AECOM

Environment

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Platte River Power Authority
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Submitted by:
AECOM
Greenwood Village, Colorado
60514657
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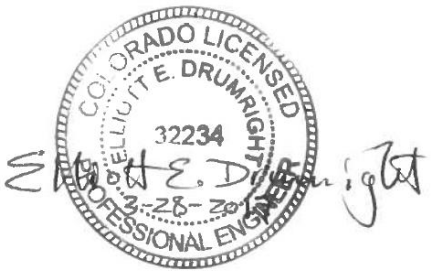
Platte River Power Authority
Rawhide Station

Annual Ash Monofill Inspection Report
Final

Inspection Completed by:



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1.0 Introduction

1.1 Objective

Per the Coal Combustion Residual (CCR) Rule published by the United States Environmental Protection Agency (USEPA) and entered into the Federal Register on April 17, 2015 (40 CFR 257.84 (b)), existing and new CCR landfills (including any lateral expansion of a CCR landfill) are required to be inspected annually by a qualified professional engineer to establish that the CCR unit is in good condition and that the design, construction, operation, and maintenance conform to standard engineering practices for this type of facility. The inspection includes review of documentation and weekly reports indicating the condition of the facility, and a visual inspection of the CCR unit.

The CCR rule is a self-implementing rule which regulates the handling and disposal of CCRs as non-hazardous solid waste under Subtitle D of the Resource Conservation and Recovery Act (RCRA). The context of 40 CFR 257.84 (b) is in compliance with Federal EPA Regulations, as they existed as of December 19, 2014.

The objective of this report prepared by AECOM Technical Services, Inc. (AECOM), on behalf of Platte River Power Authority (PRPA) is to present the results of the annual inspection of the ash monofill at the Rawhide Energy Station Unit 1 (Rawhide), conducted in February 2017 per the CCR Rule established by the USEPA.

1.2 Outline of Rule Requirements

In accordance with the USEPA Final CCR Rule, AECOM was required to perform an annual inspection "To ensure that the design, construction, operation, and maintenance of the CCR unit is consistent with recognized and generally accepted good engineering standards". The minimum requirements, as per §257.84(b) of the USEPA Final CCR Rule include the following:

- A review of available status and condition information including operational records, and previous inspections
- A visual inspection for signs of distress or malfunction
- An inspection report

The inspection (described below, within Section 3 of this report) was the second annual inspection performed by AECOM designed to address the items listed below, pursuant to §257.84(b)(2) of the USEPA Final CCR Rule:

(i) Any changes in geometry of the structure since the previous annual inspection;

(ii) The approximate volume of CCR contained in the unit at the time of the inspection;

(iii) Any appearances of an actual or potential structural weakness of the CCR unit, in addition to any existing conditions that are disrupting or have the potential to disrupt the operation and safety of the CCR unit; and

(iv) Any other change(s) which may have affected the stability or operation of the CCR unit since the previous annual inspection.

1.3 Facility Description

The CCR landfill (ash monofill or monofill) at Rawhide is a Residual Solid Waste (RSW) landfill located in Larimer County, Colorado. The solid waste disposal site at Rawhide is located in the northwest corner of the property. In March 1981, Platte River Power Authority (PRPA) obtained a Certificate of Designation for the Northeast ¼ of Section 6 Township 10 North Range 68 West, and the Southern ½ of Section 31 Township 11 North Range 68 West.

Overall, Rawhide encompasses approximately 3,120 acres. In addition to the plant buildings, the major feature of the facility is a 500-acre cooling water reservoir which contains approximately 15,000 acre-feet

of water. The power block area contains the boiler and turbine buildings, the air quality control equipment and the administrative offices. A rail spur along the northern edge of the site connects Rawhide with the mainline of the BNSF Railway and is used to deliver coal and construction materials for plant operations.

Six generating units are located at Rawhide. Units A, B, C, D, and F are fueled by natural gas, and Unit 1 is fueled by coal which produces the CCR solid wastes contained in the monofill. The coal used in Rawhide Unit 1 operation comes from the Powder River Basin in Wyoming.

CCR waste from Unit 1 operations is disposed of in an ash monofill comprised of two cells, described in this report as Cell 1 and Cell 2. The figure labeled as A.1 in Attachment 2 shows the location and general area occupied by Cells 1 and 2. Cell 1 (ca 1980-2007) is capped and no longer in use, but has not undergone official closure. On January 25, 2008, the Colorado Department of Public Health and Environment (CDPHE), Hazardous Materials and Waste Management Division approved a request to modify the original Engineered Design and Operations Plan (1980 EDOP). The EDOP modification allowed the facility to expand the current footprint of waste management for the monofill immediately to the west and adjoining Cell 1, into the area of current CCR disposal operations designated as Cell 2. A copy of the approval is included as Attachment 3. Similar to Cell 1, CCR waste placement in Cell 2 started behind a containment dike and progressively moves north.

Rawhide is owned and operated by PRPA. PRPA may be contacted as follows:

Rawhide Energy Station
Attn: Ms. Courtney Stewart
2700 E. County Road 82
Wellington, CO 80549

1.4 Solid Waste Stream

According to the 1980 EDOP, more than 99% of the solid wastes generated at Rawhide are a result of the combustion of coal and the cleaning of the flue gas produced by the combustion (FGC waste). The removal of sulfur dioxide and fly ash are required to comply with USEPA and CDPHE emission standards. Approximately 82% of the solid wastes produced at Rawhide come from the operation of the air quality control system. Bottom ash accounts for approximately 17.9% of the solid waste generated by Rawhide. The bottom ash produced in the combustion process is collected in the bottom of the boiler. That ash is then hydraulically sluiced to bottom ash ponds located near the boiler buildings. When the solids in the pond reach their storage capacity, the pond is dried out and the solids are dredged and hauled to the solid waste disposal area. The remaining 0.1% of the solid wastes placed in the monofill is made up phosphorous sludges and inorganic construction materials.

The quantities of each segment of the waste stream, taken from the 1980 EDOP, are estimated in Table 1-1 below. Figure 3 in Attachment 1 (appended from the 1980 EDOP) provides an illustration of the solid waste stream and waste management.

Table 1-1: Estimated Solid Waste Quantities (1)

	Average Daily		Maximum Daily		Average Annual		Average Plant Life		
	Ton	acre-feet	Ton	acre-feet	Ton	acre-feet	Ton	acre-feet	
FGC Waste	175	0.11	262	0.16	64,000	39.2	2,240,000	1,370	82%
Bottom Ash	38	0.02	58	0.04	14,000	8.6	490,000	300	18%
Phosphorous Solids	-	-	-	-	-	0.23	2	8	<1%
Construction Materials	-	-	-	-	-	-	10,000	4	<1%
Total	213	0.13	320	0.02	78,000	48.08	2,299,002	1,682	100%

Notes:

(1) ED&OP 1980, Table 1 “Estimated Solid Waste Quantities”

- Approximately 82% flue gas residuals (75% fly ash, 4.7% unreacted slaked lime, 2.3% unslaked lime, and 0.8% inert matter)
- 17.9% bottom ash (mostly sand and gravel-sized ash from the combustion process)
- 0.1% phosphorus sludge from tertiary treatment of the plant cooling water, plus inert construction waste.

In 2007, a revised EDOP for the new Cell 2 was prepared by Smith Geotechnical, Inc. (2007 EDOP), which indicated that the CCR waste stream was to be comprised of products of coal combustion, flue gas cleaning wastes, phosphorous sludge, and construction wastes from the continued development and construction of Rawhide. The monofill expansion was to continue to be used for the disposal of approved waste products from current operations.

According to CDPHE, the CCR landfill at Rawhide is a non-hazardous solid waste under Subtitle D of RCRA. The wastes deposited in Cells 1 and 2 are not combustible; therefore, there are no plans for providing fire hydrants or other control measures in the disposal area. The wastes are odorless and do not create rodent or insect issues since the wastes have no caloric value.

1.5 Facility Design and Components

1.5.1 Siting

This section describes the siting considerations with respect to the geology and hydrogeology at the Unit 1 plant and at the monofill.

Geology

The geologic setting at Rawhide lies on the high plains immediately east of the Colorado Front Range, where soil and bedrock units are incised by drainage from nearby mountains to the west, forming small, relatively minor valley and ridge topographic expressions. Elevations within the project area range from about 5,580 to 5,805 feet above mean sea level (amsl). The most distinctive topographic feature at Rawhide is a broad basin that occupies the center of the site and extends from northwest to southeast. Smooth ridges and rounded bluffs surround this basin and mark the transition to uplands that are 50 to 70 feet higher. It is within this basin that the site for the Rawhide monofill disposal area was selected. The cooling water reservoir occupies the lower portion of this valley to the south.

According to the United States Geological Survey (USGS) geologic map, bedrock at Rawhide consists of Cretaceous units including the Upper Pierre Shale Formation. Specifically, the majority of the Rawhide site lies on the Upper Pierre Shale Formation transition zone, the eastern extent of which transitions to the Lower Fox Hills Sandstone downslope and east of the Rawhide site. The Pierre Shale transition zone is described as shale with interbedded sandstones. The portions 600 feet below the contact with the Fox Hills sandstone are mapped by the USGS as being the most permeable within the unit, yielding 5 to 15 gallons per minute in wells (Hershey and Schneider 1972). The Fox Hills Sandstone is described as a pale yellow, massive, silty, fine-grained sandstone with lenticular black shale partings, but is not present on the Rawhide site.

The bedrock surface at the site is mapped as dipping east-southeast toward the cooling water reservoir. The geologic map indicates bedrock bedding structure in the area striking roughly north-south with shallow dips 5 to 10 degrees to the east. Several faults are recorded in the area surrounding Rawhide: the Rawhide Fault approximately 5 miles to the north, the Round Butte Fault approximately 4 miles northwest, and an unnamed fault about one mile north of the site. None of these faults are considered potentially active or have been associated with recent seismic events. The Rawhide site is considered to be in an area of overall minor seismicity.

Soils at the site are mapped as Pleistocene pediment deposits consisting of arkosic sands and gravel with minor amounts of red clay. More recent, relatively thin soils mantling the pediment deposits and bedrock in the area are likely wind-blown silts and clays.

The original geotechnical investigation for Rawhide was conducted by Black and Veatch in 1978/79. During the investigation three borings were drilled within or near the area of the monofill (B-94, B-95 and B-96). Boring B-95 encountered sands with varying silt and clay content in the upper 10 feet and claystone bedrock (very weathered shale) below. Borings B-94 and B-96 were completed to the west and east of the proposed monofill, respectively. At those locations, sands with varying silt and clay content were observed to depths of 23 and 50 feet, and underlain by weathered shale bedrock.

The most recent investigation was performed by Smith Geotechnical in 2007, to classify soils and provide engineering recommendations for the footprint area of Cell 2. The investigation consisted of drilling and sampling seven borings. Subsurface information collected in the Smith Geotechnical report summarizes the soil and bedrock as follows: A layer of clay was encountered in all borings from the ground surface to a maximum depth of eight (8) feet below grade. The clay was tan, moist, stiff to very stiff, and plastic. Claystone was encountered in all borings under the overburden clay at depths ranging from three to approximately twenty feet below grade. The claystone was generally tan, moist, soft, and completely to severely weathered.

Relevant soil borings in the area of the monofill from the 1980 and 2007 EDOP documents are included in Attachments 1 and 2. Figure 1.3 in Attachment 2 indicates areas where the borings were advanced in the monofill from both of these earlier investigations. Two new monitoring wells were installed along the southern boundary of the monofill during an investigation conducted in January and February, 2016 (locations added to Figure 1.3 cited above). Those wells were installed as part of a broad investigation performed to further the understanding of shallow groundwater characteristics at the monofill and at the location of the bottom ash transfer (BAT) ponds.

Hydrogeology

The hydrogeology at Rawhide is discussed in the 1980 EDOP and in the “Final Report Investigation of the Groundwater Monitoring Program for the Bottom Ash Disposal Site,” conducted by Lidstone and Anderson in 1989. According to the 1980 EDOP, hydrogeology of the RES site was originally investigated by drilling and installing twenty-one (21) monitoring wells. Data from the wells indicated that a groundwater table exists within the Pierre Shale bedrock below the site and in surficial deposits along Coal Creek. The report explained depth to groundwater varied across the site from 11 to 67 feet and follows a general gradient to the south-southeast. The shallow water table, as explained in the 1980 EDOP, was determined to be recharged by infiltration from precipitation and surface runoff.

Groundwater was not encountered in any of the borings drilled in the Cell 2 footprint by Smith Geotechnical in 2007.

Lidstone and Anderson concluded that sufficient data was collected on the groundwater beneath the Rawhide site to determine a mound has formed in the shallow fractured Pierre Shale Aquifer in the vicinity of the cooling water reservoir. After a review of available documents on the current water levels within the area, AECOM concludes that the monofill is hydraulically upgradient of any groundwater mound that may be created by the cooling water reservoir, and groundwater mounding associated with the cooling water reservoir would not affect the overall performance of the monofill disposal site.

1.5.2 Subgrade, Liner, and Leachate Collection

According to the 1980 EDOP, Cell 1 of the monofill was constructed by removing and stockpiling the existing topsoil over one to two acres at a time (approximately one year’s waste generation at that time) then placing the CCR wastes directly on the exposed subgrade. A complete earthen liner was not prescribed for solid waste collection in the 1980 EDOP. The EDOP did recommend that approximately 13 acres on the east side of Cell 1 receive an 18-inch-thick partial liner above elevation 5,740 feet to limit leachate movement southeastward along the dip of the bedrock. No evidence of the construction of this partial liner was identified in the documents reviewed by AECOM.

Per the 1980 EDOP, based on the premises that “groundwater resources associated with the overall plant site are minor”; the general dip of the shale bedrock toward the southeast; low permeability of the waste material; and high evapotranspiration and diversion of limited precipitation around the monofill, “leachate from the landfill will be insignificant”. The 1980 EDOP continues to explain, “Precipitation that falls on temporarily uncovered wastes in active fill areas will run off and be collected behind the

temporary earth dike and held for evaporation." Any leachate that did leave the monofill was judged to be captured by the downstream cooling water dam and reservoir which is constructed down to bedrock and designed to minimize seepage.

According to the revised 2007 EDOP for Cell 2, that portion of the monofill is constructed similarly to Cell 1 by removing/stockpiling the existing topsoil over one to two acres at a time for use during reclamation activities. After clearing the topsoil, the active area is filled to approximately 21 feet above the existing grade with solid waste material. After filling and compacting the one to two acre section, a two-foot-thick earthen cover will be placed over the waste material. The cover material will be moisture conditioned, compacted, and reseeded.

A March 12, 2010 letter from CDPHE approved the Construction Quality Assessment Report for Cell 2 and is included as Attachment 4.

Groundwater protection for Cell 2 was based on similar premises and remedial actions for Cell 1 and includes: limiting leachate produced through the use of soil cover and diversion away from the monofill; low permeability of the waste material, high evapotranspiration rates; stormwater diversion; and groundwater protection provided by the down-gradient cooling pond. Due to the combination of these safeguards, the 2007 EDOP determined the "leachate resulting from the Cell 2 monofill material will be insignificant".

1.5.3 Material Placement and Final Slopes

The 1980 EDOP indicated that CCR waste was to be placed typically 21 feet above grade, starting behind a compacted starter dike and moving northward. The ash was to be hauled and unloaded in a wetted condition to reduce fugitive dust, then placed in lifts and compacted. Figure 11 in Attachment 1 shows the solid waste disposal fill sequence for Cell 1. Table 1-2 from the 1980 EDOP provides the landfill volumetric and reclamation schedule for Cell 1.

Table 1-2: Cell 1 Landfill and Reclamation Schedule

Section Number	Section Area (acres)	Section Volume* (acre-feet)	Start of Fill Date (year)	Annual Filled & Reclaimed Area (acres)
1	9.8	200	1984**	2.3
2	18.7	425	1988	2.1
3	15.8	500	1997	1.5
4	17.6	545	2007	1.5
Totals	61.9	1670		

Notes:

*Volume capacity was based on mounding the material to an approximate height of 21 feet above level fill where required using 4:1 side slopes.

**Construction wastes were placed in this section beginning in 1980.

The 2007 EDOP retained the general placement features of the 1980 plan. To avoid disrupting the views of the neighbors, section 4 of Cell 1 was not fully filled prior to beginning placement in section 1A of Cell 2. Figure 2 in Attachment 2 shows the solid waste disposal fill sequence for Cell 2. Table 1-3 below is from the 2007 EDOP and provides the landfill volumetric and reclamation schedule for Cell 2.

Table 1-3: Cell 2 Landfill and Reclamation Schedule

Section Number	Section Area (acres)	Estimated Storage Volume* (acre-feet)	Start of Fill Date** (year)	Annual Filled & Reclaimed Area (acres)
1A	15.60	330	2008	2.2
2A	16.00	370	2015	2.1
3A	14.62	465	2023	1.5
4A	14.69	455	2032	1.6
Totals	60.91	1620		

Notes:

*Storage volume capacity was based on mounding the material to an approximate height of 21 feet above level fill where required using 4:1 side slopes.

**Estimated fill time based on a yearly average of 80,000 tons/year and an estimated conversion of 1.0125 tons/cy.

The 2007 EDOP lists the following equipment and their respective uses for solid material placement in Cell 2:

- **Dump Trucks** These trucks will be used in transporting the solid waste to the disposal area.
- **Compactor Tractor and Blade** This tractor will be used for moving and compacting waste after dumping.
- **Water Spray Truck** This truck is for applying water to waste prior to compaction and wetting the haul roads to prevent fugitive dust emissions.
- **Scraper** This will be used for removal of topsoil prior to waste disposal and for depositing topsoil during reclamation.
- **Medium Size Farm Tractor** This tractor will be used to mix the ash and water prior to compaction. The tractor will also be used to seed and fertilize reclaimed areas.
- **Portable Irrigation Equipment** This equipment is for use in establishing the vegetative cover after reclamation.

Per Ms. Courtney Stewart (PRPA), the CCR disposed at the Rawhide monofill is transported from the combustion area by loading off-road haul trucks that transport the CCR to the working face of the monofill. The plant combustion/generation system generally runs 24 hours a day, seven days a week. Disposal operations are typically limited to three days a week on Monday, Tuesday, and Thursday. A summary of the volume of CCR contained in the monofill, prepared by PRPA from their records, is appended as Attachment 5.

1.5.4 Final Cover

For Cell 1, the 1980 EDOP noted that after each section was filled, a two-foot-thick earthen cover was to be placed, compacted and seeded. Finished surface grades were reported to be four-horizontal to one vertical (4H:1V) in the north-south direction. The 2007 EDOP retained the final covering and grade features of the 1980 plan. Figure 12 (Attachment 1) and Figure 3 (Attachment 2) provide typical landfill north-south cross sections from the 1980 EDOP and 2007 EDOP documents, respectively.

1.5.5 Stormwater Management

The 1980 EDOP suggested that precipitation runoff would be limited by excavation of a capture trench on the upgradient (north) side of the active face of Cell 1 to divert storm water around the landfill, with the main cooling water reservoir as the down-gradient destination. It is not known whether such a capture trench was constructed.

As noted within the 2007 EDOP, to prevent damage from stormwater runoff, a diversion channel along the west toe of Cell 1 was to be reproduced and constructed along the western edge of the monofill expansion (AECOM observed that a stormwater swale exists on the west perimeter of Cell 2). According to the 2007 EDOP, the west diversion channel was designed to pass the 100-year, 24-hour storm flows from the areas upstream of the monofill. The diversion channel is a permanent fixture of the monofill and will remain after the final closure.

2.0 Review of Existing Information

In accordance with the USEPA Final CCR Rule §257.84(b)(i), Elliott Drumright (a professional engineer with AECOM) completed "A review of available information regarding the status and condition of the CCR unit, including, but not limited to, files available in the operating record (e.g., the results of inspections by a qualified person, and results of previous annual inspections)".

2.1 CCR Unit Documents and Operating Records

Below is a list of documents reviewed with respect to the ash monofill:

- Geotechnical Analysis Report, Platte River Power Authority Rawhide Project, Black & Veatch Consulting Engineers, July 1979.
- Engineering Report and Operational Plan for the Solid Waste Disposal Facility, Rawhide Energy Project, December 1980.
- Investigation of the Ground-Water Monitoring Program for the Bottom Ash Disposal Site. Lidstone & Anderson, Inc. March 1989.
- Addendum to Engineering Report and Operation Plan for the Solid Waste Disposal Facility. Rawhide Engineering Services, October 1997.
- Geotechnical Investigation for Platte River Power Authority Rawhide Simple Cycle, Smith Geotechnical, March 2001.
- Subsurface Investigation, CGRS, Inc., July 2001.
- Groundwater Monitoring Report, CGRS, Inc., September 2002.
- Revised Design and Operations Plan for the Solid Waste Disposal Facility, Rawhide Energy Station, Smith Geotechnical, November 2007.
- Approval of Modification to Engineered Design and Operations Plan, Rawhide Energy Station Coal Ash Disposal Facility, issued by Colorado Department of Public Health and Environment, January 25, 2008.
- Approval of Construction Quality Assurance Report, Rawhide Energy Station Coal Ash Disposal Facility, issued by Colorado Department of Public Health and Environment, March 12, 2010.
- CCR Landfill Weekly Inspection Reports, Platte River Power Authority, January-April 2016.
- Platte River Power Authority – Rawhide Station Annual Ash Monofill Inspection Report, AECOM, April 2016.
- Platte River Power Authority – Rawhide Residual Solid Waste Ash Monofill Stability Evaluation, April, 2016.
- Monofill Annual Volume Summary, 1998-2017 (PRPA file information).

3.0 Annual Inspection Summary

The annual inspection was conducted on Wednesday, February 22nd, 2017, starting at 9:00 am mountain standard time (MST) outside of the Rawhide administrative offices. A brief site safety meeting was held between the AECOM participants prior to the field observations. The weather was partly cloudy, approximately 50 degrees Fahrenheit with moderate to high winds.

Personnel in attendance for the inspection included:

- Elliott Drumright, PE, AECOM
- Robert Lankford, EIT, AECOM

The completed Federal CCR Annual Inspection form used during the inspection is appended as Attachment 6. A sample weekly inspection form used by PRPA is appended as Attachment 7. A photo log for the 2017 inspection is included as Attachment 8.

3.1 Strategy and Route

The general strategy and route of the inspection included a general walkover of Cells 1 and 2 of the ash monofill, and a driving inspection of the monofill along its perimeter and intermediate access roads. The inspection started and concluded at the parking lot of the plant administrative offices.

The inspection began by driving the entire monofill site to gain orientation of the general area. After general orientation, Cell 1 was walked in a criss-cross pattern from the southern end to the northern end, followed by an inspection of the starter dike at the southern end of Cell 2, working north across the completed part of Cell 2 to the working face. The working face of Cell 2 was observed to be approximately 600 feet north of the starter dike. By driving and walking the access roads, native soils stockpiled within Cell 2 (for future cover) were observed as well as the transition fill zone where the east side of Cell 2 is being extended to blend into the covered west slope of Cell 1.

3.2 Facility Conditions

In general, the ash monofill at Cell 2 is well organized and maintained. It was apparent that the monofill does experience some transport of windblown ash when winds are strong, as on the day of the inspection and similar to the previous year's inspection. Rawhide does have a fugitive dust plan in place which includes primary wetting of the ash at the plant prior to transport, plus additional spraying as required during placement in the monofill. It is noted that once the ash is spread, compacted (to the extent achieved by the spreading equipment) and exposed to weather, a significant part of the ash surface crusts over due to the cementitious properties of the fly ash. This serves to limit wind-blown ash.

No other significant observations associated with the CCR regulations were noted. Additional evaluation is in progress per the CCR regulations, relative to groundwater quality adjacent to the monofill. Some minor stormwater management and minor housekeeping items were noted and are discussed below:

- The starter dike at Cell 1 and Cell 2 appeared to be in good condition with minor amounts of animal burrows in the upper eight to 12 inches of the ground surface in isolated areas. Access roads over starter dike areas and around the monofill perimeter are maintained with gravel surfacing and have storm water drainage swales, preventing direct runoff onto the face of the starter dike. No changes were noted of these conditions from the previous year.
- Between the starter dike and the working face (Cell 2), the existing soil cover was observed in sequential stages from fully established stands of groundcover grasses to recently seeded and mulched areas, to new soil cover placement (measured typically at 2.5 to 3-feet thick) and to end-dumped CCR at and just above the working face. The finished slope of Cell 2 in the north-south direction is 10H:1V or flatter, and 4H:1V in the east-west direction. This is similar to the finished cover shape of Cell 1.
- The working face had end dumped material from the top elevation estimated at 5,725 feet. The material was loosely piled at the working face and terminated at the edge of an excavation at the

bottom into the native soil. The excavation at the bottom was approximately six to eight feet, advanced into silty sand and silty clay overburden that contains some fine gravel. The excavation is made to create stockpiled material to be used for final cover and to be seeded. No significant changes were noted of the method of base excavation and ash placement from the previous year's inspection.

- The working face of Cell 2 was approximately 800 feet in the east-west direction, an increase of 125 feet from the previous year's inspection. Ash and eventually soil cover are placed at the eastern edge of Cell 2 to blend into the finished west side slope of Cell 1.

Also per the 1980 EDOP, "The moistened wastes hauled to the disposal area will be spread into layers 6 to 8 inches thick and then thoroughly wetted by a sprayer truck. Complete mixing of the solid waste and water will be accomplished by a soils mixer before it is rolled and compacted". AECOM was advised that the fly ash is thoroughly moistened at the point of collection before transport to the monofill, so lack of additional wetting at the point of placement is not considered to be significant. Although the method of compaction (dozing from a working face vs. compaction in lifts) varies from the 1980 EDOP, the relatively gentle finished grades and results of an April 2016 stability analysis by AECOM indicate that the alternate method of placement is acceptable (see Section 3.3 below).

3.3 Geometry of Monofill

As required by §257.84(b)(2)(i), other than encapsulating the finished west slope of Cell 1 by in-progress Cell 2, no changes in finished geometry were noted from those reported in previous documentation reviewed by AECOM. The 1980 and 2007 EDOP documents indicate that the general finished slope configuration should be at 4H:1V. This appears to be the case in the north-south direction where the slopes vary from 10H:1V or flatter, up to 4H:1V. On the eastern side of Cell 1, the eastern slope was measured at approximately 3:1 (H:V) in localized areas around a high-voltage transmission line pole. This is steeper than what was recommended 1980 EDOP, although the slopes appeared to be performing well and showed no signs of distress.

The April 2016 slope stability analysis was performed on the eastern side of Cell 1 and through the starter dike and finished portion of Cell 2, and concluded that the slopes have adequate safety for the static case, though some minor slope maintenance might be required after a seismic event. The facility slopes and benches appeared well graded and maintained. AECOM observed that the finished cover of Cell 1 (and the completed portion of Cell 2) are graded in a manner that discourages surface ponding and minimizes infiltration through the cover. The primary run-off swale is present on the west side of Cell 2 and appears to discharge from the completed top surface of Cell 2 through a pipe extending under the access road and to the front of the containment dike, allowing surface water to move by overland flow downstream to the cooling water reservoir.

3.4 Approximate Volume

According to information by PRPA, the total volume of CCR in the monofill as of December 31, 2016, was 2,329,130 cubic yards (cy). At a projected 2017 CCR disposal rate of 62,183.1 tons per year or 5,182 tons per month, and a density equivalent of 1.0125 tons/cy, on the date of the inspection (February 22, 2017), an estimated 2,338,087 cy of CCR was contained in the monofill (per CCR Regulation Section §257.84(b)(2)(ii)).

3.5 Structural Inspection

There was no observed structural weakness of the CCR monofill unit, nor any existing conditions that are disrupting or have the potential to disrupt the operation and safety of the CCR unit, per CCR Regulation Section §257.84(b)(2)(iii).

3.6 Additional Changes

The ash monofill and appurtenant structures (culverts and power poles) did not show any signs of major distress or malfunction, per CCR Regulation Section §257.84(b)(1)(ii). AECOM did not observe any other changes which may affect the stability or operation of the monofill per CCR Regulation Section §257.84(b)(2)(iv).

4.0 Conclusions and Recommendations

As noted in the CCR Rules §257.84(b)(5), “If a deficiency or release is identified during an inspection, the owner or operator must remedy the deficiency or release as soon as feasible and prepare documentation detailing the corrective measures taken”.

No significant deficiencies or releases were identified during the inspection. Two items identified during the document review were regarded as “potential” deficiencies and are discussed in Section 4.2 below.

4.1 Recommendations Other Than Normal Maintenance

Recommendations other than normal regular maintenance items were noted including:

- Increase dust mitigation efforts near the working face of Cell 2, particularly on windy days (see Attachments 1 and 2, respectively).
- Perform periodic monitoring and maintenance of the minor rill erosion on the slopes when slope and weather conditions allow, to make sure it is not a progressive problem.
- Monitor and or mitigate small animal burrows on the starter dike slopes so that the associated loss of embankment is not accompanied by an increase in rill erosion.
- Continue surface water best management practices to prevent standing water on monofill surfaces especially the transition zones between Cell 1 and 2, where lower elevations may increase potential for standing water.
- PRPA should report any signs of distress, malfunction, or any appearances of an actual or potential structural weakness of the CCR monofill to CDPHE. Additionally, changes to the slope configuration, excessive erosion, sinkholes, or any disruption to the safe operation of monofill Cells 1 and 2 should also be reported immediately.
- If available, PRPA should provide records of compacted fill placement in Cell 1 and Cell 2 to add to the inspection record.
- From the documents available for review, there was specific information that covered the starter dike design and construction for Cell 2 (Smith Geotechnical, November 2009), but not for Cell 1. PRPA may consider providing any available documentation of the design and construction of the starter dike at the southern end of Cell 1 to add to the inspection record.
- Continue groundwater monitoring on regular intervals to evaluate and if necessary, mitigate, rise in the phreatic surface within the monofill that may degrade stability.

4.2 Deficiencies Discovered

No significant deficiencies were noted as part of this annual inspection. However, PRPA does not have file information confirming the construction of the partial clay liner mentioned in the 1980 EDOP intended for the eastern boundary of Cell 1. Furthermore, the reference to the specific area to receive the liner was either illegible or not included in the copy of the 1980 EDOP Appendix 6 reviewed. Should PRPA have records of the construction of this liner, they should be made available and appended to this inspection report.

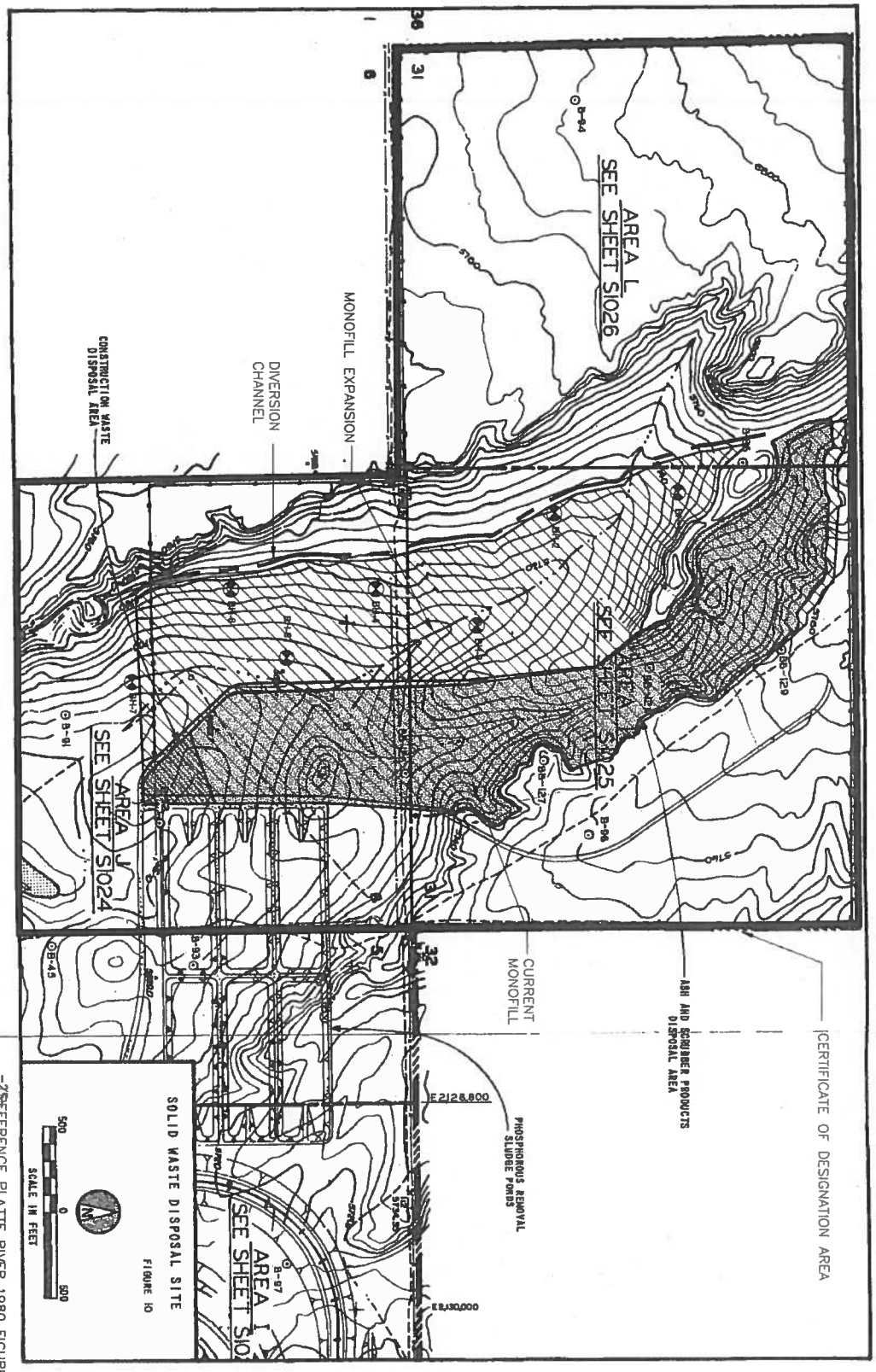
4.3 Corrective Measures Taken

No corrective measures for significant deficiencies were noted that need to be taken by PRPA as part of this annual inspection.

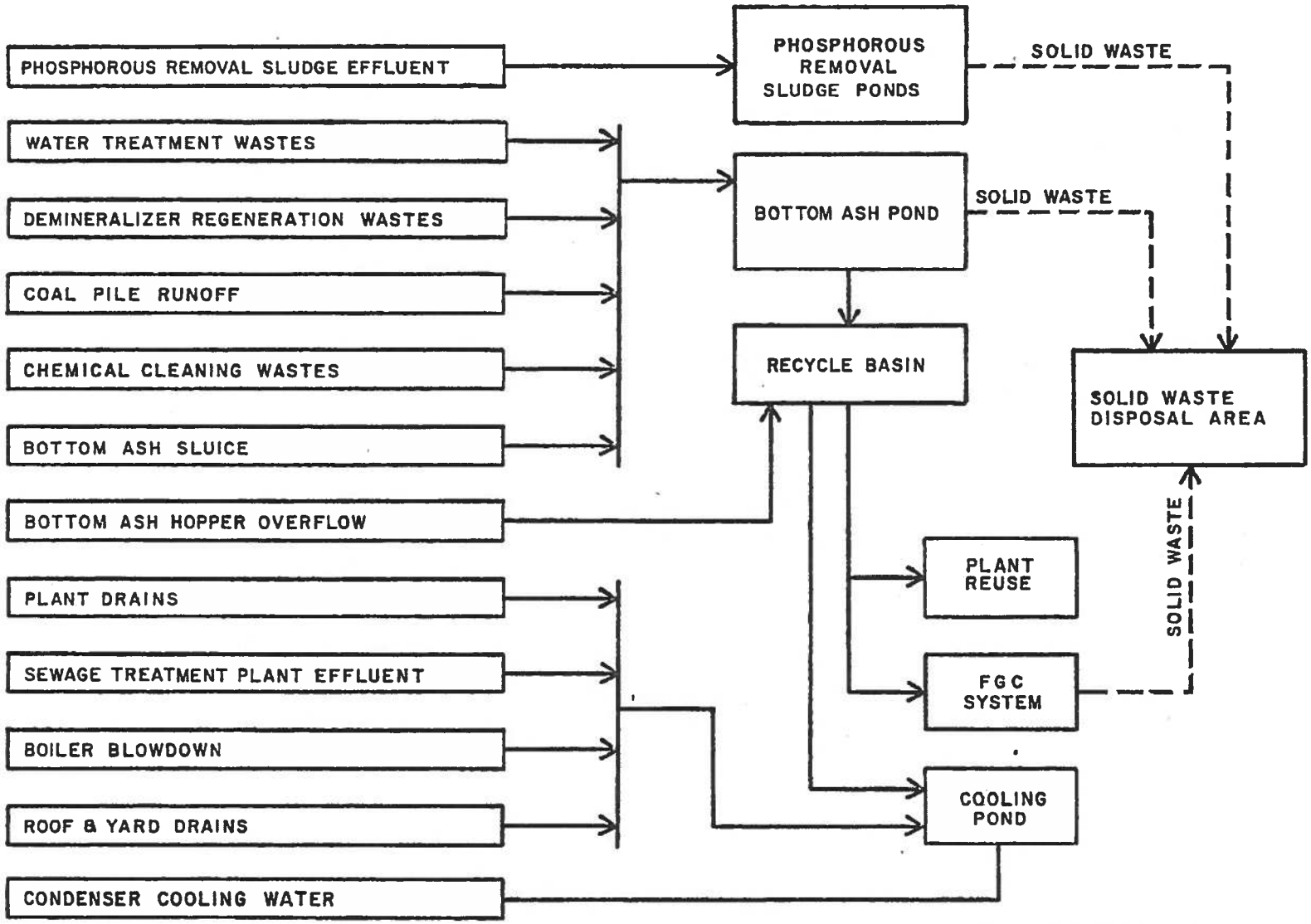
5.0 References

- Geotechnical Analysis, Report Platte River Power Authority Rawhide Project, Black & Veatch Consulting Engineers, July 1979.
- Engineering Report and Operational Plan for the Solid Waste Disposal Facility, Rawhide Energy Project, Platte River Power Authority, December 1980.
- Investigation of the Ground-Water Monitoring Program for the Bottom Ash Disposal Site. Lidstone & Anderson, Inc. March 1989.
- Addendum to Engineering Report and Operation Plan for the Solid Waste Disposal Facility, Rawhide Engineering Services, October 1997.
- Geotechnical Investigation for Platte River Power Authority Rawhide Simple Cycle, Smith Geotechnical. March 2001.
- Subsurface Investigation, CGRS, Inc., July 2001.
- Groundwater Monitoring Report, CGRS, Inc., September 2002.
- Revised Design and Operations Plan for the Solid Waste Disposal Facility Rawhide Energy Station, Smith Geotechnical, November 2007.
- Approval of Modification to Engineered Design and Operations Plan, Rawhide Energy Station Coal Ash Disposal Facility, issued by Colorado Department of Public Health and Environment, January 25, 2008.
- Construction Report for The Solid Waste Disposal Facility, Rawhide Energy Station Monofill Expansion, Smith Geotechnical, November 2009.
- Approval of Construction Quality Assurance Report, Rawhide Energy Station Coal Ash Disposal Facility, issued by Colorado Department of Public Health and Environment., March 12, 2010.
- CCR Landfill Weekly Inspection Reports, Platte River Power Authority, January-April 2016.
- Platte River Power Authority – Rawhide Station Annual Ash Monofill Inspection Report, AECOM, April 2016.
- Platte River Power Authority – Rawhide Residual Solid Waste Ash Monofill Stability Evaluation, AECOM, April, 2016.
- Monofill Annual Volume Summary, 1998-2017 (PRPA file information).

Attachment 1
Engineering Report and Operational Plan for the Solid Waste Disposal Facility, Rawhide Energy Project, December 1980 (selected figures)

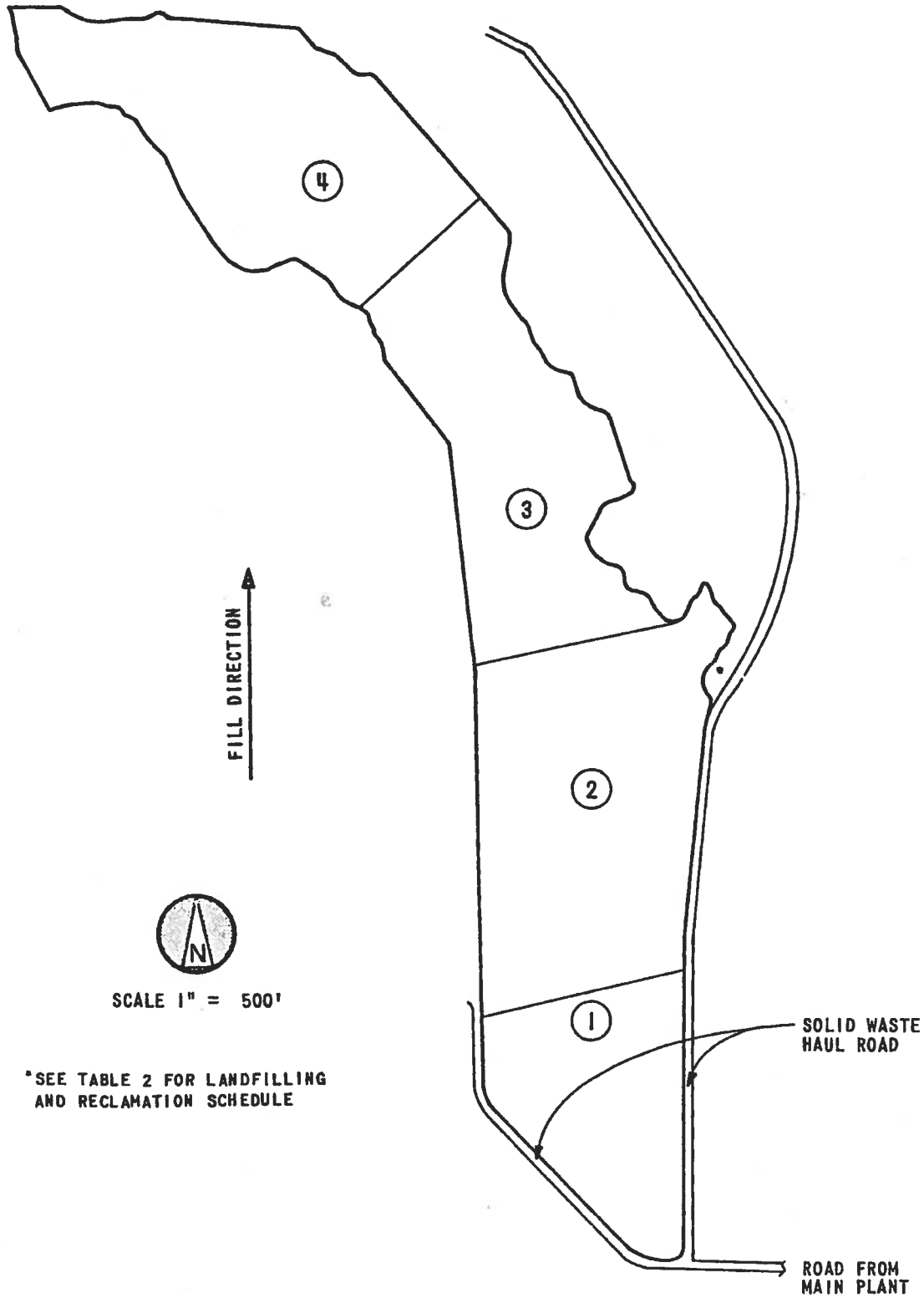


Project: 07.028	**FIGURE 1**	Smith Geotechnical ENGINEERING CONSULTANTS
Date: November 2007	**SOLID WASTE DISPOSAL SITE**	



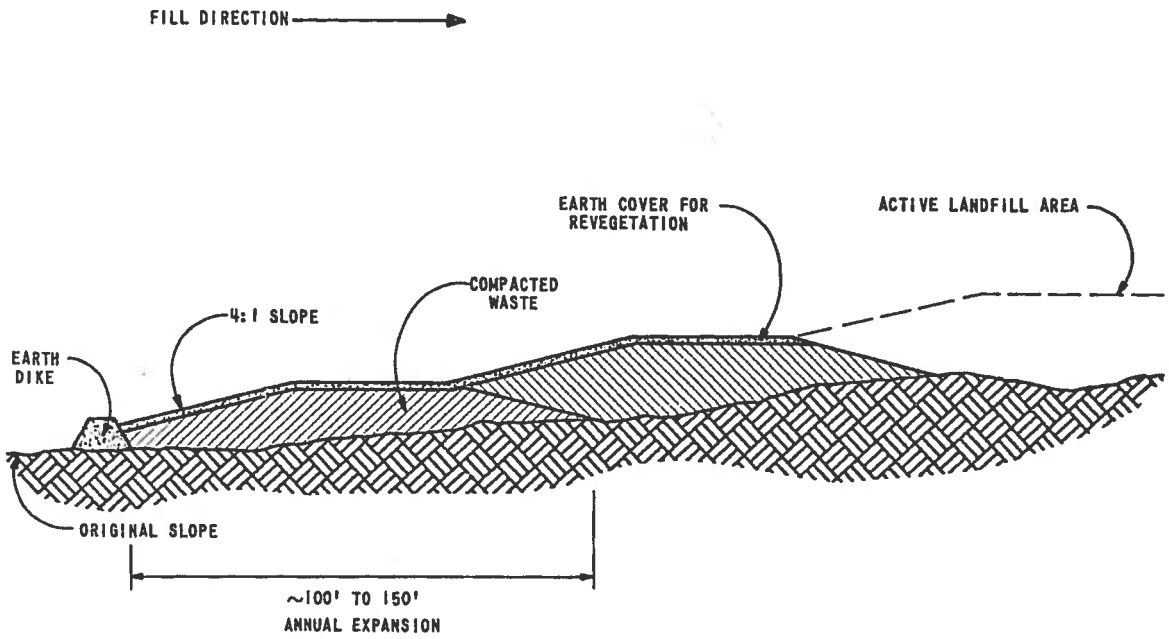
RAWHIDE ENERGY PROJECT
WASTE MANAGEMENT SYSTEM

FIGURE 3



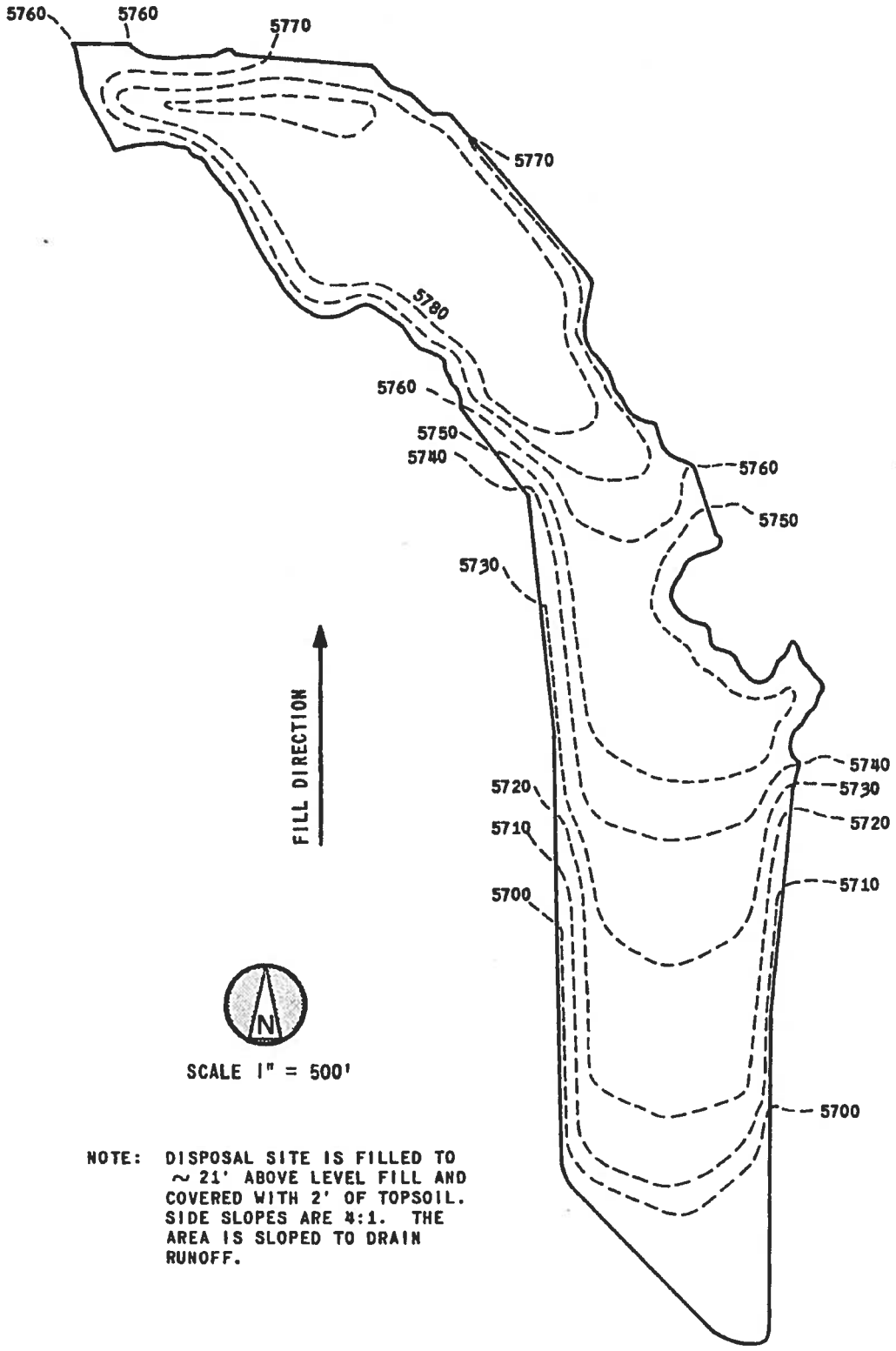
SOLID WASTE DISPOSAL SITE FILL SEQUENCE * (CELL 1)

FIGURE II



LANDFILL AND RECLAMATION OPERATION
TYPICAL NORTH-SOUTH CROSS SECTION

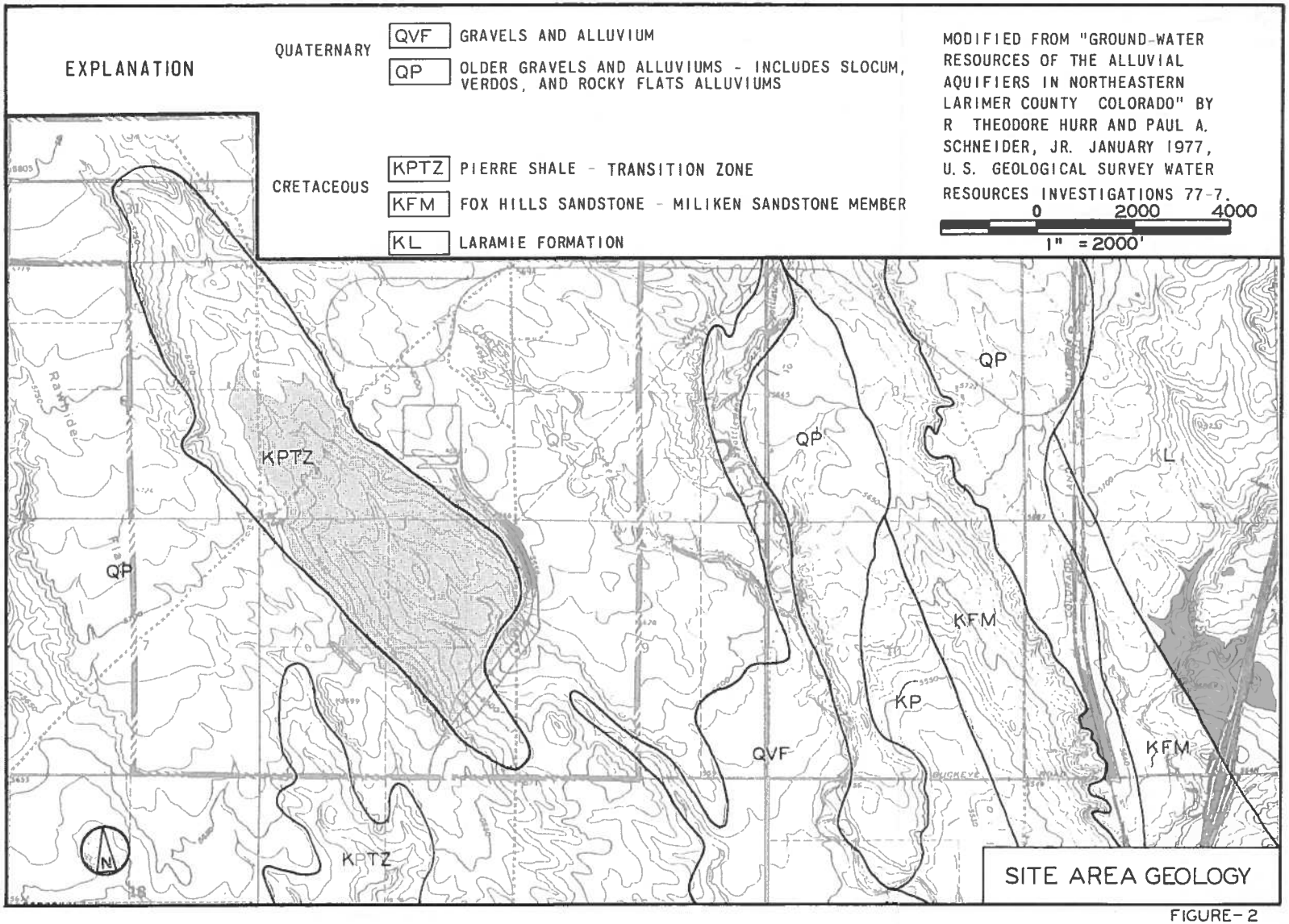
FIGURE 12



NOTE: DISPOSAL SITE IS FILLED TO ~ 21' ABOVE LEVEL FILL AND COVERED WITH 2' OF TOPSOIL. SIDE SLOPES ARE 4:1. THE AREA IS SLOPED TO DRAIN RUNOFF.

SOLID WASTE DISPOSAL SITE
FINAL CONTOURS (CELL 1)

FIGURE 13



REVISED 2/26/79

FIGURE-2

LOG OF BORING

BLACK & VEATCH
Consulting Engineers

BORING NO. B-92

CLIENT	PROJECT NO.	SHEET OF
Platte River Power Authority	7750	1 2

PROJECT	LOCATION	ELEVATION
Rawhide Energy Project	N-558,940 E-2,127,170	5681.3

DRILLING CONTRACTOR	DRILL RIG TYPE AND NO.	DRILLER
Hogan & Olhausen, Inc.	C.M.E. 55	C. Dearmore

DIRECTION AND INCLINATION OF HOLE	DATE	INSPECTOR
Vertical	2-17-78	L. Almaleh

DEPTH IN FEET	LOG	CLASSIFICATION OF MATERIAL (DESCRIPTION)	ELEV. FT., MSL	SAMPLER & BIT	BLOWS/6 IN. INCREMENTS (PER FOOT)	SAMPLE RECOVERY	PENETROMETER READING, TSF	REMARKS
		SILTY CLAY; tan-yellow, stiff, trace fine sand, moist, v calcareous (CL)		2" SB	15-20-22 (42)	0.8		Boring advanced w/4" diameter solid-stem auger
5		(severely to completely weathered shale)						
10		SHALE; sev wx, olv, sft, sandy, fossiliferous	5670.3					
		Continued on next page						Boring continued w/NWM double tube core barrel w/diamond bit using water as drilling fluid

FIGURE 205

LOG OF BORING

BLACK & VEATCH
Consulting Engineers

BORING NO. B-92

PROJECT	PROJECT NO.	SHEET OF
Rawhide Energy Project	7750	2 2

DEPTH IN FEET	LOG	UNIT	CLASSIFICATION OF MATERIAL (DESCRIPTION)	ELEV. FT., MSL	SAMPLE OR RUN	N	% REC / % RQD	REMARKS
		PIERRE SHALE	SHALE; weathered, olive green and gray, iron oxide stained, soft to medium, sandy, occasionally fossiliferous, calcareous in part		R-1		100/15	
15					R-2		100/8	
				5661.9				20° joint
20			SHALE; gray, medium to moderately hard, silty, occasionally sandy, occasional thin fossiliferous zones, calcareous in part		R-3 C.L.0.4'		92/0	
25					R-4 C.L.0.1'		98/60	20% circulation loss during Run 4
30					R-5 C.L.0.2'		96/37	30% circulation loss during Run 5
				5647.9				
35								Bottom of boring @ 33.4'

FIGURE 206

P-ST-019A

LOG OF BORING

BLACK & VEATCH
Consulting Engineers

BORING NO. B-94

CLIENT	PROJECT NO.	SHEET OF
Platte River Power Authority	7750	1 1

PROJECT	LOCATION	ELEVATION
Rawhide Energy Project	N-561,410 E-2,122,980	5794.5

DRILLING CONTRACTOR	DRILL RIG TYPE AND NO.	DRILLER
Hogan & Olhausen, Inc.	C.M.E. 55	C. Dearmore

DIRECTION AND INCLINATION OF HOLE	DATE	INSPECTOR
Vertical	2-16-78	L. Almaleh

DEPTH IN FEET	LOG	CLASSIFICATION OF MATERIAL (DESCRIPTION)	ELEV. FT., MSL	SAMPLER & BIT	BLOWS/6 IN. INCREMENTS (PER FOOT)	SAMPLE RECOVERY	PENETROMETER READING, TSF	REMARKS
		CLAYEY SAND; tan, medium dense, moist, very calcareous (SC)		2" SB	6-5-8 (14)	0.9		Boring advanced w/4" diameter solid-stem auger
5								
		SILTY SAND; tan, dense, coarse to fine-grained, little to some fine gravel, moist, calc (SM)		2" SB	7-18-19 (37)	1.3		
10								
		SAND; light pale brown, medium dense to dense, trace of fine gravel, little silt, calcareous (SW-SM)		2" SB	10-13-15 (28)	1.4		
15								
		reddish-brown, less fines		2" SB	13-23-10 (33)	1.4		
		SAND; orng, med, fn-grnd, sm slt, mst, lmnt stng (SP-SM)	5775.6	3" TW		0.3		
20								
		SANDY SHALE; sev wx, olv, soft, sm slt, sm cl, mst	5770.0	3" TW		0.5	45+	
25								Bottom of boring @ 24.5'

P-ST-016A

FIGURE 208

LOG OF BORING

BLACK & VEATCH
Consulting Engineers

BORING NO. B-95

CLIENT	PROJECT NO.	SHEET OF
Platte River Power Authority	7750	1 2

PROJECT	LOCATION	ELEVATION
Rawhide Energy Project	N-562,320 E-2,125,100	5772.0

DRILLING CONTRACTOR	DRILL RIG TYPE AND NO.	DRILLER
Hogan & Olhausen, Inc.	C.M.E. 55	C. Dearmore

DIRECTION AND INCLINATION OF HOLE	DATE	INSPECTOR
Vertical	2-15-78	L. Almaleh

DEPTH IN FEET	LOG	CLASSIFICATION OF MATERIAL (DESCRIPTION)	ELEV. FT., MSL	SAMPLER & BIT	BLOWS/6 IN. INCREMENTS (PER FOOT)	SAMPLE RECOVERY	PENETROMETER READING, TSF	REMARKS
		SILTY SAND; crs to fn-grnd, tan to white, medium dense, trace fine gravel, moist, calcareous (SM-SC)		2" SB	3-7-7 (14)	1.2		Boring advanced w/4" diameter solid-stem auger
5		clay content increasing						
		alternating layers of SM and SC		2" SB	7-4-4 (8)	1.2		
10				2" SB	10-14-19 (33)			
		SHALE; severely to com weathered, gray-green, little silt, moist, calcareous						
15			5756.6					
		Continued on next page						Boring continued w/NWM double tube core barrel w/diamond bit using water as drilling fluid

FIGURE 209

LOG OF BORING

BLACK & VEATCH
Consulting Engineers

BORING NO. B-95

PROJECT	PROJECT NO.	SHEET	OF
Rawhide Energy Project	7750	2	2

DEPTH IN FEET	LOG	UNIT	CLASSIFICATION OF MATERIAL (DESCRIPTION)	ELEV. FT., MSL	SAMPLE OR RUN	N	% REC / % RQD	REMARKS
		PIERRE SHALE	SHALE; severely weathered, olive green and gray, soft to medium, silty, sandy, iron oxide stained		R-1 C.L.1.0'		69/0	
20					R-2		100/0	5° joint 20° joint
25					R-3		100/38	approximate 5 gallon water loss during Run 3
					R-4 C.L.0.4'		43/0	
30					R-5 C.L.0.6'		70/15	50% circulation loss from 31.1' to 34.0'
			SHALE; slightly weathered, gray, medium to moderately hard, silty, sandy, fossiliferous, calcareous in part	5740.9				
35					R-6		100/66	
				5733.4	R-7 C.L.0.9'		64/40	
40								Bottom of boring @ 38.6'

FIGURE 210

P-ST-019A

LOG OF BORING

BLACK & VEATCH
Consulting Engineers

BORING NO. B-96

CLIENT	PROJECT NO.	SHEET OF
Platte River Power Authority	7750	1 2

PROJECT	LOCATION	ELEVATION
Rawhide Energy Project	N-561,410 E-2,127,270	5761.5

DRILLING CONTRACTOR	DRILL RIG TYPE AND NO.	DRILLER
Hogan & Olhausen, Inc.	C.M.E. 55	C. Dearmore

DIRECTION AND INCLINATION OF HOLE	DATE	INSPECTOR
Vertical	2-17-78	L. Almaleh

DEPTH IN FEET	LOG	CLASSIFICATION OF MATERIAL (DESCRIPTION)	ELEV. FT., MSL	SAMPLER & BIT	BLOWS/6 IN. INCREMENTS (PER FOOT)	SAMPLE RECOVERY	PENETROMETER READING, TSF	REMARKS
		SAND; white, medium dense, coarse to fine-grained, little to some silt, little fine gravel, moist, very calcareous (SM)		2" SB	5-5-12 (17)	1.2		Boring advanced w/4" diameter solid-stem auger
5								
		(SP-SM)		2" SB	12-19-25 (44)	1.5		
10				3" TW		2.1	2.5	
15		medium dense, trace to some fine gravel (SP-SM)		2" SB	5-10-12 (22)	1.2		
		a layer of silt (ML) at ≈ 16'						
20		SAND; light brown, dense, coarse to fine-grained, some fine gravel, trace silt (SW-SM)		2" SB	18-25-25 (50)	1.4		
25		becoming very dense		2" SB	20-38-35 (73)	1.5		
30				2" SB	30-40-25 (65)	1.5		
35		Continued on next page						

FIGURE 211

LOG OF BORING

BLACK & VEATCH
Consulting Engineers

BORING NO. B-96

PROJECT	PROJECT NO.	SHEET OF
Rawhide Energy Project	7750	2 2

DEPTH IN FEET	LOG	CLASSIFICATION OF MATERIAL (DESCRIPTION)	ELEV. FT., MSL	SAMPLER & BIT	BLOWS/6IN. INCREMENTS (PER FOOT)	SAMPLE RECOVERY	PENETROMETER READING, TSF	REMARKS
		reddish-tan, little silt		2" SB	25-37-33 (70)	1.5		
40		trace fine gravel, trace clay (SW)		2" SB	21-50-45 (95)	1.5		
45				2" SB	32-43-45 (88)	1.5		
50		SHALE; sev wx, olv-grn, sft ltl fn snd, mst, v fsl	5710.1	3" TW		1.0	4.5	
								Bottom of boring @ 51.4'
55								

FIGURE 212

P-ST-017A

CONSULTING ENGINEERS

LOG OF BORING

BORING No. B-126

CLIENT	PROJECT NO	ELEVATION	SHEET OF
Platte River Power Authority	7750	5711.0	1 1

PROJECT	LOCATION	DATE: START FINISH
Rawhide Energy Project	N-560,330 E-2,126,530	6/1/79 6/1/79

DEPTH (FEET)	PROJECT RECOVERY	RQD	SPT N VALUE	SAMPLE	LOG	CLASSIFICATION	ELEVATION (FEET)	UNIT	REMARKS
0						Silty Clay; dark grayish brown; firm; moist; trace roots; trace gravel (Topsoil)		CL	Boring drilled w/6" diameter flight-stem auger
						Sandy Clay; pale yellow; firm; dry; highly calcareous; trace gravel		CL	
			45			Clayey Sand; light olive brown; dense; fine to coarse grained; dry; some gravel; highly calcareous	5704.5	SC	
			58			Shale; silty; olive; highly weathered; severely iron stained		PIERRE SHALE	
			15/7.5"			grading dark olive gray; moderately weathered; less iron staining			Boring cont'd w/4" split tube core bit with carbide insert bit using water as drlg fluid
	83	0				highly calcareous 16.8'-17.0' below 17.0' grading olive			
							5691.6		Bottom of boring at 19.4' Water level not recorded

P-31-02A

BLACK & VEATCH
CONSULTING ENGINEERS

LOG OF BORING

BORING NO. B-127

CLIENT	PROJECT NO	ELEVATION	SHEET OF
Platte River Power Authority	7750	5751.0	1 1

PROJECT	LOCATION	DATE: START FINISH
Rawhide Energy Project	N-561,120 E-2,136,500	6/1/79 6/1/79

DEPTH (FEET)	PERCENT RECOVERY	RQD	SPT N VALUE	SAMPLE	LOG	CLASSIFICATION	ELEVATION (FEET)	UNIT	REMARKS
0						Sandy Clay; dark brown; firm slightly moist; trace roots; some gravel (Topsoil)		CL	Boring drilled w/6" diameter hollow-stem auger
1 2 3 4 5			23			Clayey Sand; pink; medium dense; fine grained; dry; trace roots; calcareous		SC	
6 7 8 9			39			Gravelly Sand; pink; dense; fine to medium grained; slightly moist; trace clay; calcareous		SP	
10						Sandy Gravel; light brown		GP	
1 2 3 4 5 6 7 8			25			Clayey Sand; light yellowish brown; medium dense; fine grained; slightly moist; highly calcareous		SC	
9			32			Shale; silty; sandy; olive; slightly calcareous; highly weathered; iron stained throughout	5733.0	PIERRE SHALE	
2 1 7 8			180			grading olive gray			
9 0 1 2 3 4 5 6 7 8 9			155			grading dark olive gray; moderately weathered			
3 1 2 3 4 5 6 7 8 9			50/3"			grading dark gray; slightly weathered			Boring cont'd w/RX split tube core bit with carbide insert bit using water as drlg fluid
2	100	100				very dark gray; thick bedded; fresh			
4							5712.1		Bottom of boring at 38.9 water level not recorded

FIGURE ____

BLACK & VEATCH
CONSULTING ENGINEERS

LOG OF BORING

BORING NO. BT-128

CLIENT	PROJECT NO.	ELEVATION	SHEET	OF
Platte River Power Authority	7750	5731.7	1	1

PROJECT	LOCATION	DATE: START	FINISH
Rawhide Energy Project	N-561,760 E-2,126,250	6/4/79	6/4/79

DEPTH (FEET)	PENETRATION RECOVERY	RQD	SPT N VALUE	SAMPLE	LOG	CLASSIFICATION	ELEVATION (FEET)	UNIT	REMARKS
0						Silty Clay; brown; soft; dry; trace roots; some sand (Topsoil)		CL	Boring drilled w/6" diameter hollow-stem auger
1						Sandy Clay; yellowish brown; firm; dry; trace gravel; highly calcareous		CL	
2									
3									
4									
5						Silty Clay; olive; stiff; some sand; dry; calcareous (Residual Shale)		CL	
6							5725.7		
7									
8						Shale; silty; sandy; olive gray; highly weathered; iron stained throughout		PIERRE SHALE	
9			94						
10									
11									
12									
13			106			grading moderately weathered			
14									
15									
16									
17									
18			127			grading olive gray and dark gray banded; medium bedded; calcareous vertical iron stained fracture			Boring cont'd w/NX split tube core brl with carbide insert bit using water as drlg fluid
19									
20									
21	93	3'				grading dark gray; slightly weathered; occasional anhydrite partings			
22									
23									
24									
25							5707.3		Bottom of boring at 24.4' Water level not recorded
26									
27									
28									
29									
30									
31									
32									

P-ST-01KA

FIGURE _____

BLACK & VEATCH
CONSULTING ENGINEERS

LOG OF BORING

BORING NO. B-129

CLIENT	PROJECT NO	ELEVATION	SHEET OF
Platte River Power Authority	7750	5777.0	1 2

PROJECT	LOCATION	DATE: START	FINISH
Rawhide Energy Project	N-562,510 E-2,126,150	6/4/79	6/4/79

DEPTH (FEET)	PERCENT RECOVERY	RQD	SPT N VALUE	SAMPLE	LOG	CLASSIFICATION	ELEVATION (FEET)	UNIT	REMARKS
0						Sandy Clay; dark brown; firm; trace roots; some gravel; (Topsoil)		CL	Boring drilled w/6" diameter hollow-stem auger
1						Sandy Gravel; light brown; medium dense; dry		GP	
2			45			Gravelly Sand; brown; dense; fine to coarse grained; dry; calcareous		SP	
5						Clayey Sand; very pale brown; medium dense; fine grained; dry; highly calcareous			
			28					SC	
10									
12			46			Clayey Sand; light brown; medium dense; fine to medium grained; dry; calcareous; trace gravel			
15			54			grading fine to coarse grained; numerous gravel		SC	
20			52						
			31			Sandy Clay; hard; yellowish brown; slightly moist; calcareous		CL	
30						Gravelly Sand; light brown; dense; fine to coarse grained; dry; calcareous		SP	
			32			Sandy Clay; brownish yellow; very stiff; slightly moist; calcareous	5742.5	CL-SC	
						grading moist grading clayey sand grading light olive gray			
			24						
4						Continued on next page			

P-51-036A

FIGURE _____

BLACK & VEATCH
CONSULTING ENGINEERS

LOG OF BORING

BORING NO. B-129 ctd.

CLIENT	PROJECT NO	ELEVATION	SHEET OF
Platte River Power Authority	7750	5777.0	2 2

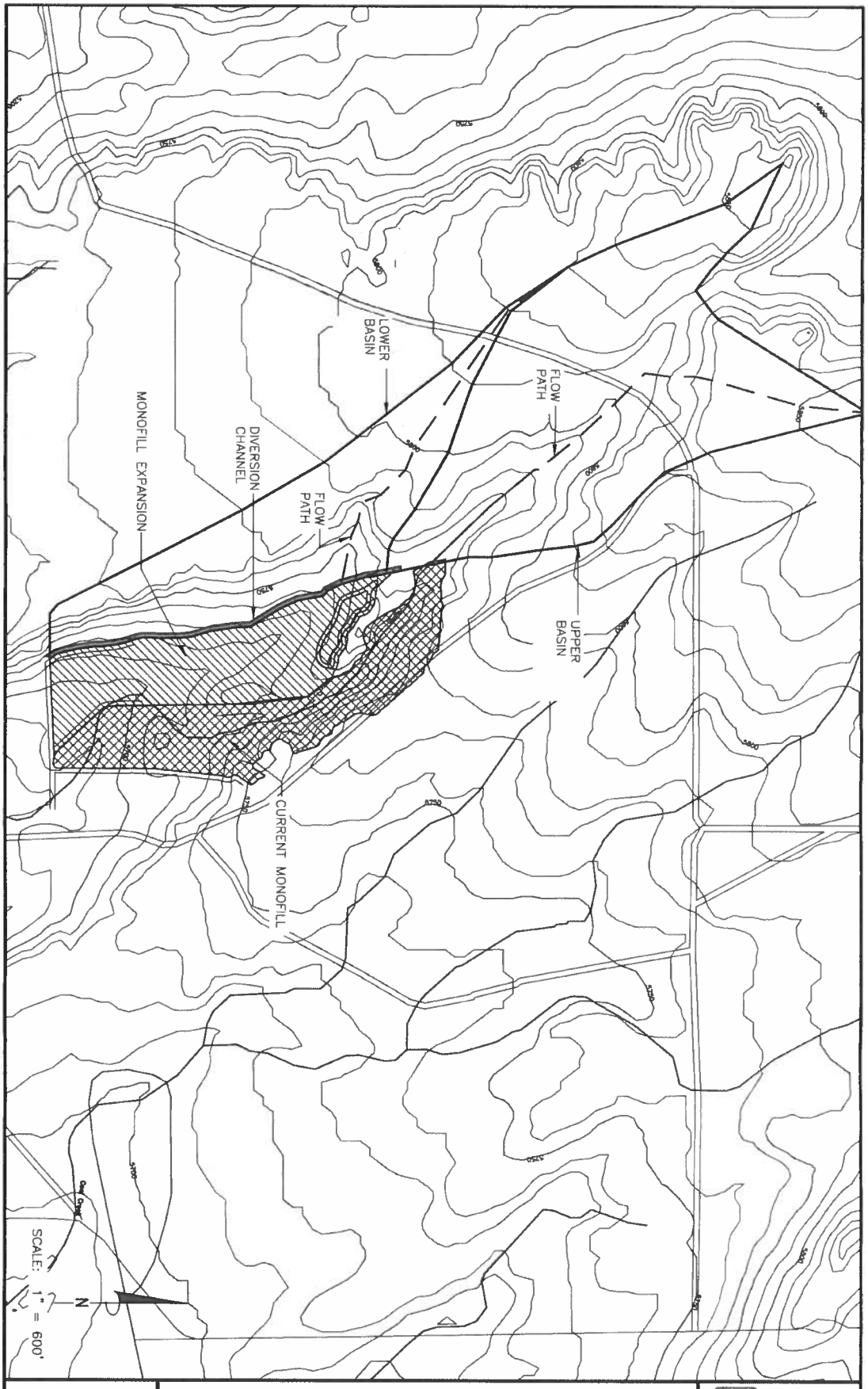
PROJECT	LOCATION	DATE: START	FINISH
Rawhide Energy Project	N-562,510 E-2,120,150	6/4/79	6/4/79

DEPTH (FEET)	PERCENT RECOVERY	RQD	SPT N VALUE	SAMPLE	LOG	CLASSIFICATION	ELEVATION (FEET)	UNIT	REMARKS
40									
1									
2									
3			15			trace gravel			
4									
5									
6									
7							5730.5	PIERRE SHALE	Boring cont'd w/HX split tube core brl with carbide insert bit using water as drlg fluid
8						Shale; silty; sancy; olive gray; medium bedded; highly weathered; iron stained throughout fractures at intervals of 0.1' calcareous at 50.9' below 51.2' dark gray and olive mottled; moderately weathered			
9			137/9"						
50									
1									
2	71	71							
3									
4									
5							5722.6		
6									Bottom of boring at 54.4'
7									Water level not recorded
8									
9									
60									
1									
2									
3									
4									
5									
6									
7									
8									
9									
70									
1									
2									
3									
4									
5									
6									
7									
8									
9									
80									

P-51-016A

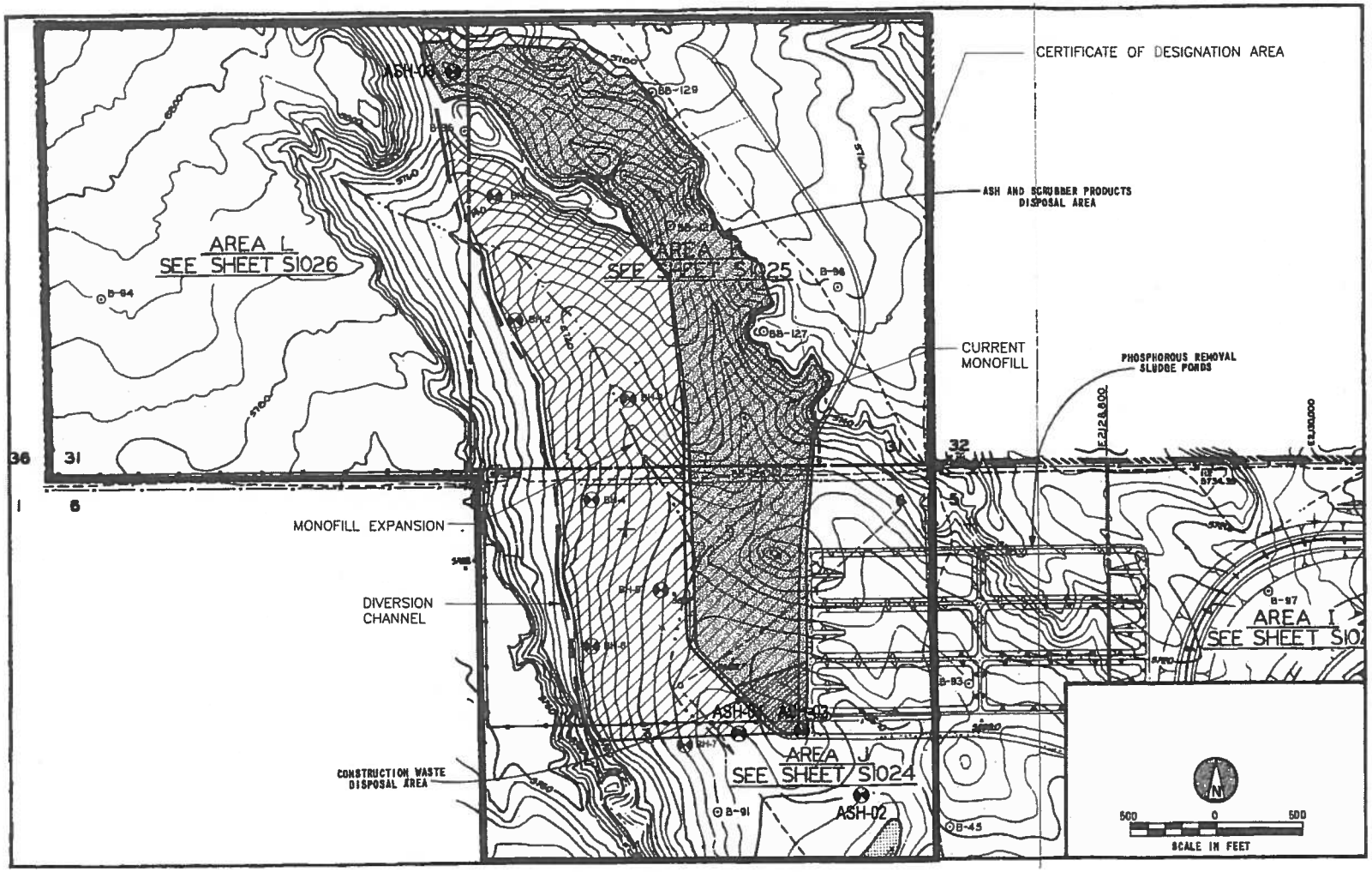
FIGURE _____

Attachment 2
Revised Design and Operations Plan for the Solid Waste Disposal Facility, Rawhide Energy Station, November 2007 (selected figures)



Project: 07.028	FIGURE A.1	Smith Geotechnical ENGINEERING CONSULTANTS
Date: November 2007	MONOFILL EXPANSION BASINS	

AECOM

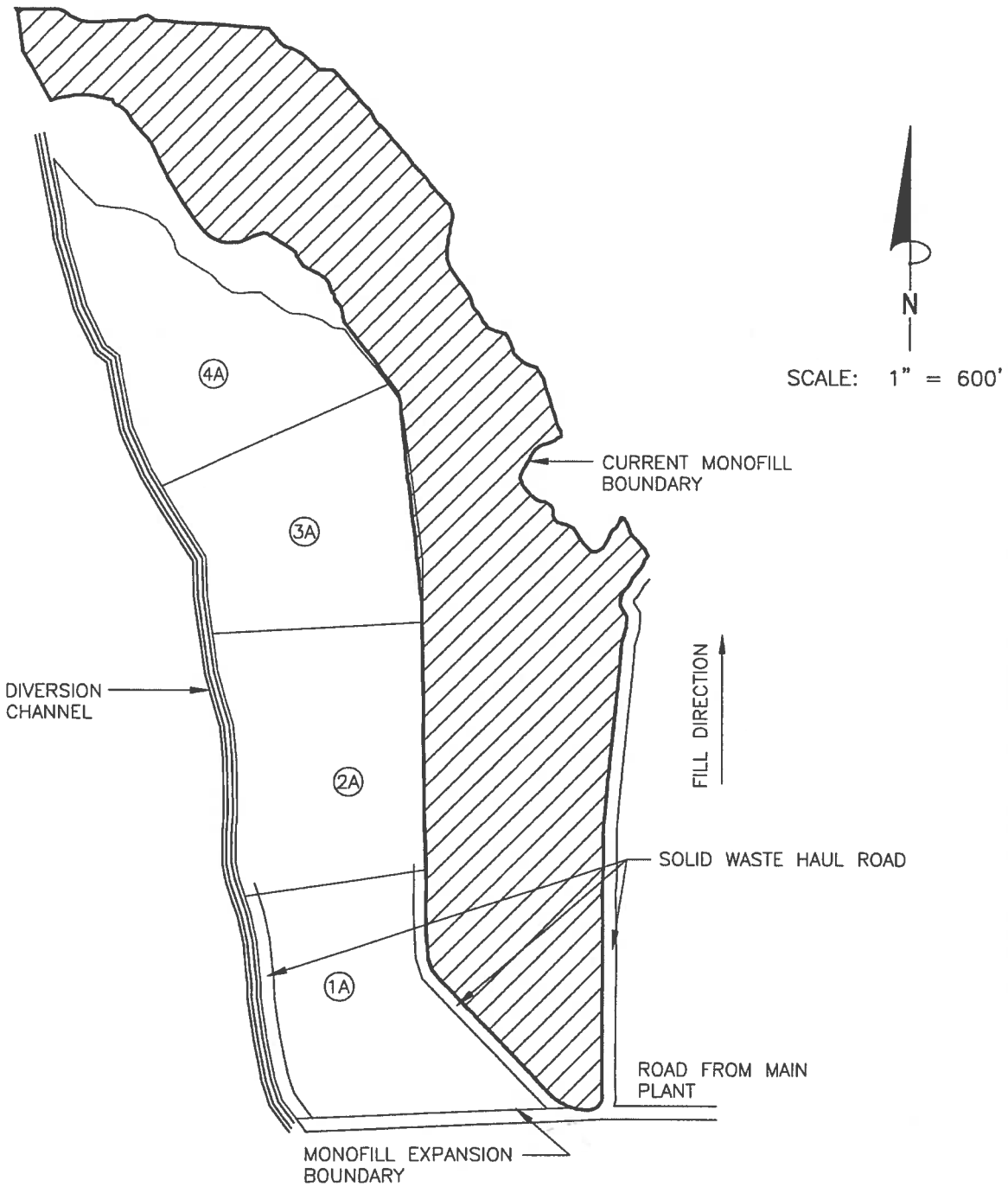


Reference Smith Geotechnical 2007 Figure 1

Job No	60431998
Prepared By	JMC
Date	4/19/16

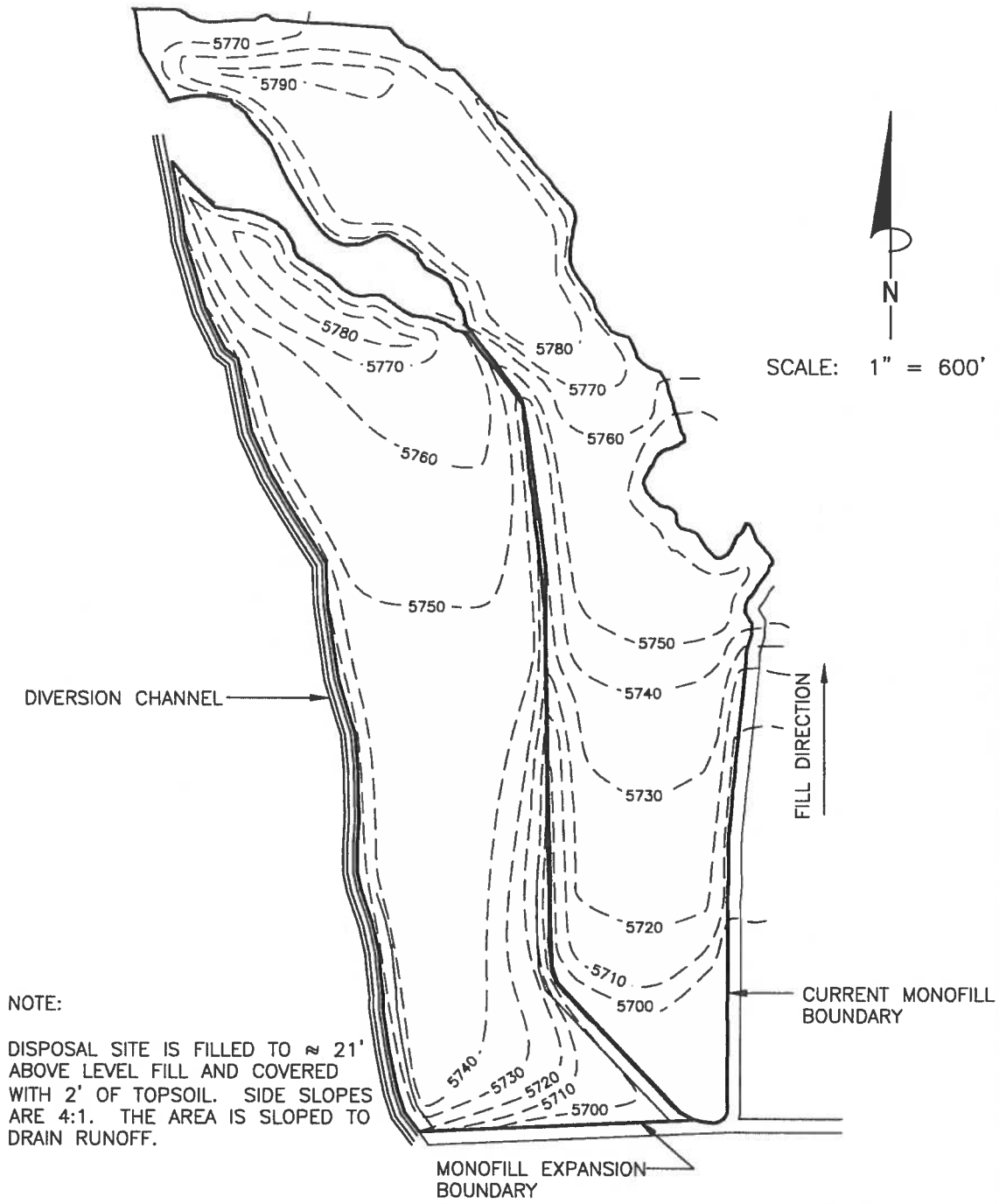
SUBSURFACE BORING LOCATIONS FOR CELL 2

FIG. 1.3



(REFERENCE PLATTE RIVER 1980 FIGURE 11)

Project: 07.028	**FIGURE 2** **SOLID WASTE DISPOSAL SITE FILL SEQUENCE**	Smith Geotechnical ENGINEERING CONSULTANTS
Date: November 2007		

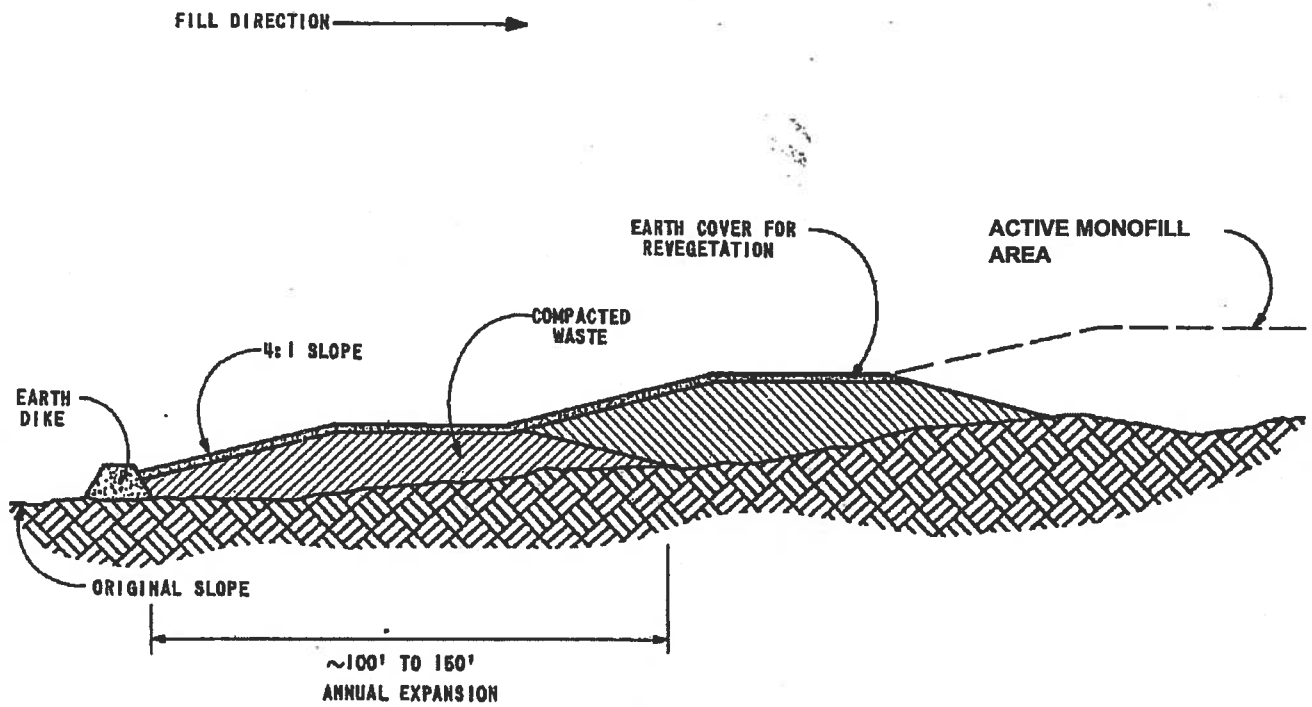


NOTE:

DISPOSAL SITE IS FILLED TO ≈ 21' ABOVE LEVEL FILL AND COVERED WITH 2' OF TOPSOIL. SIDE SLOPES ARE 4:1. THE AREA IS SLOPED TO DRAIN RUNOFF.

(REFERENCE PLATTE RIVER 1980 FIGURE 13)

Project: 07.028	**FIGURE 4** **SOLID WASTE DISPOSAL SITE FINAL CONTOURS**	Smith Geotechnical ENGINEERING CONSULTANTS
Date: November 2007		



(REFERENCE PLATTE RIVER 1980 FIGURE 12)

Project: 07.028	**FIGURE 3** **FILLING AND RECLAMATION OPERATION,** **TYPICAL NORTH-SOUTH CROSS SECTION**	Smith Geotechnical ENGINEERING CONSULTANTS
Date: November 2007		

Smith Geotechnical
ENGINEERING CONSULTANTS

BORING LOG

BORING NO. BH-1

PROJECT	JOB NO.	SHEET	OF
Rawhide Ash Landfill	07.028	1	1

CLIENT	FIELD ENGINEER
PRPA	Kent Flowers
DRILLING COMPANY	**DRILL RIG**
High Plains Drilling	CME-55 Buggy with 4"CFA

LOCATION	ELEVATION	DATE
	Grade	07/18/07

DEPTH (Feet)	LOG	DESCRIPTION OF MATERIAL	BLOWS/6 IN. INCREMENTS (PER FOOT)	REC.	REMARKS
0		TOPSOIL:			
		CLAY: tan, damp, very stiff, plastic, with fine grained sand	9/17 (26)	4	
5		CLAYSTONE: tan moist, very soft, complete weathering, plastic	50 for 12" (>50)	4	
10		CLAYSTONE: tan moist, very soft, very severe weathering, plastic	50 for 8" (>50)	4	
		EOH:			
15					
20					
25					
30					

Smith Geotechnical
ENGINEERING CONSULTANTS

BORING LOG

BORING NO. BH-2

PROJECT	JOB NO.	SHEET	OF
Rawhide Ash Landfill	07.028	1	1

CLIENT	FIELD ENGINEER
PRPA	Kent Flowers
DRILLING COMPANY	**DRILL RIG**
High Plains Drilling	CME-55 Buggy with 4"CFA

LOCATION	ELEVATION	DATE
	Grade	07/18/07

DEPTH (Feet)	LOG	DESCRIPTION OF MATERIAL	BLOWS/6 IN. INCREMENTS (PER FOOT)	REC.	REMARKS
0		TOPSOIL:			
5		CLAYSTONE: tan moist, very soft, complete weathering, plastic	10 / 16 (26)	4	
10		CLAYSTONE: tan, moist, soft. very severe weathering. plastic	50 for 11" (>50)	4	
		EOH:			
15					
20					
25					
30					

Smith Geotechnical
ENGINEERING CONSULTANTS

BORING LOG

BORING NO. BH-3

PROJECT	JOB NO.	SHEET	OF
Rawhide Ash Landfill	07.028	1	1

CLIENT	FIELD ENGINEER
PRPA	Kent Flowers
DRILLING COMPANY	**DRILL RIG**
High Plains Drilling	CME-55 Buggy with 4"CFA

LOCATION	ELEVATION	DATE
	Grade	07/18/07

DEPTH (Feet)	LOG	DESCRIPTION OF MATERIAL	BLOWS/6 IN. INCREMENTS (PER FOOT)	REC.	REMARKS
0		TOPSOIL:			
		CLAY: tan, damp, very stiff, plastic, with fine grained sand	8/9 (17)	4	
5		CLAY: tan, damp, plastic, very stiff, with fine grained sand	9/11 (20)	4	
10		CLAYSTONE: tan, moist, very soft, very severe weathering, plastic	50 for 12" (>50)	4	
		EOH:			
15					
20					
25					
30					

Smith Geotechnical
ENGINEERING CONSULTANTS

BORING LOG

BORING NO. BH-4

PROJECT	JOB NO.	SHEET	OF
Rawhide Ash Landfill	07.028	1	1

CLIENT	FIELD ENGINEER
PRPA	Kent Flowers

DRILLING COMPANY	DRILL RIG
High Plains Drilling	CME-55 Buggy with 4"CFA

LOCATION	ELEVATION	DATE
	Grade	07/18/07

DEPTH (Feet)	LOG	DESCRIPTION OF MATERIAL	BLOWS/6 IN. INCREMENTS (PER FOOT)	REC.	REMARKS
0		TOPSOIL:			
5		CLAY: tan, damp, stiff, plastic, with fine grained sand	6/4 (10)	4	
10		CLAYSTONE: tan, moist, very soft, complete weathering, plastic EOH:	14/15 (29)	4	
15		CLAYSTONE: tan, moist, soft very severe weathering, plastic EOH:	50 for 7" (>50)	4	
20					
25					
30					

Smith Geotechnical
ENGINEERING CONSULTANTS

BORING LOG

BORING NO. BH-5

PROJECT	JOB NO.	SHEET	OF
Rawhide Ash Landfill	07.028	1	1

CLIENT	FIELD ENGINEER
PRPA	Kent Flowers
DRILLING COMPANY	**DRILL RIG**
High Plains Drilling	CME-55 Buggy with 4"CFA

LOCATION	ELEVATION	DATE
	Grade	07/18/07

DEPTH (Feet)	LOG	DESCRIPTION OF MATERIAL	BLOWS/6 IN. INCREMENTS (PER FOOT)	REC.	REMARKS
0		TOPSOIL:			
5		CLAYSTONE: tan, moist, very soft, complete weathering, plastic	11/18 (29)	4	
10		CLAYSTONE: tan, moist, soft, very severe weathering, plastic	50 for 11" (>50)	4	
		EOH:			
		EOH:			
15					
20					
25					
30					

Smith Geotechnical
ENGINEERING CONSULTANTS

BORING LOG

BORING NO. BH-6

PROJECT	JOB NO.	SHEET	OF
Rawhide Ash Landfill	07.028	1	1

CLIENT	FIELD ENGINEER
PRPA	Kent Flowers

DRILLING COMPANY	DRILL RIG
High Plains Drilling	CME-55 Buggy with 4"CFA

LOCATION	ELEVATION	DATE
	Grade	07/18/07

DEPTH (Feet)	LOG	DESCRIPTION OF MATERIAL	BLOWS/6 IN. INCREMENTS (PER FOOT)	REC.	REMARKS
0		TOPSOIL:			
5		CLAY: tan moist, stiff, plastic, with fine grained sand	5/8 (13)	4	
10		CLAYSTONE: tan, moist, very soft, very severe weathering, plastic	50 for 12" (>50)	4	
		EOH:			
15					
20					
25					
30					

Smith Geotechnical
ENGINEERING CONSULTANTS

BORING LOG

BORING NO. BH-7

PROJECT	JOB NO.	SHEET	OF
Rawhide Ash Landfill	07.028	1	1

CLIENT	FIELD ENGINEER
PRPA	Kent Flowers
DRILLING COMPANY	**DRILL RIG**
High Plains Drilling	CME-55 Buggy with 4"CFA

LOCATION	ELEVATION	DATE
	Grade	07/18/07

DEPTH (Feet)	LOG	DESCRIPTION OF MATERIAL	BLOWS/6 IN. INCREMENTS (PER FOOT)	REC.	REMARKS
0		TOPSOIL:			
		CLAY: tan moist, very stiff, plastic, with fine grained sand	9/8 (17)	4	
5		CLAY: tan moist, very stiff, plastic, with fine grained sand	9/10 (19)	4	
10		CLAYSTONE: tan, moist, very soft, complete weathering, plastic	11/19 (30)	4	
15		CLAYSTONE: tan, moist, soft, very severe weathering, plastic	50 for 9"	4	
		EOH:			
20					
25					
30					

Attachment 3
CDPHE Approval of Modification to Engineered Design and Operations Plan, Rawhide Energy Station Coal Ash Disposal Facility, January 25, 2008

STATE OF COLORADO

Bill Ritter, Jr., Governor
James B. Martin, Executive Director

Dedicated to protecting and improving the health and environment of the people of Colorado

4300 Cherry Creek Dr. S.
Denver, Colorado 80246-1530
Phone (303) 692-2000
TDD Line (303) 691-7700
Located in Glendale, Colorado

http://www.cdphe.state.co.us

Laboratory Services Division
8100 Lowry Blvd.
Denver, Colorado 80230-6928
(303) 692-3090

Colorado Department
of Public Health
and Environment

CERTIFIED MAIL #7005 1820 0000 3213 5517
Return Receipt Requested

January 25, 2008

Mr. Christopher R. Wood
Platte Rover Power Authority
2000 E. Horsetooth Road
Fort Collins, Colorado 80525

RE: Approval of Modification to Engineered Design and Operations Plan
Rawhide Energy Station Coal Ash Disposal Facility
Larimer County, Colorado
SW/LAR/RAW 2.2

Dear Mr. Wood:

Thank you for providing the Colorado Department of Public Health and Environment, Hazardous Materials and Waste Management Division ("the Division") with your request to modify the Engineered Design and Operations Plan ("EDOP") for the Rawhide Energy Station Coal Ash Disposal facility in Larimer County, Colorado ("the facility"). The EDOP was submitted to the Division under the requirements of the "Regulations Pertaining to Solid Wastes Sites and Facilities" (6 CCR 1007-2, "the Regulations") and the Section 30-20-100 *et. seq.* of the Colorado Revised Statutes ("Colorado Solid Waste Act," "the Act.").

The proposed EDOP modification would allow the facility to expand the current footprint of waste management area for the facility's landfill to the west of the current waste disposal site. The expansion of approximately 60.91 acres would allow for the facility to begin management of wastes in the remainder of the entire permitted site area of 122.91 acres, as approved in the facility's Certificate of Designation granted by Larimer County. The expansion would include construction of a permanent surface water diversion canal to the western border of the proposed waste pile expansion. This diversion canal was originally proposed and approved in the original EDOP and will be constructed adjacent to the waste. The expansion is proposed to begin at the south of the permitted area, working its way to the north of the facility. Borehole sample data in support of the proposed expansion indicate that soil and ground water conditions in the area are similar to those observed in the current waste management area.

Based on the information provided, the Division approves the modified EDOP as submitted. This EDOP modification incorporates by reference the Department's January 24, 2008 approved waiver for explosive gas monitoring at the site. As required under Section 3.2.7 of the Regulations, you must provide the Division and the local governing body having jurisdiction (Larimer County Commissioners) with a report documenting that the design construction for the expansion of the facility has been completed in accordance with the approved EDOP ("Construction Quality Assurance report," "CQA report") prior to accepting and managing waste in each proposed expansion module identified in the EDOP. The CQA report must be signed by a Colorado registered professional engineer and reviewed and approved by the Department. In addition, any financial assurance established for the facility must be adjusted to take into account the increase in acreage size where wastes are being managed. This information must be submitted in the facility's next financial assurance update due to the Division.

In closing, please note the Department is authorized to bill for its review of technical submittals pursuant to 30-20-109(2)(b). An invoice for the Division's review of the above referenced document will be transmitted under separate cover.

If you have any additional questions or concerns, please contact me at (303) 692-3347, or by e-mail at caren.johannes@state.co.us.

Sincerely,

Caren Johannes
Solid Waste Unit
Solid and Hazardous Waste Program

cc: Larimer County Commissioners
Mr. Rich Grossmann, Larimer County Department of Health and Environment

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STATE OF COLORADO

Bill Ritter, Jr., Governor
James B. Martin, Executive Director

Dedicated to protecting and improving the health and environment of the people of Colorado

4300 Cherry Creek Dr. S.
Denver, Colorado 80246-1530
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Located in Glendale, Colorado

http://www.cdphe.state.co.us

Laboratory Services Division
8100 Lowry Blvd.
Denver, Colorado 80230-6928
(303) 692-3090

Colorado Department
of Public Health
and Environment

January 24, 2008

Mr. Christopher R. Wood
Platte Rover Power Authority
2000 E. Horsetooth Road
Fort Collins, Colorado 80525

RE: Waiver Request for Explosive Gas Monitoring
Design and Operations Plan, Coal Ash Disposal Facility
Rawhide Energy Station, Larimer County, Colorado
SW/LAR/RAW 2.5

Dear Mr. Wood:

Thank you for providing the Colorado Department of Public Health and Environment, Hazardous Materials and Waste Management Division ("the Division") with your wavier request to delete requirements for explosive gas monitoring at the Rawhide Energy Station Coal Ash Disposal facility in Larimer County, Colorado ("the facility"). This request was made based on the non-putrescent nature of the material being disposed at the facility (waste bottom ash, phosphorus sludge and inorganic construction wastes) as per the facility's Design and Operations Plan and Certificate of Designation.

Based on the information provided, the Division approves the waiver as submitted. This waiver shall be incorporated into the facility's Design and Operation Plan. At any time the facility no longer meets the waiver criteria, the waiver is void and ceases to exist. We have consulted with Larimer County on our approval of the waiver. If you have any additional questions or concerns, please contact me at (303) 692-3347, or by e-mail at caren.johannes@state.co.us.

Sincerely,

Caren Johannes
Solid Waste Unit
Solid and Hazardous Waste Program

cc: Mr. Rich Grossmann, Larimer County Department of Health and Environment
Larimer County Commissioners

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Attachment 4
CDPHE Approval of Construction Quality Assurance Report, Rawhide Energy Station Coal Ash Disposal Facility, March 12, 2010

STATE OF COLORADO

Bill Ritter, Jr., Governor
James B. Martin, Executive Director

Dedicated to protecting and improving the health and environment of the people of Colorado

4300 Cherry Creek Dr. S.
Denver, Colorado 80246-1530
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Laboratory Services Division
8100 Lowry Blvd.
Denver, Colorado 80230-6928
(303) 692-3090

Colorado Department
of Public Health
and Environment

March 12, 2010

Mr. Christopher R. Wood
Platte Rover Power Authority
2000 E. Horsetooth Road
Fort Collins, Colorado 80525

RE: Approval of Construction Quality Assurance Report
Rawhide Energy Station Coal Ash Disposal Facility
Larimer County, Colorado
SW/LAR/RAW 2.3

Dear Mr. Wood:

Thank you for providing the Colorado Department of Public Health and Environment, Hazardous Materials and Waste Management Division ("the Division") with the Construction Quality Assurance Report for the Monofill Expansion Project ("the CQA Report") for the Rawhide Energy Station Coal Ash Disposal facility in Larimer County, Colorado ("the facility"). The CQA Report was submitted to the Division under the requirements of the "Regulations Pertaining to Solid Wastes Sites and Facilities" (6 CCR 1007-2, "the Regulations") and the Section 30-20-100 *et. seq.* of the Colorado Revised Statutes ("Colorado Solid Waste Act," "the Act"). The CQA Report as reviewed by the Division included both the November 2009 report on the expansion project received by the Division January 5, 2010 and the "as-built" drawings requested from the facility February 8, 2010 and received by the Division on February 16, 2010.

The CQA Report provides a description of final construction and engineered drawings of the cell expansion conducted at the facility in September and October 2009. The report also includes information concerning the redesign of the drainage swale for the expansion at the facility to divert and control storm water drainage from the monofill for the 100-year, 24-hour event and construction of an embankment berm at the southern end of the monofill expansion to contain drainage from a 25-year, 24-hour event. The drainage swale was reconfigured as a trapezoidal channel with a base width of 30 feet and a maximum grade of 1.25 percent from its original design of base width 10 feet and maximum grade

of 0.5 percent. The report states that the original dimensions for the swale, when overlaid on the topographic map for the expansion area, would have caused erosion problems for the monofill.

Based on our review, the Division approves the CQA Report as submitted. Please ensure that financial assurance documents for the facility are adjusted to take into account the increase in area where wastes are being managed.

In closing, please note the Department is authorized to bill for its review of technical submittals pursuant to 30-20-109(2)(b). An invoice for the Division's review of the above referenced document will be transmitted under separate cover.

If you have any additional questions or concerns, please contact me at (303) 692-3347, or by e-mail at caren.johannes@state.co.us.

Sincerely,

Caren Johannes
Solid Waste Unit
Solid and Hazardous Waste Program

cc: Larimer County Commissioners
Mr. Rich Grossmann, Larimer County Department of Health and Environment

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Attachment 5
Summary of CCR Monofill Volume

FUELS, EMISSIONS and WASTES SUMMARY
RAWHIDE ENERGY STATION

Current as of 12/31/16

------ ANNUAL FUEL, MATERIAL CONSUMPTION and WASTE MANAGEMENT INFORMATION ------

		Scrubber/ Baghouse Info.					Coal Info. Handling and Consumption					Sales & Hg Control		COAL ASH WASTE				Monofill Disposal and Reclamation							
YEAR #	YEAR	Lime tons	Stoich. Ratio [3]	SO2 % Removal	SO2 (tons) Emitted [1]	Sulfate (tons) Collected	Received KTons	Stock-out KTons	Reclaim KTons	Burned KTons	% Ash	S303/S304 Ash Sales tons	B-PAC tons	S301 / S302 / S303 / S304 Flyash/Scrub tons	S306 Bottom Ash tons	S305 / S308 TOTAL tons	Section Number Tables 7 &1	East & West Monofill Waste Accumulation (cubic yds) [2]	(acre feet)	Cumulative with Topsoil @ 2 feet (acre feet)	Percent Full %	West Monofill Waste Accumulation (cubic yds) [2]	(acre feet)	Cumulative with Topsoil @ 2 feet (acre feet)	Percent Full %
1	1984	2,950.0	0.777	47.0%	1,912.5	2,544.0				645.5	4.98%			32,818.0	4,821.9	37,639.9	1	38,110.4	23.62	28.2	1.7%				
2	1985	6,006.0	0.860	78.9%	1,399.3	7,848.7	1,160.3			1,121.6	4.83%			59,902.0	8,126.0	68,028.0	1	106,988.7	66.32	70.9	4.2%				
3	1986	4,375.5	0.842	82.8%	849.4	6,133.5	1,046.0	185.4	190.8	1,051.4	4.81%			53,495.4	7,585.9	61,081.3	1	168,833.5	104.65	109.2	6.5%				
4	1987	4,384.5	0.803	80.5%	1,012.0	6,266.6	1,141.7	35.1	35.4	1,109.3	5.19%			59,587.9	8,635.9	68,223.8	1	237,910.1	147.46	152.1	9.1%				
5	1988	5,800.0	0.841	82.5%	1,146.6	8,108.1	1,176.5	103.5	98.4	1,171.4	5.65%			70,164.6	9,927.6	80,092.2	2	319,003.4	197.73	202.3	12.1%				
6	1989	4,926.0	0.767	82.0%	1,098.4	7,505.7	1,161.9	98.7	60.8	1,129.8	5.23%			62,657.0	8,863.3	71,520.3	2	391,417.7	242.61	246.8	14.8%				
7	1990	4,660.0	0.791	81.7%	1,024.5	6,860.8	1,089.9	78.5	61.1	1,072.5	5.50%			61,660.2	8,848.1	70,508.3	2	462,807.4	286.86	291.1	17.4%				
8	1991	3,970.0	0.733	83.2%	864.9	6,425.0	1,001.3	75.8	60.9	986.4	5.30%			54,832.3	7,841.9	62,674.2	2	526,265.0	326.20	330.4	19.8%				
9	1992	4,174.0	0.769	82.3%	912.9	6,367.1	1,013.7	52.9	39.9	1,000.7	5.54%			57,662.4	8,315.5	65,977.9	2	593,067.6	367.60	371.8	22.3%				
10	1993	5,725.0	0.857	82.6%	1,104.6	7,865.5	1,212.9	72.5	69.5	1,209.8	5.35%			68,607.5	9,708.9	78,316.4	2	672,362.9	416.75	421.0	25.2%				
11	1994	4,578.0	0.903	82.0%	866.9	5,923.8	1,095.6	199.7	179.5	1,075.3	5.21%			58,120.7	8,403.3	66,524.0	2	739,718.4	458.50	462.7	27.7%				
12	1995	3,961.8	0.965	81.7%	713.8	4,780.1	1,055.5	71.4	63.8	1,047.9	5.11%			54,257.5	8,032.2	62,289.6	2	802,786.7	497.60	501.8	30.0%				
13	1996	4,337.6	0.953	82.7%	746.3	5,368.2	1,205.0	58.3	37.9	1,184.7	5.16%			61,666.8	9,169.6	70,836.4	2	874,508.5	542.05	546.3	32.7%				
14	1997	4,214.1	0.935	81.7%	783.4	5,246.2	1,103.6	40.2	30.6	1,094.0	5.31%			58,838.0	8,713.7	67,551.8	2	942,904.6	584.45	588.6	35.2%				
15	1998	5,122.1	1.021	82.2%	848.7	5,878.9	1,043.9	85.9	71.9	1,043.9	5.35%			58,472.4	8,377.3	66,849.7	3	1,010,589.9	626.40	630.6	37.8%				
16	1999	5,599.7	1.003	81.9%	960.4	6,518.5	1,316.6	120.1	43.0	1,263.6	5.40%			70,115.3	10,234.8	80,350.1	3	1,091,944.4	676.83	679.8	40.7%				
17	2000	4,098.6	0.927	82.5%	735.3	5,196.0	1,167.7	57.5	40.6	1,171.8	4.58%			54,911.1	8,050.0	62,961.1	3	1,155,692.5	716.34	719.3	43.1%				
18	2001	5,738.1	1.053	83.9%	834.5	6,513.4	1,312.0	151.7	105.9	1,290.6	5.13%			68,526.4	9,930.9	78,457.2	3	1,235,130.4	765.58	768.6	46.0%				
19	2002	5,381.4	0.988	83.9%	834.5	6,513.1	1,217.0	121.0	77.1	1,184.8	5.29%			65,176.7	9,402.7	74,579.4	3	1,310,642.0	812.38	815.4	48.8%				
20	2003	5,290.1	0.918	84.0%	874.4	6,896.2	1,307.6	101.3	61.4	1,295.1	5.27%			70,172.5	10,232.9	80,405.4	3	1,392,052.5	862.84	865.8	51.8%				
21	2004	4,879.4	0.854	83.6%	892.3	6,807.6	1,313.2	94.5	77.6	1,324.3	5.38%			72,293.7	10,695.3	82,989.0	3	1,476,078.8	914.92	917.9	55.0%				
22	2005	4,298.5	1.004	82.1%	729.3	5,007.1	1,209.3	211.0	116.3	1,127.6	5.32%			60,262.7	8,992.4	69,255.1	3	1,546,199.6	958.39	961.4	57.6%				
23	2006	4,814.7	0.879	83.6%	853.6	6,528.3	1,214.2	94.7	98.7	1,241.1	5.49%	804.8		69,283.0	10,224.7	78,702.9	3	1,625,886.3	1,007.78	1,010.8	60.5%				
24	2007	5,177.8	0.847	84.4%	906.2	7,347.4	1,304.1	121.5	95.5	1,296.3	5.44%	1,227.9		72,482.3	10,580.7	81,835.1	3	1,708,744.4	1,059.14	1,062.1	63.6%				
25	2008	4,300.8	0.825	83.9%	795.5	6,234.1	1,168.0	152.3	115.4	1,147.8	5.34%	1,476.1		62,593.9	9,186.9	70,304.6	1A	1,779,927.8	1,103.26	1,103.3		71,183.4	44.12	48.5	3.0%
26	2009	5,025.8	0.755	84.8%	958.9	8,044.3	1,329.4	84.5	66.7	1,334.0	5.29%	12,226.5		73,032.6	10,581.6	71,387.7	1A	1,852,207.9	1,148.06	1,148.1		143,463.5	88.92	93.3	5.8%
27	2010	4,750.5	0.762	85.0%	887.4	7,554.2	1,274.3	88.0	38.1	1,251.6	5.33%	5,583.2		72,323.0	6,668.7	73,408.5	1A	1,926,533.9	1,194.13	1,194.1		217,789.6	134.99	139.4	8.6%
28	2011	4,745.9	0.772	84.4%	909.4	7,400.3	1,310.0	84.3	42.9	1,281.3	5.21%	11,008.4		72,177.5	6,670.1	67,839.2	1A	1,995,221.2	1,236.71	1,236.7		286,476.8	177.57	182.0	11.2%
29	2012	4,237.8	0.774	84.1%	826.5	6,560.0	1,162.6	80.2	90.5	1,177.9	5.22%	9,572.2		66,126.1	6,147.6	62,701.6	1A	2,058,706.5	1,276.06	1,276.1		349,962.2	216.92	221.3	13.7%
30	2013	4,548.5	0.825	83.0%	891.2	6,517.0	1,255.0	43.9	103.8	1,320.1	5.15%	17,763.9	69.1	72,263.9	6,792.2	61,292.1	1A	2,120,764.8	1,314.52	1,314.5		412,020.4	255.38	259.8	16.0%
31	2014	4,942.5	0.887	83.4%	875.7	6,622.9	1,216.0	177.2	184.4	1,239.9	5.51%	8,954.3	89.1	73,110.8	6,828.5	70,985.1	1A	2,192,637.2	1,359.07	1,359.1		483,892.8	299.93	304.3	18.8%
32	2015	4,861.7	0.954	83.4%	772.6	5,803.1	1,271.7	230.0	52.1	1,107.5	5.59%	9,326.5	82.4	66,283.1	6,192.9	63,149.5	2A	2,256,576.1	1,398.70	1,398.7		547,831.7	339.57	343.8	21.2%
33	2016	4,924.1	0.870	83.5%	885.8	6,741.1	1,242.7	81.3	87.8	1,265.1	5.42%	8,611.2	98.2	73,418.9	6,850.6	71,658.3	2A	2,329,130.1	1,443.68	1,443.7		620,385.8	384.54	388.7	24.0%
34	2017	4,924.1	0.914	81.8%	929.9	6,278.2	1,242.7	81.3	87.8	1,265.1	5.42%	8,611.2	98.2	72,956.0	6,850.6	71,195.4	2A	2,401,215.4	1,488.36	1,488.4		692,471.1	429.22	433.4	26.8%
	Mean	4,750.7	0.871	81.8%	930.5	6,417.8	1,192.2	104.1	80.8	1,162.6	5.27%	7,930.5	87.4	64,125.1	8,426.0	70,725.2	1984-07 Mean	71,197.7	44.1	44.3					
	Maximum	6,006.0	1.053	85.0%	1,912.5	8,108.1	1,329.4	230.0	190.8	1,334.0	5.65%	17,763.9	98.2	73,418.9	10,695.3	82,989.0	Mean	70,579.7	43.7	43.7		68,931.8	42.7	43.2	
	Limits/PTE	8,400.0		80.0%	1,832.5	N/A	2,500.0	1,500.0	1,500.0	1,500.0	11.57%		2,000	148,650	24,750	173,400									
	Change Links								Coal Ash Waste Totals (tons)			95,166	437	2,180,252	286,485	2,371,571									

Note: Flyash/Scrubber Waste = [(Coal Burned x % Flyash) + Lime Used + ((Mass SO2 Emission x 1.5 SO4 Factor) / (1 - SO2 % Removal)*(SO2 % Removal)]

Bottom Ash Waste = (Coal Burned x % Bottom Ash)

Above Assumes 85% Flyash and 15% Bottom Ash - This changed to 90:10 split in 2010.

[1] SO2 (tons) are calculated from CEMS, Part 60 emissions rate and total coal consumption.

[2] Assumes 1.0125 tons per cubic yard ("Engineering Report and Operational Plan for the Solids Waste Disposal Facility", Black & Veatch 12/80)

[3] Stoichiometric Ratio CaO (tons)/SO2 Removed (tons) assumes lime is 95% CaO.

[4] Section date fill estimate based on assumed 80,000 tons/year disposal rate.

Table 7 - Landfill and Reclamation Schedule
(Engineering Report and Operational Plan, December 1980)

Section Number	Section Area (acres)	Section Volume (acre feet)	Start Fill [4] Date (year)	Annual Filled & Reclaimed (acres)	Cumulative Volume (acre feet)
1	9.8	200	1984	2.3	200
2	18.7	425	1988	2.1	625
3	15.8	500	1997	1.5	1,125
4	17.6	545	2007	1.5	1,670

Table 1 - Solid Waste Disposal Site Filling and Reclamation Schedule
(Revised Design and Operational Plan, November 2007)

Section Number	Section Area (acres)	Section Volume (acre feet)	Start Fill [4] Date (year)	Annual Filled & Reclaimed (acres)	Cumulative Volume (acre feet)
1A	15.60	330	2008	2.2	330
2A	16.00	370	2015	2.1	700
3A	14.62	465	2023	1.5	1,165
4A	14.69	455	2032	1.6	1,620

Prepared by Paul Schulz 3/16/2017

Attachment 6
Federal CCR Annual Inspection Form

Federal CCR Annual Inspection Form

Station: PRRA - Rawhide CCR Unit: Ash Monofill

Date: 2/22/2017 Inspector(s): E. Drumright; E. Underwood

Weather Conditions: Sunny turning cloudy, 45deg F; very windy Ground Conditions: Clear

Purpose of Inspection: Per the CCR Rule published by the USEPA and entered into the federal register on April 17, 2015, existing and new CCR landfills are required to be inspected annually by a qualified professional engineer to ensure that the design, construction, operation, and maintenance of the CCR facility is in good condition and conforms to standard engineering practices for this type of facility.

Please refer to the attached figure to mark location of any identified conditions.

CCR UNIT FEATURE	Yes	No	NA	Location ID # or map identifier
CCR Placement				
1) Is waste being handled or placed differently than standard station practices?		X		
Bench Conditions				
2) Any signs of surface cracking?		X		
3) Any signs of depressions or sunken areas?		X		
Slope Conditions				
4) Any signs of surface cracking?		X		
5) Any signs of surface movement? If yes, please categorize		X		
5a) Sloughing (sliding of materials in sheets)		--		
5b) Sliding		--		
5c) Sinking		--		
6) Any signs of erosion rills greater than 3 inches?		X		
7) Any signs of erosion gullies greater than 6 inches?		X		
8) Any signs of holes or animal burrows?	X			Occasional in Cell 2 starter dike.
Haul Road Conditions				
9) Any obstructions?		X		
10) Any noticeable damage? If yes, please categorize		X		
10a) Rutting		--		
10b) Sinking		--		
10c) Pot holes		--		
Erosion Controls				
11) Any areas of active construction lacking erosion controls (silt fence)?		X		
12) Any signs that existing erosion controls are not properly functioning?		X		
13) Any evidence of insufficient vegetative cover?		X		
Liner System Conditions (prior to CCR palcement or during active liner construction)				
14) Any damage to liner protective cover?			X	
15) Any damage to liner system observed?			X	

Federal CCR Annual Inspection Form - CCR Landfills

Station: PRRA - Rawhide CCR Unit: Ash Monofill Date: 2 /22/2017

CCR UNIT FEATURE	Yes	No	NA	Location ID # or map identifier
Leachate Collection/Detection System			X	
16) Any signs of obstruction to leachate collection/detection pipe outlets?			X	
17) Any signs of obstruction to leachate flow(s) to storage lagoon(s)?			X	
Surface Water Controls (Diversion Channels/Collection Channels/Sedimentation Ponds)				
18) Any signs of uncontrolled run-on to the landfill?		X		
19) Any signs of uncontrolled run-off from the landfill		X		
20) Any signs of obstruction in surface water conveyance channels?		X		
21) Any cracking or separation in surface water conveyance channels?		X		
22) Any signs of heaving or sinking of surface water conveyance channels?		X		
23) Any signs of obstruction in culverts, drop boxes, or sumps?		X		
24) Any signs of sedimentation pond malfunction (excessive sediment buildup)?			X	
25) Any signs of excessive sedimentation pond water loss (leaking)?			X	
26) Any signs of obstruction to sedimentation pond outlet structure (in pond)?			X	
27) Any signs of obstruction to sedimentation pond effluent discharge?			X	
Fugitve Dust Controls				
28) Any evidence that fugitive dust controls are not being used?	X			Some windblown ash from working face Cell 2
Other				
29) Any nontypical operations occuring at facility? If yes, please describe.		X		

Additional Comments: After tracking in-place, the horizontal surface of exposed fly ash tends to crust over with slight moisture, due to the cementitious nature of the ash. This helps to limit windblown ash.

Individual Completing Form: Elliott E. Drumright (Print) Elliott E. Drumright (Signature)

Attachment 7
Sample PRPA Weekly Inspection Form

Platte River Power Authority

CCR Landfill
Weekly Inspection Report

Name of CCR Landfill: Rawhide Ash Monofill
Landfill ID Number:
Owner: Platte River Power Authority
Operator: Platte River Power Authority

Qualified Inspector: Courtney Stewart
Date: 2/1/2016 **Time:** 9:00 AM
Weather: Actively Snowing, Snow on Ground

I. Perimeter Slope

1. How would you describe the vegetation on the crest and side slopes? (Check all that apply)

___ Recently Mowed
___ Overgrown (Greater than 6-in.)
x Good Cover
___ Sparse
___ Paved
___ Gravel

Other (describe):

2. Are there any areas of hydrophilic (lush, water-loving) vegetation? ___ Yes x No
If 'Yes', describe (size, location, severity, etc.)

3. Are there any trees or other undesired vegetation on the slope? x Yes ___ No
If 'Yes', describe (type of vegetation, size, location, etc.) Tree located near south edge of landfill and transmission line may be removed. Best management practices are being discussed.

4. Is there an access ramp up the side slope or a road around the perimeter slope? x Yes ___ No
If 'Yes', describe (good condition, numerous cracks, newly paved, stone uniformly distributed, etc.) Ramp is in good condition and is a dirt road which is free from cracks.

5. Are there any depressions, ruts, or holes on the access ramp or road? ___ Yes x No
If 'Yes', describe (size, location, etc.)

6. Are there any cracks, sloughs, bulges, or indications of slope distress? ___ Yes x No
If 'Yes', describe (length and width, location and direction of cracking, slough, or distress, etc.)

7. Do any wet areas indicate seepage through the slope? ___ Yes x No
If 'Yes', describe (size, location, etc.)

8. Are there any active seeps (flowing water) from the slope of the slope? ___ Yes x No
If 'Yes', describe (size, location, flow quantity and color, etc.)

9. Are there any active seeps or wet areas at the toe of the slope? ___ Yes x No
If 'Yes', describe (size, location, etc.)

10. Other observations on the perimeter slope (changes since last inspection, etc.): None.

II. Stormwater Conveyance

1. Is stormwater being properly diverted by the existing infrastructure? x Yes ___ No

Platte River Power Authority

CCR Landfill
Weekly Inspection Report

Name of CCR Landfill: Rawhide Ash Monofill **Qualified Inspector:** Courtney Stewart
Landfill ID Number: **Date:** 2/1/2016 **Time:** 9:00 AM

If 'Yes', describe (size, location, etc.) A stormwater diversion ditch runs along the perimeter of the landfill.

2. Is the stormwater infrastructure in good condition? x Yes ___ No

If 'No', describe (Is there any erosion in or around the structures, signs of leakage or movement, etc?).

III. Landfill Conditions

1. Describe operations in the landfill (disposal, reclamation, general operational activities):
Landfill operations include the disposal of coal ash residuals, and minimizing dust potential. This includes disposing of moist ash residuals, and berming material to reduce wind erosion.

2. Are any stormwater controls obstructed? ___ Yes x No
If 'Yes', describe (type of debris, reason for obstruction, etc.)

3. Are there indications of erosion on the landfill slopes? ___ Yes x No
If 'Yes', describe what type and its condition (rill, gully, dimensions, etc.)

4. Do conditions exist that may require additional dust controls? ___ Yes x No
If 'Yes', describe (location, appropriate dust control measures, etc.)

5. Other observations around the landfill (changes since last inspection, etc.):

IV. Repairs, Maintenance, Action Items

1. Has any routine maintenance been conducted since the last inspection? x Yes ___ No
If 'Yes', describe. The consolidation and compaction of residuals allows for better use of space and reduces wind erosion potential.

2. Have any repairs been made since the last inspection? ___ Yes x No
If 'Yes', describe.

Platte River Power Authority

CCR Landfill
Weekly Inspection Report

Name of CCR Landfill: Rawhide Ash Monofill **Qualified Inspector:** Courtney Stewart
Landfill ID Number: **Date:** 2/1/2016 **Time:** 9:00 AM

3. Are there any areas of potential concern? ___ Yes _x_ No
If 'Yes', describe.

4. Has this inspection identified any need for repair or maintenance? _x_ Yes ___ No
If 'Yes', describe and state the urgency of maintenance. "Urgent" for maintenance that should be conducted as soon as possible, "Moderate" for maintenance that should be conducted within three months, and "Not Urgent" for maintenance that can be conducted in a year.
The tree found on the south end of the landfill may be removed for maintenance. This is not urgent, but will be tended to with best management practices.

V. Photographs

Photographs can be taken of notable features. List of photographs:

	Location	Direction of Photo	Description
i.			
ii.			
iii.			
iv.			
v.			
vi.			
vii.			
viii.			
ix.			
x.			

Attachment 8
Photo Log of 2017 Monofill Inspection

Figure 1: Rawhide Energy Station. The CCR Monofill (Circled) is on the Northwest Side of the Facility.

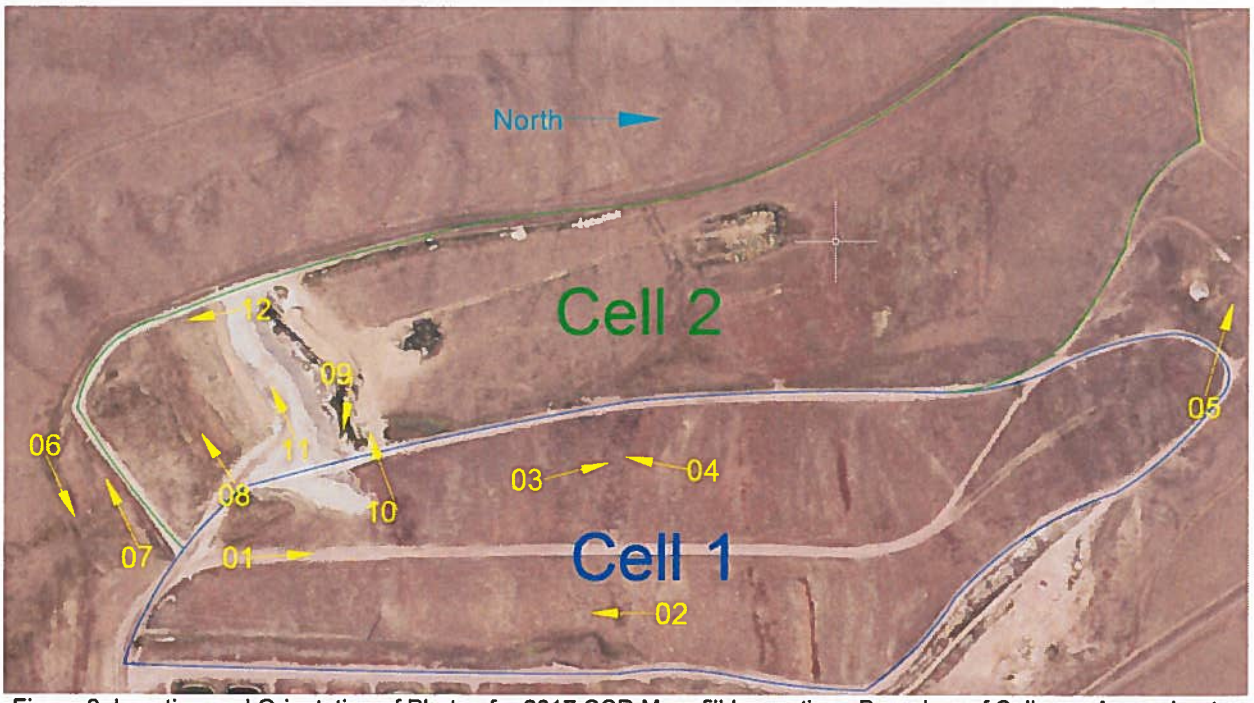

Figure 2: Location and Orientation of Photos for 2017 CCR Monofill Inspection. Boundary of Cells are Approximate.

Photo 01: Cell 1 Crest, Facing North.

Photo 02: Cell 1 East Slope, Facing South.

Photo 03: Cell 1 West Slope, Facing North-Northwest

Photo 04: Cell 1 West Slope, Facing South towards Working Face of Cell 2.

Photo 05: Cell 1, North Slope, Facing Northwest

Photo 06: Monitoring Wells South of Cell 2 Starter Dike, Facing East.

Photo 07: Cell 2 Starter Dike, Facing West

Photo 08: Cell 2 Progressive Reclamation from South (left side) to North (right side).

Photo 09: Excavation into Native Soil (on left) with Working Face (on right).

Photo 10: Cell 2 Working Face, Facing West.

Photo 11: Crusted Surface of Ash Material in Cell 2, Immediately South of Working Face.

Photo 12: Cover Soil Measurement at Cell 2.