US Army Corps
of Engineers®

WATER CONTROL MANUAL

MATHEWS CANYON DAM & RESERVOIR
CLOVER CREEK, LINCOLN COUNTY, NEVADA

SEPTEMBER 2000

MATHEWS CANYON DAM AND RESERVOIR
LINCOLN COUNTY, NEVADA
JULY 1999

PERTINENT DATA

Construction completed		December 1957
Stream System		Clover Creek
Drainage Area	sq mi.	34
Reservoir		
Elevation		
Streambed at Dam	ft., msl	5,420
Flood Control Pool (Spillway Crest)	ft., msl	5,461
Revised PMF surcharge level	ft., msl	5,481.7**
Top of Dam	ft., msl	5,483
Area *(From 1977 Survey)*		
Spillway Crest	acres	299.0
Revised Spillway Surcharge Level	acres	443.0
Top of Dam	acres	448.3
Capacity, Gross *(From 1977 Survey)*		
Spillway Crest	acre-ft.	6,270.7 (3.46*)
Revised Spillway Surcharge Level	acre-ft.	13,994.7 (6.86*)
Top of Dam	acre-ft.	14,576.5 (8.04*)
Allowance for Sediment (50-year)	acre-ft.	1,000 (0.55*)
Dam		
Type		Earthfill
Height Above Original Streambed	ft.	71
Crest Length	ft.	800
Crest Width	ft.	20
Freeboard	ft.	4.9
Spillway		
Type		Ungated, ogee
Crest Length	ft.	50
Crest elevation	ft., msl	5,461
Design Surcharge	ft.	20.7
Design Discharge	cfs	13,060
Outlet Conduit (ungated)		
Invert Elevation (inlet portal)	ft., msl	5,420
Diameter	ft.	3.5
Length	ft.	368
Discharge Capacity (Reservoir at Spillway crest)	cfs	260
Reservoir Design Flood		
Duration (inflow)	days	2
Total Volume	acre-ft.	5,800 (3.20*)
Inflow Peak	cfs	8,500
Revised Probable Maximum Flood		
Duration (inflow)	days	1.25**
Total Volume	acre-ft.	16,000** (8.82*)
Inflow Peak	cfs	57,000**
Historic Maximums		
Instantaneous Maximum release	cfs	204
Date		3-3-83
Maximum Water Surface Elevation	ft., msl	5,445.0
Date		3-3-83

*Inches of runoff
**Revised PMF based on new criteria set by the National Weather Service

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U.S. ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT

JULY 1999

Prepared By:

U.S. ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT

Reservoir Regulation Section
CESPL-ED-HR

MATHEWS CANYON DAM

NOTICE TO USERS OF THIS MANUAL

Regulations specify that this Water Control Manual be published in a hard copy binder with 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. Changes to individual pages must carry the date of revision, which is the Division's approval date.

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, Reservoir Regulation Section at (213) 452-3527 or (213) 452-3623.

WATER CONTROL MANUAL

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LIST OF ABBREVIATIONS

ac-ft	Acre-feet
BLM	Bureau of Land Management
cfs	Cubic feet per second
COE	Corps of Engineers
DOMSAT	Domestic Satellite
DSS	Data Storage System
EM	Engineering Manual
EOC	Emergency Operations Center of the U.S. Army Corps of Engineers (Construction-Operations Division)
ER	Engineering Regulation
ft	feet
GDM	General Design Memorandum
GOES	Geostationary Observational Environmental Satellite
HECDSS	Hydrologic Engineering Center Data Storage System
ID	Identification
LAD	Los Angeles District
Manning's n	Manning's roughness coefficient
MOA	Memorandum of Agreement
msl	Mean Seal Level
NOAA	National Oceanic and Atmospheric Administration
NOHRSC	National Operational Hydrologic Remote Sensing Center
NWS	National Weather Service
PMF	Probable Maximum Flood
ROC	Reservoir Operations Center (LAD Engineering Division)
SPF	Standard Project Flood
sq mi	Square mile
USACE	U.S. Army Corps of Engineers
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
WCDS	Water Control Data System
WSE	Water Surface Elevation

I - INTRODUCTION

1-01 Authorization. This water control manual was prepared in compliance with the following authorities and directives:

Engineering Regulation (ER) 1110-2-240: Engineering and Design, Water Control Management; dated 8 October 1982.

Engineering Manual (EM) 1110-2-3600: Engineering and Design, Management of Water Control Systems; dated 30 November 1987.

Engineering Regulation (ER) 1110-2-8156: Engineering and Design, Preparation of Water Control Manuals; dated 31 August 1995.

The chain of correspondence leading to approval of this manual is included in Exhibit D.

1-02 Purpose and Scope. This Water Control Manual is a revision of the original manual dated August 1975. It provides current information about Mathews Canyon Dam and its drainage basin, its water control plan, the facilities used for collection of hydrologic data, and the agencies involved and affected by its regulation.

Mathews Canyon Dam falls under a Type III project category as defined in ER 1110-2-240 referenced above. This category includes uncontrolled projects such as Mathews Canyon Dam which control floods, including their corresponding project design floods, using ungated outlets. This manual prescribes policies and procedures to be followed by the U.S. Army Corps of Engineers in carrying out water control management activities. In addition, this manual was prepared in accordance with the standardized format as required by ER 1110-2-8156 referenced above.

1-03 Related Manuals and Reports. Manuals and reports with data and information relevant to the information in this water control manual are listed in Table 1-1.

1-04 Project Owner. Mathews Canyon Dam was built, and is owned and maintained by the U.S. Army Corps of Engineers, Los Angeles District (LAD).

1-05 Operating Agencies. LAD is responsible for the maintenance of the dam, reservoir, and outlet works. The outlets are ungated, and are therefore, self operating. They are maintained as necessary following significant storm events, or in response to recommendations following the periodic inspection which is performed every 5 years.

1-06 Regulating Agencies. LAD is solely responsible for the regulation of Mathews

Canyon Dam. The Mathews Canyon Dam Water Control Plan is specified in this water control manual, which was prepared by the LAD, Reservoir Regulation Section. LAD also coordinates its regulation with the following agencies:

a. Lincoln County Emergency Management, has the responsibility for local cooperation. According to the House Document No. 530, 81st Congress, 2nd Session, "*the local interests shall adjust all water-rights claims resulting from operation of the improvement and keep the flood channel below the flood-control reservoir free from man-made encroachments"*. The Corps is responsible for maintaining the project.

b. National Weather Service, located at Las Vegas, Nevada, which is about 100 miles southwest of the City of Caliente. Upon request, this office can provide weather forecasts and climatological reports for the Muddy River Basin, which is located in the State of Nevada and includes the drainage area above Mathews Canyon Dam.

c. The National Resources Conservation Service, formerly, the Soils Conservation Service, located in Reno, Nevada, can provide data on existing snow cover in the nearby Pine Canyon Basin, which can be used as an indicator of snow cover in the Mathews Canyon Basin.

Table 1-1. Mathews Canyon Dam Water Control Manual Related Manuals, Reports and References

No.	Title	Date
1	Report on Survey, Flood Control, Virgin River and Tributaries in Nevada, Arizona and Utah	Jun 1942
2	Design Memorandum No. 1, Hydrology for Pine and Mathews Canyon Dams, Meadow Valley Wash and Lower Muddy River Basins, Nevada	Jan 1955
3	Design Memorandum No. 2, General Design for Mathews Canyon Dam, Meadow Valley Wash and Lower Muddy River Basins, Nevada	Mar1955
4	Operation and Maintenance Manual for Mathews Canyon Dam and Pine Canyon Dam, Meadow Valley Wash and Lower Muddy River Basins, Nevada	Jul 1963
5	Water Resources Development by the U.S. Army Corps of Engineers in Nevada	Jan 1967
6	Summary Report on Review of Design Features of Existing Dams	Jun 1967
7	Pine Canyon Dam and Reservoir and Mathews Canyon Dam and Reservoir Periodic Inspection Report No. 1	Oct 1969
8	Nevada, A Guide to the Silver State, Nevada State Historical Society, Inc.	1973
9	Pine Canyon Dam and Reservoir and Mathews Canyon Dam and Reservoir Periodic Inspection Report No. 2	May1974
10	Flood Plain Information, Muddy River, Vicinity of Overton, Clark County, Nevada	Jun 1974
11	Reservoir Regulation Manual for Mathews Canyon Dam, Virgin River and Tributaries, Nevada, Arizona, and Utah, meadow Valley Wash and Tributaries, Nevada	Aug1975
12	Hydrology and Hydraulic Review of Design Features of Existing Dams for Pine Canyon and Mathews Canyon Dams	Jul 1978
13	Interim Report on Hydrology and Hydraulic Review of Design Features of Existing Dams for Pine Canyon and Mathews Canyon Dam	Jul 1978
14	Pine Canyon Dam and Reservoir and Mathews Canyon Dam and Reservoir Periodic Inspection Report No. 3	Jul 1979
15	Pine Canyon Dam and Reservoir and Mathews Canyon Dam and Reservoir Periodic Inspection Report No. 4	May1984
16	General Report, Flood Emergency Plan, Mathews Canyon Dam, Clover Creek, Lincoln County, Nevada	Jan 1986
17	Flood Emergency Plan, Mathews Canyon Dam, Clover Creek, Lincoln, Nevada, Emergency Action and Notification Subplan, Mathews Canyon Dam, Inundation Maps Emergency Plan	Feb 1986
18	Pine Canyon Dam and Reservoir and Mathews Canyon Dam and Reservoir Periodic Inspection Report No. 5	Jun 1989
19	Pine Canyon Dam and Reservoir and Mathews Canyon Dam and Reservoir Periodic Inspection Report No. 6	Jun 1994
20	Pine Canyon Dam and Reservoir and Mathews Canyon Dam and Reservoir Periodic Inspection	Jun 1999

II - DESCRIPTION OF PROJECT

2-01 Location. Mathews Canyon Dam is located about 20 miles southeast of Caliente, Nevada and about 100 miles northeast of Las Vegas, Nevada. The drainage area above Mathews Canyon Dam comprises about 34 square miles in Lincoln County, Nevada, and consists of rolling hills and narrow valleys, with some alluvial wash. Mathews Canyon Dam project provides protection to downstream areas along Clover Creek, Meadow Valley Wash, and the lower Muddy River. Plate 2-01 shows the general location of the dam. Photos 2-1 and 2-2 show the Union Pacific Railroad Station at Caliente and Clover Creek at Meadow Valley Wash, respectively.

2-02 Purpose. The purpose of Mathews Canyon Dam is to provide protection from floods to areas comprising about 13,280 acres. This flood plain includes a portion of 80 miles of Union Pacific Railroad mainline, many miles of county roads, the City of Caliente, and about 3,500 acres of irrigated lands.

2-03 Physical Components. The Mathews Canyon Dam project consists of an embankment, outlet works (intake structure, conduit, and stilling basin), spillway, and reservoir. General plans of the dam embankment and spillway are shown on Plates 2-02 to 2-04. The following paragraphs provide a brief description of specific components in the project.

a. Embankment. The embankment is a compacted earthfill structure with a crest length of 800 feet and a crest width of 20 feet. The crest, at elevation 5,483 feet, msl, has a maximum height above streambed of 71 feet. The upstream slope is 1 vertical on 3 horizontal and the downstream slope is 1 vertical on 2-1/2 horizontal. Access roads traverse both faces as well as the crest of the embankment. The upstream slope is covered by a 2-foot layer of riprap for protection against wave action. To prevent scour from eddy currents that may develop from spillway discharges, a 4-foot layer of stone was placed on the downstream face below elevation 5,430 feet, msl. This detail is shown on Plate 2-03 as part of the relief well detail.

The embankment consists of mostly impervious material. A “chimney” of pervious material, 10 feet thick, rises in the center of the embankment and extends the full length from the left to the right abutment. A blanket of pervious material underlies the downstream part of the embankment and extends from the “chimney” to the downstream toe of the dam. Five relief wells are located along the downstream toe to relieve excessive seepage that may develop in the embankment. Continuous grout curtains, to prevent seepage through the foundation rock, are provided in both abutments. Sections of the embankment are shown on Plate 2-03.

b. Outlet Works. The outlet works is located in the embankment at the right

abutment (looking downstream) and consists of an intake structure, an ungated conduit and a stilling basin. The plan, profile and sections of the outlet works are shown on Plate 2-04 and 2-05. Studies were conducted to determine the type of conduit to be constructed as part of the outlet works. Consideration was given to the following: 1) ease of construction, 2) accessibility for inspection and maintenance, and 3) desirability of providing sufficient capacity to drain the reservoir in a reasonable length of time (estimated to be about 2 weeks). From these studies, it was found that the smallest practicable conduit that would meet these requirements was a 3.5 feet diameter conduit. The outlet discharge curve for the 3.5 feet diameter conduit is shown on Plate 2-06. A general description of the outlet works is contained in the following paragraphs.

(1) Intake Structure. The intake structure is a rectangular concrete tower, 19 feet high and 8.5 feet square, perforated by a series of intake ports 1.5 feet wide by 2 feet high. Inside the tower there is a bell-mouth conduit entrance. Photo 2-3 shows the intake structure located at the right abutment of Mathews Canyon Dam.

(2) Conduit. The conduit, an ungated reinforced-concrete structure, is 3.5 feet in diameter and 368 feet long. Elevations of the conduit's invert are 5,420.00 feet, msl at the upstream end, and 5,416.19 feet, msl at the downstream end. Referring back to the outlet discharge curve on Plate 2-06, the outflow curve reflects that within elevations 5,420 feet, msl and 5,425 feet, msl, the outflow is controlled by critical flow at the grade break at the entrance. When the water surface elevation exceeds elevation 5,425 feet, msl, the conduit entrance pressurizes. The curve generated beyond elevation 5,425 feet, msl is based on an equation for orifice flow, $Q = CA\sqrt{2gh}$, where C = 0.526. The maximum capacities with the water surface at the spillway crest (elevation 5,461.00 feet, msl) and at the top of the dam (elevation 5,483.00 feet, msl) are 260 cfs and 321 cfs, respectively. The conduit downstream of the entrance is designed to convey flows in an open channel condition for all discharges.

(3) Stilling Basin. The stilling basin was designed to dissipate energy from high velocity discharges leaving the outlet conduit. Energy is dissipated by the formation of a hydraulic jump. Major features of the stilling basin are a parabolic invert drop, a transition for channel expansion, a baffle wall and an exit sill. Detail sections for these features are shown on Plate 2-04. The stilling basin is also shown in Photos 2-4, 2-5, and 2-6.

c. <u>Spillway.</u> The spillway is made of reinforced concrete and is located in the left abutment. The crest is at elevation 5,461 feet, msl, rectangular in cross-section and leads into a 15.29-foot long ogee profile. A 50-foot long concrete approach channel leads to the crest. A 250-foot long concrete spillway channel transports discharges away from the crest. The spillway channel reduces in width from 50 feet at the toe of the ogee weir to 32.25 feet at the channel's downstream end. Downstream of the spillway channel a 40-foot long unlined trapezoidal channel leads to the natural streambed of Mathews Canyon.

Plan, profile, and sections of the spillway are shown on Plate 2-04.

d. <u>Reservoir.</u> Mathews Canyon Dam backs up a reservoir about 1-1/2 miles long and ½ mile wide when water surface reaches the spillway crest elevation of 5,461 feet, msl. Based on the latest available survey data (survey date August 1977), at spillway crest the reservoir covers an area of 299 acres and has a calculated gross capacity of 6,270 acre-feet. At the top of the dam (elevation 5,483 feet, msl) the reservoir has a calculated area of 415 acres and a calculated capacity of 14,576 acre-feet. The sediment-storage allotment is approximately 1,000 acre-feet. The required volume was determined from a study of silt-accumulation rates in the reservoirs in the southwest United Sates, where it was found that the silting rate was approximately 20 acre-feet per year. Gross capacity is the total reservoir storage capacity including the storage capacity allocated for sediment throughout the life of the project. Net capacity is the current overall storage capacity of a reservoir. *Gross Cap. = Total capacity + capacity allocated for sediment (throughout project life). Net Cap. = Gross capacity - sediment accumulation up to present time.* The reservoir is illustrated on Plate 2-06. The area and capacity curves based on the survey of 1977 are shown on Plate 2-07.

During scheduled maintenance, the maintenance crew excavates excess sediment that accumulates at the approach basin and around the intake tower. In 1990, the maintenance crew constructed a berm within the reservoir. The purpose of this berm is to direct sediment flows away from the approach basin and the intake tower so they do not plug up the outlet works. The berm allows inflows of sediment and water to pond at the upstream end of the reservoir, where the sediment would settle and the water would gradually flow toward the approach and intake. Scheduled maintenance is performed once every year. The reservoir and berm are shown on Photo 2-7.

2-04 <u>Related Control Facilities.</u> Mathews Canyon Dam operates in conjunction with Pine Canyon Dam to provide protection to the downstream areas along Clover Creek, Meadow Valley Wash, and the lower Muddy River. Pine Canyon Dam is located approximately 5 miles southwest of Mathews Canyon Dam and controls a drainage basin of about 45 square miles. The Pine Canyon Dam project was completed on 16 December 1957, and consists of an embankment and dike, an outlet works (intake structure and conduit), a spillway, and a reservoir. Pertinent data about Pine Canyon Dam are included in this manual under Exhibit B. Other existing projects located within the Muddy River Basin include various small dams and weirs constructed for the purposes of flood control, erosion control, irrigation, and recreation; however, none of these structures significantly affect large floods.

2-05 <u>Real Estate Acquisition.</u> The Mathews Canyon Dam Project encompasses an area of about 801 acres total. Land in fee comprised 205 acres where the dam and the majority of the reservoir basin are located. Easements on private and public domain lands comprising 350 acres and 246 acres, respectively, were both acquired with rights only to

subject the property to intermittent inundation as required to control flood waters. The Corps' reservoir taking line is at elevation 5,461 feet, msl. The highest elevation in easements is at elevation 5,500 feet, msl. Plate 2-06 shows the reservoir boundaries.

2-06 <u>Public Facilities.</u> Although Mathews Canyon Dam Project was originally authorized for recreational development (PL 78-534), no recreational facilities have been formally developed. However, there is a picnic site that was constructed to accommodate contractor employees and Los Angeles District employees working at the project site during the construction of the dam. This site, consisting of two restrooms, two picnic tables, and a barbeque pit, is not formally open to the public. In addition, since the camp site is located in a remote back-country far from any urban area, it does not receive many visitors outside of the Los Angeles District maintenance personnel. Photo 2-8 shows the picnic site.

TABLE 2-1. Mathews Canyon Dam Water Control Manual
Storage Capacity Table (acre-feet)

Survey Date: August 1977

ELEV	0.0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
5,420.0	20.0	20.8	21.7	22.7	23.6	24.7	25.8	27.0	28.2	29.5
5,421.0	30.8	32.2	33.6	35.1	36.7	38.3	40.0	41.7	43.5	45.3
5,422.0	47.2	49.1	51.2	53.2	55.3	57.5	59.7	62.0	64.4	66.7
5,423.0	69.2	71.7	74.3	76.9	79.6	82.3	85.1	87.9	90.8	93.8
5,424.0	96.8	99.9	103.0	106.2	109.4	112.7	116.0	119.5	122.9	126.4
5,425.0	130.0	133.6	137.4	141.2	145.0	149.0	153.0	157.1	161.3	165.6
5,426.0	169.9	174.3	178.8	183.4	188.0	192.8	197.6	202.5	207.4	212.5
5,427.0	217.6	222.8	228.1	233.4	238.9	244.4	250.0	255.6	261.4	267.2
5,428.0	273.1	279.1	285.1	291.3	297.5	303.8	310.1	316.6	323.1	329.7
5,429.0	336.4	343.2	350.0	356.9	363.9	371.0	378.1	385.4	392.7	400.0
5,430.0	407.5	415.0	422.6	430.3	438.1	445.9	453.8	461.7	469.7	477.8
5,431.0	486.0	494.2	502.5	510.9	519.4	527.9	536.5	545.1	553.8	562.6
5,432.0	571.5	581.4	589.4	598.5	607.7	616.9	626.2	635.5	644.9	654.4
5,433.0	664.0	673.6	683.3	693.1	703.0	712.9	722.9	732.9	743.0	753.2
5,434.0	763.5	773.8	784.2	794.7	805.3	815.9	826.6	837.3	848.1	859.0
5,435.0	870.0	881.0	892.2	903.4	914.6	926.0	937.4	948.9	960.5	972.2
5,436.0	983.9	995.7	1,007.6	1,019.6	1,031.6	1,043.8	1,056.0	1,068.3	1,080.6	1,093.1
5,437.0	1,105.6	1,118.2	1,130.9	1,143.6	1,156.5	1,169.4	1,182.4	1,195.4	1,208.6	1,221.8
5,438.0	1,235.1	1,248.5	1,261.9	1,275.5	1,289.1	1,302.8	1,316.5	1,330.4	1,344.3	1,358.3
5,439.0	1,372.4	1,386.6	1,400.8	1,415.1	1,429.5	1,444.0	1,458.5	14,773.2	1,487.9	1,502.6
5,440.0	1,517.5	1,532.4	1,547.5	1,562.6	1,577.7	1,593.0	1,608.3	1,623.8	1,639.3	1,654.8
5,441.0	1,670.5	1,686.2	1,702.1	1,718.0	1,733.9	1,750.0	1,766.1	1,782.4	1,798.7	1,815.0
5,442.0	1,831.5	1,848.0	1,864.7	1,881.4	1,898.1	1,915.0	1,931.9	1,949.0	1,966.1	1,983.2
5,443.0	2,000.5	2,017.8	2,035.3	2,052.8	2,070.3	2,088.0	2,105.7	2,123.6	2,141.5	2,159.4
5,444.0	2,177.5	2,195.6	2,213.9	2,232.2	2,250.5	2,269.0	2,287.5	2,306.2	2,324.9	2,343.6
5,445.0	2,362.5	2,381.4	2,400.4	2,419.5	2,438.6	2,457.7	2,477.0	2,496.3	2,515.6	2,535.0
5,446.0	2,554.5	2,574.0	2,593.6	2,613.3	2,633.0	2,652.7	2,672.6	2,692.5	2,712.4	2,732.4
5,447.0	2,752.5	2,772.6	2,792.8	2,813.1	2,833.4	2,853.7	2,874.2	2,894.7	2,915.2	2,935.8
5,448.0	2,956.5	2,977.2	2,998.0	3,018.9	3,039.8	3,060.7	3,081.8	3,102.9	3,124.0	2,145.2
5,449.0	3,166.5	3,187.8	3,209.2	3,230.7	3,252.2	3,273.7	3,295.4	3,317.1	3,338.8	3,360.6
5,450.0	3,382.5	3,404.4	3,426.5	3,448.6	3,470.8	3,493.1	3,515.5	3,538.0	3,560.5	3,583.2
5,451.0	3,605.9	3,628.7	3,651.6	3,674.6	3,697.7	3,720.9	3,744.2	3,767.5	3,791.0	3,814.5
5,452.0	3,838.1	3,861.8	3,885.6	3,909.5	3,933.4	3,957.5	3,981.6	4,005.9	4,030.2	4,054.6
5,453.0	4,079.1	4,103.7	4,128.4	4,153.1	4,178.0	4,202.9	4,227.9	4,253.0	4,278.2	4,303.5
5,454.0	4,328.9	4,354.4	4,379.9	4,405.6	4,431.3	4,457.1	4,483.0	4,509.0	4,535.1	4,561.2
5,455.0	4,587.5	4,613.8	4,640.2	4,666.7	4,693.2	4,719.7	4,746.3	4,773.0	4,799.8	4,826.5
5,456.0	1,853.4	4,880.3	4,907.3	4,934.3	4,961.4	4,988.5	5,015.7	5,043.0	5,070.3	5,097.7
5,457.0	5,125.1	5,152.6	5,180.1	5,207.7	5,235.4	5,263.1	5,290.9	5,318.7	5,346.6	5,374.6
5,458.0	5,402.6	5,430.7	5,458.8	5,487.0	5,515.2	5,543.5	5,571.1	5,600.3	5,628.8	5,657.3
5,459.0	5,685.9	5,714.5	5,746.3	5,772.0	5,800.8	5,829.7	5,858.7	5,887.7	5,916.7	5,945.8
5,460.0	5,975.0	6,004.2	6,033.5	6,062.9	6,092.4	6,121.9	6,151.5	6,181.2	6,211.0	6,240.8
5,461.0	6,270.7	6,300.7	6,330.7	6,360.9	6,391.1	6,421.3	6,451.7	6,482.1	6,512.6	6,543.2
5,462.0	6,573.8	6,604.5	6,635.3	6,666.2	6,697.1	6,728.1	6,759.2	6,790.4	6,821.6	6,852.9
5,463.0	6,884.3	6,915.8	6,947.3	6,978.9	7,010.6	7,042.1	7,074.2	7,106.1	7,138.0	7,170.1
5,464.0	7,202.2	7,234.4	7,266.7	7,299.0	7,331.4	7,363.9	7,396.5	7,429.1	7,461.8	7,494.6
5,465.0	7,527.5	7,560.4	7,593.4	7,626.5	7,659.7	7,692.9	7,726.2	7,759.6	7,793.0	7,826.5
5,466.0	7,860.1	7,893.8	7,927.5	7,961.3	7,995.2	8,029.1	8,063.1	8,097.2	8,131.4	8,165.6
5,467.0	8,199.9	8,234.3	8,268.7	8,303.2	8,337.8	8,372.5	8,407.2	8,442.0	7,476.9	8,511.9
5,468.0	8,546.9	8,582.0	8,617.2	8,652.4	8,687.7	8,723.1	8,758.6	8,794.1	8,829.7	8,865.4
5,469.0	8,901.1	8,936.9	8,972.8	9,008.8	9,044.8	9,080.9	9,117.1	9,153.3	9,189.6	9,226.0
5,470.0	9,262.5	9,299.0	935.6	9,372.3	9,409.0	9,445.8	9,482.7	9,519.6	9,556.5	9,596.3
5,471.0	9,630.7	9,667.9	9,705.1	9,742.4	9,779.8	9,817.2	9,854.7	9,892.2	9,929.9	9,967.6
5,472.0	10,005.3	10,043.1	10,081.0	10,118.9	10,156.9	10,195.0	10,233.1	10,271.3	10,309.6	10,347.9
5,473.0	10,386.3	10,424.8	10,463.3	10,501.8	10,540.5	10,579.2	10,618.0	10,656.8	10,695.7	10,734.7
5,474.0	10,773.7	10,812.8	10,851.9	10,891.2	10,930.5	10,969.8	11,009.2	11,048.7	11,088.2	11,127.8
5,475.0	11,167.5	11,207.2	11,247.1	11,286.9	11,326.9	11,366.9	11,407.1	11,447.3	11,487.5	11,527.9
5,476.0	11,568.3	11,608.8	11,649.4	11,690.0	11,730.7	11,771.5	11,812.4	11,853.4	11,894.4	11,935.5
5,477.0	11,976.7	12,018.0	12,059.3	12,100.7	12,142.2	12,183.7	12,225.4	12,267.1	12,308.9	12,350.8
5,478.0	12,392.7	12,434.7	12,476.8	12,519.0	12,561.2	12,603.5	12,645.9	12,688.4	12,731.0	12,773.6
5,479.0	12,816.3	12,859.1	12,901.9	12,944.9	12,987.9	13,030.9	13,074.1	13,117.3	13,160.7	13,204.0
5,480.0	13,247.5	13,291.0	13,334.6	13,378.2	13,421.9	13,465.7	13,509.5	13,553.3	13,597.2	13,641.2
5,481.0	13,685.2	13,729.2	13,773.3	13,817.5	13,861.7	13,906.0	13,950.3	13,994.7	14,039.1	14,083.6
5,482.0	14,128.2	14,172.8	14,217.4	14,262.1	14,306.9	14,351.7	14,396.5	14,441.1	14,486.4	14,531.4
5,483.0	14,576.5									

TABLE 2-2. Mathews Canyon Dam Water Control Manual
Surface Area Table (acres)

Survey Date: August 1977

ELEV	0.0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
5,420	8.0	8.0	9.0	9.0	10.0	10.0	11.0	11.0	11.0	12.0
5,421	12.0	13.0	13.0	14.0	14.0	15.0	15.0	16.0	17.0	17.0
5,422	18.0	18.0	19.0	19.0	20.0	21.0	21.0	22.0	22.0	23.0
5,423	24.0	24.0	25.0	26.0	26.0	27.0	28.0	29.0	29.0	30.0
5,424	31.0	31.0	32.0	33.0	34.0	35.0	35.0	36.0	37.0	38.0
5,425	39.0	39.0	40.0	40.0	41.0	42.0	42.0	43.0	43.0	44.0
5,426	45.0	45.0	46.0	47.0	47.0	48.0	49.0	49.0	50.0	51.0
5,427	51.0	52.0	53.0	53.0	54.0	55.0	55.0	56.0	57.0	57.0
5,428	58.0	59.0	60.0	60.0	61.0	62.0	63.0	63.0	64.0	65.0
5,429	66.0	66.0	67.0	68.0	69.0	69.0	70.0	71.0	72.0	73.0
5,430	73.0	74.0	75.0	75.0	76.0	77.0	78.0	78.0	79.0	80.0
5,431	80.0	81.0	82.0	83.0	83.0	84.0	85.0	86.0	86.0	87.0
5,432	88.0	89.0	89.0	90.0	91.0	92.0	92.0	93.0	94.0	95.0
5,433	96.0	96.0	97.0	98.0	99.0	100.0	100.0	101.0	102.0	103.0
5,434	104.0	104.0	105.0	106.0	107.0	108.0	109.0	109.0	110.0	111.0
5,435	112.0	113.0	113.0	114.0	115.0	115.0	116.0	117.0	117.0	118.0
5,436	119.0	119.0	120.0	121.0	121.0	122.0	123.0	123.0	124.0	125.0
5,437	126.0	126.0	127.0	128.0	128.0	129.0	130.0	130.0	131.0	132.0
5,438	133.0	133.0	134.0	135.0	135.0	136.0	137.0	138.0	138.0	139.0
5,439	140.0	141.0	141.0	142.0	143.0	144.0	144.0	145.0	146.0	147.0
5,440	147.0	148.0	149.0	150.0	150.0	151.0	152.0	153.0	154.0	154.0
5,441	155.0	156.0	157.0	158.0	159.0	159.0	160.0	161.0	162.0	163.0
5,442	163.0	164.0	165.0	166.0	167.0	168.0	168.0	169.0	170.0	171.0
5,443	172.0	173.0	174.0	174.0	175.0	176.0	177.0	178.0	179.0	180.0
5,444	180.0	181.0	182.0	183.0	184.0	185.0	186.0	187.0	188.0	188.0
5,445	189.0	190.0	190.0	191.0	192.0	192.0	193.0	193.0	194.0	194.0
5,446	195.0	196.0	196.0	197.0	197.0	198.0	199.0	199.0	200.0	200.0
5,447	201.0	201.0	202.0	203.0	203.0	204.0	204.0	205.0	206.0	206.0
5,448	207.0	207.0	208.0	209.0	209.0	210.0	210.0	211.0	212.0	212.0
5,449	213.0	213.0	214.0	215.0	215.0	216.0	216.0	217.0	218.0	218.0
5,450	219.0	220.0	220.0	221.0	222.0	223.0	224.0	225.0	226.0	226.0
5,451	227.0	228.0	229.0	230.0	231.0	232.0	232.0	233.0	234.0	235.0
5,452	236.0	237.0	238.0	239.0	239.0	240.0	241.0	242.0	243.0	244.0
5,453	245.0	246.0	247.0	247.0	248.0	249.0	250.0	251.0	252.0	253.0
5,454	254.0	255.0	256.0	256.0	257.0	258.0	259.0	260.0	261.0	262.0
5,455	263.0	263.0	264.0	265.0	265.0	266.0	266.0	267.0	267.0	268.0
5,456	268.0	269.0	270.0	270.0	271.0	271.0	272.0	272.0	273.0	274.0
5,457	274.0	275.0	275.0	276.0	276.0	277.0	278.0	278.0	279.0	279.0
5,458	280.0	280.0	281.0	282.0	282.0	283.0	283.0	284.0	284.0	285.0
5,459	286.0	286.0	287.0	287.0	288.0	288.0	289.0	290.0	290.0	291.0
5,460	291.0	292.0	293.0	294.0	294.0	295.0	296.0	296.0	297.0	298.0
5,461	299.0	299.0	300.0	301.0	302.0	302.0	303.0	304.0	304.0	305.0
5,462	306.0	307.0	307.0	308.0	309.0	310.0	310.0	311.0	312.0	313.0
5,463	313.0	314.0	315.0	316.0	316.0	317.0	318.0	319.0	319.0	320.0
5,464	321.0	322.0	322.0	323.0	324.0	325.0	325.0	326.0	327.0	328.0
5,465	329.0	329.0	330.0	331.0	331.0	332.0	333.0	334.0	334.0	335.0
5,466	336.0	336.0	337.0	338.0	339.0	339.0	340.0	341.0	342.0	342.0
5,467	343.0	344.0	345.0	345.0	346.0	347.0	347.0	348.0	349.0	350.0
5,468	350.0	351.0	352.0	353.0	353.0	354.0	355.0	356.0	356.0	357.0
5,469	358.0	359.0	359.0	360.0	361.0	362.0	362.0	363.0	364.0	365.0
5,470	366.0	366.0	367.0	367.0	368.0	368.0	369.0	370.0	370.0	371.0
5,471	371.0	372.0	373.0	373.0	374.0	374.0	375.0	376.0	376.0	377.0
5,472	377.0	378.0	378.0	379.0	380.0	380.0	381.0	381.0	382.0	383.0
5,473	383.0	384.0	384.0	385.0	386.0	386.0	387.0	387.0	388.0	389.0
5,474	389.0	390.0	390.0	391.0	392.0	392.0	393.0	393.0	394.0	395.0
5,475	395.0	396.0	397.0	398.0	399.0	399.0	400.0	401.0	402.0	403.0
5,476	403.0	404.0	405.0	406.0	407.0	407.0	408.0	409.0	410.0	411.0
5,477	411.0	412.0	413.0	414.0	415.0	416.0	416.0	417.0	418.0	419.0
5,478	420.0	420.0	421.0	422.0	423.0	424.0	425.0	425.0	426.0	427.0
5,479	428.0	429.0	430.0	430.0	431.0	432.0	433.0	434.0	435.0	435.0
5,480	436.0	437.0	437.0	437.0	438.0	438.0	439.0	439.0	439.0	440.0
5,481	440.0	441.0	441.0	441.0	442.0	442.0	443.0	443.0	443.0	444.0
5,482	444.0	444.0	445.0	445.0	446.0	446.0	446.0	447.0	447.0	448.0
5,483	448.0									

Note: This table was generated using the storage values shown in Table 2-1.

Photo 2-1. Union Pacific Railroad at Caliente, Nevada.

Photo 2-2. Clover Creek at Meadow Valley Wash on Hwy 93, Caliente, NV.

Photo 2-3. Intake structure and staff boards at right abutment.

Photo 2-4. Looking upstream at outlet tunnel and stilling basin.

Photo 2-5. Looking downstream at stilling basin.

Photo 2-6. Riprap at the Transition from Stilling Basin to Outlet Channel

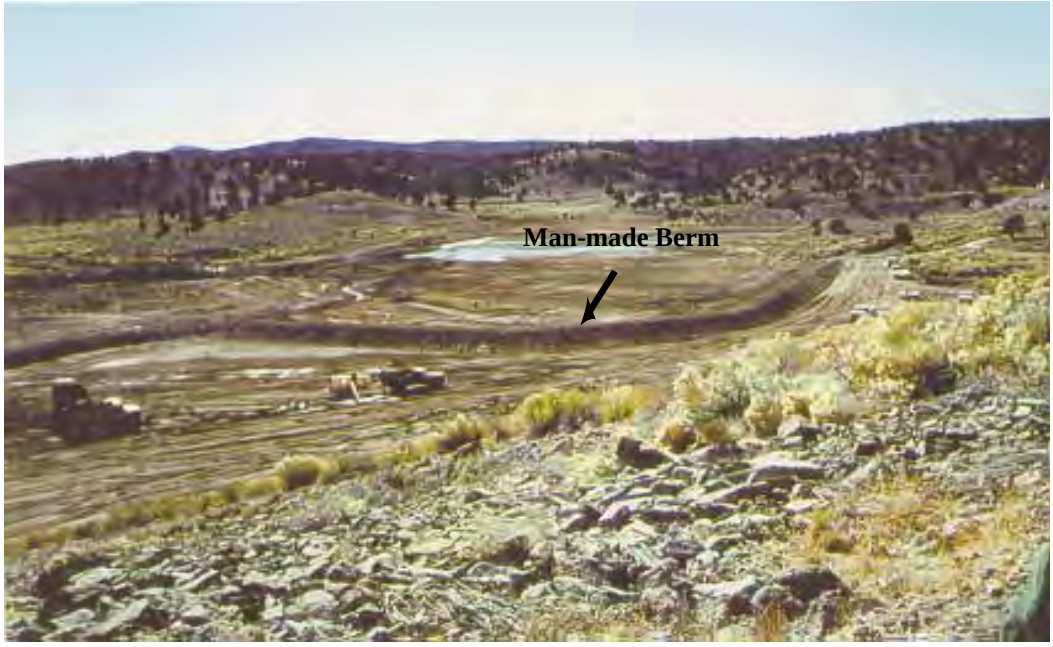


Photo 2-7. Mathews Canyon Reservoir from top of dam.

Photo 2-8. Sheltered picnic area at Mathews Canyon Dam looking towards the reservoir.

III - HISTORY OF PROJECT

3-01 Authorization. Mathews Canyon Dam was authorized by act of Congress, Flood Control Act of 1950, Public Law 516, Eighty-first Congress, second session, and approved 17 May 1950 in accordance with the recommendations of the Chief of Engineers in his report as contained in House Document Number 530, Eighty-first Congress.

3-02 Planning and Design. Records of flooding in the Muddy River Basin date back as early as 1905. According to these records, the floods that occurred below Mathews Canyon Dam prior to its construction caused severe property damage, mainly to the Union Pacific Railroad and agricultural areas. From 1906 to 1941, inclusive, the railroad company spent approximately $2,300,000 (1955 price levels) for restoration of the main line, and more than $5,500,000 (1955 price levels) for its relocation to higher elevations. Extended interruption of the railroad service was common after each significant flood event, ranging from more than two weeks (in 1946) to six months (in 1910).

These events led the local government, through their state's representatives, to seek the Federal Government's assistance to investigate and provide a flood control measure for the area. Planning studies for a flood control measure began as early as 1946. Subsequent investigations led to a flood control improvement project that would comprise of two interdependent units - the Mathews Canyon and Pine Canyon Dams. Project alternative plans for Mathews Canyon Dam ranging from various configurations of the dam embankment and spillway structure were investigated. The selection of the recommended plan was coordinated with the office of the State Engineer of the State of Nevada, United States Bureau of Reclamation, the United Sates Soil Conservation Service, and the local agencies. The overall flood control project was recommended for approval in the Chief of Engineer's report, dated 12 September 1949. In May 1950, the overall Meadow Valley Wash Basin Flood Control Project was Congressionally authorized, as set forth in House Document No. 530, 81st Congress, 2nd session. Hydrologic information pertaining to the design of the two dams is documented in a Corps' report entitled "Design Memorandum No. 1, Hydrology for Pine Canyon and Mathews Canyon Dams, Meadow Valley Wash and Lower Muddy River Basins, Nevada", dated April 1955.

A Corps document entitled "Design Memorandum No. 2 - General Design for Mathews Canyon Dam" and dated June 1955 describes the recommended project plan for Mathews Canyon Dam as follows: *"The project recommended in this memorandum provides for the construction of a flood-control reservoir at the Mathews Canyon site. Mathews Canyon Dam would be an earth-fill structure about 800 feet long and 71 feet high above stream bed. At spillway crest (elev 5,461), the reservoir would have a capacity of 6,260 acre-feet including an allowance of 1,000 acre-feet for sediment and*

debris storage. The reservoir would reduce the reservoir design flood from a peak inflow of 8,500 cubic feet per second to a maximum outflow of 260 cubic feet per second with the water surface at spillway crest. No storage for water conservation would be provided." The Design Memorandum further states: *"The cost to the United States for construction of the Mathews Canyon Dam and Reservoir Project is estimated at $830,000, on the basis of June 1955 price levels. The time estimated to complete the work is estimated at 1 year".*

3-03 <u>Construction.</u> Mathews Canyon Dam was constructed at the same time as Pine Canyon Dam. Construction of both dams began on 18 March 1957 and was completed on 16 December 1957. Mathews Canyon Dam and Pine Canyon Dam were coordinated improvements under the overall plan of improvement for flood control. The total cost of the two projects (excluding maintenance and operation expenditures) through December 1957, was $1,401,000.

3-04 <u>Related Projects.</u> Pine Canyon Dam is located approximately 5 miles southwest of Mathews Canyon Dam and the size of its drainage basin behind the dam is about 45 square miles. The Pine Canyon Dam project was completed on 16 December 1957, and consists of an embankment and dike, outlet works (intake structure and conduit), spillway, and reservoir. Pertinent data about Pine Canyon Dam are included in this manual under Exhibit B. Other existing projects located within the Muddy River Basin include various small dams and weirs constructed for the purposes of flood control, erosion control, irrigation, and recreation; however, none of these structures significantly affect large floods.

3-05 <u>Modifications to Regulations.</u> The water control plan currently utilized for this dam has never been modified. Mathews Canyon Dam has an ungated outlet, which releases flood waters through a 3.5-foot diameter circular conduit. The outlet works does not include any gate nor mechanical equipment that permit adjustment of reservoir outflows.

3-06 <u>Principal Regulation Problems.</u>

a. Spillway Inadequacy. The report entitled "Hydrology and Hydraulic Review of Design Features of Existing Dams" for Pine Canyon and Mathews Canyon Dams, dated July 1978, contains a routing of a revised probable maximum flood (PMF) which was based on updated criteria set by the National Weather Service. Based on the results of the routing, the spillway was found inadequate to pass the revised PMF with the minimum required 3 feet of freeboard. In order to correct this design deficiency, the report recommended that the dam be raised by 1.7 feet, or that the spillway be widened from 50 feet to 100 feet. Currently, however, there are no plans to implement any of these recommendations.

IV - WATERSHED CHARACTERISTICS

4-01 General Characteristics. The drainage area above Mathews Canyon Dam comprises about 34 square miles in Lincoln County, Nevada. The longest watercourse in the drainage area extends 10.5 miles above the dam and has an average streambed gradient of 103 feet per mile. Clover Creek which receives the drainage from Mathews Canyon at a point approximately 2 miles downstream (northwest) from the dam, flows northwestward nearly 20 miles to Caliente, where it empties into Meadow Valley Wash. Meadow Valley Wash flows southward to its confluence with the Muddy River near Glendale, 70 miles downstream from Caliente. Downstream from Glendale, the Muddy River flows for a distance of 12 miles to the point where it empties into Lake Mead. Areas downstream of Mathews Canyon Dam are shown on Plate 4-01.

4-02 Topography. The dam's drainage area mainly consists of rolling hills and narrow valleys, with some alluvial wash. The elevations in the drainage area vary from 5,420 feet, msl at the dam to about 7,000 feet, msl at the mountain crest. The project location and topography are shown on Plate 4-02.

4-03 Geology and Soils.

a. Geology. Mathews Canyon Dam lies within the basin and range physiographic province where typically elongated mountain ranges have a strong north-northeast trend. These ranges average approximately 50 miles or more in length with an average width from 5 to 15 miles and vary in height from 1,000 to 5,000 feet. The broad, flat intervening valleys tend to be of equal or greater width than the mountains they separate. Drainage is predominantly internal and many valleys are characterized by flat mud-surfaced playas which are commonly flooded during the rainy season.

Within the Caliente Caldron complex, in which the dam is located, mountains are more irregular than typical basin and range structures and appear almost equi-dimensional. The long mountain ranges and broad valleys west of Meadow Valley Wash retain a strong north-south trend, while east of the wash, the ranges are shorter and their trends are varied. South of Clover Creek, short northeast-trending ranges merge with other ranges trending northwest to form a winding east-west rim along the south border of the Clover Creek drainage basin.

The dam is at the head of a narrow section of Mathews Canyon where bedrock outcrops along both sides of the canyon and underlies the stream bed alluvium at depths of as much as 52 feet. The canyon trends northwestward in a nearly straight course for about 2,000 feet downstream from the dam. The streambed elevation at the dam is about 5,412 feet, msl. The canyon is 300 feet wide from toe to toe of the abutments and about 600 feet wide at elevation 5,483 feet, msl, which is at the crest elevation of the top of dam. The bottomlands forming the reservoir spread out to a maximum width of about one-third of a

mile.

Bedrock at the site is volcanic. Three kinds of fragmental volcanic rock occur below elevation 5,483 feet, msl: pumiceous breccia, andesite agglomerate, and slightly pumiceous breccia, which is the most common rock at the site, is light gray, soft, partly cemented, and composed of many pumice fragments and occasional felsite fragments embedded in a tuff matrix. Most fragments are less than one-inch in diameter; however a few pieces as much as one-foot in diameter occur. In general, the breccia is moderately to sparsely jointed. The andesite agglomerate, which consists of large block of andesite in a matrix of soft tuff, occurs only in irregular lenses. Its outcrops are conspicuously marked by hard reddish-brown andesite blocks as much as 10 feet in diameter. The slightly pumiceous breccia is a light-gray, moderately-hard rock consisting of pumice, rhyolite, small feldspar crystals, and miscellaneous volcanic fragments embedded in well-cemented tuff. It is a much stronger rock than the pumiceous breccia.

b. Seismicity. Within a 100-miles radius of Mathews Canyon Dam are six active and potentially active faults that have the capability of producing an event of sufficient magnitude to affect the dam. Mainstreet-Hurricane, Dry Lake Valley, Coal Valley, and Toroweap-Sevier are active faults located approximately 50, 35, 68, and 70 miles, respectively, from the dam. There is one potentially active fault, the Grand Wash, which is 25 miles from the dam. Seismic events have occurred within the proximity of the dam, but cannot be accurately assigned to any known fault.

c. Soils. The mountainous drainage area is covered with shallow soils and large areas of bare rock. In the canyons, soils are deep. Soils throughout the drainage area are volcanic in origin, and are low in organic content.

4-04 <u>Sediment.</u> There are no sedimentation ranges in the reservoir. The volume and distribution of accumulated sediment are determined by surveys of the appropriate parts (usually the lower elevations) of the reservoir. The original allotted sediment-storage volume of 1,000 acre-foot in the reservoir, was determined from a study of silt accumulation rates in existing reservoirs in the southwest United States. From this study, the silting rate was established at 20 acre-foot per year, or 0.59 acre-foot per square mile per year.

Surveys are conducted after major storms where the water surface has exceeded elevation 5,455 feet, msl or after visual inspection indicates significant sedimentation. The most recent survey, and also the only survey on record, was completed in August 1977. Visual inspection of the reservoir performed just prior to the preparation of the 1978 Review of Hydrology of Mathews Canyon Dam confirmed the adequacy of the original sediment volume estimate. No other surveys have been performed since that time.

Periodic inspection of the dam and reservoir occurs every five years. The latest Periodic Inspection occurred in June 1999. As it was mentioned in paragraph 2-03(d),

during scheduled maintenance times, excess sediment that collects at the approach basin and around the intake tower is excavated and used to create a berm that diverts all sediment flows away from the approach basin and intake tower.

4-05 Climate. The climate of the drainage area is semiarid with hot dry summers and mild, moist winters. Rainless periods of several months during the summer are common. Outside of precipitation, there were never any instrumentation set up for monitoring temperature, snow, or evaporation within the Mathews Canyon Dam basin. Climatological data for temperature, snow, precipitation, and evaporation were collected at the nearby city of Caliente, and are shown on Table 4-1.

a. Temperature. During the summer, days are long and hot, while in the winters, they are short and mild. Records of temperatures in the city of Caliente, which is approximately 20 miles northeast of the Mathews Canyon Dam show temperatures have ranged from 50 to 60 degrees during the winter months and 90 to 110 degrees during the summer months.

b. Precipitation. Precipitation records are available for four selected precipitation stations in or near the drainage area, namely, Mathews Canyon and Pine Canyon Dams, the nearby city of Caliente, and another nearby town, Acoma. The mean annual precipitation ranges from about 10 inches at the dam to 20 inches in the higher mountains. Climatic conditions in the Mathews Canyon basin generally vary with elevation. The months of May and June are somewhat drier than the other months. Precipitation data for the period of record are shown on Table 4-2.

c. Snow. Snow is common during winter storms, especially at higher elevations. According to statements by local residents, the maximum snow accumulation in the mountains probably does not exceed 3 or 4 feet. In the lower valleys, snow never remains on the ground for more than a few days. However, snow data collected at Caliente showed that on February 4, 1989, there was 14 inches of snow, which was the recorded high of the year, as well as the recorded high on record. Snow maps for the area are available through the National Operation Hydrologic Remote Sensing Center (NOHRSC).

d. Evaporation. Available evaporation data is from Caliente, for the period of record beginning in 1956 and ending in 1972. From the available data, average monthly evaporation ranges from ½ to 1 inch. However, maximum records show that during the summer months, evaporation can range from 1 to 5 inches. There has been no collection of evaporation data since 1972.

e. Wind. Within Nevada, the prevailing winds are from the south, southwest, and west. Wind velocities are generally moderate, though in a few places, as around Mount Davidson, there are sometimes fierce winds.

4-06 Storms and Floods.

a. Storms.

(1) Winter Storms. Storm rainfall is usually of low intensity, and its distribution reflects orographic influence. Most precipitation in the drainage area results from general winter storms that are associated with extra tropical cyclones of north Pacific origin. The duration of the most intense, flood-producing rain rarely exceeds 6 hours, although the storm itself may last several days.

(2) Summer Storms. Storms occurring during the summer are of two types: general summer storms and local summer storms. The latter, which are frequent, may result in heavy rain over small areas, but their duration rarely exceeds 3 hours. The general summer storms, which are infrequent, cover comparatively large areas. The duration of these storms may be 24 hours or more. They sometimes include cells of high intensity and short duration rainfall.

b. Floods. Available flood history in the Muddy River Basin dates back to 1905, however, quantitative records are few. Information on floods were collected from historical accounts, records of the Union Pacific Railroad Company, reports by Local, State and Federal agencies, and statements from the local residents. Before the completion of Mathews Canyon Dam, the storms of 1910, 1925, 1938, 1941, and 1946 all generated runoff that resulted in severe property damage near the basin. The storms and floods of 1938 and 1946 were the most significant events on record prior to the construction of Mathews Canyon and Pine Canyon Dams. Brief descriptions of these events are provided in the following paragraphs.

(1) Storm and Flood of 27 February - 3 March 1938. This storm produced large floods over much of southern Nevada, Arizona, southern California, and southern Utah. The flood was the largest general flood of record in the Muddy River Basin. Low rainfall loss rates and unusually heavy rainfall on 2 March caused high rates of runoff, especially in the mountains. At Caliente, the peak discharge on Meadow Valley Wash below Clover Creek was estimated at 15,000 cfs at the mouth of Mathews Canyon. Snowmelt made a significant contribution to runoff during the storm.

(2) Storm and Flood of 27 - 30 October 1946. This general winter storm deposited up to 10 inches of rainfall in the mountains near Clover Creek. Autographic rain gages in the general region, operated by the U.S. Bureau of Reclamation, recorded the severity of rainfall. Isohyets of the total storm precipitation are shown on Plate 4-03. Estimated peak discharges were 700 cfs for Meadow Valley Wash near Panaca, and 3,000 cfs on Muddy River below Glendale. No data was available for the flow at the mouth of Mathews Canyon.

c. Flood Damages. Estimates of damages from floods in Meadow Valley Wash and Lower Muddy River Basins are available for only those floods that have occurred since 1905. However, these estimates are incomplete. Tangible damages estimated at

about $3,000,000 have been reported for the period 1906 to 1955. The principal damage was to the railroad and agricultural property, as mentioned in section 3-02. Since the construction of Mathews Canyon Dam, no significant flood damages have been reported downstream. However, major losses in property and crops in other parts of the state have been reported, such as the damage reported after a storm in 1969 that totaled about $600,000.

4-07 Runoff Characteristics. Streamflow is negligible except immediately after heavy rains or after extensive snowmelt. Climatic conditions are not conducive to perennial flow. However, high-intensity rainfall in combination with the effects of steep gradients result in intense debris-laden floods. Due to the limited size of the drainage area, the greatest peak discharges occur from thunderstorms.

Plate 4-04 graphically shows the monthly mean, maximum and minimum flows at Mathews Canyon Dam for the period of record which began in 1958. Plate 4-05 is a tabulation of this data. The maximum runoff values occur during the winter flood season months of January, February, March, and April.

Plate 4-06 tabulates the annual maximum values for inflow, outflow, and water surface elevation at Mathews Canyon Dam for the period of record. Plate 8-07 is the inflow and outflow discharge frequency curve for Mathews Canyon Dam.

4-08 Water Quality. There is no water quality program at Mathews Canyon Dam. The nearest water quality station, USGS station 09418700, Meadow Valley Wash near Rox, Nevada, was discontinued after 1994. Further information about this station is provided in Section 5-02, Water Quality Stations.

4-09 Channel and Floodway Characteristics. Discharge from the outlet works enters a short open channel that leads to the natural streambed of Mathews Canyon. Discharge from the spillway enters the natural stream about 200 feet below the toe of the dam. This is shown on Photo 4-1. The spillway discharge curve is shown on Plate 4-07. There exists a continuous stage-recording gage downstream from the dam which is housed in a corrugated metal pipe. The discharge rating curve for stream flow at this station is shown on Plate 4-08.

The reaches extending downstream from Mathews Canyon Dam to Lake Mead are predominantly natural streams. Flow from the outlet works is contained in downstream channels. Peak spillway discharges and floods from other drainage areas will overflow the channels of the downstream reaches. The non-damaging channel capacities were evaluated by the Corps of Engineers for their “Report on Survey, Flood Control, Virgin River and Tributaries in Nevada, Arizona and Utah”, dated June 20, 1942. The Corps of Engineers’ report entitled “Flood Plain Information, Muddy River, Vicinity of Overton, Clark County, Nevada”, dated June 1974, identifies overflow areas and profiles of the standard project flood and the intermediate regional flood (100-year frequency flood) for a

7.8 mile reach of the lower Muddy River. The non-damaging channel capacities of the downstream reaches have not been re-evaluated since the survey in 1942. This is because since the completion of the Mathews Canyon Dam project, the most significant flood event observed during the period of record was about a 25-year event, and the economic development at the downstream reaches have not been that rapid or extensive enough to require a new survey. Lincoln County Emergency Management District is the agency responsible for local cooperation and has agreed with the Corps to keep the downstream channels free from man-made encroachment.

4-10 Upstream Structures. No structure that significantly affects runoff exists in the drainage area above Mathews Canyon Dam.

4-11 Downstream Structures. Other existing projects below Mathews Canyon Dam include small dams and weirs constructed for purposes of flood control, erosion control, irrigation and recreation. However, none of these downstream structures significantly affect large floods. Mathews Canyon Dam has an ungated outlet and is self-regulating, which makes coordination of flood releases with other existing projects impossible.

4-12 Economic Data.

a. Population. The dam is in an isolated area located about 20 miles upstream of the City of Caliente, which has a population of approximately 1,160 people (based on Census survey of 1990). The drainage area above Mathews Canyon Dam comprises about 34 square miles in Lincoln County, Nevada, which has a total resident population of approximately 3,837 people. There are also about 1,325 occupied housing units, 58 non-farm establishments (retail trade), and 122 farms within Lincoln County, Nevada.

b. Agriculture. As of 1990, there are 122 farms, which comprise about one percent of the total land within Lincoln County. Agriculture is contained mostly within the general Caliente-Pioche area. Pioche is located approximately 23 miles north of the city of Caliente. These farm lands are locally irrigated, consisting mainly of pasture for cattle feed.

c. Industry. Economic development in the general Caliente-Pioche area consists of scattered areas of irrigated farming land, cattle grazing on privately owned and Public Domain land, mining industries, and some tourist trade in Caliente, which is on U.S. Highway 93. There is also some employment for local road maintenance and construction on the Union Pacific Railroad extending north along Meadow Valley Wash, turning east along Clover Valley, and on into Utah.

d. Flood Damages. Since the completion of the project, the flood damages prevented through fiscal year 1998 are estimated to be $8,000,000. This is a combined benefit from both Mathews Canyon and Pine Canyon Dams and Reservoirs. Because they are an interdependent unit for improvements, a combined economic analysis was

performed. The economic analysis was performed by the Los Angeles District's Economic Section, and the numeric estimate of flood damages prevented was based on their Damage-Discharge curve. The damage reach considered in this analysis were four overflow areas, namely Clover Creek, Caliente, Lower Meadow Valley Wash from Caliente to Muddy River, and Lower Muddy River from Meadow Valley Wash to Lake Mead. The Damage-Discharge curve is shown on Plate 4-09.

Table 4-1. Climatological Data near Mathews Canyon Dam - Caliente

Station Name: CALIENTE
Station ID: 1358

MONTH	TEMPERATURE (EF)[1]			PRECIPITATION (Inches)[2]			SNOW (Inches)[3]			EVAPORATION (Inches)[4]		
	Mean	Maximum	Minimum	Mean	Maximum	Minimum	Mean	Maximum	Minimum	Mean	Maximum	Minimum
January	58.57	71.00	40.00	0.37	1.41	0.00	1.79	12.00	0.00	0.00	0.00	0.00
February	64.55	81.00	49.00	0.36	1.90	0.00	1.17	14.00	0.00	0.00	0.00	0.00
March	72.96	90.00	64.00	0.37	1.35	0.00	0.59	8.00	0.00	0.09	1.26	0.00
April	81.24	92.00	69.00	0.32	1.15	0.00	0.07	2.50	0.00	0.32	0.78	0.00
May	89.82	98.00	82.00	0.31	1.48	0.00	0.01	0.50	0.00	0.66	2.55	0.50
June	98.67	109.00	92.00	0.19	0.99	0.00	0.00	0.00	0.00	0.93	5.24	0.48
July	101.84	109.00	98.00	0.35	1.51	0.00	0.00	0.00	0.00	0.87	1.47	0.47
August	98.63	108.00	94.00	0.43	1.70	0.00	0.00	0.00	0.00	1.02	3.19	0.50
September	93.07	106.00	88.00	0.33	1.56	0.00	0.03	2.00	0.00	0.62	0.90	0.36
October	81.04	94.00	77.00	0.39	2.13	0.00	0.06	4.00	0.00	0.42	1.08	0.24
November	68.70	80.00	64.00	0.38	1.80	0.00	0.41	5.00	0.00	0.16	0.54	0.00
December	60.27	71.00	50.00	0.30	2.11	0.00	1.28	11.00	0.00	0.03	0.35	0.00

Table 4-2. Precipitation Data from Mathews and Pine Canyon Dams and Acoma

Month	MATHEWS CANYON DAM[5]			PINE CANYON DAM[5]			ACOMA[6]		
	Mean	Maximum	Minimum	Mean	Maximum	Minimum	Mean	Maximum	Minimum
January	1.25	5.02	0.00	1.28	5.43	0.00	0.31	0.40	0.00
February	1.90	7.51	0.00	1.81	6.16	0.00	0.31	0.42	0.00
March	1.71	5.98	0.00	1.57	5.68	0.00	0.12	0.20	0.00
April	0.73	4.08	0.00	0.73	3.23	0.00	0.43	0.83	0.00
May	0.68	2.96	0.00	0.77	3.13	0.00	0.01	0.02	0.00
June	0.34	2.59	0.00	0.33	1.44	0.00	0.00	0.00	0.00
July	0.96	6.45	0.00	0.93	6.88	0.00	0.56	0.67	0.00
August	1.13	3.55	0.00	1.07	3.41	0.00	0.27	0.54	0.00
September	0.96	4.72	0.00	0.93	4.42	0.00	0.58	0.67	0.00
October	0.72	3.58	0.00	0.77	3.46	0.00	0.04	0.08	0.00
November	0.98	3.09	0.00	1.03	3.17	0.00	0.00	0.00	0.00
December	0.86	3.64	0.00	0.82	3.88	0.00	0.32	0.62	0.00

1. Period of record for temperature spans 67 years (1931-1997) - Data from NCDC
2. Period of record for precipitation spans 40 years (1958-1997) - Data from NCDC
3. Period of record for snow spans 70 years (1928-1997) - Data from NCDC
4. Available data for evaporation spans only 17 years (1956-1972) - Data from NCDC
5. Period of record for precipitation spans 40 years (1958-1997) - Data from USACE
6. Available data for precipitation in Acoma spans only three years (1949-1951) - Data from NCDC

Photo 4-1. Looking downstream below spillway

V - DATA COLLECTION AND COMMUNICATION NETWORKS

5-01 Hydrometeorological Stations.

a. Facilities. Climatological, stream flow, and reservoir water level data are collected and monitored by gages located in and adjacent to the Mathews Canyon watershed. Active gages are listed in Table 5-1 and their locations are shown on Plate 5-01. Other gages located in the Muddy River Basin are listed in Table 5-2. Hydrometeorological facilities at the dam are listed and described in Table 5-3. A Geostationary Observational Environmental Satellite (GOES) data collection platform (DCP) located at the dam provides LAD with near real-time precipitation and reservoir water level data.

b. Reporting.

(1) Manual. Because Mathews Canyon Dam is ungated and self-regulating, there are no dam tenders at the dam to directly observe and report precipitation, water surface elevation, or outflow.

(2) Recording Instruments. The reservoir water surface elevation recorder, the water surface recorder at the downstream outlet channel gage, and the recording precipitation gages, automatically record by means of charts or punch tapes, which are collected every six months by the Corps of Engineers, Reservoir Regulation Section, Water Control Data Unit personnel.

(3) GOES Telemetry. Reservoir water level and precipitation data from Mathews Canyon Dam are collected at fifteen minute intervals, then transmitted to one of two GOES satellites, and then to a ground station every four hours. The data is then transmitted as eight hours of data. The eight hour blocks of reported data include the new four hour data plus the previous four hour data block. The GOES data are then collected and processed by a Domestic Satellite (DOMSAT) receive station located at the LAD office. The DOMSAT system processes and stores the data on the LAD's Water Control Data System (WCDS). GOES data can be viewed using the WCDS menu system or from the Reservoir Regulation Section web site.

c. Maintenance. The precipitation and stream gage stations located within the Mathews Canyon Dam reservoir are maintained by the LAD Reservoir Regulation Section, Water Control Data Unit (WCDU). At least every six months, WCDU personnel visit Mathews Canyon Dam to perform maintenance on all gages and to collect data from all recording instruments. Other gages located in the nearby city of Caliente are maintained by Lincoln County. Once the data has been collected from gages in Caliente, they are sent to the National Climatic Data Center (NCDC) for publishing. These active stations are shown on Table 5-1. Other gages throughout the Muddy River Basin that were maintained

by either Lincoln or Clark County, and by U.S. Geological Survey (USGS) are shown on Table 5-2.

5-02 Water Quality Stations.

a. Facilities. There are no water quality stations located in the watershed above Mathews Canyon Dam or in the downstream channel. From 1987 to 1994, the USGS operated a water quality station (USGS No. 09418700) at Meadow Valley Wash near Rox, Nevada. This station was located approximately 82 miles downstream from Mathews Canyon Dam, covering a drainage area of 2,384 square miles. Samples of runoff events were analyzed for specific dissolved ions and suspended sediment. The USGS have discontinued monitoring this water quality station since 1994.

b. Reporting. No formal agreements exist between the USGS and the Corps to transmit water quality data directly to the LAD.

c. Maintenance. The LAD had no maintenance responsibilities with respect to the former water quality station.

5-03 Sediment Stations.

a. Facilities. There are no sedimentation ranges in Mathews Canyon Reservoir. The volume and distribution of accumulated sediment are determined by surveys of the appropriate parts (usually the lower elevations) of the reservoir. To date, the total sediment accumulation has not significantly affected the overall flood control capacity of the reservoir, yet. Minor accumulation of sediment in the lower portion of the reservoir can cause problems with the performance of the water level gage and stream, however, this problem has been resolved by constructing a berm within the reservoir, as discussed in section 2-03.d.

b. Reporting. There are no reporting stations that allow the LAD to obtain sedimentation data. However, surveys are conducted after major storms where the water surface has exceeded elevation 5,455 feet, msl or after a visual inspection that indicates significant sedimentation.

c. Maintenance. There has never been a sediment station at Mathews Canyon Dam, thus the LAD has no maintenance responsibilities.

5-04 Recording Hydrologic Data. LAD permanently maintains records of all precipitation, reservoir water level, and stream flow data recorded by its gaging stations. From 1958 to 1984, the U.S. Geological Survey collected water surface elevation and precipitation data, and maintained the downstream flow gage at Mathews Canyon Dam. All data collected by the USGS at Mathews Canyon Dam were sent to the Corps of Engineers for processing by the hydrologic technical staff. The streamflow data collected

by the USGS were also published annually in their publications of "USGS Water Resources Data - Nevada". The USGS no longer collects and publishes streamflow data for Mathews Canyon Dam.

Climatological data collected by the National Weather Service (NWS) from the Caliente station are archived at the National Oceanic Atmospheric Administration, National Climatic Data Center (NCDC) in Asheville, North Carolina. Precipitation and other data are published monthly by the NCDC in Climatological Data and Hourly Precipitation Data.

LAD receives real-time precipitation and water surface elevation data from Mathews Canyon Dam through GOES telemetry system which records directly into a computer data base. Real-time information is transmitted every 4 hours and can be viewed by accessing the WCDS menu system or the LAD web site. The data is also recorded by means of punch tapes and charts which are collected by the WCDU personnel every six months during scheduled maintenance times (usually during the spring and fall months) on four gages; two precipitation stations located upstream, as shown on Plate 5-01; a precipitation station located on top of the dam; and a stream gage station located downstream of the dam. Table 5-3 shows the hydrometeorological instrumentation and the specific types of data collected at each gaging station.

All hydrometeorological data collected by the WCDU personnel are processed to create an official record of operation.

5-05 Communication Network. The LAD does not maintain a voice radio communication network connection with Mathews Canyon Dam. It does not require dam tenders since the reservoir is ungated and self-regulating. However, daily reports from Mathews Canyon Dam are collected through the GOES DOMSAT Receive Station located in the downtown LAD office. Real-time information is transmitted every 4 hours and can be viewed by accessing the WCDS menu system or the LAD web site. There are also alarm functions within the GOES Telemetry system that notifies the LAD ROC staff in the event that critical situations are imminent. These situations include 1) when the water surface elevation reaches 5,440 feet, msl, the ROC notifies and activates the dam safety inspection team; and 2) prior to spillway flow at water surface elevation 5,461 feet, msl, the ROC then notifies the LAD's Emergency Operation Center and affected local and other Federal Government agencies for possible evacuations and emergency operations. The "Orange Book" contains the list of the agencies, with names and phone numbers of their representatives.

5-06 Communication With Project.

a. Regulating Office with Project Office. There are no permanent attendants,

telephones or radios located at Mathews Canyon Dam. The outlet at the dam is ungated and self-regulating. The GOES Telemetry system is the primary source for monitoring precipitation and flood flow activities at Mathews Canyon Dam.

b. Between Project Office and Others. No routine communication exists between Mathews Canyon Dam and other agencies.

c. Between ROC and Others. A list of agencies to be notified, with applicable office and home telephone numbers is published annually in the LAD's Instructions for Reservoir Operations Center Personnel (unofficially called the "Orange Book"). Should a major runoff event occur, the LAD ROC would be in constant contact with the Lincoln County Emergency Management in Nevada to coordinate any potential emergency situation.

5-07 Project Reporting Instructions. The LAD Water Control Data Unit monitors the GOES telemetry to ensure collection of data. Technicians from the Water Control Data Unit are dispatched to restore data collection should the equipment fail. The Operations & Maintenance Branch of LAD dispatches a maintenance crew to Mathews Canyon Dam if there is a suspicion that the outlet gate is obstructed by debris. The outlet gate may be obstructed if the telemetry data shows there is low precipitation but abnormally high water surface elevations in the reservoir.

5-08 Warnings. The responsibility for issuing all weather watches and warnings and all flood and flash flood watches warnings rests with the National Weather Service. Local emergency officials of Lincoln County Emergency Management, NV are responsible for issuing any public warnings regarding unusual overflows, evacuations, unsafe roads or bridges, etc.

There was an existing agreement documented in the 1975 Water Control Manual between Lincoln County Emergency Management and the Corps of Engineers which indicated that when any of the following conditions are observed: rainfall of ½ inch in 2 hours in Caliente; rainfall of 1 to 2 inches in 2 hours at the dam or mountain area; a reservoir water surface elevation of 5,442.0 feet, msl; and if the reservoir water surface reaches elevation 5,675.0 feet, msl at the nearby Pine Canyon Dam, Lincoln County would contact the Corps. However, this agreement was established prior to the installation of the GOES Telemetry system and, therefore, no longer applies. If an uncontrolled spillway flow or dam breach were imminent, the ROC would notify the LAD Emergency Operations Center to commence their Mathews Canyon Dam flood emergency plan. The ROC would also notify the Lincoln County Emergency Management and other agencies listed in the "Orange Book".

Table 5-1. Active Hydrometeorological Gages In Vicinity of Mathews Canyon Dam Watershed

STATION NAME	ID	ELEV	LAT	LONG	COUNTY	AGENCY	YRS IN SERV	PARAMETERS
CALIENTE	1358*	4,400	37:37:00	114:31:00	LINCOLN	NCDC	1928-PRESENT	PRECIP, TEMP
MATHEWS CANYON WASH NR CALIENTE[1]	09418200**	5,409	37:29:55	114:13:20	LINCOLN	USACE	1958-PRESENT	STREAMFLOW
PINE CANYON WASH NR CALIENTE, NV[2]	09418300**	5,595	37:28:40	114:19:00	LINCOLN	USACE	1958-PRESENT	STREAMFLOW
MATHEWS CANYON DAM (G)	CE47988A***	5,420	37:29:57	114:13:25	LINCOLN	USACE	1957-PRESENT	PRECIP, ELEV
PINE CANYON DAM (G)	CE479658***	5,595	37:28:38	114:18:24	LINCOLN	USACE	1957-PRESENT	PRECIP, ELEV
BUNKER PASS RAIN GAGE (N)	-	5,910	37:25:59	114:08:49	LINCOLN	USACE	1957-PRESENT	PRECIPITATION
MUD SPRINGS RAIN GAGE (N)	-	5,950	37:25:41	114:11:42	LINCOLN	USACE	1957-PRESENT	PRECIPITATION
JACK'S RANCH RAIN GAGE (N)	-	6,040	37:24:55	114:14:17	LINCOLN	USACE	1957-PRESENT	PRECIPITATION
SHEEP SPRINGS RAIN GAGE (N)	-	6,240	37:24:02	114:17:16	LINCOLN	USACE	1957-PRESENT	PRECIPITATION

See Plate 5-01 for locations.
Notes:
USGS - U.S. Geological Survey
NCDC - National Climatic Data Center
USACE - U.S. Army Corps of Engineers
(G) - GOES gage
(N) - Non-telemetry gage

* - NCDC ID
** - USGS ID
*** - GOES ID
1 and 2. All data from these stations were collected by USGS from 1958 to 1984. USACE has been collecting data from these stations since 1984.

Table 5-2. Other Hydrometeorological Stations Located in Muddy River Basin

STATION NAME	ID	ELEV	LATITUDE	LONGITUDE	COUNTY	AGENCY	YRS IN SERV	PARAMETERS
ELGIN	2557*	3,390	37:21:00	114:32:00	LINCOLN	NCDC	1985-1997	PRECIP, TEMP, EVAP
ELGIN 3 SE	2562*	3,300	37:19:00	114:30:00	LINCOLN	NCDC	1965-1985	PRECIP, TEMP, EVAP
PIOCHE	6252*	6,170	37:56:00	114:27:00	LINCOLN	NCDC	1948-1997	PRECIP, TEMP, EVAP
SPRING VALLEY ST PK	7750*	5,950	38:02:00	114:11:00	LINCOLN	NCDC	1974-1997	PRECIP, TEMP, EVAP
URSINE	8538*	5,830	37:59:00	114:13:00	LINCOLN	NCDC	1964-1972	PRECIP, TEMP, EVAP
BUNKERVILLE	1327*	1,550	36:46:00	114:07:00	CLARK	NCDC	1979-1997	PRECIP, TEMP, EVAP
LOGANDALE UN EXP FARM	4651*	1,320	36:34:00	114:28:00	CLARK	NCDC	1968-1992	PRECIP, TEMP, EVAP
MESQUITE	5085*	1,570	36:48:00	114:04:00	CLARK	NCDC	1956-1965	PRECIP, TEMP, EVAP
OVERTON	5846*	1,220	36:31:00	114:25:00	CLARK	NCDC	1948-1997	PRECIP, TEMP, EVAP
VALLEY OF FIRE STATE PK	8588*	2,000	36:26:00	114:31:00	CLARK	NCDC	1972-1997	PRECIP, TEMP, EVAP
MESQUITE CA NR MESQUITE NV	09415060**	1,610	36:48:00	114:03:00	CLARK	USGS	1951-1955	DAILY FLOW
BUNKERVILLE CA NR BUNKERVILLE NV	09415080**	1,540	36:47:00	114:06:00	CLARK	USGS	1951-1955	DAILY FLOW
VIRGIN R AT RIVERSIDE, NV	09415190**	1,410	36:43:44	114:13:36	CLARK	USGS	1970-1995	DAILY, PEAK FLOW
VIRGIN R AB HALFWAY WASH NR RIVERSIDE NV	09415230**	1,320	36:40:28	114:17:54	CLARK	USGS	1978-1985	DAILY, PEAK FLOW
PHARANAGAT WASH NR MOAPA, NV	09415850**	2,110	36:43:46	114:46:09	CLARK	USGS	1988-1993	DAILY, PEAK FLOW
MUDDY SPRINGS AT LDS FARM NR MOAPA, NV	09415900**	-	36:43:18	114:42:53	CLARK	USGS	1985-1996	DAILY, PEAK FLOW
PEDERSON SPRING NR MOAPA, NV	09415910**	1,800	36:42:35	114:42:54	CLARK	USGS	1986-1996	DAILY, PEAK FLOW
WARM SPRINGS WEST NR, MOAPA, NV	09415920**	-	36:42:41	114:42:48	CLARK	USGS	1985-1996	DAILY, PEAK FLOW
MUDDY RIVER POWER DIV NR MOAPA, NV	09415950**	-	36:42:42	114:41:40	CLARK	USGS	1977-1985	DAILY, PEAK FLOW
MUDDY R AB MOAPA IND RES NR MOAPA NV	09416500**	1,670	36:41:00	114:41:00	CLARK	USGS	1914-1918	DAILY FLOW
MUDDY R AT RR PUMP PLANT NR MOAPA, NV	09417000**	1,585	36:39:30	114:38:30	CLARK	USGS	1914-1917	DAILY FLOW
CALIFORNIA WASH AB HIDDEN VALLEY RD NR MOAPA, NV	09417310**	1,610	36:38:15	114:37:23	CLARK	USGS	1990-1993	DAILY FLOW
MUDDY R AT WEISER RANCH NR MOAPA, NV	09417400**	1,495	36:39:45	114:34:27	CLARK	USGS	1915-1917	DAILY FLOW
MUDDY R NR OVERTON, NV	09419500**	1,432	36:38:00	114:30:00	CLARK	USGS	1913-1952	DAILY, PEAK FLOW
MUDDY R AB LAKE MEAD NR OVERTON, NV	09419515**	1,200	36:31:21	114:24:49	CLARK	USGS	1978-1993	DAILY, PEAK FLOW
ROGERS SPRING NR OVERTON BEACH, NV	09419550**	1,560	36:22:36	114:26:33	CLARK	USGS	1985-1996	DAILY, PEAK FLOW
MEADOW VALLEY WASH AT EAGLE CANYON, NR URSINE, NV	09417500**	5,500	38:00:10	114:12:20	LINCOLN	USGS	1962-1974	DAILY, PEAK FLOW
MEADOW VAL WASH NR PANACA, NV	09418000**	-	37:52:00	114:19:00	LINCOLN	USGS	1944-1949	DAILY FLOW
PULSIPHER WASH NR MESQUITE, NV	09415100**	1,580	36:48:04	114:06:37	CLARK	USGS	1963-1981	PEAK FLOW
MUDDY R TR NR ALAMO, NV	09415800**	2,650	37:02:00	114:58:50	LINCOLN	USGS	1964-1981	PEAK FLOW
PATTERSON WASH TR NR PIOCHE, NV	09418100**	5,900	38:09:00	114:35:10	LINCOLN	USGS	1964-1981	PEAK FLOW
CASELTON WASH NR PANACA, NV	09418150**	4,680	37:45:46	114:25:44	LINCOLN	USGS	1963-1981	PEAK FLOW
MEADOW VALLEY WASH TR NR CALIENTE, NV	09418450**	6,050	37:36:00	114:39:30	LINCOLN	USGS	1964-1981	PEAK FLOW
ESCALANTE VALLEY TR NR PANACA, NV	10242460**	6,300	37:44:10	114:08:20	LINCOLN	USGS	1964-1981	PEAK FLOW
DRY LAKE VALLEY TR NR CALIENTE, NV	10245270**	4,960	37:37:18	114:46:24	LINCOLN	USGS	1967-1981	PEAK FLOW

Notes:
USGS - U.S. Geological Survey
NCDC - National Climatic Data Center
* - NCDC ID
** - USGS ID

TABLE 5-3. Hydrologic Instrumentation at Mathews Canyon Dam

Parameter	Gage Type	Report Mode	Stored Record	Comments
WATER SURFACE ELEVATION	Staff Boards	Visual Inspection	-	-
	Float Well System	GOES Telemetry	COE Telemetry HECDSS Computer Database	-
		A35 Stevens Recorder	Paper Strip Chart	
PRECIPITATION	Tipping Bucket	GOES Telemetry	COE Telemetry HECDSS Computer Database	Located on top of dam
	Tipping Bucket	Digital Recorder	Punch Tape	Located d/s of flow gage
OUTFLOW	Float Well System	Digital Recorder	Punch Tape	Maintained by USGS, 1957-1984, by USACE since 1985

VI - HYDROLOGIC FORECASTS

6-01 General.

a. Role of the Corps of Engineers. The Los Angeles District (LAD) does not prepare formal published hydrologic forecasts for Mathews Canyon Dam. The dam is designed with one ungated outlet to provide automatic regulation of the reservoir so as to limit all normal storm inflows to a maximum 260 cfs outflow up to the spillway crest elevation. The LAD has limited responsibilities for warnings other than in cases of extreme flooding events at Mathews Canyon Dam, and proper agencies are notified of any significant changes or anticipated changes as described in Section 5-06c.

b. Role of Other Agencies.

(1) Lincoln County Emergency Management. Formerly known as the Lincoln County Flood Control District, this is the agency responsible for local cooperation. This agency has agreed with the Corps of Engineers to adjust all water-rights claims resulting from the operation of Mathews Canyon Dam, and to keep the downstream channels free from man-made encroachment. Lincoln County Emergency Management is also responsible for providing warnings to downstream communities during emergencies.

(2) National Weather Service. The Airport Station of the National Weather Service at Las Vegas, Nevada, upon request, provides the LAD Reservoir Operation Center (ROC) with weather forecasts and climatological reports for the Muddy River Basin. The phone number and contact for this station is listed in the LAD document entitled "Instructions for Reservoir Operations Center Personnel" (the "Orange Book").

(3) National Resources Conservation Service. Data on existing snow cover in the nearby Pine Canyon Basin are available from the National Resources Conservation Service office in Reno, Nevada. This data is a good indicator of snow cover in the Mathews Canyon Basin. The phone number and contact for this office is also included in the "Orange Book".

6-02 Flood Condition Forecasts. Forecasts of flood hydrographs are not made for Mathews Canyon Reservoir. However, routine evaluation of precipitation, resulting inflow, and forecast precipitation, provides valuable information for use in subjective evaluations of flood situations. Using such information, LAD ROC can evaluate if an ongoing flood will increase or decrease over the next 24 hours.

6-03 Conservation Purpose Forecasts. No conservation forecasts are made for Mathews Canyon Reservoir since the outlet is ungated and cannot impound water for water conservation purposes.

6-04 Long-Range Forecasts. Long-range forecasts are not made for Mathews Canyon Dam because the project is a single-purpose flood control reservoir.

6-05 Drought Forecasts. Drought forecasts are not made at Mathews Canyon Dam and reservoir.

VII - WATER CONTROL PLAN

7-01 General Objectives. Mathews Canyon Dam and reservoir, along with Pine Canyon Dam and reservoir, are components of a coordinated flood protection improvement under the overall plan of improvement for flood control at Clover Creek, Meadow Valley Wash and the Lower Muddy River, Nevada. At Mathews Canyon Dam, flood control protection is achieved by reducing flood discharges to a maximum outflow of 260 cfs.

7-02 Constraints. Mathews Canyon Dam was designed as an ungated dam strictly for the purposes of flood control. There are no known physical, legal, social, or political constraints.

7-03 Overall Plan for Water Control. Mathews Canyon Dam is a component of a coordinated flood control plan. Together with Pine Canyon Dam, it is essential for reducing flood peaks on Clover Creek, Meadow Valley Wash and lower Muddy River. The ungated outlet at the dam provides automatic regulation of the reservoir, therefore, coordination of flood releases from Mathews Canyon Dam with other projects in the Muddy River Basin is not possible. At Mathews Canyon Dam, flood control protection is achieved by reducing a peak flow of up to 8,500 cfs to a maximum outflow discharge of 260 cfs.

7-04 Standing Instructions to Damtender. There are no permanent attendants, telephones nor radios located at Mathews Canyon Dam, since its ungated outlet provides for automatic regulation of the reservoir.

7-05 Flood Control. Floods of magnitudes 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 3.5-foot diameter conduit, which has a maximum capacity of 260 cfs. The outlet works do not include any mechanical equipment that permits adjustment of reservoir outflows. Plate 7-01 shows the maximum storage capacity for Mathews Canyon Dam flood control reservoir.

7-06 Recreation. Water is neither impounded nor released for either upstream or downstream recreation purposes.

7-07 Water Quality. Mathews Canyon Dam is not operated for water quality objectives and it is not designed to hold water for an extended period. Therefore, water quality is not monitored.

7-08 Fish and Wildlife. The operation of Mathews Canyon Dam does not consider fish and wildlife objectives.

7-09 Water Supply. Prolonged water impoundment is not possible at Mathews

Canyon Dam due to its ungated outlet, and there are no formal agreements between the Corps of Engineers and the Bureau of Reclamation, nor any local agencies, concerning the waters passing through the dam. The water passing through the dam supplies the local water tables, and ultimately, becomes part of the Colorado River storage at Lake Mead.

7-10 Hydroelectric Power. No facilities for the generation of hydroelectric power at Mathews Canyon Dam exist, nor are any contemplated.

7-11 Navigation. There is no navigation possible in Mathews Canyon Dam reservoir.

7-12 Drought Contingency Plans. Since Mathews Canyon Dam is ungated, it cannot be used to prolong the storage of water during drought periods. Therefore, a drought contingency plan cannot be developed.

7-13 Flood Emergency Action Plans. The Flood Emergency Action Plan for Mathews Canyon Dam is contained in a document entitled "Flood Emergency Plan Mathews Canyon Dam, Clover Creek, Lincoln County, Nevada, Emergency Action and Notification Subplan," dated February 1986. The report includes dam breach and spillway flow inundation maps which delineate flood boundaries downstream from Mathews Canyon Dam. The downstream area that would be inundated by failure of Mathews Canyon Dam is largely undeveloped except for the town of Caliente, small groups of homes near railroad sidings, isolated homes, and the main line of the Union Pacific Railroad. Flooding would extend downstream to Lake Mead. The plan also covers identification of impending and existing emergencies, notification of other parties about impending or existing emergencies, emergency operations and repairs, and post earthquake response procedures. Copies of this plan are available at the LAD ROC.

7-14 Deviation from Normal Regulation. Although the reservoir is self-regulating, should there be an instance when it is necessary to deviate from the established flood control plan as described in this chapter, prior approval of deviations is required from the Corps SPD office in San Francisco. The protocol established in "CESPD-ET-EW Memorandum for SPL dated 12 August 1999, Subject: Guidance on the Preparation of Deviations from Approved Water Control Plans, dated 1 August 1999", shall be followed when requesting deviations.

7-15 Rate of Release Change. Since the dam is ungated, there is no manual control of reservoir discharges, therefore, there is no control over the rate of release change.

VIII - EFFECT OF WATER CONTROL PLAN

8-01 General. Mathews Canyon Dams is a component of a coordinated flood control plan with Pine Canyon Dam. Both units provide protection for much of the downstream area, which consists of about 13,280 acres of flood plain lands. The flood plain includes about 80 miles of the Union Pacific Railroad mainline, many miles of county roads, the City of Caliente, and about 3,500 acres of irrigated land.

8-02 Flood Control.

a. Spillway Design Flood. The spillway of the dam was designed to pass, without danger to the structural integrity of the dam or threat of overtopping the dam, the greatest discharge that could be expected from the most severe combination of rainfall and runoff conditions that could reasonably occur. This hypothetical flood is called the probable maximum flood (PMF).

(1) Original Probable Maximum Flood. In the design of the spillway structure, two types of floods were analyzed to determine which was most critical, namely 1) Type "A" flood, which produces a peak discharge based on the maximum possible thunderstorm, and 2) Type "B" flood, which produces a peak volume based on the maximum possible general storm, with accretion to storm runoff from snowmelt. The Type "A" flood was determined to be most critical for Mathews Canyon, and was used as the probable maximum flood in designing the spillway. The probable maximum precipitation (PMP) that would produce this hypothetical flood would have an average rainfall depth over the entire basin of 8.6 inches in 6 hours. The 1/2-, 1-, 3-, and 6-hour precipitation totals are 2.0, 3.5, 7.7, and 8.6 inches, respectively. Routing of the original PMF through the dam having a peak inflow of 35,000 cfs (a total volume of 13,400 acre-feet) resulted in a calculated peak water surface elevation and peak outflow discharge of 5,478.1 feet, msl, and 13,060 cfs, respectively.

(2) Revised Probable Maximum Flood. According to the "Interim Report on Hydrology and Hydraulic Review of Design Feature of Existing Dams for Pine Canyon and Mathews Canyon Dams," dated July 1978, the National Weather Service updated the PMP based on a new criteria which was established in September 1977. The 1/2-, 1-, 3-, and 6-hour precipitation values changed from 2.0, 3.5, 7.7, and 8.6 inches, to 5.2, 6.6,, 8.8, and 10.1 inches, respectively. As a result, the probable maximum flood that would result from this updated PMP would produce a peak inflow of 57,000 cfs and a total runoff volume of 16,000 acre-feet. Routing of this revised PMF through the dam would result in a maximum water surface elevation of 5,481.7 feet, msl, and a maximum outflow of 16,650 cfs. Since the maximum water surface would be 1.3 feet below the top of dam elevation, the report also recommended that the dam be raised 1.7 feet or the spillway lengthened from 50 feet to 100 feet to satisfy the minimum freeboard

requirement of 3.0 feet; however, there are no plans to implement any of these recommendations. Plate 8-01 shows the routing for the revised probable maximum flood.

b. Standard Project Flood (SPF). The standard project flood, which was used as the reservoir design flood, occurs from the most severe combination of meteorologic and hydrologic conditions that are reasonably characteristic of the geographic area. A synthetic general winter type storm based on previous events, especially the storms of 1938 and 1946, was established in Design Memorandum No.1, "Hydrology for Pine Canyon and Mathews Canyon Dams, dated April 1955, as the basis of design. The duration of the synthetic storm was 24 hours, including intense rainfall. Ground conditions reasonably conducive to runoff were established by assuming the intense rainfall to occur 17 hours after the start of the storm. Rainfall over the entire drainage area during the 24-hour storm resulted in a total average depth of 7.2 inches, of which 3.9 inches occurred during the 6-hour period of intense rainfall. Infiltration loss rates varied with time. The average loss rate for the period of intense rainfall was 0.15 inches per hour. Runoff from snowmelt was considered to constitute a minor contribution to the flood flows and was therefore neglected. The routing for a reservoir design flood having a peak inflow of 8,500 cfs (a volume of 5,800 acre-feet) resulted in a calculated maximum water surface elevation of 5,460.6 feet, msl, and a peak outflow of 260 cfs. Plate 8-02 shows the Mathews Canyon Dam reservoir design standard project flood routing.

c. Other Floods. As mentioned before, the floods of 1910, 1925, 1938, 1941, and 1946 were representative of major floods within the basin. Based on the flood events of 1938 and 1946, the value for the SPF was later derived. The outcomes of storms and floods that occurred after Mathews Canyon and Pine Canyon Dams were completed in December 1957, were not as severe as before. These storms and floods are discussed in the following paragraphs.

(1) Storms and Floods of January and February 1969. General winter storms produced widespread precipitation throughout the state. Total precipitation at the Mathews Canyon Dam was 3.09 inches during January and 5.69 inches during February. Runoff was negligible during February because most of the precipitation fell as snow. The peak mean hourly inflow of 1,771 cfs to the reservoir resulted in a maximum water surface elevation of 5,430.66 feet, msl, and a peak outflow of 132.6 cfs on 21 January. Plate 8-03 shows the operation hydrographs of Mathews Canyon Dam during the storm period.

(2) Storms and Floods of 10 February - 5 March 1978. In a series of low-latitude winter storms between early February and early March 1978, one especially intense storm stalled just off the southern California coast, pumping abundant tropical moisture into Nevada and to western and central Arizona. This strong storm occurred on February 9 -10, and brought 2.16 inches of precipitation to the Pine Canyon precipitation

station and 1.74 inches of precipitation to the Caliente precipitation station. On 10 February, Mathews Canyon Dam reached a maximum water surface elevation of 5,439.61 feet, msl with a peak inflow of 1,462 cfs and a peak outflow of 180 cfs. Meadow Valley Wash near Caliente had a peak flow of 580 cfs on 10 February. Inflows, water surface elevations, and outflows from Mathews Canyon Dam are shown graphically on Plate 8-04.

(3) Storms and Floods of 24 February - 3 March 1983. The winter season of 1982-83 was characterized by several series of low-latitude Pacific storms that moved across southern California, Nevada, and Arizona from the west, driven by a very prominent El Nino condition in the equatorial Pacific Ocean. The climax of the season occurred from 24 February through 3 March, when storms stalled just southeast of San Diego and produced large quantities of tropical moisture in southern California, Nevada and western Arizona. Mathews Canyon Dam had 3.98 inches of precipitation during the entire period, with 1.26 inches on 2 March alone. Pine Canyon Dam had 2.48 inches for the entire period, and the Caliente precipitation station had 2.32 inches. Mathews Canyon Dam briefly experienced the highest water surface elevation in 37 years of service, when it reached 5,445.0 feet, msl, on 3 March. The peak inflow on 3 March was 1,588 cfs, resulting in a peak outflow of 204 cfs to Clover Creek. The peak flow at Meadow Valley Wash near Caliente was 1,610 cfs, also recorded on 3 March. Plate 8-05 shows the operation hydrographs at Mathews Canyon Dam during the storm period.

(4) Storms and Floods of 6 January - 27 February 1993. The winter season of 1992-93 was characterized by a series of low-latitude Pacific storms that moved across southern California, Nevada, and Arizona from the west, driven by cooler than normal temperatures across the north Pacific Ocean. The first significant storm period occurred on 6-18 January. The Mathews Canyon precipitation station recorded 4.37 inches for that period and the Caliente precipitation station recorded 2.56 inches for the period of 7-19 of January. The second significant storm period occurred during 1-10 February. The Mathews Canyon station recorded 3.45 inches of precipitation for that period. The Caliente station recorded 1.70 inches of precipitation for the same period. The highest water surface elevation occurred on 9 February with an elevation of 5,435.24, a peak inflow of 1,475 cfs on 8 February, and a peak outflow of about 160 cfs on 9 February to Clover Creek. The highest peak instantaneous flow at Meadow Valley Wash near Caliente also occurred on 9 February, with a flow of 1,590 cfs. The mean flow records for this storm in Meadow Valley Wash near Caliente were the maximum highest for the months of January and February for the USGS station's 42 years of record. Plate 8-06 shows the operation hydrographs of Mathews Canyon Dam during the storm period of 8 - 10 February.

8-03 <u>Recreation.</u> Although Mathews Canyon Dam Project was originally authorized for recreational development (PL 78-534), no recreational facilities have been formally developed. However, there was a camp site that was provided under the dam

construction contract to accommodate contractor employees and Los Angeles District employees working at the project site. This site, consisting of two restrooms, picnic table, and a barbeque pit, is not formally open or closed to the public. However, because the camp site is located in a remote back-country far from any urban area, it does not receive many visitors outside of the Los Angeles District maintenance personnel.

8-04 Water Quality. The operation of Mathews Canyon Dam has a negligible effect on Water Quality.

8-05 Fish and Wildlife. The Bureau of Land Management (BLM) lands associated with Mathews Canyon Dam are used for cattle grazing, and otherwise are in their natural state. The intermittent nature of streams in the area preclude the existence of fish, and wildlife resources are small. The effects of the project and its water control plan on fish and wildlife is negligible.

8-06 Water Supply. Waters passing through the Mathews Canyon Dam supply local water tables and ultimately become part of the Colorado River storage at Lake Mead. However, neither the dam nor its operation plan has any effect on water supply.

8-07 Hydroelectric Power. The water control plan does not include procedures for hydroelectric power since there is no existing or contemplated hydroelectric power generation at Mathews Canyon Dam.

8-08 Navigation. The water control plan does not include procedures for navigation since there is no navigation in the Mathews Canyon Dam reservoir, in Clover Creek, in Meadow Valley Wash, nor in the lower Muddy River.

8-09 Drought Contingency Plans. Drought contingency plans are only required at projects with controlled reservoir storage (ER 1110-2-1941).

8-10 Flood Emergency Action Plans. A Corps document entitled "Flood Emergency Plan Mathews Canyon Dam, Clover Creek, Lincoln County, Nevada, Emergency Action and Notification Subplan", dated February 1986, contains the flood emergency plan for this project as discussed in paragraph 7-13. Since the dam is ungated, however, it cannot be regulated for emergency purposes, and does not have an effect on the plan.

8-11 Frequencies.

a. Peak Inflow Probability. Plate 8-07 shows the peak inflow and outflow discharge frequency curves for Mathews Canyon Dam. The curves were derived from a recent discharge frequency analysis of historical flows through the reservoir. The frequency analysis was completed in July 1998. Frequency analysis data are shown on

Plate 8-08.

b. Filling Frequency. Plate 8-09 shows the exceedance filling frequency curves. Maximum pool elevations for the period of record are shown on Plate 4-05. The curves were derived from the same discharge frequency analysis mentioned above.

8-12 Environmental Documentation. An Environmental Assessment report (EA) was developed to establish baseline conditions at the project site and the effects of the current water control plan. The EA was completed on 24 August 2000 and resulted in a "Finding of No Significant Impact" (FONSI) which documents that the continued operation of the existing project would not have any lasting negative impacts to the surrounding environment. The EA and FONSI are included in this report as Exhibit D.

8-13 Other Studies. There are no other up-to-date studies in relation to Mathews Canyon Dam and reservoir.

IX - WATER CONTROL MANAGEMENT

9-01 Responsibilities and Organization.

a. Corps of Engineers. Mathews Canyon Dam is owned and maintained by Corps of Engineers, Los Angeles District (LAD). Table 9-1 shows the organizational chart depicting the chain of command for water control and operations and maintenance decisions in the LAD. The chart shows that the Reservoir Regulation Section, in the Hydrology and Hydraulics Branch is charged with water control decisions. However, since the dam was designed to control floods with an ungated outlet, water control decisions are seldom necessary. Decisions about the dam and reservoir maintenance are made by the Operations and Maintenance Section, Operations Branch, Construction and Operations Division, in coordination with the Reservoir Regulation Section.

b. Other Federal Agencies. There are no other Federal agencies that are directly responsible for the operation and maintenance of Mathews Canyon Dam.

c. State and County Agencies. There are no state or county agencies directly responsible for the operation and maintenance of Mathews Canyon Dam. However, Lincoln County Emergency Management has agreed with the Corps of Engineers to keep the downstream channels free from man-made encroachment, and to adjust all water rights claims resulting from the operation of Mathews Canyon Dam.

9-02 Interagency Coordination. The Corps of Engineers, LAD coordinates with the following organizations and agencies:

a. Local Press and Corps Bulletins. The Public Affairs Office of LAD is responsible for interfacing with the press regarding floods and other aspects of project operation. This is accomplished through interviews and the occasional issuance of press releases. LAD does not issue flood watches or warnings or other status reports or forecasts to the general public. These are the responsibility of the National Weather Service.

b. National Weather Service (NWS). The NWS has the responsibility for issuing the flood watches and warnings to the public. The LAD utilizes NWS data to aid in real-time flood control operations. The airport station of the NWS at Las Vegas, Nevada, upon request, provides the LAD Reservoir Regulation Section with weather forecasts and climatological reports for the Muddy River Basin. The NWS - Colorado River Forecast Center at Salt Lake City, Utah, provides a Water Supply Outlook monthly for the Lower Colorado River watershed, which encompasses the Mathews Canyon Dam watershed.

c. U.S. Geological Survey. The data from Mathews Canyon Dam is published in the USGS publication, "USGS Water Resources Data - Nevada", under the station name, Mathews Canyon Wash near Caliente, NV.

d. The Natural Resources Conservation Service. The Natural Resources Conservation Service maintains an office in Caliente, Nevada. The staff at Caliente cooperates with the Corps of Engineers during emergency situations in the area of Mathews Canyon Dam. The Natural Resources Conservation Service monthly publication "Nevada Basin Outlook Report" gives an estimate of antecedent precipitation.

e. The Bureau of Land Management (BLM). The U.S. Department of Interior, Bureau of Land Management, coordinates with the Corps of Engineers in case an emergency evacuation of people and property on the lands adjacent to Mathews Canyon Dam is necessary. The BLM manages this from their local office in Caliente, NV.

9-03 Interagency Agreements. In a letter dated April 27, 1965, the Lincoln County Flood Control District wrote to the Corps of Engineers advising the Corps that they were adopting a resolution which furnishes assurance of local responsibilities in connection with adjustment of water rights claims as a result of the project, and in keeping the flood control channels downstream of the dam free from encroachments. A copy of this letter is contained in Exhibit C.

9-04 Commissions, River Authorities, Compacts, and Committees. Mathews Canyon Dam controls flood flows in Mathews Canyon which is a small tributary in the Lower Muddy River Basin, for the purpose of preventing erosion adjacent to the tracks of the major transcontinental railroad passing along Meadow Valley Wash and Clover Creek. As such, the facility is not part of any river authority, compact, or committee.

9-05 Non-Federal Hydropower. There is no hydropower associated with Mathews Canyon Dam.

9-06 Reports. As required by ER 1110-2-240 "Water Control Management", the LAD prepares three reports for transmittal to the South Pacific Division Office concerning the regulation of Mathews Canyon Dam and reservoir. These reports are as follows:

a. Annual Water Control Management Report. This report is prepared by LAD each year to document significant water control related activities including the operation of Mathews Canyon Dam.

b. Periodic Inspection Report. Every five years, LAD is required to inspect its flood control projects which include Mathews Canyon Dam. The inspection findings and recommendations are documented in a periodic inspection report prepared by LAD.

Table 1-1 contains a list of inspection reports to date.

c. Flood Emergency Plan. The LAD has prepared a Flood Emergency Plan for Mathews Canyon Dam titled, "Flood Emergency Plan Mathews Canyon Dam, Clover Creek, Lincoln County, Nevada, Emergency Action and Notification Subplan", for LAD reference. In addition, there is also a General Report that supplements the Flood Emergency Plan, which provides information about the general project area.

Table 9-1. Chain of Command for Reservoir Operations*
(Decisions at Mathews Canyon Dam)

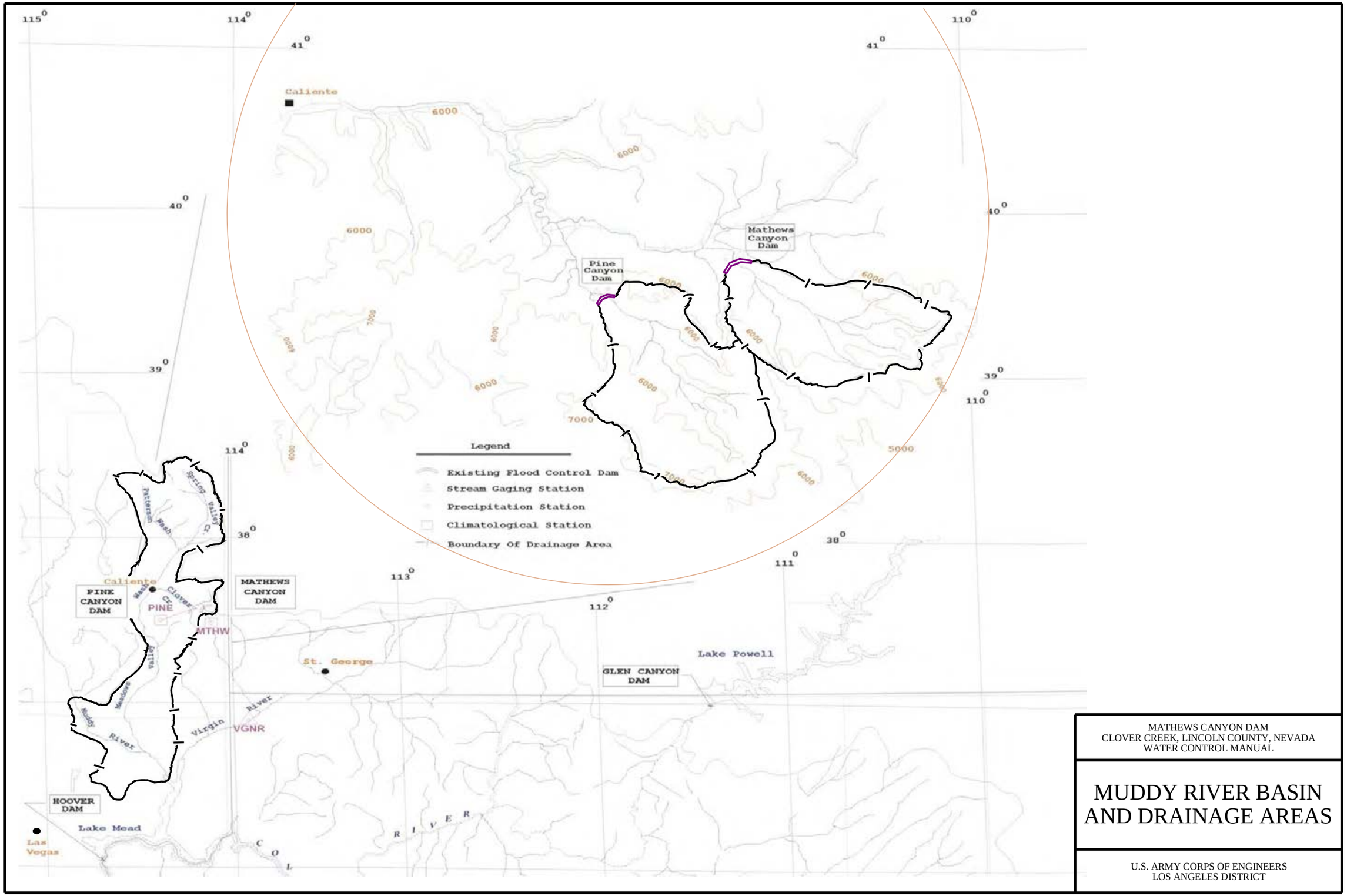
South Pacific Division** (415) 977-8102	
District Engineer (213) 452-3961	
Water Control Decisions	Operation and Maintenance Decisions
Chief, Engineering Division (213) 452-3629	Chief, Construction and Operations Division (213) 452-3349
Chief, Hydrology and Hydraulics Branch (213) 452-3525	Chief, Operations Branch (213) 452-3385
Chief, Reservoir Regulation Section (213) 452-3527	Chief, Operations and Maintenance Section (626) 401-4008
Chief, Reservoir Regulation Unit (213) 452-3530	

*Notes:

1. Point of contacts and their pager numbers are updated annually. These references can be found within the "Instructions for Reservoir Operations Center Personnel ("Orange Book")".

2. Call Reservoir Operation Center (ROC) for the latest phone numbers.

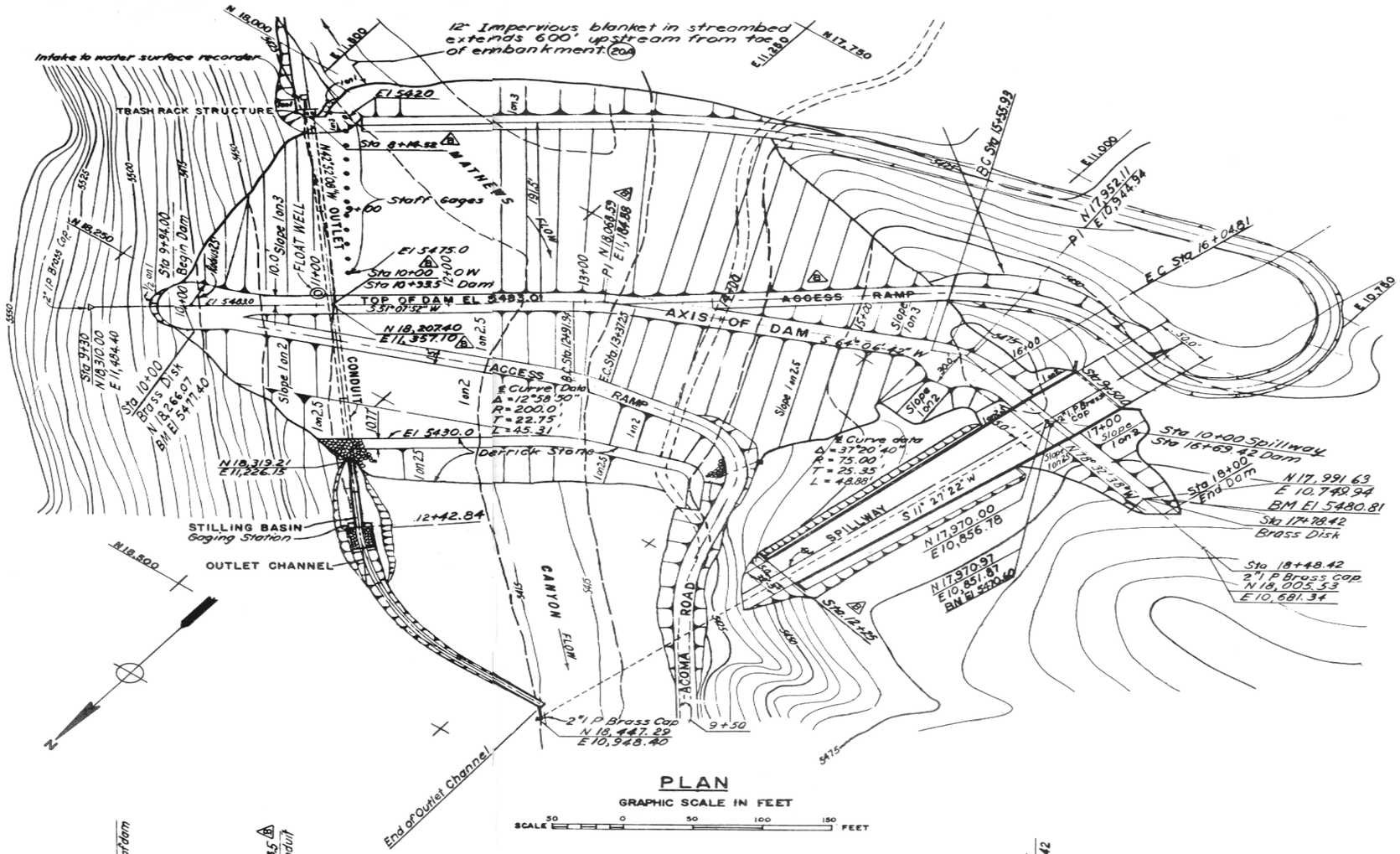
**South Pacific Division point of contacts and their phone numbers are also in the "Orange Book". SPD is notified when unusual circumstances occur, or when a deviation is necessary.

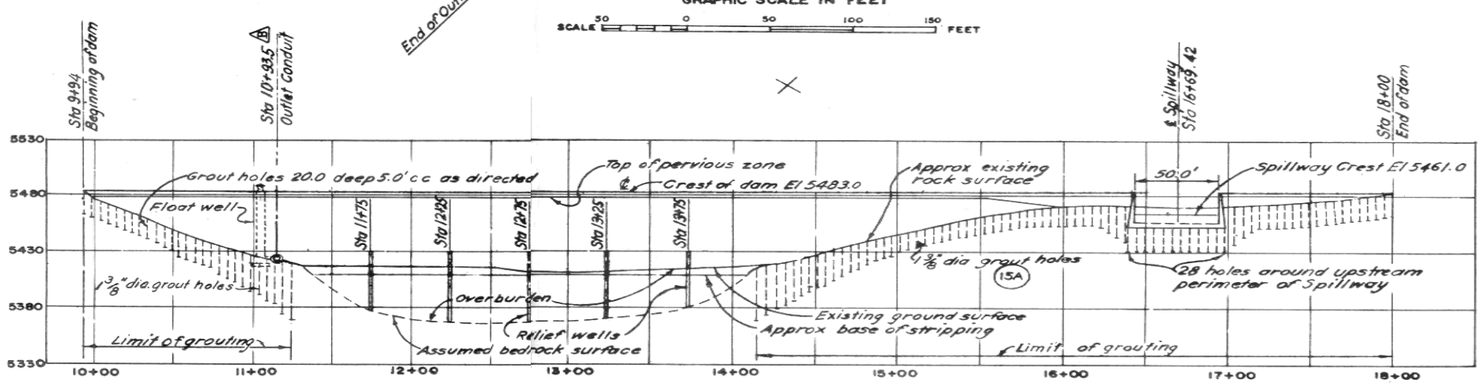


MATHEWS CANYON DAM
CLOVER CREEK, LINCOLN COUNTY, NEVADA
WATER CONTROL MANUAL

MUDDY RIVER BASIN AND DRAINAGE AREAS

U.S. ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT





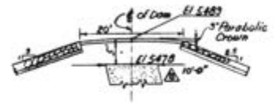
PROFILE ON AXIS OF DAM

NOTE:
TOPOGRAPHY FROM C OF E PLANE TABLE SHEETS NO. M 7-1, M 7-2, & M 7-3, SURVEY OF SEPT. 1941, MATHEWS CANYON, LINCOLN COUNTY, NEVADA.
ASSUMED COORDINATES.
BEARINGS FROM OBSERVATION ON POLARIS.

MATHEWS CANYON DAM
CLOVER CREEK, LINCOLN COUNTY, NEVADA
WATER CONTROL MANUAL

DAM EMBANKMENT, PLAN, AND PROFILE

U.S. ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT



TYPICAL SECTION
AT
CREST OF DAM
SCALE: 1 IN = 10 FT

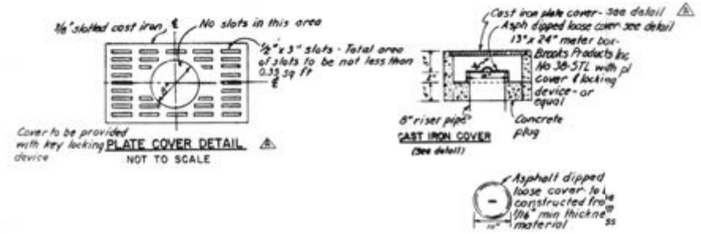
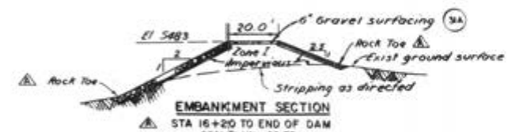
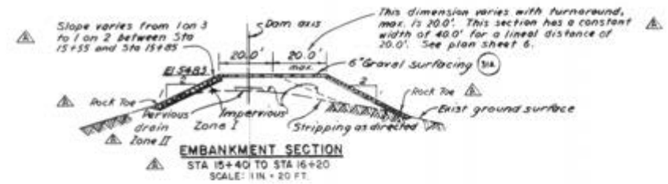


PLATE COVER DETAIL
NOT TO SCALE

CAST IRON COVER
(See detail)

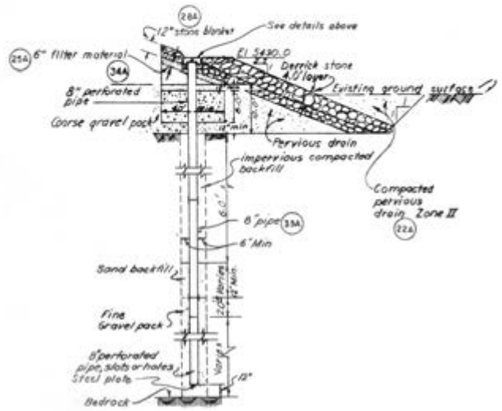


EMBANKMENT SECTION
STA 16+20 TO END OF DAM
SCALE: 1 IN = 20 FT

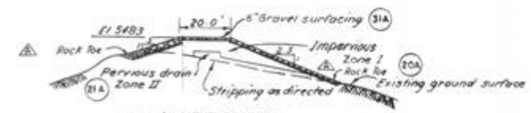


EMBANKMENT SECTION
STA 15+40 TO STA 16+20
SCALE: 1 IN = 20 FT

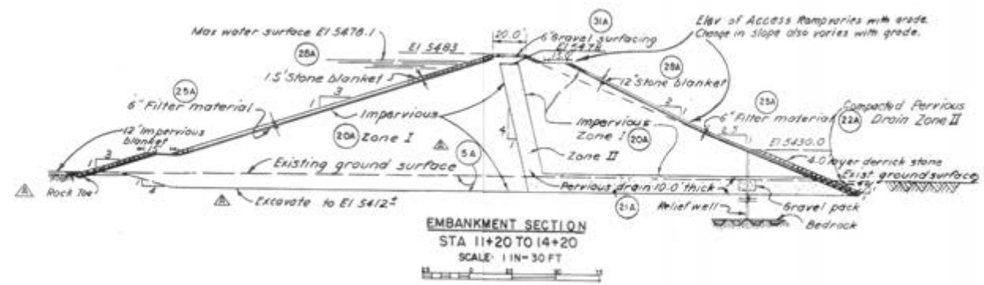
ROCK TOE DETAIL
SCALE 1 IN = 5 FEET



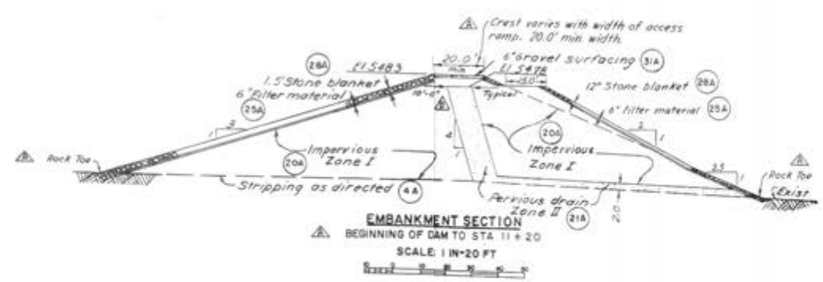
RELIEF WELL DETAIL
NOT TO SCALE



EMBANKMENT SECTION
STA 14+20 TO STA 15+40
SCALE: 1 IN = 20 FT



EMBANKMENT SECTION
STA 11+20 TO 14+20
SCALE: 1 IN = 30 FT

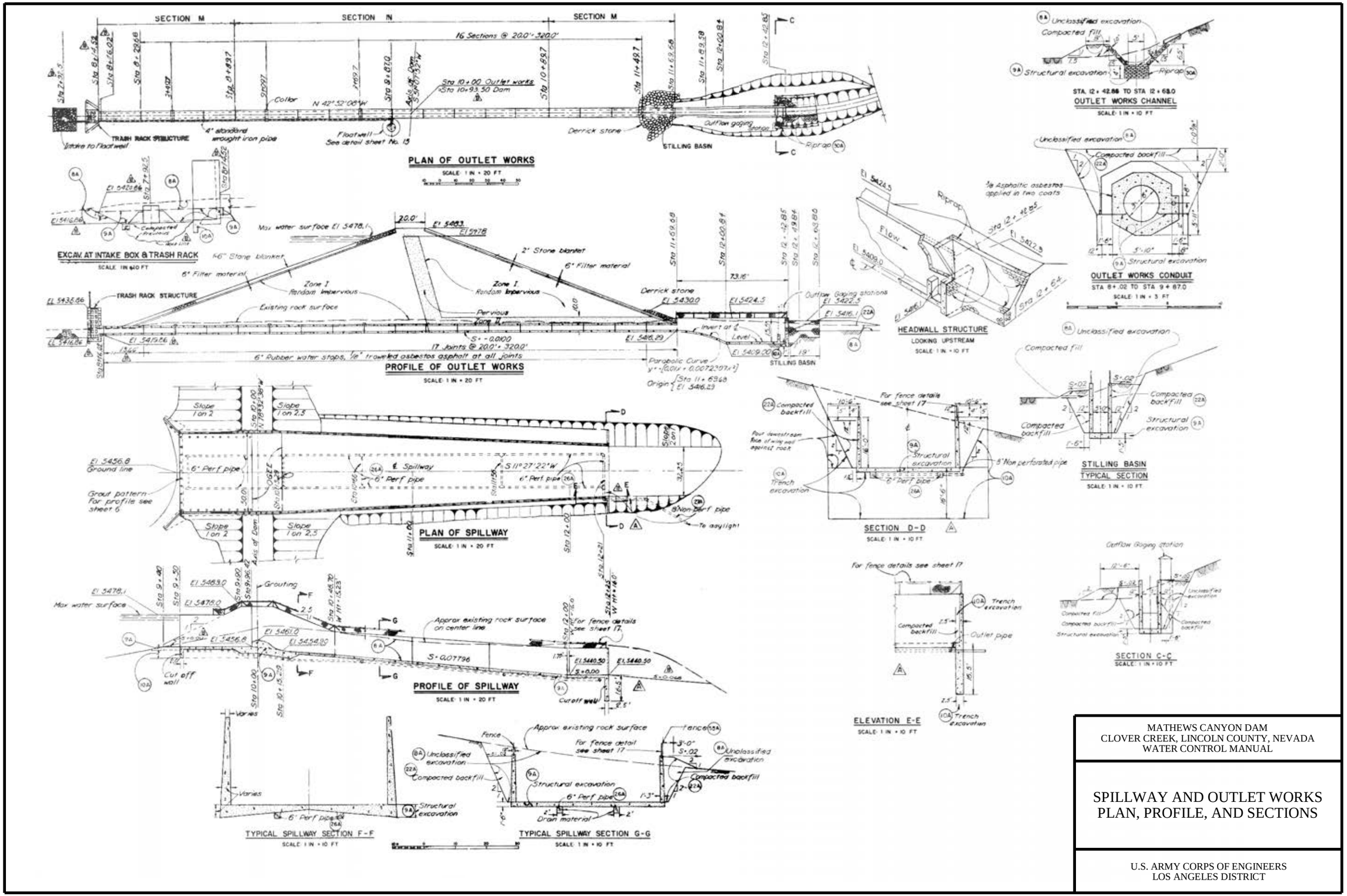


EMBANKMENT SECTION
BEGINNING OF DAM TO STA 11+20
SCALE: 1 IN = 20 FT

MATHEWS CANYON DAM
CLOVER, CREEK, LINCOLN COUNTY, NEVADA
WATER CONTROL MANUAL

DAM EMBANKMENT SECTIONS

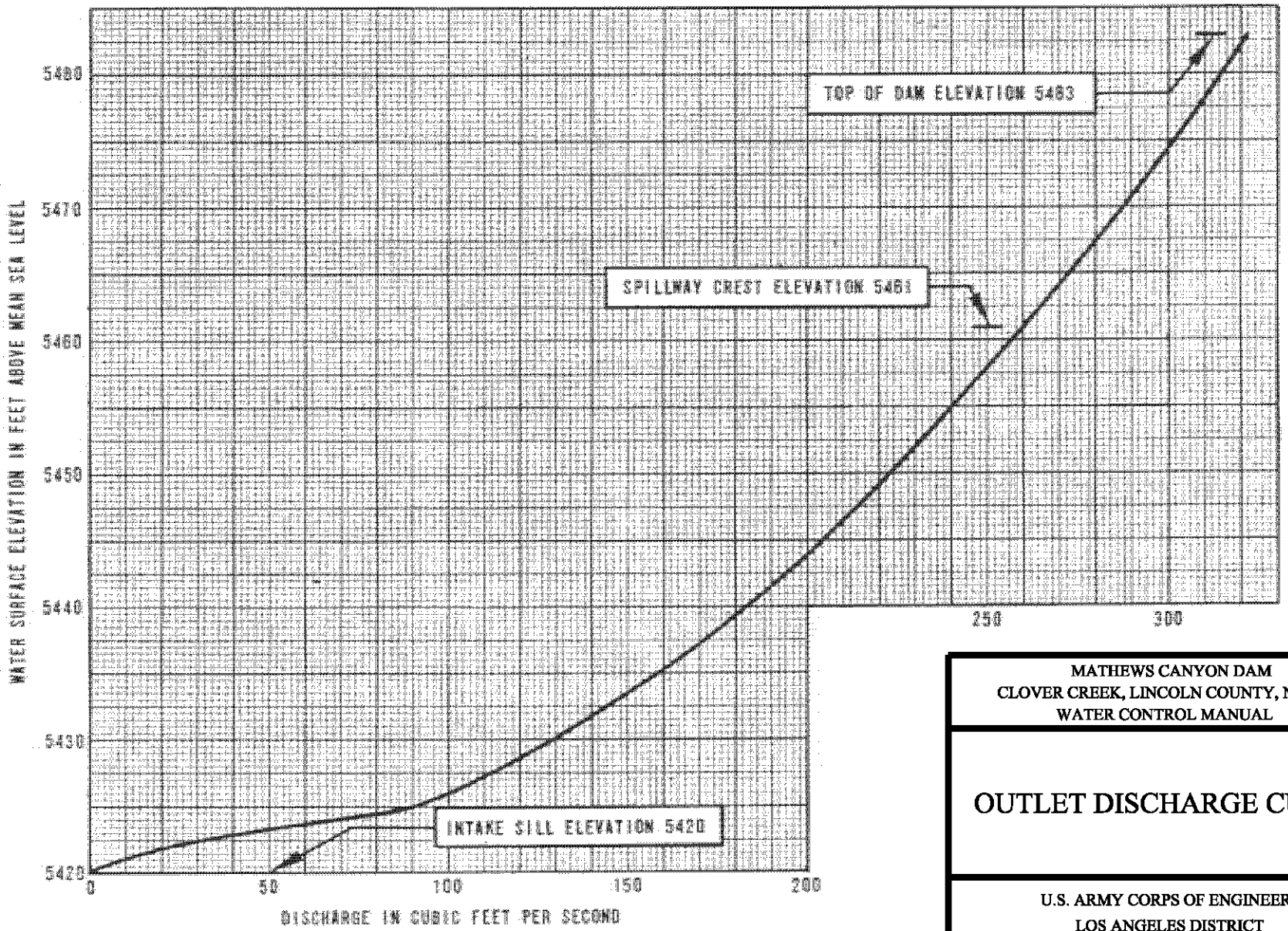
U.S. ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT



MATHEWS CANYON DAM
CLOVER CREEK, LINCOLN COUNTY, NEVADA
WATER CONTROL MANUAL

SPILLWAY AND OUTLET WORKS
PLAN, PROFILE, AND SECTIONS

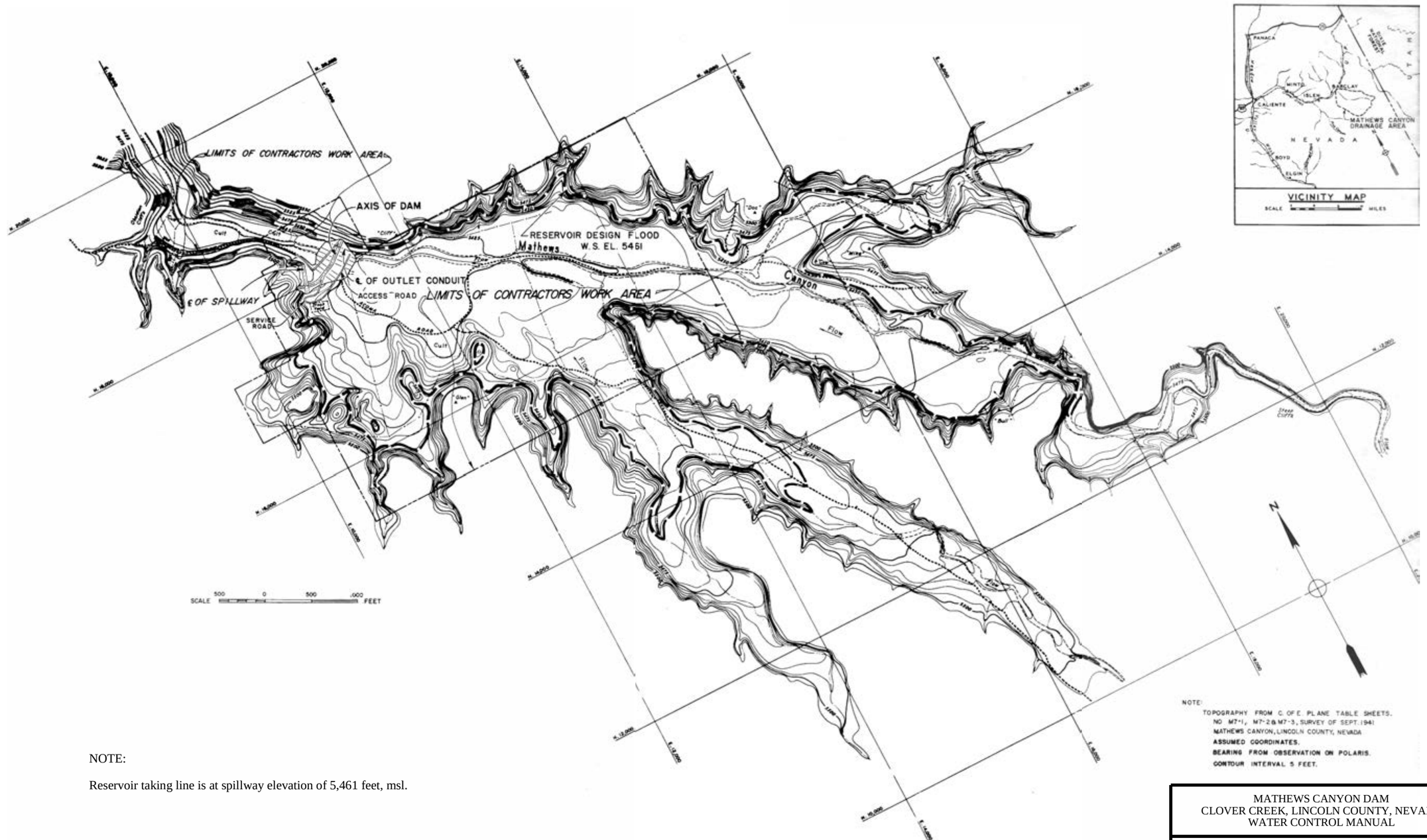
U.S. ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT



MATHEWS CANYON DAM
CLOVER CREEK, LINCOLN COUNTY, NEVADA
WATER CONTROL MANUAL

OUTLET DISCHARGE CURVE

U.S. ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT



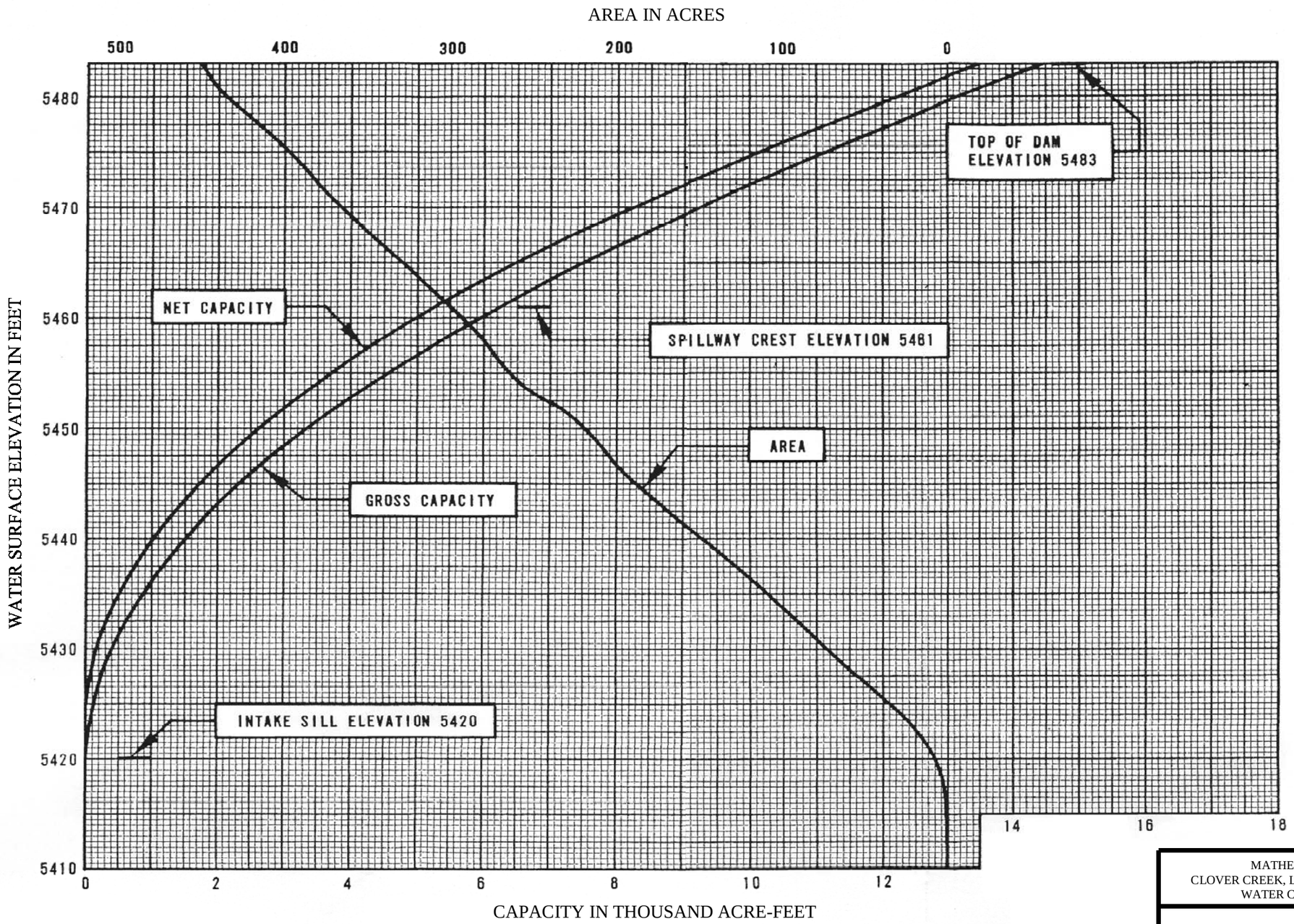
NOTE:

Reservoir taking line is at spillway elevation of 5,461 feet, msl.

MATHEWS CANYON DAM
CLOVER CREEK, LINCOLN COUNTY, NEVADA
WATER CONTROL MANUAL

GENERAL PLAN OF RESERVOIR

U.S. ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT



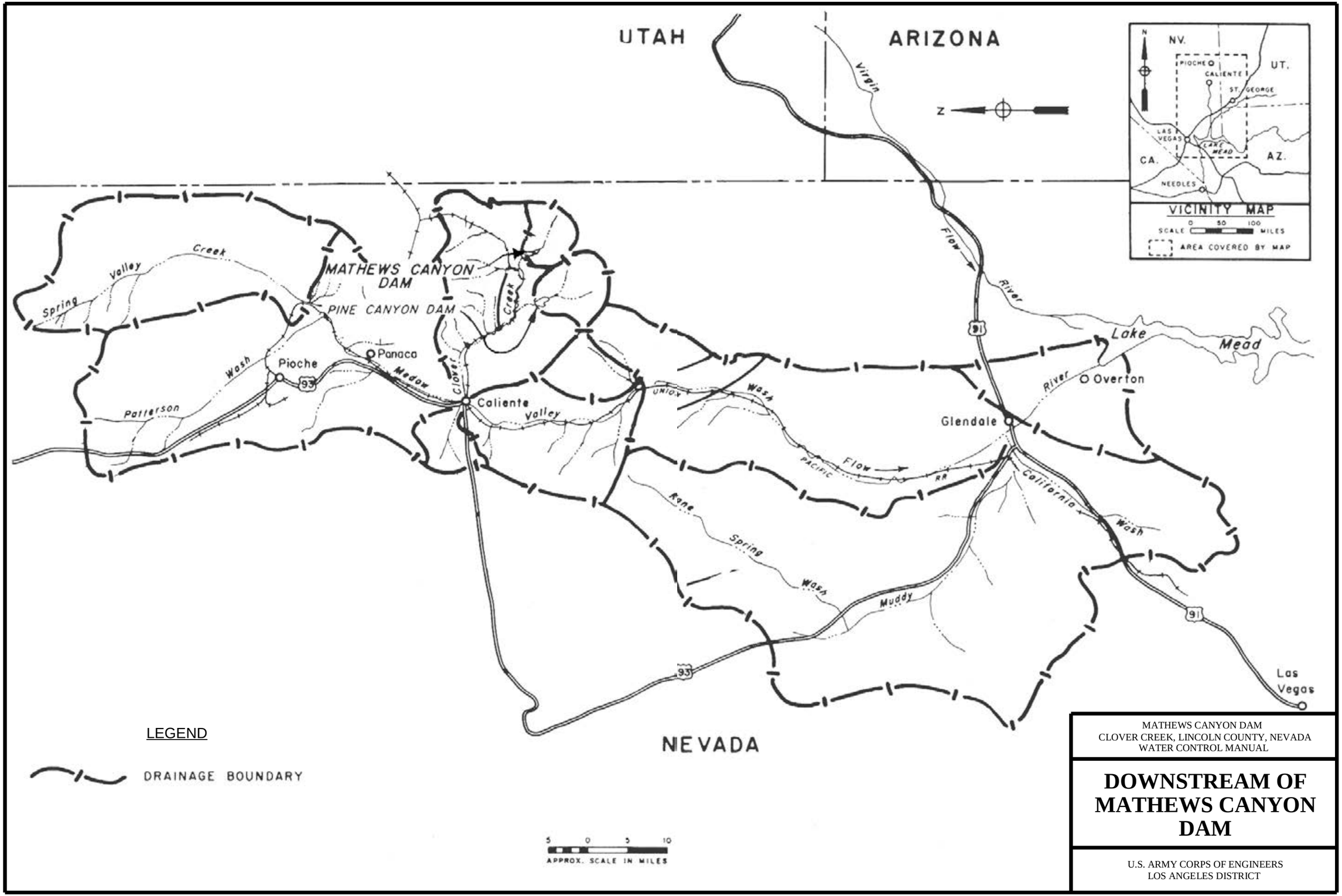
Note:

"Gross Capacity" is total capacity of the reservoir including the storage allotted for sediment accumulation.
"Net Capacity" is total capacity of the reservoir without the additional sediment accumulation storage space.

MATHEWS CANYON DAM
CLOVER CREEK, LINCOLN COUNTY, NEVADA
WATER CONTROL MANUAL

AREA AND CAPACITY CURVES
BASED ON 1977 SURVEY

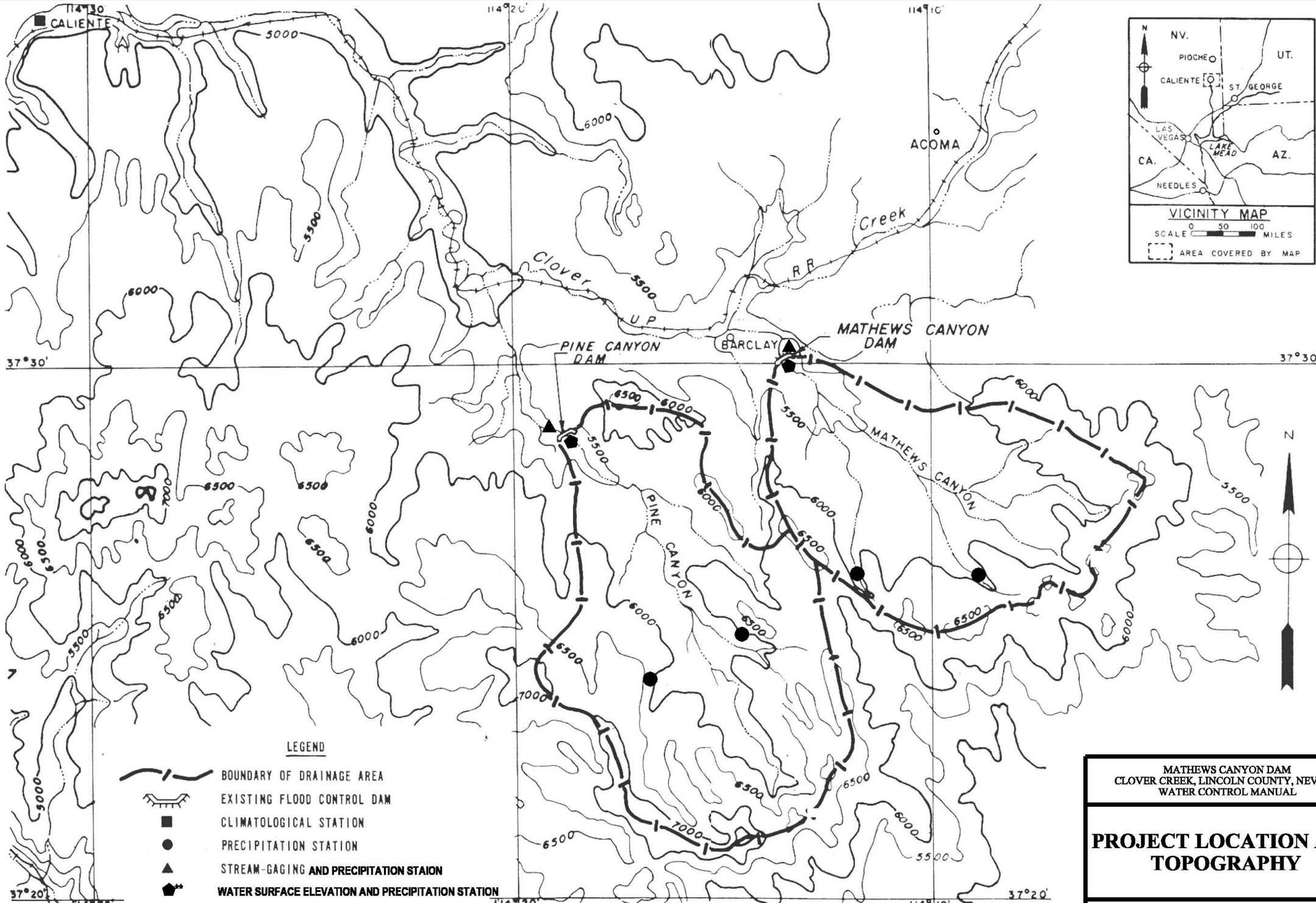
U.S. ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT

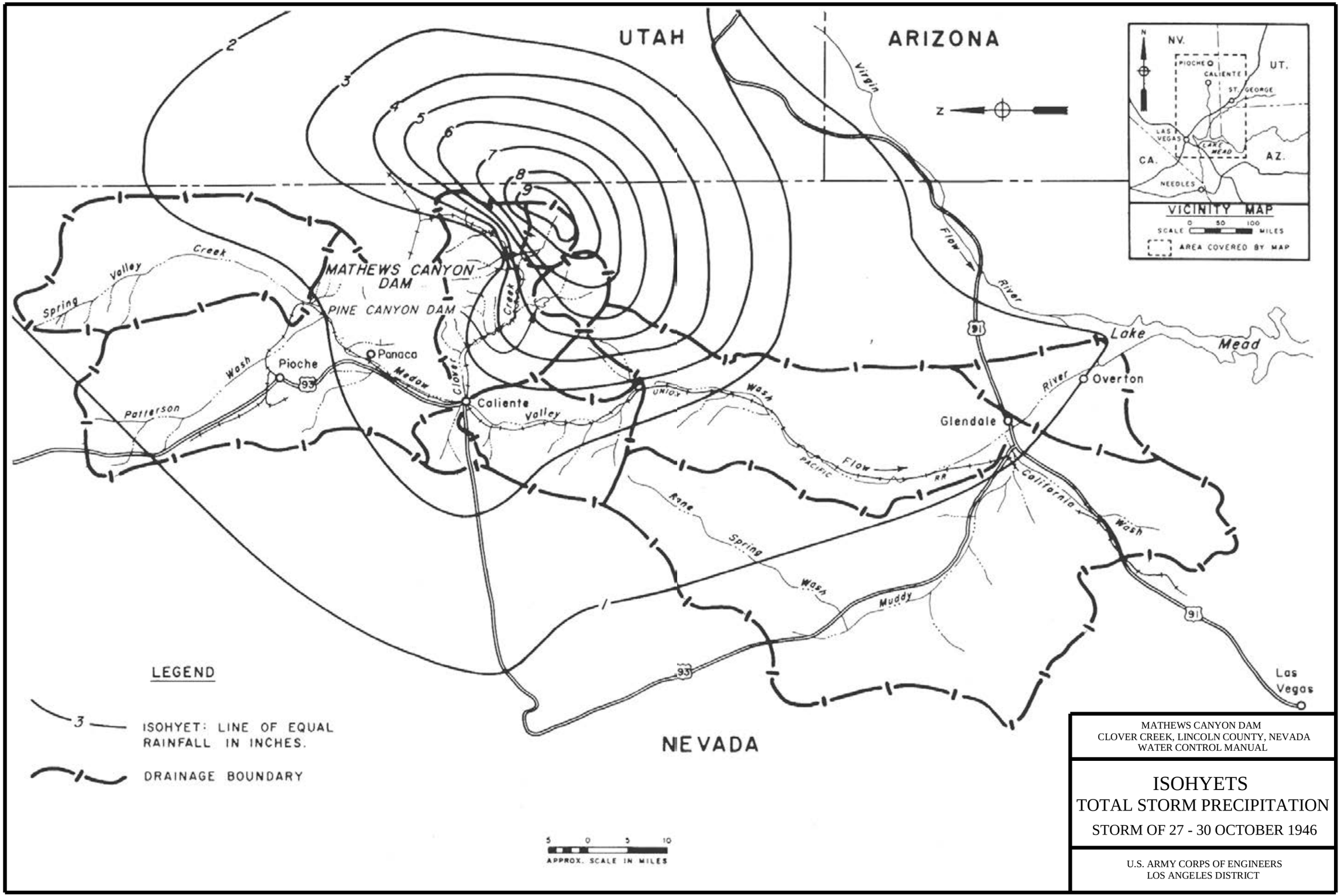


MATHEWS CANYON DAM
CLOVER CREEK, LINCOLN COUNTY, NEVADA
WATER CONTROL MANUAL

DOWNSTREAM OF MATHEWS CANYON DAM

U.S. ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT

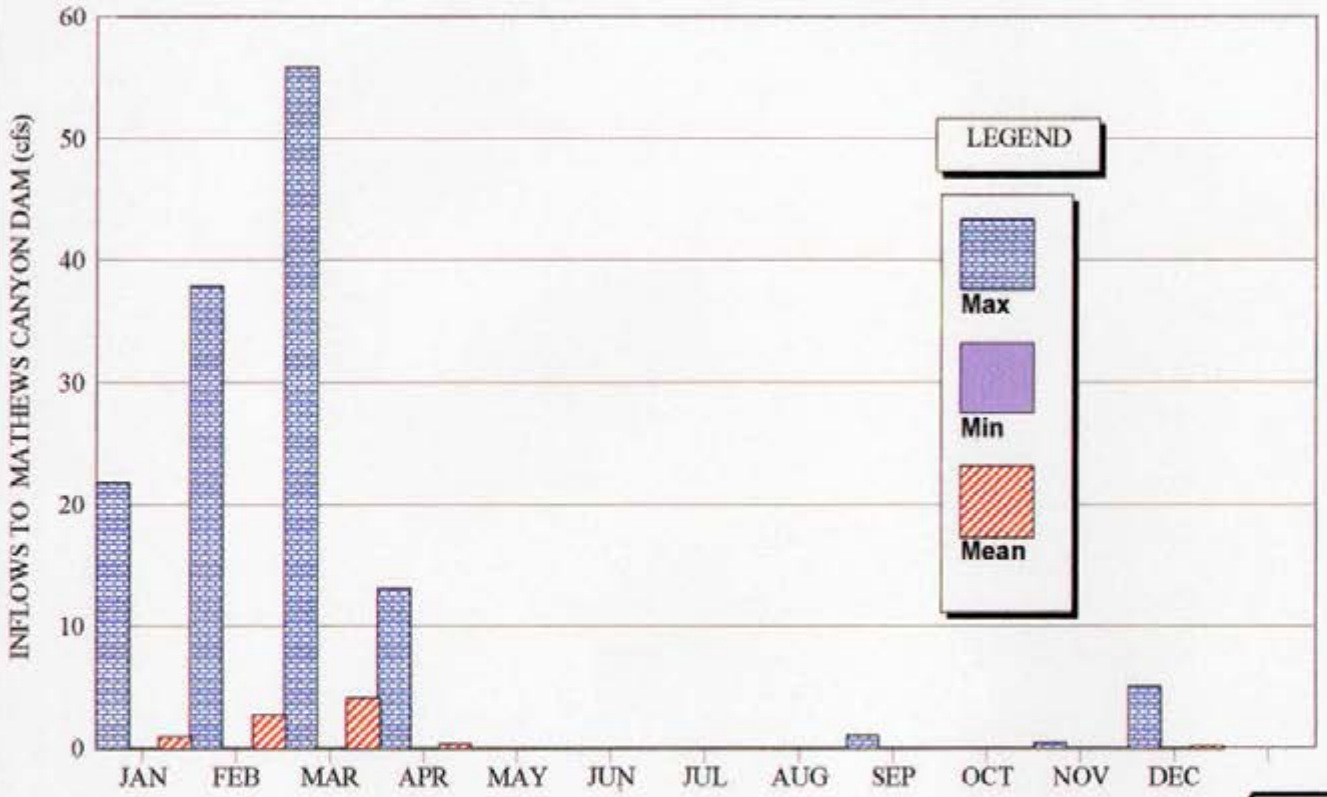

CALIENTE
ACOMA
BARCLAY
Clover Creek
R R
U P
PINE CANYON DAM
MATHEWS CANYON DAM
PINE CANYON
MATHEWS CANYON
114°30'
114°20'
114°10'
37°30'
37°20'
5000
5500
6000
6500
7000
NV.
UT.
CA.
AZ.
PIOCHE
CALIENTE
ST. GEORGE
LAS VEGAS
LAKE MEAD
NEEDLES
VICINITY MAP
SCALE 0 50 100 MILES
AREA COVERED BY MAP
LEGEND
BOUNDARY OF DRAINAGE AREA
EXISTING FLOOD CONTROL DAM
CLIMATOLOGICAL STATION
PRECIPITATION STATION
STREAM-GAGING AND PRECIPITATION STAION
WATER SURFACE ELEVATION AND PRECIPITATION STATION
** NOTE: THESE STATIONS PROVIDE TELEMETRY DATA.
MATHEWS CANYON DAM
CLOVER CREEK, LINCOLN COUNTY, NEVADA
WATER CONTROL MANUAL
PROJECT LOCATION AND TOPOGRAPHY
U.S. ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT



MATHEWS CANYON DAM
CLOVER CREEK, LINCOLN COUNTY, NEVADA
WATER CONTROL MANUAL

ISOHYETS
TOTAL STORM PRECIPITATION
STORM OF 27 - 30 OCTOBER 1946

U.S. ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT



	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Max	21.815	37.935	55.832	13.125	0.000	0.000	0.000	0.000	1.020	0.000	0.456	5.032
Min	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Mean	0.952	2.735	4.148	0.361	0.000	0.000	0.000	0.000	0.026	0.000	0.012	0.192

Note:
Data from official records of the Corps of Engineers'
Reservoir Regulation Section
Period of Record from 1959 - 1997.

MATEHWS CANYON DAM
CLOVER CREEK, LINCOLN COUNTY, NEVADA
WATER CONTROL MANUAL

MONTHLY MAXIMUM, MINIMUM AND MEAN INFLOWS FOR PERIOD OF RECORD

U.S. ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
1959	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1960	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1961	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1962	0.000	2.839	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	2.839
1963	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1964	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1965	0.000	0.000	0.000	0.947	0.000	0.000	0.000	0.000	0.000	0.000	0.000	5.032	5.979
1966	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.355	1.355
1967	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.020	0.000	0.000	0.000	1.020
1968	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1969	21.815	0.544	27.151	13.125	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	62.635
1970	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1971	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.291	0.291
1972	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1973	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1974	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1975	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1976	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1977	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1978	0.000	27.242	55.832	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	83.074
1979	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1980	0.000	37.935	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	37.935
1981	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1982	0.000	0.000	1.006	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.807	1.813
1983	0.000	0.000	50.796	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	50.796
1984	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1985	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1986	0.000	0.495	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.495
1987	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.456	0.000	0.456
1988	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1989	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1990	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1991	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1992	0.000	1.531	3.989	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	5.520
1993	15.070	34.490	8.101	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	57.661
1994	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1995	0.238	1.588	14.913	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	16.739
1996	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1997	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
AVG	0.952	2.735	4.148	0.361	0.000	0.000	0.000	0.000	0.026	0.000	0.012	0.192	8.426

* Data from Official records of the Corps of Engineers' Reservoir Regulation Section Period of Record 1959 - 1997

Maximum inflow values

Note: Unit of all flows are in cubic feet per second.

MATHEWS CANYON DAM
CLOVER CREEK, LINCOLN COUNTY, NEVADA
WATER CONTROL MANUAL

MONTHLY FLOWS FOR PERIOD OF RECORD

U.S. ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT

WATER YEAR	DATE	WATER SURFACE ELEVATION (ft)	DATE	INFLOW** (cfs)	DATE	OUTFLOW** (cfs)
1958	-	5,420.000	-	0	-	0
1959	-	5,420.000	-	0	-	0
1960	-	5,420.000	-	0	-	0
1961	-	5,420.000	-	0	-	0
1962	13 FEB	5,421.985	12 FEB	72	12 FEB	45
1963	-	5,420.000	-	0	-	0
1964	-	5,420.000	-	0	-	0
1965	30 DEC	5,426.736	30 DEC	115	30 DEC	104
1966	7 DEC	5,422.333	6 DEC	30	7 DEC	30
1967	24 SEP	5,421.247	24 SEP	18	24 SEP	13
1968	-	5,420.000	-	0	-	0
1969	1 APR	5,428.245	21 JAN	262	26 JAN	117
1970	-	5,420.000	-	0	-	0
1971	26 DEC	5,420.920	26 DEC	14	26 DEC	9
1972	-	5,420.000	-	0	-	0
1973	-	5,420.000	-	0	-	0
1974	-	5,420.000	-	0	-	0
1975	-	5,420.000	-	0	-	0
1976	-	5,420.000	-	0	-	0
1977	-	5,420.000	-	0	-	0
1978	5 MAR	5,438.785	10 FEB	808	5 MAR	177
1979	-	Not Available	16 MAR	29	-	Not Available
1980	21 FEB	5,432.190	19 FEB	285	21 FEB	142
1981	-	5,420.000	-	0	-	0
1982	23 DEC	5,421.897	26 MAR	36	23 DEC	22
1983	4 MAR	5,445.000	3 MAR	745	4 MAR	196
1984	-	5,420.000	-	0	-	0
1985	-	5,420.000	-	0	-	0
1986	16 FEB	5,420.901	15 FEB	11	16 FEB	9
1987	7 NOV	5,420.708	6 NOV	18	6 NOV	7
1988	-	5,420.000	-	0	-	0
1989	-	5,420.000	-	0	-	0
1990	-	5,420.000	-	0	-	0
1991	-	5,420.000	-	0	-	0
1992	4 MAR	5,424.560	3 MAR	89	4 MAR	76
1993	19 JAN	5,432.316	18 JAN	469	19 JAN	143
1994	-	5,420.000	-	0	-	0
1995	13 MAR	5,429.541	11 MAR	427	12 MAR	145
1996	-	5,420.000	-	0	-	0
1997	-	5,420.000	-	0	-	0

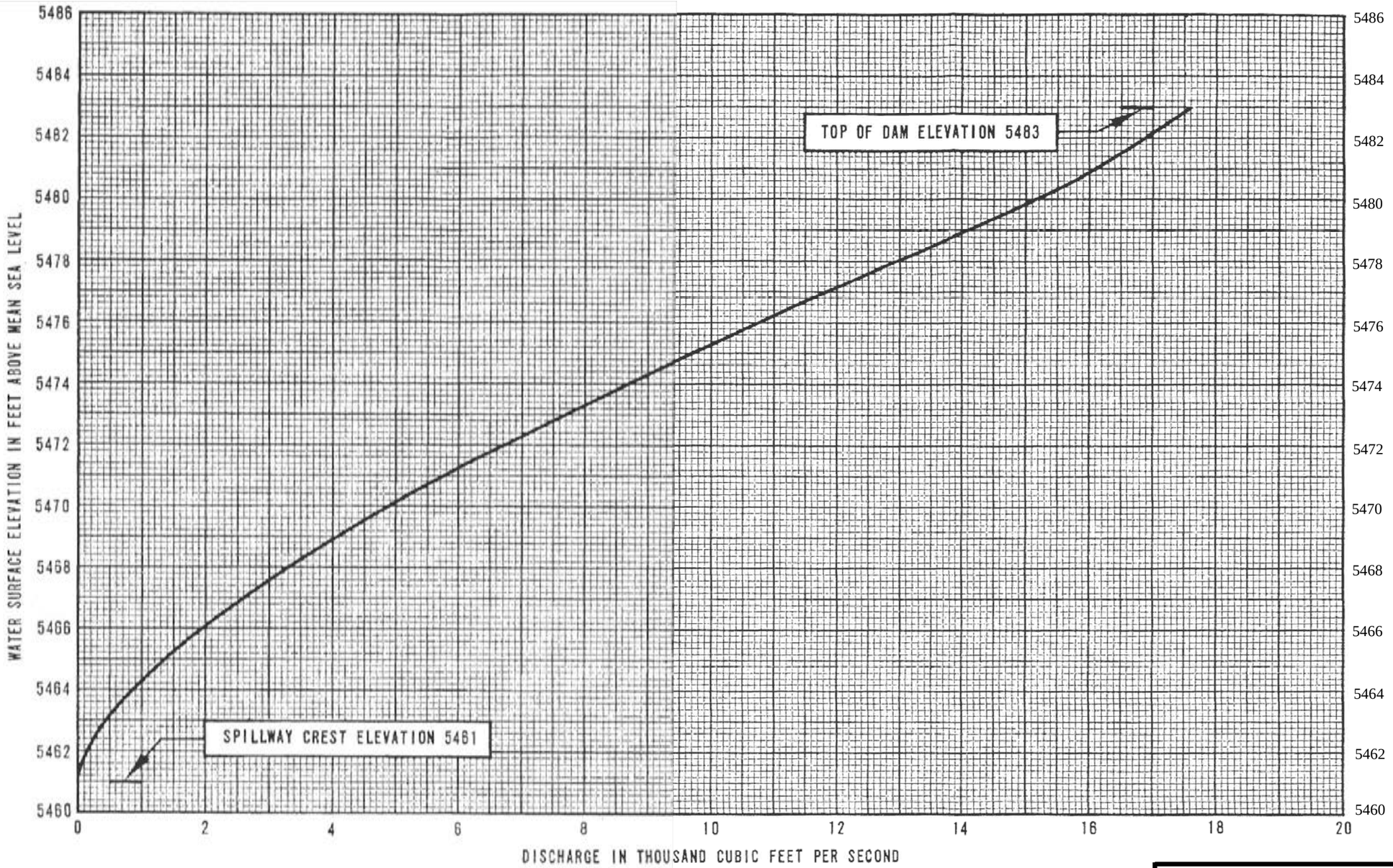
* Period of Record spans 1959 - 1997
Data from the official records of the COE's Reservoir Regulation Section.

** Inflow and Outflow values are averaged over a Period of 1 day.

MATHEWS CANYON DAM
CLOVER CREEK, LINCOLN COUNTY, NEVADA
WATER CONTROL MANUAL

ANNUAL MAXIMUM INFLOWS, OUTFLOWS AND WATER SURFACE ELEVATIONS FOR PERIOD OF RECORD *

U.S. ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT



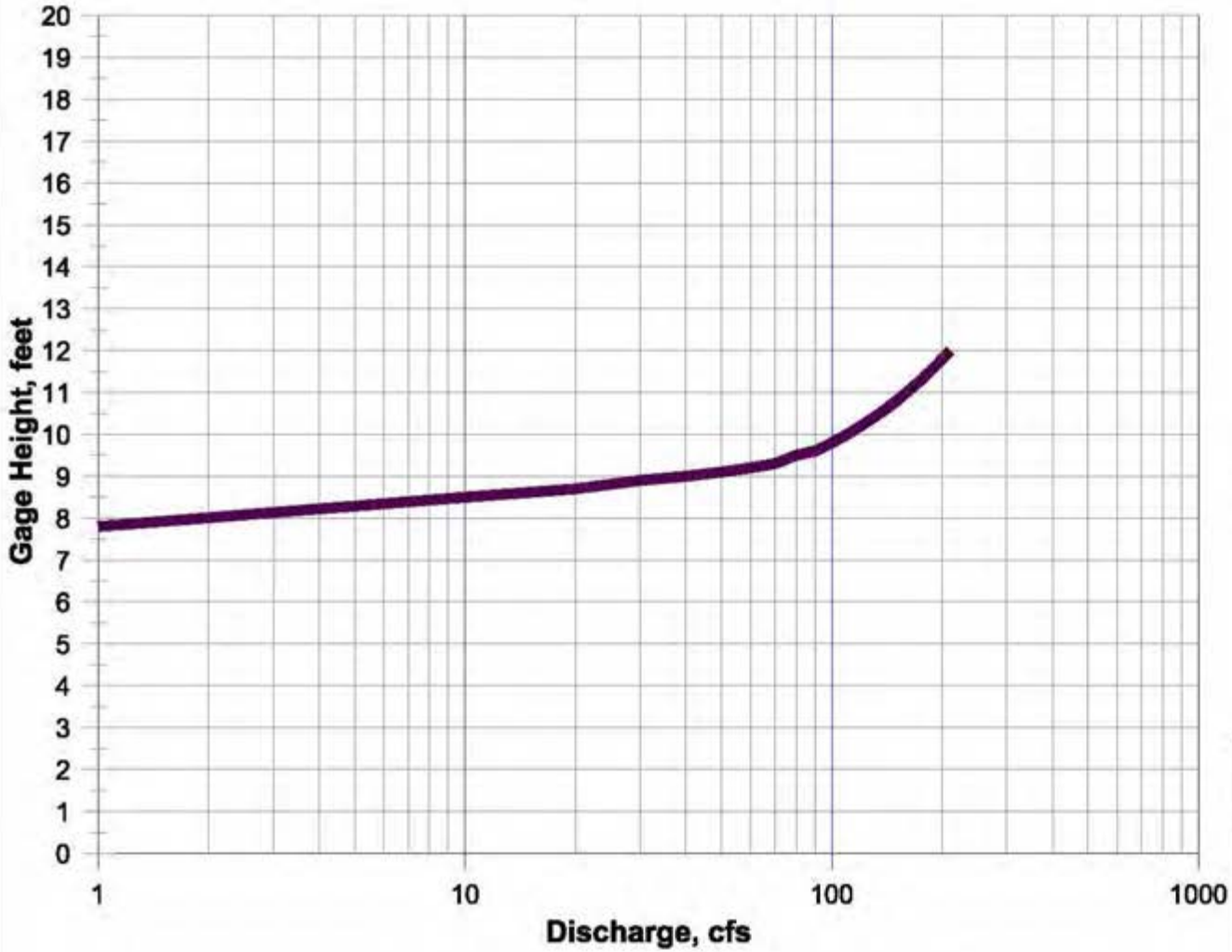
Note:

Curve was computed by the formula $Q = CLH^{3/2}$, where C is based on the P/H_d ratio of 0.33 and corrected for submergence. Corrected C values ranged from 2.96 to 3.71.

MATHEWS CANYON DAM
CLOVER CREEK, LINCOLN COUNTY, NEVADA
WATER CONTROL MANUAL

SPILLWAY DISCHARGE CURVE

U.S. ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT



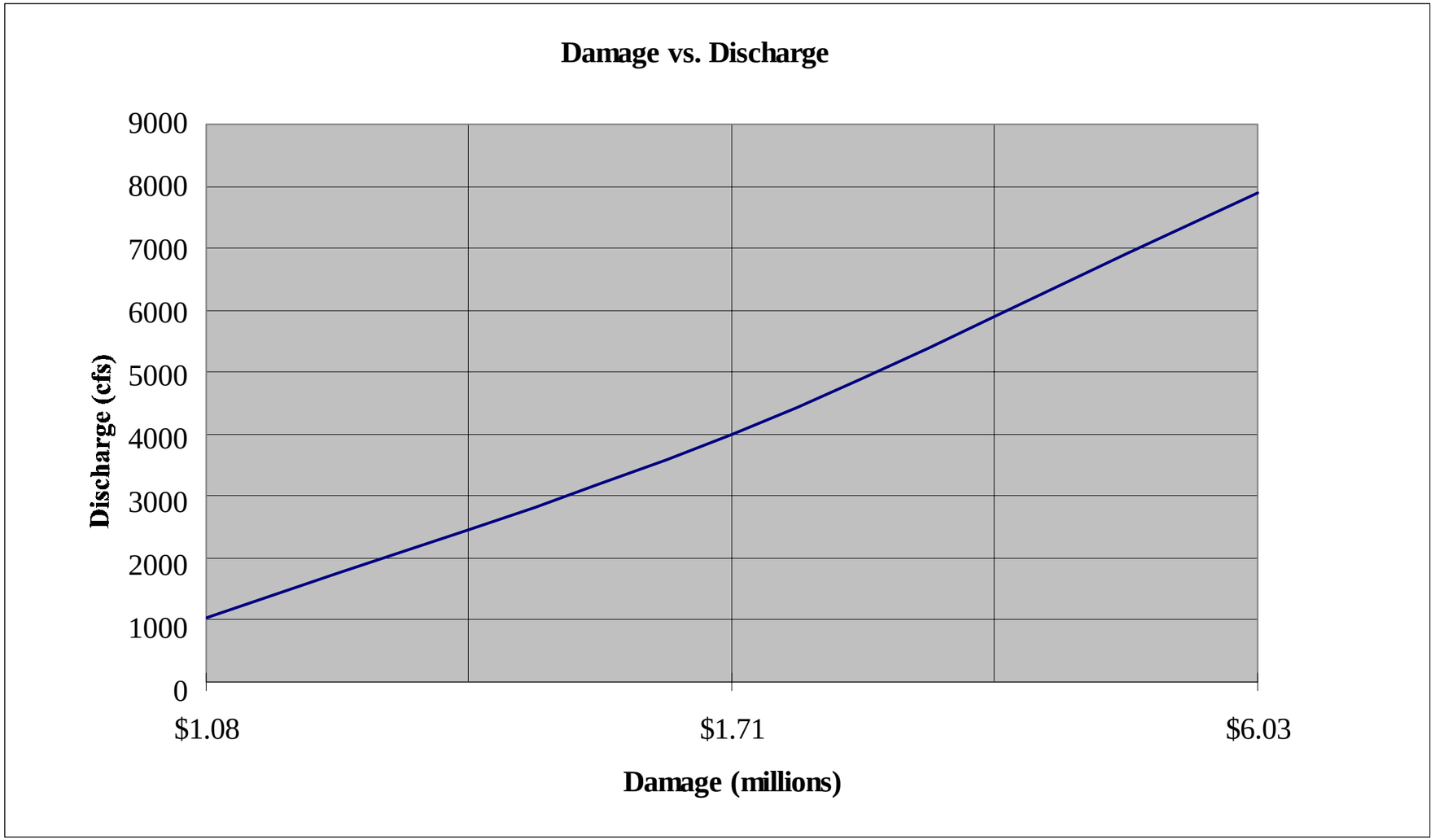
Notes:

1. Rating curve supplied by U.S. Geological Survey.
2. Zero flow is at gage height of 7.4 feet.

MATHEWS CANYON DAM
CLOVER CREEK, LINCOLN COUNTY, NEVADA
WATER CONTROL MANUAL

DISCHARGE RATING CURVE
DOWNSTREAM GAGING STATION

U.S. ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT



Notes:

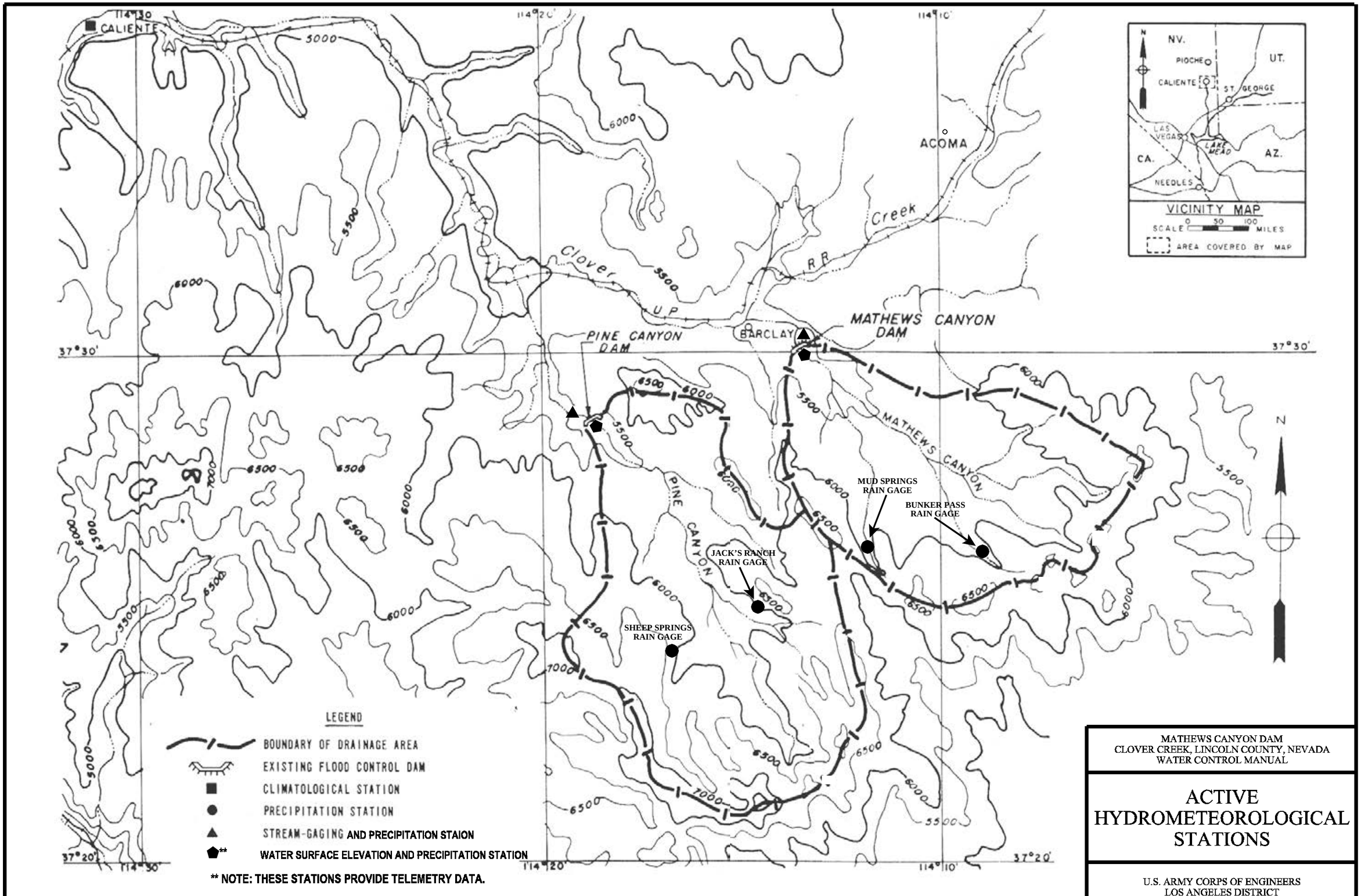
1. The damage reach considered for the economic analysis were four overflow areas, namely Clover Creek, Caliente, Lower Meadow Valley Wash from Caliente to Muddy River, and Lower Muddy River from Meadow Valley Wash to Lake Mead. The damages prevented are discussed in Section 4-12.d.

2. The damage-discharge curve was based on Mathews Canyon and Pine Canyon Dams and Reservoirs as an interdependent unit.

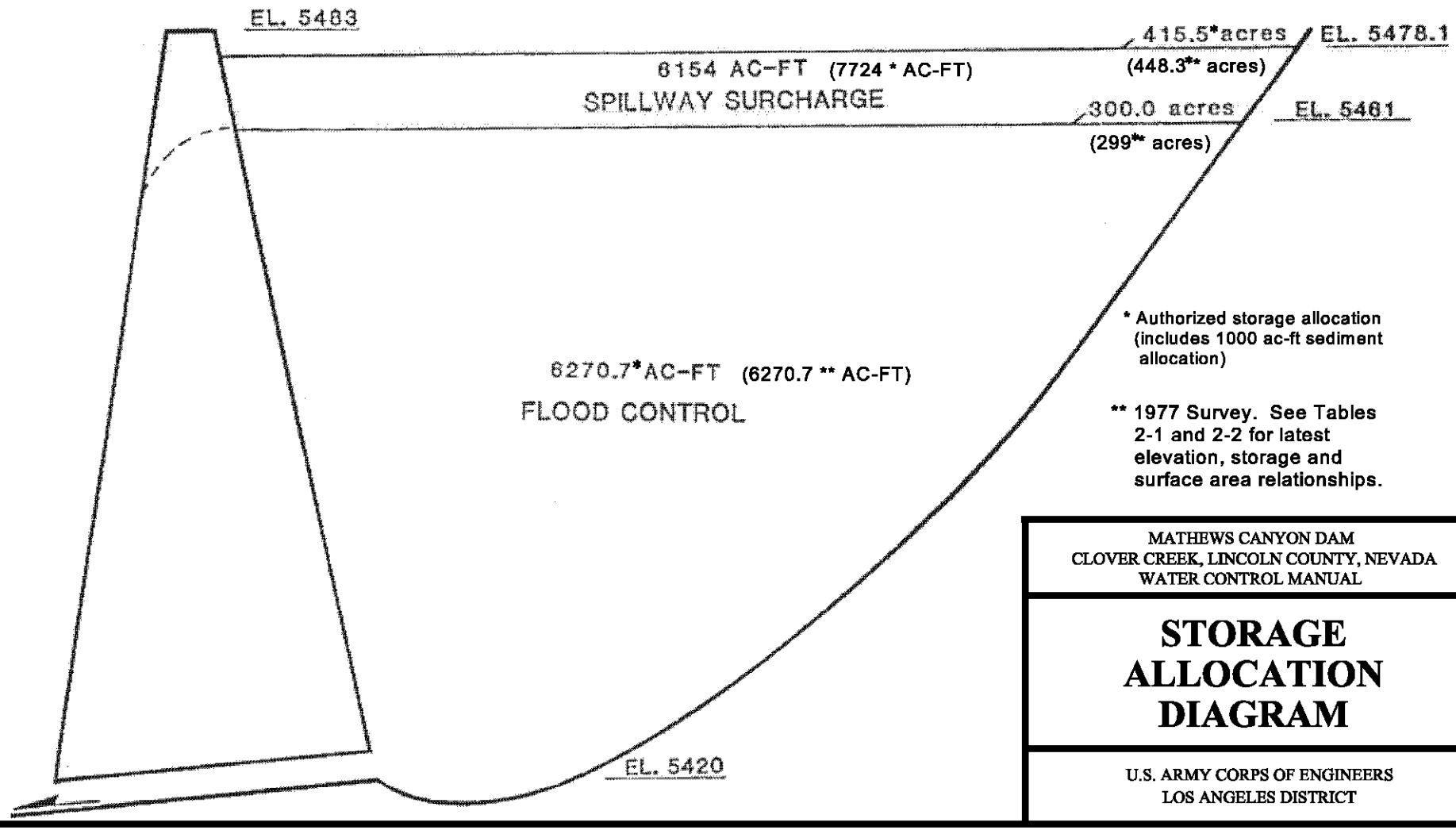
MATHEWS CANYON DAM
CLOVER CREEK, LINCOLN COUNTY, NEVADA
WATER CONTROL MANUAL

DAMAGE - DISCHARGE CURVE

U.S. ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT


CALIENTE
ACOMA
BARCLAY
Clover Creek
R R
U P
PINE CANYON DAM
MATHEWS CANYON DAM
MATHEWS CANYON
PINE CANYON
MUD SPRINGS RAIN GAGE
BUNKER PASS RAIN GAGE
JACK'S RANCH RAIN GAGE
SHEEP SPRINGS RAIN GAGE
114°30'
114°20'
114°10'
37°30'
37°20'
NV.
UT.
AZ.
CA.
PIOCHE
ST. GEORGE
LAS VEGAS
LAKE MEAD
NEEDLES
VICINITY MAP
SCALE 0 50 100 MILES
AREA COVERED BY MAP
LEGEND
BOUNDARY OF DRAINAGE AREA
EXISTING FLOOD CONTROL DAM
CLIMATOLOGICAL STATION
PRECIPITATION STATION
STREAM-GAGING AND PRECIPITATION STAION
** WATER SURFACE ELEVATION AND PRECIPITATION STATION
** NOTE: THESE STATIONS PROVIDE TELEMETRY DATA.
MATHEWS CANYON DAM
CLOVER CREEK, LINCOLN COUNTY, NEVADA
WATER CONTROL MANUAL
ACTIVE HYDROMETEOROLOGICAL STATIONS
U.S. ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT

MATHEWS CANYON RESERVOIR, NEVADA



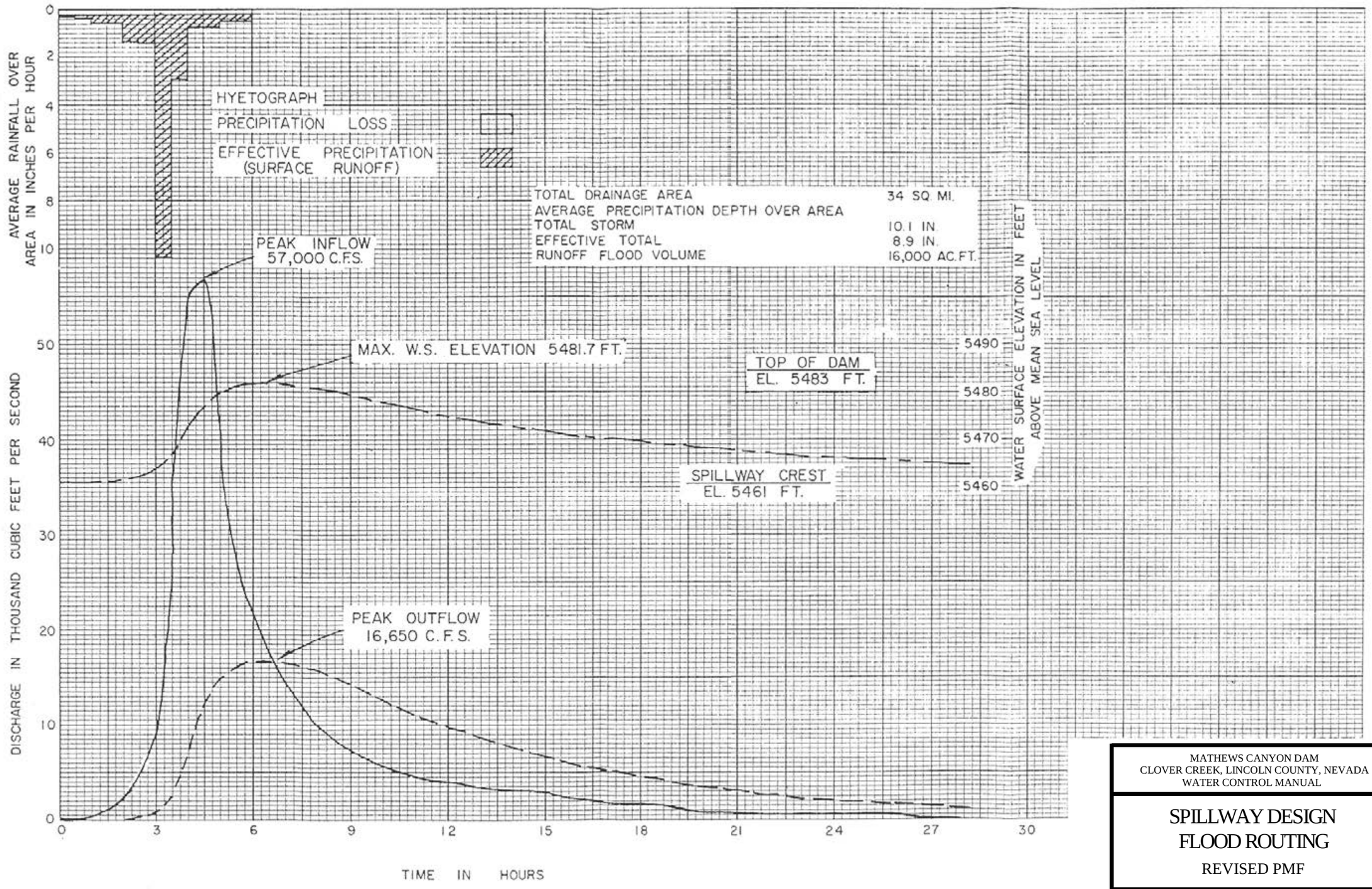
* Authorized storage allocation (includes 1000 ac-ft sediment allocation)

** 1977 Survey. See Tables 2-1 and 2-2 for latest elevation, storage and surface area relationships.

MATHEWS CANYON DAM
CLOVER CREEK, LINCOLN COUNTY, NEVADA
WATER CONTROL MANUAL

STORAGE ALLOCATION DIAGRAM

U.S. ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT

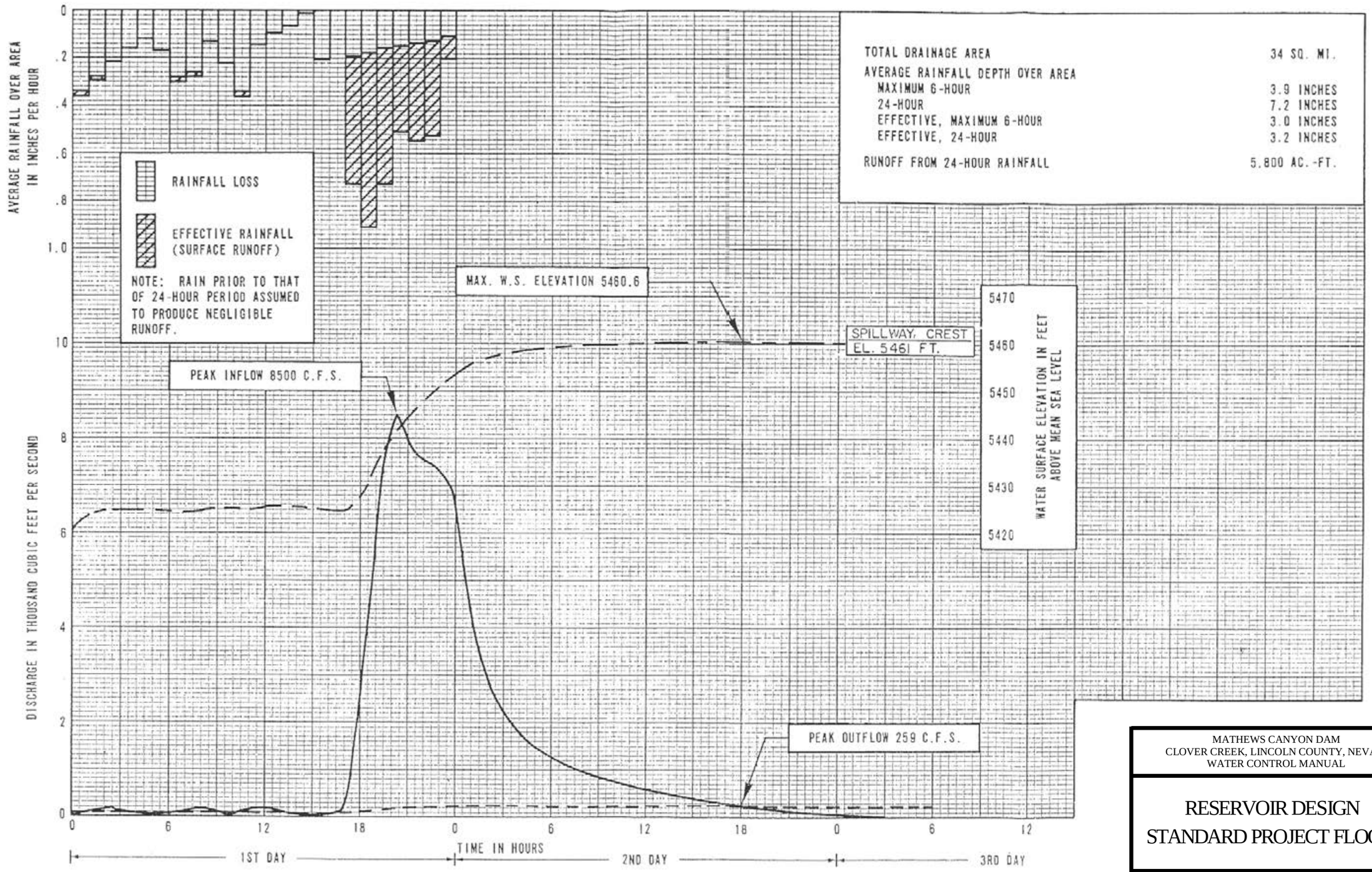


MATHEWS CANYON DAM
CLOVER CREEK, LINCOLN COUNTY, NEVADA
WATER CONTROL MANUAL

SPILLWAY DESIGN
FLOOD ROUTING

REVISED PMF

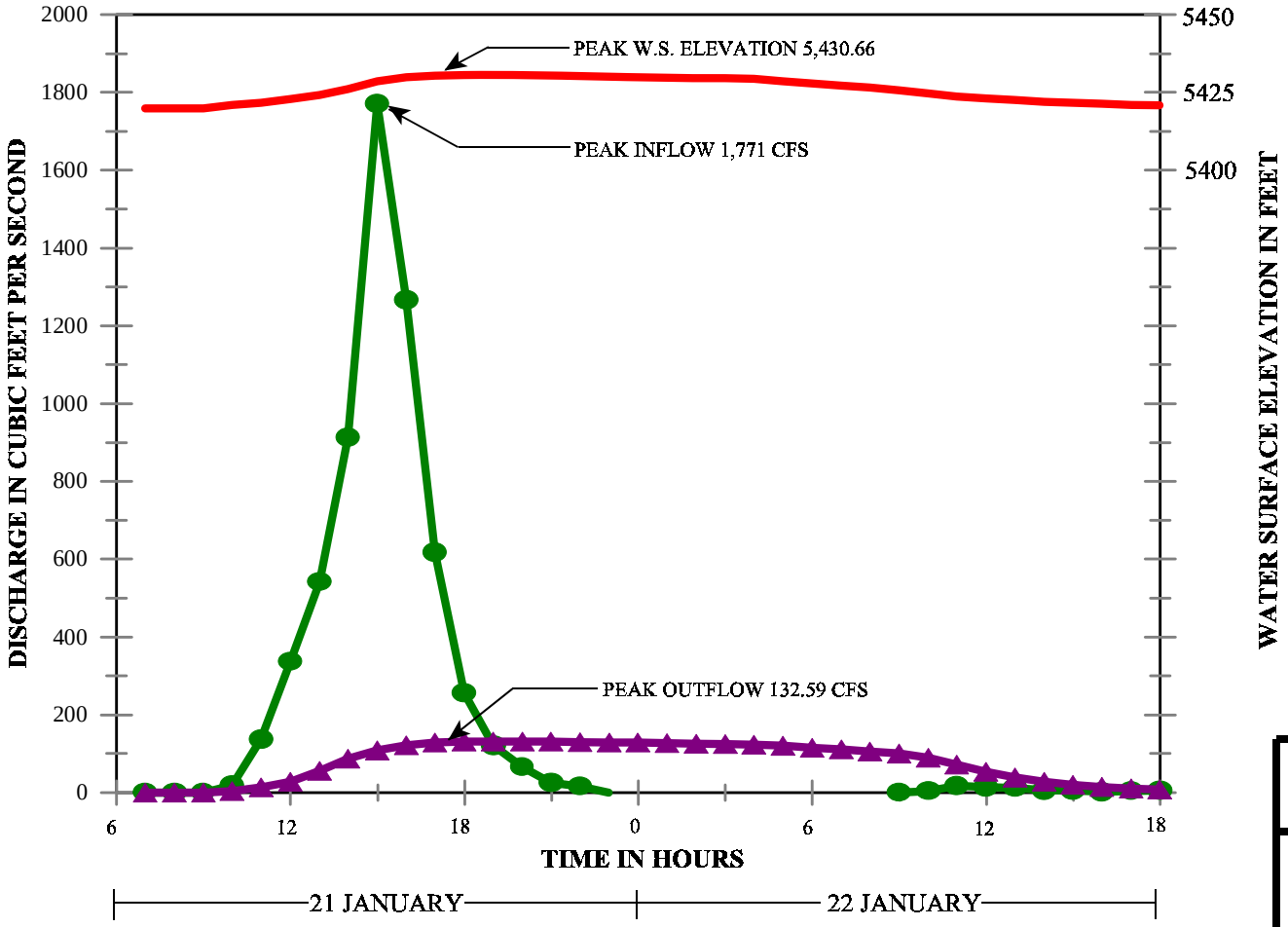
U.S. ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT



MATHEWS CANYON DAM
CLOVER CREEK, LINCOLN COUNTY, NEVADA
WATER CONTROL MANUAL

RESERVOIR DESIGN
STANDARD PROJECT FLOOD

U.S. ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT

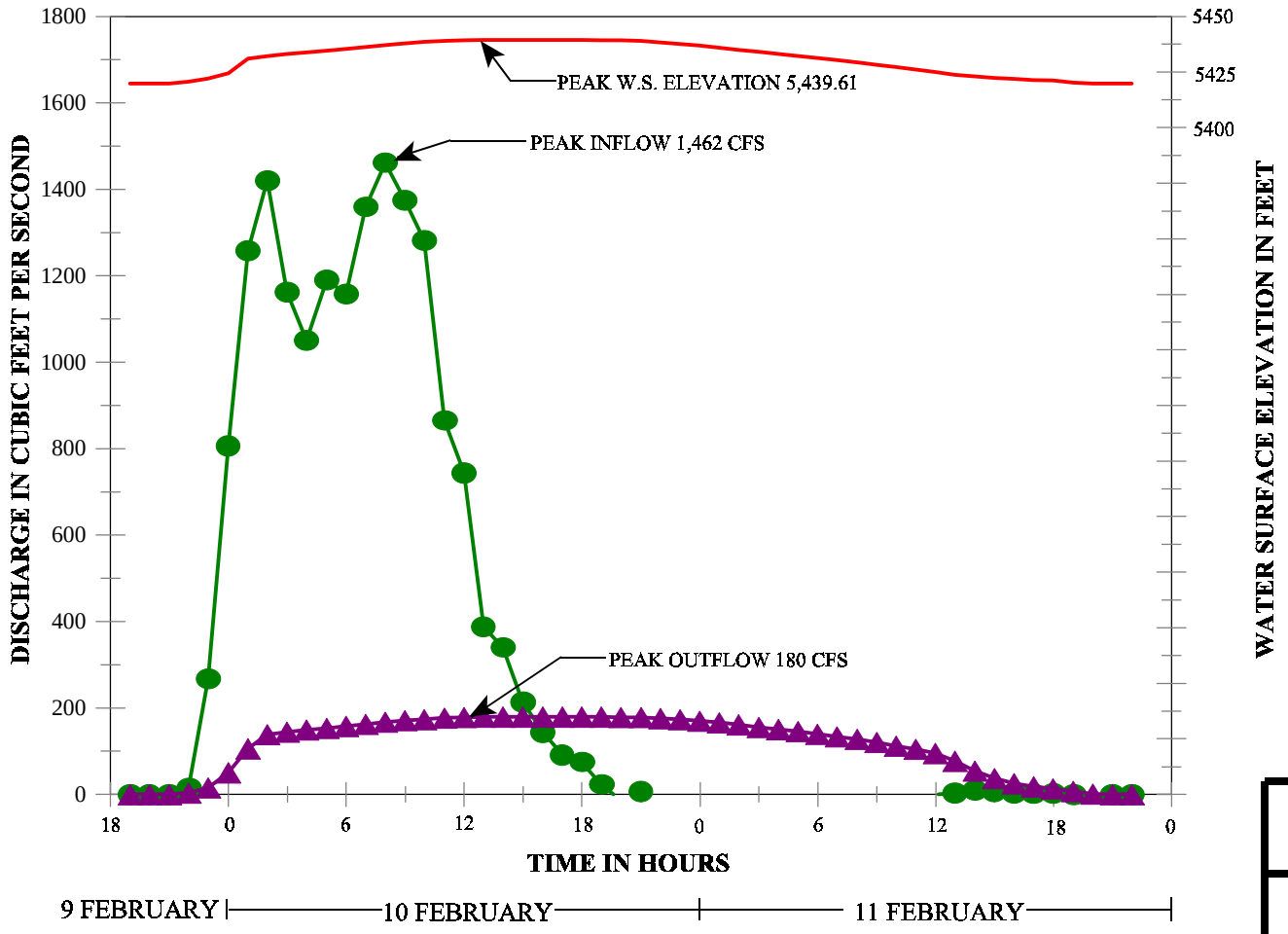


MATHEWS CANYON DAM
CLOVER CREEK, LINCOLN COUNTY, NEVADA
WATER CONTROL MANUAL

OPERATION HYDROGRAPHS

21 JANUARY - 22 JANUARY1969

U.S. ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT

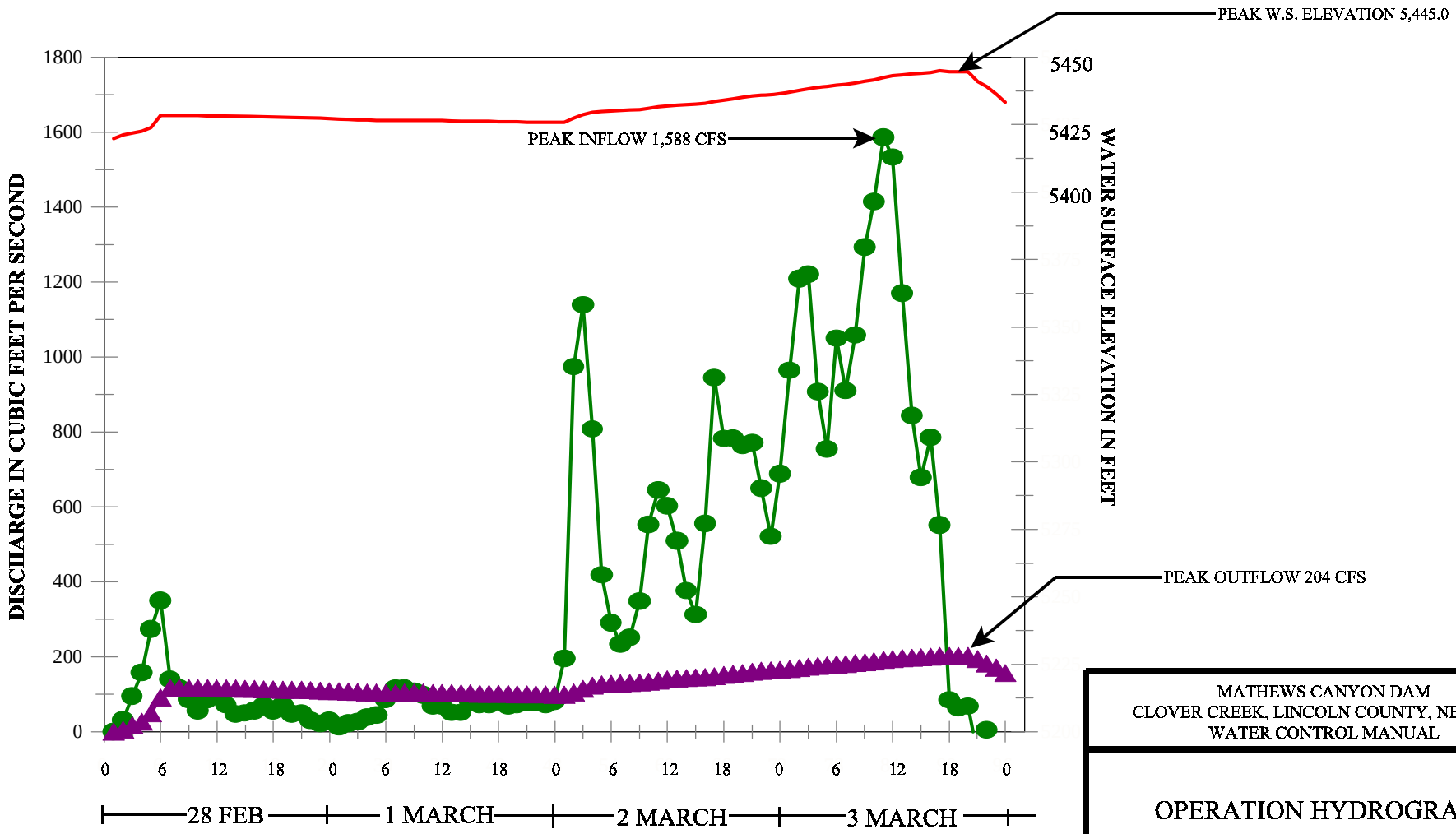


MATHEWS CANYON DAM
CLOVER CREEK, LINCOLN COUNTY, NEVADA
WATER CONTROL MANUAL

OPERATION HYDROGRAPHS

9 FEBRUARY - 11 FEBRUARY 1978

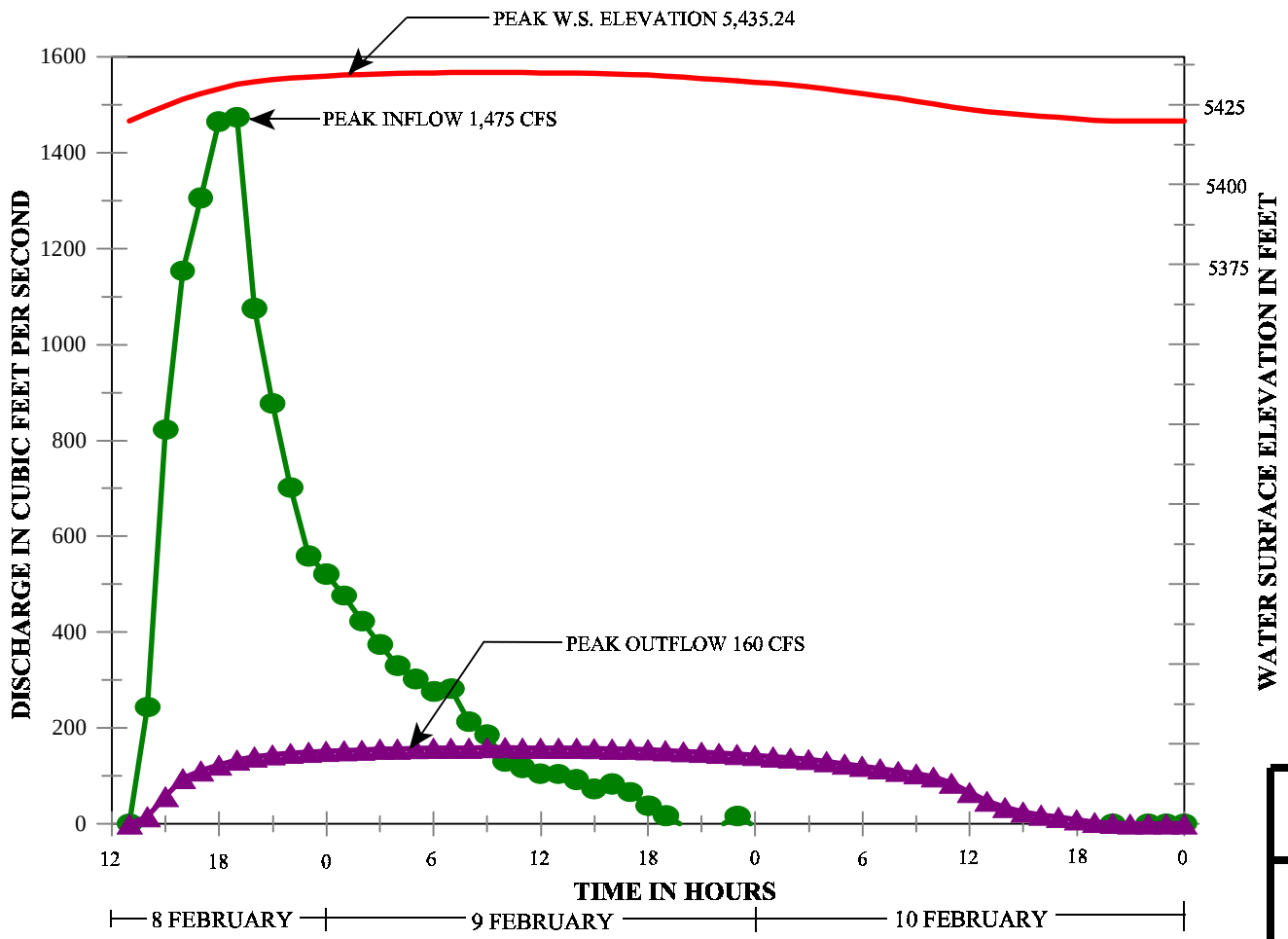
U.S. ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT



MATHEWS CANYON DAM
CLOVER CREEK, LINCOLN COUNTY, NEVADA
WATER CONTROL MANUAL

OPERATION HYDROGRAPHS
28 FEBRUARY - 3 MARCH 1983

U.S. ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT

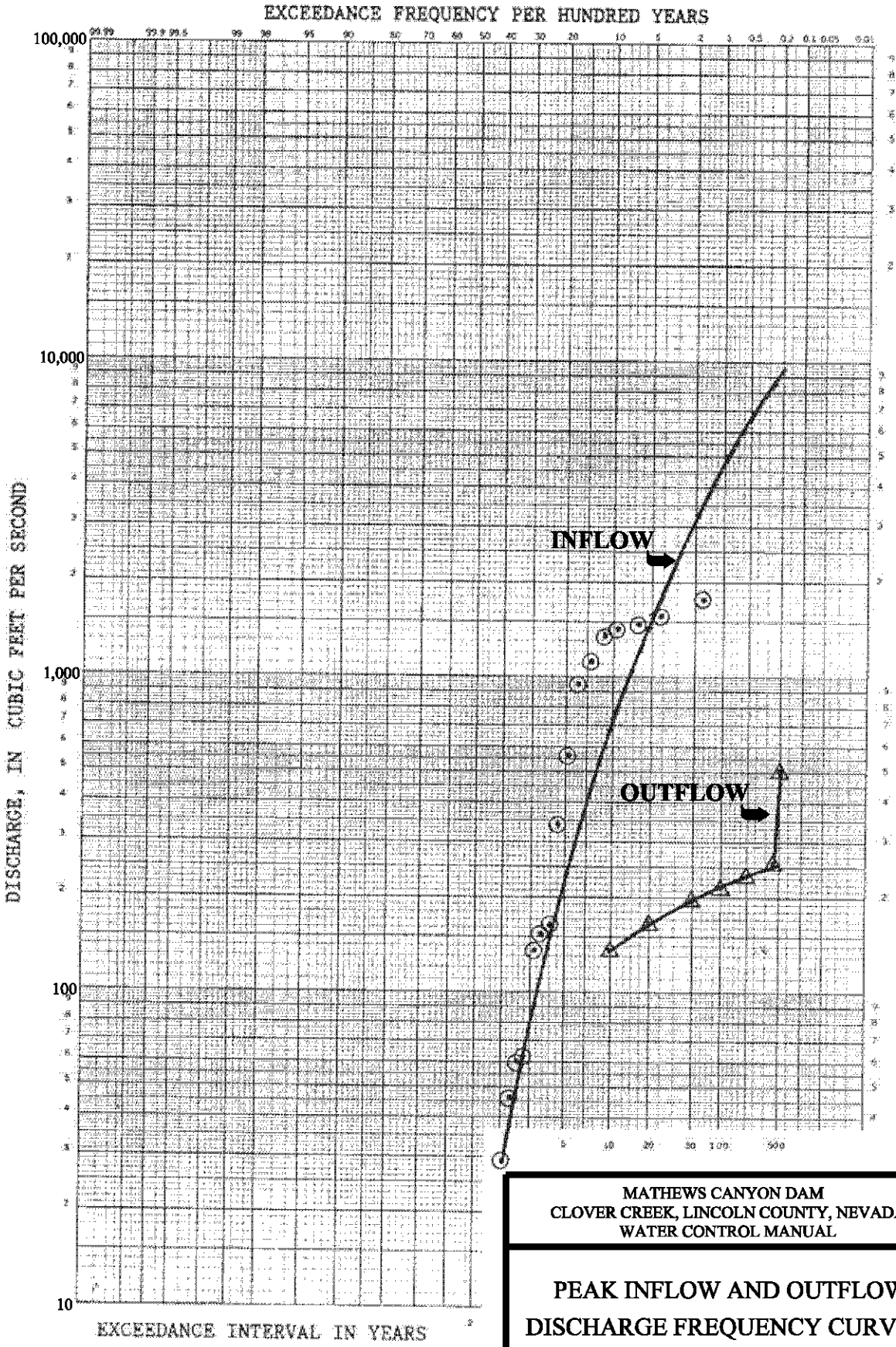


MATHEWS CANYON DAM
CLOVER CREEK, LINCOLN COUNTY, NEVADA
WATER CONTROL MANUAL

OPERATION HYDROGRAPH

8 FEBRUARY - 10 FEBRUARY 1993

U.S. ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT



NOTE:

PERIOD OF RECORD 1959 - 1997

The pattern of peak inflows plotted for this graphical analysis is not representative of the entire period of record. Within the available 39 years of record, there were 22 years of zero (0) peaks. Refer to table on plate 8-08.

MATHEWS CANYON DAM
CLOVER CREEK, LINCOLN COUNTY, NEVADA
WATER CONTROL MANUAL

PEAK INFLOW AND OUTFLOW DISCHARGE FREQUENCY CURVES PRESENT CONDITIONS

U.S. ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT

					Ordered Data				Exceedence	Exceedence
YEAR	PEAKS	1 DAY	2 DAYS	3 DAYS	PEAKS	1 DAY	2 DAYS	3 DAYS	Frequency	Interval (yrs)
1959	0	0	0	0	0	0	0	0	98.200	1.018
1960	0	0	0	0	0	0	0	0	95.700	1.045
1961	0	0	0	0	0	0	0	0	93.200	1.073
1962	563	72	37	25	0	0	0	0	90.600	1.104
1963	0	0	0	0	0	0	0	0	88.100	1.135
1964	0	0	0	0	0	0	0	0	85.500	1.169
1965	946	115	82	55	0	0	0	0	83.000	1.205
1966	164	30	22	15	0	0	0	0	80.500	1.242
1967	138	18	16	11	0	0	0	0	77.900	1.284
1968	0	0	0	0	0	0	0	0	75.400	1.326
1969	1,771	262	158	125	0	0	0	0	72.900	1.372
1970	0	0	0	0	0	0	0	0	70.300	1.422
1971	60	14	7	5	0	0	0	0	67.800	1.475
1972	0	0	0	0	0	0	0	0	65.200	1.534
1973	0	0	0	0	0	0	0	0	62.700	1.595
1974	0	0	0	0	0	0	0	0	60.200	1.661
1975	0	0	0	0	0	0	0	0	57.600	1.736
1976	0	0	0	0	0	0	0	0	55.100	1.815
1977	0	0	0	0	0	0	0	0	52.500	1.908
1978	1,462	808	370	300	0	0	0	0	50.000	2.000
1979	29	29	29	22	0	0	0	0	47.500	2.105
1980	1,353	285	237	199	0	0	0	0	44.900	2.227
1981	0	0	0	0	1	1	1	1	42.400	2.358
1982	153	36	18	12	29	11	7	5	39.800	2.513
1983	1,588	745	688	498	46	14	9	6	37.300	2.681
1984	0	0	0	0	60	18	9	6	34.800	2.873
1985	0	0	0	0	64	18	16	11	32.200	3.105
1986	46	11	9	6	138	29	18	12	29.700	3.367
1987	64	18	9	6	153	30	22	15	27.100	3.69
1988	0	0	0	0	164	36	29	22	24.600	4.065
1989	0	0	0	0	341	72	37	25	22.100	4.525
1990	0	0	0	0	563	89	65	43	19.500	5.128
1991	0	0	0	0	946	115	82	55	17.000	5.882
1992	341	89	65	43	1,133	262	158	125	14.500	6.896
1993	1,475	469	301	202	1,353	285	237	159	11.900	8.403
1994	0	0	0	0	1,462	427	239	199	9.400	10.638
1995	1,133	427	239	159	1,475	469	301	202	6.800	14.706
1996	0	0	0	0	1,588	745	370	300	4.300	23.256
1997	0	0	0	0	1,771	808	688	498	1.760	56.818

NOTE:

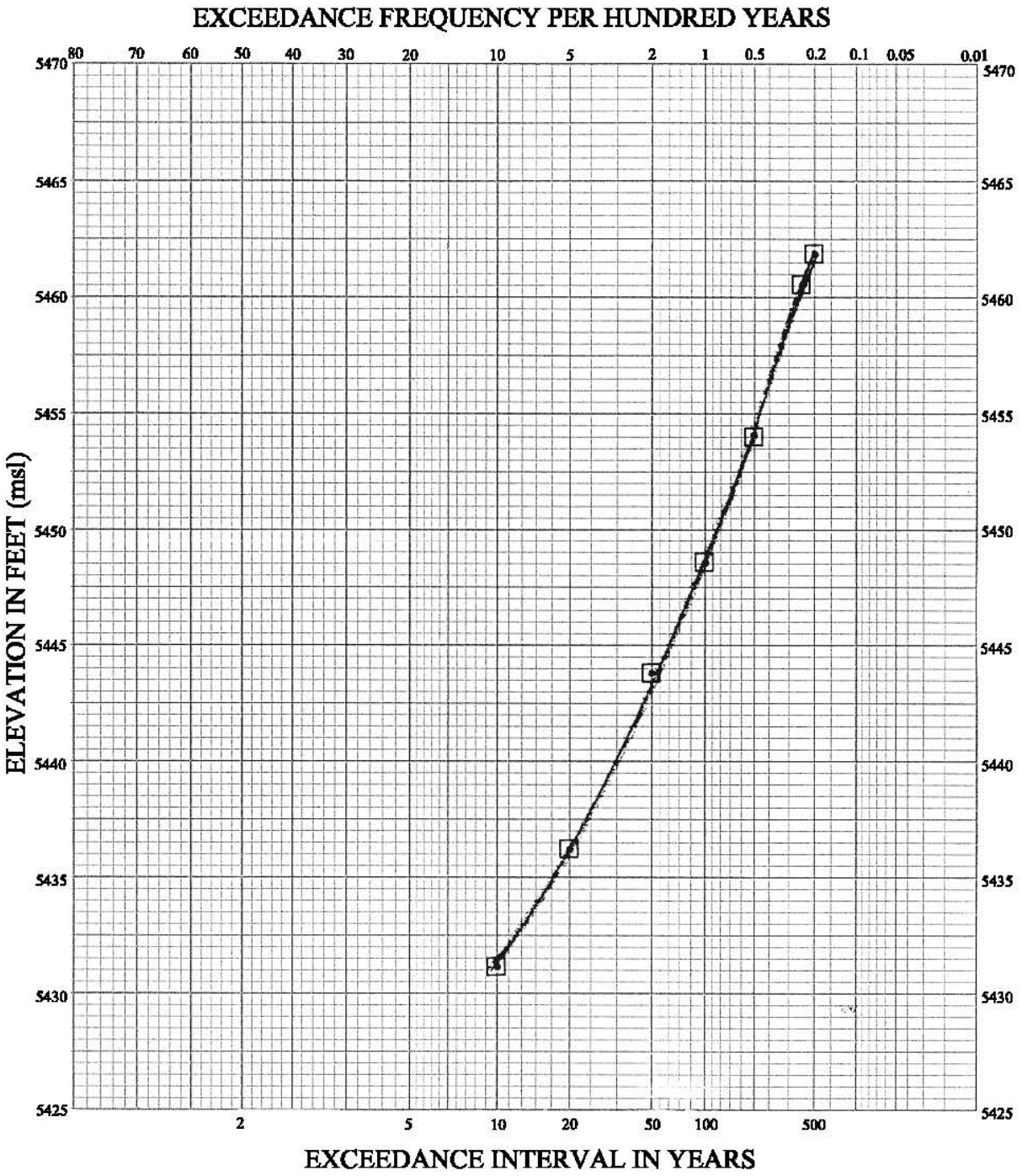
Period of Record spans 1959 - 1997.

Data from the official records of the COE's Reservoir Regulation Section.

MATHEWS CANYON DAM
CLOVER CREEK, LINCOLN COUNTY, NEVADA
WATER CONTROL MANUAL

ANNUAL PEAK, 1-DAY, 2-DAY, AND 3-DAY INFLOW VALUES USED FOR FREQUENCY ANALYSIS

U.S. ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT



NOTE:

PERIOD OF RECORD 1959 - 1997

MATHEWS CANYON DAM
CLOVER CREEK, LINCOLN COUNTY, NEVADA
WATER CONTROL MANUAL

FILLING FREQUENCY CURVE PRESENT CONDITONS

U.S. ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT

EXHIBIT A. SUPPLEMENTARY PERTINENT DATA

SUPPLEMENTARY PERTINENT DATA

General Information

Item	Description or Quantity & Units
Other names of Project	Mathews Canyon Dam - Meadow Valley Wash and Lower Muddy River Basins, Nevada
Location	Mathews Canyon tributary to Meadow Valley Wash, Lincoln County, Nevada
Type of Project	Flood Control Reservoir
Objectives of regulation	Project authorized for single-purpose operation (flood control)
Project owner	U.S. Army Corps of Engineers, Los Angeles District
Operation Agency	U.S. Army Corps of Engineers, Los Angeles District. Official business hours: 0730-1600, Monday through Friday Tel (213) 452-3527
Regulating Agency	U.S. Army Corps of Engineers, Los Angeles District
Inter-Agency Agreements	U.S. Army Corps of Engineers has an agreement with Lincoln County Flood Emergency Management to keep the downstream channels free from man-made encroachment, and to adjust all water-rights claims resulting from the operation of Mathews Canyon Dam.
Project Cost	$830,000 (Cost based on June 1955 price levels)
Closure date	16 December 1957
Reservoir Lake or Pool	
Pertinent Elements	See Table located on the inside front cover.

Real Estate	Lands acquired for the project were Public Domain land and acquired by withdrawal by Public Land Order. Elevation of taking line is approximately the top of the dam, elevation 5,483 ft, msl. Real Estate taking line for easement is 0 acres.
Range of clearing	Real Estate lands acquired below top of dam elevation of 5,483 and above spillway surcharge elevation of 5,481.7 ft, msl, totals 415.5 acres. Total acquired Real Estate below spillway crest elevation 5,461 ft, msl, is 300.0 acres.
Pool elevation corresponding to maximum non-damaging releases	Non-damaging release is 260 cfs, which is the maximum capacity of the dam outlet.
Reservoir length at top of conservation pool	None
Shoreline length at top of conservation pool	None
Safety aspects, possibly requiring warning	Dam breach and spillway flow conditions - Check Emergency Action Plan dated January 1986.
Emergency drawdown	Not applicable. The only outlet is the 3.5 ft diameter opening which conveys all flood flows from the reservoir.
Project area data Reservoir area Downstream area	 Construction camp site (picnic area) is located approximately at elevation 5,425 ft, msl. No downstream facilities are affected by releases from the outlet works.
<u>Hydrology</u>	
Drainage area	34 square miles
Design Floods	See Table on the inside front cover.
Climate	Semiarid with some wet winters and dry summers.

One inch of runoff	Over Mathews Canyon Basin drainage area (34 square miles) is equivalent to a volume of 1814 acre-feet
Storm types	General winter storms, general summer storms (tropical rain)
Flood seasons	Flood season is 15 November - 15 April
Low flow season	Reservoir remains dry most of the year, especially during the months of June - September.
Minimum daily flow	Minimum daily inflow is 0 cfs
Minimum monthly flow	Same as minimum daily flow
Minimum annual flow	Same as minimum daily flow
Average annual flow	8.43 cfs
Maximum annual flow	Maximum recorded flow is 1771 cfs during the January storm of 1969
Maximum monthly flow	Same as maximum annual flow
Maximum daily flow	Maximum daily flow is 1771 cfs, 21 January 1969
Key streamflow station tunnel	Downstream gage located at outlet
Type of data at dam	Automatic recording telemetry gages for precipitation, water surface elevation
Stations for hydrologic forecasting	None. No hydrologic forecasting is done
No. of snow courses	None. Snow doesn't last for more than a few days.
Number of sediment ranges	None. Sedimentation records are not kept.
Embankment	
Location	20 miles southeast of Caliente and 100 miles northeast of Las Vegas, Nevada.
Purpose	Protection of agriculture, community, structures, and against loss of life
Type of fill	Earthfill

Slope protection	Upstream face is covered with 2-foot layer of riprap. There is also a 4-foot layer of stone on the downstream toe.
Height	71 feet
Length	800 feet
Top elevation	5,483 feet, msl
Design flood	SPF - 8,000 cfs
Freeboard	4.9 feet
Spillway	
Location	Left abutment
Type	Rectangular reinforced concrete with an ogee crest
Crest elevation	5,461 feet, msl
Net overflow length	50 feet
Spillway activation	When WSE exceeds 5,461 feet, msl
Outlet Facilities	
Location	Right abutment of dam
Purpose	Flood control
Type outlet	Circular conduit
Size of outlet	3.5 feet diameter
Type of service gate or valve	Ungated
Number and size of gates and valves	None
Entrance invert elevation	5,420 feet, msl
Discharge at pertinent elevations	Bottom, elevation 5,420 = 0 cfs Flood control pool, elevation 5,461 = 260 cfs
Minimum pool elevation	5,420 feet, msl
Type energy dissipater	Stilling basin

EXHIBIT B. PERTINENT DATA OF PROJECT AFFECTING MATHEWS CANYON DAM

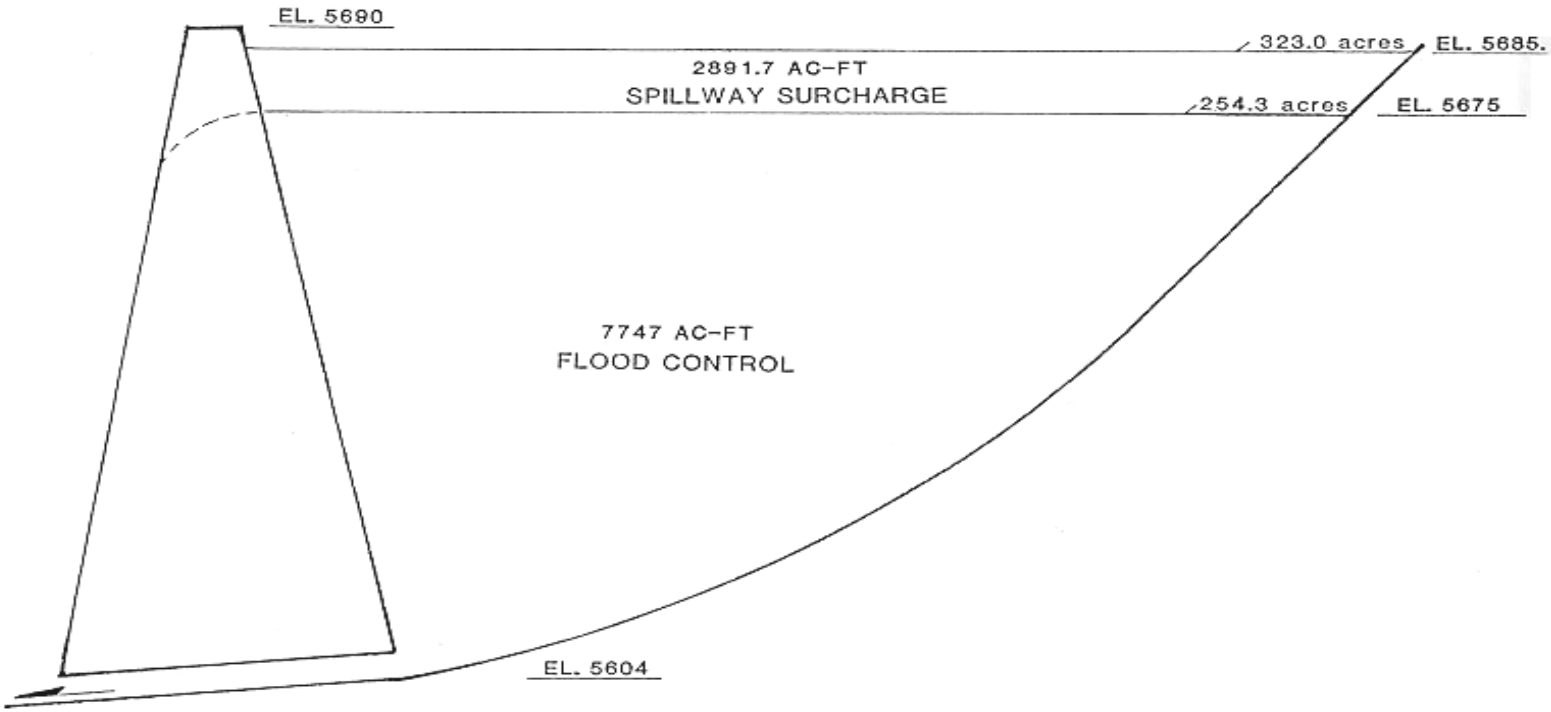
PINE CANYON DAM AND RESERVOIR
LINCOLN COUNTY, NEVADA

PERTINENT DATA
MAY 1983

Stream System	Clover Creek
Drainage Area ... sq.mi..	45
Reservoir:	
Elevation	
Streambed at dam ... ft., m.s.l..	5,604
Flood control pool (spillway crest) ... ft., m.s.l..	5,675
Spillway design surcharge level ... ft., m.s.l..	5,685.1
Top of Dam ... ft., m.s.l..	5,690.0
Area	
Spillway crest ... acres..	254.3
Spillway design surcharge level ... acres..	323.0
Top of dam ... acres..	362.5
Capacity, gross	
Spillway crest ... acre-ft..	7,747 (3.23*)
Spillway design surcharge level ... acre-ft..	10,638.7 (4.43*)
Top of Dam ... acre-ft..	12,328.5 (5.14*)
Allowance for sediment (50 year) ... acre-ft..	1,400 (0.58*)
Dam: - Type	Earthfill
Height above original streambed ... ft..	92
Top length ... ft..	884
Top width ... ft..	20
Freeboard ... ft..	4.9
Spillway: - Type	Ungated, Crest-Block
Crest length ... ft..	330
Design surcharge ... ft..	10.1
Design discharge ... c.f.s..	31,700
Outlets conduit:	
Invert elevation ... ft., m.s.l..	5,604
Diameter ... ft..	3.5
Length ... ft..	479
Maximum capacity at spillway crest ... c.f.s..	322
Outlet channel (unlined):	
Length ... ft..	150
Capacity ... c.f.s..	340
Reservoir design flood:	
Duration (inflow) ... Days..	3
Total volume ... acre-ft..	7,300 (3.04*)
Inflow peak ... c.f.s..	10,500
Spillway design flood:	
Duration (inflow) ... Days..	1
Total volume ... acre-ft..	18,000 (7.50*)
Inflow peak ... c.f.s..	68,000
Historic maximums:	
Maximum release ... c.f.s..	303
Date	3-3-78
Maximum water surface elevation ... ft., m.s.l..	5639.4
Date	3-5-78

*inches of runoff

PINE CANYON RESERVOIR, NEVADA



PINE CANYON DAM

ELEVATION IN FEET VS STORAGE IN ACRE-FEET

ELEV	0.0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
5604	0.0	0.0	0.1	0.1	0.2	0.4	0.5	0.7	1.0	1.2
5605	1.5	1.8	2.1	2.5	2.9	3.3	3.7	4.2	4.6	5.1
5606	5.7	6.2	6.8	7.4	8.0	8.6	9.3	10.0	10.7	11.4
5607	12.1	12.9	13.7	14.5	15.4	16.2	17.1	18.1	19.0	20.0
5608	20.9	21.9	22.9	24.0	25.1	26.2	27.3	28.5	29.7	30.8
5609	32.1	33.3	34.6	35.8	37.2	38.5	39.8	41.2	42.6	44.1
5610	45.5	47.0	48.5	50.0	51.5	53.1	54.7	56.3	57.9	59.6
5611	61.3	63.0	64.7	66.5	68.3	70.1	71.9	73.8	75.6	77.5
5612	79.5	81.4	83.4	85.4	87.4	89.4	91.5	93.6	95.7	97.8
5613	100.0	102.2	104.4	106.6	108.9	111.2	113.5	115.8	118.2	120.5
5614	122.9	125.4	127.8	130.3	132.8	135.3	137.8	140.4	143.0	145.6
5615	148.2	150.9	153.6	156.3	159.1	161.8	164.6	167.4	170.3	173.2
5616	176.0	179.0	181.9	184.9	187.9	190.9	194.0	197.1	200.2	203.3
5617	206.4	209.6	212.8	216.1	219.3	222.6	225.9	229.3	232.6	236.0
5618	239.4	242.9	246.4	249.9	253.4	256.9	260.5	264.1	267.7	271.4
5619	275.0	278.8	282.5	286.2	290.0	293.8	297.7	301.5	305.4	309.3
5620	313.2	317.2	321.2	325.2	329.3	333.4	337.5	341.6	345.8	350.0
5621	354.2	358.5	362.7	367.1	371.4	375.8	380.2	384.6	389.0	393.5
5622	398.0	402.6	407.2	411.8	416.4	421.1	425.8	430.5	435.2	440.0
5623	444.8	449.6	454.5	459.4	464.3	469.3	474.2	479.3	484.3	489.4
5624	494.4	499.6	504.7	509.9	515.1	520.4	525.6	530.9	536.3	541.6
5625	547.0	552.4	557.9	563.3	568.8	574.4	579.9	585.5	591.2	596.8
5626	602.5	608.2	614.0	619.7	625.5	631.4	637.2	643.1	649.1	655.0
5627	661.0	667.0	673.1	679.1	685.2	691.4	697.5	703.7	710.0	716.2
5628	722.5	728.8	735.2	741.5	747.9	754.4	760.8	767.3	773.9	780.4
5629	787.0	793.6	800.3	806.9	813.6	820.4	827.1	833.9	840.8	847.6
5630	854.5	861.4	868.4	875.3	882.3	889.4	896.4	903.5	910.7	917.8
5631	925.0	932.2	939.5	946.7	954.0	961.4	968.7	976.1	983.6	991.0
5632	998.5	1006.0	1013.6	1021.1	1028.7	1036.4	1044.0	1051.7	1059.5	1067.2
5633	1075.0	1082.8	1090.7	1098.5	1106.4	1114.4	1122.3	1130.3	1138.4	1146.4
5634	1154.5	1162.6	1170.8	1178.9	1187.1	1195.4	1203.6	1211.9	1220.3	1228.6
5635	1237.0	1245.4	1253.9	1262.4	1270.9	1279.4	1288.0	1296.7	1305.3	1314.0
5636	1322.7	1331.5	1340.3	1349.2	1358.0	1366.9	1375.9	1384.9	1393.9	1402.9
5637	1412.0	1421.1	1430.3	1439.5	1448.7	1457.9	1467.2	1476.6	1485.9	1495.3
5638	1504.7	1514.2	1523.7	1533.3	1542.8	1552.4	1562.1	1571.8	1581.5	1591.2
5639	1601.0	1610.8	1620.7	1630.6	1640.5	1650.4	1660.4	1670.5	1680.5	1690.6
5640	1700.7	1710.9	1721.1	1731.4	1741.6	1752.0	1762.3	1772.7	1783.1	1793.6
5642	1911.1	1922.1	1933.0	1944.0	1955.0	1966.1	1977.2	1988.3	1999.5	2010.7
5644	2136.3	2148.0	2159.7	2171.4	2183.2	2195.0	2206.8	2218.7	2230.6	2242.5
5646	2376.4	2388.8	2401.2	2413.7	2426.2	2438.8	2451.4	2464.0	2476.7	2489.4
5648	2631.6	2644.8	2658.0	2671.2	2684.5	2697.8	2711.1	2724.5	2737.9	2751.4
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5652	3188.0	3202.7	3217.5	3232.3	3247.1	3262.0	3276.9	3291.9	3306.9	3321.9
5654	3490.0	3506.5	3521.1	3536.7	3552.3	3568.0	3583.7	3599.5	3615.3	3631.1
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5660	4495.7	4513.8	4531.9	4550.1	4568.3	4586.6	4604.9	4623.3	4641.7	4660.1
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5668	6091.5	6113.4	6135.4	6157.4	6179.5	6201.6	6223.8	6246.0	6268.3	6290.6
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5674	7495.5	7520.4	7545.4	7570.4	7595.5	7620.6	7645.8	7671.0	7696.3	7721.6
5676	8004.0	8030.0	8056.1	8082.3	8108.5	8134.7	8161.1	8187.5	8213.9	8240.4
5678	8536.0	8563.2	8590.5	8617.9	8645.3	8672.7	8700.3	8727.9	8755.5	8783.2
5680	9092.0	9120.4	9149.0	9177.5	9206.2	9234.9	9263.8	9292.7	9321.6	9350.7
5682	9675.1	9705.1	9735.1	9765.2	9795.4	9825.6	9856.0	9886.4	9916.8	9947.4
5684	10288.5	10319.9	10351.5	10383.1	10414.8	10446.5	10478.4	10510.3	10542.3	10574.4
5686	10932.8	10965.9	10999.2	11032.5	11065.9	11099.4	11133.0	11166.6	11200.4	11234.2
5688	11612.6	11647.5	11682.5	11717.7	11752.9	11788.2	11823.6	11859.0	11894.6	11930.3
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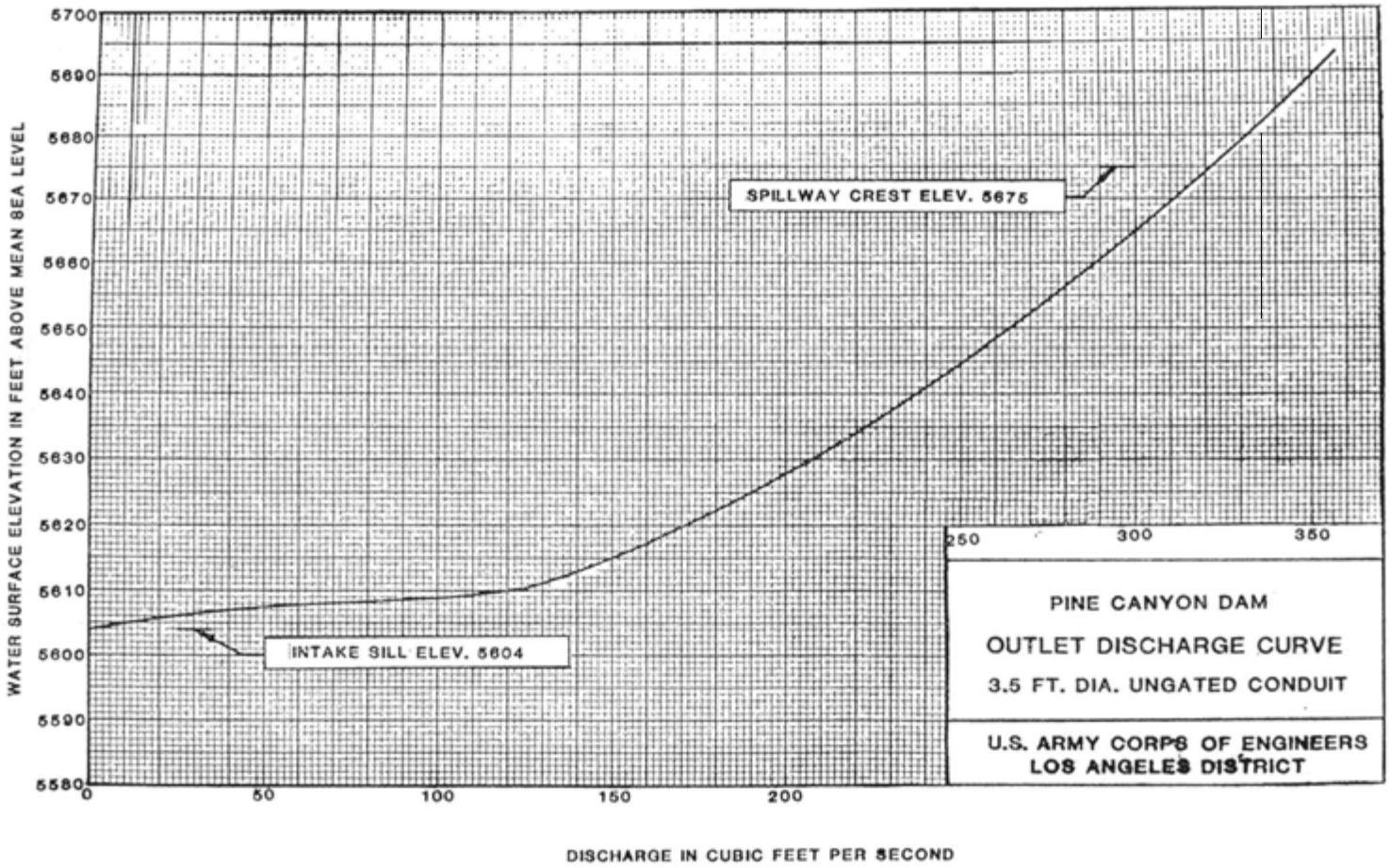
SURVEY DATE AUGUST 1977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100
150
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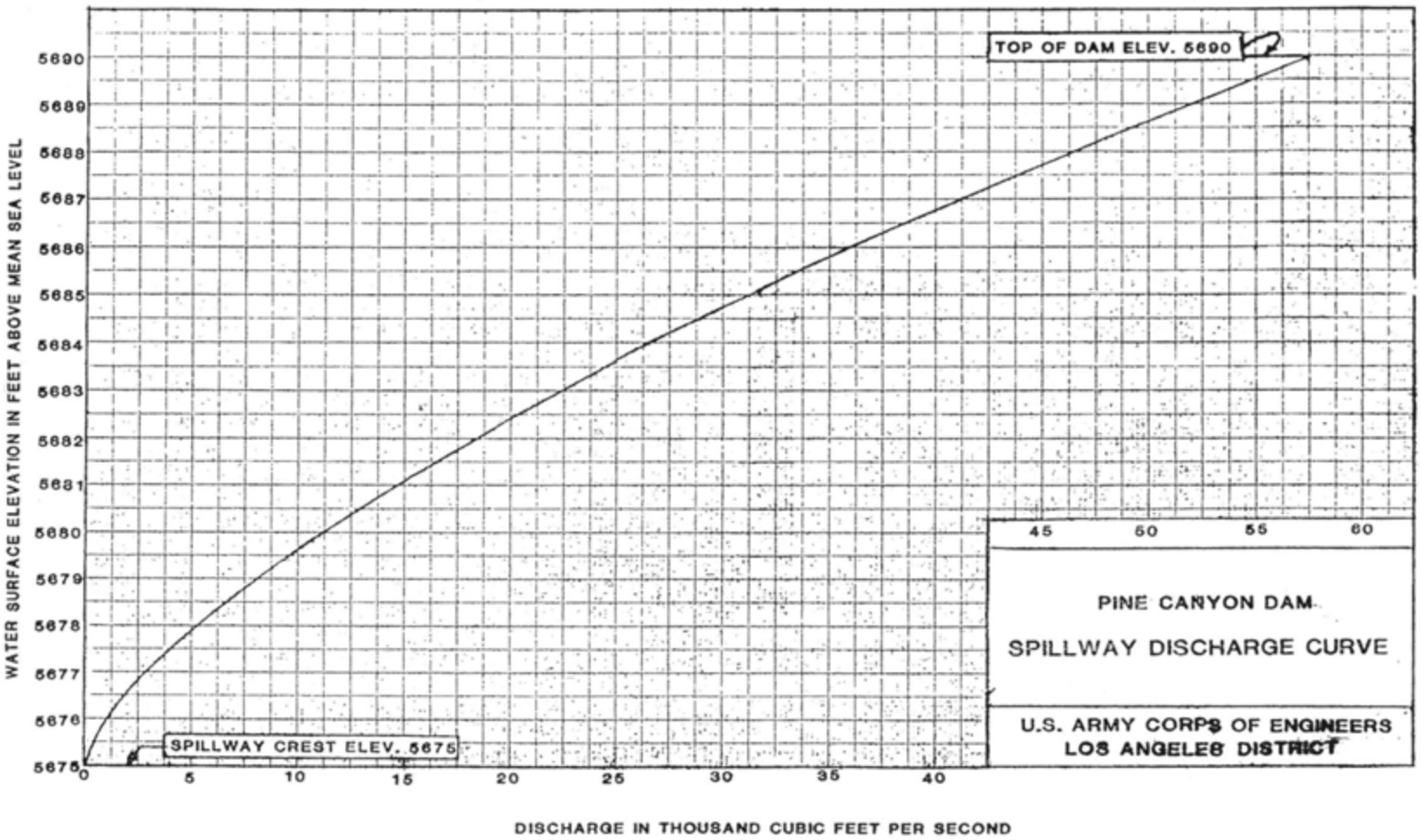
250
300
350
DISCHARGE IN CUBIC FEET PER SECOND
SPILLWAY CREST ELEV. 5675
INTAKE SILL ELEV. 5604
PINE CANYON DAM
OUTLET DISCHARGE CURVE
3.5 FT. DIA. UNGATED CONDUIT
U.S. ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT


TOP OF DAM ELEV. 5690
SPILLWAY CREST ELEV. 5675
WATER SURFACE ELEVATION IN FEET ABOVE MEAN SEA LEVEL
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DISCHARGE IN THOUSAND CUBIC FEET PER SECOND
PINE CANYON DAM
SPILLWAY DISCHARGE CURVE
U.S. ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT

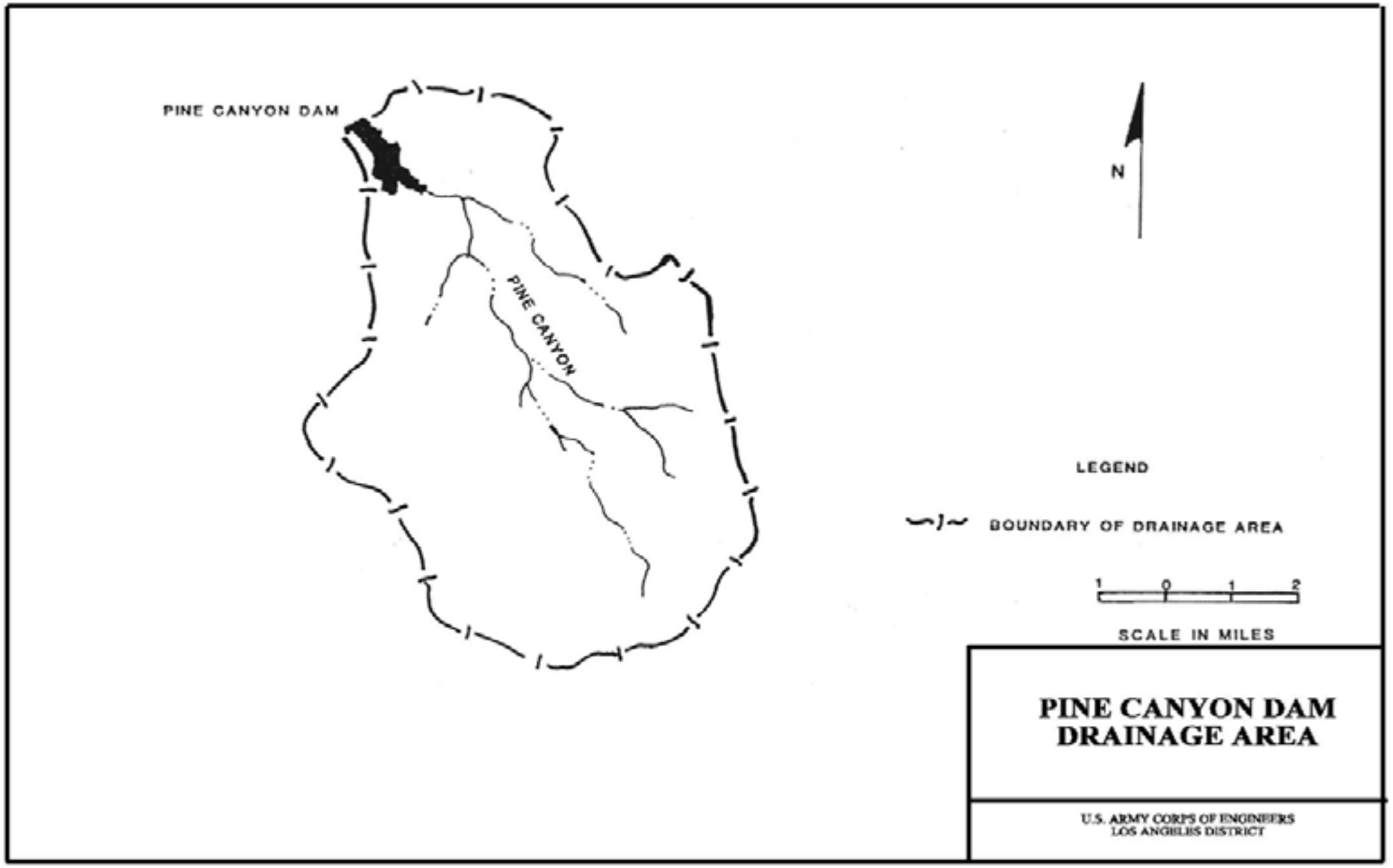
PINE CANYON DAM
PINE CANYON
N
LEGEND
BOUNDARY OF DRAINAGE AREA
1 0 1 2
SCALE IN MILES
PINE CANYON DAM
DRAINAGE AREA
U.S. ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT

EXHIBIT C. LOCAL COOPERATION

MAX C. FLEISCHMANN COLLEGE OF A[illegible]ULTURE
OF THE UNIVERSITY OF NE[illegible]
U. S. DEPARTMENT OF AGRICUL[illegible]RE
- LINCOLN COUNTY COOPERATING

AGRICULTURAL EXTENSION SERVI[illegible]
LINCOLN COUNTY

COOPERATIVE EXTENSION WORK
IN
AGRICULTURE AND HOME ECONOMICS
STATE OF NEVADA

CALIENTE, NEVADA

April 27, 1956

Corps of Army Engineers
U. S. Army Office of District Engineers
Los Angeles District
Los Angeles 17, California

ATT: Chas. A. Carroll, Lt. Colonel Corp of Engineers,
Assistant District Engineer

In compliance with your letter of April 13, the Lincoln County Flood Control District has met and adopted the enclosed resolution which furnishes assurance of local responsibilities in connection with adjustment of water rights claims resulting from operations from improvements and keeping the flood channels below the flood line free from man made encroachments.

You will also find our District Attorney's opinion and citation of the law regarding this matter. If for any reason these do not satisfy the requirements of the Secretary of Army, please notify us.

Sincerely yours,

Ferren W. Bunker

Ferren W. Bunker,
Lincoln County Flood
Control District

FWB/wg

Enclosures/2

OFFICE OF DISTRICT ATTORNEY

LINCOLN COUNTY

PIOCHE, NEVADA

ROSCOE H. WILKES,
DISTRICT ATTORNEY

OFFICE: YORKTOWN 3-4443
RESIDENCE: YORKTOWN 3-4487

April 19, 1956

Mr. Ferren W. Bunker, Secretary
Lincoln County Flood Control District
Caliente, Nevada

Dear Mr. Bunker:

At your request I have again examined the Statutes of Nevada as they relate to the Lincoln County Flood Control District. You will recall that in October 1955 I wrote you regarding the Statutes of Nevada then in force as they related to two problems which the district was presenting at that time.

At that time two problems were presented which could be generally stated to be as follows: (1) protection of the United States by the local Flood Control District from possible claims arising from reduction of water levies in the general area and (2) preventing, by the local Flood Control District, of man-made encroachments being placed in the channels and thereby reducing the carrying capacity of the channels. These assurances were requested by the Federal Government.

It was my opinion, at that time, that the Flood Control Laws of the State of Nevada were not broad enough to allow the local Flood Control District to give these assurances and it was recommended that Chapter 174 Statutes of Nevada 1947 at Page 611 be amended in certain particulars.

These amendments were made and while it is not felt necessary to re-copy the entire Act you will find attached hereto a copy of the pertinent sections including the amendments made thereto in the 1956 Special Legislative Session.

A reading of these amendments discloses that Lincoln County Flood Control District may furnish assurances satisfactory to the Secretary of the Army, as prescribed by any public law of the United States, etc. Also it is noted that, when needed, the Board of County Commissioners of Lincoln County shall levy special taxes as may be necessary to pay any claims for which the district is

liable, or for which the district has assumed liability, in connection with any assurances of local cooperation furnished by it to the Government of the United States.

To my knowledge the Board of County Commissioners of Lincoln County have pledged their cooperation to the local Flood Control District in the way of levying such special taxes at any time same becomes necessary. The wording of the amendment makes it mandatory that the County Commissioners levy such taxes, should same become necessary. The County Commissioners have pledged their cooperation in this regard, but even if a different and later Board were not so disposed to cooperate, the law makes it mandatory that taxes be levied to pay the obligations of the district.

I shall conclude that the present status of the Lincoln County Flood Control District Act enables the district to give the assurances which have been requested by the United States Government, or Departments thereof. Further it should be stated that since the boundaries of Lincoln County Flood Control District are the same as the boundaries for Lincoln County, Nevada, that taxable property over the entire county may be pledged to the payment of obligations incurred by virtue of these assurances if same should become necessary.

Respectfully submitted,

Roscoe H Wilkes

RHW:fb
Encl.

SPLCH 800.06 (Mathews and Pine Canyons) 4 May 1956

Mr. Ferren W. Bunker, Secretary
Lincoln County Flood Control District
Caliente, Nevada

Dear Mr. Brunker:

Receipt is acknowledged of your letter dated 27 April 1956 inclosing an extract of an amendment passed in the 1956 Special Legislative Session pertaining to Chapter 174, Statutes of Nevada 1947, under the authority of which the Lincoln County Flood Control District was organized; also a resolution adopted 26 April 1956 by the Board of Directors of the Lincoln County Flood Control District, giving assurances of local cooperation in connection with the proposed construction of Mathews and Pine Canyons Dams authorized by the Act of Congress approved 17 May 1950, Public Law 516, Eighty-first Congress, Second Session.

In the name of and by authority of the Secretary of the Army, the assurances for the projects described in the preceding paragraph are accepted.

Your cooperation is appreciated.

Very truly yours,

ARTHUR H. FRYE, JR.
Colonel, Corps of Engineers
District Engineer

cc: Ch of Engrs, Wash, D. C. w/d to be trans by ltr
Div Engr, SPD, S/Fran
cc: Legal Br w/cy resol
Real Estate Div w/cy resol
Dams Sec w/cy resol
Adv Plg Sec w/cy resol
ED

AHF
LED
CEM
JSG
HWT
JGJ
LHF
SFC
NAL
SDS/fr

SPLGH 800.06 (Mathews and Pine Canyons Dams)

7 May 1956

SUBJECT: Acceptance of Assurances of Local Cooperation for Mathews Canyon and Pine Canyon Dams

TO: Division Engineer
South Pacific Division
Corps of Engineers, U. S. Army
San Francisco, California

1. A formal request for assurances of local cooperation for the subject project was made of the Lincoln County Flood Control District by letter dated 13 April 1956. A copy of that letter was transmitted to you by separate letter dated 16 April 1956.

2. Inclosed for your information and files are copies of a letter dated 27 April 1956 from Mr. Ferron W. Dunker, Secretary of the Lincoln County Flood Control District, inclosing a resolution adopted by the Board of Directors of the Lincoln County Flood Control District, 26 April 1956, giving assurances of local cooperation for the Mathews Canyon and Pine Canyon Dams. Also inclosed is the District Attorney's opinion and citation of the law.

3. As required by paragraph 5209.02, Orders and Regulations, it is determined that (a) the assurances furnished comply with those required by the authorizing act; (b) the instrument (resolution) is legally sufficient; and (c) local interests have the legal authority to give the assurances. The amended legislation gives the Board of County Commissioners taxing power to levy special taxes as necessary to pay any claims for which the district is liable or for which the district has assumed liability. Accordingly, the assurances were accepted by me on 4 May 1956 "in the name of and by authority of the Secretary of the Army."

AHF
LED
GEM
HWT
JGJ
LHF
SFC
NAL
BIS/fr

3 Incls (in dup)
1. Cy ltr from LADE to LCFCD dtd 4 May 1956
2. Cy ltr from LCFCD to LADE dtd 27 Apr 1956 w/attached atty's opinion
3. Cy resolution

ARTHUR H. FRYE, JR.
Colonel, Corps of Engineers
District Engineer

cc: Adv Plg Sec
ED
Dams Sec

SPDGP 800.06 (Mathews Canyon Dam) 1st Ind
x (Pine Canyon Dam) LA Dist
SUBJECT: Acceptance of Assurances of Local Cooperation for Mathews Canyon and Pine Canyon Dams (Basic: 7 May 1956)

South Pacific Division, Corps of Engineers, US Army, San Francisco, California, 10 May 1956

TO: Chief of Engineers, Department of the Army, Washington 25, D. C.

Forwarded for the information and files of OCE in compliance with paragraph 5209.02e of Orders and Regulations.

FOR THE DIVISION ENGINEER:

3 Incls
w/d - 1 cy ea

A. E. McCOLLAM
Colonel, CE
Executive

cc: Los Angeles District
Ref Letter 7 May 56
File SPLGH 800.06
(Mathews and Pine Canyons Dams)

LOCAL COOPERATION

13. Local cooperation required.--The local cooperation required by the authorizing legislation is the same as that specified in the project document. In accordance with the Chief of Engineers' report published in the project document, responsible local interests would be required to "give assurances satisfactory to the Secretary of the Army that they will adjust all water-rights claims resulting from operation of the improvements and keep the flood channels below the flood-control reservoirs free from man-made encroachments."

14. Public hearings and views of local interests.--No public hearings on this project have been held since preparation of the survey report, which is included in the project document. The Lincoln County Flood Control District, which is the local agency responsible for the fulfillment of local cooperation, has - through correspondence with the Los Angeles District - concurred in the features of the general plan of improvement recommended in this memorandum.

15. Senator Malone of Nevada, former State Engineer for that State, and Congressman Young have appeared before congressional committees in support of the project. Local interests have appeared before congressional appropriations committees in support of the project.

16. Local interests' compliance with requirements of local cooperation.--Compliance with the requirements of local cooperation prescribed by the authorizing legislation is expected from the Lincoln County Flood Control District, which is the agency responsible for representing local interests. The Lincoln County Flood Control District was formed 7 July 1947 to meet the requirements of local cooperation in the construction of Mathews Canyon Dam and Pine Canyon Dam and of other projects relating to the public welfare and interest.

17. The secretary of the Lincoln County Flood Control District, in a letter dated 11 May 1955 to Mr. Hugh Shamberger, State Engineer of Nevada, stated that the directors of the Lincoln County Flood Control District have "* * * indicated a willingness to assume what [sic] responsibilities that are necessary on the part of the district to expedite these projects [Mathews Canyon Dam and Pine Canyon Dam]."

18. Principal officers responsible.--The principal officers responsible are officers of the Lincoln County Flood Control District, the agency responsible for local cooperation. The address of the Lincoln County Flood Control District is Caliente, Nev.; the names and titles of the principal officers are as follows:

Name	Title
Ferren W. Bunker	Secretary
Grant Lee	Director
Emery Conaway	Director
Samuel J. Hollinger	Director

EXHIBIT D.

FINDING OF NO SIGNIFICANT IMPACT (FONSI) & ENVIRONMENTAL ASSESSMENT (EA)

U.S. ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT

FINDING OF NO SIGNIFICANT IMPACT

Continued Operation of Pine Canyon and Mathews Canyon Dams, Lincoln County, Nevada

OPN # 00-07

I have reviewed the attached Environmental Assessment which was prepared for the Pine and Mathews on Corps lands in Nevada. This project updates information in the Water Control Manuals for these two dams. Both dams protect the town of Caliente, Nevada, Union Pacific Railroad trackage and assorted local roads from flooding.

Resources potentially affected by this project are discussed in the Environmental Effects section of the EA. Primary impacts to natural resources in this area would be minor in nature and due to continued operation of both ungated dams. There is expected to be no lasting, negative impact to resources in the area, due to this project. Mitigation for the project was not deemed to be necessary since no construction or maintenance activity will occur. These lands are not leased out for any purpose.

This project would not be expected to impact an endangered species or the designated critical habitat of any listed species. Both dams offer primitive day use - camping facilities which benefit local residents.

Consideration of all the significant factors and all pertinent environmental legislation, in addition to comments and coordination with concerned agencies as discussed in the EA, indicate that the proposed action would not significantly affect the quality of the human environment nor would there be significant adverse environmental effects. Therefore, an Environmental Impact Statement will not be required, pursuant to 33 CFR 230.11.

Prepared by:

Phyllis A. Träbold
Ecologist, Natural Resources Management Section

22 August 2000
Date

Approval Recommended by:

Charles S. Dwyer
Chief, Operations Branch

23 August 2000
Date

Approved by:

for John P. Carroll
Colonel, Corps of Engineers
District Engineer

LTC, EN

24 AUG 00
Date

LOS ANGELES DISTRICT
U.S. ARMY CORPS OF ENGINEERS
OPERATIONS BRANCH

PUBLIC NOTICE OF PROPOSED ACTIVITY
AFFECTING FEDERAL LANDS

Operations Branch Public Notice OPN # 00-01
Comment Period: June 27 through July 27, 2000

CONTINUED OPERATION OF PINE CANYON AND MATHEWS CANYON FCB'S, LINCOLN COUNTY, NEVADA

Applicant(s)

U.S. Army Corps of Engineers, Los Angeles District
Reservoir Regulation Section
911 Wilshire Blvd.
Los Angeles, CA 90017
213.452.3533

Location

Pine Canyon and Mathews Canyon Flood Control Basins, near Caliente, Lincoln County, Nevada. The U.S. Army Corps of Engineers owns and operates these two dams and basins.

Activity

The Pine Canyon Dam and Mathews Canyon Dam provide flood protection to the town of Caliente, Nevada, 80 miles of Union Pacific Railroad trackage and 3,500-acres of cropland. Both dams are ungated and when water reaches the outlet structure it flows out via gravity.

The Water Control manuals discuss different inflow-outflow scenarios which are based on precipitation events vs. outlet capacity. The Reservoir Regulation staff wishes to update the water control manuals based on the latest historic flood information and computer storm modeling. Both dams operate independently of each other. The outflow from each basin flows into Clover Creek and eventually Lake Mead. No construction would occur as a result of this project.

This project would allow both these Water Control manuals to be updated. They were last revised in 1974 (Pine Canyon) and 1975 (Mathews Canyon).

Interested parties are invited to provide their views on the proposed activity

which will become part of the record and will be considered in the decision.

Please mail comments to:

U.S. Army Corps of Engineers
ATTN: Phyllis Träbold CESPL-CO-O
P.O. Box 532711
Los Angeles, CA 90053-2325

Comments should be received by July 27, 2000.

Evaluation Factors

The decision whether or not to proceed with this project will be based on an evaluation of the probable impact including cumulative impacts of the proposed activity on the public interest. The decision will reflect the national concern for protection and utilization of important resources. The benefit(s) which may reasonably be expected to accrue from the proposal must be balanced against its reasonably foreseeable detriments. All factors which may be relevant to the proposal will be considered including the cumulative effects thereof. Factors that will be considered include: conservation, economics, general environmental concerns, aesthetics, wetlands, cultural values, fish and wildlife values, flood hazards, floodplain values, land use, soil erosion, recreation, water supply and conservation, water quality, energy needs, safety, food production, and, in general, the needs and welfare of the people.

For additional information please contact: Phyllis Träbold, Operations Branch, Ecologist, (213) 452.3391.

This public notice is issued by the Chief, Construction-Operations Division.

DEPARTMENT OF THE ARMY
LOS ANGELES DISTRICT CORPS OF ENGINEERS

FINAL ENVIRONMENTAL ASSESSMENT

PROPOSED PROJECT:

Continued Operation of the Pine Canyon and Mathews Canyon Dams

APPLICANT: Reservoir Regulation Section, Los Angeles District
LOCATION: Pine Canyon & Mathews Canyon Flood Control Basins, Caliente, Nevada

REVIEW PERIOD:

June 27, 2000 - July 27, 2000

Prepared For:
US ARMY CORPS OF ENGINEERS
Los Angeles District
Operations Branch
911 Wilshire
Los Angeles, California 90017

Prepared by:
Phyllis Träbold, Operations Branch
Los Angeles District
U.S. Army Corps of Engineers

DRAFT ENVIRONMENTAL ASSESSMENT

Continued Operation of the Pine Canyon and Mathews Canyon Dams

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(3.1 through 3.21)

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APPENDIX

A. Mailing List

1.0 PROJECT INFORMATION

Project Proponent: US Army Corps of Engineers
Operations Branch POC - Phyllis Trabold - (213) 452.3391
911 Wilshire, Suite 11063
Los Angeles, California 90017

Project Name : Continued Operation of Pine Canyon & Mathews Canyon Dams

Introduction and Rationale: This document constitutes the draft environmental analysis (EA) and public notification for a proposed Corps of Engineers action on Federal land, pursuant to the National Environmental Policy Act (NEPA). The document's public review period is June 27, 2000 through July 27, 2000.

Project Type:
"Overall, the project is to establish the environmental baseline condition at both reservoirs, and to continue the present operation of both dams. The finalized environmental assessment is part of the process to update the water control manuals for each dam that are both scheduled to be revised in accordance with the Corps' current guidelines. Since both dams have ungated outlets, they are designed as "self operating" and their water control plans cannot be modified without doing a major design change in the dams themselves. The project does not alter the performance of the dams as originally intended to control floods, and therefore, has no effect on water control plans.

Overall, the project would show the water outflow rates for each dam based on fluctuating water elevations. The quantity of storm water and the length of time it is impounded depend on the current precipitation cycle. Downstream flows through the watershed would continue to affect the landscape as at present. No construction activity will occur as a result of this project.

A water control manual is a Corps publication that contains the current information about a dam, its reservoir, the regulating policy and a description of the organizations responsible for or affected by its operation. Also included in a manual are discussions of issues related to the dam operation such as but not limited to flood control, recreation, environmental, and commercial issues. The Matthews canyon dam Water Control manual is currently being revised and Pine Canyon Dam Water Control manual is currently scheduled for next year. Both water control mauls need an Environmental Assessment (EA) to establish the baseline environmental setting and to obtain environmental clearances for continued operation prior to their approval.

Water control manuals (WCM's) discuss storm water storage-release scenarios based on different types of storm events. For ungated dams, the manuals address the water

elevations and quantity of water outflow at different elevations. This project will update the water inflow chart and the water storage vs. outflow ratios using the most current information from historic flood events, changes in the quantity or timing of flood water accumulation or other pertinent information. These manuals allow the Corps to predict the quantity of outflow and storage based on the timing and quantity of storm water accumulation.

Neither dam basin is intended for permanent water storage but passively holds water as it arrives until the water levels subside naturally. Both dams are intended to minimize downstream flood damage during storms using ungated outlet structures, which detain storm water and release it more slowly over a longer time span. This project will update the background information, i.e., economics and population. No changes in the dam or basin information are needed. The Mathews Canyon WCM will be revised during Summer, 2,000, followed by the Pine Canyon WCM about 1 year later.

Project Location: The project location is 20 miles southeast of Caliente, Nevada in Lincoln County, Nevada. Pine Canyon FCB is located in Pine Canyon and Mathews Canyon FCB is located in Mathews Canyon. The State of Nevada Parks Department operates Beaver Dam State Park nearby. The two existing watersheds, Pine Canyon and Mathews Canyon, are part of the Muddy River Basin. Both watersheds direct the storm water into their respective basins, Pine Canyon FCB and Mathews Canyon FCB, and ultimately to Lake Mead.

The Corps owns the dam structures, reservoir lands, and a portion of land downstream of each dam for the outlet channel floodway. The dams were designed to work in conjunction with each other for flood control.

Purpose and Need: The project purpose is to document the current environmental baseline conditions at both reservoir areas and to obtain environmental clearances for their continued operation. An EA is necessary to accompany the Mathews canyon Dam and the Pine Canyon Dam Water Control Manuals, which are scheduled for revision in accordance with the Corps latest requirements for water control manuals. The project does not include a change in the regulating policy or the water control plan of each dam, and therefore, will not result in any change in the dams' effects to the environment

The project purpose is to provide the most current storage/outflow information on Pine Canyon and Mathews Canyon Dams for the Corps and local interests, including the Union Pacific Railroad, the Bureau of Land Management and the town of Caliente, Nevada. The BLM owns lands surrounding Corps property.

Project Description: The Corps will distribute a draft Environmental Assessment for public review during 27 June- 27 July 2000 and comments will be received and answered during July 2000. A Final Environmental Assessment, resulting from the present environmental

assessment process, may be completed by August 2000. The revised water control manuals will be available for review, if requested, through the Corps, Los Angeles District, Hydrology and Hydraulics Branch as well as available in large part through the Los Angeles District's Internet website.

2.0 ALTERNATIVES TO THE PROPOSED PROJECT AND DISCUSSION

None of the alternatives is going to result in any physical impact. Under all alternatives, the flood control performance of the dams will remain as they have been.

The project necessitates continuing implementation of revised water control manual for Pine Canyon and Mathews Canyon FCB's using the most current hydrologic information.

The following alternatives to the proposed action -

1) NO ACTION ALTERNATIVE - This alternative is the proposed alternative.

2) SOME ACTION ALTERNATIVE - No action alternatives are being considered.

   The proposed FULL ACTION ALTERNATIVE, which was developed by the Reservoir Regulation staff, appears to best solve the potential need.

3.0 AFFECTED ENVIRONMENT AND PROJECT SETTING

The project setting at Pine Canyon and Mathews Canyon is described in the following paragraphs. The extent and timing of future flood events cannot be predicted.

3.1 VEGETATION AND HABITAT

a. In general, both Pine Canyon Flood Control Basin (FCB) and Mathews Canyon Flood Control Basin represent small basins delineated at the east by a long dam (earth embankment), with Pine Canyon Wash and Mathews Canyon Wash respectively, meandering through them. Deer use both canyons year round. Pine Canyon FCB is surrounded by the BLM's Sheep Flat Grazing Allotment # 73 and Mathews by BLM's Haypress Allotment # 71. Livestock on these allotments stray onto Corps lands. The type of habitat at these elevations is pinyon juniper and is characterized by the following vegetation types: crested-wheatgrass, pinyon and juniper.

b. Project Effects on Vegetation/Habitat

During water storage all vegetation up to the water storage level will be wholly or partially inundated until the storage level declines. Depending on prevailing weather patterns the habitat would continue being affected as it has been, ie. some inundation, scouring, or intermittent drying out.

3.2. Wildlife

a. In addition to the above information, common wildlife species include: mountain lion, coyote and deer as well as small mammals, reptiles and birds.

b. Project Effects on Wildlife

Any ground-dwelling species, especially subterranean species, unable to fly, who remained in the inundation zone would likely drown during flow events. These species have adapted to intermittent weather conditions.

3.3 NATURAL DRAINAGE

a. Pine Canyon Wash and Mathews Canyon Wash each flow into Clover Creek several miles downstream of their respective dams. Clover Creek flows northwest toward Clover Valley, then into the Virgin River and eventually Lake Mead.

b. Project Effects on Natural Drainage

The two dams do not appreciably affect natural drainage patterns at either dam site since they only delay the water flow.

3.4 RIPARIAN AND WETLAND RESOURCES

a. The two basins do not contain significant permanent wetland habitat. Water unable to reach the outlet behind each dam may create small moist area (more so at Mathews Dam) and contribute to varying elevations of subsurface water distribution. Eventually this water percolates or evaporates but may be retained seasonally.

The two basins do not contain significant permanent wetland habitat. Water unable to reach the outlet behind each dam may create small areas of seasonal moist areas (more so at Mathews Dam) and contribute to varying elevations of subsurface water distribution. Eventually this water generally percolates or evaporates but may be retained in seasonally moist areas of small extent.

b. Project Effects on Riparian and Wetland Resources

The dams have long affected, but not controlled, riparian resources by their passive response to weather patterns. The patchiness of riparian vegetation is a response more to local weather patterns than to the dams themselves.
The State Regional Water Quality Control Board and other State, Federal, and local

resource agencies will be notified of this project by public notice and their comments will be solicited for inclusion during the public review process.

3.5 ENDANGERED AND THREATENED SPECIES

a. Federally listed threatened or endangered species are not known at these specific locations.

b. Project Effects on Endangered and Threatened Species

Existing Corps use of these areas is not expected to affect federally-listed sensitive species as a result of this project. The U.S. Fish and Wildlife Service (Service) will be notified by public notice of this proposed project and we will incorporate their comments into the Final Environmental Assessment.

3.6 CULTURAL RESOURCES

a. A cultural resources survey of portions of the flood control basins behind the two dams were surveyed for historic and prehistoric resources in 1977 by the Archaeological Research unit, at the University of California at Riverside (Helen Wells 1977). This survey identified more than 20 prehistoric archaeological sites within, and near both flood control basins. Several of these may be eligible for listing on the National Register of Historic Places.

b. Project Effects on Cultural Resources

Revision of the Water Control Manual itself would not have the potential to cause effects to resources behind the dams. As the revision would not change the actual inundation period or duration, the effects would be the same as before the revision.

3.7 WATER QUALITY AND SUPPLY

a. Water sources within the project area include natural washes and creeks. Some livestock grazing occurs in the vicinity and this animal waste may degrade water quality. All roads in the area are graded dirt. In the winter the precipitation can fall as snow. Some local surface water is likely to contain trace amounts of organic nutrients, liquid and solid animal waste, herbicides and petroleum products from use by recreational vehicles. Game

hunting occurs on Corps and adjacent lands which may contribute a small quantity of lead to the environment.

b. Project Effects on Water Quality and Supply

Neither surface water nor groundwater qualities are expected to be affected by this project. Without the two dams this water would flow unimpeded through the regular drainage area.

3.8 FLOOD CONTROL AND HYDROLOGY

a. Mathews and Pine Canyon Dams are both ungated flood control structures designed to work in conjunction with one another to control floods. The dams control floods up to and including the reservoir design flood such that the peak overflows from each dam are safely carried in downstream reaches. Floodwaters are temporarily stored in the reservoir and slowly released through a 3.5 foot-diameter conduit for each dam.

a. Both dams are ungated. When storm water reaches the height of the outlet, it flows out via gravity. The Pine Canyon Dam watershed encompasses 45 square miles. Mathews Canyon FCB watershed is 34 acres. The twin dams are owned and maintained by the U.S. Army Corps of Engineers (ACOE). The size and design of the outlet works determine the outflow capacity.

b. Project Effects on Flood Control and Hydrology

Both dams detain storm water until the water reaches the outlet works, elevation 5420 ft. mean sea level (M. S. L.) Mathews and 5604 ft. M.S.L. Pine Canyon. If storm water inflow exceeds outlet capacity, the water ponds. If the impounded water reaches the spillway elevation, (elevation 5461 ft. Mathews Canyon, and 5675 ft. Pine Canyon) it discharges via the spillway. Ungated dams cannot impound water permanently nor can the discharge rate be changed. Impoundment undoubtedly alters the downstream hydraulics by interfering with natural flooding regimes, by helping concentrate water flows. No significant adverse effects to flood control and/or hydrology are foreseen as a result of this project.

3.9 RECREATION

Besides being an important civil works flood control structure, Pine Canyon and Mathews Canyon are rural recreation venues. Each basin has two picnic shelters with tables and a pit toilet. People use the shelters for day use and camping. These facilities are maintained by BLM but were built by the Corps.

b. Project Effects on Recreation

The project does not impact the recreation facilities which are built as floodable structures.

3.10 AIR QUALITY

a. Ambient air quality on the site is largely affected by wind.

b. Project Effects on Air Quality

This project has no impact on air quality on or off-site.

3.11 SOILS AND GEOLOGY

a. Pine Canyon geology is a shallow cover where young materials overlay older bedrock soils from igneous rock. Erosion factor is slight to moderate. Mathews has tertiary volcanic rocks, lava flows and tuffs. Soils are on semi-arid terraces and fans with slight erosion potential.

b. Project Effects to Soils and Geology

The project is expected to have no significant effect on soils and geology.

3.12 EROSION AND SEDIMENTATION

a. The ground surface of Pine Canyon FCB and Mathews FCB are largely covered by grassland vegetation with a few ponderosa pines (Pinus ponderosa). The ground slopes so gradually that erosion does not occur in either basin. There may be minimal soil erosion (scouring) at the end of outlet works channels at both dams.

b. Project Effects to Erosion and Sedimentation

Temporarily impounding water at each basin causes the water to drop part of its bed load. When the sediment deposit reaches a particular volume at either dam, it is removed from that basin by machinery and taken off-site. This restores each basin's original sediment storage capacity.

3.13 MINERAL RESOURCES

a. No mining or oil leases exist in either basin.

b. Project Effects on Mineral Resources

No impacts are expected.

3.14 LAND USE AND MASTER PLAN COMPATIBILITY

a. There are no Corps of Engineers Master Plans for Pine Canyon or Mathews Canyon and no recreation, agriculture or other lessees. There are two picnic ramadas with tables and one restroom at each basin. BLM's Caliente Resource Area Office unofficially oversees the recreation use at these two basins.

b. Project Effects on Land Use and Master Plan Compatibility

This project will not cause any significant adverse effect to land use.

3.15 ECONOMICS

a. Both dams provide flood protection for many downstream residents and users. Pine Canyon and Mathews Canyon protect 80 miles of Union Pacific Railroad track, the town of Caliente and 3,500 acres of farmland, thus representing a large economic benefit. This water control manual revision has been determined as necessary in order to maintain the appropriate degree of readiness to manage future flood events.

b. Project Effects on Economics

None.

3.16 SAFETY AND HEALTH

a. The project is expected to result in a continued positive effect on the safety and health of local downstream Lincoln County, Nevada residents. No significant adverse effects are foreseen.
Currently the water control manuals for the project area are considered to need such attention.

b. Project Effects on Safety and Health

No effect.

3.17 NOISE

a. Existing uses on the sites do not now create nuisance noise.

b. Project Effects to Noise

No noise impacts will occur.

3.18 TRAFFIC

a. Regional access to both sites is provided by a small network of dirt roads off the main highway. On occasional years the U.S. Army Corps of Engineers performs maintenance and periodic inspections at the structures and their access points.

b. Project Effects to Traffic

No traffic impacts are anticipated.

3.19 AESTHETICS

a. The project areas are quiet open space and generally used for low-impact recreation activities when actively used at all.

b. Project Effects to Aesthetics

This project will have no impact on aesthetics

3.20 SCIENTIFIC AND EDUCATIONAL VALUE

a. The natural landscape at the two sites provides low-quality native and ruderal habitats that are of some scientific and educational value concerning high desert ecology and hydrology. These resources are used by wildlife and by local residents interested in enjoying and learning about southern Nevada ecology, bird life and mammals.

b. Project Effects to Scientific and Educational Value

No significant adverse effects to scientific and educational values at these locations are expected as a result of the project.

3.21 ENERGY NEEDS AND EFFICIENCY

a. Both project sites use energy to transmit daily water flow information via an automated telemetry system.

b. Project Effects to Energy

The project is expected to have no significant adverse effects to energy needs or efficiency.

ENVIRONMENTAL IMPACTS

The proposed project would not result in significant impacts to the above-mentioned list of

environmental parameters. No adverse impacts associated with the project will occur. Some beneficial impacts to flood management may result from this project.

Cumulative impacts are expected to remain near zero since no additional activities are proposed at these remote facilities.

4.0 ALTERNATIVES REVIEW

NEPA requires that an alternatives review be completed before embarking on a significant federal action. The alternatives involve the Preferred Project (Full Action Alternative, revise both water control manuals), or Only 1 Manual (Some Action Alternative) or No Project (No Action Alternative). We have chosen the Preferred Project: Revise Both Manuals which updates our flood management based on the latest historic flood data and computer simulations thus enhancing our flood management for this region. The Proposed Project has been determined at this stage to be the best alternative to accomplish this task.

5.0 MITIGATION (if needed)

No effects to the envioenmental or cultural resources will occur as the result of this project which is to gather baseline environmental data.
No significant effects have been noted and therefore no mitigation is planned.

6.0 COMPLIANCE WITH APPLICABLE FEDERAL ENVIRONMENTAL LAWS AND REGULATIONS

The following federal laws and regulations were considered in preparation of this environmental assessment.

LAW/REGULATION	COMPLIANCE ACTION
National Historic Preservation Act	Revision of the water control manual does not have the potential to cause effects to NRHP resources. As the revision would not change the actual inundation period or duration, the effects would be the same as before the revision. Based on this determination the Corps has no further obligations under Section 106 of the Act (36 CFR 800.3(a((1).
Clean Air Act	The project is in compliance. The Corps will be responsible for complying with all applicable federal, State, and local air quality laws.
Clean Water Act	The project is in compliance. No jurisdictional wetlands will be affected.

Endangered Species Act	The project will be in compliance. No federally listed threatened or endangered species would be adversely affected by implementation of the project. The US Fish and Wildlife Service has been notified of this project and will receive a copy of receive a copy of this draft Environmental Assessment for their review and comments.
National Environmental Policy Act	The project is in compliance. This final Environmental Assessment is consistent with the requirements of NEPA.
Floodplain Management (E.O. 11988)	This is a flood control project and does not compromise the intent of this law.
Protection of Wetlands	No impacts to wetlands will occur.

7.0 COORDINATION AND RELATED ENVIRONMENTAL DOCUMENTATION

The following agencies have been notified of this Final Environmental Assessment and were forwarded copies of this document for review:

Local:

County of Lincoln, Nevada

State of Nevada:

Department of Conservation and Natural Resources
State Historical Office of Preservation
State Department of Transportation

Federal:

Army Corps of Engineers
Fish and Wildlife Service
Environmental Protection Agency
Bureau of Land Management

Ronald James, SHPO
Nevada State Historic Preservation Office
100 North Stewart Street
Carson City, NV 89710

Corrine Hogan
Lincoln County Government

Lincoln County Government
County Courthouse
U.S. Highway 93
Pioche, NV 89043

Shirley Johnson
DOI, BLM
Caliente Field Office
P.O. Box 2
Caliente, NV 89008

State of Nevada
Dept. Of Conservation & Natural Resources
123 W. Nye Lane
Room 230
Carson, City, NV 89706-0818

Nevada Dept. Of Transportation
1263 S. Stewart Street
Carson City, NV 89712

EPA - Region IX
75 Hawthorne Street
San Francisco, CA 94105

DOI, USFWS
Eastside Federal Complex
911 NE 11th Avenue
Portland, OR 97232

In addition, other individuals, associations, and agencies are being contacted in this mailing for their comments to be included. This mailing list is being finalized at this time.

Environmental Documentation

Bureau of Land Management. 1979. (Final) Caliente Environmental Statement - Proposed Domestic Livestock Grazing Management Program.

U.S. Army Corps of Engineers. 1963. Operations and maintenance Manual For Mathews Canyon Dam and Pine Canyon Dam - Meadow Valley Wash and Lower Muddy River Basins, Nevada

U.S. Army Corps of Engineers. 1955. Design Memorandum # 2, General Design For Mathews Canyon Dam - Meadow Valley Wash and Lower Muddy River Basins, Nevada

U.S. Army Corps of Engineers. 1975. Reservoir Regulation Manual For Mathews Canyon Dam

U.S. Army Corps of Engineers. 1974. Reservoir Regulation Manual For Pine Canyon Dam

Wells, Helen. 1977. Description and Evaluation of the Cultural Resources Within Matthews canyon and Pine Canyon, Lincoln County, Nevada. Archaeological Research Unit, University of California Riverside. Prepared for the U.S. Army Corps of Engineers.

8.0 PREPARER(S)

Phyllis Träbold, Ecologist
Operations Branch, Los Angeles District
U.S. Army Corps of Engineers

EXHIBIT E.

CHAIN OF CORRESPONDENCE FOR APPROVAL

CESPL-ED-HR 15 September 1999

MEMORANDUM FOR Commander, South Pacific Division, Attn: CESPD-ED-W

SUBJECT: Mathews Canyon Dam and Reservoir Water Control Manual

1. Enclosed are four copies of the revised Mathews Canyon Dam and Reservoir Water Control Manual prepared in accordance with ER 1110-2-8156. The enclosed report is a revision of the approved August 1975 Mathews Canyon Dam Reservoir Regulation Manual to incorporate updated information. Approval of the manual is requested.

2. If there are any questions, please contact Moon Kim Gilbert of the Reservoir Regulation Section at (213) 452-3533.

Enclosure

GEORGE L. BEAMS, PE
Chief, Engineering Division

BEAMS
CESPL-ED
9/16/99
LEIFIELD
CESPL-ED
JBE 9-15-99
EVELYN
CESPL-ED-H
9/15/99
TRACY
CESPL-ED-HR

MENESES
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GILBERT
CESPL-ED-HR

DEPARTMENT OF THE ARMY
SOUTH PACIFIC DIVISION, CORPS OF ENGINEERS
333 Market Street, Room 923
San Francisco, California 94105-2195

REPLY TO
ATTENTION OF:

CESPD-MT-EW

13 DEC 2000

MEMORANDUM FOR Commander, Los Angeles District, ATTN: CESPL-ED-HR

SUBJECT: Approval of the Mathews Canyon Dam Water Control Manual

The subject water control manual is herein approved subject to the addressing of the following minor comments:

a. Update the List of Photos to include Photo 4-1.

b. Spell out the acronym, NOHRSC in Section 4-05c.

c. List of Plates on page x -- the titles for Plates 4-01 thru 4-07 does not correspond with the actual plates shown. Also, the listings of Plates 4-08 and 4-09 are missing.

d. Plates 2-05 and 2-06 are reversed.

FOR THE COMMANDER:

CARL R. POSTLEWATE, P.E.
Director, Military and
Technical Directorate