STATE OF CALIFORNIA

The Resources Agency

Department of Water Resources

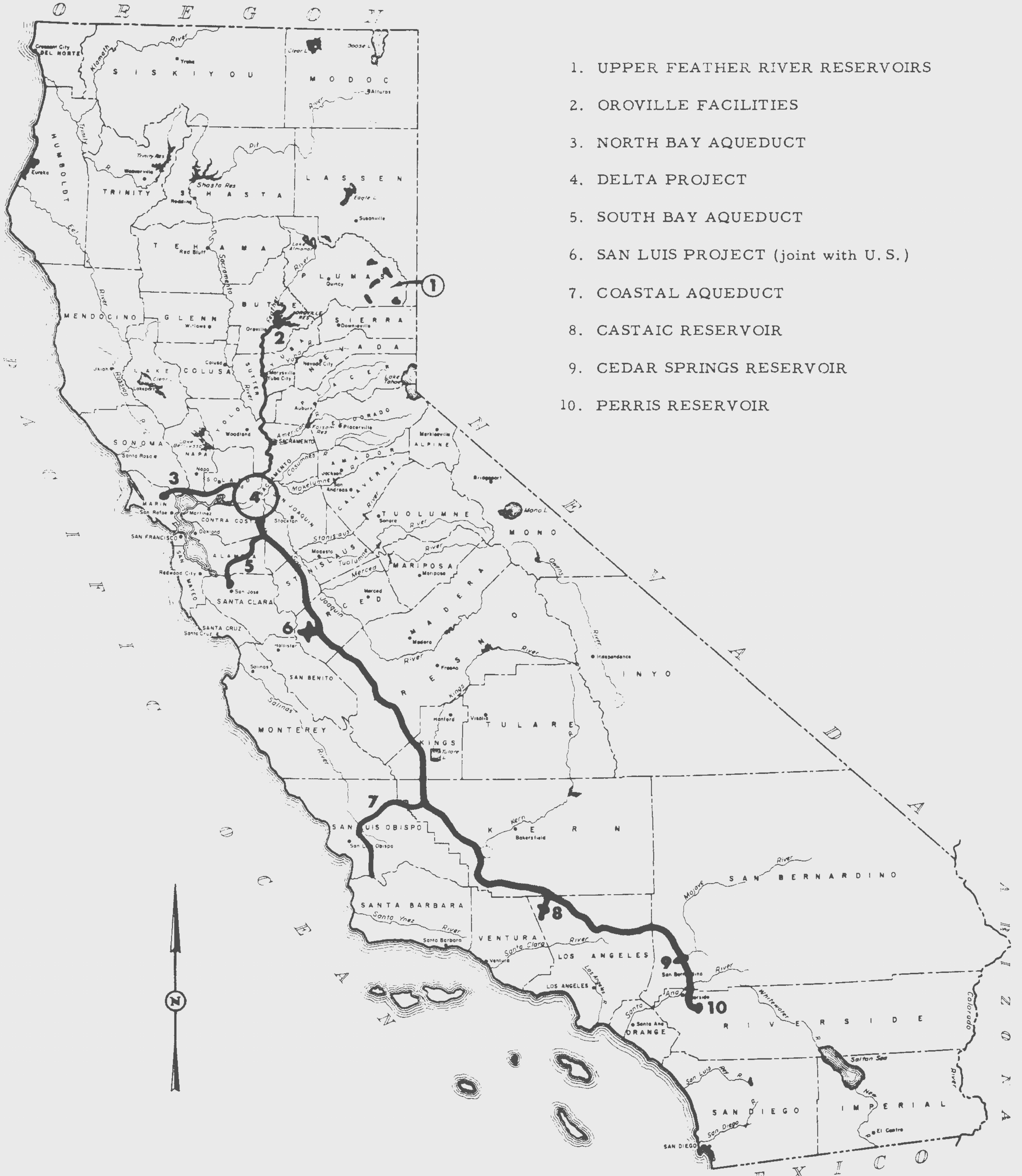
Oroville Dam

Key Unit of the STATE WATER PROJECT

RONALD REAGAN
Governor
State of California

WILLIAM R. GIANELLI
Director
Department of Water Resources

California's State Water Project



1. UPPER FEATHER RIVER RESERVOIRS
2. OROVILLE FACILITIES
3. NORTH BAY AQUEDUCT
4. DELTA PROJECT
5. SOUTH BAY AQUEDUCT
6. SAN LUIS PROJECT (joint with U. S.)
7. COASTAL AQUEDUCT
8. CASTAIC RESERVOIR
9. CEDAR SPRINGS RESERVOIR
10. PERRIS RESERVOIR

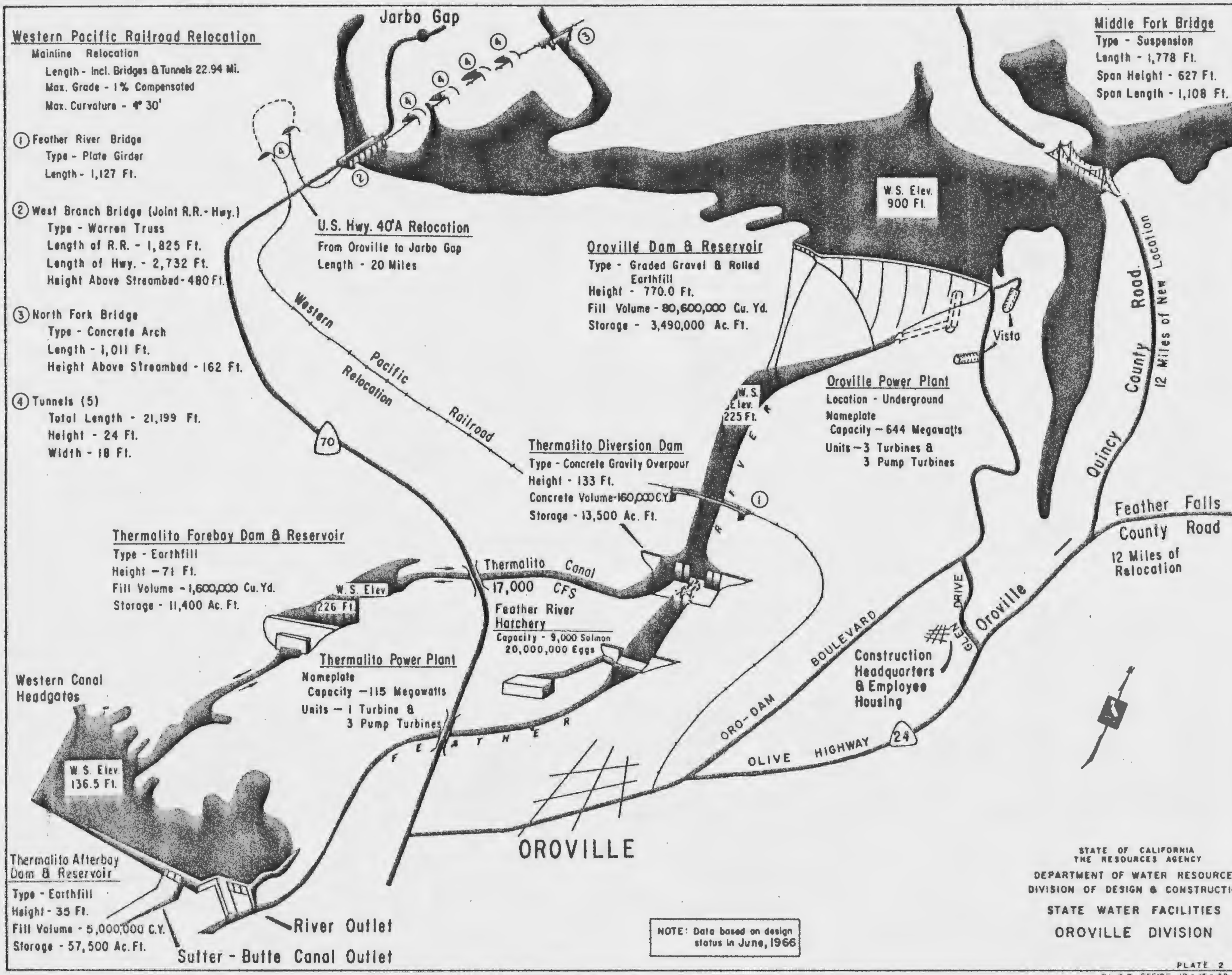


PLATE 2
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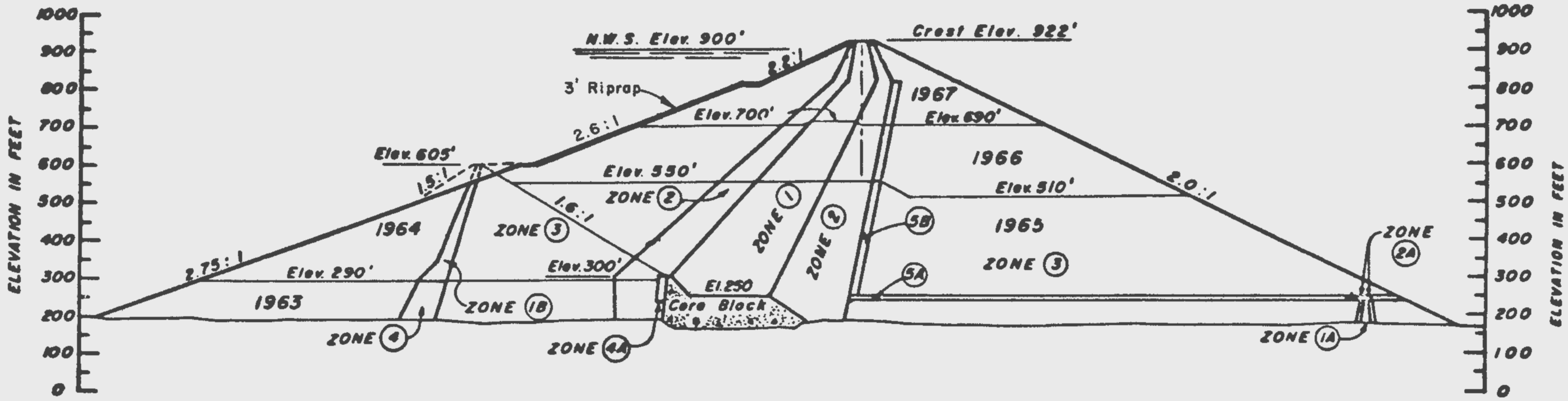


SCHEDULE OF MATERIALS REQUIREMENTS, CUBIC YARDS

CONSTR. YEAR	RIPRAP	PERVIOUS	TRANSITION	IMPERVIOUS	TOTAL	CONCRETE
1962	0	0	0	0	0	0
1963	0	1,600,000	200,000	200,000	2,000,000	290,700
1964	0	12,600,000†	300,000	400,000	13,300,000	0
1965	5,000	16,000,000	3,500,000	3,100,000	22,600,000	0
1966	114,000	16,500,000	3,200,000	2,600,000	22,400,000	0
1967	294,000	14,400,000	2,300,000	2,700,000	19,700,000	0
TOTAL	413,000	61,100,000	9,500,000	9,000,000	80,000,000	290,700

† MINIMUM 1964 PERVIOUS REQUIREMENT TO CONSTRUCT EMBANKMENT TO ELEVATION 605 IS 9,658,000

OROVILLE DAM

MAXIMUM SECTION SHOWING PROPOSED CONSTRUCTION SCHEDULE

EMBANKMENT SECTION WITH ESTIMATED MATERIAL QUANTITIES

State of California
The Resources Agency
DEPARTMENT OF WATER RESOURCES
Division of Operations and Maintenance

OROVILLE FIELD DIVISION FACILITIES
State Water Project

BASIC DATA

OROVILLE DAM

Type - Zoned Earthfill With Inclined Core and Graded Gravel Shells

Crest Elevation Above Sea Level	922 ft.
Maximum Normal Water Surface Elevation	900 ft.
Reservoir Shore Line at Elevation 900	167 mi.
Freeboard	22 ft.
Maximum Height of Dam	770 ft.
Crest Width	50.6 ft.
Crest Length	6,920 ft.
Side Slopes:	
Upstream	2.75:1, 2.6:1 & 2.2:1
Downstream	2.0:1
Embankment Volume	80,000,000 cu. yd.
Reservoir Capacity	3,538,000 acre-ft.
Reservoir Area	15,800 acres

OROVILLE DAM SPILLWAY

Flood Control Outlet

Top-Seal Radial Gates	
Number and Size	8 - 17.6 ft. x 33.5 ft.
Sill Elevation	813.6 ft.
Maximum Project Release	150,000 c.f.s.
Maximum Release (Reservoir at Spillway Design Pool)	277,000 c.f.s.
Chute Length	3,055 ft.
Chute Width	178.7 ft.
Chute Wall Height	20 to 27 ft.

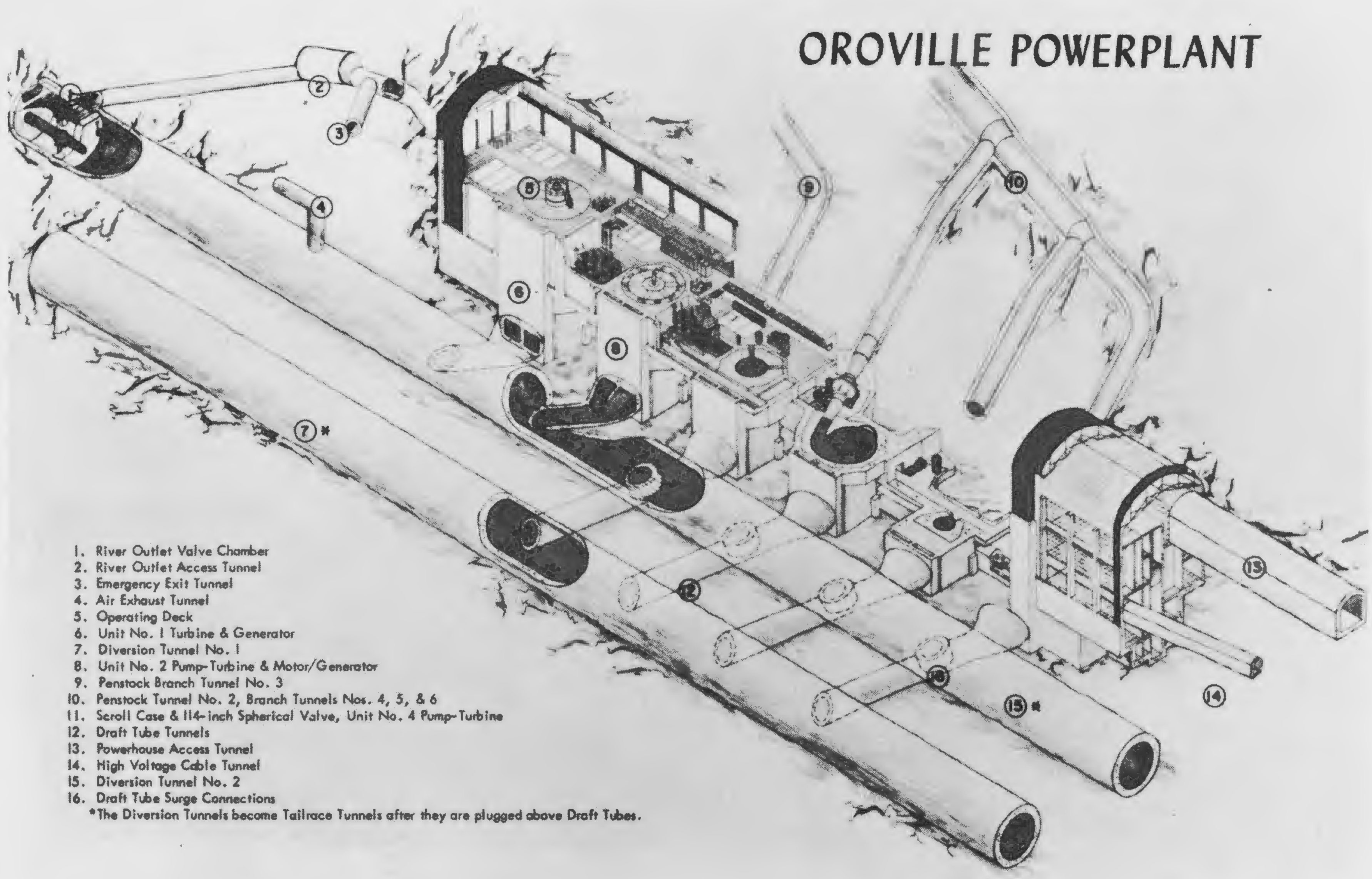
Emergency Spillway

Crest Length	1,730 ft.
Crest Elevation	901.0 ft.
Maximum Release	359,000 c.f.s.
Total Excavation	3,271,000 cu. yd.
Total Volume of Concrete	157,000 cu. yd.

OROVILLE INTAKE STRUCTURE

Type	2 - Sloping Rectangular Channels
Location	Upstream of Left Abutment
Height	Elev. 614 to 900 ft.
Length	650 ft.
Water Channel:	
Width	40 ft.
Height	29 ft.

OROVILLE POWERPLANT



1. River Outlet Valve Chamber
2. River Outlet Access Tunnel
3. Emergency Exit Tunnel
4. Air Exhaust Tunnel
5. Operating Deck
6. Unit No. 1 Turbine & Generator
7. Diversion Tunnel No. 1
8. Unit No. 2 Pump-Turbine & Motor/Generator
9. Penstock Branch Tunnel No. 3
10. Penstock Tunnel No. 2, Branch Tunnels Nos. 4, 5, & 6
11. Scroll Case & 114-inch Spherical Valve, Unit No. 4 Pump-Turbine
12. Draft Tube Tunnels
13. Powerhouse Access Tunnel
14. High Voltage Cable Tunnel
15. Diversion Tunnel No. 2
16. Draft Tube Surge Connections

*The Diversion Tunnels become Tailrace Tunnels after they are plugged above Draft Tubes.

State of California DEPARTMENT OF WATER RESOURCES The Resources Agency

EDWARD HYATT POWERPLANT

Rock Chamber

Length	550 ft.
Width	69 ft.
Depth	137 ft.

Rock bolting:

Ceiling - 1-inch diam., 20 ft. long @ 4 ft. on centers

Side Walls - 1-inch diam., 20 ft. long @ 6 ft. on centers

Drainage:

Rock - NX holes @ approximately 25 ft. on centers, 25 to 48 ft. long

Peripheral - consists of a system of pipes to the sump below Elevation 217

Powerhouse Structure

6 Structural Bays, length	78 ft.
1 Service Bay, length	66 ft.

Roof - metal panels suspended on steel frames bolted to the rock

Main Equipment

3 Turbine-generator Units

3 Pump Turbine-motor Generator Units

Total Generating Capacity 644,250 kw

6 - 114-inch Spherical Valves

6 - 230 kv Transformers

2 - 200-ton Capacity Bridge Cranes

EDWARD HYATT POWERPLANT (CONTD)

Power Waterways

Q Generating	14,550 c.f.s.
Q Pumping	5,600 c.f.s.
Static Head	675 ft.

2 Sloping Intakes on the Left Abutment

2 - 22-foot diam. reinf. conc. power tunnels

6 - 12-foot diam. tunnel branchlines

6 - Steel Spiral Cases

6 - reinf. concrete draft-tubes and extensions

2 - 35-foot diam. concrete-lined tailrace tunnels

Main Access Tunnel

Type	Concrete Lined Horseshoe
Width	25 ft.
Height	25 ft.
Length	1,500 ft.
Excavation	46,000 cu. yd.

High Voltage Cable Tunnel

Type	Concrete Lined
Width	9.5 ft.
Height	9.0 ft.
Length	500 ft.
Excavation	3,800 cu. yd.

EDWARD HYATT POWERPLANT (CONTD)

Penstock Tunnels and Branches

Type	Circular Concrete Lined - Last 100 ft. of Branches Are Steel Lined
Diameter - Main Penstocks	2 @ 22 ft.
Branches	6 @ 12 ft.
Excavation	39,000 cu. yd.
Capacity of Branches - Turbines	3 @ 3,400 c.f.s.
Pump Turbines	3 @ 2,600 c.f.s.
Velocity - Main Penstocks	25 f.p.s.
Branches - Turbines	30 f.p.s.
Pump Turbines	23 f.p.s.

Draft Tube Tunnels

Type	Concrete Lined Rectangular to Circular
Diameter Circular - Units 1, 3 & 5	21 ft.
Units 2, 4 & 6	18 ft.
Length - Units 1 & 2	70 ft.
Units 3, 4, 5 & 6	150 ft.
Excavation	9,000 cu. yd.

Emergency Exit Tunnel

Type	Circular Concrete Lined
Diameter	8 ft.
Length	570 ft.
Excavation	2,000 cu. yd.

EDWARD HYATT POWERPLANT (CONTD)

Core Block Access Tunnel

Type	Circular Concrete Lined
Diameter	7.5 ft.
Length	780 ft.
Excavation	Accomplished Under Exploration for Powerhouse

Diversion and Tailrace Tunnels

Type	2 - Circular Concrete Lined with Concrete Plug at Approximate Mid Point
Diameter	2 - 35 ft.
Length - Tunnel #1	4,300 ft.
Tunnel #2	4,600 ft.
River Outlet	2 - 72" Steel Pipes through plug in Tunnel #2
Purpose	Maintain flow in river during construction and during powerplant shutdown periods.
Control	2 - 54-Inch fixed dispersion concrete valves for control guarded by 72-inch guard valves.
Capacity	5,400 c.f.s. (combined)

PALERMO OUTLET TUNNEL

Location	In Left Abutment
Elevation	551.25 ft.
Valve	12-inch ∅ Hollow Cone
Capacity	40 c.f.s.

THERMALITO DIVERSION DAM

Dam

Type	Concrete Gravity
Crest Elevation	233 ft.
Crest Length	1,300 ft.
Crest Width	24 ft.
Height of Dam above Streambed	143 ft.

Spillway

Type	Concrete Gravity Ogee with Dentated Bucket
Number of Radial Gates	14
Crest Elevation	205 ft.
Net Length	506 ft.
Design Flood - Inflow	650,000 c.f.s.
Outflow	650,000 c.f.s.

Reservoir

Normal Water Surface Elevation	225 ft.
Minimum Operating Pool Elevation	225 ft.
Maximum Water Surface Elevation	246 ft.
Reservoir Area at N.W.S.	330 acres
Storage Capacity at N.W.S.	13,500 acre-ft.

THERMALITO POWER CANAL

Normal Water Surface Elevation	225.0 ft.
Invert Elevation (Constant)	196.7 ft.
Bottom Width	48.0 ft.
Side Slopes	1.5:1
Depth to Top of Lining	31.3 ft.
Length	2.5 mi.
Capacity	17,000 c.f.s.
Lining	Concrete

THERMALITO FOREBAY DAM

Type	Earthfill
Crest Elevation	231 ft.
Maximum Water Surface Elevation	226 ft.
Reservoir Shore Line at Elevation 226	10 mi.
Freeboard	5 ft.
Maximum Height of Dam	71 ft.
Crest Width	30 ft.
Crest Length	15,900 ft.
Side Slopes - Upstream	1.75 to 3.0:1
Downstream	2.5:1
Fill Volume	1,580,000 cu. yd.
Reservoir Capacity	11,400 acre-ft.
Reservoir Area	600 acres

THERMALITO POWERPLANT

Headworks Structure

Type	Concrete Gravity
Length	350 ft.
Foundation width	75 ft.
Height	82 ft.

Powerhouse

Length	350 ft.
Width	151 ft.
Height	137 ft.

Units

3 Pump-generating units	
1 Generating unit	
Total Generating Q	16,500 c.f.s.
Total Pumping Q	7,000 c.f.s.
Head	102 ft.

Bypass Capacity	10,000 c.f.s.
Rated Generating Capacity	115,100 kw

THERMALITO AFTERBAY DAM

Type	Earthfill	
Crest Elevation	142	ft.
Maximum Water Surface Elevation	136.5	ft.
Minimum Water Surface Elevation	123	ft.
Freeboard	5.5	ft.
Maximum Height of Dam	37	ft.
Crest Width	30	ft.
Crest Length	41,600	ft.
Side Slopes - Upstream	3.0:1	
Downstream	2.5:1	
Fill Volume	5,038,000	cu. yd.
Reservoir Capacity at Elevation 136.5	56,000	acre-ft.
Reservoir Area at Elevation 136.5	4,300	acres

Structures:

	Maximum Operating Release
*Western Canal Outlet	1,150 c.f.s.
*Richvale Canal Outlet	500 c.f.s.
*Sutter-Butte Canal Outlet	2,300 c.f.s.
**River Outlet	17,000 c.f.s.
*PG&E Lateral Outlet	50 c.f.s.

Drainage Area 5 sq. mi.

*Pressure flow conduit with upstream slide gate control

**Open channel flow with top seal radial gate control

PARISH CAMP SADDLE DAM

Dam

Crest Length	260 ft.
Maximum Height	27 ft.
Volume of Embankment	11,000 cu. yd.
Crest Elevation	922 ft.
Crest Width	30 ft.
Side Slopes - Upstream	2.5:1
Downstream	2.5:1

Mine Adit Plug

Volume of Embankment	850 cu. yd.
Surface Slope	4:1

BIDWELL BAR CANYON SADDLE DAM

Crest Length	2,270 ft.
Maximum Height	47 ft.
Volume of Embankment	175,000 cu. yd.
Crest Elevation	922 ft.
Crest Width	30 ft.
Side Slopes - Main Dam - Upstream	2.5:1
Downstream	2.5:1 & 2.0:1
West Dam - Upstream	2.5:1
Downstream	2.0:1

FISH BARRIER DAM

Type	Concrete Gravity
Crest Elevation	181 ft.
Maximum Height Above Streambed	61 ft.
Crest Length	600 ft.
Method of Stream Passage	Overflow Spill Section
Capacity	200,000 c.f.s.
Hydrology	Flow past the Dam is controlled by releases at Oroville Dam and Thermalito Diversion Dam

GEOLOGICAL ORIGINS

OF THE FEATHER RIVER CANYON

The Feather River Canyon is the result of volcanic activity and water erosion in a relatively recent geological period. Events which led up to this development, however, began in a much more remote period of time.

The evolution of the Sierra Nevada began perhaps 120 to 130 million years ago, in the late Jurassic Period, when the western half of a great sediment-filled trough was crumpled into mountains. Available evidence indicates that this took place beneath the sea and that the mountains thus formed appeared as islands, to be "welded" into the continent at a later time. The height of these mountains is not known, but it is estimated to have been about 6,000 to 7,000 feet above sea level.

About a mile below the surface, meanwhile, the formations of igneous rock, solidified from molten masses, developed a huge body of granitic rock under a very large part of the range. This rock, under tremendous pressure, was forced upward through weak spots in the earth's crust to form the large masses of granite subsequently exposed by erosion.

By the beginning of the Cenozoic Era, about 60 million years later, the mountains had been so eroded that they were nearly inconspicuous and in places the ocean had approached the base of the range. The land was so low that western winds carried moisture over it and into the land to the east. This area, so arid at the present time, was then characterized by luxuriant vegetation.

During the Eocene Epoch, the second part of the Cenozoic Era, the land was bowed upward, creating a low mountain barrier into which streams cut deep gorges. About 10 million years later it was again uplifted to sufficient height to catch and hold the moisture from the western winds.

Much more vigorous disturbances in the Miocene, Pliocene, and Pleistocene epochs - comprising approximately 30 million years - elevated the range to its present height.

Volcanic activity and water erosion played the principal parts in the development of the Sierra Nevada in more recent epochs. Glacier action within the last one million years affected parts of the range greatly, as is evidenced by Mono Lake, Yosemite Valley and other places. Feather River Canyon, however, is non-glaciated; it is one of many valleys throughout the range which were formed by water erosion.

About 20 million years ago volcanic eruptions blocked the huge 500 square mile watershed which is now drained by the North Fork of the Feather River, forming a large lake. Gradually a notch began to develop, permitting the water to drain slowly out, which in turn enlarged the notch. The erosion developed in this way cut through lava rock and clay to create the beautiful Feather River Canyon, as we know it.

Sediment deposited on the former lake bottom had formed a broad flat area which was named Big Meadows early in the American period of California history. The construction of Big Meadows Dam in 1914 created modern Lake Almanor, which stores water for regulated release for hydroelectric generation downstream.

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