

# **Arizona Public Service Four Corners Power Plant**

## **Upper Retention Sump**

### **Location Restrictions Demonstration Report**

Prepared for :  
Arizona Public Service

AECOM Job No. 60587725  
October 8, 2018

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## Certification Statement

### Certification Statement for Location Restrictions:

- 40 CFR § 257.60 – Placement above the uppermost aquifer
- 40 CFR § 257.61 – Wetlands
- 40 CFR § 257.62 – Fault areas
- 40 CFR § 257.63 – Seismic impact zones
- 40 CFR § 257.64 – Unstable Areas

**CCR Unit:** Arizona Public Service Company; Four Corners Power Plant; Upper Retention Sump

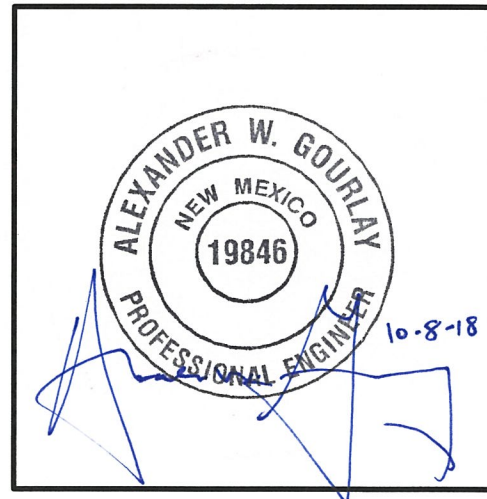
I, Alexander Gourlay, being a Registered Professional Engineer in good standing in the State of New Mexico, do hereby certify, to the best of my knowledge, information, and belief that the information contained in this certification has been prepared in accordance with the accepted practice of engineering. I certify, for the above-referenced CCR unit, that the demonstration regarding the location of the CCR unit in the wetlands, the demonstration regarding the location of the CCR unit within 60 meters (200 feet) of the outermost damage zone of a fault that has had a displacement in Holocene time, the demonstration regarding the location of the CCR unit in a seismic impact zone, and the demonstration that the location of the CCR unit is not in an unstable area, as included in the Location Restrictions Demonstration Report dated October 8, 2018 meet the requirements of 40 CFR § 257.61(a), § 257.62(a), § 257.63(a), and § 257.64(a). I certify, for the above-referenced CCR unit, that the demonstration regarding the location of the CCR unit less than 1.52 meters (5 feet) above the upper limit of the uppermost aquifer does not meet the requirements of 40 CFR § 257.60(a),

Alexander W. Gourlay, P.E.

*Printed Name*

October 8, 2018

*Date*





# 1 Introduction

Arizona Public Service Company (APS) AECOM to assist in the location restrictions demonstrations of the existing coal combustion residual (CCR) surface impoundments at the Four Corners Power Plant (FCPP, the Plant) within the Navajo Nation, near Fruitland, New Mexico. Figure 1-1 shows the location of the CCR Impoundments at the FCPP. This Demonstration Report documents location-specific conditions relevant to the Upper Retention Sump.

## 1.1 Report Purpose and Description

The purpose of this report is to document the location restrictions demonstration for the Upper Retention Sump. The Upper Retention Sump is an existing CCR surface impoundment operated by APS. In 2015, the United States Environmental Protection Agency (EPA) finalized a rule (Rule) regulating CCRs under subtitle D of the Resource Conservation and Recovery Act (RCRA). As part of this Rule, owners and operators of existing CCR surface impoundments must obtain a certification from a qualified professional engineer stating that the demonstrations for the CCR unit meet the requirements relative to the uppermost aquifer, wetlands, fault areas, seismic impact zones, and unstable areas.

## 1.2 EPA Regulatory Requirements

On April 17, 2015 the United States Environmental Protection Agency issued 40 CFR Part 257 Hazardous and Solid Waste Management System; Disposal of Coal Combustion Residuals from Electric Utilities; Final Rule (the Rule). Sections 257.60 through 257.64 define location restriction criteria for existing CCR surface impoundments and require the owner or operator of the CCR unit to demonstrate that the unit meets minimum requirements for:

- a) Placement above the uppermost aquifer (§ 257.60);
- b) Location outside wetlands (§ 257.61);
- c) Location more than 60 meters (200 feet) from the outermost damage zone of a fault that has had displacement in Holocene time (§ 257.62);
- d) Location outside seismic impact zones (§ 257.63);
- e) Location away from unstable areas (§ 257.64).

Existing CCR surface impoundments, such as the Upper Retention Sump, are required to demonstrate compliance with the location restrictions no later than October 17, 2018. An owner or operator unable to demonstrate compliance is prohibited from placing CCR in the CCR unit under either 40 CFR § 257.60(c)(4), § 257.61(c)(4), § 257.62(c)(4), § 257.63(c)(4), or § 257.64(c)(4), as applicable.

## 1.3 Report Organization

This Demonstration Report is organized into the following sections:

<u>Report Section</u>	<u>Applicable CFR 40 Part 257 Citation</u>
• Section 1 – Introduction	
• Section 2 – Placement Above the Uppermost Aquifer	§ 257.60 Placement above the uppermost aquifer
• Section 3 – Location Relative to Wetlands	§ 257.61 Wetlands
• Section 4 – Location Relative to Fault Areas	§ 257.62 Fault areas

- Section 5 – Location Relative to Seismic Impact Zones § 257.63 Seismic impact zones
- Section 6 – Location Relative to Unstable Areas § 257.64 Unstable areas
- Section 7 – Conclusions
- Section 8 – Limitations
- Section 9 – References
- Appendix A – Construction Plans
- Appendix B – National Wetlands Inventory Map
- Appendix C – Unified Hazard Tool Summary

## 1.4 Facility Description

The FCPP is an electric generating station located within the Navajo Nation, near Fruitland, New Mexico. The FCPP is operated by APS and owned by a consortium of utility companies. The FCPP consists of two coal-fired electrical generating units, Units 4 and 5. Units 1, 2, and 3 ceased generation in 2013 and were then decommissioned. The two generating units are cooled by water from Morgan Lake, a man-made reservoir located immediately north of the Plant. Five existing CCR units are located at the FCPP: the Combined Waste Treatment Pond (CWTP) located immediately east of the Plant, the Lined Ash Impoundment (LAI) located approximately 1 mile west of the Plant, the Lined Decant Water Pond (LDWP) located approximately 1.5 miles west of the Plant and adjacent to the LAI, the Upper Retention Sump located immediately southeast of the Plant, and the Dry Fly Ash Disposal Area (DFADA), a landfill located approximately 2 miles southwest of the Plant and south of the LAI. Figure 1-1 shows the locations of these units.

The Upper Retention Sump was constructed in 1984. It is an approximately 1.09-acre, unlined surge pond associated with operation of the flue gas desulfurization (FGD) systems for treatment of flue gas from Units 4 and 5. Lime slurry was transferred between the Upper Retention Sump and various FGD absorber vessels as needed to operate and maintain the overall FGD system. The base of the sump slopes from the north edge to a concrete pump intake structure located at the south end.

APS initiated in June 2018 a process to close the Upper Retention Sump by removing all CCR material in accordance with the provisions of 40 CFR § 257.102(c). After removing the CCR material in the Upper Retention Sump, APS began construction of a replacement concrete tank.

## 2 Placement Above the Uppermost Aquifer

40 CFR § 257.60 requires that existing CCR surface impoundments must be constructed with a base that is located no less than 1.52 meters (5 feet) above the upper limit of the uppermost aquifer, unless the owner or operator demonstrates that there will not be an intermittent, recurring, or sustained hydraulic connection between any portion of the base of the CCR unit and the uppermost aquifer due to normal fluctuations in groundwater elevation (including the seasonal high water table).

*Uppermost aquifer* is defined by the Rule to mean the geologic formation nearest the natural ground surface that is an aquifer, as well as lower aquifers that are hydraulically interconnected with this aquifer within the facility's property boundary.

### 2.1 Methodology

This Location Restrictions Demonstration Report includes an assessment of the separation between the base of the Upper Retention Sump and the uppermost aquifer based on available data. The following information was reviewed to assess the vertical location of the Upper Retention Sump relative to the uppermost aquifer:

- Topographic conditions shown on construction plans (included in Appendix A)
- CCR Monitoring Well Network Report and Certification (AECOM 2017)
- Annual Groundwater Monitoring and Corrective Action Report for 2017 (Amec Foster Wheeler 2018)

### 2.2 Discussion and Conclusion

#### 2.2.1 Base Elevation of the CCR Unit

The Upper Retention Sump is an unlined, incised structure with a base and sides constructed of soil cement. Based on APS construction drawings (APS Drawing G-71729, Figure A-2 in Appendix A), the lowest portion of the base of the Upper Retention Sump is the pump intake structure at the south end. The pump intake structure was constructed with a base elevation of 5336.0 feet (NGVD29; EL 5339.0 NAVD88).

#### 2.2.2 Groundwater Elevations

Monitoring wells MW-66, MW-67, MW-68, MW-69, MW-70, MW-71, and MW-72 were installed to monitor groundwater quality and elevation (Figure 2-1). Table 1 presents well data and the water level elevations in the wells monitored near the Upper Retention Sump (AECOM 2017, Amec Foster Wheeler 2018).

**Table 1 – Well Data and Groundwater Elevations (ft)<sup>1</sup>**

	Well Name						
	MW-66	MW-67	MW-68	MW-69	MW-70	MW-71	MW-72
Location Relative to the Upper Retention Sump	North	West	West	South	East	Southwest	South
Surface Elevation (ft)	5344.69	5354.02	5353.95	5355.26	5368.62	5363.62	5379.09
Bottom of Screen (ft)	5319.69	5324.38	5324.91	5320.94	5318.62	5321.08	5318.35
Screened In	Pictured Cliffs Formation						
Measurement Date	MW-66	MW-67	MW-68	MW-69	MW-70	MW-71	MW-72
11/3-11/9, 11/14/2015	5331.64	5331.91	5333.00	5334.55	5333.64	NI <sup>2</sup>	NI <sup>2</sup>
4/25/2016	NM <sup>3</sup>	NM <sup>3</sup>	5333.58	5335.46	5334.42	5331.50	5332.50
9/12/2016	5332.56	5332.59	5334.18	5335.83	5334.74	5331.70	5332.19
10/19-10/20/2016	5332.15	5331.83	5333.91	5335.33	5334.53	5331.33	5332.13
1/31-2/1/2017	5331.93	5331.98	5334.00	5335.27	5334.17	5331.40	5332.13
5/1/2017	5331.77	5331.71	5333.45	5334.89	5334.15	5331.42	5332.29
9/9/2017	5331.04	5330.84	5332.61	5333.79	5333.21	5331.02	5331.87
10/11/2017	5331.26	5331.26	5333.34	5334.58	5333.53	5331.09	5331.81
Highest Recorded Groundwater Elevation (ft)	5332.56	5332.59	5334.18	5335.83	5334.74	5331.70	5332.50

1) Elevations are presented in NAVD88.

2) NI = Not installed. Monitoring wells MW-71 and MW-72 were installed in March 2016.

3) NM = Not measured.

### 2.2.3 Separation from the Uppermost Aquifer

Groundwater elevations measured in the adjacent CCR groundwater monitoring wells indicate that the highest recorded elevation in MW-69 (EL 5335.83 feet NAVD88) is less than five feet below the lowest elevation of the base of the Upper Retention Sump (EL 5339.0 NAVD88).

**Conclusion:** The Upper Retention Sump does not meet the location restriction requirement relative to the uppermost aquifer and is subject to closure per 40 CFR § 257.101(b)(1).

### 3 Location Relative to Wetlands

40 CFR § 257.61 requires that existing surface impoundments not be located in wetlands. Wetlands are defined in 40 CFR § 232.2 as “those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas.”

#### 3.1 Methodology

The U.S. Fish and Wildlife Service (USFWS) maintains the National Wetlands Inventory mapper on the Internet (<https://www.fws.gov/wetlands/data/Mapper.html>). The application integrates digital map data along with other resources information to produce information on the status, extent, characteristics, and functions of wetlands and other resources. The National Wetlands Inventory, last modified on May 1, 2018, was reviewed to assess the location of the Upper Retention Sump relative to wetlands. The results are presented in Appendix B.

#### 3.2 Discussion and Conclusion

The USFWS National Wetlands Inventory identified Morgan Lake (classified as L1UBHh) and four man-made ponds (classified as PUBFx) north of the Upper Retention Sump as wetlands; however, the Upper Retention Sump footprint is not located in wetlands.

**Conclusion:** The Upper Retention Sump is not located in wetlands.

## 4 Location Relative to Faults

40 CFR § 257.62 requires that existing surface impoundments not be located within 60 meters (200 feet) of the outermost damage zone of a fault that has had displacement in Holocene time (beginning 11,700 years before present (BP)) unless the owner or operator demonstrates the an alternative setback distance of less than 60 meters (200 feet) will prevent damage to the structural integrity of the CCR unit.

### 4.1 Methodology

AECOM reviewed the Quaternary Faults and Folds database maintained by the United States Geological Survey (USGS) as part of the Holocene fault search (USGS 2018). The Holocene epoch is the most recent subdivision of the Quaternary period and therefore any faults that have had displacement in the Holocene would also be included in the Quaternary period database. The Quaternary Faults and Folds database is the source for the faults used in the National Seismic Hazard Maps and contains information on faults and associated folds that are believed to be sources of  $M > 6$  earthquakes during the Quaternary Period. AECOM searched the USGS Quaternary Fault and Fold Database for Category A and Category B faults in San Juan County, New Mexico. Fault categories are defined in Table 2. Fault categories A and B relate to the Rule; fault categories C and D describe less defined or non-tectonic features.

**Table 2 – Fault Categories**

Category	Definition
A	Geologic evidence demonstrates the existence of a Quaternary fault of tectonic origin, whether the fault is exposed by mapping or inferred from liquefaction or other deformational features.
B	Geologic evidence demonstrates the existence of Quaternary deformation, but either (1) the fault might not extend deeply enough to be a potential source of significant earthquakes, or (2) the currently available geologic evidence is too strong to confidently assign the feature to Class C but not strong enough to assign it to Class A.
C	Geologic evidence is insufficient to demonstrate (1) the existence of tectonic faulting, or (2) Quaternary slip or deformation associated with the feature.
D	Geologic evidence demonstrates that the feature is not a tectonic fault or feature; this category includes features such as joints, landslides, erosional or fluvial scarps, or other landforms resembling scarps but of demonstrable non-tectonic origin.

### 4.2 Discussion and Conclusion

The USGS Quaternary Faults and Folds Database of the United States does not contain any Class A or Class B faults in San Juan County.

**Conclusion:** No faults with Holocene displacement are present within 200 feet of the Upper Retention Sump.

## 5 Location Relative to Seismic Impact Zones

40 CFR § 257.63 requires existing surface impoundments not be located in seismic impact zones unless the owner or operator demonstrates that all structural components, including liners, leachate collection and removal systems, and surface water control systems, are designed to resist the maximum horizontal acceleration in lithified earth material for the site. *Seismic impact zone* is defined by the Rule as an area having a 2 percent or greater probability that the maximum expected horizontal acceleration, expressed as a percentage of the earth's gravitational pull (g), will exceed 0.10 g in 50 years.

### 5.1 Methodology

The USGS maintains the Unified Hazard Tool website to provide access to the source and attenuation models for locations within the United States. AECOM utilized version 4.0.x of the 2014 Unified Hazard Tool to calculate the peak horizontal ground acceleration (PGA) with a 2 percent probability of exceedance in 50 years (USGS 2018a) for the Upper Retention Sump location. The Unified Hazard Tool result is presented in Appendix C.

### 5.2 Discussion and Conclusion

The PGA with a 2 percent probability of exceedance in 50 years for the Upper Retention Sump is 0.0748g. This value is less than the Rule-required maximum value of 0.10 g in 50 years.

**Conclusion:** The Upper Retention Sump is not located in a seismic impact zone.

## 6 Location Relative to Unstable Areas

40 CFR § 257.64 requires that existing surface impoundments not be located in an unstable area unless the owner or operator demonstrates that recognized and generally accepted good engineering practices have been incorporated into the design of the CCR unit to ensure that the integrity of the structural components of the CCR unit will not be disrupted. The following factors must be considered when determining whether the area is unstable:

- 1) On-site or local soil conditions that may result in significant differential settling;
- 2) On-site or local geologic or geomorphologic features; and
- 3) On-site or local human-made features or events (both surface and subsurface).

*Structural components* include any component used in the construction and operation of the CCR landfill or CCR surface impoundment that is necessary to ensure the integrity of the unit and to ensure that the contents will not be released to the environment, including liners, leachate collection system, embankments, spillways, outlets, final covers, inflow design flood control systems.

*Unstable area* means a location that is susceptible to natural or human-induced events or forces capable of impairing the integrity, including structural components of some or all of the CCR unit that are responsible for preventing releases from such unit. Unstable areas can include poor foundation conditions, areas susceptible to mass movements, and karst terrains.

### 6.1 Methodology

The location of the Upper Retention Sump relative to unstable areas was assessed by reviewing design and construction documentation and historic subsurface investigations. Information was reviewed to assess: 1) whether poor foundation conditions may exist which could result in inadequate foundation support for structural components of the Upper Retention Sump; and 2) whether areas susceptible to mass movement (such as subsidence, landslides, avalanches, debris slides and flows, block sliding, or rock falls) capable of impairing the integrity of the structural components of the Upper Retention Sump are present.

### 6.2 Discussion and Conclusion

#### 6.2.1 Geologic Setting

The FCPP is located on the western flank of the San Juan Basin, in the Colorado Plateau physiographic province in northwestern New Mexico. The San Juan Basin is a structural basin approximately 100 miles from north to south and 90 miles from east to west underlain by laterally extensive, gently dipping to flat-lying sedimentary rocks of Late Cretaceous age. The northwestern boundary of the San Juan Basin is defined by the Hogback Monocline. The Hogback Monocline is a structural monocline where the generally horizontal to gently dipping Cretaceous sedimentary rock units in the area are uplifted into a one-sided fold which dips steeply (approximately 38 degrees) to the east. The resulting bedrock ridge approximately 3 miles west of the Plant is composed of younger rock units on the eastern flank and progressively older units exposed in the central and western portions of the Hogback.

Karst terrain is not known to be present beneath the FCPP or Upper Retention Sump footprint based on the predominance of shale and sandstone in the area.



### 6.2.2 Foundation Conditions

The Upper Retention Sump is an incised CCR unit. As such, the subgrade consists of native soil. Based on AECOM's experience, native soil underlying the FCPP consists of varying proportions of silt, sand, and clay in addition to hard weathered shale and sandstone (AECOM 2017). The hard weathered shale and sandstone within the Upper Retention Sump footprint appear to be competent materials based on nearby well logs (AECOM 2017).

### 6.2.3 Areas Susceptible to Mass Movement

The north and east sides of the Upper Retention Sump are higher than the west and south sides, which are level with the surrounding grade. The slopes above the north and east sides of the Upper Retention Sump are reinforced with Fabriform Filter Point Fabric Style 8-inch FP to provide protection against erosion of these slopes (see Figure A-3 in Appendix A). The slopes, which support road and rail lines, have performed successfully for over 30 years. Topographic and geologic conditions in the area do not indicate the potential for avalanches, debris slides, or other mass movements (not mitigated by the Fabriform erosion protection) that could impact the structural components of the Upper Retention Sump.

As an incised CCR unit, significant settlements or horizontal movements along the top of the Upper Retention Sump are unlikely.

**Conclusion:** The Upper Retention Sump is not located in an unstable area.

## 7 Conclusions

Based on the findings and results of the location restrictions demonstrations, AECOM provides the following conclusions for the Upper Retention Sump:

- The Upper Retention Sump does not meet the location restriction requirement relative to the uppermost aquifer and is subject to closure per 40 CFR § 257.101(b)(1).
- The Upper Retention Sump is not located in wetlands.
- No faults with Holocene displacement are present within 200 feet of the Upper Retention Sump.
- The Upper Retention Sump is not located in a seismic impact zone.
- The Upper Retention Sump is not located in an unstable area.

## 8 Limitations

This report is for the sole use of APS on this project only and is not to be used for other projects. In the event that conclusions based upon the data obtained in this report are made by others, such conclusions are the responsibility of others. The Certification of Professional Opinion is limited to the information available to AECOM at the time this report was written. This report was written in accordance with current practice and the standard of care. Standard of care is defined as the ordinary diligence exercised by fellow practitioners in this area performing the same services under similar circumstances during the same period. Professional judgments presented herein are primarily based on information from previous reports that were assumed to be accurate partly based on knowledge of the site and partly based on our general experience with similar evaluations performed for similar structures. No warranty or guarantee, either express or implied, is applicable to this work.

The use of the words "certification" and/or "certify" in this document shall be interpreted and construed as a Statement of Professional Opinion and is not and shall not be interpreted or construed as a guarantee, warranty, or legal opinion.

## 9 References

AECOM, 2017. "CCR Monitoring Well Network Report and Certification, Four Corners Power Plant, Fruitland, New Mexico." September 18.

Amec Foster Wheeler, 2018. "Annual Groundwater Monitoring and Corrective Action Report for 2017." Prepared for Arizona Public Service, January 29.

Arizona Public Service Company (APS), 2018. "Four Corners Power Plant Lined Ash Impoundment, Lined Decant Water Pond, Combined Waste Treatment Pond, Upper Retention Sump, and Dry Fly Ash Disposal Area – Annual CCR Impoundment and Landfill Inspection Report – 2017." January.

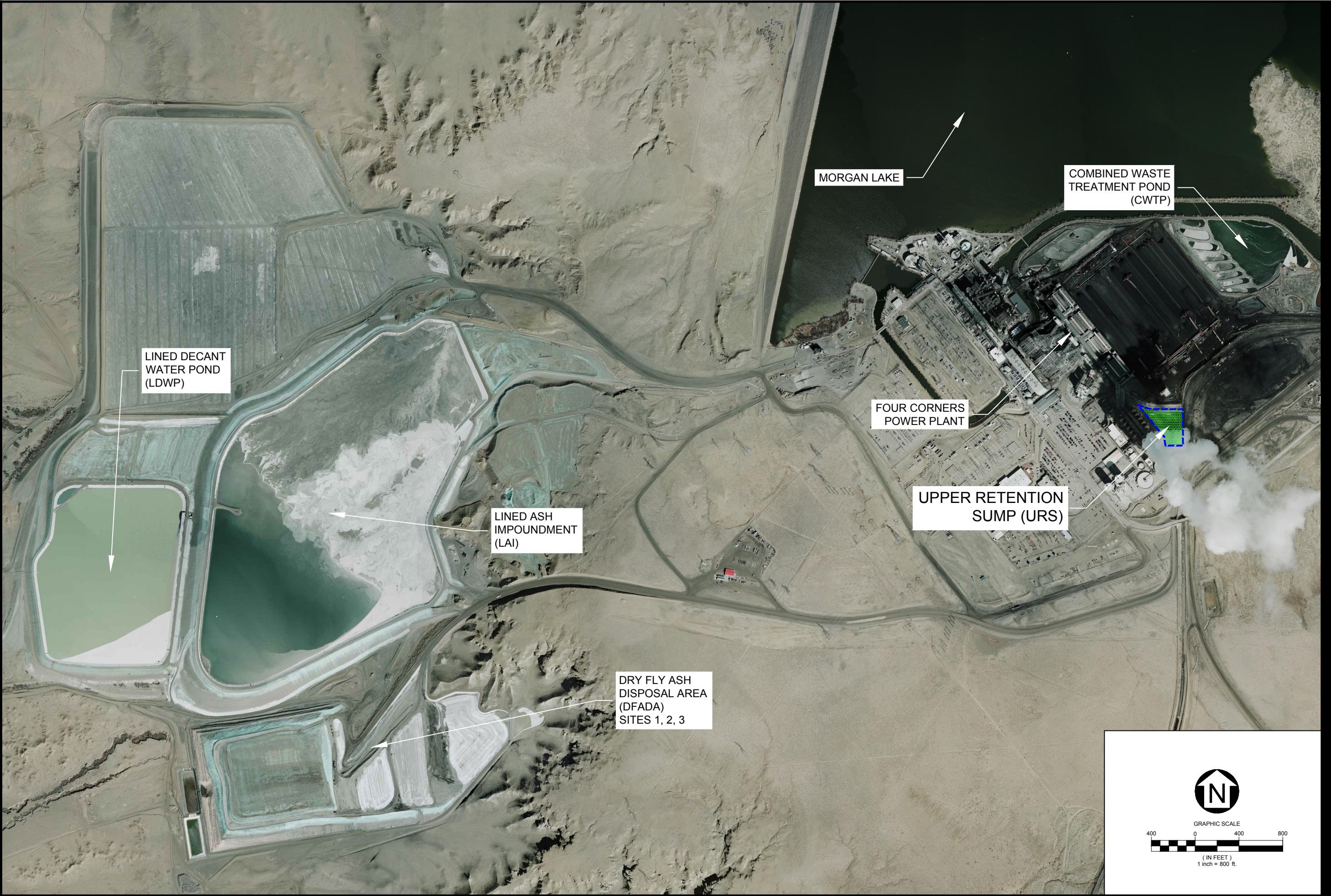
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## Figures





**FOUR CORNERS POWER PLANT  
UPPER RETENTION SUMP LOCATION RESTRICTIONS**  
ARIZONA PUBLIC SERVICE  
Project No.: 60587725

**SITE VICINITY MAP**







## **Appendix A. Construction Plans**







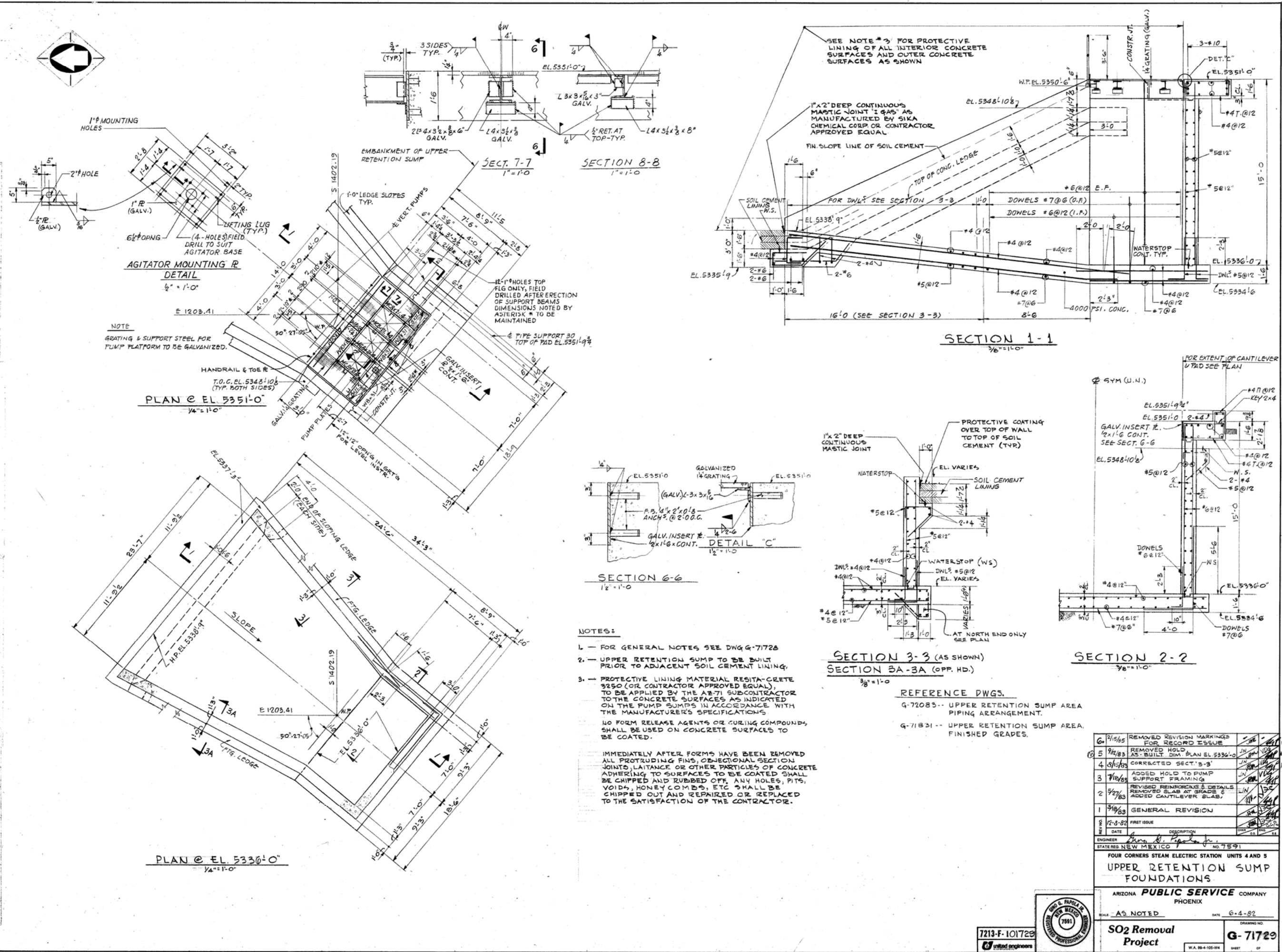


Figure A-2

GENERAL NOTES FOR BANK EROSION PROTECTION

MATERIAL REQUIREMENTS

- STRUCTURAL FILL MATERIAL FOR BANK EROSION PROTECTION WORK SHALL BE AS SPECIFIED IN SECTION 6.1.1 OF SPECIFICATION 723.001 - 8-1.
- FABRIC FORMING MATERIAL SHALL BE FABRIFORM FILTER POINT FABRIC STYLE 8'FP AS MANUFACTURED BY CONSTRUCTION TECHNIQUES INC. THE FILTER POINT FABRIC SHALL CONSIST OF DOUBLE-LAYER FABRIC NOVEN TOGETHER IN SUCH A MANNER AS TO PROVIDE FILTER POINTS ON EIGHT (8) INCH CENTERS FOR THE RELIEF OF ANY HYDROSTATIC UPLIFT PRESSURES. INDIVIDUAL MILL WIDTH PANELS SHALL BE CUT TO SUITABLE LENGTH AND THE TWO LAYERS OF FABRIC SEPARATELY JOINED EDGE TO EDGE BY MEANS OF NYLON OR POLYESTER THREAD.
- GROUT SHALL CONSIST OF A MIXTURE OF PORTLAND CEMENT, FINE AGGREGATE, AND WATER SO PROPORTIONED AND MIXED AS TO PROVIDE A READILY PUMPABLE SLURRY. ADMIXTURES AND/OR A POZZOLAN MAY BE USED WITH THE APPROVAL OF THE CONTRACTOR. THE HARDENED GROUT SHALL EXHIBIT A MINIMUM COMPRESSIVE STRENGTH OF 2000 PSI. AT 28 DAYS, WHEN SPECIMENS ARE MADE AND TESTED IN ACCORDANCE WITH THE PROVISIONS OF ASTM C-31 AND C-39.
- CERTIFICATES OF CONFORMANCE FOR THE FABRIC FORMING MATERIAL AND GROUT MIX DESIGN SHALL BE SUBMITTED TO THE CONTRACTOR FOR REVIEW PRIOR TO COMMENCING WITH WORK.
- FABRIC POROSITY IS ESSENTIAL FOR THE SUCCESSFUL EXECUTION OF THE WORK. THE SUBCONTRACTOR SHALL DEMONSTRATE THE SUITABILITY OF THE FABRIC DESIGN BY INJECTING THE PROPOSED GROUT MIX INTO 6" DIAMETER SLEEVES UNDER PRESSURE OF 10 TO 15 PSI, WHICH SHALL BE MAINTAINED BY MEANS OF AIR PRESSURE OR A STANDPIPE FOR 10 MINUTES. THE SLEEVES SHALL BE CONSTRUCTED OF A SINGLE LAYER OF FILTER POINT FABRIC. TEST CYLINDERS, 12" LONG, SHALL BE CUT FROM EACH SPECIMEN AND TESTED IN ACCORDANCE WITH ASTM C-39.
- THE AVERAGE COMPRESSIVE STRENGTH OF FABRIFORM CAST TEST CYLINDERS, AS DESCRIBED IN ITEM 5 ABOVE, SHALL BE AT LEAST 20% HIGHER AT SEVEN (7) DAYS THAN THAT OF COMPANION TEST CYLINDERS MADE IN ACCORDANCE WITH ASTM C-31, AND NOT LESS THAN 2500 PSI. AT 28 DAYS.
- IMMEDIATELY FOLLOWING RECEIPT OF FABRIC ON THE JOBSITE, FABRIC SHALL BE INSPECTED AND STORED IN A CLEAN AND DRY AREA, WHERE IT WILL NOT BE SUBJECT TO MECHANICAL DAMAGE OR EXPOSURE TO MOISTURE, OR DIRECT SUNLIGHT UNTIL INSTALLATION OF THE FABRIC.
- MATERIAL SUBSTITUTIONS SHALL NOT BE MADE WITHOUT OBTAINING SPECIFIC APPROVAL FROM THE CONTRACTOR PRIOR TO COMMENCING WITH THE WORK.

GENERAL REQUIREMENTS

- THE SUBCONTRACTOR SHALL CONSTRUCT TEMPORARY RAMPS TO THE WORK AREAS AS REQUIRED TO ACCOMPLISH ALL PHASES OF THE WORK.
- BANK EROSION PROTECTION WORK SHALL NOT BE DONE WHILE THE RAILROAD IS OPERATING OR PRIOR TO COMPLETION OF THE ASH HAUL ROAD PAVING ABOVE THE EMBANKMENT. THE SUBCONTRACTOR SHALL NOTIFY THE CONTRACTOR OF HIS INTENT TO PROCEED WITH WORK SUFFICIENTLY IN ADVANCE SO THAT THE NECESSARY ARRANGEMENTS CAN BE MADE.
- WHERE REMOVAL OF BALLAST IS REQUIRED TO FACILITATE EXCAVATION OF THE FABRIC TRENCH ALONG THE TOP OF THE RAILROAD EMBANKMENT, THE BALLAST SHALL BE RESTORED TO ITS ORIGINAL CONDITION UPON COMPLETION OF THE WORK.
- THE SUBCONTRACTOR SHALL REMOVE, REPAIR AND RE-INSTALL THE EXISTING FENCE AND DIRECT BURIAL GROUNDING CABLE, WHICH BORDER THE ASH HAUL ROAD AND RAILROAD EMBANKMENT AS REQUIRED TO PERMIT PROPER INSTALLATION OF THE BANK EROSION PROTECTION SYSTEM.
- FABRIC MAY BE CUT AND FIELD SEWN AROUND THE EXISTING FENCE POSTS AND POLE FOUNDATIONS AS REQUIRED.

EARTHWORK

- ALL SURFACE SOIL AND LOOSE SURFACE MATERIALS SHALL BE COMPLETELY REMOVED FROM THE EXISTING EMBANKMENTS PRIOR TO PROCEEDING WITH BANK EROSION PROTECTION WORK.
- ALL SURFACES TO BE PROTECTED SHALL BE PREPARED, NEATLY DRESSED AND GRADED TO A REASONABLY SMOOTH AND UNIFORM SURFACE CONFORMING TO THE SLOPES AND ELEVATIONS SHOWN ON THE DRAWINGS.
- CUTS AND FILLS SHALL BE MADE AS REQUIRED SO THAT THE FABRIC FORMING MATERIAL CAN BE POSITIONED OVER THE SURFACES TO BE PROTECTED, AND FILLED WITH A PUMPABLE SAND CEMENT GROUT IN SUCH A WAY AS TO FORM A STABLE MAT OF UNIFORM WEIGHT AND CONFIGURATION.
- THE ASH HAUL ROAD EMBANKMENT SHALL BE CONTINUOUSLY BENCHED OVER THOSE AREAS WHERE FILL IS REQUIRED. BENCHING SHALL BE OF SUFFICIENT WIDTH TO PROVIDE A STABLE SURFACE AND TO FACILITATE PROPER PLACEMENT AND COMPACTION OF STRUCTURAL FILL MATERIAL AS THE FILL IS BROUGHT UP IN HORIZONTAL LAYERS.
- STRUCTURAL BACKFILL SHALL BE PLACED IN HORIZONTAL LAYERS NOT EXCEEDING EIGHT (8) INCHES IN THICKNESS AND COMPACTED TO AT LEAST NINETY-FIVE (95) PERCENT OF THE MAXIMUM MODIFIED PROCTOR DENSITY IN ACCORDANCE WITH ASTM. D-1557.
- ALL RUTS AND SURFACE IRREGULARITIES ALONG THE EXISTING RAILROAD EMBANKMENT THAT ARE DEEPER THAN SIX (6) INCHES SHALL BE FILLED IN AND COMPACTED TO PROVIDE UNIFORM SUPPORT FOR THE FABRIFORM EROSION PROTECTION SYSTEM.

EARTHWORK CONT.

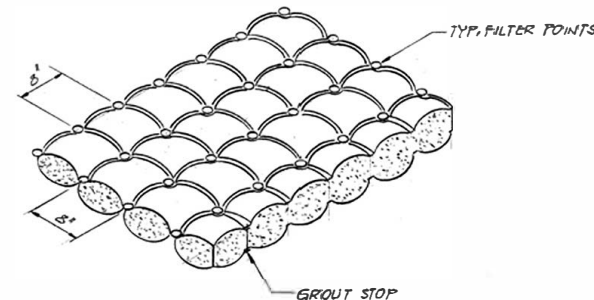
- THE SUBCONTRACTOR SHALL EXERCISE CARE IN EXCAVATING JOE TRENCHES IN THE VICINITY OF EXISTING POLE FOUNDATIONS AND SHALL PROVIDE ANY TEMPORARY SHORING OR BRACING REQUIRED TO ENSURE SAFETY DURING CONSTRUCTION.
- THE FINISHED SURFACES TO BE PROTECTED SHALL HAVE A ROUGH GRADED APPEARANCE. ALL SHARP PARTICLES, WHICH COULD PUNCTURE THE FABRIC SHALL BE REMOVED.

FABRIFORM INSTALLATION

- PRIOR TO GROUT INJECTION, FABRIC PANELS SHALL BE POSITIONED IN THEIR DESIGNATED LOCATION AS SHOWN ON THE DRAWING.
- GROUT STOPS SHALL BE INSTALLED PARALLEL TO MILL PANEL WIDTHS AT PREDETERMINED INTERVALS TO REGULATE THE FLOW OF FLUID GROUT.
- PANELS SHALL BE JOINED TOGETHER EDGE TO EDGE BY FIELD SEWING THE BOTTOM LAYER OF FABRIC TOGETHER AND THE TWO TOP LAYERS OF FABRIC TOGETHER. PANELS MAY BE JOINED TOGETHER BY MEANS OF FACTORY INSTALLED ZIPPERS.
- IF CONVENTIONAL JOINING OF PANELS IS IMPRACTICAL, THEY MAY BE OVERLAPPED A MINIMUM OF TWO FEET PENDING APPROVAL BY THE CONTRACTOR. IN NO CASE WILL SIMPLE BUTT JOINTS BETWEEN PANELS BE PERMITTED.
- FOLLOWING PANEL PLACEMENT, GROUT SHALL BE INJECTED BETWEEN THE TOP AND BOTTOM LAYERS OF FABRIC INFLATING THE FABRIC REVETMENT TO RECOMMENDED THICKNESS.
- THE FABRIC PANELS SHALL BE CONSIDERED FULLY FILLED WHEN THE INDIVIDUAL NODULES, BETWEEN FILTER POINTS ARE APPROXIMATELY 5 INCHES IN DIAMETER AND THE AVERAGE THICKNESS BETWEEN THE TOP AND BOTTOM LAYER OF FABRIC IS APPROXIMATELY 3/4" THICK. ONE (1) CUBIC YARD OF GROUT SHOULD COVER APPROXIMATELY 75 SQ.-FT. OF FABRIC AREA WHEN FULLY FILLED.
- THE SUBCONTRACTOR SHALL SUBMIT WRITTEN INSTALLATION PROCEDURES FOR REVIEW BY THE CONTRACTOR PRIOR TO COMMENCING WITH ANY WORK.
- FOR TECHNICAL ASSISTANCE CONTACT CONSTRUCTION TECHNIQUES INC. AT (216) 623-0679.

GROUT TEST REQUIREMENTS

- IN ORDER TO CERTIFY THAT THE GROUT MIX DESIGN MEETS THE MANUFACTURER'S SPECIFICATION REQUIREMENTS, THREE (3) COMPANION TEST CYLINDERS SHALL BE MADE AND TESTED INITIALLY PRIOR TO COMMENCING WITH GROUT INSTALLATION.
- THREE (3) FABRIFORM CAST TEST CYLINDERS SHALL BE TAKEN AND TESTED NOT LESS THAN TWICE A DAY (I.E. ONE IN THE MORNING AND ONE IN THE AFTERNOON), NOR LESS THAN ONCE FOR EACH 25 CU.Y. OF GROUT PLACED.



TYP. SEGMENT OF FABRIFORM  
FILTER POINT FABRIC STYLE 8'FP

DESIGNATION		FILTER POINT	AVERAGE	COVERAGE PER
STYLE	FIBER	SPACING	THICKNESS	CU. YD. GROUT
8" FP	NYLON AND/OR POLYESTER	8"	3.5"	75 SQ. FT.

REFERENCE DRAWINGS:

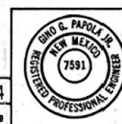
9-71915	BANK EROSION PROTECTION SECTIONS & DETAILS SH. # 2
9-71916	BANK EROSION PROTECTION SECTIONS & DETAILS SH. # 3
9-71831	UPPER RETENTION SUMP AREA FINISHED GRADES
9-71838	UPPER RETENTION SUMP AREA GEOMETRY & ROAD PLAN
9-71861	UPPER RETENTION SUMP SECTIONS & DETAILS
9-71896	YARD FENCING PLAN UPPER RETENTION SUMP

DESIGN	NEW	CONTRACT	NO. 1
DATE	3-30-84	BY	W. J. H. / J. H. H.
APPROVED		FOR	CONSTRUCTION
DATE	3-30-84	BY	W. J. H. / J. H. H.

3042-27 MAGNETIC 8-83 PCI 804-1P

APS	RECORD ISSUE	4
THIS PROJECT	FOR CONSTRUCTION	3
PURCHASE ORDER OR SUBCONTRACT	STATUS	REVISION

7213-F-101914



1	2/15/85	REMOVED REVISION MARKINGS FOR RECORD ISSUE	W. J. H. H.
3	8/28/84	REVISED NOTE 6	W. J. H. H.
2	5-7-84	REVISED NOTES PER DCN. NPSI-047	W. J. H. H.
1	3-30-84	REDRAWN	W. J. H. H.
0	8-15-83	FIRST ISSUE	W. J. H. H.
DATE		DESCRIPTION	
ENGINEER		W. J. H. H.	
STATE REG. NO.		NEW MEXICO	7591
FOUR CORNERS STEAM ELECTRIC STATION UNITS 4 AND 5			
UPPER RETENTION SUMP AREA			
BANK EROSION PROTECTION			
GENERAL NOTES SH. # 1.			
ARIZONA		PUBLIC SERVICE COMPANY	
PHOENIX			
SCALE		NONE	DATE 3-30-84
SO2 Removal Project			
G-71914			
INDEX			

Figure  
A-3

## **Appendix B. National Wetlands Inventory Map**





U.S. Fish and Wildlife Service

# National Wetlands Inventory

## Upper Retention Sump



August 4, 2018

### Wetlands

- Estuarine and Marine Deepwater
- Estuarine and Marine Wetland

- Freshwater Emergent Wetland
- Freshwater Forested/Shrub Wetland
- Freshwater Pond

- Lake
- Other
- Riverine

This map is for general reference only. The US Fish and Wildlife Service is not responsible for the accuracy or currentness of the base data shown on this map. All wetlands related data should be used in accordance with the layer metadata found on the Wetlands Mapper web site.

## **Appendix C.**

### **Unified Hazard Tool Summary**

# Unified Hazard Tool



- Please do not use this tool to obtain ground motion parameter values for the design code reference documents covered by the [U.S. Seismic Design Maps web tools](#) (e.g., the International Building Code and the ASCE 7 or 41 Standard). The values returned by the two applications are not identical.

## ^ Input

### Edition

Conterminous U.S. 2014 (v4.0.x)

### Spectral Period

Peak ground acceleration

### Latitude

Decimal degrees

36.6872277777778

### Time Horizon

Return period in years

2475

### Longitude

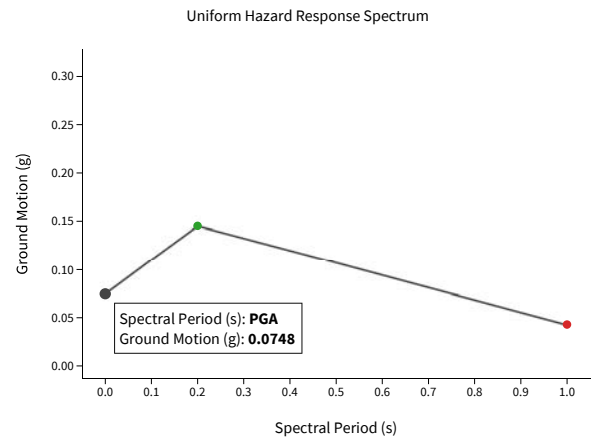
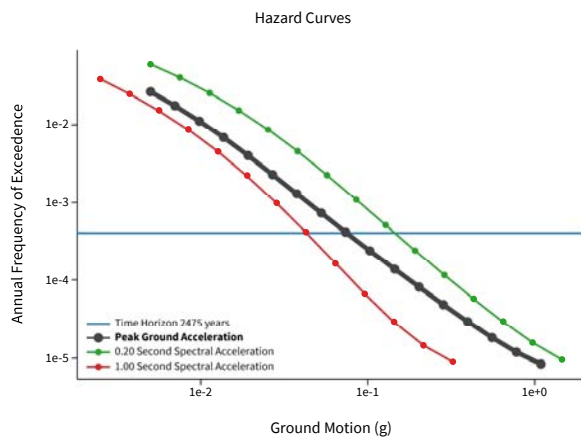
Decimal degrees, negative values for western long...

-108.47719166666667

### Site Class

760 m/s (B/C boundary)

## ^ Hazard Curve



[View Raw Data](#)