydraulically placed uranium tailings |
| Maximum gradient through tailings | 2 | | 2 | | |
| Application rate, W | 1.31E-06 | ft/s | 6.56E-06 | ft/s | |
| | 4.00E-05 | cm/s | 2.00E-04 | cm/s | |

W is typically used for application of solution.
This analysis conservatively assumes that the
max value is equal to the saturated hydraulic
conductivity of tailings.

| | | | | |
|---|---|---|---|---|
| c = ratio of w:k= | 1.33E-03 | | 6.67E-03 | |
| Side Slopes | 2.5 | xH:1V | | |
| phi | 0.381 | radians | | |
| | 21.8 | degrees | | |
| **Pipe Spacing (L) =sqrt{[hmax^2-ho^2]4k/W} =** | **82** | **ft** | **37** | **ft** |

Pipe Spacing on side slopes (Ls) = 2*hmax/[(sqrt(c)*(tan^2phi/c)+1-(tanphi/c)*sqrt(tan^2phi+c)] =

| | | | | | |
|---|---|---|---|---|---|
| | 164 | ft | 73 | ft | equation 9.4 from Sharma and Lewis Waste Containment Systems, Waste Stabilization, and Landfills |

(2) Calculate the maximum pipe length of 4" pipe:

| | | | | | |
|---|---|---|---|---|---|
| Pipe Diameter (D) = | 0.3333 | ft | 0.3333 | ft | |
| Design Pipe Spacing (L) = | 80 | ft | 40 | ft | |
| Minimum Slope (S) = | 0.01 | ft/ft | 0.01 | ft/ft | |
| Flow Capacity (FC) = 1.486*PI*SQRT(S)*D^(8/3)/4^(5/3)/n = | | | | | |
| FC = | 0.25 | cfs | 0.25 | cfs | |
| Design Flow Capacity (DFC) = Flow Capacity/FS | 0.12 | cfs | 0.12 | cfs | |
| **Maximum Pipe Length (PL) = DFC/W/L** | | | | | |
| PL = | **1178** | **ft** | **471** | **ft** | limit max pipe length to mid value = 800 ft |

(3) Calculate Pipe Diameter of Collector Pipes:

| Pipe Segment | Pipe Length (ft) | Min Slope (ft/ft) | Contributing Area (ft) | Maximum Flow (cfs) | Design Flow (cfs) | Calculated Pipe Size (ft) | Calculated Pipe Size (in) | Design Pipe Size (in) | Pipe Capacity (cfs) | FS |
|---|---|---|---|---|---|---|---|---|---|---|
| 4-in collector | 550 | 0.01 | 44000 | 0.058 | 0.115 | 0.250 | 3.0 | 4 | 0.247 | 4.3 |
| N1 perforated | 395 | 0.031 | 296,337 | 0.389 | 0.778 | 0.414 | 5.0 | 5 | 0.793 | 2.0 |
| N2 perforated | 1085 | 0.031 | 813,202 | 1.067 | 2.134 | 0.604 | 7.2 | 8 | 2.777 | 2.6 |
| N3 perforated | 395 | 0.031 | 248,474 | 0.326 | 0.652 | 0.387 | 4.6 | 5 | 0.793 | 2.4 |
| N4 perforated | 1090 | 0.031 | 613,380 | 0.805 | 1.610 | 0.544 | 6.5 | 7 | 1.937 | 2.4 |
| N5 perforated | 985 | 0.029 | 387,379 | 0.508 | 1.017 | 0.465 | 5.6 | 6 | 1.233 | 2.4 |
| S1 perforated | 425 | 0.037 | 259,002 | 0.340 | 0.680 | 0.381 | 4.6 | 5 | 0.863 | 2.5 |
| S2 perforated | 795 | 0.034 | 320,022 | 0.420 | 0.840 | 0.418 | 5.0 | 5 | 0.833 | 2.0 |
| S3 perforated | 545 | 0.038 | 713,505 | 0.936 | 1.873 | 0.553 | 6.6 | 7 | 2.158 | 2.3 |
| S4 perforated | 985 | 0.048 | 400,774 | 0.526 | 1.052 | 0.428 | 5.1 | 6 | 1.592 | 3.0 |
| S5 perforated | 470 | 0.056 | 275,617 | 0.362 | 0.723 | 0.361 | 4.3 | 5 | 1.057 | 2.9 |
| S6 perforated | 545 | 0.038 | 347,522 | 0.456 | 0.912 | 0.423 | 5.1 | 6 | 1.422 | 3.1 |

|  | sqft | acre |
|---|---|---|
| N area | 2,358,772 | 54.1 |
| S area | 2,316,442 | 53.2 |

| | | | |
|---|---|---|---|
| Client: | Uranium One | Date: | 1-Apr-08 |
| Job Title: | Shootaring Canyon | Job No.: | 181692 |
| Subject: | Capacity of LDS | By: | RTS |

## ACTION LEAKAGE RATES, ALR

| Zone | ND1 | ND2 | ND3 | ND4 | SD1 | SD2 | SD3 | SD4 |
|---|---|---|---|---|---|---|---|---|
| Area (ft^2)) | 431,800 | 419,800 | 348,800 | 535,900 | 379,500 | 289,500 | 389,000 | 696,900 |
| Area (acre) | 9.91 | 9.64 | 8.01 | 12.30 | 8.71 | 6.65 | 8.93 | 16.00 |
| Longest Flow path (ft) | 270 | 400 | 400 | 400 | 800 | 400 | 500 | 500 |
| Action leakage rate, gpad | 200 | 200 | 200 | 200 | 200 | 200 | 200 | 200 |
| Action leakage rate, ft/s | 7.1E-09 | 7.1E-09 | 7.1E-09 | 7.1E-09 | 7.1E-09 | 7.1E-09 | 7.1E-09 | 7.1E-09 |
| Action leakage rate of zone, gpd | 1983 | 1927 | 1601 | 2461 | 1742 | 1329 | 1786 | 3200 |
| Action leakage rate of zone, cfs | 0.0031 | 0.0030 | 0.0025 | 0.0038 | 0.0027 | 0.0021 | 0.0028 | 0.0050 |
| Action leakage rate per unit width of flow, ft2/s | 1.9E-06 | 2.8E-06 | 2.8E-06 | 2.8E-06 | 5.7E-06 | 2.8E-06 | 3.6E-06 | 3.6E-06 |

## GEONET CAPACITY

Geonet Capacity per unit width = T * i /LTRF

| Zone | ND1 | ND2 | ND3 | ND4 | SD1 | SD2 | SD3 | SD4 | |
|---|---|---|---|---|---|---|---|---|---|
| Transmisivity, T (m2/sec) | 1.00E-03 | 1.00E-03 | 1.00E-03 | 1.00E-03 | 1.00E-03 | 1.00E-03 | 1.00E-03 | 1.00E-03 | |
| Transmisivity, T (ft2/sec) | 1.08E-02 | 1.08E-02 | 1.08E-02 | 1.08E-02 | 1.08E-02 | 1.08E-02 | 1.08E-02 | 1.08E-02 | |
| min gradient of geonet, i | 0.033 | 0.033 | 0.036 | 0.025 | 0.040 | 0.043 | 0.040 | 0.050 | |
| Long Term Reduction Factor, LTRF | 9.1 | 9.1 | 9.1 | 9.1 | 9.1 | 9.1 | 9.1 | 9.1 | From Koerner |
| Geonet Capacity (ft2/sec) | 3.94E-05 | 3.94E-05 | 4.22E-05 | 2.96E-05 | 4.73E-05 | 5.14E-05 | 4.73E-05 | 5.91E-05 | |
| Factor of Safety of Geonet = Geonet Capacity/ALR per unit width of flow | **21** | **14** | **15** | **10** | **8** | **18** | **13** | **17** | |

## LDS PIPE CAPACITY

Pipe Capacity = 1.486*PI*SQRT(S)*D^(8/3)/4^(5/3)/n =

| | |
|---|---|
| minimum pipe slope, S | 0.01 |
| pipe diameter, D (ft) | 0.25 |
| Mannings n | 0.010 |
| Pipe Capacity (cfs) | 0.115 |

| Zone | ND1 | ND2 | ND3 | ND4 | SD1 | SD2 | SD3 | SD4 |
|---|---|---|---|---|---|---|---|---|
| Factor of Safety of Pipe = Pipe Capacity/ALR of zone (cfs) | **37** | **39** | **46** | **30** | **43** | **56** | **42** | **23** |

| | | | |
|---|---|---|---|
| Client: | Uranium One | Date: | 25-Mar-08 |
| Job Title: | Shootaring Canyon | Job No.: | 181692 |
| Subject: | Geonet of LDS | By: | RTS |

| | | | |
|---|---|---|---|
| Action leakage rate, q | 200 | gpad | use 200 |
| | 26.7 | cf/acre/day | |
| | 6.14E-04 | ft/day | |
| | 7.10E-09 | ft/sec | |

Qreq = q*L*W

L=longest length of geonet in direction of flow
W=unit width of geonet

Qcapacity = kiA = kitW =Transmissivity*i/unit width

| | | | |
|---|---|---|---|
| Transmissivity, T | 1.00E-03 | m2/sec | From Tailings and Management plan |
| | 1.08E-02 | ft2/sec | |
| | 930 | ft2/day | |

| | | | | |
|---|---|---|---|---|
| slope (min) of geonet | 0.025 | North Cell | 0.08 | South Cell |
| gradient of geonet = slope of geonet | | | | |
| Qcapacity = | 23.2 | ft2/day | 74.4 | ft2/day |
| Long Term Reduction Factor= | 9.1 | | 9.1 | from Koerner |
| Qallowable = Qcapacity/LTRF | | | | |
| Qallowable = | 2.55 | ft2/day | 8.17 | ft2/day |
| Qreq/FS=Qall | | | | |
| Therefore, L=Qall*FS/q | | | | |
| FS= | 10 | | 10 | |
| L= | 416 | | 1331 | |

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# APPENDIX F.2
# BURIED PIPE LOADING

# APPENDIX F.2
# Buried Pipe Loading

## Introduction

The load bearing capacity of the piping that is installed as a component in the leak detection, leachate collection and recovery system and the sump access pipes must be sufficient to withstand the load imposed by up to 110 feet of overburden above the pipes. Leak detection and leachate collection piping is specified as 3- to 8-inch diameter, standard dimension ratio (SDR) 15.5, perforated HDPE pipe. The sump access pipes are specified as 4 inch and 12 inch diameter, SDR 9, solid-wall HDPE pipe. The methods used to evaluate the deflection, potential buckling and crushing of the pipes under the imposed loads are as presented in the "Polyethylene Pipe Handbook" available on-line from Plastic Pipe Institute (PPI, 2006). The following sections describe the method of analysis. Spreadsheets showing example calculations are presented at the end of this appendix. Calculations are presented for SDR 17 pipe (approximately 9% reduction in ratio of outer diameter to wall thickness as compared to SDR 15.5 pipe) to approximate some loss in strength of SDR 15.5 pipe due to perforations.

## Pipe Bedding

Characterization of the material in which the pipe is embedded greatly influences the reaction of the buried pipe to the imposed overburden loads. The piping in the leak detection and leachate collection will be embedded in a minimum depth of 24 inches of drainage sands and gravels that blanket the base of the tailings facility. Therefore, the bedding material has been characterized as gravely sands and gravels compacted to 90% standard proctor density.

The sump access pipes are routed up 2.5H:1V and 2.0H:1V slopes. It is difficult to place and compact bedding around the pipe on the slopes. However, dumped gravel will be placed around the access pipes from the sump to surround, anchor, and protect these access pipes. The bedding material will be gravely sands and gravels compacted (or dumped) to 85% standard proctor density.

## Ring Deflection

Ring deflection is the normal response of flexible pipes to soil pressure. The deflection leads to the redistribution of soil stress and the initiation of arching. A method presented in PPI (2006) uses the Watkins-Gaube Graph. This method does not rely on the soil reaction modulus (E'). It is based on the concept that the deflection of a pipe embedded in a layer of soil is proportional to the compression or settlement of the soil layer and that the constant of proportionality is a function of the relative stiffness between the pipe and the soil. To use the Watkins-Gaube Graph, the designer first determines the relative stiffness between pipe and soil, which is given by the Rigidity Factor, $R_F$, as calculated by the following formula:

$$R_F = \frac{12E_S(DR-1)^3}{E}$$

where:
DR = Dimension Ratio = Outside diameter of pipe/wall thickness,
$E_S$ = Secant modulus of the soil (psi), and
E = Apparent modulus of elasticity of pipe material (psi).

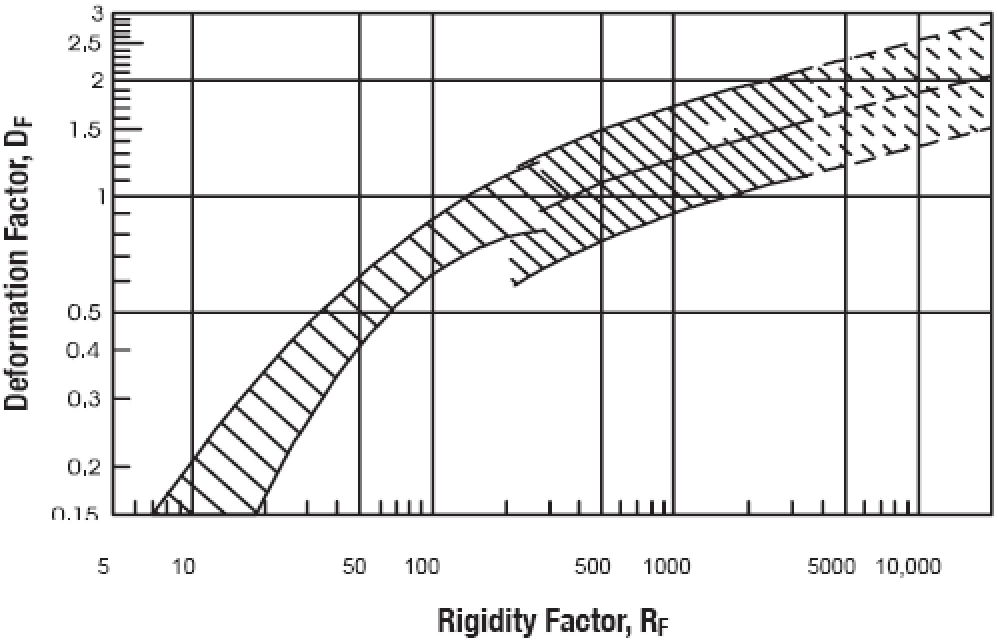
The secant modulus of the soil may be related to the one-dimensional modulus, $M_S$, by the following equation:

$$E_S = M_S \frac{(1+\mu)(1-2\mu)}{(1-\mu)}$$

where: $M_S$ = one-dimension modulus, and
$\mu$ = soil's Poisson ratio.

A typical value of $M_s$ is interpolated from Table 2.14 of PPI (2006) to be 2828 psi for a vertical soil stress of 76 psi (110 feet of overburden at a moist unit weight of 100 pcf) and pipe embedment in gravely sands and gravels compacted to 90% standard proctor density. A typical value of the Poisson ratio for dense sand of 0.3 was used (from Table 2-15 of PPI, 2006). The Dimension Ratio is available from tabulated values from PPI (2006) for the selected pipe diameter and SDR. The long-term (50 years) apparent modulus of elasticity for HDPE pipe is estimated to be 28,200 psi, reflecting approximately a 75% reduction of the short-term modulus value, as recommended by PPI (2006, Table 2-6).

Next, the Deformation Factor, $D_F$, is determined by entering the Watkins-Gaube Graph, as presented below, with the Rigidity Factor.



The Deformation Factor is the proportionality constant between vertical deflection (compression) of the soil layer containing the pipe and the deflection of the pipe. Thus, pipe deflection can be obtained by multiplying the proportionality constant $D_F$ times the soil settlement. If $D_F$ is less than 1.0 from the above figure, 1.0 is used. The soil layer surrounding the pipe bears the entire load of the overburden above it without arching. Therefore, settlement (compression) of the soil layer is proportional to the prism load and not the radial directed earth pressure. Soil strain, $\varepsilon_S$, may be determined from the following equation:

$$\varepsilon_s = \frac{wH}{144E_S}$$

where: w = moist unit weight of soil = 100 (pcf), and
H = height of fill above pipe crown (ft).

The height of fill above the pipe crown is approximately 110 feet. The pipe deflection as a percent of the diameter can be found by multiplying the soil strain, in percent, by the deformation factor:

$$\frac{\Delta X}{D_M}(100) = D_F \varepsilon_s$$

where: $\Delta X/D_M$ = deflection.

As discussed in PPI (2006), a 7.5 percent deflection limit provides a large safety factor against instability and strain and is considered a safe design deflection for non-pressure applications. For pressurized pipe with a SDR of 9, a safe deflection is considered to be 4.0 percent.

Ring Deflection using Spangler's Modified Iowa formula, which does not account for the effects of soil arching, was also calculated for comparison. Details of these calculations are shown on the spreadsheets at the end of this appendix.

**Constrained Buckling**

Constrained buckling for pipes below the ground water level was evaluated using the Luscher Equation as follows:

$$P_{WC} = \frac{5.65}{N}\sqrt{RB'E'\frac{E}{12(DR-1)^3}}$$

where: $P_{WC}$ = allowable constrained buckling pressure (psi),
N = safety factor,
R = buoyancy reduction factor, and
E' = soil reaction modulus (psi).

The buoyancy reduction factor and the B' term are calculated using the following equations:

$$R = 1 - 0.33\frac{H_{GW}}{H}$$

$$B' = \frac{1}{1+4e^{(-0.065H)}}$$

where: $H_{GW}$ = height of ground water above pipe (ft).

The height of ground water above pipe is estimated to be 100 feet (assuming tailings are saturated when cover is placed). Although buckling occurs rapidly, long-term external pressure can gradually deform the pipe to the point of instability. This behavior is considered viscoelastic and can be accounted for by using the long-term (50 years) apparent modulus of elasticity value of 28,200 psi, as recommended by PPI (2006, Table 2-6). The soil reaction modulus is estimated to be 3000 psi for the leak detection and leachate collection systems with well compacted sand and gravel bedding material. The soil reaction modulus is reduced to 2000 psi for the sump access pipes to reflect the lesser degree of compaction of the bedding material on the side slopes. A typical safety factor of 2.0 has been used for thermoplastic pipe. The allowable constrained buckling pressure should be greater than the total vertical stress acting on the pipe crown from the combined load of soil and ground water.

Constrained buckling was also computed using the Moore-Selig Equation for comparison purposes. However, this method is not as applicable because it does not take into account the buoyancy reduction factor to account for pipes below the water level. These calculations are presented in the spreadsheets at the end of this appendix.

**Wall Crushing**

The combined horizontal and vertical earth load acting on a buried pipe creates a radially-directed compressive load acting around the pipe's circumference. When a PE pipe is subjected to ring compression, thrust stress develops around the pipe hoop, and the pipe's circumference will shorten slightly. The shortening permits "thrust arching". That is, the pipe hoop thrust stiffness is less than the soil hoop thrust stiffness and, as the pipe deforms, less load follows the pipe. The Vertical Arching Factor (VAF) is calculated as follows:

$$VAF = 0.88 - 0.71\frac{S_A - 1}{S_A + 2.5}$$

where: SA = Hoop Thrust Stiffness Ratio.

The Hoop Thrust Stiffness Ratio can be calculated as follow:

$$S_A = \frac{1.43 M_S r_{cent}}{EA}$$

Where: $r_{cent}$ = radius to centroidal axis of pipe (in), and
A = wall thickness for DR pipe (in).

As discussed above for ring deflection, $M_s$ is interpolated from Table 2.14 of PPI (2006) to be 2828 psi. The long-term (50 years) apparent modulus of elasticity, E, is estimated to be 28,200 psi.

The radial directed earth pressure, $P_{RD}$, can be found by multiplying the prism load (pressure) by the vertical arching factor as follows:

$$P_{RD} = (VAF)wH$$

The wall crushing calculation is basically a comparison of the allowable compressive stress in the pipe wall with the ring compressive stress imposed by the loading. The ring compressive stress, S, is determined as follows:

$$S = \frac{P_{RD} DR}{288}$$

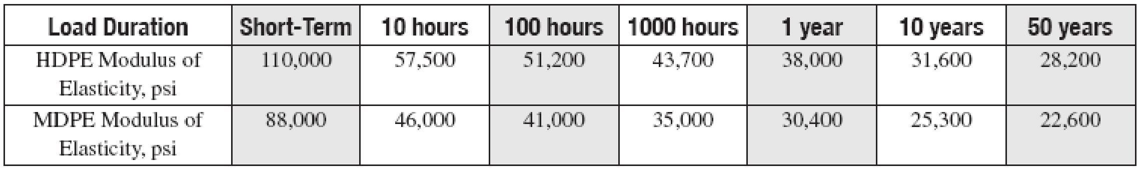
The compressive stress in the pipe wall can be compared to the pipe material allowable compressive stress. The allowable long-term compressive stress value for PE3408 material is 1,000 psi (PPI 2006).

**References**

Plastic Pipe Institute (PPI), 2006. Handbook of Polyethylene Pipe, 1st edition.

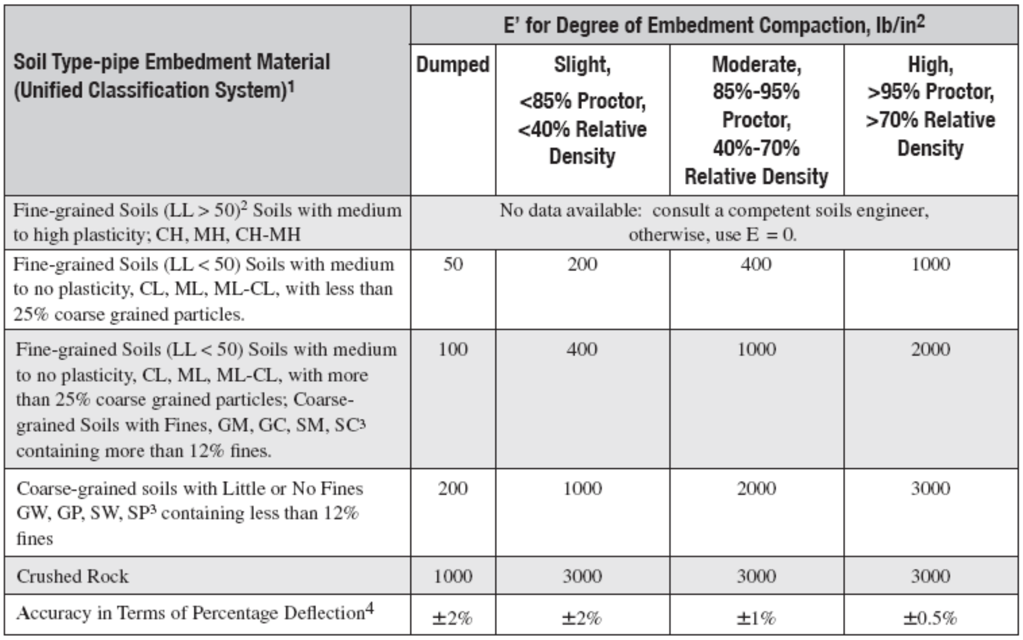
Pertinent Tables and Figures from Plastic Pipe Institute, Handbook of Polyethylene Pipe, 1st Edition, 2006.

### TABLE 2-6
**Design Values for Apparent Modulus of Elasticity, E @ 73°F**



| Load Duration | Short-Term | 10 hours | 100 hours | 1000 hours | 1 year | 10 years | 50 years |
|---|---|---|---|---|---|---|---|
| HDPE Modulus of Elasticity, psi | 110,000 | 57,500 | 51,200 | 43,700 | 38,000 | 31,600 | 28,200 |
| MDPE Modulus of Elasticity, psi | 88,000 | 46,000 | 41,000 | 35,000 | 30,400 | 25,300 | 22,600 |

### TABLE 2-7
**Values of E' for Pipe Embedment (See Howard (8))**



| Soil Type-pipe Embedment Material (Unified Classification System)[1] | E' for Degree of Embedment Compaction, lb/in² | | | |
|---|---|---|---|---|
| | Dumped | Slight, <85% Proctor, <40% Relative Density | Moderate, 85%-95% Proctor, 40%-70% Relative Density | High, >95% Proctor, >70% Relative Density |
| Fine-grained Soils (LL > 50)[2] Soils with medium to high plasticity; CH, MH, CH-MH | No data available: consult a competent soils engineer, otherwise, use E = 0. | | | |
| Fine-grained Soils (LL < 50) Soils with medium to no plasticity, CL, ML, ML-CL, with less than 25% coarse grained particles. | 50 | 200 | 400 | 1000 |
| Fine-grained Soils (LL < 50) Soils with medium to no plasticity, CL, ML, ML-CL, with more than 25% coarse grained particles; Coarse-grained Soils with Fines, GM, GC, SM, SC[3] containing more than 12% fines. | 100 | 400 | 1000 | 2000 |
| Coarse-grained soils with Little or No Fines GW, GP, SW, SP[3] containing less than 12% fines | 200 | 1000 | 2000 | 3000 |
| Crushed Rock | 1000 | 3000 | 3000 | 3000 |
| Accuracy in Terms of Percentage Deflection[4] | ±2% | ±2% | ±1% | ±0.5% |

[1] ASTM D-2487, USBR Designation E-3

[2] LL = Liquid Limit

[3] Or any borderline soil beginning with one of these symbols (i.e., GM-GC, GC-SC).

[4] For ±1% accuracy and predicted deflection of 3%, actual deflection would be between 2% and 4%.

**Note:** Values applicable only for fills less than 50 ft (15 m). Table does not include any safety factor. For use in predicting initial deflections only; appropriate Deflection Lag Factor must be applied for long-term deflections. If embedment falls on the borderline between two compaction categories, select lower E' value, or average the two values. Percentage Proctor based on laboratory maximum dry density from test standards using 12,500 ft-lb/cu ft (598,000 J/m²) (ASTM D-698, AASHTO T-99, USBR Designation E-11). 1 psi = 6.9 KPa.

## TABLE 2-8

### Values of E' for Pipe Embedment (See Duncan and Hartley[(10)])

| Type of Soil | Depth of Cover, ft | E' for Standard AASHTO Relative Compaction, lb/in$^2$ | | | |
|---|---|---|---|---|---|
| | | 85% | 90% | 95% | 100% |
| Fine-grained soils with less than 25% sand content (CL, ML, CL-ML) | 0-5 | 500 | 700 | 1000 | 1500 |
| | 5-10 | 600 | 1000 | 1400 | 2000 |
| | 10-15 | 700 | 1200 | 1600 | 2300 |
| | 15-20 | 800 | 1300 | 1800 | 2600 |
| Coarse-grained soils with fines (SM, SC) | 0-5 | 600 | 1000 | 1200 | 1900 |
| | 5-10 | 900 | 1400 | 1800 | 2700 |
| | 10-15 | 1000 | 1500 | 2100 | 3200 |
| | 15-20 | 1100 | 1600 | 2400 | 3700 |
| Coarse-grained soils with little or no fines (SP, SW, GP, GW) | 0-5 | 700 | 1000 | 1600 | 2500 |
| | 5-10 | 1000 | 1500 | 2200 | 3300 |
| | 10-15 | 1050 | 1600 | 2400 | 3600 |
| | 15-20 | 1100 | 1700 | 2500 | 3800 |

## TABLE 2-11

### Safe Deflection Limits for Pressurized Pipe

| DR or SDR | Safe Deflection as % of Diameter |
|---|---|
| 32.5 | 7.5 |
| 26 | 7.5 |
| 21 | 7.5 |
| 17 | 6.0 |
| 13.5 | 6.0 |
| 11 | 5.0 |
| 9 | 4.0 |
| 7.3 | 3.0 |

*Based on Long-Term Design Deflection of Buried Pressurized Pipe given in ASTM F1962.

## TABLE 2-12

### Long-Term Compressive Stress at 73°F (23°C)

| Material | Long-Term Compressive Stress, lb/in$^2$ |
|---|---|
| PE 3408 | 1000 |
| PE 2406 | 800 |

## TABLE 2-14

### Typical Values of $M_S$, One-Dimensional Modulus of Soil

| Vertical Soil Stress[1] (psi) | Gravelly Sand/Gravels 95% Std. Proctor (psi) | Gravelly Sand/Gravels 90% Std. Proctor (psi) | Gravelly Sand/Gravels 85% Std. Proctor (psi) |
|---|---|---|---|
| 10 | 3000 | 1600 | 550 |
| 20 | 3500 | 1800 | 650 |
| 40 | 4200 | 2100 | 800 |
| 60 | 5000 | 2500 | 1000 |
| 80 | 6000 | 2900 | 1300 |
| 100 | 6500 | 3200 | 1450 |

*Adapted and extended from values given by McGrath(20). For depths not shown in McGrath(20), the MS values were approximated using the hyperbolic soil model with appropriate values for K and n where n=0.4 and K=200, K=100, and K=45 for 95% Proctor, 90% Proctor, and 85% Proctor, respectively.

[1] Vertical Soil Stress (psi) = [ soil depth (ft) x soil density (pcf)]/144

## TABLE 2-15

### Typical range of Poisson's Ratio for Soil (Bowles (21))

| Soil Type | Poisson Ratio, $\mu$ |
|---|---|
| Saturated Clay | 0.4-0.5 |
| Unsaturated Clay | 0.1-0.3 |
| Sandy Clay | 0.2-0.3 |
| Silt | 0.3-0.35 |
| Sand (Dense) | 0.2-0.4 |
| Coarse Sand (Void Ratio 0.4-0.7) | 0.15 |
| Fine-grained Sand (Void Ratio 0.4-0.7) | 0.25 |

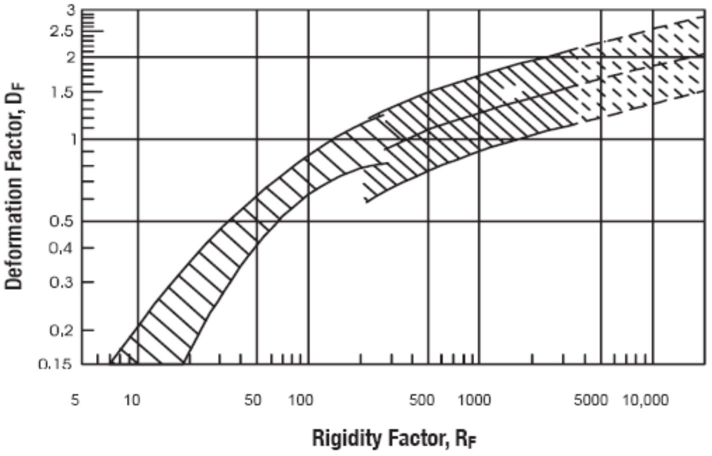


**Figure 2-6** Watkins-Gaube Graph

| | | | |
|---|---|---|---|
| Client: | Uranium One | Date: | 5/1/2008 |
| Job: | Shootaring Canyon | Job No.: | 181692 |
| Subject: | Buried Pipe Calculations | By: | RTS |

Calculations for PE3408 (black) HDPE pipe, IPS Dimensions

| | | |
|---|---|---|
| **Nominal Diameter (in)** | **3** | |
| **Dimension Ratio, Do/t, DR** | **17** | |
| | | |
| Outside Diameter, Do (in) | 3.5 | Plastic Pipe Inst. PE pipe handbk |
| Inside Diameter (in) | 3.06 | Plastic Pipe Inst. PE pipe handbk |
| Min Wall Thickness, t (in) | 0.206 | Plastic Pipe Inst. PE pipe handbk |
| Depth of Soil Cover, H (ft) | 110 | cell design |
| Soil Density, w (pcf) | 100 | |
| Bedding Soil Compaction | 90% Std. Proctor | |
| | | |
| Vertical Soil Pressure (psi) | 76.39 | |

**Compressive Ring Thrust (Wall Crushing) and Vertical Arching Factor**

VAF=0.88-0.71*(SA-1)/(SA+2.5)
SA=1.43*Ms*rcent/E/t
PRD=VAF*w*H

| | | |
|---|---|---|
| Ms (psi) | 2828 | Table 2-14, interpolate between 60 and 80 psi |
| rcent (in) | 1.64 | |
| Apparent Modulus of Elasticity, E (psi) | 28200 | 50-year value from Plastic Pipe Inst. PE pipe handbk |
| average cross-sectional area or wall thickness for DR pipe, A (in) | 0.206 | |
| Hoop Thrust Stiffness Ratio, SA | 1.14 | |
| Vertical Arching Factor, VAF | 0.85 | |
| Radial Directed Earth Pressure, PRD (psf) | 9376 | |
| Radial Directed Earth Pressure, PRD (psi) | 65 | |

S=PRD*DR/288

| | | |
|---|---|---|
| Pipe Wall Compressive Stress, S (psi) | 553 | |
| Allowable Long-Term Compressive Stress (psi) | 1000 | Table 2-12 |

S<1000, so ok against wall crushing

**Deflection of Pipe Using Watkins-Gaube Graph**

Rf=(12*Es*(DR-1)^3)/E
Es=Ms*(1+μ)*(1-2μ)/(1-μ)
εs=wH/144/Es
ΔX/Dm=εs*Df

| | | |
|---|---|---|
| Poisson ratio of bedding, μ | 0.3 | Table 2-15, dense sand |
| Secant modulus of bedding, Es (psi) | 2101 | |

| | | |
|---|---|---|
| Rigidity Factor, Rf | 3661 | |
| Deformation Factor, Df | 1.5 | look-up on Figure 2-6 |
| Soil strain, εs | 3.6% | |
| Ring Deflection, ΔX/Dm | 5.5% | |

Ring Deflection less than 7.5% (as recommended by Plastic Pipe Institute PE pipe handbook for non-pressurized pipe)

**Deflection of Pipe Using Spangler's Modified Iowa Formula**

ΔX/Dm=1/144(Kbed*LDL*PE)/((2*E/3)*(1/(DR-1))^3+(0.061Fs*E'))

| | | |
|---|---|---|
| Bedding Factor, Kbed | 0.1 | typical value |
| Deflection lag factor, LDL | 1 | typical value for plastic pipe |
| Vertical Soil Pressure, PE (psf) | 11000 | |
| Soil Support Factor, Fs | 1 | for very wide trenches (i.e. blanket embedment) |
| Modulus of Soil Reaction, E' (psi) | 3000 | crushed rock with slight to high compaction |
| | | |
| Ring Deflection, ΔX/Dm | 4.1% | |

Ring Deflection less than 7.5% (as recommended by Plastic Pipe Institute PE pipe handbook for non-pressurized pipe)

**Constrained Buckling using Luscher Equation**

PWC=5.65/N*sqrt(RB'*E'*E/(12*(DR-1)^3))
R=1-0.33*Hgw/H
B'=1/(1+4*e^(-0.065*H))

| | |
|---|---|
| Safety Factor, N | 2 |
| height of ground water above pipe, Hgw (ft) | 100 |
| Buoyancy Reduction Factor, R | 0.7 |
| B' | 0.99687 |
| Allowable Constrained Buckling Pressure, PWC (psi) | 98 |

Vertical Soil Pressure (76 psi) < PWC, so ok against buckling

**Constrained Buckling in Dry Ground using Moore-Selig Equation**

PCR=2.4*Ψ*RH/DM*(E*I)^(1/3)*(E*s)^(2/3)
E*s=ES/(1-μ)

| | | |
|---|---|---|
| Calibration Factor, Ψ | 0.55 | for granular soil |
| Geometry Factor, RH | 1 | for deep uniform fills |
| Mean diameter, DM (in) | 3.29 | |
| Moment of Inertia, I (in^4/in) | 0.0007 | |
| E*s (psi) | 3000.907 | |
| Constrained Buckling Pressure, PCR (psi) | 228 | |
| Factor of Safety against buckling | 3.0 | |

| | | | |
|---|---|---|---|
| Client: | Uranium One | Date: | 5/1/2008 |
| Job: | Shootaring Canyon | Job No.: | 181692 |
| Subject: | Buried Pipe Calculations | By: | RTS |

Calculations for PE3408 (black) HDPE pipe, IPS Dimensions

| | | |
|---|---|---|
| **Nominal Diameter (in)** | **8** | |
| **Dimension Ratio, Do/t, DR** | **17** | |
| Outside Diameter, Do (in) | 8.625 | Plastic Pipe Inst. PE pipe handbk |
| Inside Diameter (in) | 7.55 | Plastic Pipe Inst. PE pipe handbk |
| Min Wall Thickness, t (in) | 0.507 | Plastic Pipe Inst. PE pipe handbk |
| Depth of Soil Cover, H (ft) | 110 | cell design |
| Soil Density, w (pcf) | 100 | |
| Bedding Soil Compaction | 90% Std. Proctor | |
| Vertical Soil Pressure (psi) | 76.39 | |

## Compressive Ring Thrust (Wall Crushing) and Vertical Arching Factor

VAF=0.88-0.71*(SA-1)/(SA+2.5)
SA=1.43*Ms*rcent/E/t
PRD=VAF*w*H

| | | |
|---|---|---|
| Ms (psi) | 2828 | Table 2-14, interpolate between 60 and 80 psi |
| rcent (in) | 4.04 | |
| Apparent Modulus of Elasticity, E (psi) | 28200 | 50-year value from Plastic Pipe Inst. PE pipe handbk |
| average cross-sectional area or wall thickness for DR pipe, A (in) | 0.507 | |
| Hoop Thrust Stiffness Ratio, SA | 1.14 | |
| Vertical Arching Factor, VAF | 0.85 | |
| Radial Directed Earth Pressure, PRD (psf) | 9372 | |
| Radial Directed Earth Pressure, PRD (psi) | 65 | |

S=PRD*DR/288

| | | |
|---|---|---|
| Pipe Wall Compressive Stress, S (psi) | 553 | |
| Allowable Long-Term Compressive Stress (psi) | 1000 | Table 2-12 |

S<1000, so ok against wall crushing

## Deflection of Pipe Using Watkins-Gaube Graph

Rf=(12*Es*(DR-1)^3)/E
Es=Ms*(1+μ)*(1-2μ)/(1-μ)
εs=wH/144/Es
ΔX/Dm=εs*Df

| | | |
|---|---|---|
| Poisson ratio of bedding, μ | 0.3 | Table 2-15, dense sand |
| Secant modulus of bedding, Es (psi) | 2101 | |

|  |  |  |
|---|---|---|
| Rigidity Factor, Rf | 3661 |  |
| Deformation Factor, Df | 1.5 | look-up on Figure 2-6 |
| Soil strain, εs | 3.6% |  |
| Ring Deflection, ΔX/Dm | 5.5% |  |

Ring Deflection less than 7.5% (as recommended by Plastic Pipe Institute PE pipe handbook for non-pressurized pipe)

### Deflection of Pipe Using Spangler's Modified Iowa Formula

ΔX/Dm=1/144(Kbed*LDL*PE)/((2*E/3)*(1/(DR-1))^3+(0.061Fs*E'))

|  |  |  |
|---|---|---|
| Bedding Factor, Kbed | 0.1 | typical value |
| Deflection lag factor, LDL | 1 | typical value for plastic pipe |
| Vertical Soil Pressure, PE (psf) | 11000 |  |
| Soil Support Factor, Fs | 1 | for very wide trenches (i.e. blanket embedment) |
| Modulus of Soil Reaction, E' (psi) | 3000 | crushed rock with slight to high compaction |
|  |  |  |
| Ring Deflection, ΔX/Dm | 4.1% |  |

Ring Deflection less than 7.5% (as recommended by Plastic Pipe Institute PE pipe handbook for non-pressurized pipe)

### Constrained Buckling using Luscher Equation

PWC=5.65/N*sqrt(RB'*E'*E/(12*(DR-1)^3))
R=1-0.33*Hgw/H
B'=1/(1+4*e^(-0.065*H))

|  |  |
|---|---|
| Safety Factor, N | 2 |
| height of ground water above pipe, Hgw (ft) | 100 |
| Buoyancy Reduction Factor, R | 0.7 |
| B' | 0.99687 |
| Allowable Constrained Buckling Pressure, PWC (psi) | 98 |

Vertical Soil Pressure (76 psi) < PWC, so ok against buckling

### Constrained Buckling in Dry Ground using Moore-Selig Equation

PCR=2.4*Ψ*RH/DM*(E*I)^(1/3)*(E*s)^(2/3)
E*s=ES/(1-μ)

|  |  |  |
|---|---|---|
| Calibration Factor, Ψ | 0.55 | for granular soil |
| Geometry Factor, RH | 1 | for deep uniform fills |
| Mean diameter, DM (in) | 8.12 |  |
| Moment of Inertia, I (in^4/in) | 0.0109 |  |
| E*s (psi) | 3000.907 |  |
| Constrained Buckling Pressure, PCR (psi) | 228 |  |
| Factor of Safety against buckling | 3.0 |  |

| | | | |
|---|---|---|---|
| Client: | Uranium One | Date: | 5/1/2008 |
| Job: | Shootaring Canyon | Job No.: | 181692 |
| Subject: | Buried Pipe Calculations | By: | RTS |

Calculations for PE3408 (black) HDPE pipe, IPS Dimensions

| | | |
|---|---|---|
| **Nominal Diameter (in)** | **4** | |
| **Dimension Ratio, Do/t, DR** | **9** | |
| Outside Diameter, Do (in) | 4.5 | Plastic Pipe Inst. PE pipe handbk |
| Inside Diameter (in) | 3.47 | Plastic Pipe Inst. PE pipe handbk |
| Min Wall Thickness, t (in) | 0.484 | Plastic Pipe Inst. PE pipe handbk |
| Depth of Soil Cover, H (ft) | 110 | cell design |
| Soil Density, w (pcf) | 100 | |
| Bedding Soil Compaction | 90% Std. Proctor | |
| Vertical Soil Pressure (psi) | 76.39 | |

**Compressive Ring Thrust (Wall Crushing) and Vertical Arching Factor**

VAF=0.88-0.71*(SA-1)/(SA+2.5)
SA=1.43*Ms*rcent/E/t
PRD=VAF*w*H

| | | |
|---|---|---|
| Ms (psi) | 2828 | Table 2-14, interpolate between 60 and 80 psi |
| rcent (in) | 1.99 | |
| Apparent Modulus of Elasticity, E (psi) | 28200 | 50-year value from Plastic Pipe Inst. PE pipe handbk |
| average cross-sectional area or wall thickness for DR pipe, A (in) | 0.484 | |
| Hoop Thrust Stiffness Ratio, SA | 0.59 | |
| Vertical Arching Factor, VAF | 0.97 | |
| Radial Directed Earth Pressure, PRD (psf) | 10715 | |
| Radial Directed Earth Pressure, PRD (psi) | 74 | |

S=PRD*DR/288

| | | |
|---|---|---|
| Pipe Wall Compressive Stress, S (psi) | 335 | |
| Allowable Long-Term Compressive Stress (psi) | 1000 | Table 2-12 |

S<1000, so ok against wall crushing

**Deflection of Pipe Using Watkins-Gaube Graph**

Rf=(12*Es*(DR-1)^3)/E
Es=Ms*(1+μ)*(1-2μ)/(1-μ)
εs=wH/144/Es
ΔX/Dm=εs*Df

| | | |
|---|---|---|
| Poisson ratio of bedding, μ | 0.3 | Table 2-15, dense sand |
| Secant modulus of bedding, Es (psi) | 2101 | |
| Rigidity Factor, Rf | 458 | |

| | | |
|---|---|---|
| Deformation Factor, Df | 1 | look up on Figure 2-6 |
| Soil strain, εs | 3.6% | |
| Ring Deflection, ΔX/Dm | 3.6% | |

Ring Deflection less than 4% (as recommended by Plastic Pipe Institute PE pipe handbook for pressurized pipe).

**Deflection of Pipe Using Spangler's Modified Iowa Formula**

ΔX/Dm=1/144(Kbed*LDL*PE)/((2*E/3)*(1/(DR-1))^3+(0.061Fs*E'))

| | | |
|---|---|---|
| Bedding Factor, Kbed | 0.1 | typical value |
| Deflection lag factor, LDL | 1 | typical value for plastic pipe |
| Vertical Soil Pressure, PE (psf) | 11000 | |
| Soil Support Factor, Fs | 1 | for very wide trenches (i.e. blanket embedment) |
| Modulus of Soil Reaction, E' (psi) | 2000 | crushed rock with slight compaction |

| | |
|---|---|
| Ring Deflection, ΔX/Dm | 4.8% |

Ring Deflection slightly greater than 4% (as recommended by Plastic Pipe Institute PE pipe handbook for pressurized pipe)

**Constrained Buckling using Luscher Equation**

PWC=5.65/N*sqrt(RB'*E'*E/(12*(DR-1)^3))
R=1-0.33*Hgw/H
B'=1/(1+4*e^(-0.065*H))

| | |
|---|---|
| Safety Factor, N | 2 |
| height of ground water above pipe, Hgw (ft) | 100 |
| Buoyancy Reduction Factor, R | 0.7 |
| B' | 0.99687 |
| Allowable Constrained Buckling Pressure, PWC (psi) | 226 |

Vertical Soil Pressure (76 psi) < PWC, so ok against buckling

**Constrained Buckling in Dry Ground using Moore-Selig Equation**

PCR=2.4*Ψ*RH/DM*(E*I)^(1/3)*(E*s)^(2/3)
E*s=ES/(1-μ)

| | | |
|---|---|---|
| Calibration Factor, Ψ | 0.55 | for granular soil |
| Geometry Factor, RH | 1 | for deep uniform fills |
| Mean diameter, DM (in) | 4.02 | |
| Moment of Inertia, I (in^4/in) | 0.0094 | |
| E*s (psi) | 3000.907 | |
| Constrained Buckling Pressure, PCR (psi) | 440 | |
| Factor of Safety against buckling | 5.8 | |

| | | | |
|---|---|---|---|
| Client: | Uranium One | Date: | 5/1/2008 |
| Job: | Shootaring Canyon | Job No.: | 181692 |
| Subject: | Buried Pipe Calculations | By: | RTS |

Calculations for PE3408 (black) HDPE pipe, IPS Dimensions

| | | |
|---|---|---|
| **Nominal Diameter (in)** | **12** | |
| **Dimension Ratio, Do/t, DR** | **9** | |
| Outside Diameter, Do (in) | 12.75 | Plastic Pipe Inst. PE pipe handbk |
| Inside Diameter (in) | 9.75 | Plastic Pipe Inst. PE pipe handbk |
| Min Wall Thickness, t (in) | 1.417 | Plastic Pipe Inst. PE pipe handbk |
| Depth of Soil Cover, H (ft) | 110 | cell design |
| Soil Density, w (pcf) | 100 | |
| Bedding Soil Compaction | 90% Std. Proctor | |
| Vertical Soil Pressure (psi) | 76.39 | |

**Compressive Ring Thrust (Wall Crushing) and Vertical Arching Factor**

VAF=0.88-0.71*(SA-1)/(SA+2.5)
SA=1.43*Ms*rcent/E/t
PRD=VAF*w*H

| | | |
|---|---|---|
| Ms (psi) | 2828 | Table 2-14, interpolate between 60 and 80 psi |
| rcent (in) | 5.63 | |
| Apparent Modulus of Elasticity, E (psi) | 28200 | 50-year value from Plastic Pipe Inst. PE pipe handbk |
| average cross-sectional area or wall thickness for DR pipe, A (in) | 1.417 | |
| Hoop Thrust Stiffness Ratio, SA | 0.57 | |
| Vertical Arching Factor, VAF | 0.98 | |
| Radial Directed Earth Pressure, PRD (psf) | 10776 | |
| Radial Directed Earth Pressure, PRD (psi) | 75 | |

S=PRD*DR/288

| | | |
|---|---|---|
| Pipe Wall Compressive Stress, S (psi) | 337 | |
| Allowable Long-Term Compressive Stress (psi) | 1000 | Table 2-12 |

S<1000, so ok against wall crushing

**Deflection of Pipe Using Watkins-Gaube Graph**

Rf=(12*Es*(DR-1)^3)/E
Es=Ms*(1+μ)*(1-2μ)/(1-μ)
εs=wH/144/Es
ΔX/Dm=εs*Df

| | | |
|---|---|---|
| Poisson ratio of bedding, μ | 0.3 | Table 2-15, dense sand |
| Secant modulus of bedding, Es (psi) | 2101 | |
| Rigidity Factor, Rf | 458 | |

| | | |
|---|---|---|
| Deformation Factor, Df | 1 | look up on Figure 2-6 |
| Soil strain, εs | 3.6% | |
| Ring Deflection, ΔX/Dm | 3.6% | |

Ring Deflection less than 4% (as recommended by Plastic Pipe Institute PE pipe handbook for pressurized pipe).

**Deflection of Pipe Using Spangler's Modified Iowa Formula**

ΔX/Dm=1/144(Kbed*LDL*PE)/((2*E/3)*(1/(DR-1))^3+(0.061Fs*E'))

| | | |
|---|---|---|
| Bedding Factor, Kbed | 0.1 | typical value |
| Deflection lag factor, LDL | 1 | typical value for plastic pipe |
| Vertical Soil Pressure, PE (psf) | 11000 | |
| Soil Support Factor, Fs | 1 | for very wide trenches (i.e. blanket embedment) |
| Modulus of Soil Reaction, E' (psi) | 2000 | crushed rock with slight compaction |
| Ring Deflection, ΔX/Dm | 4.8% | |

Ring Deflection slightly greater than 4% (as recommended by Plastic Pipe Institute PE pipe handbook for pressurized pipe)

**Constrained Buckling using Luscher Equation**

PWC=5.65/N*sqrt(RB'*E'*E/(12*(DR-1)^3))
R=1-0.33*Hgw/H
B'=1/(1+4*e^(-0.065*H))

| | |
|---|---|
| Safety Factor, N | 2 |
| height of ground water above pipe, Hgw (ft) | 100 |
| Buoyancy Reduction Factor, R | 0.7 |
| B' | 0.99687 |
| Allowable Constrained Buckling Pressure, PWC (psi) | 226 |

Vertical Soil Pressure (76 psi) < PWC, so ok against buckling

**Constrained Buckling in Dry Ground using Moore-Selig Equation**

PCR=2.4*Ψ*RH/DM*(E*I)^(1/3)*(E*s)^(2/3)
E*s=ES/(1-μ)

| | | |
|---|---|---|
| Calibration Factor, Ψ | 0.55 | for granular soil |
| Geometry Factor, RH | 1 | for deep uniform fills |
| Mean diameter, DM (in) | 11.33 | |
| Moment of Inertia, I (in^4/in) | 0.2371 | |
| E*s (psi) | 3000.907 | |
| Constrained Buckling Pressure, PCR (psi) | 457 | |
| Factor of Safety against buckling | 6.0 | |

# APPENDIX F.3
# LINER SYSTEM ANCHORAGE

# APPENDIX F.3
# Liner System Anchorage

## 1.0 INTRODUCTION

Anchorage of the liner system for the tailings facility will consist of conventional L-shaped anchor trenches. The most conservative case was evaluated with a slope of 2.5H:1V and cover thickness of 1.5 inches were used for the anchor trench design calculations.

The two general anchor failure modes include an anchor pullout or an HDPE liner failure. The anchor pullout will be considered the controlling condition. An anchor pullout will generally be an observable occurrence, while there may be no evidence of a tension failure of one or both of the liners. The tensile strength of one liner will be considered the critical (maximum) anchorage tension. The following methods of evaluating and designing liner anchorage are presented in Koemer (2005b).

### 1.1 Anchor Trench Design Method

An anchor trench typically includes a runout section with a terminating anchor trench with the liner(s) folded over the edge of the trench prior to backfill. The depth of the anchor trench then introduces another variable into the design process. The formulation of the governing equation is very to similar to that of liner runout with the addition of the earth pressures in the trench.

### 1.1.1 Summation of Forces

Koerner (2005b) presents a summation of horizontal forces for an anchor trench liner pullout as:

$$\Sigma Fx = 0$$

$$\mathrm{T_{allow}} \cos\beta = \mathrm{F_{U\sigma}} + \mathrm{F_{L\sigma}} + \mathrm{F_{LT}} - \mathrm{P_A} + \mathrm{P_P}$$

where the variables are as previously defined with the addition of:

$P_A$ = active earth pressure against the backfill side of the anchor trench; and
$P_P$= passive earth pressure against the inside of the anchor trench.

### 1.1.2 Earth Pressure

The additional forces resisting liner pullout are the imposed by the passive and active earth pressure within the anchor trench. Koemer (2005b) presents the calculation of these forces as:

$$P_A = (0.5\gamma_{AT} d_{AT} + \sigma_n)\mathrm{K}_A d_{AT}$$

$$P_P = (0.5\gamma_{AT} d_{AT} + \sigma_n)\mathrm{K}_P d_{AT}$$

where:

$\gamma_{AT}$ = unit weight of soil in anchor trench
$d_{AT}$ = depth of the anchor trench
$\sigma_n$ = applied normal stress from cover soil
$K_A$ = coefficient of active earth pressure = $\tan^2(45 - \varphi/2)$
$K_P$ = coefficient of passive earth pressure = $\tan^2(45 + \varphi/2)$
$\varphi$ = angle of shearing resistance of respective soil

The resulting equation for determining liner pullout resistance has the design variables of cover thickness, length of runout and trench depth. Since the equation can only be solved for one variable, the cover thickness and length of runout are generally established as constants and the equation is solved for the depth of the trench.

### 1.2 Anchor Trench Design

This section presents the anchor trench design for the top of the slopes for the tailings facility. The minimum cover layer and steepest slope were used for the design. The cover layer will consist of a protective sand layer with a roadbed sand and gravel overlay. The total cover thickness is estimated as a minimum of 1.5 feet with a unit weight of 112 lb/ft$^3$. The interior slopes will be 2.5H:1V. In order to limit the potential for a tensile failure in the liner, the pullout force will be limited to one-half of the available tensile strength.

#### 1.2.1 Anchor Trench Calculation

The inputs for the calculation are as follows:

$\sigma_{allow}$ = 3800 psi (calculated from minimum tensile strength break of HDPE)

t = 0.060 inch (60 mil)

$T_{allow} = \sigma_{allow}$ t/2 = 228/2 = 114 lb/in (minimum tensile strength break of HDPE from Appendix C, Table 3 of original Tailings Management Plan(Hydro-Engineering, 2005))

$\beta$ = 21.8 degrees (2.5H:1V sideslopes)

Unit weight of soil = 112 lb/ft$^3$ (calculated as 90% of standard Proctor at optimum water content for bulk Entrada Sand sample tested. Laboratory results attached in Appendix C.3.4)

$\sigma_n$= cover thickness x unit weight of soil = 1.5 ft. x 112 lb/ft$^3$ = 168lb/ft$^2$ = 1.17 psi

$\delta_L$ = 9 degrees (interface friction angle between textured HDPE and geonet, minimum value given in Koerner, 2005a)

$\delta_u$ = 0 degrees

$L_{RO}$ = 3 feet = 36 inches

$\gamma$AT = 112 lb/ft$^3$ = 0.065 lb/in$^3$ (unit weight of soil in anchor trench)

$\varphi$ = conservatively assumed to be 28 degrees for sand.

$K_A = \tan^2(45 - \varphi/2) = \tan^2(45 - 28/2) = 0.36$

$K_P = \tan^2(45 + \varphi/2) = \tan^2(45 + 28/2) = 2.77$

The required depth of anchor trench is calculated according to:

$$T_{allow} \cos\beta = F_{U\sigma} + F_{L\sigma} + F_{LT} - P_A + P_P$$

$F_{U\sigma} = \sigma_n \tan\delta_u (L_{RO}) = (1.17)\tan(0)(L_{RO}) = 0$
$F_{L\sigma} = \sigma_n \tan\delta_L (L_{RO}) = (1.17)\tan(9)\ (36) = 6.7\ lb/in$
$F_{U\sigma} = T_{allow} \sin\beta \tan\delta_L = (114)\sin(21.8)\tan(9) = 6.7\ lb/in$

$P_A = (0.5\gamma_{AT}d_{AT} + \sigma_n)K_A d_{AT} = (0.5(0.065)d_{AT} + 1.17)(0.36)d_{AT}$
$P_A = 0.012\ d_{AT}^2 + 0.42\ d_{AT}$

$P_P = (0.5\gamma_{AT}d_{AT} + \sigma_n)K_P d_{AT} = (0.5(0.065)d_{AT} + 1.17)(2.77)\ d_{AT}$
$P_P = 0.090\ d_{AT}^2 + 3.24\ d_{AT}$

$T_{allow} \cos\beta = 114 \cos(21.8) = 105.8\ lb/in$

$105.8 = 0 + 6.7 + 6.7 - (0.012\ d_{AT}^2 + 0.42\ d_{AT}) + (0.090\ d_{AT}^2 + 3.24 d_{AT})$

$0 = 0.078\ d_{AT}^2 + 2.82\ d_{AT} - 92.4$

Using the quadratic equation solution, the depth of the trench is determined to be:

$$d_{AT} = 20.8 \text{ inches}$$

A specified trench depth of 24 inches with a minimum runout of 3 feet is sufficient to utilize one-half or more of the available tensile strength for a single HDPE liner. A typical detail for the anchor trench was provided in Figure 7-2 of this report.

### 1.3 Summary and Conclusions

The specified minimum runout for the anchor trenches is 3 feet with a minimum trench depth of 24 inches. This is sufficient for the critical areas of anchorage on the perimeter of the cells.

## 2.0 REFERENCES

Hydro-Engineering, LLC, 2005. Tailings Management Plan for Shootaring Canyon Uranium Processing Facility. Amended December 2005. revised April 2007.

Koerner, G.K. and Narejo, D., 2005a. “Direct Shear Database of Geosynthetic to Geosynthetic and Geosynthetic to Soil Interfaces,” Geosynthetic Research Institute, Report No.30.

Koerner, R.M., 2005b. Designing With Geosynthetics — Fifth Edition. Prentice Hall, Upper Saddle River, NJ.

# APPENDIX F.4
# LINER UPLIFT

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# Calculation Package

## Liner Uplift Analysis

## Introduction:

This calculation package has been prepared to evaluate the potential for wind uplift on the liner system proposed for the tailings storage facility (TSF) at the Shootaring Canyon Uranium Mill site (Shootaring). The proposed TSF has been designed with an exposed geomembrane on the side slopes of the facility. The bottom of the TSF will be covered with 18 inches of gravel and 6 inches of sand to act as both a protective layer and a drainage layer for the overlying tailings. The perimeter of the liner system will be laid in an anchor trench that will restrain the edge of the liner system and prevent the introduction of wind under the liner. However, the side slopes of the geomembrane will remain exposed until such time that the tailings reach the top elevation of the liner.

Wind generated uplift (uplift) is a common occurrence on exposed geomembrane covers and liner systems. Wind passing over a geomembrane results in a reduction in pressure at ground level. The presence of side slopes or other obstructions under the geomembrane has been shown to alter the pressure distribution along the geomembrane. Giroud, 1995 provided a detailed discussion of this pressure distribution and a methodology by which the pressure distribution can be estimated and used for designing the restraints and anchor system of the geomembrane. These equations were further modified by Giroud and Zornberg (Zornberg, 1997) to take into account the reduction in normal forces acting on geomembranes placed on a slope.

This calculation package evaluates the potential for uplift on the exposed geomembrane liner, as well as the strength of the geomembrane with respect to tension developed by wind uplift. Several methods of preventing uplift have been developed for exposed geomembrane applications, including: strategic placement of weight on the geomembrane, placement of a soil or liquid cover over the geomembrane, installation of intermediate anchor trenches and the application of vacuum below the geomembrane. For purposes of this project, only the strategic placement of weight on the geomembrane has been evaluated. Ultimately the geomembrane will be covered by mill tailings that will hold the geomembrane in place. Therefore, this calculation package will focus only on the ability of the liner to resist uplift and prevent material failure of the liner system during temporary exposure to the design wind. Additional, calculations are provided to identify the spacing of supplemental weight on the liner system to help resist uplift and to avoid shifting during uplift events.

This calculation package has been prepared by Mr. Erik Nelson, P.E. at Engineering Analytics, Inc.

**References:**

Giroud, J.P., Pelte, T., and Bathurst, R.J., 1995, "Uplift of Geomembranes by Wind", Geosynthetics International, Vol. 2, No. 6, pp.897-952.

Hydro-Engineering, LLC, 2005, "Tailings Reclamation and Decommissioning Plan for Shootaring Canyon Uranium Project, Garfield County, Utah", December 2005, Revised December 2006

Zornberg, J.G. and Giroud, J.P., 1997, "Uplift of Geomembranes by Wind – Extension of Equations", Geosynthetics International, Vol. 4, No. 2, pp 187-207.

Zornberg, J.G. and Giroud, J.P., 1999, "Errata for Uplift of Geomembranes by Wind – Extension of Equations", Geosynthetics International, Vol. 6, No. 6, pp 521-522.

**Calculations:**

Liner specifications were provided in the Tainlings Reclamation and Decommissioning Plan (Hydro-Engineering, 2005) provided as attachment A.

Wind speed criteria are 70 mph (113 km/h) as shown on Figure 1 (Basic Wind Speed).

The average site elevation is approximately 1350 m above sea level.

The average atmospheric pressure at an elevation of 1350 m is 86,175 Pa as interpolated from values provided by Giroud, 1995 (pg, 902)

Calculate Uplift Potential:

Based on the above values the maximum change in pressure expected to be generated by a 70mph wind is calculated by equation (9) (Giroud, 1995)

$\Delta p_R = 0.050\ V^2 e^{-(1.252x10-4)z}$

Where V = Wind velocity (km/h)

And z = elevation in meters

$\Delta p_R = 539$ Pa

This value represents the maximum uplift that should be experienced by the liner system. Depending on the liners location within the TSF the actual wind suction will be factored to provide a realistic distribution of suction forces within the facility. The following table presents the factored loads for each area evaluated.

| Location | Suction Factor ($\lambda$) (1) | Wind Suction ($\Delta p_R$ x $\lambda$) |
|---|---|---|
| Slopes (full face) | 0.7 | 377 Pa |
| Bottom | 0.4 | 216 Pa |

(1) Per Giroud, 1995

Check Uplift on Bottom Liner:

Weight of soil on bottom liner = 2 ft x 130 pcf = 260 psf (12,448 Pa)

This value is much greater than the 216 Pa uplift pressure, therefore, no uplift expected on the bottom liner.

Check Uplift on Side Slope Liner:

Slope angle for 2:1 slope = 26.56° (maximum slope)

From the Design Drawings the maximum length of exposed geomembrane along the slope = 152 ft. (46.2 m).

From the HDPE material specifications:

Liner thickness = 60 mil – 1.5mm

Allowable tension at yield $T_{all}$ = 126 lb/in of width (22.07 kN/m)

Allowable strain at yield $\varepsilon_{all}$ = 12 percent

Density of HDPE = 0.94 $g/cm^3$

Weight of geomembrane = 0.15cm x 0.94 $g/cm^3$ = 0.141$g/cm^2$ = 1.41 $kg/m^2$

Effective Suction $S_e$ = ($\Delta p_R$ x $\lambda$) – (9.81x wt. geomembrane x cos (slope angle)) Equation A-41 (Zornberg, 1997)

$S_e$ = 377 – (9.81 x 1.41 x cos 26.56) = 375 Pa

$S_eL$ = 375 x 46.2 = 17,325 N/m = 17.325 kN/m

$T'_{all} = T_{all}/S_eL$ = 22.07/17.325 = 1.274

Per Table 2 (Giroud, 1995) $T/S_eL$ at 12 percent Strain = 0.69. $T'_{all}$ is greater than 0.69, therefore the liner is strong enough to withstand the tension generated by the wind uplift without yielding.

Per Giroud (1995), strain and tension at maximum wind load is estimated using Figure 12 (Attachment B) and the iterative process identified in Example 7. Figure 12 provided in Giroud, 1995 is for a 1.5mm thick HDPE liner and therefore is appropriate for this analysis.

Tension at maximum wind load $T_{max}$ = 18.3 kN/m width (104.5 lb/in width)

Strain at maximum wind load $\varepsilon_{max}$ = 4.17 percent

Calculation of Supplemental Restraints:

Although the above calculations indicate that the liner is capable of withstanding the uplift forces generated by the design wind, it would be undesirable to have the liner along an entire side of the TSF lifted off its underlayment. Potential problems associated with allowing unrestrained uplift include shifting and wrinkling of the liner or uncontrolled flapping of the liner which could result in fatigue failures. Therefore the addition of supplemental weight to the surface of the exposed geomembrane on the side slopes is recommended to help retain the liner system in place. Although several different types of restrain systems are available, the primary method of restraint analyzed for this application is the addition of weight on top of the liner. The use of sand bags was analyzed to keep the liner in place however, it was calculated that 70 lb sandbags would need to be placed every 3 feet to keep the liner in place. Therefore, the weight will be added either by filling an HDPE tube or corrugated HDPE culvert with soil and laying the tube/culvert on the liner from top to bottom.

Weight spacing was calculated as follows:

Uplift on Liner = 375 Pa = 7.83 lb/ft$^2$

Therefore, the weight of the supplemental restraints is calculated by:

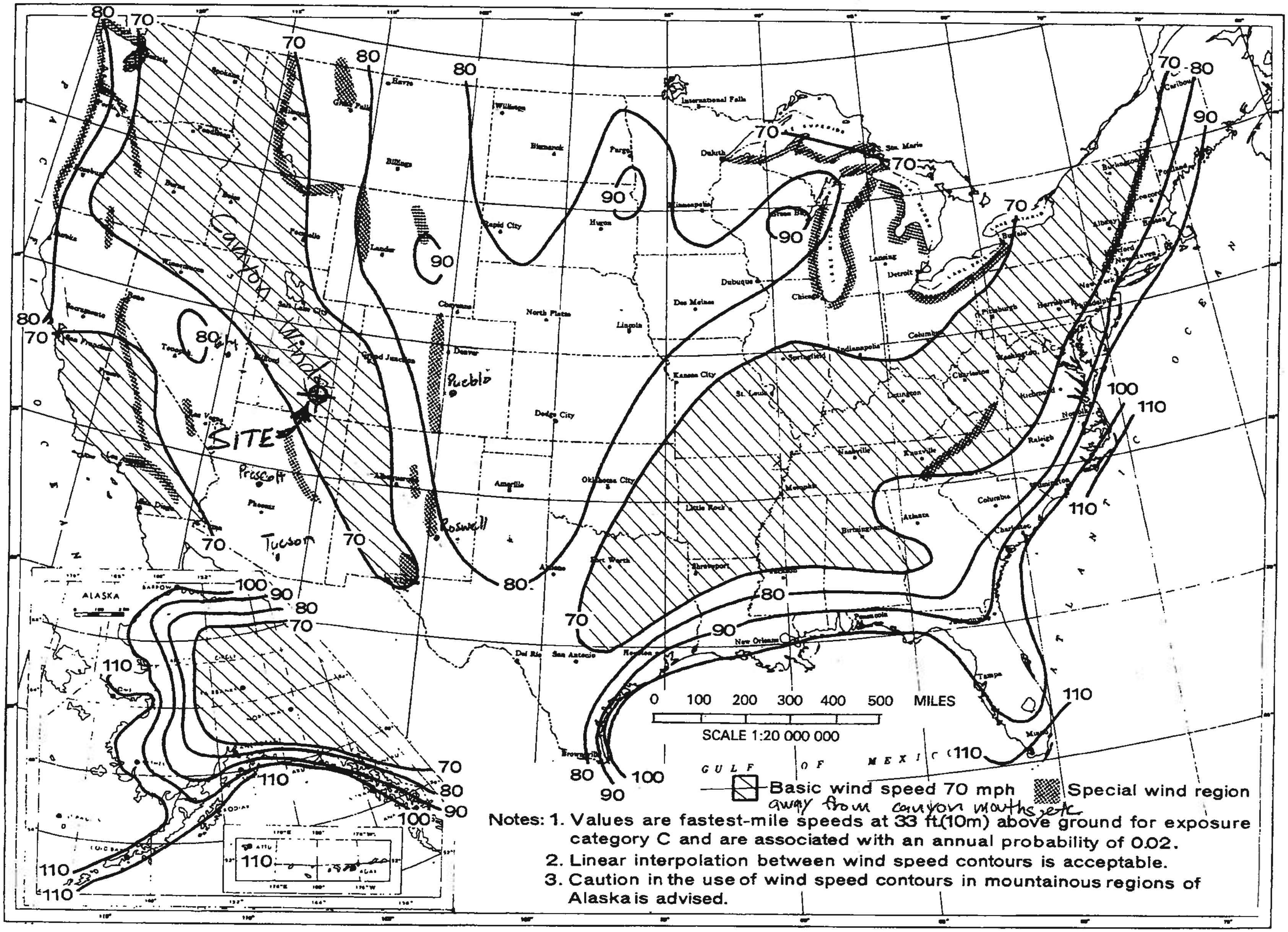
$W_{sup}$ = 7.83 x S

Where S is the distance between the restraints.

| Spacing of Restraints, S (ft.) | Weight per linear foot (lb) | Equivalent Culvert ID (in) |
|---|---|---|
| 50 | 391 | 24 |
| 75 | 587 | 29 |
| 100 | 783 | 33 |

**Conclusions:**

Based on the calculations performed as part of this package, the exposed portions of the 60 mil HDPE geomembrane liner will be capable of withstanding the design wind without tearing or pulling apart, provided the anchoring system is capable of withstanding the tension forces generated by the uplift. A supplemental restraint system is recommended to help maintain the positioning of the exposed liner. The supplemental restraints are important in that they will reduce the likelihood of stress increased in the liner due to shifting or uneven deformation of the liner.



away from canyon mouths etc

Notes: 1. Values are fastest-mile speeds at 33 ft(10m) above ground for exposure category C and are associated with an annual probability of 0.02.

2. Linear interpolation between wind speed contours is acceptable.

3. Caution in the use of wind speed contours in mountainous regions of Alaska is advised.

Fig. 1. Basic Wind Speed (mph)

Attachment A

pulled off of the seam by the squeeze-out, the weld is considered unacceptable. If the seaming process is interrupted during mid-seaming, the extrudate should trail off gradually and not in a large mass of solidified extrudate. Where such welds are abandoned long enough to cool, a new patch strip shall be placed over the entire existing patch. No extrusion welds will be permitted over the top of another extrusion weld or side-by-side of another weld. The only cases that extrudate will be allowed over the top of another weld is for "T" or "Y" shaped seams after the existing weld has been ground. In the event an extrusion weld cannot be tested with a vacuum box, provisions must be provided for the seam to be spark tested according to the spark tester manufacturer's procedures.

**TABLE 3 - Material Properties for HDPE Geomembrane**

| **Property** | **Test Method** | **Minimum Requirement** |
|---|---|---|
| Thickness (mils minimum ± 10%) | ASTM D 5199 | 60 |
| Specific Gravity (g/cc minimum) | ASTM D 1505/D 792 | 0.94 |
| Carbon Black Content (%) | ASTM D 1603 | 2 - 3 |
| Carbon Black Dispersion | ASTM D 5596 | Note 1 |
| Minimum Tensile Strength (each direction)<br>1. Tensile strength yield (lb/in. width)<br>2. Tensile strength break (lb/in. width)<br>3. Elongation at yield (%)<br>4. Elongation at break (%) | ASTM D 6693 | <br>126<br>228<br>12<br>700 |
| Tear Strength (lb.) | ASTM D 1004 | 42 |
| Puncture Resistance | FTMS 101 - 2065<br>ASTM D 4833 | 80<br>108 |
| Stress Crack Resistance[2] (hrs) | ASTM D 5397 | 300 |
| Oxidative Induction Time (OIT) (minutes) | ASTM D 3895 | 100 |
| Oven Aging at 85 °C<br>Standard OIT- % retained after 90 days | ASTM D 5721<br>ASTM D 3895 | 55 |
| UV Resistance[3]<br>High Pressure OIT[4]- % retained after 1600 hrs | GRI GM11<br>ASTM D 5885 | 50 |

(1) Carbon black dispersion for 10 different views: Nine in Categories 1 and 2 with one allowed in Category 3.

(2) The yield stress used to calculate the applied load for the SP-NCTL test should be the mean value via MQC testing.

(3) The condition of the test should be 20 hr. UV cycle at 75 °C followed by 4 hr. condensation at 60 °C.

(4) UV resistance is based on percent retained value regardless of original HP-OIT value.

Attachment B

On the basis of the above discussion, the considered geomembrane is acceptable regarding wind uplift resistance if its normalized allowable tension is above the curve of the uplift tension-strain relationship shown in Figures 10 and 11. The normalized allowable tension is defined as:

$$T'_{all} = T_{all}/(S_e L) \tag{48}$$

In Figure 11, the geomembrane represented by Curve (1) is acceptable because its allowable tension and strain are represented by $A_1$ , which is above the uplift tension-strain curve. In contrast, the geomembranes represented by Curves (2) and (3) are not acceptable (for the considered wind-generated suction, $S_e$ , and exposed length, $L$) because their allowable tensions and strains are represented by points, $A_2$ and $A_3$, which are below the curve of the uplift tension-strain relationship.

In fact, it is not necessary to draw the entire normalized tension curve of the geomembrane. It is sufficient to plot the allowable tension defined by Equation 48 versus the allowable strain, and to check that it is above the curve of the uplift tension-strain relationship shown in Figures 10 and 11. However, it will be useful to draw the entire curve for the next step of the calculation which consists of determining the deformed shape of the geomembrane, as explained in Section 3.4.

**Example 5.** A 1.5 mm thick HDPE geomembrane has the tension-strain curve shown in Figure 12, with $T_{all} = 22$ kN/m at $\varepsilon_{all} = 12\%$. This geomembrane is installed in a reser-

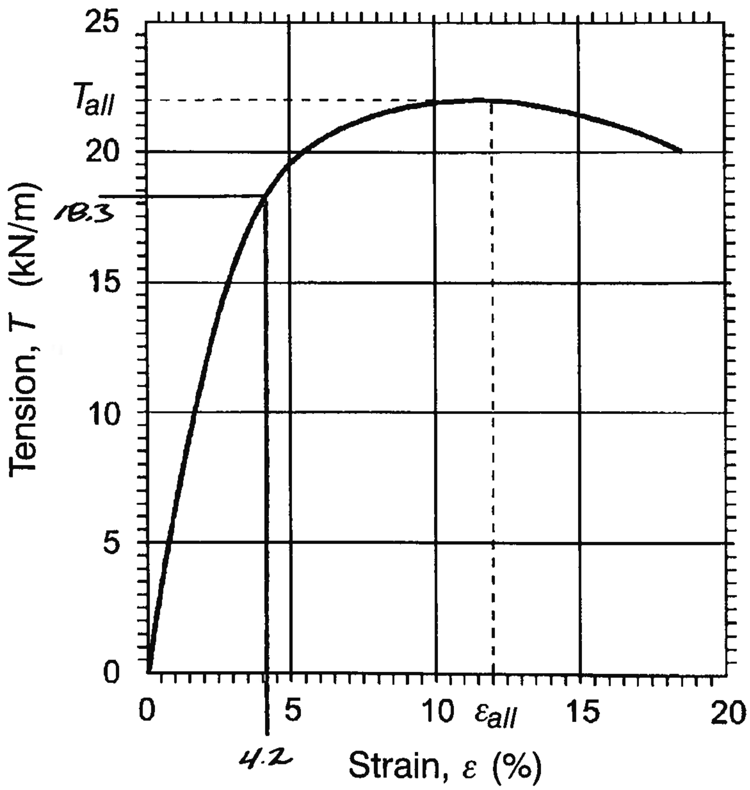


**Figure 12. Tension-strain curve of the geomembrane used in Example 5.**

(Note: Only the initial portion of the curve is shown, as it is the only portion of the curve relevant to design. The allowable tension and strain are assumed to correspond to the yield peak.)

# APPENDIX G

# SURFACE WATER HYDROLOGY AND EROSION PROTECTION CALCULATIONS

# APPENDIX G.1
# DRAINAGE CHANNEL DESIGN CALCULATIONS

**TETRA TECH**

CLIENT: Uranium One
MADE BY: EKB
DATE: 5/16/2008
JOB TITLE: Shootaring Mill Operations
CHECKED:
JOB NUMBER: 114-181692
SUBJECT: Hydrology and Hydraulic Design Assumptions/Equations
APPROVED:
SHEET:

### *Catchment Area and Hydrology:*

Catchment boundaries were delineated in AutoCAD, based on contours from 1"=200' scale aerial photogrammetry.
Design flows were computed with the Rational Method, using Kirpich's formula for time of concentration.
Time of concentration is accumulated downstream based on the maximum of the current subcatchment $T_c$ (by Kirpich's formula), or the sum of the previous $T_c$ plus the in-channel travel time, $T_t$.
In-channel travel time assumed (conservatively) to be 8 fps for purposes of computing $T_t$
Rainfall intensity is linearly interpolated from IDF table values.

Kirpich's formula: $T_c = 60 * 11.9\ L^3 / H^{0.385}$

Where:
$T_c$ = Time of concentration, minutes
L = Flow length, miles
H = Basin relief, feet

Rational Method: $Q_p = C\ I\ A$

Where:
$Q_p$ = Peak flow, cfs
C = Runoff coefficient, conservatively assumed to be 0.90
I = Rainfall intensity (for duration equal to $T_c$), in/hr
A = Drainage area, acres

Travel time in channel: $T_t = L_{chl} / ( 60\ V )$

Where:
$T_t$ = Travel time in channel, minutes
$L_{chl}$ = Length of channel, feet
V = Full-flow velocity, ft/sec

**100-year IDF curve (NOAA Atlas 14)**

| Storm Duration | | | I (in/hr) |
|---|---|---|---|
| (min) | (hours) | (days) | |
| 0 | 0 | 0 | 5.66 |
| 5 | 0.083 | 0.003 | 5.66 |
| 10 | 0.167 | 0.007 | 4.31 |
| 15 | 0.25 | 0.010 | 3.56 |
| 30 | 0.5 | 0.021 | 2.4 |
| 60 | 1 | 0.042 | 1.48 |
| 120 | 2 | 0.083 | 0.85 |
| 180 | 3 | 0.125 | 0.57 |
| 360 | 6 | 0.25 | 0.3 |
| 720 | 12 | 0.5 | 0.16 |
| 1440 | 24 | 1 | 0.1 |
| 2880 | 48 | 2 | 0.06 |
| 5760 | 96 | 4 | 0.03 |
| 10080 | 168 | 7 | 0.02 |
| 14400 | 240 | 10 | 0.02 |
| 28800 | 480 | 20 | 0.01 |
| 43200 | 720 | 30 | 0.01 |
| 64800 | 1080 | 45 | 0.01 |
| 86400 | 1440 | 60 | 0 |

Drainage areas denote "half-lateral" are those where the catchment characteristics to a particular ford were considered uniform enough to assume a 50-50 split of the drainage area between the two opposing laterals.
In these locations, the hydrology calculations show the full drainage area in the "Drainage Area" column, with half of the full value shown in the "Cumulative Area" column, and carried forward in the rest of of the calculations.
Because Phase 1 computations consistently led to minimum travel times for these structures, and Phase 2 flow paths were shorter due to the the larger areal extent of tailings, no $T_c$ paths were delineated for laterals, rundowns, and fords installed during Phase 2, and the minimum $T_c$ of 5 minutes was used for calculations.

**TETRA TECH**

CLIENT: Uranium One | MADE BY: EKB | DATE: 5/16/2008

JOB TITLE: Shootaring Mill Operations | CHECKED: | JOB NUMBER: 114-181692

SUBJECT: Hydrology and Hydraulic Design Assumptions/Equations | APPROVED: | SHEET:

***Non-contributing Areas:***

Offsite area OS1-1 (OS2-1 in Phase 2 mapping) drains to a natural sump, which overflows to both the north and south, depending on the accumulated water elevation. Based on contour end areas, it stores 2.18 ac-ft of water at elevation 4498, and 7.68 ac-ft at elevation 4500.

Overflow to the north occurs via a small pass, at an elevation between 4498 and 4500. Overflow to the south occurs over a long berm at an elevation above 4500, and would only occur if peak flows are sufficiently high that water builds up to the southern overflow elevation, rather than all overflow occurring to the north.

Overflow to the south would thus only occur if runoff volume exceeded 7.68 ac-ft, and if the northern overflow were sufficiently constricted that water accumulated above the southern overflow elevation during peak flow conditions.

No hydrograph routing was performed to determine the relative effects of the two overflow elevations, but a simple volume-based analysis confirms that OS1-1/OS2-1 is non-contributing for the 100-year event:

Given a contributing area of 23.21 acres, a rainfall intensity of 5.11 in/hr, a duration equal to the time of concentration of 7.04 minutes, and C=0.90, the Rational Method 100-year runoff volume is 1.18 ac-ft.

Alternatively, the 100-year, 24-hour rainfall is 2.4". Again assuming C=0.90, the 100-year runoff volume is 4.18 ac-ft. Either computed volume is significantly less than the 7.68 ac-ft at elevation 4500, which is at or slightly below the point at which the sump overflows to the south.

Therefore, OS1-1/OS2-1 can be safely considered non-contributing for the 100-year design event.

For the PMP (for freeboard determination), the sump was conservatively assumed to fully contribute runoff to the tailings storage facility.

| | | | | | |
|---|---|---|---|---|---|
| | CLIENT: Uranium One | MADE BY: | EKB | DATE: | 5/16/2008 |
| JOB TITLE: | Shootaring Mill Operations | CHECKED: | | JOB NUMBER: | 114-181692 |
| SUBJECT: | Hydrology and Hydraulic Design Assumptions/Equations | APPROVED: | | SHEET: | |

***Channel Hydraulics:***

Channel hydraulics are computed using Manning's equation for trapezoidal channels:

$V_{avg} = ( 1.486 R^{2/3} S^{1/2} ) / n$ $\quad$ $A = B y + z y^2$

$Q = V_{avg} A$ $\quad$ $P = ( B y + z y^2 ) / ( B + 2 y (z^2 + 1)^{0.5} )$

$R = A / P$ $\quad$ $T = B + 2 z y$

Where:

Q = Design discharge, cfs
$V_{avg}$ = Average Velocity, ft/sec
A = Cross-sectional Area of flow, $ft^2$
B = Bottom width, ft
y = Flow depth, ft
P = Wetted perimeter, ft
R = Hydraulic radius, ft
z = Side slope ratio, ft H : ft V
S = Bed slope, ft/ft
n = Manning's roughness
T = Top width, ft

Manning's n was assigned according to the channel bed material. Concrete was assigned a roughness of 0.013; bare earth or gravel was assigned n = 0.035; and heavy riprap was assigned n = 0.08 for small flow depths and n = 0.045 for larger flow depths. Additional detail, such as the use of a split range of n-values for capacity versus erosion protection, was not justified at this design level.

Hydraulic calculations for laterals, rundowns, and fords used the respective design slopes of 0.004, 0.01, and 0.01. The alignment of some rundowns may dictate slopes flatter than 1.0%, such as F1-2A, F1-2B, F1-6A through C, and F2-11A. This detail will be addressed later.

Hydraulic calculations for mill drainage ditches located on the mill site atop the bluff used a slope of 0.005 to provide conservative results for flow depth. Mill drainage ditches in steeper areas away from the top of the bluff used the actual, steeper, proposed slope, which exceeded 1%.

Note that both drainage area and flow cross-sectional area are both denoted as the variable A, by convention. The context in which each is used should provide sufficient indication of which is under discussion.

***Hydraulic Residence Time:***

Hydraulic residence time provides an indication of the possible contact time for potentially contaminated mill site runoff to infiltrate through ditch bottoms before entering the lined tailings area.

Residence times are accumulated by taking the maximum time entering a junction at the head of a channel, and adding the time for the channel in question, in a similar fashion to the summation of $T_c$s.

Hydraulic residence time is computed as the channel volume, divided by the design flow rate:

$$\text{Volume} = A_{chl} * L_{chl}$$

$$T_{res} = \text{Volume} / ( 60 Q )$$

Where:

Volume = Volume of channel reach, $ft^3$

$T_{res}$ = Hydraulic residence time, min

All other variables are as defined above.

| Location / ID # | Type | $L_{chl}$ (ft) | Discharge, $Q_{100}$ (cfs) | Area, $A_{chl}$ ($ft^2$) | Volume ($ft^3$) | Increm. $T_{res}$ (min) | Cum. $T_{res}$ (min) |
|---|---|---|---|---|---|---|---|
| PH 1: Mill to S Cell | | | | | | | |
| M1-3 | mill | 690 | 7.6 | 3.6 | 2496 | 5.5 | 5.5 |
| M1-2 | mill | 957 | 15.4 | 6.1 | 5821 | 6.3 | 11.8 |
| M1-4 | mill | 458 | 9.0 | 4.1 | 1873 | 3.5 | 3.5 |
| M1-1 | chute | 603 | 29.6 | 4.5 | 2737 | 1.5 | 13.3 |
| PH 1: Mill to Ex. Tails | | | | | | | |
| M1-12 | mill | 430 | 5.4 | 2.8 | 1219 | 3.7 | 3.7 |
| M1-11 | chute | 35 | 5.4 | 1.3 | 45 | 0.1 | 3.9 |
| M1-10 | mill | 184 | 7.2 | 3.5 | 643 | 1.5 | 1.5 |
| M1-8 | mill | 489 | 20.5 | 7.5 | 3676 | 3.0 | 6.9 |
| M1-7 | mill | 311 | 11.5 | 4.9 | 1526 | 2.2 | 2.2 |
| M1-6 | chute | 605 | 30.8 | 5.2 | 3126 | 1.7 | 8.6 |
| M1-14 | mill | 947 | 8.7 | 4.0 | 3792 | 7.2 | 7.2 |
| M1-13 | mill | 1490 | 42.9 | 6.7 | 9923 | 3.9 | 11.1 |
| M1-5 | mill | 961 | 76.0 | 10.5 | 10116 | 2.2 | 13.3 |

Residence time does not exceed 15 min. during Phase 1 for either of the two mill discharge points to the tailings. During Phase 2, M1-5 will be shortened to 343 feet, giving it an incremental residence time of 0.8 min, and a cumulative residence time along the flow path of 11.9 min.

**TETRA TECH**

| | | | | | |
|---|---|---|---|---|---|
| | CLIENT: Uranium One | MADE BY: | EKB | DATE: | 5/16/2008 |
| JOB TITLE: | Shootaring Mill Operations | CHECKED: | | JOB NUMBER: | 114-181692 |
| SUBJECT: | Hydrology and Hydraulic Design Assumptions/Equations | APPROVED: | | SHEET: | |

***Channel lining / Erosion Control:***

Riprap is designed using the Corps of Engineers' method, from EM-1110-2-1601 (updated 30 June 1994).

$D_{30} = S_f\, C_S\, C_V\, C_T\, d\, [\, (\, \gamma_w / (\, \gamma_s - \gamma_w\, )\, )^{1/2}\, V / (\, K_1\, g\, d\, )^{1/2}\, ]^{2.5}$ From EM 1110-2-1601, Equation 3-3.

Where:

$S_f$ = Safety factor, assumed to be the minimum value of 1.1 due to conservative assumptions elsewhere.
$C_S$ = Stability coefficient for incipient failure, assumed to be 0.375 for rounded rock (0.30 for angular)
$C_V$ = Vertical velocity distribution coefficient, 1.0 for straight channels; 1.283 - 0.2 log (R/W) outside of bends.
$C_T$ = Thickness coefficient, 1.0 for thickness of $1.5^*D_{50}$.
d = Local flow depth, ft. Same as y in notation followed above; d is Corps' notation.
$\gamma_w$ = Unit weight of water, 62.4 lb/ft$^3$.
$\gamma_s$ = Unit weight of rock, conservatively assumed to be 150 lb/ft$^3$.
V = Local depth-averaged velocity, ft/s. Use $V_{SS}$ for side-slope riprap. Velocities in a straight channel having equal bottom and side slope roughness range from 10 to 20% greater than $V_{AVG}$; conservatively used $V = 1.2^*V_{AVG}$ for computing channel bottom riprap size.
$K_1$ = Side slope correction factor, $K_1 = (\, 1 - \sin^2\theta / \sin^2\phi\, )^{0.5}$ From EM 1110-2-1601, Equation 3-4.
g = Gravitational constant, 32.2 ft/sec$^2$.
$\theta$ = Side slope angle, $\tan^{-1}(1/z)$, degrees.
$\phi$ = Riprap angle of repose, assumed to be 40 degrees.

And,

$V_{SS} / V_{AVG} = 1.74 - 0.52 \log (\, R / W\, )$ From EM 1110-2-1601, Plate B-33.

Where:

$V_{SS}$ = Depth-averaged velocity at 20% up slope length from toe, ft/sec.
$V_{AVG}$ = Average velocity in channel, ft/sec (from hydraulic calculations above).
R = Bend radius at channel centerline, ft.
W = Flow top width, ft.

$D_{50}$ is related to $D_{30}$ by the equation $D_{50} = D_{30}\, (\, D_{85} / D_{15}\, )^{1/3}$
The ratio $D_{85} / D_{15}$ typically ranges from 1.7 to 2.7, implying that $D_{50} / D_{30}$ ranges from 1.2 to 1.4.
Conservatively assume $D_{50} = 1.4\, D_{30}$.

Lumping coefficients, $D_{50}/D_{30}\, S_f\, C_S\, C_T\, [\, (\, \gamma_w / (\, \gamma_s - \gamma_w\, )\, )^{1/2}\, ]^{2.5}$ =

$= 1.4 * 1.1 * 0.375 * 1.0 * [\, 62.4 / (\, 150 - 62.4\, )]^{1.25}$
$= 0.3779$

$C_V$, V, d, and $K_1$ are determined individually for each channel.

**TETRA TECH**

CLIENT: Uranium One MADE BY: EKB DATE: 5/16/2008
JOB TITLE: Shootaring Mill Operations CHECKED: JOB NUMBER: 114-181692
SUBJECT: Hydrology and Hydraulic Design Assumptions/Equations APPROVED: SHEET:

Equation 3-3, above, is strictly applicable for slopes up to 2%. For steeper channels, Eqn. 3-5 from the Corps' manual provides a check. That equation is below:

$D_{30} = 1.95\ S^{0.555}\ q^{2/3} / g^{1/3}$ From EM 1110-2-1601, Equation 3-5.

Where:
S = Slope of bed, ft/ft.
q = Unit discharge, Q / B, times a flow concentration factor of 1.25 (greater for skewed approach flow).

Eqn 3-5 is applicable for thickness = 1.5 $D_{100}$, angular rock, unit weight of 167 pcf, slopes from 2 to 20%, and side slopes flatter than 2.5:1.
Because the present application assumes a layer thickness of 1.5 $D_{30}$, rounded rock, unit weight 150 pcf, correction factors must be applied:

Correction for unit weight, $C_1$ = 1.22 (from Plate B-38)
Correction for rounded rock = 0.375 / 0.30 = 1.25 (based on stability coefficients above)
Assume no correction for layer thickness, as gradation is not yet established. Provide 1.5*$D_{30}$ layer.

For channels steeper than 2%, the greater of the results from Eqns. 3.3 and 3.5 were used.
For channels 2% and flatter, the result from Eqn. 3.3 was used (maximum of channel bottom or side values).
Where some, but not all, computed values slightly exceeded a nominal riprap size, the nominal value was specified.

Shear stress was computed for comparison with other riprap design methods, if desired:

$$\tau = \gamma_w\ y\ S$$

Where:
$\tau$ = Bed shear, lb/ft$^2$, and
$\gamma_w$ , y, S are as defined above

Use of y instead of R leads to a conservative estimate of shear stress.

Bed shear in bends is modified by the bend ratio, $K_b$ (tabulated to the right):

$$\tau_b = K_b\ \tau$$

Where:
$\tau_b$ = Bed shear at outside of bend, lb/ft$^2$
$K_b$ = Bend coefficient, and
$\tau$, R, W are as defined above.

| R / W | $K_b$ |
|---|---|
| 2 | 2.00 |
| 3 | 1.85 |
| 4 | 1.70 |
| 5 | 1.56 |
| 6 | 1.43 |
| 7 | 1.31 |
| 8 | 1.20 |
| 9 | 1.12 |
| 10 | 1.05 |

Bend R / W values were assumed; during final design actual values will be computed, and larger rock provided at specific bends as needed.

| Location / ID # | Type | Drainage Area (ac) | Cum. Area (ac) | Ridgeline Elev. (ft) | Outlet Elev. (ft) | Basin Relief, H (ft) | $T_c$ Path Length (ft) | Channel Length (ft) | Kirpich's $T_c$ (min) | $T_c + T_t$ at head (min) | Use $T_c$ (min) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **PH 1: S Cell - W Side** | | | | | | | | | | | |
| F1-1A | lateral | 2.26 | 2.26 | 4904 | 4430 | 474 | 728 | n/a | 1.47 | n/a | 5.00 |
| F1-1B | lateral | 0.31 | 0.31 | 4540 | 4430 | 110 | 282 | n/a | 0.86 | n/a | 5.00 |
| F1-1 | ford | 0.00 | 2.56 | | | | | n/a | 0.00 | n/a | 5.00 |
| F1-2A | rundown | 2.25 | 2.25 | 4901 | 4430 | 471 | 644 | 93 | 1.28 | n/a | 5.00 |
| F1-2B | rundown | 2.21 | 2.21 | 4930 | 4430 | 500 | 702 | 78 | 1.38 | n/a | 5.00 |
| F1-2C | lateral | 0.11 | 0.11 | 4452 | 4430 | 22 | 98 | n/a | 0.47 | n/a | 5.00 |
| F1-2D | lateral | 0.79 | 0.79 | 4810 | 4430 | 380 | 503 | n/a | 1.05 | n/a | 5.00 |
| F1-2 | ford | 0.00 | 5.35 | | | | | n/a | 0.00 | n/a | 5.00 |
| F1-3A | rundown | 1.41 | 1.41 | 4802 | 4430 | 372 | 481 | 24 | 1.00 | n/a | 5.00 |
| F1-3B | lateral | 0.55 | 0.55 | 4807 | 4430 | 377 | 504 | n/a | 1.05 | n/a | 5.00 |
| F1-3C | lateral | 0.32 | 0.32 | 4492 | 4430 | 62 | 160 | n/a | 0.56 | n/a | 5.00 |
| F1-3 | ford | 0.00 | 2.27 | | | | | n/a | 0.00 | n/a | 5.00 |
| F1-4A | rundown | 4.74 | 4.74 | 4944 | 4430 | 514 | 1099 | 97 | 2.30 | n/a | 5.00 |
| F1-4B | lateral | 0.57 | 0.57 | 4548 | 4430 | 118 | 245 | n/a | 0.72 | n/a | 5.00 |
| F1-4C | lateral | 0.55 | 0.55 | 4530 | 4430 | 100 | 263 | n/a | 0.83 | n/a | 5.00 |
| F1-4 | ford | 0.00 | 5.87 | | | | | n/a | 0.00 | n/a | 5.00 |
| F1-5A | rundown | 1.82 | 1.82 | 4744 | 4430 | 314 | 451 | 115 | 0.99 | n/a | 5.00 |
| F1-5B | lateral | 1.09 | 1.09 | 4736 | 4430 | 306 | 488 | n/a | 1.10 | n/a | 5.00 |
| F1-5C | lateral | 0.63 | 0.63 | 4516 | 4430 | 86 | 205 | n/a | 0.66 | n/a | 5.00 |
| F1-5 | ford | 0.00 | 3.54 | | | | | n/a | 0.00 | n/a | 5.00 |
| F1-6A | rundown | 1.76 | 1.76 | 4798 | 4430 | 368 | 678 | 41 | 1.50 | n/a | 5.00 |
| F1-6E | rundown | 0.18 | 1.94 | 4490 | 4430 | 60 | 160 | 127 | 0.57 | n/a | 5.00 |
| F1-6B | rundown | 0.45 | 0.45 | 4460 | 4430 | 30 | 274 | 42 | 1.38 | n/a | 5.00 |
| F1-6C | rundown | 0.37 | 0.37 | 4480 | 4430 | 50 | 284 | 63 | 1.18 | n/a | 5.00 |
| F1-6D | lateral | 0.28 | 0.28 | 4512 | 4430 | 82 | 182 | n/a | 0.58 | n/a | 5.00 |
| F1-6F | lateral | 1.00 | 1.00 | 4486 | 4430 | 56 | 398 | n/a | 1.67 | n/a | 5.00 |
| F1-6 | ford | 0.00 | 4.04 | | | | | n/a | 0.00 | n/a | 5.00 |

| Location / ID # | Type | Rainfall Intensity, I (in/hr) | Discharge, $Q_{100}$ (cfs) | Side slope, z | Base width, B (ft) | Rough-ness, n | Slope, S (ft/ft) | Built Depth, D (ft) | Flow Depth, y (ft) | Area, $A_{chl}$ (ft$^2$) | Wetted Perimeter, P (ft) | Hydraulic Radius, R (ft) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **PH 1: S Cell - W Side** | | | | | | | | | | | | |
| F1-1A | lateral | 5.66 | 11.5 | 2 | 4 | 0.035 | 0.004 | 1 | 0.94 | 5.6 | 8.2 | 0.68 |
| F1-1B | lateral | 5.66 | 1.6 | 2 | 4 | 0.035 | 0.004 | 1 | 0.31 | 1.4 | 5.4 | 0.26 |
| F1-1 | ford | 5.66 | 13.1 | 6 | 0 | 0.013 | 0.010 | 1 | 0.64 | 2.5 | 7.8 | 0.32 |
| F1-2A | rundown | 5.66 | 11.4 | 2 | 6 | 0.080 | 0.010 | 1.5 | 0.96 | 7.6 | 10.3 | 0.74 |
| F1-2B | rundown | 5.66 | 11.2 | 2 | 6 | 0.080 | 0.010 | 1.5 | 0.95 | 7.5 | 10.2 | 0.73 |
| F1-2C | lateral | 5.66 | 0.6 | 2 | 4 | 0.035 | 0.004 | 1 | 0.17 | 0.7 | 4.8 | 0.15 |
| F1-2D | lateral | 5.66 | 4.0 | 2 | 4 | 0.035 | 0.004 | 1 | 0.53 | 2.7 | 6.4 | 0.42 |
| F1-2 | ford | 5.66 | 27.3 | 6 | 0 | 0.013 | 0.010 | 1 | 0.84 | 4.3 | 10.3 | 0.42 |
| F1-3A | rundown | 5.66 | 7.2 | 2 | 6 | 0.080 | 0.010 | 1.5 | 0.74 | 5.5 | 9.3 | 0.59 |
| F1-3B | lateral | 5.66 | 2.8 | 2 | 4 | 0.035 | 0.004 | 1 | 0.43 | 2.1 | 5.9 | 0.35 |
| F1-3C | lateral | 5.66 | 1.6 | 2 | 4 | 0.035 | 0.004 | 1 | 0.31 | 1.5 | 5.4 | 0.27 |
| F1-3 | ford | 5.66 | 11.6 | 6 | 0 | 0.013 | 0.010 | 1 | 0.61 | 2.2 | 7.4 | 0.30 |
| F1-4A | rundown | 5.66 | 24.2 | 2 | 6 | 0.080 | 0.010 | 1.5 | 1.44 | 12.8 | 12.4 | 1.03 |
| F1-4B | lateral | 5.66 | 2.9 | 2 | 4 | 0.035 | 0.004 | 1 | 0.44 | 2.1 | 6.0 | 0.36 |
| F1-4C | lateral | 5.66 | 2.8 | 2 | 4 | 0.035 | 0.004 | 1 | 0.43 | 2.1 | 5.9 | 0.35 |
| F1-4 | ford | 5.66 | 29.9 | 6 | 0 | 0.013 | 0.010 | 1 | 0.87 | 4.6 | 10.6 | 0.43 |
| F1-5A | rundown | 5.66 | 9.3 | 2 | 6 | 0.080 | 0.010 | 1.5 | 0.85 | 6.5 | 9.8 | 0.67 |
| F1-5B | lateral | 5.66 | 5.5 | 2 | 4 | 0.035 | 0.004 | 1 | 0.63 | 3.3 | 6.8 | 0.49 |
| F1-5C | lateral | 5.66 | 3.2 | 2 | 4 | 0.035 | 0.004 | 1 | 0.47 | 2.3 | 6.1 | 0.38 |
| F1-5 | ford | 5.66 | 18.0 | 6 | 0 | 0.013 | 0.010 | 1 | 0.72 | 3.1 | 8.8 | 0.36 |
| F1-6A | rundown | 5.66 | 9.0 | 2 | 6 | 0.080 | 0.010 | 1.5 | 0.83 | 6.4 | 9.7 | 0.66 |
| F1-6E | rundown | 5.66 | 9.9 | 2 | 6 | 0.080 | 0.010 | 1.5 | 0.88 | 6.8 | 9.9 | 0.69 |
| F1-6B | rundown | 5.66 | 2.3 | 2 | 6 | 0.080 | 0.010 | 1.5 | 0.38 | 2.6 | 7.7 | 0.33 |
| F1-6C | rundown | 5.66 | 1.9 | 2 | 6 | 0.080 | 0.010 | 1.5 | 0.34 | 2.3 | 7.5 | 0.30 |
| F1-6D | lateral | 5.66 | 1.4 | 2 | 4 | 0.035 | 0.004 | 1 | 0.29 | 1.3 | 5.3 | 0.25 |
| F1-6F | lateral | 5.66 | 5.1 | 2 | 4 | 0.035 | 0.004 | 1 | 0.60 | 3.2 | 6.7 | 0.47 |
| F1-6 | ford | 5.66 | 20.6 | 6 | 0 | 0.013 | 0.010 | 1 | 0.76 | 3.5 | 9.2 | 0.37 |

| Location / ID # | Type | Velocity, $V_{AVG}$ (fps) | $\tau$ (psf) | R / W | Bend coeff., $K_b$ | Bend shear, $\tau_b$ (psf) | $\theta$ (deg.) | $K_1$ | $C_V$ | $V_{SS}$ (ft/s) | Steep-channel $D_{50}$ (in) | Bottom $D_{50}$ (in) | Side slope $D_{50}$ (in) | Use D50 (in) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **PH 1: S Cell - W Side** | | | | | | | | | | | | | | |
| F1-1A | lateral | 2.07 | 0.24 | 12 | 1.05 | 0.25 | 26.6 | 0.72 | 1.07 | 2.44 | 1.72 | 0.9 | 0.9 | 2.5 |
| F1-1B | lateral | 1.10 | 0.08 | 12 | 1.05 | 0.08 | 26.6 | 0.72 | 1.07 | 1.30 | 0.46 | 0.3 | 0.2 | 2.5 |
| F1-1 | ford | 5.30 | 0.40 | 50 | 1.05 | 0.42 | 9.5 | 0.97 | 0.94 | 5.30 | 0.00 | 6.6 | 4.2 | 9.0 |
| F1-2A | rundown | 1.51 | 0.60 | 3 | 1.85 | 1.10 | 26.6 | 0.72 | 1.19 | 2.26 | 2.17 | 0.5 | 0.8 | 6.0 |
| F1-2B | rundown | 1.51 | 0.59 | 3 | 1.85 | 1.09 | 26.6 | 0.72 | 1.19 | 2.25 | 2.15 | 0.5 | 0.8 | 6.0 |
| F1-2C | lateral | 0.77 | 0.04 | 12 | 1.05 | 0.04 | 26.6 | 0.72 | 1.07 | 0.91 | 0.23 | 0.1 | 0.1 | 2.5 |
| F1-2D | lateral | 1.50 | 0.13 | 12 | 1.05 | 0.14 | 26.6 | 0.72 | 1.07 | 1.77 | 0.85 | 0.5 | 0.5 | 2.5 |
| F1-2 | ford | 6.37 | 0.53 | 50 | 1.05 | 0.55 | 9.5 | 0.97 | 0.94 | 6.37 | 0.00 | 9.8 | 6.2 | 12.0 |
| F1-3A | rundown | 1.31 | 0.46 | 3 | 1.85 | 0.85 | 26.6 | 0.72 | 1.19 | 1.95 | 1.59 | 0.4 | 0.6 | 6.0 |
| F1-3B | lateral | 1.34 | 0.11 | 12 | 1.05 | 0.11 | 26.6 | 0.72 | 1.07 | 1.58 | 0.67 | 0.4 | 0.4 | 2.5 |
| F1-3C | lateral | 1.12 | 0.08 | 12 | 1.05 | 0.08 | 26.6 | 0.72 | 1.07 | 1.32 | 0.47 | 0.3 | 0.3 | 2.5 |
| F1-3 | ford | 5.15 | 0.38 | 50 | 1.05 | 0.40 | 9.5 | 0.97 | 0.94 | 5.15 | 0.00 | 6.2 | 3.9 | 9.0 |
| F1-4A | rundown | 1.89 | 0.90 | 3 | 1.85 | 1.66 | 26.6 | 0.72 | 1.19 | 2.82 | 3.58 | 0.8 | 1.3 | 6.0 |
| F1-4B | lateral | 1.36 | 0.11 | 12 | 1.05 | 0.12 | 26.6 | 0.72 | 1.07 | 1.60 | 0.69 | 0.4 | 0.4 | 2.5 |
| F1-4C | lateral | 1.34 | 0.11 | 12 | 1.05 | 0.11 | 26.6 | 0.72 | 1.07 | 1.58 | 0.67 | 0.4 | 0.4 | 2.5 |
| F1-4 | ford | 6.52 | 0.55 | 50 | 1.05 | 0.57 | 9.5 | 0.97 | 0.94 | 6.52 | 0.00 | 10.3 | 6.5 | 12.0 |
| F1-5A | rundown | 1.42 | 0.53 | 3 | 1.85 | 0.98 | 26.6 | 0.72 | 1.19 | 2.12 | 1.89 | 0.4 | 0.7 | 6.0 |
| F1-5B | lateral | 1.66 | 0.16 | 12 | 1.05 | 0.17 | 26.6 | 0.72 | 1.07 | 1.96 | 1.06 | 0.6 | 0.6 | 2.5 |
| F1-5C | lateral | 1.40 | 0.12 | 12 | 1.05 | 0.12 | 26.6 | 0.72 | 1.07 | 1.65 | 0.74 | 0.4 | 0.4 | 2.5 |
| F1-5 | ford | 5.75 | 0.45 | 50 | 1.05 | 0.47 | 9.5 | 0.97 | 0.94 | 5.75 | 0.00 | 7.9 | 5.0 | 9.0 |
| F1-6A | rundown | 1.40 | 0.52 | 3 | 1.85 | 0.96 | 26.6 | 0.72 | 1.19 | 2.09 | 1.85 | 0.4 | 0.7 | 6.0 |
| F1-6E | rundown | 1.45 | 0.55 | 3 | 1.85 | 1.02 | 26.6 | 0.72 | 1.19 | 2.16 | 1.97 | 0.4 | 0.8 | 6.0 |
| F1-6B | rundown | 0.89 | 0.24 | 3 | 1.85 | 0.44 | 26.6 | 0.72 | 1.19 | 1.33 | 0.75 | 0.2 | 0.3 | 6.0 |
| F1-6C | rundown | 0.83 | 0.21 | 3 | 1.85 | 0.39 | 26.6 | 0.72 | 1.19 | 1.24 | 0.65 | 0.1 | 0.2 | 6.0 |
| F1-6D | lateral | 1.06 | 0.07 | 12 | 1.05 | 0.08 | 26.6 | 0.72 | 1.07 | 1.25 | 0.42 | 0.2 | 0.2 | 2.5 |
| F1-6F | lateral | 1.62 | 0.15 | 12 | 1.05 | 0.16 | 26.6 | 0.72 | 1.07 | 1.91 | 1.00 | 0.6 | 0.5 | 2.5 |
| F1-6 | ford | 5.94 | 0.47 | 50 | 1.05 | 0.50 | 9.5 | 0.97 | 0.94 | 5.94 | 0.00 | 8.5 | 5.4 | 9.0 |

| Location / ID # | Type | Drainage Area (ac) | Cum. Area (ac) | Ridgeline Elev. (ft) | Outlet Elev. (ft) | Basin Relief, H (ft) | $T_c$ Path Length (ft) | Channel Length (ft) | Kirpich's $T_c$ (min) | $T_c + T_t$ at head (min) | Use $T_c$ (min) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **PH 1: S Cell - E Side** | | | | | | | | | | | |
| F1-8A | chute | 4.67 | 4.67 | 4548 | 4522 | 26 | 774 | 128 | 4.83 | n/a | 5.00 |
| F1-8B | lateral | 0.26 | 0.26 | 4540 | 4466 | 74 | 163 | n/a | 0.53 | n/a | 5.00 |
| F1-8C | lateral | 0.84 | 0.84 | 4524 | 4466 | 58 | 138 | n/a | 0.48 | n/a | 5.00 |
| F1-8 | ford | 0.00 | 5.76 | | | | | n/a | 0.00 | n/a | 5.00 |
| F1-9A | half-lateral | 0.70 | 0.35 | 4554 | 4466 | 88 | 205 | n/a | 0.65 | n/a | 5.00 |
| F1-9 | ford | 0.00 | 0.70 | | | | | n/a | 0.00 | n/a | 5.00 |
| F1-10A | half-lateral | 1.12 | 0.56 | 4552 | 4466 | 86 | 277 | n/a | 0.93 | n/a | 5.00 |
| F1-10 | ford | 0.00 | 1.12 | | | | | n/a | 0.00 | n/a | 5.00 |
| **PH 1: Mill to S Cell** | | | | | | | | | | | |
| M1-3 | mill | 1.78 | 1.78 | 4554 | 4549 | 5 | 722 | 690 | 8.42 | 8.42 | 8.42 |
| M1-2 | mill | 2.24 | 4.02 | 4550 | 4540 | 10 | 922 | 957 | 8.55 | 10.41 | 10.41 |
| M1-4 | mill | 1.91 | 1.91 | 4550 | 4540 | 10 | 738 | 458 | 6.61 | 6.61 | 6.61 |
| M1-1 | chute | 2.16 | 8.09 | 4551 | 4530 | 21 | 656 | 603 | 4.34 | 11.67 | 11.67 |
| F1-7 | ford | 0.00 | 8.09 | | | | | | 0.00 | | 5.00 |

| Location / ID # | Type | Rainfall Intensity, I (in/hr) | Discharge, $Q_{100}$ (cfs) | Side slope, z | Base width, B (ft) | Rough-ness, n | Slope, S (ft/ft) | Built Depth, D (ft) | Flow Depth, y (ft) | Area, $A_{chl}$ ($ft^2$) | Wetted Perimeter, P (ft) | Hydraulic Radius, R (ft) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **PH 1: S Cell - E Side** | | | | | | | | | | | | |
| F1-8A | chute | 5.66 | 23.8 | 3 | 6 | 0.080 | 0.438 | 2 | 0.48 | 3.6 | 9.0 | 0.40 |
| F1-8B | lateral | 5.66 | 1.3 | 2 | 4 | 0.035 | 0.004 | 1 | 0.28 | 1.3 | 5.2 | 0.24 |
| F1-8C | lateral | 5.66 | 4.3 | 2 | 4 | 0.035 | 0.004 | 1 | 0.55 | 2.8 | 6.4 | 0.43 |
| F1-8 | ford | 5.66 | 29.4 | 6 | 0 | 0.013 | 0.010 | 1 | 0.87 | 4.5 | 10.6 | 0.43 |
| F1-9A | half-lateral | 5.66 | 1.8 | 2 | 4 | 0.035 | 0.004 | 1 | 0.33 | 1.6 | 5.5 | 0.28 |
| F1-9 | ford | 5.66 | 3.6 | 6 | 0 | 0.013 | 0.010 | 1 | 0.39 | 0.9 | 4.8 | 0.19 |
| F1-10A | half-lateral | 5.66 | 2.9 | 2 | 4 | 0.035 | 0.004 | 1 | 0.44 | 2.1 | 5.9 | 0.36 |
| F1-10 | ford | 5.66 | 5.7 | 6 | 0 | 0.013 | 0.010 | 1 | 0.47 | 1.3 | 5.7 | 0.23 |
| **PH 1: Mill to S Cell** | | | | | | | | | | | | |
| M1-3 | mill | 4.74 | 7.6 | 2 | 2 | 0.035 | 0.005 | 1.5 | 0.93 | 3.6 | 6.2 | 0.59 |
| M1-2 | mill | 4.25 | 15.4 | 2 | 2 | 0.035 | 0.005 | 1.5 | 1.31 | 6.1 | 7.9 | 0.77 |
| M1-4 | mill | 5.23 | 9.0 | 2 | 2 | 0.035 | 0.005 | 1.5 | 1.01 | 4.1 | 6.5 | 0.63 |
| M1-1 | chute | 4.06 | 29.6 | 3 | 6 | 0.080 | 0.338 | 2 | 0.59 | 4.5 | 9.7 | 0.47 |
| F1-7 | ford | 5.66 | 41.2 | 6 | 0 | 0.013 | 0.010 | 1 | 0.99 | 5.8 | 12.0 | 0.49 |

| Location / ID # | Type | Velocity, $V_{AVG}$ (fps) | $\tau$ (psf) | R / W | Bend coeff., $K_b$ | Bend shear, $\tau_b$ (psf) | $\theta$ (deg.) | $K_1$ | $C_V$ | $V_{SS}$ (ft/s) | Steep-channel $D_{50}$ (in) | Bottom $D_{50}$ (in) | Side slope $D_{50}$ (in) | Use D50 (in) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **PH 1: S Cell - E Side** | | | | | | | | | | | | | | |
| F1-8A | chute | 6.63 | 13.15 | 50 | 1.05 | 13.81 | 18.4 | 0.87 | 0.94 | 6.63 | 28.85 | 14.2 | 9.0 | 24.0 |
| F1-8B | lateral | 1.04 | 0.07 | 12 | 1.05 | 0.07 | 26.6 | 0.72 | 1.07 | 1.22 | 0.40 | 0.2 | 0.2 | 2.5 |
| F1-8C | lateral | 1.53 | 0.14 | 12 | 1.05 | 0.14 | 26.6 | 0.72 | 1.07 | 1.81 | 0.89 | 0.5 | 0.5 | 2.5 |
| F1-8 | ford | 6.49 | 0.54 | 50 | 1.05 | 0.57 | 9.5 | 0.97 | 0.94 | 6.49 | 0.00 | 10.2 | 6.5 | 12.0 |
| F1-9A | half-lateral | 1.16 | 0.08 | 12 | 1.05 | 0.09 | 26.6 | 0.72 | 1.07 | 1.36 | 0.50 | 0.3 | 0.3 | 2.5 |
| F1-9 | ford | 3.84 | 0.25 | 50 | 1.05 | 0.26 | 9.5 | 0.97 | 0.94 | 3.84 | 0.00 | 3.3 | 2.1 | 6.0 |
| F1-10A | half-lateral | 1.35 | 0.11 | 12 | 1.05 | 0.11 | 26.6 | 0.72 | 1.07 | 1.59 | 0.68 | 0.4 | 0.4 | 2.5 |
| F1-10 | ford | 4.31 | 0.29 | 50 | 1.05 | 0.31 | 9.5 | 0.97 | 0.94 | 4.31 | 0.00 | 4.3 | 2.7 | 6.0 |
| **PH 1: Mill to S Cell** | | | | | | | | | | | | | | |
| M1-3 | mill | 2.10 | 0.29 | 6 | 1.43 | 0.42 | 26.6 | 0.72 | 1.13 | 2.81 | 2.34 | 1.0 | 1.4 | 2.5 |
| M1-2 | mill | 2.53 | 0.41 | 6 | 1.43 | 0.59 | 26.6 | 0.72 | 1.13 | 3.37 | 3.75 | 1.5 | 2.0 | 2.5 |
| M1-4 | mill | 2.20 | 0.32 | 6 | 1.43 | 0.45 | 26.6 | 0.72 | 1.13 | 2.93 | 2.62 | 1.1 | 1.5 | 2.5 |
| M1-1 | chute | 6.51 | 12.4 | 50 | 1.05 | 12.98 | 18.4 | 0.87 | 0.94 | 6.51 | 28.91 | 12.9 | 8.2 | 24.0 |
| F1-7 | ford | 7.07 | 0.61 | 50 | 1.05 | 0.65 | 9.5 | 0.97 | 0.94 | 7.07 | 0.00 | 12.2 | 7.8 | 15.0 |

| Location / ID # | | Type | Drainage Area (ac) | Cum. Area (ac) | Ridgeline Elev. (ft) | Outlet Elev. (ft) | Basin Relief, H (ft) | $T_c$ Path Length (ft) | Channel Length (ft) | Kirpich's $T_c$ (min) | $T_c + T_t$ at head (min) | Use $T_c$ (min) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **PH 1: Mill to Ex. Tails** | | | | | | | | | | | | |
| | M1-12 | mill | 1.20 | 1.20 | 4563 | 4561 | 2 | 472 | 430 | 7.33 | 7.33 | 7.33 |
| | M1-11 | chute | 0.00 | 1.20 | 4561 | 4551 | 10 | 37 | 35 | 0.21 | 7.40 | 7.40 |
| | M1-10 | mill | 1.51 | 1.51 | 4562 | 4551 | 11 | 720 | 184 | 6.19 | 6.19 | 6.19 |
| | M1-8 | mill | 2.09 | 4.80 | 4550 | 4548 | 2 | 325 | 489 | 4.76 | 8.42 | 8.42 |
| | M1-7 | mill | 2.50 | 2.50 | 4552 | 4548 | 4 | 574 | 311 | 7.04 | 7.04 | 7.04 |
| | M1-6 | chute | 0.49 | 7.79 | 4550 | 4482 | 68 | 262 | 605 | 0.96 | 9.68 | 9.68 |
| | M1-14 | mill | 1.81 | 1.81 | 4568 | 4531 | 37 | 1061 | 947 | 6.07 | 6.07 | 6.07 |
| | M1-13 | mill | 8.72 | 10.52 | 4570 | 4482 | 88 | 664 | 1490 | 2.53 | 9.18 | 9.18 |
| | M1-5 | mill | 2.51 | 20.82 | 4474 | 4430 | 44 | 849 | 961 | 4.39 | 11.68 | 11.68 |
| **PH 1: Mill to E Cyn.** | | | | | | | | | | | | |
| | M1-16 | mill | 2.31 | 2.31 | 4566 | 4531 | 35 | 1001 | 715 | 5.80 | 5.80 | 5.80 |
| | M1-15 | mill | 0.85 | 0.85 | 4577 | 4536 | 41 | 295 | 390 | 1.33 | 1.33 | 5.00 |
| | M1-14 | mill | 0.75 | 3.90 | 4550 | 4530 | 20 | 662 | 101 | 4.46 | 6.01 | 6.01 |
| **PH 1: Offsite N/pond** | | | | | | | | | | | | |
| | OS1-1 | offsite | 23.21 | 0.00 | 4574 | 4500 | 74 | 1518 | 0 | 7.04 | 7.04 | 7.04 |
| | OS1-2 | offsite | 27.43 | 27.43 | 4654 | 4500 | 154 | 2970 | 947 | 11.52 | 11.52 | 11.52 |

| Location / ID # | | Type | Rainfall Intensity, I (in/hr) | Discharge, $Q_{100}$ (cfs) | Side slope, z | Base width, B (ft) | Rough-ness, n | Slope, S (ft/ft) | Built Depth, D (ft) | Flow Depth, y (ft) | Area, $A_{chl}$ ($ft^2$) | Wetted Perimeter, P (ft) | Hydraulic Radius, R (ft) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **PH 1: Mill to Ex. Tails** | | | | | | | | | | | | | |
| | M1-12 | mill | 5.03 | 5.4 | 2 | 2 | 0.035 | 0.005 | 1.5 | 0.79 | 2.8 | 5.5 | 0.51 |
| | M1-11 | chute | 5.01 | 5.4 | 2 | 2 | 0.080 | 0.229 | 1.5 | 0.45 | 1.3 | 4.0 | 0.32 |
| | M1-10 | mill | 5.34 | 7.2 | 2 | 2 | 0.035 | 0.005 | 1.5 | 0.91 | 3.5 | 6.1 | 0.57 |
| | M1-8 | mill | 4.74 | 20.5 | 2 | 2 | 0.035 | 0.005 | 1.5 | 1.50 | 7.5 | 8.7 | 0.86 |
| | M1-7 | mill | 5.11 | 11.5 | 2 | 2 | 0.035 | 0.005 | 1.5 | 1.14 | 4.9 | 7.1 | 0.69 |
| | M1-6 | chute | 4.40 | 30.8 | 3 | 6 | 0.080 | 0.252 | 2 | 0.65 | 5.2 | 10.1 | 0.51 |
| | M1-14 | mill | 5.37 | 8.7 | 2 | 2 | 0.035 | 0.005 | 1.5 | 1.00 | 4.0 | 6.5 | 0.62 |
| | M1-13 | mill | 4.53 | 42.9 | 2 | 4 | 0.035 | 0.034 | 2 | 1.08 | 6.7 | 8.8 | 0.75 |
| | M1-5 | mill | 4.06 | 76.0 | 2 | 6 | 0.045 | 0.054 | 2 | 1.24 | 10.5 | 11.6 | 0.91 |
| **PH 1: Mill to E Cyn.** | | | | | | | | | | | | | |
| | M1-16 | mill | 5.44 | 11.3 | 2 | 2 | 0.035 | 0.005 | 1.5 | 1.13 | 4.8 | 7.1 | 0.68 |
| | M1-15 | mill | 5.66 | 4.3 | 2 | 2 | 0.035 | 0.005 | 1.5 | 0.70 | 2.4 | 5.1 | 0.47 |
| | M1-14 | mill | 5.39 | 18.9 | 2 | 2 | 0.035 | 0.005 | 1.5 | 1.45 | 7.1 | 8.5 | 0.84 |
| **PH 1: Offsite N/pond** | | | | | | | | | | | | | |
| | OS1-1 | offsite | 5.11 | 0.0 | 2 | 2 | 0.035 | 0.005 | 1.5 | 1.50 | 7.5 | 8.7 | 0.86 |
| | OS1-2 | offsite | 4.08 | 100.8 | 2 | 6 | 0.045 | 0.036 | 3 | 1.61 | 14.9 | 13.2 | 1.13 |

| Location / ID # | Type | Velocity, $V_{AVG}$ (fps) | $\tau$ (psf) | R / W | Bend coeff., $K_b$ | Bend shear, $\tau_b$ (psf) | $\theta$ (deg.) | $K_1$ | $C_V$ | $V_{SS}$ (ft/s) | Steep-channel $D_{50}$ (in) | Bottom $D_{50}$ (in) | Side slope $D_{50}$ (in) | Use D50 (in) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **PH 1: Mill to Ex. Tails** | | | | | | | | | | | | | | |
| M1-12 | mill | 1.92 | 0.25 | 6 | 1.43 | 0.35 | 26.6 | 0.72 | 1.13 | 2.57 | 1.88 | 0.9 | 1.1 | 2.5 |
| M1-11 | chute | 4.19 | 6.38 | 50 | 1.05 | 6.70 | 26.6 | 0.72 | 0.94 | 4.19 | 15.63 | 5.8 | 3.7 | 12.0 |
| M1-10 | mill | 2.07 | 0.28 | 6 | 1.43 | 0.41 | 26.6 | 0.72 | 1.13 | 2.77 | 2.27 | 1.0 | 1.3 | 2.5 |
| M1-8 | mill | 2.72 | 0.47 | 6 | 1.43 | 0.67 | 26.6 | 0.72 | 1.13 | 3.63 | 4.54 | 1.8 | 2.3 | 2.5 |
| M1-7 | mill | 2.34 | 0.36 | 6 | 1.43 | 0.51 | 26.6 | 0.72 | 1.13 | 3.13 | 3.09 | 1.3 | 1.7 | 2.5 |
| M1-6 | chute | 5.96 | 10.22 | 50 | 1.05 | 10.73 | 18.4 | 0.87 | 0.94 | 5.96 | 25.23 | 10.1 | 6.4 | 24.0 |
| M1-14 | mill | 2.18 | 0.31 | 6 | 1.43 | 0.45 | 26.6 | 0.72 | 1.13 | 2.91 | 2.57 | 1.1 | 1.5 | 2.5 |
| M1-13 | mill | 6.44 | 2.26 | 6 | 1.43 | 3.24 | 26.6 | 0.72 | 1.13 | 8.60 | 13.47 | 16.4 | 21.5 | 24.0 |
| M1-5 | mill | 7.22 | 4.19 | 6 | 1.43 | 5.99 | 26.6 | 0.72 | 1.13 | 9.64 | 19.62 | 21.1 | 27.6 | 24.0 |
| **PH 1: Mill to E Cyn.** | | | | | | | | | | | | | | |
| M1-16 | mill | 2.33 | 0.35 | 6 | 1.43 | 0.51 | 26.6 | 0.72 | 1.13 | 3.11 | 3.05 | 1.3 | 1.7 | 2.5 |
| M1-15 | mill | 1.80 | 0.22 | 6 | 1.43 | 0.31 | 26.6 | 0.72 | 1.13 | 2.41 | 1.61 | 0.8 | 1.0 | 2.5 |
| M1-14 | mill | 2.67 | 0.45 | 6 | 1.43 | 0.65 | 26.6 | 0.72 | 1.13 | 3.56 | 4.31 | 1.7 | 2.2 | 2.5 |
| **PH 1: Offsite N/pond** | | | | | | | | | | | | | | |
| OS1-1 | offsite | 2.72 | 0.47 | 6 | 1.43 | 0.67 | 26.6 | 0.72 | 1.13 | 3.63 | 0.00 | 1.7 | 2.3 | 2.5 |
| OS1-2 | offsite | 6.77 | 3.61 | 6 | 1.43 | 5.17 | 26.6 | 0.72 | 1.13 | 9.04 | 18.86 | 16.8 | 22.0 | 24.0 |

| Location / ID # | | Type | Drainage Area (ac) | Cum. Area (ac) | Ridgeline Elev. (ft) | Outlet Elev. (ft) | Basin Relief, H (ft) | $T_c$ Path Length (ft) | Channel Length (ft) | Kirpich's $T_c$ (min) | $T_c$ + $T_t$ at head (min) | Use $T_c$ (min) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **PH 2: S Cell - W Side** | | | | | | | | | | | | |
| | F2-1A | lateral | 1.86 | 1.86 | | | | | n/a | 0.00 | n/a | 5.00 |
| | F2-1B | lateral | 1.13 | 1.13 | | | | | n/a | 0.00 | n/a | 5.00 |
| | F2-1 | ford | 0.00 | 2.99 | | | | | n/a | 0.00 | n/a | 5.00 |
| | F2-2A | rundown | 2.08 | 2.08 | | | | | 26 | 0.00 | n/a | 5.00 |
| | F2-2B | lateral | 1.13 | 1.13 | | | | | n/a | 0.00 | n/a | 5.00 |
| | F2-2C | lateral | 0.61 | 0.61 | | | | | n/a | 0.00 | n/a | 5.00 |
| | F2-2 | ford | 0.00 | 3.82 | | | | | n/a | 0.00 | n/a | 5.00 |
| | F2-3A | rundown | 1.14 | 1.14 | | | | | 32 | 0.00 | n/a | 5.00 |
| | F2-3B | lateral | 0.51 | 0.51 | | | | | n/a | 0.00 | n/a | 5.00 |
| | F2-3 | ford | 0.00 | 1.65 | | | | | n/a | 0.00 | n/a | 5.00 |
| | F2-4A | rundown | 4.74 | 4.74 | | | | | 69 | 0.00 | n/a | 5.00 |
| | F2-4B | lateral | 0.24 | 0.24 | | | | | n/a | 0.00 | n/a | 5.00 |
| | F2-4C | lateral | 0.15 | 0.15 | | | | | n/a | 0.00 | n/a | 5.00 |
| | F2-4 | ford | 0.00 | 5.14 | | | | | n/a | 0.00 | n/a | 5.00 |
| | F2-5A | rundown | 1.82 | 1.82 | | | | | 28 | 0.00 | n/a | 5.00 |
| | F2-5B | lateral | 0.68 | 0.68 | | | | | n/a | 0.00 | n/a | 5.00 |
| | F2-5C | lateral | 0.23 | 0.23 | | | | | n/a | 0.00 | n/a | 5.00 |
| | F2-5 | ford | 0.00 | 2.73 | | | | | n/a | 0.00 | n/a | 5.00 |
| | F2-6A | rundown | 0.27 | 0.27 | | | | | 20 | 0.00 | n/a | 5.00 |
| | F2-6B | lateral | 1.81 | 1.81 | | | | | n/a | 0.00 | n/a | 5.00 |
| | F2-6C | lateral | 1.04 | 1.04 | | | | | n/a | 0.00 | n/a | 5.00 |
| | F2-6 | ford | 0.00 | 3.12 | | | | | n/a | 0.00 | n/a | 5.00 |

| Location / ID # | Type | Rainfall Intensity, I (in/hr) | Discharge, $Q_{100}$ (cfs) | Side slope, z | Base width, B (ft) | Rough-ness, n | Slope, S (ft/ft) | Built Depth, D (ft) | Flow Depth, y (ft) | Area, $A_{chl}$ ($ft^2$) | Wetted Perimeter, P (ft) | Hydraulic Radius, R (ft) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **PH 2: S Cell - W Side** | | | | | | | | | | | | |
| F2-1A | lateral | 5.66 | 9.5 | 2 | 4 | 0.035 | 0.004 | 1 | 0.85 | 4.8 | 7.8 | 0.62 |
| F2-1B | lateral | 5.66 | 5.8 | 2 | 4 | 0.035 | 0.004 | 1 | 0.65 | 3.4 | 6.9 | 0.50 |
| F2-1 | ford | 5.66 | 15.2 | 6 | 0 | 0.013 | 0.010 | 1 | 0.68 | 2.8 | 8.3 | 0.33 |
| F2-2A | rundown | 5.66 | 10.6 | 2 | 6 | 0.080 | 0.010 | 1.5 | 0.92 | 7.2 | 10.1 | 0.71 |
| F2-2B | lateral | 5.66 | 5.7 | 2 | 4 | 0.035 | 0.004 | 1 | 0.65 | 3.4 | 6.9 | 0.50 |
| F2-2C | lateral | 5.66 | 3.1 | 2 | 4 | 0.035 | 0.004 | 1 | 0.46 | 2.2 | 6.0 | 0.37 |
| F2-2 | ford | 5.66 | 19.5 | 6 | 0 | 0.013 | 0.010 | 1 | 0.74 | 3.3 | 9.1 | 0.37 |
| F2-3A | rundown | 5.66 | 5.8 | 2 | 6 | 0.080 | 0.010 | 1.5 | 0.65 | 4.8 | 8.9 | 0.53 |
| F2-3B | lateral | 5.66 | 2.6 | 2 | 4 | 0.035 | 0.004 | 1 | 0.41 | 2.0 | 5.8 | 0.34 |
| F2-3 | ford | 5.66 | 8.4 | 6 | 0 | 0.013 | 0.010 | 1 | 0.54 | 1.8 | 6.6 | 0.27 |
| F2-4A | rundown | 5.66 | 24.2 | 2 | 6 | 0.080 | 0.010 | 1.5 | 1.44 | 12.8 | 12.4 | 1.03 |
| F2-4B | lateral | 5.66 | 1.2 | 2 | 4 | 0.035 | 0.004 | 1 | 0.27 | 1.2 | 5.2 | 0.23 |
| F2-4C | lateral | 5.66 | 0.8 | 2 | 4 | 0.035 | 0.004 | 1 | 0.20 | 0.9 | 4.9 | 0.18 |
| F2-4 | ford | 5.66 | 26.2 | 6 | 0 | 0.013 | 0.010 | 1 | 0.83 | 4.1 | 10.1 | 0.41 |
| F2-5A | rundown | 5.66 | 9.3 | 2 | 6 | 0.080 | 0.010 | 1.5 | 0.85 | 6.5 | 9.8 | 0.67 |
| F2-5B | lateral | 5.66 | 3.5 | 2 | 4 | 0.035 | 0.004 | 1 | 0.49 | 2.4 | 6.2 | 0.39 |
| F2-5C | lateral | 5.66 | 1.2 | 2 | 4 | 0.035 | 0.004 | 1 | 0.26 | 1.2 | 5.2 | 0.23 |
| F2-5 | ford | 5.66 | 13.9 | 6 | 0 | 0.013 | 0.010 | 1 | 0.66 | 2.6 | 8.0 | 0.32 |
| F2-6A | rundown | 5.66 | 1.4 | 2 | 6 | 0.080 | 0.010 | 1.5 | 0.28 | 1.8 | 7.3 | 0.25 |
| F2-6B | lateral | 5.66 | 9.2 | 2 | 4 | 0.035 | 0.004 | 1 | 0.84 | 4.7 | 7.7 | 0.61 |
| F2-6C | lateral | 5.66 | 5.3 | 2 | 4 | 0.035 | 0.004 | 1 | 0.62 | 3.2 | 6.8 | 0.48 |
| F2-6 | ford | 5.66 | 15.9 | 6 | 0 | 0.013 | 0.010 | 1 | 0.69 | 2.9 | 8.4 | 0.34 |

| Location / ID # | Type | Velocity, $V_{AVG}$ (fps) | $\tau$ (psf) | R / W | Bend coeff., $K_b$ | Bend shear, $\tau_b$ (psf) | $\theta$ (deg.) | $K_1$ | $C_V$ | $V_{SS}$ (ft/s) | Steep-channel $D_{50}$ (in) | Bottom $D_{50}$ (in) | Side slope $D_{50}$ (in) | Use D50 (in) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **PH 2: S Cell - W Side** | | | | | | | | | | | | | | |
| F2-1A | lateral | 1.95 | 0.21 | 12 | 1.05 | 0.22 | 26.6 | 0.72 | 1.07 | 2.30 | 1.51 | 0.8 | 0.8 | 2.5 |
| F2-1B | lateral | 1.68 | 0.16 | 12 | 1.05 | 0.17 | 26.6 | 0.72 | 1.07 | 1.99 | 1.09 | 0.6 | 0.6 | 2.5 |
| F2-1 | ford | 5.51 | 0.42 | 50 | 1.05 | 0.44 | 9.5 | 0.97 | 0.94 | 5.51 | 0.00 | 7.2 | 4.6 | 9.0 |
| F2-2A | rundown | 1.48 | 0.57 | 3 | 1.85 | 1.06 | 26.6 | 0.72 | 1.19 | 2.21 | 2.07 | 0.5 | 0.8 | 6.0 |
| F2-2B | lateral | 1.68 | 0.16 | 12 | 1.05 | 0.17 | 26.6 | 0.72 | 1.07 | 1.98 | 1.08 | 0.6 | 0.6 | 2.5 |
| F2-2C | lateral | 1.39 | 0.11 | 12 | 1.05 | 0.12 | 26.6 | 0.72 | 1.07 | 1.64 | 0.72 | 0.4 | 0.4 | 2.5 |
| F2-2 | ford | 5.86 | 0.46 | 50 | 1.05 | 0.49 | 9.5 | 0.97 | 0.94 | 5.86 | 0.00 | 8.2 | 5.2 | 9.0 |
| F2-3A | rundown | 1.22 | 0.41 | 3 | 1.85 | 0.75 | 26.6 | 0.72 | 1.19 | 1.83 | 1.39 | 0.3 | 0.5 | 6.0 |
| F2-3B | lateral | 1.31 | 0.10 | 12 | 1.05 | 0.11 | 26.6 | 0.72 | 1.07 | 1.54 | 0.64 | 0.4 | 0.4 | 2.5 |
| F2-3 | ford | 4.75 | 0.34 | 50 | 1.05 | 0.36 | 9.5 | 0.97 | 0.94 | 4.75 | 0.00 | 5.3 | 3.3 | 6.0 |
| F2-4A | rundown | 1.89 | 0.90 | 3 | 1.85 | 1.66 | 26.6 | 0.72 | 1.19 | 2.82 | 3.58 | 0.8 | 1.3 | 6.0 |
| F2-4B | lateral | 1.01 | 0.07 | 12 | 1.05 | 0.07 | 26.6 | 0.72 | 1.07 | 1.19 | 0.38 | 0.2 | 0.2 | 2.5 |
| F2-4C | lateral | 0.87 | 0.05 | 12 | 1.05 | 0.05 | 26.6 | 0.72 | 1.07 | 1.02 | 0.29 | 0.2 | 0.2 | 2.5 |
| F2-4 | ford | 6.31 | 0.52 | 50 | 1.05 | 0.54 | 9.5 | 0.97 | 0.94 | 6.31 | 0.00 | 9.6 | 6.1 | 12.0 |
| F2-5A | rundown | 1.42 | 0.53 | 3 | 1.85 | 0.98 | 26.6 | 0.72 | 1.19 | 2.12 | 1.89 | 0.4 | 0.7 | 6.0 |
| F2-5B | lateral | 1.44 | 0.12 | 12 | 1.05 | 0.13 | 26.6 | 0.72 | 1.07 | 1.70 | 0.78 | 0.4 | 0.4 | 2.5 |
| F2-5C | lateral | 1.00 | 0.07 | 12 | 1.05 | 0.07 | 26.6 | 0.72 | 1.07 | 1.18 | 0.38 | 0.2 | 0.2 | 2.5 |
| F2-5 | ford | 5.39 | 0.41 | 50 | 1.05 | 0.43 | 9.5 | 0.97 | 0.94 | 5.39 | 0.00 | 6.9 | 4.4 | 9.0 |
| F2-6A | rundown | 0.74 | 0.17 | 3 | 1.85 | 0.32 | 26.6 | 0.72 | 1.19 | 1.11 | 0.53 | 0.1 | 0.2 | 6.0 |
| F2-6B | lateral | 1.94 | 0.21 | 12 | 1.05 | 0.22 | 26.6 | 0.72 | 1.07 | 2.28 | 1.48 | 0.8 | 0.8 | 2.5 |
| F2-6C | lateral | 1.64 | 0.15 | 12 | 1.05 | 0.16 | 26.6 | 0.72 | 1.07 | 1.94 | 1.03 | 0.6 | 0.6 | 2.5 |
| F2-6 | ford | 5.57 | 0.43 | 50 | 1.05 | 0.45 | 9.5 | 0.97 | 0.94 | 5.57 | 0.00 | 7.4 | 4.7 | 9.0 |

| Location / ID # | Type | Drainage Area (ac) | Cum. Area (ac) | Ridgeline Elev. (ft) | Outlet Elev. (ft) | Basin Relief, H (ft) | $T_c$ Path Length (ft) | Channel Length (ft) | Kirpich's $T_c$ (min) | $T_c + T_t$ at head (min) | Use $T_c$ (min) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **PH 2: N Cell - W Side** | | | | | | | | | | | |
| F2-7A | lateral | 2.19 | 2.19 | | | | | n/a | 0.00 | n/a | 5.00 |
| F2-7B | lateral | 2.21 | 2.21 | | | | | n/a | 0.00 | n/a | 5.00 |
| F2-7 | ford | 0.00 | 4.41 | | | | | n/a | 0.00 | n/a | 5.00 |
| F2-8A | half-lateral | 2.38 | 1.19 | | | | | n/a | 0.00 | n/a | 5.00 |
| F2-8 | ford | 0.00 | 2.38 | | | | | n/a | 0.00 | n/a | 5.00 |
| F2-9A | half-lateral | 2.08 | 1.04 | | | | | n/a | 0.00 | n/a | 5.00 |
| F2-9 | ford | 0.00 | 2.08 | | | | | n/a | 0.00 | n/a | 5.00 |
| F2-10A | half-lateral | 1.84 | 0.92 | | | | | n/a | 0.00 | n/a | 5.00 |
| F2-10 | ford | 0.00 | 1.84 | | | | | n/a | 0.00 | n/a | 5.00 |
| **PH 2: N Cell - N Side** | | | | | | | | | | | |
| F2-11A | rundown | 2.14 | 2.14 | | | | | 264 | 0.00 | n/a | 5.00 |
| F2-11B | lateral | 0.36 | 0.36 | | | | | n/a | 0.00 | n/a | 5.00 |
| F2-11C | lateral | 0.83 | 0.83 | | | | | n/a | 0.00 | n/a | 5.00 |
| F2-11 | ford | 0.00 | 3.33 | | | | | n/a | 0.00 | n/a | 5.00 |
| F2-12A | rundown | 2.67 | 2.67 | | | | | 43 | 0.00 | n/a | 5.00 |
| F2-12B | lateral | 0.27 | 0.27 | | | | | n/a | 0.00 | n/a | 5.00 |
| F2-12C | lateral | 0.35 | 0.35 | | | | | n/a | 0.00 | n/a | 5.00 |
| F2-12 | ford | 0.00 | 3.29 | | | | | n/a | 0.00 | n/a | 5.00 |
| F2-13A | half-lateral | 2.04 | 1.02 | | | | | n/a | 0.00 | n/a | 5.00 |
| F2-13 | ford | 0.00 | 2.04 | | | | | n/a | 0.00 | n/a | 5.00 |
| OS2-2 (A) | offsite | 27.43 | 27.43 | 4654 | 4500 | 154 | 2970 | 508 | 11.52 | 11.52 | 11.52 |
| F2-14A (A) | offsite | 2.44 | 29.87 | | | | | 440 | 0.00 | 11.52 | 11.52 |
| OS2-1 (B) | offsite | 23.21 | 0.00 | 4574 | 4500 | 74 | 1518 | 219 | 7.04 | 7.04 | 7.04 |
| F2-14B | lateral | 0.67 | 0.67 | | | | | n/a | 0.00 | n/a | 5.00 |
| F2-14 | ford | 0.00 | 30.54 | | | | | n/a | 0.00 | 12.58 | 12.58 |

Note A: Constructed as OS1-2 in Phase 1

Note B: Natural channel, no improvements.  Sump does not contribute runoff for 100-year event.

| Location / ID # | Type | Rainfall Intensity, I (in/hr) | Discharge, $Q_{100}$ (cfs) | Side slope, z | Base width, B (ft) | Rough-ness, n | Slope, S (ft/ft) | Built Depth, D (ft) | Flow Depth, y (ft) | Area, $A_{chl}$ ($ft^2$) | Wetted Perimeter, P (ft) | Hydraulic Radius, R (ft) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **PH 2: N Cell - W Side** | | | | | | | | | | | | |
| F2-7A | lateral | 5.66 | 11.2 | 2 | 4 | 0.035 | 0.004 | 1 | 0.93 | 5.4 | 8.2 | 0.67 |
| F2-7B | lateral | 5.66 | 11.3 | 2 | 4 | 0.035 | 0.004 | 1 | 0.93 | 5.5 | 8.2 | 0.67 |
| F2-7 | ford | 5.66 | 22.4 | 6 | 0 | 0.013 | 0.010 | 1 | 0.78 | 3.7 | 9.5 | 0.39 |
| F2-8A | half-lateral | 5.66 | 6.1 | 2 | 4 | 0.035 | 0.004 | 1 | 0.67 | 3.5 | 7.0 | 0.51 |
| F2-8 | ford | 5.66 | 12.1 | 6 | 0 | 0.013 | 0.010 | 1 | 0.62 | 2.3 | 7.6 | 0.31 |
| F2-9A | half-lateral | 5.66 | 5.3 | 2 | 4 | 0.035 | 0.004 | 1 | 0.62 | 3.2 | 6.8 | 0.48 |
| F2-9 | ford | 5.66 | 10.6 | 6 | 0 | 0.013 | 0.010 | 1 | 0.59 | 2.1 | 7.2 | 0.29 |
| F2-10A | half-lateral | 5.66 | 4.7 | 2 | 4 | 0.035 | 0.004 | 1 | 0.58 | 3.0 | 6.6 | 0.45 |
| F2-10 | ford | 5.66 | 9.4 | 6 | 0 | 0.013 | 0.010 | 1 | 0.57 | 1.9 | 6.9 | 0.28 |
| **PH 2: N Cell - N Side** | | | | | | | | | | | | |
| F2-11A | rundown | 5.66 | 10.9 | 2 | 6 | 0.080 | 0.010 | 1.5 | 0.93 | 7.3 | 10.2 | 0.72 |
| F2-11B | lateral | 5.66 | 1.8 | 2 | 4 | 0.035 | 0.004 | 1 | 0.34 | 1.6 | 5.5 | 0.29 |
| F2-11C | lateral | 5.66 | 4.2 | 2 | 4 | 0.035 | 0.004 | 1 | 0.54 | 2.8 | 6.4 | 0.43 |
| F2-11 | ford | 5.66 | 16.9 | 6 | 0 | 0.013 | 0.010 | 1 | 0.71 | 3.0 | 8.6 | 0.35 |
| F2-12A | rundown | 5.66 | 13.6 | 2 | 6 | 0.080 | 0.010 | 1.5 | 1.05 | 8.5 | 10.7 | 0.80 |
| F2-12B | lateral | 5.66 | 1.4 | 2 | 4 | 0.035 | 0.004 | 1 | 0.28 | 1.3 | 5.3 | 0.25 |
| F2-12C | lateral | 5.66 | 1.8 | 2 | 4 | 0.035 | 0.004 | 1 | 0.33 | 1.6 | 5.5 | 0.28 |
| F2-12 | ford | 5.66 | 16.8 | 6 | 0 | 0.013 | 0.010 | 1 | 0.70 | 3.0 | 8.6 | 0.35 |
| F2-13A | half-lateral | 5.66 | 5.2 | 2 | 4 | 0.035 | 0.004 | 1 | 0.61 | 3.2 | 6.7 | 0.47 |
| F2-13 | ford | 5.66 | 10.4 | 6 | 0 | 0.013 | 0.010 | 1 | 0.59 | 2.1 | 7.2 | 0.29 |
| OS2-2 (A) | offsite | 4.08 | 100.8 | 2 | 6 | 0.045 | 0.036 | 3 | 1.61 | 14.9 | 13.2 | 1.13 |
| F2-14A (A) | offsite | 4.08 | 109.7 | 2 | 6 | 0.045 | 0.036 | 3 | 1.69 | 15.8 | 13.5 | 1.17 |
| OS2-1 (B) | offsite | 5.11 | 0.0 | 2 | 2 | 0.035 | 0.146 | 3 | 1.48 | 7.3 | 8.6 | 0.85 |
| F2-14B | lateral | 5.66 | 3.4 | 2 | 4 | 0.035 | 0.004 | 1 | 0.48 | 2.4 | 6.2 | 0.39 |
| F2-14 | ford | 3.92 | 107.8 | 6 | 8 | 0.013 | 0.010 | 1 | 0.93 | 12.6 | 19.3 | 0.65 |

| Location / ID # | Type | Velocity, $V_{AVG}$ (fps) | $\tau$ (psf) | R / W | Bend coeff., $K_b$ | Bend shear, $\tau_b$ (psf) | $\theta$ (deg.) | $K_1$ | $C_V$ | $V_{SS}$ (ft/s) | Steep-channel $D_{50}$ (in) | Bottom $D_{50}$ (in) | Side slope $D_{50}$ (in) | Use D50 (in) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **PH 2: N Cell - W Side** | | | | | | | | | | | | | | |
| F2-7A | lateral | 2.05 | 0.23 | 12 | 1.05 | 0.24 | 26.6 | 0.72 | 1.07 | 2.42 | 1.69 | 0.9 | 0.9 | 2.5 |
| F2-7B | lateral | 2.06 | 0.23 | 12 | 1.05 | 0.24 | 26.6 | 0.72 | 1.07 | 2.42 | 1.70 | 0.9 | 0.9 | 2.5 |
| F2-7 | ford | 6.07 | 0.49 | 50 | 1.05 | 0.51 | 9.5 | 0.97 | 0.94 | 6.07 | 0.00 | 8.9 | 5.6 | 9.0 |
| F2-8A | half-lateral | 1.71 | 0.17 | 12 | 1.05 | 0.17 | 26.6 | 0.72 | 1.07 | 2.02 | 1.12 | 0.6 | 0.6 | 2.5 |
| F2-8 | ford | 5.21 | 0.39 | 50 | 1.05 | 0.41 | 9.5 | 0.97 | 0.94 | 5.21 | 0.00 | 6.4 | 4.1 | 9.0 |
| F2-9A | half-lateral | 1.64 | 0.15 | 12 | 1.05 | 0.16 | 26.6 | 0.72 | 1.07 | 1.93 | 1.03 | 0.6 | 0.6 | 2.5 |
| F2-9 | ford | 5.03 | 0.37 | 50 | 1.05 | 0.39 | 9.5 | 0.97 | 0.94 | 5.03 | 0.00 | 5.9 | 3.8 | 6.0 |
| F2-10A | half-lateral | 1.58 | 0.14 | 12 | 1.05 | 0.15 | 26.6 | 0.72 | 1.07 | 1.86 | 0.94 | 0.5 | 0.5 | 2.5 |
| F2-10 | ford | 4.88 | 0.35 | 50 | 1.05 | 0.37 | 9.5 | 0.97 | 0.94 | 4.88 | 0.00 | 5.6 | 3.5 | 6.0 |
| **PH 2: N Cell - N Side** | | | | | | | | | | | | | | |
| F2-11A | rundown | 1.49 | 0.58 | 3 | 1.85 | 1.07 | 26.6 | 0.72 | 1.19 | 2.22 | 2.10 | 0.5 | 0.8 | 6.0 |
| F2-11B | lateral | 1.17 | 0.08 | 12 | 1.05 | 0.09 | 26.6 | 0.72 | 1.07 | 1.37 | 0.51 | 0.3 | 0.3 | 2.5 |
| F2-11C | lateral | 1.53 | 0.14 | 12 | 1.05 | 0.14 | 26.6 | 0.72 | 1.07 | 1.80 | 0.88 | 0.5 | 0.5 | 2.5 |
| F2-11 | ford | 5.66 | 0.44 | 50 | 1.05 | 0.46 | 9.5 | 0.97 | 0.94 | 5.66 | 0.00 | 7.6 | 4.8 | 9.0 |
| F2-12A | rundown | 1.60 | 0.66 | 3 | 1.85 | 1.21 | 26.6 | 0.72 | 1.19 | 2.38 | 2.44 | 0.5 | 0.9 | 6.0 |
| F2-12B | lateral | 1.06 | 0.07 | 12 | 1.05 | 0.07 | 26.6 | 0.72 | 1.07 | 1.24 | 0.42 | 0.2 | 0.2 | 2.5 |
| F2-12C | lateral | 1.16 | 0.08 | 12 | 1.05 | 0.09 | 26.6 | 0.72 | 1.07 | 1.36 | 0.50 | 0.3 | 0.3 | 2.5 |
| F2-12 | ford | 5.65 | 0.44 | 50 | 1.05 | 0.46 | 9.5 | 0.97 | 0.94 | 5.65 | 0.00 | 7.6 | 4.8 | 9.0 |
| F2-13A | half-lateral | 1.63 | 0.15 | 12 | 1.05 | 0.16 | 26.6 | 0.72 | 1.07 | 1.92 | 1.01 | 0.6 | 0.6 | 2.5 |
| F2-13 | ford | 5.01 | 0.37 | 50 | 1.05 | 0.39 | 9.5 | 0.97 | 0.94 | 5.01 | 0.00 | 5.9 | 3.7 | 6.0 |
| OS2-2 (A) | offsite | 6.77 | 3.61 | 6 | 1.43 | 5.17 | 26.6 | 0.72 | 1.13 | 9.05 | 18.86 | 16.9 | 22.0 | 24.0 |
| F2-14A (A) | offsite | 6.94 | 3.78 | 6 | 1.43 | 5.41 | 26.6 | 0.72 | 1.13 | 9.26 | 19.96 | 17.7 | 23.1 | 24.0 |
| OS2-1 (B) | offsite | 14.57 | 13.5 | 6 | 1.43 | 19.27 | 26.6 | 0.72 | 1.13 | 19.46 | 0.00 | 116.9 | 152.7 | 84.0 |
| F2-14B | lateral | 1.43 | 0.12 | 12 | 1.05 | 0.13 | 26.6 | 0.72 | 1.07 | 1.69 | 0.77 | 0.4 | 0.4 | 2.5 |
| F2-14 | ford | 8.59 | 0.58 | 50 | 1.05 | 0.61 | 9.5 | 0.97 | 0.94 | 8.59 | 0.00 | 20.2 | 12.8 | 24.0 |

| Location / ID # | Type | Drainage Area (ac) | Cum. Area (ac) | Ridgeline Elev. (ft) | Outlet Elev. (ft) | Basin Relief, H (ft) | $T_c$ Path Length (ft) | Channel Length (ft) | Kirpich's $T_c$ (min) | $T_c + T_t$ at head (min) | Use $T_c$ (min) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **PH 2: N Cell - E Side** | | | | | | | | | | | |
| F2-16A | half-lateral | 1.01 | 0.51 | | | | | n/a | 0.00 | n/a | 5.00 |
| F2-16 | ford | 0.00 | 1.01 | | | | | n/a | 0.00 | n/a | 5.00 |
| F2-17A | half-lateral | 0.42 | 0.21 | | | | | n/a | 0.00 | n/a | 5.00 |
| F2-17 | ford | 0.00 | 0.42 | | | | | n/a | 0.00 | n/a | 5.00 |
| F2-18A | half-lateral | 0.88 | 0.44 | | | | | n/a | 0.00 | n/a | 5.00 |
| F2-18 (C) | ford | 18.31 | 19.19 | | | | | n/a | 0.00 | 10.40 | 10.40 |
| F2-19A | half-lateral | 0.76 | 0.38 | | | | | n/a | 0.00 | n/a | 5.00 |
| F2-19 | ford | 0.00 | 0.76 | | | | | n/a | 0.00 | n/a | 5.00 |
| F2-20A (D) | mill | 3.60 | 3.60 | | | | | 543 | 0.00 | n/a | 5.00 |
| F2-20B | lateral | 0.13 | 0.13 | | | | | n/a | 0.00 | n/a | 5.00 |
| F2-20 | ford | 0.00 | 3.73 | | | | | n/a | 0.00 | n/a | 5.00 |
| F2-21A | half-lateral | 3.51 | 1.76 | | | | | n/a | 0.00 | n/a | 5.00 |
| F2-21 (E) | ford | 5.93 | 9.44 | | | | | n/a | 0.00 | 10.95 | 10.95 |
| **PH 2: S Cell - E Side** | | | | | | | | | | | |
| F1-8A | chute | 4.67 | 4.67 | 4548 | 4522 | 26 | 774 | 128 | 4.83 | n/a | 5.00 |
| F1-8B | lateral | 0.26 | 0.26 | 4540 | 4466 | 74 | 163 | n/a | 0.53 | n/a | 5.00 |
| F1-8C | lateral | 0.84 | 0.84 | 4524 | 4466 | 58 | 138 | n/a | 0.48 | n/a | 5.00 |
| F1-8 | ford | 0.00 | 5.76 | 0 | 0 | | 0 | n/a | 0.00 | n/a | 5.00 |
| F1-9A | half-lateral | 0.70 | 0.35 | 4554 | 4466 | 88 | 205 | n/a | 0.65 | n/a | 5.00 |
| F1-9 | ford | 0.00 | 0.70 | 0 | 0 | | 0 | n/a | 0.00 | n/a | 5.00 |
| F1-10A | half-lateral | 1.32 | 0.66 | 4552 | 4466 | 86 | 277 | n/a | 0.93 | n/a | 5.00 |
| F1-10 | ford | 0.00 | 1.32 | 0 | 0 | | 0 | n/a | 0.00 | n/a | 5.00 |

Note C: Includes drainage from M1-6 and M1-13
Note D: M2-1
Note E: Includes drainage from M1-2 and M1-4

| Location / ID # | Type | Rainfall Intensity, I (in/hr) | Discharge, $Q_{100}$ (cfs) | Side slope, z | Base width, B (ft) | Rough-ness, n | Slope, S (ft/ft) | Built Depth, D (ft) | Flow Depth, y (ft) | Area, $A_{chl}$ ($ft^2$) | Wetted Perimeter, P (ft) | Hydraulic Radius, R (ft) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **PH 2: N Cell - E Side** | | | | | | | | | | | | |
| F2-16A | half-lateral | 5.66 | 2.6 | 2 | 4 | 0.035 | 0.004 | 1 | 0.41 | 2.0 | 5.8 | 0.34 |
| F2-16 | ford | 5.66 | 5.2 | 6 | 0 | 0.013 | 0.010 | 1 | 0.45 | 1.2 | 5.5 | 0.22 |
| F2-17A | half-lateral | 5.66 | 1.1 | 2 | 4 | 0.035 | 0.004 | 1 | 0.25 | 1.1 | 5.1 | 0.22 |
| F2-17 | ford | 5.66 | 2.2 | 6 | 0 | 0.013 | 0.010 | 1 | 0.33 | 0.6 | 4.0 | 0.16 |
| F2-18A | half-lateral | 5.66 | 2.2 | 2 | 4 | 0.035 | 0.004 | 1 | 0.38 | 1.8 | 5.7 | 0.32 |
| F2-18 (C) | ford | 4.25 | 73.4 | 6 | 4 | 0.013 | 0.010 | 1 | 0.94 | 9.1 | 15.5 | 0.59 |
| F2-19A | half-lateral | 5.66 | 1.9 | 2 | 4 | 0.035 | 0.004 | 1 | 0.35 | 1.6 | 5.6 | 0.29 |
| F2-19 | ford | 5.66 | 3.9 | 6 | 0 | 0.013 | 0.010 | 1 | 0.41 | 1.0 | 4.9 | 0.20 |
| F2-20A (D) | mill | 5.66 | 18.3 | 2 | 4 | 0.035 | 0.029 | 1.5 | 0.71 | 3.8 | 7.2 | 0.53 |
| F2-20B | lateral | 5.66 | 0.7 | 2 | 4 | 0.035 | 0.004 | 1 | 0.19 | 0.8 | 4.8 | 0.17 |
| F2-20 | ford | 5.66 | 19.0 | 6 | 0 | 0.013 | 0.010 | 1 | 0.74 | 3.3 | 9.0 | 0.36 |
| F2-21A | half-lateral | 5.66 | 8.9 | 2 | 4 | 0.035 | 0.004 | 1 | 0.82 | 4.7 | 7.7 | 0.61 |
| F2-21 (E) | ford | 4.17 | 35.4 | 6 | 0 | 0.013 | 0.010 | 1 | 0.93 | 5.2 | 11.3 | 0.46 |
| **PH 2: S Cell - E Side** | | | | | | | | | | | | |
| F1-8A | chute | 5.66 | 23.8 | 3 | 6 | 0.080 | 0.438 | 2 | 0.48 | 3.6 | 9.0 | 0.40 |
| F1-8B | lateral | 5.66 | 1.3 | 2 | 4 | 0.035 | 0.004 | 1 | 0.28 | 1.3 | 5.2 | 0.24 |
| F1-8C | lateral | 5.66 | 4.3 | 2 | 4 | 0.035 | 0.004 | 1 | 0.55 | 2.8 | 6.4 | 0.43 |
| F1-8 | ford | 5.66 | 29.4 | 6 | 0 | 0.013 | 0.010 | 1 | 0.87 | 4.5 | 10.6 | 0.43 |
| F1-9A | half-lateral | 5.66 | 1.8 | 2 | 4 | 0.035 | 0.004 | 1 | 0.33 | 1.6 | 5.5 | 0.28 |
| F1-9 | ford | 5.66 | 3.6 | 6 | 0 | 0.013 | 0.010 | 1 | 0.39 | 0.9 | 4.8 | 0.19 |
| F1-10A | half-lateral | 5.66 | 3.4 | 2 | 4 | 0.035 | 0.004 | 1 | 0.48 | 2.4 | 6.1 | 0.39 |
| F1-10 | ford | 5.66 | 6.7 | 6 | 0 | 0.013 | 0.010 | 1 | 0.50 | 1.5 | 6.1 | 0.25 |

| Location / ID # | Type | Velocity, $V_{AVG}$ (fps) | $\tau$ (psf) | R / W | Bend coeff., $K_b$ | Bend shear, $\tau_b$ (psf) | $\theta$ (deg.) | $K_1$ | $C_V$ | $V_{SS}$ (ft/s) | Steep-channel $D_{50}$ (in) | Bottom $D_{50}$ (in) | Side slope $D_{50}$ (in) | Use D50 (in) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **PH 2: N Cell - E Side** | | | | | | | | | | | | | | |
| F2-16A | half-lateral | 1.31 | 0.10 | 12 | 1.05 | 0.11 | 26.6 | 0.72 | 1.07 | 1.54 | 0.64 | 0.4 | 0.4 | 2.5 |
| F2-16 | ford | 4.20 | 0.28 | 50 | 1.05 | 0.30 | 9.5 | 0.97 | 0.94 | 4.20 | 0.00 | 4.1 | 2.6 | 6.0 |
| F2-17A | half-lateral | 0.97 | 0.06 | 12 | 1.05 | 0.06 | 26.6 | 0.72 | 1.07 | 1.15 | 0.36 | 0.2 | 0.2 | 2.5 |
| F2-17 | ford | 3.38 | 0.20 | 50 | 1.05 | 0.21 | 9.5 | 0.97 | 0.94 | 3.38 | 0.00 | 2.6 | 1.6 | 3.0 |
| F2-18A | half-lateral | 1.25 | 0.09 | 12 | 1.05 | 0.10 | 26.6 | 0.72 | 1.07 | 1.47 | 0.58 | 0.3 | 0.3 | 2.5 |
| F2-18 (C) | ford | 8.04 | 0.59 | 50 | 1.05 | 0.62 | 9.5 | 0.97 | 0.94 | 8.04 | 0.00 | 17.0 | 10.8 | 18.0 |
| F2-19A | half-lateral | 1.19 | 0.09 | 12 | 1.05 | 0.09 | 26.6 | 0.72 | 1.07 | 1.40 | 0.53 | 0.3 | 0.3 | 2.5 |
| F2-19 | ford | 3.92 | 0.25 | 50 | 1.05 | 0.27 | 9.5 | 0.97 | 0.94 | 3.92 | 0.00 | 3.5 | 2.2 | 6.0 |
| F2-20A (D) | mill | 4.80 | 1.30 | 6 | 1.43 | 1.86 | 26.6 | 0.72 | 1.13 | 6.41 | 7.11 | 8.7 | 11.4 | 12.0 |
| F2-20B | lateral | 0.82 | 0.05 | 12 | 1.05 | 0.05 | 26.6 | 0.72 | 1.07 | 0.97 | 0.26 | 0.1 | 0.1 | 2.5 |
| F2-20 | ford | 5.83 | 0.46 | 50 | 1.05 | 0.48 | 9.5 | 0.97 | 0.94 | 5.83 | 0.00 | 8.1 | 5.1 | 9.0 |
| F2-21A | half-lateral | 1.92 | 0.21 | 12 | 1.05 | 0.22 | 26.6 | 0.72 | 1.07 | 2.27 | 1.46 | 0.8 | 0.8 | 2.5 |
| F2-21 (E) | ford | 6.80 | 0.58 | 50 | 1.05 | 0.61 | 9.5 | 0.97 | 0.94 | 6.80 | 0.00 | 11.3 | 7.2 | 12.0 |
| **PH 2: S Cell - E Side** | | | | | | | | | | | | | | |
| F1-8A | chute | 6.63 | 13.15 | 50 | 1.05 | 13.81 | 18.4 | 0.87 | 0.94 | 6.63 | 28.85 | 14.2 | 9.0 | 24.0 |
| F1-8B | lateral | 1.04 | 0.07 | 12 | 1.05 | 0.07 | 26.6 | 0.72 | 1.07 | 1.22 | 0.40 | 0.2 | 0.2 | 2.5 |
| F1-8C | lateral | 1.53 | 0.14 | 12 | 1.05 | 0.14 | 26.6 | 0.72 | 1.07 | 1.81 | 0.89 | 0.5 | 0.5 | 2.5 |
| F1-8 | ford | 6.49 | 0.54 | 50 | 1.05 | 0.57 | 9.5 | 0.97 | 0.94 | 6.49 | 0.00 | 10.2 | 6.5 | 12.0 |
| F1-9A | half-lateral | 1.16 | 0.08 | 12 | 1.05 | 0.09 | 26.6 | 0.72 | 1.07 | 1.36 | 0.50 | 0.3 | 0.3 | 2.5 |
| F1-9 | ford | 3.84 | 0.25 | 50 | 1.05 | 0.26 | 9.5 | 0.97 | 0.94 | 3.84 | 0.00 | 3.3 | 2.1 | 6.0 |
| F1-10A | half-lateral | 1.42 | 0.12 | 12 | 1.05 | 0.13 | 26.6 | 0.72 | 1.07 | 1.68 | 0.76 | 0.4 | 0.4 | 2.5 |
| F1-10 | ford | 4.49 | 0.31 | 50 | 1.05 | 0.33 | 9.5 | 0.97 | 0.94 | 4.49 | 0.00 | 4.7 | 3.0 | 6.0 |

# APPENDIX G.2
# TAILINGS CELL FREEBOARD CALCULATIONS

**TETRA TECH**

| | | | | | |
|---|---|---|---|---|---|
| | CLIENT: Uranium One | MADE BY: | EKB | DATE: | 4/10/2008 |
| JOB TITLE: | Shootaring Mill Operations | CHECKED: | | JOB NUMBER: | 114-181692 |
| SUBJECT: | PMP Estimation | APPROVED: | | SHEET: | 1 of 1 |

**Local Storm PMP Calculations:**

HMR 49 Step:

6.3A Local storm PMP computation

1. Average 1-hr, 1-mi$^2$ PMP for drainage [fig. 4.5] 8.3 in.

2. a. Reduction for elevation [5% per 1000' above 5000'] 0.0 %
   b. step 1 x (100 - 2a). 8.3 in

3. Average 6/1-hr ratio for drainage [fig 4.7] 1.10

DURATION (HRS)

| | | 0.25 | 0.5 | 0.75 | 1 | 2 | 3 | 4 | 5 | 6 | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 4. | Durational variation for 6/1-hr ratio of step 3 [table 4.4] | 86 | 93 | 97 | 100 | 107 | 109 | 110 | 110 | 110 | % |
| 5. | 1-mi$^2$ PMP for indicated durations [2b x 4] | 7.1 | 7.7 | 8.1 | 8.3 | 8.9 | 9.0 | 9.1 | 9.1 | 9.1 | in |
| 6. | Areal reduction [fig. 4.9] | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | % |
| 7. | Areal reduced PMP [5 x 6] | 7.1 | 7.7 | 8.1 | 8.3 | 8.9 | 9.0 | 9.1 | 9.1 | 9.1 | in |

8. Incremental PMP [successive subtraction of 7]

| | 1 | 2 | 3 | 4 | 5 | 6 | |
|---|---|---|---|---|---|---|---|
| | 8.3 | 0.6 | 0.2 | 0.1 | 0.0 | 0.0 | in |

| 1 | 2 | 3 | 4 | |
|---|---|---|---|---|
| 7.1 | 0.6 | 0.3 | 0.2 | } 15-min increments |

9. Time sequence of incremental PMP according to:

   a. HMR No. 5 Hourly increments [table 4.7]

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| order: | 5 | 3 | 1 | 2 | 4 | 6 | |
| | **0.0** | **0.2** | **8.3** | **0.6** | **0.1** | **0.0** | in |
| | **1** | **2** | **3** | **4** | **5** | **6** | hrs |

   b. EM-1110-2-1411 Hourly increments [table 4.7]

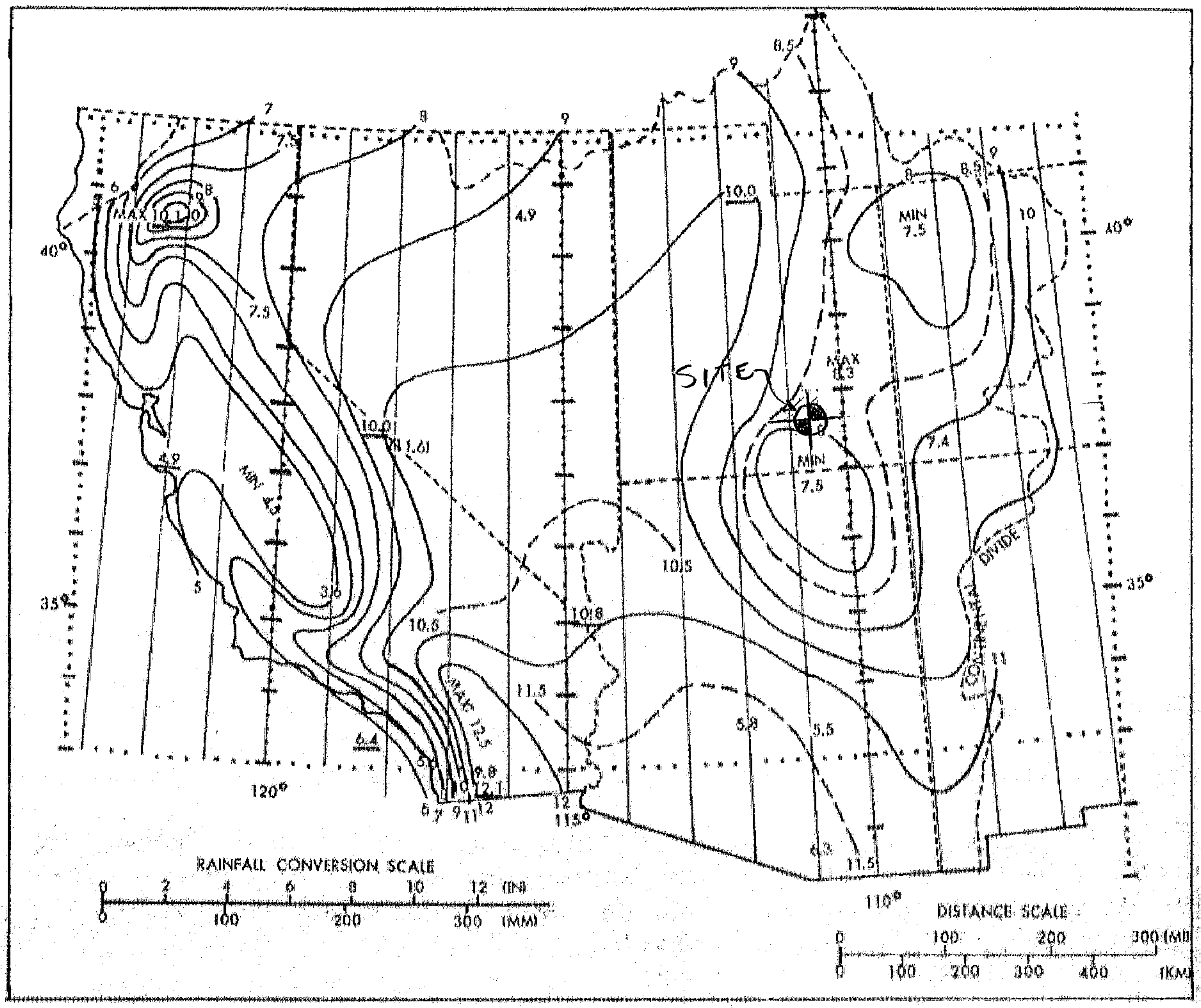
| | | | | | | | |
|---|---|---|---|---|---|---|---|
| order: | 6 | 4 | 2 | 1 | 3 | 5 | |
| | **0.0** | **0.1** | **0.6** | **8.3** | **0.2** | **0.0** | in |
| | **1** | **2** | **3** | **4** | **5** | **6** | hrs |

   c. Four largest 15-min increments [table 4.8]

| | | | | | |
|---|---|---|---|---|---|
| order: | 1 | 2 | 3 | 4 | |
| | **7.1** | **0.6** | **0.3** | **0.2** | in |
| | **0.25** | **0.50** | **0.75** | **1.00** | hrs |

Shootaring Mill PMP- Local Storm

1/6



1 mi², 1 hr. Local PMP = 8.3" (conservative)

*Figure 4.5--Local-storm PMP for 1 mi$^2$ (2.6 km$^2$) 1 hr. Directly applicable for locations between sea level and 5000 ft (1524 m). Elevation adjustment must be applied for locations above 5000 ft.*

events. In contrast to figure 4.4, figure 4.5 maintains a maximum between these two locations. There is no known meteorological basis for a different solution. The analysis suggests that in the northern portion of the region maximum PMP occurs between the Sierra Nevada on the west and the Wasatch range on the east.

A discrete maximum (> 10 inches, 254 mm) occurs at the north end of the Sacramento Valley in northern California because the northward-flowing moist air is increasingly channeled and forced upslope. Support for this PMP center comes from the Newton, Kennett, and Red Bluff storms (fig. 4.1). Although the analysis in this region appears to be an extension of the broad maximum through the center of the Southwestern Region, it does not indicate the direction of moist inflow. The pattern has evolved primarily as a result of attempts to tie plotted maxima into a reasonable picture while considering inflow directions, terrain effects, and moisture potential.

Shootaring Mill PMP-Local Storm

2/6

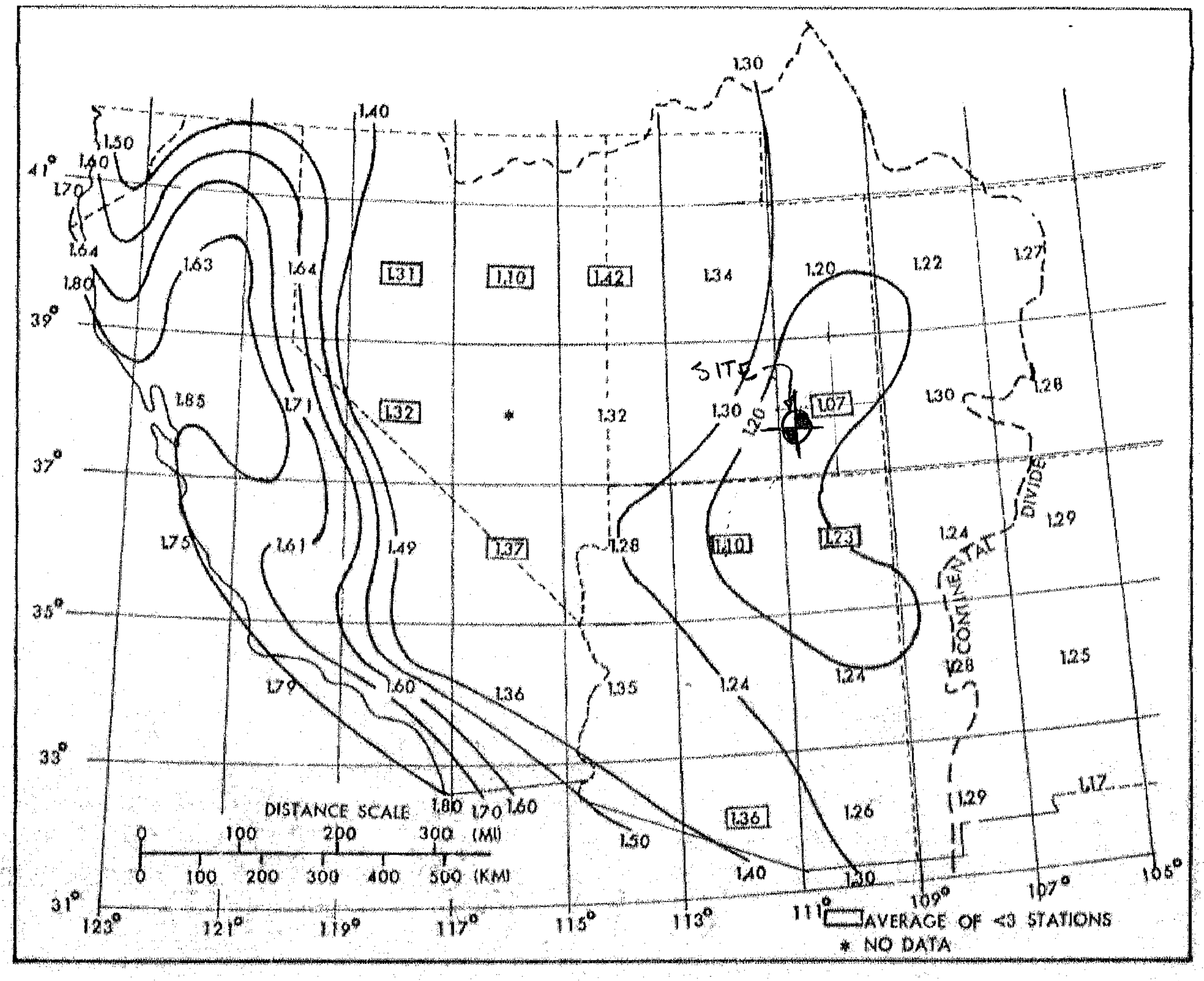


*Figure 4.7.--Analysis of 6/1-hr ratios of averaged maximum station data (plotted at midpoints of a 2° latitude-longitude grid).*

6/1-hr Ratio = 1.1

establish the basic depth-duration curve, then structure a variable set of depth-duration curves to cover the range of 6/1-hr ratios that are needed.

Three sets of data were considered for obtaining a base relation (see table 4.3 for depth-duration data).

a. An average of depth-duration relations from each of 17 greatest 3-hr rains from summer storms (1940-49) in Utah (U. S. Weather Bureau 1951b) and in unpublished tabulations for Nevada and Arizona (1940-63). The 3-hr amounts ranged from 1 to 3 inches (25 to 76 mm) in these events.

b. An average depth-duration relation from 14 of the most extreme short-duration storms listed in Storm Rainfall (U. S. Army, Corps of Engineers 1945- ). These storms come from Eastern and Central States and have 3-hr amounts of 5 to 22 inches (127 to 559 mm).

Shootaring Mill PMP—Local Storm

3/6

ratios than storms with high 3/1-hr ratios. The geographical distribution of 15-min to 1-hr ratios also were inversely correlated with magnitudes of the 6/1-hr ratios of figure 4.7. For example, Los Angeles and San Diego (high 6/1-hr ratios) have low 15-min to 1-hr ratios (approximately 0.60) whereas the 15-min to 1-hr ratios in Arizona and Utah (low 6/1-hr ratios) were generally higher (approximately 0.75).

Depth-duration relations for durations less than 1 hour were then smoothed to provide a family of curves consistent with the relations determined for 1 to 6 hours, as shown in figure 4.3. Adjustment was necessary to some of the curves to provide smoother relations through the common point at 1 hour.

We believe we were justified in reducing the number of the curves shown in figure 4.3 for durations less than 1 hour, letting one curve apply to a range of 6/1-hr ratios. The corresponding curves have been indicated by letter designators, A-D, on figure 4.3. As an example, for any 6-hr amount between 115% and 135% of 1-hr, 1-mi$^2$ (2.6-km$^2$) PMP, the associated values for durations less than 1 hour are obtained from the curve designated as "B".

Table 4.4 lists durational variations in percent of 1-hr PMP for selected 6/1-hr rain ratios. These values were interpolated from figure 4.3.

To determine 6-hr PMP for a basin, use figure 4.3 (or table 4.4) and the geographical distribution of 6/1-hr ratios given in figure 4.7.

Table 4.4.--Durational variation of 1-mi$^2$ (2.6-km$^2$) local-storm PMP in percent of 1-hr PMP (see figure 4.3)

| 6/1-hr ratio | Duration (hr) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | 1/4 | 1/2 | 3/4 | 1 | 2 | 3 | 4 | 5 | 6 |
| 1.1 | 86 | 93 | 97 | 100 | 107 | 109 | 110 | 110 | 110 |
| 1.2 | 74 | 89 | 95 | 100 | 110 | 115 | 118 | 119 | 120 |
| 1.3 | 74 | 89 | 95 | 100 | 114 | 121 | 125 | 128 | 130 |
| 1.4 | 63 | 83 | 93 | 100 | 118 | 126 | 132 | 137 | 140 |
| 1.5 | 63 | 83 | 93 | 100 | 121 | 132 | 140 | 145 | 150 |
| 1.6 | 43 | 70 | 87 | 100 | 124 | 138 | 147 | 154 | 160 |
| 1.8 | 43 | 70 | 87 | 100 | 130 | 149 | 161 | 171 | 180 |
| 2.0 | 43 | 70 | 87 | 100 | 137 | 161 | 175 | 188 | 200 |

## 4.5 Depth-Area Relation

We have thus far developed local-storm PMP for an area of 1 mi$^2$ (2.6 km$^2$). To apply PMP to a basin, we need to determine how 1-mi$^2$ (2.6-km$^2$) PMP should decrease with increasing area. We have adopted depth-area relations based on rainfalls in the Southwest and from consideration of a model thunderstorm.

Shootaring Mill PMP- Local Storm

4/6

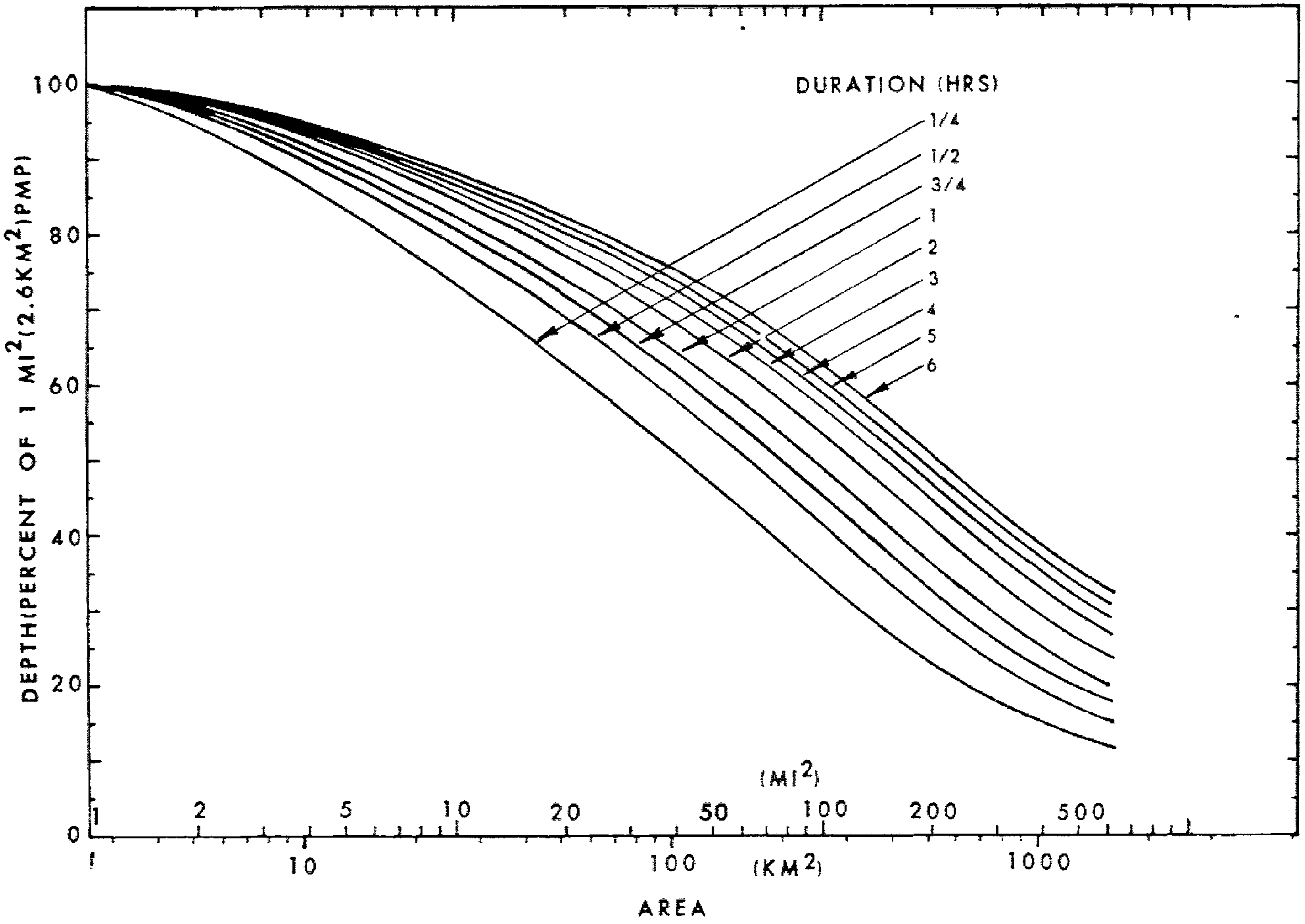
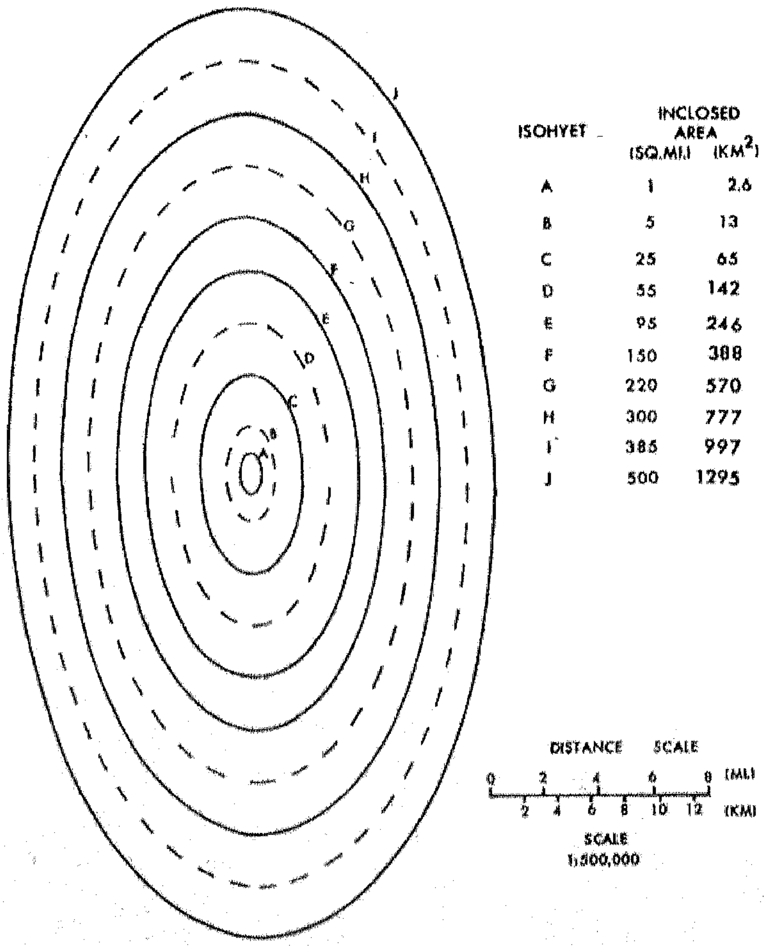


*Figure 4.9.--Adopted depth-area relations for local-storm PMP.*

D.A. < 1 mi$^2$ → No areal reduction

Shootaring Mill PMP- Local Storm

5|6



| ISOHYET | INCLOSED AREA (SQ.MI.) | INCLOSED AREA (KM²) |
|---|---|---|
| A | 1 | 2.6 |
| B | 5 | 13 |
| C | 25 | 65 |
| D | 55 | 142 |
| E | 95 | 246 |
| F | 150 | 388 |
| G | 220 | 570 |
| H | 300 | 777 |
| I | 385 | 997 |
| J | 500 | 1295 |

*Figure 4.10.--Idealized local-storm isohyetal pattern.*

storm period. The sequence of hourly incremental PMP for the Southwest 6-hr thunderstorm in accord with this study is presented in column 2 of table 4.7. A small variation from this sequence is given in Engineering Manual 1110-2-1411 (U. S. Army, Corps of Engineers 1965). The latter, listed in column 3 of table 4.7, places greater incremental amounts somewhat more toward the end of the 6-hr storm period. In application, ~~the choice~~ of either of these distributions is left to the user since one may prove to be more critical in a specific case than the other.

Table 4.7.--Time sequence for hourly incremental PMP in 6-hr storm

| Increment | HMR No. 5[1] Sequence Position | EM1110-2-1411[2] Sequence Position |
|---|---|---|
| Largest hourly amount | Third | Fourth |
| 2nd largest | Fourth | Third |
| 3rd largest | Second | Fifth |
| 4th largest | Fifth | Second |
| 5th largest | First | Last |
| least | Last | First |

---

[1] U. S. Weather Bureau 1947.

[2] U. S. Corps of Engineers 1952.

Shootaring Mill PMP - Local Storm

6/6

Also of importance is the sequence of the four 15-min incremental PMP values. We recommend a time distribution, table 4.8, giving the greatest intensity in the first 15-min interval (U.S. Weather Bureau 1947). This is based on data from a broad geographical region. Additional support for this time distribution is found in the reports of specific storms by Keppell (1963) and Osborn and Renard (1969).

Table 4.8.--Time sequence for 15-min incremental PMP within 1 hr.

| Increment | Sequence Position |
|---|---|
| Largest 15-min amount | First |
| 2nd largest | Second |
| 3rd largest | Third |
| least | Last |

## 4.8 Seasonal Distribution

The time of the year when local-storm PMP is most likely is of interest. Guidance was obtained from analysis of the distribution of maximum 1-hr thunderstorm events through the warm season at the recording stations in Utah, Arizona, and in southern California (south of 37°N and east of the Sierra Nevada ridgeline). The period of record used was for 1940-72 with an average record length for the stations considered of 27 years. The month with the one greatest thunderstorm rainfall for the period of record at each station was noted. The totals of these events for each month, by States, are shown in table 4.9.

Table 4.9.--Seasonal distribution of thunderstorm rainfalls.

(The maximum event at each of 108 stations, period of record 1940-72.)

| | Month | | | | | | |
|---|---|---|---|---|---|---|---|
| | M | J | J | A | S | O | No. of Cases |
| Utah | 1 | 5 | 9 | 14 | 5 | | 34 |
| Arizona | | 4 | 16 | 19 | 4 | | 43 |
| S. Calif.* | | 14 | 10 | 7 | | | 31 |
| No. of cases/mo. | 1 | 23 | 35 | 40 | 9 | 0 | |

*South of 37°N and east of Sierra Nevada ridgeline.

**TETRA TECH**

CLIENT: Uranium One
MADE BY: EKB
DATE: 5/12/2008
JOB TITLE: Shootaring Mill Operations Plan
CHECKED:
JOB NUMBER: 114-181692
SUBJECT: Tailings Impoundment Freeboard Calculations
APPROVED:
SHEET:

### *Tailings Impoundment Area and Volume*

Volumes determined using average end areas.

**South Cell**

| Elevation (ft) | Area (ft$^2$) | Incr. Volume (ft$^3$) | Cum. Volume (ft$^3$) | Area (ac) | Incr. Volume (ac-ft) | Cum. Volume (ac-ft) |
|---|---|---|---|---|---|---|
| 4360 | 20647 | 0 | 0 | 0.47 | 0 | 0 |
| 4370 | 183916 | 1022815 | 1022815 | 4.22 | 23.48 | 23.48 |
| 4380 | 423337 | 3036265 | 4059080 | 9.72 | 69.70 | 93.18 |
| 4390 | 705404 | 5643705 | 9702785 | 16.19 | 129.56 | 222.75 |
| 4400 | 958848 | 8321260 | 18024045 | 22.01 | 191.03 | 413.78 |
| 4410 | 1108011 | 10334295 | 28358340 | 25.44 | 237.24 | 651.02 |
| 4420 | 1209713 | 11588620 | 39946960 | 27.77 | 266.04 | 917.06 |
| 4430 | 1315462 | 12625875 | 52572835 | 30.20 | 289.85 | 1206.91 |
| 4440 | 1490284 | 14028730 | 66601565 | 34.21 | 322.06 | 1528.96 |
| 4450 | 1583228 | 15367560 | 81969125 | 36.35 | 352.79 | 1881.75 |
| 4455 | 1630927 | 8035388 | 90004512.5 | 37.44 | 184.47 | 2066.22 |
| 4460 | 1678626 | 8273883 | 98278395 | 38.54 | 189.94 | 2256.16 |
| 4466 | 1737064 | 10247070 | 108525465 | 39.88 | 235.24 | 2491.40 |
| 4468 | 1756738 | 3493802 | 112019267 | 40.33 | 80.21 | 2571.61 |

**North Cell**

| Elevation (ft) | Area (ft$^2$) | Incr. Volume (ft$^3$) | Cum. Volume (ft$^3$) | Area (ac) | Incr. Volume (ac-ft) | Cum. Volume (ac-ft) |
|---|---|---|---|---|---|---|
| 4404 | 6137 | 0 | 0 | 0.14 | 0 | 0 |
| 4410 | 89211 | 286044 | 286044 | 2.05 | 6.57 | 6.57 |
| 4420 | 355732 | 2224715 | 2510759 | 8.17 | 51.07 | 57.64 |
| 4430 | 779590 | 5676610 | 8187369 | 17.90 | 130.32 | 187.96 |
| 4440 | 1171163 | 9753765 | 17941134 | 26.89 | 223.92 | 411.87 |
| 4450 | 1520354 | 13457585 | 31398719 | 34.90 | 308.94 | 720.82 |
| 4455 | 1585132 | 7763714 | 39162432.8 | 36.39 | 178.23 | 899.05 |
| 4460 | 1649909 | 8087601 | 47250034 | 37.88 | 185.67 | 1084.71 |
| 4466 | 1710598 | 10081521 | 57331555 | 39.27 | 231.44 | 1316.15 |
| 4468 | 1730985 | 3441583 | 60773138 | 39.74 | 79.01 | 1395.16 |

**TETRA TECH**

CLIENT: Uranium One
MADE BY: EKB
DATE: 5/12/2008
JOB TITLE: Shootaring Mill Operations
CHECKED:
JOB NUMBER: 114-181692
SUBJECT: Tailings Impoundment Freeboard Calculations
APPROVED:
SHEET:

### *Catchment Area and Design Flood Volume.*

Tailings impoundment must be able to contain the water rise due to the design flood, plus wind and wave action. Design flood is the 6-hour PMF series, per NRC Regulatory Guide 3.11 (1977), and proposed Revision Three of RG 3.11, issued February 2008 as Draft Regulatory Guide DG-3032.

6-hour Local Storm PMP (in) = 9.1 (See PMP estimates)
40% of 6-hour PMP (in) = 3.64
100-year, 6-hour precipitation (in) = 1.79 (NOAA Atlas 14 rainfall, reproduced below)
Total PMF-series precipitation (in) = 14.53
Assumed runoff coefficient = 0.90 (assumed to apply to both tailings and offsite areas)
Runoff depth (in) = 13.08 (Runoff depth = Total precipitation x Runoff coefficient)

| ARI* (years) | Duration (hours) | | | | |
|---|---|---|---|---|---|
| | **6** | 12 | 24 | 48 | 192 |
| 1 | 0.55 | 0.67 | 0.79 | 0.88 | 1 |
| 2 | 0.69 | 0.83 | 1 | 1.11 | 1.26 |
| 5 | 0.89 | 1.05 | 1.29 | 1.42 | 1.62 |
| 10 | 1.06 | 1.23 | 1.53 | 1.68 | 1.91 |
| 25 | 1.31 | 1.49 | 1.86 | 2.06 | 2.32 |
| 50 | 1.52 | 1.69 | 2.12 | 2.36 | 2.65 |
| **100** | **1.79** | 1.91 | 2.4 | 2.69 | 3.01 |
| 200 | 2.14 | 2.2 | 2.7 | 3.03 | 3.38 |
| 500 | 2.71 | 2.74 | 3.11 | 3.53 | 3.92 |
| 1000 | 3.24 | 3.27 | 3.44 | 3.93 | 4.34 |

* ARI = Approximate Recurrence Interval

| Phase: | 1 | 2 | 2 |
|---|---|---|---|
| Cell: | South | | North |
| Cell Area (ac): | 34.52 | 41.85 | 40.31 |
| Outside Area Contributing Runon (ac): | 41.44 | 33.13 | 109.37 |
| Total Area (ac): | 75.96 | 74.99 | 149.67 |
| Runoff volume (ac-ft): | 82.77 | 81.72 | 163.11 |
| Maximum liner elevation (ft): | 4430.0 | 4466.0 | 4466.0 |
| Assumed operating water surface elev.(ft): | 4420.0 | 4455.0 | 4455.0 |
| Surface area at operating WSE (ac): | 27.77 | 37.44 | 36.39 |
| WSE rise due to design flood (ft): | 2.98 | 2.18 | 4.48 |

Runoff volume [ac-ft] = Total Area [ac] * Runoff depth [in] / 12 [in/foot]
WSE = Water surface elevation
WSE rise due to design flood [ft] = Runoff volume [ac-ft] / Surface area [ac]

## *Windspeed, fetch, and wind setup*

### *Fetch:*

Wind setup is typically calculated using roughly twice the effective fetch, but here the straight-line fetch was determined directly, so no adjustments to effective fetch are required.

Straight-line fetch was measured as the longest distance across the lined area for each cell in any direction. This method is conservative because it ignores the possibility that the design windspeed may not necessarily occur along the measured fetch, and because the liner extents exceed the possible pool extents due to the presence of freeboard and the width of horizontal liner atop the perimeter bench.

Water depth over fetch was assumed constant, at the operating water level plus the rise due to the design storm. The shallow depth was selected to lead to a conservative (high) estimate of wind setup, which increases with decreasing depth. Use of the shallow water depth does not affect the wave-height or wave runup determinations, which were not sensitive to operating water depth within the range of reasonable depths.

| Phase: | 1 | 2 | 2 |
|---|---|---|---|
| Cell: | South | | North |
| WSE Rise due to design flood (ft): | 2.98 | 2.18 | 4.48 |
| Operating water depth (ft): | 2.00 | 2.00 | 2.00 |
| Fetch (ft): | 1625 | 1625 | 1961 |
| Fetch (mi): | 0.31 | 0.31 | 0.37 |

### *Fastest-mile wind speed*

Design wind at 100 -year recurrence interval, based on adjustment of 50-year windspeed.

50-year windspeed based on Figure 1 in ANSI/ASCE 7-93 "Minimum Design Loads for Buildings and Other Structures".

Use importance factor, I = 1.07, for "essential facilities" (Category III), which has the effect of converting the 50-year windspeed to a 100-year value.

Revisions to ANSI/ASCE 7-93 requiring use of the 3-second gust instead of the fastest-mile windspeed are not applicable to reservoir wind-wave effects analysis in general, or this case in particular. For the present analysis, the duration of the controlling windspeed is between 0.2 and 0.3 hours (see individual cell-phase calculation sheets). Short gusts do not control wave growth.

Fastest-mile 10-m overland windspeed, V = 70.00 mph
Importance factor to obtain 100-year windspeed, I = 1.07 (Exposure Class C)
Use 100-yr fastest-mile wind speed, I x V = 75 mph (rounded)
= 110.0 fps

**TETRA TECH**

CLIENT: Uranium One
MADE BY: EKB
DATE: 5/12/2008
JOB TITLE: Shootaring Mill Operations
CHECKED:
JOB NUMBER: 114-181692
SUBJECT: Tailings Impoundment Freeboard Calculations
APPROVED:
SHEET:

### *Adjustments to Wind Speed*

See CEM II-2-1-i.(3), "Procedure for adjusting observed winds" for figures & detailed explanation of methods.

*Level:*

$U_{10} = U_z\ (10/z)^{1/7}$ For z < 20 m; z must be in meters

Use CEM Fig II-2-6 if air-sea temperature data is available, or if z exceeds 20 meters

Assume wind speed read at 10 m; no correction required

$U / U_{10} =$ 1.0 for measurements taken at 10 m

$U_{10} = U_f / (U / U_{10}) =$ 75.00 mph

*Location (overland or overwater):*

Location and stability adjustments are applied after duration adjustments in the table below

Use CEM Fig II-2-7 for windspeed measurements taken over land

$R_L = U_W / U_L =$ 1.2 for winds blowing off the water

If fetch < 10 miles & wind data is taken over land, $U_W = 1.2\ U_L$, and $R_T$ is not applied (equivalent to $R_L = R_T = 1.1$).

This applies here; fetches do not exceed 1 mile.

*Boundary layer stability:*

Location and stability adjustments are applied after duration adjustments in the table below

Use CEM Fig II-2-8 when air-sea temperature difference is known; $R_T = 1.1$ otherwise

No air-sea temperature information is available; therefore

$R_T = W_C / W_W =$ 1.0 $R_T$ is not applicable to fetches < 10 miles.

Adjusted fastest-mile windspeed, $U_{f(adj)} = U_{10} * R_L * R_T =$ 90.00 mph = 132.00 fps
40.23 m/s

*Duration:*

Equation from CEM Fig II-2-2 (SPM Fig 3-12), Duration of the fastest mile windspeed as a function of windspeed:

$t = 3600 / U_f$ ($U_f$ in mph)

Equations from CEM Fig II-2-1 (SPM Fig. 3-13), Ratio of windspeed of any duration $U_t$ to the 1-hour windspeed $U_{3600}$:

$U_t / U_{3,600} =$ $1.277 + 0.296 \tanh [0.9 \log_{10} (45/t)]$ 1 sec < t < 3,600 sec
$-0.15 \log_{10} t + 1.5334$ 3,600 sec < t < 36,000 sec

| Return Period (yr) | $U_{f(adj)}$ (mph) | t (sec) | $U_t / U_{3,600}$ | $U_{3,600}$ (mph) | $U_{3,600}$ (fps) |
|---|---|---|---|---|---|
| 100 | 90.00 | 40.0 | 1.291 | 69.7 | 102.3 |

Duration is further modified during determination of the design wave conditions.

**TETRA TECH**

CLIENT: Uranium One MADE BY: EKB DATE: 5/12/2008
JOB TITLE: Shootaring Mill Operations CHECKED: JOB NUMBER: 114-181692
SUBJECT: Tailings Impoundment Freeboard Calculations APPROVED: SHEET:

### *Wind Setup:*

Use Zuider-Zee formula, from EM-1110-2-1420 "Hydrologic Engineering Requirements for Dams" (31 Oct 97)

$$S = \frac{U^2 F}{1400 D}$$

S = Wind tide (setup)
U = Average wind velocity over the fetch (fastest-mile, adjusted to overwater value)
F = Fetch
D = Average depth of water along the fetch line

U = 90.0 mph (fastest-mile speed, adjusted to overwater value)

| Phase: | 1 | 2 | 2 |
|---|---|---|---|
| Cell: | South | | North |
| Fetch, F (mi): | 0.31 | 0.31 | 0.37 |
| WSE Rise due to design flood (ft): | 2.98 | 2.18 | 4.48 |
| Operating water depth (ft): | 2.00 | 2.00 | 2.00 |
| Water depth, D (ft): | 4.98 | 4.18 | 6.48 |
| Wind setup, S (ft): | 0.36 | 0.43 | 0.33 |

Wind setup is not included in water depth for computation of the design wave height, but is used to compute the wave runup at the shoreline

### *Design Wave & Wave Runup:*

See sheets for individual Cell-Phase combinations for design wave and wave runup computations.

### *Total Freeboard*

Total freeboard is the sum of the rise due to the design flood, wind setup, and wave runup.

| Phase: | 1 | 2 | 2 |
|---|---|---|---|
| Cell: | South | | North |
| WSE Rise due to design flood (ft): | 2.98 | 2.18 | 4.48 |
| Wind setup (ft): | 0.36 | 0.43 | 0.33 |
| Wave runup (ft): | 2.85 | 2.34 | 2.59 |
| Total freeboard (ft): | 6.19 | 4.94 | 7.40 |
| Use: rounded up to the next half-foot (ft) | 6.50 | 5.00 | 7.50 |

**TETRA TECH**

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JOB TITLE: Shootaring Mill Operations
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SUBJECT: Tailings Impoundment Freeboard Calculations
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SHEET:

### *Design Wave Conditions, Phase 1, South Cell:*

Inputs:

Use:
Adjusted 100-yr, 1-hr windspeed, $U_{3600}$ = 69.7 mph 102.3 fps
Effective fetch, X = 0.31 miles = 1625 ft (use straight-line fetch, conservative)
Water depth, d = 4.98 feet (minimum operating depth + design storm rise)

Equations:

CEM now recommends computing deepwater wave heights for shallow water, subject to the limiting wave period given by CEM Eq II-2-39, and a limiting height of 0.6 times the depth. See pp. II-2-45 through 47.

Time required for waves crossing a fetch X under a velocity u to become fetch-limited (CEM Eq II-2-35):

$$t_{x,u} = \frac{77.23\ X^{0.67}}{u^{0.34}\ g^{0.33}}$$

CEM Fig II-2-3, "Equivalent duration for wave generation as a function of fetch and wind speed," gives the same same information graphically for fetches up to 10 km.

Limiting wave period in shallow water:

$T_p = 9.78\ (d/g)^{1/2}$ CEM Eq II-2-39

Equations governing wave growth with fetch (CEM Eq II-2-36):

$gH_{mo} / u_*^2 = 0.0413\ (\ g\ X / u_*^2\ )^{1/2}$
$gT_p / u_* = 0.651\ (\ g\ X / u_*^2\ )^{1/3}$
$C_D = u_*^2 / U_{10}^2$
$C_D = 0.001\ (1.1 + 0.035\ U_{10})$ (Requires $U_{10}$ in m/s)

where
X = straight line fetch distance over which the wind blows
$H_{mo}$ = energy-based significant wave height
$T_p$ = frequency
$C_D$ = drag coefficient
$U_{10}$ = wind speed at 10 m elevation
$u_*$ = friction velocity

The fully-developed wave height is given by CEM Eq II-2-30:

$H_{:} = \lambda_5\ u^2 / g = 0.27\ u^2 / 32.2$ (u in ft/s)

The fully-developed wave height (upper limit to wave growth for any wind speed) is given by CEM Eq II-2-30:

$gH_{m0} / u_*^2 = 211.5$
$gT_p / u_* = 239.8$

For duration-limited conditions, duration is converted into an equivalent fetch using CEM Eq II-2-38:

$gX / u_*^2 = 0.00523\ (\ g\ t / u_*\ )^{3/2}$ (where t is the duration)

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Calculations:

| Wind Velocity and Duration | | | | | | Fetch-Limited Conditions | | | |
|---|---|---|---|---|---|---|---|---|---|
| Duration, t (hr) | t (sec) | $U_t / U_{3,600}$ | $U_t$ (mph) | $t_{x,u}$ (hrs) | $u_*^2$ ($ft^2/sec^2$) | $gH_{m0} / u_*^2$ | $gT_p / u_*$ | $H_{m0}$ (ft) | $T_p$ (sec) |
| 0.01 | 36 | 1.303 | 90.8 | 0.18 | 44.76 | 1.4 | 6.9 | 1.96 | 1.42 |
| 0.1 | 360 | 1.078 | 75.2 | 0.20 | 27.69 | 1.8 | 8.0 | 1.54 | 1.32 |
| 0.2 | 720 | 1.042 | 72.6 | 0.20 | 25.39 | 1.9 | 8.3 | 1.48 | 1.30 |
| 0.234 | 842.4 | 1.035 | 72.2 | 0.20 | 25.01 | 1.9 | 8.3 | 1.47 | 1.29 |
| 0.235 | 846 | 1.035 | 72.2 | 0.20 | 25.00 | 1.9 | 8.3 | 1.47 | 1.29 |
| 0.3 | 1080 | 1.027 | 71.6 | 0.20 | 24.47 | 1.9 | 8.4 | 1.45 | 1.29 |
| 1 | 3600 | 1.000 | 69.7 | 0.20 | 22.90 | 2.0 | 8.6 | 1.40 | 1.27 |
| 2 | 7200 | 0.955 | 66.6 | 0.20 | 20.42 | 2.1 | 8.9 | 1.33 | 1.25 |
| 4 | 14400 | 0.910 | 63.4 | 0.21 | 18.11 | 2.2 | 9.3 | 1.25 | 1.23 |
| 6 | 21600 | 0.883 | 61.6 | 0.21 | 16.84 | 2.3 | 9.5 | 1.20 | 1.21 |
| 8 | 28800 | 0.864 | 60.3 | 0.21 | 15.97 | 2.4 | 9.7 | 1.17 | 1.20 |
| 10 | 36000 | 0.850 | 59.3 | 0.21 | 15.32 | 2.4 | 9.8 | 1.15 | 1.19 |

| Duration, t (hr) | Duration-Limited Conditions | | | | | | Controlling Conditions | | |
|---|---|---|---|---|---|---|---|---|---|
| | $gX / u_*^2$ | X (mi) | $gH_{m0} / u_*^2$ | $gT_p / u_*$ | $H_{m0}$ (ft) | $T_p$ (sec) | Limitation | $H_{m0}$ (ft) | $T_p$ (sec) |
| 0.01 | 12 | 0.0 | 0.1 | 1.5 | 0.20 | 0.31 | Duration | 0.20 | 0.31 |
| 0.1 | 541 | 0.1 | 1.0 | 5.3 | 0.83 | 0.87 | Duration | 0.83 | 0.87 |
| 0.2 | 1632 | 0.2 | 1.7 | 7.7 | 1.32 | 1.20 | Duration | 1.32 | 1.20 |
| 0.234 | 2089 | 0.3 | 1.9 | 8.3 | 1.47 | 1.29 | Duration | 1.47 | 1.29 |
| 0.235 | 2103 | 0.3 | 1.9 | 8.3 | 1.47 | 1.30 | Fetch | 1.47 | 1.29 |
| 0.3 | 3083 | 0.4 | 2.3 | 9.5 | 1.74 | 1.46 | Fetch | 1.45 | 1.29 |
| 1 | 19718 | 2.7 | 5.8 | 17.6 | 4.12 | 2.61 | Fetch | 1.40 | 1.27 |
| 2 | 60767 | 7.3 | 10.2 | 25.6 | 6.46 | 3.59 | Fetch | 1.33 | 1.25 |
| 4 | 188086 | 20.0 | 17.9 | 37.3 | 10.07 | 4.93 | Fetch | 1.25 | 1.23 |
| 6 | 364928 | 36.1 | 24.9 | 46.5 | 13.05 | 5.93 | Fetch | 1.20 | 1.21 |
| 8 | 584561 | 54.9 | 31.6 | 54.4 | 15.66 | 6.76 | Fetch | 1.17 | 1.20 |
| 10 | 842909 | 76.0 | 37.9 | 61.5 | 18.04 | 7.48 | Fetch | 1.15 | 1.19 |

Controlling hindcast wave: Fetch-limited

$H_{mo}$ = 1.47 feet

$T_p$ = 1.29 sec

Limiting wave period: $T_p = 9.78 (d/g)^{0.5} =$ 3.85 sec

Period OK, use deepwater values

Limiting wave height: 0.6*d = 3.0 feet

Wave height OK

**TETRA TECH**

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***Check Maximum Breaking Wave:***

Fig 2-2 of EM 1110-2-1614, or SPM Fig 7-4, gives the maximum breaker height, $H_b$

*Nearshore slope, m:*

Assume nearshore slope, m = **0.000** ft/ft (tailings surface assumed level)

*Depth at structure, $d_s$:*

Operating water depth = 2.00 ft
Rise due to PMF series = 2.98 ft
Wind setup = 0.36 ft
Depth at structure, $d_s$ = 5.34 ft

*Controlling wave height:*

Wave period, T = 1.29 sec
$d_s / gT^2$ = 0.0992
Not used $H_s / H_{mo}$ = exp [$C_0$ ( d / $gT_p^2$ )$^{-C1}$] Where $C_0$=0.00089 (0.00136 conservative) & $C_1$=0.834
Not used $H_s / H_{mo}$ = 1.009
Not used $H_s$ = 1.48

$H_b / d_s$ = 0.78 (EM 1110-2-1614, Fig 2-2, "Design Breaker Height,"
Maximum breaker height, $H_b$ = 4.16 ft at T or SPM Fig 7-4, at computed m and $d_s/gT^2$.)
Hindcast wave height, $H_{m0}$ = 1.47 feet
Controlling wave height, H = **1.47** feet **(Hindcast wave height controls)**

Check maximum breaker height at a variety of wave periods other than the hindcast period (after CETN-III-2):
Typical range of periods from 0.5*T to 1.9*T = 0.65 sec to 1.16 sec

| Assumed T* (sec) | $d_s / gT^2$ | $H_b / d_s$ | $H_b$ (ft) | |
|---|---|---|---|---|
| 0.65 | 0.3966 | 0.78 | 4.2 | at 0% slope |
| 1.16 | 0.1224 | 0.78 | 4.2 | at 0% slope |
| 3.85 | 0.0112 | 0.78 | 4.2 | at 0% slope |
| 3.85 | 0.0112 | 1.2 | 6.4 | at 10% slope (assumed max; not actual) |
| 10.00 | 0.0017 | 0.8 | 4.3 | at 0% slope |

*3.85 sec is the limiting period, computed above.

Use for design:
H = 1.47 feet
$T_p$ = 1.29 sec

**TETRA TECH**

|  |  |  |  |  |  |
|---|---|---|---|---|---|
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***Check Wave Runup:***

Input data:

|  |  |  |
|---|---|---|
| Design wave height, $H_{mo}$ = | 1.47 | feet |
| Design wave period, $T_p$ = | 1.29 | sec |
| Revetment slope, cot$\theta$ = | 2 | Upstream face of dam is 2:1 in PH 1; divider berm is 2.5:1 |

Equations:

Maximum runup by irregular waves on riprap covered revetments is estimated by:

$$R_{max} / H_{mo} = \frac{a \xi}{1 + b \xi}$$ (Eq 2-6 in EM 1110-2-1614)

where

$R_{max}$ = maximum vertical height of runup above swl

a, b = regression coefficients determined as 1.022 and 0.247, respectively
The more conservative value of a = 1.286 is used here.

$\xi$ = surf parameter defined by:

$$\xi = \frac{\tan \theta}{( 2 \pi H_{mo} / g T_p^2 )^{1/2}}$$

Results for slopes other than riprap or quarrystone can be adjusted by the factors in Table 2-2 of EM-1110-2-1614. See pages 2-6 & 2-7 of that manual for details.

The surf parameter equation above is equivalent to that in CEM, Eqn II-4-1.

For quarrystone at 2:1 slope, Rough slope runup correction factor r = 0.615

Calculations:

|  |  |  |
|---|---|---|
| $\xi$ = | 1.21 |  |
| $R_{max} / H_{mo}$ = | 1.20 |  |
| $R_{max}$ = | 1.76 | feet |
| Wave runup, $R_{max}$ / r = | 2.85 | feet |

TETRA TECH

| | | | | | |
|---|---|---|---|---|---|
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| SUBJECT: | Tailings Impoundment Freeboard Calculations | APPROVED: | | SHEET: | |

***Design Wave Conditions, Phase 2, South Cell:***

Inputs:

Use:

Adjusted 100-yr, 1-hr windspeed, $U_{3600}$ = 69.7 mph 102.3 fps

Effective fetch, X = 0.31 miles = 1625 ft (use straight-line fetch, conservative)

Water depth, d = 4.18 feet (minimum operating depth + design storm rise)

Equations:

CEM now recommends computing deepwater wave heights for shallow water, subject to the limiting wave period given by CEM Eq II-2-39, and a limiting height of 0.6 times the depth. See pp. II-2-45 through 47.

Time required for waves crossing a fetch X under a velocity u to become fetch-limited (CEM Eq II-2-35):

$$t_{x,u} = \frac{77.23\, X^{0.67}}{u^{0.34}\, g^{0.33}}$$

CEM Fig II-2-3, "Equivalent duration for wave generation as a function of fetch and wind speed," gives the same same information graphically for fetches up to 10 km.

Limiting wave period in shallow water:

$T_p = 9.78\,(d/g)^{1/2}$ CEM Eq II-2-39

Equations governing wave growth with fetch (CEM Eq II-2-36):

$$gH_{mo} / u_*^2 = 0.0413\,( g X / u_*^2 )^{1/2}$$

$$gT_p / u_* = 0.651\,( g X / u_*^2 )^{1/3}$$

$$C_D = u_*^2 / U_{10}^2$$

$$C_D = 0.001\,(1.1 + 0.035\, U_{10})$$

(Requires $U_{10}$ in m/s)

where

$X$ = straight line fetch distance over which the wind blows

$H_{mo}$ = energy-based significant wave height

$T_p$ = frequency

$C_D$ = drag coefficient

$U_{10}$ = wind speed at 10 m elevation

$u_*$ = friction velocity

The fully-developed wave height is given by CEM Eq II-2-30:

$H_: = \lambda_5\, u^2 / g = 0.27\, u^2 / 32.2$ (u in ft/s)

The fully-developed wave height (upper limit to wave growth for any wind speed) is given by CEM Eq II-2-30:

$$gH_{m0} / u_*^2 = 211.5$$

$$gT_p / u_* = 239.8$$

For duration-limited conditions, duration is converted into an equivalent fetch using CEM Eq II-2-38:

$gX / u_*^2 = 0.00523\,( g\, t / u_* )^{3/2}$ (where t is the duration)

**TETRA TECH**

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Calculations:

| Wind Velocity and Duration | | | | | | Fetch-Limited Conditions | | | |
|---|---|---|---|---|---|---|---|---|---|
| Duration, t (hr) | t (sec) | $U_t$ / $U_{3,600}$ | $U_t$ (mph) | $t_{x,u}$ (hrs) | $u_*^2$ ($ft^2/sec^2$) | $gH_{m0}$ / $u_*^2$ | $gT_p$ / $u_*$ | $H_{m0}$ (ft) | $T_p$ (sec) |
| 0.01 | 36 | 1.303 | 90.8 | 0.18 | 44.76 | 1.4 | 6.9 | 1.96 | 1.42 |
| 0.1 | 360 | 1.078 | 75.2 | 0.20 | 27.69 | 1.8 | 8.0 | 1.54 | 1.32 |
| 0.2 | 720 | 1.042 | 72.6 | 0.20 | 25.39 | 1.9 | 8.3 | 1.48 | 1.30 |
| 0.234 | 842.4 | 1.035 | 72.2 | 0.20 | 25.01 | 1.9 | 8.3 | 1.47 | 1.29 |
| 0.235 | 846 | 1.035 | 72.2 | 0.20 | 25.00 | 1.9 | 8.3 | 1.47 | 1.29 |
| 0.3 | 1080 | 1.027 | 71.6 | 0.20 | 24.47 | 1.9 | 8.4 | 1.45 | 1.29 |
| 1 | 3600 | 1.000 | 69.7 | 0.20 | 22.90 | 2.0 | 8.6 | 1.40 | 1.27 |
| 2 | 7200 | 0.955 | 66.6 | 0.20 | 20.42 | 2.1 | 8.9 | 1.33 | 1.25 |
| 4 | 14400 | 0.910 | 63.4 | 0.21 | 18.11 | 2.2 | 9.3 | 1.25 | 1.23 |
| 6 | 21600 | 0.883 | 61.6 | 0.21 | 16.84 | 2.3 | 9.5 | 1.20 | 1.21 |
| 8 | 28800 | 0.864 | 60.3 | 0.21 | 15.97 | 2.4 | 9.7 | 1.17 | 1.20 |
| 10 | 36000 | 0.850 | 59.3 | 0.21 | 15.32 | 2.4 | 9.8 | 1.15 | 1.19 |

| Duration, t (hr) | Duration-Limited Conditions | | | | | | Controlling Conditions | | |
|---|---|---|---|---|---|---|---|---|---|
| | $gX$ / $u_*^2$ | X (mi) | $gH_{m0}$ / $u_*^2$ | $gT_p$ / $u_*$ | $H_{m0}$ (ft) | $T_p$ (sec) | Limitation | $H_{m0}$ (ft) | $T_p$ (sec) |
| 0.01 | 12 | 0.0 | 0.1 | 1.5 | 0.20 | 0.31 | Duration | 0.20 | 0.31 |
| 0.1 | 541 | 0.1 | 1.0 | 5.3 | 0.83 | 0.87 | Duration | 0.83 | 0.87 |
| 0.2 | 1632 | 0.2 | 1.7 | 7.7 | 1.32 | 1.20 | Duration | 1.32 | 1.20 |
| 0.234 | 2089 | 0.3 | 1.9 | 8.3 | 1.47 | 1.29 | Duration | 1.47 | 1.29 |
| 0.235 | 2103 | 0.3 | 1.9 | 8.3 | 1.47 | 1.30 | Fetch | 1.47 | 1.29 |
| 0.3 | 3083 | 0.4 | 2.3 | 9.5 | 1.74 | 1.46 | Fetch | 1.45 | 1.29 |
| 1 | 19718 | 2.7 | 5.8 | 17.6 | 4.12 | 2.61 | Fetch | 1.40 | 1.27 |
| 2 | 60767 | 7.3 | 10.2 | 25.6 | 6.46 | 3.59 | Fetch | 1.33 | 1.25 |
| 4 | 188086 | 20.0 | 17.9 | 37.3 | 10.07 | 4.93 | Fetch | 1.25 | 1.23 |
| 6 | 364928 | 36.1 | 24.9 | 46.5 | 13.05 | 5.93 | Fetch | 1.20 | 1.21 |
| 8 | 584561 | 54.9 | 31.6 | 54.4 | 15.66 | 6.76 | Fetch | 1.17 | 1.20 |
| 10 | 842909 | 76.0 | 37.9 | 61.5 | 18.04 | 7.48 | Fetch | 1.15 | 1.19 |

Controlling hindcast wave: Fetch-limited

$H_{mo}$ = 1.47 feet

$T_p$ = 1.29 sec

Limiting wave period: $T_p = 9.78\ (d/g)^{0.5}$ = 3.52 sec

Period OK, use deepwater values

Limiting wave height: 0.6*d = 2.5 feet

Wave height OK

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### *Check Maximum Breaking Wave:*

Fig 2-2 of EM 1110-2-1614, or SPM Fig 7-4, gives the maximum breaker height, $H_b$

*Nearshore slope, m:*

Assume nearshore slope, m = **0.000** ft/ft (tailings surface assumed level)

*Depth at structure, $d_s$:*

Operating water depth = 2.00 ft
Rise due to PMF series = 2.18 ft
Wind setup = 0.43 ft
Depth at structure, $d_s$ = 4.61 ft

*Controlling wave height:*

Wave period, T = 1.29 sec
$d_s / gT^2$ = 0.0856
Not used $H_s / H_{mo}$ = $\exp[C_0 (d / gT_p^2)^{-C1}]$ Where $C_0$=0.00089 (0.00136 conservative) & $C_1$=0.834
Not used $H_s / H_{mo}$ = 1.011
Not used $H_s$ = 1.48

$H_b / d_s$ = 0.78 (EM 1110-2-1614, Fig 2-2, "Design Breaker Height,"
Maximum breaker height, $H_b$ = 3.59 ft at T or SPM Fig 7-4, at computed m and $d_s/gT^2$.)
Hindcast wave height, $H_{m0}$ = 1.47 feet
Controlling wave height, H = **1.47** feet **(Hindcast wave height controls)**

Check maximum breaker height at a variety of wave periods other than the hindcast period (after CETN-III-2):
Typical range of periods from 0.5*T to 1.9*T = 0.65 sec to 1.16 sec

| Assumed T* (sec) | $d_s / gT^2$ | $H_b / d_s$ | $H_b$ (ft) | |
|---|---|---|---|---|
| 0.65 | 0.3424 | 0.78 | 3.6 | at 0% slope |
| 1.16 | 0.1057 | 0.78 | 3.6 | at 0% slope |
| 3.52 | 0.0115 | 0.78 | 3.6 | at 0% slope |
| 3.52 | 0.0115 | 1.2 | 5.5 | at 10% slope (assumed max; not actual) |
| 10.00 | 0.0014 | 0.8 | 3.7 | at 0% slope |

*3.52 sec is the limiting period, computed above.

Use for design:

H = 1.47 feet
$T_p$ = 1.29 sec

**TETRA TECH**

| | | | | | |
|---|---|---|---|---|---|
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***Check Wave Runup:***

Input data:

| | | |
|---|---|---|
| Design wave height, $H_{mo}$ = | 1.47 | feet |
| Design wave period, $T_p$ = | 1.29 | sec |
| Revetment slope, cotθ = | 2.5 | Upstream face of dam and divider berm are both 2.5:1 in PH 2. |

Equations:

Maximum runup by irregular waves on riprap covered revetments is estimated by:

$$R_{max} / H_{mo} = \frac{a\,\xi}{1 + b\,\xi}$$ (Eq 2-6 in EM 1110-2-1614)

where

$R_{max}$ = maximum vertical height of runup above swl

a, b = regression coefficients determined as 1.022 and 0.247, respectively

The more conservative value of a = 1.286 is used here.

$\xi$ = surf parameter defined by:

$$\xi = \frac{\tan\theta}{(\,2\,\pi\,H_{mo} / g\,T_p^{\,2}\,)^{1/2}}$$

Results for slopes other than riprap or quarrystone can be adjusted by the factors in Table 2-2 of EM-1110-2-1614. See pages 2-6 & 2-7 of that manual for details.

The surf parameter equation above is equivalent to that in CEM, Eqn II-4-1.

For quarrystone at 2.5:1 slope, Rough slope runup correction factor r = 0.63

Calculations:

| | | |
|---|---|---|
| $\xi$ = | 0.97 | |
| $R_{max} / H_{mo}$ = | 1.00 | |
| $R_{max}$ = | 1.47 | feet |
| Wave runup, $R_{max}$ / r = | 2.34 | feet |

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APPROVED:
SHEET:

### *Design Wave Conditions, Phase 2, North Cell:*

Inputs:

|  |  |  |  |  |
|---|---|---|---|---|
|  | Use: |  |  |  |
| Adjusted 100-yr, 1-hr windspeed, $U_{3600}$ = | 69.7 | mph | 102.3 | fps |
| Effective fetch, X = | 0.37 | miles = | 1961 | ft (use straight-line fetch, conservative) |
| Water depth, d = | 6.48 | feet | (minimum operating depth + design storm rise) |  |

Equations:

CEM now recommends computing deepwater wave heights for shallow water, subject to the limiting wave period given by CEM Eq II-2-39, and a limiting height of 0.6 times the depth. See pp. II-2-45 through 47.

Time required for waves crossing a fetch X under a velocity u to become fetch-limited (CEM Eq II-2-35):

$$t_{x,u} = \frac{77.23\ X^{0.67}}{u^{0.34}\ g^{0.33}}$$

CEM Fig II-2-3, "Equivalent duration for wave generation as a function of fetch and wind speed," gives the same same information graphically for fetches up to 10 km.

Limiting wave period in shallow water:

$T_p = 9.78\ (d/g)^{1/2}$ CEM Eq II-2-39

Equations governing wave growth with fetch (CEM Eq II-2-36):

$gH_{mo} / u_*^2 = 0.0413\ (\ g\ X / u_*^2\ )^{1/2}$

$gT_p / u_* = 0.651\ (\ g\ X / u_*^2\ )^{1/3}$

$C_D = u_*^2 / U_{10}^2$

$C_D = 0.001\ (1.1 + 0.035\ U_{10})$ (Requires $U_{10}$ in m/s)

where

$X$ = straight line fetch distance over which the wind blows

$H_{mo}$ = energy-based significant wave height

$T_p$ = frequency

$C_D$ = drag coefficient

$U_{10}$ = wind speed at 10 m elevation

$u_*$ = friction velocity

The fully-developed wave height is given by CEM Eq II-2-30:

$H_{:} = \lambda_5\ u^2 / g = 0.27\ u^2 / 32.2$ (u in ft/s)

The fully-developed wave height (upper limit to wave growth for any wind speed) is given by CEM Eq II-2-30:

$gH_{m0} / u_*^2 = 211.5$

$gT_p / u_* = 239.8$

For duration-limited conditions, duration is converted into an equivalent fetch using CEM Eq II-2-38:

$gX / u_*^2 = 0.00523\ (\ g\ t / u_*\ )^{3/2}$ (where t is the duration)

**TETRA TECH**

CLIENT: Uranium One  MADE BY: EKB  DATE: 5/12/2008
JOB TITLE: Shootaring Mill Operations  CHECKED:  JOB NUMBER: 114-181692
SUBJECT: Tailings Impoundment Freeboard Calculations  APPROVED:  SHEET:

Calculations:

| Wind Velocity and Duration | | | | | | Fetch-Limited Conditions | | | |
|---|---|---|---|---|---|---|---|---|---|
| Duration, t (hr) | t (sec) | $U_t / U_{3,600}$ | $U_t$ (mph) | $t_{x,u}$ (hrs) | $u_*^2$ ($ft^2/sec^2$) | $gH_{m0} / u_*^2$ | $gT_p / u_*$ | $H_{m0}$ (ft) | $T_p$ (sec) |
| 0.01 | 36 | 1.303 | 90.8 | 0.21 | 44.76 | 1.6 | 7.3 | 2.16 | 1.52 |
| 0.1 | 360 | 1.078 | 75.2 | 0.22 | 27.69 | 2.0 | 8.6 | 1.70 | 1.40 |
| 0.2 | 720 | 1.042 | 72.6 | 0.22 | 25.39 | 2.1 | 8.8 | 1.62 | 1.38 |
| 0.266 | 957.6 | 1.031 | 71.9 | 0.22 | 24.72 | 2.1 | 8.9 | 1.60 | 1.37 |
| 0.267 | 961.2 | 1.031 | 71.9 | 0.22 | 24.71 | 2.1 | 8.9 | 1.60 | 1.37 |
| 0.3 | 1080 | 1.027 | 71.6 | 0.23 | 24.47 | 2.1 | 8.9 | 1.59 | 1.37 |
| 1 | 3600 | 1.000 | 69.7 | 0.23 | 22.90 | 2.2 | 9.1 | 1.54 | 1.36 |
| 2 | 7200 | 0.955 | 66.6 | 0.23 | 20.42 | 2.3 | 9.5 | 1.46 | 1.33 |
| 4 | 14400 | 0.910 | 63.4 | 0.23 | 18.11 | 2.4 | 9.9 | 1.37 | 1.30 |
| 6 | 21600 | 0.883 | 61.6 | 0.24 | 16.84 | 2.5 | 10.1 | 1.32 | 1.29 |
| 8 | 28800 | 0.864 | 60.3 | 0.24 | 15.97 | 2.6 | 10.3 | 1.29 | 1.28 |
| 10 | 36000 | 0.850 | 59.3 | 0.24 | 15.32 | 2.7 | 10.4 | 1.26 | 1.27 |

| Duration, t (hr) | Duration-Limited Conditions | | | | | | Controlling Conditions | | |
|---|---|---|---|---|---|---|---|---|---|
| | $gX / u_*^2$ | X (mi) | $gH_{m0} / u_*^2$ | $gT_p / u_*$ | $H_{m0}$ (ft) | $T_p$ (sec) | Limitation | $H_{m0}$ (ft) | $T_p$ (sec) |
| 0.01 | 12 | 0.0 | 0.1 | 1.5 | 0.20 | 0.31 | Duration | 0.20 | 0.31 |
| 0.1 | 541 | 0.1 | 1.0 | 5.3 | 0.83 | 0.87 | Duration | 0.83 | 0.87 |
| 0.2 | 1632 | 0.2 | 1.7 | 7.7 | 1.32 | 1.20 | Duration | 1.32 | 1.20 |
| 0.266 | 2554 | 0.4 | 2.1 | 8.9 | 1.60 | 1.37 | Duration | 1.60 | 1.37 |
| 0.267 | 2569 | 0.4 | 2.1 | 8.9 | 1.61 | 1.38 | Fetch | 1.60 | 1.37 |
| 0.3 | 3083 | 0.4 | 2.3 | 9.5 | 1.74 | 1.46 | Fetch | 1.59 | 1.37 |
| 1 | 19718 | 2.7 | 5.8 | 17.6 | 4.12 | 2.61 | Fetch | 1.54 | 1.36 |
| 2 | 60767 | 7.3 | 10.2 | 25.6 | 6.46 | 3.59 | Fetch | 1.46 | 1.33 |
| 4 | 188086 | 20.0 | 17.9 | 37.3 | 10.07 | 4.93 | Fetch | 1.37 | 1.30 |
| 6 | 364928 | 36.1 | 24.9 | 46.5 | 13.05 | 5.93 | Fetch | 1.32 | 1.29 |
| 8 | 584561 | 54.9 | 31.6 | 54.4 | 15.66 | 6.76 | Fetch | 1.29 | 1.28 |
| 10 | 842909 | 76.0 | 37.9 | 61.5 | 18.04 | 7.48 | Fetch | 1.26 | 1.27 |

Controlling hindcast wave: Fetch-limited

$H_{mo}$ = 1.60 feet

$T_p$ = 1.37 sec

Limiting wave period: $T_p = 9.78 (d/g)^{0.5}$ = 4.39 sec

Period OK, use deepwater values

Limiting wave height: 0.6*d = 3.9 feet

Wave height OK

**TETRA TECH**

CLIENT: Uranium One
MADE BY: EKB
DATE: 5/12/2008
JOB TITLE: Shootaring Mill Operations
CHECKED:
JOB NUMBER: 114-181692
SUBJECT: Tailings Impoundment Freeboard Calculations
APPROVED:
SHEET:

***Check Maximum Breaking Wave:***

Fig 2-2 of EM 1110-2-1614, or SPM Fig 7-4, gives the maximum breaker height, $H_b$

*Nearshore slope, m:*

Assume nearshore slope, m = **0.000** ft/ft (tailings surface assumed level)

*Depth at structure, $d_s$:*

Operating water depth = 2.00 ft
Rise due to PMF series = 4.48 ft
Wind setup = 0.33 ft
Depth at structure, $d_s$ = 6.81 ft

*Controlling wave height:*

Wave period, T = 1.37 sec
$d_s / gT^2$ = 0.1121
Not used $H_s / H_{mo}$ = $\exp[C_0 (d / gT_p^2)^{-C1}]$ Where $C_0$=0.00089 (0.00136 conservative) & $C_1$=0.834
Not used $H_s / H_{mo}$ = 1.008
Not used $H_s$ = 1.62

$H_b / d_s$ = 0.78 (EM 1110-2-1614, Fig 2-2, "Design Breaker Height," or SPM Fig 7-4, at computed m and $d_s/gT^2$.)
Maximum breaker height, $H_b$ = 5.31 ft at T
Hindcast wave height, $H_{m0}$ = 1.60 feet
Controlling wave height, H = **1.60** feet **(Hindcast wave height controls)**

Check maximum breaker height at a variety of wave periods other than the hindcast period (after CETN-III-2):
Typical range of periods from 0.5*T to 1.9*T = 0.69 sec to 1.24 sec

| Assumed T* (sec) | $d_s / gT^2$ | $H_b / d_s$ | $H_b$ (ft) | |
|---|---|---|---|---|
| 0.69 | 0.4483 | 0.78 | 5.3 | at 0% slope |
| 1.24 | 0.1384 | 0.78 | 5.3 | at 0% slope |
| 4.39 | 0.0110 | 0.78 | 5.3 | at 0% slope |
| 4.39 | 0.0110 | 1.2 | 8.2 | at 10% slope (assumed max; not actual) |
| 10.00 | 0.0021 | 0.8 | 5.5 | at 0% slope |

*4.39 sec is the limiting period, computed above.

Use for design:
H = 1.60 feet
$T_p$ = 1.37 sec

**TETRA TECH**

CLIENT: Uranium One
MADE BY: EKB
DATE: 5/12/2008
JOB TITLE: Shootaring Mill Operations
CHECKED:
JOB NUMBER: 114-181692
SUBJECT: Tailings Impoundment Freeboard Calculations
APPROVED:
SHEET:

***Check Wave Runup:***

Input data:

Design wave height, $H_{mo}$ = 1.60 feet

Design wave period, $T_p$ = 1.37 sec

Revetment slope, $\cot\theta$ = 2.5 All side slopes are 2.5:1 for the North Cell

Equations:

Maximum runup by irregular waves on riprap covered revetments is estimated by:

$$R_{max} / H_{mo} = \frac{a\,\xi}{1 + b\,\xi}$$ (Eq 2-6 in EM 1110-2-1614)

where

$R_{max}$ = maximum vertical height of runup above swl

a, b = regression coefficients determined as 1.022 and 0.247, respectively
The more conservative value of a = 1.286 is used here.

$\xi$ = surf parameter defined by:

$$\xi = \frac{\tan\theta}{(2\,\pi\,H_{mo} / g\,T_p^{\,2})^{1/2}}$$

Results for slopes other than riprap or quarrystone can be adjusted by the factors in Table 2-2 of EM-1110-2-1614. See pages 2-6 & 2-7 of that manual for details.
The surf parameter equation above is equivalent to that in CEM, Eqn II-4-1.

For quarrystone at 2.5:1 slope, Rough slope runup correction factor r = 0.63

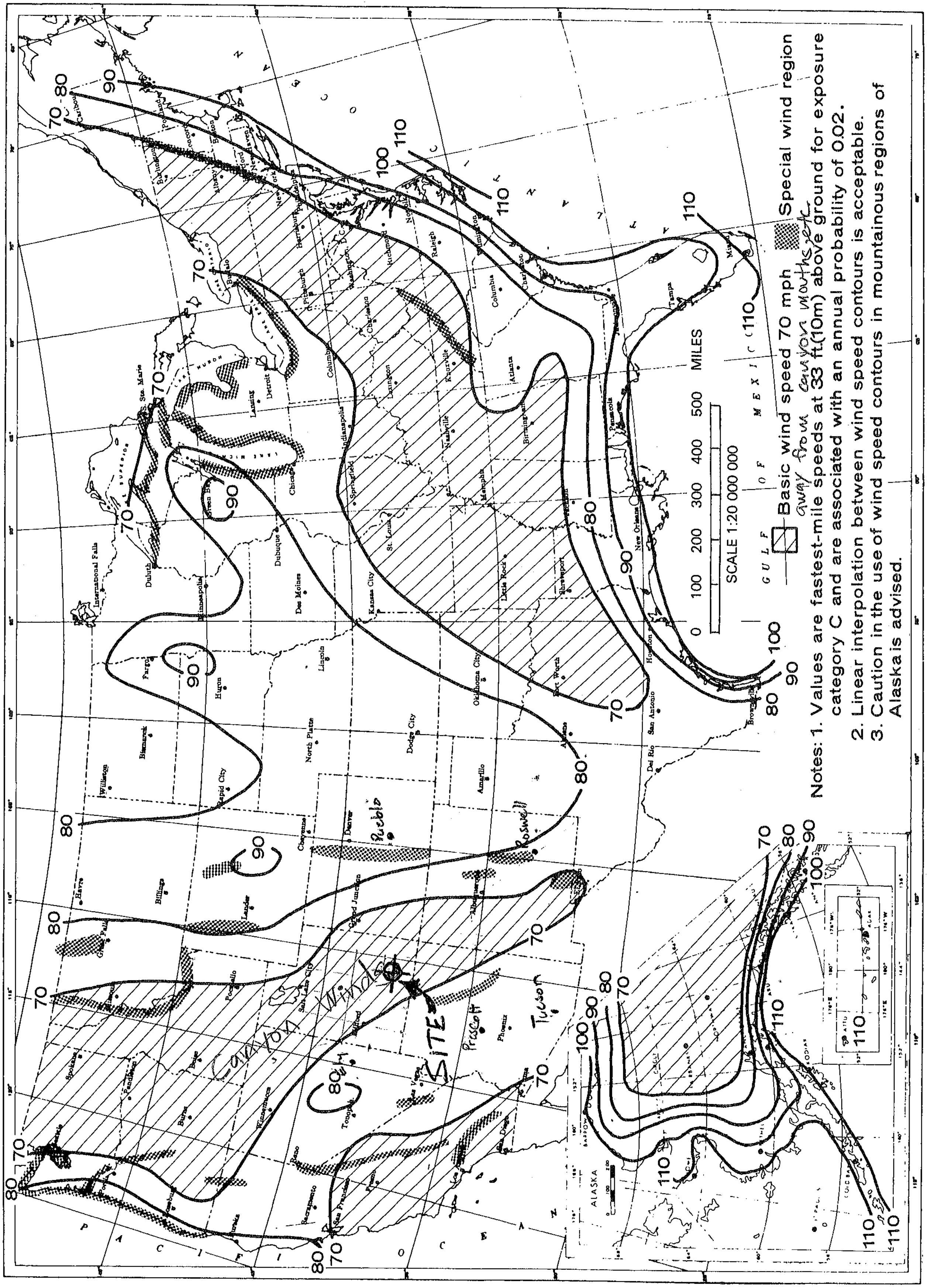
Calculations:

$\xi$ = 0.98

$R_{max} / H_{mo}$ = 1.02

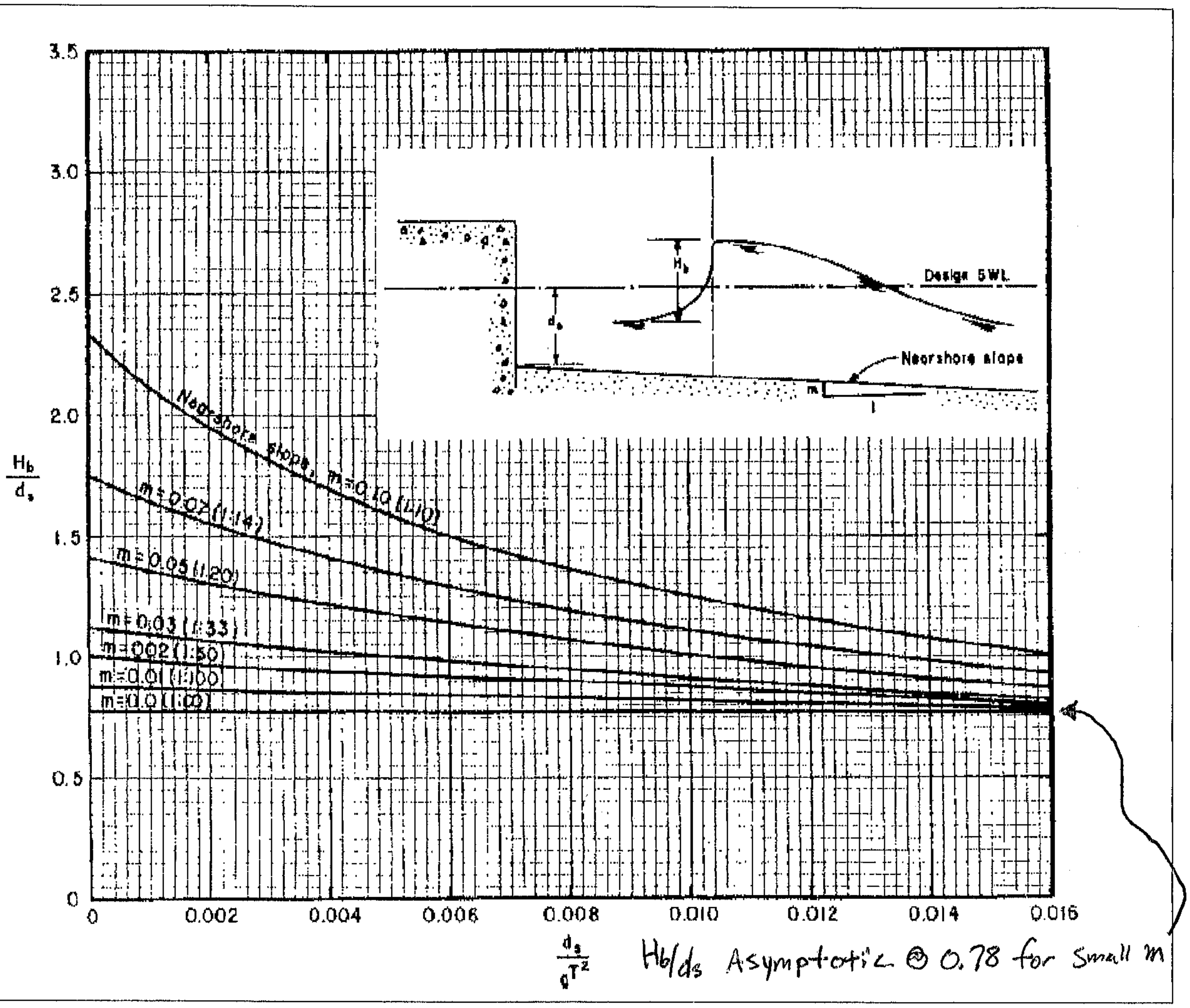
$R_{max}$ = 1.63 feet

Wave runup, $R_{max} / r$ = 2.59 feet



Notes: 1. Values are fastest-mile speeds at 33 ft.(10m) above ground for exposure category C and are associated with an annual probability of 0.02.
2. Linear interpolation between wind speed contours is acceptable.
3. Caution in the use of wind speed contours in mountainous regions of Alaska is advised.

Fig. 1. Basic Wind Speed (mph)



Hb/ds Asymptotic @ 0.78 for Small m

Figure 2-2. Design breaker height

*a. Rough slope runup.*

(1) Maximum runup by irregular waves on riprap-covered revetments may be estimated by (Ahrens and Heimbaugh 1988)

$$\frac{R_{\max}}{H_{mo}} = \frac{a\xi}{1 + b\xi} \tag{2-6}$$

where

$R_{\max}$ = maximum vertical height of the runup above the swl

$a, b$ = regression coefficients determined as 1.022 and 0.247, respectively

$\xi$ = surf parameter defined by

$$\xi = \frac{\tan\theta}{\left(\frac{2\pi H_{mo}}{g T_p^2}\right)^{1/2}} \tag{2-7}$$

where θ is the angle of the revetment slope with the horizontal. Recalling that the deepwater wavelength may be determined by

# APPENDIX G.3
# SURFACE WATER YIELD CALCULATIONS

**TETRA TECH**

CLIENT: Uranium One
MADE BY: EKB
DATE: 5/22/2008
JOB TITLE: Shootaring Mill Operations
CHECKED:
JOB NUMBER: 114-181692
SUBJECT: Monthly surface water yield for tailings water balance
APPROVED:
SHEET: 1 of 1

***Phase 1 - South Cell***

| Location | Area ($ft^2$) | Area (ac) |
|---|---|---|
| S Cell | 1503694 | 34.52 |
| W cliff | 1029843 | 23.64 |
| Mill | 775135 | 17.79 |
| | Total Area: | 75.96 |
| Area for Runon*: | | 41.44 |

***Phase 2 - South Cell***

| Location | Area ($ft^2$) | Area (ac) |
|---|---|---|
| S Cell | 1823093 | 41.85 |
| W cliff-S | 847150 | 19.45 |
| Mill-S | 596181 | 13.69 |
| | Total Area: | 74.99 |
| Area for Runon*: | | 33.13 |

***Phase 2 - North Cell***

| Location | Area ($ft^2$) | Area (ac) |
|---|---|---|
| N Cell | 1755772 | 40.31 |
| W cliff-N | 518411 | 11.90 |
| Mill-N + offsite | 4245570 | 97.46 |
| | Total Area: | 149.67 |
| Potential area for runon*: | | 109.37 |
| Less non-contributing area: | | 30.81 |
| Actual area for runon*: | | 78.55 |

**Area contributing surface water to the tailings cell, exclusive of lined cell area.*

| Month | Precip (in) | Evap (in) | Runoff Coefficient | | Runoff (in) | | Losses (in) | |
|---|---|---|---|---|---|---|---|---|
| | | | Cliffs* | Other** | Cliffs* | Other** | Cliffs* | Other** |
| Jan | 0.55 | 3.10 | 0.25 | 0.15 | 0.139 | 0.083 | 0.42 | 0.47 |
| Feb | 0.53 | 2.90 | 0.25 | 0.15 | 0.133 | 0.080 | 0.40 | 0.45 |
| Mar | 0.61 | 3.10 | 0.30 | 0.20 | 0.183 | 0.122 | 0.43 | 0.49 |
| Apr | 0.52 | 3.20 | 0.20 | 0.10 | 0.104 | 0.052 | 0.42 | 0.47 |
| May | 0.53 | 3.70 | 0.20 | 0.10 | 0.106 | 0.053 | 0.42 | 0.48 |
| Jun | 0.29 | 5.10 | 0.20 | 0.10 | 0.058 | 0.029 | 0.23 | 0.26 |
| Jul | 0.66 | 7.80 | 0.20 | 0.10 | 0.132 | 0.066 | 0.53 | 0.59 |
| Aug | 0.82 | 9.60 | 0.60 | 0.45 | 0.492 | 0.369 | 0.33 | 0.45 |
| Sep | 0.77 | 9.60 | 0.60 | 0.45 | 0.462 | 0.347 | 0.31 | 0.42 |
| Oct | 0.81 | 8.10 | 0.60 | 0.45 | 0.486 | 0.365 | 0.32 | 0.45 |
| Nov | 0.59 | 5.60 | 0.30 | 0.20 | 0.177 | 0.118 | 0.41 | 0.47 |
| Dec | 0.55 | 3.70 | 0.25 | 0.15 | 0.139 | 0.083 | 0.42 | 0.47 |
| Total: | 7.24 | 65.50 | | Annual Total: | 2.610 | 1.766 | 4.629 | 5.472 |
| | | | | Average Runoff Coefficient: | 0.361 | 0.244 | | |

| Month | Runoff Volume (ac-ft), Phase 1 | | | Runoff Volume (ac-ft), Phase 2 | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Phase 1 - South Cell | | | Phase 2 - South Cell | | | Phase 2 - North Cell | | | Total Both Cells |
| | Cliffs* | Other** | Total | Cliffs* | Other** | Total | Cliffs* | Other** | Total | |
| Jan | 0.273 | 0.123 | 0.396 | 0.224 | 0.095 | 0.319 | 0.137 | 0.462 | 0.599 | 0.918 |
| Feb | 0.261 | 0.118 | 0.379 | 0.215 | 0.091 | 0.305 | 0.131 | 0.442 | 0.573 | 0.878 |
| Mar | 0.361 | 0.181 | 0.541 | 0.297 | 0.139 | 0.436 | 0.181 | 0.678 | 0.859 | 1.295 |
| Apr | 0.205 | 0.077 | 0.282 | 0.169 | 0.059 | 0.228 | 0.103 | 0.289 | 0.392 | 0.620 |
| May | 0.209 | 0.079 | 0.287 | 0.172 | 0.060 | 0.232 | 0.105 | 0.294 | 0.400 | 0.632 |
| Jun | 0.114 | 0.043 | 0.157 | 0.094 | 0.033 | 0.127 | 0.058 | 0.161 | 0.219 | 0.346 |
| Jul | 0.260 | 0.098 | 0.358 | 0.214 | 0.075 | 0.289 | 0.131 | 0.367 | 0.497 | 0.787 |
| Aug | 0.969 | 0.547 | 1.517 | 0.797 | 0.421 | 1.218 | 0.488 | 2.050 | 2.538 | 3.756 |
| Sep | 0.910 | 0.514 | 1.424 | 0.749 | 0.395 | 1.144 | 0.458 | 1.925 | 2.383 | 3.527 |
| Oct | 0.957 | 0.541 | 1.498 | 0.788 | 0.416 | 1.203 | 0.482 | 2.025 | 2.507 | 3.710 |
| Nov | 0.349 | 0.175 | 0.524 | 0.287 | 0.135 | 0.421 | 0.176 | 0.655 | 0.831 | 1.252 |
| Dec | 0.273 | 0.123 | 0.396 | 0.224 | 0.095 | 0.319 | 0.137 | 0.462 | 0.599 | 0.918 |
| Total: | 5.141 | 2.618 | 7.759 | 4.229 | 2.014 | 6.243 | 2.588 | 9.807 | 12.395 | 18.638 |

**Cliffs include the west bluff, consisting of Dakota and Entrada sandstone, slope varying 1.5:1 to vertical, and some talus.*

***Other areas include the mill site, wind-eroded sandstone, wind-deposited sandy soils in valley, and residual soils on E bluff.*