GEI Consultants

Geotechnical
Environmental and
Water Resources
Engineering

FINAL

Specific Site Assessment for Coal Combustion Waste Impoundments at Arizona Electric Power Cooperative (AEPCO) Apache Power Plant

Cochise, Arizona

Submitted to:
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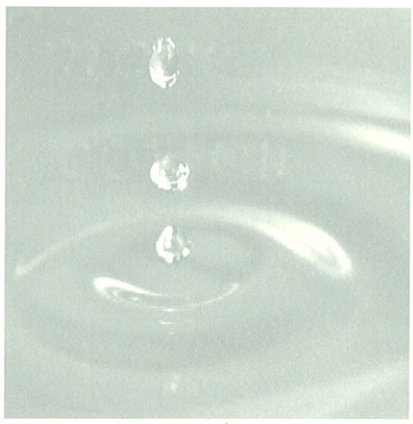

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1.0 Introduction

1.1 Purpose

This report presents the results of a specific site assessment of the dam safety of seven impoundment embankment dams at the Apache Power Plant in Cochise, Arizona. These impoundments are Ash Ponds 1, 2, 3, and 4 (Ash 1, Ash 2, Ash 3, and Ash 4), Scrubber Sludge Ponds 1 and 2 (Scrub 1 and Scrub 2), and the Evaporation Pond. These seven impoundments comprise the Coal Combustion Waste Facility at the Apache Power Plant. Other coal combustion waste impoundments at the Apache Power Plant include the Low Volume Wastewater Pond, Cooling Tower Blowdown Pond, and the Coal Pile Retention Basin. The power plant also has a coal combustion waste facility that has been closed under Arizona Department of Environmental Quality (DEQ) requirements. The specific site assessment was performed on September 2 and 3, of 2009.

These impoundments were assessed because their failure may result in significant economic loss, environmental damage, disruption of lifeline facilities or loss of life (significant or high hazard according to U.S. Environmental Protection Agency (EPA) classification). The specific site assessment was performed with reference to Federal Emergency Management Agency (FEMA) guidelines for dam safety, which includes other federal agency guidelines and regulations (such as U.S. Army Corps of Engineers (USACE) and U.S. Bureau of Reclamation) for specific issues, and defaults to state requirements where not specifically addressed by federal guidance or if the state requirements were more stringent.

1.2 Scope of Work

The scope of work between GEI and Lockheed-Martin Corporation for the specific site assessment is summarized in the following tasks:

1. Acquire and review existing reports and drawings relating to the safety of the project provided by the EPA and Owners.

2. Conduct detailed physical inspections of the project facilities. Document observed conditions on Field Assessment Check Lists provided by EPA for each management unit being assessed.

3. Review and evaluate stability analyses of the project's coal combustion waste impoundment structures.

4. Review the appropriateness of the inflow design flood (IDF), and adequacy of ability to store or safely pass the inflow design flood, provision for any spillways, including considering the hazard potential in light of conditions observed during the inspections or to the downstream channel.

5. Review existing dam safety performance monitoring programs and recommend additional monitoring, if required.

6. Review existing geologic assessments for the projects.

7. Submit draft-final and final reports.

1.3 Authorization

GEI Consultants, Inc. performed the coal combustion waste impoundment assessment for the EPA as a subcontractor to Lockheed Martin who is a contractor to the EPA. This work was authorized by Lockheed-Martin under the P.O. No.: 7100052068; EAC #0-381 between Lockheed-Martin and GEI Consultants, Inc. (GEI), dated June 5, 2009.

1.4 Project Personnel

The scope of work for this task order was completed by the following personnel from GEI:

Stephen G. Brown, P.E.	Project Manager/Task Leader
Bryan M. Scott, Ph.D., P.E.	Project Geotechnical Engineer
Daniel L. Johnson, P.E.	Technical Review

The Program Manager for the EPA was Stephen Hoffman. The Program Manager for Lockheed-Martin Corporation was Dennis Miller.

1.5 Limitation of Liability

This report summarizes the assessment of dam safety of Ash Pond 1, 2, 3, and 4, Scrubber Sludge Pond 1 and 2, and the Evaporation Pond coal combustion waste impoundments at Apache Power Plant, Cochise, Arizona. The purpose of each assessment is to evaluate the structural integrity of the impoundments and provide summaries and recommendations based on the available information and on engineering judgment. GEI used a professional standard of practice to review, analyze, and apply pertinent data. No warrantees, express or implied, are provided by GEI. Reuse of this report for any other purpose, in part or in whole, is at the sole risk of the user.

1.6 Project Datum

The project datum was not identified on the documents reviewed by the assessment team.

1.7 Prior Inspections

The embankment dams for the seven ponds are inspected monthly by an Arizona Electric Power Cooperative (AEPCO) Apache Power Plant Professional Engineer. The plant's Professional Engineers are registered with the State of Arizona. The Arizona Department of Water Resources (ADWR) Dam Safety Section last inspected the dams for the seven impoundments on December 19, 2008 and issued a Finding of No Safety Deficiency.

2.0 Description of Project Facilities

2.1 General

Apache Power Plant is a combined coal-fired, gas-fired, and gas turbine power plant consisting of seven units that generate about 604 megawatts (MW). The two coal-fired units generate about 195 MW each. The Apache Power Plant is located in the town of Cochise, Cochise County, Arizona approximately 10 miles southwest of Willcox, Arizona, and about 25 miles northeast of Benson, Arizona; see Figure 1. The Coal Combustion Waste Facility and associated seven impoundments are located adjacent to and northwest of the power plant (Figure 2). The seven impoundments are the Ash Ponds 1, 2, 3, and 4 (Ash 1, Ash 2, Ash 3, and Ash 4), Scrubber Sludge Ponds 1 and 2 (Scrub 1 and Scrub 2), and the Evaporation Pond. The power plant is owned and operated by AEPCO and the first unit went online in the early 1960s, with the two coal-fired units going online in 1978 and 1979.

2.2 Impoundment Dams and Reservoirs

The embankment dams of the seven impoundments are classified by the ADWR Dam Safety Section as high-hazard potential structures because of the potential for loss of life in event of a failure of the embankments. The basic dimensions and geometry of the seven impoundments are summarized in Table 2.1. All seven of the impoundments are adjacent to other impoundments and share common embankments with several other impoundments.

The Ash 1, Ash 2, Ash 3, and Ash 4 embankment dam crests are each at El. 4216, which results in a total height of 33 feet for each pond. Ash 1, Ash 2, Ash 3, and Ash 4 have storage capacities of about 717, 720, 720, and 693 acre-feet, respectively. Ash 1 and Ash 2 have a design freeboard of 3 feet and were observed to have about 3.7 feet of freeboard at the time of this assessment. Ash 3 and Ash 4 also have a design freeboard of 3 feet and were nearly empty with about 22 to 29 feet of freeboard at the time of this assessment. The Ash Ponds primarily contain water-slurried fly ash and bottom ash.

The Scrub 1 and Scrub 2 embankment dam crest is at El. 4226 for a total height of 17 feet for Scrub 1 and 20 feet for Scrub 2. Scrub 1 and Scrub 2 have storage capacities of about 314 and 446 acre-feet, respectively. Scrub 1 has a design freeboard of 3 feet and had about 3.2 feet of freeboard at the time of this assessment. Scrub 2 has a design freeboard of 3 feet and had about 14.5 feet of freeboard at the time of this assessment. The Scrubber Sludge Ponds primarily contain water-slurried flue gas desulfurization (FGD) residuals.

The Evaporation Pond dam crest is at El. 4216 on the east side, El. 4226 on the West side, and varies from El. 4216 to El. 4226 on the north and south sides. The Evaporation Pond has

a total height of 19 feet on the east side. The Evaporation Pond has a storage capacity of about 823 acre-feet. The Evaporation Pond currently has about 12.6 feet of freeboard and a design freeboard of 3 feet. The Evaporation Pond primarily contains decant water from either the Ash Ponds or the Scrubber Sludge Ponds.

The embankments are relatively homogeneous, and were constructed of onsite sandy clay material. The dam embankments have crests 20 feet wide and upstream and downstream slopes of 3H:1V. The impoundments each have a single high density polyethylene (HDPE) lining on the bottom and along the upstream slope of the impoundments.

Table 2.1: Summary Information for Impoundment Dam Parameters

Parameter	Value						
Dam	Ash 1	Ash 2	Ash 3	Ash 4	Scrub 1	Scrub 2	Evaporation Pond
Height (ft)	33	33	33	33	17	20	19
Approximate Length (ft)	4,700	4,700	4,900	5,000	5,400	5,500	8,200
Crest Width (ft)	20	20	20	20	20	20	20
Minimum Crest Elevation (ft)*	El. 4213.6	El. 4213.9	El. 4213.9	El. 4213.6	El. 4223.7	El. 4223.7	El. 4214.7
Side Slopes (H: V)	3:1	3:1	3:1	3:1	3:1	3:1	3:1
Current Freeboard (ft)	3.7	3.7	22.4	29.2	3.2	14.5	12.6
Storage Capacity (ac-ft)	717	720	720	693	314	446	823
Surface Area (acres)	32.6	32.6	30.4	29.5	41.7	42	80

Note: The Minimum Crest Elevation is based on the maximum measured settlement described in the Instrumentation Section subtracted from the design elevation.

2.3 Spillways

None of the seven impoundments (Ash 1, Ash 2, Ash 3, Ash 4, Scrub 1, Scrub 2, and the Evaporation Pond) have spillways.

2.4 Intakes and Outlet Works

Ash 1, Ash 2, Ash 3, and Ash 4 each have a drop inlet decant tower. These outlet towers have stop logs that can be adjusted to control the water surface elevation in the impoundments. The towers are accessed from the embankment crest using the footbridge. Each tower has a 2-foot-diameter HDPE outlet pipe that conveys decant water to a centralized wet-well sump at a pump station that services the four ash impoundments. The decant water is pumped back to the power plant for reuse.

A potential outlet structure for Scrub 1 and Scrub 2 consists of three HDPE pipes that connect Scrub 1 and Scrub 2 at three different elevations (see Photo 54). The pipes are installed horizontal. At the time of the assessment, these outlet pipes were closed with blind

flanges on both ends of the pipes. These pipes can only be used to provide an outlet under specific operating conditions, such as when the water level in one pond is higher than the other pond so that a flow can be established. With the exception of these pipes, the surface sludge impoundments have no outlet.

The Evaporation Pond has no decant pipe or drop inlet structure. Water impounded by the Evaporation Pond is only removed by evaporation.

2.5 Vicinity Map

Apache Power Plant is located in Cochise, Arizona in Cochise County approximately 25 miles northeast of Benson, as shown on Figure 1. The station is located west of Willcox Dry Lake, immediately west of Highway 191, and the seven impoundments are located adjacent to and northwest of the station. The nearest habitable structures downstream of the seven impoundments are two houses located approximately 0.5 miles east of the impoundments. Immediately downstream of the two houses is Willcox Dry Lake.

2.6 Plan and Sectional Drawings

Engineering drawings for the seven dams were prepared by Burns & McDonnell, and are numbered Y1 to Y24, S1 to S11, U01 to U19, and E6 to E24. The construction record drawings were stamped on November 26, 1996. Drawings that are generally descriptive of the impoundment structures are included in this report as Exhibits, as follows:

Exhibit 1	Site Plan and Instrument Locations
Exhibit 2	Site Sections (South-North)
Exhibit 3	Site Section (West-East)
Exhibit 4	Typical Embankment Sections
Exhibit 5	Intake Tower and Access Bridge

2.7 Standard Operational Procedures

An Operations and Maintenance Manual was not available for this assessment. The facility is manned full-time (24 hours a day and 7 days a week) and personnel perform daily inspections of the ash pond facilities. There have been no known spills or unpermitted releases for any of the seven impoundments since being placed in service in 1995.

The plant's Coal Combustion Waste Facility consists of four lined ash ponds, two lined scrubber sludge ponds, and a lined evaporation pond. The power plant also has a Low Volume Wastewater Pond, Cooling Tower Blowdown Pond, and a Coal Pile Retention Basin. An old ash and scrubber waste disposal facility that is no longer in service has been closed through Arizona DEQ and the ADWR Flood Warning and Dam Safety Section. The

old ash disposal facility is located south east of the Coal Combustion Waste Facility and east of Highway 191.

Approximately 80 percent of the produced fly ash is sold commercially for use as a concrete admixture. The remaining fly ash is mixed with bottom ash and sluiced to the Ash Ponds at the Coal Combustion Waste Facility for permanent disposal. The capacity of the pumps to convey sluiced ash is 2,700 gallons per minute (gpm). Wet scrubbers are used to remove sulfur dioxide from the coal combustion exhaust. Accumulated sludge is removed from the scrubbers and is sluiced to the two Scrubber Sludge Ponds at the Coal Combustion Waste Facility for permanent disposal. The capacity of the pumps to convey sluiced scrubber sludge is 430 gpm.

The water levels in the Ash Ponds are controlled by demand for water in the Cooling Tower Blowdown Pond. Low water levels in the Cooling Tower Blowdown Pond are instrumented to automatically start the decant water recirculation pumps located in the centralized pump station located at the Coal Combustion Waste Facility. The centralized pump station is hydraulically connected by the decant intake piping to each of the four Ash Ponds. At the time of this assessment, water levels in Ash Ponds 1 and 2 were high enough to discharge through the intake structure and supply the recirculation pump. The capacity of the recirculation pumps is 2,700 gpm.

3.0 Summary of Construction History and Operation

The first unit at Apache Power Plant went online in the early 1960s. The first coal-fired unit went online in 1978 and the second in 1979. Currently, the plant has seven generating units, including the two coal-fired units. An old ash and scrubber waste disposal facility that is located east of Highway 191 is no longer in service and has been closed in accordance with Arizona DEQ and the ADWR Flood Warning and Dam Safety Section requirements.

The seven lined ponds that comprise the Coal Combustion Waste Facility were constructed in 1995 over natural ground using onsite borrow materials. The ponds were constructed adjacent to each other such that common interior embankments separate the ponds. As a result, some of the embankments are exterior dikes (similar to typical embankment dams) and some of the embankments are interior dikes (designed to separate one pond from another pond).

The interior dikes were constructed of homogeneous select fill material, and the exterior dikes were constructed of select fill material, with a zone of general fill material on the downstream slope. The general fill zone is 10 feet wide at the toe of the slope and 5 feet wide at the crest. All slopes for the interior and exterior dikes are 3H:1V. The embankments have a maximum height of 33 feet.

The seven ponds that comprise the Coal Waste Disposal Facility were designed in 1993 and 1994 and constructed in 1995; nearly 20 years after the coal-fired steam-generation Units 2 & 3 were constructed in 1978 and 1979. Original design and construction reports for these ponds and their embankments were available. The embankments for the facility were constructed on land that was previously farmed. Foundation preparation for the embankments included removal of topsoil "to a depth sufficient to remove excessive roots and to obtain suitable fill or subgrade material" (Burns & McDonnell, 1993). Suitable soil excavated from within the facility footprint was utilized in the construction of the embankments, and unsuitable soil types were disposed in stockpiles on adjacent AEPCO land. Because the land at the site was previously used only for farming, boreholes drilled within the dam alignments or the facility footprint prior to construction do not indicate the presence of previously placed coal combustion waste materials. Evidence of prior releases, failures or patchwork construction were not observed during the site visit or disclosed by plant personnel during the site visit, with exception of local repairs to address vandalism damage to the HDPE lining of Scrub 2.

4.0 Geologic and Seismic Considerations

The site is situated near the Willcox Playa in the Sulphur Springs Valley in the Basin and Range Physiographic Province. The playa is approximately 60 square miles and is broad and flat. Mountain ranges east and west of the playa trend northwest-southeast and reach elevations up to 10,000 feet. Between the playa and the mountains are relatively moderate-sloped alluvial fans. The AEPCO Apache Power Plant is at the toe of one such alluvial fan.

The Willcox Basin was formed by block faulting during the Tertiary geologic period. The resulting mountains comprise igneous, metamorphic, and sedimentary rocks ranging in age from Precambrian to Tertiary. Since the uplift these mountains have been eroded by streams flowing toward the basin floor. This has resulted in alluvial fans along the sides of the valley, with thick sediment accumulation on the basin floor.

The alluvial deposition history of the basin is complex, but generally gravels are deposited at the upper slopes of the alluvial fans with finer-grained silts and clays deposited closer to the center of the basin. The cut and fill action of streams results in lenticular deposits of sand and gravel throughout the alluvial fan.

The Willcox Basin is a closed, internally-drained basin. Surface water flows toward the playa with no outlet. At various times in the history of the basin, this has resulted in a lake forming in the Willcox Playa. As a result, lake sediments have been periodically deposited on the playa. Therefore, the soils below the playa are predominantly clay, while the alluvial valley slopes primarily consist of interfingered sand and clay soils.

The basin deposits have been divided into three units. The lowest unit is the Lower Basin Fill. These alluvial deposits range in thickness from 100 feet along the valley slopes to over 5,000 feet at the center of the basin. The Upper Basin Fill soils overlie the Lower Basin Fill and are generally coarser than the Lower Basin Fill. These soils range from less than 10 feet of gravelly alluvium along the valley slopes to approximately 400 feet of lake deposits on the playa. In some areas of the basin, the Upper Basin Fill is overlain by up to 150 feet of alluvial sand and gravel.

Soils in the vicinity of the Apache Power Plant generally range from gravelly sandy silt to silty clay.

A peak horizontal acceleration coefficient of 0.15g was applied as a pseudo-static coefficient in the facility design. This is significantly higher than an acceleration of 0.10g as shown on the 2008 United States Geological Survey (USGS) regional probabilistic seismic hazard map for 2 percent Probability of Exceedance within 50 years (recurrence interval of approximately 2,500 years). Application of a peak horizontal acceleration coefficient of

0.15g as a pseudo-static coefficient in the facility design would be comparable to an approximate Maximum Credible Earthquake loading for the regional seismicity, which is an appropriate design earthquake for application to high hazard classification impoundments based on federal dam safety guidance.

Significant regional subsidence has occurred due to groundwater withdrawal from the aquifers for municipal, industrial, and agricultural use. Subsidence settlement at the Apache Power Plant location has ranged up to about 6 to 7 feet since the 1970s. Fissures have opened at various locations on the valley slopes as a result of tensile forces associated with different settlement rates as water has been withdrawn from the underlying water bearing deposits. The fissures can open to several feet in width and hundreds of feet in length.

A fissure was observed at the Coal Combustion Waste Facility prior to construction. Initially, the fissure opened in the vicinity of the south embankment near the junction of the Evaporation Pond and the Scrub 1, see Exhibit 1. The fissure was open to about 2 to 3 feet in width at the ground surface and was several hundred feet in length. The fissure was remediated by overexcavating a 20 foot, or greater, width trench to a depth of about 12 feet and then backfilling the trench with compacted clayey sand to sandy clay and then placing a 30 foot wide sheet of 80-mil HDPE lining material over the remediation area. Later, in 2003, a second fissure was observed in the vicinity of the north embankment near the junction of the Evaporation Pond and Scrub 2, see Exhibit 1. Deformation of the nearby steel railroad tracks due to settlement was observed at a location about 100 yards northeast of the second fissure. The settlement of the railroad tracks was about 4 to 6 inches. The second fissure was determined to be open only to a minor depth and no specific remediation was performed. The railroad tracks have not been adjusted and are surveyed regularly to provide an additional means of monitoring changes in settlement of the area. Special survey monuments for use in high precision surveys were installed in the area of each fissure. A detailed survey using high precision methods and a review and inspection for fissures and subsidence settlement is conducted and reported annually.

5.0 Instrumentation

5.1 Location and Type

There are 16 survey monuments located on the facility embankments and an array of special survey monuments for use in high precision surveys that are located at the sites of the foundation fissures that have been previously identified. The survey monuments on the embankments are a brass cap set in concrete. A graphical representation of the locations of the monitoring instruments is shown in Figure A-1 of Appendix A.

There are no observation wells or piezometer instruments installed in the dam embankments or their foundations for the purpose of monitoring water levels within the embankment and foundation. Several monitoring wells are located downstream of the embankments for the purpose of water quality sampling and all but one of these monitoring wells are pumped on a routine schedule to obtain water quality samples. The water level information obtained from the monitoring wells, except for Monitoring Well No. 2 that is not pumped, is not considered useful for monitoring ground water levels.

5.2 Time versus Reading Graphs of Data

Time versus reading data for the embankment survey monuments is presented in Figure A-2. The data indicates there has been differential settlement across the facility, with settlement of the east embankment of Ash 1 and Ash 4 being approximately 0.5 feet greater than that occurring on the west embankment of Scrub 1 and Scrub 2. A discussion of the regional subsidence settlement issue is provided in the report section Geology and in section Field Assessment.

5.3 Evaluation of Instrument Data

5.3.1 Survey Monuments

The survey monuments installed on the impoundment crest indicate general subsidence of the entire site along with some differential settlement across the site. The total settlement measured at each monument from 1996 to 2008 is summarized in Table 5.1. These data generally show more settlement on the north end of the impoundments than on the south end. They also show generally more settlement on the east side of the impoundments than on the west side. The magnitude of the difference between one side and the opposite side varies across the site. The average differential settlement from the west to the east is approximately 0.5 feet, and the average differential settlement from the south to the north is approximately 0.2 feet.

Table 5.1: Survey Monument Settlement

Monument Number	Measured Settlement (ft)
BM-1	1.3
BM-2	1.5
BM-3	0.9
BM-4	1.7
BM-5	2.0
BM-6	1.5
BM-7	2.3
BM-8	2.0
BM-9	1.1
BM-10	2.1
BM-11	2.4
BM-12	1.7
BM-13	1.6
BM-14	1.3
BM-15	1.7
BM-16	1.8

5.3.2 Monitoring Wells

The water level in AEPCO Monitoring Well No. 2 was at El. 3980 in 2004, and has not been monitored since that time. The water level information obtained from the remaining monitoring wells is not considered useful for monitoring ground water levels because the wells have been pumped during water quality sampling events.

6.0 Field Assessment

6.1 General

Field observations of Ash 1, Ash 2, Ash 3, Ash 4, Scrub 1, Scrub 2, and Evaporation Pond were made on September 3, 2009, by Stephen G. Brown, P.E. and Bryan M. Scott, P.E., of GEI. The field assessment was attended by John Schofield of the EPA – Region 9 and Charles Reece, P.E., James Andrew, and Michelle Freeark, of AEPCO. The field assessment was also attended by Mel Bunkers, Pamela Nicola, and Jaclyn Palermo of the Arizona DEQ.

The weather during the field assessment was generally clear and temperatures were warm. The discussions below are organized by facility type (Ash Ponds, Scrubber Sludge Ponds, and Evaporation Pond).

A copy of the field checklists are provided in Appendix B and photographs of conditions observed at the facilities are provided in Appendix C. Sections 6.2 to 6.8 describe observations made during the inspection relative to key project features. Sections 6.9 to 6.12 present specific observations by condition category.

6.2 Ash Pond 1

Ash Pond 1 is formed by a perimeter dam having a design crest elevation of El. 4216. The minimum current crest elevation is El. 4213.6, which reflects the settlement that has occurred since construction. The north embankment of the perimeter dam is an interior dike shared with Ash 4, and the west side is an interior dike shared with Ash 2. The dam is founded on the natural clay soil or, where natural clay soil was not present, 8-inches of compacted clay borrow soil. The exterior dikes were constructed of select sandy clay fill material, with a zone of general fill material on the downstream slope, and the interior dikes were constructed of homogeneous select sandy clay fill material. The general fill zone is 10 feet wide at the toe of the slope and 5 feet wide at the crest. All slopes for the interior and exterior dikes are 3H:1V. Ash Pond 1 has an 80-mil HDPE lining on the slopes and a 60-mil HDPE lining on the bottom to provide primary seepage control. Field observations of Ash 1 included the dam crest and downstream slope and toe of the exterior dike as well as observable features of the decant drop inlet structure.

6.2.1 Dam Crest

The dam crest appears to be in good condition. We saw no obvious signs of settlement or displacement associated with Ash 1. Based on monitoring data, regional subsidence has

resulted in settlement of the entire facility, but there was no visual evidence of distress associated with this settlement during the field assessment.

6.2.2 Upstream Slope

The pond is lined with an 80-mil HDPE lining on the slopes and 60-mil HDPE lining on the bottom, (see Photo 22). The upstream slope could not be observed directly because it is mostly obscured by the HDPE lining. There was no visual evidence of large bulges or depressions beneath the lining that would indicate stability issues. On this basis, the upstream slope was considered to be in acceptable condition.

6.2.3 Downstream Slope

The downstream slope of the dam, which consists of compacted sandy clay, has an eight inch thickness of 6-inch minus size granular rock erosion protection on the south and east exterior embankments. In several locations the granular rock was thinner than the design thickness, and the underlying embankment material was visible. No seepage was observed at the downstream toe. A wide rip-rap-lined ditch that is located beyond the downstream toe of the south and east portion of the embankment conveys stormwater around the impoundment. The downstream toes for the common west and north interior embankments were not visible because they were submerged by the contents of the adjacent ponds. The downstream slope on the north interior embankment dike was observed to be in generally acceptable condition.

6.2.4 Emergency Spillway

There is no emergency spillway for Ash 1. The only means of removing water from the pond is through evaporation or by pumping decant water to the Cooling Tower Blowdown Pond.

6.2.5 Outlet Works

The outlet structure is the decant drop inlet, which consists of a concrete tower near the northwest corner of Ash Pond 1 (see Photo 19) that is fitted with stop logs that can be adjusted to control the pond surface elevation. The tower is accessed via a foot bridge from the embankment crest at the northwest corner of the pond. At the base of the tower is a 2-foot-diameter HDPE outlet pipe that conveys decant water to a wet-well sump at the pump station, which is located in the common interior embankment dike for the four ash ponds. A similar hydraulic connection is also made between the three other ash ponds Ash 2, Ash 3, and Ash 4 and the pump station. The decant drop inlet appeared to be functioning satisfactorily and AEPCO did not report any problems with its function to date.

6.2.6 Internal Drains or Toe Drains

There are no internal drains or toe drains included in the dam embankments that impound Ash 1.

6.2.7 Water Surface Elevations and Reservoir Discharge

The water surface in Ash 1 at the time of the site visit provided 3.7 feet of freeboard. A small amount of water was passing over the stoplogs into the decant drop inlet. Reservoir discharge is by pumping, and it was not evident that the pump was operating at the time of the site visit. Therefore, the small discharge flow may have been re-filling the wet well sump for the pump.

6.3 Ash Pond 2

Ash Pond 2 is formed by a perimeter dam having a design crest elevation of El. 4216. The minimum current crest elevation is El. 4213.9, which reflects the settlement that has occurred since construction. The north embankment of the perimeter dam is an interior dike shared with the south embankment of Ash 3, the east side of the perimeter dam is an interior dike shared with the west embankment of Ash 1, and the west side is an interior dike shared with part of the east embankment of Evaporation Pond. The dam is founded on the natural clay soil or, where natural clay soil was not present, 8-inches of compacted clay borrow soil. The interior and exterior dike sections are consistent with those of Ash Pond 1. Ash Pond 2 has an 80-mil HDPE lining on the slopes and a 60-mil HDPE lining on the bottom to provide primary seepage control. Field observations of Ash 2 included the dam crest, downstream slope and toe of the south embankment, as well as observable features of the decant drop inlet structure.

6.3.1 Dam Crest

The dam crest appears to be in good condition. We saw no obvious signs of settlement or displacement associated with Ash 2. Based on monitoring data, regional subsidence has resulted in settlement of the entire facility, but there was no visual evidence of distress associated with this settlement during the field assessment.

6.3.2 Upstream Slope

The upstream slope of the dam is protected by an HDPE lining, which mostly obscures the embankment soil from visual inspection. However, there was no visual evidence of large bulges or depressions beneath the lining that would be indicative of stability issues. On this basis, the upstream slope was considered to be in acceptable condition.

6.3.3 Downstream Slope

The downstream slope of the south embankment, which consists of compacted sandy clay, has an eight inch thickness of granular rock erosion protection. No seepage was observed at the downstream toe. The downstream toes for the east, west, and north interior embankments were not visible, as they were submerged by the contents of adjacent ponds. The portion of the downstream slope that was above the water was observed to be in generally acceptable condition. A wide rip-rap-lined stormwater ditch is located beyond the toe of the south portion of the embankment.

6.3.4 Emergency Spillway

There is no emergency spillway for Ash 2. The only means of removing water from the pond is through evaporation or by pumping decant water to the Cooling Tower Blowdown Pond.

6.3.5 Outlet Works

The outlet structure is a decant drop inlet similar to the Ash 1 tower and located in the northeast corner of Ash Pond 2. The tower conveys decant water to a wet well sump and pump station that services the four ash ponds. The decant inlet appeared to be functioning satisfactorily and AEPCO did not report any problems with its function to date.

6.3.6 Internal Drains or Toe Drains

There are no internal drains or toe drains included in the embankments that impound Ash 2.

6.3.7 Water Surface Elevations and Reservoir Discharge

The water surface in Ash 2 at the time of the site visit provided 3.7 feet of freeboard. Reservoir discharges are by pumping. Ash 2 was not discharging a significant quantity of decant water at the time of the site visit based on the small depth of flow passing over the stoplogs.

6.4 Ash Pond 3

Ash Pond 3 is formed by a perimeter dam having a design crest elevation of El. 4216. The minimum current crest elevation is El. 4213.9. The south side of the perimeter dam is a common interior dike that is coincident with the south embankment of Ash 2, the east side of the dam is an interior dike shared with the west embankment of Ash 4, and the west side is an interior dike shared with part of the east embankment of Evaporation Pond. The dam is founded on the natural clay soil or, where natural clay soil was not present, 8-inches of compacted clay borrow soil. The interior and exterior dike sections are consistent with those of Ash Pond 1. Ash Pond 3 has an 80-mil HDPE lining on the slopes and a 60-mil HDPE

lining on the bottom to provide primary seepage control. Field observations of Ash 3 included the dam crest and the north downstream slope and toe, and the interior lined slopes as well as observable features of the decant drop inlet structure.

6.4.1 Dam Crest

The dam crest appears to be in good condition. We saw no obvious signs of settlement or displacement associated with Ash 3. Based on monitoring data, regional subsidence has resulted in settlement of the entire facility, but there was no visual evidence of distress associated with this settlement during the field assessment.

6.4.2 Upstream Slope

The upstream slope of the dam is protected by an HDPE lining, which mostly obscures the embankment soil from visual inspection. However, there was no visual evidence of large bulges or depressions beneath the lining that would indicate stability issues. On this basis, the upstream slope was considered to be in acceptable condition.

6.4.3 Downstream Slope

The downstream slope of the north embankment dike, which consists of compacted sandy clay, has an eight inch thickness of granular rock erosion protection. No seepage was observed at the downstream toe of the north dike. The downstream toes of the west, east, and south interior embankments were not visible, as they are submerged by the contents of the adjacent ponds. The downstream slopes were observed to be in generally acceptable condition. A wide rip-rap-lined stormwater ditch is located to the north of the embankment.

6.4.4 Emergency Spillway

There is no emergency spillway for Ash 3. The only means of removing water from the pond is through evaporation or by pumping decant water to the Cooling Tower Blowdown Pond.

6.4.5 Outlet Works

The outlet structure is the decant drop inlet similar to the Ash 1 tower and is located near the southeast corner of Ash Pond 3. The tower conveys decant water to a sump and pump that services the four ash ponds. The decant inlet appeared to be in good condition and able to function satisfactorily, however because only minor amounts of decant water has been placed in Ash 3 to date, the outlet has not been regularly operated. AEPCO did not report any problems with its function to date.

6.4.6 Internal Drains or Toe Drains

There are no internal drains or toe drains included in the embankments that impound Ash 3.

6.4.7 Water Surface Elevations and Reservoir Discharge

The water surface in Ash 3 at the time of the site visit provided 22.4 feet of freeboard. Due to the low water level in Ash 3, there was no discharge of decant water at the time of the site visit.

6.5 Ash Pond 4

Ash Pond 4 is formed by a perimeter dam having a design crest elevation of El. 4216. The minimum current crest elevation is El. 4213.6. The west side of the perimeter dam is an interior dike shared with the east embankment of Ash 3, and the south side is an interior dike shared with the north embankment of Ash 1. The dam is founded on the natural clay soil or, where natural clay soil was not present, 8-inches of compacted clay borrow soil. The interior and exterior dike sections are consistent with those of Ash Pond 1. Ash Pond 4 has an 80-mil HDPE lining on the slopes and a 60-mil HDPE lining on the bottom to provide primary seepage control. Field observations of Ash 4 included the dam crest and downstream slope and toe of the exterior dikes sections and observable features of the decant drop inlet structure.

6.5.1 Dam Crest

The dam crest appears to be in good condition. We saw no obvious signs of settlement or displacement associated with Ash 4. Based on monitoring data, regional subsidence has resulted in settlement of the entire facility, but there was no visual evidence of distress associated with this settlement during the field assessment.

6.5.2 Upstream Slope

The upstream slope of the dam is protected by an HDPE lining, which mostly obscures the embankment soil from visual inspection. However, there was no visual evidence of large bulges or depressions beneath the lining that would indicate stability issues. On this basis, the upstream slope was considered to be in acceptable condition.

6.5.3 Downstream Slope

The downstream slopes of the north and east embankments, which consist of compacted sandy clay, have eight inches of granular rock erosion protection. In several locations the granular rock was thinner than the design thickness, and the underlying embankment material was visible. The downstream slope of the north and east embankments was observed to be in

generally good condition. No seepage was observed at the downstream toe. A wide rip-rap-lined stormwater ditch is located to the north of the north embankment and curves around to the east of the east embankment. The downstream toes for the west and south interior embankments were not visible, as they were submerged by the contents of the adjacent ponds.

6.5.4 Emergency Spillway

There is no emergency spillway for Ash 4. The only means of removing water from the pond is through evaporation or by pumping decant water to the Cooling Tower Blowdown Pond.

6.5.5 Outlet Works

The outlet structure is the decant drop inlet similar to the Ash 1 tower and is located at the southwest corner of Ash Pond 4. The tower conveys decant water to a sump and pump that services the four ash ponds. The decant inlet appeared to be in good condition and able to function satisfactorily, however because only minor quantities of decant water have been placed in Ash 4, the outlet is not regularly operated. AEPCO did not report any problems with the function of the decant drop inlet to date.

6.5.6 Internal Drains or Toe Drains

There are no internal drains or toe drains included in the embankments that impound Ash 4.

6.5.7 Water Surface Elevations and Reservoir Discharge

The water surface in Ash 4 at the time of the site visit provided 29.2 feet of freeboard. Due to the low water level in Ash 4, there was no discharge of decant water at the time of the site visit.

6.6 Scrubber Sludge Pond 1

Scrubber Sludge Pond 1 is formed by a perimeter dam having a design crest elevation of El. 4226. The minimum current crest elevation is El. 4223.7. The north side of the perimeter dam is an interior dike shared with the south embankment of Scrub 2, and the east side is an interior dike shared with the west embankment of Evaporation Pond. The dam is founded on the natural clay soil or, where natural clay soil was not present, 8-inches of compacted clay borrow soil. The interior and exterior dike sections are consistent with those of Ash Pond 1. Scrubber Sludge Pond 1 has an 80-mil HDPE lining on the slopes and a 60-mil HDPE lining on the bottom to provide primary seepage control. Field observations of Scrub 1 included the dam crest and downstream slope and toe of exterior dike sections and observable features of the scrubber sludge pond connecting pipes.

6.6.1 Dam Crest

The dam crest appears to be in good condition. We saw no obvious signs of settlement or displacement associated with Scrub 1. Based on monitoring data, regional subsidence has resulted in settlement of the entire facility, but there was no visual evidence of distress associated with this settlement during the field assessment.

6.6.2 Upstream Slope

The upstream slope of the dam is protected by an HDPE lining, which mostly obscures the embankment soil from visual inspection. However, there was no visual evidence of large bulges or depressions beneath the lining that would indicate stability issues. On this basis, the upstream slope was considered to be in acceptable condition.

6.6.3 Downstream Slope

The downstream slopes of the west and south embankments, which consist of compacted sandy clay, have eight inches of granular rock erosion protection. The downstream slope of the west and south embankments was observed to be in generally good condition. No seepage was observed at the downstream toe. A wide rip-rap-lined stormwater ditch is located beyond the toe of the south and west portions of the embankment. The downstream toes for the east and north interior embankments were not visible, as they were submerged by the contents of the adjacent ponds.

6.6.4 Emergency Spillway

There is no emergency spillway for Scrub 1. The only means of removing water from the pond is through evaporation or via discharge through the pipes that connect Scrub 1 to Scrub 2.

6.6.5 Outlet Works

A potential outlet structure for Scrub 1 consists of three HDPE pipes that connect Scrub 1 and Scrub 2 at three different invert elevations (see Photo 54). The pipes are installed horizontal. At the time of the assessment, these outlet pipes were closed with blind flanges on both ends of the pipes and were not operational. These pipes can only be used to provide an outlet under specific operating conditions, such as when the water level in one pond is higher than the other pond so that a flow can be established. With the exception of these pipes, the surface sludge impoundments have no outlet. The outlet pipes appeared to be in acceptable condition and are expected to function should AEPCO choose to operate them as an outlet to discharge from Scrub 1 to Scrub 2.

6.6.6 Internal Drains or Toe Drains

There are no internal drains or toe drains included in the embankments that impound Scrub 1.

6.6.7 Water Surface Elevations and Reservoir Discharge

The water surface in Scrub 1 at the time of the site visit provided 3.2 feet of freeboard. Scrub 1 was not discharging decant water flows at the time of the site visit.

6.7 Scrubber Sludge Pond 2

Scrubber Sludge Pond 2 is formed by a perimeter dam having a design crest elevation of El. 4226. The minimum current crest elevation is El. 4223.7. The south side of the perimeter dam is an interior dike shared with the north embankment of Scrub 1, and the east side is shared with the west embankment of Evaporation Pond. The dam is founded on the natural clay soil or, where natural clay soil was not present, 8-inches of compacted clay borrow soil. The interior and exterior dike sections are consistent with those of Ash Pond 1. Scrubber Sludge Pond 2 has an 80-mil HDPE lining on the slopes and a 60 mil HDPE lining on the bottom to provide primary seepage control. Field observations of Scrub 2 included the dam crest and downstream slope and toe of the exterior dike sections and observable features of the scrubber sludge pond connecting pipes.

6.7.1 Dam Crest

The dam crest appears to be in good condition. We saw no obvious signs of settlement or displacement associated with Scrub 2. Based on monitoring data, regional subsidence has resulted in settlement of the entire facility, but there was no visual evidence of distress associated with this settlement during the field assessment.

6.7.2 Upstream Slope

The upstream slope of the dam is protected by an HDPE lining, which mostly obscures the embankment soil from visual inspection. However, there was no visual evidence of large bulges or depressions beneath the lining that would indicate stability issues. On this basis, the upstream slope was considered to be in acceptable condition.

6.7.3 Downstream Slope

The downstream slope of the north and west embankments, which consist of compacted sandy clay, has eight inches of granular rock erosion protection. The downstream slope of the north and west embankments was observed to be in generally good condition. No seepage was observed at the downstream toe. A wide rip-rap-lined stormwater ditch is located beyond the toe of the north and west portions of the embankment. The downstream

toes for the east and south interior embankments were not visible, as they were submerged by the contents of the adjacent ponds.

6.7.4 Emergency Spillway

There is no emergency spillway for Scrub 2. The only means of removing water from the pond is through evaporation or through the pipes connecting to Scrub 1.

6.7.5 Outlet Works

Assuming the three HDPE pipes that connect Scrub 1 and Scrub 2 at three different invert elevations are operated to provide an outlet for Scrub 1, such that decant water flows from Scrub 1 to Scrub 2, then there are no outlet structures for Scrub 2. The reader is referred to the previous discussion for the Scrub 1 outlet works.

6.7.6 Internal Drains or Toe Drains

There are no internal drains or toe drains included in the embankments that impound Scrub 2.

6.7.7 Water Surface Elevations and Reservoir Discharge

The water surface in Scrub 2 at the time of the site visit provided 14.5 feet of freeboard. Scrub 2 was not discharging decant water flows at the time of the site visit.

6.8 Evaporation Pond

The Evaporation Pond is formed by a perimeter dam having a design crest elevation that varies from El. 4216 to El. 4226. The west side of the perimeter dam has a design crest elevation of El. 4226 and the east side has a design crest elevation of El. 4216. The minimum current crest elevation is El. 4214.7. The elevation of the crest on the north and south sides varies to match the grades of the east and west embankments. The west embankment of the perimeter dam forms a common interior dike with the Scrub 1 and Scrub 2, and the east embankment forms a common interior dike with Ash 2 and Ash 3. The dam is founded on the natural clay soil or, where natural clay soil was not present, 8-inches of compacted clay borrow soil. The interior and exterior dike sections are consistent with those of Ash Pond 1. The Evaporation Pond has an 80-mil HDPE lining on the slopes and 60-mil HDPE lining on the bottom to provide primary seepage control. Field observations of Evaporation Pond included the dam crest, downstream slopes of the north and south embankments, and interior slopes.

6.8.1 Dam Crest

The dam crest appears to be in good condition. We saw no obvious signs of settlement or displacement associated with Evaporation Pond. Based on monitoring data, regional subsidence has resulted in settlement of the entire facility, but there was no visual evidence of distress associated with this settlement during the field assessment.

6.8.2 Upstream Slope

The upstream slope of the dam is protected by an HDPE lining, which mostly obscures the embankment soil from visual inspection. However, there was no visual evidence of slumps or bulges beneath the lining that would indicate stability issues. On this basis, the upstream slope was considered to be in acceptable condition.

6.8.3 Downstream Slope

The downstream slope of the north and south embankments, which consist of compacted sandy clay, is covered by an eight inch thickness of granular rock erosion protection. In several locations the granular rock appeared thinner than the design thickness, and the underlying embankment material was visible. The downstream slope was observed to be in generally good condition. No seepage was observed at the downstream toe. A wide rip-rap-lined stormwater ditch is present beyond the toe of the north and south portions of the embankment. The downstream toes for the east and west interior embankments were not visible, as they were submerged by the contents of the adjacent ponds.

6.8.4 Emergency Spillway

There is no emergency spillway for the Evaporation Pond. The only means of removing water from the Evaporation Pond under normal operating conditions is by evaporation.

6.8.5 Outlet Works

There is no outlet works for the Evaporation Pond.

6.8.6 Internal Drains or Toe Drains

There are no internal drains or toe drains included in the embankments that impound the Evaporation Pond.

6.8.7 Water Surface Elevations and Reservoir Discharge

The water surface in the Evaporation Pond at the time of the site visit provided 12.6 feet of freeboard.

6.9 Field Assessment Observations

6.9.1 Settlement

Visual evidence of settlement was not observed. Regional subsidence due to groundwater withdrawal has resulted in about 1.7 feet of mostly uniform settlement at the facility since construction in 1995. Measured differential settlement of about 0.5 feet from west to east across the facility has occurred since the facility was constructed. A large fissure associated with the subsidence was observed encroaching into the foundation area of the south part of the facility prior to construction; see Exhibit 1 for location of fissure. The fissure was mitigated prior to construction and a monitoring program was implemented. The monitoring program has been expanded to include a second fissure observed at the north end of the facility in 2003. Monitoring includes annual high precision survey techniques in the area of the fissures and at 16 benchmarks located on the embankments.

6.9.2 Movement

With exception of the settlement discussed above, there has been no significant slope movement of the dam embankments.

6.9.3 Erosion

Several instances of locally significant erosion of the embankment slopes have occurred and these are typically associated with leaks from the high pressure pumped slurry pipelines that convey the slurried ash from the power plant to Ash 1 through Ash 4.

6.9.4 Seepage

Previous incidents of seepage in the Scrub 2 were associated with damage to the HDPE lining. The seepage pooled between the synthetic lining and the underlying clay lining and was remediated by lowering the water level in the pond, pumping the water from behind the lining, and making repairs to the HDPE lining. The leaks in the HDPE lining associated with the Scrub 2 were considered by AEPCO to be the result of vandalism or wildlife.

6.9.5 Leakage

No water leaks were observed from the facility embankments, project piping, or structures at the time of the site visit.

6.9.6 Cracking

No cracks were observed in the upstream or downstream slopes or the crests of the dams. Fissures associated with regional subsidence are discussed in the above section on settlement.

6.9.7 Deterioration

No significant deterioration of the dam embankments or structures was observed.

6.9.8 Geologic Conditions

The geology of the project features appears consistent with descriptions in the available reports. There have been no studies or events (landslide, earthquake, etc.) that would result in changes to the description of local geologic conditions.

6.9.9 Foundation Deterioration

No signs of foundation deterioration were observed for the seven dams.

6.9.10 Condition of Spillway and Outlet Works

There is no spillway for any of the seven dams. The Ash 1, Ash 2, Ash 3, and Ash 4 outlets consist of decant drop inlets using a tower and stop log structure, HDPE outlet piping, and a sump and pump. No adverse conditions were observed for the decant drop inlets and the pipes, pump, and sump were not readily observable.

The Scrub 1 and Scrub 2 outlets consist of three pipes connecting the two ponds at three different elevations. These pipes will only serve as an outlet from the pond with the higher water level to the pond with the lower water level. No adverse conditions were observed where the pipes protrude into Scrub 2. The remaining length of the pipes was not readily observable.

There is no outlet at the Evaporation Pond. Removal of decant water is by evaporation only.

6.9.11 Observations of Operation of the Spillway and Outlet Works

The decant drop inlet structures in Ash 1 and Ash 2 were passing a small quantity of flow over the stoplogs. The decant drop inlet structures in Ash 3 and Ash 4 were not operating because the water level in Ash 3 and Ash 4 was many feet below the stoplog sills. There are no spillways in any of the seven impoundments.

6.10 Reservoir Rim Stability

Reservoir rim stability issues do not apply to the perimeter dams that exist at the seven impoundments.

6.11 Uplift Pressures on Structures, Foundations, and Abutments

There are no structures subject to uplift pressures at the seven impoundments.

6.12 Other Significant Conditions

None.

7.0 Spillway Adequacy

7.1 Floods of Record

Based on the design documents for the stormwater drainage ditches surrounding the seven ponds, the 24-hour 100-year precipitation event is 4.4 inches. Floods of record have not been recorded for the Big Draw drainage that flows past the Coal Combustion Waste Facility.

7.2 Inflow Design Floods

Currently, each of the seven dams is classified as a high hazard potential structure by ADWR. State regulations indicate that high hazard dams be able to store or safely pass an inflow design flood equivalent to between one-half and the full probable maximum flood (PMF) while maintaining appropriate freeboard. This freeboard should be the largest of the following:

- The sum of the inflow design flood maximum water depth plus wave run-up
- The sum of the inflow design flood maximum water depth plus 3 feet
- A minimum of 5 feet

Based on wave run-up calculations submitted to ADWR that meet the first criterion, AEPCO has received a license that includes a variance that allows the ash ponds and scrubber sludge ponds to be operated with 3.0 feet of freeboard and allows the evaporation pond to be operated with 3.5 feet of freeboard.

Each of the seven dams is designed as a perimeter dam with no potential to receive surface water run-on. The inflow design flood will be limited to precipitation that falls directly on the reservoirs themselves. The inflow design flood for the facility has been accepted by the State as 50 percent of the probable maximum precipitation, as reported in Burns & McDonnell (1993). Based on the provided drawings, the dams have 3.0-foot-freeboard and are capable of storing a 72-hour precipitation event of 5.6 inches, which is 50 percent of the PMP based on Hydrometeorological Report No. 49, as reported in Burns & McDonnell (1993).

None of the seven dams has an emergency spillway. Water levels in Ash 1, Ash 2, Ash 3, and Ash 4 are controlled by pumped discharge from the ash ponds back to the power plant. Each of the seven ponds is designed to have capacity to store the inflow design flood, but the required freeboard of 3 feet above the surcharge pool is not maintained.

7.2.1 Determination of the PMF

Because the facility is comprised of ring dikes, there is no contributing run-on associated with rainfall events. Therefore the PMF is equal to the PMP. The PMP of 11.2 inches was based on Hydrometeorological Report No. 49. The PMP is considered to fall directly on the reservoirs.

7.2.2 Freeboard Adequacy

Based on the variance in the License of Approval from ADWR, the planned operating freeboard of 3.0 feet at the ash and scrubber sludge ponds and 3.5 feet at the evaporation pond is adequate to store the half PMP based on incipient rainfall on the reservoirs and no contributing drainage area, and with allowance for wave run-up.

7.2.3 Dam Break Analysis

A simplified dam break analysis and inundation mapping for the facility was completed by Burns & McDonnell (2004). This analysis considered the failure of a single pond. For purposes of this assessment, this analysis is also considered generally applicable to each of the seven ponds that comprise the Coal Waste Disposal Facility. The inundation is mapped downstream to where it flows from the Big Draw drainage into the Willcox Playa. Two habitable structures and highway US 191 were identified during development of the inundation mapping. The dam break analysis and inundation mapping were not reviewed as part of this study.

7.3 Spillway Rating Curves

There are no spillways for any of the seven dams.

7.4 Evaluation

There is sufficient capacity in Ash 1, Ash 2, Ash 3, Ash 4, Scrub 1, Scrub 2, and the Evaporation Pond to store the inflow design flood, which is half of the PMP, while maintaining the required freeboard in accordance with the ADWR License of Approval. GEI concurs with the evaluation of inflow design flood and freeboard as required under the ADWR License of Approval for this facility.

8.0 Structural Stability

8.1 Visual Observations

The assessment team saw no visible signs of instability associated with the interior or exterior dikes of the seven impoundments during the September 3, 2009, site assessment.

8.2 Field Investigations

A Subsurface Investigation Report for Ash Pond Modifications was prepared by Burns & McDonnell (1992). Subsurface investigations performed at the site consist of:

- Sixteen borings completed by Burns & McDonnell to investigate the subsurface conditions and to investigate borrow sources for the dike embankments. Standard Penetration Tests (SPT) performed as part of the investigation, with borings extending to depths of 26 feet to 171 feet. Soil samples obtained for laboratory testing consisting of unit weight, moisture content, gradation, Atterberg Limits, Standard Proctor, unconfined compression, consolidation, and hydraulic conductivity tests.
- In 1974, Burns & McDonnell performed a subsurface investigation at the location of the proposed power plant for steam units 2 & 3. The original report was not available, but select borings and laboratory test results from that investigation are presented in a subsurface investigation report for the ash pond modifications (Burns & McDonnell, 1992). These borings are in the vicinity of the power plant, but may approximate the subsurface conditions near the impoundments. Laboratory tests included moisture content, dry unit weight, gradation, Atterberg Limits, consolidation, and direct shear tests.
- In 1962, Kaiser Engineers performed a subsurface investigation for the Cochise Power Plant, which pre-dated the existing power plant at the same site. Select laboratory test results from that investigation are presented in the subsurface investigation report by Burns & McDonnell (1992). The boring that is discussed in the report is located at the power plant, but may be indicative of subsurface conditions near the impoundments. The laboratory test results included in the subsurface investigation report (Burns & McDonnell, 1992) present only direct shear tests.

8.3 Methods of Analysis

The methods of structural stability analysis are presented in Design Notes and Analysis for the Ash and Scrubber Sludge Disposal Ponds and Pond Dikes (Burns & McDonnell, 1993). An addendum to this report was issued to address comments from ADWR (Burns & McDonnell, 1994). This addendum presents additional discussion on the methods of analysis.

The design reports evaluated the stability of a generalized embankment section. This section included the maximum embankment height (30 feet.), the standard embankment slopes of 3H:1V, the standard crest width of 20 feet, and typical soil parameters for the embankment and the foundation. The granular rock slope protection on the exterior embankment slopes and the HDPE liner on the interior slopes were neglected in the analyses.

Loading cases evaluated in the stability analysis included the end of construction, rapid drawdown, steady-state seepage, partial pool, and associated appropriate seismic cases. The computer software UTEXAS2 was used for all analyses. Spencer's method of slices was used, and the phreatic surfaces were estimated using Casagrande's method.

A peak horizontal acceleration coefficient of 0.15g was applied as a pseudo-static coefficient in the facility design (Burns & McDonnell, 1994). This is significantly higher than an acceleration of 0.10g as shown on the 2008 USGS regional probabilistic seismic hazard map for 2 percent Probability of Exceedance within 50 years (recurrence interval of approximately 2500 years). Application of a peak horizontal acceleration coefficient of 0.15g as a pseudo-static coefficient in the facility design would be comparable to an approximate Maximum Credible Earthquake loading, which is an appropriate recurrence interval for application to high hazard classification impoundments based on federal dam safety guidance.

8.4 Discussion of Stability Analysis

The details and results of slope stability analyses are reported in the 1993 and 1994 analysis reports. The 1993 report presented stability analyses for the design of the impoundments. Based on comments from ADWR, the revised report was issued in 1994. The stability analyses of the 1994 Response to ADWR Comments supersede the analyses presented in the 1993 report.

The stability analyses completed as part of the 1994 report were used to evaluate the Factor of Safety of a generalized critical section. Using the computer software UTEXAS2, developed by Stephen Wright at the University of Texas, stability under several conditions was evaluated using the Spencer Method. Steady-state seepage, rapid drawdown, end-of-construction, and partial pool cases were evaluated. Earthquake loading was also considered

for each of the load cases except rapid drawdown. For the seismic case, a pseudostatic acceleration of 0.15g was applied to the embankment.

It is typical to apply one-half of the peak acceleration in the stability analysis, and it is also typical to use the maximum credible earthquake (MCE) for high hazard dams. While information on the MCE has not been developed for the project site, a report prepared for the nearby Rosemont Mine indicates that the MCE is 0.15g to 0.20g based on the background earthquake (Vector, 2006). If the Santa Rita fault zone is determined to be active, the MCE could be as high as 0.34g. This range of MCE results in a range of pseudostatic coefficients from 0.075g to 0.17g. Therefore, use of 0.15g is conservative for the background earthquake, and is only slightly unconservative if the Santa Rita fault zone is determined to be active.

The material properties used in the stability modeling were based primarily on published correlations based on material classification, index testing, and field tests. Where laboratory testing of site-specific materials was completed, these results were used. The geometry of the modeled section was based on the maximum design geometry.

The phreatic surfaces used in the models were estimated using the Casagrande method. These phreatic surfaces were based on steady- seepage conditions, modeling the properties of stored ash as water, and ignoring the seepage control provided by the HDPE lining.

8.5 Factors of Safety

GEI reviewed the computed factors of safety for the embankment stability analysis contained in the 1994 Burns & McDonnell report. We compared the reported calculated factors of safety (FOS) to minimum required factors of safety as currently required by ADWR and by FERC. Table 8.1 presents the calculated factors of safety and the required factors of safety.

Table 8.1: Stability Factors of Safety and Guidance Values

Loading Condition	Min. Calculated FOS (1994 Report)	Min. Required FOS (ADWR)	Min. Required FOS (FERC)
End of Construction	3.11	1.3	1.3
End of Construction - Seismic	1.85	1.0	1.0
Full Reservoir – Steady-state Seepage	1.61	1.5	1.5
Full Reservoir – Steady-state Seepage - Seismic	1.07	1.0	1.0
Rapid Drawdown – Water depth 5 ft	1.56	1.2	1.1
Rapid Drawdown – Water depth 27 ft	0.74	1.2	1.1
Partial Pool – Water depth 0 ft	1.98	1.5	N/A
Partial Pool – Water depth 0 ft - Seismic	1.30	1.0	N/A
Partial Pool – Water depth 10 ft	2.04	1.5	N/A
Partial Pool – Water depth 10 ft - Seismic	1.30	1.0	N/A
Partial Pool – Water depth 20 ft	2.40	1.5	N/A
Partial Pool – Water depth 20 ft - Seismic	1.36	1.0	N/A
Partial Pool – Water depth 27 ft	2.83	1.5	1.5
Partial Pool – Water depth 27 ft - Seismic	1.45	1.0	1.0

As indicated in Table 8.1, the calculated factor of safety for rapid drawdown from the maximum pool is below the guidance value. Although the calculated factor of safety does not meet criteria, a 21.5 foot deep tension crack has been included in the analysis, which is not a typical assumption and is very conservative. GEI performed a check stability analysis for rapid drawdown without the tension crack that resulted in a computed factor of safety of 1.37, which exceeds the recommended ADWR and FERC minimum factors of safety.

8.6 Seismic Stability - Liquefaction Potential

The liquefaction potential at the Coal Waste Disposal Facility has not been previously evaluated based on the available documents. Certain conditions are necessary for liquefaction, including saturated, loose, granular soils and an earthquake of sufficient magnitude and duration to cause significant strength loss in the soil. The water table is more than 70 feet below the impoundments based on information from the eight borings completed within the footprint of the impoundments. The clayey foundation soils and the soils used for construction of the dikes are not likely susceptible to significant strength loss during strong shaking. Clayey soils were compacted to a minimum 95 percent Standard Proctor compaction for the embankments, which results in a dense soil, and the foundation soils generally consist of stiff to hard clays. The foundation soils and the embankment soils are unlikely to become saturated from the impounded water due to the HDPE lining. Therefore, in our opinion, the potential for liquefaction of the facility embankments or foundation soil is low.

8.7 Decant Drop Inlet Structures

The decant drop inlet tower structures in the ash ponds (Ash 1, Ash 2, Ash 3, and Ash 4) are constructed of reinforced concrete and are founded on a concrete slab. The towers are 33.5 feet high. The towers are the primary means of removing decant water from the ash ponds and are the sole means of discharging floodwater from the impoundment.

Design calculations for the drop inlet tower structures were not available. GEI completed a check analysis for a sliding loading case and for a seismic loading case for the tower assuming 0.34g horizontal acceleration. Conservatively ignoring soil loads, the resultant is within the base for the seismic loading case. Also, the factor of safety against sliding is 1.56 assuming passive soil pressures are neglected, which is a conservative assumption. These loading cases both meet or exceed the required structural stability criteria.

8.8 Summary of Results

8.8.1 Embankments

The stability analyses that have been performed for the embankments appear to address adequately the most critical section. With one exception the analyses presented in the 1994 report all meet the minimum required factor of safety criteria according to ADWR and FERC guidance. These analyses include use of appropriate material properties and loading conditions.

The low calculated factor of safety for rapid drawdown from maximum pool documented in the 1994 design resulted from a very conservative analysis that may not be representative of typical rapid drawdown analysis. A GEI check analysis for rapid drawdown using a conventional model resulted in a factor of safety that exceeded the minimum recommended factor of safety.

8.8.2 Decant Drop Inlet Structures

A 1994 design structural analysis of the decant drop inlet structures was not available for review. A check GEI analysis for sliding and seismic load conditions indicates the structure meets or exceeds stability criteria.

9.0 Maintenance and Methods of Operation

9.1 Procedures

AEPCO's experience with management of the coal combustion waste management system has resulted in the development of standard operational procedures to inspect, maintain, and operate the system. To the knowledge of the assessment team, these procedures have not been formally documented in an Operation and Maintenance Manual. Several of the plant engineers and operating personnel have been with AEPCO since the seven impoundments were placed in service. The power plant is manned 24 hours a day, seven days a week. Daily inspection rounds are performed of the entire ash pond facilities by operations staff to observe the general condition of structures and embankments. Identified deficiencies are documented and repaired.

9.2 Maintenance of Impoundments

Maintenance of the seven impoundments is performed by AEPCO staff under the guidance of AEPCO managers and engineers. Instrument readings are reported annually to the Arizona Department of Water Resources. Inspections are made monthly by AEPCO engineers and typically annually by ADWR personnel.

9.3 Surveillance

The entire Coal Waste Disposal Facility is patrolled daily by AEPCO operations personnel and every several hours by security personnel. Plant personnel are available at the power plant and on 24-hour call for emergencies that may arise. There are no automatic alarm systems at the impoundments.

10.0 Emergency Action Plan

An Emergency Action Plan (EAP) has been developed for the seven impoundments (AEPCO, 2009). The EAP was developed based on a dambreak analysis and inundation mapping for an individual pond at the facility, which indicated the potential for flooding the 2 residences that are located about 0.5 miles downstream. The dambreak flood will also inundate Highway 191, which is located immediately downstream of the seven impoundments. The inundation map indicates outflows resulting from a dam failure will be conveyed down the Big Draw drainage about 1 mile to the uninhabited Willcox Playa.

The seven impoundments were assigned a High Hazard classification based on a dambreak and inundation analysis performed by AEPCO. The High Hazard classification has been accepted by the Arizona Department of Water Resources (ADWR), Dam Safety and Flood Mitigation Division.

GEI concurs with the High Hazard classification for the seven impoundments based on both the potential for inundation of Highway 191 and associated potential for loss of life, and on the flooding of two residences located about 0.5 miles downstream of the facility.

The Low Volume Wastewater Pond has not been assigned a hazard classification. The height and storage capacity of the Low Volume Wastewater Pond is below the minimum requirements for regulation as a dam by ADWR. Discharge from the Low Volume Wastewater Pond would flow directly into the uninhabited Willcox Playa. No homes are located downstream of this pond.

The Cooling Tower Blowdown Pond (shown as Facility 4 on Exhibit 1) has not been assigned a hazard classification. The height and storage capacity of the Cooling Tower Blowdown Pond is below the minimum requirements for regulation as a dam by ADWR. Discharge from the Cooling Tower Blowdown Pond would flow directly into the uninhabited Willcox Playa. No homes are located downstream of this pond.

The Coal Pile Retention Basin has not been assigned a hazard classification. The basin is constructed entirely below grade. The height and storage capacity of the Coal Pile Retention Basin is below the minimum requirements for regulation as a dam by ADWR. Discharge from the Coal Pile Retention Basin would be retained on Apache Power Plant property. No homes are located downstream of this pond.

GEI recommends a Low Hazard Classification for the Low Volume Wastewater Pond based on the height and storage capacity and lack of potential for significant economic, environmental damage, or loss of life in the event of failure of the embankment.

GEI recommends a Low Hazard Classification for the Cooling Tower Blowdown Pond based on the height and storage capacity and lack of potential for significant economic, environmental damage, or loss of life in the event of failure of the embankment.

GEI recommends a Less-than-Low Hazard Classification for the Coal Pile Retention Basin because the basin is constructed entirely below grade and therefore there is no potential for failure of an impounding embankment.

11.0 Conclusions

11.1 Assessment of Dams

11.1.1 Field Assessment

The seven impoundment dams were generally found to be in satisfactory condition. Issues of potential concern for the facilities were identified from our field assessment as follows:

- Differential settlement across the site due to regional subsidence has resulted in portions of the crest of each impoundment being lower than other portions of the crest.
- Fissures have developed near the impoundments due to regional subsidence. At least one of these fissures extends beneath the impoundments.
- The granular rock slope protection on the downstream slope has become thin in several locations such that the underlying embankment material is exposed.

11.1.2 Stability Analysis (Adequacy of Factors of Safety)

With one exception the stability analyses addressing the generalized critical section meet the minimum required factors of safety criteria according to ADWR and FERC guidance. These analyses include the use of appropriate material properties and loading conditions.

The analysis performed for rapid drawdown from maximum pool elevation reports a factor of safety that does not meet minimum values required by ADWR and FERC. The low factor of safety for this drawdown case resulted from an analysis that assumed a deep tension crack within the embankment, which may not be an appropriate analysis condition. A check analysis performed by GEI using conventional rapid drawdown conditions resulted in a calculated factor of safety that exceeds the regulatory criteria.

11.1.3 Spillway Adequacy and Outlet Works

None of the seven impoundments have emergency spillways. Each impoundment has the capacity to store an inflow design flood equal to 50 percent of the PMF in accordance with the License of Approval from ADWR. The operating pool level maintains adequate freeboard during storage of the inflow design flood.

The four ash ponds (Ash 1, Ash 2, Ash 3, and Ash 4) each have a decant drop inlet structure that serves as an outlet works. The only means to lower the water elevation is by evaporation or by pumping decant water to the Cooling Tower Blowdown Pond. Scrubber Sludge

Pond 1, Scrubber Sludge Pond 2, and the Evaporation Pond do not have an outlet works. The addition of water (slurried fly ash) and removal of decant water from the impoundments are carefully monitored and controlled by pumps operated by power plant personnel. There is no automatic shutoff control system for the pumps delivering slurried fly ash or slurried scrubber sludge to the impoundments to prevent overfilling of the ponds or to start the recirculation pump system in case pond water levels exceed required operating levels.

Based on the maximum pumping rates for the waste materials being placed in the ponds, it would take nearly a week to raise the water level in each of the ash ponds three feet, and would take several weeks to raise the water level in each of the scrubber sludge ponds three feet. Under the current program of monitoring the dams, which includes daily inspections by operations personnel, it is likely that rising water levels would be noticed before overtopping of the dams occurred.

11.2 Adequacy of Instrumentation and Monitoring of Instrumentation

The only instrumentation for monitoring embankment performance is survey monuments, which enable evaluation of movement of the embankments. There are no observation wells or piezometers to enable measurement of changes to water levels within the dam embankments and dam foundations that may result from damage to the HDPE lining or other causes. Observation well or piezometer instrumentation should be installed at locations near the maximum dam section or other potentially critical locations to enable measurement of water levels within the dam embankments and dam foundations should the HDPE lining become compromised.

The frequency of monitoring is considered adequate. Other instrumentation and monitoring programs are generally satisfactory except that special attention should be made to monitoring the following items:

- Low areas on the crest caused by differential settlement across the site due to regional subsidence. This may have reduced the available freeboard of the impoundments.
- Any changes in the fissures that have developed near the impoundments due to regional subsidence. The existing fissure monitoring and surveying programs should be continued.

11.3 Adequacy of Maintenance and Surveillance

All seven of the impoundments have satisfactory maintenance and surveillance programs.

12.0 Recommendations

12.1 Corrective Measures for the Structures

The locally sparse granular rock slope protection on the downstream slopes of several of the embankments should be repaired.

12.2 Corrective Measures Required for Maintenance and Surveillance Procedures

None.

12.3 Corrective Measures Required for the Methods of Operation of the Project Works

Prudent practice is to provide redundancy in the system operations, which could include an automatic shutoff control system for the pumps delivering slurried fly ash or slurried scrubber sludge to the impoundments to prevent overfilling of the ponds, or an automatic control system to start the recirculation pump system in case water levels in the impoundments exceed required operating levels. An alternative for this facility is to modify the existing outlets from the currently operated ash ponds and scrubber sludge ponds to discharge to adjacent empty ponds and serve as passive controls for the pond levels. This approach could be employed as long as the water levels in the adjacent ponds are below the water levels in the currently operated ponds.

12.4 Any New or Additional Monitoring Instruments, Periodic Observations, or Other Methods of Monitoring Project Works or Conditions That May Be Required

Expand instrumentation to include staff gauges for each of the impoundments. The elevations of the staff gauges should be established by survey methods. The staff gauges should be used for estimating the pond surface elevations, which should be periodically compared to the surveyed elevations of the pond crest to maintain adequate freeboard.

No piezometers are currently installed at the facility and a modest level of instrumentation for water levels within the exterior dam embankment should be implemented to provide warming of changing conditions in addition to any warning currently provided by routine visual observation. Install observation well or piezometer instrumentation or other means of monitoring water levels consistent with standard engineering practice at locations near the maximum dam section and other potentially critical locations to enable measurement of

water levels within the dam embankments and dam foundations should the HDPE lining become compromised. If seepage or liner leaks are observed in the future, piezometers should be installed to enable evaluation of the problem area.

12.5 Acknowledgement of Assessment

I acknowledge that the management unit(s) referenced herein was personally inspected by me and was found to be in the following condition **(select one only):**

SATISFACTORY

FAIR

POOR

UNSATISFACTORY

DEFINITIONS FOR ASSESSMENT

SATISFACTORY
No existing or potential management unit safety deficiencies are recognized. Acceptable performance is expected under all applicable loading conditions (static, hydrologic, seismic) in accordance with the applicable criteria. Minor maintenance items may be required.

FAIR
Acceptable performance is expected under all required loading conditions (static, hydrologic, seismic) in accordance with the applicable safety regulatory criteria. Minor deficiencies may exist that require remedial action and/or secondary studies or investigations

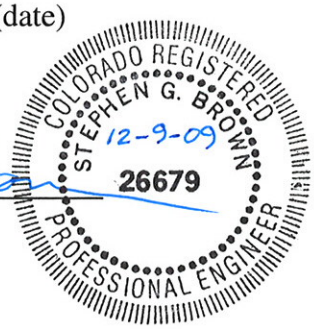
POOR
A management unit safety deficiency is recognized for any required loading condition (static, hydrologic, seismic) in accordance with the applicable dam safety regulatory criteria. Remedial action is necessary. POOR also applies when further critical studies or investigations are needed to identify any potential dam safety deficiencies.

UNSATISFACTORY
Considered unsafe. A dam safety deficiency is recognized that requires immediate or emergency remedial action for problem resolution. Reservoir restrictions may be necessary.

I acknowledge that the management unit referenced herein:

Has been assessed on September 3, 2009 (date)

Signature: _____



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13.0 References

AMEC Earth & Environmental, Inc., 2009, *Autumn 2008 Annual Readings of Survey Monuments, Monitoring Points and Benchmarks Summary Report, Combustion Waste Disposal Facility, Apache Generating Station,* Prepared for Arizona Electric Power Cooperative, January 26.

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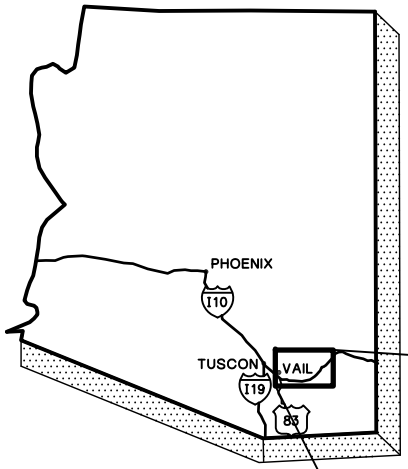
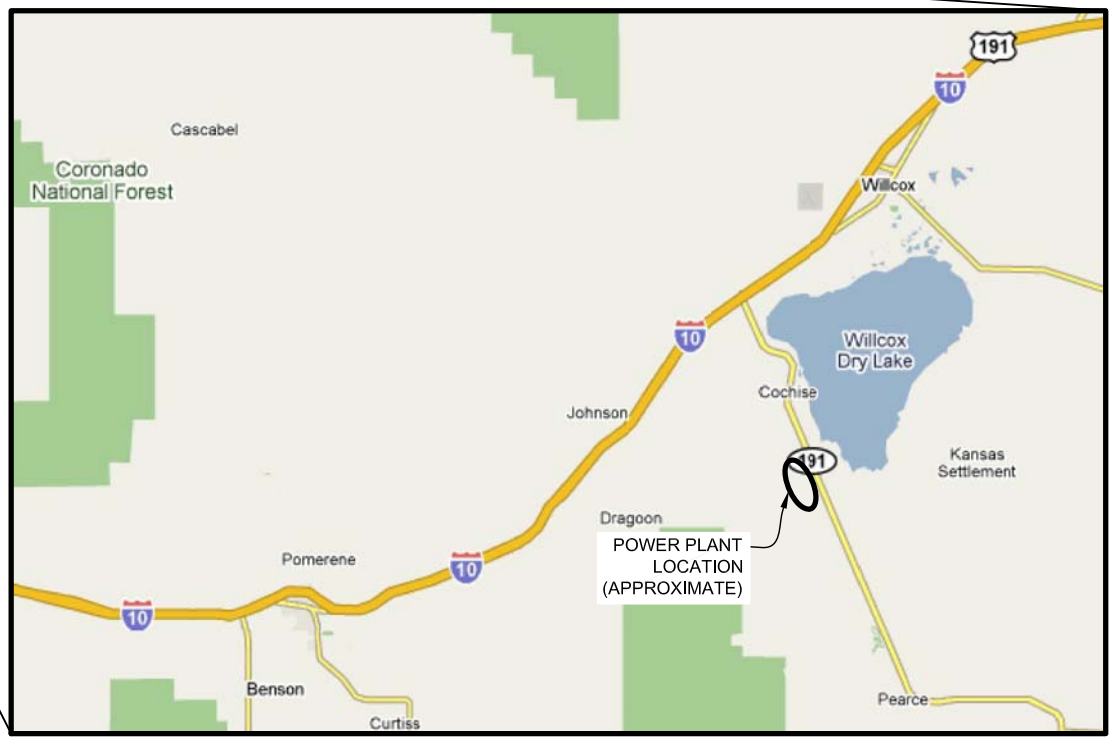
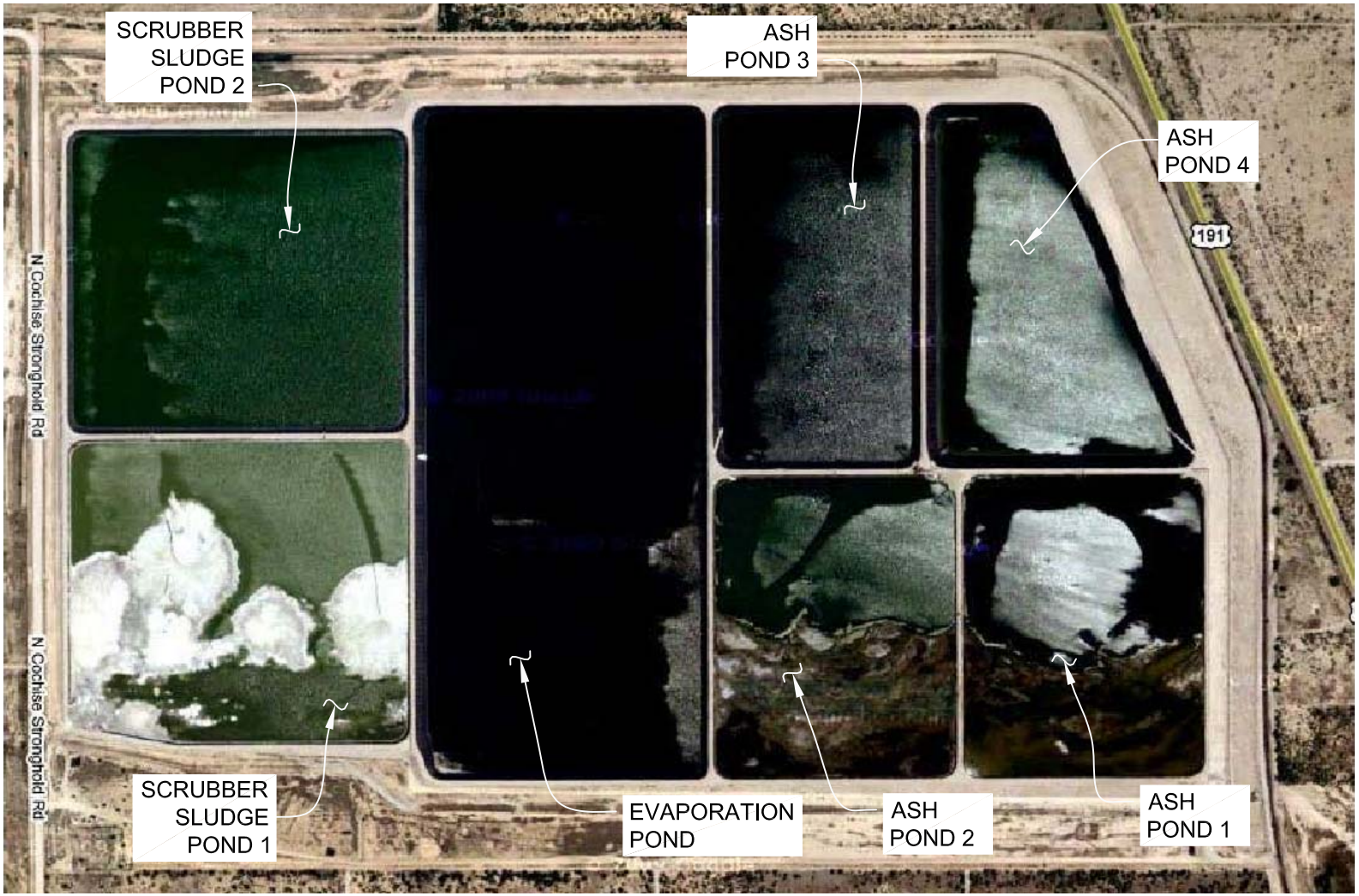
Figures and Exhibits





Assessment of Dam Safety of Coal Combustion Waste Impoundments at AEPCO Apache Power Plant	GEI Consultants	SITE VICINITY MAP
Lockheed-Martin Corporation Edison, NJ	Project 091330	December 2009 Figure 1

P:\091330 - Lockheed Martin Coal Ash Impoundments\AEPCO-Apache\Figures\ FIGURE 1 SITE VICINITY MAP.dwg Dec 2009



NOT TO SCALE

Assessment of Dam Safety of Coal Combustion Waste Impoundments at AEPCO Apache Power Plant	GEI Consultants	SATELLITE PHOTO
Lockheed-Martin Corporation Edison, NJ	Project 091330	December 2009 Figure 2

P:\091330 - Lockheed Martin Coal Ash Impoundments\AEPCO-Apache\Figures\ FIGURE 2 Satellite Photo.dwg Oct 2009

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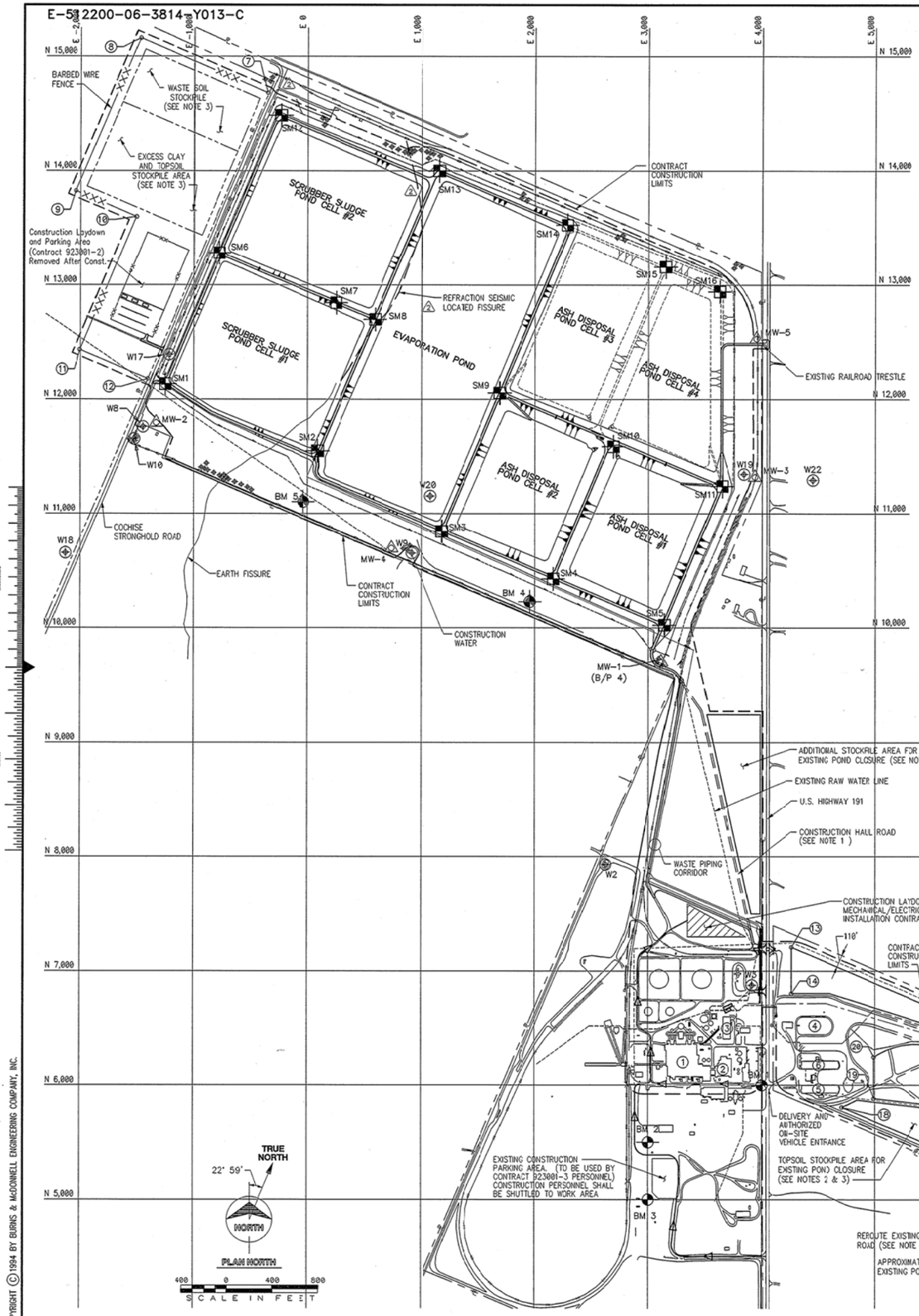

WELL SCHEDULE				
DESCRIPTION	COORDINATES	ELEVATION	CASE DIA. (IN.)	DEPTH (FT.)
W2	N 7,939.672 – E 2,624.656	4202.63	16	1087
W3	N 6,875.951 – E 3,913.410	4180.14	18	1355
W8	N 11,769.102 – E –1,451.632	4233.65	20	395
W9	N 10,652.841 – E 914.714	4211.43	16	550
W10	N 11,654.860 – E –1,529.055	4235.10	–	–
W17	N 12,398.119 – E –1,221.884	4230.30	16	500
W18	N 10,654.856 – E –2,130.246	4233.54	16	777
W19	N 11,345.276 – E 3,849.350	4186.61	12	500
W20	N 11,151.225 – E 1,081.046	4207.51	16	480
W22	N 11,293.781 – E 4,443.176	4182.79	–	–

SURVEY MONUMENT SCHEDULE (SEE NOTE 4)			
DESCRIPTION	COORDINATES	ELEVATION	COMMENTS
SM1	N 12,133.431 – E –1,254.725	4226.88	
SM2	N 11,547.720 – E 87.698	4226.40	TOP OF WASTE PIPE CROSSING STRUCTURE #2
SM3	N 10,842.823 – E 1,188.830	4216.40	
SM4	N 10,423.104 – E 2,160.985	4215.56	
SM5	N 10,022.540 – E 3,141.543	4216.14	
SM6	N 13,289.660 – E –776.074	4226.62	
SM7	N 12,842.550 – E 250.359	4227.48	TOP OF WASTE PIPE CROSSING STRUCTURE #7
SM8	N 12,697.191 – E 592.136	4226.35	
SM9	N 12,055.224 – E 1,698.146	4216.73	
SM10	N 11,586.918 – E 2,692.156	4216.58	
SM11	N 11,238.496 – E 3,650.067	4216.20	TOP OF WASTE PIPE CROSSING STRUCTURE #1
SM12	N 14,484.099 – E 237.388	4226.56	ALTERNATE 2 – BID DELETE
SM13	N 13,999.273 – E 1,157.864	4221.86	
SM14	N 13,525.601 – E 2,286.194	4215.91	
SM15	N 13,158.501 – E 3,151.401	4215.90	ALTERNATE 1 – BID ADD
SM16	N 12,940.653 – E 3,625.647	4216.13	ALTERNATE 1 – BID ADD

MONITORING WELL SCHEDULE		
DESCRIPTION	COORDINATES	ELEVATION
MW–1	N 9,661.214 – E 3,162.485	4196.12
MW–2	N 11,795 – E –1,335	4228
MW–3	N 11,320 – E 3,935	4193 ±
MW–4	N 16,671.2 – E 774.8	4211.0
MW–5	N 12,528 – E 3,949	4192 ±

BENCHMARK SCHEDULE		
DESCRIPTION	COORDINATES	ELEVATION
BM 1	N 6,000.000 – E 4,000.000	4186.93
BM 2	N 5,504.098 – E 2,999.937	4193.71
BM 3	N 5,000.206 – E 3,000.163	4193.48
BM 4	N 10,228.991 – E 1,955.774	4202.26
BM 5	N 11,163.285 – E –38.322	4217.22

KEY NOTES

1. EXISTING UNITS #2 & #3
2. EXISTING UNIT #1
3. EXISTING UNIT #1 COOLING TOWER
4. EXISTING COOLING TOWER BLOWDOWN POND
5. EXISTING UNIT #2 COOLING TOWER
6. EXISTING UNIT #3 COOLING TOWER
7. TIE INTO EXISTING BARBED WIRE FENCE N 14,681.78 E –351.77
8. FENCE CORNER N 15,160 E –1,475
9. FENCE CORNER N 13,825 E –2,042
10. FENCE CORNER N 13,600 E –1,510
11. FENCE CORNER N 12,433 E –2,006
12. TIE INTO EXISTING BARBED WIRE FENCE N 12,178.66 E –1,409.88
13. N 7,287.9 E 4,264.1 ⚠
14. N 6,883.2 E 4,264.1
15. N 6,138.7 E 6,775.4
16. N 5,810.2 E 7,278.7
17. N 5,340.6 E 5,795.6
18. N 5,805.8 E 4,706.5
19. N 5,882.4 E 4,999.0
20. N 6,248.9 E 4,999.0
21. ℄ EXISTING PIPING CORRIDOR (SEE NOTE 10)
22. EXISTING CTBD DITCH (SEE NOTE 10)

* STOCKPILE COORDINATES WERE STAKED PER PLAN EAST OF U.S. HIGHWAY 191

GENERAL NOTES:

1. CONSTRUCTION HAUL ROAD SHALL BE ALIGNED PARALLEL TO THE EXISTING RAW WATER LINE WITHOUT PASSING OVER IT AT ANY LOCATION (EXCEPT AS INDICATED). MAINTAIN A MINIMUM SPACING OF 25' BETWEEN ℄ OF HAUL ROAD AND THE RAW WATER LINE.
2. ADDITIONAL STOCKPILE AREA FOR EXISTING POND CLOSURE, IF REQUIRED, SHALL BE COORDINATED BETWEEN THE CONTRACTOR AND THE OWNER. STOCKPILE AREAS EAST OF HWY 191 MUST BE AT FULL CAPACITY BEFORE AREAS WEST OF HWY 191 MAY BE UTILIZED.
3. THE CONTRACTOR SHALL LIMIT THE STOCKPILE HEIGHT TO A MAXIMUM OF 18'. STOCKPILE SIDE SLOPES SHALL NOT BE STEEPER 3 HORIZONTAL 1 VERTICAL.
4. SEE SURVEY MONUMENT DETAIL DWG. Y15. SURVEY FINAL COORDINATES AND ELEVATIONS OF MONUMENTS, WHICH WILL BE INDICATED ON THE SURVEY MONUMENT DISC TO THE NEAREST 0.001 FOOT.
5. UNLESS OTHERWISE INDICATED ELEVATIONS AND CONTOURS REPRESENT TOP OF SUBGRADE FOR ALL AREAS EXCEPT THOSE TO RECEIVE TOPSOIL WHERE THEY REPRESENT FINISHED GRADE.
6. THE CONTRACTOR SHALL COORDINATE THE CONSTRUCTION OF PIPING, PUMPS, ELECTRICAL CONDUITS AND EQUIPMENT IN CONTRACT 923001-3 TO PREVENT THE NEED FOR ANY REWORK.
7. CONTRACTOR SHALL PROTECT 12" CTBD PIPE WHILE CROSSING WITH CONSTRUCTION EQUIPMENT AND SHALL ENSURE THAT STOCKPILES DO NOT COVER PIPE.
8. EXISTING SURVEY MONUMENTS SHALL NOT BE DISTURBED DURING CONSTRUCTION. IF DAMAGED THE CONTRACTOR SHALL REPLACE THE SURVEY MONUMENT (AS INDICATED ON Y15) AT NO COST TO THE OWNER.
9. 20' WIDE ROAD SHALL BE REROUTED AS INDICATED. CONSTRUCT ROAD ON PREPARED SUBGRADE AND PROVIDE 6" CRUSHED ROCK SURFACING.
10. CONTRACTOR SHALL PROTECT EXISTING POWER LINES, PIPE CORRIDOR AND CTBD DITCH AND KEEP THEM IN SERVICE. CONTRACTOR SHALL PROVIDE TEMPORARY CROSSINGS OVER PIPE CORRIDOR AND CTBD DITCH AS REQUIRED TO ACCESS SELECT FILL STOCKPILE AREAS.

LEGEND

EXISTING		NEW
4220	CONTOURS	4220
✳	TOP OF SLOPE	
✳	TOE OF SLOPE	
	STRUCTURES	
	ROADS	
	RAILROAD	
–X–X–X–	BARBED WIRE FENCE	–XXX–XXX–
–X–X–X–	SECURITY FENCE	–XX–XX–
	DITCH FLOWLINE	
	ABOVE GROUND PIPES	
	UNDERGROUND PIPES	
	STORM SEWER W/ END SECTIONS	
	STORM SEWER W/O END SECTIONS	
–E–	PROPERTY LINE	
	RIPRAP	
	GRANULAR SLOPE PROTECTION	
	CRUSHED ROCK SURFACING	
	SLOPE INDICATOR	
	SIGN	
	PIEZOMETER/MONITORING WELL	
	WELL	
	BENCHMARK	
	SURVEY MONUMENT	
	TREES	
	STREET LIGHT	
	FIRE HYDRANT	
	ALTERNATE BID WORK	

✳ TOP OF TOE OF SLOPE TO MATCH EXISTING GRADE UNLESS AN ELEVATION OR SLOPE IS INDICATED

no.	date	by	revision
0	5-10-94	TLL	ISSUED TO OWNER FOR BID
1	9-13-94	DLM	CLARIFIED COORDINATE LOCATION
	9-20-94	TLL	ISSUED AS BID
2	11-15-94	DLM	ADDED REFRACTION SEISMIC LOCATED FISSURE AND REVISED SURVEY MONUMENTS
	11-18-94	TLL	ISSUED PER C.O. #1
3	4-8-96	DLM	CONFORMING TO CONSTRUCTION RECORDS

Burns & McDonnell

date	detailed
JULY 29, 1992	D. MADDOCK
designed	checked
M. FRERKING	T. LARSON

AEPCO
ARIZONA ELECTRIC POWER COOPERATIVE, INC.
APACHE STATION
COMBUSTION WASTE DISPOSAL FACILITY

WASTE DISPOSAL PONDS AND APPURTENANCES CONSTRUCTION

SITE PLAN

project	contract
91-033-1-010	923001-2
drawing	rev.
Y1	3
sheet	of sheets

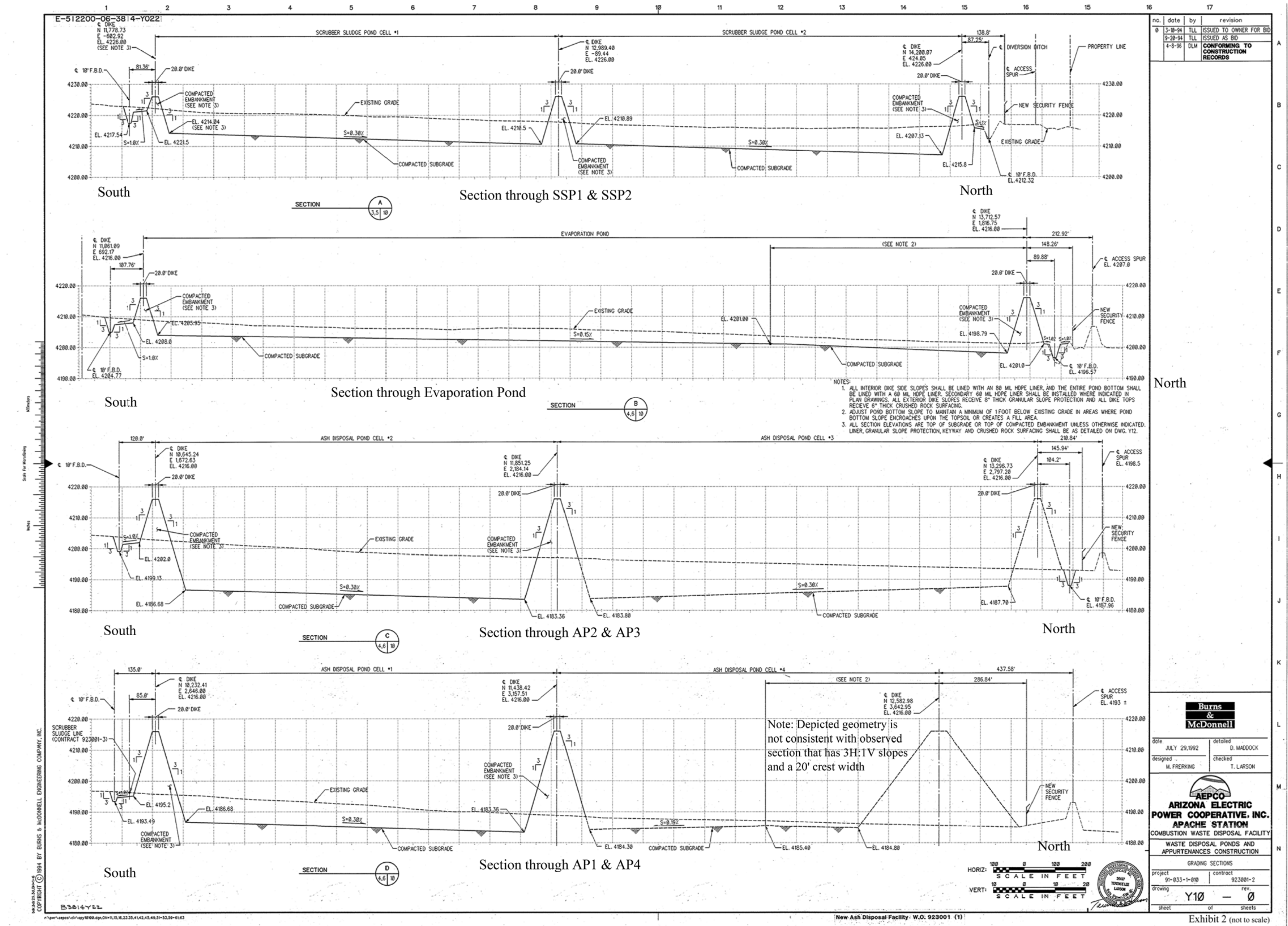

Exhibit 2 (not to scale)

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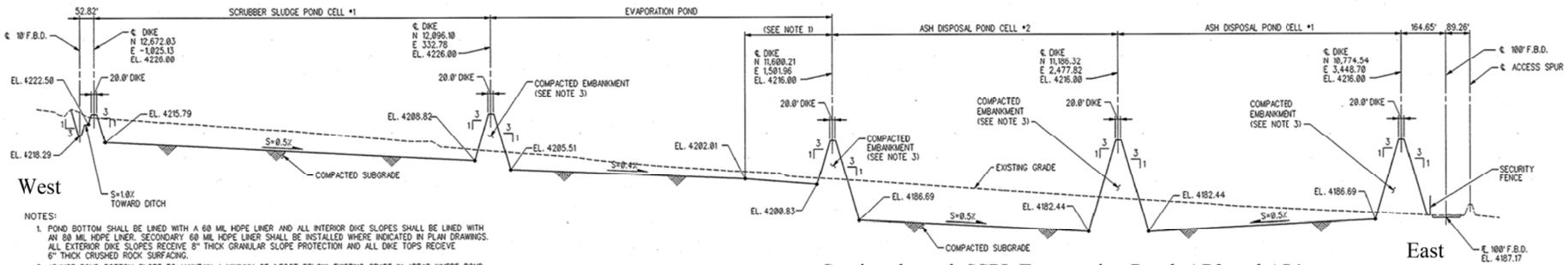
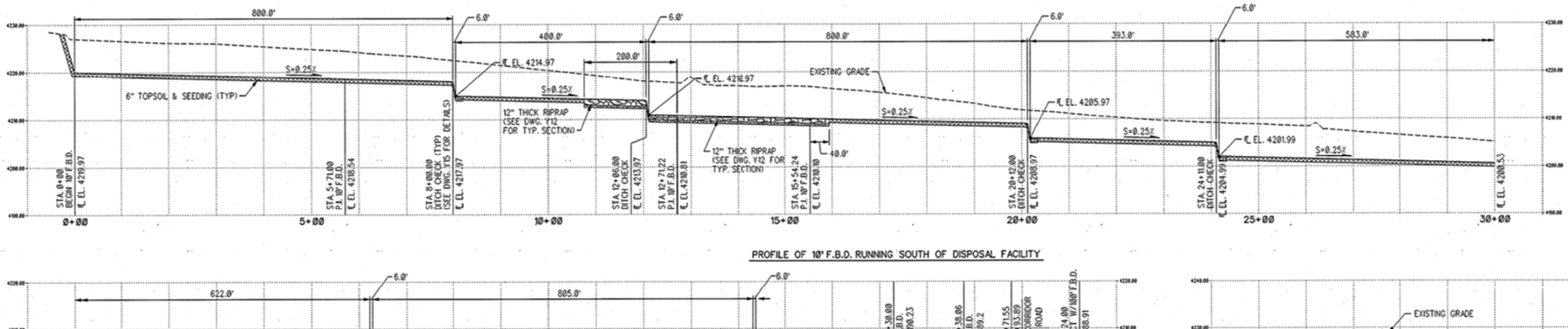


NOTES:

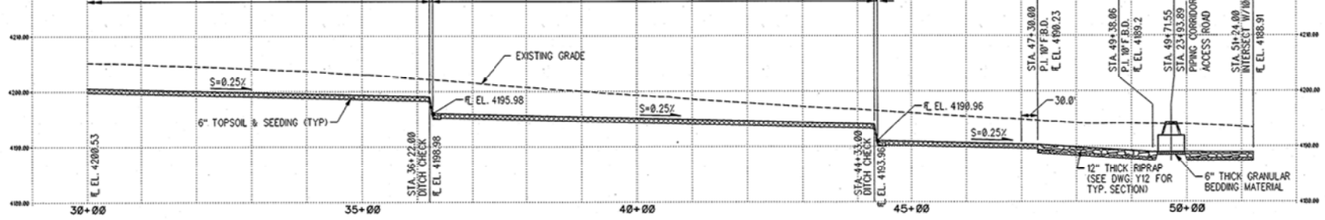
1. POND BOTTOM SHALL BE LINED WITH A 60 MIL HDPE LINER AND ALL INTERIOR DIKE SLOPES SHALL BE LINED WITH AN 80 MIL HDPE LINER. SECONDARY 60 MIL HDPE LINER SHALL BE INSTALLED WHERE INDICATED IN PLAN DRAWINGS. ALL EXTERIOR DIKE SLOPES RECEIVE 8" THICK GRANULAR SLOPE PROTECTION AND ALL DIKE TOPS RECIEVE 6" THICK CRUSHED ROCK SURFACING.
2. ADJUST POND BOTTOM SLOPE TO MAINTAIN A MINIMUM OF 1 FOOT BELOW EXISTING GRADE IN AREAS WHERE POND BOTTOM SLOPE ENCROACHES UPON THE TOPSOIL OR CREATES A FILL AREA.
3. ALL SECTION ELEVATIONS ARE TOP OF SUBGRADE OR TOP OF COMPACTED EMBANKMENT UNLESS OTHERWISE INDICATED. LINER, GRANULAR SLOPE PROTECTION, KEYWAY AND CRUSHED ROCK SURFACING SHALL BE AS DETAILED ON DWG. Y12.

SECTION A 5,6 | 11
NOT TO SCALE

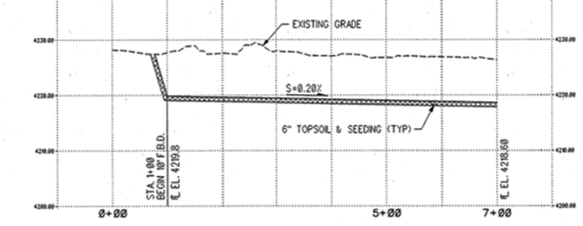
Section through SSPI, Evaporation Pond, AP2 and AP1



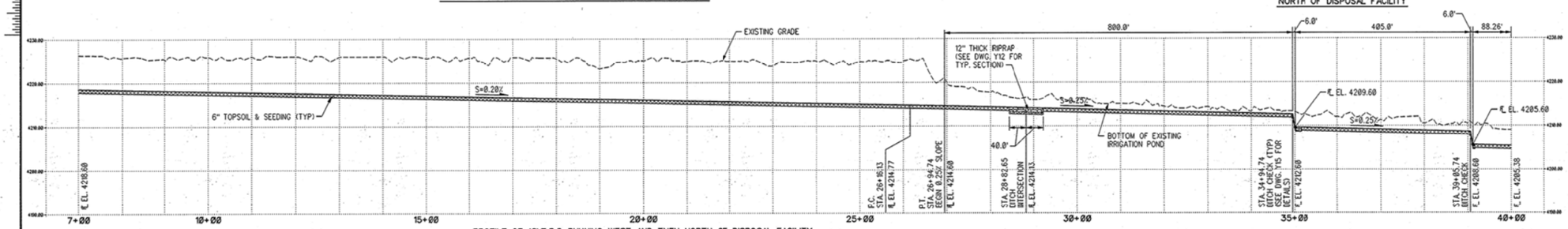
PROFILE OF 10' F.B.D. RUNNING SOUTH OF DISPOSAL FACILITY



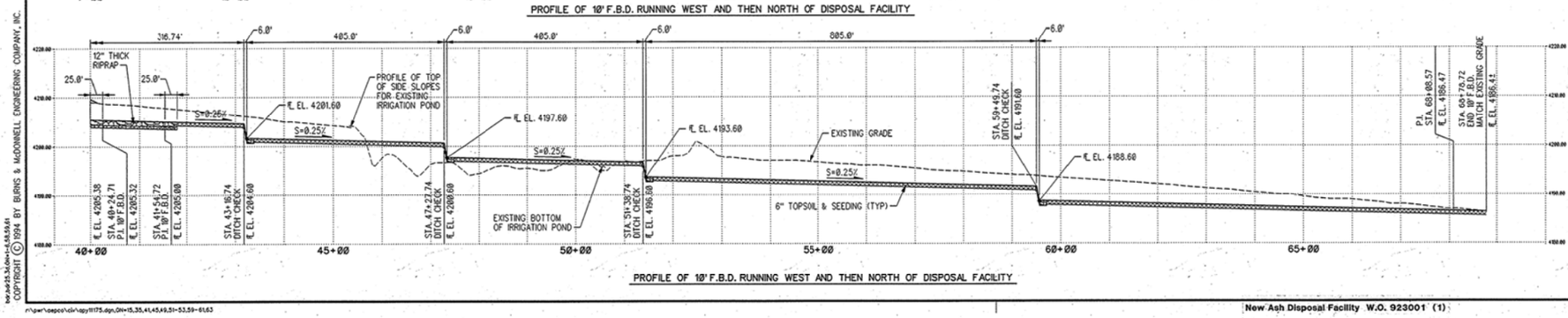
PROFILE OF 10' F.B.D. RUNNING SOUTH OF DISPOSAL FACILITY



PROFILE OF 10' F.B.D. RUNNING WEST AND THEN NORTH OF DISPOSAL FACILITY



PROFILE OF 10' F.B.D. RUNNING WEST AND THEN NORTH OF DISPOSAL FACILITY



PROFILE OF 10' F.B.D. RUNNING WEST AND THEN NORTH OF DISPOSAL FACILITY

SCALES FOR DITCH PROFILES

HORIZ: 100 0 100 200 SCALE IN FEET

VERT: 10 0 10 20 SCALE IN FEET

NOTES: (DITCH PROFILES)

1. SEE TYPICAL DITCH CHECK SECTION, DWG. Y15.

no.	date	by	revision
0	3-18-94	TLL	ISSUED TO OWNER FOR BID
	9-28-94	TLL	ISSUED AS BID
1	4-8-96	DLM	CONFORMING TO CONSTRUCTION RECORDS

Burns & McDonnell

date	detailed
JULY 29,1992	D. MADDOCK
designed	checked
M. FRERKING	T. LARSON

AEPCO
ARIZONA ELECTRIC POWER COOPERATIVE, INC.
APACHE STATION
COMBUSTION WASTE DISPOSAL FACILITY

WASTE DISPOSAL PONDS AND APPURTENANCES CONSTRUCTION

GRADING SECTIONS AND DITCH PROFILES

project	contract
91-033-1-010	923001-2

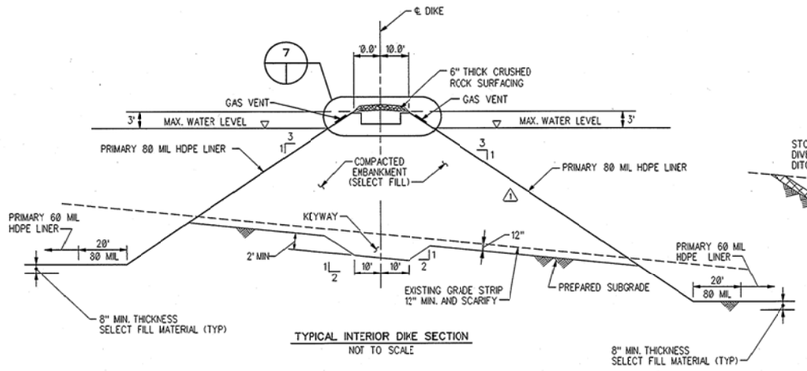
drawing Y11 — rev. 1

sheet of sheets

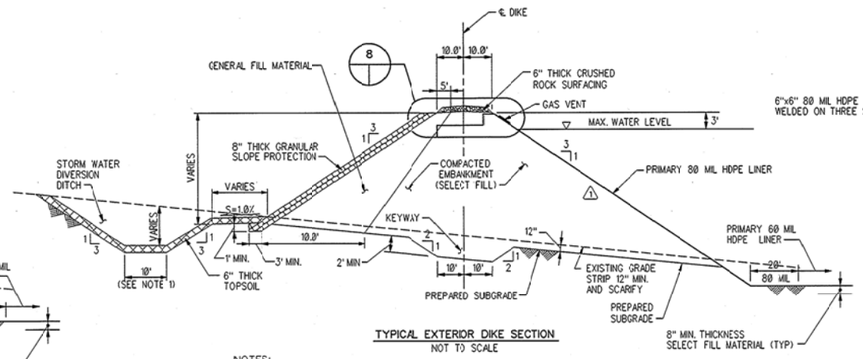
Exhibit 3 (not to scale)

E-512200-06-3814-A008-B

no.	date	by	revision
0	3-18-94	TLL	ISSUED TO OWNER FOR BID
	9-20-94	TLL	ISSUED AS BID
1	11-15-94	DLM	REMOVED SECONDARY LINER DETAILS
	11-18-94	TLL	REVISED PER C.O. #2
	1-27-95	TLL	REVISION TO C.O. #2
2	<-18-96	DLM	**CONFORMING TO CONSTRUCTION RECORDS**

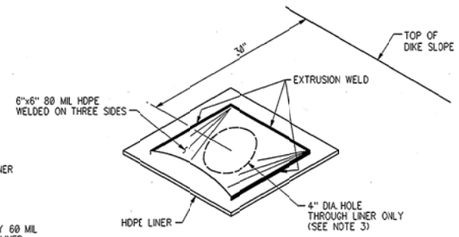


TYPICAL INTERIOR DIKE SECTION
NOT TO SCALE



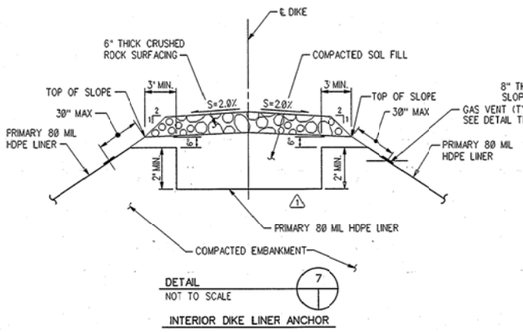
TYPICAL EXTERIOR DIKE SECTION
NOT TO SCALE

NOTES:
1. STORM WATER DIVERSION DITCH WILL BE 10' WIDE EXCEPT THE DITCH ON THE EAST SIDE OF ASH POND CELL 1 WHICH WILL BE 100' WIDE.

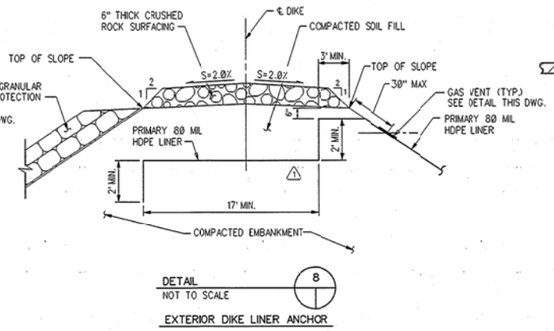


NOTES:
1. INSTALL VENTS AT 50' INTERVALS AROUND POND DIKE PERIMETER.
2. ORIENT VENT SUCH THAT THE OPEN SIDE IS ON BOTTOM.

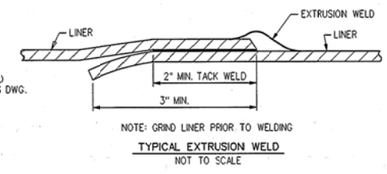
TYPICAL GAS VENT
NOT TO SCALE



DETAIL 7
NOT TO SCALE
INTERIOR DIKE LINER ANCHOR

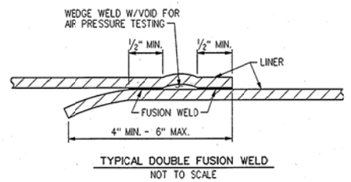


DETAIL 8
NOT TO SCALE
EXTERIOR DIKE LINER ANCHOR

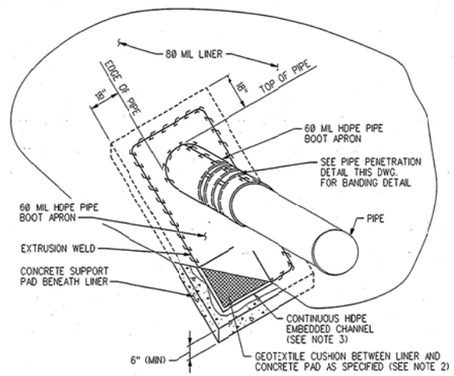


NOTE: GRIND LINER PRIOR TO WELDING

TYPICAL EXTRUSION WELD
NOT TO SCALE

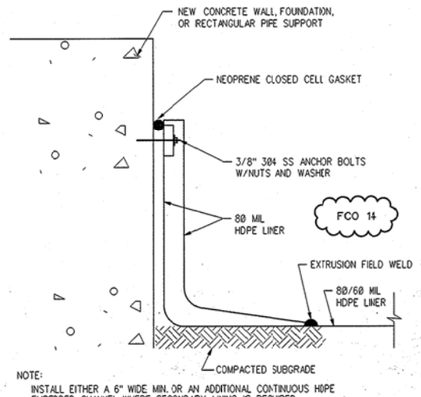


TYPICAL DOUBLE FUSION WELD
NOT TO SCALE



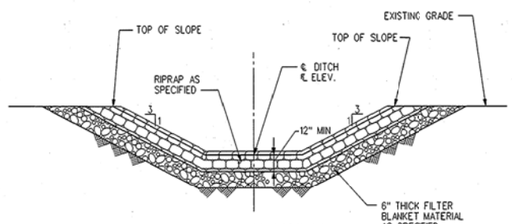
NOTES:
1. STEEL TROWEL FINISH ALL CONCRETE SURFACES WITH ROUND AND SMOOTH EDGES.
2. GEOTEXTILE CUSHION SHALL BE TREVIRA SPUNBOND 1145 AS MANUFACTURED BY HOECHST CELANESE CORPORATION OR AN ENGINEER APPROVED EQUAL.
3. SEE LINER ANCHOR TO NEW CONCRETE DETAIL THIS DWG.

PIPE PENETRATION ISOMETRIC
NOT TO SCALE

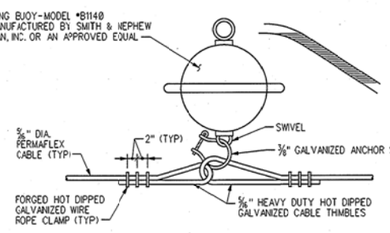


NOTE:
INSTALL EITHER A 6" WIDE MIN. OR AN ADDITIONAL CONTINUOUS HDPE EMBEDDED CHANNEL WHERE SECONDARY LINING IS REQUIRED.

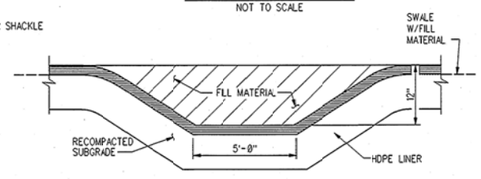
LINER ANCHOR TO NEW CONCRETE
NOT TO SCALE



TYPICAL RIPRAP SECTION IN DIVERSION DITCH
NOT TO SCALE

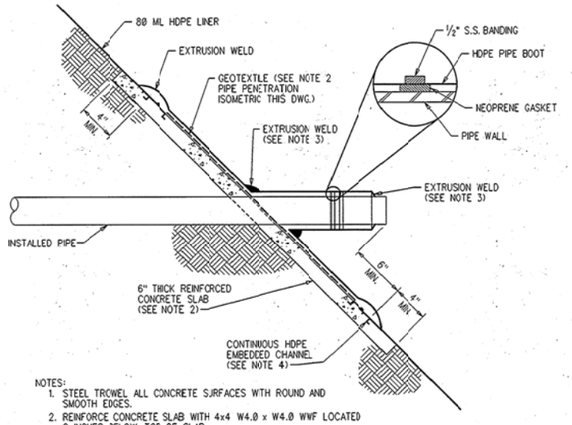


BUOY CONNECTION DETAIL
NOT TO SCALE



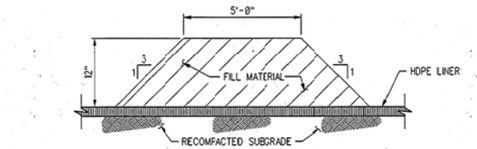
NOTES:
1. INSTALL WIND BALANCE ANCHOR TRENCHES IN EVAPORATION POND ONLY.
2. THE TRENCHES SHALL SPAN EAST TO WEST ACROSS THE POND AND ON EVERY FOURTH PANEL (110' MAX SPACING)
3. DO NOT INSTALL ANCHOR TRENCHES WITH A SEAM SPANNING THE TRENCH BENEATH THE COMPACTED FILL.

EVAPORATION POND
WIND BALANCE ANCHOR TRENCH DETAIL
NOT TO SCALE



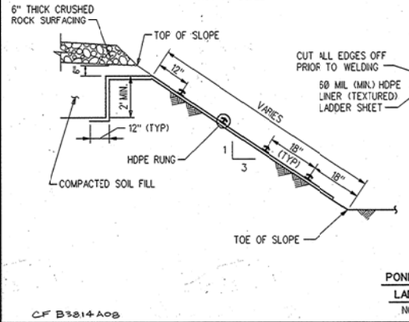
NOTES:
1. STEEL TROWEL ALL CONCRETE SURFACES WITH ROUND AND SMOOTH EDGES.
2. REINFORCE CONCRETE SLAB WITH 4x4 W4.0 x W4.0 WWF LOCATED 2 INCHES BELOW TOP OF SLAB.
3. FOR HDPE PIPE, WELD THE PIPE BOOT APRON AND PIPE BOOT TO THE PIPE. FOR NON-HDPE PIPE, APPLY A SILICONE OR OTHER ENGINEER APPROVED SEALANT.
4. SEE LINER ANCHOR TO NEW CONCRETE DETAIL THIS DWG.

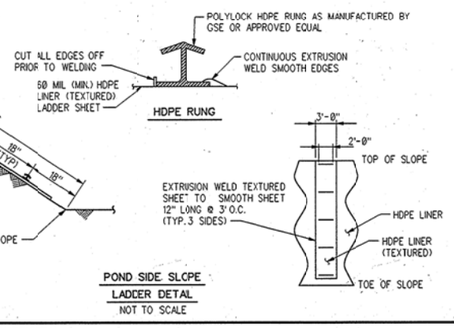
PIPE PENETRATION DETAIL
NOT TO SCALE



NOTES:
1. POSITION ANCHORING BERM FOR ASH POND AND SCRUBBER POND ON EVERY FOURTH PANEL (110' MAX SPACING) SPANNING EAST TO WEST ACROSS THE POND.
2. DO NOT INSTALL FILL OVER A SEAM SPANNING THE LENGTH OF THE POND.

ASH AND SCRUBBER POND ANCHORING DETAIL
NOT TO SCALE





POND SIDE SLOPE
LADDER DETAIL
NOT TO SCALE

NOTE:
LINER MANUFACTURER SHALL APPROVE ALL WELDING, PENETRATIONS, GAS VENTS AND ANCHORING DETAILS PRIOR TO INSTALLATION.

Burns & McDonnell

date	detailed
JULY 29,1992	D. MADDOCK
designed	checked
M. FRERKING	T. LARSON

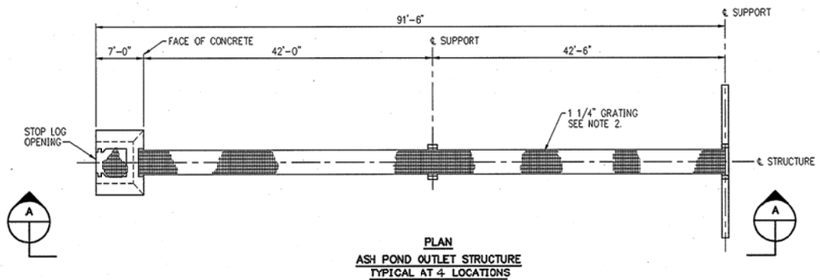
AEPCO
ARIZONA ELECTRIC POWER COOPERATIVE, INC.
APACHE STATION
COMBUSTION WASTE DISPOSAL FACILITY

WASTE DISPOSAL PONDS AND APPURTENANCES CONSTRUCTION
WASTE POND DIKE CROSS SECTIONS AND LINER DETAILS

project	contract
91-033-1-010	923001-2
drawing	rev.
Y12	2
sheet	of sheets

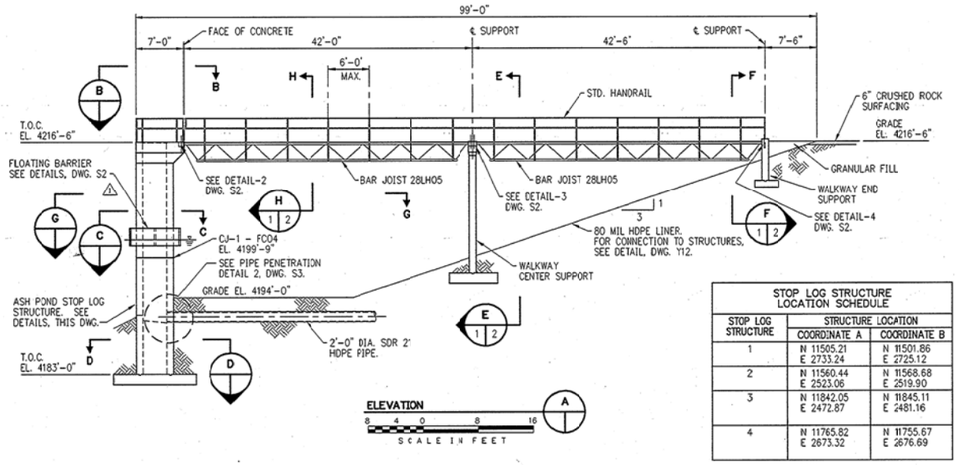
CERTIFICATE NO. 20487 TERENCE LEE LARSON

CF B3814A08



PLAN
ASH POND OUTLET STRUCTURE
TYPICAL AT 4 LOCATIONS
TOP OF GRATING 4216'-6"
SCALE IN FEET

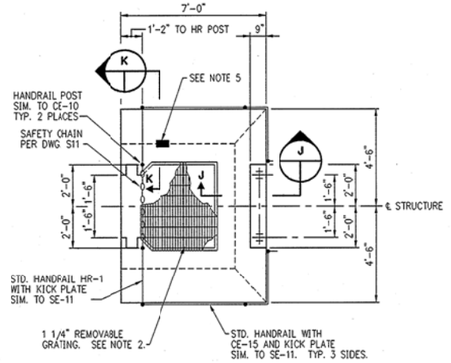
NOTE:
FOR ORIENTATION OF OUTLET STRUCTURES, SEE DWG. Y4.



ELEVATION
SCALE IN FEET

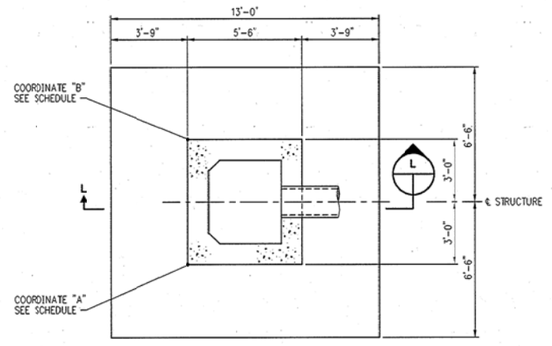
STOP LOG STRUCTURE LOCATION SCHEDULE

STOP LOG STRUCTURE	STRUCTURE LOCATION	
	COORDINATE A	COORDINATE B
1	N 11505.21 E 2733.24	N 11501.86 E 2725.12
2	N 11560.44 E 2523.06	N 11568.68 E 2519.90
3	N 11842.05 E 2472.87	N 11845.11 E 2481.16
4	N 11765.82 E 2673.32	N 11755.67 E 2676.69



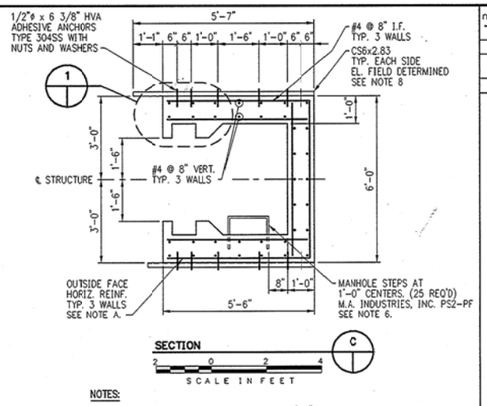
SECTION B

TOP PLAN
T.O.C. EL. 4216'-6"
SCALE IN FEET



SECTION D

BASE PLAN
T.O.C. EL. 4183'-0"
SCALE IN FEET

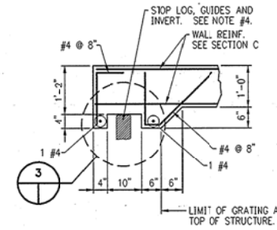


SECTION C

SCALE IN FEET

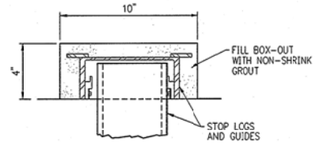
NOTES:

A. FROM TOP OF BASE SLAB TC EL. 4202'-0", PROVIDE #6 HORIZONTAL BARS AT 8" SPACING AT OUTSIDE FACE OF WALLS. FROM EL. 4202'-0" TO TOP SLAB OF STRUCTURE, PROVIDE #5 HORIZONTAL BARS AT 8" SPACING.

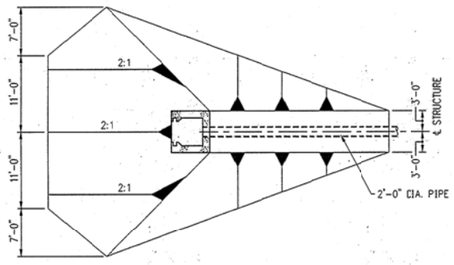


DETAIL 1

STOP LOG BOX-OUT
TYP. 2 SIDES OF STRUCTURE
SCALE IN FEET

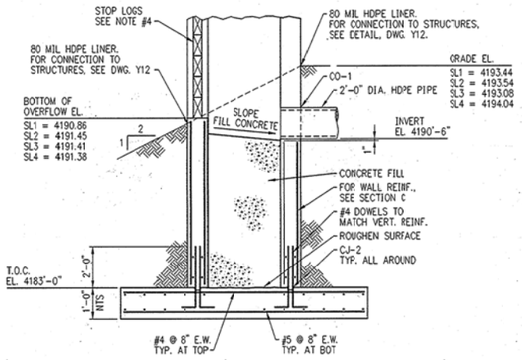


DETAIL 3
SCALE IN INCHES



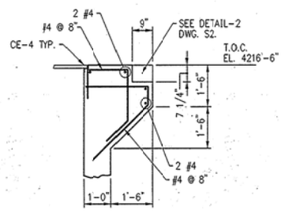
SECTION G

GRADING PLAN
STOP LOG DISCHARGE PIPE COVER
SCALE IN FEET



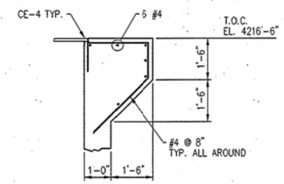
SECTION L

SCALE IN FEET



SECTION J

SCALE IN FEET



SECTION K

SCALE IN FEET

GENERAL NOTES:

1. FOR STANDARD DETAILS, SEE DWG. S10 AND S11.
2. GRATING OVER STOP LOG STRUCTURES AND FOR WALKWAYS SHALL BE 1 1/4" DEEP GALVANIZED SERRATED GRATING.
3. WALKWAY BAR JOISTS ARE SIZED FOR A WALKWAY LIVE LOAD OF 75 PSF AND A POINT LOAD OF 2000 LBS. AT ANY PANEL POINT. BAR JOIST MANUFACTURER SHALL VERIFY BAR JOIST DESIGN INCLUDING BRIDGING REQUIREMENT, HANDRAIL SUPPORTS, AND TOP CHORD HORIZONTAL BRACING. THE DESIGN WIND LOAD IS 70 MPH, EXPOSURE C, AND IMPORTANCE FACTOR 1.0.
4. STOP LOGS SHALL BE 12" HIGH x 5" THICK EXTRUDED ALUMINUM AS MANUFACTURED BY RODNEY HUNT COMPANY, OR APPROVED EQUAL. THE INSTALLATION OF STOP LOGS, GUIDES, INVERT, AND NEOPRENE SEALS, SHALL BE AS REQUIRED BY MANUFACTURER. THE CONCRETE BOX-OUT SHALL BE GROUTED WITH NON-SHRINK GROUT SUCH AS MASTERFLOW 928, OR APPROVED EQUAL.
5. PROVIDE AND INSTALL ONE CRANE AT TOP OF EACH STOP LOG STRUCTURE FOR REMOVAL OF STOP LOGS. THE CRANE SHALL BE ECONO CRANE MODEL SL22M1-CRANE BASE 522 AND CABLE WA15-36NS MANUFACTURED BY DAVIT CRANES, OR AN APPROVED EQUAL. CRANE SHALL BE ANCHORED TO TOP OF STRUCTURE WITH HILTI HVA ADHESIVE ANCHOR SYSTEM, OR APPROVED EQUAL.
6. PROVIDE, AT EACH LOCATION OF STEPS, A COMPLETE FALL PREVENTION DEVICE SUCH AS SAF-T-CLIMB INCLUDING RAIL, CLAMPS, SLEEVE, SAF-T-MOUNT SECTION, SAF-T-BELT AND OTHER COMPONENTS AS MANUFACTURED BY NORTH CONSUMER PRODUCTS, SAFETY PRODUCT DIVISION OF APPROVED EQUAL. ALL METAL COMPONENTS SHALL BE TYPE 304 STAINLESS STEEL.
7. AT ALL LOCATIONS WHERE STRUCTURES PENETRATE THE HDPE LINER, THE LINER SHALL BE FASTENED TO STRUCTURES AS SHOWN ON DWG. Y12. ATTACHMENT OF THE LINER TO STRUCTURES SHALL BE CONTINUOUS AROUND ALL CORNERS AND BENDS IN STRUCTURE WALLS TO ASSURE A LEAK PROOF SEAL.
8. PROVIDE A HEAVY COATING OF ALKALINE RESISTANT BITUMINOUS PAINT ON BACK OF ALUMINUM CHANNELS.

no.	date	by	revision
0	3-10-94	TLL	ISSUED TO OWNER FOR BID
0	9-26-94	TLL	ISSUED AS BID
1	4-16-96	TLL	CONFORMING TO CONSTRUCTION RECORDS
B	4/8/98	CRM	DCN 96/104, C. Reece

Burns & McDonnell

date AUGUST 17, 1992	detailed B. GRACE
designed M. ASHBROOK	checked N.C.S.

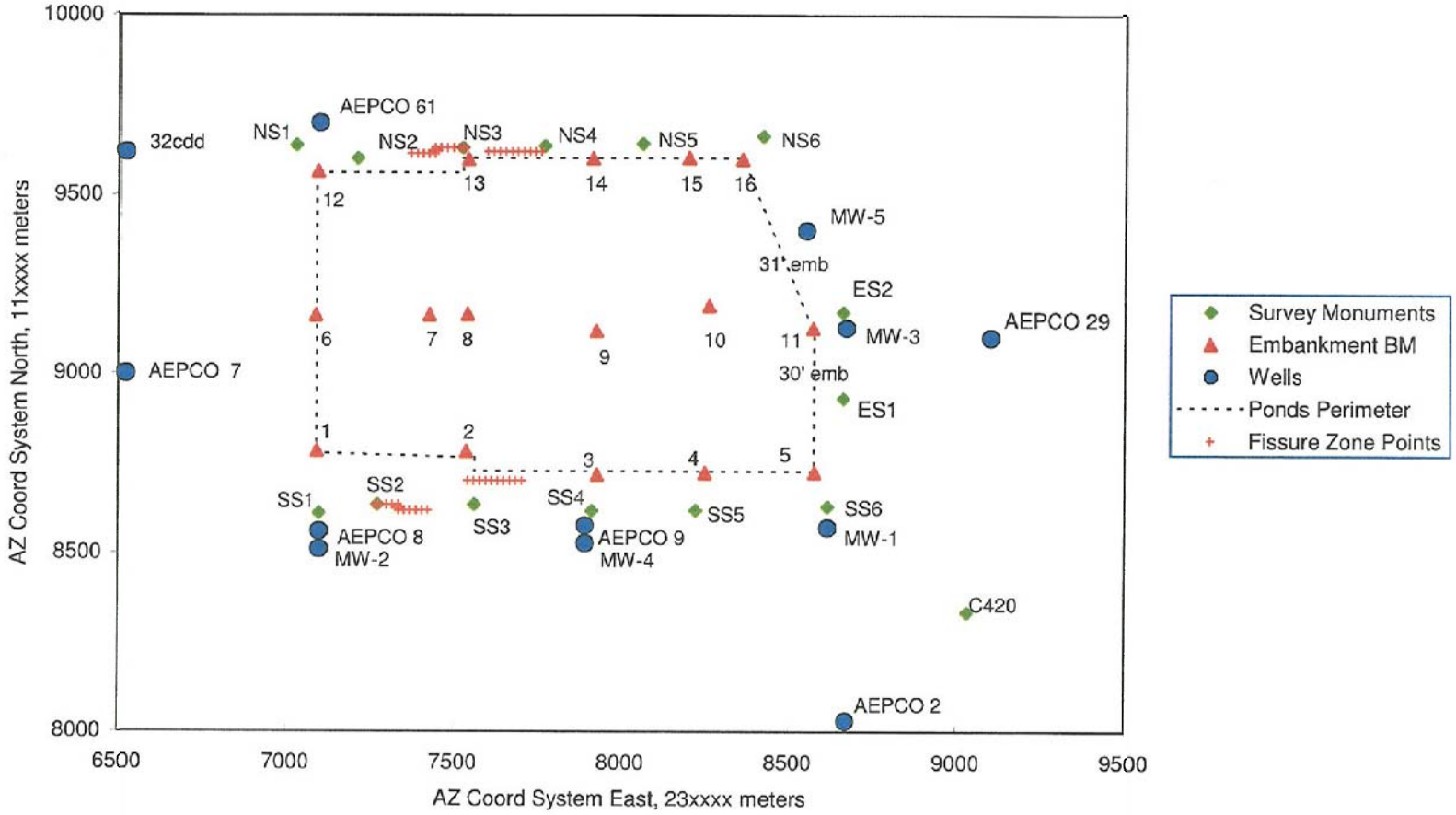
AEPCO
ARIZONA ELECTRIC POWER COOPERATIVE, INC.
APACHE STATION
COMBUSTION WASTE DISPOSAL FACILITY

WASTE DISPOSAL PONDS AND APPURTENANCES CONSTRUCTION
ASH POND STOP LOG STRUCTURES
PLANS AND ELEVATIONS

project 91-033-1-010	contract 923001-2
drawing S1	rev. – 1
sheet	of sheets

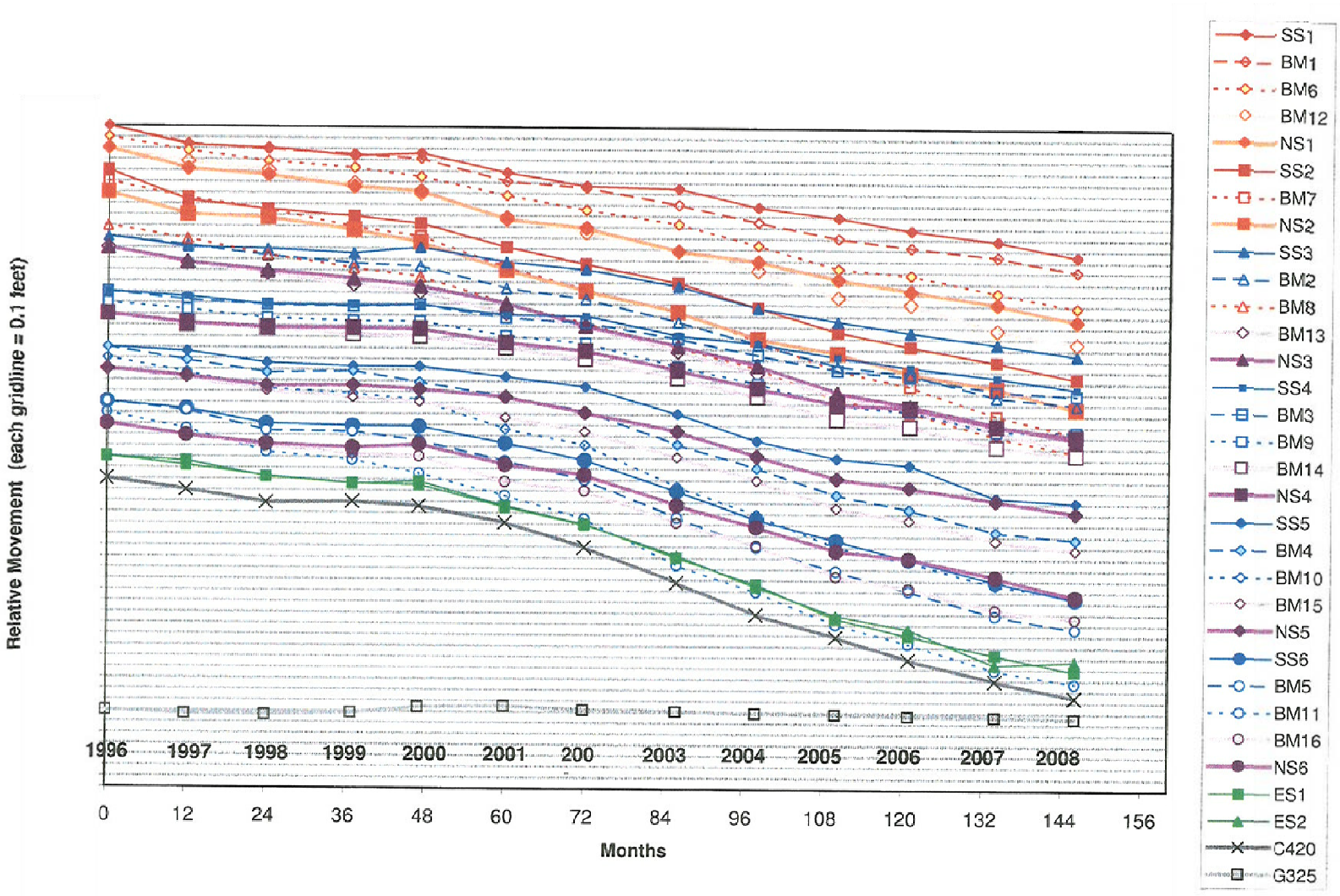
Appendix A

Instrumentation and Instrumentation Readings



	Assessment of Dam Safety of Coal Combustion Waste Impoundments at AEPCO Apache Power Plant	GEI Consultants	LOCATIONS OF MONITORING INSTRUMENTS
FROM AMEC 2009	Lockheed-Martin Corporation Edison, NJ	Project 091330	December 2009 Figure A-1

P:\091330 - Lockheed Martin Coal Ash Impoundments\AEPCO-Apache\Figures\ FIGURE A-1.dwg Oct 2009



Assessment of Dam Safety of Coal Combustion Waste Impoundments at AEPCO Apache Power Plant	GEI Consultants	VERTICAL DISPLACEMENT OF SURVEY MONUMENTS
Lockheed-Martin Corporation Edison, NJ	Project 091330	December 2009 Figure A-2

FROM AMEC 2009

P:\091330 - Lockheed Martin Coal Ash Impoundments\AEPCO-Apache\Figures\ FIGURE A-2.dwg Dec 2009

Appendix B

Inspection Checklists

September 3, 2009

Site Name: Apache Generating Station Date: September 3, 2009

Unit Name: Ash Pond No. 1 Operator's Name: Arizona Electric Power Cooperative

Unit ID: Hazard Potential Classification: (High) Significant Low

Inspector's Name: Stephen G. Brown

Check the appropriate box below, Provide comments when appropriate. If not applicable or not available, record "N/A", Any unusual conditions or construction practices that should be noted in the comments section, For large diked embankments, separate checklists may be used for different embankment areas. If separate forms are used, identify approximate area that the form applies to in comments.

	Yes	No		Yes	No
1. Frequency of Company's Dam Inspections?	X		18. Sloughing or bulging on slopes?		X
2. Pool elevation (operator records)?	4212.3		19. Major erosion or slope deterioration?		X
3. Decant inlet elevation (operator records)?	4212.3		20. Decant Pipes		
4. Open channel spillway elevation (operator records)?	N/A		Is water entering inlet, but not exiting outlet?		X
5. Lowest dam crest elevation (operator records)?	4215.6		Is water exiting outlet, but not entering inlet?		X
6. If instrumentation is present, are readings recorded (operator records)?	X		Is water exiting outlet flowing clear?		X
7. Is the embankment currently under construction?		X	21. Seepage (specify location, if seepage carries fines, and approximate seepage rate below):		
8. Foundation preparation (remove vegetation, stumps, topsoil in area where embankment fill will be placed)?	X		From underdrain?		X
9. Trees growing on embankment? (If so, indicate largest diameter below.)		X	At isolated points on embankment slopes?		X
10. Cracks or scarps on crest?		X	At natural hillside in the embankment area?		X
11. Is there significant settlement along the crest?	X		Over widespread areas?		X
12. Are decant trashracks clear and in place?		X	From downstream foundation area?		X
13. Depressions or sink holes in tailings surface or whirlpool in the pool area		X	"Boils" beneath stream or ponded water?		X
14. Clogged spillways, groin or diversion ditches?		X	Around the outside of the decant pipe?		X
15. Are spillway or ditch linings deteriorated?		X	22. Surface movements in valley bottom or on hillside?	X	
16. Are outlets of decant or underdrains blocked?		X	23. Water against downstream toe?		X
17. Cracks or scarps on slopes		X	24. Were Photos taken during the dam inspection?	X	

Major adverse changes in these items could cause instability and should be reported for further evaluation. Adverse conditions noted in these items should normally be described (extent, location, volume, etc.) in the space below and on the back of this sheet.

Inspection Issue # & Comment	Inspection Issue # & Comment
1. Weekly for berm integrity and waste conveyance; Quarterly by engineer for liner integrity and perimeter embankment integrity	11. Significant regional settlement on entire site; differential settlement is limited to about 0.1 ft across Ash Pond 1.
3. Stop logs in inlet structure are adjustable	12. No decant trash racks
4. No Spillway	20. Outlet was submerged and not visible
5. Survey indicates east embankment is 0.4 ft low	22. General subsidence settlement throughout the basin; 6 ft total settlement at power plant site.
6. Settlement monuments; no observation wells; no staff gage	
9. Minor woody shrubs becoming established on downstream slope	

Coal Combustion Waste (CCW)
Impoundment Inspection

Impoundment NPDES Permit # AZR05B058 INSPECTOR Stephen G. Brown

Date September 3, 2009

Impoundment Name Apache Generating Station – Ash Pond No. 1

Impoundment Company Arizona Electric Power Cooperative

EPA Region 9

State Agency (Field Office) Address Arizona DEQ, 1110 West Washington St.

Phoenix, AZ 85007

Name of Impoundment Apache Generating Station – Ash Pond No. 1
(Report each impoundment on a separate form under the same Impoundment NPDES Permit number)

New X Update

	Yes	No
Is impoundment currently under construction?		X
Is water or ccw currently being pumped into the impoundment?	X	

IMPOUNDMENT FUNCTION: Permanent fly and bottom ash disposal

Nearest Downstream Town: Name 2 homes in outskirts of Cochise, then to Willcox Dry Lake
Distance from the impoundment 0.5 mile
Impoundment Location:
Longitude ~~W109~~ Degrees ~~54~~ Minutes ~~4~~ Seconds
Latitude ~~N32~~ Degrees 4 Minutes ~~20~~ Seconds
State ~~AZ~~ County ~~Cochise~~

Does a state agency regulate this impoundment? YES X NO

If So Which Sate Agency? Arizona Department of Water Resources – Dam Safety Division

HAZARD POTENTIAL (In the event the impoundment should fail, the following would occur):

_____ **LESS THAN LOW** HAZARD POTENTIAL: Failure or misoperation of the dam results in no probable loss of human life or economic or environmental losses.

_____ **LOW HAZARD POTENTIAL:** Dams assigned the low hazard potential classification are those where failure or misoperation results in no probable loss of human life and low economic and/or environmental losses. Losses are principally limited to the owner's property.

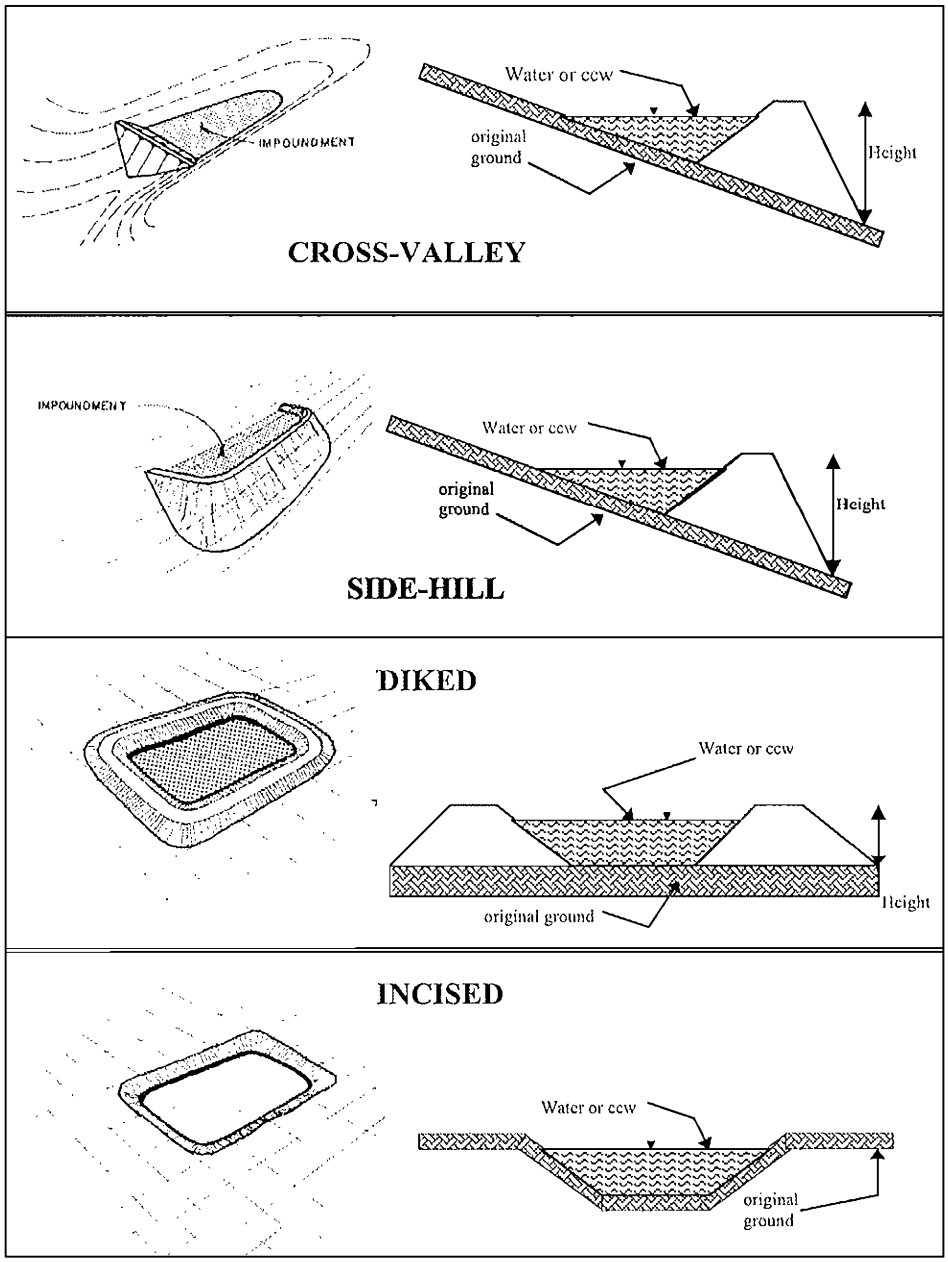
_____ **SIGNIFICANT HAZARD POTENTIAL:** Dams assigned the significant hazard potential classification are those dams where failure or misoperation results in no probable loss of human life but can cause economic loss, environmental damage, disruption of lifeline facilities, or can impact other concerns. Significant hazard potential classification dams are often located in predominantly rural or agricultural areas but could be located in areas with population and significant infrastructure.

__X__ **HIGH HAZARD POTENTIAL:** Dams assigned the high hazard potential classification are those where failure or misoperation will probably cause loss of human life.

DESCRIBE REASONING FOR HAZARD RATING CHOSEN:

US highway immediately downstream and 2 residences located about 0.5 mile downstream. We concur with the High Hazard Classification based AEPC's approximate inundation analysis.

CONFIGURATION:

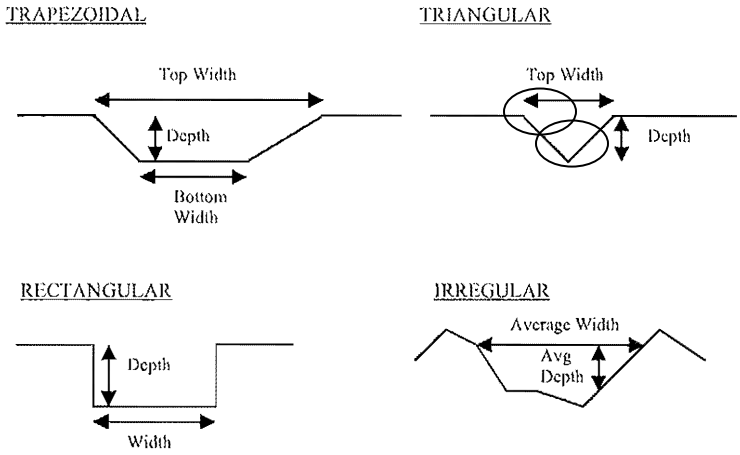


_____ Cross-Valley
_____ Side-Hill
__X__ Diked
_____ Incised (form completion optional)
_____ Combination Incised/Diked

Embankment Height 33 feet
Pool Area 32.6 acres
Current Freeboard 3.7 feet

Embankment Material Generally Sandy Clay
Liner HDPE over Clay
Liner Permeability HDPE:$1x10^{-10}$ cm/s; Clay: $1x10^{-6}$ cm/s

TYPE OF OUTLET (Mark all that apply)

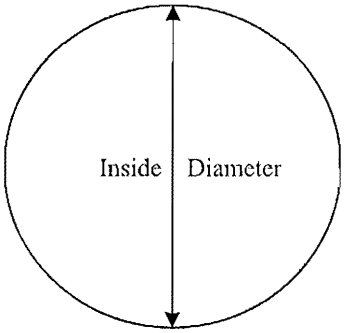


None **Open Channel Spillway**
_____ Trapezoidal
_____ Triangular
_____ Triangular

_____ Depth
_____ Bottom (or average) width
_____ Top width

__X__ **Outlet**

24 in. inside diameter



Material
_____ corrugated metal
_____ welded steel
_____ concrete
__**X**__ plastic (**hdpe**, pvc, etc.)
_____ other (specify)_____

Is water flowing through the outlet? YES__X__ NO_____
(water flow to pump sump is inferred from pump operation)

_____ **No Outlet**

_____ **Other Type of Outlet (Specify)** _____

The Impoundment was Designed By Burns & McDonnell (1994)

_____

Has there ever been a failure at this site? YES _____ NO __X__

If So When? _____

If So Please Describe: _____

Has there ever been significant seepages at this site? YES _____ NO__X__

If So When? _____

If So Please Describe: _____

Has there ever been any measures undertaken to monitor/lower Phreatic water table levels based on past seepages or breaches at this site? YES _____ NO__X__

If So which method (e.g., piezometers, gw pumping, …)? _____

If So Please Describe: _____

Site Name: Apache Generating Station Date: September 3, 2009

Unit Name: Ash Pond No. 2 Operator's Name: Arizona Electric Power Cooperative

Unit ID: Hazard Potential Classification: (High) Significant Low

Inspector's Name: Stephen G. Brown

Check the appropriate box below, Provide comments when appropriate. If not applicable or not available, record "N/A", Any unusual conditions or construction practices that should be noted in the comments section, For large diked embankments, separate checklists may be used for different embankment areas. If separate forms are used, identify approximate area that the form applies to in comments.

	Yes	No		Yes	No
1. Frequency of Company's Dam Inspections?	X		18. Sloughing or bulging on slopes?		X
2. Pool elevation (operator records)?	4212.3		19. Major erosion or slope deterioration?		X
3. Decant inlet elevation (operator records)?	4212.3		20. Decant Pipes		
4. Open channel spillway elevation (operator records)?	N/A		Is water entering inlet, but not exiting outlet?		X
5. Lowest dam crest elevation (operator records)?	4215.7		Is water exiting outlet, but not entering inlet?		X
6. If instrumentation is present, are readings recorded (operator records)?	X		Is water exiting outlet flowing clear?		X
7. Is the embankment currently under construction?		X	21. Seepage (specify location, if seepage carries fines, and approximate seepage rate below):		
8. Foundation preparation (remove vegetation, stumps, topsoil in area where embankment fill will be placed)?	X		From underdrain?		X
9. Trees growing on embankment? (If so, indicate largest diameter below.)		X	At isolated points on embankment slopes?		X
10. Cracks or scarps on crest?		X	At natural hillside in the embankment area?		X
11. Is there significant settlement along the crest?	X		Over widespread areas?		X
12. Are decant trashracks clear and in place?		X	From downstream foundation area?		X
13. Depressions or sink holes in tailings surface or whirlpool in the pool area		X	"Boils" beneath stream or ponded water?		X
14. Clogged spillways, groin or diversion ditches?		X	Around the outside of the decant pipe?		X
15. Are spillway or ditch linings deteriorated?		X	22. Surface movements in valley bottom or on hillside?	X	
16. Are outlets of decant or underdrains blocked?		X	23. Water against downstream toe?		X
17. Cracks or scarps on slopes		X	24. Were Photos taken during the dam inspection?	X	

Major adverse changes in these items could cause instability and should be reported for further evaluation. Adverse conditions noted in these items should normally be described (extent, location, volume, etc.) in the space below and on the back of this sheet.

Inspection Issue # & Comment	Inspection Issue # & Comment
1. Weekly for berm integrity and waste conveyance; Quarterly by engineer for liner integrity and perimeter embankment integrity	11. Significant regional settlement on entire site; differential settlement is limited to about 0.1 ft across Ash Pond 2.
3. Stop logs in inlet structure are adjustable	12. No decant trash racks
4. No Spillway	20. Outlet was submerged and not visible
5. Survey indicates east embankment is 0.3 ft low	22. General subsidence settlement throughout the basin; 6 ft total settlement at power plant site.
6. Settlement monuments; no observation wells; no staff gage	
9. Minor woody shrubs becoming established on downstream slope	

Coal Combustion Waste (CCW)
Impoundment Inspection

Impoundment NPDES Permit # AZR05B058 INSPECTOR Stephen G. Brown

Date September 3, 2009

Impoundment Name Apache Generating Station – Ash Pond No. 2

Impoundment Company Arizona Electric Power Cooperative

EPA Region 9

State Agency (Field Office) Address Arizona DEQ, 1110 West Washington St.

Phoenix, AZ 85007

Name of Impoundment Apache Generating Station – Ash Pond No. 2
(Report each impoundment on a separate form under the same Impoundment NPDES Permit number)

New X Update

	Yes	No
Is impoundment currently under construction?		X
Is water or ccw currently being pumped into the impoundment?	X	

IMPOUNDMENT FUNCTION: Permanent fly and bottom ash disposal

Nearest Downstream Town: Name 2 homes in outskirts of Cochise, then to Willcox Dry Lake
Distance from the impoundment 0.5 mile
Impoundment Location:
Longitude ~~W109~~ Degrees ~~54~~ Minutes ~~16~~ Seconds
Latitude ~~N32~~ Degrees ~~4~~ Minutes ~~20~~ Seconds
State ~~AZ~~ County ~~Cochise~~

Does a state agency regulate this impoundment? YES X NO

If So Which Sate Agency? Arizona Department of Water Resources – Dam Safety Division

HAZARD POTENTIAL (In the event the impoundment should fail, the following would occur):

_____ **LESS THAN LOW** HAZARD POTENTIAL: Failure or misoperation of the dam results in no probable loss of human life or economic or environmental losses.

_____ **LOW HAZARD POTENTIAL:** Dams assigned the low hazard potential classification are those where failure or misoperation results in no probable loss of human life and low economic and/or environmental losses. Losses are principally limited to the owner's property.

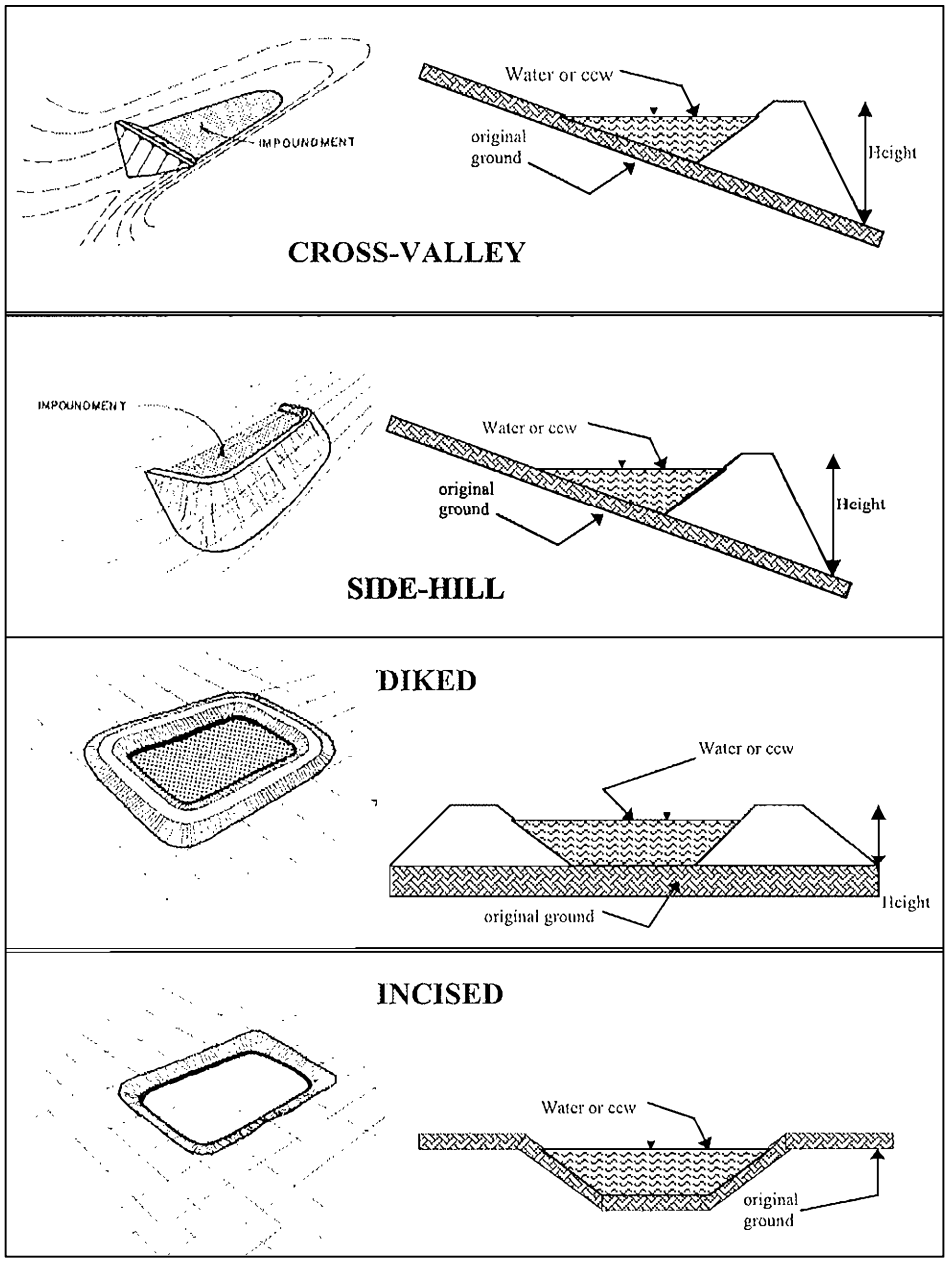
_____ **SIGNIFICANT HAZARD POTENTIAL:** Dams assigned the significant hazard potential classification are those dams where failure or misoperation results in no probable loss of human life but can cause economic loss, environmental damage, disruption of lifeline facilities, or can impact other concerns. Significant hazard potential classification dams are often located in predominantly rural or agricultural areas but could be located in areas with population and significant infrastructure.

__X__ **HIGH HAZARD POTENTIAL:** Dams assigned the high hazard potential classification are those where failure or misoperation will probably cause loss of human life.

DESCRIBE REASONING FOR HAZARD RATING CHOSEN:

US highway immediately downstream and 2 residences located about 0.5 mile downstream. We concur with the High Hazard Classification based AEPC's approximate inundation analysis.

CONFIGURATION:

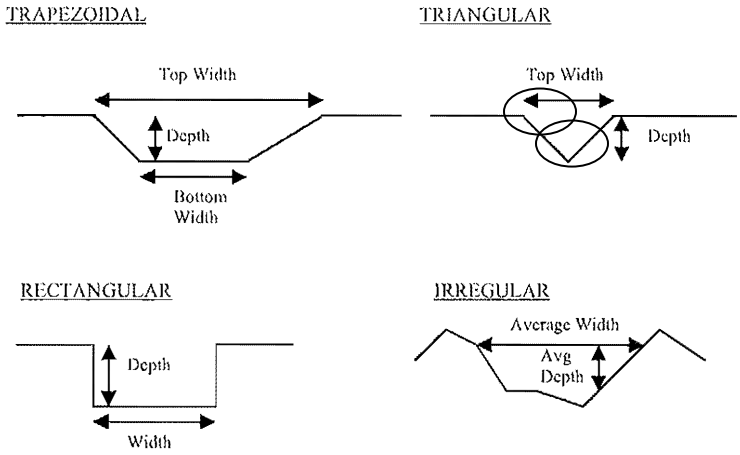


_____ Cross-Valley
_____ Side-Hill
__X__ Diked
_____ Incised (form completion optional)
_____ Combination Incised/Diked

Embankment Height 33 feet
Pool Area 32.6 acres
Current Freeboard 3.7 feet

Embankment Material Generally Sandy Clay
Liner HDPE over Clay
Liner Permeability HDPE:$1x10^{-10}$ cm/s; Clay: $1x10^{-6}$ cm/s

TYPE OF OUTLET (Mark all that apply)

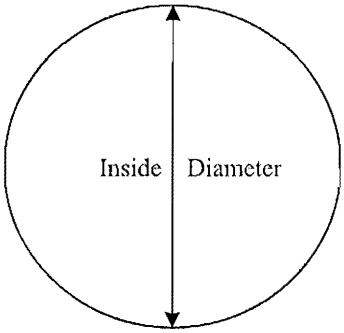


None **Open Channel Spillway**
_____ Trapezoidal
_____ Triangular
_____ Triangular

_____ Depth
_____ Bottom (or average) width
_____ Top width

__X__ **Outlet**

24 in. inside diameter



Material
_____ corrugated metal
_____ welded steel
_____ concrete
__**X**__ plastic (**hdpe**, pvc, etc.)
_____ other (specify)_____

Is water flowing through the outlet? YES__X__ NO_____
(water flow to pump sump is inferred from pump operation)

_____ **No Outlet**

_____ **Other Type of Outlet (Specify)** _____

The Impoundment was Designed By Burns & McDonnell (1994)

_____

Has there ever been a failure at this site? YES _____ NO __X__

If So When? _____

If So Please Describe: _____

Has there ever been significant seepages at this site? YES _____ NO__X__

If So When? _____

If So Please Describe: _____

Has there ever been any measures undertaken to monitor/lower Phreatic water table levels based on past seepages or breaches at this site? YES _____ NO__X__

If So which method (e.g., piezometers, gw pumping, …)? _____

If So Please Describe: _____

Site Name: Apache Generating Station Date: September 3, 2009

Unit Name: Ash Pond No. 3 Operator's Name: Arizona Electric Power Cooperative

Unit ID: Hazard Potential Classification: (High) Significant Low

Inspector's Name: Stephen G. Brown

Check the appropriate box below, Provide comments when appropriate. If not applicable or not available, record "N/A", Any unusual conditions or construction practices that should be noted in the comments section, For large diked embankments, separate checklists may be used for different embankment areas. If separate forms are used, identify approximate area that the form applies to in comments.

	Yes	No		Yes	No
1. Frequency of Company's Dam Inspections?	X		18. Sloughing or bulging on slopes?		X
2. Pool elevation (operator records)?	4193.6		19. Major erosion or slope deterioration?		X
3. Decant inlet elevation (operator records)?	4212.3		20. Decant Pipes		
4. Open channel spillway elevation (operator records)?	N/A		Is water entering inlet, but not exiting outlet?		X
5. Lowest dam crest elevation (operator records)?	4215.7		Is water exiting outlet, but not entering inlet?		X
6. If instrumentation is present, are readings recorded (operator records)?	X		Is water exiting outlet flowing clear?		X
7. Is the embankment currently under construction?		X	21. Seepage (specify location, if seepage carries fines, and approximate seepage rate below):		
8. Foundation preparation (remove vegetation, stumps, topsoil in area where embankment fill will be placed)?	X		From underdrain?		X
9. Trees growing on embankment? (If so, indicate largest diameter below.)		X	At isolated points on embankment slopes?		X
10. Cracks or scarps on crest?		X	At natural hillside in the embankment area?		X
11. Is there significant settlement along the crest?	X		Over widespread areas?		X
12. Are decant trashracks clear and in place?		X	From downstream foundation area?		X
13. Depressions or sink holes in tailings surface or whirlpool in the pool area		X	"Boils" beneath stream or ponded water?		X
14. Clogged spillways, groin or diversion ditches?		X	Around the outside of the decant pipe?		X
15. Are spillway or ditch linings deteriorated?		X	22. Surface movements in valley bottom or on hillside?	X	
16. Are outlets of decant or underdrains blocked?		X	23. Water against downstream toe?		X
17. Cracks or scarps on slopes		X	24. Were Photos taken during the dam inspection?	X	

Major adverse changes in these items could cause instability and should be reported for further evaluation. Adverse conditions noted in these items should normally be described (extent, location, volume, etc.) in the space below and on the back of this sheet.

Inspection Issue # & Comment	Inspection Issue # & Comment
1. Weekly for berm integrity and waste conveyance; Quarterly by engineer for liner integrity and perimeter embankment integrity	11. Significant regional settlement on entire site; differential settlement is limited to about 0.1 ft across Ash Pond 3.
3. Stop logs in inlet structure are adjustable	12. No decant trash racks
4. No Spillway	20. Outlet was submerged and not visible
5. Survey indicates east embankment is 0.3 ft low	22. General subsidence settlement throughout the basin; 6 ft total settlement at power plant site.
6. Settlement monuments; no observation wells; no staff gage	
9. Minor woody shrubs becoming established on downstream slope	

Coal Combustion Waste (CCW)
Impoundment Inspection

Impoundment NPDES Permit # AZR05B058 INSPECTOR Stephen G. Brown

Date September 3, 2009

Impoundment Name Apache Generating Station – Ash Pond No. 3

Impoundment Company Arizona Electric Power Cooperative

EPA Region 9

State Agency (Field Office) Address Arizona DEQ, 1110 West Washington St.

Phoenix, AZ 85007

Name of Impoundment Apache Generating Station – Ash Pond No. 3
(Report each impoundment on a separate form under the same Impoundment NPDES Permit number)

New X Update

	Yes	No
Is impoundment currently under construction?		X
Is water or ccw currently being pumped into the impoundment?	X	

IMPOUNDMENT FUNCTION: Permanent fly and bottom ash disposal

Nearest Downstream Town: Name 2 homes in outskirts of Cochise, then to Willcox Dry Lake
Distance from the impoundment 0.5 mile
Impoundment Location:
Longitude W109 Degrees 54 Minutes 18 Seconds
Latitude N32 Degrees 4 Minutes 34 Seconds
State AZ County Cochise

Does a state agency regulate this impoundment? YES X NO

If So Which Sate Agency? Arizona Department of Water Resources – Dam Safety Division

HAZARD POTENTIAL (In the event the impoundment should fail, the following would occur):

_____ **LESS THAN LOW** HAZARD POTENTIAL: Failure or misoperation of the dam results in no probable loss of human life or economic or environmental losses.

_____ **LOW HAZARD POTENTIAL:** Dams assigned the low hazard potential classification are those where failure or misoperation results in no probable loss of human life and low economic and/or environmental losses. Losses are principally limited to the owner's property.

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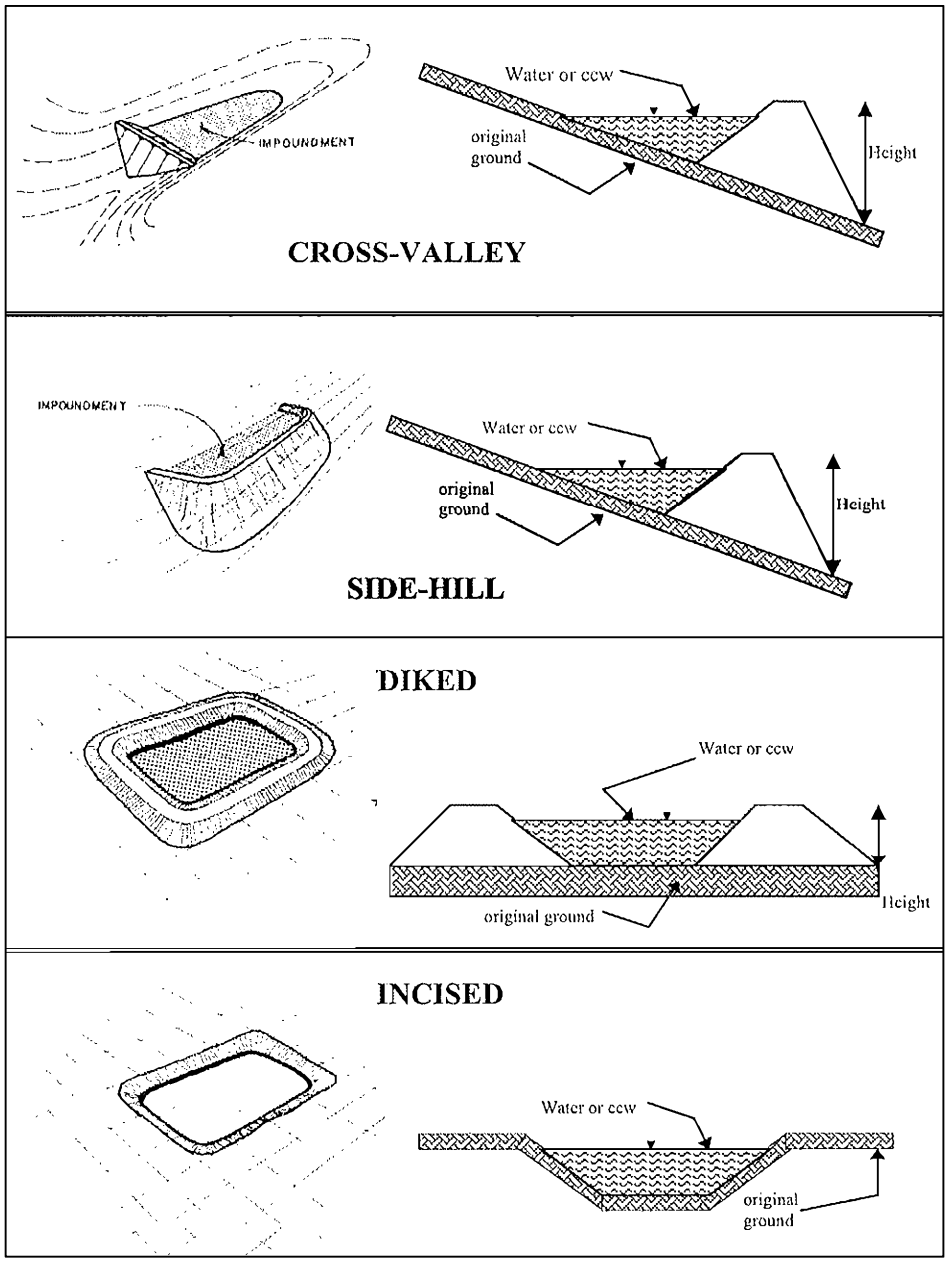
__X__ **HIGH HAZARD POTENTIAL:** Dams assigned the high hazard potential classification are those where failure or misoperation will probably cause loss of human life.

DESCRIBE REASONING FOR HAZARD RATING CHOSEN:

US highway immediately downstream and 2 residences located about 0.5 mile downstream. We concur with the High Hazard Classification based AEPC's approximate inundation analysis.

CONFIGURATION:

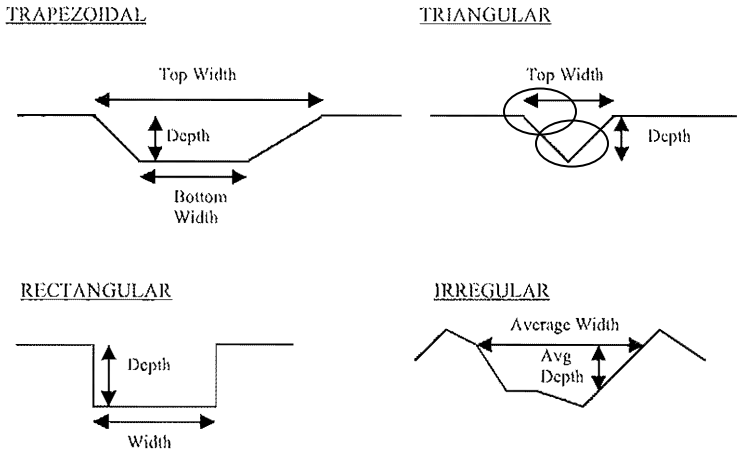


_____ Cross-Valley
_____ Side-Hill
__X__ Diked
_____ Incised (form completion optional)
_____ Combination Incised/Diked

Embankment Height 33 feet
Pool Area 32.6 acres
Current Freeboard 22.1 feet

Embankment Material Generally Sandy Clay
Liner HDPE over Clay
Liner Permeability HDPE:$1x10^{-10}$ cm/s; Clay: $1x10^{-6}$ cm/s

TYPE OF OUTLET (Mark all that apply)

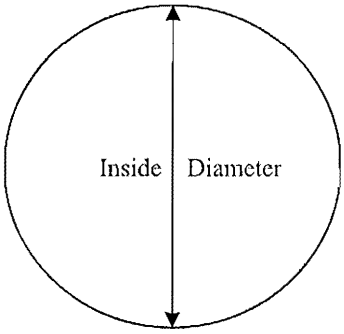


None **Open Channel Spillway**
_____ Trapezoidal
_____ Triangular
_____ Triangular

_____ Depth
_____ Bottom (or average) width
_____ Top width

__X__ **Outlet**

24 in. inside diameter



Material
_____ corrugated metal
_____ welded steel
_____ concrete
__**X**__ plastic (**hdpe**, pvc, etc.)
_____ other (specify)_____

Is water flowing through the outlet? YES_____ NO__X__

_____ **No Outlet**

_____ **Other Type of Outlet (Specify)** _____

The Impoundment was Designed By Burns & McDonnell (1994)

_____

Has there ever been a failure at this site? YES _____ NO __X__

If So When? _____

If So Please Describe: _____

Has there ever been significant seepages at this site? YES _____ NO__X__

If So When? _____

If So Please Describe: _____

Has there ever been any measures undertaken to monitor/lower Phreatic water table levels based on past seepages or breaches at this site? YES _____ NO__X__

If So which method (e.g., piezometers, gw pumping, …)? _____

If So Please Describe: _____

Site Name: Apache Generating Station Date: September 3, 2009

Unit Name: Ash Pond No. 4 Operator's Name: Arizona Electric Power Cooperative

Unit ID: Hazard Potential Classification: (High) Significant Low

Inspector's Name: Stephen G. Brown

Check the appropriate box below, Provide comments when appropriate. If not applicable or not available, record "N/A", Any unusual conditions or construction practices that should be noted in the comments section, For large diked embankments, separate checklists may be used for different embankment areas. If separate forms are used, identify approximate area that the form applies to in comments.

	Yes	No		Yes	No
1. Frequency of Company's Dam Inspections?	X		18. Sloughing or bulging on slopes?		X
2. Pool elevation (operator records)?	4186.8		19. Major erosion or slope deterioration?		X
3. Decant inlet elevation (operator records)?	4212.3		20. Decant Pipes		
4. Open channel spillway elevation (operator records)?	N/A		Is water entering inlet, but not exiting outlet?		X
5. Lowest dam crest elevation (operator records)?	4215.6		Is water exiting outlet, but not entering inlet?		X
6. If instrumentation is present, are readings recorded (operator records)?	X		Is water exiting outlet flowing clear?		X
7. Is the embankment currently under construction?		X	21. Seepage (specify location, if seepage carries fines, and approximate seepage rate below):		
8. Foundation preparation (remove vegetation, stumps, topsoil in area where embankment fill will be placed)?	X		From underdrain?		X
9. Trees growing on embankment? (If so, indicate largest diameter below.)		X	At isolated points on embankment slopes?		X
10. Cracks or scarps on crest?		X	At natural hillside in the embankment area?		X
11. Is there significant settlement along the crest?	X		Over widespread areas?		X
12. Are decant trashracks clear and in place?		X	From downstream foundation area?		X
13. Depressions or sink holes in tailings surface or whirlpool in the pool area		X	"Boils" beneath stream or ponded water?		X
14. Clogged spillways, groin or diversion ditches?		X	Around the outside of the decant pipe?		X
15. Are spillway or ditch linings deteriorated?		X	22. Surface movements in valley bottom or on hillside?	X	
16. Are outlets of decant or underdrains blocked?		X	23. Water against downstream toe?		X
17. Cracks or scarps on slopes		X	24. Were Photos taken during the dam inspection?	X	

Major adverse changes in these items could cause instability and should be reported for further evaluation. Adverse conditions noted in these items should normally be described (extent, location, volume, etc.) in the space below and on the back of this sheet.

Inspection Issue # & Comment	Inspection Issue # & Comment
1. Weekly for berm integrity and waste conveyance; Quarterly by engineer for liner integrity and perimeter embankment integrity	11. Significant regional settlement on entire site; differential settlement is limited to about 0.1 ft across Ash Pond 4.
3. Stop logs in inlet structure are adjustable	12. No decant trash racks
4. No Spillway	20. Outlet was submerged and not visible
5. Survey indicates east embankment is 0.3 ft low	22. General subsidence settlement throughout the basin; 6 ft total settlement at power plant site.
6. Settlement monuments; no observation wells; no staff gage	
9. Minor woody shrubs becoming established on downstream slope	

Coal Combustion Waste (CCW)
Impoundment Inspection

Impoundment NPDES Permit # AZR05B058 INSPECTOR Stephen G. Brown

Date September 3, 2009

Impoundment Name Apache Generating Station – Ash Pond No. 4

Impoundment Company Arizona Electric Power Cooperative

EPA Region 9

State Agency (Field Office) Address Arizona DEQ, 1110 West Washington St.

Phoenix, AZ 85007

Name of Impoundment Apache Generating Station – Ash Pond No. 4
(Report each impoundment on a separate form under the same Impoundment NPDES Permit number)

New X Update

	Yes	No
Is impoundment currently under construction?		X
Is water or ccw currently being pumped into the impoundment?	X	

IMPOUNDMENT FUNCTION: Permanent fly and bottom ash disposal

Nearest Downstream Town: Name 2 homes in outskirts of Cochise, then to Willcox Dry Lake
Distance from the impoundment 0.5 mile
Impoundment
Location: Longitude W109 Degrees 54 Minutes 18 Seconds
Latitude N32 Degrees 4 Minutes 34 Seconds
State AZ County Cochise

Does a state agency regulate this impoundment? YES X NO

If So Which Sate Agency? Arizona Department of Water Resources – Dam Safety Division

HAZARD POTENTIAL (In the event the impoundment should fail, the following would occur):

_____ **LESS THAN LOW** HAZARD POTENTIAL: Failure or misoperation of the dam results in no probable loss of human life or economic or environmental losses.

_____ **LOW HAZARD POTENTIAL:** Dams assigned the low hazard potential classification are those where failure or misoperation results in no probable loss of human life and low economic and/or environmental losses. Losses are principally limited to the owner's property.

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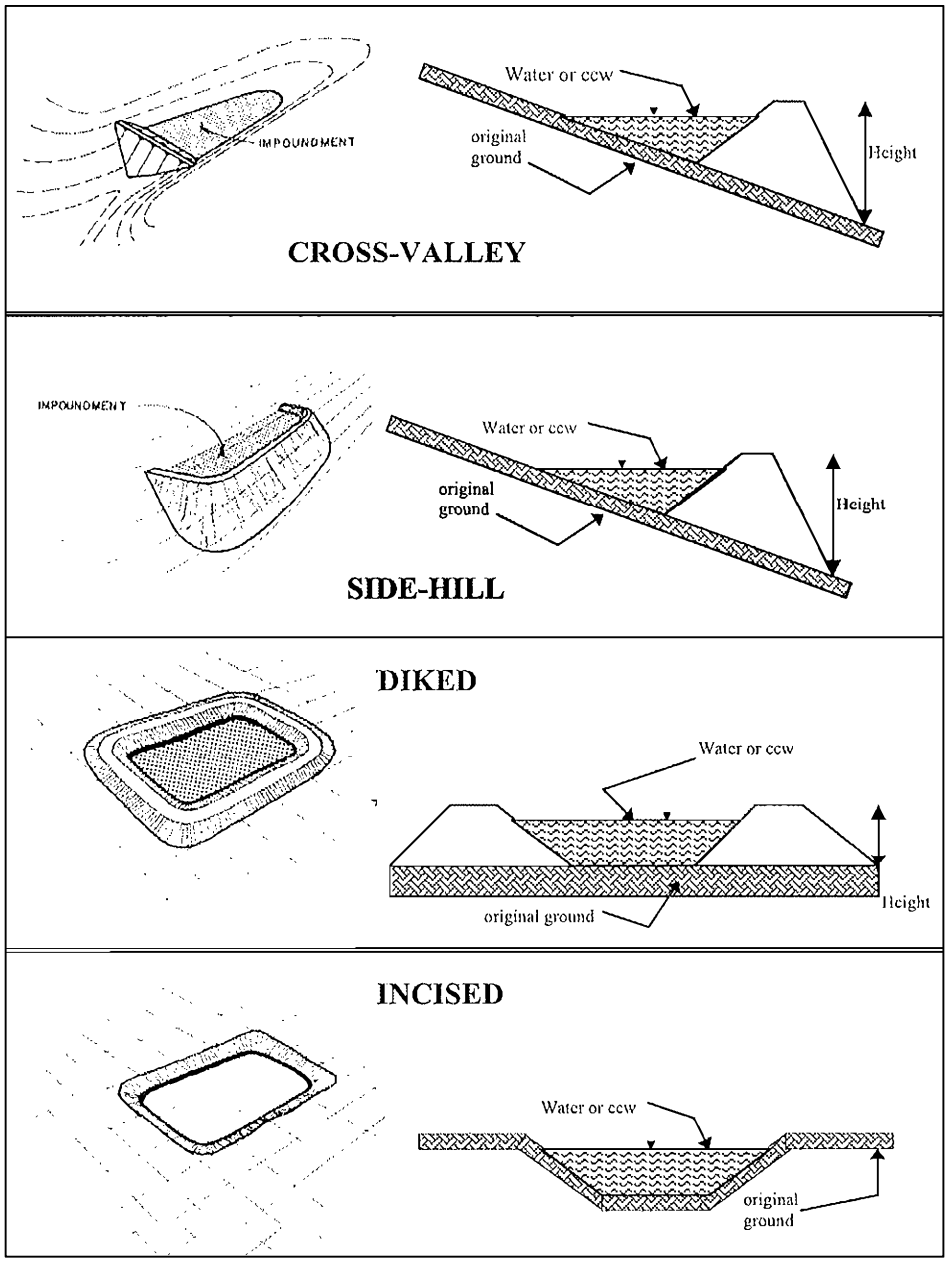
__X__ **HIGH HAZARD POTENTIAL:** Dams assigned the high hazard potential classification are those where failure or misoperation will probably cause loss of human life.

DESCRIBE REASONING FOR HAZARD RATING CHOSEN:

US highway immediately downstream and 2 residences located about 0.5 mile downstream. We concur with the High Hazard Classification based AEPC's approximate inundation analysis.

CONFIGURATION:

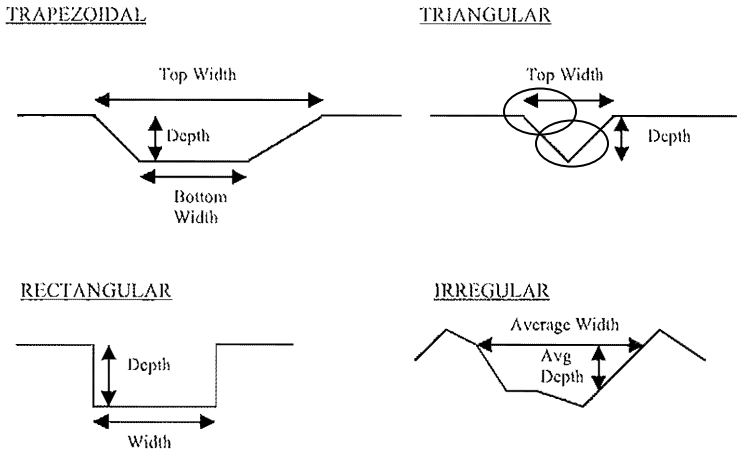


_____ Cross-Valley
_____ Side-Hill
__X__ Diked
_____ Incised (form completion optional)
_____ Combination Incised/Diked

Embankment Height 33 feet
Pool Area 32.6 acres
Current Freeboard 28.8 feet

Embankment Material Generally Sandy Clay
Liner HDPE over Clay
Liner Permeability HDPE:$1x10^{-10}$ cm/s; Clay: $1x10^{-6}$ cm/s

TYPE OF OUTLET (Mark all that apply)

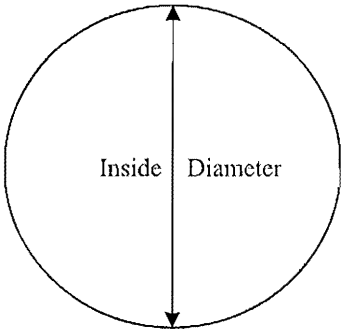


None **Open Channel Spillway**
_____ Trapezoidal
_____ Triangular
_____ Triangular

_____ Depth
_____ Bottom (or average) width
_____ Top width

__X__ **Outlet**

24 in. inside diameter



Material
_____ corrugated metal
_____ welded steel
_____ concrete
__**X**__ plastic (**hdpe**, pvc, etc.)
_____ other (specify)_____

Is water flowing through the outlet? YES_____ NO__X__

_____ **No Outlet**

_____ **Other Type of Outlet (Specify)** _____

The Impoundment was Designed By Burns & McDonnell (1994)

_____

Has there ever been a failure at this site? YES _____ NO __X__

If So When? _____

If So Please Describe: _____

Has there ever been significant seepages at this site? YES _____ NO__X__

If So When? _____

If So Please Describe: _____

Has there ever been any measures undertaken to monitor/lower Phreatic water table levels based on past seepages or breaches at this site? YES _____ NO__X__

If So which method (e.g., piezometers, gw pumping, …)? _____

If So Please Describe: _____

Site Name: Apache Generating Station Date: September 3, 2009

Unit Name: Scrubber Sludge Pond No. 1 Operator's Name: Arizona Electric Power Cooperative

Unit ID: Hazard Potential Classification: (High) Significant Low

Inspector's Name: Stephen G. Brown

Check the appropriate box below, Provide comments when appropriate. If not applicable or not available, record "N/A", Any unusual conditions or construction practices that should be noted in the comments section, For large diked embankments, separate checklists may be used for different embankment areas. If separate forms are used, identify approximate area that the form applies to in comments.

	Yes	No		Yes	No
1. Frequency of Company's Dam Inspections?	X		18. Sloughing or bulging on slopes?		X
2. Pool elevation (operator records)?	4222.8		19. Major erosion or slope deterioration?		X
3. Decant inlet elevation (operator records)?	N/A		20. Decant Pipes		
4. Open channel spillway elevation (operator records)?	N/A		Is water entering inlet, but not exiting outlet?		X
5. Lowest dam crest elevation (operator records)?	4225.9		Is water exiting outlet, but not entering inlet?		X
6. If instrumentation is present, are readings recorded (operator records)?	X		Is water exiting outlet flowing clear?		X
7. Is the embankment currently under construction?		X	21. Seepage (specify location, if seepage carries fines, and approximate seepage rate below):		
8. Foundation preparation (remove vegetation, stumps, topsoil in area where embankment fill will be placed)?	X		From underdrain?		X
9. Trees growing on embankment? (If so, indicate largest diameter below.)		X	At isolated points on embankment slopes?		X
10. Cracks or scarps on crest?		X	At natural hillside in the embankment area?		X
11. Is there significant settlement along the crest?	X		Over widespread areas?		X
12. Are decant trashracks clear and in place?		X	From downstream foundation area?		X
13. Depressions or sink holes in tailings surface or whirlpool in the pool area		X	"Boils" beneath stream or ponded water?		X
14. Clogged spillways, groin or diversion ditches?		X	Around the outside of the decant pipe?		X
15. Are spillway or ditch linings deteriorated?		X	22. Surface movements in valley bottom or on hillside?	X	
16. Are outlets of decant or underdrains blocked?		X	23. Water against downstream toe?		X
17. Cracks or scarps on slopes		X	24. Were Photos taken during the dam inspection?	X	

Major adverse changes in these items could cause instability and should be reported for further evaluation. Adverse conditions noted in these items should normally be described (extent, location, volume, etc.) in the space below and on the back of this sheet.

Inspection Issue # & Comment	Inspection Issue # & Comment
1. Weekly for berm integrity and waste conveyance; Quarterly by engineer for liner integrity and perimeter embankment integrity	10. Subsidence fissures that cross dam foundation have been mitigated and are closely monitored.
3. Three interconnect pipes to SSP #2 can function as decant when water level in SSP #2 is lower than SSP #1.	11. Significant regional settlement on entire site; differential settlement is limited to about 0.1 ft across Scrubber Sludge Pond 1.
4. No Spillway	12. No decant trash racks
5. Survey indicates east embankment is 0.1 ft low	20. Outlet pipes were closed with blind flanges.
6. Settlement monuments; no observation wells; no staff gage	22. General subsidence settlement throughout the basin; 6 ft total settlement at power plant site.

Coal Combustion Waste (CCW)
Impoundment Inspection

Impoundment NPDES Permit # AZR05B058 INSPECTOR Stephen G. Brown

Date September 3, 2009

Impoundment Name Apache Generating Station – Scrubber Sludge Pond No. 1

Impoundment Company Arizona Electric Power Cooperative

EPA Region 9

State Agency (Field Office) Address Arizona DEQ, 1110 West Washington St.

Phoenix, AZ 85007

Name of Impoundment Apache Generating Station – Scrubber Sludge Pond No. 1
(Report each impoundment on a separate form under the same Impoundment NPDES Permit number)
New X Update

	Yes	No
Is impoundment currently under construction?		X
Is water or ccw currently being pumped into the impoundment?	X	

IMPOUNDMENT FUNCTION: Permanent flue gas emission control residuals disposal

Nearest Downstream Town: Name 2 homes in outskirts of Cochise, then to Willcox Dry Lake
Distance from the impoundment 0.5 mile
Impoundment Location:
Longitude W109 Degrees 54 Minutes 46 Seconds
Latitude N32 Degrees 4 Minutes 22 Seconds
State AZ County Cochise

Does a state agency regulate this impoundment? YES X NO

If So Which Sate Agency? Arizona Department of Water Resources – Dam Safety Division

HAZARD POTENTIAL (In the event the impoundment should fail, the following would occur):

_____ **LESS THAN LOW** HAZARD POTENTIAL: Failure or misoperation of the dam results in no probable loss of human life or economic or environmental losses.

_____ **LOW HAZARD POTENTIAL:** Dams assigned the low hazard potential classification are those where failure or misoperation results in no probable loss of human life and low economic and/or environmental losses. Losses are principally limited to the owner's property.

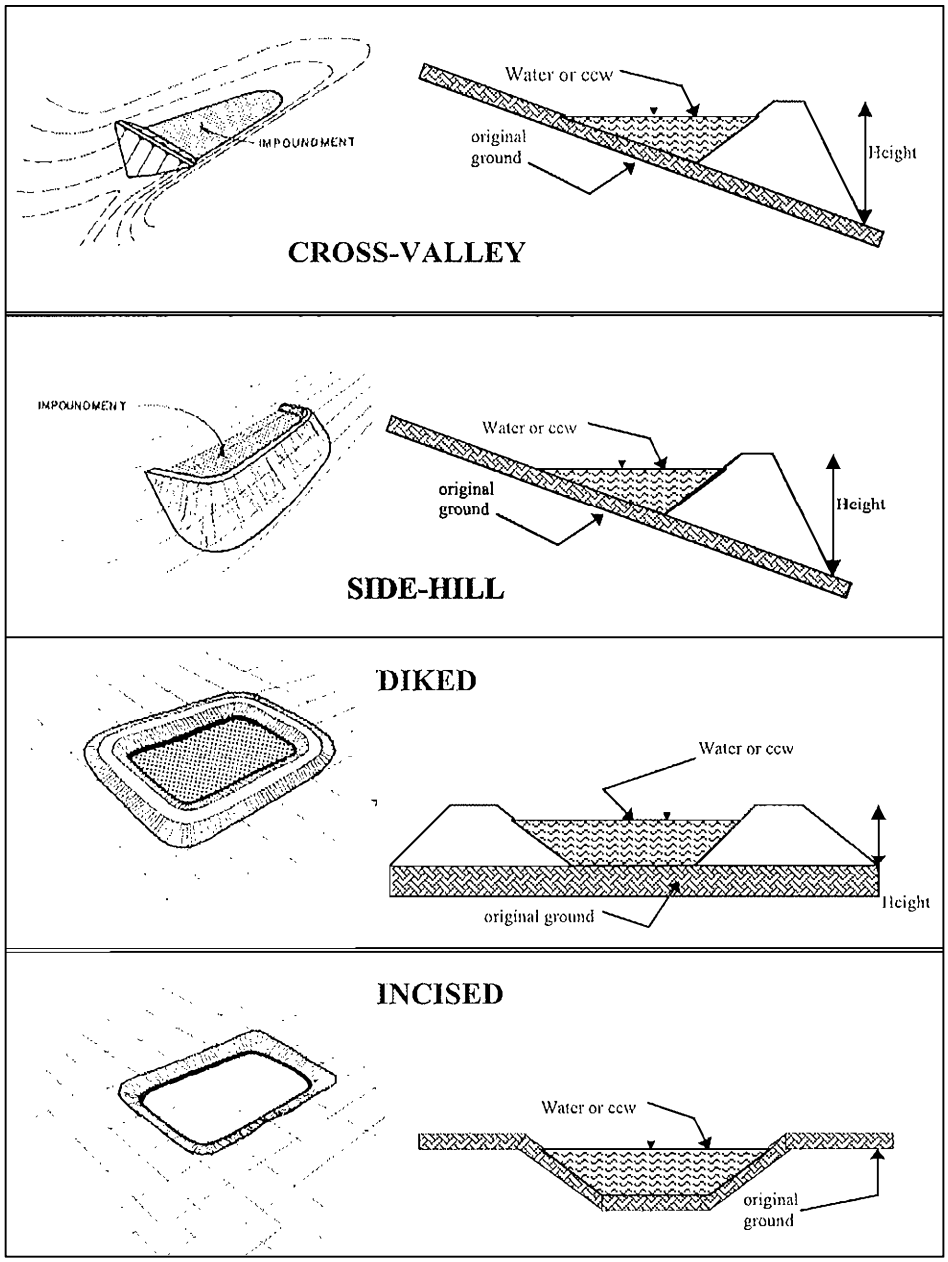
_____ **SIGNIFICANT HAZARD POTENTIAL:** Dams assigned the significant hazard potential classification are those dams where failure or misoperation results in no probable loss of human life but can cause economic loss, environmental damage, disruption of lifeline facilities, or can impact other concerns. Significant hazard potential classification dams are often located in predominantly rural or agricultural areas but could be located in areas with population and significant infrastructure.

__X__ **HIGH HAZARD POTENTIAL:** Dams assigned the high hazard potential classification are those where failure or misoperation will probably cause loss of human life.

DESCRIBE REASONING FOR HAZARD RATING CHOSEN:

US highway immediately downstream and 2 residences located about 0.5 mile downstream. We concur with the High Hazard Classification based AEPC's approximate inundation analysis.

CONFIGURATION:

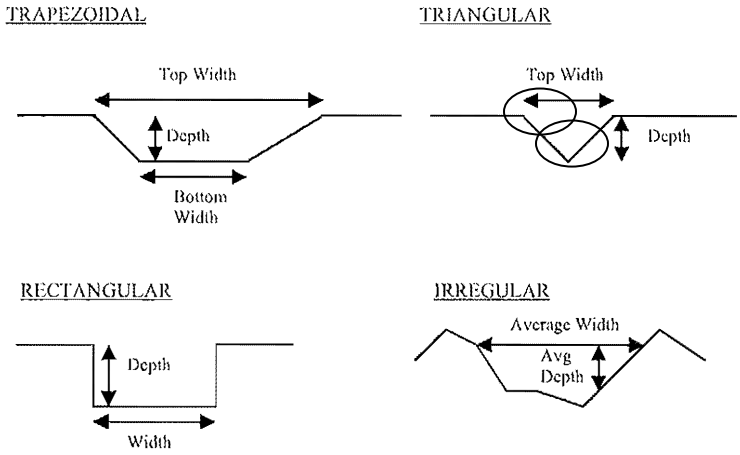


_____ Cross-Valley
_____ Side-Hill
__X__ Diked
_____ Incised (form completion optional)
_____ Combination Incised/Diked

Embankment Height 17 feet
Pool Area 41.7 acres
Current Freeboard 3.1 feet

Embankment Material Generally Sandy Clay
Liner HDPE over Clay
Liner Permeability HDPE:$1x10^{-10}$ cm/s; Clay: $1x10^{-6}$ cm/s

TYPE OF OUTLET (Mark all that apply)

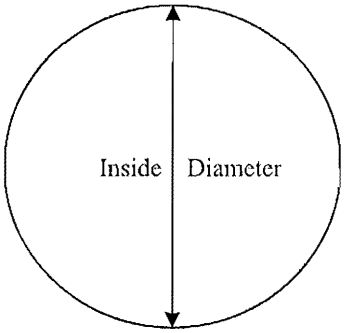


None **Open Channel Spillway**
_____ Trapezoidal
_____ Triangular
_____ Triangular

_____ Depth
_____ Bottom (or average) width
_____ Top width

__X__ **Outlet**

Approx. 24 in. inside diameter



Material
_____ corrugated metal
_____ welded steel
_____ concrete
__**X**__ plastic (**hdpe**, pvc, etc.)
_____ other (specify)_____

Is water flowing through the outlet? YES_____ NO__X___ (See comment #20 on first page)

_____ **No Outlet**

_____ **Other Type of Outlet (Specify)** _____

The Impoundment was Designed By Burns & McDonnell (1994)

_____

Has there ever been a failure at this site? YES _____ NO __X__

If So When? _____

If So Please Describe: _____

Has there ever been significant seepages at this site? YES _____ NO__X__

If So When? _____

If So Please Describe: _____

Has there ever been any measures undertaken to monitor/lower Phreatic water table levels based on past seepages or breaches at this site? YES _____ NO__X__

If So which method (e.g., piezometers, gw pumping, …)? _____

If So Please Describe: _____

Site Name: Apache Generating Station Date: September 3, 2009

Unit Name: Scrubber Sludge Pond No. 2 Operator's Name: Arizona Electric Power Cooperative

Unit ID: Hazard Potential Classification: (High) Significant Low

Inspector's Name: Stephen G. Brown

Check the appropriate box below, Provide comments when appropriate. If not applicable or not available, record "N/A", Any unusual conditions or construction practices that should be noted in the comments section, For large diked embankments, separate checklists may be used for different embankment areas. If separate forms are used, identify approximate area that the form applies to in comments.

	Yes	No		Yes	No
1. Frequency of Company's Dam Inspections?	X		18. Sloughing or bulging on slopes?		X
2. Pool elevation (operator records)?	4211.5		19. Major erosion or slope deterioration?		X
3. Decant inlet elevation (operator records)?	N/A		20. Decant Pipes		
4. Open channel spillway elevation (operator records)?	N/A		Is water entering inlet, but not exiting outlet?		X
5. Lowest dam crest elevation (operator records)?	4225.9		Is water exiting outlet, but not entering inlet?		X
6. If instrumentation is present, are readings recorded (operator records)?	X		Is water exiting outlet flowing clear?		X
7. Is the embankment currently under construction?		X	21. Seepage (specify location, if seepage carries fines, and approximate seepage rate below):		
8. Foundation preparation (remove vegetation, stumps, topsoil in area where embankment fill will be placed)?	X		From underdrain?		X
9. Trees growing on embankment? (If so, indicate largest diameter below.)		X	At isolated points on embankment slopes?		X
10. Cracks or scarps on crest?		X	At natural hillside in the embankment area?		X
11. Is there significant settlement along the crest?	X		Over widespread areas?		X
12. Are decant trashracks clear and in place?		X	From downstream foundation area?		X
13. Depressions or sink holes in tailings surface or whirlpool in the pool area		X	"Boils" beneath stream or ponded water?		X
14. Clogged spillways, groin or diversion ditches?		X	Around the outside of the decant pipe?		X
15. Are spillway or ditch linings deteriorated?		X	22. Surface movements in valley bottom or on hillside?	X	
16. Are outlets of decant or underdrains blocked?		X	23. Water against downstream toe?		X
17. Cracks or scarps on slopes		X	24. Were Photos taken during the dam inspection?	X	

Major adverse changes in these items could cause instability and should be reported for further evaluation. Adverse conditions noted in these items should normally be described (extent, location, volume, etc.) in the space below and on the back of this sheet.

Inspection Issue # & Comment	Inspection Issue # & Comment
1. Weekly for berm integrity and waste conveyance; Quarterly by engineer for liner integrity and perimeter embankment integrity	10. Subsidence fissures that cross dam foundation have been mitigated and are closely monitored.
3. No decant structures or pipes.	11. Significant regional settlement on entire site; differential settlement is limited to about 0.1 ft across Scrubber Sludge Pond 1.
4. No Spillway	12. No decant trash racks
5. Survey indicates east embankment is 0.1 ft low	20. No outlet pipes. Interconnect pipes with SSP #1 have been closed with blind flanges.
6. Settlement monuments; no observation wells; no staff gage	22. General subsidence settlement throughout the basin; 6 ft total settlement at power plant site.

Coal Combustion Waste (CCW)
Impoundment Inspection

Impoundment NPDES Permit # AZR05B058 INSPECTOR Stephen G. Brown

Date September 3, 2009

Impoundment Name Apache Generating Station – Scrubber Sludge Pond No. 2

Impoundment Company Arizona Electric Power Cooperative

EPA Region 9

State Agency (Field Office) Address Arizona DEQ, 1110 West Washington St.

Phoenix, AZ 85007

Name of Impoundment Apache Generating Station – Scrubber Sludge Pond No. 2
(Report each impoundment on a separate form under the same Impoundment NPDES Permit number)
New X Update

	Yes	No
Is impoundment currently under construction?		X
Is water or ccw currently being pumped into the impoundment?		X

IMPOUNDMENT FUNCTION: Permanent flue gas emission control residuals disposal

Nearest Downstream Town: Name 2 homes in outskirts of Cochise, then to Willcox Dry Lake
Distance from the impoundment 0.5 mile
Impoundment Location:
Longitude W109 Degrees 54 Minutes 46 Seconds
Latitude N32 Degrees 4 Minutes 36 Seconds
State AZ County Cochise

Does a state agency regulate this impoundment? YES X NO

If So Which State Agency? Arizona Department of Water Resources – Dam Safety Division

HAZARD POTENTIAL (In the event the impoundment should fail, the following would occur):

_____ **LESS THAN LOW** HAZARD POTENTIAL: Failure or misoperation of the dam results in no probable loss of human life or economic or environmental losses.

_____ **LOW HAZARD POTENTIAL:** Dams assigned the low hazard potential classification are those where failure or misoperation results in no probable loss of human life and low economic and/or environmental losses. Losses are principally limited to the owner's property.

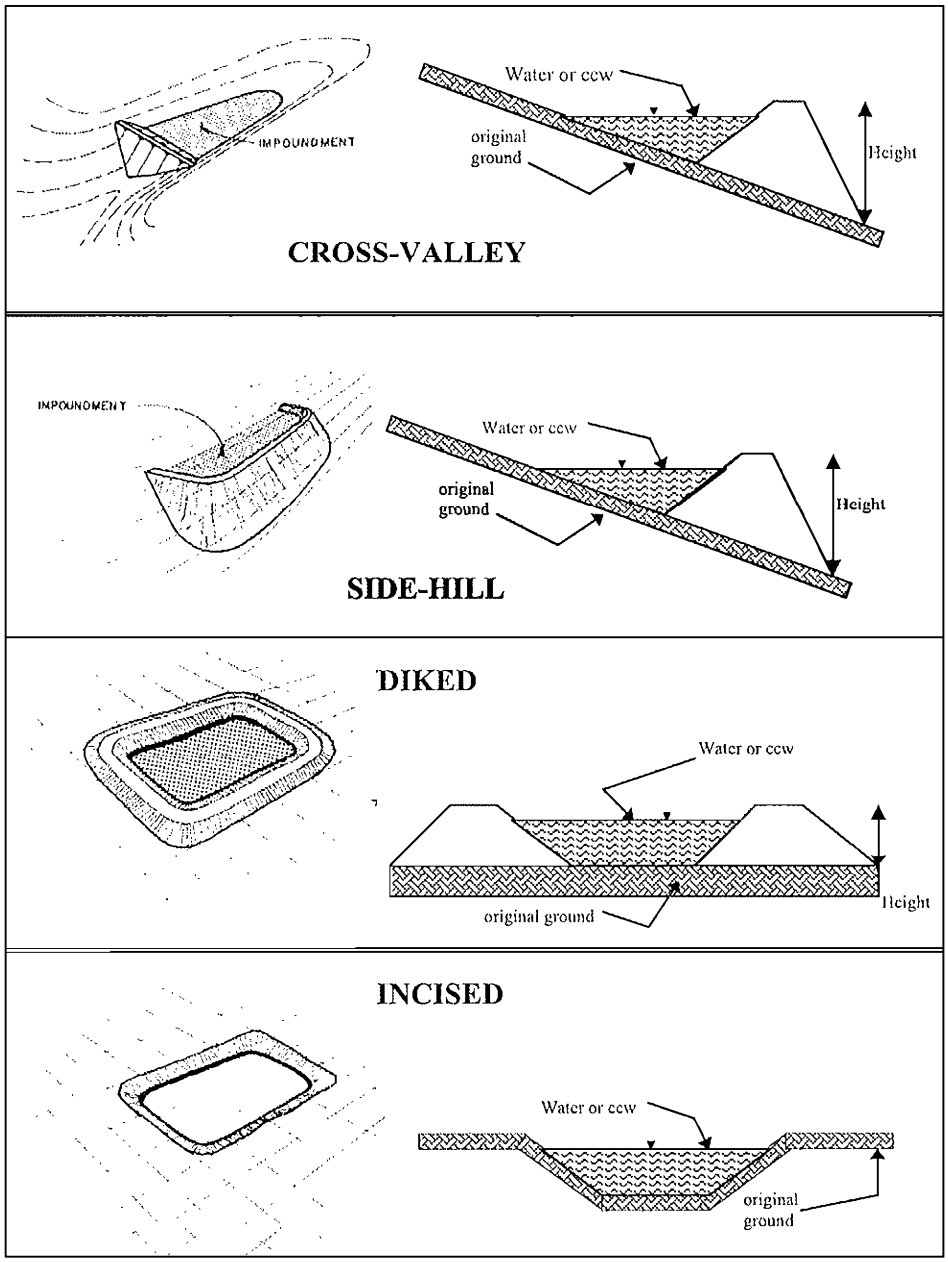
_____ **SIGNIFICANT HAZARD POTENTIAL:** Dams assigned the significant hazard potential classification are those dams where failure or misoperation results in no probable loss of human life but can cause economic loss, environmental damage, disruption of lifeline facilities, or can impact other concerns. Significant hazard potential classification dams are often located in predominantly rural or agricultural areas but could be located in areas with population and significant infrastructure.

__X__ **HIGH HAZARD POTENTIAL:** Dams assigned the high hazard potential classification are those where failure or misoperation will probably cause loss of human life.

DESCRIBE REASONING FOR HAZARD RATING CHOSEN:

US highway immediately downstream and 2 residences located about 0.5 mile downstream. We concur with the High Hazard Classification based AEPC's approximate inundation analysis.

CONFIGURATION:

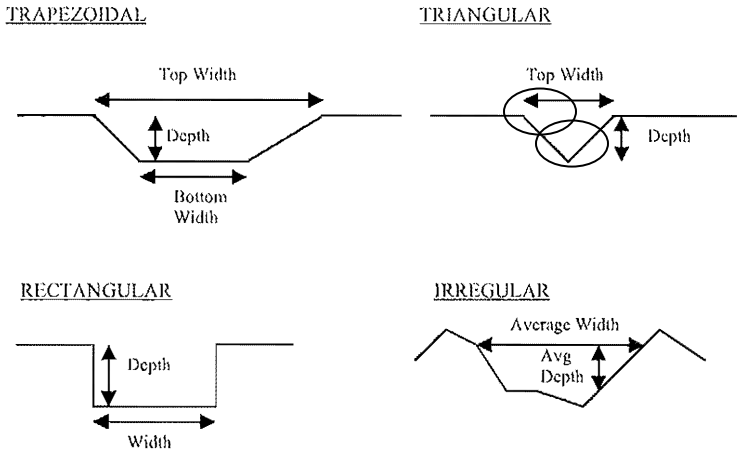


_____ Cross-Valley
_____ Side-Hill
__X__ Diked
_____ Incised (form completion optional)
_____ Combination Incised/Diked

Embankment Height 20 feet
Pool Area 42 acres
Current Freeboard 14.4 feet

Embankment Material Generally Sandy Clay
Liner HDPE over Clay
Liner Permeability HDPE:$1x10^{-10}$ cm/s; Clay: $1x10^{-6}$ cm/s

TYPE OF OUTLET (Mark all that apply)

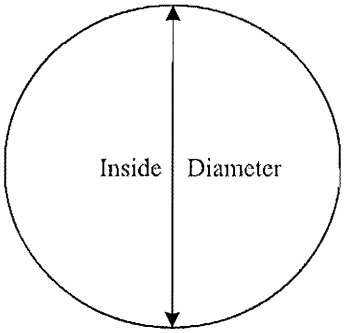


None **Open Channel Spillway**
_____ Trapezoidal
_____ Triangular
_____ Triangular

_____ Depth
_____ Bottom (or average) width
_____ Top width

_____**Outlet**

_____ inside diameter



Material
_____ corrugated metal
_____ welded steel
_____ concrete
_____plastic (hdpe, pvc, etc.)
_____ other (specify)_____

Is water flowing through the outlet? YES_____ NO_____

X ____**No Outlet**

_____ **Other Type of Outlet (Specify)** _____

The Impoundment was Designed By Burns & McDonnell (1994)

_____

Has there ever been a failure at this site? YES _____ NO __X__

If So When? _____

If So Please Describe: _____

Has there ever been significant seepages at this site? YES _____ NO__X__

If So When? _____

If So Please Describe: _____

Has there ever been any measures undertaken to monitor/lower Phreatic water table levels based on past seepages or breaches at this site? YES _____ NO__X__

If So which method (e.g., piezometers, gw pumping, …)? _____

If So Please Describe: _____

Site Name: Apache Generating Station Date: September 3, 2009

Unit Name: Evaporation Pond Operator's Name: Arizona Electric Power Cooperative

Unit ID: Hazard Potential Classification: (High) Significant Low

Inspector's Name: Stephen G. Brown

Check the appropriate box below, Provide comments when appropriate. If not applicable or not available, record "N/A", Any unusual conditions or construction practices that should be noted in the comments section, For large diked embankments, separate checklists may be used for different embankment areas. If separate forms are used, identify approximate area that the form applies to in comments.

	Yes	No		Yes	No
1. Frequency of Company's Dam Inspections?	X		18. Sloughing or bulging on slopes?		X
2. Pool elevation (operator records)?	4203.4		19. Major erosion or slope deterioration?		X
3. Decant inlet elevation (operator records)?	N/A		20. Decant Pipes		
4. Open channel spillway elevation (operator records)?	N/A		Is water entering inlet, but not exiting outlet?		X
5. Lowest dam crest elevation (operator records)?	4215.8		Is water exiting outlet, but not entering inlet?		X
6. If instrumentation is present, are readings recorded (operator records)?	X		Is water exiting outlet flowing clear?		X
7. Is the embankment currently under construction?		X	21. Seepage (specify location, if seepage carries fines, and approximate seepage rate below):		
8. Foundation preparation (remove vegetation, stumps, topsoil in area where embankment fill will be placed)?	X		From underdrain?		X
9. Trees growing on embankment? (If so, indicate largest diameter below.)		X	At isolated points on embankment slopes?		X
10. Cracks or scarps on crest?		X	At natural hillside in the embankment area?		X
11. Is there significant settlement along the crest?	X		Over widespread areas?		X
12. Are decant trashracks clear and in place?		X	From downstream foundation area?		X
13. Depressions or sink holes in tailings surface or whirlpool in the pool area		X	"Boils" beneath stream or ponded water?		X
14. Clogged spillways, groin or diversion ditches?		X	Around the outside of the decant pipe?		X
15. Are spillway or ditch linings deteriorated?		X	22. Surface movements in valley bottom or on hillside?	X	
16. Are outlets of decant or underdrains blocked?		X	23. Water against downstream toe?		X
17. Cracks or scarps on slopes		X	24. Were Photos taken during the dam inspection?	X	

Major adverse changes in these items could cause instability and should be reported for further evaluation. Adverse conditions noted in these items should normally be described (extent, location, volume, etc.) in the space below and on the back of this sheet.

Inspection Issue # & Comment	Inspection Issue # & Comment
1. Weekly for berm integrity and waste conveyance; Quarterly by engineer for liner integrity and perimeter embankment integrity	10. Subsidence fissures that cross dam foundation have been mitigated and are closely monitored.
3. No decant structures or pipes.	11. Significant regional settlement on entire site; differential settlement is limited to about 0.1 ft across the Evaporation Pond.
4. No Spillway	12. No decant trash racks
5. Survey indicates east embankment is 0.2 ft low	20. No outlet pipes.
6. Settlement monuments; no observation wells; no staff gage	22. General subsidence settlement throughout the basin; 6 ft total settlement at power plant site.

Coal Combustion Waste (CCW)
Impoundment Inspection

Impoundment NPDES Permit # AZR05B058 INSPECTOR Stephen G. Brown

Date September 3, 2009

Impoundment Name Apache Generating Station – Evaporation Pond

Impoundment Company Arizona Electric Power Cooperative

EPA Region 9

State Agency (Field Office) Address Arizona DEQ, 1110 West Washington St.

Phoenix, AZ 85007

Name of Impoundment Apache Generating Station – Evaporation Pond
(Report each impoundment on a separate form under the same Impoundment NPDES Permit number)
New X Update

	Yes	No
Is impoundment currently under construction?		X
Is water or ccw currently being pumped into the impoundment?		X

IMPOUNDMENT FUNCTION: Decant water storage and evaporation. Decant water is from ash disposal ponds and scrubber sludge (flue gas emission control residuals) ponds.

Nearest Downstream Town: Name 2 homes in outskirts of Cochise, then to Willcox Dry Lake
Distance from the impoundment 0.5 mile
Impoundment Location:
Longitude W109 Degrees 54 Minutes 30 Seconds
Latitude N32 Degrees 4 Minutes 27 Seconds
State AZ County Cochise

Does a state agency regulate this impoundment? YES X NO

If So Which State Agency? Arizona Department of Water Resources – Dam Safety Division

HAZARD POTENTIAL (In the event the impoundment should fail, the following would occur):

_____ **LESS THAN LOW** HAZARD POTENTIAL: Failure or misoperation of the dam results in no probable loss of human life or economic or environmental losses.

_____ **LOW HAZARD POTENTIAL:** Dams assigned the low hazard potential classification are those where failure or misoperation results in no probable loss of human life and low economic and/or environmental losses. Losses are principally limited to the owner's property.

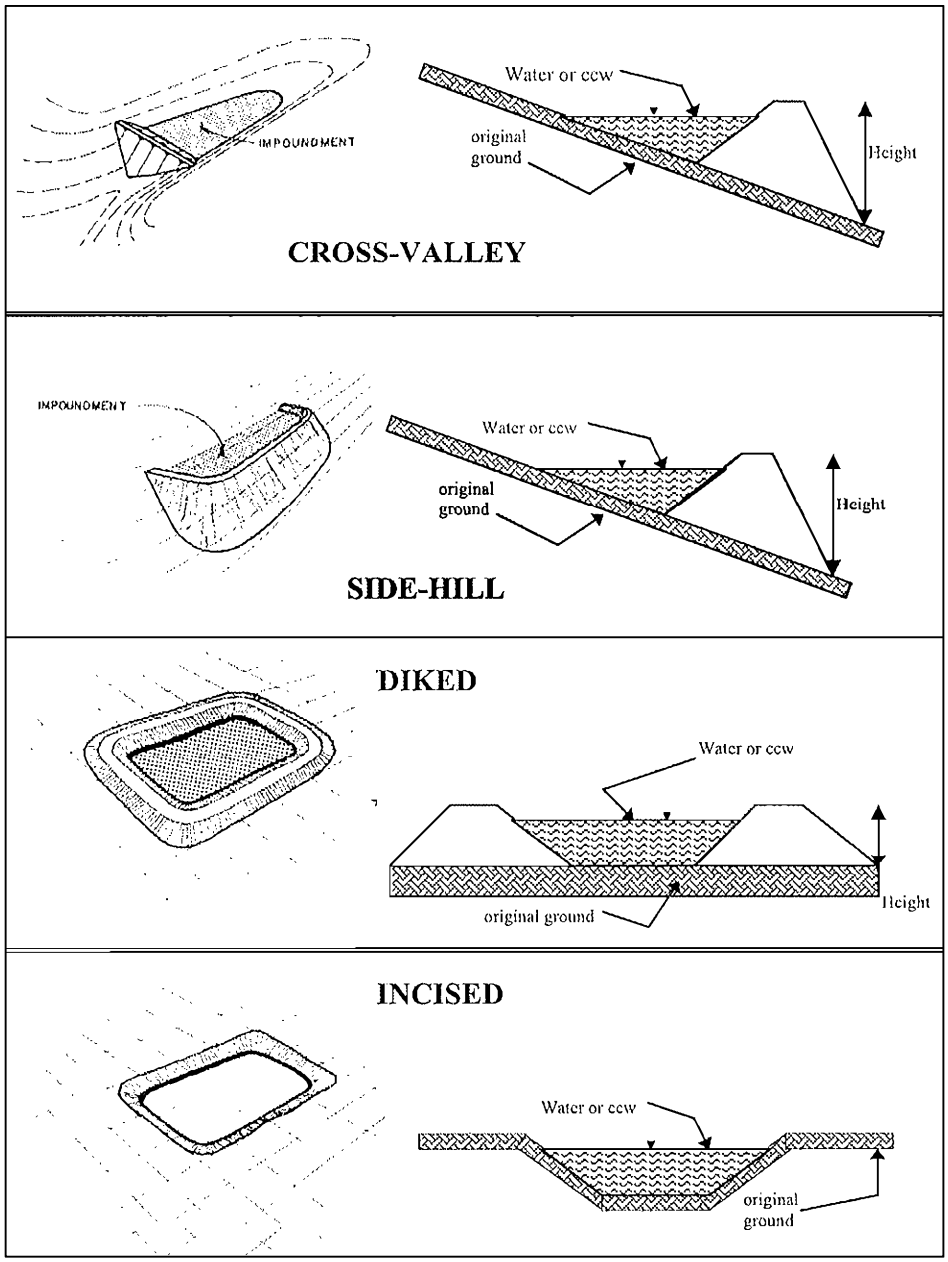
_____ **SIGNIFICANT HAZARD POTENTIAL:** Dams assigned the significant hazard potential classification are those dams where failure or misoperation results in no probable loss of human life but can cause economic loss, environmental damage, disruption of lifeline facilities, or can impact other concerns. Significant hazard potential classification dams are often located in predominantly rural or agricultural areas but could be located in areas with population and significant infrastructure.

__X__ **HIGH HAZARD POTENTIAL:** Dams assigned the high hazard potential classification are those where failure or misoperation will probably cause loss of human life.

DESCRIBE REASONING FOR HAZARD RATING CHOSEN:

US highway immediately downstream and 2 residences located about 0.5 mile downstream. We concur with the High Hazard Classification based AEPC's approximate inundation analysis.

CONFIGURATION:

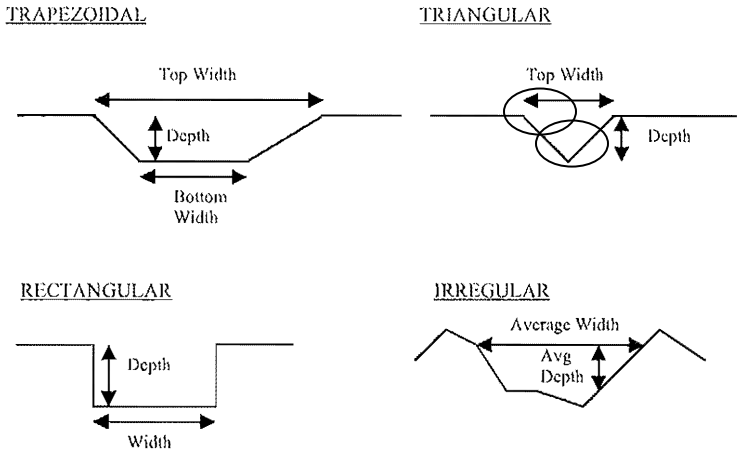


_____ Cross-Valley
_____ Side-Hill
__X__ Diked
_____ Incised (form completion optional)
_____ Combination Incised/Diked

Embankment Height 19 feet
Pool Area 80 acres
Current Freeboard 12.6 feet

Embankment Material Generally Sandy Clay
Liner HDPE over Clay
Liner Permeability HDPE:$1x10^{-10}$ cm/s; Clay: $1x10^{-6}$ cm/s

TYPE OF OUTLET (Mark all that apply)

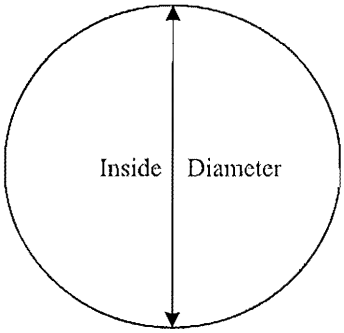


None **Open Channel Spillway**
_____ Trapezoidal
_____ Triangular
_____ Triangular

_____ Depth
_____ Bottom (or average) width
_____ Top width

_____**Outlet**

_____ inside diameter



Material
_____ corrugated metal
_____ welded steel
_____ concrete
_____ plastic (hdpe, pvc, etc.)
_____ other (specify)_____

Is water flowing through the outlet? YES_____ NO_____

__X__**No Outlet**

_____ **Other Type of Outlet (Specify)** _____

The Impoundment was Designed By Burns & McDonnell (1994)

_____

Has there ever been a failure at this site? YES _____ NO __X__

If So When? _____

If So Please Describe: _____

Has there ever been significant seepages at this site? YES _____ NO__X__

If So When? _____

If So Please Describe: _____

Has there ever been any measures undertaken to monitor/lower Phreatic water table levels based on past seepages or breaches at this site? YES _____ NO__X__

If So which method (e.g., piezometers, gw pumping, …)? _____

If So Please Describe: _____

Appendix C

Inspection Photographs

September 3, 2009

Arizona Electric Power Cooperative, Apache Power Plant
Site visit photos, September 3, 2009

Photo 1:Crest of north embankment of Ash Pond 4 facing west.

Photo 2: Upstream slope of north embankment of Ash Pond 4 facing west.

Photo 3: Downstream slope of north embankment of Ash Pond 4 facing west. Note train tracks located to north of facility.

Photo 4: Crest of east embankment of Ash Pond 4 facing south.

Photo 5: Upstream slope of east embankment of Ash Pond 4 facing south.

Photo 6: Downstream slope of east embankment of Ash Pond 4 facing south.

Photo 7: Downstream toe of east embankment of Ash Pond 4 facing south. Note granular rock slope protection and riprap in stormwater ditch at toe.

Photo 8: Downstream toe of east embankment of Ash Pond 4 facing north.

Photo 9: Looking downstream from the east embankment of Ash Pond 4 at the stormwater ditch that discharges to the east through the railroad bridge. Two residences are in the floodway between the bridge and Willcox Playa located further east.

Photo 10: Upstream slope of east embankment of Ash Pond 4 facing north. Note the maintenance access concrete ramp. Pond is nearly empty.

Photo 11: Crest of east embankment of Ash Pond 1 facing south. Pipelines convey slurried fly ash and residuals for disposal in the ash ponds. Note depressed pipe vault for traffic crossing.

Photo 12: Crest of north embankment of Ash Pond 1 facing west. Note fly ash slurry pipelines.

Photo 13: Upstream slope of east embankment of Ash Pond 1 facing south

Photo 14: Downstream slope of east embankment of Ash Pond 1 facing south

Photo 15: Panorama view of Ash Pond 1 facing southwest

Photo 16: Looking downstream, east, at Pipe Vault

Photo 17: View of broken floating discharge pipe in Ash Pond 1. Occasional breaks occur in the slurried ash and residual discharge pipe due to pressure build-up, possibly associated with clogging.

Photo 18: Pipe Vault in crest between Ash Pond 1 and Ash Pond 4 looking north. Note concrete backwall at north end of vault only.

Photo 19: Ash Pond 4 decant drop inlet intake tower and access bridge, looking northwest. Note that Ash Pond 4 is nearly empty.

Photo 20: Crest between Ash Pond 1 and Ash Pond 2, looking south.

Photo 21: Crest and centralized recirculation pump station located at intersection of Ash Pond 1, 2, 3, & 4, looking west. Decant water is pumped back to the Cooling Tower Blowdown Pond.

Photo 22: Upstream slope of west embankment of Ash Pond 1, looking south.

Photo 23: Exterior view of intake tower at Ash Pond 4, looking down. Note the aluminum stop logs that can be adjusted to control pond decant level.

Photo 24: Upstream slope of embankment of Ash Pond 2, looking south. Note erosion of granular crest surface material from behind the wall formed of cement bags.

Photo 25: Upstream slope of north embankment of Ash Pond 2, looking west. Note the small pipe that drains a pipe vault.

Photo 26: Upstream slope of east embankment of Ash Pond 1, looking south. Note vegetation established on the ash deposits.

Photo 27: Downstream slope of east embankment of Ash Pond 1, looking south.

Photo 28: Downstream slope of south embankment of Ash Pond 1, looking west. Note pipes conveying slurried scrubber sludge to Scrubber Sludge Pond 1. Note riprapped stormwater channel located downstream of the embankment.

Photo 29: Ash Pond 1 Crest, looking west.

Photo 30: Upstream slope of south embankment of Ash Pond 1, looking west.

Photo 31: Ash Pond 2, upstream slope of south embankment, looking west.

Photo 32: Ash Pond 2, downstream slope of south embankment, looking west.

Photo 33: Ash Pond 2 Crest of south embankment, looking west.

Photo 34: Survey Monument on crest of Ash Pond 2.

Photo 35: Evaporation Pond, downstream slope of south embankment, looking west.

Photo 36: Ash Pond 2, upstream slope, looking north.

Photo 37: Crest of Evaporation Pond south embankment, looking west.

Photo 38: Downstream toe of Evaporation Pond, south embankment, looking west.

Photo 39: Stormwater ditch located south of the Evaporation Pond, looking east.

Photo 40: Evaporation Pond, upstream slope of south embankment, looking west.

Photo 41: Pipes conveying scrubber sludge entering the facility at southwest corner of Scrubber Sludge Pond 1, looking southeast.

Photo 42: Pipe vault where pipes cross the crest to discharge into Scrubber Sludge Pond 1, looking north. Note the vault lacks a concrete headwall at the downstream end, which could provide a pathway to concentrate discharge of overtopping flows.

Photo 43: Crest of embankment between Evaporation Pond (on right) and Scrubber Sludge Pond 1 (on left), looking north.

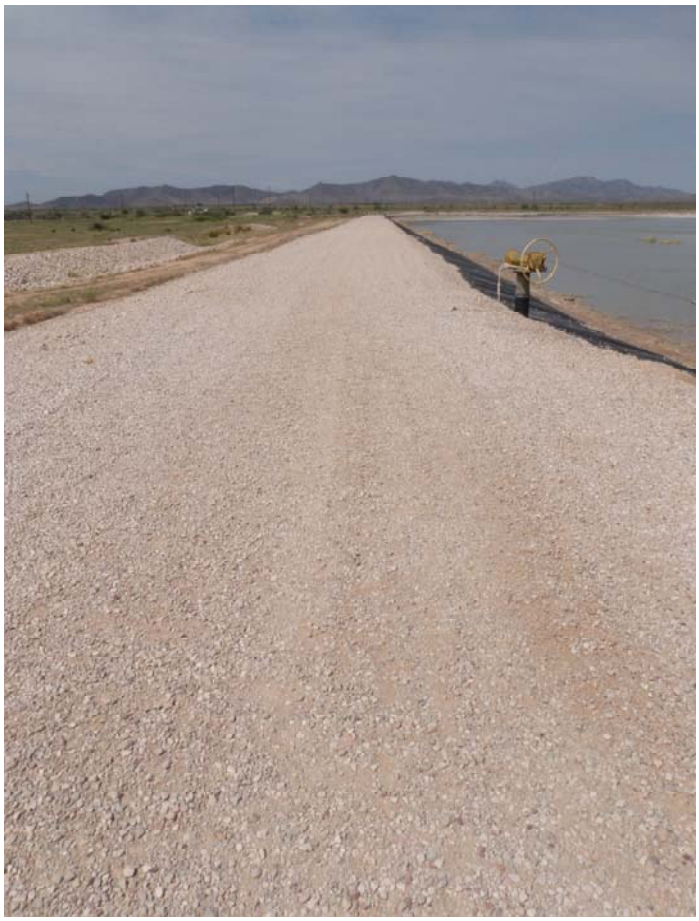


Photo 44: Crest of south embankment of Scrubber Sludge Pond 1, looking west.

Photo 45: Upstream slope of south embankment of Scrubber Sludge Pond 1, looking west.

Photo 46:Downstream slope of south embankment of Scrubber Sludge Pond 1, looking west.

Photo 47: Upstream slope of east embankment of Scrubber Sludge Pond 1, looking north.

Photo 48: Crest of west embankment of Scrubber Sludge Pond 1, looking north.

Photo 49: Downstream slope of west embankment of Scrubber Sludge Pond 1, looking north.

Photo 50: Upstream slope of west embankment of Scrubber Sludge Pond 1, looking north.

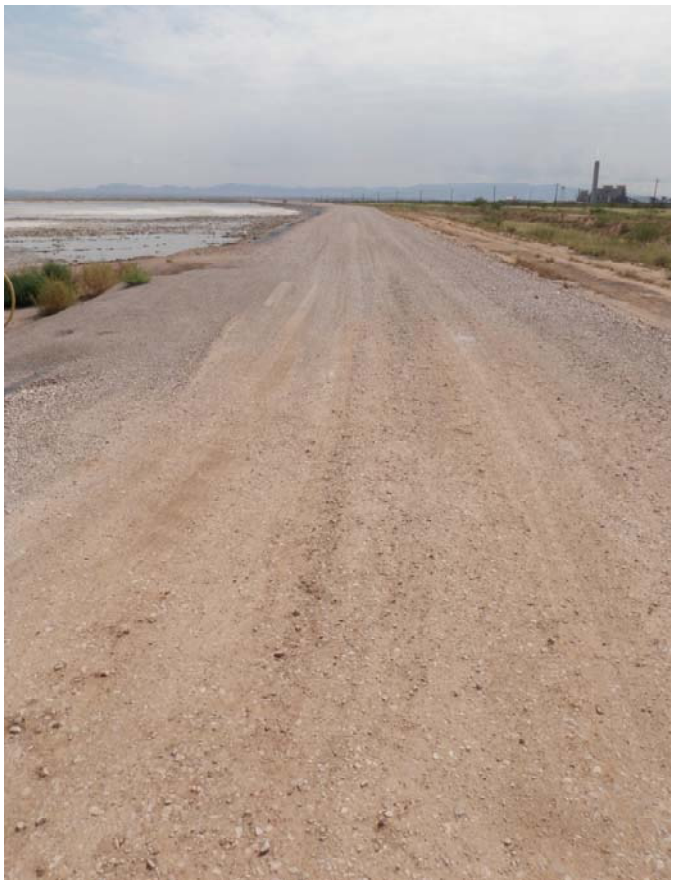


Photo 51: Crest of south embankment of Scrubber Sludge Pond 1, looking east.

Photo 52: Downstream slope of south embankment of Scrubber Sludge Pond 1, looking east.

Photo 53: Upstream slope of north embankment of Scrubber Sludge Pond 2, looking east.

Photo 54: Upstream slope of the south embankment of Scrubber Sludge Pond 2, looking west. Note 3 HDPE pipes that connect Scrubber Sludge Pond 1 and Scrubber Sludge Pond 2. The pipes were closed with blind flanges at each end.

Photo 55: Crest between Ash Pond 3 and Evaporation Pond, looking south.

Photo 56: Upstream slope of Evaporation Pond, east embankment, looking south.

Photo 57: Upstream slope of Ash Pond 3, west embankment, looking south. Evaporation Pond is at right side of photo.

Photo 58: Upstream slope of Evaporation Pond, north embankment, looking west.

Photo 59: Downstream slope of north embankment of Scrubber Sludge Pond 2, looking west.

Photo 60: Downstream slope of Scrubber Sludge Pond 2, north embankment, looking east.

Photo 61: High precision survey monuments located in area where fissures were identified on north side of Scrubber Sludge Pond 2/ Evaporation Pond prior to construction. Note train on tracks located north of the facility.

Appendix D

Reply to Request for Information Under Section 104(e)

Arizona Electric Power Cooperative, Inc.

P.O. Box 670 • Benson, Arizona 85602-0670 • Phone 520-586-3631

Via Federal Express

March 26, 2009

Mr. Richard Kinch
U.S. Environmental Protection Agency
Two Potomac Yard
2733 S. Crystal Dr.
5th Floor; N05783
Arlington, VA 22202-2733

RE: RESPONSE AND CERTIFICATION OF ARIZONA ELECTRIC POWER COOPERATIVE, INC. (AEPCO) TO REQUESTS FOR INFORMATION UNDER SECTION 104(E) OF THE COMPREHENSIVE ENVIRONMENTAL RESPONSE, COMPENSATION, AND LIABILITY ACT, 42 U.S.C. 9604(E)

Dear Mr. Kinch:

This is in response to copies of letters from Barry N. Breen, Acting Assistant administrator, issued to the Chief Executive Officer of AEPCO on March 9, 2009, and to the Plant Manager of AEPCO's Apache Station on March 9, 2009. Please be advised that Apache Station, located in Cochise, Arizona, is AEPCO's only electric generating facility, and therefore, except for the subject facilities at Apache Station, AEPCO does not own or operate any other facilities "relating to the surface impoundments or similar diked or bermed management units or management units designated as landfill which receive liquid-borne material from surface impoundment used for the storage or disposal of residuals or by-products from the combustion of coal, including, but not limited to, fly ash, bottom ash, boiler slag, or flue gas emission control residuals."

Please therefore find enclosed AEPCO's Responses to each request for information, including documentation pertaining to the combustion waste disposal facility, low volume wastewater pond, cooling tower blowdown pond and coal pile retention basin at Apache Station. Please also find two Certifications, one executed by Donald W. Kimball, AEPCO's Executive Vice President and Chief Executive Officer, and one executed by Michael D. Nelson, AEPCO's Manager of Power Production. This Response and Certifications are made on behalf of AEPCO and its Apache Station.

If you require any additional information please feel free to contact me at (520) 586-5000.

Sincerely,

Michelle Freeark

Michelle Freeark
Manager of Environmental Services

Enc.

cc: J. Andrew
G. Grim
D. Kimball
P. Ledger
M. Nelson

ARIZONA ELECTRIC POWER COOPERATIVE, INC.

CERTIFICATE

I certify that the information contained in this Response to the United States Environmental Protection Agency's request for information and the accompanying documents is true, accurate, and complete. As to the identified portions of this Response for which I cannot personally verify their accuracy, I certify under penalty of law that this Response and all attachments were prepared in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fines and imprisonment for knowing violations.

Michael D. Nelson
Manager of Power Production

ARIZONA ELECTRIC POWER COOPERATIVE, INC.

CERTIFICATE

I certify that the information contained in this Response to the United States Environmental Protection Agency's request for information and the accompanying documents is true, accurate, and complete. As to the identified portions of this Response for which I cannot personally verify their accuracy, I certify under penalty of law that this Response and all attachments were prepared in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fines and imprisonment for knowing violations.

Michael D. Nelson
Manager of Power Production

ARIZONA ELECTRIC POWER COOPERATIVE, INC.

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Donald W. Kimball
Executive Vice President and
Chief Executive Officer

ARIZONA ELECTRIC POWER COOPERATIVE, INC.

CERTIFICATE

I certify that the information contained in this Response to the Unitied States Environmental Protection Agency's request for information and the accompanying documents is true, accurate, and complete. As to the identified portions of this Response for which I cannot personally verify their accuracy, I certify under penalty of law that this Response and all attachments were prepared in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fines and imprisonment for knowing violations.

Donald W. Kimball
Executive Vice President and
Chief Executive Officer

Response to EPA Section 104 Request

1. The Apache Station Combustion Waste Disposal Facility (Facility) has been rated as a High Hazard. The Facility was rated by and is regulated by the Arizona Department of Water Resources (ADWR), Dam Safety and Flood Mitigation Division. The rating basis was modified in 2004 from Significant to High Hazard due to the potential for loss of human life (two homes are located in the modeled inundation area downstream of the Facility).
2. The Facility entered operation in 1995. No expansions have been made since that date.
3. The Facility contains fly ash, bottom ash, and flue gas emission control residuals.
4. The Facility was designed and stamped by a Burns & McDonnell Registered Professional Civil Engineer. The Facility was constructed under the supervision of a Registered Professional Engineer. The Facility safety inspection and monitoring is under the supervision of a Registered Professional Engineer.
5. The last Facility structural integrity survey was completed in December 2008. The survey was completed by a Registered Land Surveyor (RLS), and the data analysis was completed by a Registered Professional Civil Engineer (RPCE). Actions to be taken, as a result of the last survey report recommendations, include: observation and maintenance of erosion prevention devices after large rainfall events, performed by Facility Equipment Operators, and; continued annual monitoring of the Facility survey monuments as performed by the RLS and RPCE. The next survey will occur in late 2009.
6. A representative of ADWR last inspected the Facility in December 2008. ADWR conducts an annual inspection each December. A copy of the last inspection report is attached.
7. No safety issues have been uncovered in the last year during inspections by ADWR.
8. The Facility has a total of 285 acres of subsurface area. The Facility has a total of seven separate lined ponds. The last stored solids volume measurements were taken in February 2009. The maximum height of the Facility is thirty-one (31) feet. The total storage capacity and volume of materials in each pond is as shown below:

Description	Total Volume	Stored Solids Volume
• Ash Pond 1	717 acre-feet	250 acre-feet
• Ash Pond 2	720 acre-feet	313 acre-feet
• Ash Pond 3	720 acre-feet	0 acre-feet
• Ash Pond 4	693 acre-feet	0 acre-feet
• Evaporation 1	823 acre-feet	0 acre-feet
• Scrubber Pond 1	314 acre-feet	250 acre-feet
• Scrubber Pond 2	446 acre-feet	0 acre-feet

9. No known spills or unpermitted releases have occurred within the last ten years from the Facility.
10. The Facility is currently owned and operated by Arizona Electric Power Cooperative, Inc.

Low Volume Wastewater Pond

Apache Station has additional facilities on-site that are designed to receive/hold liquid wastes that receive fly ash, bottom ash, etc. It is our belief that these facilities do not meet the definition of an impoundment but the information has been included in the request.

1. The Low Volume Wastewater (LVWW) Pond does not have a rating. The height and storage capacity is below the minimum requirements for regulation by ADWR. No homes are located downstream of this pond.
2. The LVWW Pond entered service in 2005. No expansions have been made since that date.
3. The LVWW Pond contains small quantities of fly ash, bottom ash, limestone, and flue gas emission control residuals.
4. The LVWW Pond was designed and stamped by a CH2M Hill Registered Professional Civil Engineer. It was constructed under the supervision of a registered Professional Engineer. Inspection and monitoring is under the supervision of a Registered Professional Engineer.
5. No structural integrity surveys have been completed on this pond. No future structural integrity surveys are planned.
6. No state or local governmental representatives have inspected this pond. No inspection reports are available
7. N/A.
8. The LVWW Pond is a lined pond accepting low flows of process water and precipitation run-off from the Power Plant. The pond surface area is 20 acres, with a dike height less than six (6) feet above grade. The storage capacity of the pond is 30 acre-feet. It is estimated there is less than 0.3 acre-feet, or 0.001 percent, material storage in this pond.
9. There have been no known spills, or unpermitted releases, from this pond since it was placed in service.
10. The LVWW Pond is currently owned and operated by Arizona Electric Power Cooperative, Inc.

Cooling Tower Blowdown Pond

Apache Station has additional facilities on-site that are designed to receive/hold liquid wastes that receive fly ash, bottom ash, etc. It is our belief that these facilities do not meet the definition of an impoundment but the information has been included in the request.

1. The Cooling Tower Blowdown (CTB) Pond does not have a rating. The height and storage capacity is below the minimum requirements for regulation by ADWR. No homes are located downstream of this pond.
2. The CTB Pond entered operation in 1978. No expansions have been made since that date.
3. The CTB Pond contains small quantities of fly ash.
4. The CTB Pond was designed and stamped by a Burns & McDonnell Registered Professional Civil Engineer. It was constructed under the supervision of a registered Professional Engineer. Inspection and monitoring is under the supervision of a Registered Professional Engineer.
5. No structural integrity surveys have been completed on this pond. No future structural integrity surveys are planned.
6. No state or local governmental representatives have inspected this pond. No inspection reports are available
7. N/A.
8. The CTB Pond is a bermed pond 10 feet above grade that is 260 feet by 125 feet with a capacity of 2.22 million gallons of water. It is estimated there is less than 30,000 cubic feet of fly ash in this pond.
9. This pond has an overflow flume which diverts overflow water to the Low Volume Wastewater Pond.
10. The CTB Pond is currently owned and operated by Arizona Electric Power Cooperative, Inc.

Coal Pile Retention Basin

Apache Station has additional facilities on-site that are designed to receive/hold liquid wastes that receive fly ash, bottom ash, etc. It is our belief that these facilities do not meet the definition of an impoundment but the information has been included in the request.

1. The Coal Pile Retention (CPR) Basin does not have a rating. The Basin is located below grade. The height and storage capacity is below the minimum requirements for regulation by ADWR. No homes are located downstream of this pond.
2. The CPR Basin entered operation in 1978. No expansions have been made since that date.
3. The CPR Basin contains minimal quantities of coal.
4. The CPR Basin was designed and stamped by a Burns & McDonnell Registered Professional Civil Engineer. It was constructed under the supervision of a registered Professional Engineer. No inspection or monitoring of this basin is completed.
5. No structural integrity surveys have been completed on this basin. No future structural integrity surveys are planned.
6. No state or local governmental representatives have inspected this basin. No inspection reports are available
7. N/A.
8. The CPR Basin is below grade and triangular shaped with dimensions of 515, 255 and 390 feet. The basin is three (3) feet deep. The surface area is 46,856 square feet with a capacity of 1.12 million gallons. It is estimated there is less than 15,000 cubic feet of coal ash in this pond.
9. There have been no known spills, or unpermitted releases, from this basin, as it is located below grade.
10. The CPR Basin is currently owned and operated by Arizona Electric Power Cooperative, Inc.