LADM 1130-2-47

SANTA ROSA WASH, ARIZONA

TAT MOMOLIKOT DAM AND LAKE SAINT CLAIR

WATER CONTROL MANUAL

U.S. ARMY ENGINEER DISTRICT, LOS ANGELES

CORPS OF ENGINEERS

DECEMBER 1990

TAT MOMOLIKOT DAM AND LAKE SAINT CLAIR

ARIZONA

PERTINENT DATA

Drainage Basin	Santa Rosa Wash
Drainage area ... sq. mi.	1,780
Reservoir:	
Elevation	
Conservation pool ... ft., m.s.l.	1,509
Flood control pool (spillway crest) ... ft., m.s.l.	1,539
Spillway design surcharge level ... ft., m.s.l.	1,551.2
Area *	
Top of conservation pool ... ac.	2,050
Spillway crest ... ac.	11,790
Top of saddle dikes ... ac.	17,495
Capacity (Gross) *	
Allowance of sediment ... ac.-ft.	40,000
Conservation Pool ... ac.-ft.	19,560
Spillway crest ... ac.-ft.	198,545
Spillway design surcharge level ... ac.-ft.	373,220
Top of saddle dikes ... ac.-ft.	402,420
Main Dam:	
Type	earthfill
Top elevation ... ft., m.s.l.	1,557.5
Maximum height above original streambed ... ft.	75.5
Top length ... ft.	12,440
Top width ... ft.	20
Freeboard ... ft.	6.3
Saddle Dikes:	
Type	earthfill
Top elevation ... ft., m.s.l.	1,552.9
Maximum height above ground	
East dike ... ft.	5.5
West dike ... ft.	4.5
Top length	
East dike ... ft.	1,440
West dike ... ft.	1,195
Top Width ... ft.	12
Freeboard ... ft.	1.7
Spillway (Ungated)	
Type	broadcrested
Control section	trapezoid
Crest length ... ft.	1,000
Crest elevation ... ft., m.s.l.	1,539
Design surcharge ... ft.	12.2
Discharge (Reservoir at design surcharge level) ... c.f.s.	134,240
Conservation Outlet Works (gated)	
Inlet portal (invert elevation) ... ft., m.s.l.	1,485
Exit portal (invert elevation) ... ft., m.s.l.	1,483.85
Conduit length ... ft.	448
Conduit diameter ... ft.	5
Gate size (rectangular) ... inches.	60WX42H
Discharge (gate fully opened and reservoir at El. 1509) ... c.f.s.	200
Flood control outlet works (ungated)	
No flashboards ... ft., m.s.l.	1,509
With all flashboards ... ft., m.s.l.	1,515
Inlet portal (invert elevation) ... ft., m.s.l.	1,509
Exit portal (invert elevation) ... ft., m.s.l.	1,509
Conduit length ... ft.	79.12
Conduit dimensions ... ft.	13WX12H
Discharge (reservoir at spillway crest) ... c.f.s.	4,960
Reservoir design flood	
Duration (inflow) ... days.	5
Total volume ... ac.-ft.	178,000
Inflow peak ... c.f.s.	77,000
Outflow peak ... c.f.s.	4,960
Reduction in peak ... c.f.s.	72,170
Spillway design flood	
Duration (inflow) ... days.	5
Total volume ... ac.-ft.	455,000
Inflow peak ... c.f.s.	280,000
Outflow peak ... c.f.s.	140,600
Reduction in peak ... c.f.s.	139,400

*Based on surveys of 1968 & 1975.

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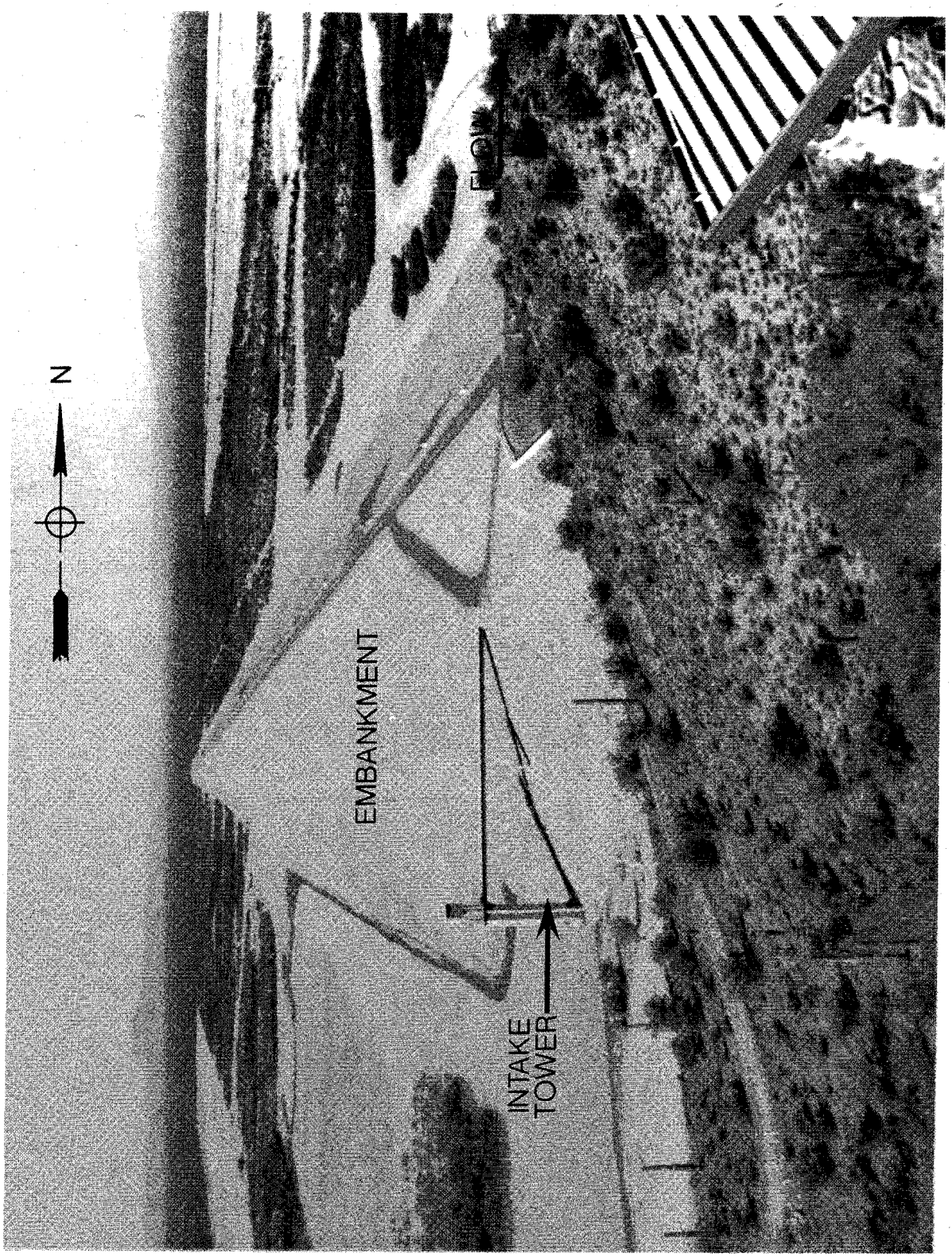
AND
LAKE SAINT CLAIR

WATER CONTROL MANUAL

DECEMBER 1990

U.S ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT
RESERVOIR REGULATION SECTION



TAT MOMOLIKOT DAM

NOTICE TO USERS OF THIS MANUAL

Regulations specify that this Water Control Manual be published in looseleaf form, and only those sections, or parts thereof, requiring changes will be revised and printed. Therefore, this copy should be preserved in good condition so that inserts can be made to keep the manual current.

EMERGENCY REGULATION ASSISTANCE PROCEDURES

In the event that unusual conditions arise, contact can be made by telephone to the U. S. Army Corps of Engineers, Los Angeles District Office during official business hours (0730-1600, Monday through Friday), plus during non-duty periods of flood operations:

Reservoir Regulation Unit (213) 894-4756

WATER CONTROL MANUAL

TAT MOMOLIKOT DAM AND LAKE SAINT CLAIR
SANTA ROSA WASH, ARIZONA

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B	Existing Channel on Santa Rosa Wash
C	Code of Federal Regulations, Title 33, Paragraph 208.11
D	Memorandum of Understanding
E	Finding of No Significant Environmental Impact (FONSI)
F	Chain of Correspondence for Approval of Water Control Manual

ABBREVIATIONS USED

ac-ft	acre-feet or acre-foot
BIA	Bureau of Indian Affairs
cfs	cubic feet per second
COE	United States Army Corps of Engineers
DCP	Data Collection Platform
DRGS	Digital Readout Ground Station
EM	Engineer Manual
ER	Engineer Regulation
ETL	Engineer Technical Letter
ft	feet or foot
GOES	Geostationary Operational Environmental Satellite
LAD	Los Angeles District
MSL	Mean Sea Level
NESDIS	National Environmental Satellite, Data, and Information Service
NGVD	National Geodetic Vertical Datum
NOAA	National Oceanic and Atmospheric Administration
NWS	National Weather Service
QPF	Quantitative Precipitation Forecast
ROC	Reservoir Operations Center
SEED	Safety Evaluation of Existing Dams
SPF	Standard Project Flood
USGS	United States Geological Survey

I - INTRODUCTION

1-01 Authorization. This Water Control Manual for Tat Momolikot Dam was prepared in compliance with regulations and guidelines set forth in the following directives: Engineer Regulation (ER) 1110-2-240, "Engineering and Design, Water Control Management", dated 8 October 1982; Engineer Technical Letter (ETL) 1110-2-251, "Engineering and Design, Preparation of Water Control Manuals", dated 14 March 1980; and Engineer Manual (EM) 1110-2-3600, "Engineering and Design, Management of Water Control Systems", dated 30 November 1987.

1-02 Purpose and Scope. The main purpose of this manual is to provide water control information for day to day use of Tat Momolikot Dam for essentially all foreseeable conditions. It also provides current information on the dam, the drainage area in which Tat Momolikot Dam is located, and the interagency coordination associated with this dam. Physical characteristics, hydrologic information, and structural details are provided. Because they do not apply to Tat Momolikot Dam, this manual does not address the issues of hydroelectric power generation or navigation. Watershed hydrologic characteristics preclude any application of hydroelectric power generation or navigation.

1-03 Related Manual and Reports. Manuals and reports with data relevant to the regulations in this manual are listed in Table 1-01.

1-04 Project Owner. Tat Momolikot Dam is under the jurisdiction of and is administered by the Bureau of Indian Affairs, as approved by the Secretary of the Interior and the Secretary of the Army.

1-05 Operating Agencies.

a. Bureau of Indian Affairs (BIA). The BIA is responsible for the operation and maintenance of the dam, reservoir, and intake and outake works.

b. Corps of Engineers (COE). The COE has agreed to assist the BIA in the operation of the dam, if asked, and in the collection of hydrologic data.

1-06 Regulating Agencies. A list of agencies together with a brief explanation of their functions related to reservoir operations are given in the following subparagraphs.

a. Bureau of Indian Affairs. This agency is responsible for the operation and maintenance of the project. They have agreed to report local storm and flood conditions to the Corps of Engineers.

b. Tohono O'odham Indian Tribe. The Tohono O'odham (referred to hereafter as O'odham and formerly known as the Papago) Tribal Council furnished to the Federal Government the rights to those lands required for the construction of Tat Momolikot Dam. They also guaranteed public access to the project lands and water areas for recreation and fish and wildlife purposes. All monetary benefits (less operation, maintenance, and

replacement costs) from operation of the project for uses other than flood control would accrue to the O'odham Indian Tribe.

c. Department of the Interior. The Department of the Interior is responsible for the adjustment of all claims arising from the construction, operation, repair, maintenance, and periodic inspection of the project for purposes other than flood control. They are also responsible for the establishment and enforcement of floodway limits and regulations and for performing necessary work on the Santa Rosa Wash through the Papago, Maricopa, and Gila River Indian Reservations downstream from the dam to maintain the hydraulic capacity of the existing channel. See the Memorandum of Understanding (Exhibit D) for details.

d. Corps of Engineers. Tat Momolikot Dam was designed and constructed by the COE. The Corps has agreed to assist the BIA in the operation of the dam and in the collection of hydrologic data.

e. U. S. Geological Survey (USGS). This agency measured streamflow below the dam on the Santa Rosa Wash near Cockleburr stream gaging station from 1954 to 1980. The gage has been discontinued.

f. Pinal County. The Pinal County Board of Supervisors is the agency responsible for local cooperation. They adopted Resolution No. 111069 on November 10, 1969, in which they agreed to: (a) hold and save the United States free from damages (downstream from the Papago Indian Reservation) arising from construction, maintenance and operation of the works for flood control and (b) hold and save the United States free from all damages arising from water-rights' claims resulting from construction, maintenance, and operation of the project for flood control.

g. Independent Flood Control Districts. The Maricopa, Midway, and Stanfield Flood Control Districts have been established by the state downstream of Tat Momolikot Dam. The flood control districts are responsible for establishing and enforcing floodway limits and regulations for Santa Rosa Wash from the north boundary of the Papago Indian Reservation to Santa Cruz River (excluding Indian land) and maintaining the existing hydraulic capacity of the existing channel.

h. National Weather Service (NWS). The National Weather Service office at Phoenix, Arizona will provide, upon request, weather forecasts and climatological reports for the region in which the project is located.

Table 1-01. Previously Issued Publications.
(Chronological Listing)

Title	Date
Vaiva Vo Irrigation Project, a feature of the Santa Rosa Wash Multiple Purpose Project, Papago Indian Reservation, Arizona, Bureau of Indian Affairs	March 1963
Interim Report on Survey for Flood Control, Santa Rosa Wash, Arizona, U. S. Army Corps of Engineers	Aug. 1963
Design Memorandum No. 1, Hydrology for Santa Rosa Wash (Tat Momolikot Dam and Lake St. Clair), U. S. Army Corps of Engineers	April 1969
Design Memorandum No. 3, Real Estate for Santa Rosa Wash (Tat Momolikot Dam and Lake St. Clair), U. S. Army Corps of Engineers	Nov. 1970
Design Memorandum No. 2, General Design for Santa Rosa Wash (Tat Momolikot Dam and Lake St. Clair), U. S. Army Corps of Engineers	April 1971
Tat Momolikot Dam, Gila River Basin, Santa Rosa Wash, Arizona, Dam, Outlet Works and Spillway Periodic Inspection Report No. 1, U. S. Army Corps of Engineers	Nov. 1974
Tat Momolikot Dam, Gila River Basin, Santa Rosa Wash, Arizona, Dam, Outlet Works and Spillway Periodic Inspection Report No. 2, U. S. Army Corps of Engineers	Oct. 1975
Tat Momolikot Dam, Gila River Basin, Santa Rosa Wash, Arizona, Dam, Outlet Works and Spillway Periodic Inspection Report No. 3, U. S. Army Corps of Engineers	Dec. 1976
Santa Rosa Wash, Arizona, Tat Momolikot Dam and Lake Saint Clair, Reservoir Regulation Manual, U. S. Army Corps of Engineers	Jan. 1977 Revised Sept. 1984
Safety Evaluation of Existing Dams Report on Tat Momolikot Dam, Bureau of Indian Affairs, Phoenix Area, Papago Agency, Arizona, Bureau of Reclamation, Division of Dam Safety	Dec. 1983
Safety Evaluation of Existing Dams Report on Tat Momolikot Dam, Bureau of Indian Affairs, Phoenix Area, Papago Agency, Arizona, Bureau of Reclamation, Division of Dam Safety	Oct. 1988

II - DESCRIPTION OF PROJECT

2-01 Location. Tat Momolikot Dam is located on the Papago Indian Reservation in Pinal County, Arizona. The dam is about 65 miles south of Phoenix, 60 miles northwest of Tuscon, and 20 miles south of Casa Grande. Indian Highway 15 can be taken from Casa Grande to its intersection with the dam's access road. The access road extends about 3-3/4 miles to the dam. The project location is shown on Plate 2-01.

2-02 Purpose. Tat Momolikot Dam was constructed as a multiple-purpose reservoir project. The project was built to provide (a) protection against floods to downstream lands and improvements, (b) water conservation storage, (c) for development of irrigable lands, and (d) recreation and fish and wildlife facilities. The dam provides partial flood protection to development in the overflow area, which for the standard project flood would extend to Santa Cruz Wash, about 33 miles to the north, covering 57,000 acres, as shown on Plate 2-02. The water in the conservation pool was to be used for irrigation and for ground water recharge. Water related recreation was also to be set up. Some of the other recreational activities were to include fishing in the fish ponds downstream of the dam, hunting animals attracted to the water in the reservoir, and picnicing. Area redevelopment was to occur because of the increased jobs due to the operation and maintenance of the project.

2-03 Physical Components. The Tat Momolikot Dam project consists of a compacted-earthfill embankment, a reservoir area, flood-control outlet works, water conservation outlet works, several detached dikes, a detached concrete spillway, pits for fish ponds, an overlook area, and two new roads. The components of Tat Momolikot Dam are shown on the site plan on Plate 2-03. They include:

a. Main Dam. The main dam is a compacted-earthfill embankment with a crest length of 12,440 feet (ft) and a crest width of 20 ft. The longitudinal profile of the crest is cambered with a maximum elevation of 1,559.5 ft mean sea level (MSL) near the center and a minimum elevation of 1,557.5 ft MSL at either end. The elevation difference is due to a pipe running over the top of the dam that was used to carry pumped water over the dam from a well within the reservoir to the farm. The road along the dam crest has been raised to go over this pipe. See Photo 2-01. The maximum height above the original streambed is 75.5 ft. The slope of the downstream face is 1 vertical on 2.5 horizontal. The upstream face has a slope of 1 vertical on 3 horizontal above elevation 1,502.4 ft MSL; a slope of 1 vertical on 10 horizontal between elevations 1,492 and 1,502.4 ft MSL; and a slope of 1 vertical on 5 horizontal below elevation 1,492 ft MSL. The upstream slope protection consists of a 1.5 ft layer of facing stone placed on 0.5 ft of bedding material and extends from elevation 1,502.4 ft MSL to the top of the dam. A 1-foot-thick stone facing is provided on the downstream slope for erosion protection. The embankment is composed of random fill with a 12-ft layer of select fill along the upstream slope. A 10-ft wide central vertical sand drain extends from streambed to elevation 1,509 ft MSL. The sand drain would discharge through a downstream, 5-ft-

thick horizontal blanket, composed of layers of sand and gravel. The dam's east abutment is a natural hillside. The west end of the dam daylights into the sloping valley floor. The top of the dam is surfaced with a 12-ft-wide asphalt pavement and has 5 equally-spaced turnarounds. A 15-ft-wide asphalt ramp provides access to the conservation outlet tower bridge from the crest road. The main dam is shown on Plate 2-04 and in Photo 2-02.

b. Outlying Dikes. Four dikes are located apart from the main dam. Two are saddle dikes to the east of the main dam. A third dike surrounds the Tat Momoli cemetery and a fourth dike protects the village of Tat Momoli.

(1) Saddle Dikes. Two dikes are located on the eastern edge of the reservoir about five and six miles due east from the dam. The dikes are compacted, homogeneous earthfill structures with crest lengths of 1,440 ft and 1,195 ft, crest widths of 12 ft, crest elevations of 1,552.9 ft MSL and maximum heights of 4.5 ft and 5.5 ft, respectively. Both dikes are completely covered by a 1-foot layer of stone. The upstream and downstream slopes of both dikes are 1 vertical on 2.25 horizontal. The saddle dikes were constructed so that the spillway design flood would travel over the spillway and not flow through the passes into the adjacent valley. For floods larger than the spillway design flood, flows will overtop the saddle dikes before overtopping the main embankment. The saddle dikes were constructed with a crest elevation 4.6 feet lower than that of the main embankment in order to achiefve this sequence of overtopping. The saddle dikes are shown on Plate 2-12.

(2) Cemetery Dike. The cemetery dike is a compacted-earthfill embankment with a crest width of 12 ft and side slopes of 1 vertical on 2.25 horizontal. The dike consists of random fill and is entirely surfaced by a 1-ft thick layer of stone. This dike completely surrounds the cemetery which is located in the reservoir area. The dike has a maximum height of 3 ft and has a crest elevation of 1,539 ft MSL. A ramp with a 6-inch-thick aggregate surface provides access over the dike. A 24-inch diameter corrugated metal pipe with a downstream flap gate provides drainage through the dike. Floods greater than the reservoir design flood would cause the reservoir to inundate the cemetery. The cemetery dike is shown on Plate 2-12 and in Photo 2-03.

(3) Village Dike. A horseshoe shaped dike protects the new Tat Momoli Village from reservoir waters. The village is located about 4 miles southeast of the outlet works on the perimeter of the design reservoir. The old village in the reservoir area has been abandoned. The village dike is identical in structure and elevation to the cemetery dike, however, it reaches a maximum height of six feet. The village dike also has an access ramp and a drainage culvert that are similar to those built at the cemetery dike. Floods greater than the reservoir design flood would cause the reservoir to inundate the new Tat Momoli Village. The village dike is shown on Plate 2-12 and in Photo 2-04.

c. Reservoir Area. Tat Momolikot Dam backs up a reservoir about three miles long and five miles wide. At the spillway crest (elevation 1,539 ft MSL), the reservoir covers an area of 11,790 acres and has a gross capacity of 198,547 acre-feet (ac-ft). At the top of the saddle dikes (elevation

1,552.9 ft MSL), the reservoir has an area of 17,495 acres and a gross capacity of 402,421 ac-ft, which includes a 40,000 ac-ft allowance for sedimentation. The allotted sediment-storage volume of 40,000 ac-ft in the reservoir was determined in a study based on silt-accumulation rates in existing reservoirs in the southwest United States. From this study the average annual silting rate was established at about 0.2 ac-ft per square mile. The distribution of the sediment deposit was assumed to vary in proportion to the reservoir area up to the spillway crest elevation of 1,539 ft MSL. Gross capacity is the total volume in the reservoir below a particular elevation, whereas net capacity or flood control capacity is the gross capacity minus the sediment volume predicted to accumulate below this particular elevation. The reservoir limits are shown on Plate 2-03. Area and capacity curves based on the survey of 1968 and 1975 are shown on Plate 2-05. This information is also tabulated in Table 2-01. A summary of the reservoir's storage allocation is shown on Plate 2-06.

d. Water Conservation Outlet Works. The outlet works for the water conservation pool is located along the east abutment of the main dam. Plate 2-13 illustrates the water conservation outlet works. Discharge rating curves for full and partial gate openings are shown on Plates 2-14 and 2-15. Major components of the water conservation outlet works are described below.

(1) Intake Tower. The intake tower is a reinforced concrete structure of square cross section, about 8 ft by 8 ft and is about 73 ft in height. The tower supports three external 42-inch-square slide gates. The gates, with intake elevations of 1,485 ft MSL and 1,493 ft MSL are on the south wall. The third gate with an intake elevation of 1,501 ft MSL is on the west wall. Trash racks protect the three external gates from debris blockage. The gates are shown on Photo 2-05. An internal 60-inch-wide by 42-inch-high gate regulates flow from inside the tower into the outlet conduit. A 12-inch-diameter air vent is provided immediately below the internal gate. All of the gates are operated by hand cranks located on the operating platform. The operating platform is at elevation 1,539 ft MSL. Access to the operating platform is by a bridge that has two 75-foot spans and a five foot walkway that leads to the main dam. The instrument house, located atop the outlet tower, has a floor elevation of 1549.5 ft MSL. The instrument house is reached by ladder from the operating platform. The outlet tower is illustrated on Plate 2-16 and in Photo 2-06.

(2) Conduit. The reinforced concrete conduit is 5 ft in diameter and 448 ft long. The first 10 ft of the conduit transitions from a 5-ft-square section to a five-foot-diameter section. Invert elevations in the conduit range from 1,485 ft MSL at the intake to 1,483.85 ft MSL at the exit. The invert slope is 0.0025. The conduit is shown on Plate 2-16.

(3) Outlet Channel. The reinforced concrete outlet channel is a 5-foot-wide rectangular section that extends 78 ft beyond the conduit is at a slope of 0.0025. The outlet channel is shown on Plate 2-16 and on Photo 2-07.

Table 2-01

AREA AND GROSS CAPACITY - TAT MOMOLIKOT DAM

Elevation Feet Above mean sea level	Capacity Acre-feet	Area Acres	Elevation Feet Above mean sea level	Capacity Acre-feet	Area Acres
1,480	0	0	1,519	48,847	3,902
1,481	5	8	1,520	52,850	4,115
1,482	17	14	1,521	57,077	4,348
1,483	34	20	1,522	61,547	4,592
1,484	58	27	1,523	66,262	4,837
1,485	87	37	1,524	71,221	5,081
1,486	133	58	1,525	76,424	5,392
1,487	204	84	1,526	82,006	5,838
1,488	301	110	1,527	88,100	6,351
1,489	424	136	1,528	94,709	6,865
1,490	573	172	1,529	101,830	7,378
1,491	769	229	1,530	109,465	7,877
1,492	1,032	297	1,531	117,584	8,347
1,493	1,363	365	1,532	126,160	8,803
1,494	1,761	432	1,533	135,191	9,260
1,495	2,227	508	1,534	144,678	9,716
1,496	2,778	602	1,535	154,622	10,160
1,497	3,432	705	1,536	164,996	10,575
1,498	4,188	807	1,537	175,775	10,980
1,499	5,046	909	1,538	186,958	11,385
1,500	6,006	1,012	**1,539	198,547	11,790
1,501	7,070	1,117	1,540	210,540	12,195
1,502	8,240	1,223	1,541	222,940	12,605
1,503	9,516	1,328	1,542	235,750	13,015
1,504	10,897	1,433	1,543	248,968	13,420
1,505	12,383	1,544	1,544	262,596	13,830
1,506	13,986	1,667	1,545	276,633	14,245
1,507	15,717	1,795	1,546	291,091	14,675
1,508	17,576	1,922	1,547	305,983	15,110
*1,509	19,562	2,050	1,548	321,308	15,540
1,510	21,676	2,192	1,549	337,068	15,975
1,511	23,946	2,361	1,550	353,261	16,395
1,512	26,399	2,544	1,551	369,857	16,780
1,513	29,034	2,727	1,552	386,828	17,160
1,514	31,853	2,910	1,553	404,172	17,530
1,515	34,855	3,098	1,554	421,890	17,905
1,516	38,050	3,296	1,555	439,982	18,295
1,517	41,447	3,498	1,556	458,483	18,720
1,518	45,046	3,700	1,557	477,427	19,170
			***1,557.5	487,066	19,400

NOTE: Table from computed elevation vs. storage tables based on surveys of July 1968 and October 1975. Table revised in September 1984.
* Conservation Pool, ** Spillway Crest, *** Top of Dam

(4) Stilling Basin. The 77-ft-long stilling basin is located immediately below the outlet channel. The stilling basin dissipates energy from high velocity discharges leaving the outlet channel. Energy is dissipated by the formation of a hydraulic jump. A diversion gate in the west wall of the stilling basin is used to divert water into the Vaiva Vo Irrigation Project. See Photo 2-08. Major components of the stilling basin include a parabolic invert drop, a transition for channel expansion, an 8-ft-high by 10-ft-wide radial gate and a 42-inch-square diversion gate. Both gates can be operated by hand crank. The diversion gate will be used for delivery of water to the Vaiva Vo Irrigation Project. The radial gate is used for creating a head behind the diversion gate and for supplementing flood releases. It can be seen on Photo 2-09. The stilling basin is shown on Plate 2-16.

(5) Auxiliary Outlet Channel. Water not diverted to the Vaiva Vo Irrigation Project can be discharged by opening the radial gate at the downstream end of the stilling basin. A discharge rating curve for this gate is shown on Plate 2-17. This water will flow into the auxiliary outlet channel, which empties into Santa Rosa Wash. The 700-ft-long auxiliary outlet channel has a trapezoidal cross section as shown on Plate 2-16. The invert slope is 0.0025.

e. Flood Control Outlet Works. The flood control outlet works is located in the spillway at the northeast edge of the reservoir. A plan and profile of the outlet works is shown on Plate 2-07, and the discharge rating curve is shown on Plate 2-08. Major components of the outlet works are described below.

(1) Approach Channel. The approach channel directs flow from the flood control pool into the outlet conduit. The approach channel consists of an excavated earth channel leading to a concrete section at the outlet conduit. A 13-ft-wide rectangular concrete channel extends about 60 ft upstream from the outlet conduit. Grooves in the channel walls permit the installation of 12-six-inch-high metal stop logs. Stop logs would function to block outflow and thus raise the conservation pool to a maximum elevation of 1,515 ft MSL. The vertical channel walls project upstream to meet the trapezoidal approach channel. The unlined portion of the trapezoidal channel has a base width of 13 ft, side slopes of 1 vertical on 2 horizontal and a length of about 1,000 ft. The entire approach channel is on an adverse slope of 0.002 and serves to train flow from the reservoir into the outlet conduit. The approach channel is shown on Plate 2-07 and in Photo 2-10.

(2) Conduit. The conduit is an ungated reinforced concrete structure, rectangular in section, 12-ft-high by 13-ft-wide and 79.12 ft long. At the upstream end of the outlet conduit, the roof forms a 20-ft-long, curved transition. The conduit's invert is horizontal at elevation 1,509 ft MSL. This invert elevation permits the formation of a 19,560 ac-ft reservoir that can be evacuated through the water conservation outlet works. The conduit is shown on Plate 2-09 and in Photo 2-11.

(3) Outlet Channel. The walls of the 13-ft-wide rectangular conduit extend about 43 ft downstream from the spillway side slope into the

trapezoidal outlet channel. The trapezoidal channel has a 13-ft base width, 1 vertical on 2 horizontal side slopes, concrete lining, and a length of about 310 ft to station 35+00. In this reach, the channel's bottom has a battery of 9-inch-high dentates that will reduce energy from the high velocity discharges emerging from the conduit, as shown on Plate 2-09. Between station 35+00 and station 41+00, the trapezoidal outlet channel has a base width of 16 ft, side slopes of 1 vertical on 2 horizontal, and has a grouted stone protection on the west bank. Between station 41+00 and station 67+10 a single unlined levee forms the channel's west bank. Rising ground forms the channel's east bank. The outlet channel is shown on Plates 2-07 and 2-09 and in Photos 2-12 through 2-14.

f. Spillway. A detached broadcrested spillway with a crest elevation of 1,539 ft MSL and a crest length of 1,000 ft is located in a saddle about one-half mile east of the right abutment of the dam. The spillway cross section is trapezoidal with side slopes of 2 vertical on 1 horizontal formed by a concrete sill. The spillway crest is atop a concrete lined embankment. The concrete lining is 1-ft thick and is keyed into bedrock on the downstream slope. This embankment has upstream and downstream slopes of 1 vertical on 2.25 horizontal. The crest is 22 ft wide, paved, and serves as an access road to the dam. The upstream toe has an 18 inch layer of stone and the downstream toe has two rows of dentates, that will dissipate energy from spillway flow. The dentates are covered with backfill that will quickly be washed away by spillway flows. The ungated flood control outlet works passes directly through the spillway embankment. A sand and gravel drain underlies the concrete surfacing. The spillway plan and profile are shown on Plate 2-10. The spillway can be seen in Photo 2-15. Plate 2-11 shows the spillway discharge rating curve.

g. Fish Ponds. Four borrow pits, 700 ft downstream from the dam, were to be utilized as settling basins to clarify water to be injected into the groundwater by recharge wells. The borrow pits were also designated to be used as fish ponds, however, due to lack of surplus water, they have never been filled and maintained. The fish ponds were excavated with side slopes of 1 on 1 to a bottom elevation of 1,468 ft MSL. Depths range from 12 ft to 22 ft. The surface area would be about 50 acres. The fish ponds were to be supplied with water from the conservation outlet works and from the wells. The U.S. Fish and Wildlife Service was to propagate fish in these ponds. The original plan of the ponds is shown on Plate 2-18.

h. Overlook Area. The overlook area is on the hill just east of the right abutment of the dam. The area includes a 1,200 ft-long road, a parking area for nine cars, rest rooms, an overlook structure, a lookout point, and connecting footpaths. A plan view of the overlook area is shown on Plate 2-19.

i. Access Road. Access to the project is provided by a paved road about 3-3/4 miles in length which extends from Indian Highway Route 15 to the dam. The road consists of two 11-ft asphalt lanes with 3-ft shoulders and necessary culverts. The access road drainage system was designed for the 50-year-frequency storm. The access road is shown on Plates 2-20 and 2-21.

j. Village Road. Access from Indian Highway Route 15 to Tat Momoli Village and to the cemetery is provided by the village road. The road has a 20-ft-wide driving surface made of aggregate. It includes pertinent drainage structures such as culverts and drainage ditches.

2-04 Related Control Facilities. Downstream of the dam, the Tohono O'odham Farm's irrigation system consists of a main supply canal, a pumping plant, eleven turnout structures, concrete pipe laterals, risers, a concrete-lined ditch lateral, and 13 wells which can supply over 1500 acres with water for agriculture. Presently the irrigation project is farming 800 acres and has an average annual water consumption of 4000 - 4800 ac-ft. When water is released from the dam, the main supply canal receives irrigation water from the gated outlet conduit. The canal length is approximately 7 miles and within this 7 miles, 11 turnout structures supply water to laterals located every 1/2-mile along the east side of the canal. Risers are provided to distribute irrigation water to individual field border strips. During periods of low or no flow from the reservoir, wells located along the main canal and laterals discharge pumped water directly into the canal or laterals. See Photo 2-16. The farm has been relying on well water to irrigate the fields, due to low levels in the conservation pool. The ground water for the well field has been stable with runoff to the reservoir recharging the ground water aquifer.

2-05 Real Estate Acquisition. On 22 July 1975 the Tohono O'odham Council passed a resolution that accepted the sum of $349,215 as full compensation for the 9,000.92 acres of flowage easements associated with the flood control portion of the project. However, since its construction, Tat Momolikot Dam has not provided the recreational benefits that the Tribe envisioned, so they sought compensation for all easements required for the project in addition to those required for flood control. In October 1986, the United States Congress awarded the O'odham Indians a settlement of $6,000,000 as fair and equitable compensation for the rights to the lands required for the construction of the dam and its reservoir. The Tohono O'odham Tat Momolikot Dam Settlement Act is Public Law 99-469 [H.R. 4217]; October 14, 1986.

2-06 Public Facilities. At present, no public facilities have been developed at the project except for the overlook area. The BIA may construct and manage public facilities in the future. Such facilities could include picnic, camping, and fishing areas and associated components such as roads and comfort stations.

Photo No. 2-01. Pipeline Crossing over Dam Embankment.

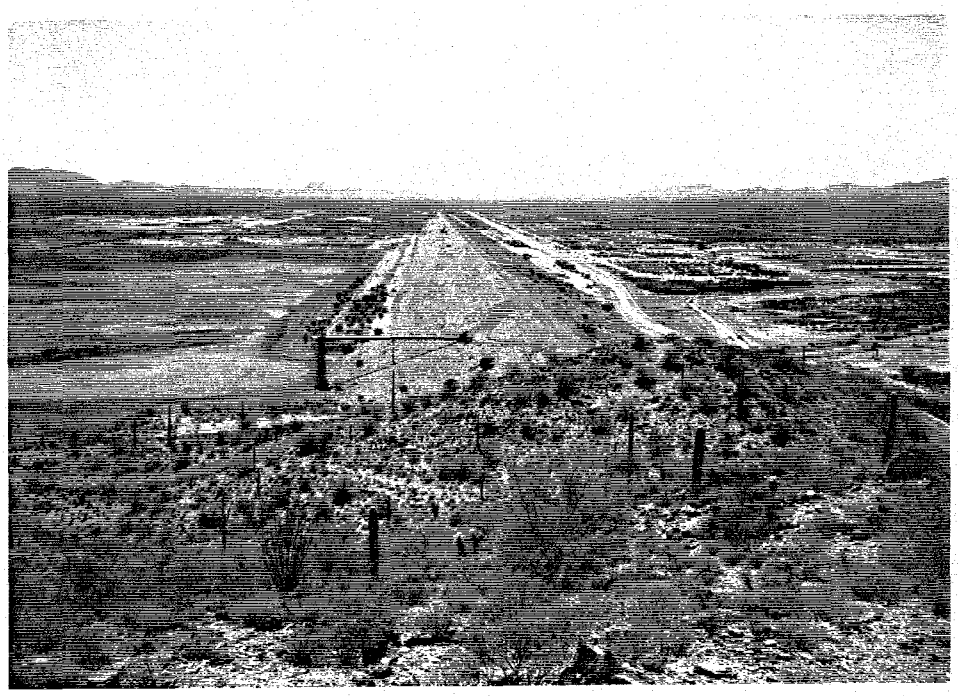

Photo 2-02. Upstream Face of the Tat Momolikot Dam Embankment (looking west from the overlook area).

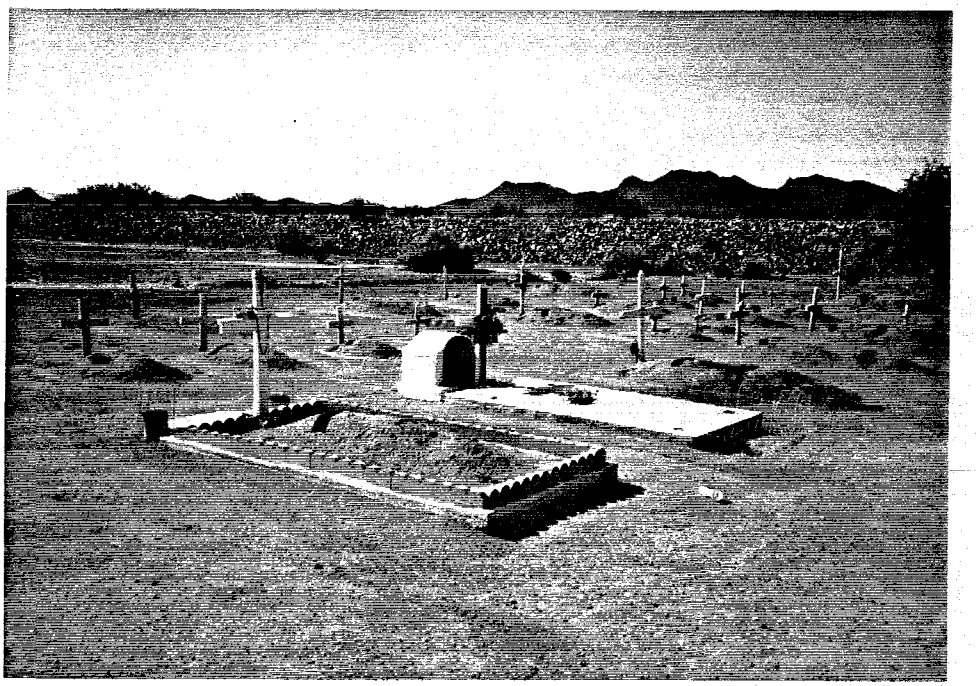

Photo 2-03. Tat Momolikot Cemetery and Dike (beyond the white crosses).

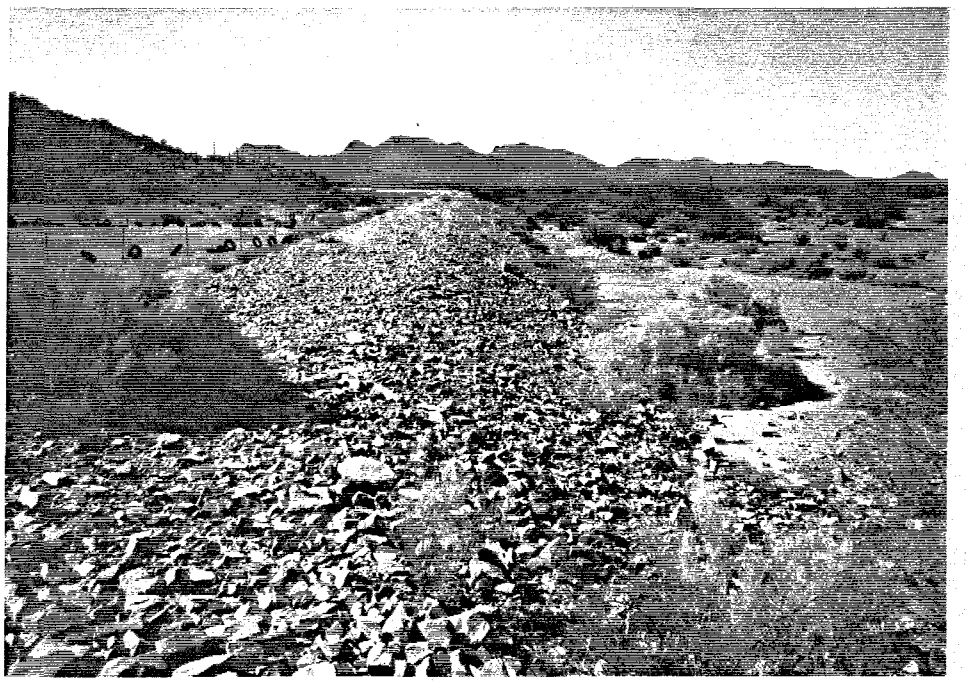

Photo 2-04. Tat Momolikot Village Dike (looking north along the east village dike).

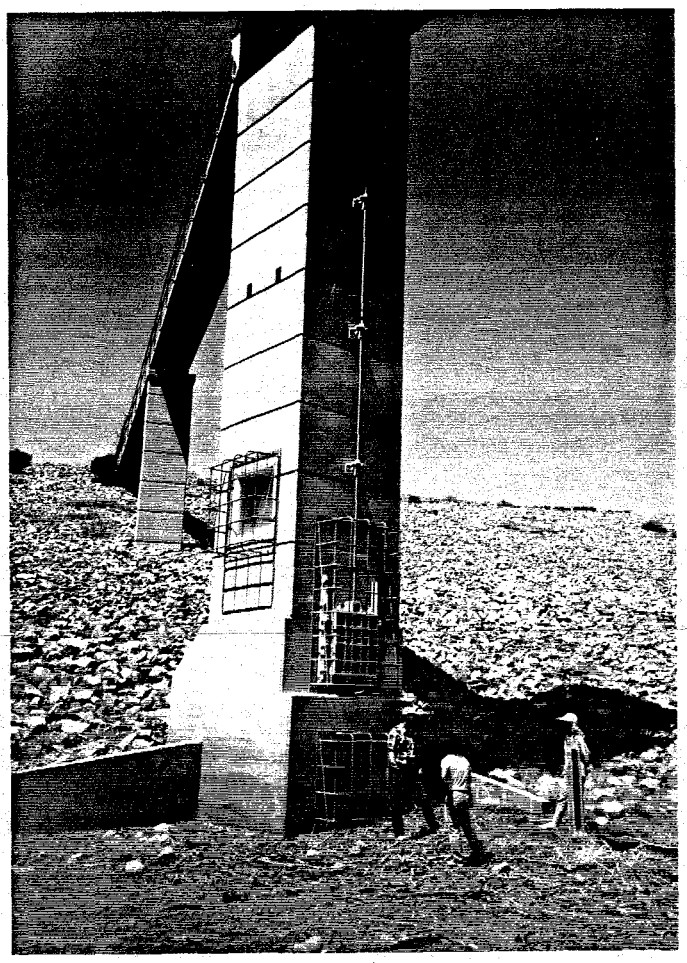

Photo 2-05. Conservation Outlet Works Intake Tower (view from upstream, within reservoir).

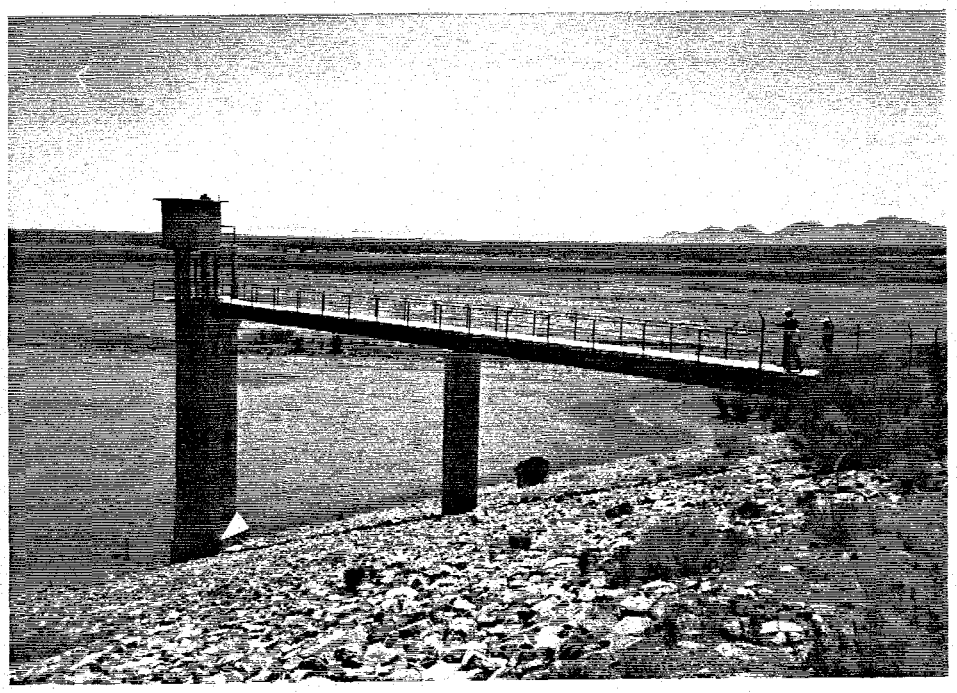

Photo 2-06. Conservation Outlet Works Intake Tower and Access Bridge (looking southwest from the main dam embankment).

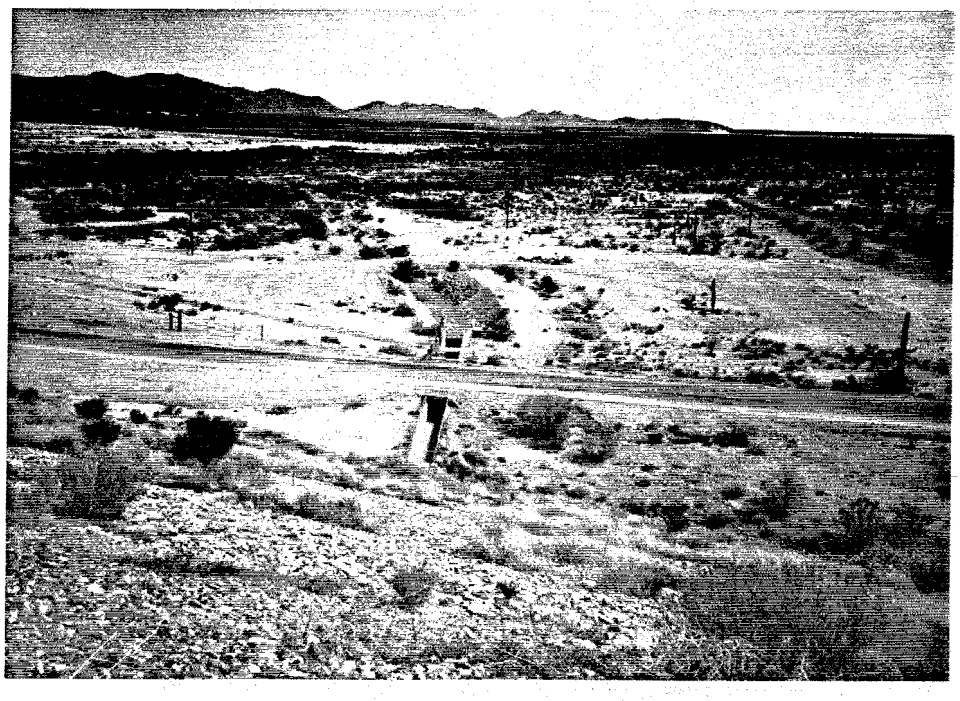

Photo 2-07. Conservation Outlet Works Outlet Channel, Stilling Basin (foreground center), and Vaiva Vo Irrigation Project Canal (left from stilling basin; looking downstream from the main dam embankment).

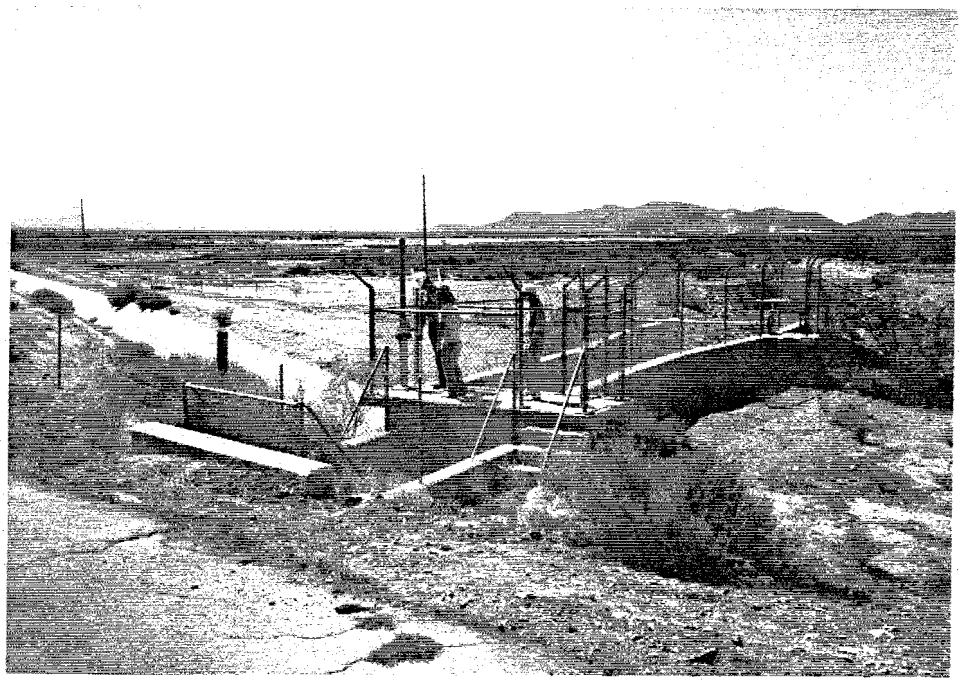

Photo 2-08. Conservation Outlet Works Stilling Basin and Vaiva Vo Irrigation Project Canal (background left; looking northwest from the road).

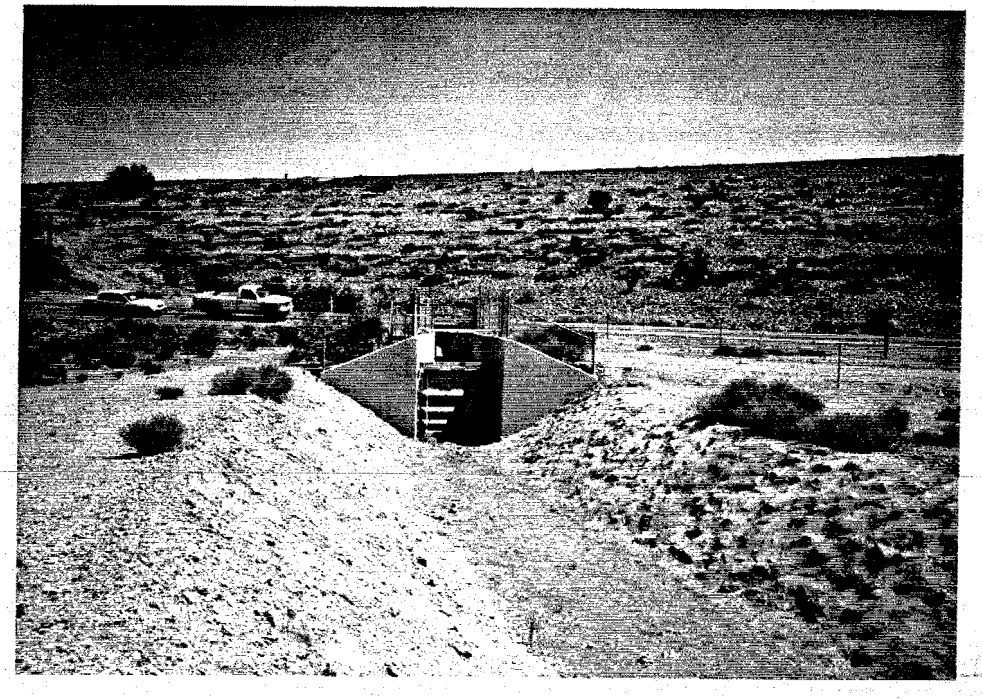

Photo 2-09. Conservation Outlet Works Radial Gate at the Downstream End of the Stilling Basin (view from outlet channel, looking upstream).

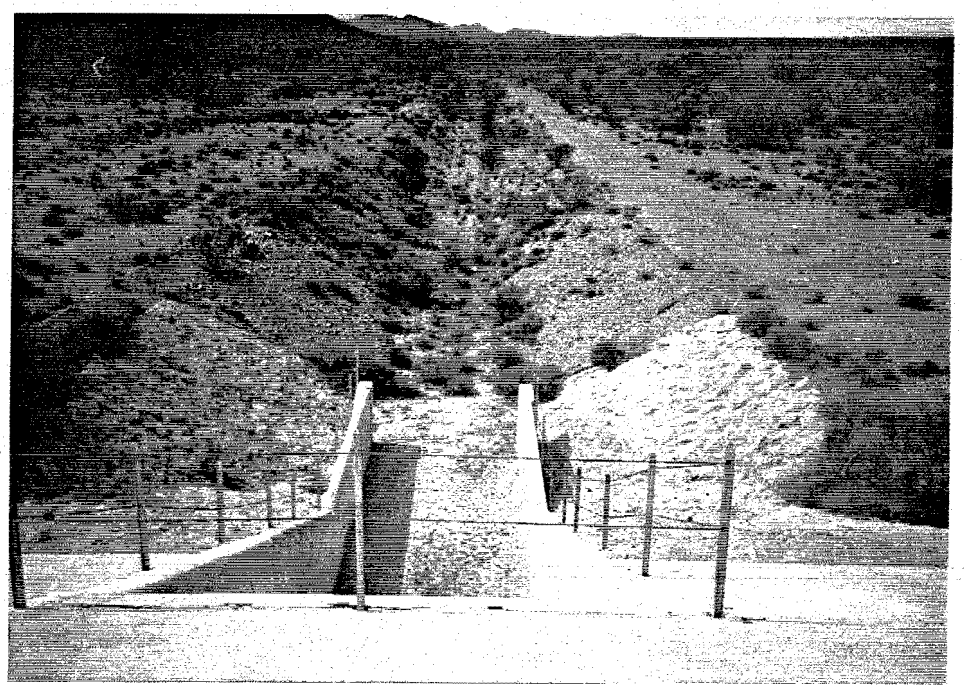

Photo 2-10. Flood Control Outlet Works Approach Channel (view from spillway embankment, looking upstream).

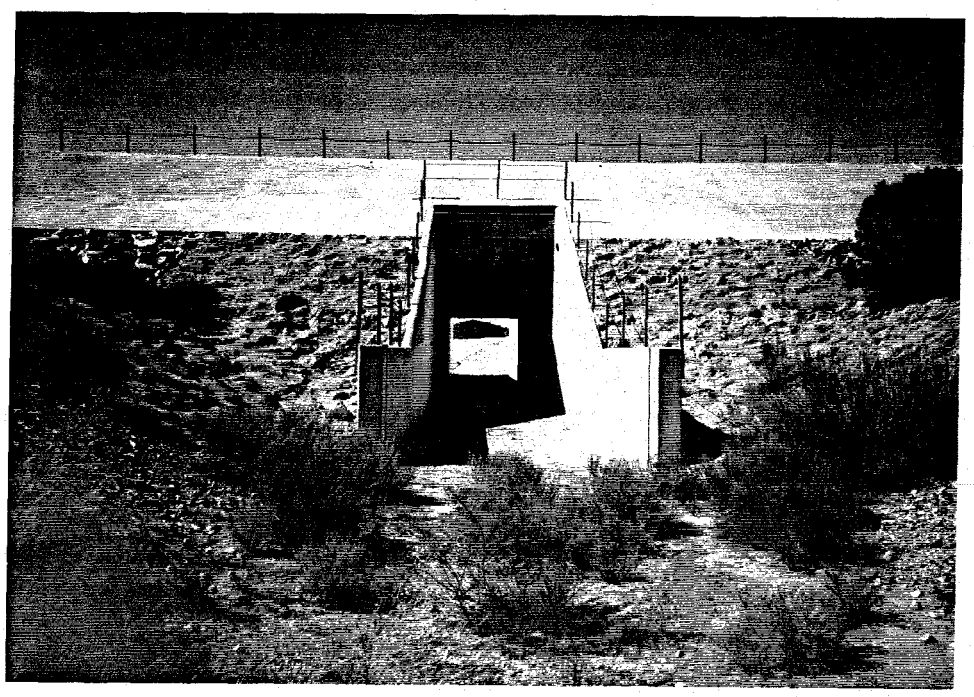

Photo 2-11. Flood Control Outlet Works Conduit (view from approach channel, looking downstream).

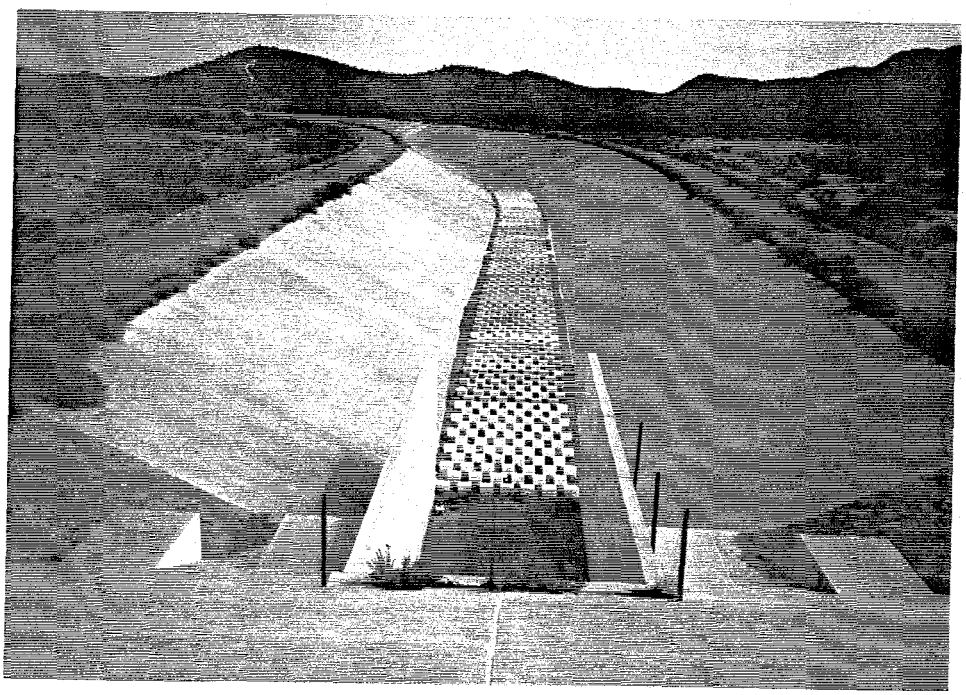

Photo 2-12. Flood Control Outlet Works Outlet Channel (view from spillway embankment, looking downstream).

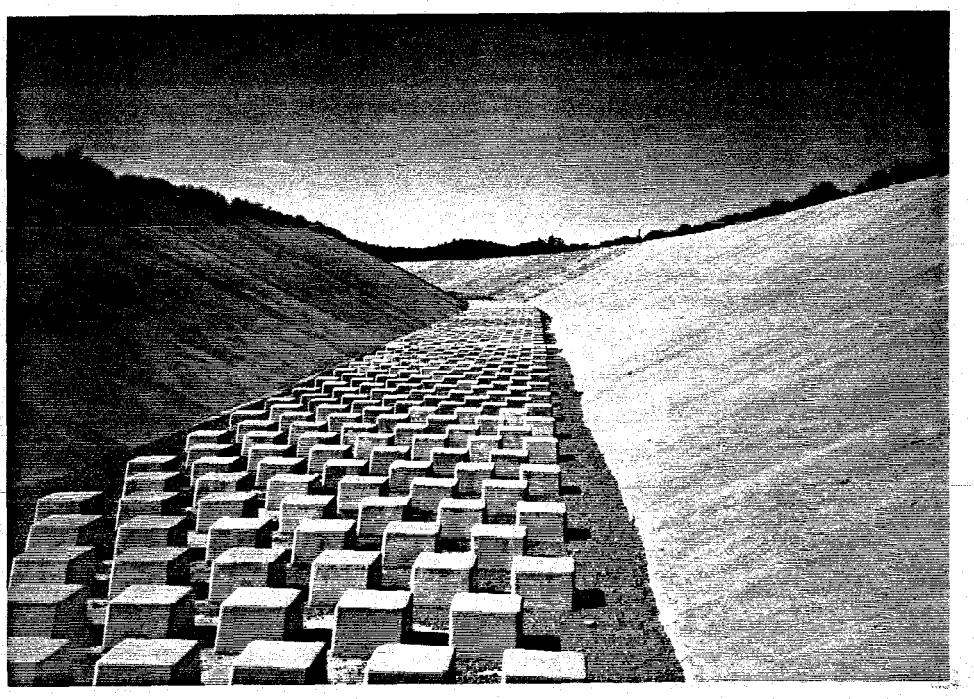

Photo 2-13. Flood Control Outlet Works Outlet Channel (looking downstream at baffle blocks from within channel).

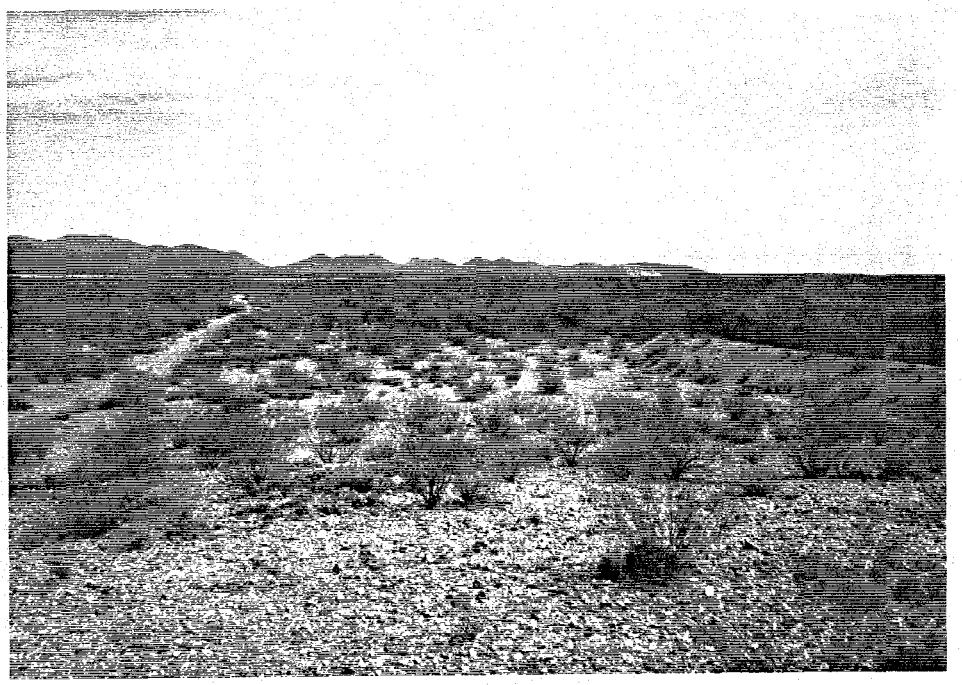

Photo 2-14. Flood Control Outlet Works Outlet Channel at the Downstream End of the Single Unlined West Levee (looking northwest toward Santa Rosa Wash).

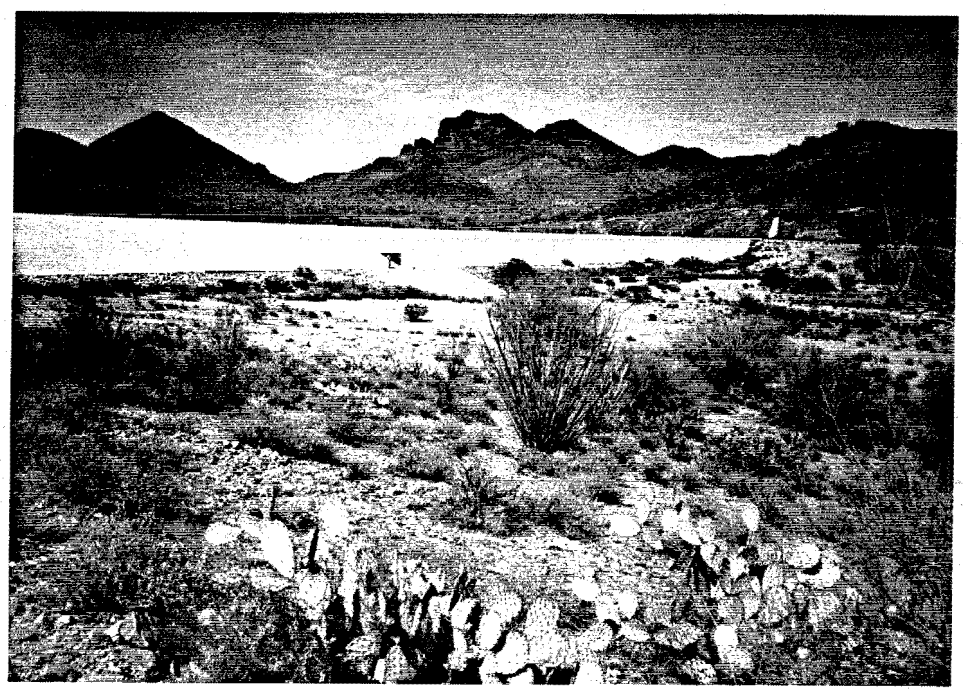

Photo 2-15. Upstream Slope of Spillway (view toward northeast).

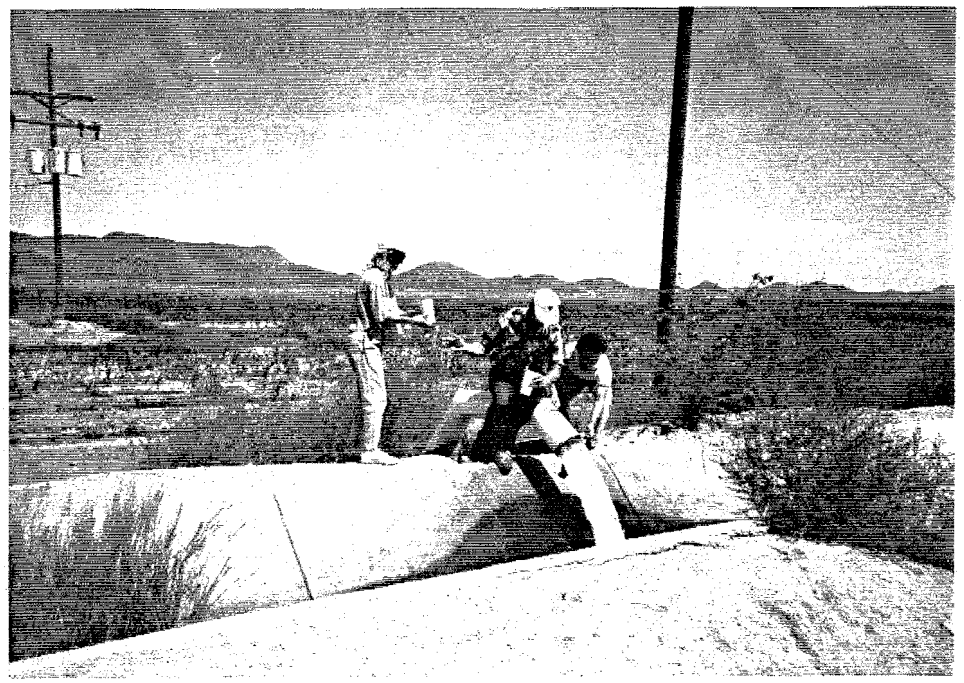

Photo 2-16. Water being pumped into an irrigation canal from a well on the Tonoho O'odham Farm.

III - PROJECT HISTORY

3-01 Authorization. Tat Momolikot Dam was authorized by Flood Control Act of 1965, Public Law 89-298, Eighty-ninth Congress, First Session, approved October 1965. However, the final project plan differs from the Project-Document Plan (House Document 189, 89th Congress, 1st Session), which was the plan for flood control recommended in the Chief of Engineers' report dated 16 September 1964. The departure from the original plan was due primarily to the relocation of the dam about two miles further downstream. In relocating the dam additional changes that were made include: (a) the gross capacity of the reservoir at the spillway crest increased to 198,545 ac-ft from 181,000 ac-ft; (b) the flood control capacity of the reservoir at spillway crest increased to 145,000 ac-ft from 126,000 ac-ft; (c) the height of the dam was increased to 75.5 ft from 66 ft above the streambed; (d) it deferred the proposed initial development of the recreation, and fish and wildlife facilities in the reservoir area; (e) the lengths and heights of 2 compacted earthfill saddle dikes decreased to 1,440 ft and 1,195 ft from 2,800 ft and 3,600 ft, respectively, in length and the height to 4.5 ft and 5.5 ft from about 17 ft.

3-02 Planning and Design. Prior to construction of the dam, the potential standard project flood (SPF) overflow area extended from the damsite to Santa Cruz Wash, about 33 miles to the north. The overflow would cover about 57,000 acres and is shown on Plate 2-02. Populated areas subject to inundation include the communities of Maricopa, Stanfield, and the O'odham Village, Cockleburr. In 1969, 46,000 acres (80 percent of the overflow area) was found to be irrigable land and 31,000 acres were being cultivated. The economy of the Santa Rosa Wash is primarily based on agriculture. Over-pumping has depleted the ground water supply and has threatened to cause a reduction in crop acreage. In order to protect the population and agriculture in the overflow area, Tat Momolikot Dam and other flood control projects were proposed in the area. After considering many alternatives, Tat Momolikot Dam was found to be the best alternative to control the design flood, provide storage for sediment carried from the tributary drainage area, and provide water storage for the conservation of storm runoff.

3-03 Construction. Construction of the dam began on 27 September 1972 and was completed on 27 June 1974. The total cost of the project was $7,657,000. Pueblo Construction Company began the work, but the project was finished by Western Construction Company.

3-04 Related Projects. Tat Momolikot Dam is the primary regulating facility on Santa Rosa Wash. No major flood control structures are in the drainage basin above Tat Momolikot Dam. There are many small detention and diversion dikes that have been constructed by the BIA. The detention dikes capture very small runoff volumes but would have little effect on larger floods. There are also excavated stock tanks in the watershed that tend to reduce the peak flows and total runoff to the reservoir. The size of the stock tanks generally varies between about 2 and 500 ac-ft. The average structure capacity is around 10 to 15 ac-ft. Altogether these detention and diversion dikes and stock tanks number 300 to 400 and have a total volume of about 3500

ac-ft. Approximately 9 miles downstream of the dam, the local flood control districts have confined Santa Rosa Wash by constructing levees. The leveed channel of Santa Rosa Wash is 24 miles long to its confluence with Santa Cruz Wash. The design discharge capacity of the channel within these levees is 5000 cfs. The leveed channel is shown on Photos 3-01 through 3-03.

3-05 Modifications to Regulation. The water control plan presented in the 1977 Reservoir Regulation Manual for Tat Momolikot Dam called for the establishment of a water conservation pool. Releases from the pool through the conservation outlet works were to be based upon: (a) the existing needs for water in the Vaiva Vo Irrigation Project; (b) maintenance of the water level in the fish ponds; (c) maintenance of the Lake Saint Clair water level for recreation; and (d) existing hydrologic conditions at the time of operation. The desired water surface elevation for the conservation pool is 1509 ft MSL, however, flash boards can be installed to raise the pool level to 1515 ft MSL. To this date, the maximum elevation of the water in the conservation pool has been approximately 1501.5 ft above sea level and releases have only been made three times since 1980.

3-06 Principal Regulation Problems. No problems have been encountered with regulation since the project was completed. However, the BIA has reported that the stop logs used to provide additional water conservation storage at the flood control outlet works approach channel, have been stolen.

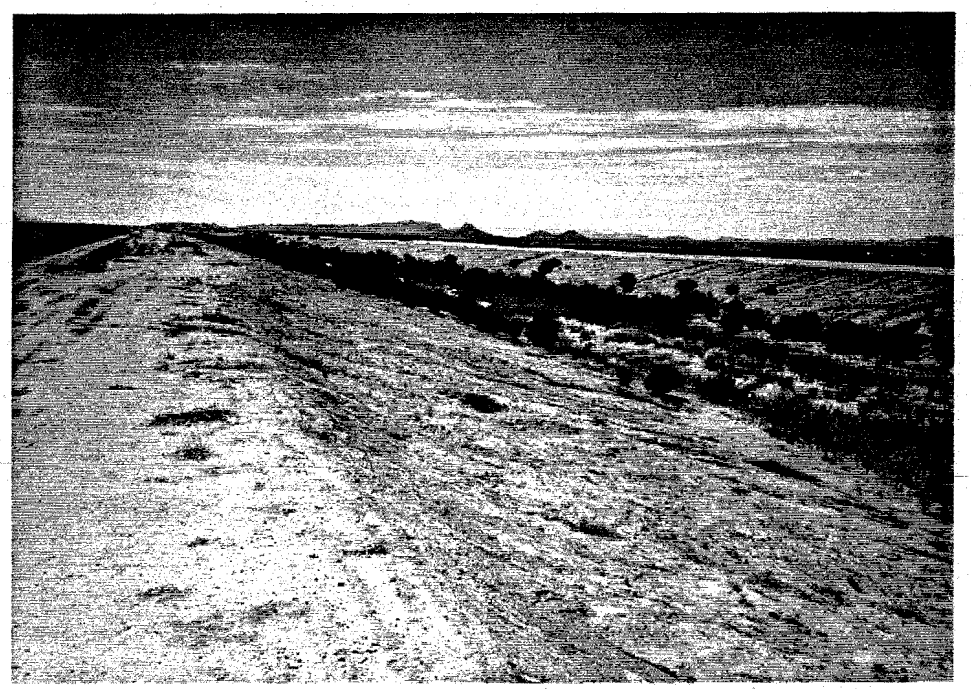

Photo 3-01. Channelized section of the Santa Rosa Wash approximately 17 miles downstream of the dam (looking upstream).

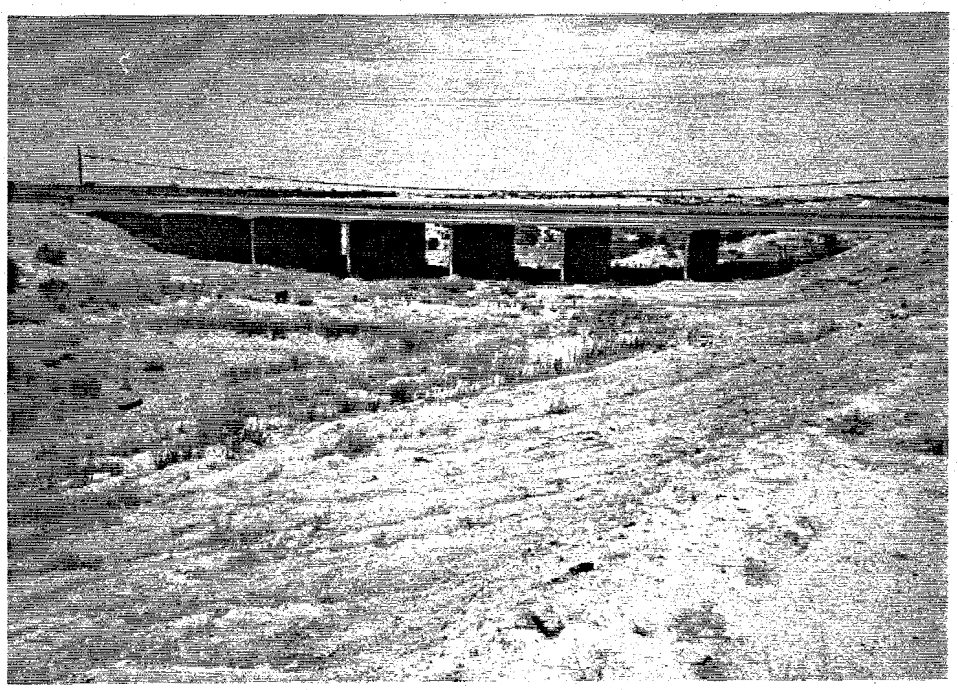

Photo 3-02. Bridge crossing over channelized section of Santa Rosa Wash approximately 17 miles downstream of the dam (looking downstream).

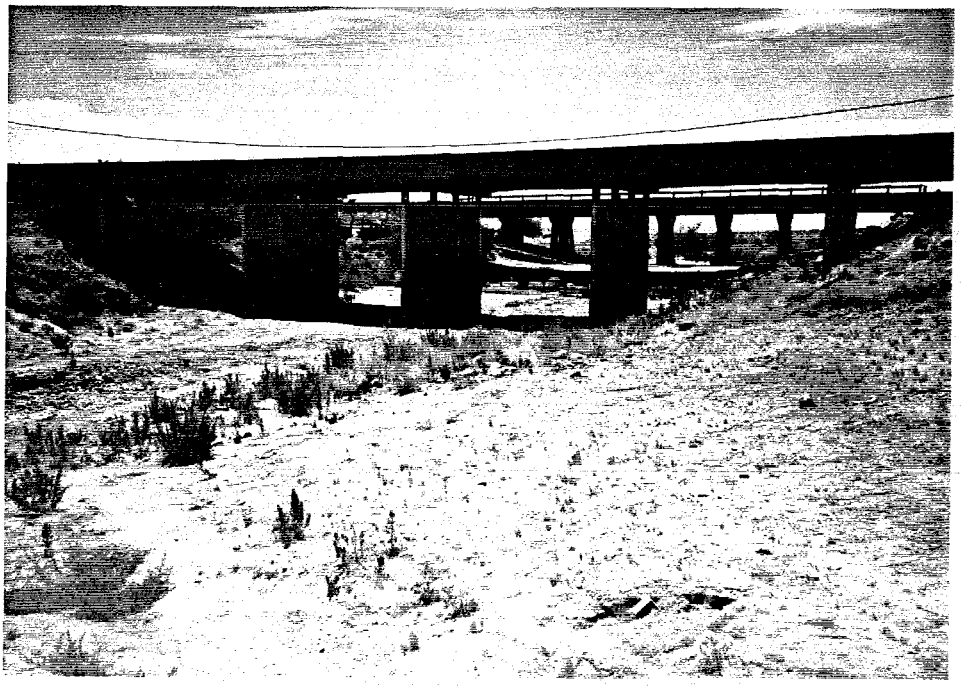

Photo 3-03. Highway and Southern Pacific Railroad Crossings over a channelized section of Santa Rosa Wash (looking upstream, near Maricopa).

IV - WATERSHED CHARACTERISTICS

4-01 General Characteristics. The Santa Rosa Wash drainage basin upstream of Tat Momolikot Dam (as shown on Plate 4-01 and 4-04) comprises 1,780 square miles and is in parts of Pima, Pinal, and Maricopa Counties. Nearly all of the watershed lies within the Papago Indian Reservation. The drainage area contains three major tributaries that join at the dam. The streams, which are ephemeral, descend the slopes of the mountains to alluvial plains where the watercourses are not well defined and are unstable due to sediment deposition and erosion. The Kohatk Wash to the west drains 301 square miles; the main Santa Rosa Wash drains an area of 683 square miles; and the Tat Momoli Wash to the east drains an area of 793 square miles. The lengths of the three main streams - Kohatk, Santa Rosa, and Tat Momoli Washes - are 38, 51, and 60 miles, respectively. The gradients of the channels range from about 800 feet per mile (0.1515) in the headwaters to 12 feet per mile (0.0023) near the damsite. Streambed profiles are shown on Plate 4-02.

Vegetal cover in the Santa Rosa Wash watershed is sparse to medium density, consisting of various types of cacti, sagebrush, greasewood, and small trees such as mesquite and paloverde. This vegetation tends to be thicker and denser along and adjacent to the stream courses. There are areas with perennial grasses at the higher elevations. Covers of annual grasses occur in much of the basin after the winter rains.

The Santa Rosa Wash drainage basin is part of the Gila River Basin (shown on Plate 4-03), which covers an area of 58,200 square miles, extending from the Continental Divide in New Mexico to where the river drains into the Colorado River. The drainage area comprises 5,600 square miles in New Mexico, 51,450 square miles in Arizona and 1,150 square miles in Sonora, Mexico. The Gila River which is 654 miles long, rises in an area of high mountains and plateaus and flows westward, in a generally central course through the basin, to a point on the Colorado River about 3 miles upstream from Yuma, Arizona. Much of the northern part of the basin is extremely irregular and rugged. The boundary elevations range from about 7,000 ft MSL to more than 12,000 ft MSL. The northern part of the basin is mostly drained by the Salt River, the largest tributary, which joins the Gila River near Phoenix. An extensive system of dams comprise the Salt River Project which provides power and water to Phoenix. There are also other large dams on the Verde and Agua Fria Rivers. The southeastern part of the basin consists largely of long desert valleys lying between north-south ranges of rugged mountains. In this region, Coolidge Dam forms the large San Carlos Reservoir on the Gila River. The southwest third of the basin consists essentially of broad, flat, low-lying desert valleys and isolated mountains of relatively low relief. Comparatively few localities are more than 4,000 ft NGVD in elevation. The elevation of the Gila River's mouth is about 130 ft NGVD. Painted Rock Dam, constructed and operated by the Corps of Engineers, is a large flood control structure located 126 miles above the Gila River's mouth. About 85 percent of the Gila River basin is tributary to Painted Rock Dam. Tat Momolikot Dam is located 110 stream miles upstream of Painted Rock Dam.

4-02 Topography. The Santa Rosa Wash drainage area is bounded on the east by the Sawtooth, Waterman, and Roskruge Mountains; on the south by the Quinlan and South Comobabi Mountains; on the west by the Sierra Blanca and

Sand Tank Mountains; and on the north by the Vekol and Tat Momoli Mountains. Between the mountain ranges, there are some low divides where the drainage boundary is indistinct. Elevations in the area range from about 1,500 ft at the damsite to about 6,800 ft in the Quinlan Mountains.

4-03 Geology and Soils. The soils in Santa Rosa Wash watershed are extremely varied. The mountains consist of weathered native rock, while the valley floors contain unconsolidated gravels, sands, silts, and the clays derived from these rocks. The rock materials are almost equally divided between schists, granites, and older volcanic rocks such as basalt, with some small amounts of limestone appearing in the northern part of the basin at the dam site. The soils of the mountain area are shallow and stony with occasional rock outcrops. Desert and semidesert soils occur in the hills and valleys. The valley surface soils generally range from fine silty clays to clay and are fairly deep.

4-04 Sediment. Erosion of soil is widespread in the watershed; however, an insignificant amount of sediment has been transported to the reservoir area. The erosion problem is believed to be caused by the loss of ground cover due to livestock overgrazing. Efforts to eliminate the overgrazing problem have had limited success over the past forty or fifty years; however, recent methods of rotating grazing livestock in order to allow the land to rest after the grass has been grazed, have shown excellent results in maintaining a ground cover. Since the dam was completed in 1974, storms have not produced significant sediment deposits in the allocated sediment space.

4-05 Climate. The climate is typically desert in character, with short, mild winters and long, hot summers. Much of the year is dry, but several light general winter storms and a few heavy summer thunderstorms usually occur each year. A summary of climatological data at Casa Grande, Arizona, located about 20 miles north-northeast of Tat Momolikot Dam, is given in Table 4-01.

a. Temperature. Average daily maximum and minimum temperatures (degrees Fahrenheit) over most of the watershed range from about 65 and 35 respectively to about 105 and 75 in summer. In the highest elevations of the watershed the values are about 20 to 25 degrees lower. High diurnal (day-to-night) temperature variations are characteristic of the region. All-time high and low temperature extremes are about 120 and 15 respectively in the lower elevations to about 100 and 0 in the highest mountains of the drainage. Significant periods of freezing are rare in the lower desert areas, but are common during the winter above 6,000 ft. Table 4-01 lists, among other items, the mean daily maximum and minimum temperature and record highest and lowest temperature for each month of the year at Casa Grande.

b. Precipitation. The 30-year (1931-1960) normal annual precipitation (Plate 4-04, the most recent map available) ranges from about 9.0 inches at the dam to about 16.0 inches in the headwater area with an average of 10.8 inches for the drainage area. The heaviest precipitation occurs in the summer, and the driest occurs during late spring (See Table 4-01).

Table 4-01 also lists the mean and maximum monthly and annual precipitation, as well as the maximum daily precipitation for each month of

the year, at the Tuscon station. Also listed in Table 4-01 are the probabilities (from 5 to 95 percent) for each month of the year that the monthly total precipitation will be equal to or less than the indicated amounts. This table demonstrates that there can be great year-to-year variability in annual, monthly, and daily precipitation.

A description of general winter storms, general summer storms, and local thunderstorms, all of which produce precipitation in the basin, are given in the following subparagraphs:

(1) General Winter Storms. General winter storms usually occur during the period from December through March. They originate over the Pacific Ocean and move slowly eastward across Arizona. These storms last anywhere from a few hours to several days and can result in widespread precipitation over southern Arizona, with snow at the highest elevations.

(2) General Summer Storms. General summer storms usually occur during the period August through early October. They are associated with an influx of tropical maritime air originating over Mexico and the adjacent tropical Pacific Ocean and enter the area from a south or southeast direction. Such storms are often associated with the remnants of a tropical hurricane. General summer storms are often accompanied by relatively heavy precipitation over large areas for periods of from 12 hours to 4 days.

(3) Local Thunderstorms. The local thunderstorms can occur at any time of the year, either during general storms or as isolated phenomena. However, they are most common during the period July through September, when the basin is frequently covered by moist, unstable air originating over Mexico or the Gulf of California. These storms cover comparatively small areas and result in high-intensity precipitation of short duration (up to 3 hours).

c. Snow. Snow falls occasionally at the higher elevations in the basin, but usually melts within a few days. The effect of snowmelt on floodflows in the basin is negligible.

d. Evaporation. There are no evaporation data available for Tat Momolikot Dam or the watershed above, but data for pan evaporation in the desert areas of southwestern Arizona indicate that mean monthly evaporation ranges from 3-4 inches in early winter to 10-20 inches in early summer. Table 4-02 shows this seasonal variation in mean monthly pan evaporation, and also reveals the great variation the occurs from one well-exposed location to another. Raw daily pan evaporation data from Alamo Dam support the range of figures shown in Table 4-02, and show that evaporation can greatly exceed 1 inch per day during very dry, windy conditions. Further support can be obtained for evaporation stations in the Tucson area through the University of Arizona.

e. Wind. The prevailing winds are from the east and are usually light, although severe windstorms occur at rare intervals as the result of local thunderstorms, tropical storms, intense winter storms, or unusually strong Great Basin high pressure cells.

Table 4-01

CLIMATOLOGICAL DATA AT TUCSON, ARIZONA*

Month	Temperatures (Degrees Fahrenheit)			Precipitation (Inches)		
	Mean	Maximum	Minimum	Mean	Maximum	Minimum
Jan	50.1	87	16	.76	4.00	0
Feb	53.2	92	20	.79	4.15	"T"
Mar	57.7	92	20	.71	3.88	0
Apr	64.4	102	27	.34	3.53	0
May	72.6	107	38	.18	1.34	0
Jun	81.9	111	47	.26	2.07	0
Jul	85.9	111	63	2.25	6.24	0.25
Aug	83.9	109	61	1.21	7.93	0
Sep	79.8	107	44	1.21	5.11	0
Oct	69.3	101	26	.69	4.51	0
Nov	58.1	90	24	.77	4.61	0
Dec	51.1	84	16	1.02	5.85	0
Period of Record**	67.3	111	16	**11.09	7.93	0

* National Weather Service climatological station at Municipal, Airport; 320 07'N Latitude 110 56'W Longitude Elevation (ground), 2,854 feet.

** Mean Annual

Note:
1. Information taken from "Climatological Date, Arizona" by Weather Bureau, National Oceanic and Atmospheric Administration.
2. Period of record is from January 1905 to March 1975.
3. "T" indicates less than 0.01 inch of precipitation.

TABLE 4-02a. EVAPORATION STATIONS IN SOUTHWESTERN ARIZONA

CA DWR NO.	STATION NAME	LATITUDE (Degrees-Minutes-Seconds)	LONGITUDE	ELEVATION (ft)	RECORD from-to
--	Painted Rock Dam	33-04-08	113-01-48	560	8/74 5/88
230202	Davis Dam No. 2	35-12-00	114-34-00	657	3/48 12/73
988502	Yuma Citrus UAEF	32-36-45	114-38-00	191	1/21 12/73
988750	Yuma Field Sta	32-48	114-34	135	5/10 12/46

TABLE 4-02b. MONTHLY EVAPORATION
(inches)

Painted Rock Dam (14-year mean)

Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
8.08	4.61	2.91	3.02	4.41	7.09	10.60	14.35	17.52	16.46	15.04	12.19

Davis Dam No. 2 (26-year mean)

Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
10.75	8.03	6.89	6.54	7.05	9.72	12.28	15.90	18.07	18.54	16.81	13.86

Yuma Citrus UAEF (53-year mean)

Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
7.64	4.76	3.50	3.70	4.72	7.60	9.96	12.83	14.13	15.28	13.50	10.63

Yuma Field Station (37-year mean)

Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
5.39	3.46	2.48	2.52	3.35	5.55	7.16	9.37	9.92	10.15	9.02	7.32

Data for Painted Rock Dam are compiled from Corps of Engineers records.

Data for the remaining western Arizona stations (all adjacent to the Colorado River) are published by the California Department of Water Resources, in Evaporation from Water Surfaces in California, Bulletin 73-79, 1979.

Note: Each evaporation station consists of a National Weather Service Class A Pan. Readings are adjusted for observed rainfall to yield net evaporation. Reservoir evaporation may be estimated by multiplying measured pan evaporation by a pan coefficient ranging from 0.6 to 0.8.

4-06 Storms and Floods. Historical accounts indicate that many damaging floods have occurred in the Gila River Basin. Sizable floods occurred in 1884, 1891, 1916, 1926, 1937, 1957, 1962, 1964, 1977, 1980, and 1983. Indications are that these floods were the result either of general storms or, in a few cases, of tropical cyclones centered in or near the Gila River Basin. A summary of peak annual discharges and maximum mean daily discharges as recorded by the USGS stream gage on Santa Rosa Wash near Cockleburr for 1954-1980 are included in Table 4-03. Table 4-04 gives the hourly maximum average inflow to Tat Momolikot Dam for 1974-1988. Brief descriptions of significant past storms and floods are given in the following subparagraphs:

a. Storm and Flood of 3-8 September 1939. The storm apparently had two centers covering large areas, one northeast of the Imperial Valley in California and one east of Needles in Arizona. The unusually heavy precipitation during the storm was associated with three tropical cyclones originating off the west coast of Mexico, one of which traveled northward through the Gulf of California and dissipated over the lower Colorado River Valley. A total of 6 to 7 inches of precipitation fell over an area of more than 2,300 square miles within the center near Imperial Valley and over an area of more than 3,000 square miles within the center of the storm east of Needles, California. Precipitation intensities recorded by the Stations at Yuma and Phoenix were high. At Yuma, 2.17 inches of precipitation fell in 90 minutes; and at Phoenix, 2.41 inches fell in 6 hours. Isohyets of the total storm precipitation are shown on Plate 4-05. No measurements of runoff were made in the Santa Rosa Wash area, but high peak discharges were measured on streams (with well-defined channels) near the centers of the storm. The Big Sandy River (a tributary of the Bill Williams River) below Burro Creek, at Signal, Arizona, had a peak discharge of about 100,000 cfs from an area of 2,670 square miles. Picacho Wash at All-American Canal, near Yuma, Arizona, had a peak discharge of 37,000 cfs from an area of 41.5 square miles.

b. Storm and Flood of 19 August 1954. The storm and flood of 19 August 1954, according to available reports, were the most severe of record in the Queen Creek drainage area (approximately 60 miles northeast of the Santa Rosa Wash area). Very moist, warm, tropical air that originated over the Gulf of California entered Arizona from the south during the storm period, accompanied by widespread thunderstorm activity. Precipitation intensities were very high during small portions of the storm. An estimated 100 square miles of area (near the storm center) had over 5 inches of precipitation. Although the Santa Rosa Wash area was not hard hit by this storm, the peak discharge at the USGS gaging station known as Queen Creek at Whitlow Ranch damsite near Superior, Arizona (area 143 square miles), was estimated at 42,900 cfs.

c. Storm and Flood of 31 October 1957. The storm of 31 October 1957, which was of the general summer type, but with some winter characteristics, is noteworthy because of the hydrologic records available for the Santa Rosa Wash area. The storm was of tropical maritime origin. In and near the area the recorded precipitation varied from about 2 inches in the area around Stanfield to 1.05 inches at Picacho Reservoir, 1.89 inches at Sells, and 0.79 inch at Ajo. Greater depths of precipitation in the headwaters of the streams were likely, but records of amounts are not available. The

precipitation continued with moderate to high intensities for a period of 2 to 3 hours at most stations. The isohyets of the total storm precipitation are shown on Plate 4-06. The flooding of fields in the Stanfield-Maricopa area resulted from the failure of dikes along Santa Rosa Wash. A small conservation dam on Anegam Wash, a few miles west of Gu Achi, failed during the flood and caused several breaks in dikes protecting the road from Casa Grande to Quijotoa. The peak discharge of Santa Rosa Wash at Gu Komelik was estimated at 14,000 cfs and near Vaiva Vo at 10,000 cfs.

Table 4-03

RUNOFF DATA - SANTA ROSA WASH NEAR COCKLEBURR*

Year**	Maximum Peak discharge	Date	Maximum Mean daily discharge	Date
	Cubic feet per second		Cubic feet per second	
1954-55	1,150	8 Aug	1,040	8 Aug
1955-56	740	24 Jul	434	24 Jul
1956-57	492	12 Aug	212	18 Jul
1957-58	10,000	1 Nov	4,040	1 Nov
1958-59	4,120	13 Jul	1,460	13 Jul
1959-60	805	30 Jul	580	31 Oct
1960-61	892	27 Jul	443	31 Aug
1961-62	53,100	27 Sep	22,000	27 Sep
1962-63	4,180	14 Sep	798	16 Aug
1963-64	6,760	25 Jul	2,370	13 Aug
1964-65	433	4 Sep	176	14 Aug
1965-66	1,820	14 Sep	847	13 Sep
1966-67	302	26 Jun	190	6 Aug
1967-68	840	28 Jul	600	15 Dec
1968-69	514	8 Aug	115	8 Aug
1969-70	865	10 Aug	518	10 Aug
1970-71	6,110	4 Aug	2,230	4 Aug
1971-72	410	14 Aug	195	14 Aug
1972-73	762	21 Oct	568	21 Oct
1973-74	364	2 Aug	24	2 Aug
1974-75	580	17 Jul	45	17 Jul
1975-76	390	25 Sep	18	25 Sep
1976-77	291	17 Jul	19	19 Jul
1977-78	66	13 Feb	5.1	13 Feb
1978-79	51	17 Jan	4.3	17 Jan
1979-80	105	24 Aug	2.5	24 Aug

* Latitude 32 40'00"N; longitude 11 55'40"W; in SW1/4, Sec 2, T. 95, R. 4E. Papago Indian Reservation on right bank 3-1/2 miles south of Cockleburr, 1-1/8 miles north of Tat Momolikot Dam. Data from U.S.G.S. Water Records of Arizona. Station was discontinued in September 1980.

** 1 October to 30 September, inclusive.

TABLE 4-04

MAXIMUM AVERAGE INFLOWS AND WATER SURFACE ELEVATIONS

Water Year	1-Hour Maximum Average Inflow (cfs)*	Date	Maximum Elevation (ft)	Date
1974	580	4 Aug	1490.40	4 Aug
1975	550	29 Oct	1490.68	31 Oct
1976	2820	25 Sep	1501.53	27 Sep
1977	1180	18 Jul	1499.84	1 Oct
1978	980	28 Dec	1494.78	13 Mar
1979	246	21 Jul	1489.14	21 Jul
1980	288	31 Jan	1486.55	1 Feb
1981	1250	31 Jul	1493.45	31 Jul
1982	905	12 Aug	1492.57	26 Aug
1983	860	15 Aug	1492.46	30 Sep
1984	2400	3 Oct	1499.63	4 Oct
1985	80	28 Dec	1489.34	4 Oct
1986	1040	26 Aug	1492.01	26 Aug
1987	220	3 Aug	1488.00**	24 Sep
1988	620	30 Jul	1491.59	31 Jul

* Calculated from Reservoir Computation Sheets.

** Estimated value.

d. Storm and Flood of 25-26 September 1962. The unusually heavy precipitation during the storm was associated with Tropical Storm Claudia, which had originated off the west coast of Mexico. The main stream of moist air, which was about 70 miles wide, passed over Sells, the Tucson Mountains-Cortaro area, Oracle, and on into New Mexico. Heaviest rain fell during the night of 25 September and most of 26 September. A total of 4 inches of precipitation occurred at Sells in a 10-hour period on 25-26 September. Estimates of depths of 7 inches were made for two locations, 7 and 12 miles west of the Arizona-Sonora Desert Museum. The peak discharges of Santa Rosa Wash near Vaiva Vo and Santa Rosa Wash at State Highway 84 between Casa Grande and Stanfield were estimated at 53,100 cfs and 12,800 cfs, respectively.

e. Storm and Flood of March 1983. Following a wetter than normal winter, a heavy storm moved into southern Arizona from the southwest, dropping moderate rain throughout the region. Rain began late on 2 March and continued into 4 March, with a few lingering showers into 5 March. The heaviest rain fell late 3 March into early 4 March, with amounts estimated to be as high as 1 inch in 9-12 hours. Total precipitation at nearby stations included 1.65 inches at Casa Grande, 1.15 inches at Eloy, and 1.11 inch at Anvil Ranch. A little farther from the drainage area, .95 inch fell at Ajo, 1.44 inch fell at Organ Pipe Cactus NM, and about 1 inch in the Tucson area. Since the US Geological Survey stream gauges on Santa Rosa Wash had been

discontinued in 1980, there were no streamflow measurements on the wash itself in 1983. There was no major inflow to Tat Momolikot Reservoir from this storm.

4-07 Runoff Characteristics. Little streamflow occurs except during and immediately following heavy precipitation. Climatic and drainage-area characteristics are not conducive to continuous runoff. Because of steep gradients, streamflow in the mountains increases rapidly in response to high-intensity precipitation and causes debris-laden flash floods to pass out onto the valley plains below. When the flood waters reach the valley plains, it spreads out as overland flow. The velocities and peaks are reduced, the debris is deposited, and a considerable amount of flow is lost to percolation. Vegetation has negligible effect on flood runoff, except where perennial grasses impede overland flow in the upper areas.

4-08 Channel and Floodway Characteristics. Below Tat Momolikot Dam, the natural watercourse of Santa Rosa Wash extends 9.0 miles. In this reach, braided channels cover the streambed, which varies in width from about 500 ft below the dam to about 2 miles in the downstream end of the reach. Below this natural channel, the flood control districts have confined Santa Rosa Wash by the construction of levees. The leveed channel of Santa Rosa Wash extends 24 miles to its confluence with Santa Cruz Wash. Channel capacities of this reach were evaluated in August 1971. Rating curves based on uniform flow depths and variable roughness coefficients were determined for 23 cross sections. For the leveed sections, the maximum capacity is defined as the discharge 2-1/2 feet (freeboard allowance) below the lower levee's top. The limiting capacity for the reach is about 5,000 cfs. In Exhibit B, plates 1B and 2B show the plan and profile of this reach and the location of cross sections. Plate 3B is a cross section of the Santa Rosa Wash at Sta 1257+00. All 3 of the aforementioned plates were taken from the 1977 Reservoir Regulation Manual for Tat Momolikot Dam. Rating curves for the cross sections are available at the LAD Office. The Santa Cruz Wash extends about 18 miles below its confluence with Santa Rosa Wash to its confluence with the Gila River. In this reach, the Santa Cruz Wash streambed is over 2 miles wide with many braided channels. The Santa Cruz Wash meets the Gila River about 80 miles upstream of Painted Rock Dam and about 10 miles upstream of where the Salt River meets the Gila River. Plate 4-07 exhibits the approximate travel time for outflow from the dam to reach downstream points of interest.

4-09 Structures Affecting Santa Rosa Wash. Upstream of Tat Momolikot Dam there are many small diversion and detention dikes. They have little effect on large floods, but will divert or trap small flows. The few detention dikes upstream will most likely only trap 1 to 2 acre-feet of water each. No operational facilities exist upstream of the dam.

Just downstream of Tat Momolikot Dam, some of the water released through the gated conservation outlet works conduit is diverted from the Santa Rosa Wash into the Vaiva Vo Irrigation Project canal. Approximately 9 miles downstream of the dam, Santa Rosa Wash is confined by levees for about 24 miles.

4-10 Economic Data.

a. Population. The Santa Rosa Wash drainage basin above Tat Momolikot Dam is sparsely populated and no population figures are available specifically for the watersheds above or below the dam. In 1988 the Arizona Department of Economic Security, Population Statisitics Section estimated Pinal County to have a population of approximately 110,300. Casa Grande was estimated to have a population of 18,685. The 1980 census counted 825 people in Arizona City and 7,203 people on the Papago Indian Reservation. Only 643 people of the 7,203 on the Reservation were in Pinal County. The College of Business at Arizona State University has projected the population of Pinal County to be approximately 136,000 by July 1, 2000.

b. Agriculture. Agriculture is a major activity in Pinal County. The Arizona Agricultural Statistics Service published a 1988 Arizona Agricultural Statistics report, from which information for this section was taken. Crops and livestock are almost equally important to the revenue of the county.

Crops which are planted include cotton, wheat, alfalfa, barley, principal vegetables, grapes, and citrus fruits. Cotton, which is the major crop, was planted on about 159,000 acres. Wheat was planted on 15,400 acres and alfalfa was planted on 11,600 acres.

Livestock in Pinal County includes cattle, sheep, hogs and pigs. At the end of 1988 there were 120,000 head of cattle and calves, 36,000 head of sheep and lambs, and 9,000 head of hogs and pigs. These and other livestock and livestock products accounted for approximately one-half of the agricultural revenue for the county.

c. Industry. Mineral development is a predominant industry throughout Pinal County. In 1987 approximately on quarter of the gross county product was from mining operations. Many mines can be found in the hills south and east of Tat Momolikot Dam. The only working mine in the vicinity of Tat Momolilot is a copper mine that is about 9 miles south-southeast of the dam.

Manufacturing operations are predominantly located in central Arizona. They include: chemical processing; manufacturing of stone, clay and glass products; printing and publishing; metal fabrication; primary metals processing; textiles and apparels; leather and leather goods; and especially manufacturing and assembly of electrical and electronic goods.

d. Flood Damages. Since the construction of Tat Momolikot Dam there have been no flood damages downstream of the dam on Santa Rosa Wash. Releases from the dam have only occurred three times. Each time, the release was made through the water conservation outlet works and was only sustained for a short time.

V - DATA COLLECTION AND COMMUNICATION NETWORKS

5-01 Hydrometeorological Stations.

a. Facilities.

(1) Reservoir Water Surface Recorder. Reservoir water surface elevations are continuously recorded. The Stevens A-71 graphic water surface recorder is in the instrument house located atop the conservation intake tower. The instrument is mechanically connected to a float and records the reservoir water surface in a 18-inch diameter float well that is located on the east face of the intake tower. The float well is screened such that only water surface levels above elevation 1,485 will be measured.

(2) Reservoir Staff Gages. There are 14 adjustable 5-foot staff sections located on the upstream slope of the dam. These sections are located just east of the conservation outlet tower. The staff gage system indicates reservoir water surface elevations from 1,485 to 1,555 MSL. See Photo 5-01.

(3) Precipitation Gages. Long-term-recording precipitation gages were installed near Kohatk, Santa Rosa School, and Queens Well in January 1972. The Bureau of Indian Affairs services these gages every 4 months. These gages all use catch tank-float systems and are connected to Stevens A-35 graphic recorders. In the near future these 3 gages will be replaced with tipping buckets and Stevens digital recorders. A tipping bucket rain gage is installed in the instrument house atop the intake tower. This gage provides current rainfall data. In the near future a Stevens digital recorder will be installed in the instrument house to provide the Corps with a tape copy of the rainfall data. The Corps of Engineers provided assistance for the operation and maintenance of the precipitation gages during the first three years of operation of Tat Momolikot Dam.

(4) Stream Gages. In 1954, the USGS established 3 stream gaging stations on Santa Rosa Wash. The gage on Santa Rosa Wash at Gu Komelik was discontinued in 1959. The gage on Kohatk Wash near Chiapuk was discontinued in 1960. The gage on Santa Rosa Wash near Cockleburr was discontinued in September 1980.

b. Reporting. Hydrologic data from Tat Momolikot Dam and the upstream and downstream watersheds are observed and reported in three different ways. Readings are made manually by BIA personnel, recorded automatically by gages, and reported in real-time by the telemetry system.

(1) Manual. The BIA personnel can observe precipitation, water surface elevation, and gate settings. Reports are only given to the Reservoir Regulation Section when there is rainfall of 1-1/2 inches at Tat Momolikot Dam or at Casa Grande, or when the reservoir water surface elevation reaches 1,505 ft MSL.

(2) Recording Instruments. The recording instruments store data on paper tape, which can be removed at any time and is maintained on file by the BIA. See Photo 5-02.

(3) Telemetry System. LAD's data collection system for Tat Momolikot Dam is the Geostationary Operational Environmental Satellite (GOES) system. Via this system the LAD receives precipitation and water surface elevation information for Tat Momolikot Dam. GOES consists of a Digital Readout Ground Station (DRGS) at the Baseyard facility and hydromet gages connected to Data Collection Platforms (DCP's) located within Arizona, Nevada, and California. These DCP's transmit data to LAD's DRGS through the GOES satellites, operated by the National Oceanic Atmospheric Administration's (NOAA's) National Environmental Satellite, Data, and Information Service (NESDIS). The transmisions are broadcast only at specifically assigned times (every 3 to 4 hours) for each DCP. The system provides near real-time data necessary for flood control operations and monitoring of the dam.

c. Maintenance. Each operating agency is responsible for the maintenance of its own gage.

5-02 Water Quality Stations. No water quality stations exist at Tat Momolikot Dam.

5-03 Sediment Stations. No sediment stations exist for Tat Momolikot Dam. Instead, surveys will be conducted to determine the quantity and distribution of sediment in the reservoir, and to determine aggradation or degradation of the channels below the dam. Range lines, that are topographic cross sections, were established in fiscal year 1977. Resurveys of range lines will indicate the projects affect on sediment transport. Category "A" index ranges will be established in the reservoir area and Category "C" index ranges will be established in the downstream channel. Key range lines will be resurveyed every five years or after a major storm where the reservoir water surface reaches elevation 1,510 ft MSL (which ever comes first). If the range survey indicates a considerable change, the appropriate parts of the reservoir (usually the lower elevations) will be resurveyed to establish a new elevation-capacity relationship.

5-04 Recording Hydrologic Data. Hydrologic data are collected for evaluating past and predicting future effectiveness of Tat Momolikot Dam. The accumulation of such data will be valuable for future hydrologic predictions for both flood control and water conservation.

Each agency maintains records of its own data. The U.S. Army Corps of Engineers maintains a file of data from its recording and telemetry gages at the District's Base Yard Office. The BIA records the data from its manual observations and maintains these records on file.

5-05 Communication Network. There are no permanent attendants, telephones or radios located at the Tat Momolikot Dam. Communications would only be achieved by courier.

5-06 Communication With Project.

a. Regulating Office with Project Office. No routine communication is made between the COE and the BIA. A set of Standing Operating Instructions to the Project Operator for Water Control have been compiled for each dam. A copy of these instructions for Tat Momolikot Dam is included in Exhibit A of this manual.

b. Between Project Office and Others. No routine communication exists between the BIA and other agencies about Tat Momolikot Dam.

5-07 Project Reporting Instructions. The BIA will notify the LAD Reservoir Operations Center (ROC) (telephone number (213) 894-4756) when any of the following conditions occur: rainfall of 1-1/2 inches at Tat Momolikot Dam or 1-1/2 inches at Casa Grande, or when reservoir water surface elevation reaches 1,505 ft NGVD.

5-08 Warnings. The responsibility for issuing all weather watches and warnings and all flood and flash flood watches and warnings rests with the NWS. Local emergency officials of the O'odham tribe, cities, and counties are responsible for issuing any public warning regarding unusual overflows, evacuations, unsafe roads or bridges, toxic spills, etc. The BIA is responsible for providing these officials with current information, and when possible, forecasts of water surface elevations within Lake Saint Clair, and flow rates in Santa Rosa Wash downstream of Tat Momolikot Dam. The BIA's Supervisory Civil Engineers of Land Operations for the Papago Agency are authorized to make flood warnings on behalf of the BIA concerning water release from the dam. If an uncontrolled spillway flow or dam break were imminent, the O'odham Tribal Police Department (telephone no. (602) 383-3280) and the Pinal County Sheriff's Office located in Stanfield (telephone no. 1-800-352-3796 or (602) 836-8226) should be notified immediately so they could initiate evacuations.

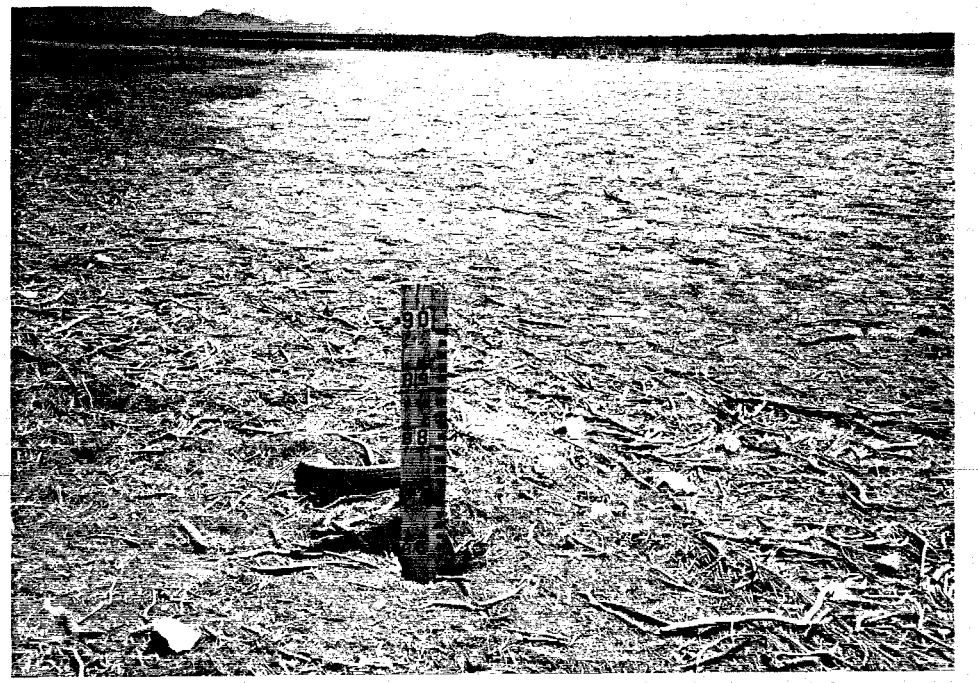

Photo 5-01. Reservoir Staff Gage in Lake Saint Clair (looking upstream near the Conservation Intake Tower).

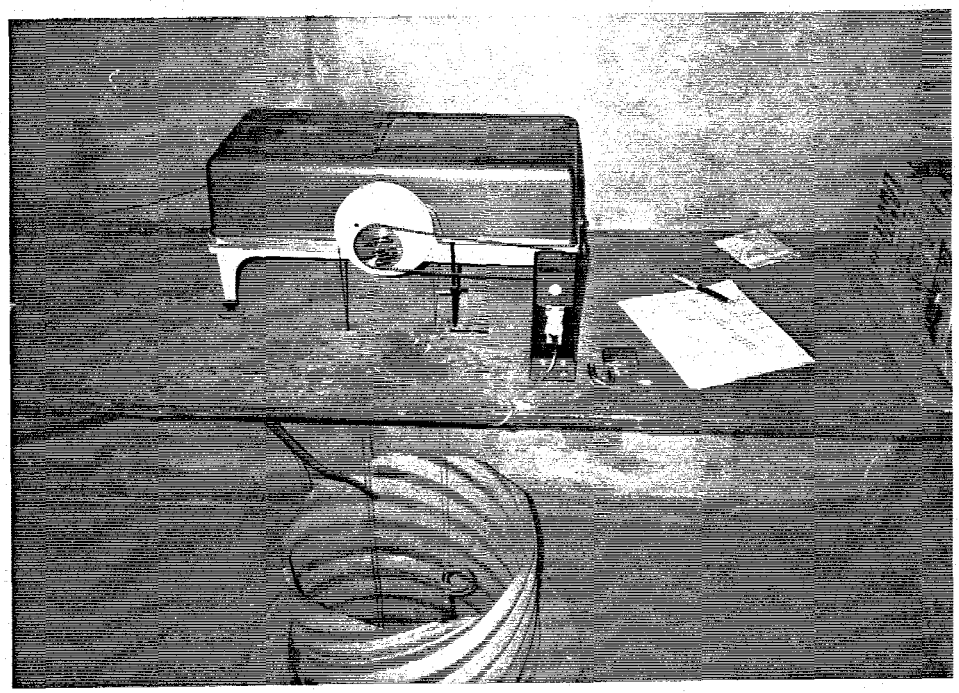

Photo 5-02. Recording Instrument inside the Instrument House on top of the Conservation Intake Tower.

VI - HYDROLOGIC FORECASTS

6-01 General. There are no official forecasts made by the U. S. Army Corps of Engineers or the National Weather Service for Tat Momolikot Dam. Santa Rosa Wash water quality is not monitored by any agency.

a. Role of Corps. Although no formal hydrologic forecasts are made for Tat Momolikot Dam, the Corps of Engineers does monitor conditions at the dam and can make a general forecast for the area as needed. Any significant change in hydrologic conditions at the dam will prompt the LAD to notify pertinent agencies and coordinate with them when necessary.

The LAD meteorologist prepares quantitative precipitation forecasts (QPF's), when significant rain is forecast in any region of the district. The QPF assists in estimating the severity of the upcoming event and in scheduling personnel to work in affected areas.

b. Role of Other Agencies. No other agency currently prepares forecasts of inflow to Tat Momolikot Dam. The NWS office at Phoenix, Arizona (phone number (602) 261-4000) will provide, upon request, weather forecasts and climatological reports for the region in which the project is located. Unit hydrographs for drainage subareas are presented in Table 6-01. These unit hydrographs may be applied to predict inflow when rainfall data in these subareas are available.

Historical precipitation and streamflow data are available from the BIA, NWS, USGS, and others. These data, while not of use in real-time, are important to studies of historical storms and floods that aid in the development and refinement of computerized rainfall-runoff models.

6-02 Flood Condition Forecasts. Forecasts of flood hydrographs are not currently made. However, inflow and precipitation conditions are collected and evaluated to provide a general prediction of flood situations. Using such information, an evaluation can be made as to whether an ongoing flood will increase or decrease over the next 24 hours.

6-03 Conservation Purpose Forecasts. The maximum water surface elevation in the conservation pool since the construction of Tat Momolikot Dam has been approximately 1501.5 ft. This is 7.5 ft below the desired water surface elevation. As a result, only three releases have ever been made from the dam and no conservation-purpose forecasts are made.

6-04 Long Range Forecasts. Since water is only rarely and briefly impounded behind Tat Momolikot Dam and since there are no major upstream flood control facilities, there is little if any, direct need for long-range forecasts in the operation of Tat Momolikot Dam. Thus, at this time, no long range forecasts are made for Tat Momolikot Dam.

Only in the event of major impoundment at Lake Saint Clair, would a forecast of more than 1 day be of significance to the operation of Tat Momolikot Dam. In such a case, the forecast of another impending major storm or lack of such storm might influence the release rate of water from the dam in order to prevent or minimize downstream damages.

Table 6-01

UNIT HYDROGRAPHS CORRESPONDING TO SUBAREA
SHOWN ON PLATE 4-04 FOR SANTA ROSA WASH

TIME (hours)	Subarea Unit Hydrographs [(ft3/sec)/(inch/hour)]						
	A	B	C	D	E	F	G
1	390	250	960	370	320	130	680
2	1,550	1,720	8,610	2,560	950	630	3,650
3	3,490	4,410	27,890	6,590	2,050	1,130	10,050
4	6,990	9,440	40,890	14,110	4,270	2,130	21,460
5	13,200	16,050	24,610	24,000	7,110	3,750	37,670
6	19,030	22,790	10,120	34,070	10,750	5,380	44,070
7	27,370	18,510	5,880	27,660	14,850	7,760	31,970
8	27,570	13,240	4,100	19,780	20,540	10,390	20,090
9	20,580	7,600	2,870	11,360	19,750	13,640	11,870
10	15,730	5,020	2,190	7,510	15,330	14,010	8,220
11	10,290	3,800	1,500	5,680	12,330	11,760	6,160
12	7,380	2,820	1,230	4,210	8,220	9,010	4,790
13	5,630	2,450	1,090	3,630	6,000	7,630	4,110
14	4,270	1,840	680	2,750	4,420	5,010	2,970
15	3,490	1,470	680	2,200	3,480	4,000	2,510
16	3,110	1,350	550	2,020	3,160	3,500	2,050
17	2,720	1,100	410	1,650	2,530	2,500	2,050
18	1,940	980	410	1,470	2,210	2,250	1,600
19	1,940	980	410	1,470	1,900	1,750	1,370
20	1,550	610	410	920	1,740	1,750	1,140
21	1,550	610	410	920	1,420	1,380	910
22	1,160	490	410	730	1,260	1,250	910
23	1,160	490	410	730	1,110	1,130	910
24	1,160	490		730	950	1,000	680
25	970	370		550	790	880	680
26	780	370		550	790	880	680
27	780	370		550	790	750	460
28	580	370		550	630	750	460
29	580	250		370	630	630	460
30	580	250		370	630	630	460
31	580	250		370	470	500	460
32	580	250		370	470	380	460
33	580	250		370	470	380	460
34	390	250		370	320	380	460
35	390	250		370	320	380	460
36	390	120		190	320	380	230
37	390	120		180	320	380	230
38	390	120		180	320	380	230
39	200	120		180	320	250	230
40	200	120		180	320	250	
41	200	120		180	320	250	
42	200	120		180	160	250	
43	200				160	250	
44	200				160	250	
45	200				160	250	
46	200				160	130	
47	200				160	130	
48	190				160	130	
49	190				160	130	
50	190				160	130	
51	190				160	130	
52	190				160	130	
53	190				160	130	
54					160	130	
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58					160	120	
59					160	120	
60					160	120	
61					160	120	
62						120	
63						120	
64						120	
65						120	
66						120	
67						120	
68						120	

VII - WATER CONTROL PLAN

7-01 General Objectives. Tat Momolikot Dam and Reservoir was designed as a multiple-purpose project. It was built to provide (a) protection against floods to lands and improvements, (b) conservation storage, (c) for development of irrigable lands, and (d) recreation, and fish and wildlife facilities. It is operated independently of any other flood control facility or system. Flood waters are stored in the conservation pool, and released as the need for irrigation water arises.

7-02 Major Constraints. Constraints that impact the regulation of Tat Momolikot Dam and Lake Saint Clair are:

a. Channel Capacity. Below Tat Momolikot Dam the natural watercourse of Santa Rosa Wash extends 9.0 miles. In this reach, the streambed is a braided channel and varies in width from about 500 ft below the dam to about 2 miles in the downstream end of the reach. Below this natural channel, local interests have confined Santa Rosa Wash by the construction of levees. The channel is leveed for 24 miles to its confluence with Santa Cruz Wash. Channel capacities of this reach were evaluated in August 1971. Rating curves based on uniform flow depths and variable roughness coefficients were determined for 23 cross-sections. The limiting cross sectional capacity for the 24 mile leveed reach is about 5,000 cfs. If the combination of dam releases and local runoff were greater than 5,000 cfs, it is likely that the levees would be overtopped and would fail. Levee failure could lead to flooding of agricultural fields and towns.

b. Spillway Flow. Spillway flow has great damage potential. Immediately downstream of the Tat Momolikot Dam embankment is the Tohono O'odham farm which could sustain damage. Four miles downstream of the dam, the O'odham village of Cockleburr would sustain damage from the combined spillway flow and local runoff. In addition, individual farms and dwellings in the vicinity of Santa Rosa Wash would sustain damages.

7-03 Overall Plan for Water Control. Tat Momolikot Dam and Lake Saint Clair is operated as a multiple-purpose facility on Santa Rosa Wash. It was built to provide flood protection, water conservation storage, irrigation water for downstream agriculture, and recreation facilities. The operational emphasis is storing water to maintain a pool for the above purposes. Plate 2-06, which depicts the storage allocations for Lake Saint Clair, shows that the entire space of the reservoir below elevation 1509.0 ft is devoted to conservation operations. Between elevation 1509.0 and 1515.0 ft (the maximum elevation to which the flashboards can be raised), the space can be used for either conservation or flood control or both, depending on whether flashboards are in place. The addition of flashboards to the flood control outlet works approach channel was made so that a minimum of 15,000 acre-ft of conservation storage could be maintained at all times in the future. The flashboards would be added individually as needed to offset the sedimentation in the basin. Assuming no sediment removal from the basin, the flashboards, once inserted, would be left in place. Elevation 1515.0 to 1539.0 ft (the spillway crest) is allocated to flood control. Between elevation 1539.0 and

1551.2 ft (the maximum reservoir water surface elevation for the spillway design flood), the space is used for spillway surcharge. The distance between elevation 1551.2 and 1557.5 ft (the top of the dam) is reserved for freeboard.

7-04 Standing Instructions to Damtender. There are no permanent attendants, telephones or radios at the Tat Momolikot Dam. Communications from the damsite can only be achieved by portable radio. The "Standing Operating Instructions to the Project Operator for Water Control" for Tat Momolikot Dam and reservoir are given in Exhibit A. The project operator should follow the Standing Operating Instructions in Exhibit A.

7-05 Flood Control. Floods of magnitude up to and including the reservoir design flood are controlled by the project such that peak outflows from the reservoir are safely carried in downstream reaches. Flood waters are released through a 12-ft high by 13-ft wide ungated conduit. The flood control outlet works do not include any mechanical equipment that permits adjustment of reservoir outflows. The flood control conduit capacity when the water surface elevation reaches the spillway crest (elevation 1539.0 ft) is 4,960 cfs. The reservoir design flood discharge of 4,960 cfs would not exceed the downstream channel capacity of 5,000 cfs. The conduit capacity increases to 6,360 cfs when the water reaches the maximum elevation of the spillway design flood (1551.2 ft). At this water surface elevation, 134,240 cfs of water would be flowing over the top of the spillway. If spillway flow does occur, the conservation outlet gates should be closed to minimize the downstream flow as much as possible.

Although the reservoir design flood discharge and limiting cross sectional capacity of the leveed channel are nearly equal, it was concluded that the likelihood of the reservoir design flood discharge and significant local runoff downstream of the dam occuring simultaneously was slim. There is 15,000 ac-ft of water conservation space in the dam to be filled before the water even reaches the elevation of the flood control conduit invert without flashboards in place. With the flashboards in place there is 34,855 ac-ft of storage behind the dam. It is not deemed economically viable to take any structural action when assessing the flood damages resulting from the rare event when the discharge from the dam and local runoff combine to exceed 5,000 cfs causing local downstream flooding.

7-06 Recreation. The Tat Momolikot Dam water control objectives that exist for recreation have to do mainly with fish and wildlife (see paragraph 7-08). Tat Momolikot Dam is not operated to meet recreation objectives such as boating or swimming.

7-07 Water Quality. Tat Momolikot Dam is not operated to meet specific water quality objectives.

7-08 Fish and Wildlife. There are fish and wildlife water control objectives for Tat Momolikot Dam within both the reservoir and fish ponds downstream of the dam. If the reservoir were to be stocked with fish, it would be necessary to maintain an adequate water level to support them. It would be necessary to maintain their water level by occasionally releasing water into them from either the conservation pool or some other source (i.e.

wells). Water temperature and water quality should be considered when adding water to the fish ponds. Occasional impounding of water behind the dam is expected to intensify wildlife and thus, enhance hunting in the reservoir area. In the event that additional inflows to the reservoir occur while water is impounded behind it, the BIA would decide what releases may be made to keep the wildlife habitat in balance.

Water needed for irrigation and lack of subsequent inflows continues to constrain the fish and wildlife water control objectives.

7-09 Water Supply. The primary water supply objective is irrigation. The Tohono O'odham Farm just downstream of Tat Momolikot Dam is to be supplied with the 4000 - 4800 ac-ft per year of water it needs from the conservation pool whenever available via the Vaiva Vo Irrigation System supply canal. Releases are to be made as water is needed.

This water control objective is the number one priority, so, unless water is left impounded behind the dam for ground water recharge, releases from the dam will reflect irrigation needs.

7-10 Other. In the event of maintenance or construction on the downstream channel of the Santa Rosa Wash, the gated outlet for the conservation pool may be closed in order to reduce releases in support of such downstream activities.

7-11 Deviation from Normal Regulation. There may be instances when it is necessary for the operation of Tat Momolikot Dam to deviate from the established flood control plan. Prior approval of deviations is required from the Reservoir Regulation Section, LAD, except for emergencies and minor deviations as discussed below.

a. Emergencies. Emergencies can take the form of drowning or other accidents, chemical spills, or failure of operation facilities. Necessary action should be taken immediately, so long as this does not create a worsened overall condition. For any action taken, assessment of the situation by those operating the dam should rely on their knowledge of the dangers involved. All concerned agencies should be informed of any deviations due to emergencies as soon as practical.

b. Unplanned Minor Deviations. Unplanned instances arise where there is a need for minor deviations from the normal regulation of the reservoir, although they are not considered emergencies. Construction activities are the primary source of these deviations. Downstream maintenance of culverts, bridges, and channel sections are another reason for minor regulation changes. Each request is analyzed on its own merits. Consideration is given to the potential of flooding and possible alternative measures. Requests will be complied with, providing there are no adverse effects on the overall project regulation. Approval for these minor deviations should be obtained from the BIA when they involve the conservation pool or Reservoir Regulation Section, LAD when they involve flood control. Again, all deviations should be reported to the concerned agencies as soon as practical.

c. Planned Deviations. There are planned instances which require deviations from normal regulation. Each condition will be judged on its own

merits. Sufficient data on flood potential, effect on the environment, reservoir and watershed conditions, possible alternative measures, benefits to be expected, probable effects on other projects, and useful purposes will be presented to the BIA and Reservoir Regulation Section, LAD, along with recommendations for review and approval.

d. Drought Contingency Plan. Tat Momolikot Dam and Lake Saint Clair has a storage allocation for water conservation. Santa Rosa Wash downstream of the dam has a natural bed making groundwater recharge possible. In the event of a drought, water would be impounded behind the dam in the conservation space, which can be increased by the insertion of flashboards into the flood control outlet works approach channel. Any such plan would be evaluated to ensure that the flood control purpose of the project would not be compromised.

VIII - EFFECT OF WATER CONTROL PLAN

8-01 General. Tat Momolikot Dam's main benefits come from flood control and water supply. Potentially damaging floods to downstream development are controlled and a percentage of the water can be stored behind the dam to use for water conservation purposes (irrigation and recreation). Section 8-02 discusses the major aspects of flood control at Tat Momolikot Dam for both the reservoir and spillway design floods. Sections 8-03 through 8-06 describe the effects and benefits of the conservation purposes.

8-02 Flood Control.

a. Spillway Design Flood. The spillway design flood represents the discharge and volume that would be expected from the most severe combination of critical meteorologic and hydrologic conditions that are reasonably possible in the region. This flood would result from probable maximum precipitation occurring at a time when ground conditions were conducive to maximum runoff. The Hydrometeorological Section of the U. S. Weather Bureau estimated that the probable maximum precipitation would be 12.1 inches of rain in a 72-hour period. For the determination of flood runoff a constant rainfall loss rate of 0.19 inch per hour was estimated. The loss rate during periods with precipitation-intensity rates less than the 0.19 inch per hour would be 90 percent of the precipitation-intensity rate. Base flow was considered to compensate for percolation losses. The resultant peak discharge was 280,000 cfs and the volume of runoff was 455,000 ac-ft at the damsite.

The spillway design flood was routed through the reservoir assuming the reservoir full to spillway crest at the beginning of the flood, the conservation outlet works closed, net capacity available, and the 12-ft by 13-ft flood control outlet discharging at full capacity. A maximum water surface elevation of 1,551.2 ft was calculated and the peak inflow of 280,000 cfs was reduced to a peak outflow of 140,600 cfs (134,240 cfs spillway flow plus 6,360 cfs flood control outlet flow). See Plate 8-01 for the spillway design flooding routing.

b. Standard Project Flood. The standard project flood is the reservoir design flood for Tat Momolikot Dam. The reservoir design flood is expected to occur from the most severe combination of meteorologic and hydrologic conditions that are reasonably characteristic of the geographic area. The reservoir design flood was based on the occurrence of a synthetic storm equal in magnitude to that of 3-8 September 1939. The storm was transposed directly over the drainage area in such a position that the largest possible discharge would result at the damsite. The three-day storm produced an average precipitation depth over the area of 6.40 inches. For the mountain areas a variable rainfall loss rate ranging from 0.35 to 0.15 inch per hour was used. For the valley areas a constant loss rate of 0.20 inch per hour was used. Over the total area loss rates were estimated at 90 percent of the precipitation when precipitation was less than the assigned loss rates, stated above. Effective total runoff resulting from the storm was computed. The average effective total runoff resulting from the storm was computed to be 2.44 inches over the total drainage area. Runoff from snowmelt was

104 year period of record.

c. Damage-Discharge and Damage-Frequency Relationships. Plate 8-05 is the Damage-Discharge and Damage-Frequency Curves. These curves represent the amount of damage (in dollars) that can be expected from various floods and the frequency with which these floods may occur. The curves are based on 1969 conditions and were computed in 1977 for the Reservoir Regulation Manual. The validity of these curves has not been studied since 1977, so it is possible that they are no longer valid.

8-08 Other Studies. Presently, the COE is conducting a feasibility study for flood control on the Santa Cruz River. Five alternatives are being analyzed in which flows in the Santa Cruz River would be contained and/or diverted. One of the alternatives is the diversion of some of the water from the Santa Cruz River to behind Tat Momolikot Dam. The feasibility portion of the study is scheduled to be completed in 1991. If the alternative involving diversion to Tat Momolikot Dam were to be implemented, a new water control plan would be developed.

IX - WATER CONTROL MANAGEMENT

9-01 Responsibilities and Organization.

a. Corps of Engineers. Tat Momolikot was designed and constructed by the COE. The Corps has agreed to assist the BIA in the operation of the dam and in the collection of hydrologic data. Since the dam has an ungated flood control outlet there is no active regulation of floods through that outlet.

Reservoir regulation criteria that are specified for Tat Momolikot Dam by the Corps are done so by the Reservoir Regulation Section of the LAD. Table 9-01 is an organizational chart depicting the chain of command for Reservoir Regulation decisions.

The flood control regulations are subject to temporary modification by the Los Angeles District Engineer, Corps of Engineers, if found necessary in time of emergency. Requests for and action on such modifications may be made by the fastest means of communications available. The action taken shall be confirmed in writing the same day to the office of the BIA's Area Director and shall include justification for the action.

In the event of a major storm, the Reservoir Regulation Section of the LAD should be notified when 1-1/2 inches of rain falls at either Tat Momolikot Dam or Casa Grande, or when the reservoir water surface elevation reaches 1,505 ft MSL. The COE should also be notified in the event of any drastic changes in the condition of the dam or reservoir storage allocation. Once the flood waters have subsided, the Corps should be made aware of the condition of the dam and reservoir.

b. Other Federal Agencies. The BIA has responsibility for the operation of Tat Momolikot Dam, although they do receive data and information from the COE and other federal and local agencies and inform these agencies of major decisions affecting Tat Momolikot Dam. As mentioned above in Section 9-01a, the BIA will notify the Corps of conditions at the dam during and after major flood events. The BIA is also responsible for maintenance of the project.

The BIA's Regional Director may temporarily deviate from the flood control regulations in the event an immediate short-term departure is deemed necessary for emergency reasons. Such actions will be immediately reported by the fastest means of communication available. Actions shall be confirmed in writing the same day to the Los Angeles District Engineer, Corps of Engineers, and shall include justification for the action.

The BIA is responsible for performing necessary work on the Santa Rosa Wash through the Papago, Maricopa, and Gila River Indian Reservations downstream of the dam to maintain the hydraulic capacity of the existing channel.

c. State and County Agencies. The Maricopa, Midway, and Stanfield Flood Control Districts include the Santa Rosa Wash within their boundaries and are responsible for maintaining the hydraulic capacity of the Wash in their area.

d. Private Organizations. No private agencies have operation or maintenance responsibilities for the dam or the downstream channel.

Table 9-01.

Chain of Command for Reservoir Operations Decisions

Corps of Engineers
Los Angeles District

Title	Office Phone Number:
District Engineer	(213) 894-5300

Water Control Decisions		Operational and Maintenance	
Title	Phone:	Title	Phone:
Chief, Engineering Division	(213) 894-5470	Chief, Construction-Operations Division	(213) 894-5600
Chief, Hydrology & Hydraulics Branch	(213) 894-5520	Chief, Operations Branch	(213) 894-5620
Chief, Reservoir Regulation Section	(213) 894-6915	Chief, Operations and Maintenance Section	(818) 401-4008
Chief, Reservoir Regulation Unit	(213) 894-6916		

9-02 Interagency Coordination. The BIA coordinates with other Federal, State, County, and local organizations, and informs the press concerning water control of Tat Momolikot Dam and Lake Saint Clair.

a. Local Press and Corps Bulletins. The BIA is responsible for notifying the press regarding operations at Tat Momolikot Dam, but the Public Affairs Office of the Corps of Engineers, LAD, will assist if asked to do so. This notification is accomplished through both interviews and the occasional issuance of press releases. Neither the BIA or COE publicly issues flood watches or warnings, or other status reports of forecasts to the general public. These notifications are the responsibility of the NWS.

b. National Weather Service. The BIA utilizes NWS data and forecasts to assist in the operation of Tat Momolikot Dam. The BIA and the COE share data with the NWS and other agencies both on a real-time basis and on a post-event basis.

c. U. S. Geological Survey. The USGS will supply historical streamflow data to the BIA or the COE if requested.

d. Other Federal, State, or Local Agencies. The BIA coordinates the flood control operation of Tat Momolikot Dam with the Corps of Engineers, LAD. Coordination with other federal, state, and local agencies generally only occurs in times of emergency.

9-03 Interagency Agreements. The BIA has a maintenance agreement with the Farming Authority of the O'odham Tribe for the main dam, spillway, and outlet channels. The BIA has an agreement with the Bureau of Reclamation to perform 'Safety Evaluation of Existing Dams' (SEED) examinations and analyses and preparation of SEED reports. See Table 1-01 for a list of the above references.

9-04 Commissions, River Authorities, Compacts, and Committees. Tat Momolikot Dam is not involved in any commissions, compacts, or other such formal multi-agency agreements.

9-05 Reports. The BIA does not prepare any formal reports for Tat Momolikot Dam.

As required by ER 1110-2-240 "Water Control Management", the LAD prepares reports for transmittal to the South Pacific Division Office concerning the operation of Tat Momolikot Dam:

a. Annual Division Water Control Management Report. This report covers significant activities of the previous water year and a description of project accomplishments planned for the current year.

b. Summary of Runoff Potentials in Current Season. This report is generally submitted monthly during the storm season (October 15 - April 15), and covers snow accumulation and runoff potential in the District. Supplemental reports are submitted in the event of severe situations.

c. Periodic Inspection. This report gives the condition of the dam and recommendations for any necessary repairs.
Reports prepared by other agencies:

d. Safety Evaluation of Existing Dams (SEED) Reports. This report is prepared by the Bureau of Reclamation approximately once every five years. It is a very extensive report covering all aspects of dam safety after examining the dam and analyzing the data.

Table 9-01.

Chain of Command for Reservoir Operations Decisions

Corps of Engineers
Los Angeles District

Title	Office Phone Number:
District Engineer	(213) 894-5300

Water Control Decisions		Operational and Maintenance	
Title	Phone:	Title	Phone:
Chief, Engineering Division	(213) 894-5470	Chief, Construction-Operations Division	(213) 894-5600
Chief, Hydrology & Hydraulics Branch	(213) 894-5520	Chief, Operations Branch	(213) 894-5620
Chief, Reservoir Regulation Section	(213) 894-6915	Chief, Operations and Maintenance Section	(818) 401-4008
Chief, Reservoir Regulation Unit	(213) 894-6916		

9-02 Interagency Coordination. The BIA coordinates with other Federal, State, County, and local organizations, and informs the press concerning water control of Tat Momolikot Dam and Lake Saint Clair.

a. Local Press and Corps Bulletins. The BIA is responsible for notifying the press regarding operations at Tat Momolikot Dam, but the Public Affairs Office of the Corps of Engineers, LAD, will assist if asked to do so. This notification is accomplished through both interviews and the occasional issuance of press releases. Neither the BIA nor COE publicly issues flood watches or warnings, or other status reports of forecasts to the general public. These notifications are the responsibility of the NWS.

b. National Weather Service. The BIA utilizes NWS data and forecasts to assist in the operation of Tat Momolikot Dam. The BIA and the COE share data with the NWS and other agencies both on a real-time basis and on a post-event basis.

c. U. S. Geological Survey. The USGS will supply historical streamflow data to the BIA or the COE if requested.

d. Other Federal. State, or Local Agencies. The BIA coordinates the flood control operation of Tat Momolikot Dam with the Corps of Engineers, LAD. Coordination with other federal, state, and local agencies generally only occurs in times of emergency.

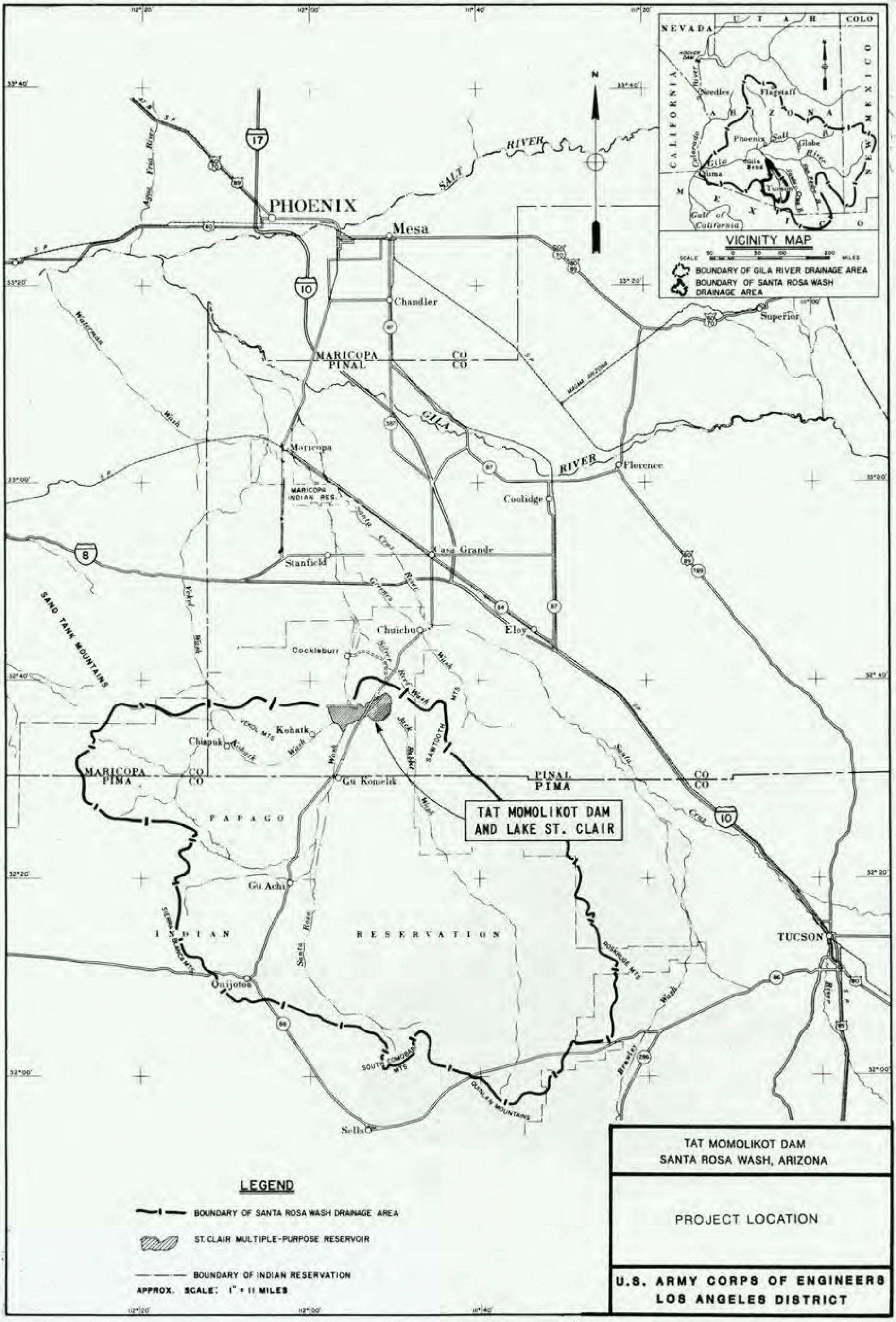
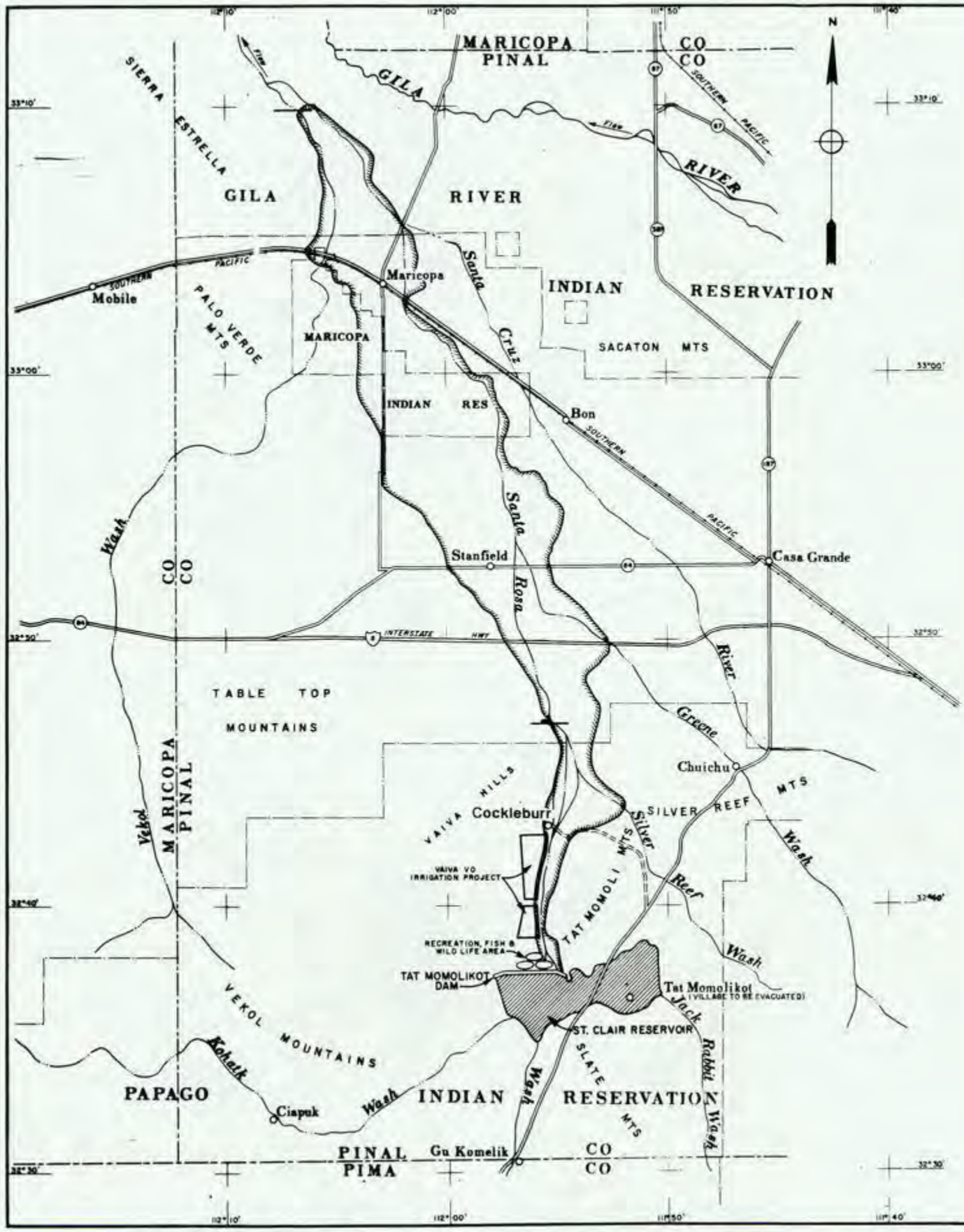

PHOENIX
Mesa
Chandler
Superior
Maricopa
Florence
Coolidge
Casa Grande
Stanfield
Eloy
Chuichu
Cocklebur
Kohatk
Chiapuk
Gu Komelik
Gu Achi
Ouijoton
Sells
TUCSON
SALT RIVER
GILA RIVER
MARICOPA CO
PINAL CO
PIMA CO
MARICOPA INDIAN RES.
SAND TANK MOUNTAINS
VEKOL MTS
SAWTOOTH MTS
SIERRA BLANCA MTS
SOUTH COMOBABI MTS
QUITLAN MOUNTAINS
ROSKRUDGE MTS
PAPAGO
INDIAN
RESERVATION
TAT MOMOLIKOT DAM AND LAKE ST. CLAIR
VICINITY MAP
SCALE 50 0 50 100 200 MILES
BOUNDARY OF GILA RIVER DRAINAGE AREA
BOUNDARY OF SANTA ROSA WASH DRAINAGE AREA
NEVADA
UTAH
COLO
NEW MEXICO
CALIFORNIA
Needles
Flagstaff
Phoenix
Globe
Gila
Yuma
Tucson
Gulf of California
LEGEND
BOUNDARY OF SANTA ROSA WASH DRAINAGE AREA
ST. CLAIR MULTIPLE-PURPOSE RESERVOIR
BOUNDARY OF INDIAN RESERVATION
APPROX. SCALE: 1" = 11 MILES
TAT MOMOLIKOT DAM
SANTA ROSA WASH, ARIZONA
PROJECT LOCATION
U.S. ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT

PLATE 2-01



NOTE:

1. THE OVERFLOW AREA REPRESENTS THE AREA SUBJECT TO FLOODING BY THE STANDARD PROJECT FLOOD BEFORE TAT MOMOLIKOT DAM WAS CONSTRUCTED. THE OVERFLOW AREA WAS EXTRACTED FROM ''INTERIM REPORT ON SURVEY FOR FLOOD CONTROL, SANTA ROSA WASH, ARIZONA, AUGUST 1, 1963.'' BY THE CORPS OF ENGINEERS AND IS REPRESENTATIVE OF CONDITIONS AT THAT TIME.

LEGEND

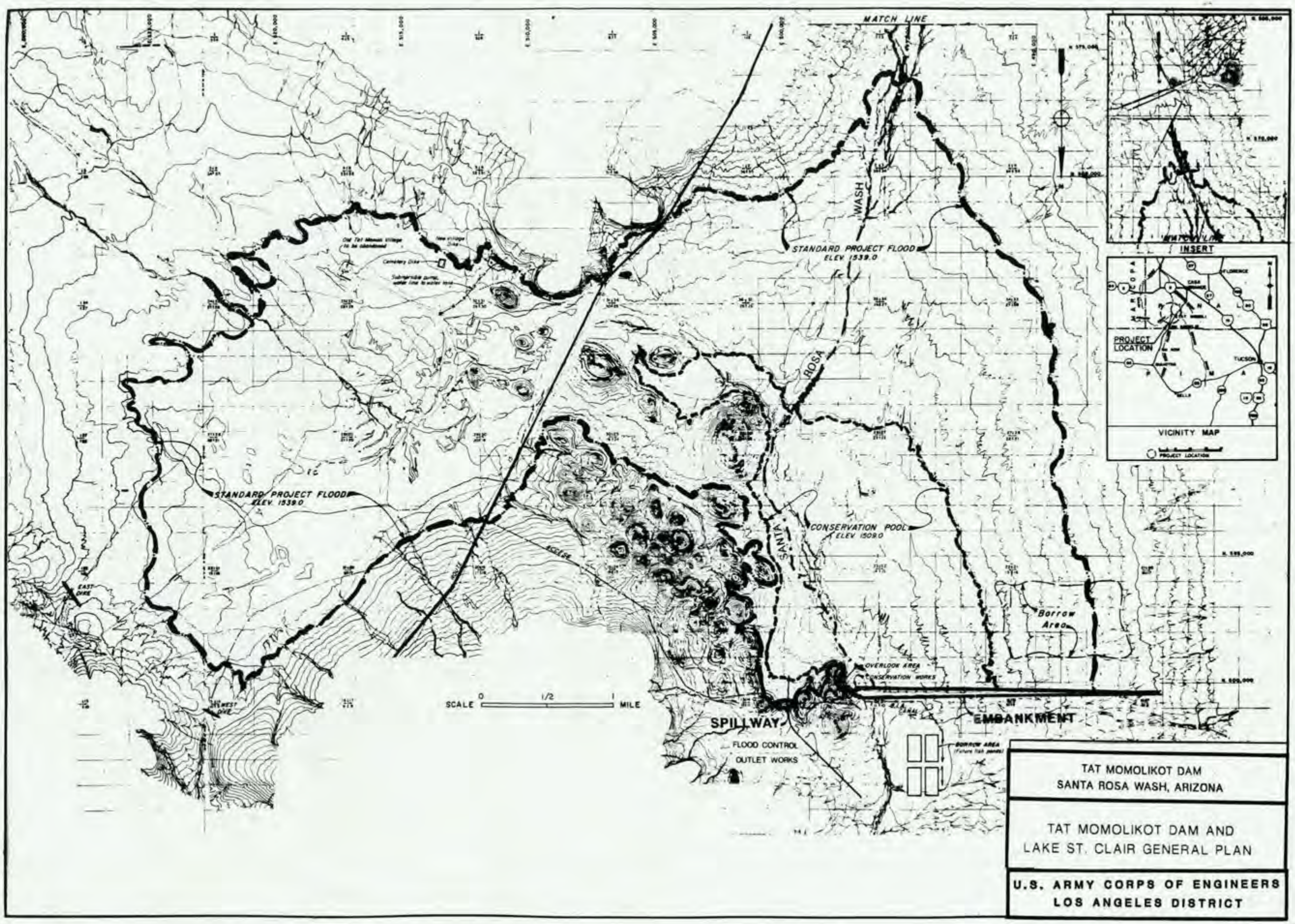
BOUNDARY OF AREA SUBJECT TO OVERFLOW BY STANDARD PROJECT FLOOD WITHOUT IMPROVEMENT.

RESERVOIR

TAT MOMOLIKOT DAM
SANTA ROSA WASH, ARIZONA

OVERFLOW AREA

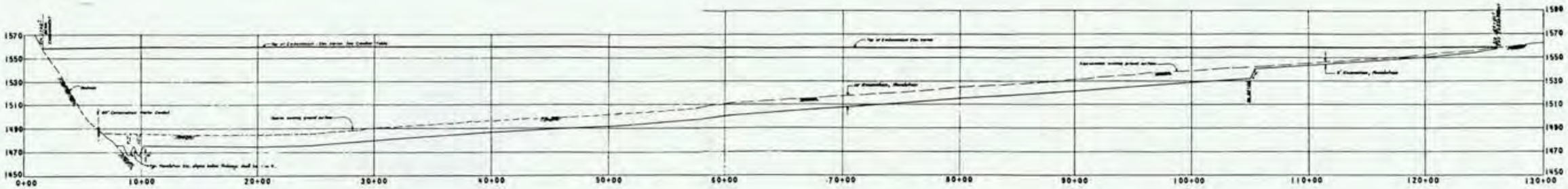
U.S. ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT



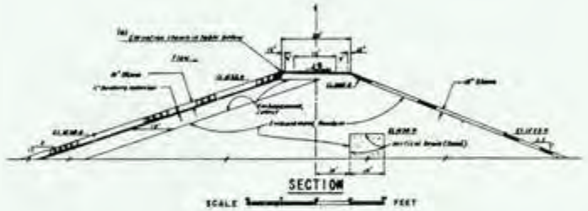
TAT MOMOLIKOT DAM
SANTA ROSA WASH, ARIZONA

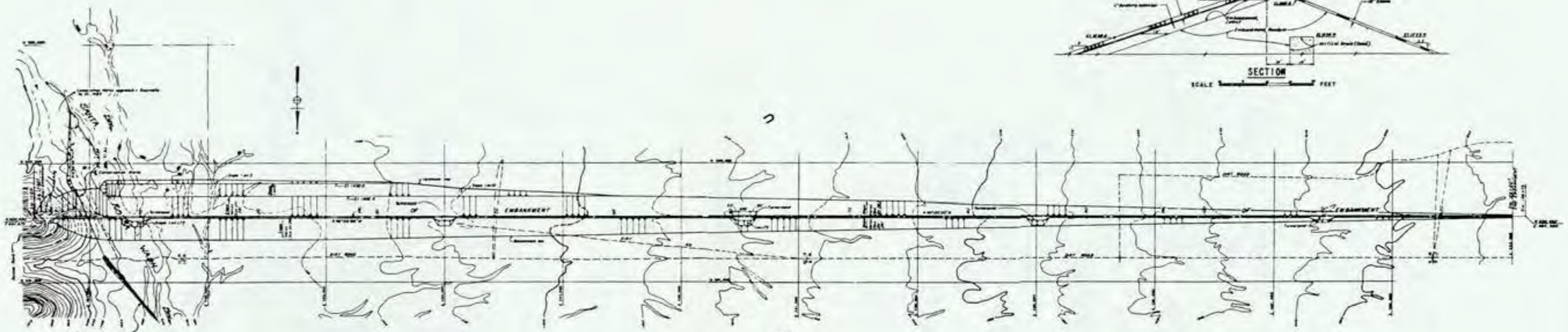
TAT MOMOLIKOT DAM AND
LAKE ST. CLAIR GENERAL PLAN

U.S. ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT



℄ EMBANKMENT PROFILE





PLAN
SCALE
FEET

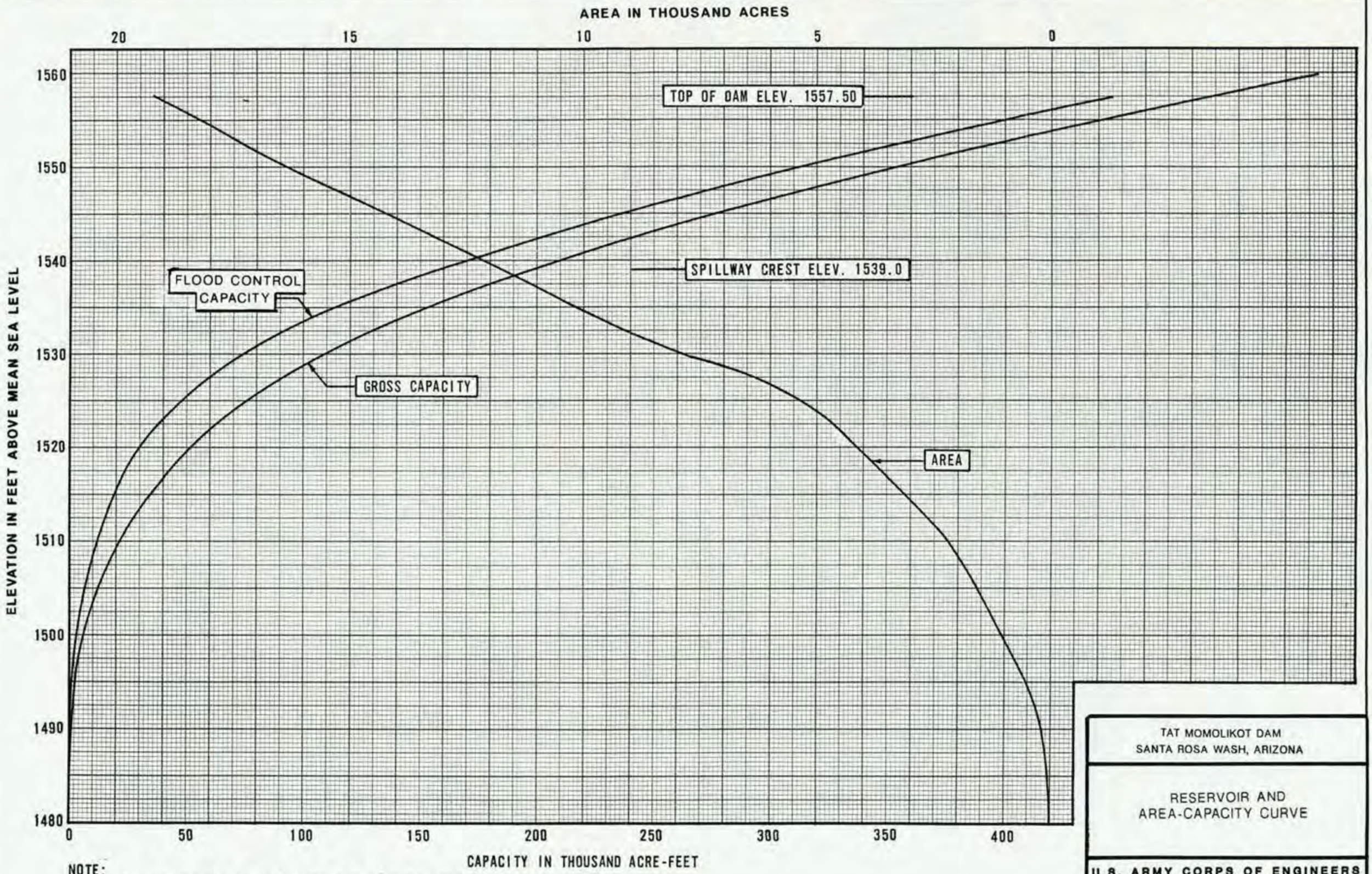
TAT MOMOLIKOT DAM

SANTA ROSA WASH, ARIZONA

MAIN DAM

PLAN, PROFILE and SECTIONS

U.S. ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT



NOTE:
1. BASED ON SURVEYS OF JULY 1968 AND OCTOBER 1975

TAT MOMOLIKOT DAM
SANTA ROSA WASH, ARIZONA

RESERVOIR AND
AREA-CAPACITY CURVE

U.S. ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT

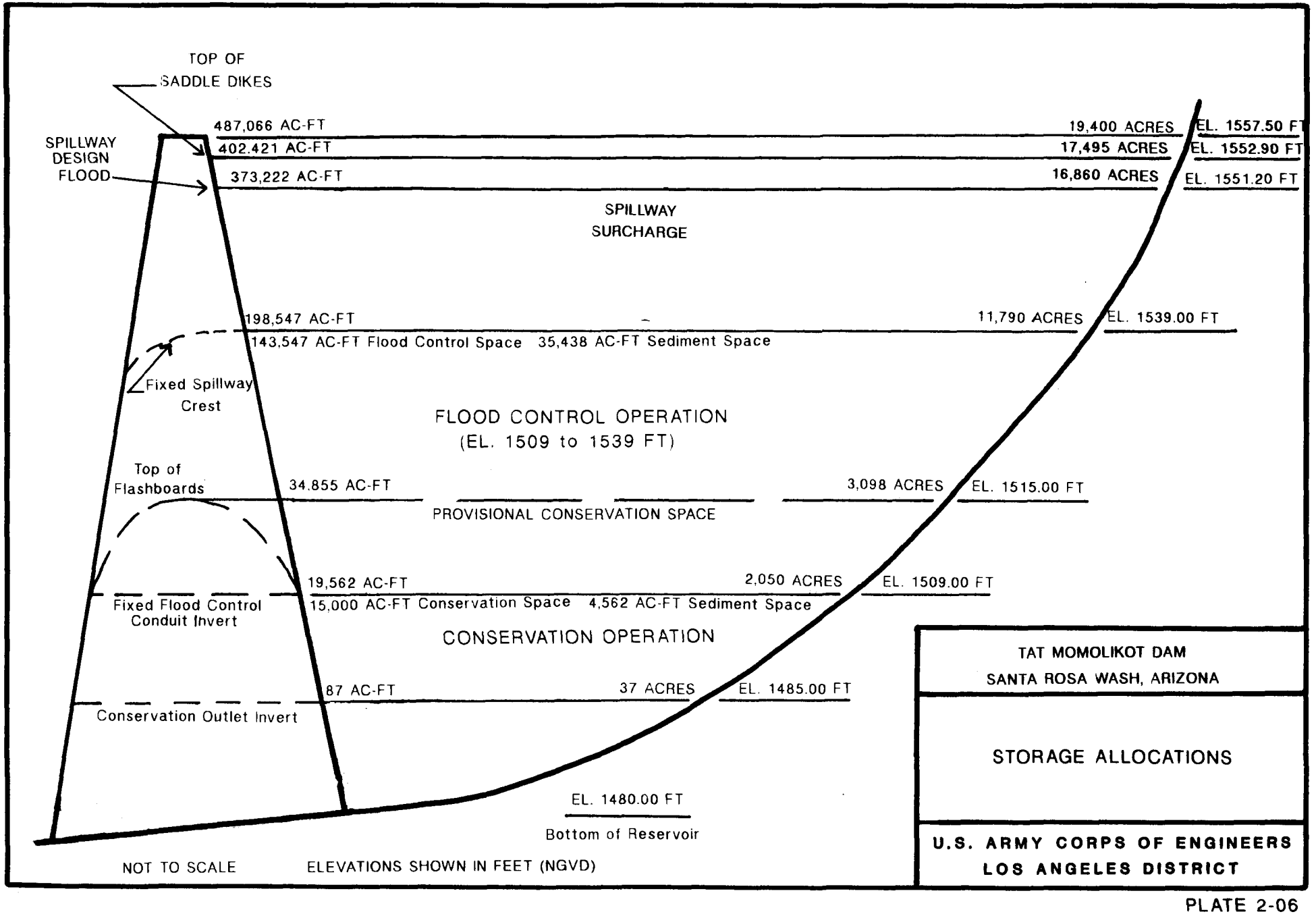
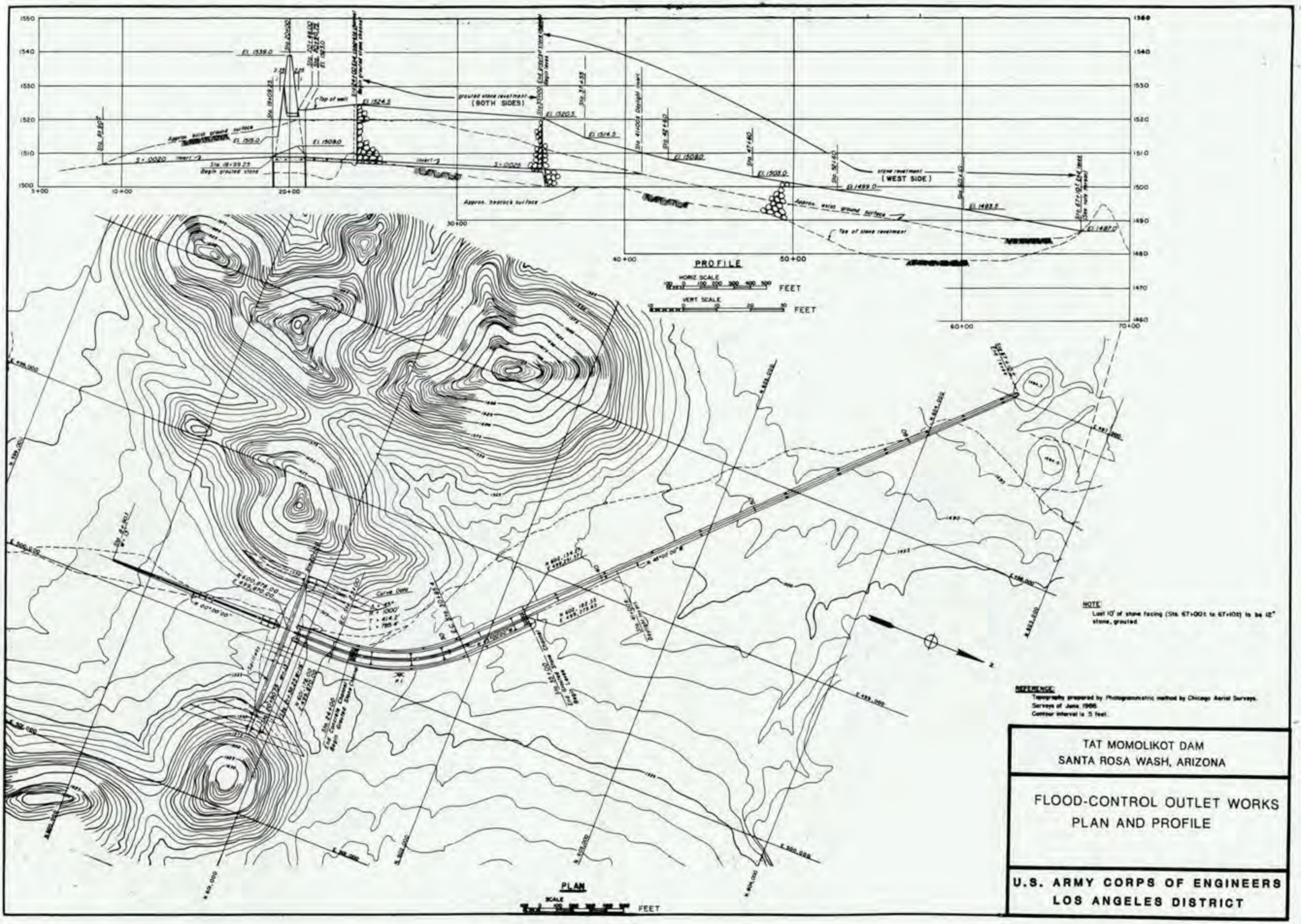
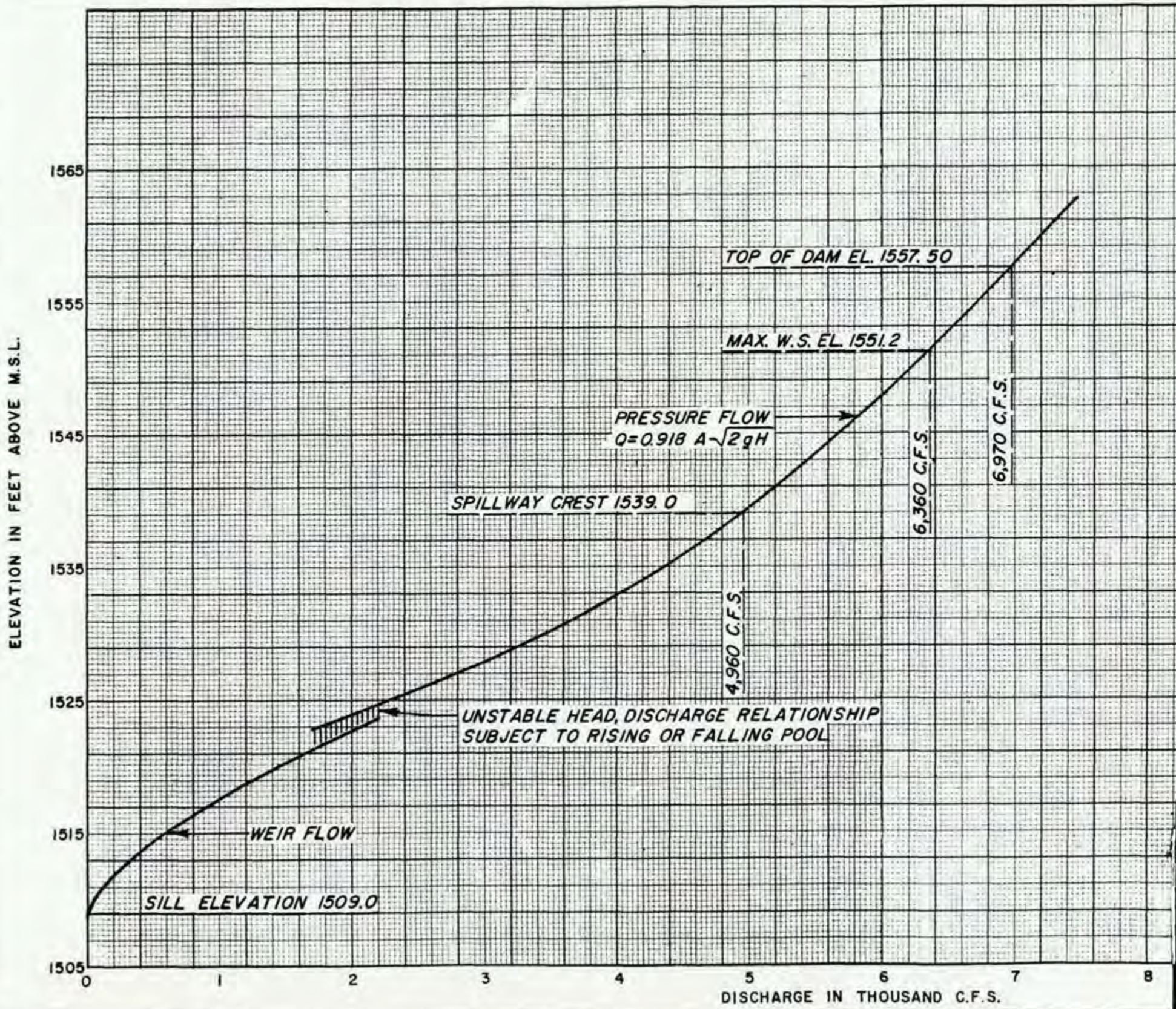

TOP OF
SADDLE DIKES
SPILLWAY
DESIGN
FLOOD
487,066 AC-FT
19,400 ACRES
EL. 1557.50 FT
402,421 AC-FT
17,495 ACRES
EL. 1552.90 FT
373,222 AC-FT
16,860 ACRES
EL. 1551.20 FT
SPILLWAY
SURCHARGE
198,547 AC-FT
11,790 ACRES
EL. 1539.00 FT
143,547 AC-FT Flood Control Space
35,438 AC-FT Sediment Space
Fixed Spillway
Crest
FLOOD CONTROL OPERATION
(EL. 1509 to 1539 FT)
Top of
Flashboards
34,855 AC-FT
3,098 ACRES
EL. 1515.00 FT
PROVISIONAL CONSERVATION SPACE
19,562 AC-FT
2,050 ACRES
EL. 1509.00 FT
Fixed Flood Control
Conduit Invert
15,000 AC-FT Conservation Space
4,562 AC-FT Sediment Space
CONSERVATION OPERATION
87 AC-FT
37 ACRES
EL. 1485.00 FT
Conservation Outlet Invert
EL. 1480.00 FT
Bottom of Reservoir
NOT TO SCALE
ELEVATIONS SHOWN IN FEET (NGVD)
TAT MOMOLIKOT DAM
SANTA ROSA WASH, ARIZONA
STORAGE ALLOCATIONS
U.S. ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT

PLATE 2-06

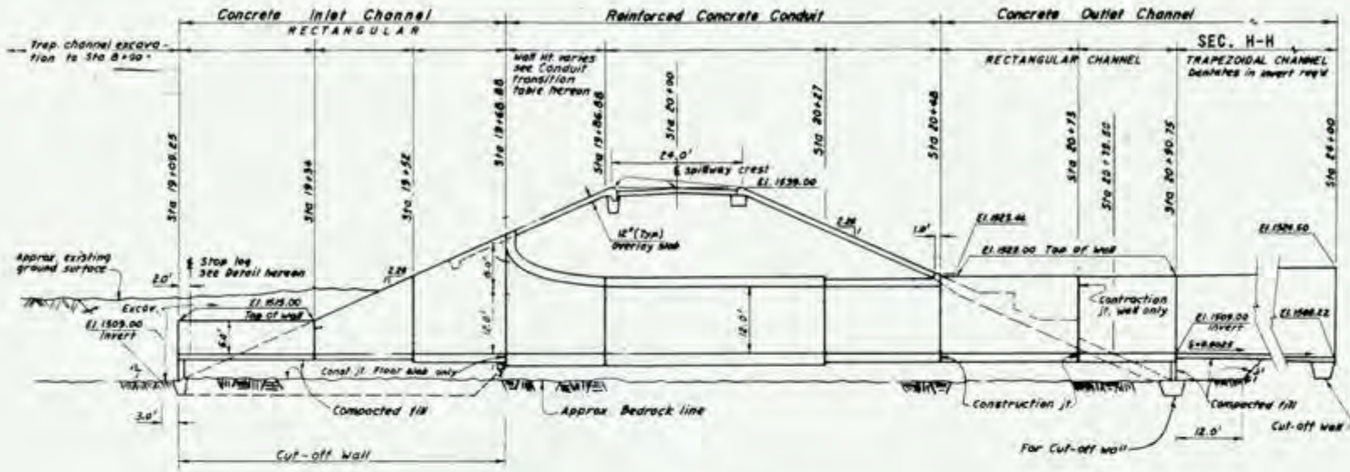

PROFILE
HORIZ SCALE
FEET
VERT SCALE
FEET
grouted stone revetment (BOTH SIDES)
stone revetment (WEST SIDE)
Approx. bedrock surface
Approx. weir ground surface
Top of stone revetment
Top of wall
Begin grouted stone
Inverts
S=.0020
S=.0026
El. 1539.0
El. 1524.5
El. 1520.5
El. 1514.5
El. 1509.0
El. 1505.0
El. 1499.0
El. 1493.5
El. 1487.0
PLAN
SCALE
FEET
NOTE:
Last 10' of stone facing (Sta. 67+00± to 67+10±) to be 12" stone, grouted.
REFERENCE:
Topography prepared by Photogrammetric method by Chicago Aerial Surveys.
Surveys of June, 1966.
Contour interval is 5 feet.
TAT MOMOLIKOT DAM
SANTA ROSA WASH, ARIZONA
FLOOD-CONTROL OUTLET WORKS
PLAN AND PROFILE
U.S. ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT



TAT MOMOLIKOT DAM
SANTA ROSA WASH, ARIZONA

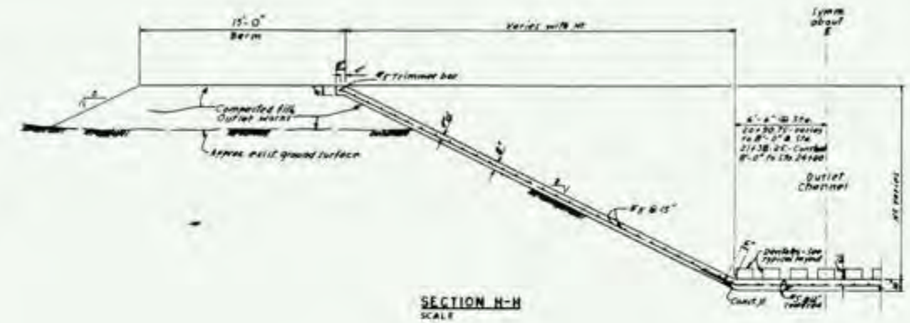
FLOOD-CONTROL OUTLET WORKS
12.0 x 13.0 FT.R.C.B.
DISCHARGE RATING CURVE

U.S. ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT



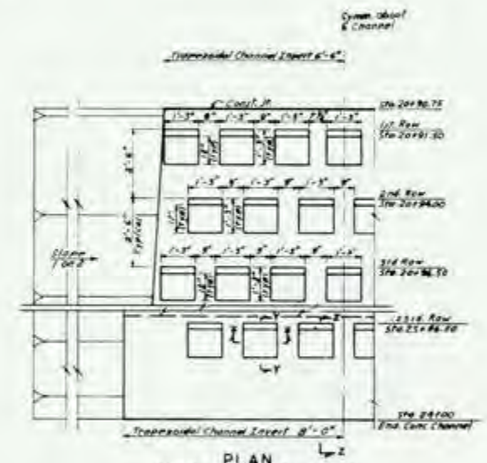
SECTION THROUGH ℄ OUTLET WORKS

SCALE FEET



SECTION H-H

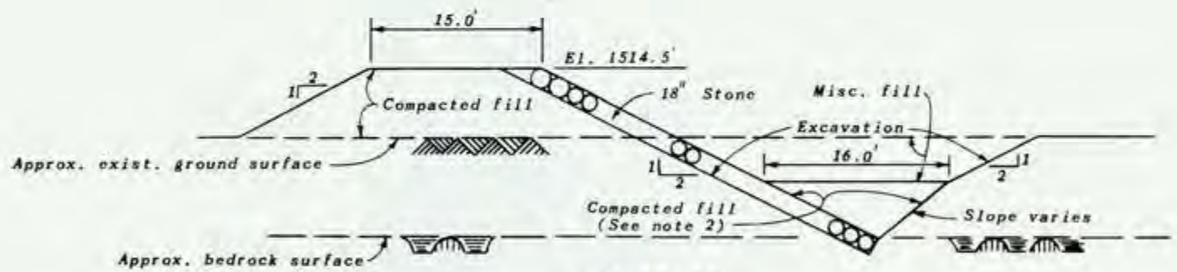
SCALE



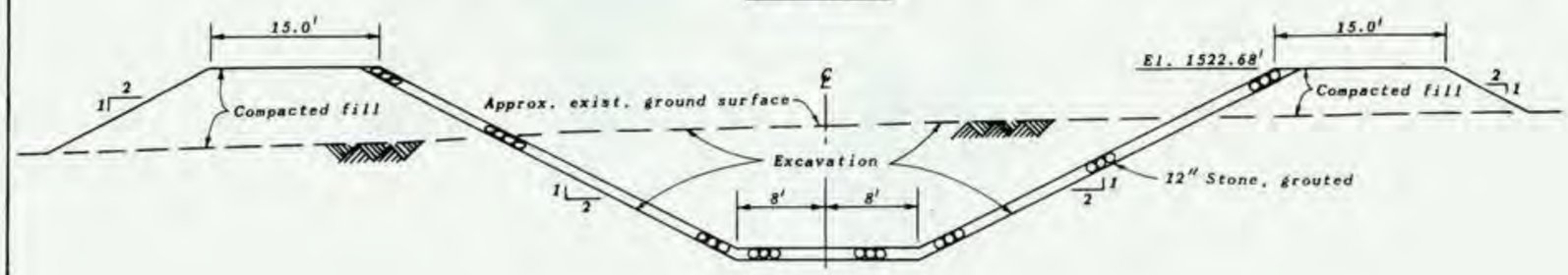
PLAN

TYPICAL DENTATE LAYOUT FOR OUTLET CHANNEL

SCALE FEET



STA 37+55



STA 29+00

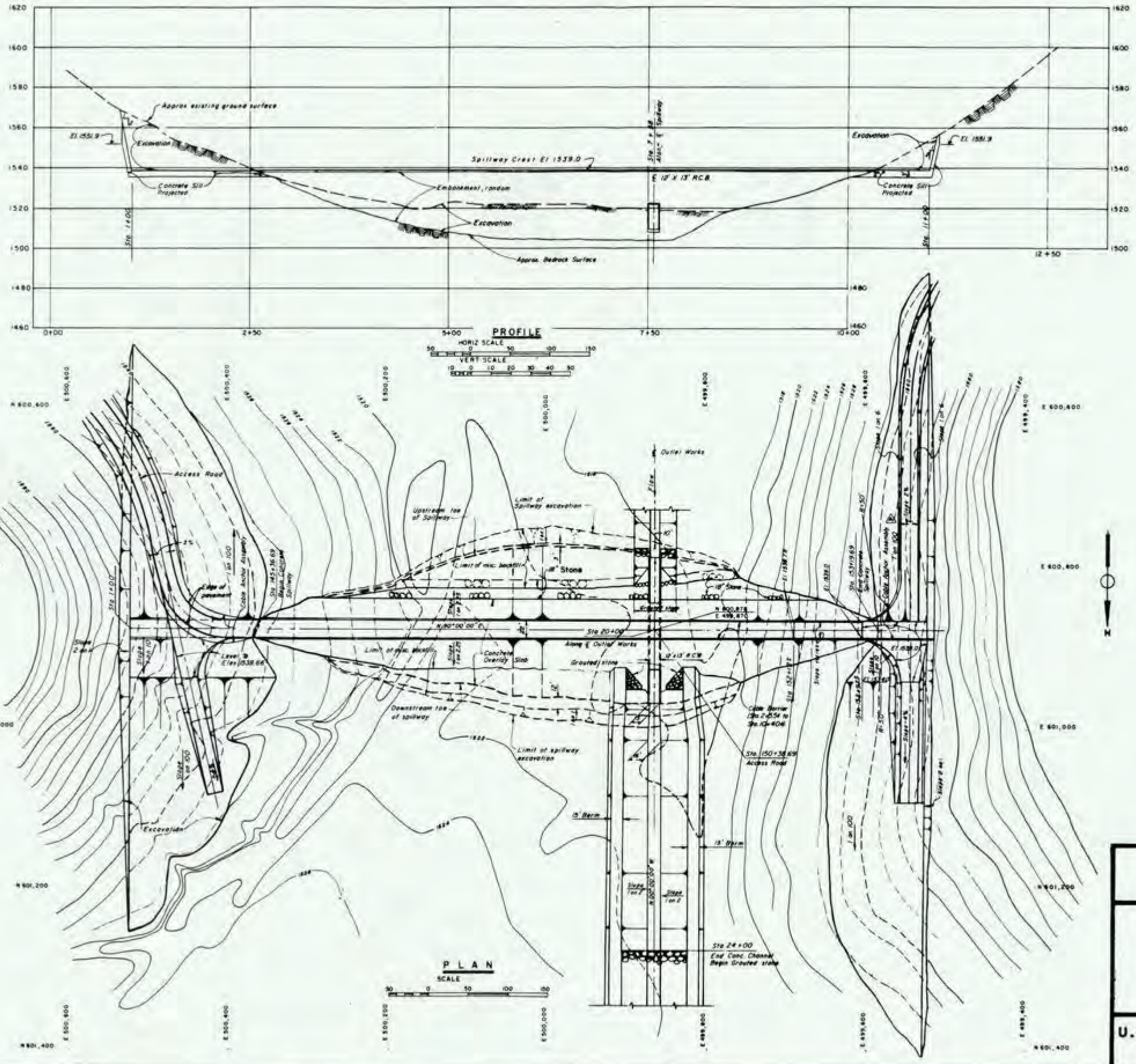
TAT MOMOLIKOT DAM

SANTA ROSA WASH, ARIZONA

FLOOD CONTROL OUTLET WORKS

CONDUIT, DENTATES, & CROSS SECTIONS OF OUTLET CHANNEL

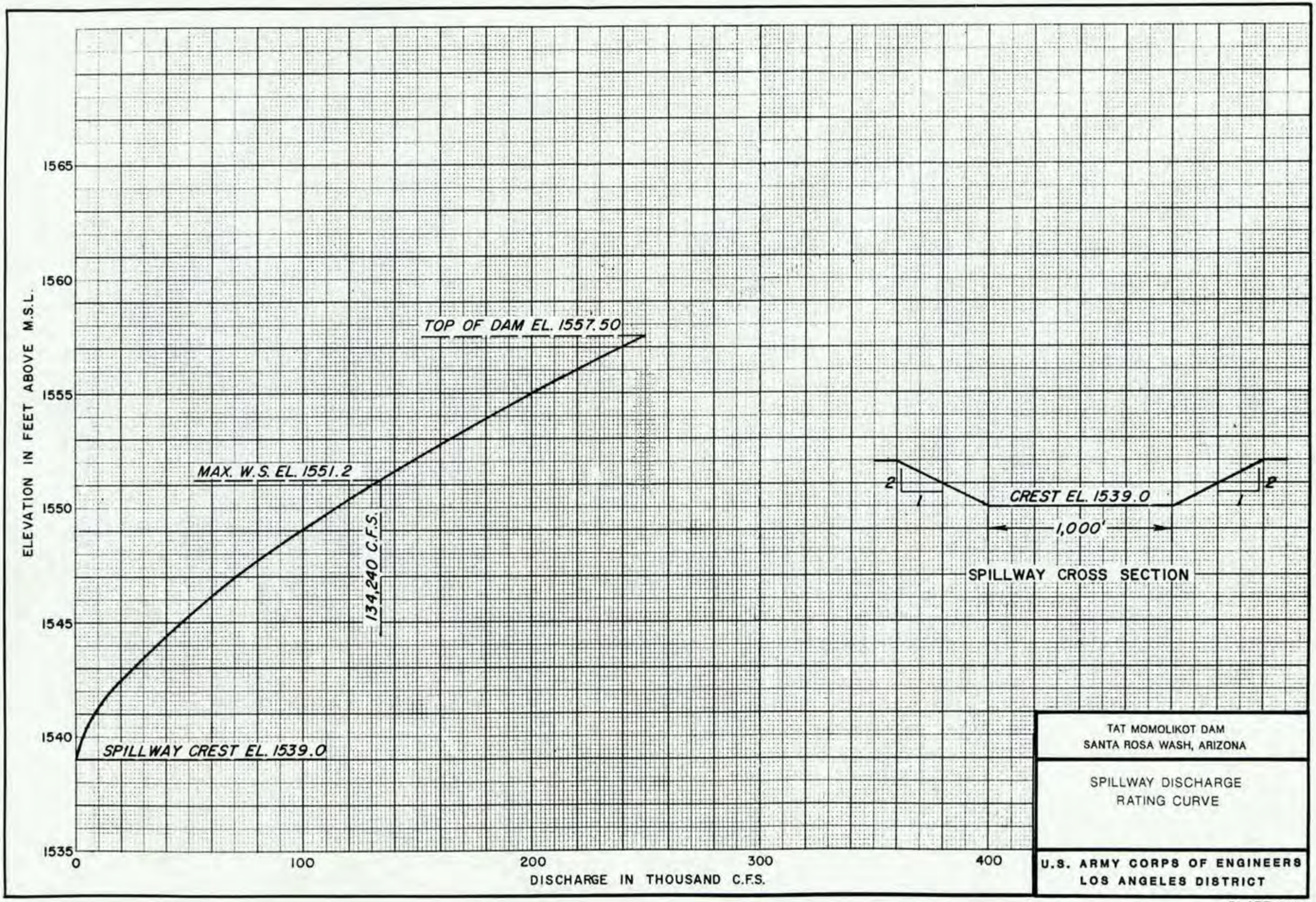
U.S. ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT

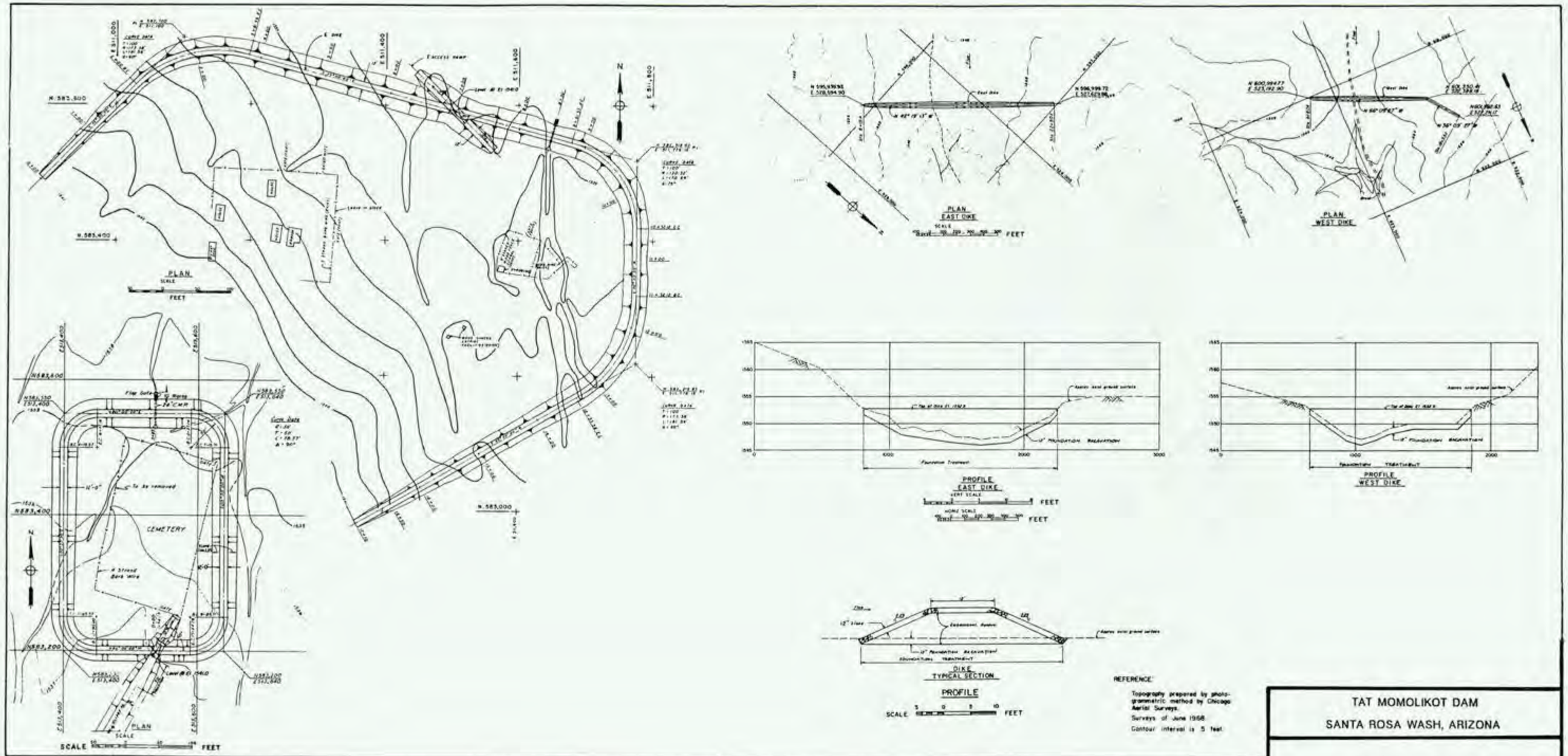


TAT MOMOLIKOT DAM
SANTA ROSA WASH, ARIZONA

SPILLWAY PLAN AND PROFILE

U.S. ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT


ELEVATION IN FEET ABOVE M.S.L.
1565
1560
1555
1550
1545
1540
1535
0
100
200
300
400
DISCHARGE IN THOUSAND C.F.S.
TOP OF DAM EL. 1557.50
MAX. W.S. EL. 1551.2
134,240 C.F.S.
SPILLWAY CREST EL. 1539.0
2
1
CREST EL. 1539.0
1,000'
SPILLWAY CROSS SECTION
TAT MOMOLIKOT DAM
SANTA ROSA WASH, ARIZONA
SPILLWAY DISCHARGE
RATING CURVE
U.S. ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT



TAT MOMOLIKOT DAM

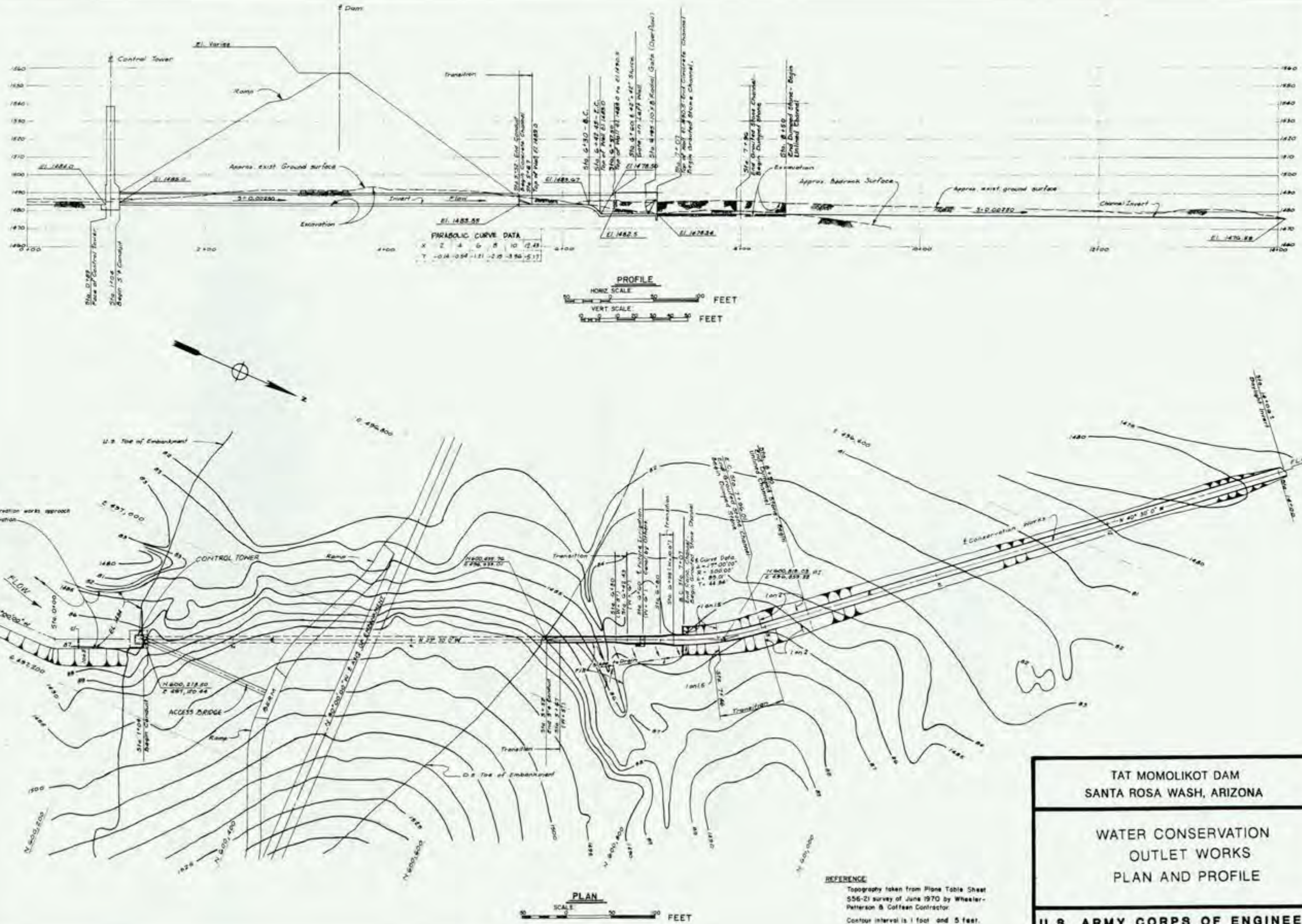
SANTA ROSA WASH, ARIZONA

SADDLE, CEMETERY

and VILLAGE DIKES

U.S. ARMY CORPS OF ENGINEERS

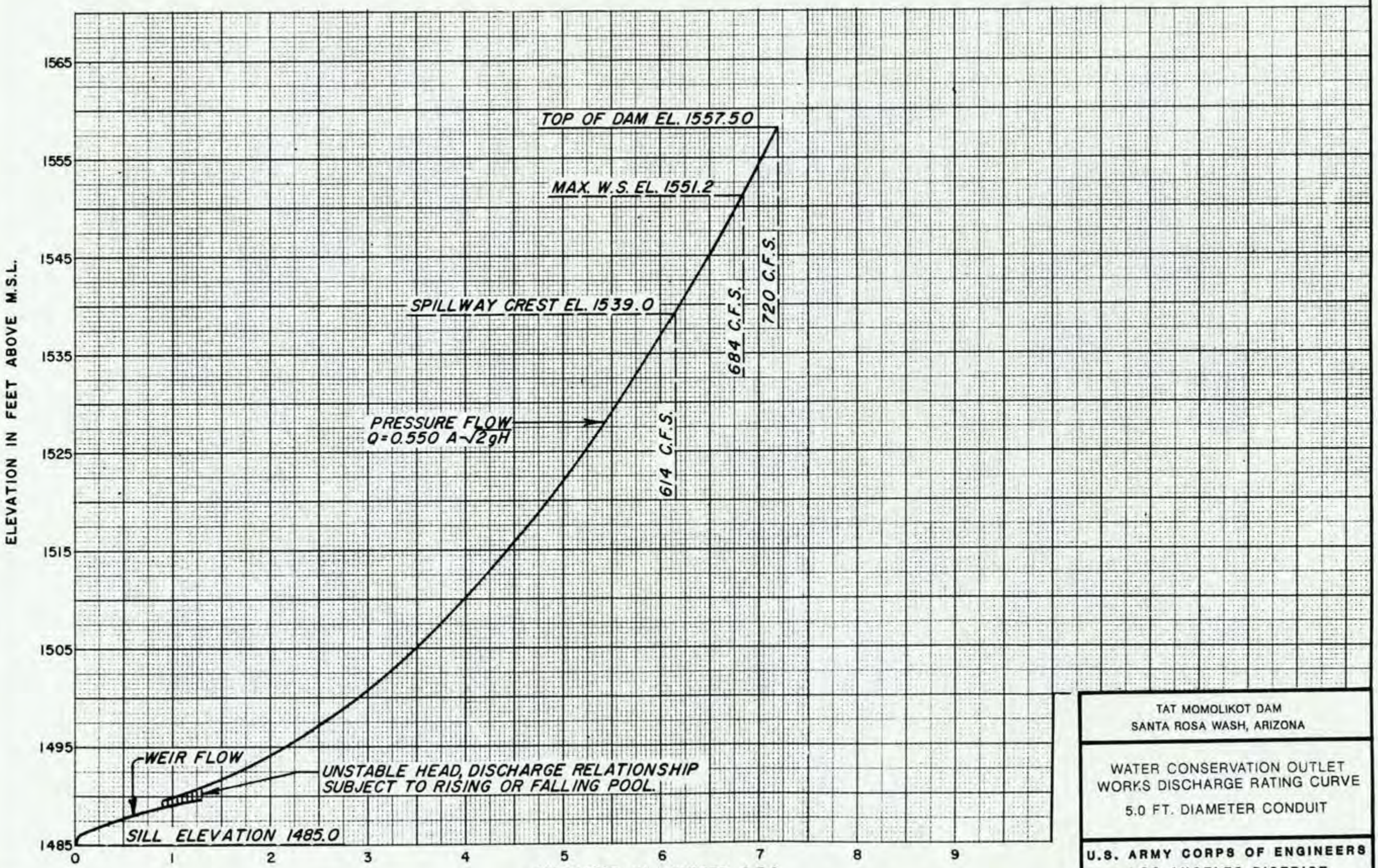
LOS ANGELES DISTRICT



TAT MOMOLIKOT DAM
SANTA ROSA WASH, ARIZONA

WATER CONSERVATION
OUTLET WORKS
PLAN AND PROFILE

U.S. ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT

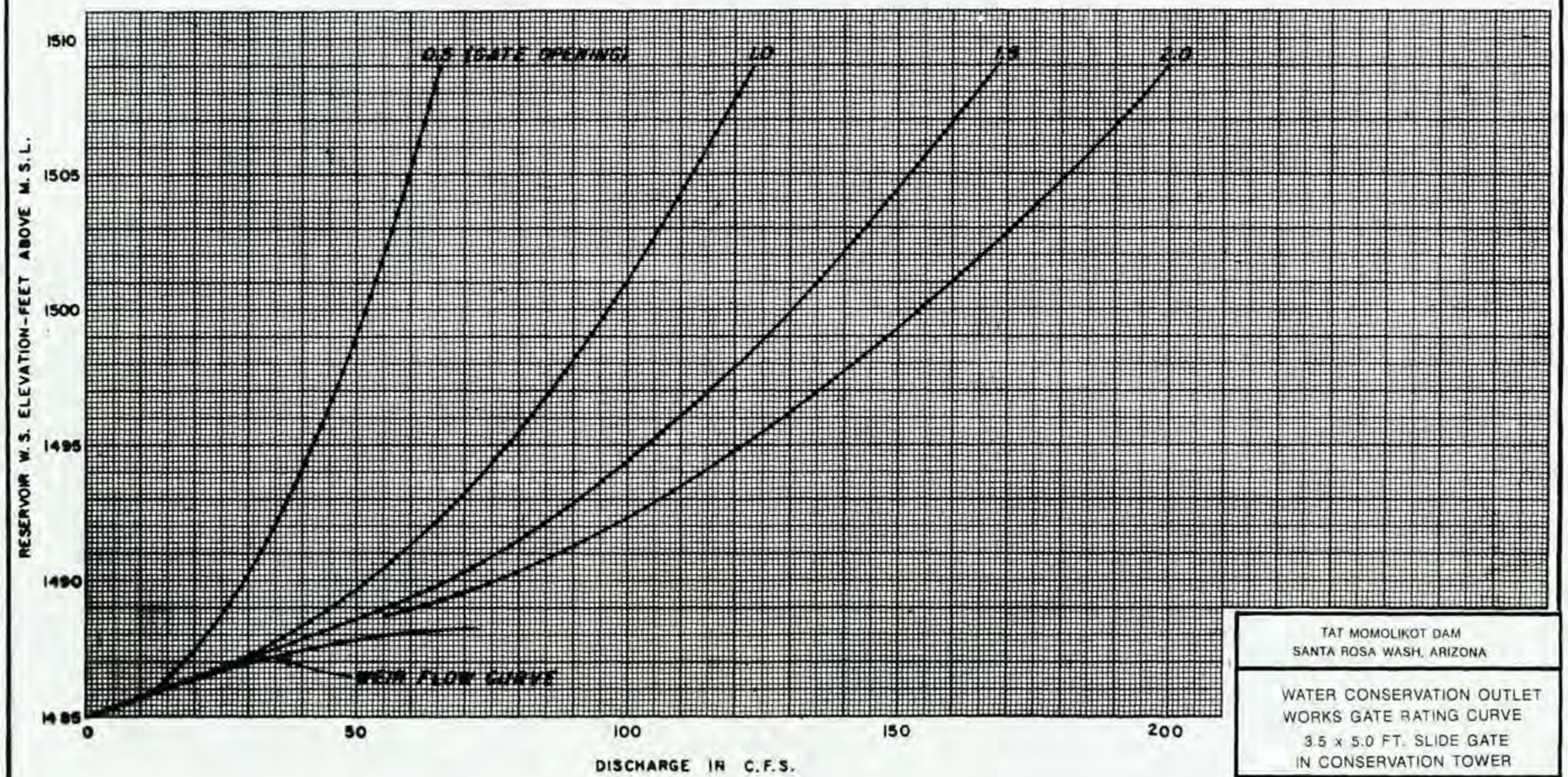


TAT MOMOLIKOT DAM
SANTA ROSA WASH, ARIZONA

WATER CONSERVATION OUTLET WORKS DISCHARGE RATING CURVE

5.0 FT. DIAMETER CONDUIT

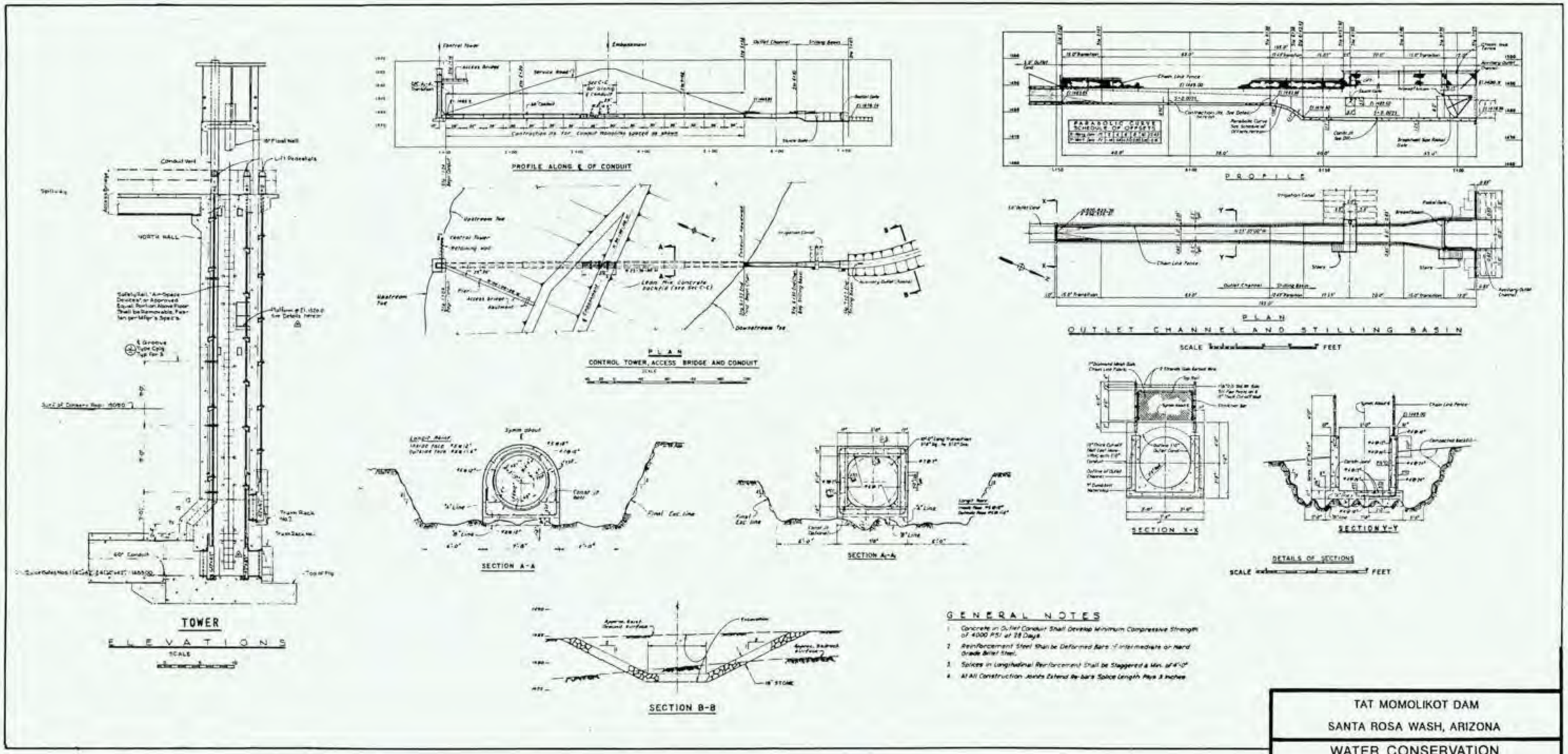
U.S. ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT



TAT MOMOLIKOT DAM
SANTA ROSA WASH, ARIZONA

WATER CONSERVATION OUTLET WORKS GATE RATING CURVE
3.5 x 5.0 FT. SLIDE GATE IN CONSERVATION TOWER

U.S. ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT



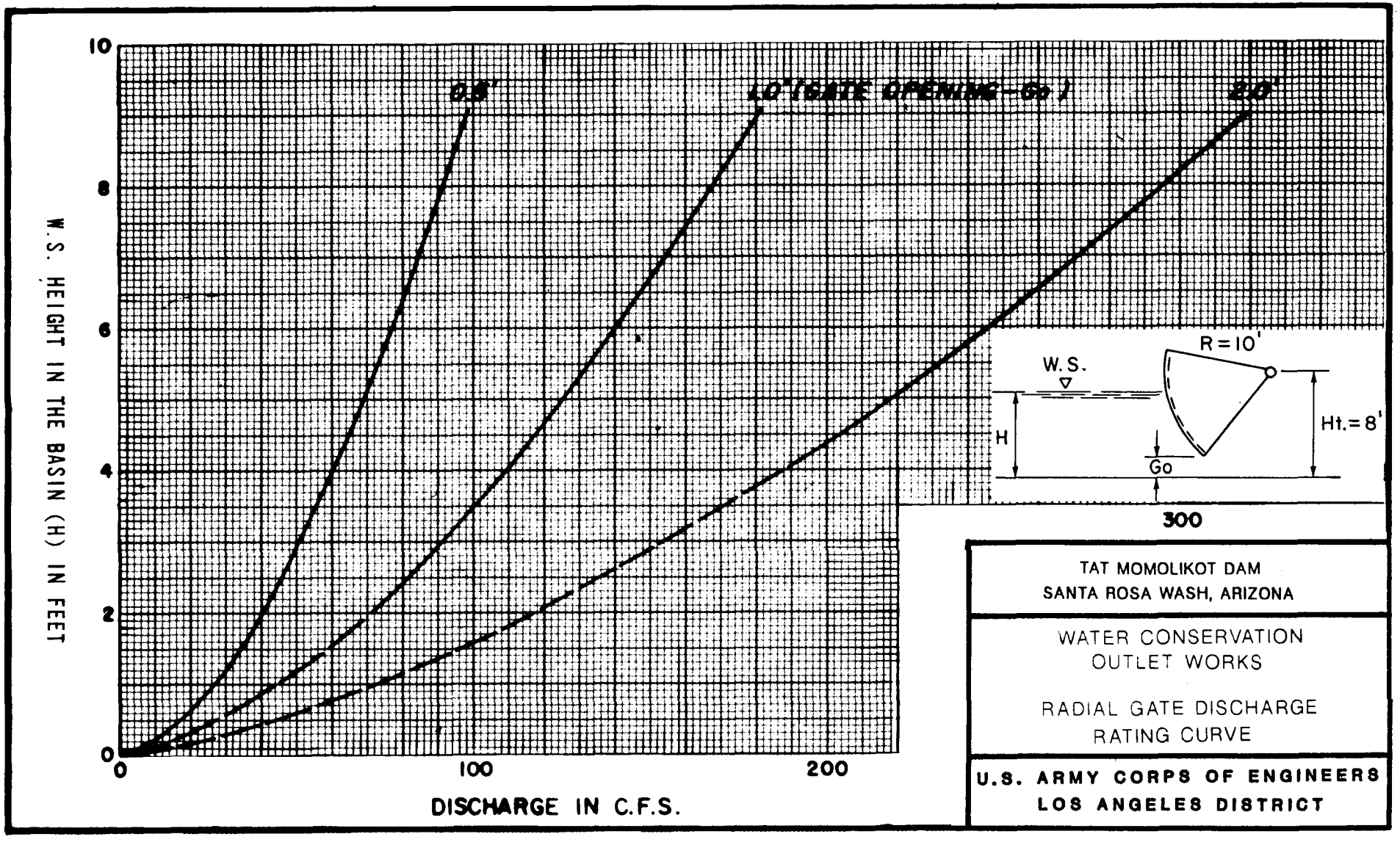
TAT MOMOLIKOT DAM

SANTA ROSA WASH, ARIZONA

WATER CONSERVATION
OUTLET WORKS

TOWER, CONDUIT, CHANNEL
and STILLING BASIN

U.S. ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT

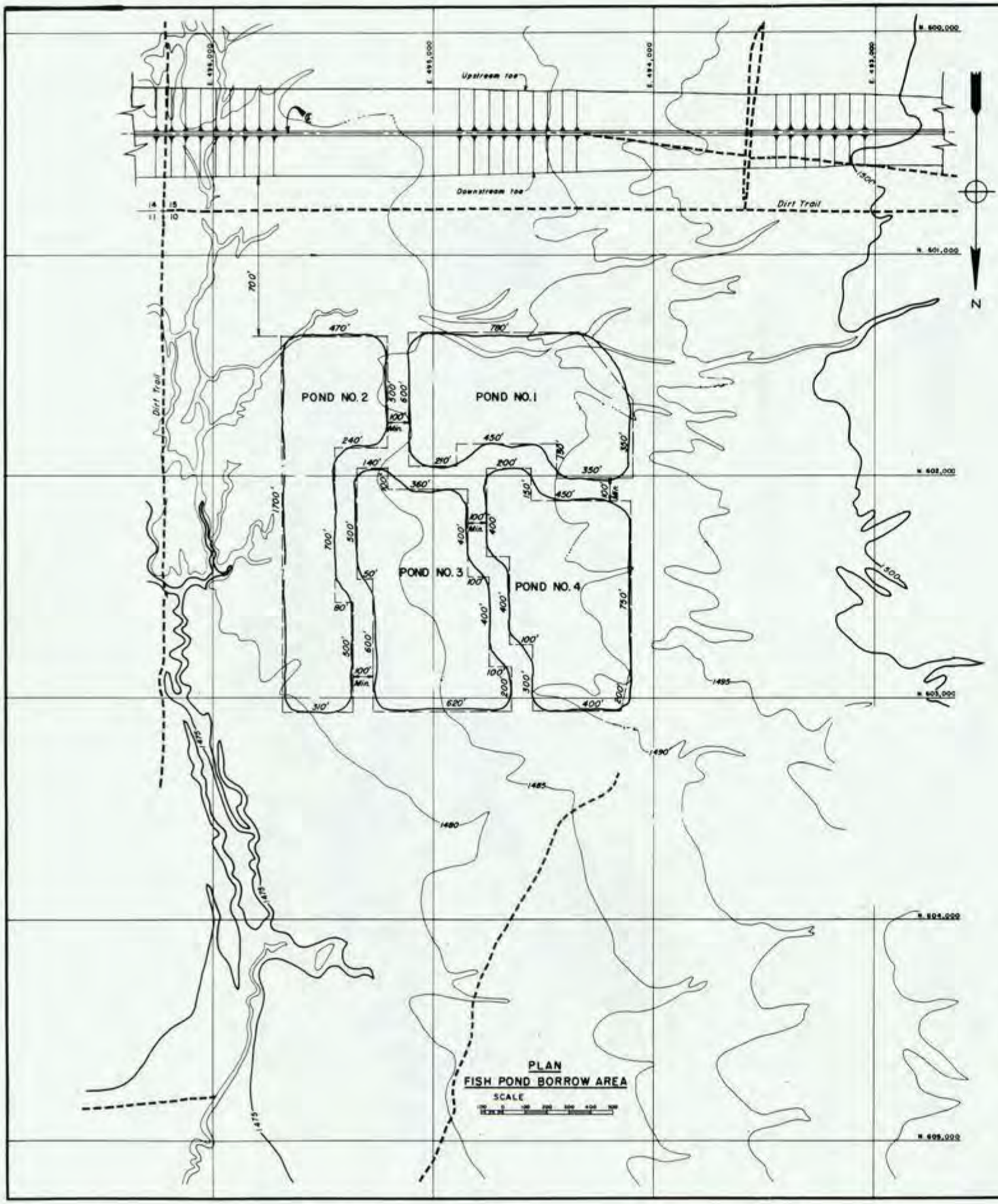


TAT MOMOLIKOT DAM
SANTA ROSA WASH, ARIZONA

WATER CONSERVATION
OUTLET WORKS

RADIAL GATE DISCHARGE
RATING CURVE

U.S. ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT



Notes: (Fish Pond Borrow Area)
1. Banks to be irregular.
2. Side excavation slope to be 1 on 1.
3. Bottom Elev. of ponds to be 1468.0'

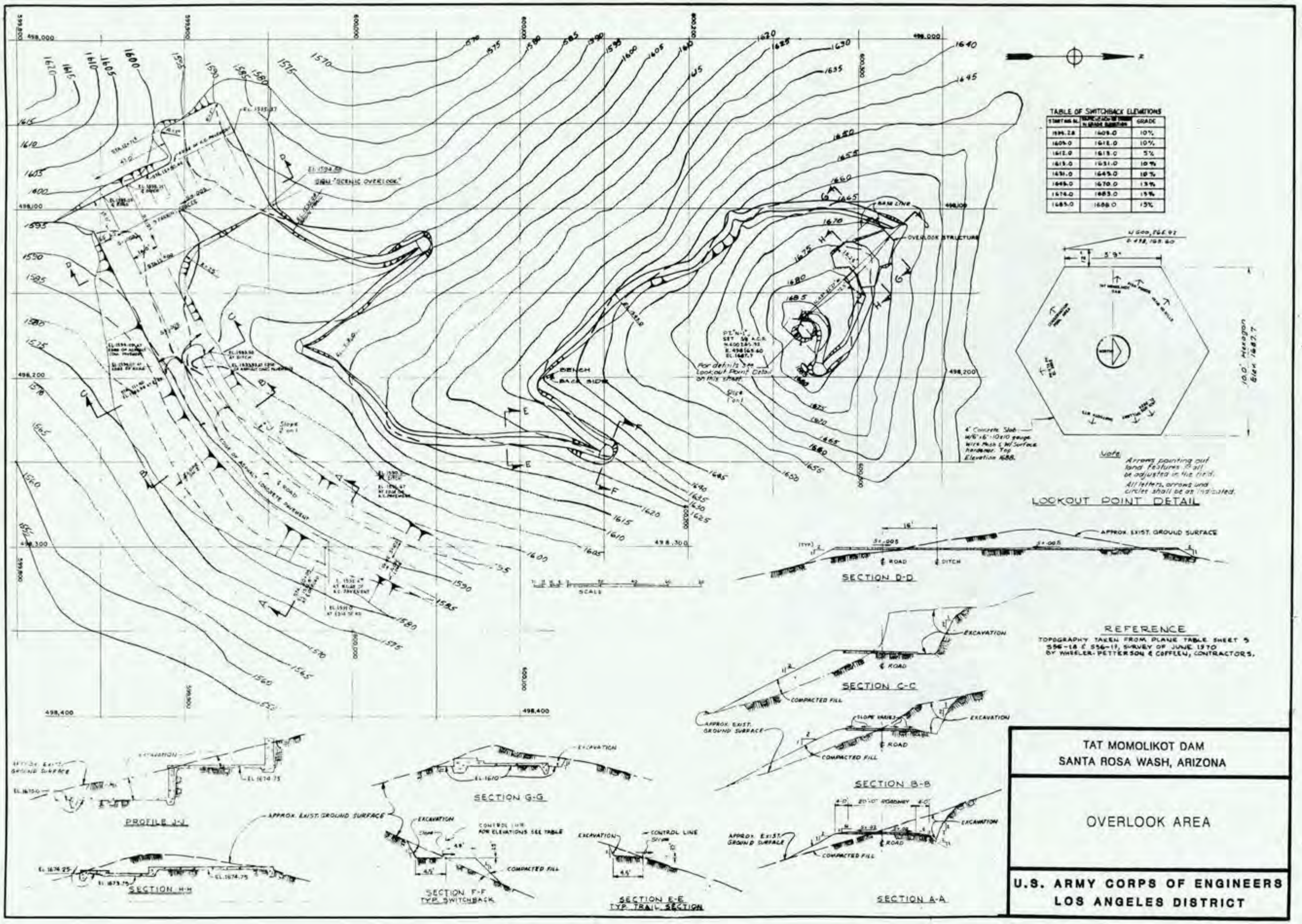
REFERENCE:
TOPOGRAPHY PREPARED BY PHOTOGRAMMETRIC METHOD BY CHICAGO AERIAL SURVEYS.
SURVEYS OF JUNE 1966.
CONTOUR INTERVAL IS 5 FEET.

DATUM IS MEAN SEA LEVEL

TAT MOMOLIKOT DAM
SANTA ROSA WASH, ARIZONA

FISH PONDS

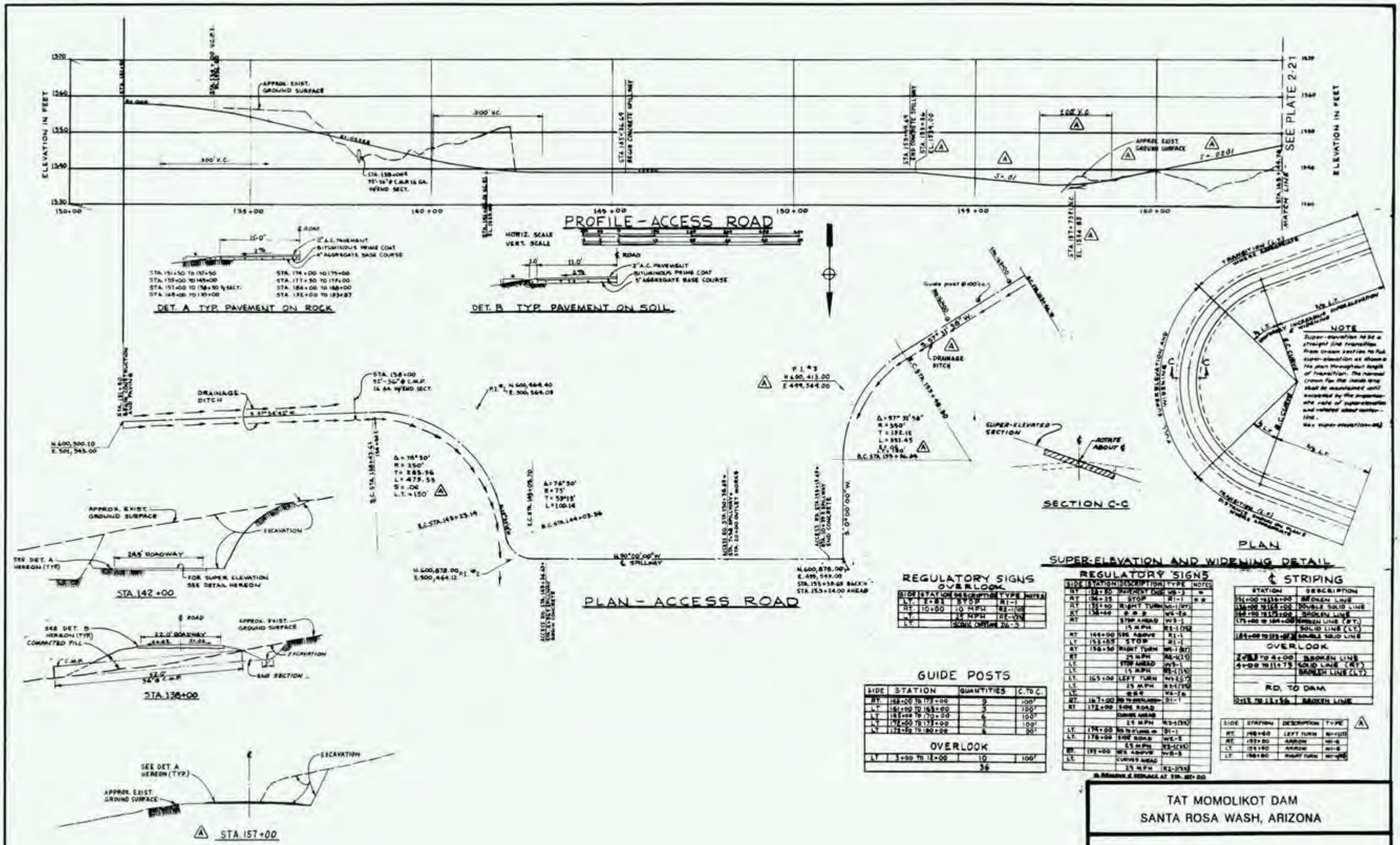
U.S. ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT



TAT MOMOLIKOT DAM
SANTA ROSA WASH, ARIZONA

OVERLOOK AREA

U.S. ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT



REGULATORY SIGNS
OVERLOOK

SIDE	STATION	DESCRIPTION	TYPE	NOTES
LT.	2+85	STOP	R1-1	
RT	10+00	10 MPH	R2-1(10)	
RT		25 MPH	R2-1(25)	
LT		SCENIC OVERLOOK	D6-3	

GUIDE POSTS

SIDE	STATION	QUANTITIES	C. TO C.
RT.	168+00 TO 173+00	3	100'
LT.	161+00 TO 163+00	3	100'
LT.	165+00 TO 170+00	6	100'
LT.	172+00 TO 173+00	2	100'
LT.	173+50 TO 180+00	6	30'
OVERLOOK			
LT	5+00 TO 12+00	10	100'
		30	

REGULATORY SIGNS

SIDE	STATION	DESCRIPTION	TYPE	NOTES
RT	134+25	STOP	R1-1	
RT	135+00	RIGHT TURN	W1-1(RT)	
RT	138+00	[illegible]	W6-2a	
RT		STOP AHEAD	W3-1	
		15 MPH	R2-1(15)	
RT	144+00	SIGN ABOVE	R1-1	
LT	153+55	STOP	R1-1	
RT	156+50	RIGHT TURN	W1-1(RT)	
RT		25 MPH	R2-1(25)	
LT		STOP AHEAD	W3-1	
LT		15 MPH	R2-1(15)	
LT	165+00	LEFT TURN	W1-1(LT)	
LT		25 MPH	R2-1(25)	
LT		[illegible]	W6-2a	
RT	167+00	[illegible]	D1-1	
RT	172+00	SIDE ROAD		
		CURVE AHEAD		
		25 MPH	R2-1(25)	
LT.	174+00	[illegible]	D1-1	
LT.	176+00	SIDE ROAD	W6-2	
		25 MPH	R2-1(25)	
RT.	192+00	SIGN ABOVE	W8-3	
LT.		CURVES AHEAD		
		25 MPH	R2-1(25)	

℄ STRIPING

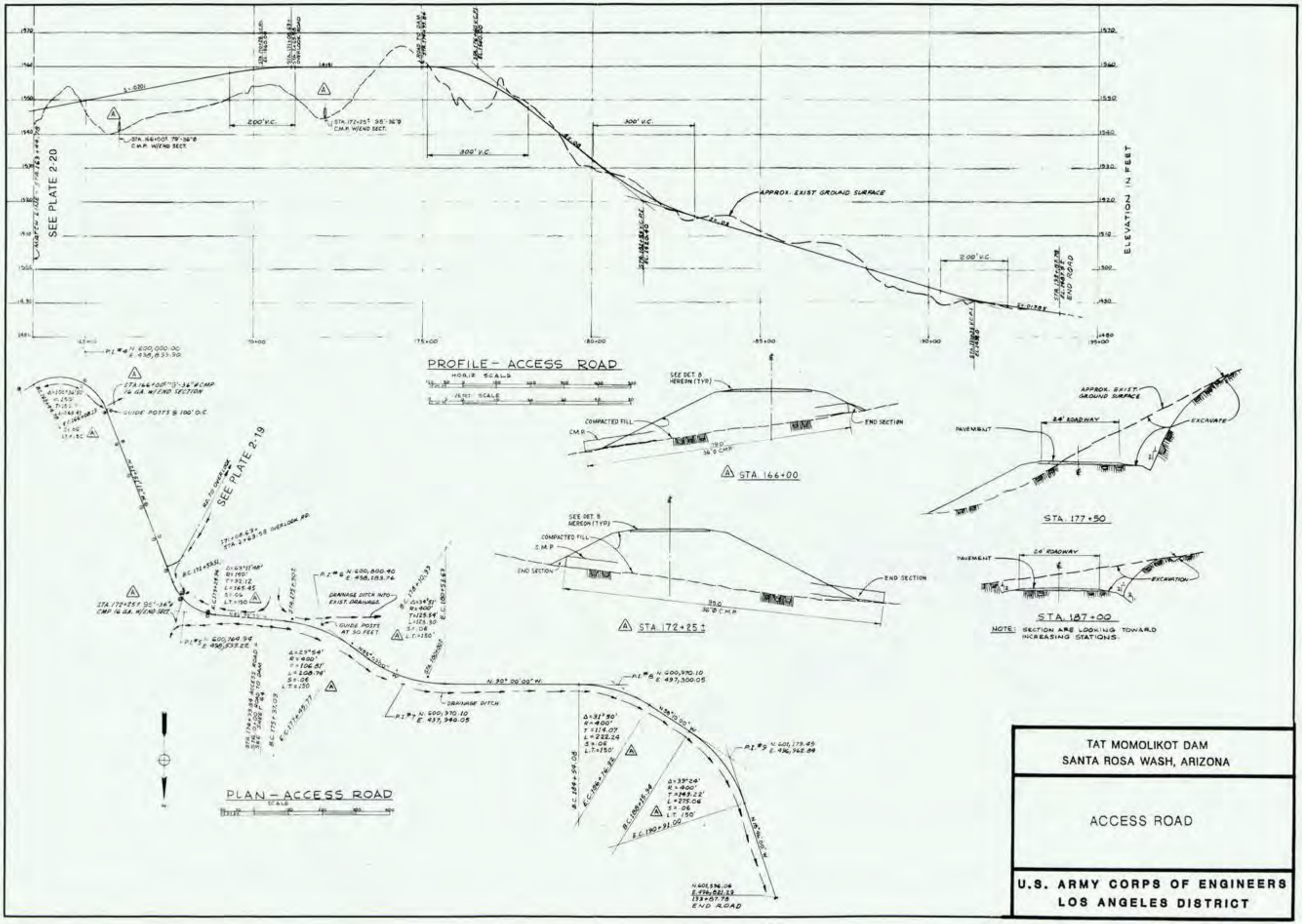
STATION	DESCRIPTION
95+00 TO 136+00	BROKEN LINE
136+00 TO 145+00	DOUBLE SOLID LINE
145+00 TO 175+00	BROKEN LINE
175+00 TO 184+00	BROKEN LINE (RT.)
	SOLID LINE (LT.)
184+00 TO 195+00	DOUBLE SOLID LINE
OVERLOOK	
2+85 TO 4+00	BROKEN LINE
4+00 TO 11+75	SOLID LINE (RT.)
	BROKEN LINE (LT.)
RD. TO DAM	
0+15 TO 12+55	BROKEN LINE

SIDE	STATION	DESCRIPTION	TYPE
RT.	148+60	LEFT TURN	W1-1(LT)
RT.	152+50	ARROW	W1-6
LT	154+50	ARROW	W1-6
LT	158+50	RIGHT TURN	W1-1(RT)

TAT MOMOLIKOT DAM
SANTA ROSA WASH, ARIZONA

ACCESS ROAD

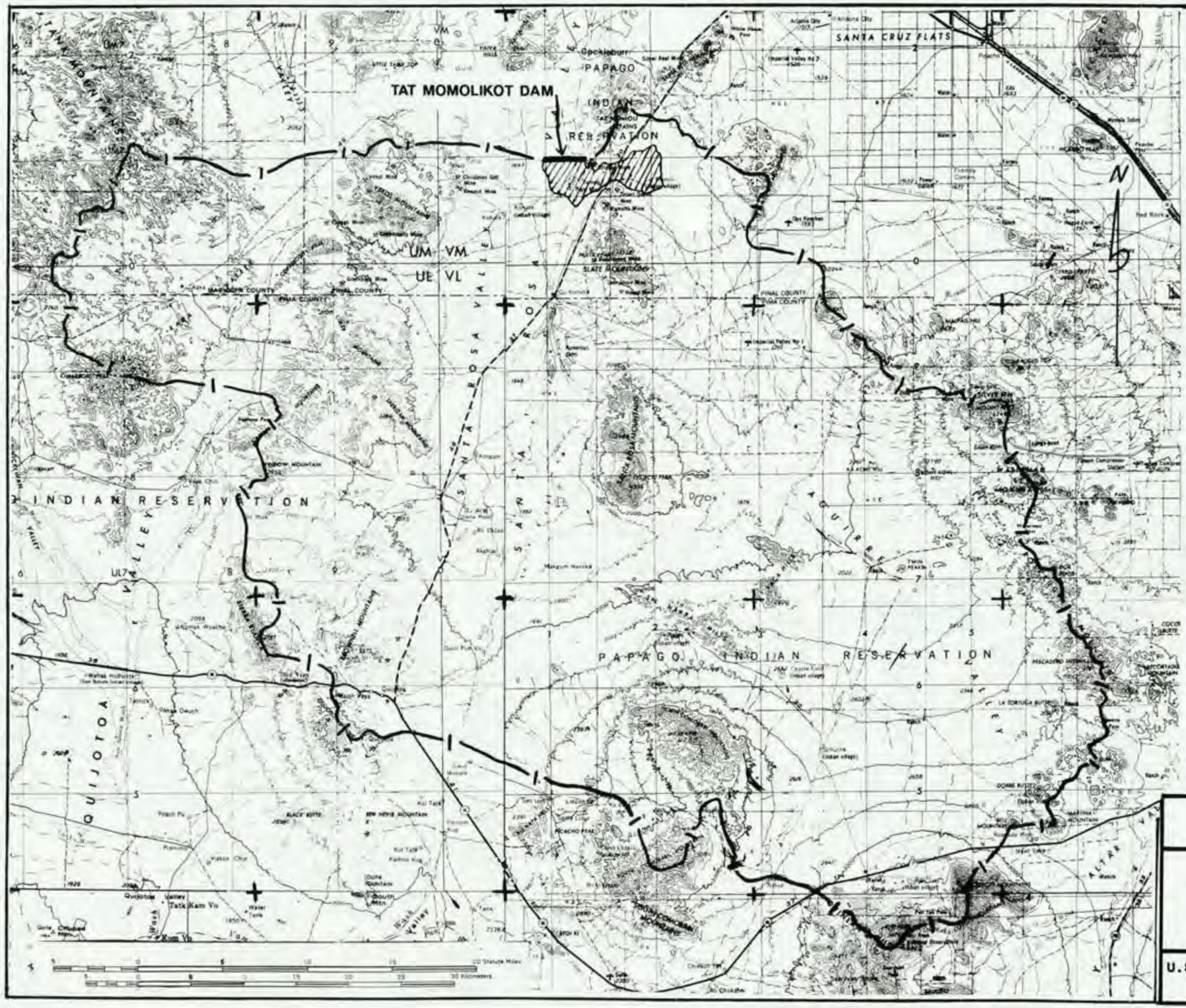
U.S. ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT



TAT MOMOLIKOT DAM
SANTA ROSA WASH, ARIZONA

ACCESS ROAD

U.S. ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT



LEGEND

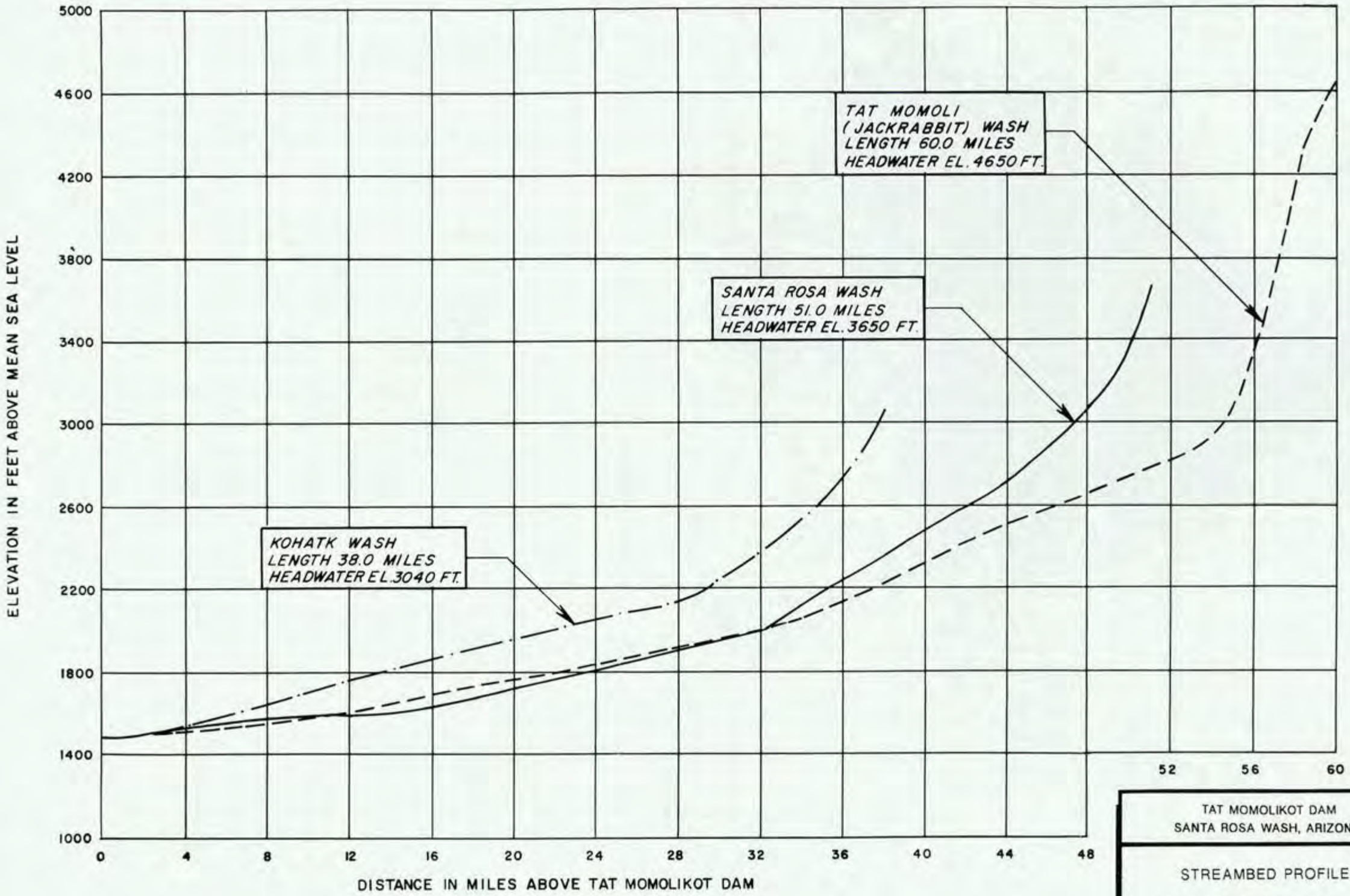
—/— DRAINAGE BOUNDARY

TAT MOMOLIKOT DAM
SANTA ROSA WASH, ARIZONA

SANTA ROSA WASH DRAINAGE AREA
ABOVE TAT MOMOLIKOT DAM

U.S. ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT

PLATE 4-01

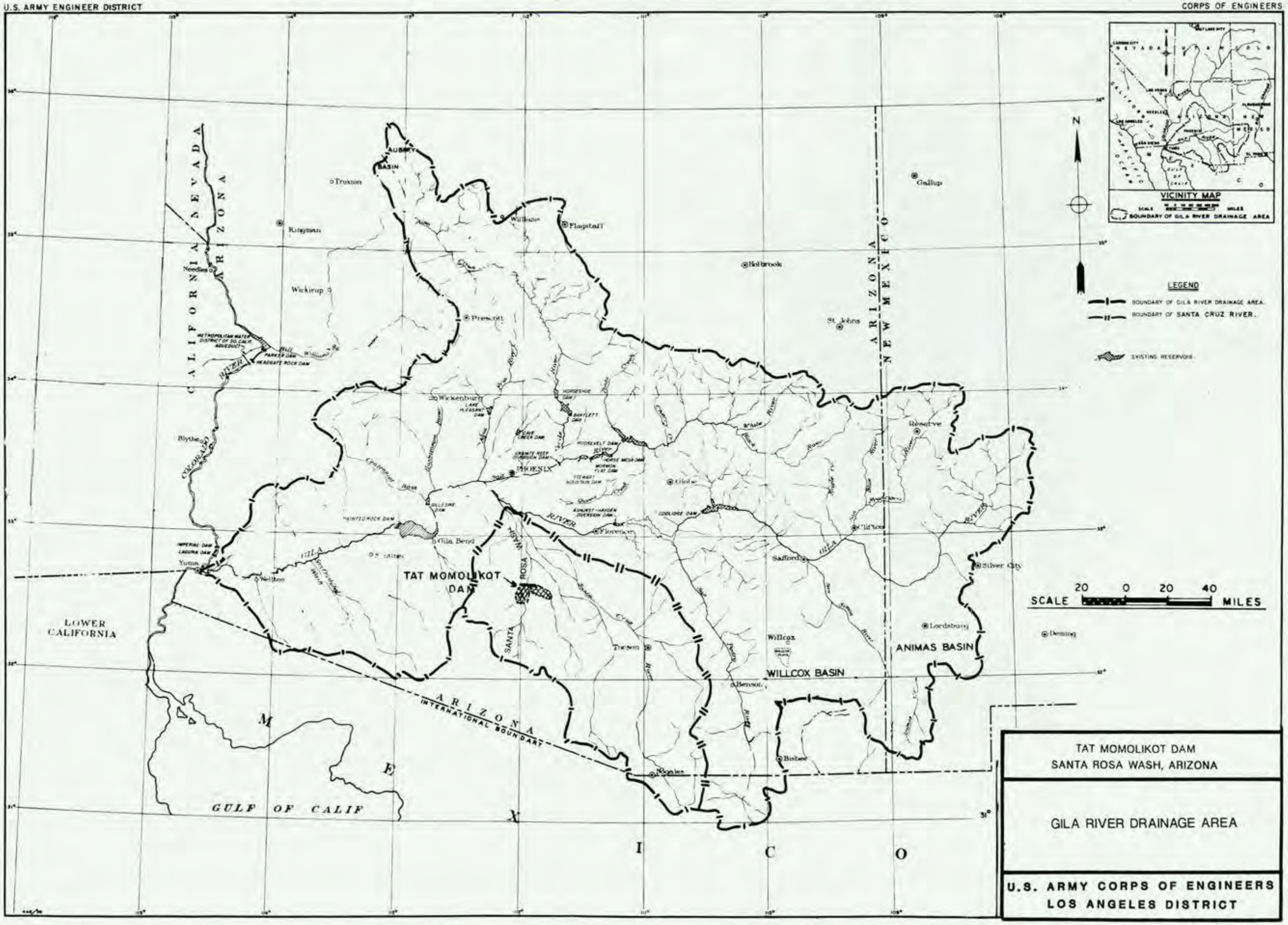


TAT MOMOLIKOT DAM
SANTA ROSA WASH, ARIZONA

STREAMBED PROFILES

STREAMS ABOVE TAT MOMOLIKOT DAM

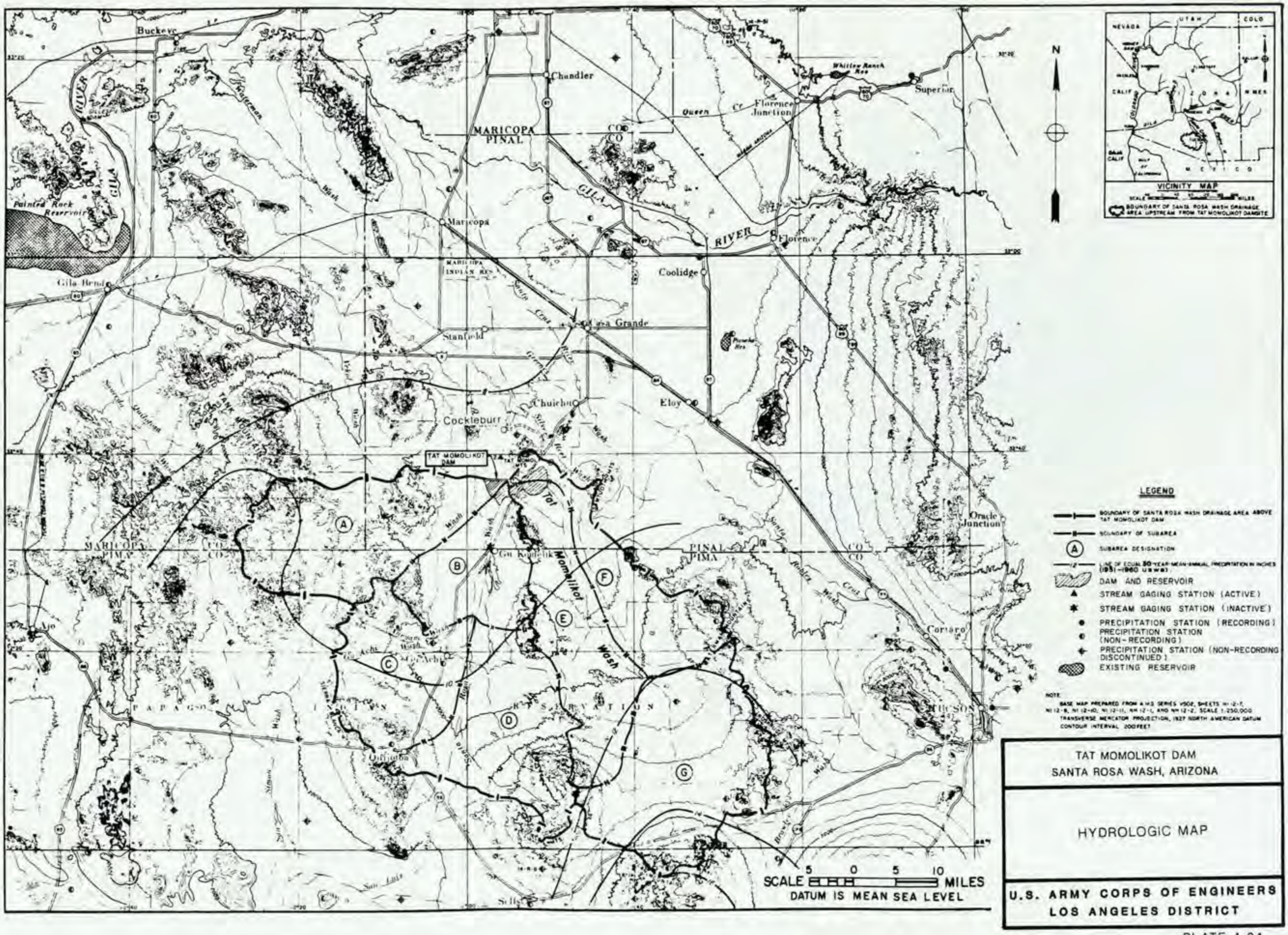
U.S. ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT



TAT MOMOLIKOT DAM
SANTA ROSA WASH, ARIZONA

GILA RIVER DRAINAGE AREA

U.S. ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT



TAT MOMOLIKOT DAM
SANTA ROSA WASH, ARIZONA

HYDROLOGIC MAP

U.S. ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT

PLATE 4-04

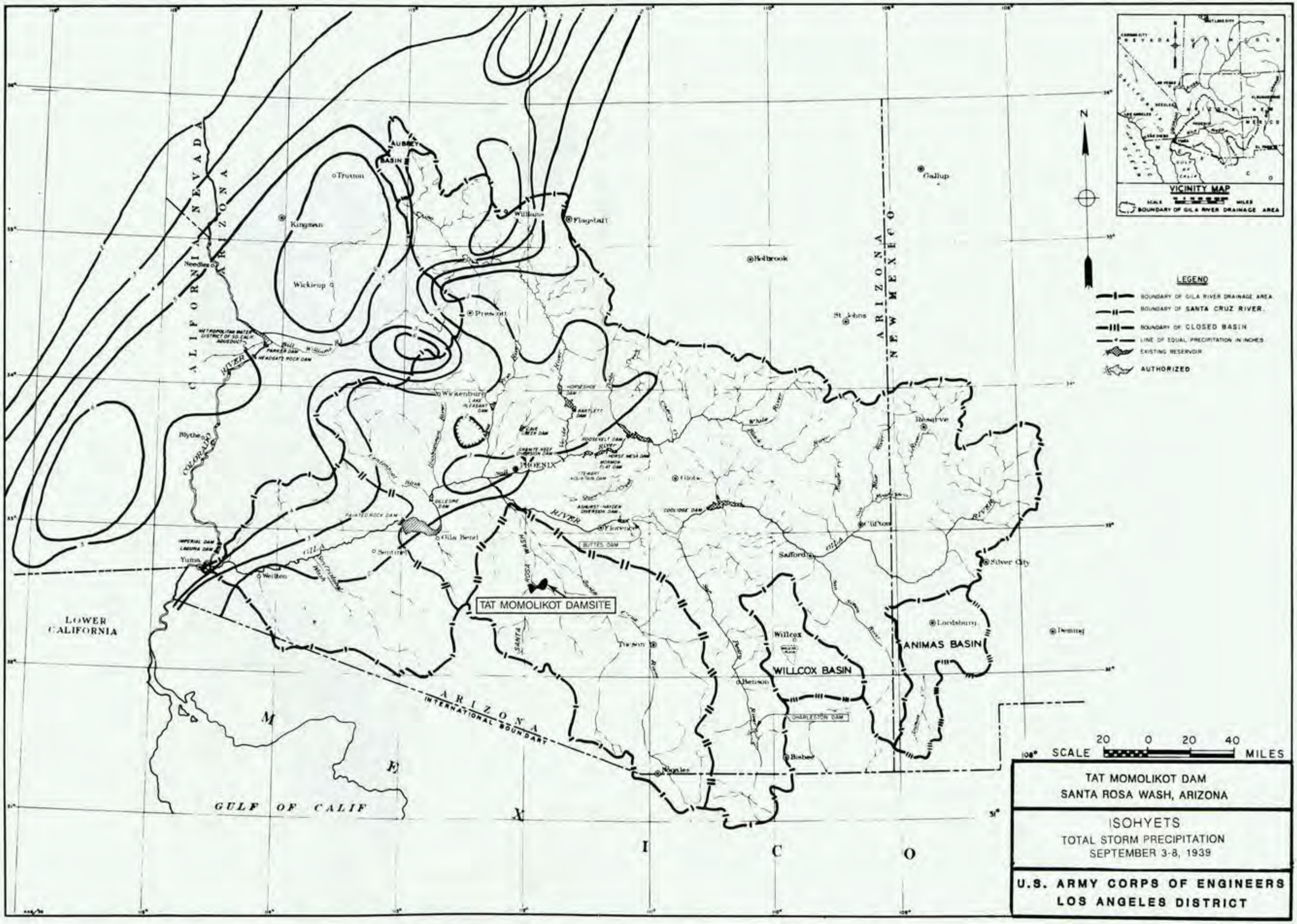
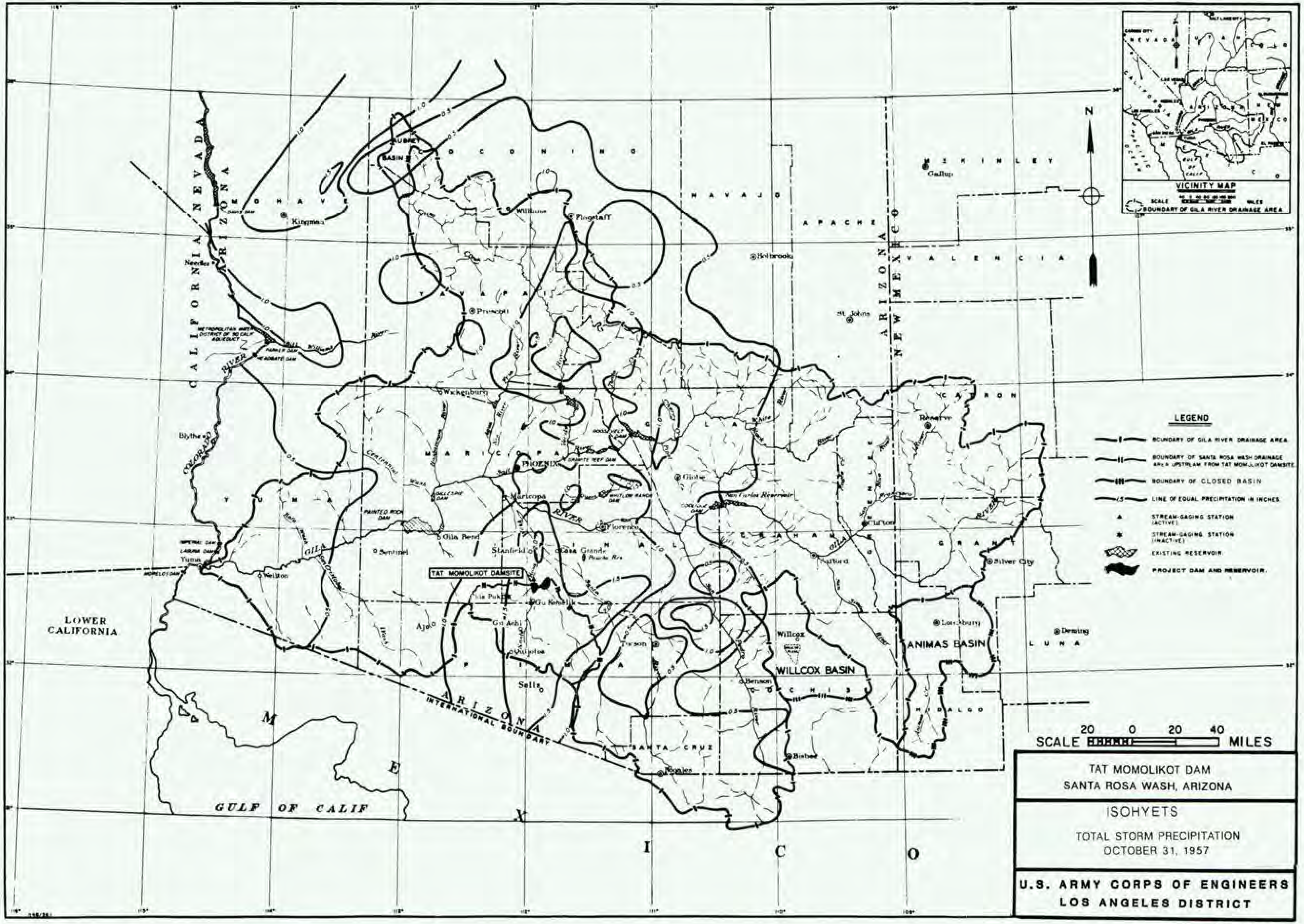
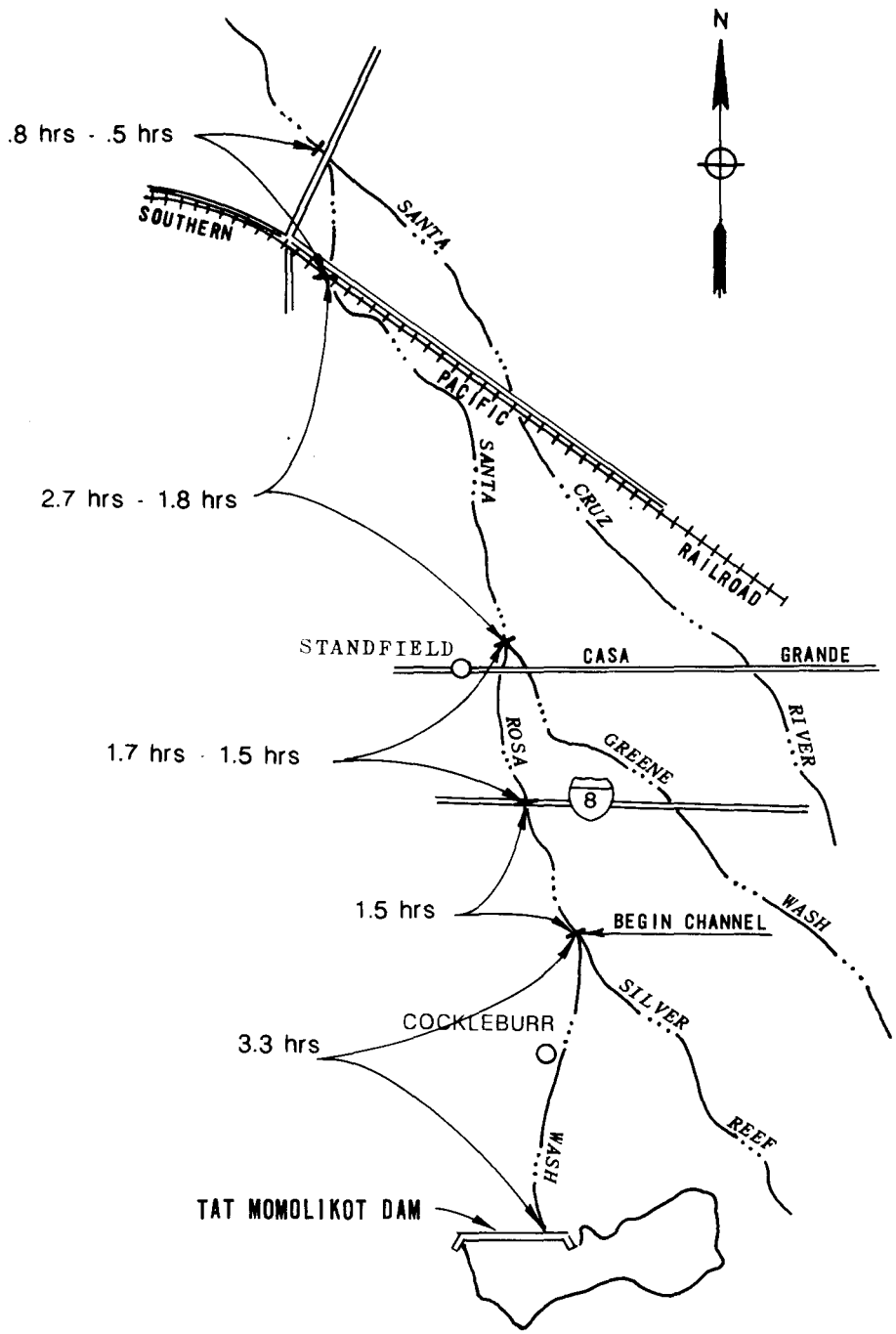

VICINITY MAP
SCALE MILES
BOUNDARY OF GILA RIVER DRAINAGE AREA
LEGEND
BOUNDARY OF GILA RIVER DRAINAGE AREA
BOUNDARY OF SANTA CRUZ RIVER
BOUNDARY OF CLOSED BASIN
LINE OF EQUAL PRECIPITATION IN INCHES
EXISTING RESERVOIR
AUTHORIZED
N
CALIFORNIA
NEVADA
ARIZONA
NEW MEXICO
LOWER CALIFORNIA
GULF OF CALIF
M E X I C O
ARIZONA INTERNATIONAL BOUNDARY
AUBREY BASIN
Truxton
Kingman
Needles
Wickiup
Prescott
Williams
Flagstaff
Holbrook
Gallup
St Johns
Wickenburg
Phoenix
Blythe
Yuma
Wellton
Gila Bend
Sentinel
Tucson
Safford
Silver City
Lordsburg
Deming
Willcox
Benson
Bisbee
Nogales
Globe
Winslow
Tempe
Roosevelt
Buckeye
Rimrose
TAT MOMOLIKOT DAMSITE
WILLCOX BASIN
ANIMAS BASIN
SANTA ROSA WASH
SCALE 20 0 20 40 MILES
TAT MOMOLIKOT DAM
SANTA ROSA WASH, ARIZONA
ISOHYETS
TOTAL STORM PRECIPITATION
SEPTEMBER 3-8, 1939
U.S. ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT

PLATE 4-05


TAT MOMOLIKOT DAM
SANTA ROSA WASH, ARIZONA
ISOHYETS
TOTAL STORM PRECIPITATION
OCTOBER 31, 1957
U.S. ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT
SCALE
20 0 20 40
MILES
LEGEND
BOUNDARY OF GILA RIVER DRAINAGE AREA
BOUNDARY OF SANTA ROSA WASH DRAINAGE AREA UPSTREAM FROM TAT MOMOLIKOT DAMSITE
BOUNDARY OF CLOSED BASIN
LINE OF EQUAL PRECIPITATION IN INCHES
STREAM-GAGING STATION (ACTIVE)
STREAM-GAGING STATION (INACTIVE)
EXISTING RESERVOIR
PROJECT DAM AND RESERVOIR
VICINITY MAP
BOUNDARY OF GILA RIVER DRAINAGE AREA
N
TAT MOMOLIKOT DAMSITE
WILLCOX BASIN
ANIMAS BASIN
AUBREY BASIN
LOWER CALIFORNIA
GULF OF CALIF
M E X I C O
CALIFORNIA
NEVADA
ARIZONA
NEW MEXICO
ARIZONA
INTERNATIONAL BOUNDARY
Kingman
Needles
Flagstaff
Holbrook
St. Johns
Gallup
Prescott
Wickenburg
Blythe
PHOENIX
Maricopa
Globe
Florence
Gila Bend
Sentinel
Yuma
Wellton
Ajo
Casa Grande
Safford
Clifton
Silver City
Lordsburg
Deming
Willcox
Tucson
Benson
Bisbee
Nogales
Sells
Reserve
M O H A V E
N A V A J O
A P A C H E
V A L E N C I A
C A T R O N
M A R I C O P A
Y U M A
P I M A
G R A N T
L U N A
H I D A L G O
S A N T A C R U Z
GILA RIVER
COLORADO RIVER

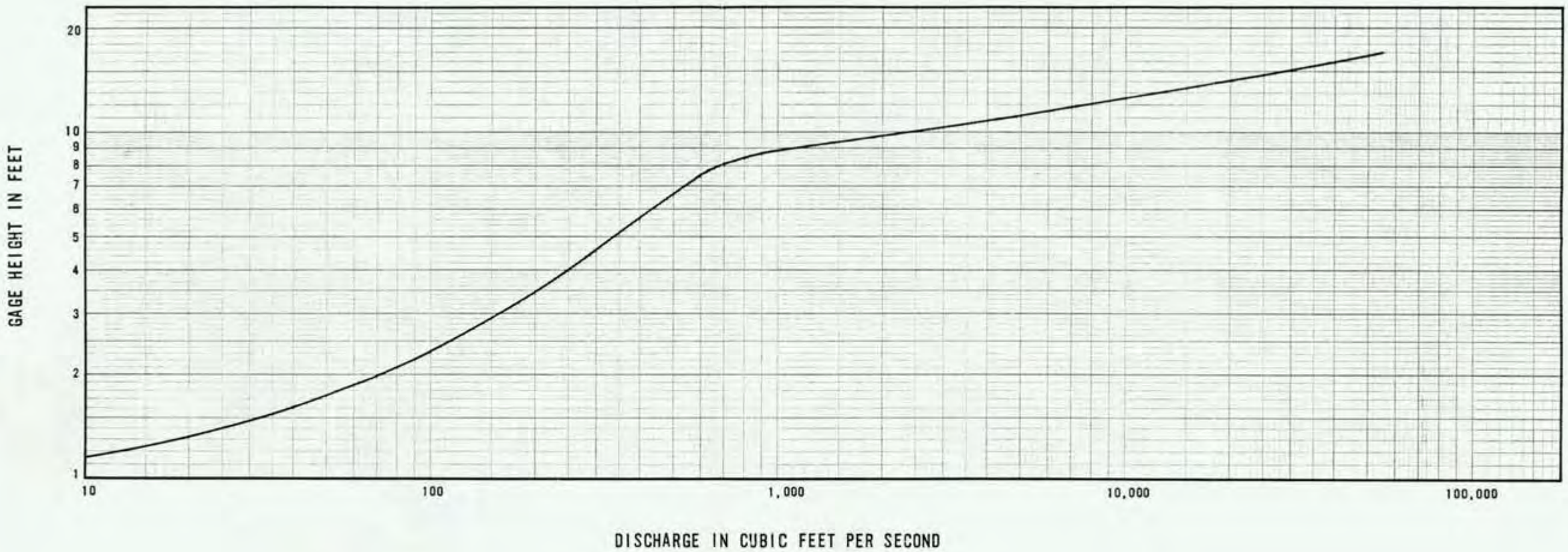


NOTE TRAVEL TIMES ARE BASED ON STEADY FLOW CONDITIONS FOR THE PEAK OUTFLOW AT THE DAM (Q=4960 cfs).

TAT MOMOLIKOT DAM
SANTA ROSA WASH, ARIZONA

APPROXIMATE OUTFLOW TRAVEL TIMES BETWEEN POINTS ALONG SANTA ROSA WASH FROM TAT MOMOLIKOT DAM TO THE SANTA CRUZ RIVER

U.S. ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT



NOTES:

1. RATING CURVE SUPPLIED BY U.S. GEOLOGICAL SURVEY.
2. ZERO FLOW IS AT GAGE HEIGHT OF 0.60 FEET.

TAT MOMOLIKOT DAM
SANTA ROSA WASH, ARIZONA

DISCHARGE RATING CURVE

SANTA ROSA WASH
NEAR COCKLEBURR, ARIZONA

U.S. ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT

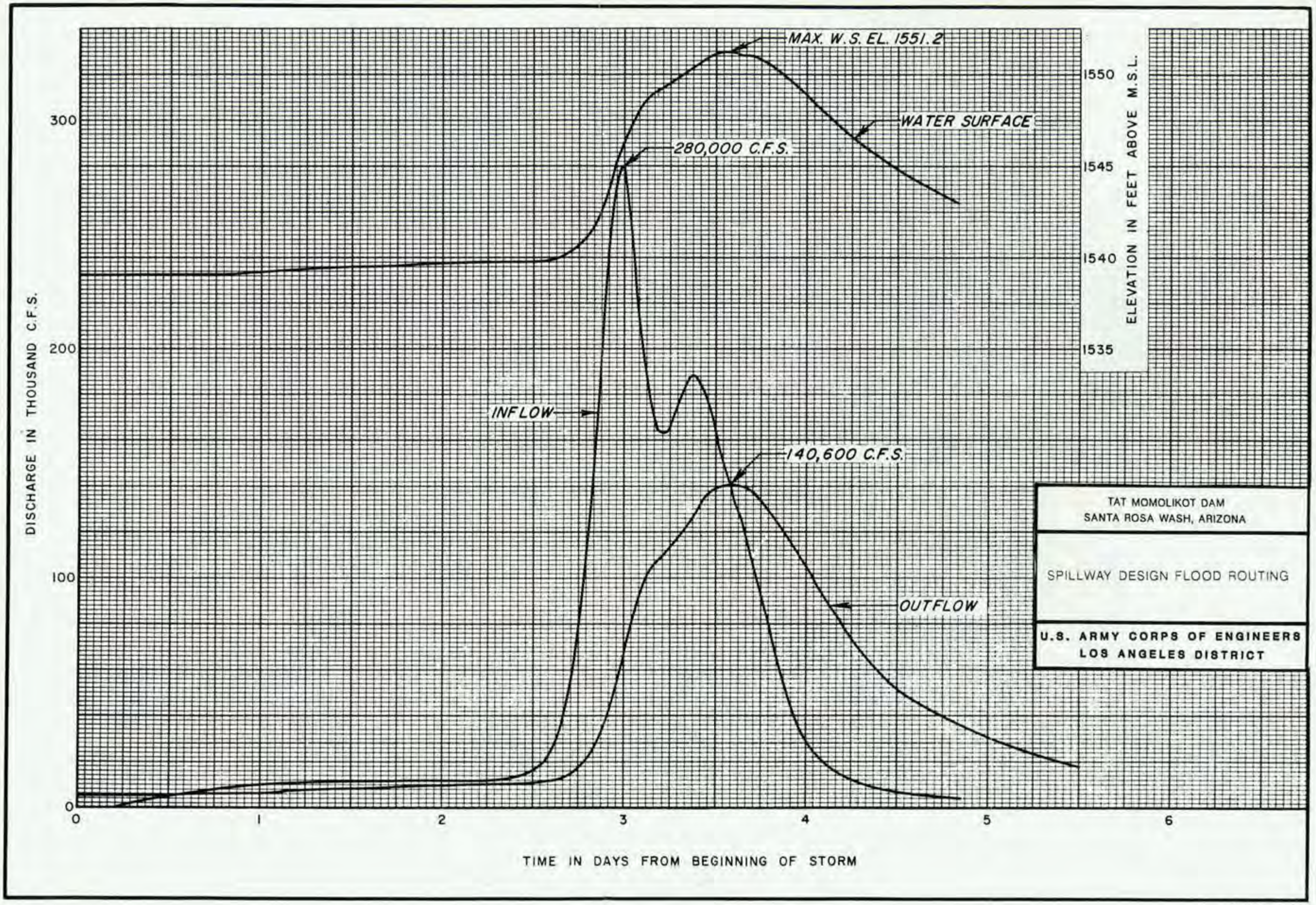
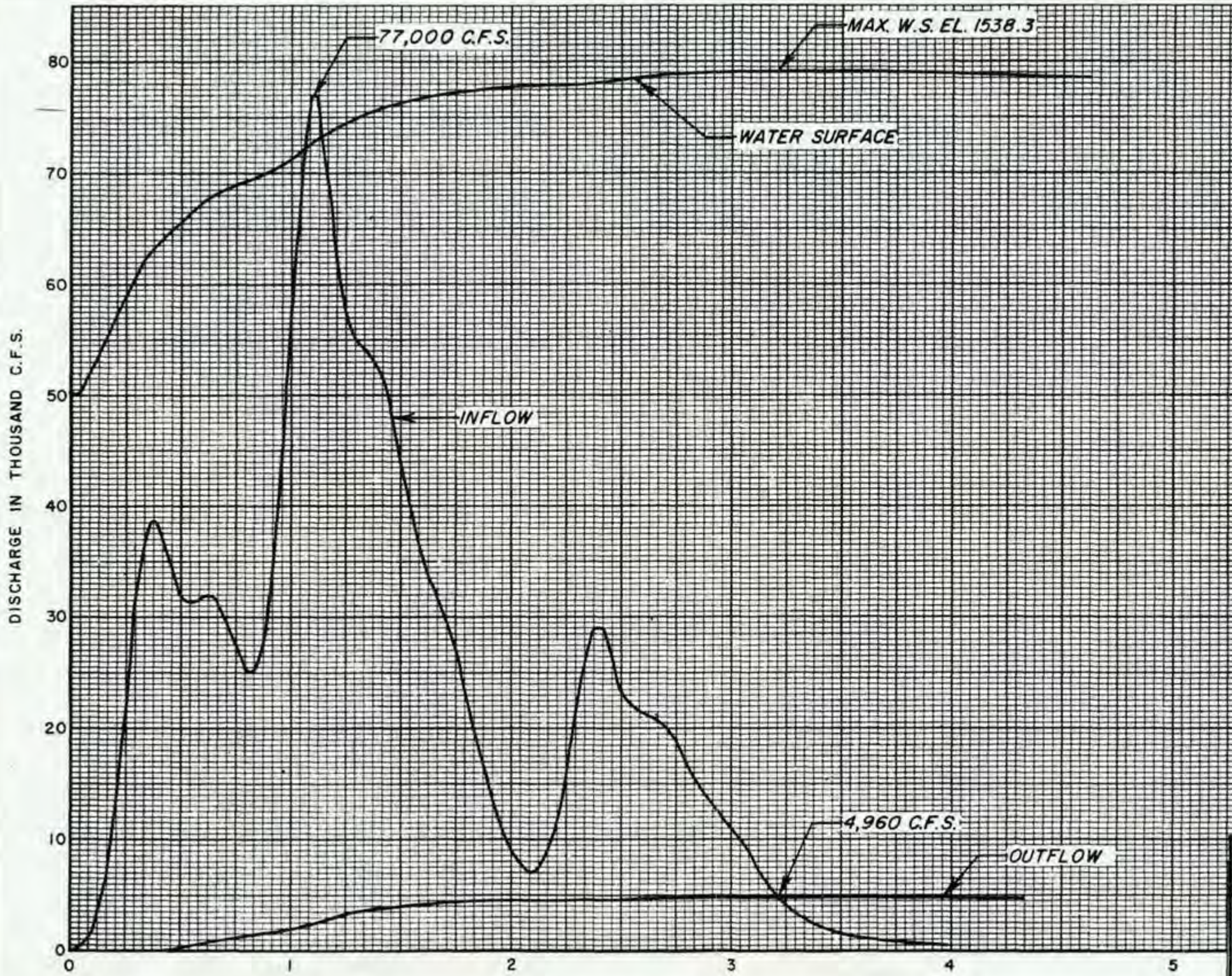

MAX. W.S. EL. 1551.2
WATER SURFACE
280,000 C.F.S.
INFLOW
140,600 C.F.S.
OUTFLOW
DISCHARGE IN THOUSAND C.F.S.
300
200
100
0
ELEVATION IN FEET ABOVE M.S.L.
1550
1545
1540
1535
0
1
2
3
4
5
6
TIME IN DAYS FROM BEGINNING OF STORM
TAT MOMOLIKOT DAM
SANTA ROSA WASH, ARIZONA
SPILLWAY DESIGN FLOOD ROUTING
U.S. ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT

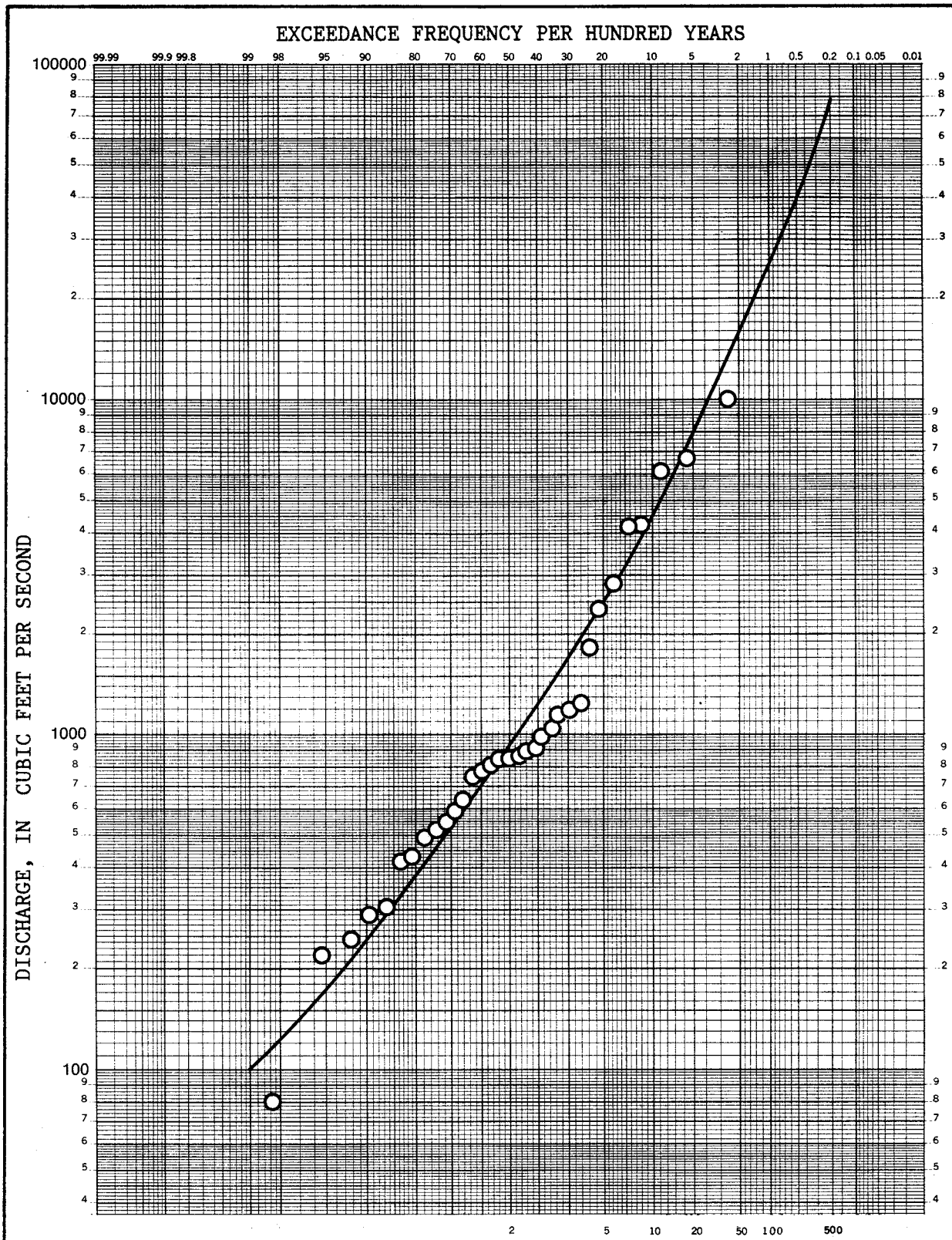
PLATE 8-01



TAT MOMOLIKOT DAM
SANTA ROSA WASH, ARIZONA

RESERVOIR DESIGN FLOOD ROUTING

U.S. ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT



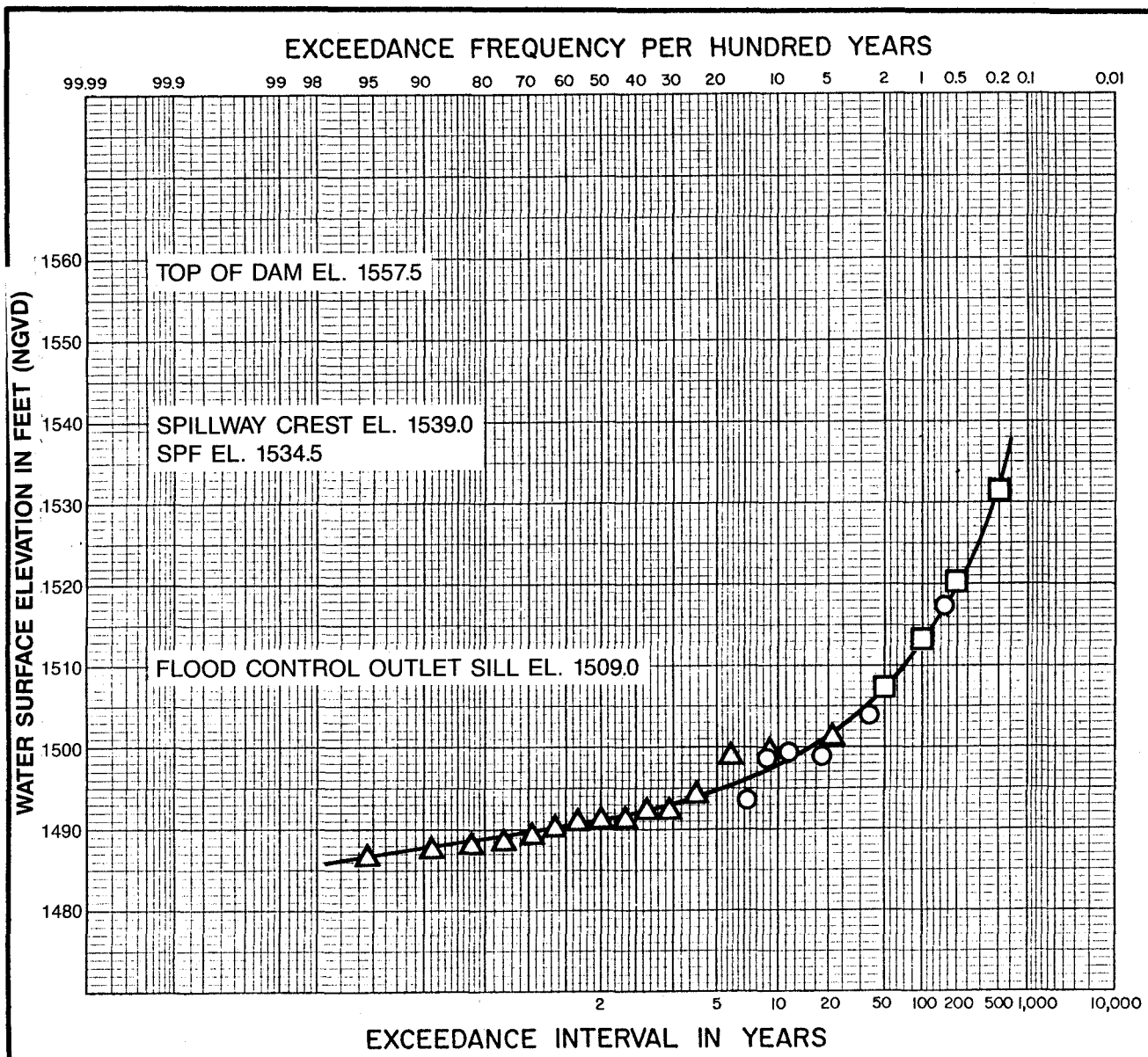
DRAINAGE AREA = 1780 SQ. MI.
MEAN LOGARITHM = 2.99
STANDARD DEVIATION = 0.48
ADOPTED SKEW = 0.500

REFERENCE PARAGRAPH 8-07a. IN TEXT

TAT MOMOLIKOT DAM
SANTA ROSA WASH, ARIZONA

INFLOW FREQUENCY CURVE

U.S. ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT



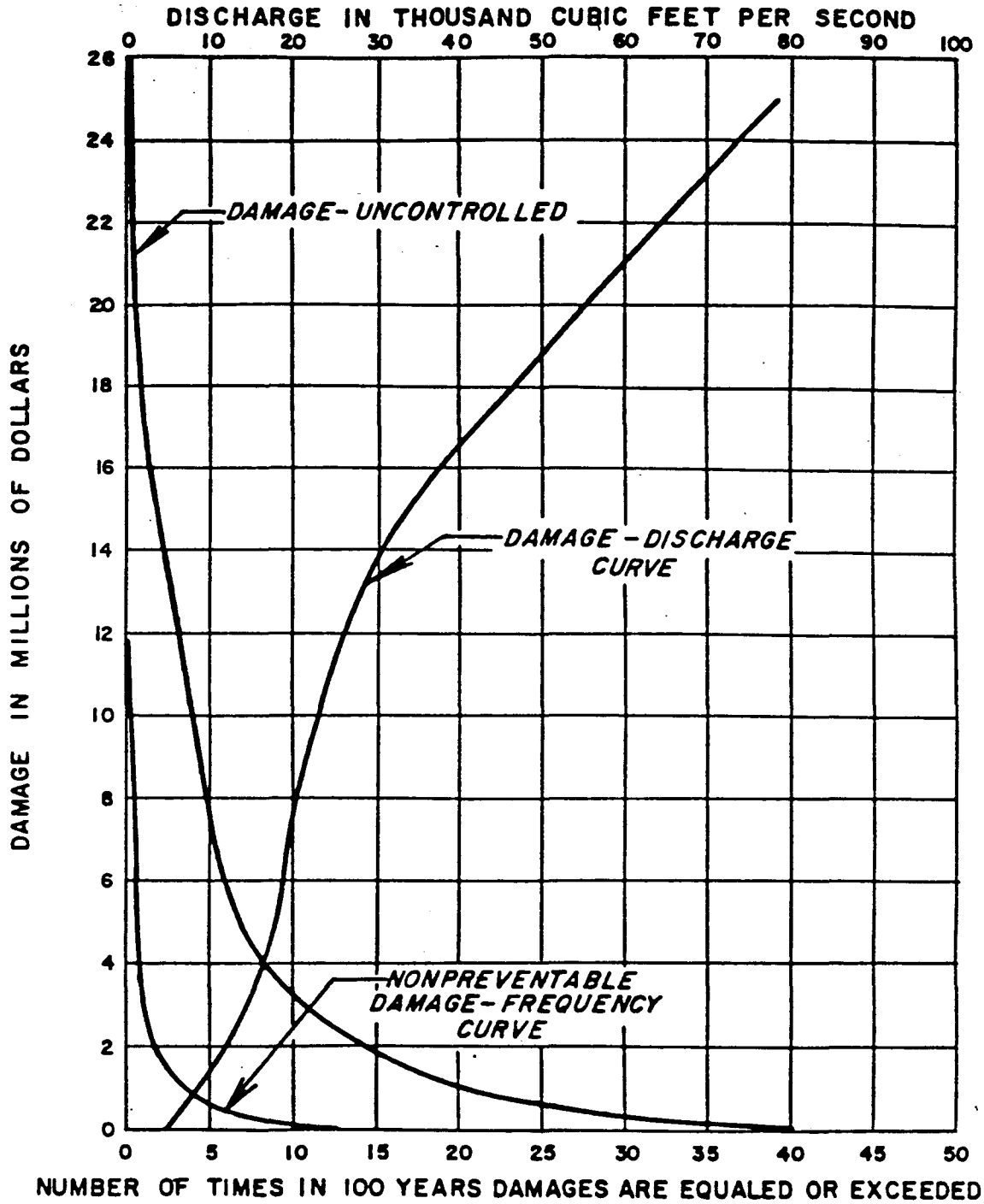
LEGEND

- □ BALANCED HYDROGRAPH
- ○ HISTORIC RECORD
- △ INFLOW RECORD

TAT MOMOLIKOT DAM
SANTA ROSA WASH, ARIZONA

ELEVATION FREQUENCY CURVE

U.S. ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT



NOTE:

DAMAGE-DISCHARGE RELATIONSHIP REPRESENT 1969 CONDITIONS.

TAT MOMOLIKOT DAM
SANTA ROSA WASH, ARIZONA

DAMAGE-DISCHARGE AND DAMAGE-FREQUENCY CURVES

U.S. ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT

EXHIBIT A

STANDING INSTRUCTIONS TO THE PROJECT OPERATOR FOR WATER CONTROL

TAT MOMOLIKOT DAM
SANTA ROSA WASH

Los Angeles District
U. S. Army Corps of Engineers

December 1989

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Paragraph		Page
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3	Operational Responsibilities	A-1
4	Gate/Valve Operation	A-3
5	Normal Operation Procedures	A-3
6	Limitations on Storage	A-3
7	Limitations on Release	A-3
8	Emergency Deviation From Normal Regulation	A-3
9	Emergency Notifications	A-3
10	Measurement of Hydrologic Data	A-4
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TAT MOMOLIKOT DAM AND LAKE SAINT CLAIR

OPERATION DIAGRAM
(WATER CONTROL RELEASE SCHEDULE)

ELEVATION IN FEET MSL		AREA IN ACRES	STORAGE IN ACRE-FEET	FC CONDUIT CAPACITY IN CFS	SPILLWAY CAPACITY IN CFS
1557.5	Top of Dam	19,400	487,066	6,970	250,000
1552.9	Top of Saddle Dikes	17,495	402,421	6,520	162,000
	FREEBOARD (4)				
1551.2	Spillway Design Flood Max. Elev.	16,860	373,222	6,360	134,240
	SURCHARGE OPERATION (3)				
1539.0	Spillway Crest	11,790	198,547	4,960	0
	FLOOD CONTROL OPERATION (2) (Elev. 1509 to 1539)				
	143,547 Ac-Ft Flood Control Space 35,438 Ac-Ft Sediment Space				
1515.0		3,098	34,855	580	
	Provisional Conservation Space				
1509.0	Top Conservation Pool (Invert FC Conduit)	2,050	19,562	0	
	CONSERVATION OPERATION (1)				
	15,000 Ac-Ft Conservation Space 4,562 Ac-Ft Sediment Space				
1485.0	Invert Conservation Outlet	37	87		
1480.0	Bottom of Reservoir	0	0		

Action Required When Water Is In The Pools

Described In The Chart At The Left.

(1) Conservation pool (to 1509.0 ft, NGVD) will be operated by the Bureau of Indian Affairs (BIA). The civil engineer for the Land Operations Section of the Papago Indian Agency (P.O. Box 578, Sells, AZ, 85634, telephone no. (602) 383-3277 or -3224) shall notify the Los Angeles District (telephone no. (213) 894-4756 or FTS 798-4756) at the end of each month during periods of storage in the reservoir and provide the water surface elevation of the reservoir. Provisional conservation space is part of the reservoir storage volume allocated for sediment. Flash boards may be used to raise the invert elevation of the flood control outlet works to impound 6 additional feet of water from elevation 1509.0 ft, NGVD to elevation 1515.0 ft, NGVD.

(2) Flood control outlet shall be maintained free of trash and debris. The civil engineer of the Land Operations Section of the Papago Indian Agency shall notify Los Angeles District each day by telephone when in flood control operation and provide the storage, water surface elevation, inflow, outflow measurements and any supplemental information concerning the condition of the dam (cracks, erosion, status of stop logs, etc.). Water surface elevation should be read from the staff gage located on the upstream slope of the dam just east of the conservation outlet works.

(3) When water rises above the spillway crest, the Los Angeles District will be notified as soon as possible; and again if any problem should develop. The main dam and saddle dikes will be patrolled frequently. Reporting shall continue as specified in paragraph 2 above.

(4) Should the reservoir water surface elevation rise above 1551.2 ft, NGVD continue patrol of main dam and saddle dikes. Notify Los Angeles District as soon as possible for instructions. Alert residents in the downstream flood plain and prepare for evacuation as required. Reporting shall continue as specified in paragraph 2 above.

SANTA ROSA WASH, ARIZONA
TAT MOMOLIKOT DAM

OPERATION DIAGRAM

Prepared in accordance with Code of Federal Regulations Title 33 Part 208.11

APPROVED: _____
Brigadier General, USA, Division Engineer
South Pacific Division, Dept. of the Army

APPROVED: _____
Area Director, USA, Bureau of Indian Affairs
Dept. of Interior

Effective Date: _____

1. GENERAL

a. This exhibit is prepared in accordance with instructions contained in EM 1110-2-3600, paragraph 9-02, (Standing Instructions to Project Operators for Water Control), and ETL 1110-2-251 and pertains to duties and responsibilities of the dam tender (in the case of Tat Momolikot Dam, the dam tender is the BIA) in connection with the operation of Tat Momolikot Dam and the reporting of required hydrologic data.

b. Operational instructions to the dam tender (BIA) are outlined with specific emphasis on flood emergencies. This exhibit is designed to be used in conjunction with the rest of the water control manual. Plates and tables referred to in this exhibit that are used in the main body of the water control manual are not duplicated. Other plates or tables such as chain of command for reservoir operations decisions, etc., that are in the main body of the manual are referenced in this exhibit as necessary. This avoids duplication of work and the possibility of two versions of the table in the same water control manual.

c. The dam tender is required to have available at the dam other pertinent books that complement these standing instructions. These books are the current year's Orange Book - "Instructions for Reservoir Operations Center Personnel," and the "Operation and Maintenance Manual for Tat Momolikot Dam."

2. RESERVOIR OPERATIONAL REQUIREMENTS

The flood control objective for Tat Momolikot Dam is to minimize flood damage and the flood risk to public safety along the Santa Rosa Wash downstream from the dam. See paragraph 7-05 for a detailed description of the flood control operation of Tat Momolikot Dam.

3. OPERATIONAL RESPONSIBILITIES

The primary responsibilities for operating Tat Momolikot Dam are delegated to units of the Bureau of Indian Affairs (BIA) and Engineering Division and Construction-Operation Division of the Los Angeles District (LAD), U.S. Army Corps of Engineers, as outlined below. The chain of command for reservoir operations decisions in the LAD is given in Table 9-01.

a. The Reservoir Regulation Unit (Reservoir Regulation Section, H&H Branch, Engineering Division) responsibilities are:

(1) Obtain current hydrometeorological data and weather forecasts for the region.

(2) Establish and update water control criteria for flood and nonflood periods and document in water control manual.

(3) Monitor meteorologic conditions, activate the Reservoir Operations Center (ROC), analyze current reservoir and hydrologic data, and issue appropriate water control instructions to the BIA (dam tender).

(4) Initiate the call out of mobile channel observation teams.

(5) Coordinate the control of water with, and make notifications to pertinent organizations. Keep up to date on all temporary conditions and actions that are restrictive or that require a change to established water control practices.

(6) Prepare reports relative to the control of water at the reservoir and keep district management and higher authority offices informed of ongoing water control activities.

(7) Advise the District Engineer, through the chain of command, whenever there is evidence that Tat Momolikot Dam will not be able to provide flood protection along the Santa Rosa Wash.

b. The Water Control Data Unit (Reservoir Regulation Section, H&H Branch, Engineering Division) responsibilities are:

(1) Assist in the operation and maintenance of all hydrologic recording and telemetry system equipment as requested.

(2) Calculate and maintain a record of all hydrologic data including stage, inflows, outflows, storage, weather data, etc.

c. The Dam Tender's (BIA's) responsibilities are:

(1) Be present at the dam when significant rainfall or runoff occurs or as requested by the Reservoir Regulation Unit through appropriate organization channels.

(2) Ensure that all equipment at the project, including recording and indicating gages, gate mechanisms, power units, etc., are in good operating condition.

(3) Record and report all pertinent conditions at the dam such as erosion problems, condition of the embankment, hydraulic connections of stage recorders, hazardous public actions at the project, intensity of rainfall, and any other conditions pertinent to the safe and successful operation of the dam.

(4) Maintain records, including water surface elevations, precipitation amounts, and a log of all communications.

(5) Periodically test/operate the mechanical and electrical facilities and inspect all structures and equipment according to the preestablished schedule.

(6) Refer to the O&M manual for the instructions on actual operating procedures for all mechanical equipment.

4. GATE/VALVE OPERATION

There are no flood control outlet gates at Tat Momolikot Dam.

5. NORMAL OPERATION PROCEDURES

Tat Momolikot Dam under normal operation procedures is operated as a multiple-purpose facility on Santa Rosa Wash according to the Operation Diagram provided at the front of this exhibit. The flood control outlet is ungated, so no regulation of flows through the flood control outlet can be achieved. For more information on flood control operation see paragraph 7-05 in the main text.

6. LIMITATIONS ON STORAGE

There are no legal limitations on storage, as the project boundary is above the maximum conservation pool water surface elevation of 1515.0 ft, NGVD.

7. LIMITATIONS ON RELEASES

The maximum discharge that can be released without exceeding the downstream channel capacity is 5,000 cfs. This release would be nearly achieved when the flood control outlet conduit was flowing full and the water surface elevation reached the spillway crest at 1539.0 ft, NGVD.

8. EMERGENCY DEVIATION FROM NORMAL REGULATION

Emergency departures from the regulation instructions issued by the ROC or the BIA may be required because of operating equipment failures, accidents such as a drowning, or other emergencies that require immediate action. The dam tender should contact the ROC when possible by telephone for instructions when the deviation involves flood control. The BIA's main office and other agencies should be informed as soon as practical. In most cases the dam tender will be required to act independently of others' instructions due to the lack of communication facilities at the dam. The ROC and BIA should be notified of departures from normal regulation as soon as possible. All other nonemergency deviations should be approved by the ROC and BIA in advance.

9. EMERGENCY NOTIFICATIONS

Emergency notifications to local emergency officials are normally made by the BIA dam tender. The BIA's Supervisory Civil Engineers of Land Operations for the Papago Agency are authorized to make flood warnings on behalf of the BIA concerning water release from the dam.

The parties listed below are to be notified immediately upon declaration of an uncontrollable emergency. Notification should include: (a) description of the type and extent of emergency that exists or is impending; (b) advice to evacuate people from flood plains; (e) information on the time that the release of hazardous amounts of water began or is estimated to begin; and (d) the name of the person making the notification and a telephone number where an informed BIA representative can be reached.

a. Tohono O'odham Tribal Police Department (602) 383-3280

b. Pinal County Sheriff's Office in Stanfield (602) 836-8226
1-800-352-3796

Upon completing the above notifications, the LAD office should be contacted. Document all notifications made and refer to the Orange Book, "Instructions for Reservoir Operations Center Personnel", for more information on additional desirable emergency notifications.

10. MEASUREMENT OF HYDROLOGIC DATA

All measurements taken should be documented. During flood situations hourly measurements are usually sufficient. Measurements should include the reservoir staff reading (water surface elevation), the "tape" reading, incremental precipitation since the last reading, the time of these measurements, and the initiation and termination of spillway flow. When reporting these measurements, the dam tender should clearly describe the silt and debris situation at the outlet conduit. When instruments are not working properly or are stuck in the silt, the dam tender should not report the erroneous reading, but should rather state the instrument or staff problem. When debris or silt cause the flows to be deceptively perched above the invert or result in a loss of contact with a staff board, the dam tender should report a descriptive message identifying the limitation and quantifying the average streamflow depth and width or estimated reservoir depth as appropriate.

11. REPORTS

There are no permanent attendants, telephones, or radios located at Tat Momolikot Dam. Communication with the dam tender can only be achieved away from the damsite. The BIA will notify the Reservoir Regulation Unit (telephone no. (213) 894-4756) when any of the following conditions occur: rainfall of 11/2 inches at Tat Momolikot Dam or at Casa Grande, and when the water surface elevation reaches 1505.0 ft, NGVD. Every call made will be noted, whatever its purpose.

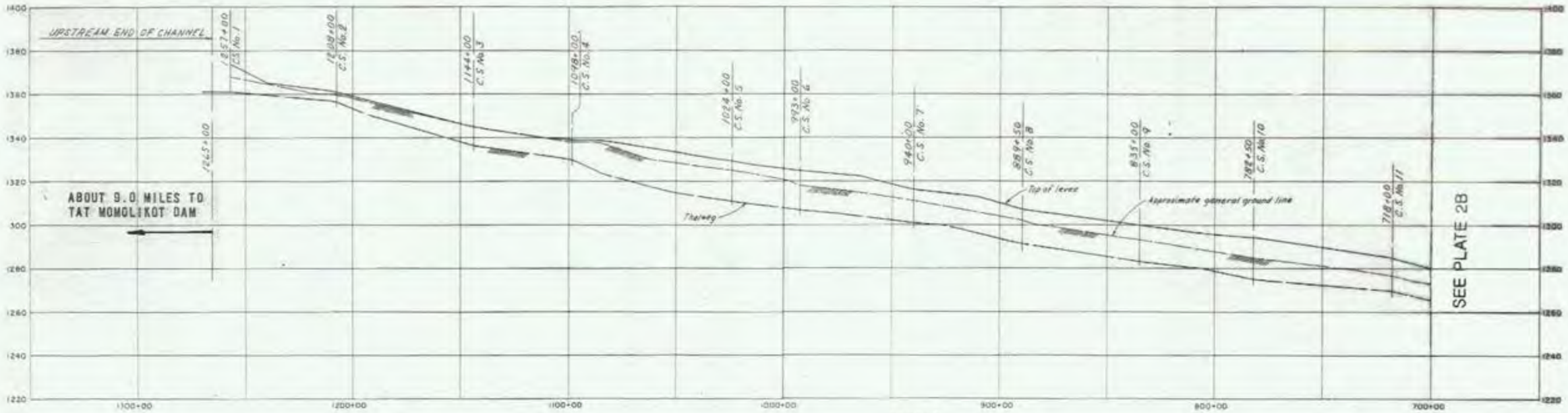
EXHIBIT B

EXISTING CHANNEL ON SANTA ROSA WASH

TAT MOMOLIKOT DAM
SANTA ROSA WASH

Los Angeles District
U. S. Army corps of Engineers

December 1989



PROFILE

VERT SCALE 20 0 5 10 20 30 40 50 FEET

HOR. SCALE 1000 0 1000 2000 3000 4000 5000 FEET

PLAN

SCALE 1000 0 1000 2000 3000 4000 5000 FEET

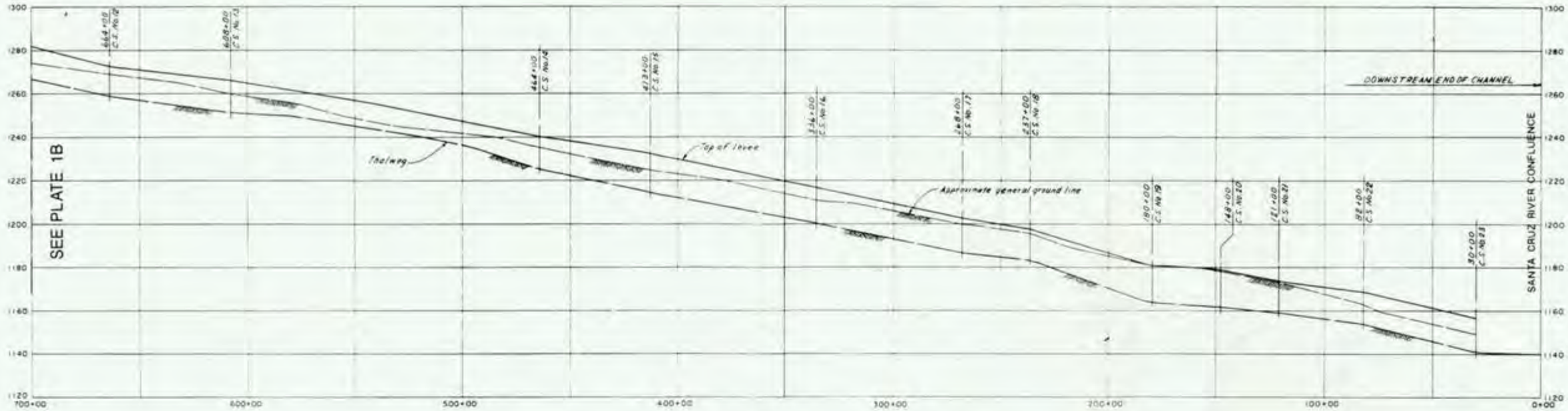
SANTA ROSA WASH, ARIZONA

TAT MOMOLIKOT DAM

DOWNSTREAM CHANNEL
PLAN AND PROFILE

STA 1265 + 00 TO STA 700 + 00

U S ARMY ENGINEER DISTRICT
LOS ANGELES, CORPS OF ENGINEERS



PROFILE

VERT. SCALE 20 0 20 40 60 FEET

HOR. SCALE 1000 0 1000 2000 3000 4000 5000 FEET

PLAN

SCALE 1000 0 1000 2000 3000 4000 5000 FEET

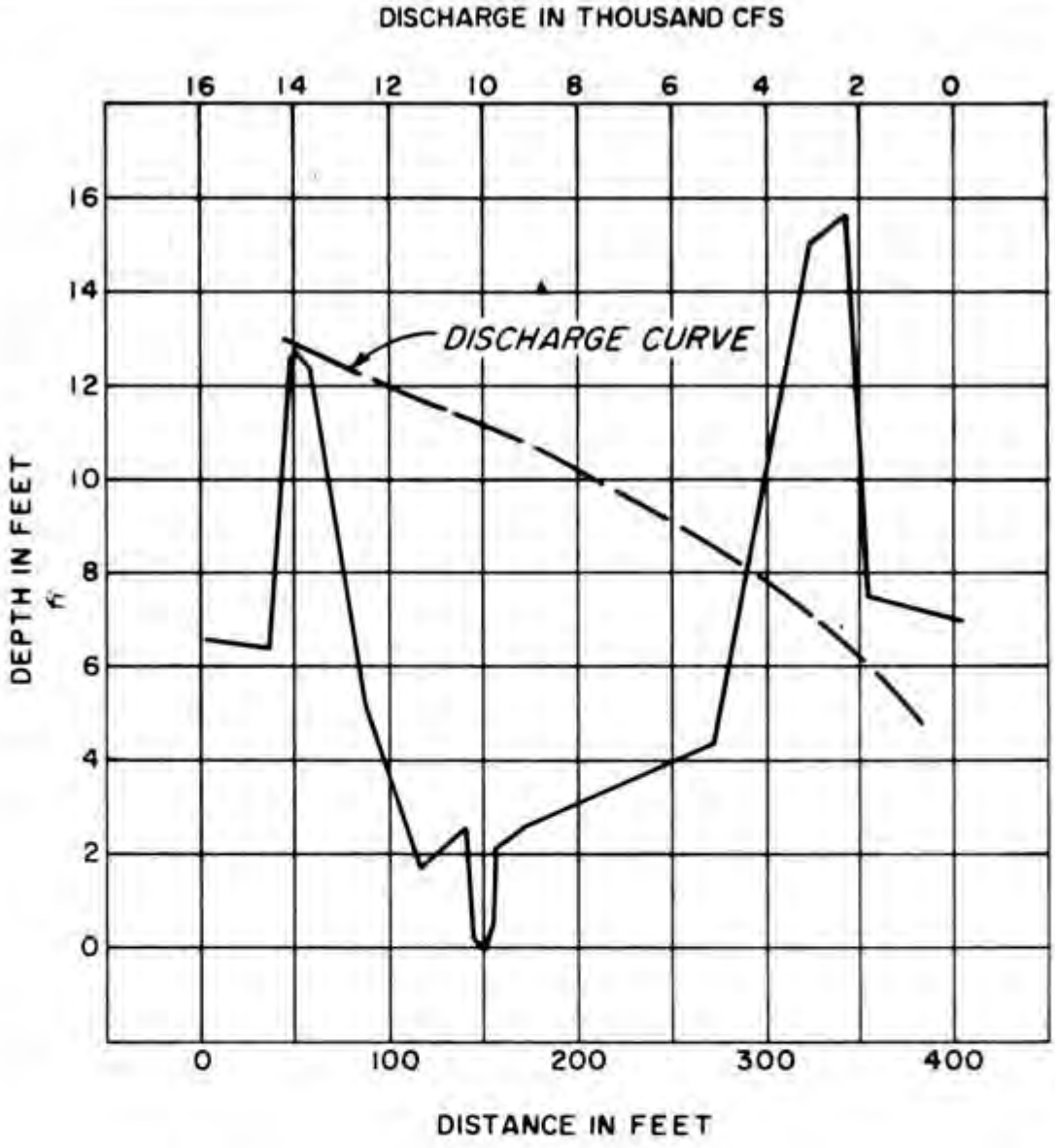
SANTA ROSA WASH, ARIZONA

TAT MOMOLIKOT DAM

DOWNSTREAM CHANNEL
PLAN AND PROFILE

STA 700 + 00 TO STA 0 + 00

U S ARMY ENGINEER DISTRICT
LOS ANGELES, CORPS OF ENGINEERS



*NOTE: CROSS-SECTIONAL PLOTS AND DISCHARGE CURVES FOR CROSS-SECTIONS 2 THROUGH 23 ARE AVAILABLE AT THE LAD OFFICES

SANTA ROSA WASH, ARIZONA

TAT MOMOLIKOT DAM

CROSS SECTION NO. 1

STA. 1257+00

U. S. ARMY ENGINEER DISTRICT
LOS ANGELES, CORPS OF ENGINEERS

EXHIBIT C

CODE OF FEDERAL REGULATIONS,
TITLE 33, PARAGRAPH 208.11

TAT MOMOLIKOT DAM
SANTA ROSA WASH

Los Angeles District
U. S. Army Corps of Engineers

December 1989

absence of any indication that further public comment would shed any new light on the matter, OSHA concludes that no change in the standard is warranted. Accordingly, the ground-fault protection standard at 29 CFR 1910.309(c) and 29 CFR 1926.400(h), as promulgated on December 21, 1976, is hereby reaffirmed.

(Secs. 6(b) and 8(c), Pub. L. 91-596, 84 Stat. 1593, 1599 (29 U.S.C. 655, 657); sec. 107, Pub. L. 91-54, 83 Stat. 96 (40 U.S.C. 333); Secretary of Labor's Order No. 8-76 (41 FR 25059); 29 CFR Part 1911.)

Signed at Washington, D.C., this 3d day of October 1978.

EULA BINGHAM,
Assistant Secretary of Labor.

[FR Doc. 78-28687 Filed 10-12-78; 8:45 am]

[3710-92-M]

Title 33—Navigation and Navigable Waters

CHAPTER II—CORPS OF ENGINEERS, DEPARTMENT OF THE ARMY

[ER 1110-2-241]

PART 208—FLOOD CONTROL REGULATIONS

Use of Storage Allocated for Flood Control and Navigation Purposes

AGENCY: U.S. Army Corps of Engineers, DOD.

ACTION: Final rule.

SUMMARY: This revision of 33 CFR 208.11 regulations prescribes the policy and procedure for regulating reservoir projects capable of regulation for flood control or navigation and the use of storage allocated for such purposes and provided on the basis of flood control and navigation. The revised regulations are applicable to dam and reservoir projects licensed, maintained, and operated under provisions of the Federal Power Act (41 Stat. 1063 (16 U.S.C. 791(A))), Pub. L. 83-436, and other similar authorizing legislation; as well as to reservoir projects constructed wholly or in part with Federal funds as directed by section 7 of the Flood Control Act of 1944. These regulations are intended to establish an understanding between project owners, operating agencies and the Corps of Engineers with regard to certain activities and responsibilities concerning water control management throughout the Nation in the interest of flood control and navigation. Interested persons were given until November 2, 1977 (42 FR 57141) to submit comments. No written comments were received.

DATES: This regulation is effective on October 15, 1978.

ADDRESSES: HQDA (DAEN-CWE-HY) Washington, D.C. 20314.

FOR FURTHER INFORMATION CONTACT:

Mr. Edgar P. Story, Engineering Division, Civil Works Directorate, Office of the Chief of Engineers, Washington, D.C. 20314 202-693-7330.

SUPPLEMENTARY INFORMATION: This final regulation is essentially the same as the proposed rule (42 FR 53637), however, certain reordering has been done of the reference material presented in § 208.11(b). Specifically, excerpts from sections 4(e), 10(a), and 10(c) of the Federal Power Act have been added for improved clarity. Also Federal Power Commission order No. 540 issued October 31, 1975, and published November 7, 1975 (40 FR 51998), amending § 2.9 of the Commission's general policy and interpretations which prescribed standardized conditions (Forms) for inclusion in preliminary permits and licenses issued under part I of the Federal Power Act has been cited and appropriately excerpted. Reference to and citation from article 33 of Federal Power Commission license No. 2009 have been deleted in lieu thereof.

In addition to the proposed action, certain project names and pertinent data are added to and deleted from the list of projects shown in § 208.11(e), list of projects (42 FR 53637). The following projects are added to the list of projects:

(a) U.S. Army Corps of Engineers, Missouri River Division area: Webster Dam and Lake.

(b) U.S. Army Corps of Engineers, New England Division area:

(i) Bear Swamp Pumped Storage Project.

(ii) Turners Falls Reservoir.

(c) U.S. Army Corps of Engineers, North Pacific Division area:

(i) American Falls Dam and Reservoir.

(ii) Anderson Ranch Dam and Reservoir.

(iii) Arrowrock Dam and Reservoir.

(iv) Brownlee Dam and Reservoir.

(v) Grand Coulee Dam and Franklin D. Roosevelt Lake.

(vi) Hells Canyon Dam and Reservoir.

(vii) Kerr Dam and Flathead Lake.

(viii) Mayfield Dam and Reservoir.

(ix) Mossyrock Dam and Davisson Lake.

(x) Oxbow Dam and Reservoir.

(xi) Priest Rapids Dam and Reservoir.

(xii) Ririe Dam and Reservoir.

(xiii) Rocky Reach Dam and Lake Entiat.

(xiv) Ross Dam and Reservoir.

(xv) Upper Baker Dam and Baker Lake.

(xvi) Wanapum Dam and Reservoir.

(xvii) Wells Dam and Lake Pateros.

(d) U.S. Army Corps of Engineers, South Atlantic Division area: Lewis M. Smith Dam and Reservoir.

(e) U.S. Army Corps of Engineers, South Pacific Division area:

(i) Indian Valley Dam and Reservoir.

(ii) Lemon Dam and Reservoir.

(iii) Navajo Dam and Reservoir.

(iv) Paolna Dam and Reservoir.

(v) Vallecito Dam and Reservoir.

The following projects are deleted from the list of projects:

(a) U.S. Army Corps of Engineers, South Atlantic Division area: H. Neely Henry Dam and Reservoir.

(b) U.S. Army Corps of Engineers, South Pacific Division area:

(i) Causey Dam and Reservoir.

(ii) Devil Creek Dam and Reservoir.

NOTE—The Chief of Engineers has determined that this rule does not contain a major proposal requiring preparation of an inflation impact statement under Executive Order 11821 and OMB Circular A-107 (Statutory Authority Pub. L. 90-483).

Dated: October 10, 1978.

CHARLES I. MCGINNIS,
Major General, USA,
Director of Civil Works.

Section 208.11 is revised to read as follows:

§ 208.11 Regulations for use of storage allocated for flood control or navigation and/or project operation at reservoirs subject to prescription of rules and regulations by the Secretary of the Army in the interest of flood control and navigation.

(a) *Purpose.* This regulation prescribes the responsibilities and general procedures for regulating reservoir projects capable of regulation for flood control or navigation and the use of storage allocated for such purposes and provided on the basis of flood control and navigation, except projects owned and operated by the Corps of Engineers; the International Boundary and Water Commission, United States and Mexico; and those under the jurisdiction of the International Joint Commission, United States, and Canada, and the Columbia River Treaty. The intent of this regulation is to establish an understanding between project owners, operating agencies, and the Corps of Engineers.

(b) *Responsibilities.* The basic responsibilities of the Corps of Engineers regarding project operation are set out in the cited authority and described in the following paragraphs:

(1) Section 7 of the Flood Control Act of 1944 (58 Stat. 890, 33 U.S.C. 709) directs the Secretary of the Army to prescribe regulations for flood control and navigation in the following manner:

Hereafter, it shall be the duty of the Secretary of War to prescribe regulations for the use of storage allocated for flood control or navigation at all reservoirs constructed wholly or in part with Federal funds provided on the basis of such purposes, and the operation of any such project shall be in accordance with such regulations: *Provided*, That this section shall not apply to the Tennessee Valley Authority, except that in case of danger from floods on the lower Ohio and Mississippi Rivers the Tennessee Valley Authority is directed to regulate the release of water from the Tennessee River into the Ohio River in accordance with such instructions as may be issued by the War Department.

(2) Federal Energy Regulatory Commission (formerly Federal Power Commission (FPC)) licenses.

(i) Responsibilities of the Secretary of the Army and/or the Chief of Engineers in Federal Energy Regulatory Commission (FERC) licensing actions are set out in the Federal Power Act. Pertinent sections of that Act are cited herein. The Commission may also stipulate, as part of license conditions, that the licensee enter into an agreement with the Department of the Army providing for operation of the project during flood times, in accordance with rules and regulations prescribed by the Secretary of the Army.

(A) Section 4(e) of the Federal Power Act requires approval by the Chief of Engineers and the Secretary of the Army of plans of dams or other structures affecting the navigable capacity of any navigable waters of the United States, prior to issuance of a license by the Commission as follows:

The Commission is hereby authorized and empowered to issue licenses to citizens * * * for the purpose of constructing, operating, and maintaining dams, water conduits, reservoirs, powerhouses, transmission lines, or other project works necessary or convenient for the development and improvement of navigation and for the development, transmission, and utilization of power across, along, from or in any of the streams or other bodies of water over which Congress has jurisdiction * * * *Provided further*, That no license affecting the navigable capacity of any navigable waters of the United States shall be issued until the plans of the dam or other structures affecting navigation have been approved by the Chief of Engineers and the Secretary of the Army.

(B) Sections 10(a) and 10(c) of the Federal Power Act specify conditions of project licenses including the following:

(1) Section 10(a). That the project adopted * * * shall be such as in the judgment of the Commission will be best adapted to a comprehensive plan for improving or developing a waterway or waterways for the use of benefit of interstate or foreign commerce, for the improvement and utilization of waterpower development, and for other beneficial public use * * *.

(2) Section 10(c). That the licensee shall * * * so maintain and operate said works as not to impair navigation, and shall conform to such rules and regulations as the Commission may from time to time prescribe for the protection of life, health, and property.* * *

(C) Section 18 of the Federal Power Act directs the operation of any navigation facilities built under the provision of that act, be controlled by rules and regulations prescribed by the Secretary of the Army as follows:

The operation of any navigation facilities which may be constructed as part of or in connection with any dam or diversion structure built under the provisions of this Act, whether at the expense of a licensee hereunder or of the United States, shall at all times be controlled by such reasonable rules and regulations in the interest of navigation; including the control of the pool caused by such dam or diversion structure as may be made from time to time by the Secretary of the Army. * * *

(ii) Federal Power Commission order No. 540 issued October 31, 1975, and published November 7,1975 (40 FR 51998), amending section 2.9 of the Commission's general policy and interpretations prescribed standardized conditions (forms) for inclusion in preliminary permits and licenses issued under part I of the Federal Power Act. As an example, article 12 of standard form L-3, titled: "Terms and Conditions of License for Constructed Major Projects Affecting Navigable Waters of the United States," sets out the Commission's interpretation of appropriate sections of the Act, which deal with navigation aspects, and attendant responsibilities of the Secretary of the Army in licensing actions as follows:

The United States specifically retains and safeguards the right to use water in such amount, to be determined by the Secretary of the Army, as may be necessary for the purposes of navigation on the navigable waterway affected; and the operation of the Licensee, so far as they affect the use, storage and discharge from storage of waters affected by the license, shall at all times be controlled by such reasonable rules and regulations as the Secretary of the Army may prescribe in the interest of navigation, and as the Commission may prescribe for the protection of life, health, and property, * * *, and the Licensee shall release water from the project reservoir at such rate * * *, as the Secretary of the Army may prescribe in the interest of navigation, or as the Commission may prescribe for the other purposes hereinbefore mentioned.

(3) Section 9 of Public Law 436, 83d Congress (68 Stat. 303) provides for the development of the Coosa River, Ala. and Ga., and directs the Secretary of the Army to prescribe rules and regulations for project operation in the interest of flood control and navigation as follows:

The operation and maintenance of the dams shall be subject to reasonable rules and regulations of the Secretary of the Army in the interest of flood control and navigation.

NOTE.—This Regulation will also be applicable to dam and reservoir projects operated under provisions of future legislative acts wherein the Secretary of the Army is directed to prescribe rules and regulations in the interest of flood control and navigation. The Chief of Engineers, U.S. Army Corps of Engineers, is designated the duly authorized representative of the Secretary of the Army to exercise the authority set out in the congressional acts. This regulation will normally be implemented by letters of understanding between the Corps of Engineers and project owner and will incorporate the provisions of such letters of understanding prior to the time construction renders the project capable of significant impoundment of water. A water control agreement signed by both parties will follow when deliberate impoundment first begins or at such time as the responsibilities of any corps-owned projects may be transferred to another entity. Promulgation of this regulation for a given project will occur at such time as the name of the project appears in the FEDERAL REGISTER in accordance with the requirements of § 208.11(d)(11). When agreement on a water control plan cannot be reached between the corps and the project owner after coordination with all interested parties, the project name will be entered in the FEDERAL REGISTER and the Corps of Engineers plan will be the officials water control plan until such time as differences can be resolved.

(c) *Scope and terminology.* This regulation applies to Federal authorized flood control and/or navigation storage projects, and to non-Federal projects which require the Secretary of the Army to prescribe regulations as a condition of the license, permit or legislation, during the planning, design and construction phases, and throughout the life of the project. In compliance with the authority cited above, this regulation defines certain activities and responsibilities concerning water control management throughout the Nation in the interest of flood control and navigation. In carrying out the conditions of this regulation, the owner and/or operating agency will comply with applicable provisions of Pub. L. 85-624, the Fish and Wildlife Coordination Act of 1958, and Pub. L. 92-500, the Federal Water Pollution Control Act Amendments of 1972. This regulation does not apply to local flood protection works governed by § 208.10, or to navigation facilities and associated structures which are otherwise covered by part 207 (Navigation Regulations) of title 33 of the code. Small reservoirs, containing less than 12,500 acre-feet of flood control or navigation storage, may be excluded from this regulation and covered under § 208.10, unless specifically required by law or conditions of the license or permit.

(1) The terms "reservoir" and "project" as used herein include all water resource impoundment projects constructed or modified, including natural lakes, that are subject to this regulation.

(2) The term "project owner" refers to the entity responsible for maintenance, physical operation, and safety of the project, and for carrying out the water control plan in the interest of flood control and/or navigation as prescribed by the Corps of Engineers. Special arrangements may be made by the project owner for "operating agencies" to perform these tasks.

(3) The term "letter of understanding" as used herein includes statements which consummate this regulation for any given project and define the general provisions or conditions of the local sponsor, or owner, cooperation agreed to in the authorizing legislative document, and the requirements for compliance with section 7 of the 1944 Flood Control Act, the Federal Power Act or other special congressional act. This information will be specified in the water control plan and manual. The letter of understanding will be signed by a duly authorized representative of the Chief of Engineers and the project owner. A "field working agreement" may be substituted for a letter of understanding, provided that the specified minimum requirements of the latter, as stated above, are met.

(4) The term "water control agreement" refers to a compilation of water control criteria, guidelines, diagrams, release schedules, rule curves and specifications that basically govern the use of reservoir storage space allocated for flood control or navigation and/or release functions of a water control project for these purposes. In general, they indicate controlling or limiting rates of discharge and storage space required for flood control and/or navigation, based on the runoff potential during various seasons of the year.

(5) For the purpose of this regulation, the term "water control plan" is limited to the plan of regulation for a water resources project in the interest of flood control and/or navigation. The water control plan must conform with proposed allocations of storage capacity and downstream conditions or other requirements to meet all functional objectives of the particular project, acting separately or in combination with other projects in a system.

(6) The term "real-time" denotes the processing of current information or data in a sufficiently timely manner to influence a physicial response in the system being monitored and controlled. As used herein the term connotes * * * the analyses for and execution of water control decisions for both minor and major flood events and for navigation, based on prevailing hydrometeorological and other conditions and constraints, to achieve efficient management of water resource systems.

(d) *Procedures.* (1) *Conditions during project formulation.* During the planning and design phases, the project owner should consult with the Corps of Engineers regarding the quantity and value of space to reserve in the reservoir for flood control and/or navigation purposes, and for utilization of the space, and other requirements of the license, permit or conditions of the law. Relevant matters that bear upon flood control and navigation accomplishment include: runoff potential, reservoir discharge capability, downstream channel characteristics, hydrometeorological data collection, flood hazard, flood damage characteristics, real estate acquisition for flowage requirements (fee and easement), and resources required to carry out the water control plan. Advice may also be sought on determination of and regulation for the probable maximum or other design flood under consideration by the project owner to establish the quantity of surcharge storage space, and freeboard elevation of top of dam or embankment for safety of the project.

(2) *Corps of Engineers involvement.* If the project owner is responsible for real-time implemenetation of the water control plan, consultation and assistance will be provided by the Corps of Engineers when appropriate and to the extent possible. During any emergency that affects flood control and/or navigation, the Corps of Engineers may temporarily prescribe regulation of flood control or navigation storage space on a day-to-day (real-time) basis without request of the project owner. Appropriate consideration will be given for other authorized project functions. Upon refusal of the project owner to comply with regulations prescribed by the Corps of Engineers, a letter will be sent to the project owner by the Chief of Engineers or his duly authorized representative describing the reason for the regulations prescribed, events that have transpired, and notification that the project owner is in violation of the Code of Federal Regulations. Should an impasse arise, in that the project owner or the designated operating entity persists in noncompliance with regulations prescribed by the Corps of Engineers, measures may be taken to assure compliance.

(3) *Corps of Engineers implementation of real-time water control decisions.* The Corps of Engineers may prescribe the continuing regulation of flood control storage space for any project subject to this regulation on a day-to-day (real-time) basis. When this is the case, consultation and assistance from the project owner to the extent possible will be expected. Special requests by the project owner, or appropriate operating entity, are preferred before the Corps of Engineers offers advice on real-time regulation during surcharge storage utilization.

(4) *Water control plan and manual.* Prior to project completion, water control managers from the Corps of Engineers will visit the project and the area served by the project to become familiar with the water control facilities, and to insure sound formulation of the water control plan. The formal plan of regulation for flood control and/or navigation, referred to herein as the water control plan, will be developed and documented in a water control manual prepared by the Corps of Engineers. Development of the manual will be coordinated with the project owner to obtain the necessary pertinent information, and to insure compatibility with other project purposes and with surcharge regulation. Major topics in the manual will include: Authorization and description of the project, hydrometeorology, data collection and communication networks, hydrologic forecasting, the water control plan, and water resource management functions, including responsibilities and coordination for water control decisionmaking. Special instructions to the dam tender or reservoir manager on data collection, reporting to higher Federal authority, and on procedures to be followed in the event of a communication outage under emergency conditions, will be prepared as an exhibit in the manual. Other exhibits will include copies of this regulation, letters of understanding consummating this regulation, and the water control agreements. After approval by the Chief of Engineers or his duly authorized representative, the manual will be furnished the project owner.

(5) *Water control agreement.* (i) A water control diagram (graphical) will be prepared by the Corps of Engineers for each project having variable space reservation for flood control and/or navigation during the year, e.g., variable seasonal storage, joint-use space, or other rule curve designation. Reservoir inflow parameters will be included on the diagrams when appropriate. Concise notes will be included on the diagrams prescribing the use of storage space in terms of release schedules, runoff, nondamaging or other controlling flow rates downstream of the damsite, and other major factors as appropriate. A water control release schedule will be prepared in tabular form for projects that do not have variable space reservation for flood control and/or navigation. The water control diagram or release schedule will be signed by a duly authorized representative of the Chief of Engineers, the project owner, and the designated operating agency, and will be used as the basis for carrying out this

regulation. Each diagram or schedule will contain a reference to this regulation.

(ii) When deemed necessary by the Corps of Engineers, information given on the water control diagram or release schedule will be supplemented by appropriate text to assure mutual understanding on certain details or other important aspects of the water control plan not covered in this regulation, on the water control diagram or in the release schedule. This material will include clarification of any aspects that might otherwise result in unsatisfactory project performance in the interest of flood contol and/or navigation. Supplementation of the agreement will be necessary for each project where the Corps of Engineers exercises the discretionary authority to prescribe the flood control regulation on a day-to-day (real-time) basis. The agreement will include delegation of the responsibility. The document should also cite, as appropriate, section 7 of the 1944 Flood Control Act, the Federal Power Act and/or other congressional legislation authorizing construction an/or directing operation of the project.

(iii) All flood control regulations published in the FEDERAL REGISTER under this section (part 208) of the code prior to the date of this publication which are listed in paragraph 208.11(e) are hereby superseded.

(iv) Nothing in this regulation prohibits the promulgation of specific regulations for a project in compliance with the authorizing acts, when agreement on acceptable regulations cannot be reached between the Corps of Engineers and the owner.

(6) *Hydrometeorological instrumentation.* The project owner will provide instrumentation in the vicinity of the damsite and will provide communication equipment necessary to record and transmit hydrometeorological and reservoir data to all appropriate Federal authorities on a real-time basis unless there are extenuating circumstances or are otherwise provided for as a condition of the license or permit. For those projects where the owner retains responsibility for real-time implementation of the water control plan, the owner will also provide or arrange for the measurement and reporting of hydrometeorological parameters required within and adjacent to the watershed and downstream of the damsite, sufficient to regulate the project for flood control and/or navigation in an efficient manner. When data collection stations outside the immediate vicinity of the damsite are required, and funds for installation, observation, and maintenance are not available from other sources, the Corps of Engineers may agree to share the costs for such stations with the project owner. Availability of funds and urgency of data needs are factors which will be considered in reaching decisions on cost sharing.

(7) *Project safety.* The project owner is responsible for the safety of the dam and appurtenant facilities and for regulation of the project during surcharge storage utilization. Emphasis upon the safety of the dam is especially important in the event surcharge storage is utilized, which results when the total storage space reserved for flood control is exceeded. Any assistance provided by the Corps of Engineers concerning surcharge regulation is to be utilized at the discretion of the project owner, and does not relieve the owner of the responsibility for safety of the project.

(8) *Notification of the general public.* The Corps of Engineers and other interested Federal and State agencies, and the project owner will jointly sponsor public involvement activities, as appropriate, to fully apprise the general public of the water control plan. Public meetings or other effective means of notification and involvement will be held, with the initial meeting being conducted as early as practicable but not later than the time the project first becomes operational. Notice of the initial public meeting shall be published once a week for 3 consecutive weeks in one or more newspapers of general circulation published in each county covered by the water control plan. Such notice shall also be used when appropriate to inform the public of modifications in the water control plan. If no newspaper is published in a county, the notice shall be published in one or more newspapers of general circulation within that county. For the purposes of this section a newspaper is one qualified to publish public notices under applicable State law. Notice shall be given in the event significant problems are anticipated or experienced that will prevent carrying out the approved water control plan or in the event that an extreme water condition is expected that could produce severe damage to property or loss of life. The means for conveying this information shall be commensurate with the urgency of the situation. The water control manual will be made available for examination by the general public upon request at the appropriate office of the Corps of Engineers, project owner or designated operating agency.

(9) *Other generalized requirements for flood control and navigation.* (i) Storage space in the reservoirs allocated for flood control and navigation purposes shall be kept available for those purposes in accordance with the water control agreement, and the plan of regulation in the water control manual.

(ii) Any water impounded in the flood control space defined by the water control agreement shall be evacuated as rapidly as can be safely accomplished without causing downstream flows to exceed the controlling rates; i.e., releases from reservoirs shall be restricted insofar as practicable to quantities which, in conjunction with uncontrolled runoff downstream of the dam, will not cause water levels to exceed the controlling stages currently in force. Although conflicts may arise with other purposes, such as hydropower, the plan or regulation may require releases to be completely curtailed in the interest of flood control or safety of the project.

(iii) Nothing in the plan of regulation for flood control shall be construed to require or allow dangerously rapid changes in magnitudes of releases. Releases will be made in a manner consistent with requirements for protecting the dam and reservoir from major damage during passage of the maximum design flood for the project.

(iv) The project owner shall monitor current reservoir and hydro- meteorological conditions in and adjacent to the watershed and downstream of the damsite, as necessary. This and any other pertinent information shall be reported to the Corps of Engineers on a timely basis, in accordance with standing instructions to the damtender or other means requested by the Corps of Engineers.

(v) In all cases where the project owner retains responsibility for real-time implementation of the water control plan, he shall make current determinations of: Reservoir inflow, flood control storage utilized, and scheduled releases. He shall also determine storage space and releases required to comply with the water control plan prescribed by the Corps of Engineers. The owner shall report this information on a timely basis as requested by the Corps of Engineers.

(vi) The water control plan is subject to temporary modification by the Corps of Engineers if found necessary in time of emergency. Requests for and action on such modifications may be made by the fastest means of communication available. The action taken shall be confirmed in writing the same day to the project owner and shall include justification for the action.

(vii) The project owner may temporarily deviate from the water control plan in the event an immediate short-term departure is deemed necessary for emergency reasons to protect the safety of the dam, or to avoid other serious hazards. Such actions shall be immediately reported by the fastest

means of communication available. Actions shall be confirmed in writing the same day to the Corps of Engineers and shall include justification for the action. Continuation of the deviation will require the express approval of the Chief of Engineers, or his duly authorized representative.

(viii) Advance approval of the Chief of Engineers, or his duly authorized representative, is required prior to any deviation from the plan of regulation prescribed or approved by the Corps of Engineers in the interest of flood control and/or navigation, except in emergency situations provided for in paragraph (d)(9)(vii) of this section. When conditions appear to warrant a prolonged deviation from the approved plan, the project owner and the Corps of Engineers will jointly investigate and evaluate the proposed deviation to insure that the overall integrity of the plan would not be unduly compromised. Approval of prolonged deviations will not be granted unless such investigations and evaluations have been conducted to the extent deemed necessary by the Chief of Engineers, or his designated representatives, to fully substantiate the deviation.

(10) *Revisions.* The water control plan and all associated documents will be revised by the Corps of Engineers, as necessary, to reflect changed conditions that come to bear upon flood control and navigation, e.g., reallocation of reservoir storage space due to sedimentation or transfer of storage space to a neighboring project. Revision of the water control plan, water control agreement, water control diagram, or release schedule requires approval of the Chief of Engineers or his duly authorized representative. Each such revision shall be effective upon the date specified in the approval. The original (signed document) water control agreement shall be kept on file in the Office, Chief of Engineers, Department of the Army, Washington, D.C. Copies of the agreement shall be kept on file and may be obtained from the office of the project owner, or from the office of the appropriate Division Engineer, Corps of Engineers.

(11) *Federal Register.* The following information for each project subject to section 7 of the 1944 Flood Control Act and other applicable congressional acts shall be published in the FEDERAL REGISTER prior to the time the projects becomes operational and prior to any significant impoundment before project completion or * * * at such time as the responsibility for physical operation and maintenance of the Corps of Engineers owned projects is transferred to another entity: (i) Reservoir, dam, and lake names, (ii) stream, county, and State corresponding to the damsite location, (iii) the maximum current storage space in acre-feet to be reserved exclusively for flood control and/or navigation purposes, or any multiple-use space (intermingled) when flood control or navigation is one of the purposes, with corresponding elevations in feet above mean sea level, and area in acres at the upper and lower limits of said space, (iv) the name of the project owner, and (v) congressional legislation authorizing the project for Federal participation.

(e) *List of projects.* The following tables, "Pertinent Project Data—Section 208.11 Regulation," show the pertinent data for projects which are subject to this regulation.

(Sec. 7, Pub. L. 78-534, 58 Stat. 890 (33 U.S.C. 709); the Federal Power Act, 41 Stat. 1063 (16 U.S.C. 791(A)); and Sec. 9, Pub. L. 83-436, 68 Stat. 303.)

(FR Doc. 78-29100 Filed 10-12-78; 8:45 am)

with regard to certain activities and responsibilities concerning water control management throughout the nation in the interest of flood control and navigation.

EFFECTIVE DATE: November 30, 1981.

FOR FURTHER INFORMATION CONTACT: Mr. Earl Eiker, Chief, Water Control/Quality Section, Office, Commander, U.S. Army Corps of Engineers, Department of the Army, Washington, DC 20314 (202) 272-0234.

SUPPLEMENTARY INFORMATION:

Note.—The Commander has determined that this rule is not a "major rule" proposal requiring preparation of a regulatory impact analysis under Executive Order 12291.

Dated: November 16, 1981.

James W. Ray,

Colonel, Corps of Engineers, Executive Director, Engineer Staff.

PART 208—FLOOD CONTROL REGULATIONS

§ 208.11 [Amended]

Accordingly 33 CFR 208.11 is amended by revising the table in paragraph (e) as follows:

LIST OF PROJECTS

[Pertinent project data]

Project name[1]	State, county and stream[1]	Exclusive-use					Multiple-use					Project owner[2]	Authorizing legislation[3]
		Flood control/navigation					Flood control/navigation						
		Storage (1,000 AF)	Elevation limits (feet, m.s.l.)		Area (acres)		Storage (1,000 AF)	Elevation limits (feet, m.s.l.)		Area (acres)			
			Upper	Lower	Upper	Lower		Upper	Lower	Upper	Lower		
Alpine Dam	IL, Winnebago, Keith Cr	0.8	796.0	764.0	52	0						City of Rockford, IL	PWA Proj.
Agency Valley Dam & Res	OR, Malheur, N. Fork Malheur R						60.0	3,340.0	3,263.2	1,900	0	USBR	PL 68-292.
American Fall Dam & Res	ID, Power, Snake River						1,700.0	4,343.2	4,295.6	56,100	0	USBR	FERC 2259.
Anderson Ranch Dam & Res.	ID, Elmore, S. Fk. Boise River						423.2	4,198.0	4,043.0	4,740	1,150	USBR	Act of 1939 53 Stat 1187.
Arrowrock Dam & Res	ID, Elmore, Boise River						286.6	3,216.0	2,967.0	3,100	200	USBR	Act of 1902 32 Stat 388.
Bear Cr Dam	MO, Marion Ralls, Bear Cr	8.7	548.5	520.0	540	0						City of Hannibal, MO	PL 83-780.
Bear Swamp Pumped Storage.	MA, Franklin, Deerfield R Trib											New England Pwr Co	Fed Pwr Act.
Big Dry Creek and Div	CA, Fresno, Big Dry Cr & Dog Cr	16.2	425.0	393.0	1,530	0						Reclamation Board of CA	PL 77-228.
Bocu Dam & Res	CA, Nevada, Little Truckee R					41	5,605.0	5,596.4	980	873		USBR	PL 81-289, PL 68-292.
Bonny Dam & Res	CO, Yuma, S. Fork Republican R	128.8	3,710.0	3,672.0	5,036	2,042						USBR	PL 78-534.
Boysen Dam & Res	WY, Fremont, Wild River	148.0	4,732.0	4,725.0	22,100	19,560	148.1	4,725.0	4,717.0	19,560	16,955	USBR	PL 78-534.
Brownlee Dam & Res	OR, Baker, ID, Washington, Snake River						980.3	2,077.0	1,976.0	13,840	6,650	Idaho Pwr Co	FERC No 1971-C.
Bully Cr Dam & Res	OR, Malheur, Bully Creek						31.6	2,523.0	2,458.8	1,082	140	USBR	PL 86-248.
Camanche Dam & Res	CA, San Joaquin, Mokelumne R						200.0	235.5	205.1	7,600	5,507	East Bay Mun Util Dist	PL 86-645.
Canyon Ferry Dam & Lk	MT, Lewis, Clark, Missouri R						799.1	3,797.0	3,770.0	34,435	24,126	USBR	PL 78-534.
Cedar Bluff Dam & Res	KS, Trego, Smoky Hill River	191.9	2,166.0	2,144.0	10,790	6,869						USBR	PL 78-534.
Clark Canyon Dam & Res	MT, Beaverhead, Beaverhead River	79.1	5,560.4	5,548.1	5,903	5,160	50.4	5,545.1	5,535.7	5,160	4,496	USBR	PL 78-534.
Del Valle Dam & Res	CA, Alameda, Alameda Cr	37.0	745.0	703.1	1,060	710	1.0	03.1	702.2	710	700	CA Dept of Wtr Rsc	PL 97-874.
Don Pedro Dam & Lk	CA, Tuolumne, Tuolumne R						340.0	830.0	802.0	12,900	11,260	Modesto & Turlock Irr	PL 78-534.
East Canyon Dam & Res	UT, Morgan, East Canyon Creek						48.0	5,705.5	5,577.0	684	127	USBR	PL 81-273.
Echo Dam & Res	UT, Summit, Weber River						74.0	5,560.0	5,450.0	1,455	0	USBR	PL 81-273.
Emigrant Dam & Res	OR, Jackson, Emigrant Cr	39.0	2,241.0	2,131.5	601	80						USBR	PL 83-606.
Enders Dam & Res	NB, Chase, Frenchman Cr	30.0	3,127.0	3,112.3	2,405	1,707						USBR	PL 78-534.
Folsom Dam & Lk	CA, Sacramento, American R						400.0	466.0	427.0	11,450	9,040	USBR	PL 81-356.
Friant Dam & Millerton LK	CA, Fresno, San Joaquin River						390.0	578.0	466.3	4,650	2,101	USBR	PL 75-392, PL 78-868.
Gaston-Roanoke Rapids Dam Res.	NC, Northhampton, Halifax, Roanoke R	63.0	203.0	200.0	22,500	20,300						VA Elec & Pwr Co	Fed Pwr Act.
Glen Elder Dam & Waconda Lk.	KS, Mitchel, Solomon R	722.3	1,488.0	1,455.8	33,682	12,602						USBR	PL 78-534, PL 79-526.
Glendo Dam & Res	WY, Platte, N. Platte R	271.9	4,653.0	4,653.0,	17,966	12,365						USBR	PL 78-534.
Grand Coulee Dam, FDR Lk.	WA, Okanogan, Grant, Columbia R						5,165.5	1,290.0	1,208.0	62,280	45,592	USBR	PL 89-561.
H. Neely Henry	AL, Calhoun, St. Clair, Coosa River						49.7	508.0	502.5	11,235	7,632	Alabama, Pwr Co	PL 83-436.
Heart Butte Dam & Lk Tschida.	ND, Grant, Heart River	150.0	2,094.5	2,064.5	6,825	3,400						USBR	PL 78-534.
Hells Canyon Dam & Res	OR, Wallowa, ID, Adams, Snake River						11.7	1,688.0	1,663.0	2,360	2,280	Idaho Pwr Co	FERC No 1971-A.
Hoover Dam & Lake Mead	NV, Clark, AZ, Mohave, Colorado R	1,500	1,229.0	1,219.6	182,700	158,500	15.6	1,219.6	1,063.0	158,500	83,500	USBR	PL 70-642.
Hungry Horse Dam & Res	MT, Flathead, S. Fork Flathead R	2,982.0	3,560.0	3,336.0	23,800	5,400						USBR	PL 78-329.
Indian Valley Dam & Res	CA, Lake, N. Fork Cache Creek						40.0	1,485.0	1,474.7	3,975	3,749	Yolo Cty Fl Cont & Wtr	PL 84-984 Cons Dist.
Jamestown Dam & Res	ND, Stutsman, James River	165.4	1,454.0	1,432.7	13,206	2,555	6.6	1,432.7	1,429.6	2,555	2,065	USBR	PL 78-534.
Kerr Dam, Flathead Lk	MT, Lake, Flathead R						1,219.0	2,893.0	2,883.0	125,560	120,000	Montana Pwr Co	FERC No 5.
Keyhole Dam & Res	WY, Crook, Belle Fourche River	140.2	4,111.5	4,099.3	13,686	9,394						USBR	PL 78-534.
Kirwin Dam & Res	KS, Phillips, N. Fork Solomon R	215.1	1,757.3	1,729.3	10,640	5,073						USBR	PL 78-534.
Lemon Dam & Res	CO, La Plata, Florida R						39.0	6,148	6,023	622	62	USBR	PL 84-485
Lewis M. Smith Dam & Res.	AL, Walker, Culman, Sipsey Fork Black Warrior River.	280.0	522.0	510.0	25,700	21,200						Alabama Pwr Co	Fed Pwr Act.
Little Wood	ID, Blain, Little Wood River	30.0	5,237.3	5,127.6	574	0						USBR	PL 64-993.

LIST OF PROJECTS—Continued

[Pertinent project data]

Project name [1]	State, county and stream [1]	Exclusive-use					Multiple-use					Project owner [2]	Authorizing legislation [3]
		Flood control/navigation					Flood control/navigation						
		Storage (1,000 AF)	Elevation limits (feet, m.s.l.)		Area (acres)		Storage (1,000 AF)	Elevation limits (feet, m.s.l.)		Area (acres)			
			Upper	Lower	Upper	Lower		Upper	Lower	Upper	Lower		
Logan Martin Dam & Res	AL, Talladega, Coosa River	245.3	477.0	465.0	26,310	15,260						Alabama Pwr Co	PL 83-436.
Los Banos Dam & Detention.	CA, Merced, Los Banos Cr						14.0	353.5	327.8	619	467	USBR	PL 86-488.
Lost Creek Dam & Res	UT, Morgan, Lost Creek						20.0	6,005.0	5,912.0	365	93	USBR	PL 81-273.
Lovewell Dam & Res	KS, Jewell, White Rock Cr	50.5	1,595.3	1,582.8	5,025	2,966						USBR	PL 78-534.
Markham Ferry Dam, Lake Wash E. Hudson.	OK, Mayes, Grand Neosho River	244.2	636.0	619.0	16,000	10,900						Grand R Dam Authority	PL 76-476.
Mayfield Dam & Res	WA, Lewis, Cowlitz River						21.4	425.0	415.0	2,070	1,825	City of Tacoma	FPC No 2016-A.
Medicine Cr Dam Harry Strunk Lk.	NB, Frontier, Medicine Cr	52.2	2,366.2	2,366.1	3,465	1,650						USBR	PL 78-534.
Mossyrock Dam Davisson Lk.	WA, Lewis, Cowlitz River						1,397.0	778.5	621.5	11,800	5,000	City of Tacoma	FERC No 2016-B.
Navajo Dam & Res	NM, San Juan, Arriba, Rio, San Juan R						1,036.1	6,065.0	5,990.0	15,610	7,400	USBR	PL 84-485.
New Exchequer Dam & Lake.	CA, Tuolumne, Merced River						400.0	867.0	799.7	7,110	4,649	Merced Irr	PL 86-645.
New Melones Dam & Lk	CA, Tuolumne, Calaveras, Stanislaus R						450.0	1,066.0	1,049.5	12,500	10,900	USBR	PL 87-874.
Norton Dam Res	KS, Norton, Prairie Dog Cr	96.8	2,331.4	2,304.3	5,316	5,316						USBR	PL 78-534.
Ochoco Dam & Res	OR, Crook, Ochoco Creek	61.4	3,136.2	3,048.1	1,150	120						USBR	PL 84-992.
Oroville Dam & Lake	CA, Butte, Feather River						750.0	900.0	848.5	15,800	13,346	CA Dept of Wtr Rsc	PL 85-500.
Oxbow Dam & Res	OR, Baker, ID, Adams, Snake River						5.0	1,805.0	1,800.0	1,165	1,115	Idaho Pwr Co	FERC No 1971-B.
Pactola Dam & Res	SD, Pennington, Rapid Creek	34.0	4,621.5	4,580.2	1,232	860						USBR	PL 78-534.
Palisades Dam & Res	ID, Bonneville, Snake River	1,202.0	5,620.0	5,452.4	16,100	2,170						USBR	PL 81-864.
Paonia Dam & Res	CO, Gunnision, Muddy Creek						17.0	6,447.5	6,373.0	334	120	USBR	PL 80-177, PL 84-485.
Pineview Dam & Res	UT, Weber, Odgen River						110.0	4,900.0	4,816.0	2,874	0	USBR	PL 81-273.
Platoro Dam & Res	CO, Conejos, Conejos R	8.0	10,034.0	10,027.6	947	920	84.0	10,027.5	9,911.0	920	0	USBR	PL 76-640.
Priest Rapid Dam & Res	WA, Grant, Columbia R						44.0	488.0	481.0	7,100	6,500	Grant County PUD No 2	FERC No 2114-A.
Pineville Dam & Res	OR, Crook, Crooked Cr	153.0	3,234.8	3,112.0	2,990	120						USBR	PL 84-992.
Prosser Cr & Res	CA, Nevada, Prosser Cr						20.0	5,741.2	5,703.7	745	334	USBR	PL 84-858.
Pueblo Dam & Res	CO, Pueblo, Arkansaw R	27	4,896.7	4,893.6	5864	5350	66.0	4,693.6	4,680.6	5,350	4,841	USBR	PL 97-590
Red Willow Dam, Hugh Butler Lk.	NB, Frontier, Red Willow	46.9	2,604.0	2,581.8	2,682	1,629						USBR	PL 78-534, PL 85-783.
Ririe Dam & Res	ID, Bonneville, Willow Cr						99.0	5,119.0	5,023.0	1,560	360	USBR	PL 87-874.
Rocky Reach Dam Lk Entiat.	WA, Chelan, Columbia R						37.0	707.0	703.0	9,800	0	Chelan Cnty PUD No 1	FERC No 2145.
Ross Dam & Res	WA, Whatcom, Skagit R						530.5	1,602.5	1,475.0	6,000	2,168	City of Seattle	FERC No 553-C.
Sanford Dam & Lk Meredith.	TX, Hutchison, Canadian R	462.1	2,965.0	2,941.3	21,640	17,320						USBR	PL 81-898.
Savage River Dam & Res	MD, Garrett, Savage R						16.0	1,468.5	1,400.0	366	127	Upper Potomac R Commission.	PL 78-534.
Shadehill Dam & Res	SD, Perkins, Grand R	217.7	2,302.0	2,272.0	9,900	4,800						USBR	PL 78-534.
Shasta Dam & Lake	CA, Shasta, Sacramento R						1,300.0	1,067.0	1,016.8	29,570	23,894	USBR	PL 75-392.
Smith Mtn & Leesville Dam & Res.	VA, Bedford, Compbell, VA, Pittsylvania, Roanoke River.						(4)	(4)	(4)	(4)	(4)	Appalachian Pwr Co	Fed Pwr Act.
Stampede Dam & Res	CA, Sierra, Little Truckee R						226.5	5,946.7	5,942.1	3,430	3,230	USBR	PL 84-858.
Trenton Dam & Res	NB, Hitchcock, Republican R	133.6	2,773.0	2,752.0	7,975	4,974						USBR	PL 78-534.
Twitchell Dam & Res	CA, Santa Barbara, Cuyama River	89.0	651.5	623.0	3,690	2,650						USBR	PL 83-774.
Upper Baker Dam, Baker Lk.	WA, Whatcom, Baker River						220.6	724.0	655.0	4,890	0	Puget Sound Pwr Light Co.	PL 89-298, FERC 2150-B.
Vallecito Dam & Res	CO, La Plata, Los Pinos R						115.4	7,665	7,600	2,723	693	USBR	PL 61-288, PL 88-292.
Wanapum Dam & Res	WA, Grant, Columbia R						151.6	571.5	560.0	14,400	9,600	Grant Cnty PUD No 2	FERC No 2114-B.
Wanship Dam & Rockport	UT, Summit, Weber River						61.0	6,037.0	5,930.0	1,077	121	USBR	PL 81-273.
Warm Springs Dam & Res	OR, Malheur, Middle Fork Malheur R						191.0	3,406.0	3,327.0	4,800	90	50% Yale Irr 50% USBR	
Waterbury Dam & Res	VT, Washington, Little River	27.2	617.5	592.0	1,330	690						State of VT	PL 78-534.
Weiss Dam & Res	AL, Cherokee, Coosa River	397.0	574.0	564.0	50,000	30,200						Alabama Pwr Co	PL 83-436.
Wells Dam Lk Pateros	WA, Douglas, Columbia R						74.0	799.0	711.0	10,700	7,700	Douglas Cnty PUD No 1	FERC No 2149.
Webster Dam & Res	KS, Rocks, S. Fork Solomon R	183.4	1,923.7	1,892.45	6,480	3,766						USBR	PL 534 78-2.
Yellowtail Dam & Bighorn Lk.	MT, Big Horn, Bighorn R	259.0	3,657.0	3,640.0	17,298	12,685	250.0	3,640.0	3,614.0	12,685	7,410	USBR	PL 78-534.

[1] Res—Reservoir; Lk—Lake; Div—Division; R—River; Cr—Creek.
[2] USBR—United States Bureau of Reclamation; Irr—Irrigation District; Mun—Muncipal; Fl—Flood; Rso—Resources.
[3] PL—Public Law; HD—House Document; FERC—Federal Energy Regulatory Commission (formerly Federal Power Commission (FPC)).
[4] No specific FC/Nav. storage allocation.

[FR Doc. 81-34222 Filed 11-27-81; 8:45 am]

BILLING CODE 3710-08-M

EXHIBIT D

MEMORANDUM OF UNDERSTANDING

TAT MOMOLIKOT DAM
SANTA ROSA WASH

Los Angeles District
U. S. Army Corps of Engineers

August 1973

(Superceded by Letter Dated Nov 1990 and Field Working Agreement Included as Exhibit D of this WCM)

MEMORANDUM OF UNDERSTANDING

THIS MEMORANDUM OF UNDERSTANDING entered into by and between the DEPARTMENT OF THE ARMY, by and through the District Engineer, U.S. Army Engineer District, Los Angeles, and the DEPARTMENT OF THE INTERIOR, by and through the Area Director, Bureau of Indian Affairs, Phoenix, Arizona,

WITNESSETH:

WHEREAS, the Flood Control Act of 1965, Public Law 89-298, approved October 27, 1965, authorized the construction of a project for flood protection and other purposes on the Santa Rosa Wash within the Papago Indian Reservation, Arizona, in substantial conformance with the recommendations of the Chief of Engineers, Department of the Army, in House Document 189, 89th Congress, 1st Session.

WHEREAS, the said house document provides that the said project shall be transferred upon completion to the Bureau of Indian Affairs or a designated organization approved by the Secretary of the Interior and Secretary of the Army for operation and maintenance subject to flood control provisions prescribed by the Secretary of the Army.

WHEREAS, the parties hereto are desirous of entering into this agreement to provide for the orderly transfer of the project and the continuing operation and maintenance thereof.

NOW, THEREFORE, the parties hereto do hereby agree as follows:

1. That upon completion of construction, the Department of the Army shall transfer the said project to the Department of the Interior for continuous operation, repair, and maintenance in a manner to assure maximum benefits from the project for flood control and water conservation purposes.

2. That the Department of the Interior shall operate and maintain the said project without cost or expense to the Department of the Army and in accordance with regulations promulgated from time to time by the Department of the Army regarding the operation and maintenance of the project for flood control purposes. The Department of the Army shall furnish the Department of the Interior an Operation and Maintenance Manual for the project.

3. That the Department of the Interior shall prohibit encroachment or trespass on the structures constructed by the Department of the Army which in the opinion of the said District Engineer would adversely affect the effective operation and maintenance of the said project for flood control purposes.

4. That the Department of the Interior shall (1) allow no construction on, over, under or through any of the structures constructed by the Department of the Army for the project, (2) allow no excavation or construction within the limits of the project in violation of property rights secured by the Department of the Army for the project, and (3) allow no changes in any feature of the structures constructed by the Department of the Army for the project, without the prior written determination by the said District Engineer or his authorized representative that such improvement, excavation, construction, or alteration will not adversely affect the flood control features of the project. Any such improvement, excavation, construction, or alteration approved in writing by the said District Engineer shall be accomplished in accordance with standard engineering practices. Drawings or prints showing such improvement, excavation, construction, or alteration as finally accomplished shall be furnished the said District Engineer after completion of the work. Advice regarding the effect of any proposed improvement, excavation, construction, or alteration on the functioning of the project and information concerning methods of construction acceptable under standard engineering practice may be obtained from the said District Engineer.

5. That the said District Engineer and other authorized representatives of the Department of the Army shall have the continuing right to enter upon land and structures in the project for any purpose deemed appropriate by them in connection with the flood control aspects thereof, including the right to conduct periodic inspections and condition surveys.

6. That the Department of the Army shall conduct periodic condition surveys of the project and shall render written reports of the findings thereof. Copies of said reports shall be made available to the Department of the Interior.

7. That the Department of the Interior shall promptly perform such operation, repair, and maintenance activities at the project as deemed necessary from time to time by the said District Engineer in furtherance of the flood control aspects of the project.

8. That the Department of the Interior shall be responsible for the adjustment of all claims arising from the construction, operation, repair, and maintenance of the said project for purposes other than flood control.

9. That the Department of the Interior shall be responsible for the establishment and enforcement of floodway limits and regulations and for performing necessary work on the Santa Rosa Wash through the Papago, Maricopa, and Gila River Indian Reservations downstream from the dam site of the said project to maintain the hydraulic capacity of the existing channel.

10. That the Department of the Interior shall take appropriate measures to insure that the activities of all local organizations operating public and private facilities connected with the said project are coordinated with its activities at the project during flood periods.

11. That the Department of the Interior shall appoint a permanent committee composed of the Superintendent of the Papago Indian Agency and the Superintendent of the Pima Indian Agency, headed by the Superintendent of the Papago Indian Agency, hereinafter called "Superintendent", who shall be responsible for the efficient operation and maintenance for all of the structures and facilities of the project and for continuous inspection and maintenance of the project, all without cost to the Department of the Army. The Department of the Interior shall delegate sufficient authority to the said Superintendent to enable him to adequately function as the manager of the said project under this memorandum of understanding.

12. That the said Superintendent of the project shall submit a semiannual report to the said District Engineer covering inspection, maintenance, repair, and operation of the said project.

DEPARTMENT OF THE ARMY

Date: 30 August 1973

By: John V. Foley
JOHN V. FOLEY
COL, CE
District Engineer

DEPARTMENT OF THE INTERIOR

Date: MAY 15 1973

By: Dale M. Belcher
Acting Area Director
Dale M. Belcher

File

November 6, 1990

Office of the Chief
Design Branch

Mr. Barry W. Welch
Acting Area Director
Bureau of Indian Affairs
Phoenix Area Office
P.O. Box 10
Phoenix, Arizona 85001

Dear Mr. Welch:

We are in receipt of your letter of August 30, 1990 regarding Tat Momolikot Dam. As you stated, the Authorizing House Document 189 (89th Congress, 1st Session) specified transfer of the responsibility for operating and maintaining the dam to the Bureau of Indian Affairs (BIA). The Memorandum of Understanding between the Department of Army and Department of Interior dated August 30, 1973 accomplished that transfer of responsibility for operation and maintenance. In addition the Department of Army retained the right to approve improvements or alterations to the project, inspect the project, conduct condition surveys and direct the BIA to perform operation, repair and maintenance as deemed necessary. These are standard provisions included in agreements with project sponsors/owners for operation and maintenance of a project. Although not clearly stated, the intent of the agreement was not to bind the Corps of Engineers to the operation and maintenance responsibility.

In regards to Tat Momolikot Dam, the Corps of Engineers conducted and prepared the reports for three periodic inspections, in which the BIA participated. At the time of last inspection which was in December 1976 this office was told by our higher headquarters that future periodic inspections were the responsibility of the BIA. Since that time the Corps has not conducted any extensive investigations, inspections or condition surveys other than accompanying the BIA and Bureau of Reclamation on their periodic inspections of the project and making informal pre-flood season inspections. In essence there have not been any Corps of Engineers periodic inspections of the project since December 1976, and hence no duplication of efforts.

The Corps of Engineers considers periodic inspections, instrumentation, dam safety evaluation etc. as a part of operation and maintenance function of the project. In light of current agreements between the BIA and the Bureau of Reclamation, and manpower shortages within our office, the Corps of Engineers feels it would be inappropriate to assume inspection responsibility for the project even if reimbursed. We will continue to provide a representative for future inspections.

If you have further questions regarding this matter feel free to contact Marty Carlassare, our Dam Safety Coordinator, at (213) 894-5540.

Sincerely,

Robert E. Koplin, PE
Chief, Engineering Division

CESPL-ED
CESPL-ED-D
CESPL-ED-DA
CESPL-CO
CESPL-OC
CESPL-ED-G

FIELD WORKING AGREEMENT
BETWEEN
DEPARTMENT OF THE INTERIOR, BUREAU OF INDIAN AFFAIRS
DEPARTMENT OF THE ARMY, CORPS OF ENGINEERS
FOR
FLOOD CONTROL OPERATION
TAT MOMOLIKOT DAM AND LAKE ST. CLAIR, SANTA ROSA WASH, ARIZONA

This field working agreement, made and entered into this _____ day of _____ 1990, between the DEPARTMENT OF THE ARMY, by and through the District Engineer, U.S. Army Engineer District, Los Angeles, and the DEPARTMENT OF THE INTERIOR, by and through the Area Director, Bureau of Indian Affairs, Phoenix, Arizona,

WITNESSETH THAT:

WHEREAS, the Flood Control Act of 1965, Public Law 89-298, approved October 27, 1965, authorized the construction of a project for flood protection and other purposes on the Santa Rosa Wash within the Papago Indian Reservation, Arizona, in substantial conformance with the recommendations of the Chief of Engineers, Department of the Army, in House Document 189, 89th Congress, 1st Session.

WHEREAS, the said house document provides that the said project shall be transferred upon completion to the Bureau of Indian Affairs or a designated organization approved by the Secretary of the Interior and Secretary of the Army for operation and maintenance subject to flood control provisions prescribed by the Secretary of the Army.

WHEREAS, the Department of the Army, acting through the Corps of Engineers, represented by its appropriate District and Division Engineers, is responsible for the flood control operation of Tat Momolikot Dam and Lake St. Clair in accordance with Section 7 of the 1944 Flood Control Act (Section 7, Public Law 78-534, 58 Stat. 890, 33 U.S.C. 709), which directs the Army to prescribe regulations for the use of storage allocated for flood control or navigation at all reservoirs constructed wholly or in part with Federal funds, and as promulgated in the Code of Federal Regulations, Title 33, Part 208.11, 13 October 1978.

WHEREAS, there is a need for a working agreement to insure a clear understanding of flood control regulations and information exchange required for the operation of Tat Momolikot Dam and Lake Saint Clair.

NOW, THEREFORE, the parties hereto do hereby agree as follows:

1. That the Department of the Army transferred the said project to the Department of the Interior for continuous operation, repair, and maintenance in a manner to assure maximum benefits from the project for flood control and water conservation purposes.

2. That the Department of the Interior shall operate and maintain the said project without cost or expense to the Department of the Army and in accordance with regulations promulgated from time to time by the Department of the Army regarding the operation and maintenance of the project for flood control purposes. The Department of the Army shall furnish the Department of the Interior an Operation and Maintenance Manual for the project.

3. That the Department of the Interior shall prohibit encroachment or trespass on the structures constructed by the Department of the Army which in the opinion of the said District Engineer would adversely affect the effective operation and maintenance of the said project for flood control purposes.

4. That the Department of the Interior shall (1) allow no construction on, over, under or through any of the structures constructed by the Department of the Army for the project, (2) allow no excavation or construction within the limits of the project in violation of property rights secured by the Department of the Army for the project, and (3) allow no changes in any feature of the structures constructed by the Department of the Army for the project, without the prior written determination by the said District Engineer or his authorized representative that such improvement, excavation, construction, or alteration will not adversely affect the flood control features of the project. Any such improvement, excavation, construction, or alteration approved in writing by the said District Engineer shall be accomplished in accordance with standard engineering practices. Drawings or prints showing such improvement, excavation, construction, or alteration as finally accomplished shall be furnished the said District Engineer after completion of the work. Advice regarding the effect of any proposed improvement, excavation, construction, or alteration on the functioning of the project and information concerning methods of construction acceptable under standard engineering practice may be obtained from the said District Engineer.

5. That the said District Engineer and other authorized representatives of the Department of the Army shall have the continuing right to enter upon land and structures in the project for any purpose deemed appropriate by them in connection with the flood control aspects thereof, including the right to conduct periodic inspections and conditions surveys.

6. That the Department of the Interior shall conduct periodic inspections of the project and shall render written reports of the findings thereof. Copies of said reports shall be made available to the Department of the Army.

7. That the Department of the Interior shall promptly perform such operation, repair, and maintenance activities at the project as deemed necessary from time to time by the said District Engineer in furtherance of the flood control aspects of the project.

8. That the Department of the Interior shall be responsible for the adjustment of all claims arising from the construction, operation, repair, and maintenance of the said project for purposes other than flood control.

9. That the Department of the Interior shall be responsible for the establishment and enforcement of floodway limits and regulations and for performing necessary work on the Santa Rosa Wash through the Papago, Maricopa, and Gila River Indian Reservations downstream from the dam site of the said project to maintain the hydraulic capacity of the existing channel.

10. That the Department of the Interior shall take appropriate measures to insure that the activities of all local organizations operating public and private facilities connected with the said project are coordinated with its activities at the project during flood periods.

11. That the Department of the Interior shall appoint a permanent committee composed of the Superintendent of the Papago Indian Agency and the Superintendent of the Pima Indian Agency, headed by the Superintendent of the Papago Agency, hereinafter called "Superintendent", who shall be responsible for the efficient operation and maintenance for all of the structures and facilities of the project and for continuous inspection and maintenance of the project, all without cost to the Department of the Army. The Department of the Interior shall delegate sufficient authority to the said Superintendent to enable him to adequately function as the manager of the said project under this field working agreement.

12. That the said Superintendent of the project shall submit a semiannual report to the said District Engineer covering inspection,

maintenance, repair, and operation of the said project.

13. The flood control regulations are subject to temporary modification by the Los Angeles District Engineer, Corps of Engineers, if found necessary in time of emergency. Requests for and action on such modifications may be made by the fastest means of communications available. The action taken shall be confirmed in writing the same day to the office of the Area Director and shall include justification for the action.

14. The Regional Director may temporarily deviate from the flood control regulations in the event an immediate short-term departure is deemed necessary for emergency reasons. Such actions will be immediately reported by the fastest means of communication available. Actions shall be confirmed in writing the same day to the Los Angeles District Engineer, Corps of Engineers, and shall include justification for the action.

15. Revisions to the flood control operation for Tat Momolikot Dam and Lake St. Clair may be developed as necessary by the parties of this agreement. Each such revision shall be effective on the date specified.

IN WITNESS WHEREOF, the parties hereto have caused this memorandum of agreement to be executed as of the day and date first above written.

Corps of Engineers

BY:_____
Roger F. Yankoupe
Brigadier General, U.S. Army
Commander, South Pacific Division

Department of the Interior
Bureau of Indian Affairs

BY:_____
Wilson Barber
Phoenix Area Director

EXHIBIT E

FINDING OF NO SIGNIFICANT ENVIRONMENTAL IMPACT (FONSI)

TAT MOMOLIKOT DAM
SANTA ROSA WASH

Los Angeles District
U. S. Army Corps of Engineers

December 1989

EXHIBIT F

CHAIN OF CORRESPONDENCE FOR APPROVAL OF WATER CONTROL MANUAL

TAT MOMOLIKOT DAM
SANTA ROSA WASH

Los Angeles District
U. S. Army Corps of Engineers

December 1989

RR - Tat Momolikot

DEPARTMENT OF THE ARMY
LOS ANGELES DISTRICT, CORPS OF ENGINEERS
P.O. BOX 2711
LOS ANGELES, CALIFORNIA 90053-2325

July 10, 1989

REPLY TO
ATTENTION OF:

Office of the Chief
Hydrology and Hydraulics Branch

Mr. Wilson Barber
Phoenix Area Director
Bureau of Indian Affairs
P.O. Box 10
Phoenix, Arizona 85001

Dear Mr. Barber:

The U.S. Army Corps of Engineers, Los Angeles District is currently preparing an update of the water control manual for Tat Momolikot Dam and Lake Saint Clair. We request your cooperation in providing information throughout the study. Mr. Boniface Bigornia, Mr. Algis Bliudzius, and Mrs. Wendy Gist of this office will be visiting the site for a field reconnaissance on 18 - 20 July, 1989. It is requested that an initial coordination meeting be set up for the afternoon of July 18 with representatives of the Bureau of Indian Affairs that have knowledge of and interest in the dam and its operation.

Before meeting with the above representatives it would be appreciated if the following questions could be considered and commented on in writing by the appropriate persons.

1. Please discuss anything known about erosion and sediment production for the watershed.

2. Are there any integrated components or control facilities related to the dam besides the Vaiva Vo Irrigation Project (i.e. diversions, pumping, reregulation)?

3. Have any public facilities besides the overlook area been constructed?

4. Provide a list of neighboring projects (i.e. check dams, levees) in the same water system that have some effect on the water control objective.

5. Have there been any problems with regulation since the project has been completed (i.e. leakage, hydraulic malfunction, groundwater, residential encroachment, deterioration)?

If you have any questions or comments, please feel free to contact Mrs. Wendy Gist, of the Hydraulics Section at (213) 894-6981 or Mr. Boniface Bigornia of the Reservoir Regulation Section at (213) 894-6916.

Sincerely,

Robert Koplin, P.E.
Acting Chief, Engineering Division

Copies Furnished:

Mr. Ken Clouser
Area Safety of Dams Coordinator
Bureau of Indian Affairs
P.O. Box 10
Phoenix, Arizona 85001

Mr. Joe Revak
Superintendent of the Papago Agency
Bureau of Indian Affairs
P.O. Box 578
Sells, Arizona 85634

RR-TAT MOHOLIKOT

United States Department of the Interior
BUREAU OF INDIAN AFFAIRS
PAPAGO INDIAN AGENCY
Sells, Arizona 85634

IN REPLY REFER TO:
Civil Engineer
Land Operations

Mr. Robert Koplin
Acting Chief, Eng. Div.
Corps of Engineers
P. O. Box 2711
Los Angeles, CA 90053

Dear Mr. Koplin:

The following is in response to your letter dated July 10, 1989:

1. Erosion of soil is widespread in the watershed, however, an insignificant amount of sediment has been transported to the reservoir area. The erosion problem is believed to be caused by the loss of ground cover due to livestock overgrazing. Efforts to eliminate the overgrazing problem have had little success over the past forty or fifty years, however, recent experiments with livestock rotation grazing methods on the reservation that allow the land to rest after the grass has been grazed show excellent results. Apparently the stream grades are not steep enough and the stream velocities are not great enough to convey significant amounts of sediment to the reservoir area for the types of storms that have occurred since the dam was completed in 1974.

2. There are no other components or control facilities related to the dam other than the Vaiva Vo Irrigation Project.

3. No other public facilities have been constructed since the completion of the dam.

4. There are a number of small detention dams and stock tanks in the watershed that tend to reduce the peak flows and total runoff to the reservoir than would otherwise occur if they were not present. There are around 150 such structures in the watershed, with the average structure capacity being around 10 to 15 acre-ft.

5. No problems have been encountered with regulation since the project was completed.

Sincerely,

Joe Revak

Joe Revak
Supervisory Civil Engineer