MWH

BUILDING A BETTER WORLD

June 24, 2011

New Mexico Mining and Minerals Division
1220 South St Francis Drive
Santa Fe, NM 87505

Attention: Mr. David Ohori

RE: Supplemental Closeout Plan
Section 27 Mine Site, New Mexico
Permit No. MK005RE

Dear Mr. Ohori:

MWH is submitting the attached *Supplemental Closeout Plan* for the Section 27 Mine to the New Mexico Mining and Minerals Division on behalf of United Nuclear Corporation (UNC). By submitting this *Supplemental Closeout Plan*, UNC does not intend to, nor does it, agree that the standards, requirements or areal extent of required remediation used in this plan, or any other provisions, are appropriate for closure of any other existing uranium mine, or are precedential in any way.

Please let us know if you have questions or require additional information.

Sincerely,

Toby Leeson, P.G.
Principal Hydrogeologist

Encl.: Section 27 Supplemental Closeout Plan

CC: Roy Blickwedel, GE
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SECTION 27 MINE
SUPPLEMENTAL CLOSEOUT PLAN

June 24, 2011

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1.0 INTRODUCTION

This Supplemental Closeout Plan (Plan) for United Nuclear Corporation's (UNC's) former Section 27 Mine has been prepared in compliance with the requirements of Section 5 of the New Mexico Mining Act (NMAC 19.10.5.506, Closeout Plans). This issuance of the Section 27 Supplemental Closeout Plan (June 2011) incorporates added areas requiring reclamation within the permit boundary, and limited areas outside and adjacent to the permit boundary.

The Plan is based on available site data and topographic mapping. The Section 27 Plan was prepared using the State of New Mexico Energy, Minerals and Natural Resources Department Mining Act Reclamation Program (MARP) document *Closeout Plan Guidelines* (MARB, 1996) plus additional criteria prescribed by the New Mexico Mining and Minerals Division (MMD).

This Plan describes the construction tasks that will be completed to reclaim the Site in accordance with the guidelines. Closeout construction will be conducted in two phases: Phase 1 construction was completed in 2010, and Phase 2 construction will be conducted subsequent to MMD approval. A summary of the construction phases is included below and a more detailed description is included in Section 2.0

This document is divided into six sections. Section 1 discusses the project site including: soils, geology, surface and groundwater and post-mining land use. Section 2 describes components of this Plan. Section 3 provides a description of construction and verification gamma radiation level surveys. Section 4 provides a Financial Assurance Cost Estimate. A general construction schedule is provided in Section 5. References are provided in Section 6. The geotechnical stability model output is presented in Appendix A. Gamma radiation surveys methods are included in Appendix B. The Financial Assurance Cost Estimate is included in Appendix C. A drawing set for the Plan follows the text.

UNC's submission of this Plan does not constitute a waiver of any of its arguments or positions, or an admission regarding future applications or projects of UNC concerning reclamation at other sites. Closeout plans for other sites are independent of this Plan and based on the application of the Act and Rules to the specifics of such other sites and pertinent, surrounding conditions, without reference to this Plan.

1.1 PROJECT DESCRIPTION AND BACKGROUND

The mine is located in Section 27, Township 14N, Range 9W of the New Mexico Principal Meridian approximately 35 miles north of Grants, New Mexico. The Section 27 mine is located approximately two miles east of the Philips Mill and Rio Algom Mill tailings impoundment in the Ambrosia Lake District of McKinley County, as shown on Drawing 1, *Cover and Index Sheet* and Drawing 2, *Site Vicinity Map.* Prior to Closeout construction conducted in 2010, features at the Site included two shafts, three vent holes, two small piles of non-economic mine materials containing overburden rock, sands and gravels, one small ore stockpile, two topsoil stockpiles and several small piles of ball mill reject materials. The mine site is currently inactive and the mining features encompass approximately 14 acres. Original site features are shown on Drawing 3, *Original Conditions.*

UNC produced uranium ore from the Section 27 mine during operations from 1970 to 1977. The Section 27 mineral lease covered approximately 200 acres in the southern half of Section 27 and was surrendered in 1988. Surface ownership at the mine is currently held by Kent Schmitt. Ownership of the mineral estate is held by Hecla Mining Company.

Phase 1 construction activities occurred in 2010 and included reclamation of the mining features at the site. Phase 1 construction activities are summarized in Sections 1.7 and 2.0 of this Plan with details provided in the *Section 27 Construction Completion Report* (MWH, 2010a).

1.2 SITE SOILS AND GEOLOGY

Native soils on the Site consist of well-drained silty, slightly clayey sands. Soils in the non-economic storage areas (NESA) consist of fine to coarse-grained sands with gravels and cobble-sized sandstone and some shale. The ore stockpiles were comprised of gray-colored medium to coarse-grained sands with cobbles and gravels. On the outer surfaces of all the piles the cobbles and gravels had formed a natural armoring layer, greatly reducing wind and water erosion. Currently all areas support a variety of native vegetation.

The Section 27 mine is located southwest of the San Mateo Mesa and northeast of the Mesa Montanosa within the San Juan Basin. Bedrock beneath the Site consists of the following stratigraphic units, in descending sequence: alluvium/weathered Mancos shale; the Tres Hermanos-C, -B, and -A sandstones; the Dakota Formation; the Westwater Canyon Member and Recapture Member of the Morrison Formation, and the Bluff Sandstone Formation. Uranium production at the mine was from the Westwater Canyon Member, located over seven hundred feet below the ground surface.

1.3 SURFACE WATER AND GROUNDWATER

The site is located within the drainage basin of the Arroyo del Puerto, an ephemeral drainage located over two miles southwest of the Site. Two surface water drainages lie to the east of the Site, with the Mulatto Canyon drainage lying immediately east of the Site and another, unnamed drainage approximately one-half mile to the east (see Drawing 2). The unnamed drainage drains into a small impoundment area known as Voght Tank, primarily used as a stock watering pond. Both drainages are intermittent, with flows occurring only after the spring runoff and during heavy thunderstorms. The non-economic mine material piles and other portions of the Site are not within the floodplain of the stream, and as such do not impede the natural flow. Surface water at the Site has not been characterized due to the intermittent nature of the flows, which occur primarily as sheet flow, except for the small incised channel that intersects the eastern side of the site. As no surface water will be impounded at the Site, a surface water monitoring plan will not be required.

Current groundwater quality at the Section 27 Mine was evaluated during the *Phase 1 Groundwater Abatement Study*, which is described in detail in the report *Stage I Abatement Plan and Investigation Report* (Intera, 2007). Intera determined that the mine cannot be viewed as the source of a release of contaminants that can be removed or stabilized. Instead, the act of dewatering the basin to enable mining allowed for the introduction of air, which can promote the dissolution of ore minerals. Water quality, both locally and regionally, is expected to naturally improve as water levels recover from mining. Intera suggested that the State consider the water quality at the site to be within the regional background and/or that technical infeasibility and alternate abatement standards be applied to fulfill the ground water abatement process. As such, groundwater quality issues within the formations that lie several hundreds of feet below the ground surface are independent of the mine closeout activities and not applicable to this Plan.

1.4 POST-MINING LAND USE

Reclamation of the Section 27 mine will exceed conditions that are necessary to support a post-mining land use of livestock grazing (MWH, 2010b). Mine reclamation will also be consistent with the potential for future mining. A vegetation and wildlife survey was conducted to determine the native species, corresponding plant densities, and current range conditions for the Site and adjacent range areas (see Section 1.5). The topsoil stockpiles and surrounding native soils were sampled for agronomic parameters to determine the suitability of the soil as a growth medium. The results of the agronomic analyses are presented in the document *Section 27 Materials Characterization Report* (MWH, 2007).

1.5 VEGETATION AND WILDLIFE

A vegetation and wildlife survey was conducted that provided recommendations for revegetation of the Site during closeout construction (Cedar Creek, 2006). The survey was conducted in accordance with Title 19, Chapter 10, Part 5 of the New Mexico Administrative Code (NMAC) and the MARP. The purpose of the survey was to facilitate a determination of: 1) current floral and faunal conditions extant in the vicinity of the permit area, 2) quality of habitat for indigenous wildlife, and 3) revegetation potential along with a revegetation plan and recommendations to optimize the ability of reclamation to meet post-mining land use considerations. The results of the survey are presented in detail in the document *Vegetation and Wildlife Evaluations/Revegetation Recommendations* (Cedar Creek, 2006). The document includes site-specific protocols for monitoring and eventual success evaluation to be used at the Site.

The results of the survey indicated that a single plant community exists in the Section 27 study area: grassland steppe. The grassland steppe community was sampled with 45 sets of co-located samples for ground cover, woody plant density, and current annual production (Cedar Creek, 2006). The grassland community occupies the entirety of the study area. Statistically adequate ground cover data were collected from both baseline and reference areas adjacent to the Site. Floristic surveys of the baseline and reference areas resulted in the identification of a total of 34 taxa including 10 grass or grass-like species, 13 forbs, and 11 trees, shrubs, or succulents. None of these were determined to be sensitive species or otherwise protected by statute. Similarly, only one was identified as a noxious weed (tamarisk) that was found within the disturbance area. As required by MMD, any noxious weeds that were identified in the site-specific vegetation survey will be eradicated from the permit area during reclamation and kept out of the area, as necessary, during the post-reclamation period.

According to the New Mexico Rare Plants database, none of the identified seven species of concern exist in the immediate project area and no rare, threatened or endangered plant species were found on or near the project area during the survey.

The presence of wildlife or wildlife habitat was evaluated with four transects extended radially from the Section 27 disturbance footprint over two separate days (Cedar Creek, 2006). Over the course of these transects, only a single habitat type for indigenous fauna was observed within 0.5 mile of the Site. This was the grassland steppe community described above. The project area and immediate environs do exhibit ruderal vegetation (a plant species that is first to colonize disturbed lands) amidst the disturbances and the local drainage that transects the Site. Based on the extent of the grassland steppe habitat type, it appears that the entire disturbance due to the Section 27 operation occurred within this habitat type. To the north and east of the Site at a distance of more than 4,000 feet exists another community, Juniper Scrub, at the base of rim rock cliffs. These cliffs and Juniper Scrub are the only other wildlife habitat readily observable within a mile of the project area. The only physical habitat feature within the project area is artificial in nature. This feature consists of the remnant power poles that can be utilized by indigenous avifauna as perch sites for resting, loafing, or hunting. Given the relative proximity of the rim rock to the north and east, it is unlikely that these power poles would normally be used for nesting by raptors. However, it was agreed at a site-meeting between MMD, NMGFD, and UNC that four of these power poles should be left post-closure for raptor perches or nesting platforms.

Observations made during the survey were positive regarding: 1) the quality of area habitats; 2) use of those habitats by indigenous fauna; 3) more distant mine-related impacts; or 4) any continuing hazards to wildlife. Other than access roads, there was little evidence of mining activity external to the permit area. A high quality of area habitats and their utilization by indigenous wildlife can be inferred given the observed sightings of tracks, scat, nests, and burrows (Cedar Creek, 2006).

1.6 MATERIALS CHARACTERIZATION AND GAMMA SURVEYING

1.6.1 Initial Materials Characterization

The initial materials characterization was conducted at the Site between June 25 and July 1, 2007. The initial characterization consisted of a gamma exposure rate survey, collection of surface soil samples (<0.5 feet bgs) and subsurface soil samples (up to 13 feet bgs) for chemical analysis. The characterization activities were conducted inside the permit boundary within the Non-Economic Material Piles 1 and 2, Ore Stockpiles East and West, Topsoil Stockpiles East and West, the Ball Mill Reject Piles, and Vent Hole 3. The results of the initial materials characterization are described in detail in the document *Materials Characterization Report, Section 27* (MWH, 2007).

1.6.2 Materials Characterization Update

The results of the materials characterization (MWH, 2007) indicated that radium-226 (Ra-226) was elevated above background, as determined in the *Section 27 Materials Characterization Report* (MWH, 2007) at one location within the western topsoil stockpile. Given that the material was topsoil, it was not expected to contain constituents above background, and so was re-sampled to verify the previous results. Six samples were collected around the previous sampling locations on the west topsoil stockpile. All samples were collected at approximately two to three feet bgs. All results for Ra-226 were from non-detect (<1.0 pCi/g) to 1.1 pCi/g and uranium ranged from 0.96 to 1.53 mg/kg, similar to results obtained from the background reference area (MWH, 2007). The results of the verification analyses confirm that the previous result was anomalous, and that soils within the topsoil stockpiles contain concentrations of radium and uranium within the range of background concentrations.

Two areas were chosen as borrow sources for use during closeout of the Site. Borrow Area 1 was located to the west of the former location of the western topsoil stockpile within UNC-owned land. Soil samples were collected for laboratory analysis from the area in accordance with the *Materials Characterization Work Plan* (MWH, 2006). A total of 10 samples were collected from five locations within the borrow area. The samples were composite-sampled from 0-2 and 2-4 feet bgs, and were analyzed for Ra-226 and total uranium. Two representative samples were also collected for agronomic parameters. The results of these analyses indicated that Ra-226 ranged from 2.5 to 15.4 pCi/g and uranium from 1.4 to 12 mg/kg. These results indicated that several of the samples contained Ra-226 and uranium above the range of values observed in the background area (MWH, 2007).

A second borrow source (Borrow Area 2) was subsequently identified and sampled. Borrow Area 2 is located west of the former Ball Mille Reject Piles, as shown on Drawing 3 and Drawing 4, *2010 Post Construction Topography*. Composite soil samples were collected from seven locations at 0-2 and 2-4 feet bgs and analyzed for Ra-226 and uranium. The results of these analyses indicated Ra-226 (0.9 to 3.0 pCi/g) and uranium (1.0 to 7.0 mg/kg) concentrations all within the range of background concentrations, except for one uranium result and one Ra-226 result that were slightly above the maximum background concentrations. The difference in distance from each of the borrow areas and the area between the two non-economic materials piles is less than 200 feet. Based on the materials characterization results, Borrow Area 2 was selected as the borrow source for the Phase 1 construction and will also be used for the Phase 2 construction.

1.6.3 Post-Phase 1 Reclamation Verification Gamma Survey

A post-reclamation verification gamma survey was conducted over the Phase 1 closeout areas (MWH, 2010a) after completion of Phase 1 construction. The survey consisted of static gamma exposure rate measurements that were conducted in accordance with the Standard Operating Procedures included in the Phase 1 *Section 27 Mine Closeout Plan (MWH, 2008).* The verification gamma surveying was conducted on the constructed NESA covers, as well as over the excavated areas (Ball Mill Reject Piles,

Ore Stockpiles, miscellaneous piles and Shaft 2 Area). The gamma survey consisted of static exposure rate level measurements at one meter above the ground surface using a calibrated Ludlum Model 19 μR meter and direct gamma radiation level measurements with a 0.5-inch lead collimated 2x2 NaI detector (Eberline SPA-3) coupled with a Ludlum Model 2221 Scaler/Ratemeter at the same locations. Static measurements were collected on a regular grid with 50-foot node spacing, except in smaller areas, where denser spacing was used.

The results of the verification gamma survey are described in detail in the *Section 27 Construction Completion Report* (MWH, 2010a) and are shown on Drawing 5, *2010 Post Construction Exposure Rate Survey Results*. The results of the verification gamma survey showed:

- background area (collimated) = 5 to 12 μR/hr
- primary areas (ball mill reject, ore stockpiles and NESA-1 and NESA-2) = 6 to 11 uR/hr.
- miscellaneous piles/areas = 6 to 13 μR/hr

The verification gamma survey results indicated that exposure rates barely exceeded the background range (up to 13 μR/hr) in two areas included in the verification survey: southwest and northeast of Vent 3 (see Drawing 5). All other collimated exposure rate measurements were within the range of background levels (MWH, 2010a).

1.6.4 2011 Pre-Phase 2 Characterization Surveys

Two supplemental characterization surveys were conducted subsequent to the verification survey described in Section 1.6.3: one in May/July 2010 and one in May 2011 (MWH, 2010b). The May/July 2010 gamma radiation level survey was conducted in two phases (May and July 2010) and consisted of static gamma radiation measurements using a collimated scintillation detector collected on a regular grid cast on a random origin with 100-ft grid node spacing over the entire permit area, including the reclaimed disturbed areas. To characterize gamma exposure rates beyond the mine area boundaries, six sampling transects were surveyed: two each to the north and south of the Site, and one each to the west and east. A static gamma exposure rate measurement from waist height (one meter above the ground surface) was obtained at each grid node using a Ludlum Model 19 μR meter.

The May 2011 gamma radiation exposure rate survey consisted of exposure rate measurements at 100-ft square grid nodes outside the mine permit boundary (MWH, 2011). A static exposure rate measurement at waist high (one meter) above the ground surface was obtained at each 100-ft grid node using a Ludlum Model 19 μR meter. The exposure rate measurements were conducted to the north, east, and south of the mine permit boundary. The combined results of the supplemental post-reclamation surveys are shown on Drawing 6, *2011 Exposure Rate Survey Results*.

The May 2011 characterization survey also consisted of test pits that were excavated at six locations within the mine permit area boundary for subsurface soil sampling to determine vertical extent of contamination (MWH, 2011). Subsurface soil samples were collected initially at about one foot depth or shallower if native soil was encountered before one foot depth. The soils were screened to determine Ra-226 content based on a correlation between count rate for the gamma meter and soil Ra-226 content developed using three different soils with known concentrations to determine a target count rate at 30 pCi/g. The results of this field screening were used to determine the approximate depth to which Phase 2 areas would need to be excavated, as discussed in Section 2.0.

1.7 SUMMARY OF PHASE 1 CONSTRUCTION ACTIVITIES

The Phase 1 closeout construction activities that were conducted in 2010 are described in detail in the *Section 27 Construction Completion Report (MWH, 2010)* and are summarized below.

1.7.1 NESAs, Ball Mill, and Ore Stockpiles

Materials from mining facilities throughout the site were consolidated in NESA-1 and NESA-2. Consolidated materials included the Ore Stockpiles, Ball Mill Reject Piles, foundation materials and telephone poles. Following consolidation of the mining facilities, the NESA facilities were graded to a stable slope configuration and covered with three feet of material from the borrow area and topsoil stockpiles. Removal areas were graded and backfilled with material from the borrow area as necessary to create a free draining topography similar to the surrounding areas. Original site conditions prior to Phase 1 construction activities are shown on Drawing 3. Site conditions following Phase 1 construction are shown on Drawing 4.

1.7.2 Vent Holes and Shafts

For the vent holes and shafts, the above ground portions were removed and placed in the NESA facilities. Concrete caps were then constructed over the shafts and vents and 8-inch diameter sample ports were installed. The concrete caps were then covered with three feet of cover material from the borrow area.

1.7.3 Revegetation

Areas disturbed during construction were seeded and mulched using the seed mix listed in Section 2.6 of this Plan. Temporary haul roads and other areas that were highly compacted were first ripped to a minimum of two feet prior to seeding. Other areas were ripped to a depth of six inches prior to seeding.

Following seeding, fencing was installed around the perimeter of the construction area as described in Section 2.8 of this Plan. Final site conditions and the location of fencing are shown on Drawing 4.

2.0 CLOSEOUT PLAN COMPONENTS

This Plan was prepared following the guidelines presented in the document *Closeout Plan Guidelines for Existing Mines* (MARB, 1996) that are part of the MARP. In addition, MMD has provided certain criteria that it requires to be incorporated in this Plan. Components of the Plan are intended to reclaim the Section 27 Mine to a post-mining land use that meets and exceeds (MWH, 2010b) livestock grazing or future mining.

Closeout construction will have been conducted in two phases. Phase 1 construction was conducted between May 24, 2010 and August 13, 2010, as described in detail in the *Section 27 Mine Construction Completion Report* (MWH, 2010a). The general components of the Phase 1 construction included the following:

- Regrading of non-economic storage areas
- Removal and on-site burial of the ore stockpile and ball mill reject pile materials
- Removal and on-site burial of the remaining foundations on site
- Sealing the shafts and vent holes
- Revegetating all disturbed areas

Phase 2 construction will be conducted subsequent to MMD's approval of this Plan. The general components of the Phase 2 construction will include the following:

- Removal and consolidation of materials with elevated exposure rates in the eastern and western removal areas
- Grading and covering of the consolidation area pile
- Construction of a surface water diversion channel
- Revegetating all disturbed areas

Construction components of this Plan are discussed in the following sections.

2.1 EROSION CONTROL

Erosion from the Site will be controlled by regrading and revegetating reclaimed surfaces to promote non-erosive runoff and to reduce run-on from the adjacent hillside. Erosion monitoring will be conducted as agreed to in the letter to MMD dated April 21, 2009. To ensure success, monitoring inspections will be conducted quarterly for the first year with monthly inspections during the first monsoon season (July, August and September) following Phase 2 construction. Subsequent to the first year following Phase 2 construction, monitoring inspections will be conducted annually. Inspections will be visual using the Bureau of Land Management (BLM) erosion classification system, shown in Table 2.1, *BLM Erosion Classification System*.

TABLE 2.1
BLM EROSION CLASSIFICATION SYSTEM

Classification	Description
Class 1	No soil loss or erosion; top soil layer intact, well-dispersed accumulation of litter from past year's growth plus smaller amounts of older litter.
Class 2	Soil movement slight and difficult to recognize; small deposits of soil in form of fans or cones at end of small gullies or rills, or as accumulations behind plant crowns or behind litter, litter not well dispersed or no accumulation from past year's growth obvious.
Class 3	Soil movement or loss more noticeable; topsoil loss evident, may be some pedestaled or hummocked plants; rill marks evident, poorly dispersed litter and bare spots not protected by litter.
Class 4	Soil movement and loss readily recognizable; topsoil remnants with vertical sides and exposed plant roots, roots frequently exposed, litter in relatively small amounts and washed into erosion protected patches.
Class 5	Advanced erosion; active gullies, steep sidewalls on active gullies; well developed erosion pavement on gravely soils, litter mostly washed away.

An inspection report will be submitted to MMD within 30 days following completion of the monitoring event. The inspection report will include information on any Class 3 or higher erosion feature identified. The inspection report will include a description of the erosion feature, photographs of the feature, probable cause of the feature, and any proposed corrective actions to repair erosion damage and address the probable cause of the feature. Class 3 erosion features will be evaluated on an individual basis to determine if corrective actions are needed. All Class 4 and Class 5 erosion features will have corrective actions recommended. Any corrective actions will be agreed to by both UNC and MMD and will include a schedule for implementation of the corrective actions. Corrective actions will be reported to MMD within 45 days of implementation. The report will include photographs of actions taken. Any areas where corrective actions have been taken will be inspected during the following inspection.

During construction, temporary sediment control structures, such as sediment control basins, straw bales, and silt fences will be installed. The structures will be maintained for the duration of reclamation activities and will be removed once reclamation is complete.

2.2 PHASE 1 CLOSEOUT COMPONENTS

Phase 1 construction was completed in 2010, as described in the document *Section 27 Construction Completion Report (MWH, 2010a).*

2.2.1 Regrading and Covers of Mine Piles

Regrading at the non-economic storage areas consisted of flattening the existing embankment slopes to promote sheet flow runoff and revegetating the surfaces to reduce erosion. As shown on Drawing 4 and Drawing 6, side slopes of the piles were recontoured to slopes ranging from approximately 3H:1V to 4H:1V. Regrading was performed to balance cuts and fills.

Non-Economic Storage Area 1

Non-economic Storage Area 1 (NESA-1) was regraded to have side slopes 3H:1V or flatter. The top of the pile was regraded to slope slightly toward the regraded embankment at a slope of less than two percent. Prior to regrading, concrete foundations for the entire site were demolished and placed in the designated disposal areas adjacent to the pile shown on Drawing 4. During regrading, material in the pile will be used as cover for the buried debris.

Once the final contouring had been completed, a 36-inch cover was constructed over the whole of the NESA-1. The cover consisted of 26 to 28 inches of material from the on-site borrow area plus approximately 8 to 10 inches of topsoil from the topsoil stockpiles. The cover material was placed uniformly on the regraded areas prior to the placement of fertilizer and seed for revegetation, as discussed in Section 2.6.

In order to ensure uniform cover thickness over NESA-1, test pits were dug during construction. Cover material was placed in lifts up to three feet thick and compacted by trackwalking or wheel rolling with construction equipment to create a stable surface. Additional compaction of the cover material is not desirable as it will impede vegetative success and increase stormwater runoff (and hence erosion) from the cover. Quality control was a requirement and the responsibility of the construction contractor. UNC oversaw the contractor to ensure that they adhered to an adequate quality control plan during construction.

The reclaimed configuration of the pile was analyzed for geotechnical slope stability using the Slope/W model. Circular failures were analyzed by the model at one cross-section location using Bishop's method. Input parameters for the model were estimated using typical properties for waste rock, and included a unit weight of 110 pounds per cubic foot, an internal friction angle of 33 degrees

and a cohesion of zero. Typically acceptable factors of safety for long-term stability range from 1.3 to 1.5, and flattening of the side slopes through regrading will result in a factor of safety greater than 2.5. The location of the analyzed cross-section and output from the Slope/W model are included in Appendix A.

Non-economic Storage Area 2

Non-economic Storage Area 2 (NESA-2) was regraded in place, balancing cut and fill quantities. The sides of the pile were regraded to slopes of 3H:1V or flatter to blend in with the surrounding topography, especially on the north end of the pile. To the extent possible the salt brush at the toe of the south end of the pile was left in place to provide erosional stability. At the north end of the pile the small material piles were regraded to blend them into the surrounding topography.

Once the final contouring was completed, a 36-inch cover was constructed over the whole of the NESA-2. The cover consists of 26 to 28 inches of material from the site borrow area plus approximately 8 to 10 inches of topsoil from the topsoil stockpiles. The cover material was placed uniformly on the regraded areas prior to the placement of fertilizer and seed for revegetation, as discussed in Section 2.6.

To ensure uniform cover thickness over the NESA-1, test pits were dug during construction. Cover material was placed in lifts up to three feet thick and was compacted by trackwalking or wheel rolling with construction equipment to create a stable surface. Additional compaction of the cover material is not desirable as it will impede vegetative success and increase stormwater runoff (and hence erosion) from the cover. Quality control was a requirement and the responsibility of the construction contractor. UNC oversaw the contractor to ensure that they adhered to an adequate quality control plan during construction.

A geotechnical stability analysis was performed for the regraded configuration using the same approach, methods and material properties that were used for NESA-1. Regrading of the pile resulted in a long-term stability of greater than 2.5. Stability modeling output is included in Appendix A.

Topsoil Stockpiles 1 and 2

Soil from the topsoil stockpiles was placed over the regraded non-economic storage areas prior to placement of fertilizer and seed. The stockpiles contained approximately 9,200 cubic yards of soil, sufficient to cover the regraded piles and other disturbed areas with a topsoil thickness of approximately 8 to 10 inches.

Ball Mill Reject Pile

The material in the Ball Mill Reject Piles (see Drawing 3) consisted of coarse sands, gravels, cobbles and mill ball debris. The pile was relocated to the trenches at the base and middle of NESA-1, which is included in the regrade surface shown on Drawing 4. During excavation, all soils with levels of radiation above the range of values detected in the background reference area were relocated, which was controlled by the use of gamma surveying, as explained in Section 3.0.

Ore Stockpiles

The two ore stockpiles were located to the two stockpiles were relocated to a trench within NESA-1 shown on Drawing 4. The stockpiles consisted of gray-colored medium to coarse-grained sands with cobbles and gravels. During excavation, all soils with levels of radiation above the range of values detected in the background reference area were relocated, which was controlled by the use of gamma surveying, as explained in Section 3.0.

2.2.2 Foundation Demolition and Removal

Closure of the mine was completed in 1988, leaving several foundations in place, as shown on Drawing 3. With the exception of the ore loading pull-through at Shaft #2, all structures were demolished and placed in the designated disposal area shown on Drawing 4. At the request of the landowner, the Shaft #2 pull-through left in-place for use as a livestock watering trough. The remaining on-site power lines and all but four power poles were removed and salvaged.

2.2.3 Shaft and Vent Hole Reclamation

The two shafts and three vent holes were reclaimed by plugging and capping with a system consisting of polyurethane foam, concrete and steel. The design for the vent hole and shaft plugs is shown on Drawing 10, *Typical Vent and Shaft Plug Detail.*

Shaft #1 has a diameter of approximately 5 feet and Shaft #2 has a diameter of approximately 12 feet. Vent Holes #1, #2 and #3 all have diameters of approximately five feet. All five features had above-ground access hatches consisting of steel and concrete. Prior to plugging, the above-ground features were demolished to grade. The areas around each shaft and vent were regraded as necessary to match the adjacent topography.

Once the final contouring was completed, the vents and shafts were covered with three feet of material consisting of 16 to 18 inches of cover material from the on-site borrow area plus approximately 8 to 10 inches of topsoil. The material was placed uniformly on the regraded areas prior to the placement of fertilizer and seed for revegetation.

2.3 PHASE 2 CLOSEOUT PLAN COMPONENTS

Phase 2 construction will be conducted subsequent to MMD's approval of this Plan.

2.3.1 Phase 2 Removal Areas

Removal areas consist of all identified locations within the Section 27 permit boundary with exposure rates greater than 150 μR/hr and areas outside the Section 27 permit boundary with exposure rates greater than 250 μR/hr. As shown on Drawing 6, there are two general areas that were determined to have gamma exposure rates in excess of these action levels (MWH, 2011) and that will undergo material removal during Phase 2: the West Removal Area and East Removal Area. The West Removal Area is approximately 1.25 acres in size and lies between NESA-1 and NESA-2 and the former West Ore Stockpile, plus a small area just to the north of NESA-2 (see Drawing 6). The East Removal Area is a larger area (13.5 acres) and is between Vent #2 and Shaft #2, which includes two areas outside of the north and south sides of the mine permit boundary. There is also a small area near the former eastern topsoil stockpile that is part of the Easter Removal Area. The boundaries of the removal areas were determined from the results of the gamma survey conducted in May 2011. Depths of exposure rates above these levels were estimated during the 2011 gamma survey at 0.5 to 0.75 feet in the East Removal Area and 2.0 to 2.5 feet in the West Removal Area.

Material in the removal areas will be excavated to a depth where gamma exposure rates are below the action levels of 150 μR/hr inside the permit boundary and 250 μR/hr outside the permit boundary approximately to the boundaries identified in Drawing 6. A gamma scan will be conducted during the removal to confirm that this required post-removal exposure rate has been achieved (see Section 3.0 for further details). The resulting surface will then be graded to drain and any deeper areas that cannot drain will be backfilled with clean soil from the borrow area.

2.3.2 Consolidation Area

Material excavated from the West and East Removal Areas will be placed in the Consolidation Area. The investigation performed in May 2011 indicated that the depth of material exceeding the action level may be as deep as four feet. Consolidating all excavated material in this area will reduce the total area of new disturbance required for Phase 2 by eliminating the borrow requirement to backfill the excavation if this area were excavated and it prevents the requirement to create a new Consolidation Area at a location that would not otherwise be disturbed by Phase 2 construction activities.

The Consolidation Area will be located between NESA-1, NESA-2 and the former Ore Stockpiles and will cover the former Ball Mill Reject piles. All materials that exceed the action level that are excavated during the Phase 2 construction will be placed in this area. Upon completion of material excavation from the removal areas, a three foot soil cover will be placed over the consolidated materials using soil from the borrow area. Drawing 6 shows the location of the Consolidation Area. The final configuration for the Consolidation Area is shown on Drawing 7, *Consolidation Area Grading Plan* and Drawing 8, *Consolidation Area Sections*.

Following placement of cover material, a gamma radiation exposure rate survey will be performed as described in Section 3. Additional cover will be placed over any areas exceeding the action level for the Phase 2 work.

2.3.3 Diversion Channel

In an effort to control erosion from overland flow, a channel will be constructed on the upgradient side of the Consolidation Area. The channel will be designed to intercept overland flow prior to encountering the Consolidation Area, as well as flow from the north slope of the Consolidation Area and divert these flows to the west/southwest.

Peak flow for the channel was calculated using the Curve Number method in the HEC-HMS model. A curve number of 83 was used for the contributing basin. The lag time for the basin was calculated using the equation below.

$$L = (l^{0.8} * (S + 1)^{0.7}) / (1900 * Y^{0.5})$$

Where,

L = lag time in hours
l = hydraulic length of watershed in feet
S = (1000/CN) – 10
CN = soil group curve number
Y = average watershed land slope in percent

Initial abstraction was calculated using the equation Ia = 0.2S. For the basin that contributes to the diversion channel, L = 0.16 hours, *l* = 1461 feet, S = 2.05 inches, CN = 83, and Y = 6%. HEC-HMS was used to calculate the discharge that is associated with a 100-year, 24-hour storm event with total precipitation of eight inches and a Type 2 storm distribution. Using the aforementioned values for inputs, the channel's design discharge is 28.4 cfs.

The diversion channel will be approximately 750 feet in length. To carry the design discharge, the channel will be constructed with a bottom width of 5 feet, 3:1 side slopes, 1.5 feet deep, with a riprap D_{50} of 3 inches. The location of the channel is shown on Drawing 7 and design details are shown on Drawing 9, *Channel Profile, Section, and Detail.*

A dissipation basin will be constructed at the downstream end of the channel, making up the last 20 feet of the 750-foot channel length. This basin will have the same width as that of the channel, 17 feet, and will tie in with the channel geometry where it meets the channel and tie in with the ground surface at its outlet. The material used to construct the basin will be 6-inch D_{50} riprap with a thickness of 12 inches, as detailed in Drawings 7 and 9. The source of rip rap will likely be a local supplier in Thoreau, NM that UNC has used at other sites.

2.4 BORROW SOURCE

As indicated in Section 1.0, the borrow source that was used during Phase 1 construction will also be used during Phase 2 construction and is located to the west of the western topsoil stockpile, as shown on Drawing 4. The area is approximately 400 by 400 feet and will be excavated an additional three to four feet bgs. In the proposed configuration, there is up to 10,000 cubic yards of material available. Additional material could be made available by expanding the borrow area, to the west, south; additional material is available beneath the former western topsoil stockpile. Prior to use of the borrow material, the top layer of topsoil (approximately six to eight inches) will be stripped off and placed to the side of the borrow area. Once Phase 2 construction is complete, the topsoil will be placed back onto the borrow area, and the area will be minimally regraded, as necessary, to reclaim the area, ensure revegetation success, and ensure positive drainage.

2.5 ROAD RECLAMATION

Currently the only road remaining within the mine permit area is the main access road that connects Shafts #1 and #2, which was reclaimed after completion of the Phase 1 construction. This road will be left in place for landowner access. Any other temporary haul roads used for construction will be reclaimed by ripping and regrading the surface at the completion of reclamation activities and seeding with the native seed mix used in other revegetated areas.

2.6 REVEGETATION

Areas impacted by regrading, material removal, shaft and vent hole reclamation, and foundation removal will be revegetated. Revegetation is intended to provide stability against wind and water erosion through an effort to establish a self-sustaining plant community. Soils in the revegetated areas were sampled for agronomic analysis, as described in the *Materials Characterization Report* (MWH, 2007) to determine suitability as a growth medium, and were shown to be suitable for plant growth. A crimped mulch with seed mixture prescribed below will be applied to conserve soil moisture and protect the soil from erosion. Revegetation will take place between June and September. Approximately eight acres were revegetated during Phase 1 construction, and another approximately 11 acres will be disturbed during Phase 2 construction.

Revegetated areas will be seeded (as was done during Phase 1) with a mixture that contains native grasses and forbs and will produce a self-sustaining plant community that does not depend on external inputs of water or fertilizer. Specific species, composition percentages, seeding rates and amendments will be based on the results of the *Vegetation and Wildlife Evaluation/Revegetation Recommendations Report* (Cedar Creek, 2006). The evaluation was performed in the areas around the Site that currently have a similar land use of cattle grazing, consistent with the planned land use for the Section 27 site. Based on the results of the vegetation survey (see Table 12 of Cedar Creek, 2006) and revegetation activities previously performed at the adjacent Philips Mill Site, the species listed in Table 2.2, *Revegetation Species and Percent Composition* will be used in the seed mix for the Section 27 site.

TABLE 2.2 REVEGETATION SPECIES AND PERCENT COMPOSITION	
Species	**Seeding Rate (lbs PLS/ac)**
65 Percent	
Western wheatgrass	1.50
Alkali Sacaton	0.75
Blue Grama	0.50
Galleta	0.50
Thickspike Wheatgrass	1.00
Indian Ricegrass	1.00
Sideoats Grama	1.00
Bottlebrush Squirreltail	0.25
29 Percent	
Desert Globemallow	0.75
Palmer Penstemon	0.50
Rocky Mountain	0.25
Lewis Flax	1.00
6 Percent	
Fourwing Saltbush	2.00
Winterfat	2.00

Revegetation success will depend in part on landowner activities and livestock use at the Site. Revegetation will be considered complete based on documentation that the quantities of seed and any applicable amendments applied to revegetated areas met or exceeded the recommendations in the *Vegetation and Wildlife Evaluations/Revegetation Recommendations* document (Cedar Creek, 2006). Revegetation success will be assessed by monitoring and eventual testing including sampling of ground cover and where appropriate, production and woody plant density, within the permit area and in the Grassland reference area to provide comparison parameters. Monitoring and evaluation of revegetation success will be conducted in accordance with the recommendations presented in the document *Vegetation and Wildlife Evaluation/Revegetation Recommendations Report* (Cedar Creek, 2006), and will include the calculation of species diversity from ground cover data using systematic ground cover sampling (Cedar Creek, 2006).

2.7 REGULATORY COMPLIANCE

A current stormwater discharge permit (NPDES) for construction activities will be maintained as required prior to implementation of Phase 2 construction. Temporary erosion control measures such as straw bales, silt fences and sediment basins will be placed as needed prior to the start of construction and will be removed once construction has been completed. Erosion control measures will be maintained for the duration of construction. Dust will be controlled by periodically watering haul roads and any disturbed areas producing dust. A water supply well exists near the permit area that can be used for water.

Comments on the Section 27 Site Assessment were received from the Historic Preservation Division (HPD) of the New Mexico Department of Cultural Affairs pertaining to two archeological sites that are located to the north of Non-economic Storage Area #1 (letter dated April 13, 2004) in which HPD requested that an archeologist assess the condition of the sites and any impacts from the proposed closeout operations. Lone Mountain Archeological Services, Inc. (April 2005) issued an assessment that indicated no concern with respect to the Closeout Plan. Both sites are outside of the permit boundary and any area that will be affected by the closeout activities

2.8 SITE ACCESS CONTROL AND FENCING

The Section 27 Mine is located entirely on privately-owned land. Access gates are currently in place and prevent public access to the Site. The gates will remain in place as part of the final reclamation of the Site. The new fence that was constructed during Phase 1 construction will be maintained and/or repaired, as needed. The fencing was constructed as per Bureau of Land Management guidelines (BLM, 1986). As per the BLM guidelines (BLM, 1986) and the site-specific conditions, the fencing specifications will be based on the multiple use standard for "cattle and sheep (requires extreme restriction of livestock movements)" with deer being the predominant game species. These specifications include the following:

- No. of wires: 4
- Maximum height.: 40"
- Wire spacing: 16, 6, 6 & 12 inches
- Wire type: top smooth, others barbed
- Post spacing: 16.5 to 30 ft
- No. of stays between line posts: 1-4

UNC executed an Access Agreement with the property owner on December 16, 2003 to perform the activities described in this Plan. An updated access agreement will be obtained prior to Phase 2, if required.

3.0 RADIOLOGICAL SURVEYS

3.1 OBJECTIVES OF RADIOLOGICAL SURVEYS

Gamma radiation exposure rate surveying (gamma surveying) will be conducted during the construction and post-reclamation phases of Phase 2. The construction survey will be used to guide excavation and ensure that all soils with designated gamma radiation exposure rates have been removed and placed in the Phase 2 Consolidation Area. A post-reclamation verification gamma survey will be conducted after the completion of the Phase 2 construction and final grading activities to verify that soils with elevated exposure rates have been removed from the excavated areas and that the cover systems over the Phase 2 Consolidation Area attenuate gamma radiation levels to acceptable levels. Standard Operating Procedures for the gamma surveying are included in Appendix B.

3.2 EXCAVATION CONTROL GAMMA SURVEYING

Radiological surveying was conducted during the Phase 1 construction (Ball Mill Reject Piles and Ore Stockpiles) and will be conducted during Phase 2 (Western and Eastern Removal Areas) to ensure that all soils with elevated gamma radiation levels are excavated and removed from those areas.

The construction control survey will consist of gamma radiation exposure rate (μR/hr) measurements using a calibrated μR Meter, such as Ludlum model 19, Ludlum Model 12S or Eberline PRM-7. These μR meters contain a 1x1 NaI detector. If necessary, a 2x2 NaI detector with much higher gamma radiation sensitivity, such as Eberline SPA-3 or Ludlum 44-10 (about 1200 cpm per μR/hr with Cs-137), approximately 12 inches above the ground surface and connected to a scaler/ratemeter will be used to obtain gamma radiation count rate. The gamma radiation count rate measured by the 2x2 NaI detector will be converted to exposure rate (μR/hr). An equivalent meter may be substituted for all or portions of the radiological survey. All radiation instrumentation will have a calibration performed within the past year. A visual inspection of the instrument and a daily function check will be conducted daily prior to usage.

Construction surveying will begin with field locating the boundary of Phase 2 impacted areas (with gamma radiation exposure rates above 150 μR/hr within the work permit boundary and above 250 μR/hr outside the work permit boundary). Information (exposure rates and coordinates) from previous surveys (July 2010 exposure rate survey and May 2011 supplemental exposure rate survey) and additional surveying will be used to delineate impacted area boundaries. The boundaries will be marked for excavation.

Scan and static exposure rate surveys will be conducted to guide excavation in lifts until the soil with elevated gamma radiation levels has been removed. The scan exposure rate survey will be performed with the meter at approximately waist high (one meter) from the ground surface in a serpentine pattern along a transect of an area at a rate of about three feet per second with the meter in fast response and audio speaker set to 'on' to identify any locations with an elevated levels by audio response and analog/digital rate display. Static exposure rate surveying with the μR meter will be performed with meter in slow response mode while holding the meter stationary over a point or a location for at least 15 seconds. The excavation will be repeated in lifts as necessary until the scan survey indicates that all soil with elevated gamma radiation levels has been removed. Static exposure rate surveying will be performed within the excavation areas following the final excavation lift at several locations. When the scan and static survey at all points are below the action levels, excavation in the area will be considered complete and ready for the post-reclamation verification survey.

3.3 POST-RECLAMATION VERIFICATION GAMMA SURVEY

A post-reclamation verification survey was conducted at the conclusion of the Phase 1 construction, as detailed in the *Construction Completion Report* (MWH, 2010a). A post-reclamation verification survey will also be conducted over the Phase 2 areas (East and West Removal Areas). The survey will consist of static gamma radiation exposure rate measurements on a square grid with 100-foot spacing between grid nodes in each area. The grid nodes will be field located using a GPS and recorded on field forms. In the unlikely event that any of the readings exceed the action levels, the location will be investigated using a scan radiation survey and marked for addressing residual impacts.

4.0 FINANCIAL ASSURANCE COST ESTIMATE

4.1 INTRODUCTION

This section provides an estimate of reclamation costs and supporting documentation for executing this Plan. UNC will use the reclamation cost estimate to provide a basis for the financial assurance to close the Section 27 Mine in accordance with the financial assurance requirements for non-coal mining contained in NMAC Title 19, Chapter 10, Part 12. The reclamation cost estimate reflects the cost of engaging a third-party contractor to complete both phases of the Section 27 Mine Closeout Plan, as described here.

The cost estimate is divided into the two phases of work used to describe the closeout activities in Section 2. Phase 1 construction was conducted in 2010. Costs for these activities have not been revised since the previous *Closeout Plan* (MWH, 2009). Costs for the Phase 2 construction have been added to the estimate and use current costs for equipment, labor and materials.

4.2 COST ESTIMATING METHODOLOGY

The cost estimate was prepared in general accordance with the *Handbook for Calculation of Reclamation Bond Amounts* produced by the U. S. Department of the Interior Office of Surface Mining (OSM, 2000), as well as Attachment 4 of the *Closeout Plan Guidelines* (MARB, 1996). Costs were determined for each reclamation item using the "bottom-up" method. This robust method of estimating uses equipment productivity and project specific wage and equipment rates to compute a unit cost. Unit costs were based on productivity parameters and rental equipment rates to provide a reasonably conservative cost estimate.

The cost estimate includes direct and indirect construction costs for reclamation. Direct costs are for the equipment, labor, and permanent materials directly involved in the physical construction of specific reclamation items. Indirect costs are for those items not directly involved in the physical construction but are needed for the orderly and safe completion of the work.

Direct cost construction items were categorized into the seven main reclamation components listed below:

- Site preparation
- Hauling materials for disposal and to provide cover
- Regrading
- Foundation and portal demolition
- Vent and shaft plugging
- Reclamation of disturbed areas
- Revegetation
- Installation of permanent facilities
- Post-closure operations and maintenance

Indirect cost items include:

- Contractor mobilization and demobilization
- Contingency
- Engineering redesign fee
- Contractor profit and overhead
- Project management fee
- State of New Mexico procurement cost

Cost for the gross receipts tax was excluded from the estimate since the State of New Mexico is exempt from the gross receipts tax in accordance with the New Mexico Gross Receipts and Compensation Act, as per NMAC Chapter 7, Article 9, NMSA 3.2.100.9.

4.3 RECLAMATION SEQUENCE

The cost estimate was developed assuming that reclamation activities will follow the general sequence listed below:

Phase 1 Construction

- Mobilization
- Site preparation and installation of sediment controls
- Consolidation of the ore and ball mill reject stock piles with the non-economic storage areas
- Foundation and vent/shaft demolition and consolidation in the non-economic storage areas
- Regrading non-economic storage areas
- Vent and shaft plugging
- Placement of cover material over non-economic storage areas and vent and shaft areas
- Final grading and contouring
- Topsoil placement
- Fence repair/replacement
- Revegetation

Phase 2 Construction

- Mobilization
- Site preparation and installation of sediment controls
- Excavation and consolidation of East Removal Area
- Excavation and consolidation of West Removal Area
- Construction of Diversion Channel
- Placement of cover material over consolidation area
- Final grading and contouring
- Fence repair/replacement
- Revegetation

In accordance with this Plan, the existing access road and ore loading pull-through at Shaft #2 will be left in place.

4.4 QUANTITY TAKE-OFF

Material handling quantities were determined from the conceptual drawings included with this Plan. Earthwork quantities were determined using Autodesk Land Desktop software and verified by manual methods. Quantities for other items were determined by manual methods. Earthwork volumes were adjusted in the detailed cost estimates to account for swell for cost estimating purposes. Table 4.1 provides the take-off quantities for earthworks.

TABLE 4.1 TAKE-OFF QUANTITIES		
Item	**Description**	**Quantity (cubic yards)**
Phase 1 Construction		
Ball Mill Reject Pile	Loose stockpile composed of coarse sand, gravel, cobbles, and mill ball debris	760
Ore Stockpiles	Loose stockpile composed of medium to coarse-grained sands, cobbles, and gravels	5,753
Cover material	On-site borrow	10,830(1)
Topsoil Stockpiles	Loose stockpile composed of topsoil	9,210
Non-Economic Storage Area 1	Cut Quantity - Loose stockpile composed of medium to coarse-grained sands, cobbles, and gravels	1,176
	Fill Quantity – Material from regrading and stockpile consolidation	8,049
Non-Economic Storage Area 2	Cut Quantity - Loose stockpile composed of medium to coarse-grained sands, cobbles, and gravels	1,626
	Fill Quantity – Material from regrading and stockpile consolidation	1,331
Phase 2 Construction		
East Removal Area	Native soils consisting of well-drained silty, slightly clayey sands	14,230
West Removal Area	Native soils consisting of well-drained silty, slightly clayey sands	4,070
Topsoil	Native soils consisting of well-drained silty, slightly clayey sands	13,290

The ball mill reject and ore stockpiles were used as fill material to obtain the design grades for the non-economic storage areas. These materials were placed at the base and middle of the non-economic storage areas by first excavating trenches in the middle of the piles and then filling them with the material from the ball mill reject and ore stockpiles.

4.5 EQUIPMENT RATES

Earthmoving equipment consists of typical types of equipment used by construction contractors for mine reclamation. The heavy equipment assumed for cost estimating purposes are listed below:

Phase 1

- 1 – CAT D8R Bulldozer
- 2 – CAT D25D Articulated Dump Trucks
- 1 – CAT 140H Motor Grader
- 1 – Water Truck 4000 Gallon Capacity
- 1 – 966G Loader

Phase 2

- 1 – CAT D8R Bulldozer
- 2 – CAT 725 Articulated Dump Trucks
- 1 – CAT 140H Motor Grader
- 1 – Water Truck 4000 Gallon Capacity
- 1 – CAT 324 Excavator

Hourly costs for each type of equipment included costs for fuel and maintenance. Weekly rental rates from Wagner Equipment Co. located in Farmington, New Mexico, were used in the cost estimate due to the short duration of the project. Rental rates are normally at higher cost than owned equipment, adding conservatism to the estimate.

Fuel costs were based on a diesel price of $4.50 per gallon Maintenance costs were based on values presented in the Caterpillar Performance Handbook, Edition 31, and experience.

4.6 LABOR RATES

Labor will include heavy construction equipment operators and general labor for completing the reclamation. The hourly labor rates in the cost estimate include the wage, fringe benefit, and subsistence pay since the Site is in a remote location. The hourly labor rates were taken from the Davis-Bacon wage rates determined by the Department of Labor for McKinley County, New Mexico. The hourly rate for labor in the cost estimate is provided in Table 4.2.

TABLE 4.2
HOURLY LABOR RATES

Type	Group	Wage per hour	Fringe per hour	Subsistence	Total Hourly Rate
Phase 1 Construction					
General Labor	II	$17.05	$4.75	$4.00	$25.80
Power Equipment Operator	IV	$22.57	$5.27	$4.00	$31.84
Phase 2 Construction					
General Labor	II	$16.09	$4.86	$4.00	$24.95
Power Equipment Operator	IV	$21.83	$5.70	$4.00	$31.53

The subsistence hourly rate was determined using values from Zone 4 of the Davis-Bacon wages.

4.7 COST ESTIMATE

The cost for reclaiming the Section 27 Mine is estimated at $301,000 for Phase 1 and $479,000 for Phase 2 with Post-Construction Closure Monitoring estimated at $76,000 for a total estimated project cost of $856,000, rounded to the nearest $1,000. The original cost estimate was for $377,000, which was the sum of the Phase 1 cost and the Post-Construction Closure Monitoring cost, as detailed in the letter to MMD dated April 21, 2009. Table 4.3 below provides a summary of the total Phase 1 and Phase 2 reclamation costs, plus Post-Construction Closure Monitoring, which applies to both phases. A detailed breakdown of the costs is included in Appendix C.

TABLE 4.3
RECLAMATION COST SUMMARY

Category	Activities	Cost
Phase 1 Construction		
Site Preparation	Install sediment control measures such as silt fences, straw bails, and sediment catchment ponds.	$8,606
Regrading	Excavate and haul ball mill reject materials, stockpiled ore material, and perform rough grading of non-economic storage areas to a 3H:1V or 4H:1V. Excavate and cover non-economic storage areas, vents, and shafts with 2 feet of borrow, 1 foot of topsoil, and perform finish grading on non-economic storage areas once covered with topsoil.	$96,455
Demolition and Portal Reclamation	Remove power poles and power lines, remove or cover unwanted concrete foundations on site, and cap vents and shafts.	$18,337
Reclamation of Disturbed Areas	Regrade areas disrupted by mining or reclamation activities to natural topography, cover with topsoil when necessary, and plant native vegetation.	$2,364
Revegetation	Seed and monitor progress of native vegetation planted on non-economic storage areas and disturbed areas.	$48,866
Installation of Permanent Facilities	Upgrade existing access road to allow for permanent access, and install perimeter fencing. Type of fencing is to be approved by the EMNRD prior to construction.	$19,565
Phase 1 Direct Closure Construction Cost Subtotal		$194,000
Phase 1 Indirect Construction Cost		$107,000
Phase 1 Total Estimated Reclamation Cost		**$301,000**
Phase 2 Construction		
Site Preparation	Install sediment control measures such as silt fences, straw bails, and sediment catchment ponds.	$6,337
Consolidation of Soils	Excavate, haul and consolidate material from removal areas. Grade and cover consolidation area. Construct diversion channel	$220,496
Reclamation of Disturbed Areas	Regrade areas disrupted by mining or reclamation activities to natural topography, cover with topsoil when necessary, and plant native vegetation.	$2,389
Revegetation	Seed and monitor progress of native vegetation planted on non-economic storage areas and disturbed areas.	$73,600
Installation of Permanent Facilities	Upgrade existing access road to allow for permanent access, and install perimeter fencing. Type of fencing is to be approved by the EMNRD prior to construction.	$6,030
Phase 2 Direct Closure Construction Cost Subtotal		$309,000
Phase 2 Indirect Construction Cost		$170,000
Phase 2 Total Estimated Reclamation Cost		**$479,000**
Direct Post-Construction Closure Monitoring Cost		$76,000
Total Estimated Project Cost		**$856,000**

Indirect costs are based on a percentage of the direct construction costs. Table 4.4, *Summary of Indirect Costs,* provides a description of indirect cost items, range of typical values, and selected cost for the cost estimate.

TABLE 4.4
SUMMARY OF INDIRECT COSTS

Item	Description	Range[1]	Selected[2]	Indirect Cost[3]
Phase 1 Construction				
Mobilization and Demobilization	Moving equipment to and from the Site, setting up construction support facilities, and construction permits	5% to 10%	10%	$19,400
Contingencies	Allowance to cover costs resulting from unexpected natural events and uncertainties	10%	10%	$19,400
Engineering Redesign Fee	Develop detailed construction documents and perform surveying	2.5% to 6%	2.5%	$4,900
Contractor Profit and Overhead	Third party profit, field support and supervision	10% to 30%	25%	$48,500
Project Management Fee	Inspect and supervise work performed by the contractor	2% to 7%	6	$11,600
New Mexico State Procurement Cost	Cost for state to retain a qualified contractor	Note 4	1.6%	$3,100
Phase 1 Subtotal Indirect Costs				**$107,000**
Phase 2 Construction				
Mobilization and Demobilization	Moving equipment to and from the Site, setting up construction support facilities, and construction permits	5% to 10%	10%	$30,900
Contingencies	Allowance to cover costs resulting from unexpected natural events and uncertainties	10%	10%	$30,900
Engineering Redesign Fee	Develop detailed construction documents and perform surveying	2.5% to 6%	2.5%	$7,700
Contractor Profit and Overhead	Third party profit, field support and supervision	10% to 30%	25%	$77,300
Project Management Fee	Inspect and supervise work performed by the contractor	2% to 7%	6	$18,500
New Mexico State Procurement Cost	Cost for state to retain a qualified contractor	Note 4	1.6%	$4,900
Phase 2 Subtotal Indirect Costs				**$170,000**

Notes:
1. Indirect costs are computed as a percentage of direct costs. The range of indirect percentages is suggested by the Office of Surface Mining (OSM, 2000).
2. The selected percentage of direct cost for the Section 27 Mine reclamation cost estimate.
3. The selected percentage multiplied by the direct closure construction cost subtotal.
4. Internal New Mexico State management cost for soliciting construction bids and selecting a reclamation contractor. The percentage is based on other New Mexico State reclamation cost estimates.

The rationale for selecting the specific percentage for determining the indirect cost is provided below:

- Mobilization and Demobilization: Higher percentage since the project is small and a remote location.

- Contingencies: Equal to the recommendation in the *Closeout Plan Guidelines* (MARB, 2006). Roy, we originally had this at 2-5%. The MARB Guidelines recommend 10% for smaller projects, so I change it to that. 10% seems reasonable.
- Engineering Redesign Fee: Lower percentage since there is good mapping and a complete reclamation design.
- Contractor Profit and Overhead: Higher percentage since the project will be small.
- Project Management Fee: Higher percentage since the project will be small.

4.8 COST ESTIMATE CONFIDENCE

The scope of work presented in this Plan provides the basis for the reclamation cost estimate. The reclamation costs are prepared based on industry-wide standards applicable to the local area, and are conservative in nature. This Plan provides the estimate of cost and supporting documentation for a third party to reclaim the Section 27 Mine in the unlikely event of forfeiture. There is a high level of confidence that a third-party contractor or UNC itself could complete the reclamation at or below the cost provided herein. This cost estimate was prepared for financial assurance purposes and is reasonably conservative. Actual construction costs may be lower.

5.0 CLOSEOUT PLAN SCHEDULE

Implementation of Phase 2 construction described in this Plan will begin after it has been approved by the MMD. Prior to the start of construction the following items will be performed:

- Completion of an NPDES permit
- Preparation of bid package including construction drawings and construction specifications.

Phase 1 construction was completed in 2010, as described in detail in the *Section 27 Mine Construction Completion Report*, dated September 16, 2010. Phase 2 construction will be conducted subsequent to approval of this Plan by MMD. A specific reclamation schedule will be developed by the contractor during the construction bidding process. The general schedule for Phase 2 construction is expected to be as follows:

Week 1-4:

- Mobilization
- Installation of sediment controls
- Excavation of the eastern removal area

Weeks 5-6:

- Excavation of the western removal areas
- Construction of the diversion channel

Weeks 7-8:

- Placement of cover on consolidation area
- Surface preparation and revegetation
- Fence repair/replacement

6.0 REFERENCES

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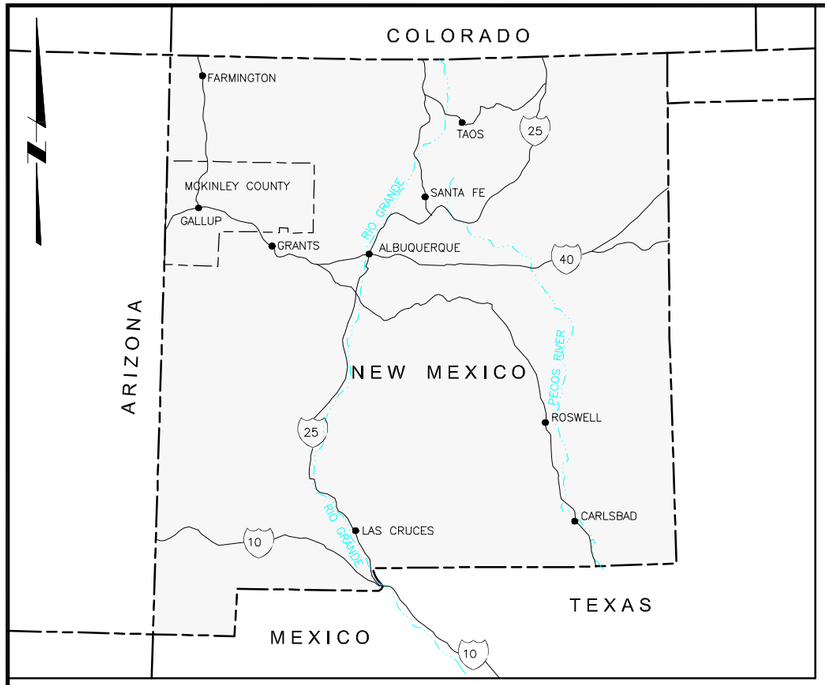
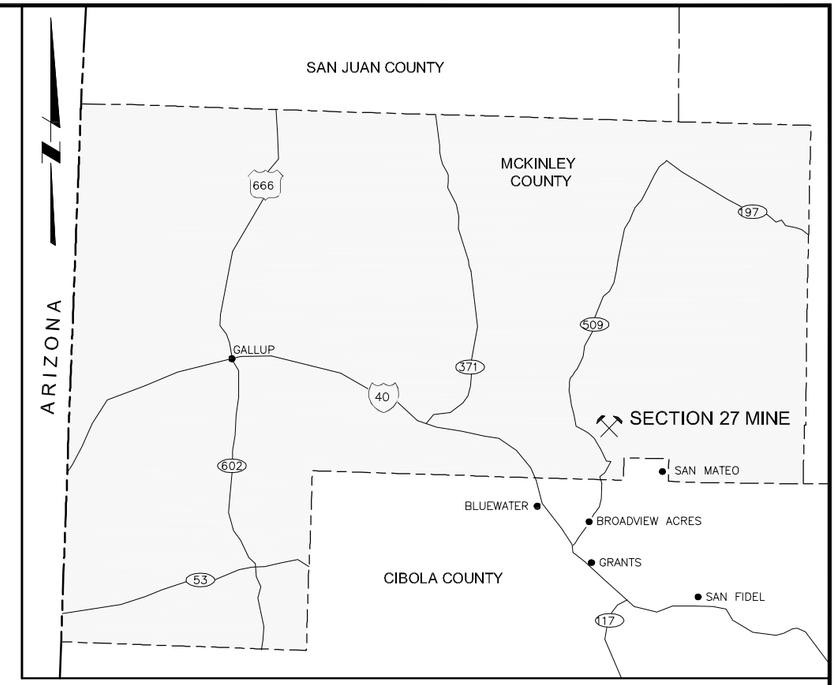
U.S. Department of Energy, 1987, *Environmental Assessment of Remedial Action at the Ambrosia Lake Uranium Mill Tailings Impoundment*, UMTRCA Project Office, Albuquerque, New Mexico, DOE/EA-0322.

DRAWINGS



LOCATION MAP
NOT TO SCALE

INDEX OF DRAWINGS	
No.	TITLE
1	COVER AND INDEX SHEET
2	SITE VICINITY MAP
3	ORIGINAL CONDITIONS
4	2010 POST CONSTRUCTION TOPOGRAHPY
5	2010 POST CONSTRUCTION EXPOSURE RATE SURVEY RESULTS
6	2011 EXPOSURE RATE SURVEY RESULTS
7	CONSOLIDATION AREA GRADING PLAN
8	CONSOLIDATION AREA SECTIONS
9	CHANNEL PROFILE, SECTION, AND DETAIL
10	TYPICAL VENT AND SHAFT PLUG DETAIL



VICINITY MAP
NOT TO SCALE

SECTION 27 MINE
SUPPLEMENTAL CLOSEOUT PLAN

Prepared for:

UNITED NUCLEAR CORPORATION

N:\design--drafting\clients_q-z\united nuclear corporation\section 27\013-sheet set\section 27 mine closeout plan\1008505D018

ISSUE / REV	DESCRIPTION	TECH	ENG	DATE
A	FINAL	CHF	JET	06/24/11

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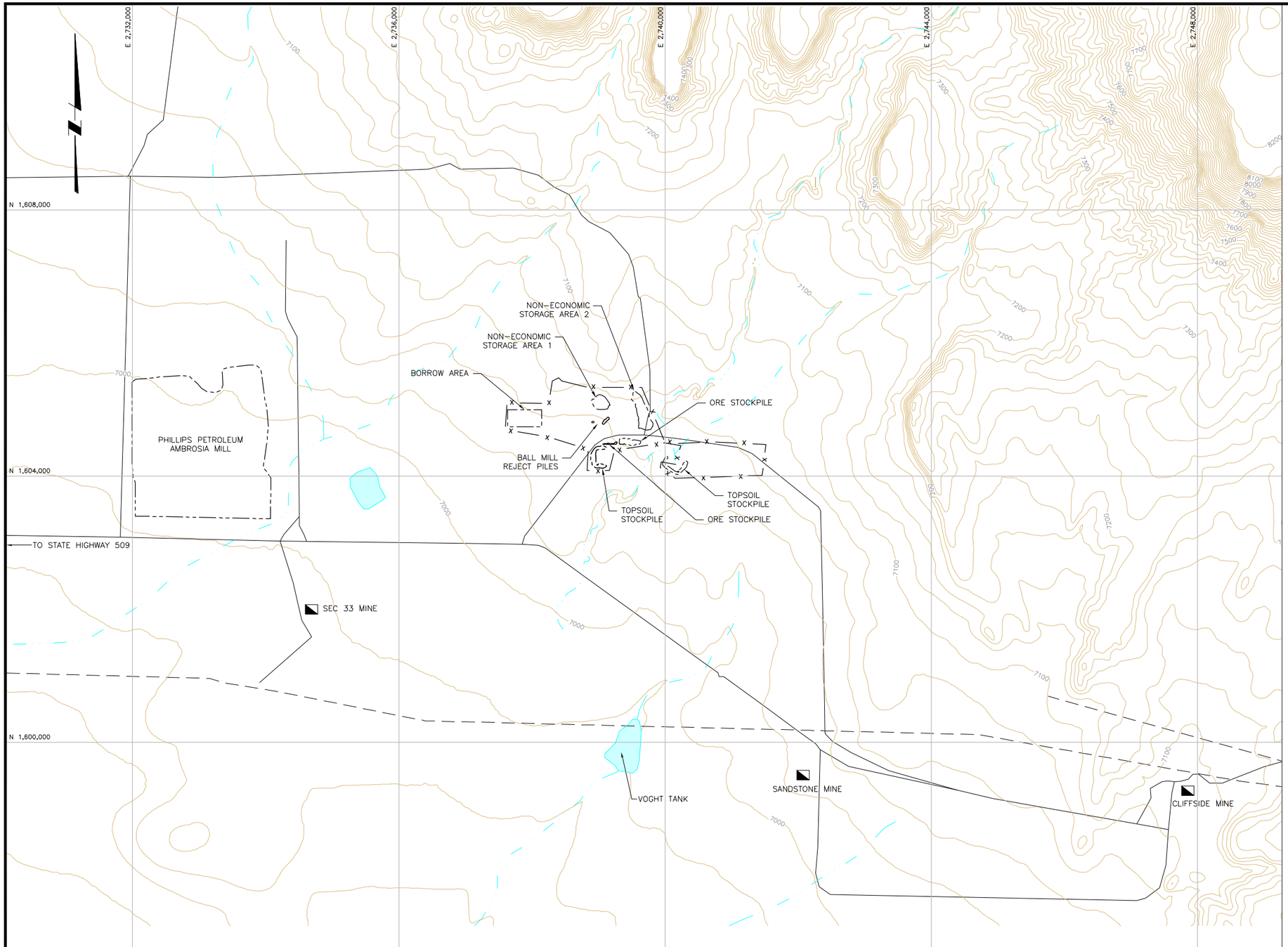
DRAWN BY	C FOWLER	06/04/11
CHECKED BY	J THOMPSON	06/04/11
APPROVED BY	J THOMPSON	06/04/11
PROJECT MANAGER	T LEESON	06/04/11
CLIENT APPROVAL		
CLIENT REFERENCE NO.		

P.O. BOX 3077
Gallup, New Mexico 87305-3077

PROJECT LOCATION: SECTION 27 MINE
PROJECT: SUPPLEMENTAL CLOSEOUT PLAN
TITLE: COVER AND INDEX SHEET

MWH

SHEET: 1 of 10
REVISION: A
FILE NAME: 1008505D018



LEGEND:

- 7040 — EXISTING GROUND SURFACE CONTOUR & ELEVATION, FEET
- UNNAMED ROAD
- FACILITY BOUNDARY
- MINE SITE FENCE
- POWER LINE
- NATURAL DRAINAGE
- MINE SHAFT

PLAN

SCALE

800' 0 800' 1600'

CONTOUR INTERVAL = 20'

ISSUE / REV	DESCRIPTION	TECH	ENG	DATE
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SEE FILE: 1005500 COORDINATE TRANSFORMATION.DWG
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UNC
P.O. BOX 3077
Gallup, New Mexico 87305-3077

PROJECT LOCATION: SECTION 27 MINE

PROJECT: SUPPLEMENTAL CLOSEOUT PLAN

TITLE: SITE VICINITY MAP

MWH

SHEET: 2 of 10

REVISION: A

FILE NAME: 1008505D019

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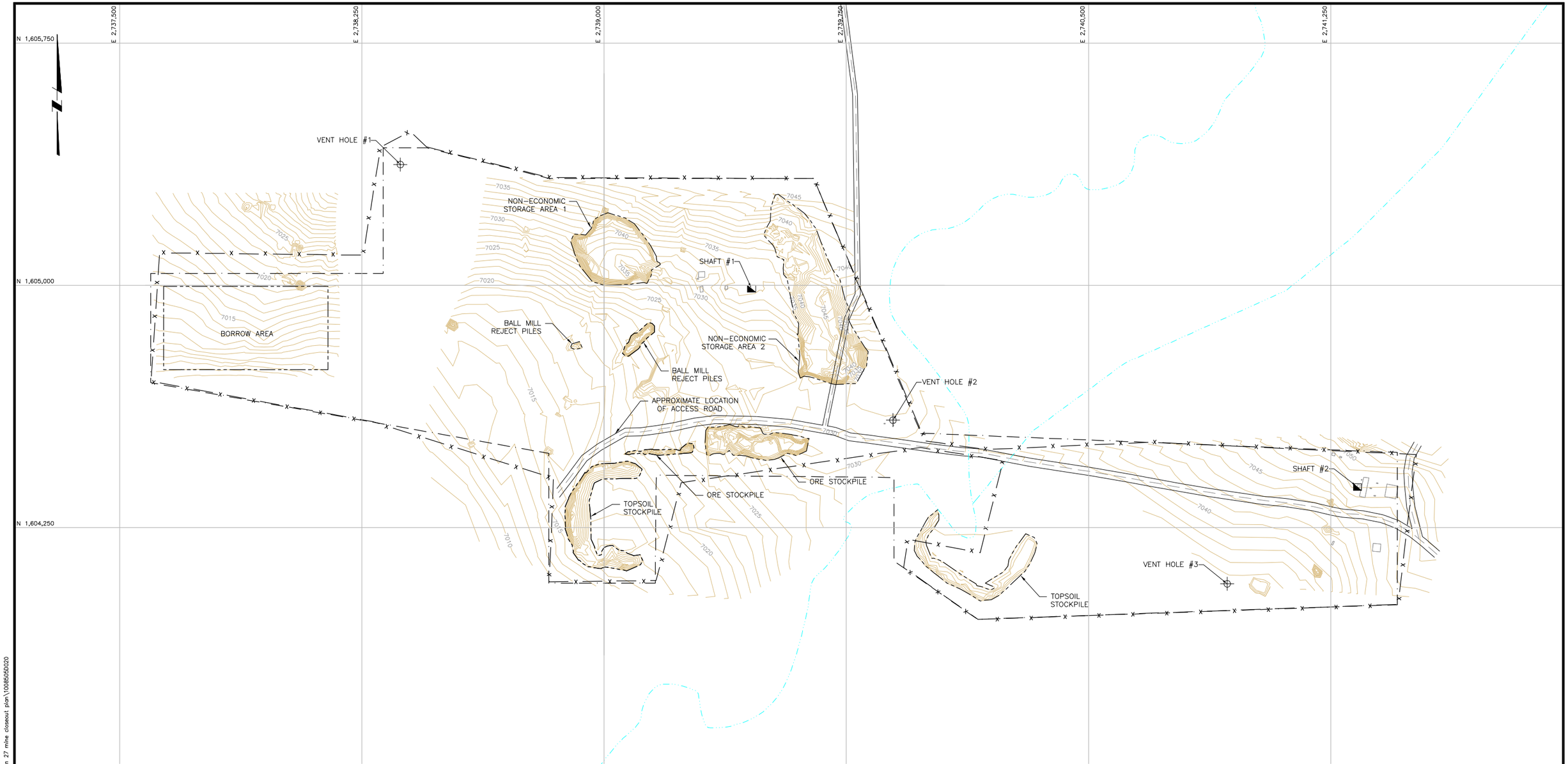

LEGEND:

- 7040 — ORIGINAL SURFACE CONTOUR & ELEVATION, FEET
- —— x —— MINE SITE FENCE
- —— — — —— FACILITY BOUNDARY
- ROADS
- NATURAL DRAINAGE
- CONCRETE FOUNDATION
- MINE SHAFT
- VENT HOLE

PLAN

SCALE

150' 0 150' 300'

CONTOUR INTERVAL = 1'

ISSUE REV	DESCRIPTION	TECH	ENG	DATE
A	FINAL	CHF	JET	06/24/11

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PROJECT MANAGER	T LEESON	06/04/11	
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CLIENT REFERENCE NO.			

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Gallup, New Mexico 87305-3077

PROJECT LOCATION: SECTION 27 MINE

PROJECT: SUPPLEMENTAL CLOSEOUT PLAN

TITLE: ORIGINAL CONDITIONS

MWH

SHEET: 3 of 10

REVISION: A

FILE NAME: 1008505D020

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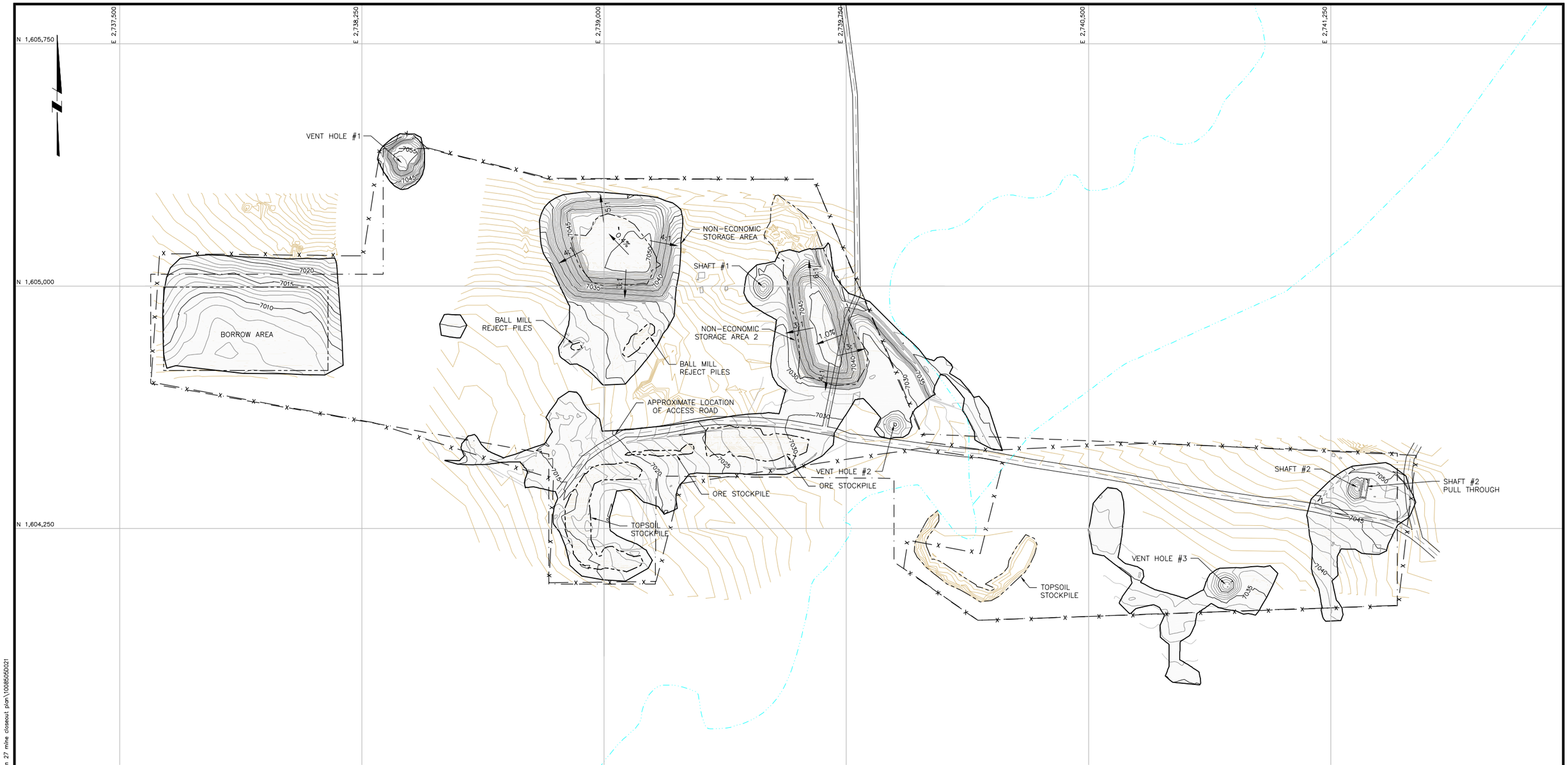

LEGEND:

- 7040 — ORIGINAL SURFACE CONTOUR & ELEVATION, FEET
- 7040 — FINAL SURFACE CONTOUR & ELEVATION, FEET
- POST CONSTRUCTION SURVEY BOUNDARY
- FACILITY BOUNDARY
- ROADS
- NATURAL DRAINAGE
- x — MINE SITE FENCE
- GRADE ARROW

PLAN

SCALE

150' 0 150' 300'

CONTOUR INTERVAL = 1'

ISSUE REV	DESCRIPTION	TECH	ENG	DATE
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PROJECT MANAGER	T LEESON	06/04/11	
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CLIENT REFERENCE NO.			

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Gallup, New Mexico 87305-3077

PROJECT LOCATION: SECTION 27 MINE

PROJECT: SUPPLEMENTAL CLOSEOUT PLAN

TITLE: 2010 POST CONSTRUCTION TOPOGRAHPY

MWH

SHEET: 4 of 10

REVISION: A

FILE NAME: 1008505D021

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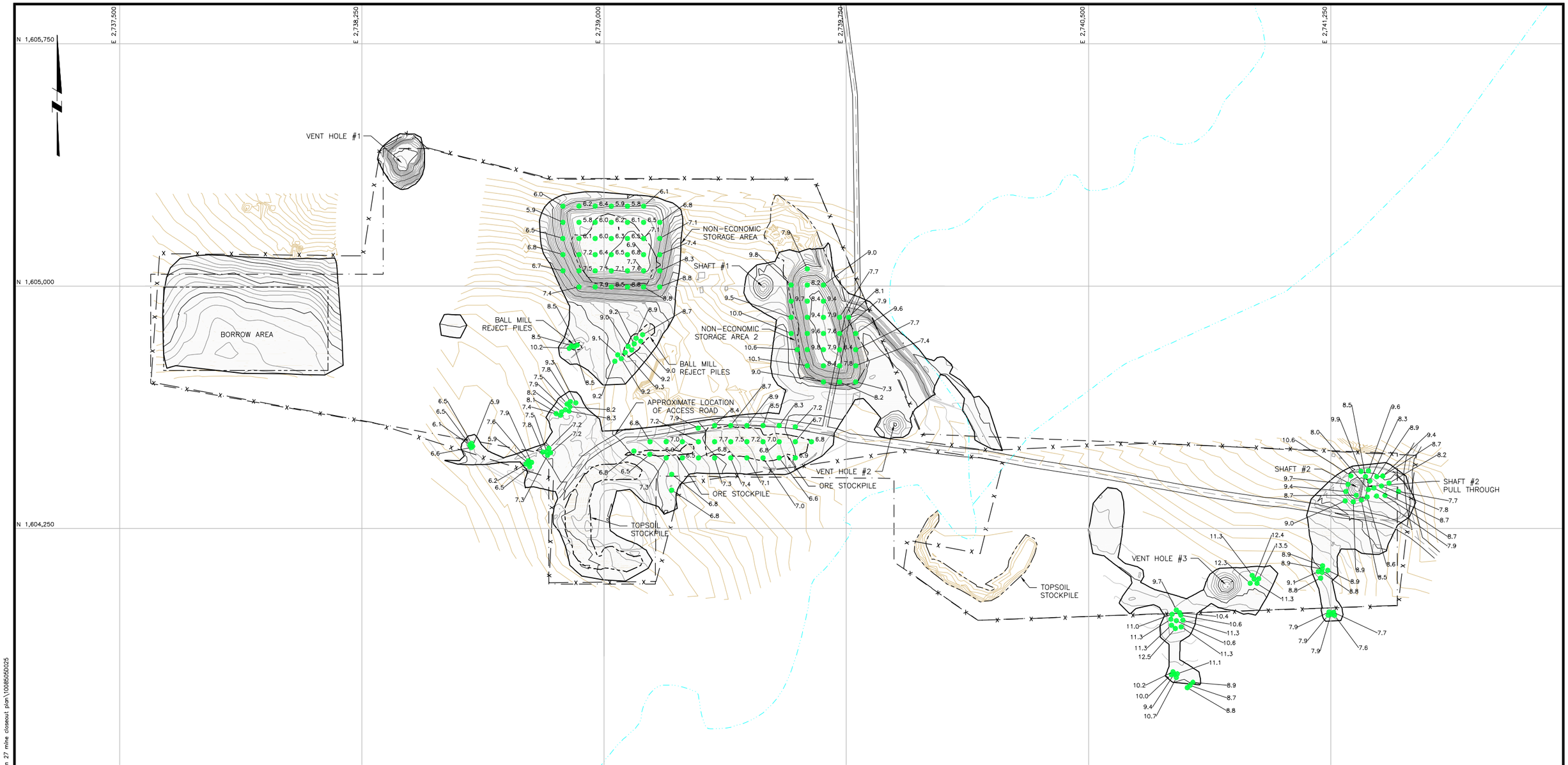

LEGEND:

- 7040 — ORIGINAL SURFACE CONTOUR & ELEVATION, FEET
- 7040 — FINAL SURFACE CONTOUR & ELEVATION, FEET
- POST CONSTRUCTION SURVEY BOUNDARY
- FACILITY BOUNDARY
- ROADS
- NATURAL DRAINAGE
- x — MINE SITE FENCE
- 10.1 — COLLIMATED STATIC GAMMA POINT (μR/hr)

PLAN

SCALE
150' 0 150' 300'
CONTOUR INTERVAL = 1'

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PROJECT MANAGER	T LEESON	06/04/11	
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P.O. BOX 3077
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PROJECT LOCATION: SECTION 27 MINE
PROJECT: SUPPLEMENTAL CLOSEOUT PLAN
TITLE: 2010 POST CONSTRUCTION EXPOSURE RATE SURVEY RESULTS

MWH

SHEET: 5 of 10
REVISION: A
FILE NAME: 1008505D025

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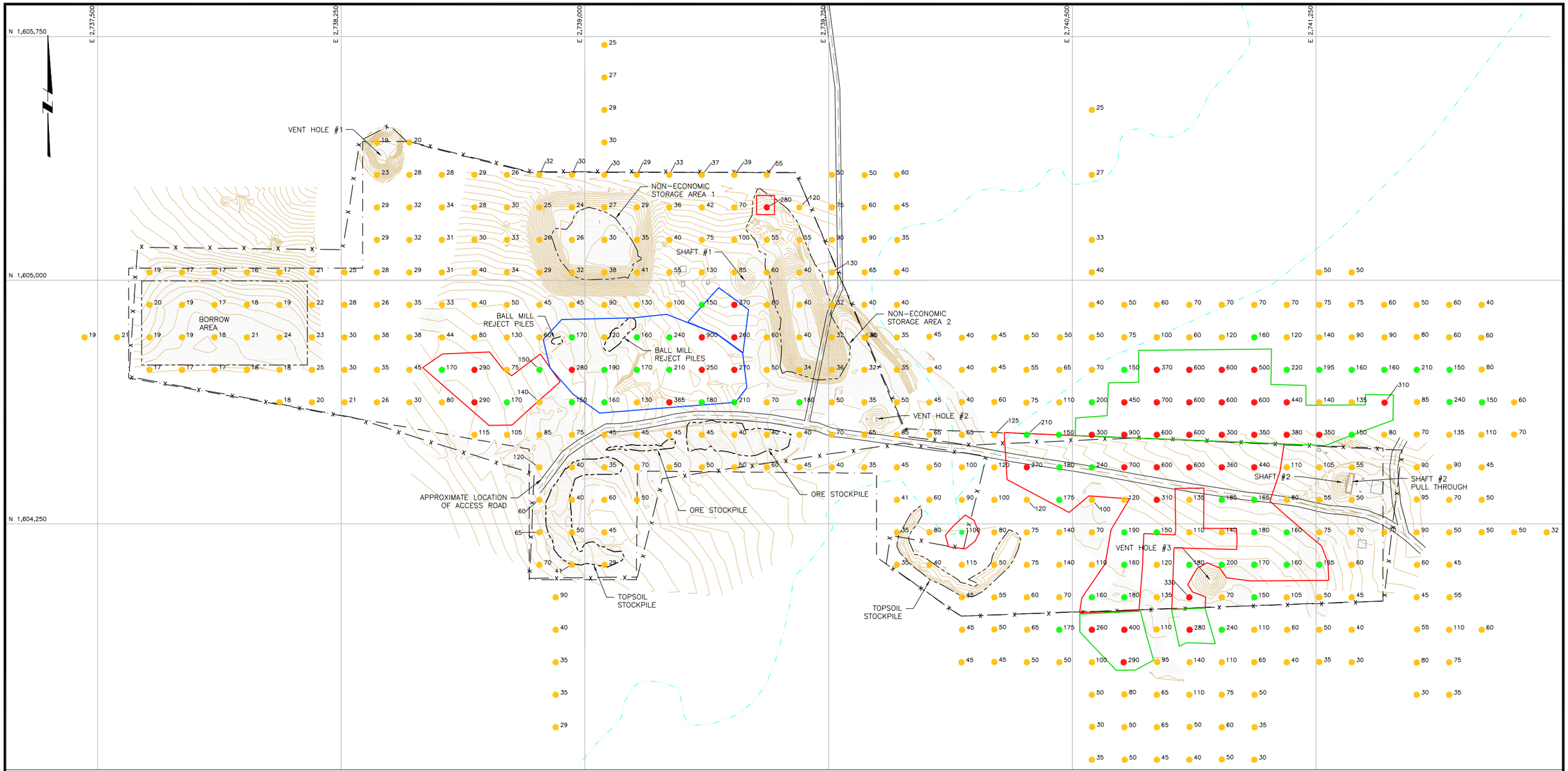

LEGEND:

- 7040 — EXISTING SURFACE CONTOUR & ELEVATION, FEET
- FACILITY BOUNDARY
- ROADS
- NATURAL DRAINAGE
- MINE SITE FENCE
- EXCAVATE AND CONSOLIDATE – 250 µR/hr
- EXCAVATE AND CONSOLIDATE – 150 µR/hr
- COVER IN PLACE
- PERMIT BOUNDARY

GAMMA µR/hr

- 16 – 150
- 150 – 250
- 250 – 1100

PLAN
SCALE
150' 0 150' 300'
CONTOUR INTERVAL = 1'

ISSUE REV	DESCRIPTION	CHF	ENG	DATE
A	FINAL	JET		06/24/11

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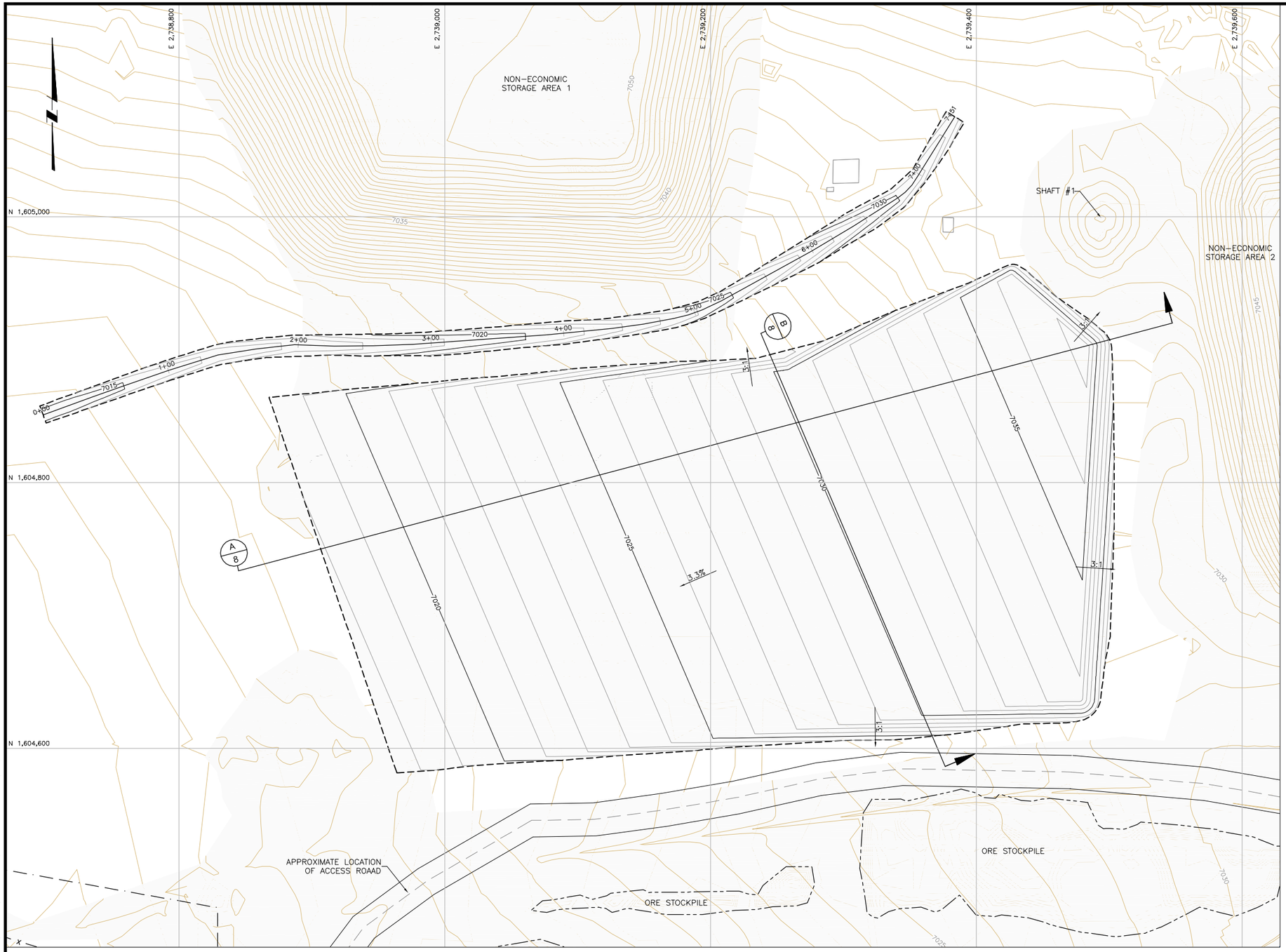
UNC
P.O. BOX 3077
Gallup, New Mexico 87305-3077

PROJECT LOCATION: SECTION 27 MINE
PROJECT: SUPPLEMENTAL CLOSEOUT PLAN
TITLE: 2011 EXPOSURE RATE SURVEY RESULTS

MWH

SHEET: 6 of 10
REVISION: A
FILE NAME: 1008505D028

N:\design-drafting\clients_o-z\united nuclear corporation\section 27\013-sheet set\section 27 mine closeout plan\1008505D028



PLAN

SCALE

40' 0 40' 80'

CONTOUR INTERVAL = 1'

LEGEND:

- 7040 ORIGINAL SURFACE CONTOUR & ELEVATION, FEET
- 7040 REGRADE SURFACE CONTOUR & ELEVATION, FEET
- FACILITY BOUNDARY
- ROADS
- CHANNEL

ISSUE REV	DESCRIPTION	TECH	ENG	DATE
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PROJECT LOCATION: SECTION 27 MINE

PROJECT: SUPPLEMENTAL CLOSEOUT PLAN

TITLE: CONSOLIDATION AREA GRADING PLAN

SHEET: 7 of 10

REVISION: A

FILE NAME: 1008505D026

MWH

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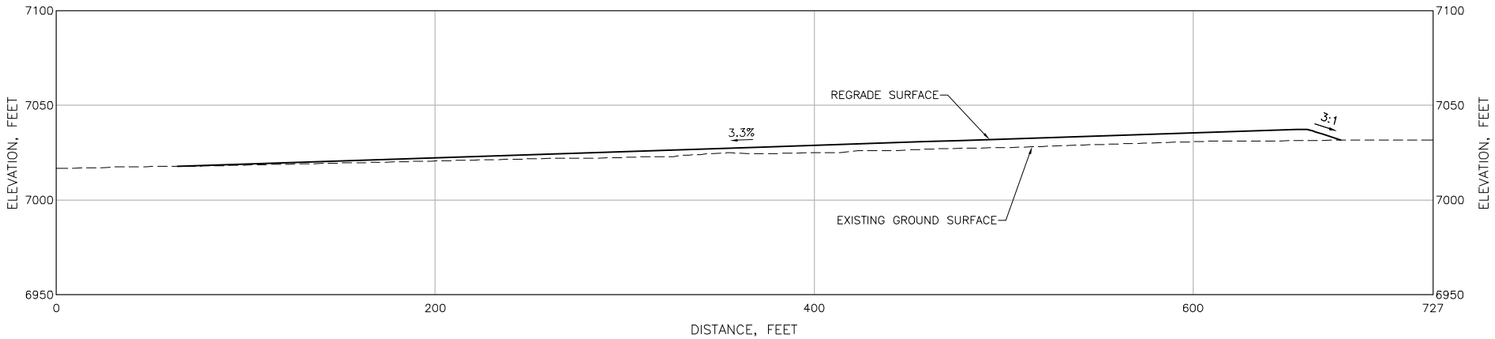
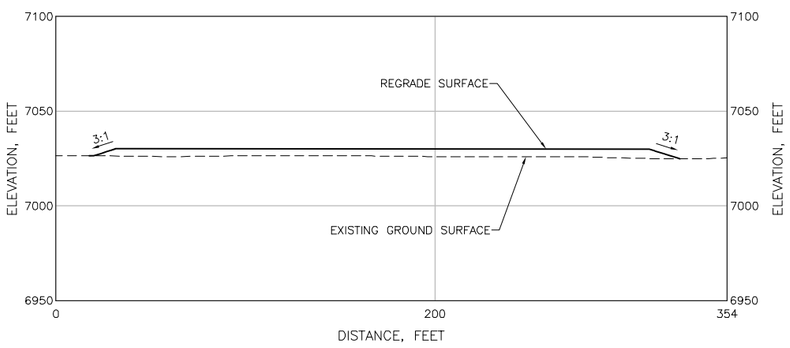


A/7 SECTION

VERTICAL SCALE 40' 0 40'

HORIZONTAL SCALE 40' 0 40'

VERTICAL EXAGGERATION = 1X



B/7 SECTION

VERTICAL SCALE 40' 0 40'

HORIZONTAL SCALE 40' 0 40'

VERTICAL EXAGGERATION = 1X

N:\design--drafting\clients_q-z\united nuclear corporation\section 27\013-sheet set\section 27 mine closeout plan\1008505D027

ISSUE/REV	DESCRIPTION			
A	FINAL	CHF	JET	06/24/11

DESIGNED BY	J THOMPSON	06/04/11
DRAWN BY	C FOWLER	06/04/11
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CLIENT REFERENCE NO.		

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PROJECT LOCATION: SECTION 27 MINE

PROJECT: SUPPLEMENTAL CLOSEOUT PLAN

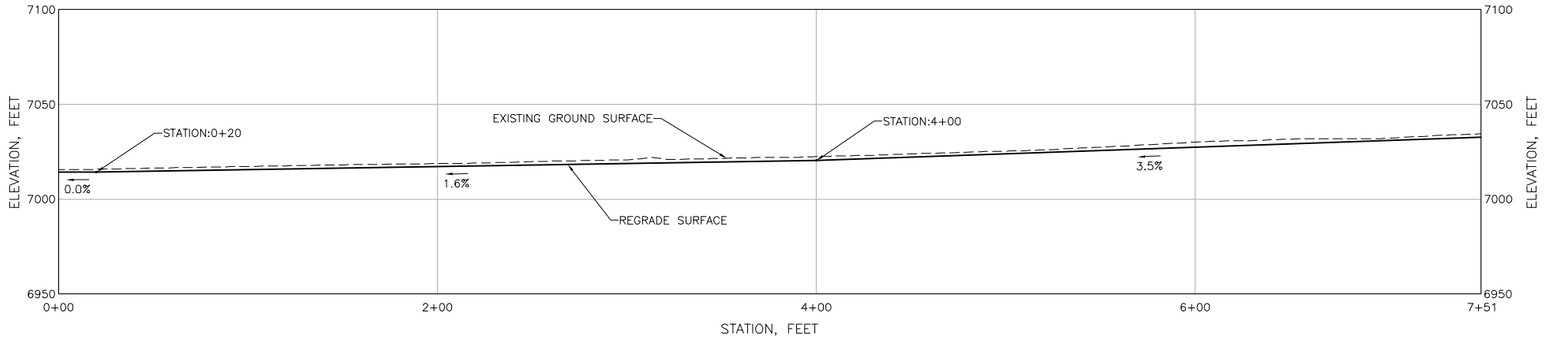
TITLE: CONSOLIDATION AREA SECTIONS

MWH

SHEET: 8 of 10

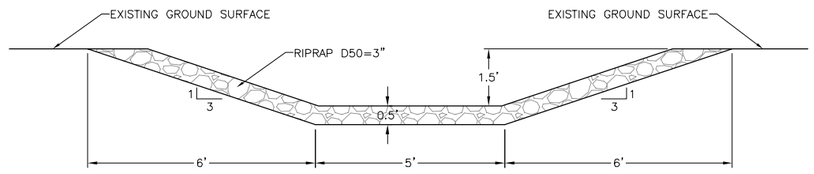
REVISION: A

FILE NAME: 1008505D027



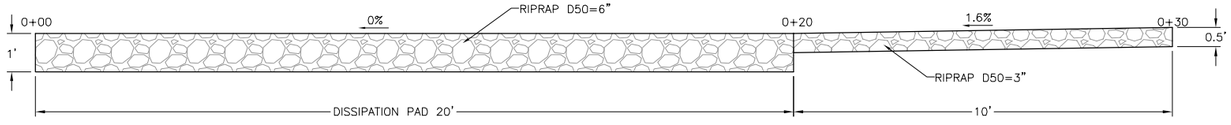
PROFILE
CHANNEL

VERTICAL SCALE 40 0 40'
HORIZONTAL SCALE 40 0 40'
VERTICAL EXAGGERATION = 1X



SECTION
CHANNEL TYPICAL SECTION

SCALE 2' 0 2' 4'



DETAIL
CHANNEL DISSIPATION PAD

SCALE 2' 0 2' 4'

ISSUE / REV	DESCRIPTION			
A	FINAL	CHF	JET	06/24/11
		TECH	ENG	DATE

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CLIENT REFERENCE NO.		

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P.O. BOX 3077
Gallup, New Mexico 87305-3077

PROJECT LOCATION: SECTION 27 MINE
PROJECT: SUPPLEMENTAL CLOSEOUT PLAN
TITLE: CHANNEL PROFILE, SECTION, AND DETAIL

MWH

SHEET: 9 of 10
REVISION: A
FILE NAME: 1008505D029

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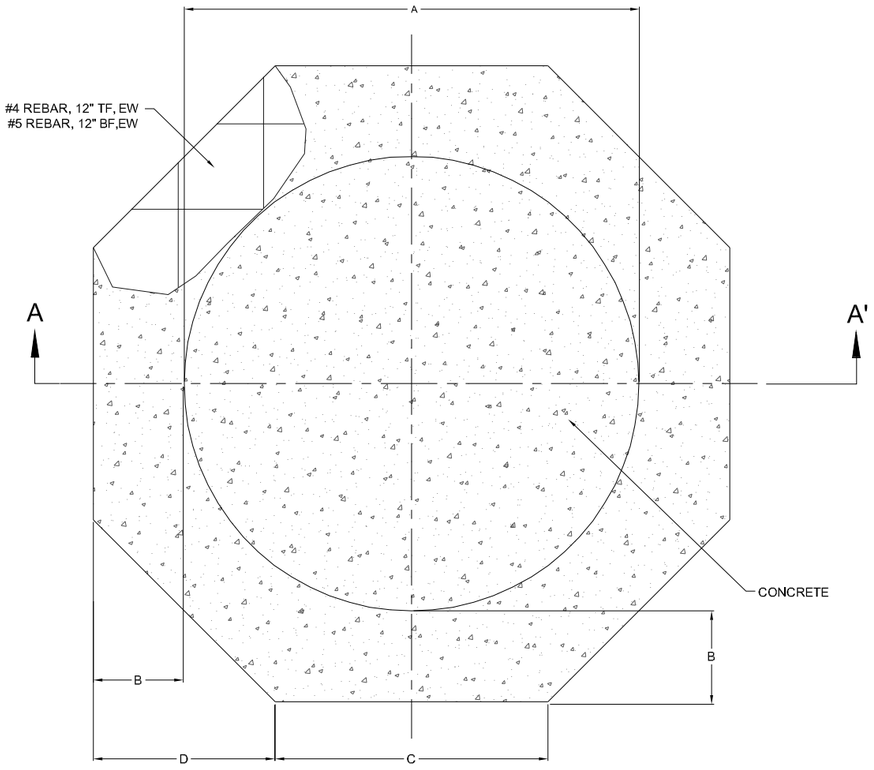
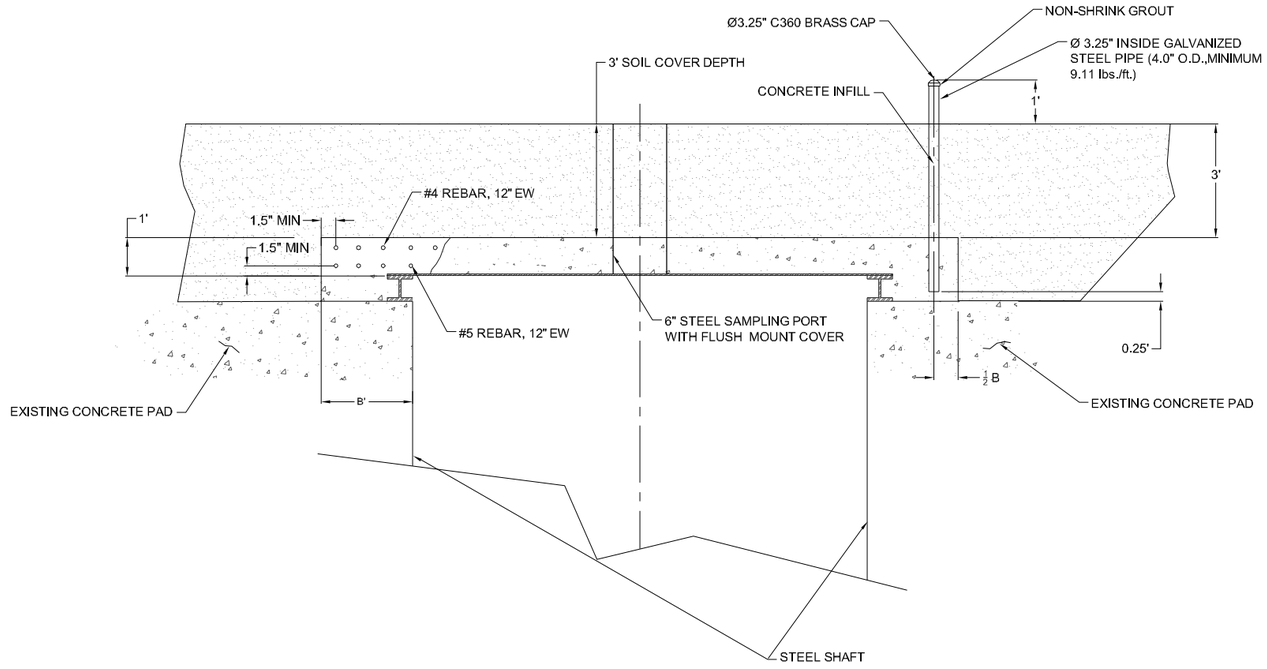


PLAN VIEW
NTS



SECTION A-A'
NTS

TABLE 1- PLUG DIMENSIONS		
SHAFT	5-FOOT DIAMETER VENTS & SHAFT	12-FOOT DIAMETER VENTS & SHAFT
A = SHAFT DIAMETER	A = 5.0'	A = 12.0'
B = $\frac{1}{5}$ A	B = 1.0'	B = 2.4'
C = $\frac{3}{5}$ A	C = 3.0'	C = 7.2'
D = $\frac{2}{5}$ A	D = 2.0'	D = 4.8'

ISSUE REV	DESCRIPTION	CHF	ENG	DATE
A	FINAL	JET		06/24/11

DISCLAIMER:
THIS DRAWING WAS DEVELOPED THROUGH THE APPLICATION OF PROFESSIONAL ENGINEERING SKILL AND PROPRIETARY METHODOLOGIES, PROCESSES, AND KNOW HOW OF MWH AS AUTHOR, ALL PURSUANT TO THE TERMS OF A CONTRACTUAL SCOPE OF WORK GOVERNING ITS PREPARATION. THIS DRAWING MAY NOT BE USED OR MODIFIED OTHER THAN IN STRICT ACCORDANCE WITH THE TERMS OF THE GOVERNING CONTRACT AND SCOPE OF WORK OR OTHERWISE ABSENT THE INVOLVEMENT AND CONSENT OF THE AUTHOR. ANY ALTERATION OR ADAPTATION OF THIS DRAWING SHALL BE CONSISTENT WITH THE AUTHOR'S CONTRACTUAL AND PROPRIETARY RIGHTS AND BE AT USER'S SOLE RISK AND WITHOUT ANY LIABILITY OR LEGAL RESPONSIBILITY OF MWH.

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CLIENT APPROVAL		
CLIENT REFERENCE NO.		

P.O. BOX 3077
Gallup, New Mexico 87305-3077

PROJECT LOCATION: SECTION 27 MINE
PROJECT: SUPPLEMENTAL CLOSEOUT PLAN
TITLE: TYPICAL VENT AND SHAFT PLUG DETAIL
SHEET: 10 of 10
REVISION: A
FILE NAME: 1008505D024

MWH

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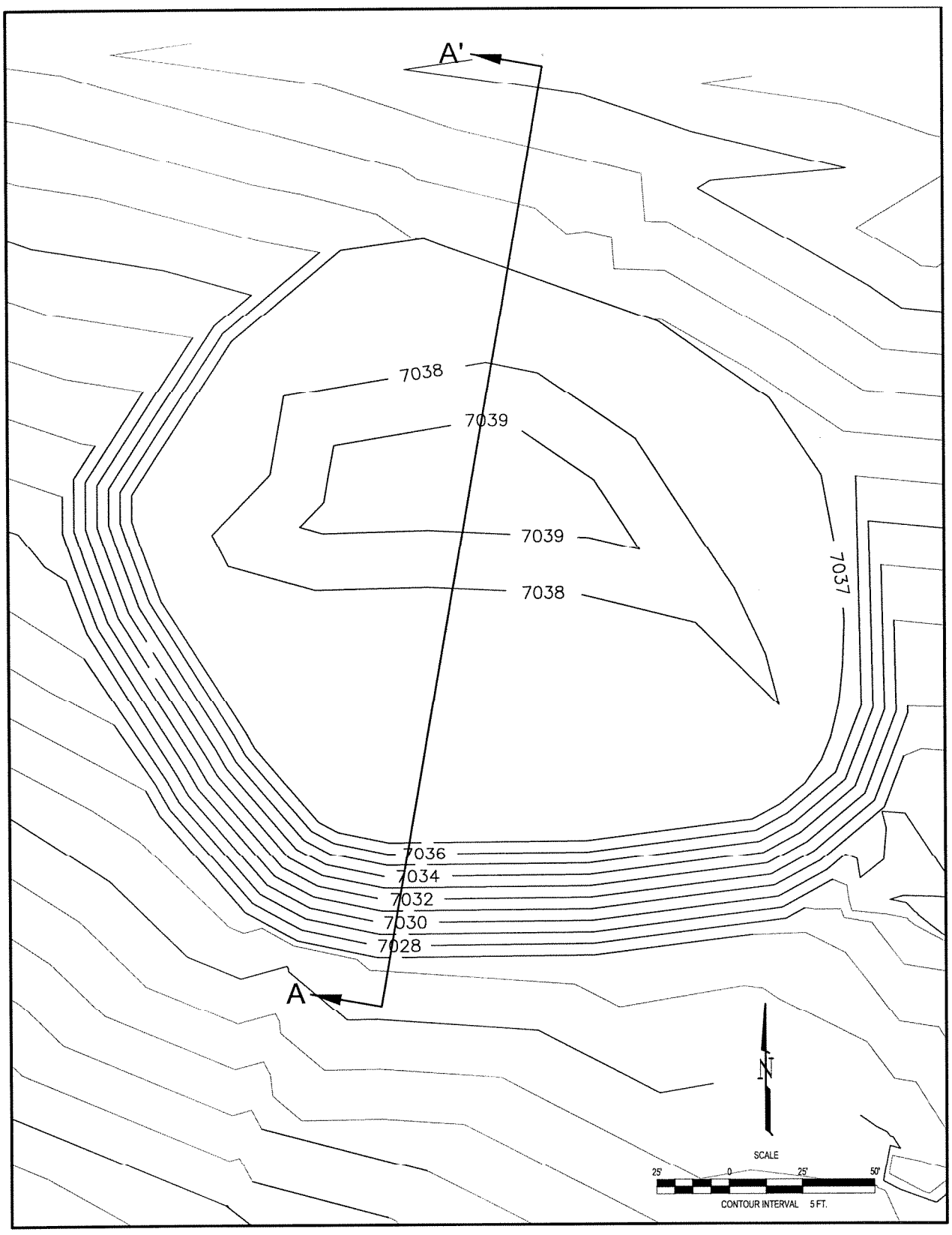
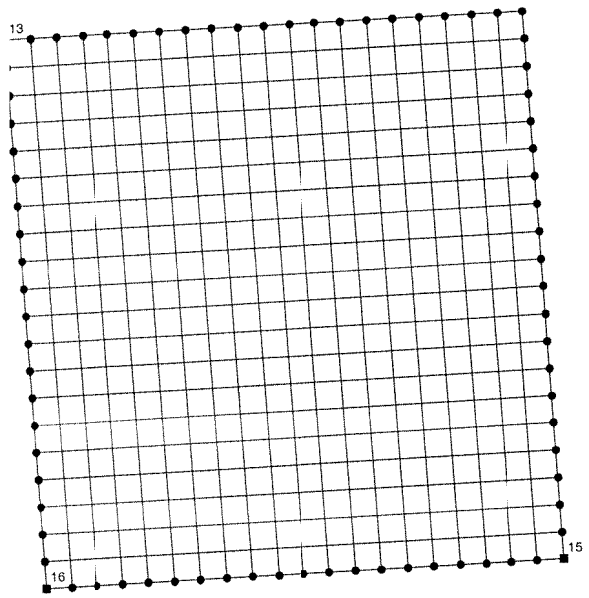
APPENDICES

APPENDIX A

GEOTECHNICAL STABILITY MODEL OUTPUT

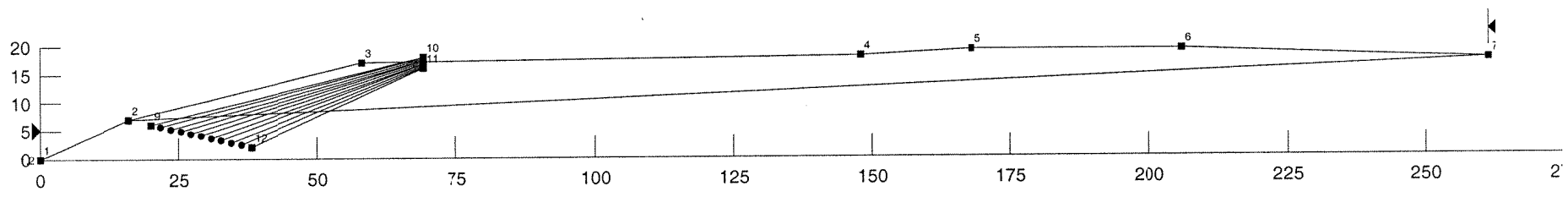


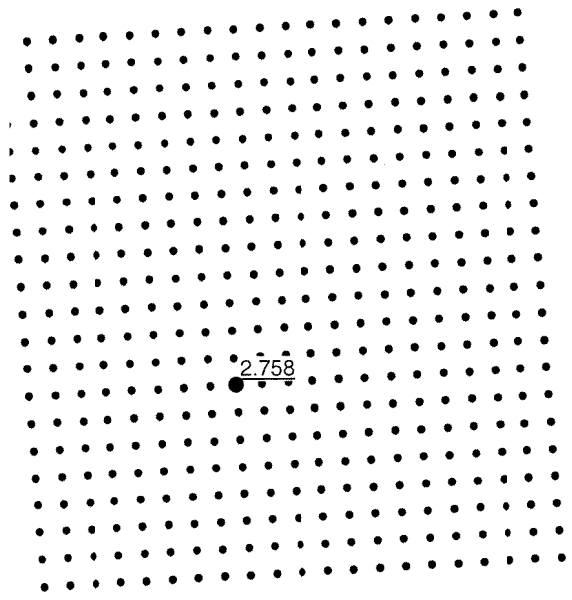
NON-ECONOMIC STORAGE AREA 1



Description: WRP-1 Section A-A'
Analysis Method: Morgenstern-Price
Slip Surface Option: Grid and Radius

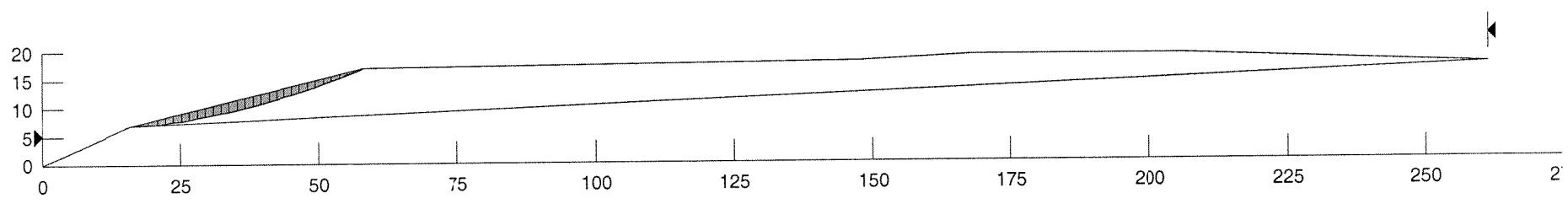
Description: Waste Rock
Soil Model: Mohr-Coulomb
Unit Weight: 110
Cohesion: 0
Phi: 33

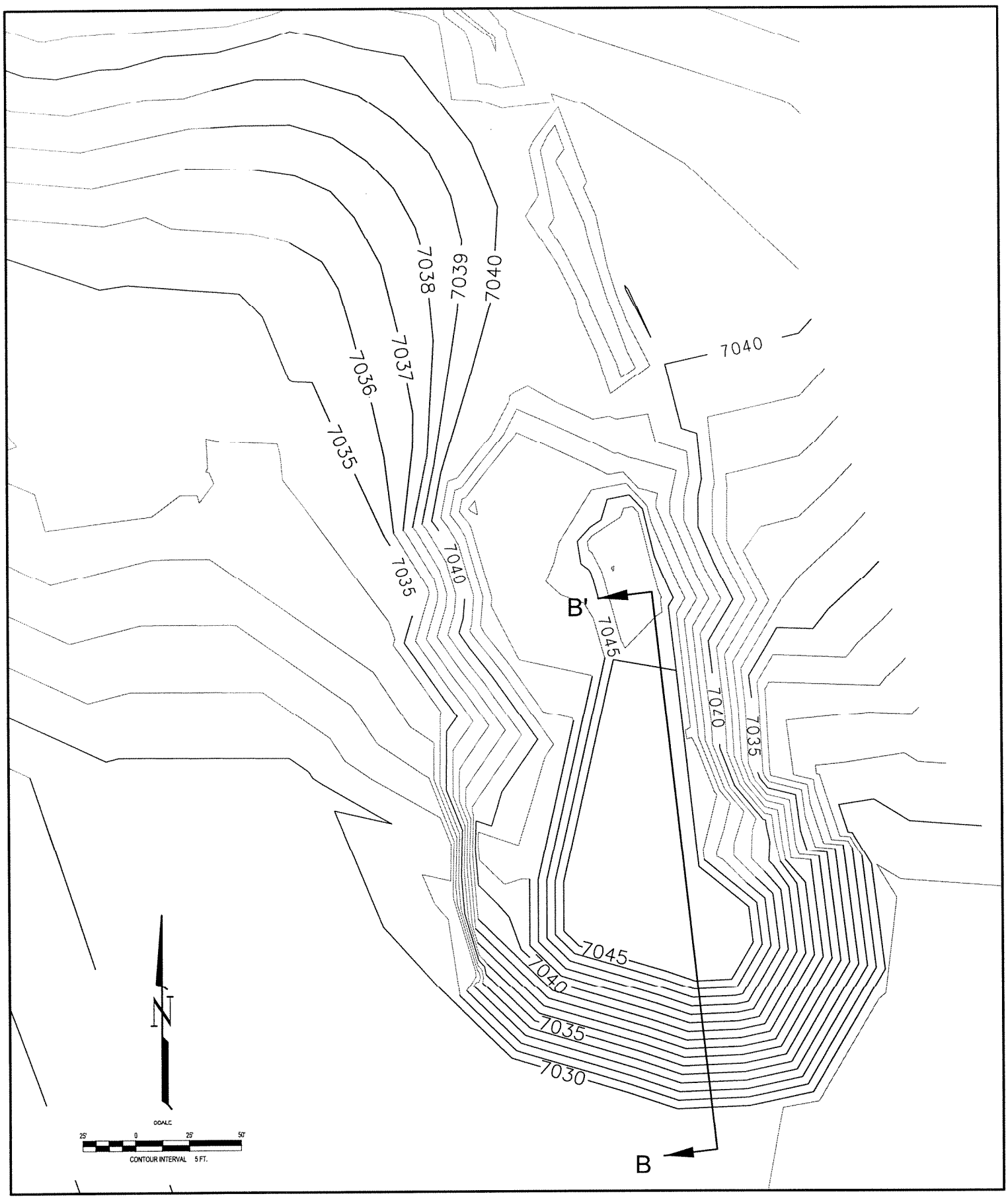




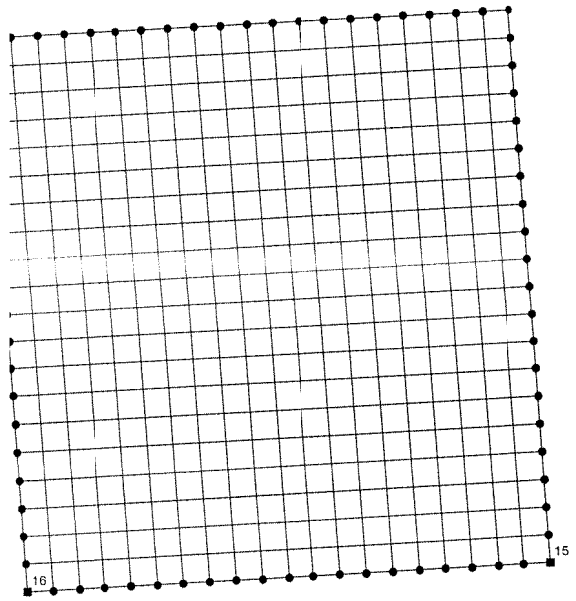
Description: WRP-1 Section A-A'
Analysis Method: Morgenstern-Price
Slip Surface Option: Grid and Radius

Description: Waste Rock
Soil Model: Mohr-Coulomb
Unit Weight: 110
Cohesion: 0
Phi: 33



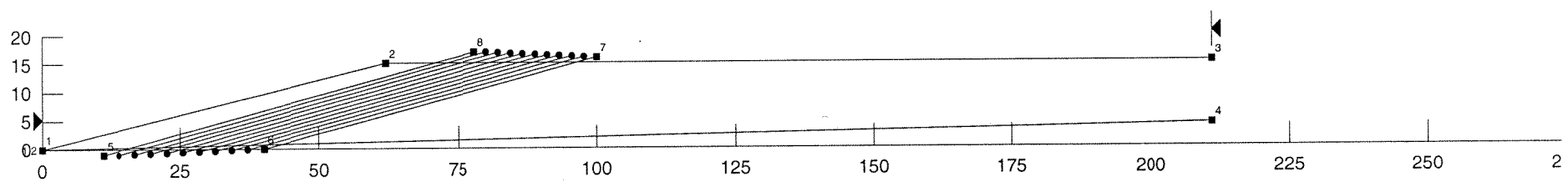


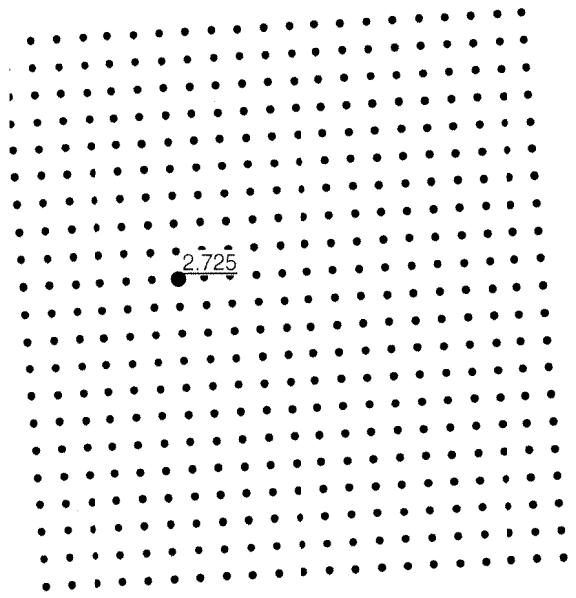
NON-ECONOMIC STORAGE AREA 2



Description: WRP-2 Section B-B'
Analysis Method: Morgenstern-Price
Slip Surface Option: Grid and Radius

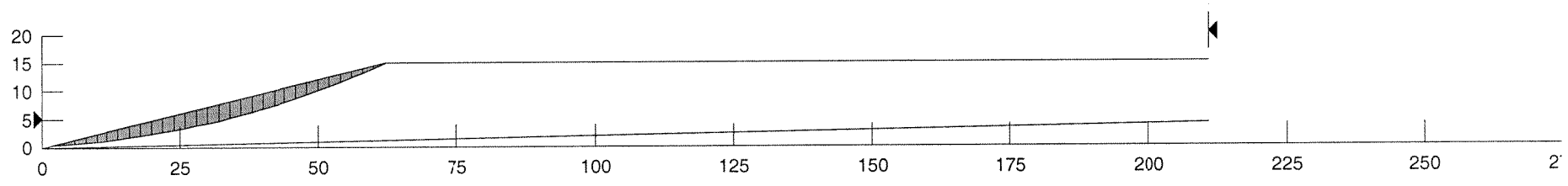
Description: Waste Rock
Soil Model: Mohr-Coulomb
Unit Weight: 110
Cohesion: 0
Phi: 33





Description: WRP-2 Section B-B'
Analysis Method: Morgenstern-Price
Slip Surface Option: Grid and Radius

Description: Waste Rock
Soil Model: Mohr-Coulomb
Unit Weight: 110
Cohesion: 0
Phi: 33



APPENDIX B

GAMMA SURVEYING METHODS

SOP-3a
AVM Environnemental Services, Inc.
Field Gamma Radiation Survey
@ UNC's Section 27 Mine Site

1.0 SCOPE

1.1 Purpose

This procedure will be used to measure gamma radiation exposure rate for conducting Excavation Control (Remedial Action Support) survey and cleanup verification survey for reclamation at the Section 27 Mine Site.

2.0 EQUIPMENT AND MATERIALS

2.1 A vendor calibrated Micro-R-Meter (Ludlum Model 12S, Ludlum Model 19 or Eberline PRM-7.

2.1 Ludlum 2221 Scaler/Rate meter coupled with an Eberline SPA-3 2"x2" NaI crystal scintillation detectors for direct gamma radiation level detection.

2.2 A global positioning system (GPS) with real time differential correction capability and a data logger. Currently AVM uses a Magellan MobilMapper with TDS SOLO surveying software. The MobilMapper Receiver is capable of real time differential position correction using WAAS correction.

2.3 Collimating lead shield for the 2"x2" NaI detectors, if needed to reduce gamma-ray shine interference and focus on area of interest under detector. The 0.5-inch thick collimating lead shield, which surrounds the NaI crystal, is contained within protective marlex housing.

2.4 Map of survey areas with marked grid nodes and transects. Ink pen and appropriate Field Survey Forms to record survey readings and notes.

2.5 Measuring tape, pin flags, area markers.

3.0 INSTRUMENT CONFIGURATION & OPERATIONS

The gamma exposure rate survey will be performed using Micro-R-meter (µR meter) during excavation control and verification surveys. The µR meters are totally configurated exposure rate measurement equipment. Micro-R-Meter, such as Ludlum model 12S or Ludlum Model 19 contain a 1x1 NaI detector. If necessary, a 2x2 NaI detector with much higher gamma radiation sensitivity, such as Eberline SPA-3 (about 1200 cpm per µR/hr for Cs-137), connected to a scaler/ratemeter (such as Ludlum 2221) will be used to obtain gamma radiation count rate. The gamma radiation count rate measured by the 2x2 NaI detector will be converted to exposure rate (µR/hr). Prior to any instrument function check or the operation, the technician will read the Technical Manual for the instrument operations. The instrumentation must be calibrated consistent with SOP-1a prior to use.

3.1 Instrument Function Check

An operational function check will be performed on the uR meters and the Scaler/Rate meter (Ludlum

2221) and the detector (SPA-3) configuration each day prior to any field surveys. Verify calibration validity for the Scaler/Rate meter and the detector. Calibration date for the instruments must be within one year. If not, the instrument must be calibrated with a certificate in file. The function check will be performed in field office. The following function check procedures will be used and the pertinent information recorded on the Function Check Form (Attachment A).

3.1.1 Scaler/Rate meter General Setting

For Ludlum 2221 Scaler/Rate meter, the WIN toggle switch must be in the OUT position.

3.1.2 Visual inspection

Perform a visual inspection of the instrument, cables, detector and the shield, checking for signs of any damage. Test for possible electrical shorts in the cable (with the instrument in the audio mode, move the cable and note for any sudden increase in counts on the Scaler/Rate meter).

3.1.3 Calibration Due

Verify calibration validity of instruments. Calibration date for the instruments must be within one year.

3.1.4 Battery charge

Assure that the meter battery is functional. For µR meters, the meter indicator should be within "Battery OK" position. For Ludlum 2221, the battery voltage digital readout must be at least 5.3 volts.

3.1.5 High Voltage

For µR meters, no HV check is necessary. For Ludlum 2221/SPA-3 configuration, the detector high voltage must match that determined during high voltage calibration (HV Plateau) for that detector.

3.1.6 Threshold (input sensitivity)

For Ludlum 2221/SPA-3 configuration, check and make sure that the Scaler/Rate meter threshold is set at 100 mV. If not, set the threshold at 100 mV. Ludlum 2221 Threshold can be set by the instrument digital read out display.

3.1.7 Window

If Ludlum 2221 Scaler/Rate meter is used for instrument configuration, the WIN toggle switch must be in OUT position.

3.1.8 Background Counts

For the Ludlum 2221/SPA-3 configuration, the background counts will be determined for the same time interval as the field survey count time, generally one minute. The background counts will be performed at the designated location in the field office. A location will be

designated in the field office for obtaining the required daily background counts. Keep all beta/gamma radiation sources away from the detector while performing the background check. The background function check counts must be within 20% of the background counts obtained during the detector high voltage calibration.

3.1.9 Source Function Counts

Obtain the gamma radiation source, (1% U_3O_8 ore standard sealed in a red can marked Function Check Source"). The 1% ore standard was used to determine the acceptable count range for the SPA-3 detector and µR meters immediately following calibration. Place the source at the same location on the detector or the µR meter used to obtain the source function check counts/reading following calibration. Count the source for one minute for L2221/SPA-3 and note the counts in cpm. For µR meters, select appropriate scale and wait about 10 seconds for reading to stabilize. The source function check counts must be within 20% of the source counts obtained during the detector and Scaler/Rate meter calibration.

3.1.10 Instrument Tolerance

The counting/reading tolerance is expressed as percent deviation from the mean of the acceptable count/reading range. The background counts and the source function check reading must be within 20% of the mean established following instrument calibration. If the source count/reading is outside this range, pull the instrument from service. The instrument will be repaired or re-calibrated prior to use.

3.1.11 Technician

After completing the function check, initial in the column marked TECH of the function check form.

3.2 Instrument Minimum Détectable Count Calculation

If required, calculate Minimum Detectable Counts (MDC) for the instrumentation using the function check background readings as described in SOP-1 (Instrument MDC Calculation) for the L2221/SPA-3 configuration. Calculate MDC for appropriate survey, i.e. Direct Measurement MDC for static (stationary) gamma radiation survey and scan MDC for scan or walkthrough gamma radiation survey. Record the MDC in the Function Check Form (Attachment A).

4.0 FIELD GAMMA RADIATION SURVEYS

The gamma radiation exposure rate survey for the surface soil will be conducted as either scan survey (walkthrough) or static survey (stationary) measurements.

4.1 Scan Radiation Survey

Scan radiation surveys (walkthrough surveys) will be performed by walking with the µR meter/detector at about waist high from the ground surface with the meter response in "FAST" Mode and audio speaker ON. Scan surveys will be performed within each survey area by walking in a serpentine shape along transects to identify and locate any hot spots and contaminated area boundaries during the excavation control survey. The scan surveys may also be performed as a component of the final verification survey.

4.2 Static Radiation Survey

Static exposure rate surveys will be performed at any point or location of interest during excavation control survey, and at specified grid nodes within survey areas for the final verification survey. The µR meter/detector will be held at about waist high from the ground surface with the µR meter response in "SLOW" Mode, and allowing at least 10 seconds to stabilize and taking a reading for that point or location. For obtaining a gamma radiation level count with SPA-3/Ludlum 2221, the L2221 will be set in the count SCALER MODE. A one- minute count (cpm) of gamma radiation level will be obtained at each location for static gamma radiation survey.

4.3 Remedial Action Support (Excavation Control) Survey

Excavation control survey will be performed to guide excavation of contaminated soil exceeding the cleanup criteria in gamma exposure rate for the Section 27 Mine Site Closeout. Excavation control survey will be performed using combination of scan and static exposure rate surveys as follow:

1. Perform the function check as indicated in Section 4.1 of this procedure.

2. Insure that the µR meter is in FAST Mode and on appropriate scale with meter audio speaker to the ON position.

3. Using the Work Plan figure, area boundary location coordinates, and DGPS to field locate and mark appropriate area exceeding the cleanup level with pin flags. Radiation scanning may be necessary between the outer points to delineate the contaminated area boundaries. Coordinate the marked area with the excavation crew. The area may be divided into small subareas such as 100 square meter areas, or 10 feet strips to efficiently control excavation based on equipment used for excavation. The excavation fleet will remove the contaminated soil in necessary thickness lift initially based on vertical extent of contamination.

   Prior to performing excavation control in the field, hold a tail gate safety meeting each day with the excavation crew to coordinate safety procedures during the excavation control survey.

   IT IS IMPORTANT TO COORDINATE WITH THE EXCAVATION CREW THE EXCAVATION AND SURVEY SEQUENCE FOR YOUR SAFETY. ESTABLISH NECESSARY SAFETY COORDINATION WITH THE EXCAVATION CREW. ALWAYS WEAR AN ORANGE SAFETY VEST WHILE PERFORMING SURVEY IN THE FIELD.

4. Following the initial excavation lift, assure that the excavation equipment is out of the way and the area is clear and safe, perform a scan survey by walking in a serpentine pattern along a transect or within the subdivided areas with the audio speaker ON to identify any locations that exceed the site action level exposure rate e by audio response and analog display.

5. If no point or a location exceeding the action level is identified within the area by the scan, perform one-minute static radiation measurement at several points (about five points within a 100 square meter area) using the static survey measurement as described in steps 2 through 5 of Section 4.4. If all points are below the cleanup level, the excavation is complete and ready for the verification survey. The static survey measurements may be used as a part of the verification survey. If any of these points exceeds the cleanup level, notify the excavation crew and guide the contaminated soil excavation repeating step 4 until all locations or points are

below the cleanup level.

6. If the scan survey following the initial soil excavation lift shows portions the area above the cleanup level, or any static measurement point is above the cleanup level, mark out those areas with pin flags and coordinate with the excavation crew for the additional excavation of contaminated soil as necessary at those locations until the scan survey shows no points or location above the cleanup level and repeat step 5 at those locations.

7. If the radiation scan following the initial soil excavation lift still shows most or all of the area above the cleanup level, the contamination in entire area is deeper than the initial lift. Coordinate with the excavation crew for additional soil excavation and repeat 5 and 6 as necessary until the area is clean.

4.4 Cleanup (Closeout) Verification Survey

The verification survey includes scan and static exposure rate surveys. The scan survey would have already been performed during the excavation control survey. If necessary, this excavation control scan survey information will be used for the verification survey. The static exposure rate measurements for the closeout verification survey will be implemented following the reclamation. Static exposure rate survey will be performed at 100-foot square grid nodes in each area. The grid system from 2010 survey and 2011 supplemental characterization survey will be used for verification survey. A static exposure rate measurement will be performed using a calibrated µR meter at specified grid nodes as a part of verification survey to demonstrate cleanup of areas. One-minute static gamma radiation survey using SPA-3/L2221 may be performed at specified grid nodes or points. The one-minute direct gamma radiation counts can be converted to the exposure rate with an appropriate cross calibration at the Site. The technician will perform the static (stationary) gamma radiation survey as follows:

1. Perform the function check as indicated in Section 4.2 of this procedure.

2. Insure that the µR meter is set on SLOW response mode. Turn the Scaler/Rate meter audio speaker to the ON position. The scale switch should be in X50 µR/hr position.

3. Locate the verification survey points (grid node) using survey point location figures, the static survey point coordinate data, and the DGPS system.

5. Hold the µR meter/detector at approximately one meter (waist level) from the ground surface above the desired survey point. Obtain a static exposure rate level.

6. Record the exposure rate for the appropriate corresponding survey point information (location ID and/or coordinates etc) on the Static Exposure Rate Survey Field Form (Attachment C).

7. If any of the reading is above the cleanup level mark the survey point with a pin flag for investigation and addressing any residual contamination.

8. Repeat step 4 to 6 for additional static exposure rate measurements.

5.0 ATTACHMENTS

Attachment A	µR meter and SPA-3/Ludlum 2221Function Check Form
Attachment B	Static Exposure Rate Survey Field Form

AVM Environmental Services, Inc.
Micro R Meter Function Check Form

Micro R Meter: Ludlum 19, SR#76248

Function Check Source ID: 1% U_3O_8 Ore in Sealed can

Function Check @ Calibration _____

Acceptable Function Check Reading (uR/hr) Range (20%) _____ to _____

Date	Physical Check	Cal Date	Battery(1) Volts or OK	BKG Reading uR/hr	Source Reading (2) uR/hr	Within Acceptable Range Y or N	Cal Due	Tech

Note: (1) Battery Voltage must be within BAT TEST Range (2) Function Check Source must be placed in the circle on the front side of the meter

AVM Environmental Services, Inc.

Radiation Survey @ UNC's Section 27 Mine Site

Scan Gamma Radiation Exposure Rate Survey Field Form

Instrumentation :_____

Instrument Calibration Date: _____, Instrument Daily Function Check Performed: _____

Survey Area/Unit Decsription _____

Survey Date/Time	Survey Area-Transect ID/Description	Exposure Rate uR/hr	Comments/Notes

Technician Signature _____, Reviewed by _____

AVM Environmental Services, Inc.

Radiation Survey @ UNC's Section 27 Mine Site

Static Gamma Radiation Level Survey Field Form

Instrumentation : Scaler/Ratemeter_____, Detector _____

Instrument Calibration Date: _____, Instrument Daily Function Check Performed: _____

2"x2" NaI Detector Collimated _____ Yes or _____ No.

Survey Area/Unit Decsription _____

Survey Date/Time	Survey Point ID/Description	Survey Point Coordinate		Gamma Radiation Reading, CPM	Comments/Notes
		Northing	Easting		

Technician Signature _____, Reviewed by _____

APPENDIX C

FINANCIAL ASSURANCE QUANTITY CALCULATIONS AND COST SHEETS

RECLAMATION COST ESTIMATE
UNITED NUCLEAR CORPORATION SECTION 27 MINE

Worksheet No.	Description
0	Schedule of Values Summary of Costs
	Phase 1 Construction
1	Site Preparation
2	Regrading Non-Economical Storage Area
3	Haul Ball Mill Rejects to Non-Economic Storage Area 1
4	Haul Ore Material to Non-Economic Storage Area 2
5	Demolition
6	Portal Reclamation
7	Reclaim Disturbed Areas
8	Haul and Spread Topsoil
9	Revegation
10	Post Closing Monitoring
11	Upgrade Existing Access Road
12	Fencing
13	Equipment Fleet Costs
14	Haul Additional Cover Material to Non-Economical Storage Areas, Vents, and Shafts
	Phase 2 Construction
15	Site Preparation
16	Excavate & Haul East Area
17	Excavate & Haul West Area
18	Construct Diversion Channel
19	Reclaim Disturbed Areas
20	Haul & Spread Cover Material
21	Revegetation
22	Fencing
23	Equipment Fleet Costs
	Assumptions[2]
1	Davis Bacon wages for equipment operators and laborers
2	Assumes all equipment is rented
3	Estimate includes 60% revegetation failure rate
4	Estimate includes 15 inspections between year 1 and year 10
5	Estimate includes a vegetation analysis at the end of years 11 and 12 for bond release
6	Assumes 3-foot thick cover and on-site suitable borrow source
7	Existing access road will be left in place
8	The existing ore loading pull through at Shaft #2 will be left in place
9	Single shift 10 hours per day, 4 days per week
10	Phase 1 labor, equipment and material costs are 2008 dollars
11	Phase 2 labor, equipment and material costs are 2011 dollars
12	Assumes work performed by a third-party contractor
13	Water will be obtained from an on-site water well.
14	See other assumptions in specific worksheets

Notes:

1. Phase 1 construction costs revised April 2009. Phase 2 construction costs added June 2011.
2. Additional assumptions included on individual worksheets.

WS 0 - SCHEDULE OF VALUES
UNC SECTION 27 MINE RECLAMATION COST ESTIMATE
(rounded to nearest $1,000)

Item	Description	Unit	Quantity	Unit Cost	Extended	Worksheet
	Phase 1 Construction					
	Site Preparation					
1	Install sediment control	ls	1	$ 8,606	$8,606	WS 1 Site Preparation
	Regrading					
2	Regrade Non-economic storage areas	ac	26,962	$ 0.86	$23,243	WS 2 Regrading NESA
3	Excavate and haul ball mill reject pile	cy	760	$ 4.16	$3,164	WS 3 Haul BM Rejects to NESA1
4	Excavate and haul ore stockpile	cy	6,616	$ 3.57	$23,616	WS 4 Haul Ore Mat to NESA 2
5	Excavate and haul borrow materials	cy	11,052	$ 4.20	$46,432	WS 14 Haul Addt'l Cover Mtrl
	Demolition and Portal Reclamation					
6	Remove foundations, power poles, and lines	ls	1	$ 8,031.52	$8,032	WS 5 Demolition
7	Concrete plugs for shafts and vents	ls	1	$ 10,305.26	$10,305	WS 6 Portal Reclamation
	Reclamation of Disturbed areas					
8	Reclaim roads and disturbed areas	ft	5,000	$ 0.47	$2,364	WS 7 Reclaim Disturbed Areas
	Revegetation					
9	Excavate, haul and spread topsoil	cy	6,480	$ 2.97	$19,266	WS 8 Haul and Spread Topsoil
10	Seed, fertilize, and mulch	ac	9	$ 3,200.00	$29,600	WS 9 Revegetate
	Permanent Facilities					
11	Upgrade existing road for permanent access	ft	3,000	$ 3.22	$9,665	WS 11 Upgrade Existing Road
12	Install Fencing	ft	6,000	$ 1.65	$9,900	WS 12 Fencing
	Phase 1 Direct Closure Construction Cost Subtotal				**$194,000**	
	Indirect Costs					
	Mobilization and Demobilization			10.0%	$ 19,400	
	Contingencies			10.0%	$ 19,400	
	Engineering Redesign Fee			2.5%	$ 4,900	
	Contractor Profit and Overhead			25.0%	$ 48,500	
	Project Management Fee			6.0%	$ 11,600	
	State Procurement Cost			1.6%	$ 3,100	
	Phase 1 Subtotal Indirect Costs				**$ 107,000**	
	Phase 1 Total Estimated Cost				**$ 301,000**	

WS 0 - SCHEDULE OF VALUES
UNC SECTION 27 MINE RECLAMATION COST ESTIMATE
(rounded to nearest $1,000)

Item	Description	Unit	Quantity	Unit Cost	Extended	Worksheet
	Phase 2 Construction					
	Site Preparation					
15	Install sediment control	ls	1	$ 6,337	$6,337	WS 15 Site Preparation
	Consolidation of Soils					
16	Excavate & Haul East Area	cy	14,230	$ 7.98	$113,557	WS 16 Excav-Haul East Area
17	Excavate & Haul West Area	cy	4,070	$ 8.23	$33,509	WS 17 Excav-Haul West Area
18	Construct Diversion Channel	lf	750	$ 20.00	$14,999	WS 18 Diversion Channel
19	Excavate, haul and spread topsoil	cy	13,290	$ 4.40	$58,431	WS 20 Haul & Spread Cover
	Reclamation of Disturbed areas					
20	Reclaim roads and disturbed areas	ft	5,000	$ 0.48	$2,389	WS 19 Reclaim Disturbed Area
	Revegetation					
21	Seed, fertilize, and mulch	ac	23	$ 3,200.00	$73,600	WS 21 Revegetation
	Permanent Facilities					
22	Install Fencing	ft	2,250	$ 2.68	$6,030	WS 22 Fencing
	Phase 2 Direct Closure Construction Cost Subtotal				**$309,000**	
	Indirect Costs					
	Mobilization and Demobilization			10.0%	$ 30,900	
	Contingencies			10.0%	$ 30,900	
	Engineering Redesign Fee			2.5%	$ 7,700	
	Contractor Profit and Overhead			25.0%	$ 77,300	
	Project Management Fee			6.0%	$ 18,500	
	State Procurement Cost			1.6%	$ 4,900	
	Phase 2 Subtotal Indirect Costs				**$ 170,000**	
	Phase 2 Total Estimated Cost				**$ 479,000**	
	Direct Post Closure Monitoring Cost Subtotal					
	Vegetation inspections and evaluation (WS 10 Post-Closure Monitoring)				**$76,000**	WS 10 Post-Closure Monitoring
	Total Bond Amount				**$ 856,000**	

PRODUCTION DETAIL

Activity Description
Install silt fence and straw bales
Build sediment pond
Set up water station

Equipment
Grader for silt fence

Labor
2 labors for silt fence and straw bale installation

Estimating Assumptions

Install silt fence at toe of non-economic storage areas	2000	ft
Silt fence in other areas	2000	ft
Total	4000	ft
Straw bales	500	bales
Sediment Pond = 50x 50 x 3 feet deep =	300	cy

Productivity calculations

Assume 2 days to install silt fence straw bales and build sediment pond (if needed)

COST DETAIL

Quantity **1**
Unit Price **$ 8,605.91 ls**

Equipment						
Item	Description	Commitment	Quantity	Rate[1]	Hours	Cost
1	140H Grader	100%	1	$ 124.97	10	$ 1,249.65
2	GMC Water truck 4000 gallon	100%	1	$ 90.84	10	$ 908.40
	Select Equipment			$ -		$ -
	Select Equipment			$ -		$ -
	Select Equipment			$ -		$ -
	Select Equipment			$ -		$ -
	Total Item Cost					**$ 2,158.05**

Labor						
Item	Description	Commitment	Quantity	Rate	Hours	Cost
1	Silt fence Labor [2]	100%	2	$ 25.80	20	$ 1,032.00
				$ -		$ -
				$ -		$ -
				$ -		$ -
				$ -		$ -
				$ -		$ -
	Total Item Cost					**$ 1,032.00**

Materials and Subcontractors						
Item	Description	Units	Quantity	Rate	Remarks	Cost
1	Purchase Silt fence	ft	4000	$ 0.35		$ 1,400.00
2	Purchase Straw bales	ea	500	$ 7.50		$ 3,750.00
3	Water	hr	4	$ 66.47		$ 265.86
				$ -		$ -
				$ -		$ -
				$ -		$ -
	Total Item Cost					**$ 5,415.86**

Notes:
1. See WS 13 Equipment Cost for breakdown of Equipment cost
2. Davis Bacon wage for Group III labor classification plus fringe.

PRODUCTION DETAIL

Activity Description

Flatten side-slope Non-economic Storage Areas 1 and 2 to between a 3H:1V or 4H:1V slope
Include quantity of ball mill reject and ore stockpile material to regrade in non-economic storage areas
Ball mill and ore stockpile material will be placed in trenches at the center of the NESA piles and buried
Include quantity of material to cover NESA 1 and NESA 2 with 2 feet of additional material from borrow source
Regrade top 12" of topsoil from excavated borrow source to 10H:1V slope at base and 3H:1V slope on sidewalls

Trench excavation for ball mill reject and ore stockpile materials		
Excavated volume for ball mill reject disposal	800	cy
Excavated volume for ore stockpile materials for disposal	6000	cy

Regrading quantities for bull dozer			
Cut quantity for Non-economic Storage Area 1 =	1,176	cy	*see Appendix A for quantity calculation*
Cut quantity for Non-economic Storage Area 2 =	1,626	cy	*see Appendix A for quantity calculation*
Ore quantity =	5,753	cy	*see Appendix A for quantity calculation*
Ball Mill reject =	760	cy	*see Appendix A for quantity calculation*
Cover material from borrow source =	10,830	cy	*see Appendix A for quantity calculation*
Topsoil replaced to borrow source =	3,300	cy	*see Appendix A for quantity calculation*
Total quantity for bull dozer to grade	23,445	cy	
with 15% swell factor =	26,962	cy	

Equipment

D8R dozer with 14-ft wide Universal Blade

Description of dozer use

Regrading
Push down from top of slope
Average dozing distance 100 ft
Grade (in percent) - 10%
Regrading production = 900 cy per hour

Trench excavation
Trenches constructed as a low-lying depression in center of NESA's
NESA 1 has average dozing distance for trench excavation of 150 ft
NESA 2 has average dozing distance for trench excavation of 200 ft
Average grade - 0%
NESA 1 production = 700 cy per hour
NESA 2 production = 500 cy per hour

Production rates obtained from Caterpillar performance handbook, and summarized charts are included on page 3 of this worksheet

Assumptions

Track-type operator
Average operator
50min/hour efficiency
Material unit weight = 2800 lb/cy
Excellent visibility
Elevation is not a factor
Loose stockpile
Normal dozing

Productivity calculations

Trench excavation for ball mill reject material

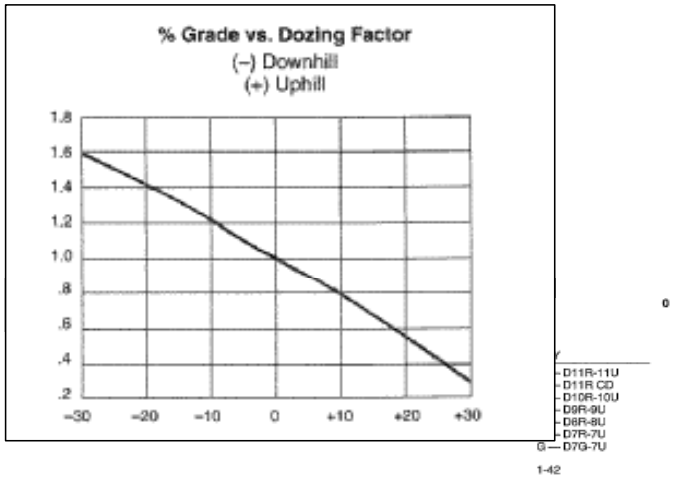
Operator Adjustment Factor	=	0.75 Operator factor	x	1.00 Material factor	x	0.83 efficiency factor	x	1.00 grade factor	x	0.82 weight correction factor	x	1.00 production method/blade factor	x	1.00 visibility factor	x	1.00 elevation factor	=	0.51						
Net Hourly Production	=	700.00 hourly production (cy/hr)	x	0.51 operating adjustment factor	=	357 cy/hr																		
Hours required	=	800 Volume to be moved	/	357 net hourly production (cy/hr)	=	**2 hr**																		

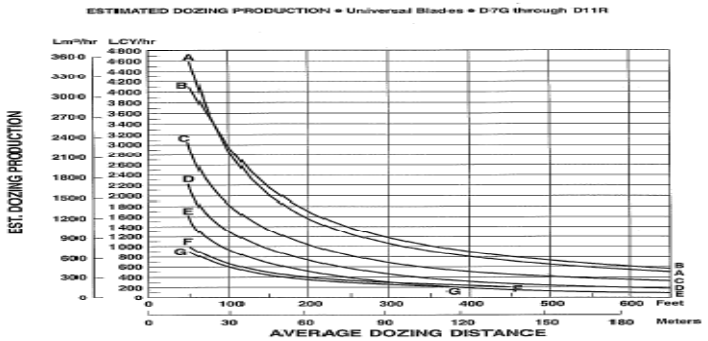
Trench excavation for stockpiled ore material

Operator Adjustment Factor	=	0.75 Operator factor	x	1.00 Material factor	x	0.83 efficiency factor	x	1.00 grade factor	x	0.82 weight correction factor	x	1.00 production method/blade factor	x	1.00 visibility factor	x	1.00 elevation factor	=	0.51						
Net Hourly Production	=	500.00 hourly production (cy/hr)	x	0.51 operating adjustment factor	=	255 cy/hr																		
Hours required	=	6,000 Volume to be moved	/	255 net hourly production (cy/hr)	=	**24 hr**																		

Regrading Non-economic storage areas, ball mill rejects, and stockpiled ore

Operator Adjustment Factor	=	0.75	x	1.00	x	0.83	x	1.20	x	0.82	x	1.00	x	1.00	x	1.00	=	0.61		
		Operator factor		Material factor		efficiency factor		grade factor		weight correction factor		production method/blade factor		visibility factor		elevation factor				
Net Hourly Production	=	900.00	x	0.61	=	551														
		hourly production (cy/hr)		operating adjustment factor		cy/hr														
Hours required	=	26,962	/	551	=	**49**														
		Volume to be moved		net hourly production (cy/hr)		**hr**														





Reprint from Caterpillar Performance Handbook Edition 31

COST DETAIL

Quantity		**26,962**	**cy**
Unit Price	**$**	**0.86**	**per cy**

Equipment Fleet						
Item	Description	Commitment	Quantity	Rate[(1)]	Hours	Cost
1	D8R Dozer	100%	1	$ 216.97	75	$ 16,197.44
2	GMC Water truck 4000 gallon	100%	1	$ 90.84	60	$ 5,450.40
	Select Equipment			$ -		$ -
	Select Equipment			$ -		$ -
	Select Equipment			$ -		$ -
	Select Equipment			$ -		$ -
	Total Item Cost					**$ 21,647.84**

Labor						
Item	Description	Commitment	Quantity	Rate	Hours	Cost
				$ -		$ -
				$ -		$ -
				$ -		$ -
				$ -		$ -
				$ -		$ -
				$ -		$ -
	Total Item Cost					**$ -**

Materials and Subcontractors						
Item	Description	Units	Quantity	Rate	Remarks	Cost
1	Water	hr	24	$ 66.47		$ 1,595.16
				$ -		$ -
				$ -		$ -
				$ -		$ -
				$ -		$ -
	Total Item Cost					**$ 1,595.16**

Notes:

1. See WS 13 Equipment Cost for breakdown of Equipment cost

PRODUCTION DETAIL

Activity Description

Haul 760 cy of Ball Mill Rejects to Non-economic Storage Area 1

Place ball mill rejects in trenches at the center of the Storage Area

Equipment

D25D Truck

Struck capacity (cy)	13
Heaped capacity (cy)	18

Materials description (Volume)

760 bank cubic yards of Ball Mill Rejects will be buried in Non-economic Storage Area 1

Route description

Travel Distance (feet)	Loaded grade (%)	Rolling resistance (%)	Loaded effective grade (%)	Empty effective grade (%)
300	5.6	3	8.6	3

Assumptions

1. Efficiency factor of 0.83 for average conditions
2. Dump maneuver time = unload time
3. The empty effective grade is equal to the rolling resistance
4. Decent road conditions
5. Truck and loader will not be able to carry full load of steel balls, so multiplying Struck Capacity and loader capacity by 0.6
6. Doubled travel time listed in CAT handbook, and doubled estimates of loading and unloading times
7. No swell assumed

Hourly estimate for hauling of 760cy of Ball Mill Rejects to Non-economic Storage Area 1

No. Loader	=	7.8 Struck truck capacity x 0.6 (LCY)	/	2.4 Loader bucket capacity x 0.6 (LCY)	=	3.3	passes				
Net Truck Capacity	=	2.4 Loader bucket capacity (LCY)	x	3.3 no. loader passes/truck	=	7.8	LCY				
Loading time/Truck	=	2 loader cycle time (min)	x	3.3 no. loader passes/truck	=	7	min				
Truck cycle time	=	2.5 Load time (min)	+	1.6 Loaded travel time (min)	+	2 Unload/maneuve	+	2 Empty travel time (min)	=	8	min
No. trucks required	=	8.1 truck cycle time (min)	/	6.5 total loading time	=	1.2	Trucks	(use 2)			
Production rate	=	7.8 net truck capacity	x	2 no. trucks	/	8.1 truck cycle time	=	1.9	LCY/min		
Hourly production	=	1.9 production rate (LCY/min)	x	60 60min/hr	x	0.83 efficiency factor	=	95.9	LCY/hr		
Hours required	=	760 volume to be moved (LCY)	/	95.9 hourly production (LCY/hr)	=	**7.9**	**hr**				

COST DETAIL

Quantity		**760 cy**
Unit Price	**$**	**4.16 per cy**

Equipment Fleet

Item	Description	Commitment	Quantity	Rate[(1)]	Hours	Cost
1	966G Loader	100%	1	$ 148.84	8	$ 1,179.41
2	D25D Truck	100%	1	$ 178.440	8	$ 1,413.96
3	GMC Water truck 4000 gallon	50%	1	$ 90.84	8	$ 359.91
	Select Equipment			$ -		$ -
	Select Equipment			$ -		$ -
	Select Equipment			$ -		$ -
	Total Item Cost					**$ 2,953.28**

Labor

Item	Description	Commitment	Quantity	Rate	Hours	Cost
				$ -		$ -
				$ -		$ -
				$ -		$ -
				$ -		$ -
				$ -		$ -
	Total Item Cost					**$ -**

Materials and Subcontractors

Item	Description	Units	Quantity	Rate	Remarks	Cost
1	Water	hr	3	$ 66.47		$ 210.67
				$ -		$ -
				$ -		$ -
				$ -		$ -
				$ -		$ -
	Total Item Cost					**$ 210.67**

Notes:

1. See WS 13 Equipment Cost for breakdown of Equipment cost
2. Dozer for pile knockdown
3. Unit price based on bank volume

PRODUCTION DETAIL

Activity Description

Haul 5753 cy of Stockpiled Ore material to Non-economic Storage Area 2

Place Stockpiled Ore material in trenches at the center of the Storage Area

Equipment

D25D Truck

Struck capacity (cy)	13
Heaped capacity (cy)	18

Materials description (Volume)

5753 bank cy of Stockpiled Ore material will be buried in Non-economic Storage Area 2

15% Swell factor so total quantity = 6616 cy

Route description

Travel Distance (feet)	Loaded	Rolling	Loaded effective	Empty effective
400	4	3	7	3

Assumptions

1. Efficiency factor of 0.83 for average conditions
2. Dump maneuver time = unload time
3. The empty effective grade is equal to the rolling resistance
4. Decent road conditions
5. Doubling cycle times and loading times for each activity

Hourly estimate to haul 6053cy of Stockpiled Ore Material to Non-economic Storage Area 2

No. Loader Passes/Truck	=	13 Struck truck capacity (LCY)	/	4 Loader bucket capacity (LCY)	=	3.3	passes					
Net Truck Capacity	=	4 Loader bucket capacity (LCY)	x	3.3 no. loader passes/truck	=	13	LCY					
Loading time/Truck	=	2 loader cycle time (min)	x	3.3 no. loader passes/truck	=	7	min					
Truck cycle time	=	2 Load time (min)	+	2 Loaded travel time (min)	+	2 Unload/maneuver time (min)	+	2 Empty travel time (min)	=	8	min	
No. trucks required	=	8 truck cycle time (min)	/	7 total loading time (min)	=	1.2	Trucks	(use 2)				
Production rate	=	13 net truck capacity (LCY)	x	2 no. trucks	/	8 truck cycle time (min)	=	3.3	LCY/min			
Hourly production	=	3.3 production rate (LCY/min)	x	60 60min/hr	x	0.83 efficiency factor	=	161.9	LCY/hr			
Hours required	=	6616 volume to be moved (LCY)	/	161.9 hourly production (LCY/hr)	=	**41**	**hr**					

COST DETAIL

Quantity		**6616 cy**
Unit Price	**$**	**3.57 per cy**

Equipment Fleet						
Item	Description	Commitment	Quantity	Rate[(1)]	Hours	Cost
1	966G Loader	100%	1	$ 148.84	41	$ 6,084.14
2	D25D Truck	100%	2	$ 178.44	41	$ 14,588.20
3	GMC Water truck 4000 gallon	50%	1	$ 90.84	41	$ 1,856.64
	Select Equipment			$ -		$ -
	Select Equipment			$ -		$ -
	Select Equipment			$ -		$ -
	Total Item Cost					**$ 22,528.98**

Labor						
Item	Description	Commitment	Quantity	Rate	Hours	Cost
				$ -		$ -
				$ -		$ -
				$ -		$ -
				$ -		$ -
				$ -		$ -
	Total Item Cost					**$ -**

Materials and Subcontractors						
Item	Description	Units	Quantity	Rate	Remarks	Cost
1	Water	hr	16	$ 66		$ 1,086.76
				$ -		$ -
				$ -		$ -
				$ -		$ -
				$ -		$ -
				$ -		$ -
	Total Item Cost					**$ 1,086.76**

Notes:

1. See WS 13 Equipment Cost for breakdown of Equipment cost
2. Unit price includes swell
3. Dozer for pile knockdown.

PRODUCTION DETAIL

Activity Description
Remove foundation remnants and place in non-economic storage area 1
Remove power line
Remove power pole

Equipment
Dump truck
Loader
Water truck

Labor
N/A

Estimating Assumptions
1. Assume that foundations greater than 3 feet deep can be buried in place at least 1 ft bgs
2. Dispose power poles on site (no cutting) or salvage.
3. Leave ore loading station in place per closure plan

Productivity calculations
Assume 1 day for foundation removal
Assume 1 day to remove and dispose of power poles

COST DETAIL

Quantity		1
Unit Price	$	8,031.52

Equipment Fleet

Item	Description	Commitment	Quantity	Rate[1]	Hours	Cost
1	966G Loader	100%	1	$ 148.84	20	$ 2,976.80
2	D25D Truck	100%	1	$ 178.44	20	$ 3,568.80
3	GMC Water truck 4000 gallon	25%	1	$ 90.84	20	$ 454.20
	Select Equipment			$ -		$ -
	Select Equipment			$ -		$ -
	Select Equipment			$ -		$ -
	Total Item Cost					**$ 6,999.80**

Labor

Item	Description	Commitment	Quantity	Rate	Hours	Cost
				$ -		$ -
				$ -		$ -
				$ -		$ -
				$ -		$ -
				$ -		$ -
				$ -		$ -
	Total Item Cost					**$ -**

Materials and Subcontractors

Item	Description	Units	Quantity	Rate	Remarks	Cost
1	Electrical utility		1	$ 500.00		$ 500.00
2	Water	hr	8	$ 66.47		$ 531.72
				$ -		$ -
				$ -		$ -
				$ -		$ -
				$ -		$ -
	Total Item Cost					**$ 1,031.72**

Notes:

1. See WS 13 Equipment Cost for breakdown of Equipment cost

PRODUCTION DETAIL

Activity Description

Build concrete plugs

Shaft #1 diameter =	5	ft
Shaft #2 diameter =	12	ft
Vent holes 1, 2, 3 diameter =	5	ft

Cover with 3' thick soil layer (2' of soil and rock from borrow source, 1' topsoil)

Volume of concrete needed for shafts =	132.7	ft^2 x	2 ft depth =	9.8	cy of concrete
Volume of concrete needed for vents =	19.6	ft^2 x	2 ft depth	1.5	cy of concrete each
Reinforcement					
Total Concrete needed				14.2	cy

Equipment

N/A

Labor

N/A

Estimating Assumptions

N/A

Productivity calculations

Assume 1 week to construct reinforcement cages for plugs
1 day for concrete pour all shafts and vents
1 day to cover using surrounding soilds.

COST DETAIL

Quantity		1
Unit Price	$	10,305.26

Equipment Fleet

Item	Description	Commitment	Quantity	Rate[1]	Hours	Cost
1	966G Loader	100%	1	$ 148.84	10	**$ 1,488.40**
	Select Equipment			$ -		**$ -**
	Select Equipment			$ -		**$ -**
	Select Equipment			$ -		**$ -**
	Select Equipment			$ -		**$ -**
	Select Equipment			$ -		**$ -**
	Total Item Cost					**$ 1,488.40**

Labor

Item	Description	Commitment	Quantity	Rate[2]	Hours	Cost
1	Build reinforcement	100%	2	$ 25.80	100	$ 5,160.00
2	Place concrete	100%	2	$ 25.80	10	$ 516.00
				$ -		$ -
				$ -		$ -
				$ -		$ -
				$ -		$ -
	Total Item Cost					**$ 5,676.00**

Materials and Subcontractors

Item	Description	Unit	Quantity	Rate	Remarks	Cost
1	Reinforcement		1	$ 1,000.00		$ 1,000.00
2	Concrete	cy	15	$ 125.00		$ 1,875.00
3	Water	hr	4	$ 66.47		$ 265.86
				$ -		
				$ -		$ -
				$ -		$ -
	Total Item Cost					**$ 3,140.86**

Notes:

1. Davis Bacon wage for Group III labor classification plus fringe.
2. Delivered concrete costs are based UNC experience.

PRODUCTION DETAIL

Activity Description
Reclaim roads and disturbed areas
Reclaim all other roads and disturbed areas by ripping and regrading the surface to provide positive drainage

Equipment
Motor grader
Water truck

Materials description (Volume)

Length of roads and disturbed areas for reclamation =	5000	ft of roads	x 20 ft wide =	2.3	ac
	0.5	ac of other areas		0.5	ac
Total disturbed area to reclaim =				2.8	ac

Productivity calculations

Rip roads to be closed	5000 ft x	1 mph =	1	hr per pass
		x	5	passes
		=	5	hrs
Rip other disturbed area			1	hrs
		total ripping	6	hrs
Regrade roads and disturbed area-----> assume 5 passes =			6	hrs
Total Production time			**12**	**hrs**

Assumptions
1. Reveg included in revegetation item

COST DETAIL

Quantity		**5000 ft**
Unit Price	**$**	**0.47 per ft**

Equipment Fleet						
Item	Description	Commitment	Quantity	Rate[1]	Hours	Cost
1	140H Grader	100%	1	$ 124.965	12	$ 1,499.58
2	GMC Water truck 4000 gallon	50%	1	$ 90.84	12	$ 545.04
	Select Equipment			$ -		$ -
	Select Equipment			$ -		$ -
	Select Equipment			$ -		$ -
	Select Equipment			$ -		$ -
	Total Item Cost					**$ 2,044.62**

Labor						
Item	Description	Commitment	Quantity	Rate	Hours	Cost
				$ -		$ -
				$ -		$ -
				$ -		$ -
				$ -		$ -
				$ -		$ -
				$ -		$ -
	Total Item Cost					**$ -**

Material						
Item	Description	Units	Quantity	Rate	Remarks	Cost
1	Water	hr	5	$ 66.47		$ 319.03
				$ -		$ -
				$ -		$ -
				$ -		$ -
				$ -		$ -
				$ -		$ -
	Total Item Cost					**$ 319.03**

Notes:

1. See WS 13 Equipment Cost for breakdown of equipment costs.

PRODUCTION DETAIL

Activity Description

Move topsoil from stockpiled areas to Non-economic Storage Area 1 and Non-economic Storage Area 2.
Perform finish grading for topsoil replaced to borrow source. Topsoil kept close to borrow source, no hauling necessary

Equipment
D25D Truck
Capacity=13 cubic yards

Materials description (Volume)

West topsoil stockpile (cy)	2100 (x 20% swell)	2520
East topsoil stockpile (cy)	3300 (x 20% swell)	3960
Total volume (cy)	5400 (x 20% swell)	6480

For production purposes assume the following
West topsoil stockpile will be used to cover NESA-1
East topsoil stockpile will be used to cover NESA-2

Assume 4 hours to finish grade borrow source, determined using WS 2 (4 hours added to required time for 140H grader in Equipment Fleet table)

Assumptions
Constructed roads for hauling materials are in moderately good condition
Truck is using 26.5R25 tires
Doubled travel time as listed on the top of spreadsheet, which came from the CAT handbook or assumed values

WS 8 Haul & Spread Topsoil

Productivity Calculations

Objective	Volume material (cy)	Source	Distance (feet)	Loaded grade	Loaded effective grade	Load time (minutes)	Loaded Travel time (minutes)	Unload time (minutes)	Empty effective grade	Empty travel time (minutes)
Cover NESA1	2520	West topsoil stockpile	820	2.4	5.4	1	0.8	0.75	3	0.5
Cover NESA2	3960	East topsoil stockpile	850	1.2	4.2	1	0.75	0.75	3	0.5

Hours required to cover NESA #1

Cycle time	=	2 Load time (min)	+	1.6 Loaded travel time (min)	+	1.5 Unload time	+	1 Empty trip time	=	6.1 minutes
Cycles/hour	=	60 min/hr	/	6.1	=	9.8 cycles/hour				
Hourly production	=	13 Load (cy)	x	9.8 Cycles/hour	=	127.9 cy/hour				
Hours required	=	2520 Volume (cy)	/	127.9 cy/hour	=	19.7				

Hours required to cover NESA #2

Topsoil from East Stockpile

Cycle time	=	2 Load time	+	1.5 Loaded travel time	+	1.5 Unload time	+	1 Empty trip time	=	6 minutes
Cycles/hour	=	60 min/hr	/	6	=	10.0 cycles/hour				
Hourly production	=	13 Load (cy)	x	10.0 Cycles/hour	=	130.0 cy/hour				
Hours required	=	3960 Volume (cy)	/	130.0 cy/hour	=	30.5				
				Total time	**=**	**50.2 hours**	for one truck	**Use 2 trucks**	**25.1**	hrs

COST DETAIL

Quantity **6480 cy**
Unit Price **$ 2.97 per cy**

Equipment Fleet						
Item	Description	Commitment	Quantity	Rate[1]	Hours	Cost
1	966G Loader	100%	1	$ 148.84	25	$ 3,733.59
2	D25D Truck	100%	2	$ 178.44	25	$ 8,952.20
3	140H Grader	100%	1	$ 124.97	29	$ 3,634.56
4	GMC Water truck 4000 gallon	100%	1	$ 90.84	25	$ 2,278.69
	Select Equipment			$ -		$ -
	Select Equipment			$ -		$ -
	Total Item Cost					**$ 18,599.04**

Labor						
Item	Description	Commitment	Quantity	Rate	Hours	Cost
				$ -		$ -
				$ -		$ -
				$ -		$ -
				$ -		$ -
				$ -		$ -
				$ -		$ -
	Total Item Cost					**$ -**

Material and Subcontractors						
Item	Description	Units	Quantity	Rate	Remarks	Cost
1	Water	hr	10	$ 66.47		$ 666.90
				$ -		$ -
				$ -		$ -
				$ -		$ -
				$ -		$ -
				$ -		$ -
	Total Item Cost					**$ 666.90**

Notes:
1. See WS 13 Equipment Cost for breakdown of equipment costs
2. Trucks can drive down slopes to spread topsoil.
3. Unit price includes swell

PRODUCTION DETAIL

Activity Description
Seed and fertilize topsoil

Equipment
Scarification
Discing
Drill seed
Mulching and crimping

Estimating Assumptions
1. Assume 9.25 acres to be seeded
2 Assume 60% revegetation failure rate
3. 12 year monitoring and evaluation period

Productivity calculations
N/A

COST DETAIL

Quantity		**9.25**	**acre**
Unit Price	**$**	**3,200.00**	**per acre**

Revegetation						
Item	Description	Unit	Quantity	Rate	Remarks	Cost
1	Initial revegetation	ac	9.25	$ 2,000.00		$ 18,500.00
2	Follow-up revegetation	ac	5.55	$ 2,000.00		$ 11,100.00
				$ -		$ -
				$ -		$ -
				$ -		$ -
				$ -		$ -
	Total Item Cost					**$ 29,600.00**

Notes

1. Cost based on the vegetation study by Cedar Creek (May, 2006) and experience at similar projects.

PRODUCTION DETAIL

Activity Description
N/A

Equipment
N/A

Estimating Assumptions
1. 12 year monitoring and evaluation period
2. Perform 6 site visits in year 1 and annual evaluations years 2 through 10
3. Assume 1 scientist and 2 days travel
4. Provide quantitative vegetation analysis in Year 11 and 12 sufficient for bond release
5. Base cost on initial vegetation study

Productivity calculations
N/A

COST DETAIL

Quantity		1	
Unit Price	$	76,000.00	ls

Inspections and Bond Release Vegetation Evaluation						
Item	Description	Unit	Quantity	Rate	Remarks	Cost
1	Vegetation inspections	ea	15	$ 3,400.00		$ 51,000.00
2	Vegetation quantitative analysis for bond release	ea	2	$ 12,500.00		$ 25,000.00
				$ -		$ -
				$ -		$ -
				$ -		$ -
				$ -		$ -
	Total Item Cost					**$ 76,000.00**

Notes
1. Cost based on initial vegetation study by Cedar Creek

PRODUCTION DETAIL

Activity Description
Upgrade the main access road to be left in place post closure per the closure plan

Equipment
Motor grader
Water truck

Materials description (Volume)

Existing access road length =	3000	ft
Width =	25	ft
Area =	75000	ft^2
Thickness=	0.25	ft
Volume of gravel =	694	yd^3

Productivity calculations

Upgrade existing road			1 mph	1 hr/pass
Regrade	3000 ft	x	x	5 passes
			=	5 hrs

Assumptions
N/A

COST DETAIL

Quantity		**3000 linear ft**
Unit Price	**$**	**3.22 per linear ft**

Equipment Fleet						
Item	Description	Commitment	Quantity	Rate[1]	Hours	Cost
1	140H Grader	100%	1	$ 124.97	5	$ 624.83
2	GMC Water truck 4000 gallon	50%	1	$ 90.84	5	$ 227.10
	Select Equipment			$ -		$ -
	Select Equipment			$ -		$ -
	Select Equipment			$ -		$ -
	Select Equipment			$ -		$ -
	Total Item Cost					**$ 851.93**

Labor						
Item	Description	Commitment	Quantity	Rate	Hours	Cost
				$ -		$ -
				$ -		$ -
				$ -		$ -
				$ -		$ -
				$ -		$ -
				$ -		$ -
	Total Item Cost					**$ -**

Material						
Item	Description	Units	Quantity	Rate	Remarks	Cost
1	Import gravel	cy	694	$ 12.50		$ 8,681
2	Water	hr	2	$ 66.47		$ 132.93
				$ -		$ -
				$ -		$ -
				$ -		$ -
				$ -		$ -
	Total Item Cost					**$ 8,813.49**

Notes:

1. See WS 13 Equipment Cost for breakdown of Equipment cost
2. Gravel costs based on UNC-experience with recent local costs.

PRODUCTION DETAIL

Activity Description
Install fencing around perimeter of site

Equipment
Included in unit price

Materials description (Volume)

1500	ft per side	=	6000	lf

Fencing
- # wires: 4
- Max ht.: 40"
- Wire spacing: 16, 6, 6 & 12 inches
- Wire: top smooth, others barbed
- Post spacing: 16.5 to 30 ft
- # of stays between line posts: 1-4

Productivity calculations
N/A

Assumptions
None.

COST DETAIL

Quantity		**6000**	linear ft
Unit Price	**$**	**1.65**	per linear ft

Material							
Item	Description	Unit	Quantity	Rate		Remarks	Cost
1	Purchase and install fence [(1)]	ft	6000	$	1.65		$ 9,900.00
				$	-		$ -
				$	-		$ -
				$	-		$ -
				$	-		$ -
				$	-		$ -
	Total Item Cost						**$ 9,900.00**

Notes:

1. Fencing specifications based on the multiple use standard for “cattle and sheep (requires extreme restriction of livestock movements)” with deer being the predominant game species, as per the BLM Fence Standard for Livestock and Wildlife (H-1741-1, BLM, 1986).

WS 13 Equipment Fleet Cost

EQUIPMENT COSTS

Item	Equipment[2]	Weekly Rate	Hourly Rate	Burden Hourly Labor	Fuel Consuption gal/hr	Hourly Fuel	Hourly Maintenance	Total Hourly Rate
1	D8R Dozer	$5,465	$136.63	$ 31.84	9	$ 40.50	$8.00	$216.97
2	GMC Water truck 4000 gallon	$1,870	$ 46.75	$ 31.84	2.5	$ 11.25	$1.00	$90.84
3	966G Loader	$3,380	$ 84.50	$ 31.84	5	$ 22.50	$10.00	$148.84
4	D25D Truck	$4,740	$118.50	$ 31.84	5.8	$ 26.10	$2.00	$178.44
5	140H Grader	$2,625	$65.63	$ 31.84	5	$ 22.50	$5.00	$124.97
6	60 KW Diesel 3 Phase	$405	$10.13	$ 31.84	5	$22.50	$2.00	$66.47

Total Hours Used

Item	Equipment[2]	WS 1	WS 2	WS 3	WS 4	WS 5	WS 6	WS 7	WS 8	WS 11	WS 14	Total Hours
1	D8R Dozer	0	75	0	0	0	0	0	0	0	0	75
2	GMC Water truck 4000 gallon	10	60	8	41	20	0	12	25	5	125	305
3	966G Loader	0	0	8	41	20	10	0	25	0	125	228
4	D25D Truck	0	0	8	41	20	0	0	25	0	125	218
5	140H Grader	10	0	0	0	0	0	12	29	5	0	56

Notes:

1. Diesel fuel rates estimated from state-wide averages and current fuel price trends.
   $4.50
2. Equipment rates from Wagner Equipment rental rates posted on-line.

PRODUCTION DETAIL

Activity Description
Haul 10,830 cy of cover/topsoil material to NESA 1, NESA 2, and vents and shafts

Equipment
966G Loader
D25D Truck

Struck capacity (cy)	13
Heaped capacity (cy)	18

Materials description (Volume)
4,200 cy material will be spread over Non-economic Storage Area 1
6,600 cy material will be spread over Non-economic Storage Area 2
10 cy material will be spread over vents and the single shaft with 5-foot diameter
20 cy material will be spread over the single shaft with 12-foot diameter

Assumptions
1. Volumes based on 3-foot covers.
2. Efficiency factor of 0.83 for average conditions
3. Dump maneuver time = unload time
4. The empty effective grade is equal to the rolling resistance
5. Decent road conditions
6. Truck and loader will not be able to carry full load of material, so multiplying Struck Capacity and loader capacity by 0.8
7. Doubled travel time listed in CAT handbook, and doubled estimates of loading and unloading times

Route description borrow source to NESA 1

Travel Distance (feet)	Loaded grade (%)	Rolling	Loaded effective grade (%)	Empty effective
1000	3	3	6	3

Route description #2-borrow source to NESA 2

Travel Distance (feet)	Loaded grade (%)	Rolling	Loaded effective	Empty effective
1800	2	3	5	3

Route description #3 -borrow source to Vent 1

Travel Distance (feet)	Loaded grade (%)	Rolling	Loaded effective	Empty effective
680	2	3	5	3

Route description #4-borrow source to Vent 2

Travel Distance (feet)	Loaded grade (%)	Rolling	Loaded effective	Empty effective
2000	0	3	3	3

Route description #5-borrow source to Vent 3

Travel Distance (feet)	Loaded grade (%)	Rolling	Loaded effective	Empty effective
3200	0	3	3	3

Route description #6-borrow source to Shaft 1

Travel Distance (feet)	Loaded grade (%)	Rolling	Loaded effective	Empty effective
1400	1	3	4	3

Route description #7-borrow source to Shaft 2

Travel Distance (feet)	Loaded grade (%)	Rolling	Loaded effective	Empty effective
3300	1	3	4	3

13,380

Hourly estimate for hauling 4089 cy of material to Non-economic Storage Area 1

No. Loader Passes/Truck	=	10.4 Struck truck capacity x 0.8 (LCY)	/	3.2 Loader bucket capacity x 0.8 (LCY)	=	3.3	passes					
		Loader bucket capacity (LCY)		no. loader passes/truck								
Loading time/Truck	=	2 loader cycle time	x	3.3 no. loader	=	7	min					
Truck cycle time	=	2 Load time (min)	+	4 Loaded travel time (min)	+	2 Unload/maneuver time (min)	+	2.1 Empty travel time	=	10.1		min
No. trucks required	=	10.1 truck cycle time (min)	/	6.5 total loading time (min)	=	1.6	Trucks	(use 2)				
Production rate	=	10.4 net truck capacity (LCY)	x	2 no. trucks	/	10.1 truck cycle time (min)	=	2.1	LCY/min			
Hourly production	=	2.1 production rate	x	60 60min/hr	x	0.83 efficiency factor	=	102.6	LCY/hr			
Hours required	=	4200 volume to be moved (LCY)	/	102.6 hourly production	=	**41.0**	**hr**					

Hourly estimate for hauling 6963 cy of material to Non-economic Storage Area 2

No. Loader Passes/Truck	=	10.4 Struck truck capacity x 0.8 (LCY)	/	3.2 Loader bucket capacity x 0.8 (LCY)	=	3.3	passes					
Net Truck Capacity	=	3.2 Loader bucket	x	3.3 no. loader	=	10.4	LCY					
Loading time/Truck	=	2 loader cycle time (min)	x	3.3 no. loader passes/truck	=	7	min					
Truck cycle time	=	2 Load time (min)	+	5.6 Loaded travel time (min)	+	2 Unload/maneuver time (min)	+	3.4 Empty travel time	=	13	min	
No. trucks required	=	13 truck cycle time (min)	/	6.5 total loading time (min)	=	2.0	Trucks	(use 2)				
Production rate	=	10.4 net truck capacity (LCY)	x	2 no. trucks	/	13 truck cycle time (min)	=	1.6	LCY/min			
Hourly production	=	1.6 production rate (LCY/min)	x	60 60min/hr	x	0.83 efficiency factor	=	79.7	LCY/hr			
Hours required	=	6600 volume to be moved (LCY)	/	79.7 hourly production	=	**82.8**	**hr**					

Hourly estimate for hauling 8.4cy of material to Vent 1

No. Loader Passes/Truck	=	10.4 Struck truck capacity x 0.8 (LCY)	/	3.2 Loader bucket capacity x 0.8 (LCY)	=	3.3	passes					
Net Truck Capacity	=	3.2 Loader bucket capacity (LCY)	x	3.3 no. loader passes/truck	=	10.4	LCY					
Loading time/Truck	=	2 loader cycle time (min)	x	3.3 no. loader passes/truck	=	7	min					
Truck cycle time	=	2 Load time (min)	+	2.2 Loaded travel time (min)	+	2 Unload/maneuver time (min)	+	1.2 Empty travel time	=	7.4	min	
No. trucks required	=	7.4 truck cycle time (min)	/	6.5 total loading time (min)	=	1.1	Trucks	(use 2)				
Production rate	=	10.4 net truck capacity (LCY)	x	2 no. trucks	/	7.4 truck cycle time (min)	=	2.8	LCY/min			
Hourly production	=	2.8 production rate (LCY/min)	x	60 60min/hr	x	0.83 efficiency factor	=	140.0	LCY/hr			
Hours required	=	10 volume to be moved (LCY)	/	140.0 hourly production (LCY/hr)	=	**0.1**	**hr**					

Hourly estimate for hauling 8.4cy of material to Vent 2

No. Loader Passes/Truck	=	10.4 Struck truck capacity x 0.8 (LCY)	/	3.2 Loader bucket capacity x 0.8 (LCY)	=	3.3	passes					
Net Truck Capacity	=	3.2 Loader bucket capacity (LCY)	x	3.3 no. loader passes/truck	=	10.4	LCY					
Loading time/Truck	=	2 loader cycle time (min)	x	3.3 no. loader passes/truck	=	7	min					
Truck cycle time	=	2 Load time (min)	+	4.2 Loaded travel time (min)	+	2 Unload/maneuver time (min)	+	3.6 Empty travel time (min)	=	11.8	min	
No. trucks required	=	11.8 truck cycle time (min)	/	6.5 total loading time (min)	=	1.8	Trucks	(use 2)				
Production rate	=	10.4 net truck capacity (LCY)	x	2 no. trucks	/	11.8 truck cycle time (min)	=	1.8	LCY/min			
Hourly production	=	1.8 production rate (LCY/min)	x	60 60min/hr	x	0.83 efficiency factor	=	87.8	LCY/hr			
Hours required	=	10 volume to be moved (LCY)	/	87.8 hourly production (LCY/hr)	=	**0.1**	**hr**					

Hourly estimate for hauling 8.4cy of material to Vent 3

No. Loader Passes/Truck	=	10.4 Struck truck capacity x 0.8 (LCY)	/	3.2 Loader bucket capacity x 0.8 (LCY)	=	3.3	passes					
Net Truck Capacity	=	3.2 Loader bucket capacity (LCY)	x	3.3 no. loader passes/truck	=	10.4	LCY					
Loading time/Truck	=	2 loader cycle time (min)	x	3.3 no. loader passes/truck	=	7	min					
Truck cycle time	=	2 Load time (min)	+	6.4 Loaded travel time (min)	+	2 Unload/maneuver time (min)	+	6.1 Empty travel time (min)	=	16.5	min	
No. trucks required	=	16.5 truck cycle time (min)	/	6.5 total loading time (min)	=	2.5	Trucks	(use 2)				
Production rate	=	10.4 net truck capacity (LCY)	x	2 no. trucks	/	16.5 truck cycle time (min)	=	1.3	LCY/min			
Hourly production	=	1.3 production rate (LCY/min)	x	60 60min/hr	x	0.83 efficiency factor	=	62.8	LCY/hr			
Hours required	=	10 volume to be moved (LCY)	/	62.8 hourly production (LCY/hr)	=	**0.2**	**hr**					

Hourly estimate for hauling 8.4cy of material to Shaft 1

No. Loader Passes/Truck	=	10.4 Struck truck capacity x 0.8 (LCY)	/	3.2 Loader bucket capacity x 0.8 (LCY)	=	3.3	passes					
Net Truck Capacity	=	3.2 Loader bucket capacity (LCY)	x	3.3 no. loader passes/truck	=	10.4	LCY					
Loading time/Truck	=	2 loader cycle time (min)	x	3.3 no. loader passes/truck	=	7	min					
Truck cycle time	=	2 Load time (min)	+	3.4 Loaded travel time (min)	+	2 Unload/maneuver time (min)	+	2.5 Empty travel time (min)	=	9.9	min	
No. trucks required	=	9.9 truck cycle time (min)	/	6.5 total loading time (min)	=	1.5	Trucks	(use 2)				
Production rate	=	10.4 net truck capacity (LCY)	x	2 no. trucks	/	9.9 truck cycle time (min)	=	2.1	LCY/min			
Hourly production	=	2.1 production rate (LCY/min)	x	60 60min/hr	x	0.83 efficiency factor	=	104.6	LCY/hr			
Hours required	=	10 volume to be moved (LCY)	/	104.6 hourly production (LCY/hr)	=	**0.1**	**hr**					

Hourly estimate for hauling 20 cy of material to Shaft 2

No. Loader Passes/Truck	=	10.4 Struck truck capacity x 0.8 (LCY)	/	3.2 Loader bucket capacity x 0.8 (LCY)	=	3.3	passes					
Net Truck Capacity	=	3.2 Loader bucket capacity (LCY)	x	3.3 no. loader passes/truck	=	10.4	LCY					
Loading time/Truck	=	2 loader cycle time (min)	x	3.3 no. loader passes/truck	=	7	min					
Truck cycle time	=	2 Load time (min)	+	8.4 Loaded travel time (min)	+	2 Unload/maneuver time (min)	+	6.2 Empty travel time (min)	=	18.6	min	
No. trucks required	=	18.6 truck cycle time (min)	/	6.5 total loading time (min)	=	2.9	Trucks	(use 2)				
Production rate	=	10.4 net truck capacity (LCY)	x	2 no. trucks	/	18.6 truck cycle time (min)	=	1.1	LCY/min			
Hourly production	=	1.1 production rate (LCY/min)	x	60 60min/hr	x	0.83 efficiency factor	=	55.7	LCY/hr			
Hours required	=	20 volume to be moved (LCY)	/	55.7 hourly production (LCY/hr)	=	**0.4**	**hr**					

COST DETAIL

Quantity		**11,052 cy**
Unit Price	**$**	**4.20 per cy**

Equipment Fleet

Item	Description	Commitment	Quantity	Rate[1]	Hours	Cost
1	966G Loader	100%	1	$ 148.84	125	$ 18,542.93
2	D25D Truck	100%	1	$ 178.44	125	$ 22,230.58
3	140H Grader	50%	1	$ 124.97	0	$ -
4	GMC Water truck 4000 gallon	50%	1	$ 90.84	125	$ 5,658.56
5	D8R Dozer	25%	1	$ 216.97	0	$ -
	Select Equipment			$ -	0	$ -
	Total Item Cost					**$ 46,432.06**

Labor

Item	Description	Commitment	Quantity	Rate	Hours	Cost
				$ -		$ -
				$ -		$ -
				$ -		$ -
				$ -		$ -
				$ -		$ -
	Total Item Cost					**$ -**

Materials and Subcontractors

Item	Description	Units	Quantity	Rate	Remarks	Cost
				$ -		$ -
				$ -		$ -
				$ -		$ -
				$ -		$ -
				$ -		$ -
	Total Item Cost					**$ -**

Notes:
1. See WS 13 Equipment Cost for breakdown of Equipment cost
2. Dozer for pile knockdown
3. Unit price based on bank volume

PRODUCTION DETAIL

Activity Description

Install silt fence and straw bales

Set up water station

Equipment

Grader for silt fence

Labor

2 labors for silt fence and straw bale installation

Estimating Assumptions

Silt fence East Area	1750	ft
Silt fence West Area	1150	ft
Total	2900	ft
Straw bales	250	bales

Productivity calculations

Assume 2 days to install silt fence straw bales

COST DETAIL

Quantity		**1**
Unit Price	**$**	**6,337** **ls**

Equipment						
Item	Description	Commitment	Quantity	Rate[1]	Hours	Cost
1	140H Grader	100%	1	$ 126.03	10	$ 1,260.30
2	GMC Water truck 4000 gallon	100%	1	$ 91.53	10	$ 915.30
	Select Equipment			$ -		$ -
	Select Equipment			$ -		$ -
	Select Equipment			$ -		$ -
	Select Equipment			$ -		$ -
	Total Item Cost					**$ 2,175.60**

Labor						
Item	Description	Commitment	Quantity	Rate	Hours	Cost
1	Silt fence Labor [2]	100%	2	$ 24.95	20	$ 998.00
				$ -		$ -
				$ -		$ -
				$ -		$ -
				$ -		$ -
				$ -		$ -
	Total Item Cost					**$ 998.00**

Materials and Subcontractors						
Item	Description	Units	Quantity	Rate	Remarks	Cost
1	Purchase Silt fence	ft	2900	$ 0.35		$ 1,015.00
2	Purchase Straw bales	ea	250	$ 7.50		$ 1,875.00
3	Water	hr	4	$ 68.28		$ 273.12
				$ -		$ -
				$ -		$ -
				$ -		$ -
	Total Item Cost					**$ 3,163.12**

Notes:

1. See WS 23 Equipment Cost for breakdown of Equipment cost
2. Davis Bacon wage for Group III labor classification plus fringe.

PRODUCTION DETAIL

Activity Description

Excavate & Haul 14230 cy soil from east portion of site to consolidation area

Place excavated materials in consolidation area with compaction by equipment traffic

Equipment

CAT 725 Articulated Truck

Struck capacity (cy)	14
Heaped capacity (cy)	18

Materials description (Volume)

Shallow excavation of silty sand to sandy silt soils. No rock excavation.

Route description

Travel Distance (feet)	Loaded grade (%)	Rolling resistance (%)	Loaded effective grade (%)	Empty effective grade (%)
1700	3	3	6	3

Assumptions

1. Efficiency factor of 0.5 for precision excavation
2. Dump maneuver time = unload time
3. The empty effective grade is equal to the rolling resistance
4. Decent road conditions
5. Capacity of excavator and trucks multiplied by 0.6 to account for material swell capacity reduction to minimize spillage
6. Doubled travel time listed in CAT handbook, and doubled estimates of loading and unloading times

Hourly estimate for excavation and haul of soils from East Area

No. Loader	=	8.4 Struck truck capacity x 0.6 (LCY)	/	0.9 Excavator bucket capacity x 0.6 (LCY)	=	9.3	passes				
Net Truck Capacity	=	0.9 Excavator bucket capacity x 0.6 (LCY)	x	9.0 no. excavator passes/truck	=	8.1	LCY				
Loading time/Truck	=	0.3 excavator cycle time (min)	x	9.0 no. loader passes/truck	=	3	min				
Truck cycle time	=	3 Load time (min)	+	3.4 Loaded travel time (min)	+	2 Unload/maneuve	+	1 Empty travel time (min)	=	9	min
No. trucks required	=	9.4 truck cycle time (min)	/	3.0 total loading time	=	3.1	Trucks	(use 3)			
Production rate	=	8.1 net truck capacity	x	3 no. trucks	/	9.4 truck cycle time	=	2.6	LCY/min		
Hourly production	=	2.6 production rate (LCY/min)	x	60 60min/hr	x	0.5 efficiency factor	=	77.6	LCY/hr		
Hours required	=	14,230 volume to be moved (LCY)	/	77.6 hourly production (LCY/hr)	=	**183**	**hr**				

COST DETAIL

Quantity **14,230 cy**
Unit Price **$ 7.98 per cy**

Equipment Fleet						
Item	Description	Commitment	Quantity	Rate[1]	Hours	Cost
1	CAT 324 Excavator	100%	1	$ 130.03	183	$ 23,795.49
2	CAT 725 Truck	100%	1	$ 152.38	183	$ 27,885.54
3	GMC Water truck 4000 gallon	100%	1	$ 91.53	183	$ 16,749.99
4	D8R Dozer	100%	1	$ 219.28	183	$ 40,128.24
	Select Equipment			$ -		$ -
	Select Equipment			$ -		$ -
	Total Item Cost					**$ 108,559.26**

Labor						
Item	Description	Commitment	Quantity	Rate	Hours	Cost
				$ -		$ -
				$ -		$ -
				$ -		$ -
				$ -		$ -
				$ -		$ -
	Total Item Cost					**$ -**

Materials and Subcontractors						
Item	Description	Units	Quantity	Rate	Remarks	Cost
1	Water	hr	73	$ 68.28		$ 4,998.10
				$ -		$ -
				$ -		$ -
				$ -		$ -
				$ -		$ -
	Total Item Cost					**$ 4,998.10**

Notes:
1. See WS 23 Equipment Cost for breakdown of Equipment cost
2. Dozer for pile knockdown
3. Unit price based on bank volume

PRODUCTION DETAIL

Activity Description

Excavate & Haul 4070 cy soil from west portion of site to consolidation area

Place excavated materials in consolidation area with compaction by equipment traffic

Equipment

CAT 725 Articulated Truck

Struck capacity (cy)	14
Heaped capacity (cy)	18

Materials description (Volume)

Shallow excavation of silty sand to sandy silt soils. No rock excavation.

Route description

Travel Distance (feet)	Loaded grade (%)	Rolling resistance (%)	Loaded effective grade (%)	Empty effective grade (%)
500	2	3	5	3

Assumptions

1. Efficiency factor of 0.5 for precision excavation
2. Dump maneuver time = unload time
3. The empty effective grade is equal to the rolling resistance
4. Decent road conditions
5. Capacity of excavator and trucks multiplied by 0.6 to account for material swell capacity reduction to minimize spillage
6. Doubled travel time listed in CAT handbook, and doubled estimates of loading and unloading times

Hourly estimate for excavation and haul of soils from West Area

No. Loader	=	8.4 Struck truck capacity x 0.6 (LCY)	/	0.9 Excavator bucket capacity x 0.6 (LCY)	=	9.3	passes				
Net Truck Capacity	=	0.9 Excavator bucket capacity x 0.6 (LCY)	x	9.0 no. excavator passes/truck	=	8.1	LCY				
Loading time/Truck	=	0.3 excavator cycle time (min)	x	9.0 no. loader passes/truck	=	3	min				
Truck cycle time	=	3 Load time (min)	+	1 Loaded travel time (min)	+	2 Unload/maneuve	+	0.5 Empty travel time (min)	=	7	min
No. trucks required	=	6.5 truck cycle time (min)	/	3.0 total loading time	=	2.2	Trucks	(use 2)			
Production rate	=	8.1 net truck capacity	x	2 no. trucks	/	6.5 truck cycle time	=	2.5	LCY/min		
Hourly production	=	2.5 production rate (LCY/min)	x	60 60min/hr	x	0.5 efficiency factor	=	74.8	LCY/hr		
Hours required	=	4,070 volume to be moved (LCY)	/	74.8 hourly production (LCY/hr)	=	**54**	**hr**				

COST DETAIL

Quantity **4,070 cy**
Unit Price **$ 8.23 per cy**

Equipment Fleet						
Item	Description	Commitment	Quantity	Rate[(1)]	Hours	Cost
1	CAT 324 Excavator	100%	1	$ 130.03	54	$ 7,021.62
2	CAT 725 Truck	100%	1	$ 152.38	54	$ 8,228.52
3	GMC Water truck 4000 gallon	100%	1	$ 91.53	54	$ 4,942.62
4	D8R Dozer	100%	1	$ 219.28	54	$ 11,841.12
	Select Equipment			$ -		$ -
	Select Equipment			$ -		$ -
	Total Item Cost					**$ 32,033.88**

Labor						
Item	Description	Commitment	Quantity	Rate	Hours	Cost
				$ -		$ -
				$ -		$ -
				$ -		$ -
				$ -		$ -
				$ -		$ -
	Total Item Cost					**$ -**

Materials and Subcontractors						
Item	Description	Units	Quantity	Rate	Remarks	Cost
1	Water	hr	22	$ 68.28		$ 1,474.85
				$ -		$ -
				$ -		$ -
				$ -		$ -
				$ -		$ -
	Total Item Cost					**$ 1,474.85**

Notes:
1. See WS 23 Equipment Cost for breakdown of Equipment cost
2. Dozer for pile knockdown
3. Unit price based on bank volume

PRODUCTION DETAIL

Activity Description

Construct 750 linear feet of channel between NESA 1 and consolidation area
Excavate and haul 306 cy of soil from channel alignment to consolidation area
Place geotextile and riprap in channel alignment

Equipment

CAT 725 Articulated Truck

Struck capacity (cy)	14
Heaped capacity (cy)	18

Channel Description

Bottom width:	5	ft
Depth	1.5	ft
Riprap thickness	0.5	ft
Side slopes	3	:1

Route description

Travel Distance (feet)	Loaded grade (%)	Rolling resistance (%)	Loaded effective grade (%)	Empty effective grade (%)
750	0	3	3	3

Assumptions

1. Efficiency factor of 0.5 for precision excavation
2. Dump maneuver time = unload time
3. The empty effective grade is equal to the rolling resistance
4. Decent road conditions
5. Doubled travel time listed in CAT handbook, and doubled estimates of loading and unloading times
6. Riprap from quarry in Thoreau, NM
7. Two laborers and 1 excavator for 10 hours to place geotextile
8. 1 excavator for 30 hours to place riprap
9. Geotextile quantity includes 2 ft anchor trench on both sides and 10% excess for overlap and waste

Hourly estimate for soil excavation

No. Loader	=	14 Struck truck capacity (LCY)	/	1.5 Excavator bucket capacity (LCY)	=	9.3	passes					
Net Truck Capacity	=	1.5 Excavator bucket	x	9.0 no. excavator	=	13.5	LCY					
Loading time/Truck	=	0.5 excavator cycle time	x	9.0 no. loader	=	5	min					
Truck cycle time	=	5 Load time (min)	+	1 Loaded travel time (min)	+	2 Unload/maneuve	+	0.5 Empty travel time (min)	=	9	min	
No. trucks required	=	8.5 truck cycle time (min)	/	5.0 total loading time	=	1.7	Trucks	(use 1)				
Production rate	=	13.5 net truck capacity	x	1 no. trucks	/	8.5 truck cycle time	=	1.6	LCY/min			
Hourly production	=	1.6 production rate (LCY/min)	x	60 60min/hr	x	0.5 efficiency factor	=	47.6	LCY/hr			
Hours required	=	306 volume to be moved (LCY)	/	47.6 hourly production (LCY/hr)	=	**6**	**hr**					

COST DETAIL

Quantity **750 lf**
Unit Price **$ 20.00 per lf**

Equipment Fleet						
Item	Description	Commitment	Quantity	Rate[(1)]	Hours	Cost
1	CAT 324 Excavator	100%	1	$ 130.03	46	$ 5,981.38
2	CAT 725 Truck	100%	1	$ 152.38	6	$ 914.28
3	GMC Water truck 4000 gallon	100%	1	$ 91.53	6	$ 549.18
4	D8R Dozer	100%	1	$ 219.28	6	$ 1,315.68
	Select Equipment			$ -		$ -
	Select Equipment			$ -		$ -
	Total Item Cost					**$ 8,760.52**

Labor						
Item	Description	Commitment	Quantity	Rate	Hours	Cost
1	Laborer	100%	2	$ 24.95	20	$ 998
				$ -		$ -
				$ -		$ -
				$ -		$ -
				$ -		$ -
	Total Item Cost					**$ 998.00**

Materials and Subcontractors						
Item	Description	Units	Quantity	Rate	Remarks	Cost
1	Water	hr	2	$ 68.28		$ 163.87
2	Geotextile	sq ft	17,861	$ 0.17		$ 2,977
3	Riprap	cy	42	$ 50.00		$ 2,100
				$ -		$ -
				$ -		$ -
	Total Item Cost					**$ 5,240.66**

Notes:
1. See WS 23 Equipment Cost for breakdown of Equipment cost

PRODUCTION DETAIL

Activity Description
Reclaim roads and disturbed areas
Reclaim all other roads and disturbed areas by ripping and regrading the surface to provide positive drainage

Equipment
Motor grader
Water truck

Materials description (Volume)

Length of roads and disturbed areas for reclamation =	5000	ft of roads	x 20 ft wide =	2.3	ac
	0.5	ac of other areas		0.5	ac
Total disturbed area to reclaim =				2.8	ac

Productivity calculations

Rip roads to be closed	5000 ft x	1 mph =	1	hr per pass
		x	5	passes
		=	5	hrs
Rip other disturbed area			1	hrs
		total ripping	6	hrs
Regrade roads and disturbed area-----> assume 5 passes =			6	hrs
Total Production time			**12**	**hrs**

Assumptions
1. Reveg included in revegetation item

COST DETAIL

Quantity		**5,000 ft**
Unit Price	**$**	**0.48 per ft**

Equipment Fleet						
Item	Description	Commitment	Quantity	Rate[1]	Hours	Cost
1	140H Grader	100%	1	$ 126.03	12	$ 1,512.36
2	GMC Water truck 4000 gallon	50%	1	$ 91.53	12	$ 549.18
	Select Equipment			$ -		$ -
	Select Equipment			$ -		$ -
	Select Equipment			$ -		$ -
	Select Equipment			$ -		$ -
	Total Item Cost					**$ 2,061.54**

Labor						
Item	Description	Commitment	Quantity	Rate	Hours	Cost
				$ -		$ -
				$ -		$ -
				$ -		$ -
				$ -		$ -
				$ -		$ -
				$ -		$ -
	Total Item Cost					**$ -**

Material						
Item	Description	Units	Quantity	Rate	Remarks	Cost
1	Water	hr	5	$ 68.28		$ 327.74
				$ -		$ -
				$ -		$ -
				$ -		$ -
				$ -		$ -
				$ -		$ -
	Total Item Cost					**$ 327.74**

Notes:

1. See WS 23 Equipment Cost for breakdown of equipment costs.

PRODUCTION DETAIL

Activity Description

Excavate and haul cover material from existing borrow southwest of Vent Hole 1 to consolidation area
Perform finish grading of borrow area and consolidation area

Equipment

CAT 725 Articulated haul truck

Struck capacity (cy)	14
Heaped capacity (cy)	18

Materials description (Volume)

Cover Material Volume (cy)	13,290	(x 20% swell)	15,948

For production purposes assume the following

Assume 4 hours to finish grade borrow source
Assume 4 hours to finish grade consolidation area

Route description

Travel Distance (feet)	Loaded grade (%)	Rolling resistance (%)	Loaded effective grade (%)	Empty effective grade (%)
1350	2	3	5	3

Assumptions

1. Efficiency factor of 0.83 for average conditions
2. Dump maneuver time = unload time
3. The empty effective grade is equal to the rolling resistance
4. Decent road conditions
5. Capacity of excavator and trucks multiplied by 0.8 to account for material swell
6. Doubled travel time listed in CAT handbook, and doubled estimates of loading and unloading times

Productivity Calculations

No. Loader Passes/Truck	=	14 Struck truck capacity (LCY)	/	1.5 Excavator bucket capacity (LCY)	=	9.3	passes				
Net Truck Capacity	=	1.5 Excavator bucket capacity (LCY)	x	9.0 no. excavator passes/truck	=	13.5	LCY				
Loading time/Truck	=	0.3 excavator cycle time (min)	x	9.0 no. loader passes/truck	=	3	min				
Truck cycle time	=	3 Load time (min)	+	2.2 Loaded travel time (min)	+	2 Unload/maneuver time (min)	+	1 Empty travel time (min)	=	8	min
No. trucks required	=	8.2 truck cycle time (min)	/	3.0 total loading time (min)	=	2.7	Trucks	(use 3)			
Production rate	=	13.5 net truck capacity (LCY)	x	3 no. trucks	/	8.2 truck cycle time (min)	=	4.9	LCY/min		
Hourly production	=	4.9 production rate (LCY/min)	x	60 min/hr	x	0.83 efficiency factor	=	246.0	LCY/hr		
Hours required	=	15,948 volume to be moved (LCY)	/	246.0 hourly production (LCY/hr)	=	**65**	**hr**				

COST DETAIL

Quantity **13,290 cy**
Unit Price **$ 4.40 per cy**

Equipment Fleet						
Item	Description	Commitment	Quantity	Rate[1]	Hours	Cost
1	CAT 324 Excavator	100%	1	$ 130.03	65	$ 8,452
2	CAT 725 Truck	100%	2	$ 152.38	65	$ 19,809
3	140H Grader	100%	1	$ 126.03	65	$ 8,192
4	GMC Water truck 4000 gallon	100%	1	$ 91.53	65	$ 5,949
5	D8R Dozer	100%	1	$ 219.28	65	$ 14,253
	Select Equipment			$ -		$ -
	Total Item Cost					**$ 56,656**

Labor						
Item	Description	Commitment	Quantity	Rate	Hours	Cost
				$ -		$ -
				$ -		$ -
				$ -		$ -
				$ -		$ -
				$ -		$ -
				$ -		$ -
	Total Item Cost					**$ -**

Material and Subcontractors						
Item	Description	Units	Quantity	Rate	Remarks	Cost
1	Water	hr	26	$ 68.28		$ 1,775
				$ -		$ -
				$ -		$ -
				$ -		$ -
				$ -		$ -
				$ -		$ -
	Total Item Cost					**$ 1,775**

Notes:
1. See WS 13 Equipment Cost for breakdown of equipment costs
2. Trucks can drive down slopes to spread topsoil.
3. Unit price includes swell

PRODUCTION DETAIL

Activity Description
Seed and fertilize topsoil

Equipment
Scarification
Discing
Drill seed
Mulching and crimping

Seeding Areas

East Area	13.5
West Area	1.3
Consolidation Area	3.8
Borrow	1.6
Roads	2.8
Total	**23**

Estimating Assumptions
1 Assume 60% revegetation failure rate
2. 12 year monitoring and evaluation period

Productivity calculations
N/A

COST DETAIL

Quantity		**23.00**	**acre**
Unit Price	**$**	**3,200.00**	**per acre**

Revegetation						
Item	Description	Unit	Quantity	Rate	Remarks	Cost
1	Initial revegetation	ac	23.00	$ 2,000.00		$ 46,000.00
2	Follow-up revegetation	ac	13.80	$ 2,000.00		$ 27,600.00
				$ -		$ -
				$ -		$ -
				$ -		$ -
				$ -		$ -
	Total Item Cost					**$ 73,600.00**

Notes

1. Cost based on the vegetation study by Cedar Creek (May, 2006) and experience at similar projects.

PRODUCTION DETAIL

Activity Description
Install fencing around perimeter of site

Equipment
Included in unit price

Materials description (Volume)

1500	ft per side	=	6000	lf

Fencing
- # wires: 4
- Max ht.: 40"
- Wire spacing: 16, 6, 6 & 12 inches
- Wire: top smooth, others barbed
- Post spacing: 16.5 to 30 ft
- # of stays between line posts: 1-4

Productivity calculations
N/A

Assumptions
None.

COST DETAIL

Quantity		**2250**	linear ft
Unit Price	**$**	**2.68**	per linear ft

Material							
Item	Description	Unit	Quantity	Rate	Remarks	Cost	
1	Purchase and install fence [(1)]	ft	2250	$ 2.68		$	6,030.00
				$ -		$	-
				$ -		$	-
				$ -		$	-
				$ -		$	-
				$ -		$	-
	Total Item Cost					**$**	**6,030.00**

Notes:

1. Fencing specifications based on the multiple use standard for “cattle and sheep (requires extreme restriction of livestock movements)” with deer being the predominant game species, as per the BLM Fence Standard for Livestock and Wildlife (H-1741-1, BLM, 1986).
2. Rate based on actual cost of construction in 2010

WS 23 Equipment Fleet Cost

EQUIPMENT COSTS

Item	Equipment[2]	Weekly Rate	Hourly Rate	Burden Hourly Labor	Fuel Consuption gal/hr	Hourly Fuel	Hourly Maintenance	Total Hourly Rate
1	D8R Dozer	$ 5,570	$ 139.25	$ 31.53	9	$ 40.50	$ 8.00	$ 219.28
2	GMC Water truck 4000 gallon	$ 1,910	$ 47.75	$ 31.53	2.5	$ 11.25	$ 1.00	$ 91.53
3	CAT 324 Excavator	$ 2,640	$ 66.00	$ 31.53	5	$ 22.50	$ 10.00	$ 130.03
4	CAT 725 Truck	$ 3,710	$ 92.75	$ 31.53	5.8	$ 26.10	$ 2.00	$ 152.38
5	140H Grader	$ 2,680	$ 67.00	$ 31.53	5	$ 22.50	$ 5.00	$ 126.03
6	60 KW Diesel 3 Phase	$ 490	$ 12.25	$ 31.53	5	$ 22.50	$ 2.00	$ 68.28

Total Hours Used

Item	Equipment[2]	WS 15	WS 16	WS 17	WS 18	WS 19	WS 20	WS 21	WS 22	Total Hours
1	D8R Dozer	0	183	54	6	0	65	0	0	308
2	GMC Water truck 4000 gallon	10	183	54	6	12	65	0	0	330
3	CAT 324 Excavator	0	183	54	46	0	65	0	0	348
4	CAT 725 Truck	0	183	54	6	0	65	0	0	308
5	140H Grader	10	0	0	0	12	65	0	0	87

Notes:

1. Diesel fuel rates estimated from state-wide averages and current fuel price trends.
   $4.50
2. Equipment rates from Wagner Equipment rental rates posted on-line.