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April 26, 2010

Document Control
U.S. Nuclear Regulatory Commission
11555 Rockville Pike
Rockville, MD 20852-2738

Re: **License SUA-1473, Docket No. 40-8905**
Alternate Disposal Cell License Condition 32

Dear Mr. McLaughlin,

On October 15, 2009 Rio submitted a modification request to license condition 32. This modification requested relocation of disposal cell 1 to an alternate location (see attached Memo Tetra Tech October 6, 2009 attached).

Consequently, we then agreed to remove that request and resubmit the request with an Environmental Evaluation.

Please find enclosed two copies of the Environmental Evaluation and respectfully request you consider a FONSI and modify license condition 32 to allow an alternate location for disposal cell #1.

If you have any questions please contact me at 505 -287-8851 x 11. Additionally, please feel free to contact Tetra Tech, John McBee directly at 505-237-8440.

Regards,

Terry J Fletcher

Terry Fletcher
President

Attachment: (2) As Stated

xc: Document Control
Chuck Wentz
File

NMSS01

TETRA TECH, INC.

6121 Indian School Rd., NE, Suite 200
Albuquerque, NM 87110
(505) 237-8440
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MEMORANDUM

DATE: October 6, 2009

TO: Mr. Terry Fletcher, Rio Algom Mining LLC

FROM: John M. McBee, P.E.

SUBJECT: Rio Algom Ambrosia Lake Facility
License Condition #32
Alternate On-Site Disposal Cell Location

In a letter dated July 20, 1995, Mr. Bill Ferdinand, Quivira Mining Company submitted a request to the Nuclear Regulatory Commission (NRC) to amend license condition #32 (License SUA -1473) for disposal of contaminated byproduct materials on the Ambrosia Lake facility site in two designated disposal areas (see attached Figure 1 showing locations per the July 1995 submittal). Subsequently, in a letter dated November 6, 1995, the NRC agreed to the license condition amendment.

The purpose of this technical memorandum is to describe regulatory compliance and design considerations for an alternate location within the permanent withdrawal area for the disposal of byproduct materials, primarily building demolition debris, mill equipment, etc. in place of one the areas shown in the July 1995 submittal (Disposal Area #1). As you are aware, the area designated as Disposal Area #1, which is in the area of the Diversion and Discharge Channels north of the Pond 1 Disposal cell, has been regraded and covered with erosion protection rock, and will not be used for disposal of byproduct material. Disposal Area #2 (1995 submittal), which is adjacent to the Pond 2

Cell, is being used for disposal of byproduct material per the license amendment and may reach capacity before demolition of the mill buildings, etc. has been completed. An option for disposal of byproduct material still under the existing license amendment, would be the former ore-storage area west of the existing mill office area (Figure 1). This location was used as below-grade transfer of ore from the mine haul trucks, crushing, and feeding of the ore to the processing area of the mill. The area is well suited for long-term stabilization and disposal of byproduct materials.

The following sections provide a description of the area, materials to be disposed, planned closure actions for isolation of the materials, design considerations and mitigation of potential environmental impacts. Areas of discussion for compliance and design will include the following:

- Materials for disposal
- Alternate disposal location
- Proposed Action
- Geologic/Geotechnical stability
- Surface water protection
- Groundwater protection
- Radon emanation
- Minimum maintenance design

Byproduct Materials for Disposal

The materials to be disposed of in the alternate site would be the same as in the existing license Amendment No. 59 under license condition #32. These materials would primarily be building demolition debris, mill equipment, concrete, wood and similar types of materials, as well as byproduct materials as authorized by license conditions 30, 36, and 41. All other requirements as described in license condition #32 would be followed such as the final design of the disposal area and list of materials included in the disposal area, which would be submitted to the NRC for approval prior to placement of the final cover.

Alternate Disposal Description

The proposed alternate location shown on Figure 1 is in the northern portion of the permanent withdrawal area near the original entrance to the mill site and is northwest of the remaining mill buildings and office, which will be demolished and disposed per the site license. It is directly north of the Pond 2 Disposal Cell on a topographic ridge formed by the Tres Hermanos B Sandstone within the Mancos Shale Formation (Alternate Concentration Limit Application for Uppermost Bedrock Units, Ambrosia Lake Facility, February, 2000). This area was excavated into bedrock for the transfer of ore from haul trucks and the start of ore processing. It is approximately 300 by 340 feet wide and 35 feet deep with an access ramp on the south side. Mancos Shale can be seen near the bottom of the existing excavated area. There is no groundwater in the Tres Hermanos B unit in the vicinity of the proposed disposal location since this is in the outcrop area of the unit (Bedrock ACL Application) and there is no water ponding in the bottom of the excavation. The proposed location is on a low topographic ridge that forms a flow divide and as such there is minimal surface water run-on into the excavated area.

Proposed Action for Disposal of Byproduct Material

Prior to placement of byproduct materials, the sides of the existing excavation would be inspected and any loose rocks would be removed and the ramp to the bottom of the excavation would be improved for equipment access. Materials in the existing bottom of the excavation would be proof-rolled and compacted prior to the placement of any byproduct material. In accordance with the approved 1995 submittal, all materials will be crushed, dismantled or spread within the disposal area in a tight and compact manner to assure that voids are minimized. To aid in this effort, any large tanks and /or vessels will be cut open to allow the materials to be placed relatively flat within the disposal cell. All pipes or other conduits that exceed 6-inches in diameter, and which cannot be compressed or otherwise crushed, will cut open to minimize voids within the placed materials.

When placed materials generally reach a thickness of approximately two to four feet, clean fill will be brought in, spread over the area and worked into the materials to fill the voids and then spread and compacted to form a layer 6-inches to 12-inches thick, prior to the placement of another layer of byproduct materials. This process will continue to be repeated for each layer as the byproduct material is placed in the disposal cell.

The uppermost layer of byproduct materials will have a minimum cover soil thickness of one-foot and be compacted to 90% Standard Proctor density. The cover of the disposal cell will be constructed when placed material are within approximately three (3) feet of the surrounding grade of the excavation. The cover design for this cell will be similar to the cover of the Pond 2 Disposal Cell (*Reclamation Plan for Disposal of Pond Sediments and Ancillary Materials, Tailings Cell 2 Expansion, Revision 1* May, 2007). There will be 1.5 feet of compacted Mancos Shale (CL materials) overlain by 1 foot of frost protection materials and erosion protection rock (see Reclamation Plan Figure 7.7). Rock sizing for erosion protection will be calculated for the design, but based on the limited run-on to the site, will probably be a 3-inch layer of rock with D_{50} of 1-inch. The surface of the disposal area will be graded and "tied" to the existing grade of the surrounding area to prevent ponding or surface water flow concentrations. The rock to be used for erosion protection will be from the same source and meet the same quality control production criteria will used for construction of the Disposal Cell #2 Expansion cover.

Geologic/Geotechnical Stability

The entire disposal cell will be a below-grade structure which has been excavated primarily in the Tres Hermanos B sandstone unit in the Mancos Shale Formation. As such, this will provide for long-term stability. Geomorphic considerations such as erosion and/or head cutting of drainages into the cell will not be a concern. The bedrock ridge into which the ore-storage area was excavated exists because of its resistance to erosion. The proposed alternate location is further removed from potential head cutting of drainages than the original location of the Disposal Area #1 in the 1995 submittal. There are 176 acres in Catchment Area 1 that drain into the interior channel.

The interior channel will be lined with erosion protection rock which will prevent head-cutting that could potentially impact the disposal cell. As previously stated, these flows would primarily go to the east of the proposed disposal cell. In addition, potential surface water flows in the Arroyo del Puerto which could possibly erode into the bedrock outcrops at the Ambrosia Lake Facility have been diverted by construction of the diversion embankment (Site *Erosion Protection Measures from Surface Water Flow in the Arroyo Del Puerto, Revision 1*, January 2008).

The most significant geotechnical issue for long-term stability of the disposal cell would be settlement of the materials that could potentially affect the integrity of the cover. Other geotechnical concerns such as slope stability and liquefaction are not issues because of below-grade disposal, and because of the density, strength, and lack of groundwater in the Tres Hermanos B sandstone. Because of the lack of soft and/or wet loose materials to be placed in the disposal cell, settlement of the cover would most likely be caused by voids incorporated in the byproduct materials during placement. As previously described, materials placement criteria and quality assurance procedures will be in place during construction to minimize this potential.

Surface Water Protection

As discussed previously, the location of the proposed disposal area is advantageous for design for surface water protection. Figure 1 shows its position on the topographic ridge with little surface water run-on to the site. During the detailed design, this impact will be evaluated and a run-on apron will be designed to dissipate and prevent flow concentration of surface water over the cell or undercutting of the cover. Surface water flow from the site would be part of Catchment Area 1 to in the interior drainage channel of the Ambrosia Lake Facility as shown in Sheet 2, Site *Erosion Protection Measures from Surface Water Flow in the Arroyo Del Puerto, Revision 1*, January 2008. The area is on the westernmost portion of the catchment area (where the flow boundary makes a "dog-leg") and as can be seen, surface water flow from the south (Disposal Cell 2 area) follows the topography to the east to drain into the interior channel. The area shown as the pond holding treated water before discharge is currently be drained and the entire

area will be re-graded to drain. Only surface water flow from the immediate area impacts the proposed disposal location and appropriately sized erosion protection rock will be designed and placed.

Groundwater Protection

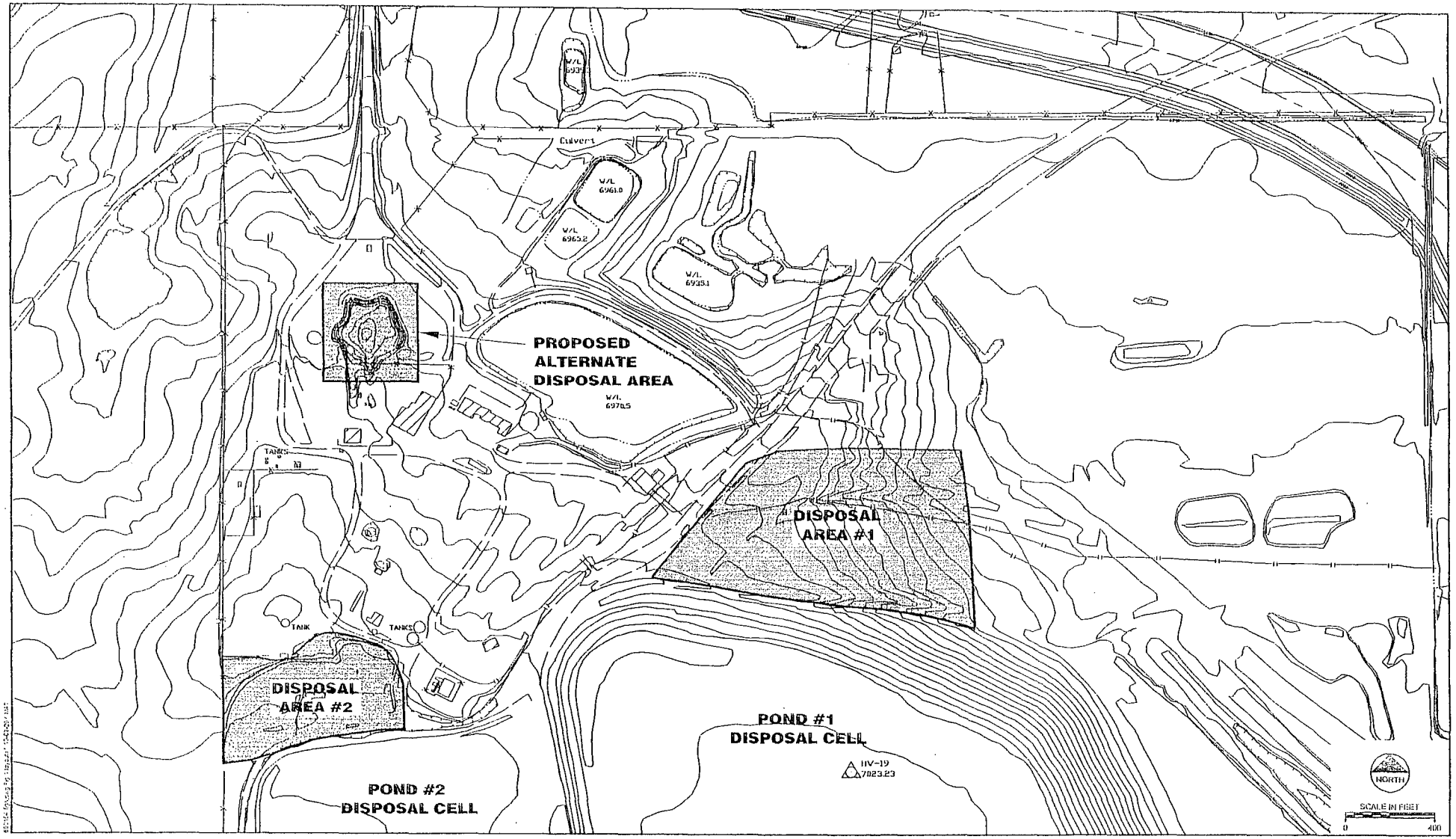
There will be no anticipated impacts to groundwater due to placement of byproduct materials in the proposed alternate disposal location. As stated in the Bedrock ACL Application, 2000, there is no groundwater in the Tres Hermanos B sandstone in the outcrop area. All byproduct materials for disposal, which will primarily be demolition debris, will be placed dry and after placement the radon barrier will be constructed. Besides acting as a radon barrier, the compacted clay soils will form an infiltration barrier into the disposal cell. Previous permeability testing of the compacted materials used for construction of the Disposal Cell 2 Expansion cover (the same source for cover borrow materials will be used) showed in a saturated hydraulic conductivity of approximately 1×10^{-7} centimeters per second. Because of grading of the cover for positive drainage, there will be no ponding at the surface which could potentially lead to an increase in infiltration.

Radon Emanation

The byproduct materials to be placed in the proposed cell per license condition 32 will have low levels of radionuclides. However, as a conservative measure, the cover of the proposed cell to meet radon emanation requirements will be the same as for the Pond 2 Disposal Cell Expansion, even though the materials being placed will not have the same level of Radium-226 or Thorium-230 content as was designed for that disposal cell. The cover will be constructed of 1.5 feet of compacted clay (CL materials derived from Mancos Shale at 95% Standard Proctor dry density) overlain by 1.0 feet of frost protection materials. Materials to build the frost protection layer will be from the same borrow area and be similar materials as the radon barrier. They will be compacted to 90% Standard Proctor dry density at a moisture content required to meet the density. A layer of erosion protection rock will form the surface of the cover.

Minimum Maintenance Design

Per U.S. Nuclear Regulatory Commission design guidance documents, the design and construction specifications will be based on the conceptual design described above and will be finalized to minimize requirements for long-term surveillance and maintenance. And as previously noted, this area is within the existing proposed permanent withdrawal boundary for the Ambrosia Lake Facility.



Project Number: 115-690104

October 2009

Figure 1
DISPOSAL AREA LOCATIONS
Rio Algom Mining - Ambrosia Lake Facility

ENVIRONMENTAL EVALUATION
OF AN
ALTERNATE DISPOSAL SITE

Rio Algom Mining, LLC
AMBROSIA LAKE FACILITY
NEW MEXICO

March 2010

By

Tetra Tech, Inc.

TETRA TECH

for

RIO ALGOM MINING, LLC.

1.0 INTRODUCTION

The Ambrosia Lake Facility is in the Ambrosia Lake Mining District of New Mexico, 25 miles north of Grants, New Mexico (Figure 1). In 1995 Quivira Mining Company (predecessor company to Rio Algom Mining, LLC), submitted a request to the Nuclear Regulatory Commission (NRC) to amend License Condition #32 (License SUA -1473) to allow disposal in two disposal areas adjacent to existing tailings ponds which were in the process of closure at the Ambrosia Lake Facility (Figure 2). This request was agreed to by the NRC and License Condition #32 was amended. The approval letter stated that this license revision was categorically excluded from preparation of an environmental assessment under 10 CFR 51.22(c)(11).

In conjunction with construction of the surface water diversion channels, north of the tailings impoundment Pond 1 cell, one of the proposed disposal areas (Disposal Area #1 in the1995 submittal) was regraded and covered with erosion protection rock, and is not available for disposal of byproduct material. The second proposed disposal area (Disposal Area #2), which is being used for disposal of byproduct material per the license amendment, may reach capacity before demolition of the mill buildings and removal of windblown materials has been completed. In order to assure that there is adequate capacity for disposal of byproduct material at the Facility, Rio Algom Mining is requesting an alternative on-site disposal cell location for disposal of material from decommissioning activities at the Facility in place of the previously approved location.

The proposed option for disposal of byproduct material, consisting primarily of mill building debris and windblown impacted soils, is the former ore-storage area west of the existing mill office area (Figure 2). This environmental report presents the results of an environmental review of the Alternate Disposal Site for use in preparation of an environmental assessment (EA).

1.1 Background Information

The Ambrosia Lake Facility began processing ore in 1958, and processed approximately 33 million tons of ore through 1985. The site continued to be an active uranium production facility through December 2002. Site reclamation activities began in 1989 with work on the top surface of the largest tailings cell (Impoundment Pond #1 Disposal Cell). Subsequent decommissioning and reclamation activities have included consolidation and stabilization of evaporation/disposal ponds, groundwater remediation, construction of channels and diversion berms to control surface water flow, and disposal of contaminated byproduct materials, crushed yellowcake drums and contaminated waste materials from past milling operations in tailings impoundments #1 and 2 (Ponds #1 and #2 Disposal Cells).

1.2 Related Documents

This environmental report was prepared for the proposed action of using an alternate on-site disposal cell site, in place of the approved 1995 Disposal Area #1 location, using much of the data gathered for the EA for Disposal Cell 2 (Tailings Cell 2 Expansion/ NRC, 2007), as well as data from the EA for Alternate Concentration Limits (NRC, 2006a). The Alternate Disposal Site is approximately 1,000 feet north of Disposal Area # 2.

The NRC staff approved License Amendment 58 which finalized the capping of the remaining mill tailing waste in Tailings Cell 2. An Environmental Assessment (EA) was prepared for this licensing action (NRC, 2007). The EA for Groundwater Alternate Concentration Limits [(NRC, 2006a) provided the most up-to-date groundwater data for this environmental report.

2.0 NEED FOR THE PROPOSED ACTION

In the amendment to License Condition #32 (License SUA -1473), Disposal Areas 1 and 2 were approved for disposal of materials from past milling operations (Figure 2). Subsequently, Disposal Area 1 has been regraded and

covered with erosion protection rock, and will not be used for disposal of byproduct material. Disposal Area 2 is being used for disposal but may reach capacity before demolition of the mill buildings, etc. has been completed. In order to ensure that the Reclamation/ Decommissioning Plan, required by 10 CFR Part 40, meets all of the requirements and standards, an alternate disposal location is proposed. The Licensee previously has addressed, and NRC has approved, the other site-wide reclamation plan elements through separate licensing actions, including the original reclamation plan for Tailings Cells 1, 2, and 3 (approved in September 1990), mill demolition, relocation of lined evaporation pond sediments, soil decommissioning plan, groundwater remediation, and the surface water diversion channel.

3.0 THE PROPOSED ACTION

The proposed action is to amend NRC Source Materials License SUA-1473 to approve an Alternate Disposal Site within the permanent withdrawal area for the disposal of byproduct materials, consisting primarily of building demolition debris, mill equipment, impacted windblown soils, etc., in place of Disposal Area #1 shown in the July 1995 submittal.

The proposed option for disposal of byproduct material still under the existing License Amendment is the former ore-storage area west of the existing mill office area (Figure 2). This area was used for below-grade transfer of ore from the mine haul trucks, crushing, blending, and feeding of the ore to the processing area of the mill. The area is approximately 35 feet deep and roughly 300 by 340 feet wide. There is an access ramp on the south side of the excavation. It would be necessary to fill this excavation as part of the overall site reclamation activities even if no byproduct material is placed in it. Based on Technical Criterion 3 in Appendix A to 10 CFR Part 40 (Criteria Relating to the Operation of Uranium Mills and the Disposition of Tailings or Wastes Produced), below-grade disposal of tailings and by-product material is the "prime" option.

The following sections provide a description of the Alternate Disposal Site, materials to be disposed, planned closure actions for isolation of the materials, and design considerations. Other than the proposed location change, all of the geologic conditions, material handling and mitigation of potential environmental impacts are identical to those currently used in Disposal Area #2 and proposed for Disposal Area #1 in the 1995 approved license amendment. Since this is a below-grade cell, design changes have been made, however, all of the cover design requirement specifications remain the same.

3.1 Alternate Disposal Site Description

The proposed Alternate Disposal Site shown on Figure 2 is in the northern portion of the permanent withdrawal area near the original entrance to the mill site. It is northwest of the remaining mill buildings and office, which will be demolished and disposed per the site license. The Alternate Disposal Site is directly north of the Pond 2 Disposal Cell on a topographic ridge formed by the Tres Hermanos C Sandstone within the Mancos Formation (Quivira, 2000). Mancos Shale is exposed in the bottom of the excavation.

This area was excavated into bedrock for the transfer of ore from haul trucks and the start of ore processing. It is approximately 300 by 340 feet wide and 35 feet deep with an access ramp on the south side. For safety reasons, to prevent unauthorized dumping, and to control surface water drainage in the area, this excavation will have to be filled prior to completion of decommissioning activities. Figure 3 shows the location of the proposed Alternate Disposal Site as well as the surface regrading that will be completed to control surface water runoff in the vicinity of the Alternate Disposal Site.

3.2 Byproduct Materials for Disposal

The materials to be disposed of in the Alternate Disposal Site would be the same as in the existing license Amendment No. 59 under license condition #32. These

materials would primarily be building demolition debris, mill equipment, concrete, wood and similar types of materials, as well as byproduct materials as authorized by license conditions 30, 36, and 41. Laboratory analyses performed in December 2009 for soils to be disposed in the cell are summarized in Table 1.

TABLE 1

SUMMARY OF LABORATORY ANALYSES
MATERIAL TO BE RELOCATED TO THE DISPOSAL CELL

Sample ID	Th-230 (pCi/g)	Ra-226 (pCi/g)	U-238 (pCi/g)	Location Description
Scraper Pile #1	41.5	4.93	1.20	From 100-Year Channel, Halos (Ponds 4-6) & Existing Water Course
Scraper Pile #2	512	8.58	5.33	From 100-Year Channel, Halos (Ponds 4-6) & Existing Water Course
Wayne's Stockpile	16.1	4.04	3.02	Excavation for Pond 3 Toe Apron
Mill Pond Area #2	16.0	22.3	10.8	Mill Pond Mixed with Soil
Septic Area #1	323	205	64.6	Area North of Mill Pond - Mine Waste & Ore Pads Inside Restricted Area

Appendix A contains an estimate of the volume of each type of material to be placed at the Alternate Disposal Site and the weighted average of thorium-230 and radium-226 concentrations when initially placed in the disposal cell. It should be noted that Mill Yard material volumes were combined with the Septic Area #1 volumes in Appendix A as no samples were collected from the Mill Yard soils. Preliminary surface gamma surveys have determined that the activity in the Mill Yard material will be less than in the Septic Area #1 materials so the calculations resulting from these data will provide conservatism to the resulting calculations and design.

Using the same methodology followed in Section 9 of the Rio Algom Mining, LLC Tailings Cell 2 Expansion Reclamation Plan, the total projected radium-226

concentrations after 1000 years was calculated as 185.3 pCi/g. This value combines the results from the decay of radium-226 and radium-226 in-growth concentrations from its parent, thorium-230. This value is well below the total projected 1000-year radium-226 concentration of 307.5 pCi/g used in the design of the cover for the Cell 2 expansion. A similar cover design and materials will be used for the Alternate Disposal site.

3.3 Proposed Plan for Disposal of Byproduct Material

As stated previously the proposed Alternate Disposal Site is an existing open pit. Prior to placement of byproduct materials, the sides of the pit would be inspected and any loose rocks would be removed and the ramp to the bottom of the excavation would be improved for equipment access. The bottom of the existing pit would be leveled, loose materials removed or moisture conditioned and compacted to form a competent subgrade. In accordance with the approved 1995 submittal, all materials will be crushed, dismantled or spread within the disposal area in a tight and compact manner to assure that voids are minimized.

When placed construction debris materials reach a thickness of approximately two to four feet, clean fill will be brought in, spread over the area and worked into the materials to fill the voids and then spread and compacted to form a layer 6 inches to 12 inches thick, prior to the placement of another layer of construction debris. Other byproduct materials as listed in Table 1 will be moisture conditioned and compacted to 90% Standard Proctor density. This process will continue to be repeated as the byproduct material is placed in the disposal cell (Figure 4).

The uppermost layer of byproduct materials will have a minimum soil cover thickness of one foot and be compacted to 90% Standard Proctor density. The cover of the disposal cell will be constructed when placed material are within approximately three (3) feet of the surrounding grade of the excavation. The cover design for this cell will be similar to the cover of the Pond 2 Disposal Cell in

the Reclamation Plan for Disposal of Pond Sediments and Ancillary Materials, Tailings Cell 2 Expansion, Revision 1 (Rio Algom, 2007a). There will be 1.5 feet of compacted Mancos Shale (CL materials) overlain by one (1) foot of frost protection materials and erosion protection rock (Figure 4). Rock sizing for erosion protection was calculated based on the Probable Maximum Precipitation event and the same methodology used for the Tailings Cell 2 Expansion Reclamation Plan design. Because of the limited run-on to the site, the topslope cover will be a 3-inch layer of rock with D_{50} of 1 inch. A six-inch-thick rock apron, twenty-feet wide will be constructed around the cell with D_{50} of 3.2-inches that will meet the regraded surface of the mill area (see Appendix A for rock size calculations). The surface of the Disposal Site will be graded and "tied" to the grade of the surrounding area to prevent ponding or surface water flow concentrations (Figure 5). The rock to be used for erosion protection will be from the same source and meet the same quality control production criteria used for construction of the Tailings Disposal Cell #2 cover.

3.4 Timeframe for Alternate Disposal Site Use

Designs for the Alternate Disposal Site to couple with the regrading of the former mill area are currently being prepared so that use of the cell could commence immediately upon approval by NRC. The timeframe for decommissioning activities at the mill facility is for demolition to be complete by August 2010. After that time, it is expected that it will take two months for construction of the cell cover at the Alternate Disposal Site.

4.0 ALTERNATIVES

Three alternatives to the Alternate Disposal Site have been considered: 1) re-locate the power line which is on the north side of the Disposal Area 2 so the capacity of this area could be increased; 2) identify another disposal location at the facility, and 3) no action. Disposal of waste material offsite was considered and rejected in the EA for the Tailings Cell 2 Expansion EA.

A large power line is located along the northern edge of Disposal Area 2. Regulations of the height of the power lines above the ground will limit the capacity of Disposal Area 2. As an alternative to the proposed Alternate Disposal Site, this power line could be relocated and the capacity of the Disposal Area increased. It is estimated that it would cost approximately $500,000 to relocate this power line and that demolition activities would be delayed. The construction activities associated with relocation would result in additional disturbance of the biological environment, temporary increases in traffic and dust emissions, and cause additional workers to be exposed to occupational risks associated with installing a power line. This alternative would have a temporary positive impact on the local economy.

The second alternative is the identification of a more suitable disposal location. Other areas that could be considered are: 1) south of the Pond #2 Disposal Cell Expansion on the footprint of the former Pond #2 that has been covered with a radon protection cover; or 2) north of the Pond #2 Disposal Cell adjacent to the 1995 approved byproduct disposal area. The area south of the relocated Section 4 materials on the Pond #2 footprint is located at a greater distance from the decommissioning activities and would be above-grade disposal. There is an existing electrical substation (Figure 3) in the area north of the Pond #2 Disposal Cell and between the byproduct disposal area and the Pond #1 Disposal Cell, which will remain in place. There is no environmental advantage to any other location over the proposed Alternate Disposal Site and use of other locations may increase haul distances, dust emissions and damage to the flora and fauna.

The third option considered was the no action alternative. If no action is taken, Disposal Area 2 could reach maximum capacity prior to completion of demolition in August 2010, leaving no viable location for safe disposal of the remaining byproduct material. The no action alternative offers no long-term solution for the byproduct material and would result in contamination left in a larger portion of the

site. This alternative would require active maintenance for the life of the waste site. Finally, this alternative would not comply with the reclamation requirements in 10 CFR Part 40, Appendix A, for disposition of byproduct material.

5.0 AFFECTED ENVIRONMENT

5.1 Socioeconomics and Land Use

The site is located in southeastern McKinley County approximately 24 miles north of Grants, New Mexico, in the Ambrosia Lake Valley. McKinley County has a population density of 14 people per square mile. In 2008 the population was estimated at 70,727, down from 74,798 in the 2000 census. The median annual income of a family living in the county is approximately $26,800, with approximately 32% of the families living under the poverty line.

Like much of McKinley County, the Ambrosia Lake Mining District is rural and sparsely populated. The closest populated areas are the small community of San Mateo (100 residents in 2008), approximately 9 miles to the southeast, and Milan (2,484 residents in 2008), located 20 miles to the south. The largest incorporated city in the area is Grants, New Mexico, (population of 8,806) located approximately 25 miles south of the site in Cibola County. The population of Grants in 2008 was 8,871, up slightly from the population of 8,806 in the 2000 census.

Ninety percent of land use in McKinley County and the Ambrosia Lake area is low-density animal grazing averaging between five and six animals per square mile. Approximately sixty percent of McKinley County is under management of the Federal government.

According to the 2005 land use survey, land uses within two miles of the site are grazing, utilities, and mine reclamation activities. Uranium mining started in this area in the mid-1950s; 17 mines are located within approximately 3 miles of the

site. The collapse of the uranium mining industry in the 1980s resulted in a depression in the local economy. Energy resource companies still own viable mining properties and claims. Reclamation activities at the Ambrosia Lake Facility provide employment for residents in the Grants area and income for local businesses.

5.2 Transportation

The Ambrosia Lake Facility is accessed on NM Highway 605, then NM Highway 509 from Interstate 40 at Milan, New Mexico about 20 miles to the south. Due to the location of the facility in a sparsely populated area of New Mexico and the collapse of the mining industry in the 1980s, road traffic levels are generally low. For on-site activities, use of dedicated haul roads and an overpass constructed for relocation of Section 4 pond materials to the Pond 2 Disposal Cell, has minimized the potential for traffic accidents. Reclamation activities are now confined to west of Highway 509, so there should be very limited interaction of construction vehicles with private vehicles.

5.3 Geology and Hydrogeology

The site is located within the Ambrosia Lake Valley north of the Zuni Uplift portion of the San Juan Basin. The structural features affecting the basin formed in the late Cretaceous (approximately 100 million years ago) to early Tertiary (58 million years ago) periods. The basin is characterized by broad areas of relatively flat-lying sedimentary rocks, dipping north 15° east at an angle of about two degrees. Local dip and direction varies somewhat due to faulting and rotational effects.

The Ambrosia Lake Valley lies at more than 7,000 feet above mean sea level. The valley is six to ten miles wide and trends northwest-southeast. In the vicinity of the Ambrosia Lake Facility, the sides are relatively steep with an elevation change of almost 1,000 feet from the valley floor to San Mateo Mesa to the northeast The slope is more gentle to the southwest, rising about 500 feet from the valley floor to the Mesa Montarosa to the southwest. Within the valley, the

low topographic relief is formed by ephemeral stream channels cutting into the alluvium and colluvium.

The bedrock units in the Ambrosia Lake Valley are, in descending order, the sandstones and shales of the Mancos Formation, the Dakota Sandstone, and the Brushy Basin and Westwater Canyon members of the Morrison Formation. The Westwater Canyon member is the uranium ore bearing unit in the Ambrosia Lake area and the primary water bearing unit in the region.

The lower portion of the Mancos Formation contains several sandstone and silty sandstone units, which are referred to as the Tres Hermanos C Sandstone (TRC), the Tres Hermanos B Sandstone (TRB), and the Tres Hermanos A Sandstone (TRA) units in order from the stratigraphically highest to lowest. Thick layers of Mancos shale separate the Tres Hermanos sandstone layers. These sandstones, which are more resistant to erosion than the shales, form ridges on either side of the Ambrosia Lake Valley. Alluvial fill derived from the Mancos Formation is found in the valley bottom.

The surficial geologic units at the Ambrosia Lake Facility are the Mancos Formation and alluvium. The alluvium consists of as much as 100 feet of clay, silt and clayey sand derived from reworked shales of the Mancos Formation. This alluvium did not contain groundwater prior to mining operations, however, discharge from mine dewatering and seepage from tailings impoundments caused saturated conditions in localized areas on site. Filling and stabilization of tailings ponds and construction of interceptor trenches were used to reduce the occurrence of water in the alluvium. Treated mine water discharged to the Arroyo del Puerto has been effective in flushing the alluvium in the vicinity of the former evaporation ponds. This discharge was stopped per approval of the NRC in 2006, resulting in decreasing water levels in the alluvium. The alluvium in the Arroyo del Puerto is monitored as part of the Groundwater Protection Program.

The TRB, TRA, the Dakota sandstone, and the Westwater Canyon member are the principal near-surface bedrock hydrogeologic units beneath the site. Groundwater flow generally follows the regional dip toward the north-northeast, however, a cone of depression has formed within these units beneath the site as a result of mine dewatering shafts and groundwater interceptor trenches. Dewatering has stopped but groundwater recovery will take centuries. (NRC, 2006a).

In order to monitor the hydrogeologic units that could potentially be impacted by the processing of uranium ore and disposal of by-product material at the Facility, the TRA, TRB and the Dakota Sandstone Unit are included, along with the Arroyo del Puerto alluvium, in the Groundwater Protection Program.

Downhole investigations were conducted by Quivira Mining Company in 1983 and 1989 to determine groundwater flow and quality in each of the bedrock units to 30 ventilation holes and mine shafts in the area north and northeast of the Ambrosia Lake Facility. No measurable fluid was observed in the TRC Sandstone in these investigations. Two monitoring wells completed in the TRC Sandstone in Section 36 north of the Facility were also dry. This is probably because of its limited extent and lack of a recharge area at the Ambrosia Lake Facility. If water were in the TRC, a layer of Mancos shale between the TRC and TRB would prevent any downward migration.

The proposed Alternate Disposal Site is located on a topographic ridge formed by a sandy siltstone unit of the TRC. Figure 5 shows the boring log and completion details for monitoring well 31-66 immediately adjacent to the southwest side of the 35-foot-deep excavation proposed as the Alternate Disposal Site. From this log it can be seen that the excavation is into about 30 feet of the TRC sandy siltstone and about five feet of the underlying Mancos shale. Based upon this boring log, There are about 45 feet of Mancos Shale and about 35 feet of TRB Sandstone underlying the existing open pit. The boring was completed a few feet into another layer of Mancos Shale, so the thickness of

this lower layer of shale is unknown. These Mancos shale layers act as aquitards between each of the sandstone units.

Monitoring well 31-66 was completed to monitor the TRB sandstone unit. Data were collected from this well from February 1988 through July 1999. This monitoring well was not included in the groundwater compliance monitoring program defined in License Amendment No. 56, so the well has been abandoned and plugged. During this time period, depth to water was 109 to 111.9 feet. Nickel, Pb-210, Ra-226 and -228, Th-230, U-nat and Gross Alpha were above the groundwater protection standards (GPS) during the time that data were collected from this well; however, they were below the health risk-based concentration levels.

5.4 Water Resources

5.4.1 Surface Water

The Arroyo del Puerto is the largest natural surface drainage feature on the site. The Arroyo connects to San Mateo Creek approximately five miles to the south. Except for intense rainfall or snowmelt events, the Arroyo was historically dry. With the advent of mining activities, the Arroyo served as a discharge for water from dewatering the local mines. Water removed during dewatering operations was treated at the Facility and discharged under requirements of National Pollutant Discharge Elimination System (NPDES) permit (Permit No. NM0020532).

A surface water diversion structure was constructed in 2008 to divert potential flood flows around the disposal areas. In response to concerns expressed by the Albuquerque District, Corps of Engineers about the impacts of the diversion structure to direct large surface water flows on the Arroyo del Puerto and San Mateo Creek, an Arroyo cross-section monitoring program was initiated in 2009.

Because of the ephemeral nature of the Arroyo del Puerto, surface water in the vicinity of the site serves only as a water source of native plants and, occasionally, small animals. Because of the high evaporation rate and reclamation activities, the Arroyo does not provide groundwater recharge to the alluvial or bedrock aquifers.

The proposed Alternate Disposal Site is on a low topographic ridge that forms a surface water flow divide and, as such, there is minimal surface water run-on into the existing excavation. This is evidenced by the fact that there is no water ponding in the bottom of the excavation. Surface water flow from this area is into to the interior drainage channel of the Ambrosia Lake Facility being constructed to outfall to the Arroyo del Puerto channel down stream of the Facility.

5.4.2 Groundwater

Uranium mining and milling operations, which began in the Ambrosia Lake area in the mid-1950s, have created significant changes in the groundwater system in the area. Dewatering from several mines and discharge of mine water and disposal of mill tailings and effluents at several facilities in the area have combined to alter the quantity, quality, and pattern of groundwater flow. Although mine dewatering has stopped, it is estimated that it will take several hundred years for the TRB and TRA to re-saturate because they are dewatered and will be the last units to recharge during groundwater recovery (NRC, 2007).

Groundwater in the Ambrosia Lake Valley is used for irrigation and livestock watering. Data from the U.S. Geological Survey shows approximately 65 groundwater wells within a 25-mile radius of the site. The closest groundwater supply well is completed in the Westwater Canyon Sandstone member of the Morrison Formation approximately 1.5 miles west of the site. A large reduction in water use and groundwater withdrawals has occurred in the Ambrosia Lake area over the past 20 years as a result of the decline of the uranium industry. However, the sparse population and current limited groundwater use does not limit future potential uses of the water.

5.5 Climate

The Ambrosia Lake Facility is in an arid to semiarid region with levels of precipitation less than 11 inches per year and an average pan evaporation rate of about 63 inches per year. The average climate data in Table 2 do not reflect the extremes of the temperature and wind speed. Chart 1 shows average maximum and minimum temperatures at the Grants Airport, approximately 20 miles to the south. Summertime temperatures have been known to be as high as 110 degrees Fahrenheit. High winds and dry conditions regularly result in dust storms in disturbed areas. Moisture usually comes in the form of brief, heavy rain showers during summer thunderstorms. These storms result in abundant runoff and very little infiltration.

5.6 Ecology (Flora and Fauna)

In 2004, the NRC received from the U.S. Fish and Wildlife Service (FWS) the Federal list of threatened and endangered species for McKinley County, New Mexico (NRC, 2007). This list included the following threatened and endangered species: bald eagle (*Haliaeetus leucocephalus),* black-footed ferret (*Mustelanigripes),* Mexican spotted owl (*Strix occidentalis lucida)* with critical habitat, southwestern willow flycatcher (*Empidonax traillii extimus),* and the rhizome Zuni fleabane (*Erigeron rhizomatus).* The Ambrosia Lake Facility is in an area classified as Great Basin Grasslands which could provide habitat to these species, however, the land at the mine processing area has been highly disturbed.

On September 2, 2004 a biologist from Marron and Associates, Inc. conducted site investigations for the construction of a haul road located approximately 0.5 mile east of the mine processing area. This survey assessed vegetation, wetlands, noxious weeds, wildlife, and listed species impacts referent to the haul

Table 2

Monthly Climate Data Summary

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Average Max. Temp. (F)	46.5	51.7	58.6	67.5	76.6	86.6	88.6	85.5	79.9	69.6	56.7	47.4	67.9
Average Min. Temp. (F)	14.5	18.7	23.9	30.3	39.1	47.6	55.2	53.2	44.7	32.7	22.1	14.5	33.0
Average Total Precip. (in.)	0.50	0.44	0.54	0.45	0.54	0.58	1.70	2.01	1.30	1.09	0.57	0.66	10.38
Average Total Snowfall (in.)	2.5	2.2	1.6	0.3	0.0	0.0	0.0	0.0	0.0	0.4	1.0	4.3	12.4
Average Snow Depth (in.)	0	0	0	0	0	0	0	0	0	0	0	0	0
Wind Speed (mph)	7.7	9.2	9.8	11	10.3	9.9	8.0	7.3	7.8	8.6	7.7	7.5	
Prevailing Wind Direction	NW	NW	NW	W	W	W	SE	SE	NW	NW	NW	NW	
Pan Evap. (in.)	0	0	0	6.6	9.31	12.12	10.5	8.70	7.95	5.07	2.20	0	

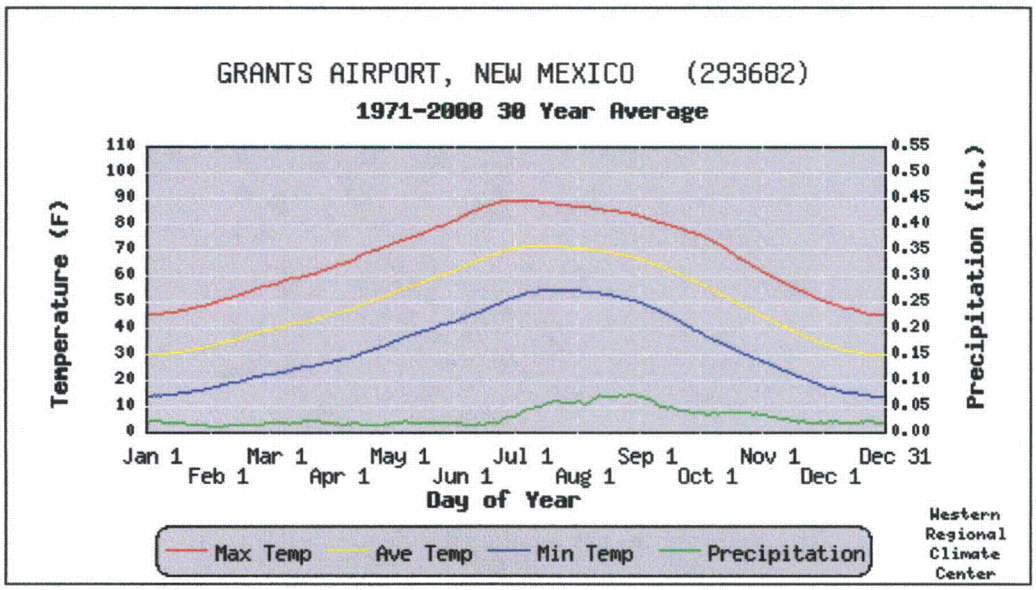
With the exception of the wind and evaporation data, all data are for the period of 5/1/1953 to 8/31/2009 are for the Grants, NM Airport.

Wind and pan evaporation data are for the Gallup Ranger Station.
Western Regional Climate Center, wrcc@dri.edu

Chart 1

Temperature and Precipitation Data
GRANTS AIRPORT, NEW MEXICO

1971 - 2000



Data is smoothed using a 29 day running average.

- Max. Temp. is the average of all daily maximum temperatures recorded for the day of the year between the years 1971 and 2000.
- Ave. Temp. is the average of all daily average temperatures recorded for the day of the year between the years 1971 and 2000.
- Min. Temp. is the average of all daily minimum temperatures recorded for the day of the year between the years 1971 and 2000.
- Precipitation is the average of all daily total precipitation recorded for the day of the year between the years 1971 and 2000.

road overpass. On September 15, 2004, Marron and Associates, Inc. issued a Biological Survey Memorandum that provided an account of the biological resources of the area, including the processing area, and concluded that no Federal or State of New Mexico listed wildlife or plant species occurred in the area. However, this memorandum failed to list or address Costa's Hummingbird (*Calypte costae*) and the Interior Least Tern (*Sterna antillarum athalassos*); Costa's Hummingbird is a State of New Mexico Endangered species and Interior Least Tern holds Federal and State of New Mexico Endangered Status.

On June 30, 2008, Tetra Tech, Inc. issued an Addendum to the Sept 15, 2004 Biological Survey Memorandum to address the least tern and Costa's Hummingbird. This addendum concluded that although it is possible that there may be migratory or vagrant individuals in the area, the highly disturbed and degraded site conditions coupled with the rare, local occurrence frequency make it very unlikely that site reclamation activities will have an adverse affect on Costa's Hummingbird or the Least Tern. The addendum also concluded that tailings runoff control and site reclamation represent a significant habitat improvement for possible future breeding or stop-over populations.

The Rio Algom uranium processing site, including the Alternate Disposal Site and associated haul roads, was highly disturbed during milling and ore processing operations. Significant tailings reclamation and clean-up construction activities have been occurring for over a decade. As a result, the site is currently highly degraded from wildlife and habitat perspective. The degraded site conditions make it very unlikely that listed or local fauna and flora will be negatively impacted by use of the Alternate Disposal Site.

Upon completion of reclamation efforts, Rio Algom Mining, LLC will be reseeding all areas of disturbance with native grasses in order to provide enhanced habitat potential, erosion management, and noxious weed control through direct

resource competition. Associated reclamation and protection of the ephemeral water courses of the area will have clear benefits to the surrounding environment. The combined reclamation activities are expected to enhance the site usefulness as habitat for all flora and fauna.

5.7 Historical and Cultural Resources

Because the Alternate Disposal Site and haul roads required to access the Disposal Site are in a previously disturbed area of the site, there are no historical or cultural resources in the construction area that can be impacted by the action.

6.0 THE ENVIRONMENTAL IMPACTS OF THE PROPOSED ACTION AND MITIGATING MEASURES

The reclamation of the Ambrosia Lake Mill Facility is intended to: 1) control radiological hazards for 1,000 years to the extent reasonably achievable; 2) limit the release of radon-222 from uranium by-product, and radon-220 from thorium by-product materials to the atmosphere, so as not to exceed an average of 20 $pCi/m^2/sec$; 3) reduce direct gamma exposure from the reclaimed tailings cells to background levels; 4) avoid proliferation of small waste disposal sites; and 5) provide a final site that is geotechnically stable and protects water resources for the long term. The following sections discuss these directives as well other impacts to the affected environment.

Disposal of material in the Alternate Disposal Site could result in impacts that include short-term impacts from construction (i.e. socioeconomic, transportation, air quality) and long-term and indirect impacts to the affected environment. The negative direct impacts from construction activities primarily would be dust generation due to excavating material for removal to the new disposal site, noise generated by construction equipment, and surface water runoff.

6.1 Socioeconomic

Approval of the Alternate Disposal Site would have a positive economic impact over the no action alternatives, but would not affect the local economy any differently from other considered alternatives. The positive economic impact would be limited to the duration of filling the disposal cell and construction of the cover and would result in temporary increases to employment and income to local businesses.

6.2 Public and Occupational Health

The proposed Alternate Disposal Site is near Disposal Areas 1 and 2, as well as facilities being decommissioned. Off-site traffic and on-site traffic would not be increased from traffic levels expected in the plans to use Disposal Areas 1 and 2. Reclamation activities are now limited to the west side of NM 509 so the impact to traffic is that of site employees commuting to work. Use of dedicated haul roads has minimized the potential for traffic accidents for on-site activities.

There will be increases in levels of noise and dust during construction activities at the Alternate Disposal Site. The "no action" alternative would not result in increased noise and dust. There would be little difference in noise and dust production from use of the Alternate Disposal Site or the other alternatives considered. Due to the remote location and sparse population, increased noise will have a minimal impact to the general public Rio Algom's Health and Safety Plan requires that noise suppression devices be worn as necessary per the plan.

Fugitive dust from heavy equipment operation would be mitigated through the use of dust suppression methods on haul roads. The NRC license requires the site to maintain comprehensive environmental monitoring programs that encompass air, soil, sediment, surface water, groundwater, vegetation, radon, and direct gamma radiation. Rio Algom's implementation of its National Pollutant Discharge Elimination System (NPDES) permits, its Storm Water Pollution

Prevention Plan for the site, its site Health, Safety, Environment and Community (HSEC) Management System, in addition to its NRC license requirements would provide adequate assurances to detect and avoid potential adverse impacts to the environment.

Ambient air monitoring stations have been installed to collect data from the dust produced during the work activity to demonstrate that control measures have been implemented and are effective. These high volume air sampling stations measure the amount of natural Uranium, Thorium-230, Radium-226, and Lead-210, and the concentrations are compared to the limits described in License Condition No. 10. Dust production is expected to be less than the associated impacts considered during the process of evaluating Disposal Areas 1 and 2 because the Site is closer to the source of disposal material resulting in shorter haul distances, and because it is below grade and somewhat protected from winds.

The proposed Alternate Disposal Site is in a heavily disturbed area of the Ambrosia Lake Facility. The excavation was dug to facilitate ore transfers on the Facility. Filling and covering this excavation will actually improve the aesthetics of the facility and reduce the potential of injury or misuse of the excavation. There will be no new disturbance of land around the open pit.

6.3 Geologic/Geotechnical Stability

The entire Alternate Disposal Site will be a below-grade structure which has been excavated primarily in the Tres Hermanos C sandstone unit and shale in the Mancos Formation. As such, this will provide for long-term stability. Geomorphic considerations such as erosion and/or head cutting of drainages into the cell will not be a concern. The bedrock ridge into which the ore-storage area was excavated exists because of its resistance to erosion.

The most significant geotechnical issue for long-term stability of the disposal cell would be settlement of the materials that could potentially affect the integrity of the cover. Because of the lack of soft and/or wet materials to be placed in the disposal cell, potential settlement of the cover would most likely be caused by voids incorporated in the byproduct materials during placement. As previously described, materials placement criteria (e.g., minimum density for soil materials) and quality assurance procedures for prevention of voids in construction debris will be in place during construction to minimize the potential for settlement.

The NRC-funded a re-evaluation of the seismic aspects of NRC-licensed uranium mill tailings sites in 1997 and concluded that the Ambrosia Lake Tailings Disposal Cell #1 Impoundment could withstand the peak ground acceleration (PGA) for the area, and thus met criterion 4(e) of Appendix A of 10 CFR Part 40, Code of Federal Regulations. Since the Alternate Disposal Site will be below grade it would not have the potential for slope failure that was considered in the analyses of the Tailings Disposal Cell #1. Since it was concluded that the Tailings Disposal Cell #1 Impoundment would be seismically stable, a seismic evaluation of the proposed below-grade cell was not conducted.

Liquefaction is another geotechnical concern that would not be an issue because of the density, strength, and lack of groundwater in the Tres Hermanos C sandstone. Also, the materials will be placed under quality control measures which will limit the addition of moisture to the materials. This will ensure that the materials will be compacted and not be saturated, and therefore will not have a potential for liquefaction.

6.4 Surface Water

As discussed previously, the location of the proposed Alternate Disposal Site is advantageous for design for surface water protection. Figure 3 shows its position on the topographic ridge with little surface water run-on to the site. Only surface

water flow from the immediate area above the proposed Disposal Site (less than 2 acres) will impact the Alternate Disposal Cell. Appropriately sized erosion protection rock will be designed and placed to control erosion. Surface water flow from the south (Disposal Cell 2 area) will not impact the Alternate Disposal Site because it follows the topography to the east of the site to drain into the interior channel (Figure 3). The area shown as the pond holding treated water before discharge is currently being drained and the entire area will be re-graded to drain into the interior channel (Figure 1).

The proposed Alternate Disposal Site is further removed from potential head cutting of drainages than the original location of the Disposal Area #1 in the 1995 submittal. Surface water flow from upland areas will be diverted around the site during regrading of the facility during closure construction. Drainage from less than two acres will directly impact the proposed Alternate Disposal Cell. The interior channel (Figure 1) will be lined with erosion protection rock which will prevent head-cutting that could potentially impact the Disposal Site. As previously stated, these flows would primarily go to the east of the proposed Alternate Disposal Site. In addition, potential surface water flows in the Arroyo del Puerto which could possibly erode into the bedrock outcrops at the Ambrosia Lake Facility have been diverted by construction of the diversion embankment (Rio Algom, 2008).

During the detailed design, the impact of surface water flow will be evaluated and a run-on apron will be designed to dissipate and prevent flow concentration of surface water over the disposal area or undercutting of the cover.

6.5 Groundwater

There will be no anticipated impacts to groundwater due to placement of byproduct materials in the proposed Alternate Disposal Site. As stated in the Uppermost Bedrock ACL Application (Rio Algom, 2000), there is no groundwater

in the Tres Hermanos C Sandstone in the outcrop area, and a 45-foot layer of Mancos shale would prevent any migration of fluids into the underlying Tres Hermanos B Sandstone. All byproduct materials for disposal, which will primarily be demolition debris and windblown soils, will be placed unsaturated, and after placement the radon barrier will be constructed. Besides acting as a radon barrier, the compacted clay soils will form an infiltration barrier into the disposal cell. Previous permeability testing of the compacted materials used for construction of the Disposal Cell 2 Expansion cover (the same source for cover borrow materials will be used) showed in a saturated hydraulic conductivity of approximately 1×10^{-7} centimeters per second. Grading of the cover for positive drainage will prevent ponding at the surface which could potentially lead to increased infiltration.

6.6 Radon Emissions

The byproduct materials to be placed in the proposed cell per license condition 32 will have low levels of radionuclides (see Table 1). Appendix A contains calculations of weighted concentrations of Radium-226 and Thorium-230 at placement based upon estimated quantities for disposal and the concentrations in Table 1. Because the estimated quantities for disposal do not include non-soil materials and because the quantity of Mill Yard material, which was not tested, was included with the quantity from the Septic Area where concentrations are expected to be greater, the concentrations at placement are higher than is actually anticipated.

Following the formulas from Section 9 of the Tailings Cell 2 Expansion Reclamation Plan (Rio Algom, 2007), Radium-226 concentrations after 1,000 years were calculated combining the calculated results from the decay of Radium -226 and the Radium-226 in-growth from the decay of Thorium-230. At placement, it is estimated that the Radium-226 concentration will be 150.1 pCi/gram and that after 1,000 years the concentration is estimated to be 185.3

pCi/gram. The concentration used for design of the Cell 2 Expansion cover was calculated as 307.5 pCi/gram.

As a conservative measure, the cover design of the Alternate Disposal cell for radon emanation requirements will be the same as for the Pond 2 Disposal Cell Expansion, even though the materials being placed will have lower concentrations of Radium-226 or Thorium-230. The cover will be constructed of 1.5 feet of compacted clay (CL materials derived from Mancos Shale at 95% Standard Proctor dry density) overlain by 1.0 feet of frost protection materials. Materials to build the frost protection layer will be from the same borrow area and be similar materials as the radon barrier. They will be compacted to 90% Standard Proctor dry density at a moisture content required to meet the density. A layer of erosion protection rock will form the surface of the cover.

Work at the Alternate Disposal Site will be performed by Rio Algom subcontractors under the Ambrosia Lake license, with Rio Algom overseeing the activities and maintaining primary responsibility. Rio Algom has in place adequate radiation protection procedures and capabilities, and will implement an acceptable program to keep exposure to radioactive materials low. Work activities are not anticipated to result in a dose to workers or the public in excess of the 10 CFR Part 20 limits.

6.7 Minimum Maintenance Design

Per U.S. Nuclear Regulatory Commission design guidance documents, the design and construction specifications will be based on the conceptual design described above and will be finalized to minimize requirements for long-term surveillance and maintenance. And as previously noted, this area is within the existing proposed permanent withdrawal boundary for the Ambrosia Lake Facility.

7.0 CONCLUSION

The potential negative environmental impacts of the proposed action of using an Alternate Disposal Site are limited to the land surface and are temporary during the construction activity. The direct impacts to the surface will be primarily dust generation due to excavation and hauling the material to the disposal area. Fugitive dust from heavy equipment operation will be mitigated through the use of dust suppression methods on haul roads. Impacts at the Alternate Disposal Site itself are minimal, since the area is already disturbed from past milling activities.

Rio Algom's implementation of its site Health, Safety, Environment, and Community (HSEC) Management System, and NRC license requirements provide adequate assurances to control impacts to the environment. Existing ambient air monitoring stations will collect data to demonstrate that control measures are implemented and effective.

The requirements of Tailings Cell 2 Expansion Reclamation Plan will be applied at this Alternate Disposal Site, which meet the Technical Criteria of Appendix A to 10 CFR Part 40. These requirements include consolidating, placing, and compacting materials in a below-grade excavation and covering them with an engineered soil and rock cover to limit radon release, limit water infiltration, and reduce erosion. As stated previously, all soil materials will be compacted and potential voids of building or equipment debris eliminated by cutting or crushing before placement and filling with soil so no loose or soft materials will be present, and construction quality control verification will be performed. Therefore, no settlement monitoring will be necessary prior to placement of the radon barrier and erosion protection cover. These requirements will provide reasonable assurance that its measures will contain the radiological hazards for 1000 years. This plan is one component of the overall site decommissioning plan.

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Rio Algom, 2007; Reclamation Plan for Disposal of Pond Sediments and Ancillary Materials, Tailings Cell 2 Expansion, Revision 1, May 2007; transmitted under cover letter dated May 31, 2007. [ADAMS Accession Nos. ML071790245 and ML071790250]

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U.S. Fish and Wildlife Service, 2004; Letter to J. Caverly dated September 20, 2004. [ADAMS Accession No. ML042780480]

FIGURES

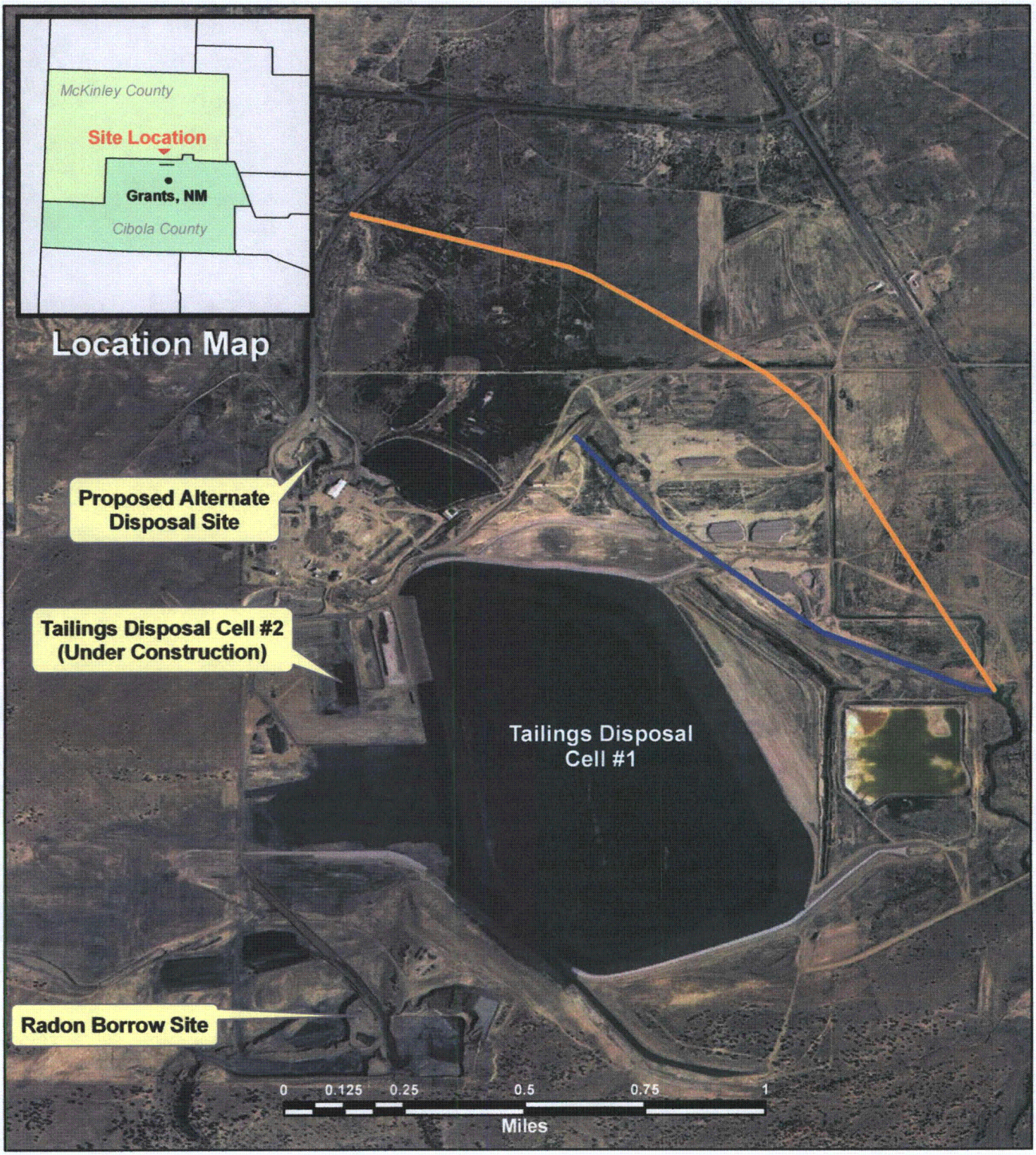
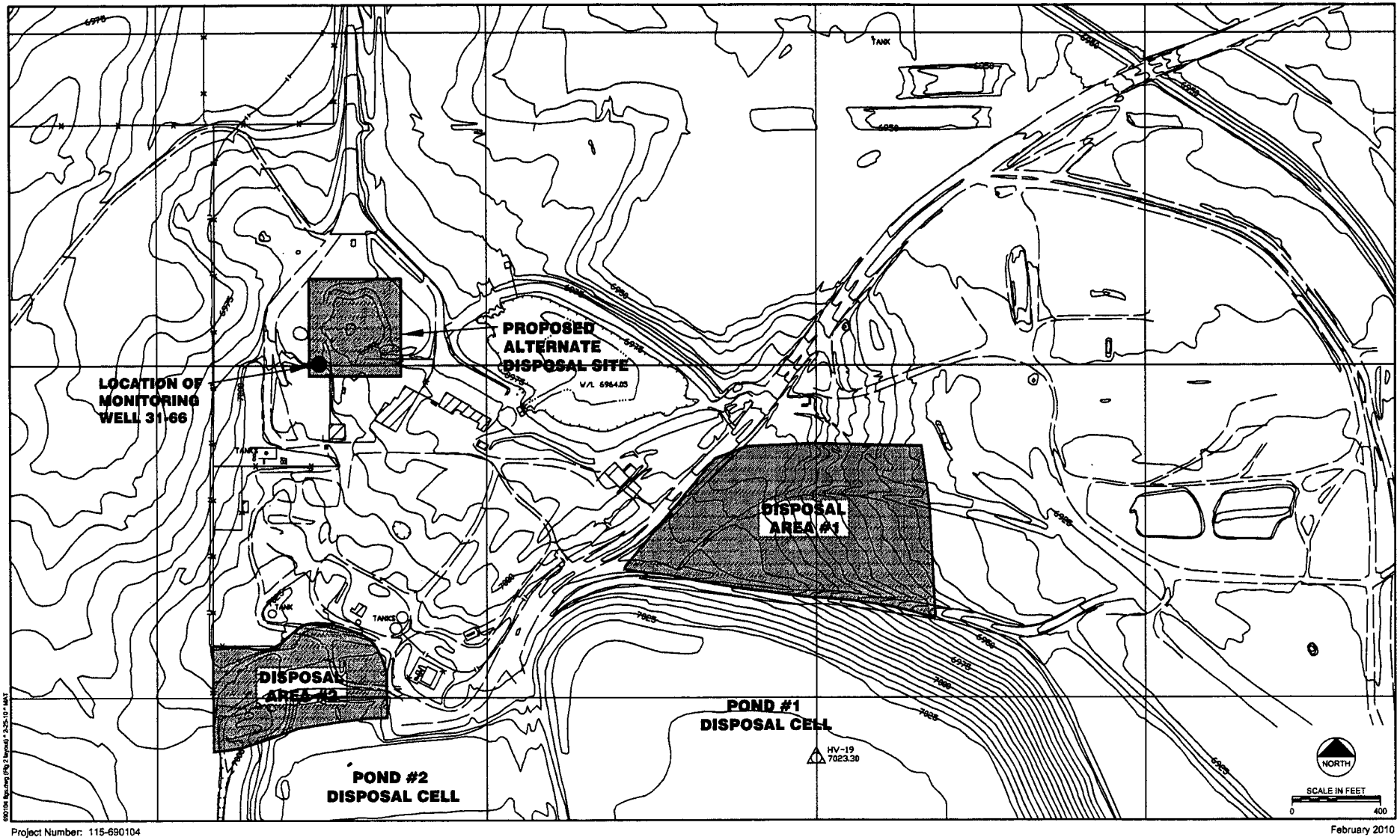


Figure 1
SITE MAP
Rio Algom Mining - Ambrosia Lake Facility

Source Imagery: NM Statewide DOQQ 2005/2006; UTM NAD83, units = meters; 1 meter GSD.

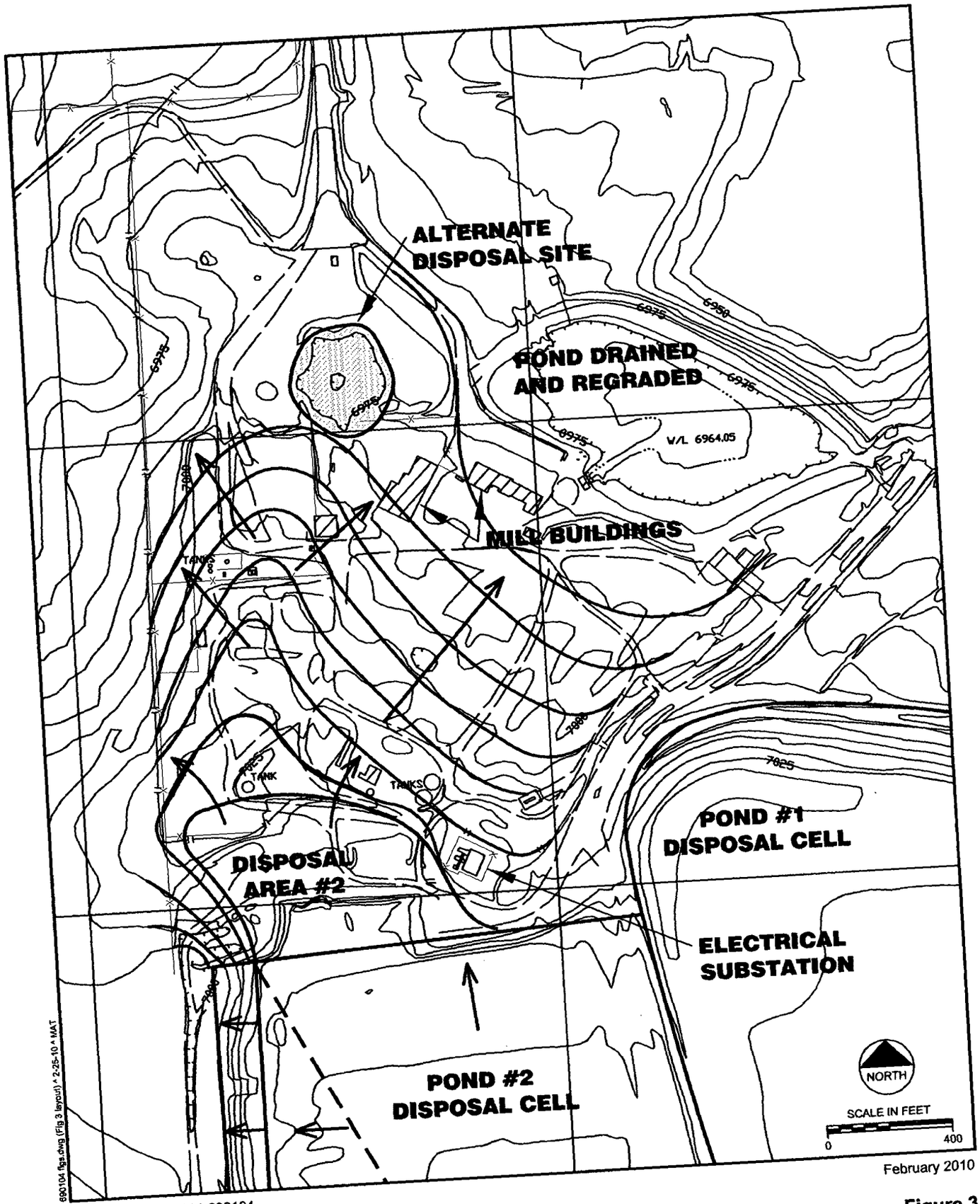
USGS 7.5 Minute Quadrangle = Ambrosia Lake, NM; T14N R9W, Secs. 30, 31, 32; Approximate Project Center = 35° 23' N, 107° 49' W.



Project Number: 115-690104

February 2010

Figure 2
DISPOSAL AREA LOCATIONS
Rio Algom Mining - Ambrosia Lake Facility



February 2010

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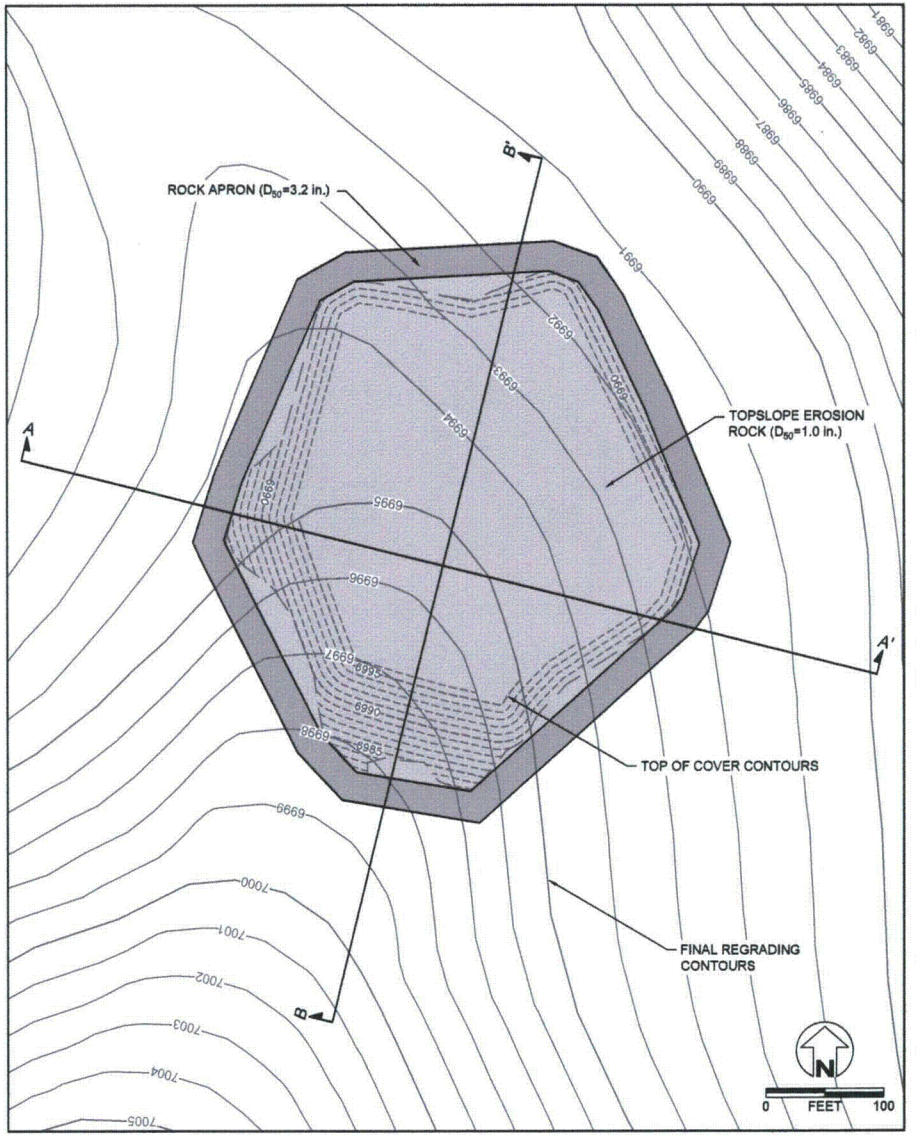
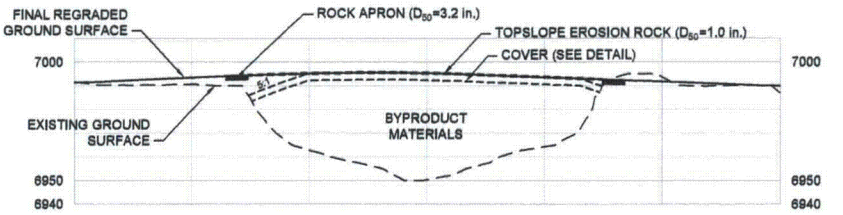
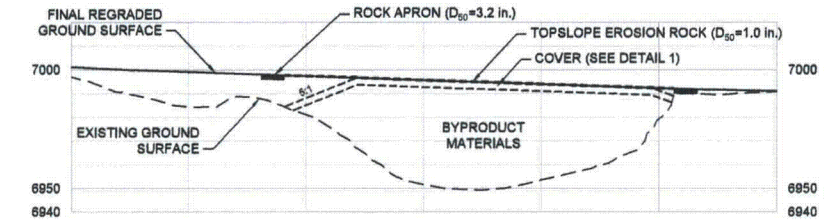
NOTE:
SHOWS SURFACE WATER FLOW DIRECTIONS AND CONCEPTUAL FINAL GRADING OF MILL AREA

Figure 3
CONCEPTUAL GRADING PLAN FOR DISPOSAL AREA LOCATIONS
Rio Algom Mining - Ambrosia Lake Facility





AA' SECTION
1" = 100'H / 1" = 50'V



BB' SECTION
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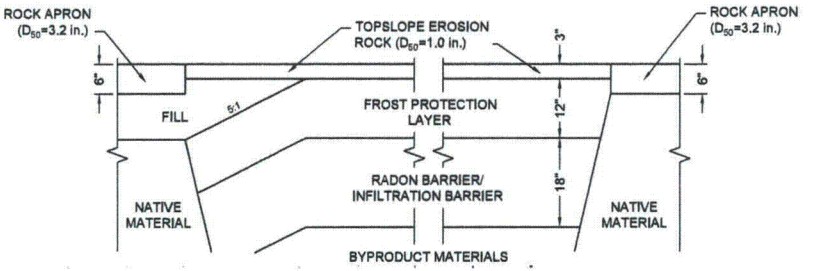


1 COVER DETAIL
1" = 2'

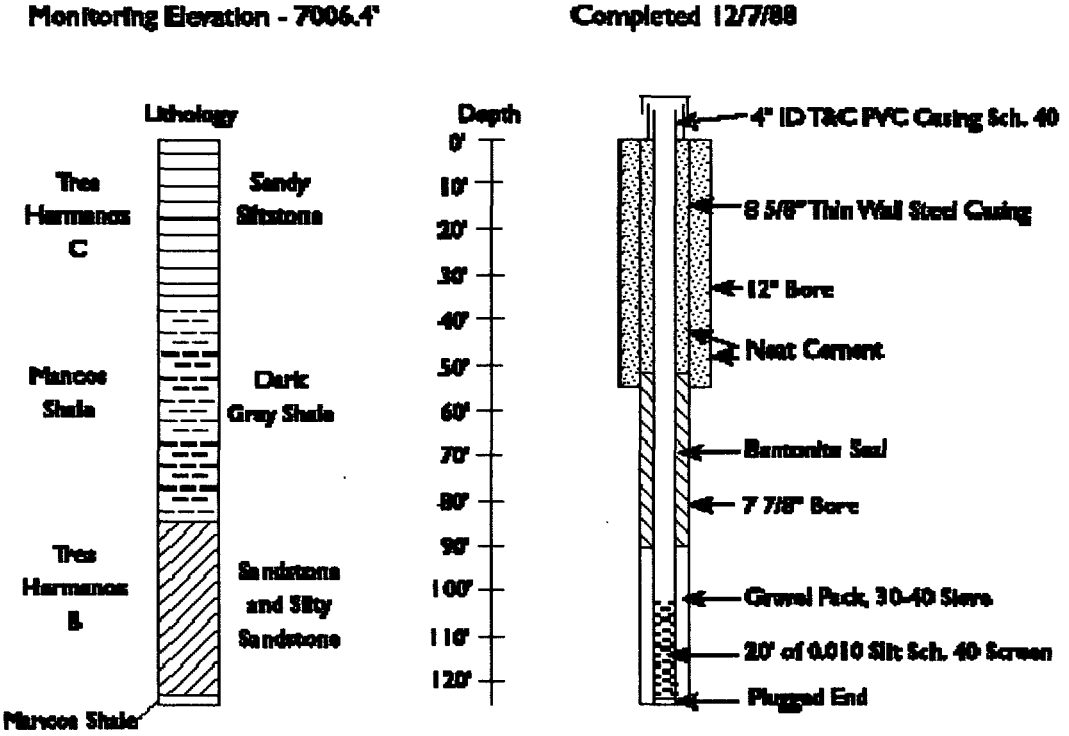
ALTERNATE DISPOSAL AREA
RECLAMATION COVER PLAN/SECTIONS
AMBROSIA LAKE MILL
RIO ALGOM MINING LLC
GRANTS, NEW MEXICO

TETRA TECH

PROJECT No. 114-690104	DRAWING BY: SEF 03/26/10
FILE NAME: F-04-AltDisposal Area.dwg	REVIEWED BY: JM

FIGURE 4

G:\Projects\Rio Algom\Ambrosia Lake\114-690104-Pond 7 & 8 Design & Support\CAD\SheetFiles\F-04-AltDisposal Area.dwg SAVED: 3/26/10 PRINTED: 3/26/10 BY: STEVE.FIELD



NOT TO SCALE

690104 figs.dwg (Fig 5 layout) ^ 2-24-10 ^ MAT

Project Number: 114-690104

February 2010

Figure 5
MONITORING WELL 31-66 BORING LOG
Rio Algom Mining - Ambrosia Lake Facility

APPENDIX A

TETRA TECH, INC.

CLIENT Rio ALGOM MINING JOB NO. 114-690104 PAGE 1/7
PROJECT ALTERNATE DISPOSAL CELL COMPUTED BY JMcBEE DATE 3/23/10
DETAIL EROSION PROTECTION CHECKED BY ✓ DATE ✓

DESIGN METHODOLOGY FOR EROSION PROTECTION

NUREG-1623, APPENDIX D.

FOR RUN-ON AREA, TOPSLOPE, AND APRON USE:

FOR DEPTH OF FLOW - RATIONAL METHOD

FOR ROCK SIZING - ABT & JOHNSON METHOD

USE PMP CALCULATION FROM "RECLAMATION PLAN FOR DISPOSAL OF POND SEDIMENTS AND ANCILLARY MATERIALS, TAILINGS CELL 2 EXPANSION", RIO ALGOM MINING, REVISION 1, MAY, 2007, APPENDIX C-1.

DEFINITIONS:

1. A = AREA (ACRES)
2. L = MAXIMUM FLOW LENGTH (FEET)
3. H_1 = UPPER ELEVATION OF SLOPE (FEET)
4. H_2 = LOWER ELEVATION OF SLOPE (FEET)
5. S = SLOPE (FT/FT)
6. T_c = TIME OF CONCENTRATION (MIN) =
7. D = DEPTH OF RAINFALL (INCHES) = % PMP (@ T_c)
   (1-HR 1 mi^2 PMP)
8. i = RAINFALL INTENSITY (INCHES/HR)

$$= \frac{D\,(60)}{T_c}$$

TETRA TECH, INC.

CLIENT RIO ALGOM MINING JOB NO. 114-690104 PAGE 2/7
PROJECT ALTERNATE DISPOSAL CELL COMPUTED BY JMcBEE DATE 3/23/10
DETAIL EROSION PROTECTION CHECKED BY ✓ DATE ✓

DRAINAGE AREA (UNIT WIDTH)

RUN-ON L_1 = 300 FT (FIG. 1, PAGE 4) SEE ALSO FIG. 2, PAGE 5

TOPSLOPE L_2 = 500 FT

$A = (300' + 500')(1') / 43{,}560 = 0.0184$ (ACRES)

TIME OF CONCENTRATION

RUN-ON $t_c = [(11.9) L_1^3 / H_1]^{.385}$ L IN MILES

$= [(11.9)(\frac{300}{5280})^3 / 6.5]^{.385}$ $H_1 = 7005' - 6998.5' = 6.5$ FT

$= 2.75$ MIN

TOPSLOPE $t_c = [(11.9)(\frac{500}{5280})^3 / 7]^{.385}$

$H_2 = 6998.5' - 6991.5' = 7$ FT

$= 4.8$ MIN

DEPTH OF RAINFALL

$D = PMP \times \%PMP @ t_c$ where PMP = 9.6 IN (1 hr, 1 mi² PMF)

(SEE PAGES 6 + 7)

$D_2 = (9.6)(.47) = 4.51$ IN @ t_c (7.55 MIN) TOPSLOPE, INCLUDES FLOW FROM RUN-ON AREA

RAINFALL INTENSITIES

$i = (D)(60) / t_c$

$i = (4.51)(60) / 7.55$

$= 35.85$ IN/HR FOR TOPSLOPE AREA (INC. APRON)

TETRA TECH, INC.

CLIENT RIO ALGOM MINING JOB NO. 114-690104 PAGE 3/7
PROJECT ALTERNATE DISPOSAL CELL COMPUTED BY JMM DATE 3/23/10
DETAIL EROSION PROTECTION CHECKED BY ✓ DATE ✓

PEAK FLOW RATE

$q_d = (C)(i)(A)$ ASSUME RUN OFF COEFF (C) = 1

$= (1)(35.85)(0.0184)$

$= 0.66$ CFS/FT

ROCK SIZING (ABT & JOHNSON)

TOPSLOPE

$D_{50} = 5.23 (S)^{.43} (q_d)^{.56}$

$= 5.23 (0.015)^{.43} (0.66)^{.56}$

$= 0.68$ INCHES

$D_{50} = 0.68 (1.04) = 0.71$ INCH (FOR 4% OVERSIZING)
ROCK QUALITY TESTING

USE $D_{50} = 1$ INCH

APRON - TRANSITION (BOTH RUN-ON & RUN-OFF)

$D_{50} = 10.46 (S)^{.43} (C_f \times q_d)^{.56}$

$= 10.46 (0.015)^{.43} (2 \times 0.66)^{.56}$ ASSUME $C_F = 2$

$= 2.0$ IN

$D_{50} = (2.0)(1.04) = 2.1$ IN (FOR 4% OVERSIZING)

USE $D_{50} = 3.2$ IN

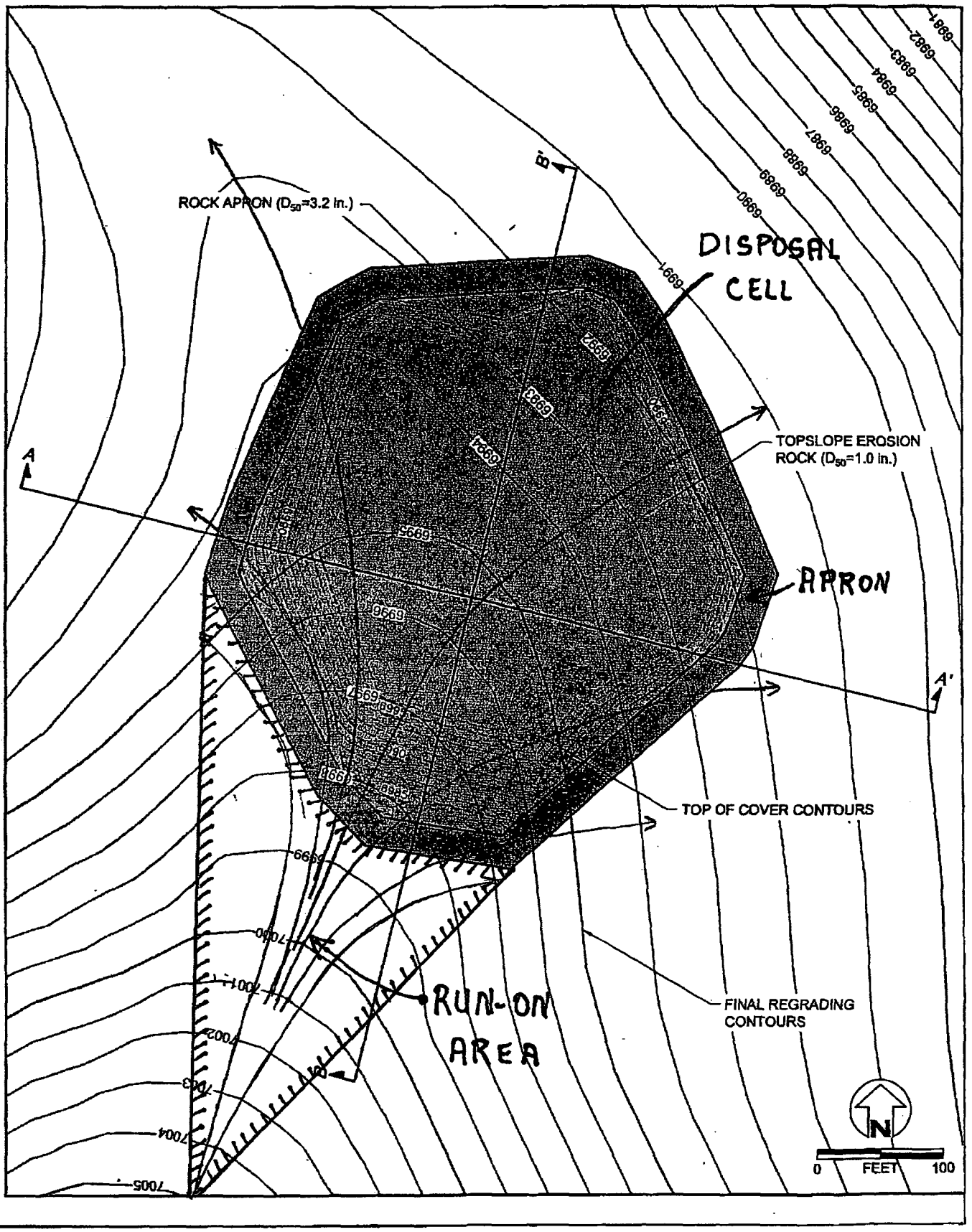
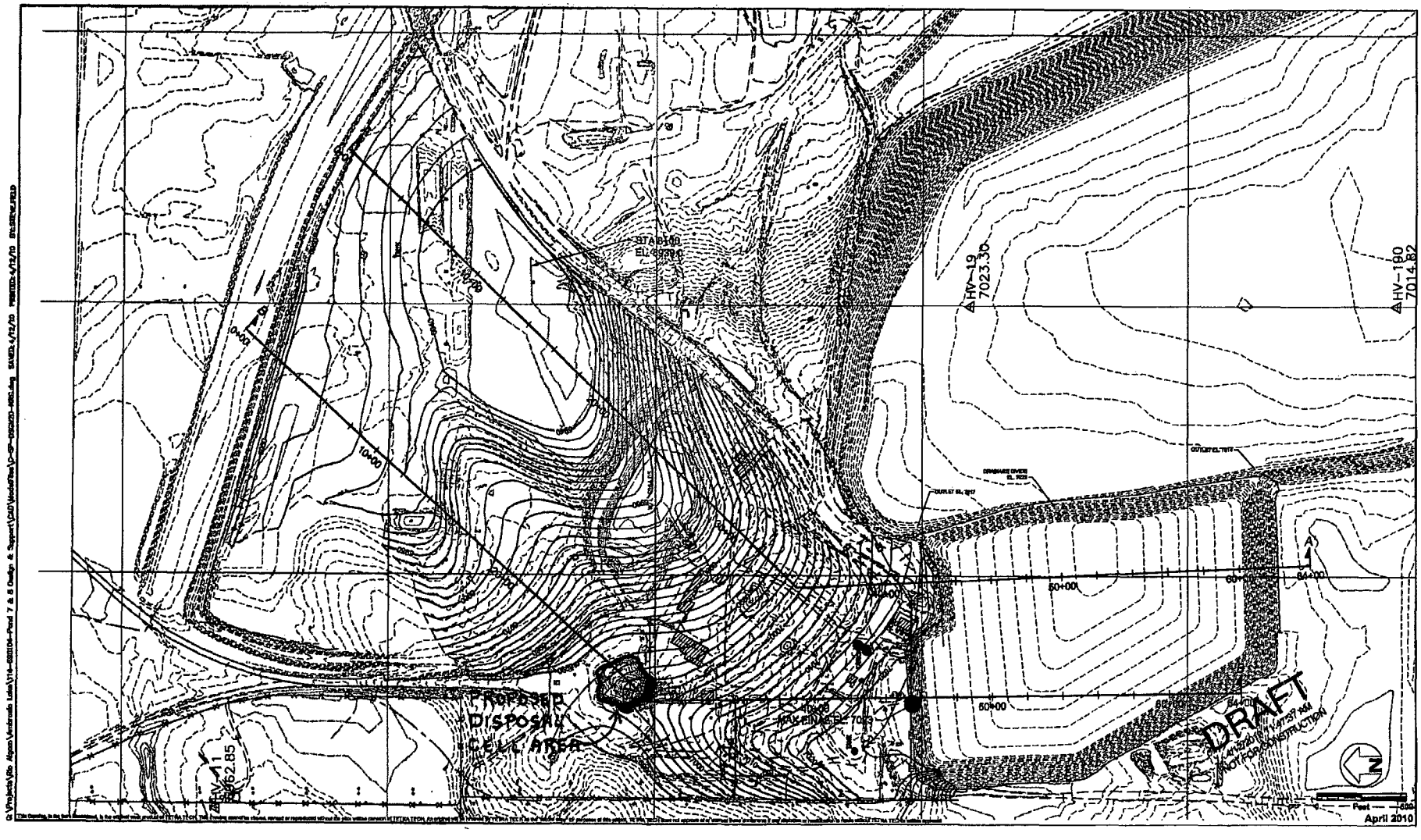


FIGURE 1

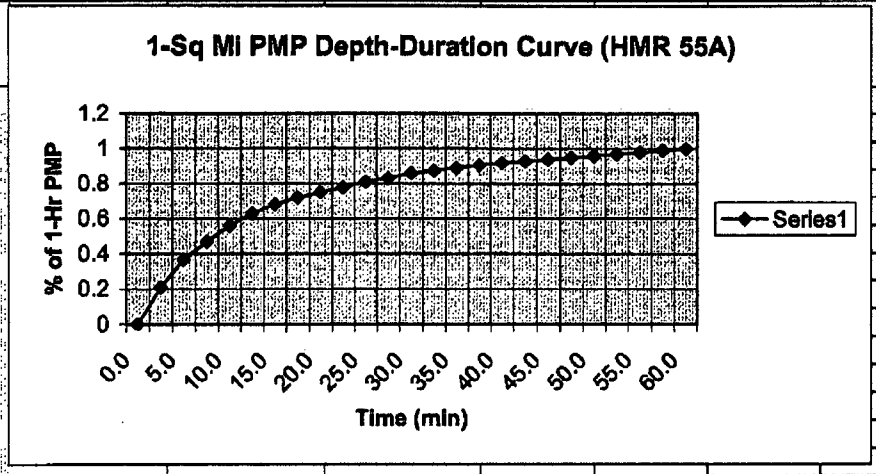


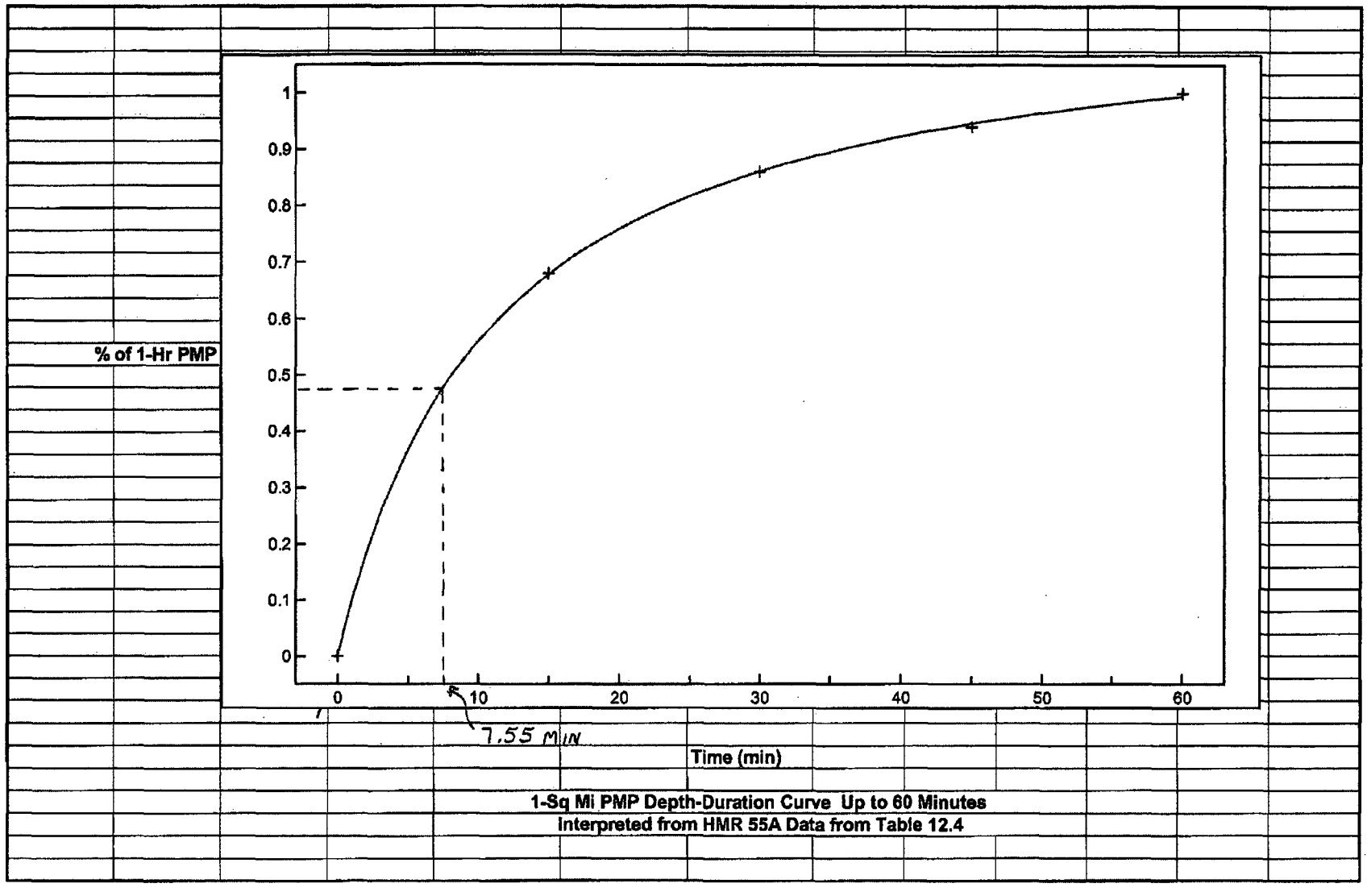
VOLUMES	CUT	FILL	NET
NORTH REGRADE AREA	402,090cy	429,136cy	27,046cy (FILL)

Preliminary North Regrade Area Contours
Ambrosia Lake Mill
Rio Algom Mining LLC
Grants, New Mexico
FIGURE - 2

FROM PMP CALCULATION APPENDIX C-1
RECLAMATION PLAN TAILINGS CELL 2, MAY, 2007

Duration (min)	Percent of 1-hr PMP	1-hr 1-mi^2 PMP (inches)	PMP 1-hr Indexes up to 1 hr			
0.0	0	9.6	0.00			
2.5	21%	9.6	2.02			
5.0	37%	9.6	3.55			
7.5	47%	9.6	4.51			
10.0	56%	9.6	5.38			
12.5	63%	9.6	6.05			
15.0	68%	9.6	6.53			
17.5	72%	9.6	6.91			
20.0	75%	9.6	7.20			
22.5	78%	9.6	7.49			
25.0	81%	9.6	7.78			
27.5	83%	9.6	7.97			
30.0	86%	9.6	8.26			
32.5	88%	9.6	8.40			
35.0	89%	9.6	8.54			
37.5	91%	9.6	8.69			
40.0	92%	9.6	8.83			1.87
42.5	93%	9.6	8.93			0.748
45.0	94%	9.6	9.02	Interpolated Values		1.87
47.5	95%	9.6	9.12			16
50.0	96%	9.6	9.22			11.968
52.5	97%	9.6	9.31			32.968
55.0	98%	9.6	9.41			
57.5	99%	9.6	9.50			
60.0	100%	9.6	9.60			





1-Sq Mi PMP Depth-Duration Curve Up to 60 Minutes
Interpreted from HMR 55A Data from Table 12.4

APPENDIX A

PROJECTED RADIUM-226 CALCULATIONS

TETRA TECH, INC.

CLIENT Rio Algom JOB NO. 114-690104 PAGE 1 of 2
PROJECT Alt. Disposal Site Env. Rpt. COMPUTED BY S M McBee DATE 2/19/10
DETAIL Radium Conc. @ 1000 years CHECKED BY JM McBee DATE 2/22/10

Radium-226 decay component

$$A = A_0(e^{-\lambda t})$$

A_0 = Original activity = 150.8 pCi/g*

$\lambda = \frac{0.693}{\text{half life}}$

t = decay time

radium half life = 1600 years

$$A_{1000yrs} = 150.8 pCi/g \left(e^{-\left(\frac{0.693}{1600yrs}\right) 1000yrs}\right)$$

$$= 97.8 pCi/g$$

* A_0 calculated as weighted average concentrations based upon estimated volume of each material type and concentrations from Dee 2009 analyses of each material type. Refer to Table A-1 for data and weighted averages.

TETRA TECH, INC.

CLIENT Rio Algom JOB NO. 114-690104 PAGE 2 of 2
PROJECT Alt Disposal Site Env. Rpt COMPUTED BY SM McGee DATE 2/19/10
DETAIL Radium Conc. @ 1,000yrs. CHECKED BY JM McBee DATE 2/22/10

Thorium-230 decay component

Equation 9.2 from Tailings Cell 2 Expansion Reclamation Plan:

$$A_d = A_{po}\left[\frac{T_p}{T_p - T_d}\right]\left(e^{-\lambda_p t} - e^{-\lambda_d t}\right)$$

where: A_d = activity of daughter (R-226) after time

A_{po} = original activity of parent = 250.1 pCi/g*

T_p = half life of parent (Thorium-230 = 80,000yrs)

T_d = half life of daughter (Radium-226 = 1,600yrs)

t = decay time = 1,000yrs

$\lambda_p = \frac{0.693}{T_p}$

$\lambda_d = \frac{0.693}{T_d}$

$$A_d = 250.1\ pCi/g\left[\frac{80{,}000}{80{,}000 - 1{,}600}\right]\left(e^{-\left(\frac{0.693}{80{,}000}\right)1000} - e^{-\left(\frac{0.693}{1600}\right)1000}\right)$$

$$= 87.5\ pCi/g$$

Total R-226 activity at 1,000yrs

A_{total} = R-226 component + Th-230 component

$= (97.8 + 87.5)\ pCi/g$

$= 185.3\ pCi/g$

* Refer to Table A-1 for analytical data and weighted averages.

TABLE A-1

Laboratory Results and Calculated Weighted Averages

Sample ID	Th-230 (pCi/g)	Ra-226 (pCi/g)	Location Description	Estimated Additional	%	Weighted Average Concentrations Th-230 (pCi/g)	Ra-226 (pCi/g)
Scraper Pile #1	41.5	4.93	From 100-Year Channel, Halos (Ponds 4-6) & Existing Water Course	5,378	3.0	1.25	0.15
Scraper Pile #2	512	8.58	From 100-Year Channel, Halos (Ponds 4-6) & Existing Water Course	5,378	3.0	15.37	0.26
Waynes Stockpile	16.1	4.04	Excavation for Pond 3 Toe Apron	5,378	3.0	0.48	0.12
Mill Pond Area #2	16.0	22.3	Mill Pond Mixed with Soil	35,556	19.8	3.18	4.43
Septic Area #1	323	205	Area North of Mill Pond - Mine Waste & Ore Pads Inside Restriced	127,453	71.1	229.80	145.85
			Area	179,142	100.0	250.1	150.8

Note: Mill Yard material volumes combined with the Spetic Area # 1 - no samples were collected from the Mill Yard soils. It is assumed that the activity in the Mill Yard material will be less than the Septic Area #1. Using these weightings will provide addtional conservatism.