MP-1408

Horse Mesa Dam
Name of Property

Maricopa, AZ
County and State

United States Department of the Interior
National Park Service

National Register of Historic Places Registration Form

This form is for use in nominating or requesting determinations for individual properties and districts. See instructions in National Register Bulletin, *How to Complete the National Register of Historic Places Registration Form.* If any item does not apply to the property being documented, enter "N/A" for "not applicable." For functions, architectural classification, materials, and areas of significance, enter only categories and subcategories from the instructions. **Place additional certification comments, entries, and narrative items on continuation sheets (NPS Form 10-900a).**

1. Name of Property

Historic name Horse Mesa Dam

Other names/site number

2. Location

street & number On the Salt River, approximately 65 miles east-northeast of Phoenix, AZ ☐ not for publication

city or town Phoenix ☒ vicinity

State Arizona code AZ county Maricopa code 013 zip code

3. State/Federal Agency Certification

As the designated authority under the National Historic Preservation Act, as amended,

I hereby certify that this X nomination ___ request for determination of eligibility meets the documentation standards for registering properties in the National Register of Historic Places and meets the procedural and professional requirements set forth in 36 CFR Part 60.

In my opinion, the property X meets ___ does not meet the National Register Criteria. I recommend that this property be considered significant at the following level(s) of significance:

___ national **_X_ statewide** **___local**

George Herbst — 11/22/2016

Signature of certifying official — Date

Federal Preservation Officer — BOR, D01

Title — State or Federal agency and bureau

In my opinion, the property ___ meets ___ does not meet the National Register criteria.

Signature of commenting official — Date

Title — State or Federal agency and bureau

United States Department of the Interior
National Park Service

National Register of Historic Places Registration Form

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In my opinion, the property X meets ___ does not meet the National Register Criteria. I recommend that this property be considered significant at the following level(s) of significance:

__ **national** X **statewide** __ **local**

George A Herbert — 11/22/2016
Signature of certifying official — Date

Federal Preservation Officer, Bureau of Reclamation, DOI
Title — State or Federal agency and bureau

In my opinion, the property X meets ___ does not meet the National Register criteria.

Kathryn Leonard — 17 Feb 2017
Signature of commenting official — Date

SHPO — Arizona State Parks
Title — State or Federal agency and bureau

Horse Mesa Dam
Name of Property

Maricopa, AZ
County and State

4. National Park Service Certification

I, hereby, certify that this property is:

Signature of the Keeper — Date of Action

✓ entered in the National Register — 8/7/2017

___ determined eligible for the National Register

___ determined not eligible for the National Register

___ removed from the National Register

___ other (explain:)

5. Classification

Ownership of Property
(Check as many boxes as apply)

	public - Local
	public - State
X	public - Federal
	private

Category of Property
(Check only **one** box)

	district
	site
X	structure
	building(s)
	object

Number of Resources within Property
(Do not include previously listed resources in the count.)

Contributing	Noncontributing	
		sites
4		structure
		objects
2	2	buildings
6	2	**Total**

Name of related multiple property listing

Salt River Project, Arizona

Number of contributing resources previously listed in the National Register

0

6. Function or Use

Historic Functions
(Enter categories from instructions)

Industry, waterworks
Industry, energy facility (power plant)
Government/Public Works

Current Functions
(Enter categories from instructions)

Industry, waterworks
Industry, energy facility (power plant)
Government/Public Works

7. Description

Architectural Classification
(Enter categories from instructions)

Other, Early 20th Century

Other/concrete thin-arch dam

Materials
(Enter categories from instructions)

foundation: Concrete

walls: Sandstone, limestone, stucco

roof: Concrete, sheet metal

other:

Narrative Description

Summary Paragraph

Horse Mesa Dam is associated with the Salt River Project's (Project) aggressive hydroelectric expansion program during the 1920s and the growth of the Phoenix metropolitan area in the 20th century. It consists of the dam (contributing structure), the north spillway (contributing structure), the south spillway (contributing structure), the spillway tunnel (contributing structure), the dam's attached power plant (contributing building), the added HEFU turbine house (non-contributing building), and the spillway discharge tunnel concrete operating house, embedded in the rock above the north abutment (contributing building). A white building (non-contributing) that houses the engine generator, which runs the spillway motors, is located on the northern bluff of the dam. Horse Mesa Dam is named after nearby Horse Mesa, where thieves allegedly hid stolen herds. The facility is located on the Salt River approximately 65 miles east-northeast of Phoenix, between the Roosevelt and Mormon Flat dams. The Horse Mesa Dam meets the Registration Requirements set forth in the Salt River Project MPS for Property Type I: Storage-Regulation Dams.

Narrative Description

As the second dam constructed from 1924 to 1927 by the Salt River Valley Water Users' Association (Association) as part of their aggressive hydroelectric expansion program, Horse Mesa Dam is a concrete, thin-arch dam that stands 305 feet high from bedrock to the top of the coping, has a hydraulic height of 266 feet above the stream bed, and a crest length of 660 feet. As a variable radius type, the upstream radius at the crest is 251.4 feet and 82 feet at the base. Thickness at the base varies from 43 to 57 feet, with the dam being 8 feet thick at the top. The arch's maximum span is 450 feet. The dam's volume is 162,000 cubic yards. The dam is topped by a service walkway detailed with a simple, continuous concrete balustrade. The spillways consist of concrete structures at each abutment, controlled by nine 27- by 23-foot steel Taintor radial gates—6 on the north side and 3 on the south side—and a concrete-lined auxiliary tunnel spillway through the right (northern) abutment, which is controlled by a single, 130-ton 40- by 44.5-foot fixed wheel gate. The spillways were modified by Reclamation between 1936 and 1937 to provide more efficient and safer discharge. Total spillway discharge capacity is rated at 150,000 cfs.

The original power outlet works consisted of three 8-foot-diameter penstocks. The powerhouse, approximately 135 feet in length, features nine bays with tall arched window openings. Despite the building's monolithic concrete exterior, the pilasters framing the window bays and heavy rooftop cornice impart a classic feel to the structure. The attached powerplant has three 11,000 kiloWatt (kW) conventional generators. In 1970 work began on the power system at the dam as part of the Hydro Expansion and Frequency Unification (HEFU) which included a pumped back storage system. A 15.6-foot diameter penstock was drilled through the dam and connected to the 93,000 kW pumped storage generator. A separate structure was built south of the existing power facility. The three conventional generators in the original powerhouse were converted from 25 to 60 hertz (Hz) cycles in 1972. Nameplate capacity is 126,000 kW. Maximum head for conventional is 251 feet; pumped storage, 279 feet.

The spillway system, as modified by the Bureau of Reclamation (Reclamation) in 1937, included a 50,000 cubic foot per second, concrete-lined auxiliary tunnel, 30 feet in diameter and 400 feet long; a regulating gate and operating house is embedded in the rock near the right abutment, an operating mechanism for controlling the tunnel, and a concrete discharge apron below the existing spillway. The tunnel operating house is reached by stairs attached to the rock face wall. Reclamation also thickened the piers on the radial-gate spillways, installed motor driven gate hoists, and installed

two 15-kilovolt-ampere gasoline-driven generators for emergency operation of the hoist motors. The dam's backwater, 17-mile-long Apache Lake, has a maximum capacity of 245,138 acre-feet, and covers 2,600 acres. The total construction cost of Horse Mesa Dam was $5,248,000.

8. Statement of Significance

Applicable National Register Criteria

(Mark "x" in one or more boxes for the criteria qualifying the property for National Register listing)

- [X] A Property is associated with events that have made a significant contribution to the broad patterns of our history.
- [ ] B Property is associated with the lives of persons significant in our past.
- [ ] C Property embodies the distinctive characteristics of a type, period, or method of construction or represents the work of a master, or possesses high artistic values, or represents a significant and distinguishable entity whose components lack individual distinction.
- [ ] D Property has yielded, or is likely to yield, information important in prehistory or history.

Criteria Considerations

(Mark "x" in all the boxes that apply)

Property is:

- [ ] A owned by a religious institution or used for religious purposes.
- [ ] B removed from its original location.
- [ ] C a birthplace or grave.
- [ ] D a cemetery.
- [ ] E a reconstructed building, object, or structure.
- [ ] F a commemorative property.
- [ ] G less than 50 years old or achieving significance within the past 50 years.

Areas of Significance

(Enter categories from instructions)

Politics/Government

Engineering

Community Planning and Development

Period of Significance

1924–1937

Significant Dates

1924–1927 – Horse Mesa facility built

1936–1937 – Spillway modified

Significant Person

(Complete only if Criterion B is marked above)

Cultural Affiliation

Architect/Builder

Charles Cragin and A. C. Jacquith

Salt River Valley Water Users' Association

Period of Significance (justification)

The period of significance is associated with Horse Mesa Dam's construction (1924–1927) and spillway modification (1936–1937).

Statement of Significance Summary Paragraph

Horse Mesa Dam qualifies for the National Register of Historic Places under Criterion A. It is associated with the evolution of the Salt River Project, one of the first five federally-sponsored western water projects authorized under the National Reclamation (Newlands) Act of 1902. This act created the United States Reclamation Service (USRS and later Reclamation), whose purpose was to design and construct storage and irrigation projects to aid in the settlement and economic development of western America's arid lands. Previous efforts by individuals and private irrigation concerns were inadequate and often unsuccessful. With the Reclamation Service's creation, the federal government assumed a lead role in developing large-scale western water projects. Along with the Roosevelt, Stewart Mountain, and Mormon Flat facilities, Horse Mesa Dam impounds water on the Salt River for use in generating power and regulating flow for irrigation, domestic, and municipal use within the Salt River Valley.

Narrative Statement of Significance

Under Politics, Government, and Community Planning and Development, Horse Mesa Dam is significant in that it was the second dam constructed as part of the Project's ambitious 1920's hydroelectric expansion program, one that further contributed to the economic growth and expansion of the Phoenix metropolitan area. Furthermore, Horse Mesa, along with Stewart Mountain and Mormon Flat facilities, reflected the increased influence and power of the Association as they attempted to privately build hydroelectric facilities to meet this increased demand and consumption, especially in the 1930s and 1940s when the valley experienced its first major growth, and post-World War II era when the valley witnessed further growth due to the perfection and resultant widespread use of air conditioning technology powered by Project hydropower.

Under Engineering, Horse Mesa Dam is a good example of a radius thin-arch concrete dam design that departed from the more traditional, massive, and expensive curved gravity design incorporated in Roosevelt Dam. In principal, the structural characteristics of this dam represent a radical approach to engineering in which the shape of the dam is more important than the mass (or weight) of material in the structure. In contrast to Roosevelt Dam, which uses sheer mass to hold back the horizontal forces of stored water, a thinner, less massive radius thin-arch dam, such as Horse Mesa Dam relies on the tremendous downward, vertical force of its mass to withstand the horizontal force created by the impounded water. Usually termed arch dams, to distinguish them from curved gravity designs, these materially conservative structures derive their strength from the structural characteristics of their shape, which is basically a bowed wall with the outside curve facing upstream. Thus, radius thin-arch dams represent the structural tradition of dam design, in which the dam's shape, rather than the amount of materials used, is the critical factor in its structural strength. As a result, these dams are less expensive to construct than a massive curved gravity facility like Roosevelt Dam. The radius arch dam was preferred by the Association because it allowed them to simultaneously expand their hydropower program and save money in material and construction costs.

Developmental history/additional historic context information

Once the improvements to Roosevelt Dam were completed and the construction of Mormon Flat Dam was underway in the summer of 1924, the Association's Engineer, Charles Cragin prepared to complete their 1922 hydroelectric expansion program. Referred to as the Mormon Flat Power Dam, Horse Mesa Dam would be built between Mormon Flat and Roosevelt Dam. It would be the focal point of the Association's electrical development. Horse Mesa Dam would generate 33,000 kW of electricity, enough for the Association to estimate that annual revenues would pay for the expansion, repay the federal government for Roosevelt Dam, and operate the Salt River Project. A key event in this expansion was the Association signing an agreement on June 14, 1924, with the Inspiration Consolidated Copper Company (Inspiration). Inspiration was one of Arizona's largest businesses and wanted to expand their operations with a new $6 million leaching plant at their Miami mine. To do so they would need the electric power the Association was more than willing to provide.

Once the Association's Board of Directors approved the plan, and the lengthy process of shareholder approval over construction bond issuance played out, the Association was ready to begin construction. On August 23, 1924, work started on a 6 mile roadway from Apache Trail to the remote and rugged dam site. The road was costly to build because of the rugged and precipitous terrain it crossed. It took nearly a year and $408,000 just to build the road. Due to the steepness and near vertical slope of the canyon walls, the construction camp for the workers had to be located a mile downstream from the work site. Because of the precarious slope and the possibility of injury to workmen from falling rock and debris, excavation of the dam's spillways and haunches was conducted early in the preconstruction phase of the project. > **See Section 8 Continuation Sheet <**

9. Major Bibliographical References

Bibliography

Please refer to SRP MPL cover document, Section I, for a comprehensive bibliography

Previous documentation on file (NPS):

____preliminary determination of individual listing (36 CFR 67 has been requested
____previously listed in the National Register
____previously determined eligible by the National Register
____designated a National Historic Landmark
____recorded by Historic American Buildings Survey #_____
x recorded by Historic American Engineering Record # AZ-14

Primary location of additional data:

____State Historic Preservation Office
____Other State agency
____Federal agency
____Local government
____University
____Other
Name of repository: Library of Congress Online Catalog

Historic Resources Survey Number (if assigned): _____

10. Geographical Data

Acreage of Property 2.09 acres

UTM References (See Section 11 Continuation Sheet)

	Zone	Easting	Northing
1	12	468090	3716848

Verbal Boundary Description

The proposed boundary encompasses the spillway generator house (non-contributing), both spillways, the spillway tunnel, the spillway discharge tunnel concrete operating house, and the dam proper with its attached powerhouse and HEFU turbine housing structure.

Boundary Justification

The boundary is defined by the limits of the eligible structure consisting of the dam, both spillways, and the spillway tunnel, while the buildings include the dam's attached power plant/HEFU turbine house, and the spillway discharge tunnel concrete operating house (embedded in the rock above the north abutment). A white structure that houses the engine generator (non-contributing), which runs the spillway motors, is located on the northern bluff of the dam. This is consistent with the boundary delineated for this cultural feature on attached map (Section 11, Page 2, Map 2).

11. Form Prepared By

name/title Jim Bailey, Ph.D., Historian
organization Bureau of Reclamation date October 1, 2010
street & number 6150 West Thunderbird Road telephone (623) 773-6263
city or town Glendale state AZ zip code 85306
email ljelinek@usbr.gov[i]

[i] All contact information is for the Phoenix Area Office Archaeologist.

Additional Documentation

Submit the following items with the completed form:

- **Maps:** An aerial map indicating the property's location.
- **Continuation Sheets:** 8 (context, photos) 11 (site map with UTMs and picture references)
- **Additional items:** None

Photographs:

Photo Log (See Section 8 Continuation Sheet)

Current Photographs

Name of Property: Horse Mesa Dam
City or Vicinity: Tortilla Flat
County: Maricopa
State: AZ
Photographers: Jim Bailey, Bureau of Reclamation; Salt River Project
Date Photographed: March 2010; May 2009
Location of Original Digital Files: Bureau of Reclamation, Denver, CO; Salt River Project, Phoenix, AZ
Number of Photographs: 9

Photo 1 of 9 (AZ_Maricopa County_Salt River ProjectMPS_Horse Mesa Dam_0001)
Horse Mesa Dam aerial looking east.

Photo 2 of 9 (AZ_Maricopa County_Salt River ProjectMPS_Horse Mesa Dam_0002)
Horse Mesa Dam looking northeast.

Photo 3 of 9 (AZ_Maricopa County_Salt River ProjectMPS_Horse Mesa Dam_0003)
Horse Mesa Dam looking northeast.

Photo 4 of 9 (AZ_Maricopa County_Salt River ProjectMPS_Horse Mesa Dam_0004)
Left spillway looking southeast.

Photo 5 of 9 (AZ_Maricopa County_Salt River ProjectMPS_Horse Mesa Dam_0005)
Left spillway from crest looking southeast.

Photo 6 of 9 (AZ_Maricopa County_Salt River ProjectMPS_Horse Mesa Dam_0006)
Right spillway looking north.

Photo 7 of 9 (AZ_Maricopa County_Salt River ProjectMPS_Horse Mesa Dam_0007)
Powerhouse looking east.

Photo 8 of 9 (AZ_Maricopa County_Salt River ProjectMPS_Horse Mesa Dam_0008)
Powerhouse from below.

Photo 9 of 9 (AZ_Maricopa County_Salt River ProjectMPS_Horse Mesa Dam_0009)
Spillway outlet tunnel looking northeast.

Historic Photographs

Name of Property: Horse Mesa Dam
City or Vicinity: Tortilla Flat
County: Maricopa
State: AZ
Photographers: Unknown; Mark Durben, Salt River Project
Date Photographed: 1924, 1926, 1927, 1988
Location of Original Digital Files: Salt River Project, Phoenix, AZ
Number of Photographs: 9

Historic Photo 1 of 9
Upstream view of the Salt River at Horse Mesa dam site. Photo taken in 1924. Photo courtesy of the SRP.

Historic Photo 2 of 9
View to the right (west side of the future Horse Mesa Dam showing excavation of the stream bed and the river diversion flume in background. Photo taken on April 1926. Photo courtesy of the SRP.

Historic Photo 3 of 9
Upstream view of the Horse Mesa Dam under construction. Three penstocks are at center. Aggregate operation is visible above construction site. Photo taken on July 22, 1926. Photo courtesy of the SRP.

Historic Photo 4 of 9
Upstream view of Horse Mesa Dam. Photo taken on September 14, 1926. Photo courtesy of the SRP.

Historic Photo 5 of 9
Upstream view of the Horse Mesa Dam and power plant housing. Photo taken on October 2, 1926. Photo courtesy of the SRP.

Historic Photo 6 of 9
Downstream view from the dam site of the northern portion of the northern Horse Mesa Dam construction camp. Photo taken on April 2, 1927. Photo courtesy of the SRP.

Historic Photo 7 of 9
Dam completed except for transformer equipment being installed above the power plant. Photo taken in 1988. Photo courtesy of the SRP.

Historic Photo 8 of 9
View to the right (west) showing the HEFU turbine unit housing and original power plant of the Horse Mesa Dam. Photo taken in 1988 by Mark Durben. Photo courtesy of the SRP.

Historic Photo 9 of 9
Telephoto view of right (north) spillway taken in 1988. Photo by Mark Durben and courtesy of the SRP.

United States Department of the Interior
National Park Service

National Register of Historic Places Continuation Sheet

Horse Mesa Dam
Name of Property
Maricopa, AZ
County and State
Salt River Project
Name of multiple listing (if applicable)

Context Continued

Cragin rushed Association workmen to prepare the dam site because the terms of the Inspiration contract left him only 34 months to complete the work. He designed Horse Mesa Dam using the same design method and allowable compressive stress as used for Mormon Flat Dam, which was under construction downstream at the time. Cragin designed Horse Mesa Dam as a 300-foot-high, concrete single arch dam, and selected the variable radius design for the same reason he chose it for Mormon Flat Dam. It was to be an appropriate design for the site, and provided significant savings in material costs. Once he submitted the design to Reclamation's engineers, they rejected it as being too high a dam to be analyzed using the simplistic cylinder formula, and suggested using the trial load method to calculate stresses.

Because of delays associated with the construction of the road and other pre-construction activities, Cragin re-drafted the design for Horse Mesa Dam. Reclamation's engineer A. C. Jaquith, who had experience in trial load methods, assisted Cragin. They redesigned Horse Mesa Dam to stand 305 feet from bedrock to the top of the coping, with a hydraulic height of 266 feet above stream bed. On April 3, 1925, Cragin submitted the redesign to Reclamation, which was approved 10 days later on April 13. Under the new design the dam was a variable radius type, the upstream radius at the crest measured 25.1 feet and 82 feet at the base. Thickness at the base varied from 43 to 57 feet. The dam was 8 feet thick at the top. The maximum span of the arch was 450 feet. The upper 175 feet of the north end thrust against an ogee gravity overflow section, 140 feet long on the crest. Storage capacity was calculated at 245,000 acre feet with an additional 15,000 acre foot possible if the upper 6 feet of coping was used. The north and south spillways were closed by nine steel Taintor gates, six on the north side and three on the south. All gates were motor operated and equal in dimension to those used at Mormon Flat. They measured 23 feet high by 27 feet wide. Spillway discharge capacity was estimated at 150,000 cubic feet per second (cfs). The power plant outlets consisted of three penstocks, each 8 feet in diameter located at the center of the dam.

Completing the above-ground excavation carried the Association through the remainder of 1925 and into spring 1926. As difficult as building the road, nearly the entire length of both spillways had to be excavated out of the canyon walls. Over 500,000 cubic yards of solid and loose rock needed to be removed. By March 1926, this job was finished, with the site ready for formal construction.

Foundation excavation, a simple open cut, was accomplished by using steam shovels converted to draglines. Excavation at the south haunch was carried to a horizontal depth of 125 feet, due to the appearance of several large seams. Grouting holes were staggered over the dam's entire base, drilled to a depth of 30 feet and grouted with a 1/1 mixture of cement and sand. Grout work was also done at the sides of the north and south haunch, and at the south spillway. The Salt River was controlled primarily by closing the gates at Roosevelt Dam. Downstream runoff below Roosevelt Dam by-passed the construction site via a wood flume measuring 300 feet long, 20 feet wide, and 10 feet deep. It was placed at the south end, or left side, of the foundation work, with water channeled into the flume by a sand and gravel coffer dam. Another coffer dam was built downstream to prevent tail water from receding into the foundation pit. Seepage was removed from the foundation area by four Kimball pumps recently used for the same purpose at Mormon Flat Dam.

The mixing plant, along with the sand, gravel, and cement storage bins, was literally perched on a small bench against the south side cliff, 50 feet above the south spillway. The concrete for the spillway was mixed with a pair of 1 yard mixers from Mormon Flat. A third mixer was held in reserve. Aggregate was discharged automatically into measured quantities into the mixer, where the correct amount of cement was added. Fresh concrete was then moved to an Insley tower, which had been reconstructed on the south overhang after being disassembled at Mormon Flat. Three hundred and forty feet high, and 700 feet above the stream bed, the tower hoisted the concrete, then dumped it into "down comer" positioned to fill the construction forms. Another Insley steel guy derrick used at Mormon Flat was also employed at Horse Mesa to move forms and handle other materials.

The first concrete for Horse Mesa Dam was poured on May 26, 1926, and was placed nearly continuously from that day forward. From May through the rest of 1926, the dam rose steadily. Although both concrete mixers could produce about a 1000 cubic yards per day, actual progress averaged about half that. By July, the flume had been disassembled because the dam was sufficiently high to install the penstock openings. Water was then conveyed through the three penstocks. By the end of 1926, Horse Mesa Dam had risen more than 100 feet from its foundation. As work progressed into 1927, it was necessary to raise the reservoir's water level in order to meet upcoming spring and summertime irrigation demands. By July 1, Horse Mesa Dam had reached its spillway crest elevation, and water was released to the almost-dry Mormon Flat facility.

There was another advantage to immediately filling Horse Mesa's reservoir: hydroelectric benefits. Cragin constructed the hydroelectric power plant while building the dam. The plant's floor was first poured in July 1926, two months after the first concrete was poured for the dam's foundation. In April 1927, while the dam face continued upward, the power plant building was completed and the first of its three 10,000 kw hydroelectric generating units was placed into operation, with all three in full operation by summer's end, much to the delight of Inspiration Copper. This early on-line operation met two goals: to meet Inspiration's 36 month contract provision and allow the Association to pay for the project's construction costs while the dam was being built.

On August 4, 1927 the last of the dam and power plant's 150,000 cubic yards of concrete was poured. The only work that remained, besides stripping forms, was the 7.5 mile long realignment of the Apache Trail, soon to be inundated by Horse Mesa's reservoir. This work was completed by the State Highway Department under contract to the Association. The final construction cost for Horse Mesa Dam was $5.319 million, which exceeded the original estimate by $576,000. Cragin did not feel that this was excessive, considering the expense in accessing the site, performing the above-stream excavation, and employing over 700 workers. The project was completed on time and under contractual expectations with Inspiration. He also felt that the dam's redesign produced a material savings of $30,000, and that the Association saved $200,000 by hauling equipment and materials to the dam site themselves.

Despite Horse Mesa's completion, work still needed to be done. As with the other three Salt River hydroelectric dams, Reclamation engineers in the early 1930s found serious problems with the (original) spillway designs and their ability to handle major flood events and releases. All the dams needed spillways capable of passing 175,000 cfs for extended periods, with the ability to pass 200,000 cfs in an extended emergency, and none of them met this requirement. A report prepared for Horse Mesa Dam concluded that the dam could not release any water from the left spillway, the one above the power plant. At the right spillway, they concluded the estimated capacity was appreciably lower than 70,000 cfs because of its narrow approach. Their final recommendation was to abandon Horse Mesa's left spillway altogether, and to re-grout the abutments.

After securing financing from the federal government for spillway improvements as part of the contract to build Bartlett Dam on the Verde River, the contract for Horse Mesa's spillway work was awarded in May 1936 to L. E. Dixon Company, Bent Brothers, and Case Construction Company (contractors), all of Los Angeles. The work consisted of two items: excavating a water discharge tunnel; and modifying both spillways by constructing concrete aprons below their crests, reinforcing the existing spillway gate piers, reconditioning and altering their position, and installing new operating equipment (rerouting the foundation was abandoned.)

Work began in September 1936 with the construction of a small work camp. The 520 foot long discharge tunnel with a 150 foot drop, the approach channel, and the gate house area began in October. Designed to act as an auxiliary spillway, work on the tunnel was simultaneously started at each end. When the downstream side excavation was carried to the mid-point, the upstream side was delayed when it became necessary to realign the tunnel by 30 feet because of poor rock conditions. The tunnel excavation was 36 percent completed by the end of 1936. Reclamation also decided to build a small concrete coffer dam when the reservoir was low, in order to install a fixed wheel gate at the tunnel's entrance. Once the coffer dam was finished, the tunnel was lined with concrete using two paving mixers moved as close to the point of placement as possible. Once installed, the 30 foot diameter spillway tunnel was closed using a single, fixed wheel steel gate measuring 40-by-44 feet and

weighing 130 tons, and operated by a 114 ton counterweight installed in an operating room above the channel intake. Reconstructing the spillways and reinforcing the piers was performed in conjunction with the tunnel work. All work was finished by November 1937, despite difficulties coordinating the construction with the reservoir's operations. These operations caused delays, material losses, and damages to equipment, which ramped up the finished total to $1.16 million, considerably more than the contractor's bid of $712,000.

Yet all in all it was a success. Horse Mesa Dam's rehabilitation caused the Association to pass 50,000 cfs through the tunnel before opening any of the dam's gates. The newly designed spillways, like at Mormon Flat, allowed water to pass unimpeded. The spillway aprons worked to elevate the falling water so that the abutment walls were saved from erosion. The timing could not have been better. The Association benefited from increased hydropower production on the Salt River with more stored water on the Verde River, and the very wet winter of 1940-1941, where all Salt River dams spilled water, proved the rehabilitation work was worth the effort. All of the dams have continued to perform well in the post-rehabilitation decades, with only minor upgrades and operational maintenance.[1]

Modernization to the Horse Mesa Dam's hydroelectric system occurred in the early 1970s to improve power reliability with the conversion of the three existing generators from 25 to 60 cycle electrical power. Simultaneously, the Association decided to install reversible pump-turbine units to add even more capacity and firm power supplies during high-demand periods. The reversible pump-turbine unit enabled SRP to use water for power generation during peak times and then pump it back into the upper reservoir during lower-usage periods to reuse the water for meeting future peak demands.

The HEFU (Hydro Expansion and Frequency Unification) at Horse Mesa required the reservoir behind the dam to be drawn down before work began. The three existing hydraulic turbines, spiral cases, draft tubes, penstocks and ancillary equipment were rebuilt for service at sixty cycles. Each maintained their capacity of 10,000 kilowatts. The new, 97,000 kilowatt reversible pump turbine facility was also constructed south of the existing power plant. It is served by a 15.6 foot diameter penstock drilled through the dam face. The new penstock was operated using a wheeled gate on the upstream face of the dam.

[1] Text (and historic photos to follow) excerpted primarily from David Introcaso, *Mormon Flat Dam, HAER no. AZ-14* (San Francisco: Historic American Building Survey, 1989). Please see cover document Section I for a more comprehensive bibliography.

United States Department of the Interior
National Park Service

National Register of Historic Places Continuation Sheet

Horse Mesa Dam
Name of Property
Maricopa, AZ
County and State
Salt River Project
Name of multiple listing (if applicable)

Section number 8 Page 4

Current Photographs

Name of Property: Horse Mesa Dam
City or Vicinity: Tortilla Flat
County: Maricopa
State: AZ
Photographers: Jim Bailey, Bureau of Reclamation; Salt River Project
Date Photographed: March 2010; May 2009
Location of Original Digital Files: Bureau of Reclamation, Denver, CO; Salt River Project, Phoenix, AZ
Number of Photographs: 9

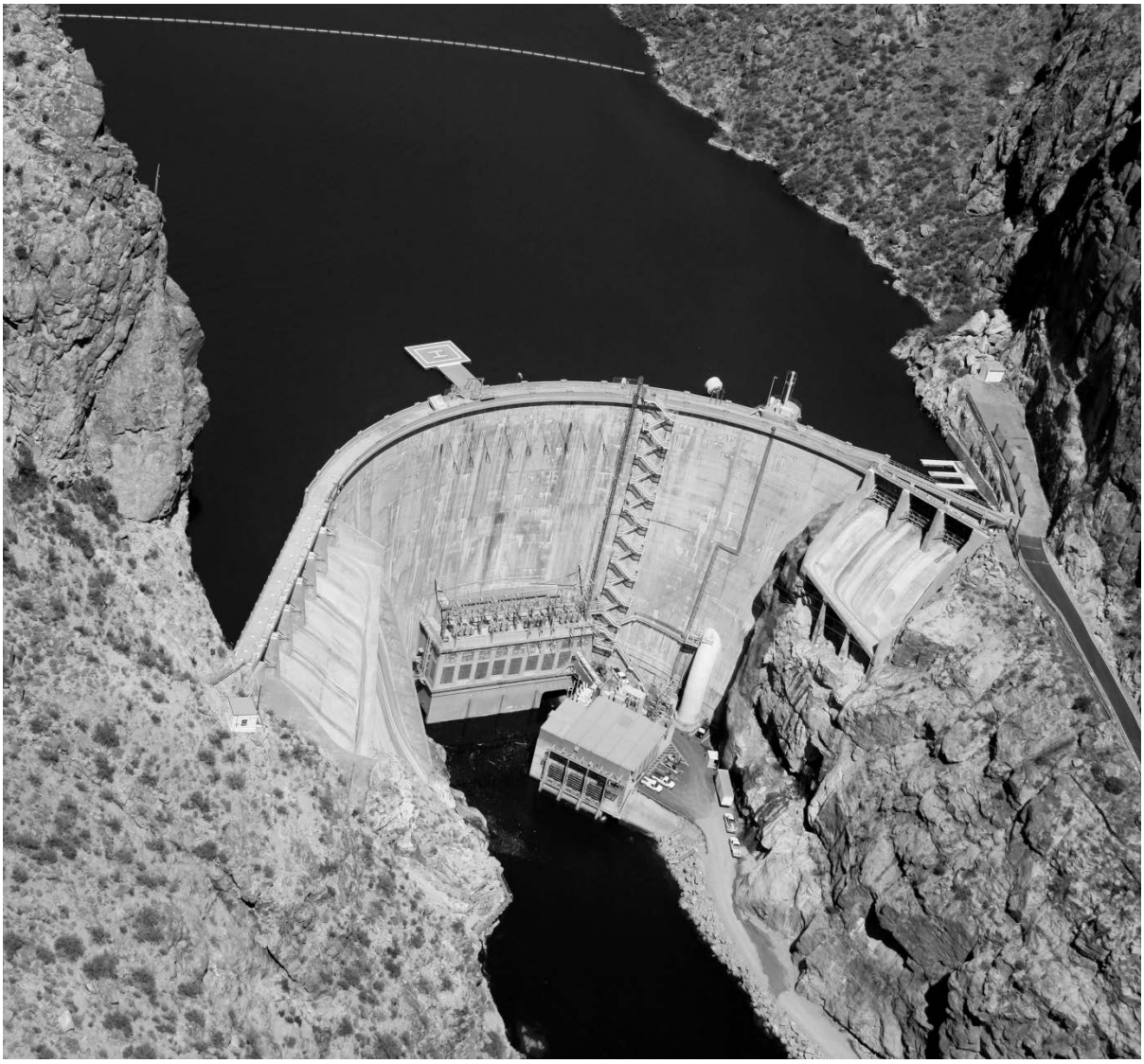

Photo 1: Horse Mesa Dam aerial looking east.

Photo 2: Horse Mesa Dam looking northeast.

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Photo 3: Horse Mesa Dam looking northeast.

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Photo 4: Left spillway looking southeast.

Photo 5: Left spillway from crest looking southeast.

Photo 6: Right spillway looking north.

Photo 7: Powerhouse looking east.

Photo 8: Powerhouse from below.

Photo 9: Spillway outlet tunnel looking northeast.

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Historic Photographs

Name of Property: Horse Mesa Dam
City or Vicinity: Tortilla Flat
County: Maricopa
State: AZ
Photographers: Unknown; Mark Durben, Salt River Project
Date Photographed: 1924, 1926, 1988
Location of Original Digital Files: Salt River Project, Phoenix, AZ
Number of Photographs: 9

Historic Photo 1. Upstream view of the Salt River at Horse Mesa dam site. Photo taken in 1924. Photo courtesy of the SRP.

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Historic Photo 2. View to the right (west side of the future Horse Mesa Dam showing excavation of the stream bed and the river diversion flume in background. Photo taken on April 1926. Photo courtesy of the SRP.

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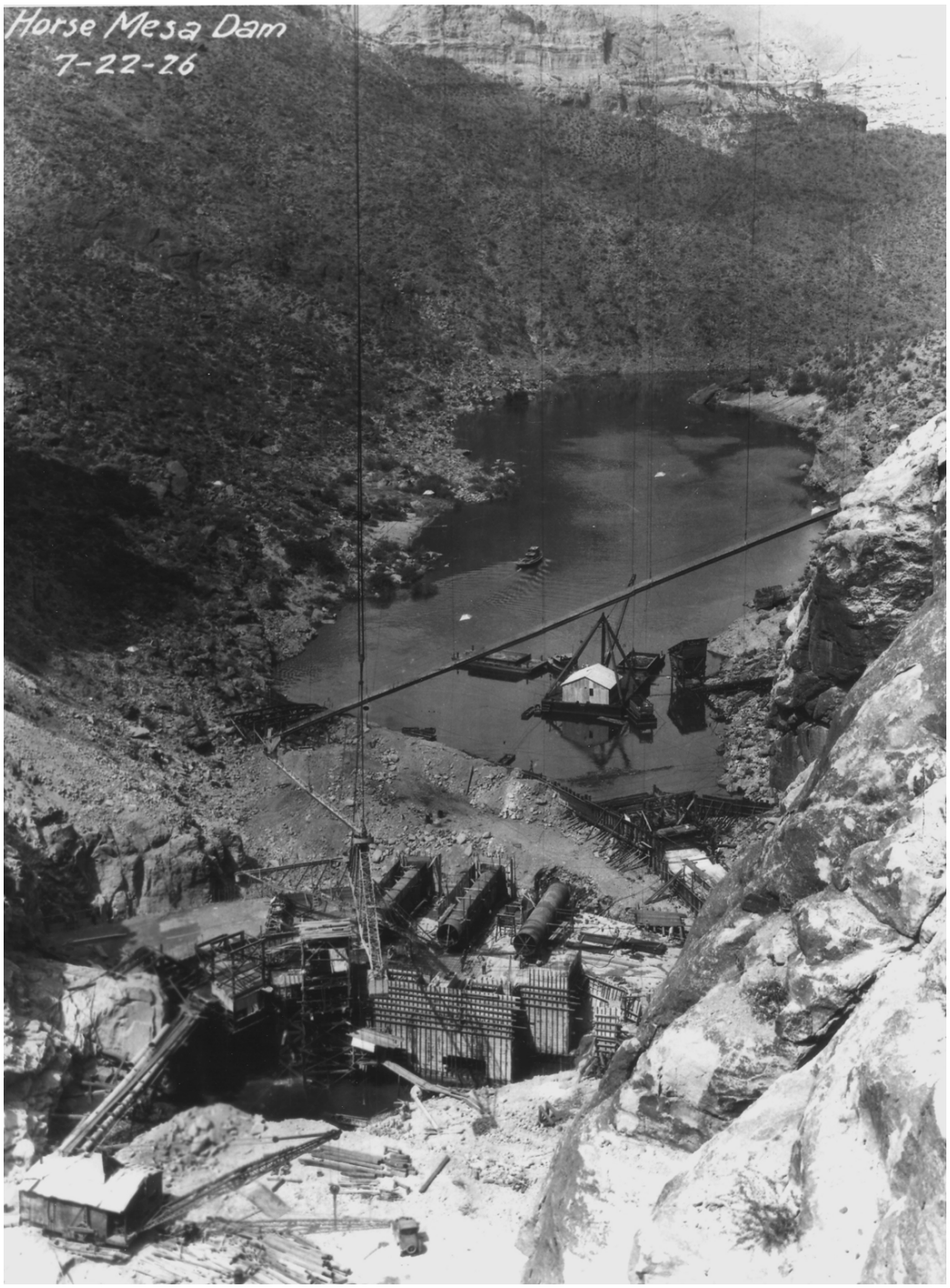

Historic Photo 3. Upstream view of the Horse Mesa Dam under construction. Three penstocks are at center. Aggregate operation is visible above construction site. Photo taken on July 22, 1926. Photo courtesy of the SRP.

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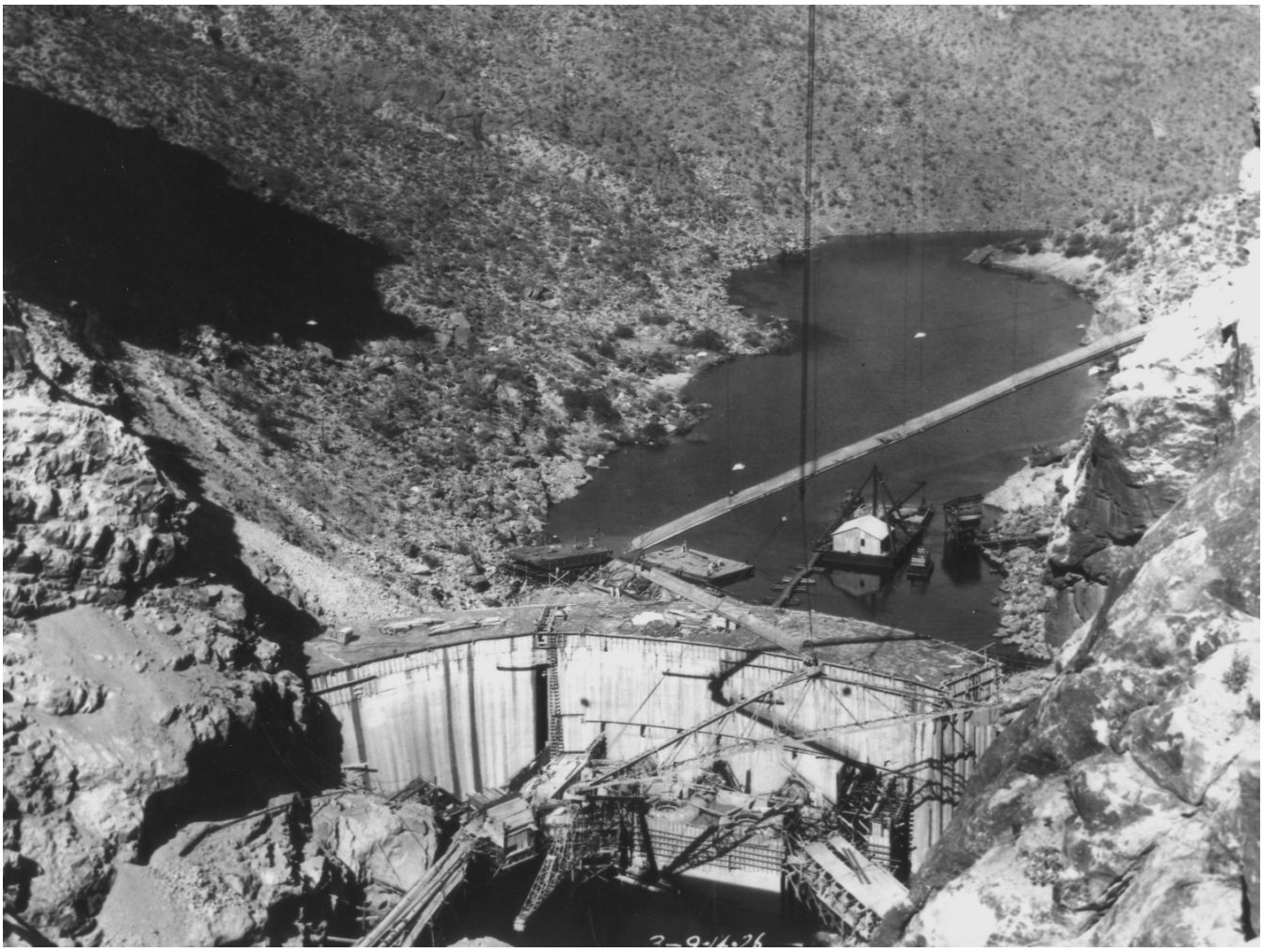
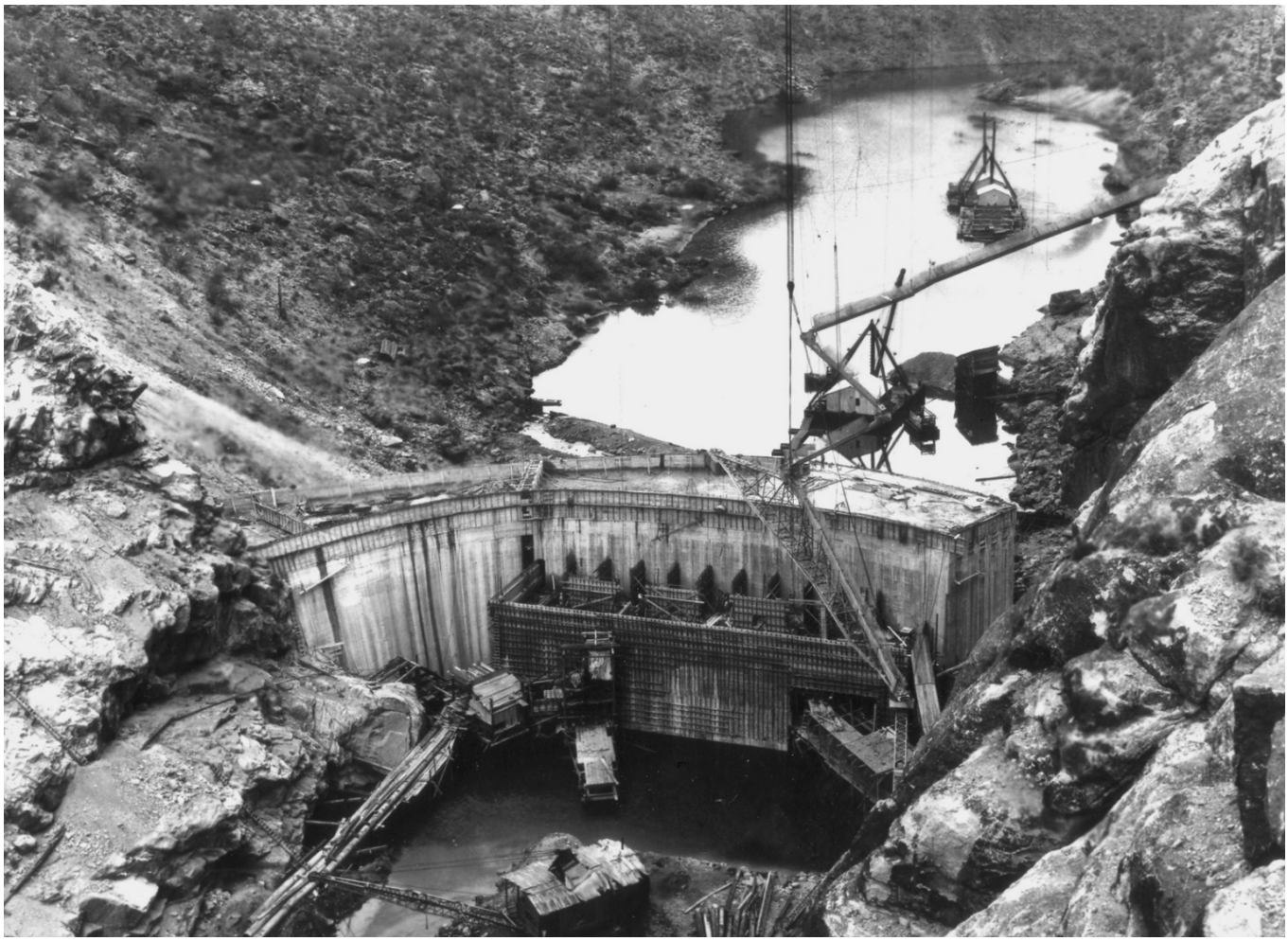


Historic Photo 4. Upstream view of Horse Mesa Dam. Photo taken on September 14, 1926. Photo courtesy of the SRP.



Historic Photo 5. Upstream view of the Horse Mesa Dam and power plant housing. Photo taken on October 2, 1926. Photo courtesy of the SRP.

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Historic Photo 6. Downstream view from the dam site of the northern portion of the northern Horse Mesa Dam construction camp. Photo taken on April 2, 1927. Photo courtesy of the SRP.

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Historic Photo 7. Dam completed except for transformer equipment being installed above the power plant. Photo taken in 1988. Photo courtesy of the SRP.

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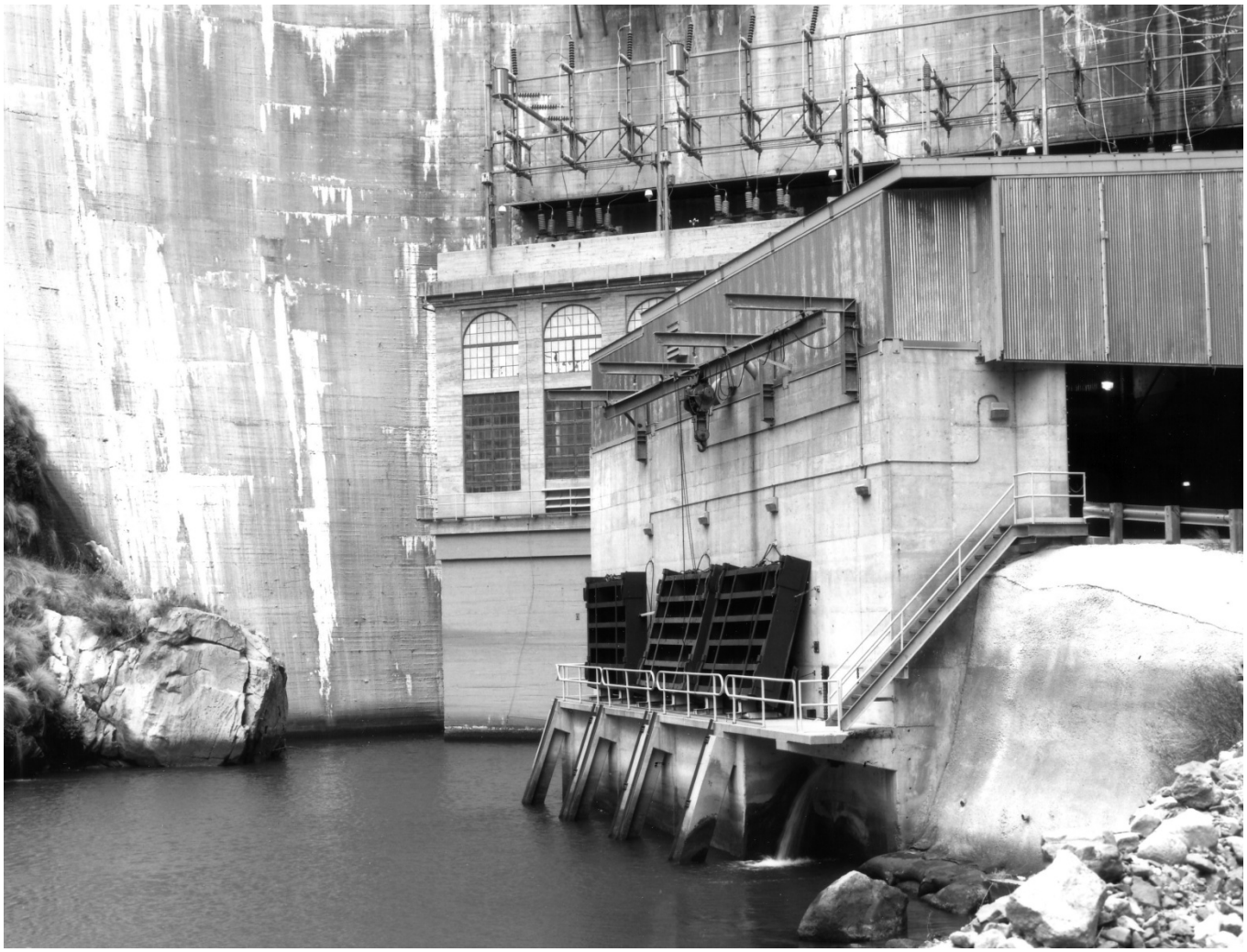

Historic Photo 8. View to the right (west) showing the HEFU turbine unit housing and original power plant of the Horse Mesa Dam. Photo taken in 1988 by Mark Durben. Photo courtesy of the SRP.

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Historic Photo 9. Telephoto view of right (north) spillway taken in 1988. Photo by Mark Durben and courtesy SRP.

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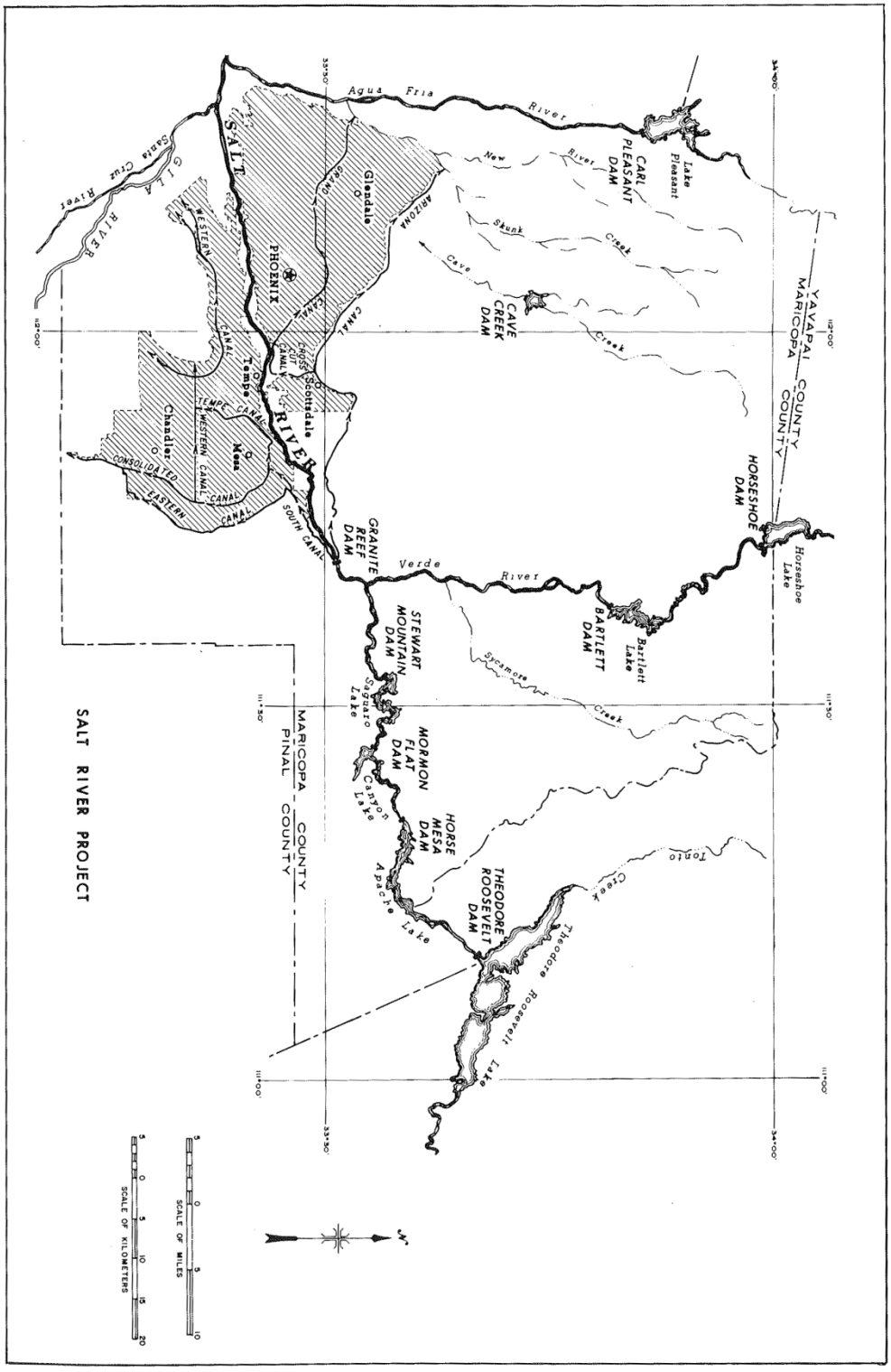

Map 1. Location of dams in the Salt River Project.

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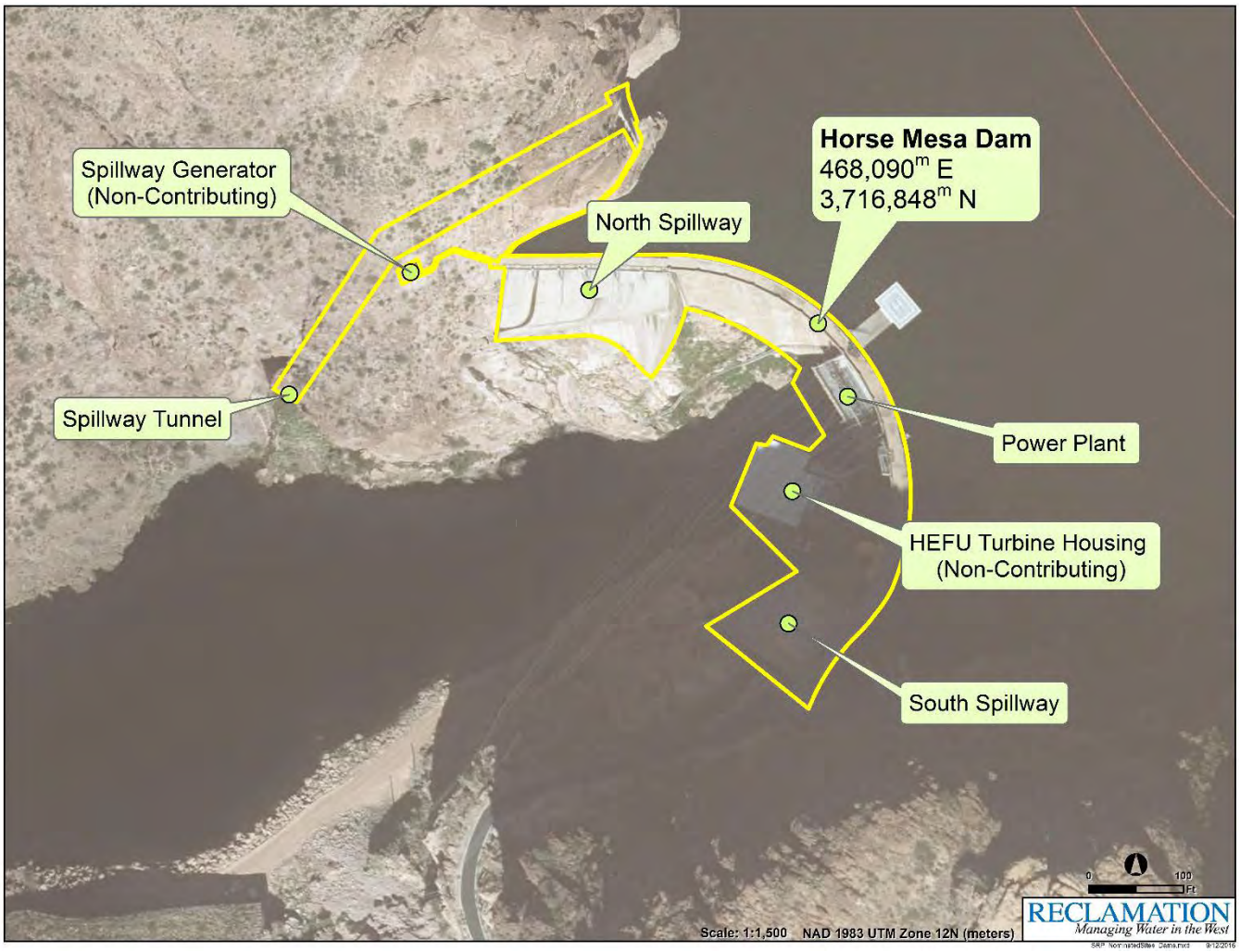
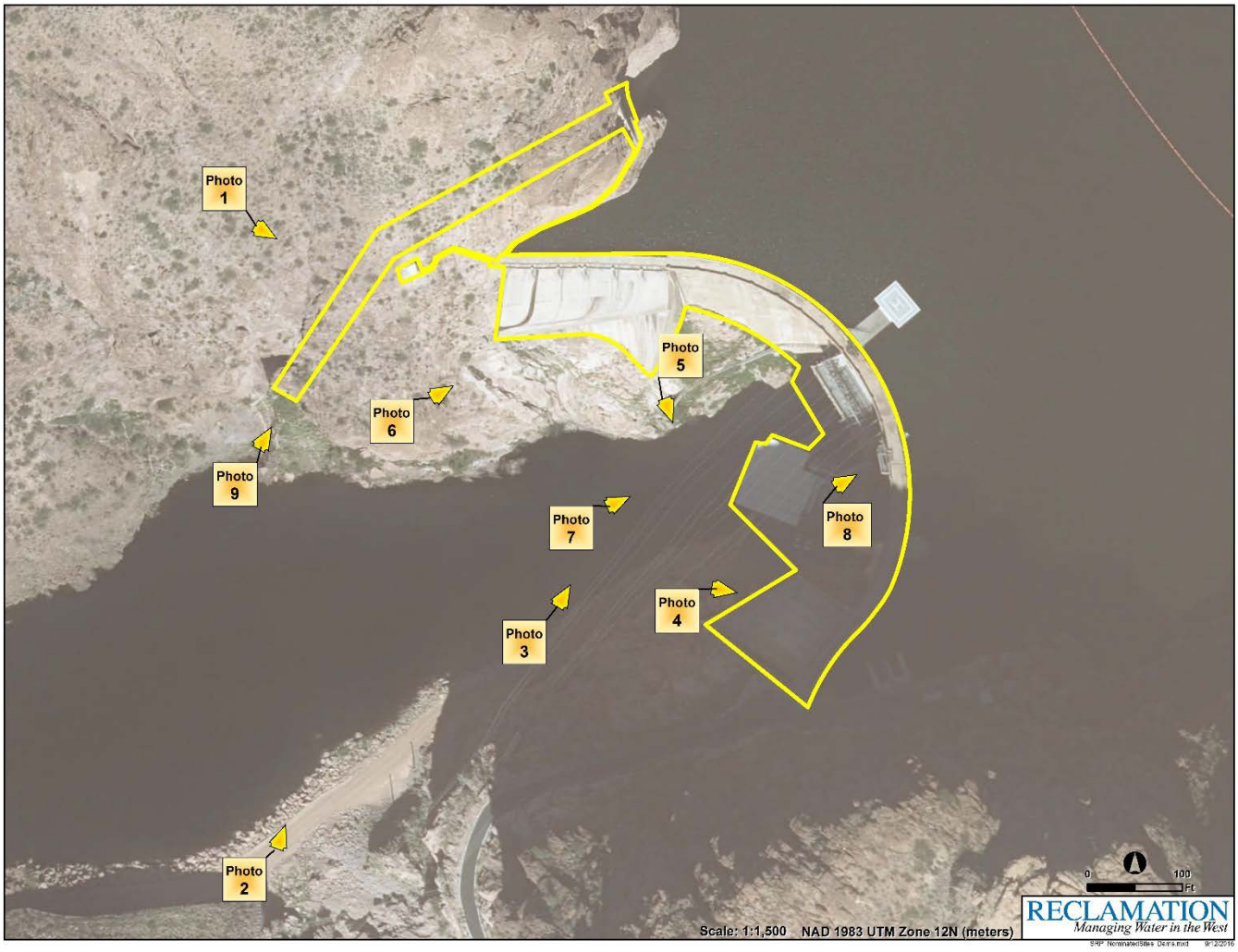


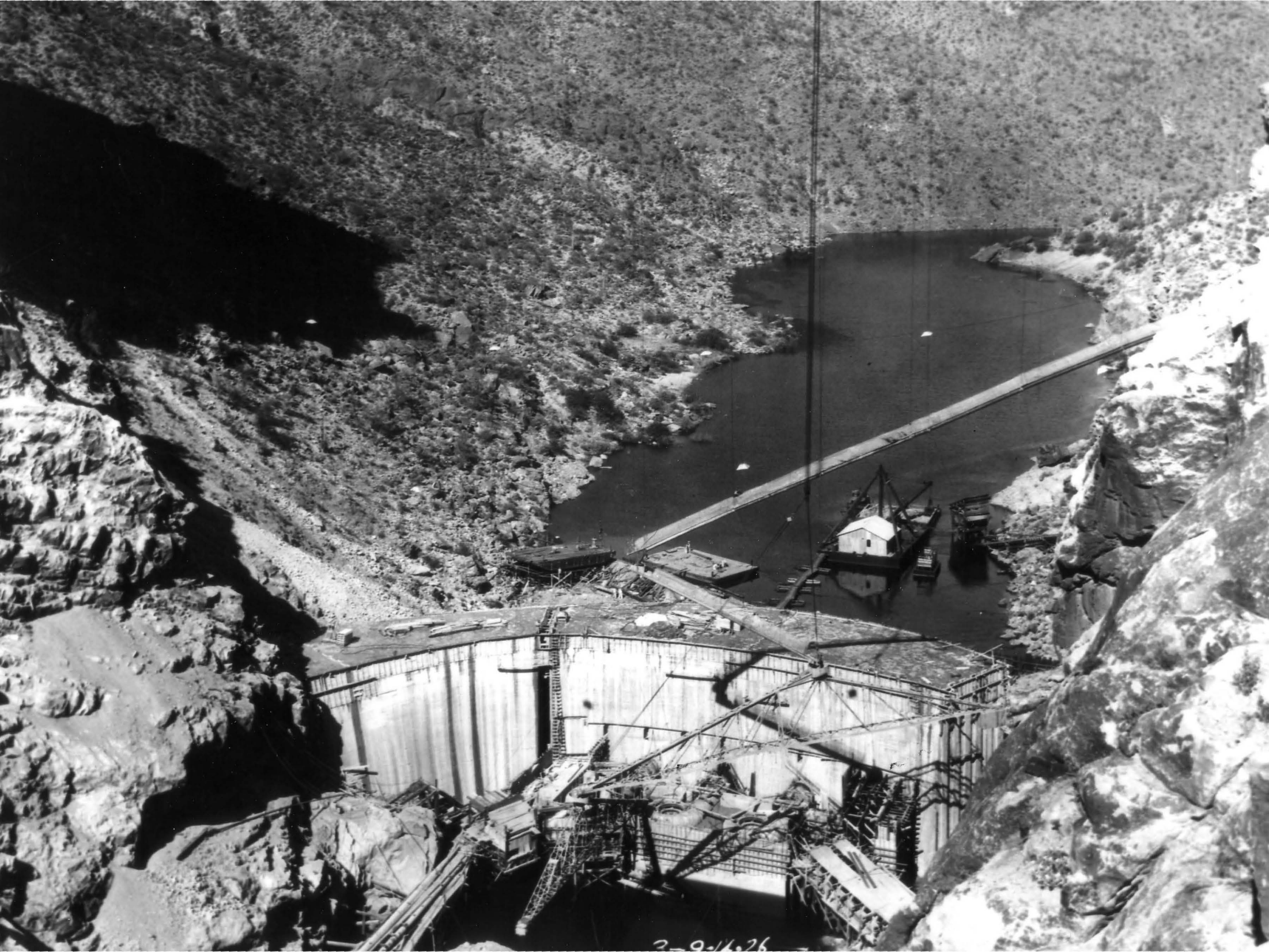
Map 2. Boundaries of contributing and non-contributing structures at Horse Mesa Dam.



Map 3. Horse Mesa Dam showing the orientation of photographs taken by Jim Bailey in 2009 and 2010.


1937


Horse Mesa Dam
7-22-26



UNITED STATES DEPARTMENT OF THE INTERIOR
NATIONAL PARK SERVICE

NATIONAL REGISTER OF HISTORIC PLACES
EVALUATION/RETURN SHEET

Requested Action: Nomination

Property Name: Horse Mesa Dam

Multiple Name: Salt River Project MPS

State & County: ARIZONA, Maricopa

Date Received:	Date of Pending List:	Date of 16th Day:	Date of 45th Day:	Date of Weekly List:
6/23/2017	7/18/2017	8/2/2017	8/7/2017	

Reference number: MP100001408

Nominator: State

Reason For Review:

__X__ Accept _____ Return _____ Reject **8/7/2017** Date

Abstract/Summary Comments: The Horse Mesa Dam is of statewide significance under National Register Criterion A in the areas of Politics/Government, Community Planning and Development, and Engineering. Constructed in 1924-1927, with historic modifications to the spillways in 1936-1937, the variable radius, concrete thin-arch dam is an excellent illustration of the innovative irrigation and municipal water storage infrastructure resources built under the supervision of the Bureau of Reclamation as part of the Salt River Project (SRP)--one of the first five federally sponsored western water projects. Directly commissioned by the Salt River Valley Water Users' Association, the dam represents the Salt River Project's aggressive hydroelectric expansion programs of the post-WWI era in service of hydro-power, irrigation, and municipal supply operations. The resources reflect the Association's design and engineering expertise and growing proficiency in managing the engineering aspects of the SRP. The resource meets the Registration Requirements of the SRP MPS. [While the nomination highlights the resources as good examples of period dam design, Reclamation has determined not to nominate this property under Criterion C at this time.]

Recommendation/ Criteria: Accept National Register Criterion A.

Reviewer Paul Lusignan Discipline Historian

Telephone (202)354-2229 Date 8/7/2017

DOCUMENTATION: see attached comments : No see attached SLR : No

If a nomination is returned to the nomination authority, the nomination is no longer under consideration by the National Park Service.

United States Department of the Interior

BUREAU OF RECLAMATION
P.O. Box 25007
Denver, CO 80225-0007

JUN 20 2017

IN REPLY REFER TO:

84-53000
ENV-3.00

MEMORANDUM

To: J. Paul Loether, Chief, National Register of Historic Places Program, National Park Service, 1201 Eye Street, NW (2280), Washington, DC 20005
Attn: Mr. Paul Lusignan

From: Roseann Gonzales
Director, Policy and Administration

Subject: Nomination of the Salt River Project (Project), Maricopa County, Arizona, as a Multiple Property Listing (MPL) in the National Register of Historic Places (National Register), and Nominations of Associated Properties under the MPL

The Bureau of Reclamation is pleased to nominate the Salt River Project as an MPL on the National Register. We are concurrently individually nominating five associated Project dams, and nominating the Project's diversion and conveyance system as a historic district. The multiple property documentation (MPD) form and associated property registration forms, with supporting information, are attached. All forms are submitted in electronic format on the two enclosed compact disks, with the required hard copy of the original signature sheet for each of the six property nomination forms. In order to provide an original signature for both the Federal Preservation Officer (FPO) and the State Historic Preservation Officer (SHPO), two copies of each signature page is attached. As is also required, I confirm that the enclosed compact disks contain the true and correct nomination forms for the Salt River Project MPD; for the Salt River Project Diversion and Conveyance System Historic District; and for Bartlett Dam, Horse Mesa Dam, Horseshoe Dam, Mormon Flat Dam, and Stewart Mountain Dam.

The nomination forms were submitted for review to the Arizona SHPO and the SHPO signed the forms without comment. In Arizona, the State Review Board does not review Federal nominations. Reclamation provided all seven forms to Maricopa County for review by their Board of Supervisors, who are the chief local elected officials. The 45-day comment period closed on May 25 without Reclamation receiving comment from the County. Although not required for Federal nominations, Reclamation also provided the MPD and historic district forms to the six Certified Local Governments (CLG) established within the greater Phoenix metropolitan area; they were not provided with the dam nomination forms because the Project dams lie outside of the jurisdictional boundary of a GLG. The comment period closed with only the City of Glendale responding to say they had no comment at this time, and that they found the "materials were very well put together."

The Project and the associated properties are important pieces of Western reclamation history. Although some modifications have occurred to keep the structures operational, in large part the nominated properties retain levels of design, materials, workmanship, feeling, and overall integrity sufficient to convey their historic character and function. They demonstrate the historic importance of this irrigation and hydropower system that was instrumental in the transformation of the Phoenix basin into one of the great regional centers of the West.

If you have any questions, please contact Mr. George Herbst, FPO, at 303-445-3311, or gherbst@usbr.gov, or Ms. Lynne MacDonald, cultural resources specialist, at 303-445-3206, or lmacdonald@usbr.gov.

Attachments - 14

cc: Archeologist, Bureau of Reclamation, 500 Fir Street, Boulder City, NV 89006-1470, Attn LC-2633 M. Slaughter
Archeologist, Bureau of Reclamation, 6150 W Thunderbird Road, Glendale AZ 85306-4001 Attn: PXAO-1500 D. Gifford
Supervisory Environmental Protection Specialist, Bureau of Reclamation 6150 W Thunderbird Road, Glendale AZ 85306-4001 Attn: PXAO-1500 S. Heath
Archeologist, Bureau of Reclamation, 6150 W Thunderbird Road, Glendale AZ 85306-4001 Attn: PXAO-1500 L Jelinek,
(all w/o att)