Arizona Public Service
Cholla Power Plant

Sedimentation Pond

Location Restrictions Demonstration Report

Prepared for :
Arizona Public Service

AECOM Job No. 60587726
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; Cholla Power Plant; Sedimentation Pond

I, Alexander Gourlay, being a Registered Professional Engineer in good standing in the State of Arizona, 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 less than 1.52 meters (5 feet) above the upper limit of the uppermost aquifer, 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 meets the requirements of 40 CFR § 257.60(a), § 257.61(a), § 257.62(a), § 257.63(a), and § 257.64(a).

Alexander W. Gourlay, P.E.

Printed Name

October 8, 2018

Date

1 Introduction

Arizona Public Service Company (APS) contracted AECOM to assist in the location restriction demonstrations of the existing coal combustion residual (CCR) surface impoundments at the Cholla Power Plant (Cholla, the Plant) near Joseph City, in Navajo County, Arizona. Figure 1-1 shows the location of the CCR Impoundments at Cholla. This Demonstration Report documents location-specific conditions relevant to the Sedimentation Pond.

1.1 Report Purpose and Description

The purpose of this report is to document the location restriction demonstration for the Sedimentation Pond. The Sedimentation Pond is an existing CCR surface impoundment owned and 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 surface CCR 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 Sedimentation Pond, are required to demonstrate compliance with the location restrictions by 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:

Report Section	Applicable CFR 40 Part 257 Citation
• 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 – AEIC Earthquakes
- Appendix D – Unified Hazard Tool Summary
- Appendix E – Karst and Land Subsidence Maps

1.4 Facility Description

The Cholla Power Plant is an electric generating station located near Joseph City, in Navajo County, Arizona. The station consists of four coal-fired units. Units 1, 2 (decommissioned), and 3 are owned by APS and Unit 4 is owned by PacifiCorp. CCR generated at the Plant is either recycled for beneficial use or disposed at two major surface impoundments: the Fly Ash Pond located approximately 1.5 miles east of the Plant and the Bottom Ash Pond located about 1 mile north of the Plant. The Bottom Ash Monofill was constructed to dispose of bottom ash excavated from the Bottom Ash Pond. Lesser amounts of CCR, from the vehicle wash station, vacuum trucks, and Plant area runoff, are collected at the Sedimentation Pond. Figure 1-1 shows the location of the Sedimentation Pond in relation to the Plant.

The Sedimentation Pond is a holding pond for CCR solids and CCR-impacted surface water. Solids are removed periodically to the Bottom Ash Monofill; free liquids are pumped to the Plant General Water Sump. The Sedimentation Pond was formed by constructing an embankment along the southeast and northwest sides in 1976. The pond is located between Tanner Wash to the northwest and a local drainage ditch to the southeast. The area surrounding the northwest embankment was subsequently mass-filled as site grading for a cooling building such that the crest appears to be at ground level. The Sedimentation Pond has two cells with a depth of approximately 12 feet, a surface area of approximately 1.6 acres, and a total capacity of approximately 10.7 acre-feet. The crest is at EL 5019.0 feet (NGVD29, EL 5021.57 NAVD88).

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 Sedimentation Pond and the uppermost aquifer based on available data. The following information was reviewed to assess the vertical location of the Sedimentation Pond relative to the uppermost aquifer:

- Preconstruction topographic conditions shown on construction plans (included in Appendix A)
- Cholla Power Plant Coal Combustion Residuals Program – Design, Installation, and Evaluation of Completeness of Groundwater Monitoring Networks (Montgomery & Associates 2017)
- Annual Groundwater Monitoring and Corrective Action Report for Cholla Power Plant Coal Combustion Residuals Program, November 2015–December 2017 (Montgomery & Associates 2018)

2.2 Discussion and Conclusion

2.2.1 Base Elevation of the CCR Unit

The Sedimentation Pond was constructed on Lower Colorado Alluvium on the west side of the Plant (Montgomery & Associates 2017). Based on the as-built construction drawing (APS Drawing No. G-44573, presented as Figure A-1 in Appendix A), the bottom of the Sedimentation Pond is at EL 5007 feet (NGVD29, EL 5009.57 NAVD88).

2.2.2 Groundwater Elevations

Groundwater is present in the alluvial materials beneath the Sedimentation Pond. APS installed three downgradient monitoring wells (M-56A, M-57A, and M-58A) on the northwest side of the Sedimentation Pond to monitor the groundwater near the Sedimentation Pond and one upgradient monitoring well (M-62A) to characterize the quality of the water passing beneath the Sedimentation Pond. All four wells are screened in the alluvium underlying the Sedimentation Pond. Table 1 presents well data and the water level elevations in the wells monitored for the Sedimentation Pond (Montgomery & Associates 2018).

Table 1 – Well Data and Groundwater Elevations (ft)[1]

	Well Name			
	M-56A	**M-57A**	**M-58A**	**M-62A**
Location Relative to the Sedimentation Pond	Northwest	Northwest	Northwest	East
Surface Elevation (ft)	5020.63	5021.16	5021.24	5021.01
Screened In	Alluvium	Alluvium	Alluvium	Alluvium

Measurement Date	**M-56A**	**M-57A**	**M-58A**	**M-62A**
11/30-12/3/2015	4977.11	4976.92	4976.99	4979.88
3/8-3/10/2016	4977.54	4977.32	4977.36	4980.36
5/5-5/22/2016	4977.57	4977.41	4977.42	4980.45
8/24-8/29/2016	4977.51	4977.27	4977.29	4980.32
9/21-9/23/2016	4977.42	4977.26	4977.30	4980.32
2/20-2/22/2017	4978.05	4977.85	4977.85	4980.92
4/11-4/13/2017	4978.54	4978.30	4978.33	4981.39
4/24-4/26/2017	4978.62	4978.38	4978.44	4981.48
5/18-5/22/2017	4978.61	4978.37	4978.43	4981.45
5/24-5/25/2017	4978.66	4978.30	4978.46	4981.52
6/29-7/1/2017	4978.54	4978.30	4978.36	4981.40
7/26-7/29/2017	4978.47	4978.23	4978.27	4981.30
9/5-9/8/2017	4978.45	4978.19	4978.29	4981.39
12/7-12/8/2017	4978.31	4978.08	4978.06	4981.03

Highest Recorded Groundwater Elevation (ft)	4978.66	4978.38	4978.46	4981.52

1) All elevations are referenced in NAVD88.

2.2.3 Separation from the Uppermost Aquifer

Groundwater elevations recorded in the alluvium underlying the Sedimentation Pond are approximately EL 4981 feet (NAVD88) on the presumed upgradient side of the pond, 28 feet below the bottom of the pond, and approximately EL 4978 feet (NAVD88) on the presumed downgradient side of the pond, 31 feet below the bottom of the pond.

Conclusion: The Sedimentation Pond is located greater than 1.52 meters (5 feet) above the groundwater level in the uppermost aquifer.

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 Sedimentation Pond relative to wetlands. The results are presented in Appendix B.

3.2 Discussion and Conclusion

The USFWS Wetlands Mapper indicates the Sedimentation Pond is located approximately 300 feet southeast of Tanner Wash (shown as a riverine habitat) and two associated mapped areas – a 2.38-acre freshwater forested/shrub wetland and a 0.28-acre freshwater pond habitat. Neither Tanner Wash nor the two associated mapped areas are in the footprint of the Sedimentation Pond.

Conclusion: The Sedimentation Pond 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 Navajo County, Arizona. 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.

The Arizona Earthquake Information Center (AEIC) at Northern Arizona University maintains a catalog of earthquakes in Arizona between 1830 and 2011 (AEIC 2018). The catalog was accessed via a .kmz file to review recorded earthquakes of lower magnitude than those included in the USGS database.

4.2 Discussion and Conclusion

The USGS Quaternary Faults and Folds Database of the United States did not contain any Class A or Class B faults in Navajo County. The AEIC catalog contained one earthquake within 10 miles of the Sedimentation Pond: a Modified Mercalli intensity VI earthquake occurred near Holbrook in 1921. The earthquake location is presented in Appendix C.

Conclusion: No faults with Holocene displacement are present within 200 feet of the Sedimentation Pond.

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 Sedimentation Pond location. The Unified Hazard Tool result is presented in Appendix D.

5.2 Discussion and Conclusion

The PGA with a 2 percent probability of exceedance in 50 years for the Sedimentation Pond is 0.0896g. This value is less than the Rule-required maximum value of 0.10 g in 50 years.

Conclusion: The Sedimentation Pond is not located in a seismic impact zone.

6 Location Relative to Unstable Areas

40 CFR § 257.64 requires that existing surface impoundments must 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 an 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 Sedimentation Pond 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 Sedimentation Pond; and 2) whether areas susceptible to mass movement (such as landslides, avalanches, debris slides and flows, block sliding, or rock falls) capable of impairing the integrity of the structural components of the Sedimentation Pond are present.

Published geologic references documenting the Holbrook Basin salt karst subsidence features and Interferometric Synthetic Aperture Radar (InSAR) data collected by the Arizona Department of Water Resources (ADWR) Satellite Based Land Subsidence Monitoring Program to monitor the spatial extent, deformation rates, and time-series history of land subsidence features identified in the state were reviewed to assess the potential for karstic terrain in the vicinity of the Sedimentation Pond.

6.2 Discussion and Conclusion

6.2.1 Geologic Setting

The Cholla Power Plant is located within the Navajo section of the Colorado Plateau Physiographic Province. The Colorado Plateau is characterized by wide areas of nearly flat-lying sedimentary rocks, separated by abrupt monoclinal folds formed when sedimentary rocks overly deep basement faults. The northwest-southeast trending Holbrook anticline occurs approximately 20 miles south of the Plant. The Navajo section is a somewhat poorly defined structural depression consisting of broad plateaus and wide valleys (Hendricks 1985). The plant is located approximately ½ mile north of the Little Colorado River. Exposed bedrock units in the vicinity of the Plant include the Permian-age Coconino Sandstone, the Triassic-age Moenkopi and Chinle Formations, and the Quaternary alluvial deposits of the Little Colorado River. Surficial geology at the Plant site consists of up to 200 feet of heterogeneous interbedded sand, silt, and clay layers of the Little Colorado River alluvium (Montgomery & Associates 2011).

The Sedimentation Pond is surrounded by fill soil and level ground on all sides. A local drainage ditch separates the southeast side from two sets of railroad tracks.

6.2.2 Foundation Conditions

The Sedimentation Pond is founded on alluvium overburden associated with Tanner Wash. The available construction documentation (Appendix A) indicates that the embankment foundation was overexcavated at least 6 inches. The embankment fill consists of clay or sandy clay placed in 8-inch thick layers and compacted to 95 percent of the maximum dry density determined by a Standard Proctor test. During excavation of the pond, sandy pockets encountered at the bottom of the excavation were to be excavated up to 3 feet deep and replaced with clay.

6.2.3 Areas Susceptible to Mass Movement

The Sedimentation Pond was initially constructed above the original grade; however, the area around the southwest, northwest, and northeast sides was later mass-filled to the same elevation as the top of the Sedimentation Pond embankment. There are currently no cliffs, rock outcrops, hills, or natural valleys adjacent to the Sedimentation Pond that may otherwise be subject to mass movements.

6.2.4 Karst Areas

Collapse features (sinkholes, fissures, depressions, expanded bedrock joints and joint sets, compression ridges and buckles) associated with dissolution of evaporate deposits within the Permian-aged Supai Formation have been documented within the Holbrook Basin (see map in Appendix E). These features, collectively referred to as "salt karst," are concentrated along a roughly 60 mile long, northwest-southeast trending dissolution front near the southwestern margin of the Holbrook Basin, approximately 20 miles from the Cholla Power Plant.

The Cholla Power Plant site is within the Holbrook Basin where ADWR monitors several land subsidence features. ADWR monitors the extent and rate of land subsidence annually using InSAR data. Land subsidence maps published by ADWR for the Holbrook Basin are included in Appendix E. Three features in the Holbrook Basin are located approximately 11 miles from the Plant site and are associated with evaporite karst dissolution. A fourth land subsidence feature has been identified south of Joseph City, approximately 2 miles southwest of the Plant site. No land subsidence features have been identified at the Plant site.

6.2.5 Subsidence

Extraction of a groundwater resource can cause lowering of the regional groundwater table, consolidation of alluvial deposits, and lowering of the ground surface. In extreme circumstances, in combination with variations in the bedrock surface, earth fissures can form and express at the ground surface around the boundary of the subsidence area. The ADWR land subsidence maps (Appendix E) indicate the presence of a 1-mile wide localized subsidence area approximately 2 miles west of the Sedimentation Pond, 3 miles southwest of the Bottom Ash Pond and Bottom Ash Monofill, and 3.5 miles west of the Fly Ash Pond.

The InSAR data suggest subsidence rates in the range of 0 to 1 centimeters per year (cm/yr) for the most recent six-year interval (2012-2018). APS operates a wellfield south and east of the Plant, east of the subsidence area indicated on the ADWR land subsidence maps (Appendix E). APS staff report that: 1) APS groundwater extraction from its wellfield has decreased by approximately one-third since the retirement of Unit 2 in 2014 and 2) the Coconino aquifer is highly productive and groundwater levels within the wellfield have been rising since the retirement of Unit 2 in 2014 (APS Internal Communication 2018b).

The ADWR land subsidence maps suggest a cumulative subsidence of 3.9 to 5.9 inches between 2012 and 2018. The ground underlying the Sedimentation Pond is not considered to be susceptible to the formation of earth fissures based on the distance of the CCR unit from the area of identified subsidence and the relatively small indicated total settlement.

Conclusion: The Sedimentation Pond 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 Sedimentation Pond.

- The Sedimentation Pond is located greater than 1.52 meters (5 feet) above the groundwater level in the uppermost aquifer.
- The Sedimentation Pond is not located in wetlands.
- No faults with Holocene displacement are present within 200 feet of the Sedimentation Pond.
- The Sedimentation Pond is not located in a seismic impact zone.
- The Sedimentation Pond 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

Arizona Public Service Company (APS) and AECOM, 2016. "Cholla Power Plant Fly Ash Pond, Bottom Ash Pond, Sedimentation Pond and Bottom Ash Monofill – Annual CCR Impoundment and Landfill Inspection Report 2015." January.

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Figures

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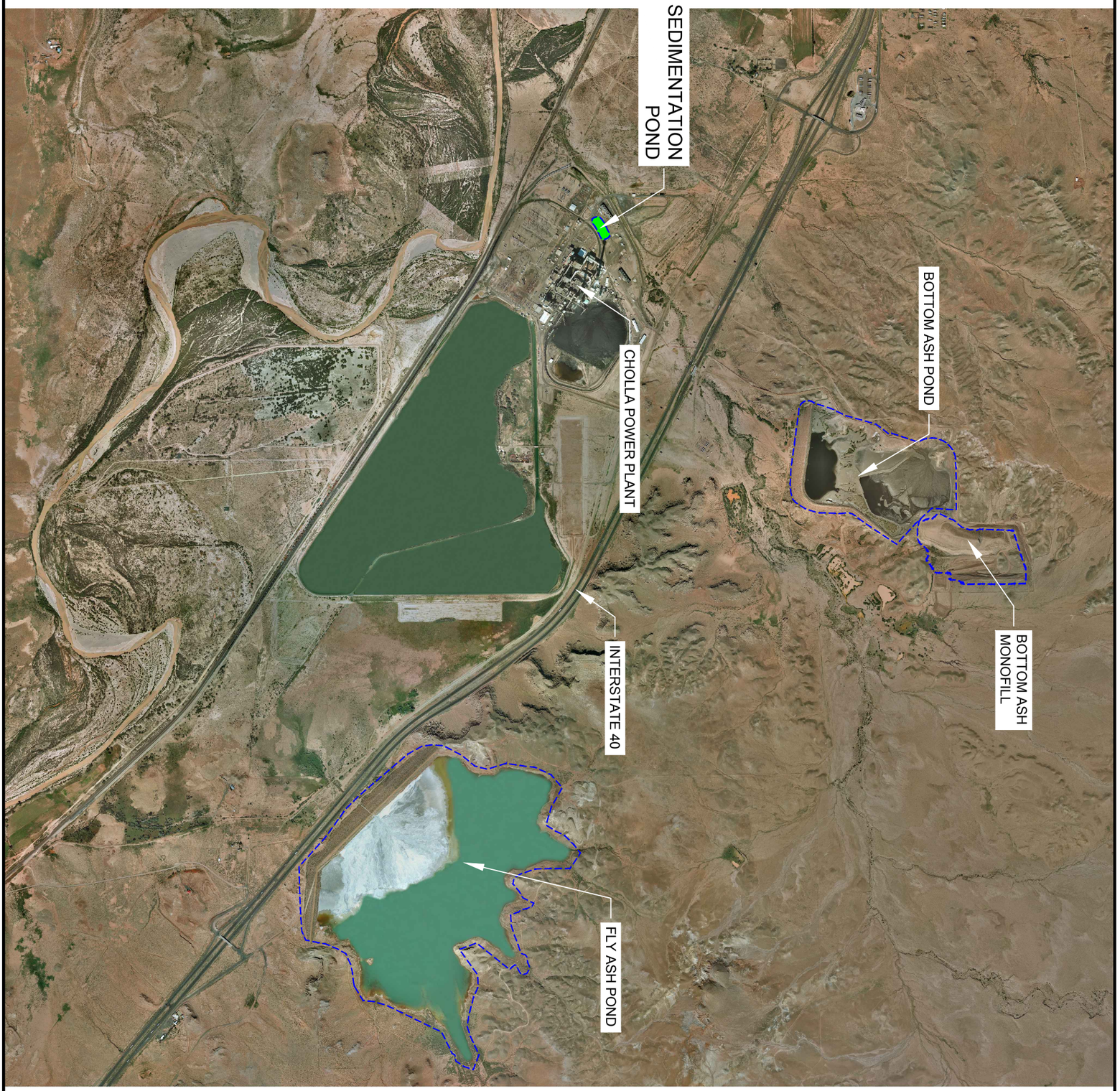

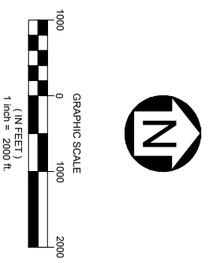

CHOLLA POWER PLANT
SEDIMENTATION POND LOCATION RESTRICTIONS
ARIZONA PUBLIC SERVICE
Project No.: 60587726

SITE VICINITY MAP

AECOM

Figure 1-1

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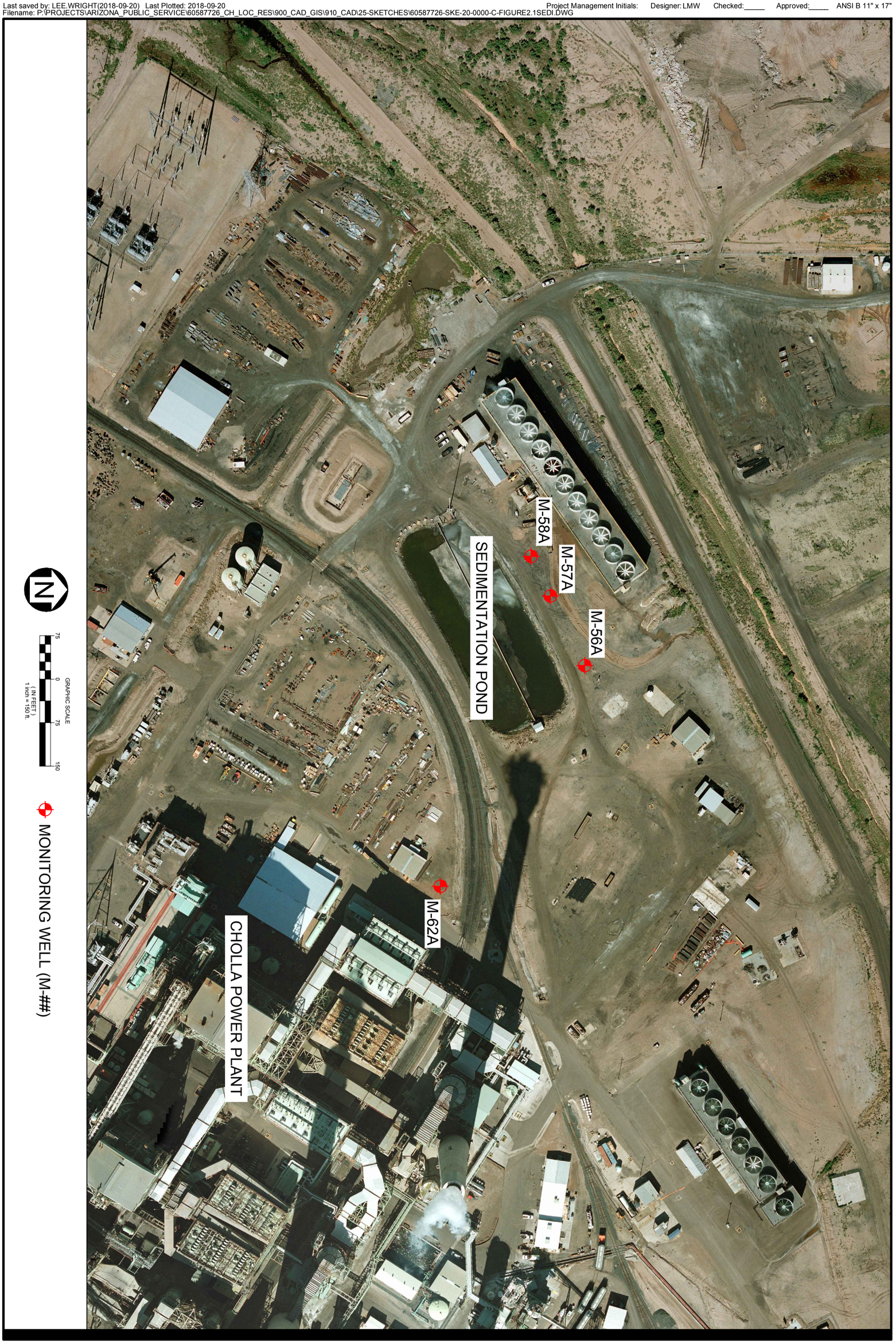


CHOLLA POWER PLANT
SEDIMENTATION POND LOCATION RESTRICTIONS
ARIZONA PUBLIC SERVICE
Project No.: 60587726

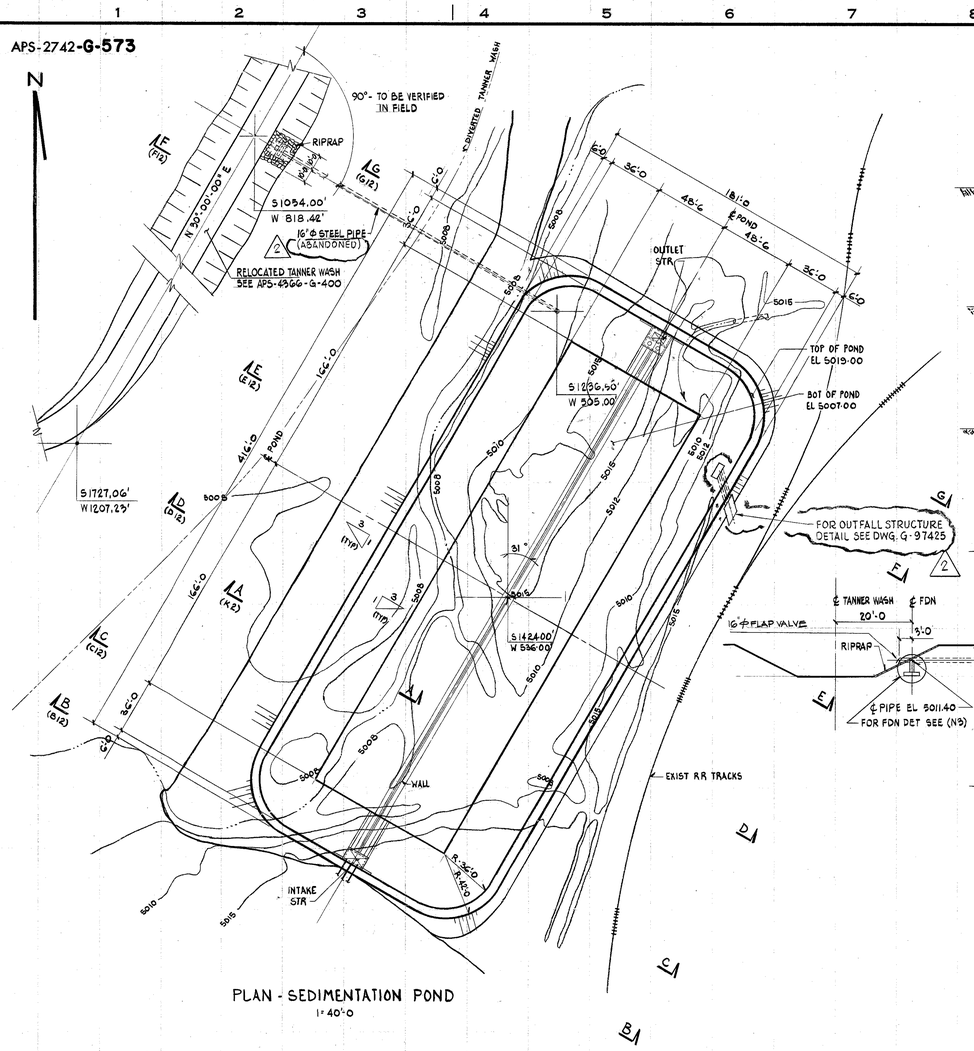
MONITORED INSTRUMENTATION LOCATION MAP

AECOM

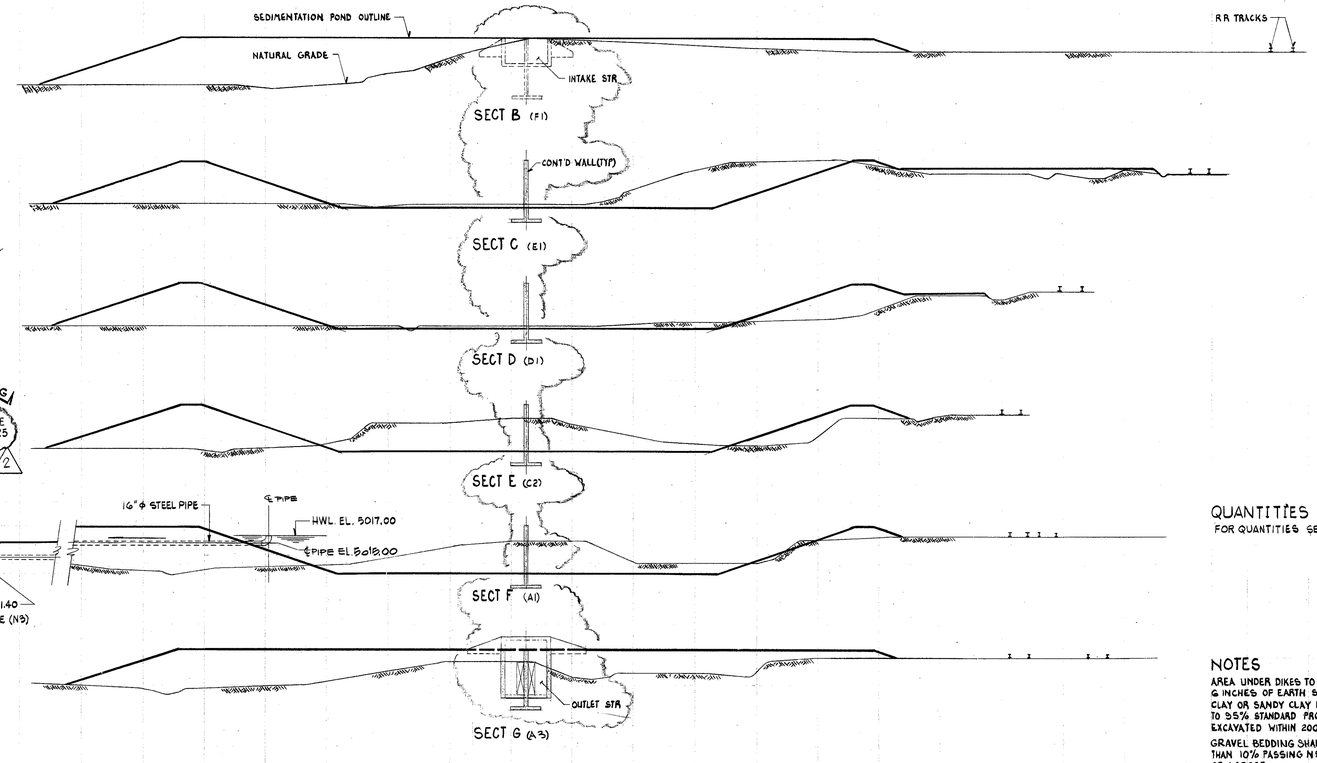
Figure 2-1

Appendix A.
Construction Plans

APS-2742-G-573



PLAN - SEDIMENTATION POND
1" = 40'-0



QUANTITIES

FOR QUANTITIES SEE G-574

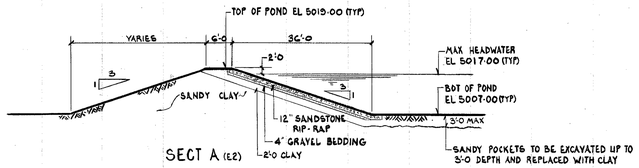
NOTES

AREA UNDER DIKES TO BE CLEARED AND A MINIMUM OF 6 INCHES OF EARTH STRIPPED. DIKE FILL SHALL CONSIST OF CLAY OR SANDY CLAY PLACED IN 8 INCH LAYERS AND COMPACTED TO 95% STANDARD PROCTOR. NO BORROW AREA SHALL BE EXCAVATED WITHIN 200 FEET OF TOE OF EXTERNAL DIKES.

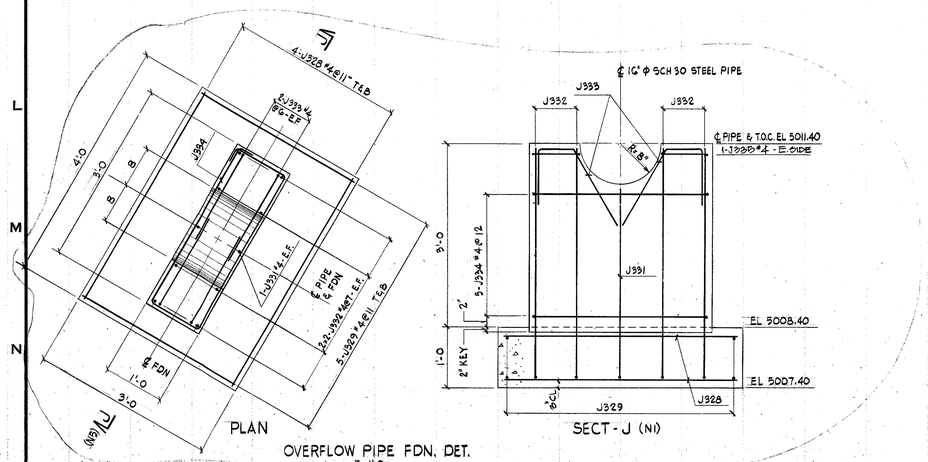
GRAVEL BEDDING SHALL CONSIST OF SAND & GRAVEL HAVING LESS THAN 10% PASSING Nº 200 SIEVE AND HAVING 50% - ¼ INCH OR LARGER.

RIP-RAP SHALL BE COCONINO SANDSTONE WITH 12 INCH MAXIMUM SIZE AND 50% OF STONES 6 INCHES OR LARGER.

FOR OTHER INFORMATION SEE SPECIFICATION APS 2742-54-02



SECT A (E2)



OVERFLOW PIPE FDN. DET.
1" = 1'-0

REFERENCE DRAWINGS

LIST OF DRAWINGS	A-233
TANNER WASH RELOCATION	G-576
SEDIMENTATION POND STRUCTURES	G-574
TANNER WASH (KENNEY AERIAL MAPPING INC) SH1/SH2	G-44247
TANNER WASH RELOCATION	APS-4356G-G-400

Figure A-1

Registered Professional Engineer Certificate No. 9161 STEPHEN I. OSBOR Arizona U.S.A.

ARIZONA PUBLIC SERVICE COMPANY
CHOLLA S.E. STATION
1977 - 250 MW INSTALLATION - UNIT No. 2
1978 - 250 MW EXTENSION - UNIT No. 3.

SEDIMENTATION POND PLAN & DETAILS

EBASCO SERVICES INCORPORATED

SCALE 1"=1'-0 UNLESS NOTED | APPROVED S. Lieu | DATE SEP. 19,75
DIV. C-H | DR. J IAFRATE | CH. R JONES | APS-2742 G-573

APS DWG. #G-44573

NO.	DATE	REVISION	BY	CH.	APPROVED
2	10-23-80	AS BUILT REVISION	VIC	TRH	
1	7-22-77	ADD: (N-N5) FDN, (J18) REF RELEASE: (H2, B5) PLAN, (A13, G12) SECT, (C4) OVERFLOW PIPE REVISED: (F6, F9) SECT.	H.B	JN.B	

PLANT NORTH

TANNER WASH FLOOD CONTROL BERM

UNIT 4 COOLING TOWER

SEDIMENTATION POND

SEWAGE TREATMENT PLANT

NORTH (ASSUMED)

EAST (ASSUMED)

STA. 0+34 N.

STA. 0+00

5015

5010

CP RECTIFIER

EXIST. 16" ROND OVERFLOW (ABANDONED).

10"-MD-98 (EXIST.)

8"-MD-98 (ABANDONED)

SEE DETAIL (1)

NOTE: WEST AREA WASTE WATER HANDLING W.A. 52-3057

EXIST. ANODES

(ACTIVE)

(ABANDONED)

C.P. CABLE (ACTIVE)

C.P. CABLE (ABANDONED)

REMOVE EXIST. A/C PAVEMENT

SAW CUT EXIST. A/C PAVEMENT

W.A. 53-4917

W.A. 53-4911

NEW 6" CONCRETE CURB SECTION (2)

ELECTRICAL CABLES

TEMPORARY CONSTRUCTION COORDINATE REF.

NEW A.B.C. SURFACE COURSE. EDGE OF A.B.C. TO BE FLUSH WITH EXIST. PAVEMENT. EXCAVATE TO FIN. SUBGRADE AS REQ'D. FOR MIN. 4" THK. A.B.C.

SAW CUT AND REPLACE EXIST. A/C PAVEMENT

CROWN @ EL. 5019.4'

12"-MD-7
12"-MD-98
10"-MD-88

10"-MD-98
12"-MD-98
10"-MD-7
8"-MD-31
10"-MD-22

2½"-MD-29
12"-FP-28
16"-RW-4
1"-SA-13
1"-TA-10

S. 1755.0' (PLANT COORDINATES)

W. 820.0'

LOCAL BENCH MARK BRASS CAP ELEV. 5016.28'

NOTE: UNIT 4 COOLING TOWER AREA PAVING & SURFACING W.A. 53-4917

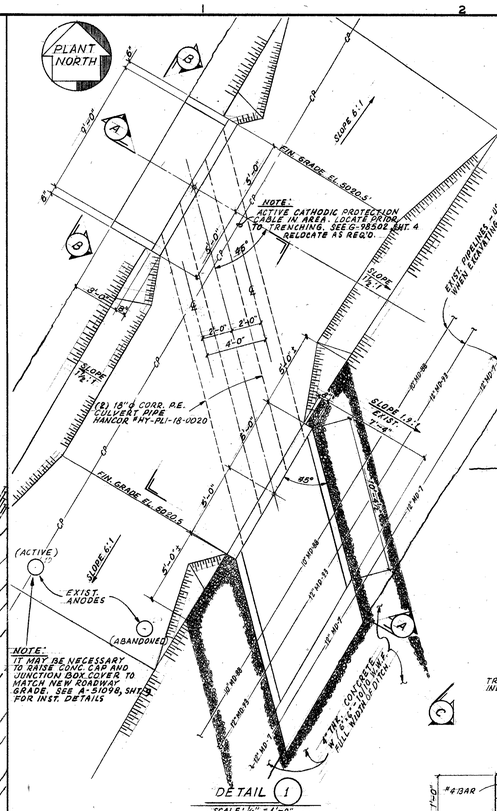
LEGEND

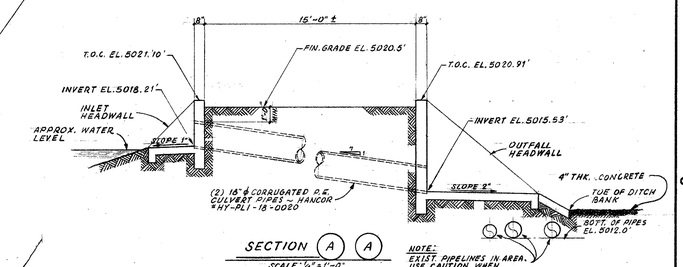
- SHADING INDICATES EDGE OF EXIST. A/C PAVEMENT
- INDICATES EDGE OF NEW A/C PAVEMENT
- INDICATES EDGE OF NEW A.B.C. SURFACE COURSE
- INDICATES SLOPE DIRECTION OF NEW FINISHED A/C PAVEMENT, GRADE OR A.B.C. SURFACE COURSE.
- * SAW CUT AND REMOVE EXIST. A/C PAVEMENT. INSTALL NEW A/C PAVEMENT. NEW FINISHED ELEVATIONS TO MATCH EXISTING.
- EXIST. GRAPHITE ANODE (APPROX. LOCATION)
- 5019.2 INDICATES EXIST. GRADE OR PAVEMENT CONTOUR.

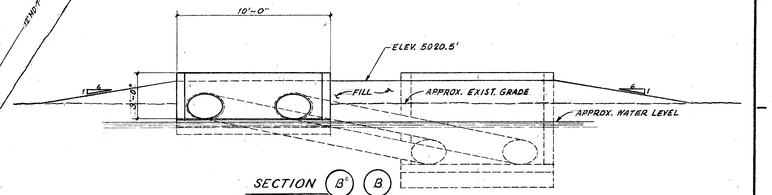
REFERENCE DRAWINGS:

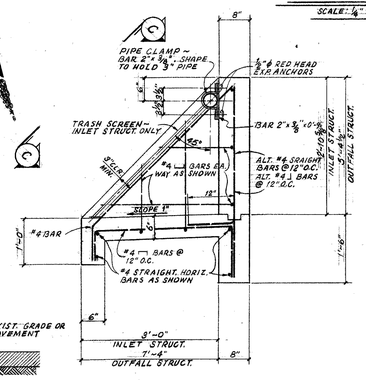
G-64264 – UNDERGROUND UTILITIES, AREA 4
G-5116.3, SHT. 6 – YARD COMPOSITE, SEDIMENTATION POND AREA
G-5116.3, SHT. 8 – YARD COMPOSITE, UNIT 4 COOLING TOWER & SEWAGE TREATMENT PLANT
G-5116.3, SHT. 9 – YARD COMPOSITE, UNIT 4 COOLING TOWER & SEDIMETATION POND
G-5116.3, SHT. 12 – YARD COMPOSITE, PLAN & SECTIONS
G-9850E, SHT. 4 – CATHODIC PROTECTION SITE PLAN
G-51648 – PLANT AREA MAIN DUCT RUNS
G-51649 – STATION GROUNDING AND ROAD LIGHTING
G-51766 – COOLING TOWER INTAKE STRUCTURE, CONDUIT, GROUNDING & LIGHTING

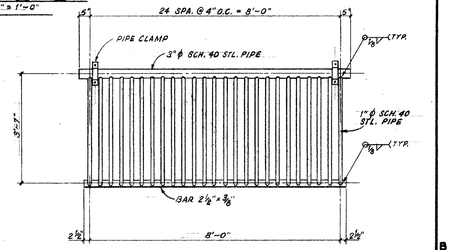
SCALE: 1" = 30'-0"

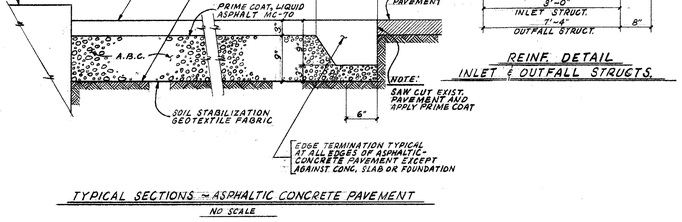












PT. No.	EXIST. GRADE OR PAVEMENT (±)	EXIST. T.O.C. (UNLESS NOTED)	NEW FINISHED SUBGRADE	NEW FINISHED A/C PAVEMENT	REMARKS
(1)	5019.33'	5020.0	5019.0	5020.0	
(2) (2A)	5019.6	5020.0 5020.91	5019.0	5020.0	
(3)	5019.35	5019.38	5018.35	5019.35	
(4)	5019.45	5019.5	5018.50	5019.50	
(5)	5019.45	5019.5	5018.50	5019.50	
(6) (6A)	5019.45	5020.0 5020.92	5018.79	5019.79	
(7)	5019.37	5020.30	5018.78	5019.78	
(8)	5019.38	5020.07	5018.66	5018.66	T.O.C. IS NEW 6" CONC. CURB
(9)	5019.4	5019.91	5018.37	5018.37	
(10)	5019.4	5020.0	5018.74	5019.74	
(11)	5018.4	—	5018.33	50193	
(12)	5019.5	5020.0	5018.54	5019.54	
(13)	5017.7	—	5017.54	5018.54	
(14)	5019.4	—	5018.52	5019.52	
(15)	5017.4	—	5017.52	5018.52	

NOTE: SEE APPENDIX "C" OF CONTRACT FOR TRENCH & BACKFILL REQUIREMENTS, CORRUGATED P.E. CULVERT PIPE AND WRAPPED CARBON STEEL PIPE.

NO.	DATE	REVISION	DWN	CHD	EXD	APPD	APPD	W.A.
3	7-22-88	REVISED "AS BUILT"	HAN	DUFFY			7-28-88	53-4917 52-3057
2	4-2-80	DELETED 4"ϕ SUMP LINE FROM CONTRACT	HAN	DUFFY			7-28-80	53-4917 52-3057
1	7-7-88	REVISED PER CONSTRUCTIBILITY REVIEW	HAN	DUFFY			7-28-80	53-4917 52-3057

CHOLLA S.E.S.
UNITS 3 & 4 – COOLING TOWER AREA PAVING
UNITS 1-4 – WEST AREA WASTEWATER HANDLING
PLANS, SECTIONS & DETAILS

ARIZONA PUBLIC SERVICE COMPANY
PHOENIX

SCALE AS SHOWN — DATE 16 JUNE 1988

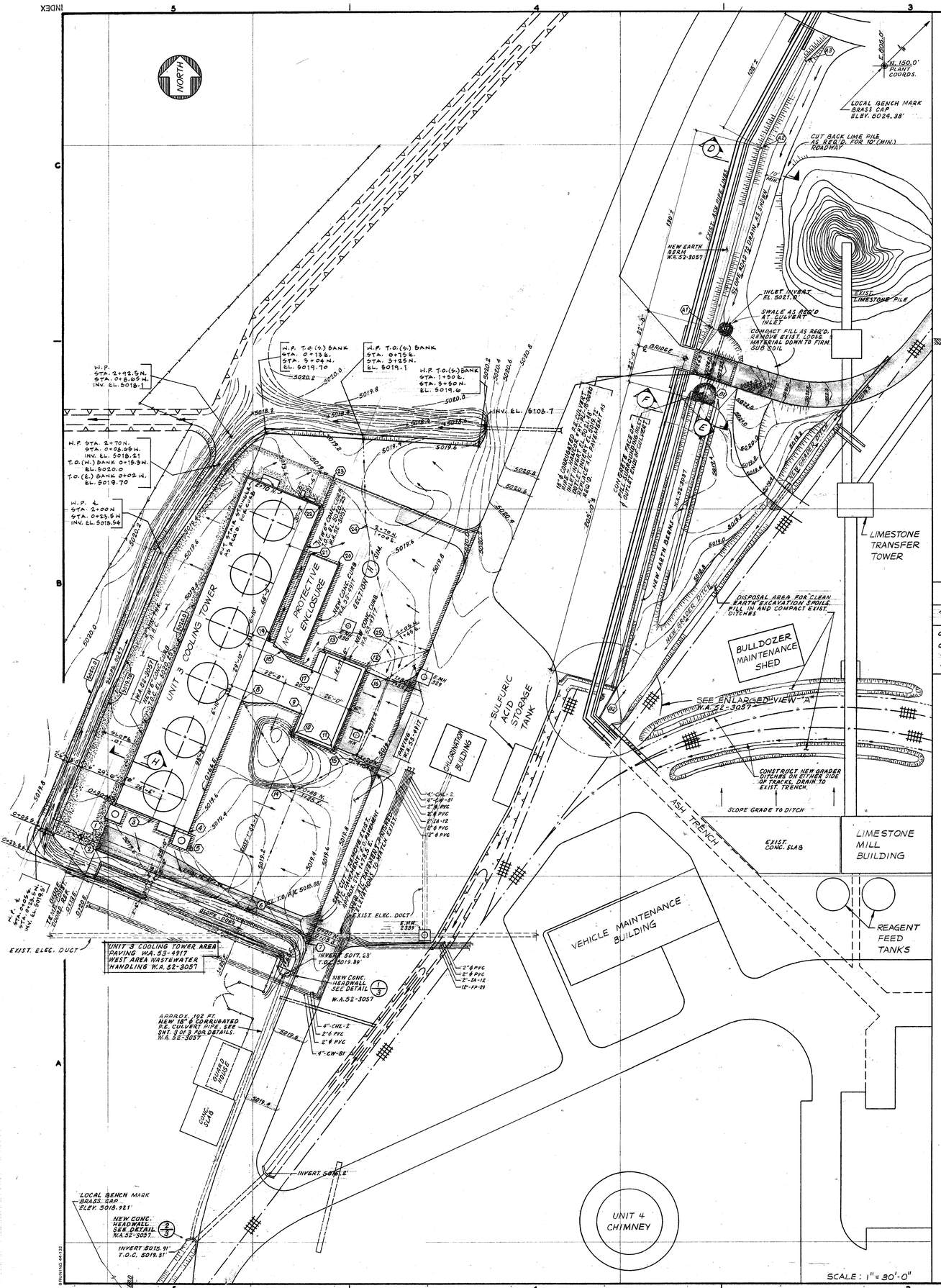
DRAWN HAN — CHECKED DUFFY — EXAMINED — APPROVED — ENGINEERING MANAGER — APPROVED

W.A. 53-4917
52-3057

DRAWING NO. G-97425

SHEET 1 OF 3

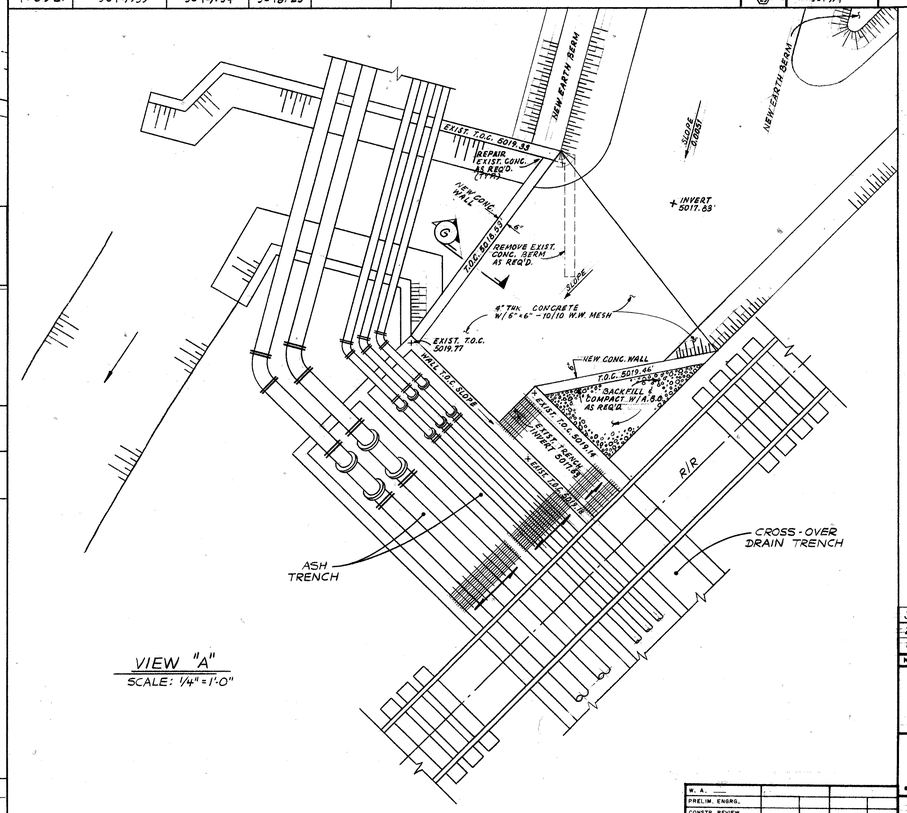
Figure A-2



PT. No.	EXIST. GRADE OR PAVEMENT (℄)	EXIST. T.O.C. (UNLESS NOTED)	NEW FINISHED SUBGRADE	NEW FINISHED A/C PAVEMENT	REMARKS
1	5019.6	5020.28	5018.97	5019.97	
2	5019.4	——	5018.85	5019.85	
3	5019.6	5020.25	5018.84	5019.84	T.O.C. IS NEW 6" CURB
4	5019.5	5019.83	5018.45	5019.45	
5	5019.5	5020.24	5018.73	5019.73	
6	5019.0	——	5017.88	5018.88	PAVEMENT WORK POINT
7	5019.74	——	5018.76	5019.76	
8	5020.1	5021.24	5018.80	5019.80	
9	5020.3	5020.0	5018.56	5019.56	T.O.C. IS NEW 6" CURB
10	5019.6	5020.11	5018.54	5019.54	
11	5019.6	5020.03	5018.56	5019.56	
12	5019.5	5020.10	5018.68	5019.68	
13	5019.6	5020.12	5018.66	5019.66	
14	5019.6	——	5018.25	5019.25	PAVEMENT WORK POINT
15	5019.4	——	5018.45	5019.45	
16	5019.4	——	5018.68	5019.68	
17	5019.7	5020.77	5018.96	5019.96	
18	5019.8	5020.52	5019.21	5020.21	T.O.C. IS NEW 6" CURB
19	5019.6	5020.27	5019.27	5020.27	
20	5019.4	5020.35	5018.79	5019.79	
21	5019.5	——	5018.93	5019.93	
22	5019.6	5020.27	5018.83	5019.83	T.O.C. IS NEW 6" CURB
23	5019.4	——	5018.31	5019.31	
24	5019.4	——	5018.39	5019.39	PAVEMENT WORK POINT
25	5019.4	——	5018.49	5019.49	

UNIT 3 COOLING TOWER
SOUTH DRAINAGE DITCH (℄ STA. 0+17 S.)

STATION	EDGE OF PVMNT. STA. 0+05 S.	NORTH T.O.B. ELEVATION	INVERT ELEV.	SOUTH T.O.B. ELEVATION
0+13 E.	5019.85	5019.85	——	5019.85
0+20 E.	5019.79	5019.74	5019.25	5020.0
1+25 E.	5018.88	5018.83	5018.53	5020.0
1+65 E.	5019.59	5019.54	5018.25	——



VIEW "A"
SCALE: 1/4" = 1'-0"

REFERENCE DRAWINGS
G-64260 UNDERGROUND UTILITIES AREA 10
G-64258 UNDERGROUND UTILITIES AREA 8
G-44195, SHT. 5 YARD PIPING PLAN & SECTIONS
G-51163, SHT. 4 YARD COMPOSITE GEN. WATER SUMP AREA
G-51163, SHT. 7 YARD COMPOSITE
G-98503; SHTS. 4 & 8 CATHODIC PROTECTION SITE PLAN
G-44319 ELECTRICAL GROUNDING
G-44439 ELECTRICAL GROUNDING

NOTE:
SEE SHEET #1 FOR LEGEND
SEE APPENDIX "C" OF CONTRACT FOR TRENCH & BACKFILL REQUIREMENTS, FOR CORRUGATED P.E. CULVERT PIPE AND WRAPPED CARBON STEEL PIPE.

NO	DATE	REVISION	DWN	CHD	EXD	APPD	APPD	W.A.
3	7/22/88	REVISED "AS BUILT"	HAM	[illegible]		TJD		53-4917 52-3057
2	6/2/88	DELETED 6"ϕ SUMP LINE FROM CONTRACT	HAM	[illegible]		TJD		53-4917 52-3057
1	4-6-88	REVISED PER CONSTRUCTIBILITY REVIEW	HAM	[illegible]		TJD		53-4917 52-3057

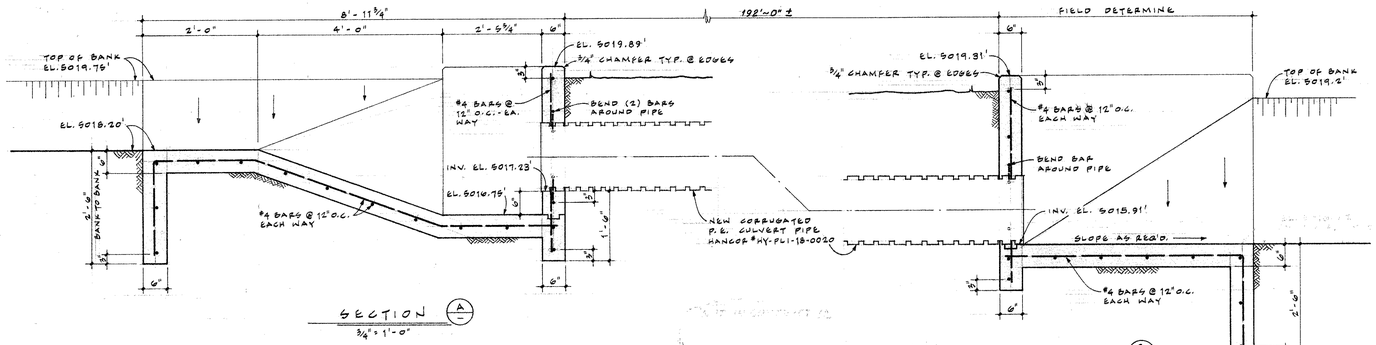
CHOLLA S.E.S.
UNITS 3 & 4 ~ COOLING TOWER AREA PAVING
UNITS 1-4 ~ WEST AREA WASTEWATER HANDLING
PLANS, SECTIONS & DETAILS

ARIZONA PUBLIC SERVICE COMPANY
PHOENIX

SCALE AS SHOWN
DATE 21 JUNE 1988
DRAWN HAM
CHECKED
DUBE:
EXAMINED
APPROVED
ENGINEERING MANAGER
APPROVED
W.A. 53-4917 52-3057
DRAWING NO. G-97425
SHEET 2 OF 3

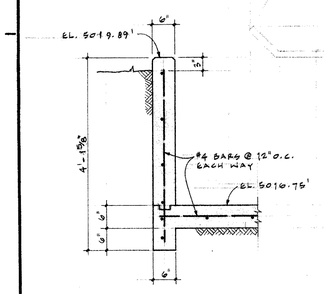
W. A. ____
PRELIM. ENGRG.
CONSTR. REVIEW
FOR BID ONLY
APVD. FOR CONSTR.
REF. ONLY

Figure A-3

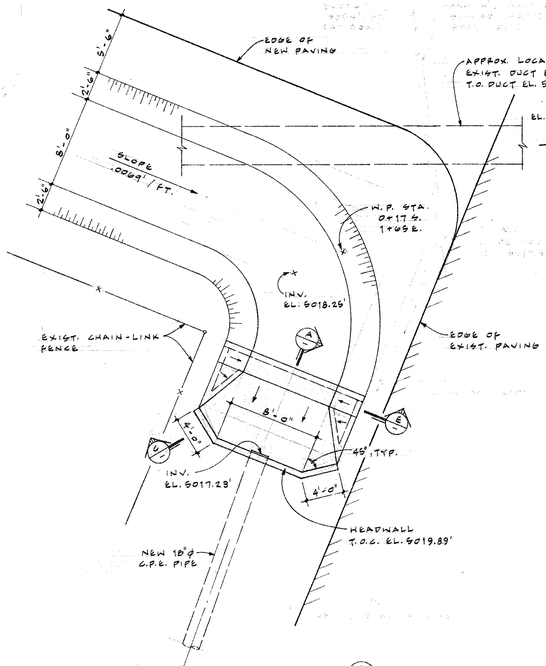


SECTION A
3/4" = 1'-0"

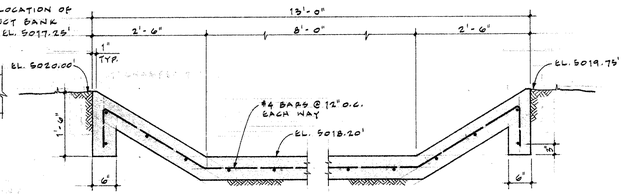
SECTION B
3/4" = 1'-0"



SECTION C
3/4" = 1'-0"

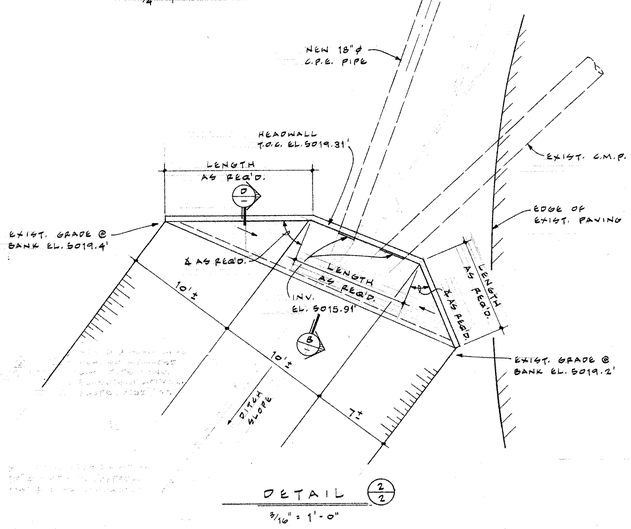


DETAIL 1/2
3/16" = 1'-0"



SECTION E
3/4" = 1'-0"

SECTION D
3/4" = 1'-0"



DETAIL 2/2
3/16" = 1'-0"

Figure A-4

NO.	DATE	REVISION	DWN	CHD	EXD	APPD	APPD	W.A.
3	11-22-88	REVISED "AS BUILT"	HAN	[illegible]			7121	53-4917 52-3057
2	9-2-88	DELETED S-8 SUMP LINE FROM CONTRACT	HAN	[illegible]			7103	53-4917 52-3057
1	7-11-88	REVISED FOR CONSTRUCTIBILITY REVIEW	DMG	[illegible]			7105	53-4917 52-3057

CHOLLA S.E.S.
UNITS 3 & 4 - COOLING TOWER AREA PAVING
UNITS 1-4 - WEST AREA WASTEWATER HANDLING
SECTIONS & DETAILS

ARIZONA PUBLIC SERVICE COMPANY
PHOENIX

SCALE AS NOTED
DATE JUNE 21, 1988

DRAWN D. SHARTZ
CHECKED DURBY
EXAMINED
APPROVED
ENGINEERING MANAGER
APPROVED
W.A. 53-4917 52-3057

DRAWING NO. G-97425
SHEET 3 OF 3

BRUNING
INDEX

Appendix B.
National Wetland Inventory

U.S. Fish and Wildlife Service
National Wetlands Inventory

Sedimentation Pond

August 10, 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.
AEIC Earthquakes

AEIC Earthquakes

8/10/2018 2:12:33 PM

Earthquake Epicenters

-0.2 To 1.1

> 1.1 To 2.4

> 2.4 To 3.7

> 3.7 To 4.9

> 4.9 To 6.2

> 6.2 To 7.5

Old Earthquakes

1:72,224

0 0.5 1 2 mi

0 0.75 1.5 3 km

Arizona Geological Survey:June 30, 2014, Esri, HERE, Garmin, © OpenStreetMap contributors, and the GIS user community, Source: Esri,

Web AppBuilder for ArcGIS

mber 2017 | Arizona Geological Survey: Fall, 2012 | Arizona Department of Emergency Management and Military Affairs:May, 2010 | Arizona Geological Survey:June 30, 2014 | Arizona Geological Survey: Janurary 2016 | Earthstar Geographics, CNES/Airbus DS | Esri, HERE, Garmin |

Appendix D.
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

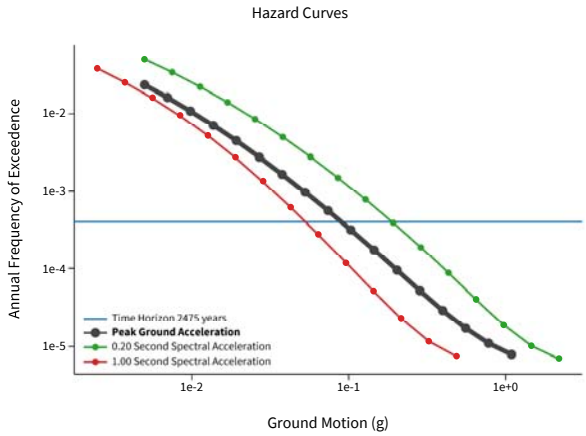
Latitude
Decimal degrees
34.941644

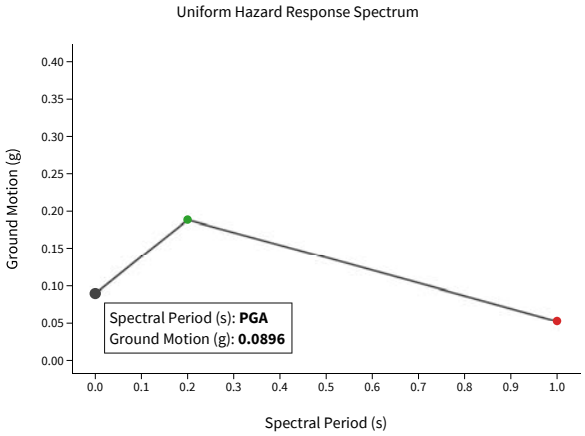
Time Horizon
Return period in years
2475

Longitude
Decimal degrees, negative values for western long…
-110.304161

Site Class
760 m/s (B/C boundary)

Hazard Curve





View Raw Data

Appendix E.
Karst and Land Subsidence Maps

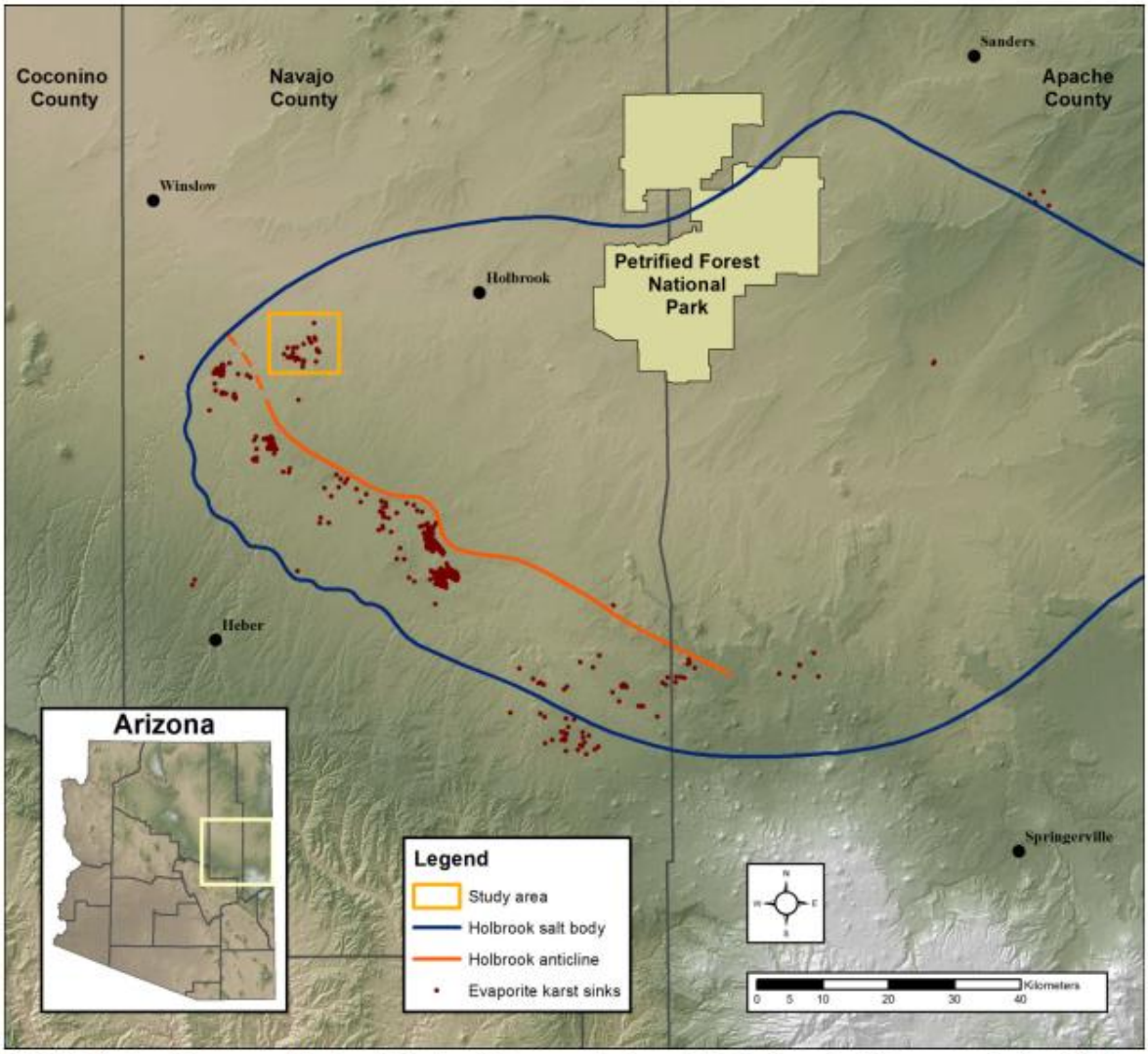
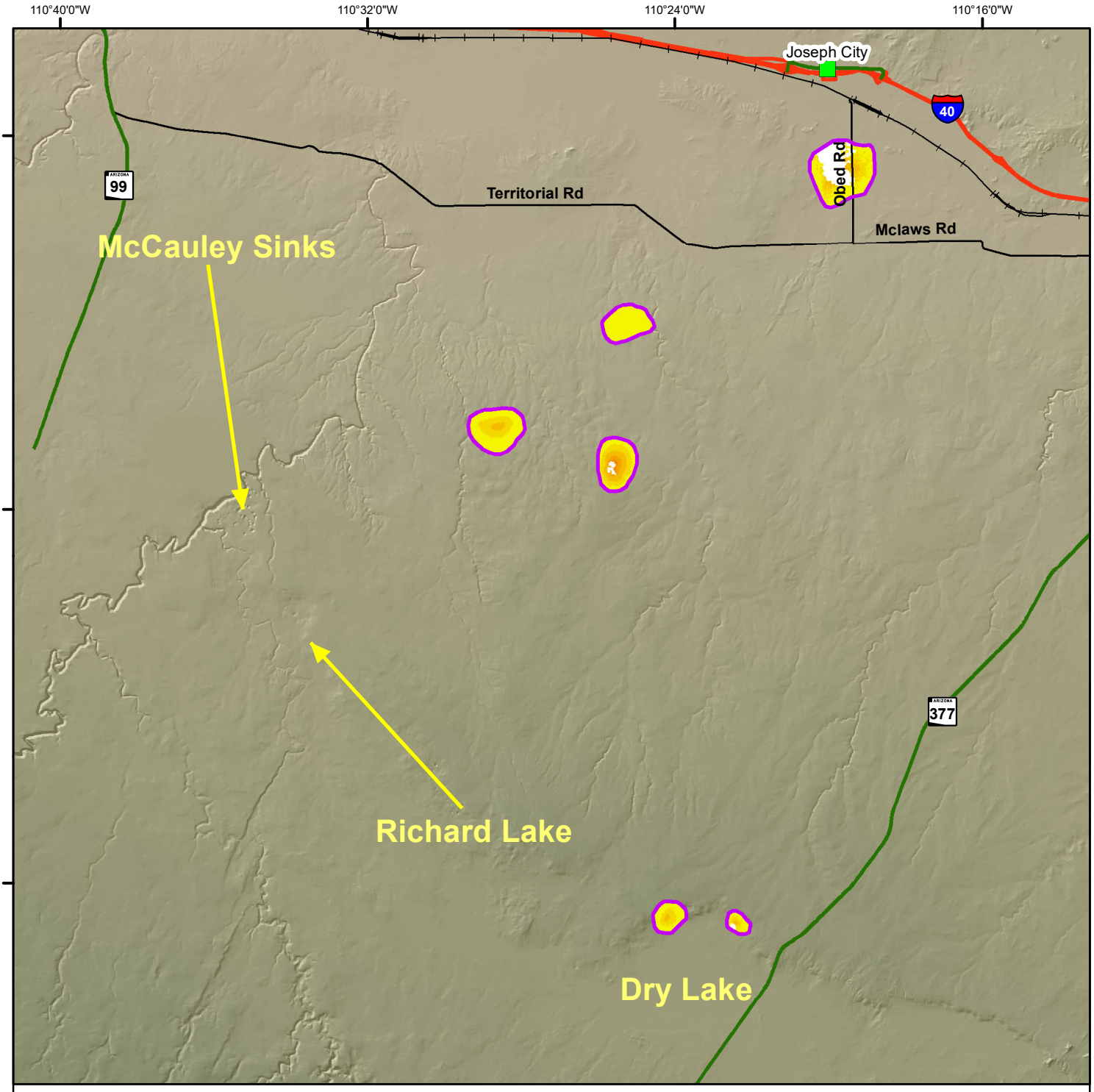


Figure 1. *Location map of Holbrook Basin, study area extent, and distribution of existing evaporite karst sinks relative to the extent of the Holbrook salt body and anticline.*



Total Land Subsidence in the Holbrook Basin, Navajo County
Based on Radarsat-2 Satellite Interferometric Synthetic Aperture Radar (InSAR) Data
Time Period of Analysis: 5.5 Years 09/22/2012 To 04/24/2018

Explanation

09/22/2012 To 04/24/2018

Total Land Subsidence

- Decorrelation/No Data
- Greater 40 cm (15.7 in)
- 25 - 40 cm (9.8 - 15.7 in)
- 15 - 25 cm (5.9 - 9.8 in)
- 10 - 15 cm (3.9 - 5.9 in)
- 6 - 10 cm (2.4 - 3.9 in)
- 4 - 6 cm (1.6 - 2.4 in)
- 2 - 4 cm (0.8 - 1.6 in)
- 1 - 2 cm (0.4 - 0.8 in)
- 0 - 1 cm (0 - 0.4 in)

- Subsidence Feature
- Hardrock
- Cities/Towns

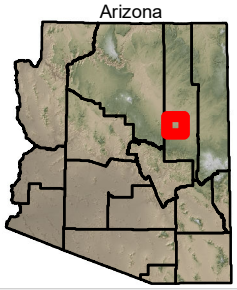
Highways and Interstates

- Interstate
- US
- State
- Roads
- Railway

1:220,000

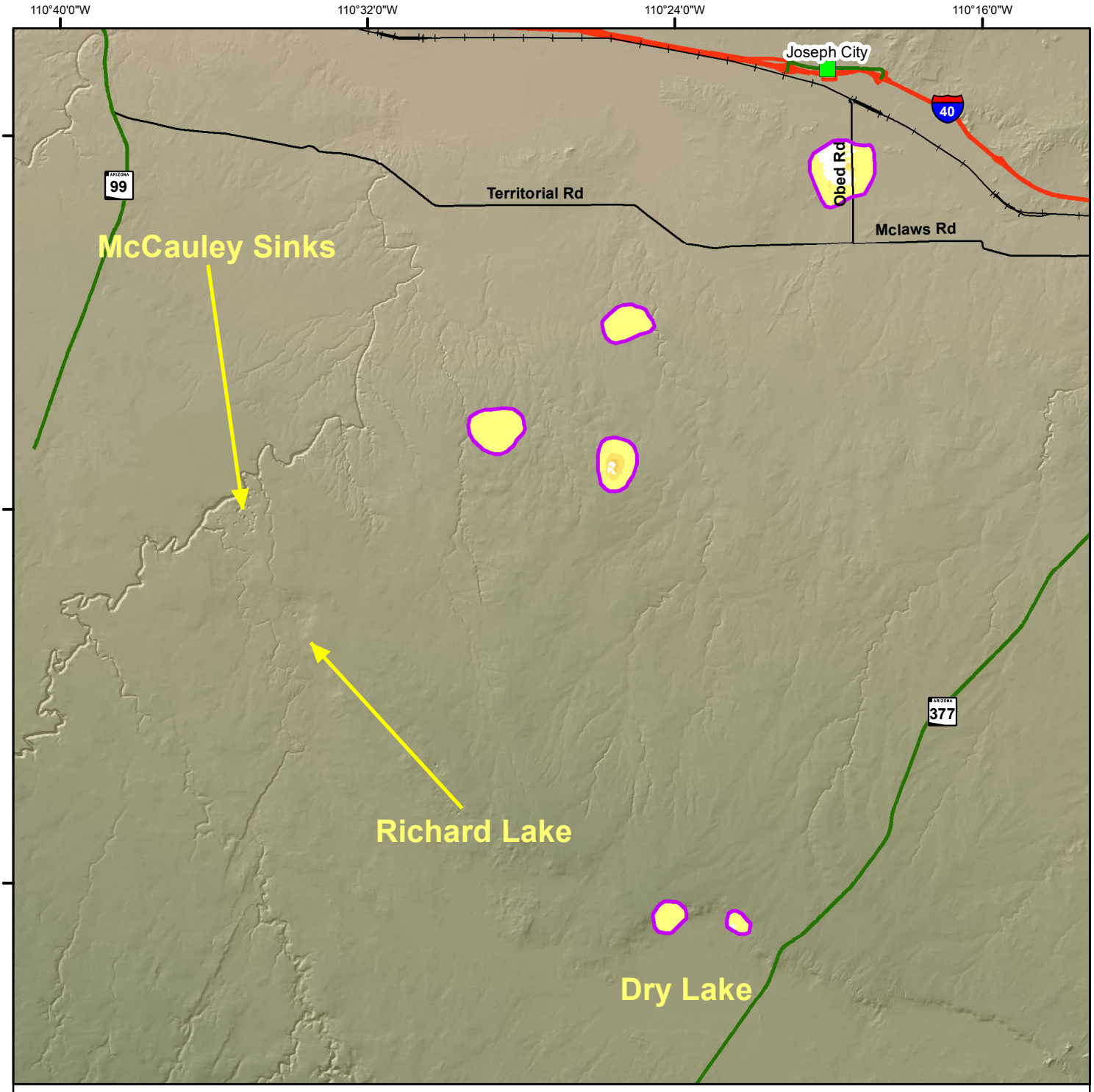
0 1 2 4 6 8 Miles

Arizona



Decorrelation (white areas) are areas where the phase of the received satellite signal changed between satellite passes, causing the data to be unusable. This occurs in areas where the land surface has been disturbed (i.e. bodies of water, snow, agriculture areas, areas of development, etc).

Coordinate System: NAD 1983 UTM Zone 12N
Projection: Transverse Mercator
Datum: North American 1983
Units: Meter
Created: 5/15/2018



Land Subsidence Rate in the Holbrook Basin, Navajo County
Based on Radarsat-2 Satellite Interferometric Synthetic Aperture Radar (InSAR) Data
Time Period of Analysis: 5.5 Years 09/22/2012 To 04/24/2018

Explanation

09/22/2012 To 04/24/2018

Land Subsidence Rate

- Decorrelation/No Data
- Greater 7 cm/yr (2.8 in/yr)
- 5 - 7 cm/yr (2.0 - 2.8 in/yr)
- 3 - 5 cm/yr (1.2 - 2.0 in/yr)
- 2 - 3 cm/yr (0.8 - 1.2 in/yr)
- 1 - 2 cm/yr (0.4 - 0.8 in/yr)
- 0.5 - 1 cm/yr (0.2 - 0.4 in/yr)
- 0 - 0.5 cm/yr (0 - 0.2 in/yr)

- Subsidence Feature
- Hardrock
- Cities/Towns
- Railway

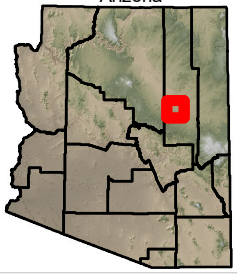
Highways and Interstates

- Interstate
- US
- State
- Roads

1:220,000

0 1 2 4 6 8 Miles

Arizona



Decorrelation (white areas) are areas where the phase of the received satellite signal changed between satellite passes, causing the data to be unusable. This occurs in areas where the land surface has been disturbed (i.e. bodies of water, snow, agriculture areas, areas of development, etc).

Coordinate System: NAD 1983 UTM Zone 12N
Projection: Transverse Mercator
Datum: North American 1983
Units: Meter
Created: 6/12/2018