

PERTINENT DATA FOR OTHER STRUCTURES  
AFFECTING SANTA FE DAM

Exhibit B  
to the  
Water Control Manual for  
Santa Fe Dam

U.S. Army Corps of Engineers  
Los Angeles District

September 1989

PERTINENT DATA FOR OTHER RESERVOIRS  
AFFECTING SANTA FE DAM

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B-1.01 COGSWELL DAM PERTINENT DATA SHEET

Completion date..... April 1934  
 Stream system.....San Gabriel River  
 Drainage area.....mi<sup>2</sup> 39.2  
 Purpose.....Flood control and water conservation  
 Owner/Operator.....LACDPW

Reservoir:

Elevation

Minimum water conservation pool.....ft, NGVD 2265  
 Spillway crest.....ft, NGVD 2385  
 Design surcharge level.....ft, NGVD 2398  
 Top of dam.....ft, NGVD 2405

Capacity (12-4-84 Survey)

Minimum water conservation pool.....ac-ft 514  
 Spillway crest.....ac-ft 8968  
 Design surcharge level.....ac-ft 10,991  
 Top of dam.....ac-ft 12,203

Dam:

Type.....Rockfill w/concrete cutoff wall; permanent concrete face placed in 1948.

Elevation.....ft 2405  
 Height.....ft 265  
 Top length.....ft 585  
 Top width.....ft 18

Spillway:

Type..... Ogee section  
 Crest elevation.....ft 2385  
 Discharge at design surcharge level.....ft<sup>3</sup>/s 29,500

Outlets:

Flood control values

Number, type, and size.....5 - 84" Butterfly  
 Elevations of sill - #1.....ft, NVGD 2213.0  
                           #2.....ft, NVGD No valve  
                           #3.....ft, NVGD 2248.1  
                           #4.....ft, NVGD 2282.9  
                           #5.....ft, NVGD 2316.2

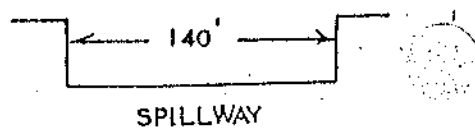
Maximum discharge at spillway

crest elevation - #1.....ft<sup>3</sup>/s 2555  
                           #2.....ft<sup>3</sup>/s 2280  
                           #3.....ft<sup>3</sup>/s 2140  
                           #4.....ft<sup>3</sup>/s 1750

Service values

Type and size - #A2.....14" Hollow jet  
                           #S.G.....6' x 6' Sluice gate  
 Elevation of sill - #A2.....ft, NVGD 2212.3  
                           #S.G.....ft, NVGD 2170.0  
 Maximum discharge at spillway  
 crest elevation - #A2.....ft<sup>3</sup>/s 75

ELEVATION  
IN FEET



2405.0 ——— CREST OF DAM ——— 2400  
 2385.0 ——— SILL OF SPILLWAY ——— 2380  
 2360  
 2340

NOTE:  
 ALL VALVES SHOWN ARE 84" DIA. BUTTERFLY EXCEPT VALVE A-2

2336.2 ——— TOP OF TRASH RACK-VALVE 5 ——— 2320  
 2319.2 ——— SILL OF VALVE 5 ———  $\phi$  VALVE 5 - EL. 2318.70  
 2305.5 ——— TOP OF TRASH RACK-VALVE 4 ——— 2300  
 2282.9 ——— SILL OF VALVE 4 ———  $\phi$  VALVE 4 - EL. 2285.78  
 2267.6 ——— TOP OF TRASH RACK VALVE 3 ——— 2260  
 2260.1 ——— TOP OF TRASH RACK VALVE 1 ——— 2240  
 2248.1 ——— SILL OF VALVE 3 ———  $\phi$  VALVE 3 - EL. 2247.46  
 2224.7 ——— TOP OF TRASH RACK VALVE A-2 ——— 2220  
 (2213.0) ——— RISER SILL - VALVE 1 ——— 2200  
 (2212.3) ——— SILL OF VALVE A-2 ——— 2180  
 2178.5 ———  $\phi$  VALVE 1 EL. 2178.03  
 2171.0 ———  $\phi$  VALVE A-2 - 14" HOLLOW JET ——— 2160

ELEVATION IN FEET

B-1-3

SILL OF SLUICE GATE

# COGSWELL DAM

RVSD, JAN, 1974  
 REVIEWED JAN

Hydraulic (Remillard) ✓

LOS ANGELES COUNTY FLOOD CONTROL DISTRICT

MEMORANDUM

TO: Mr. K. W. Kummerfeld

January 25, 1983

FROM: C. F. Eshelby  
Hydraulic Division

File No. 627.121  
Cogswell Dam and Reservoir  
Storm Operation Plan.

*Approved*  
*WK*  
*1-27*  
Recommendation

Approve the operation plan for Cogswell Dam discussed herein.

Discussion

Recent studies and field observations during releases have shown that the West Fork can safely accommodate a sustained 2,000 cfs release from the dam providing adequate freeboard without damage to the road (this takes into account tributary side flow along the entire reach). We also know that the road is subject to overtopping at its most critical section (approximately 1.5 miles below the dam) with releases of 3,500 cfs or more. Assuming 2,000 cfs is the maximum sustained release from the dam, we have routed 5-, 10-, 20-, and 25-year run-off hydrographs through the reservoir to develop a reasonable operation plan with the following objectives:

- 1) Maintain integrity of the West Fork road.
- 2) Minimize spillway flow.
- 3) Maintain adequate flood control storage capacity in the canyon system.
- 4) Retain adequate storage for post-storm season low flow releases and succeeding preseasonal pool.
- 5) Maximize end-of-season storage for water conservation.

Operation Plan

Minimum pre-season cushion pool - Elevation 2270 feet (approximately 710 acre-feet), no. 1 trash rack submerged 10 feet and approximately 25 feet over the fill at the face of the dam.

Upon receiving a forecast of significant rainfall (relating to available reservoir and watershed storage), peak Q's and event volumes are to be determined using the recently developed Run-off Forecast Models. Using the forecast results as guidelines, the reservoir will be operated as follows:

B-1-A

Mr. K. W. Kummerfeld  
Page 2  
January 25, 1983

Rising Reservoir

Throttle outflow up to 2,000 cfs as necessary to prevent spillway flow. During smaller storms, these releases would generally be under 1,000 cfs. As available flood control storage in the canyon system permits, outflow should continue until reservoir level starts downward.

Falling Reservoir

Continue outflow at a reasonable rate to maintain a consistent downward trend to provide adequate flood control storage in the reservoir for subsequent storm events. During the peak of the storm season, post-storm drawdown should be taken to fairly low reservoir levels. At no time shall the reservoir be allowed to drop below Elevation 2265 feet. The reservoir should be as full as possible at the end of storm season.

Our studies indicate that using the above plan, we can safely manage up to a 20-year run-off event with a peak inflow of 13,700 cfs.

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Tom Remillard  
Operations Section  
Extension 4190

TJR:elg

cc: Hydraulic (2) (Remillard, Files)  
General Files

## COGSWELL DAM

Revised December 1985

### Runoff Data

Drainage Area = 25,095 acres = 39.21 square miles.  
Maximum Record Runoff = 64% from rainfall of 1.61"/hr. at the dam.  
Time of concentration is 2 to 6 hours.  
Field Moisture Capacity = 8.00"+.

### Dam Operation Data

No restrictions by State.  
Water may be impounded to Elevation 2385-USGS datum (sill of spillway).  
Valve No. A-2, 14" hollow jet, is used for low flow releases of 75 cfs or less, depending on the head.  
All of the valves are remotely controlled from the control house.  
Maximum outlet capacity is 8,725. cfs (Valve No. 1 = 2,555. cfs; Valve No. 3 = 2,280. cfs; Valve No. 4 = 2,140. cfs; Valve No. 5 = 1,750. cfs) with water surface at spillway sill elevation of 2,385. feet.

### Storm Operation Procedure

See Operating Plan dated January 25, 1983.

### Channel Restrictions

Releases from the dam combined with the side flow below the dam that accumulates 2,000. cfs or more may damage the canyon access road to the dam. Combined flow of 2,000. cfs or more should be avoided is possible.

### Infiltration Capacity - West Fork Channel

None accounted for. Releases from the dam go through to San Gabriel without any losses because the West Fork has water continuously and the soil moisture demand is relatively satisfied.

### Water Rights

See the San Gabriel and Morris Dam write-ups.

### Critical Leakage Points

Gaging Station F251-R, located at the downstream toe of the dam, measures leakage through the structure. Any changes in the amount of leakage that does not correlate with a change in head should be watched carefully. Leakage at this station should not exceed 6.0 cfs under normal conditions.

General Notes

Access to the valves is limited to the outlet tunnel; therefore, all valves must be shut off 100% and remain that way during tunnel occupancy. Releases should be made through the valve of highest elevation that has adequate (5-foot minimum) water cover over the trashrack.

Stream Gaging Station F209-R, located downstream of outlet tunnel, is equipped with a remote gage height indicator that has a readout in the control house. This gage height reading should be observed and used to verify the discharge until the flow is measured. It takes six to seven minutes to open or close each 84" valve.



COGSWELL RESERVOIR  
 STORAGE TABLE NO. 21  
 SURVEY OF 12-14-84

| ELEVATION | .0   | .1   | .2   | .3   | .4   | .5   | .6   | .7   | .8   | .9   | DIFFERENCE |
|-----------|------|------|------|------|------|------|------|------|------|------|------------|
| 2183      | 0.0  | 0.0  | 0.0  | 0.1  | 0.1  | 0.1  | 0.1  | 0.1  | 0.1  | 0.2  | 0.02       |
| 2184      | 0.2  | 0.2  | 0.2  | 0.2  | 0.2  | 0.3  | 0.3  | 0.3  | 0.3  | 0.3  | 0.02       |
| 2185      | 0.3  | 0.4  | 0.4  | 0.4  | 0.4  | 0.4  | 0.4  | 0.5  | 0.5  | 0.5  | 0.02       |
| 2186      | 0.5  | 0.5  | 0.6  | 0.6  | 0.7  | 0.7  | 0.7  | 0.8  | 0.8  | 0.9  | 0.04       |
| 2187      | 0.9  | 1.0  | 1.0  | 1.1  | 1.1  | 1.2  | 1.2  | 1.3  | 1.3  | 1.4  | 0.05       |
| 2188      | 1.4  | 1.5  | 1.5  | 1.6  | 1.7  | 1.7  | 1.8  | 1.8  | 1.9  | 2.0  | 0.06       |
| 2189      | 2.0  | 2.1  | 2.2  | 2.2  | 2.3  | 2.4  | 2.4  | 2.5  | 2.6  | 2.7  | 0.07       |
| 2190      | 2.7  | 2.8  | 2.9  | 3.0  | 3.0  | 3.1  | 3.2  | 3.3  | 3.4  | 3.4  | 0.08       |
| 2191      | 3.5  | 3.6  | 3.7  | 3.8  | 3.9  | 3.9  | 4.0  | 4.1  | 4.2  | 4.3  | 0.09       |
| 2192      | 4.4  | 4.5  | 4.6  | 4.6  | 4.7  | 4.8  | 4.9  | 5.0  | 5.1  | 5.2  | 0.09       |
| 2193      | 5.3  | 5.4  | 5.5  | 5.6  | 5.7  | 5.8  | 5.9  | 6.0  | 6.1  | 6.2  | 0.10       |
| 2194      | 6.3  | 6.4  | 6.5  | 6.6  | 6.7  | 6.8  | 6.9  | 7.0  | 7.1  | 7.2  | 0.10       |
| 2195      | 7.3  | 7.4  | 7.5  | 7.6  | 7.7  | 7.8  | 7.9  | 8.0  | 8.1  | 8.2  | 0.10       |
| 2196      | 8.3  | 8.4  | 8.5  | 8.6  | 8.8  | 8.9  | 9.0  | 9.1  | 9.2  | 9.3  | 0.11       |
| 2197      | 9.4  | 9.5  | 9.6  | 9.7  | 9.9  | 10.0 | 10.1 | 10.2 | 10.3 | 10.4 | 0.11       |
| 2198      | 10.5 | 10.6 | 10.8 | 10.9 | 11.0 | 11.1 | 11.2 | 11.3 | 11.5 | 11.6 | 0.12       |
| 2199      | 11.7 | 11.8 | 11.9 | 12.1 | 12.2 | 12.3 | 12.4 | 12.5 | 12.7 | 12.8 | 0.12       |
| 2200      | 12.9 | 13.0 | 13.2 | 13.3 | 13.4 | 13.5 | 13.7 | 13.8 | 13.9 | 14.0 | 0.13       |
| 2201      | 14.2 | 14.3 | 14.4 | 14.6 | 14.7 | 14.8 | 15.0 | 15.1 | 15.2 | 15.3 | 0.13       |
| 2202      | 15.5 | 15.6 | 15.7 | 15.9 | 16.0 | 16.2 | 16.3 | 16.4 | 16.6 | 16.7 | 0.14       |
| 2203      | 16.8 | 17.0 | 17.1 | 17.3 | 17.4 | 17.5 | 17.7 | 17.8 | 18.0 | 18.1 | 0.14       |
| 2204      | 18.2 | 18.4 | 18.5 | 18.7 | 18.8 | 19.0 | 19.1 | 19.3 | 19.4 | 19.5 | 0.15       |
| 2205      | 19.7 | 19.8 | 20.0 | 20.1 | 20.3 | 20.4 | 20.6 | 20.7 | 20.9 | 21.0 | 0.15       |
| 2206      | 21.2 | 21.3 | 21.5 | 21.6 | 21.8 | 21.9 | 22.1 | 22.2 | 22.4 | 22.5 | 0.15       |
| 2207      | 22.7 | 22.9 | 23.0 | 23.2 | 23.3 | 23.5 | 23.6 | 23.8 | 23.9 | 24.1 | 0.16       |
| 2208      | 24.3 | 24.4 | 24.6 | 24.7 | 24.9 | 25.1 | 25.2 | 25.4 | 25.5 | 25.7 | 0.16       |
| 2209      | 25.9 | 26.0 | 26.2 | 26.4 | 26.5 | 26.7 | 26.9 | 27.0 | 27.2 | 27.4 | 0.17       |
| 2210      | 27.5 | 27.7 | 27.9 | 28.1 | 28.2 | 28.4 | 28.6 | 28.8 | 29.0 | 29.1 | 0.18       |

COGSWELL RD. VOIR  
STORAGE TABLE NO. 21  
SURVEY OF 12-14-84

| ELEVATION | .0    | .1    | .2    | .3    | .4    | .5    | .6    | .7    | .8    | .9    | DIFFERENCE |
|-----------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|------------|
| 2211      | 29.3  | 29.5  | 29.7  | 29.9  | 30.1  | 30.3  | 30.5  | 30.6  | 30.8  | 31.0  | 0.19       |
| 2212      | 31.2  | 31.4  | 31.6  | 31.8  | 32.0  | 32.3  | 32.5  | 32.7  | 32.9  | 33.1  | 0.21       |
| 2213      | 33.3  | 33.5  | 33.7  | 33.9  | 34.2  | 34.4  | 34.6  | 34.8  | 35.0  | 35.3  | 0.22       |
| 2214      | 35.5  | 35.7  | 36.0  | 36.2  | 36.4  | 36.7  | 36.9  | 37.1  | 37.4  | 37.6  | 0.23       |
| 2215      | 37.8  | 38.1  | 38.3  | 38.6  | 38.8  | 39.0  | 39.3  | 39.5  | 39.8  | 40.0  | 0.24       |
| 2216      | 40.3  | 40.5  | 40.8  | 41.0  | 41.3  | 41.5  | 41.8  | 42.0  | 42.3  | 42.5  | 0.25       |
| 2217      | 42.8  | 43.0  | 43.3  | 43.6  | 43.8  | 44.1  | 44.3  | 44.6  | 44.9  | 45.1  | 0.26       |
| 2218      | 45.4  | 45.6  | 45.9  | 46.2  | 46.4  | 46.7  | 47.0  | 47.2  | 47.5  | 47.8  | 0.27       |
| 2219      | 48.0  | 48.3  | 48.6  | 48.9  | 49.2  | 49.4  | 49.7  | 50.0  | 50.3  | 50.5  | 0.28       |
| 2220      | 50.8  | 51.1  | 51.4  | 51.7  | 52.0  | 52.3  | 52.6  | 52.9  | 53.2  | 53.5  | 0.29       |
| 2221      | 53.7  | 54.1  | 54.4  | 54.7  | 55.0  | 55.3  | 55.6  | 55.9  | 56.3  | 56.6  | 0.31       |
| 2222      | 56.9  | 57.2  | 57.6  | 57.9  | 58.2  | 58.6  | 58.9  | 59.3  | 59.6  | 59.9  | 0.34       |
| 2223      | 60.3  | 60.6  | 61.0  | 61.4  | 61.7  | 62.1  | 62.5  | 62.8  | 63.2  | 63.6  | 0.37       |
| 2224      | 63.9  | 64.3  | 64.7  | 65.1  | 65.5  | 65.9  | 66.3  | 66.7  | 67.1  | 67.5  | 0.40       |
| 2225      | 67.9  | 68.4  | 68.8  | 69.2  | 69.7  | 70.1  | 70.5  | 70.9  | 71.4  | 71.8  | 0.43       |
| 2226      | 72.2  | 72.7  | 73.2  | 73.6  | 74.1  | 74.6  | 75.0  | 75.5  | 76.0  | 76.4  | 0.46       |
| 2227      | 76.9  | 77.4  | 77.9  | 78.4  | 78.9  | 79.4  | 79.9  | 80.4  | 80.9  | 81.4  | 0.50       |
| 2228      | 81.9  | 82.4  | 82.9  | 83.4  | 84.0  | 84.5  | 85.0  | 85.5  | 86.1  | 86.6  | 0.53       |
| 2229      | 87.1  | 87.7  | 88.2  | 88.8  | 89.3  | 89.9  | 90.5  | 91.0  | 91.6  | 92.1  | 0.55       |
| 2230      | 92.7  | 93.2  | 93.8  | 94.4  | 95.0  | 95.6  | 96.1  | 96.7  | 97.3  | 97.9  | 0.58       |
| 2231      | 98.4  | 99.0  | 99.6  | 100.2 | 100.8 | 101.4 | 102.0 | 102.6 | 103.2 | 103.8 | 0.60       |
| 2232      | 104.4 | 105.0 | 105.6 | 106.3 | 106.9 | 107.5 | 108.1 | 108.7 | 109.3 | 109.9 | 0.62       |
| 2233      | 110.6 | 111.2 | 111.8 | 112.5 | 113.1 | 113.8 | 114.4 | 115.0 | 115.7 | 116.3 | 0.64       |
| 2234      | 116.9 | 117.6 | 118.3 | 118.9 | 119.6 | 120.3 | 121.0 | 121.6 | 122.3 | 123.0 | 0.67       |
| 2235      | 123.6 | 124.3 | 125.0 | 125.7 | 126.5 | 127.2 | 127.9 | 128.6 | 129.3 | 130.0 | 0.71       |
| 2236      | 130.7 | 131.5 | 132.2 | 133.0 | 133.7 | 134.5 | 135.2 | 136.0 | 136.8 | 137.5 | 0.76       |
| 2237      | 138.3 | 139.1 | 139.9 | 140.7 | 141.5 | 142.3 | 143.2 | 144.0 | 144.8 | 145.6 | 0.81       |
| 2238      | 146.4 | 147.3 | 148.1 | 149.0 | 149.9 | 150.7 | 151.6 | 152.5 | 153.3 | 154.2 | 0.87       |
| 2239      | 155.1 | 156.0 | 156.9 | 157.8 | 158.8 | 159.7 | 160.6 | 161.5 | 162.4 | 163.4 | 0.92       |
| 2240      | 164.3 | 165.2 | 166.2 | 167.2 | 168.1 | 169.1 | 170.1 | 171.0 | 172.0 | 172.9 | 0.96       |

COGSWELL LAKE RESERVOIR  
STORAGE TABLE NO. 21  
SURVEY OF 12-14-84

| ELEVATION | .0    | .1    | .2    | .3    | .4    | .5    | .6    | .7    | .8    | .9    | DIFFERENC |
|-----------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-----------|
| 2241      | 173.9 | 174.9 | 175.9 | 176.9 | 177.9 | 178.9 | 179.9 | 180.9 | 181.9 | 182.9 | 1.00      |
| 2242      | 183.9 | 184.9 | 185.9 | 187.0 | 188.0 | 189.0 | 190.0 | 191.1 | 192.1 | 193.1 | 1.03      |
| 2243      | 194.2 | 195.2 | 196.3 | 197.3 | 198.4 | 199.4 | 200.5 | 201.5 | 202.6 | 203.7 | 1.06      |
| 2244      | 204.7 | 205.8 | 206.9 | 208.0 | 209.1 | 210.1 | 211.2 | 212.3 | 213.4 | 214.5 | 1.09      |
| 2245      | 215.6 | 216.7 | 217.8 | 219.0 | 220.1 | 221.2 | 222.3 | 223.4 | 224.6 | 225.7 | 1.12      |
| 2246      | 226.8 | 228.0 | 229.2 | 230.3 | 231.5 | 232.7 | 233.8 | 235.0 | 236.2 | 237.3 | 1.17      |
| 2247      | 238.5 | 239.7 | 240.9 | 242.1 | 243.4 | 244.6 | 245.8 | 247.0 | 248.2 | 249.4 | 1.22      |
| 2248      | 250.7 | 251.9 | 253.2 | 254.4 | 255.7 | 257.0 | 258.2 | 259.5 | 260.8 | 262.0 | 1.26      |
| 2249      | 263.3 | 264.6 | 265.9 | 267.2 | 268.5 | 269.9 | 271.2 | 272.5 | 273.8 | 275.1 | 1.31      |
| 2250      | 276.4 | 277.8 | 279.1 | 280.5 | 281.8 | 283.2 | 284.5 | 285.9 | 287.3 | 288.6 | 1.36      |
| 2251      | 290.0 | 291.4 | 292.8 | 294.1 | 295.5 | 296.9 | 298.3 | 299.7 | 301.1 | 302.5 | 1.39      |
| 2252      | 303.9 | 305.3 | 306.7 | 308.2 | 309.6 | 311.0 | 312.5 | 313.9 | 315.3 | 316.7 | 1.43      |
| 2253      | 318.2 | 319.6 | 321.1 | 322.5 | 324.0 | 325.4 | 326.9 | 328.3 | 329.8 | 331.3 | 1.46      |
| 2254      | 332.7 | 334.2 | 335.7 | 337.2 | 338.6 | 340.1 | 341.6 | 343.1 | 344.6 | 346.1 | 1.48      |
| 2255      | 347.5 | 349.0 | 350.5 | 352.1 | 353.6 | 355.1 | 356.6 | 358.1 | 359.6 | 361.1 | 1.51      |
| 2256      | 362.6 | 364.1 | 365.7 | 367.2 | 368.7 | 370.3 | 371.8 | 373.3 | 374.9 | 376.4 | 1.53      |
| 2257      | 377.9 | 379.5 | 381.1 | 382.6 | 384.2 | 385.7 | 387.3 | 388.9 | 390.4 | 392.0 | 1.56      |
| 2258      | 393.5 | 395.1 | 396.7 | 398.3 | 399.9 | 401.5 | 403.1 | 404.7 | 406.3 | 407.8 | 1.59      |
| 2259      | 409.4 | 411.1 | 412.7 | 414.3 | 415.9 | 417.6 | 419.2 | 420.8 | 422.5 | 424.1 | 1.63      |
| 2260      | 425.7 | 427.4 | 429.1 | 430.7 | 432.4 | 434.1 | 435.7 | 437.4 | 439.1 | 440.8 | 1.67      |
| 2261      | 442.4 | 444.1 | 445.9 | 447.6 | 449.3 | 451.0 | 452.7 | 454.5 | 456.2 | 457.9 | 1.72      |
| 2262      | 459.6 | 461.4 | 463.2 | 465.0 | 466.7 | 468.5 | 470.3 | 472.0 | 473.8 | 475.6 | 1.77      |
| 2263      | 477.4 | 479.2 | 481.0 | 482.8 | 484.7 | 486.5 | 488.3 | 490.1 | 491.9 | 493.8 | 1.82      |
| 2264      | 495.6 | 497.5 | 499.3 | 501.2 | 503.0 | 504.9 | 506.8 | 508.6 | 510.5 | 512.4 | 1.86      |
| 2265      | 514.2 | 516.1 | 518.0 | 519.9 | 521.8 | 523.7 | 525.6 | 527.5 | 529.4 | 531.3 | 1.90      |
| 2266      | 533.2 | 535.1 | 537.0 | 538.9 | 540.8 | 542.8 | 544.7 | 546.6 | 548.5 | 550.4 | 1.92      |
| 2267      | 552.3 | 554.3 | 556.2 | 558.1 | 560.1 | 562.0 | 563.9 | 565.8 | 567.8 | 569.7 | 1.93      |
| 2268      | 571.6 | 573.6 | 575.5 | 577.4 | 579.4 | 581.3 | 583.3 | 585.2 | 587.1 | 589.1 | 1.94      |
| 2269      | 591.0 | 593.0 | 594.9 | 596.9 | 598.9 | 600.8 | 602.8 | 604.7 | 606.7 | 608.6 | 1.96      |
| 2270      | 610.6 | 612.6 | 614.5 | 616.5 | 618.5 | 620.5 | 622.5 | 624.4 | 626.4 | 628.4 | 1.98      |

COBSWELL RESERVOIR  
STORAGE TABLE NO. 21  
SURVEY OF 12-14-84

| ELEVATION | .0    | .1    | .2    | .3    | .4    | .5    | .6    | .7    | .8    | .9      | DIFFERENCE |
|-----------|-------|-------|-------|-------|-------|-------|-------|-------|-------|---------|------------|
| 2271      | 630.4 | 632.4 | 634.4 | 636.4 | 638.4 | 640.4 | 642.5 | 644.5 | 646.5 | 648.5   | 2.01       |
| 2272      | 650.5 | 652.5 | 654.6 | 656.7 | 658.7 | 660.8 | 662.8 | 664.9 | 666.9 | 669.0   | 2.05       |
| 2273      | 671.0 | 673.1 | 675.2 | 677.3 | 679.4 | 681.5 | 683.6 | 685.7 | 687.8 | 689.9   | 2.10       |
| 2274      | 692.0 | 694.1 | 696.2 | 698.4 | 700.5 | 702.7 | 704.8 | 707.0 | 709.1 | 711.2   | 2.14       |
| 2275      | 713.4 | 715.6 | 717.8 | 719.9 | 722.1 | 724.3 | 726.5 | 728.7 | 730.9 | 733.1   | 2.19       |
| 2276      | 735.3 | 737.5 | 739.7 | 742.0 | 744.2 | 746.4 | 748.7 | 750.9 | 753.1 | 755.4   | 2.23       |
| 2277      | 757.6 | 759.9 | 762.2 | 764.4 | 766.7 | 769.0 | 771.3 | 773.5 | 775.8 | 778.1   | 2.28       |
| 2278      | 780.4 | 782.7 | 785.0 | 787.3 | 789.7 | 792.0 | 794.3 | 796.6 | 798.9 | 801.3   | 2.32       |
| 2279      | 803.6 | 806.0 | 808.3 | 810.7 | 813.0 | 815.4 | 817.8 | 820.1 | 822.5 | 824.9   | 2.36       |
| 2280      | 827.2 | 829.6 | 832.0 | 834.4 | 836.8 | 839.3 | 841.7 | 844.1 | 846.5 | 848.9   | 2.41       |
| 2281      | 851.3 | 853.7 | 856.2 | 858.6 | 861.1 | 863.5 | 866.0 | 868.4 | 870.8 | 873.3   | 2.45       |
| 2282      | 875.7 | 878.2 | 880.7 | 883.2 | 885.7 | 888.2 | 890.7 | 893.2 | 895.6 | 898.1   | 2.49       |
| 2283      | 900.6 | 903.1 | 905.7 | 908.2 | 910.7 | 913.3 | 915.8 | 918.3 | 920.9 | 923.4   | 2.53       |
| 2284      | 925.9 | 928.5 | 931.1 | 933.6 | 936.2 | 938.8 | 941.3 | 943.9 | 946.5 | 949.1   | 2.57       |
| 2285      | 951.6 | 954.2 | 956.9 | 959.5 | 962.1 | 964.7 | 967.3 | 969.9 | 972.6 | 975.2   | 2.62       |
| 2286      | 977.8 | 980.5 | 983.1 | 985.8 | 988.4 | 991.1 | 993.8 | 996.4 | 999.1 | 1,001.7 | 2.66       |
| 2287      | 1,004 | 1,007 | 1,010 | 1,013 | 1,015 | 1,018 | 1,021 | 1,023 | 1,026 | 1,029   | 2.71       |
| 2288      | 1,032 | 1,034 | 1,037 | 1,040 | 1,043 | 1,045 | 1,048 | 1,051 | 1,054 | 1,056   | 2.77       |
| 2289      | 1,059 | 1,062 | 1,065 | 1,068 | 1,071 | 1,073 | 1,076 | 1,079 | 1,082 | 1,085   | 2.83       |
| 2290      | 1,088 | 1,090 | 1,093 | 1,096 | 1,099 | 1,102 | 1,105 | 1,108 | 1,111 | 1,114   | 2.90       |
| 2291      | 1,117 | 1,120 | 1,122 | 1,125 | 1,128 | 1,131 | 1,134 | 1,137 | 1,140 | 1,143   | 2.98       |
| 2292      | 1,146 | 1,149 | 1,153 | 1,156 | 1,159 | 1,162 | 1,165 | 1,168 | 1,171 | 1,174   | 3.07       |
| 2293      | 1,177 | 1,180 | 1,183 | 1,187 | 1,190 | 1,193 | 1,196 | 1,199 | 1,202 | 1,206   | 3.17       |
| 2294      | 1,209 | 1,212 | 1,215 | 1,219 | 1,222 | 1,225 | 1,229 | 1,232 | 1,235 | 1,238   | 3.28       |
| 2295      | 1,242 | 1,245 | 1,248 | 1,252 | 1,255 | 1,259 | 1,262 | 1,265 | 1,269 | 1,272   | 3.39       |
| 2296      | 1,276 | 1,279 | 1,283 | 1,286 | 1,290 | 1,293 | 1,297 | 1,300 | 1,304 | 1,307   | 3.51       |
| 2297      | 1,311 | 1,314 | 1,318 | 1,322 | 1,325 | 1,329 | 1,332 | 1,336 | 1,340 | 1,343   | 3.63       |
| 2298      | 1,347 | 1,351 | 1,354 | 1,358 | 1,362 | 1,366 | 1,369 | 1,373 | 1,377 | 1,381   | 3.75       |
| 2299      | 1,384 | 1,388 | 1,392 | 1,396 | 1,400 | 1,404 | 1,408 | 1,411 | 1,415 | 1,419   | 3.86       |
| 2300      | 1,423 | 1,427 | 1,431 | 1,435 | 1,439 | 1,443 | 1,447 | 1,451 | 1,455 | 1,459   | 3.97       |

COGSWELL RESERVOIR  
STORAGE TABLE NO. 21  
SURVEY OF 12-14-84

| ELEVATION | .0    | .1    | .2    | .3    | .4    | .5    | .6    | .7    | .8    | .9    | DIFFERENCE |
|-----------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|------------|
| 2301      | 1,463 | 1,467 | 1,471 | 1,475 | 1,479 | 1,483 | 1,487 | 1,491 | 1,495 | 1,499 | 4.07       |
| 2302      | 1,503 | 1,508 | 1,512 | 1,516 | 1,520 | 1,524 | 1,528 | 1,533 | 1,537 | 1,541 | 4.17       |
| 2303      | 1,545 | 1,549 | 1,554 | 1,558 | 1,562 | 1,566 | 1,571 | 1,575 | 1,579 | 1,583 | 4.26       |
| 2304      | 1,588 | 1,592 | 1,596 | 1,601 | 1,605 | 1,609 | 1,614 | 1,618 | 1,622 | 1,627 | 4.34       |
| 2305      | 1,631 | 1,636 | 1,640 | 1,644 | 1,649 | 1,653 | 1,658 | 1,662 | 1,667 | 1,671 | 4.43       |
| 2306      | 1,675 | 1,680 | 1,684 | 1,689 | 1,693 | 1,698 | 1,703 | 1,707 | 1,712 | 1,716 | 4.52       |
| 2307      | 1,721 | 1,725 | 1,730 | 1,734 | 1,739 | 1,744 | 1,748 | 1,753 | 1,757 | 1,762 | 4.60       |
| 2308      | 1,767 | 1,771 | 1,776 | 1,781 | 1,785 | 1,790 | 1,795 | 1,799 | 1,804 | 1,809 | 4.70       |
| 2309      | 1,814 | 1,818 | 1,823 | 1,828 | 1,833 | 1,838 | 1,842 | 1,847 | 1,852 | 1,857 | 4.79       |
| 2310      | 1,862 | 1,866 | 1,871 | 1,876 | 1,881 | 1,886 | 1,891 | 1,896 | 1,901 | 1,906 | 4.90       |
| 2311      | 1,910 | 1,915 | 1,920 | 1,925 | 1,930 | 1,935 | 1,940 | 1,945 | 1,951 | 1,956 | 5.00       |
| 2312      | 1,961 | 1,966 | 1,971 | 1,976 | 1,981 | 1,986 | 1,991 | 1,996 | 2,001 | 2,007 | 5.11       |
| 2313      | 2,012 | 2,017 | 2,022 | 2,027 | 2,033 | 2,038 | 2,043 | 2,048 | 2,053 | 2,059 | 5.22       |
| 2314      | 2,064 | 2,069 | 2,075 | 2,080 | 2,085 | 2,090 | 2,096 | 2,101 | 2,106 | 2,112 | 5.33       |
| 2315      | 2,117 | 2,123 | 2,128 | 2,133 | 2,139 | 2,144 | 2,150 | 2,155 | 2,161 | 2,166 | 5.42       |
| 2316      | 2,171 | 2,177 | 2,182 | 2,188 | 2,193 | 2,199 | 2,204 | 2,210 | 2,216 | 2,221 | 5.52       |
| 2317      | 2,227 | 2,232 | 2,238 | 2,243 | 2,249 | 2,255 | 2,260 | 2,266 | 2,271 | 2,277 | 5.61       |
| 2318      | 2,283 | 2,288 | 2,294 | 2,300 | 2,306 | 2,311 | 2,317 | 2,323 | 2,328 | 2,334 | 5.72       |
| 2319      | 2,340 | 2,346 | 2,352 | 2,357 | 2,363 | 2,369 | 2,375 | 2,381 | 2,386 | 2,392 | 5.83       |
| 2320      | 2,398 | 2,404 | 2,410 | 2,416 | 2,422 | 2,428 | 2,434 | 2,440 | 2,446 | 2,452 | 5.97       |
| 2321      | 2,458 | 2,464 | 2,470 | 2,476 | 2,482 | 2,488 | 2,495 | 2,501 | 2,507 | 2,513 | 6.12       |
| 2322      | 2,519 | 2,525 | 2,532 | 2,538 | 2,544 | 2,551 | 2,557 | 2,563 | 2,569 | 2,576 | 6.29       |
| 2323      | 2,582 | 2,588 | 2,595 | 2,601 | 2,608 | 2,614 | 2,621 | 2,627 | 2,633 | 2,640 | 6.44       |
| 2324      | 2,646 | 2,653 | 2,660 | 2,666 | 2,673 | 2,679 | 2,686 | 2,692 | 2,699 | 2,706 | 6.58       |
| 2325      | 2,712 | 2,719 | 2,726 | 2,732 | 2,739 | 2,746 | 2,752 | 2,759 | 2,766 | 2,773 | 6.70       |
| 2326      | 2,779 | 2,786 | 2,793 | 2,800 | 2,806 | 2,813 | 2,820 | 2,827 | 2,834 | 2,840 | 6.79       |
| 2327      | 2,847 | 2,854 | 2,861 | 2,868 | 2,875 | 2,881 | 2,888 | 2,895 | 2,902 | 2,909 | 6.86       |
| 2328      | 2,916 | 2,923 | 2,930 | 2,937 | 2,943 | 2,950 | 2,957 | 2,964 | 2,971 | 2,978 | 6.93       |
| 2329      | 2,985 | 2,992 | 2,999 | 3,006 | 3,013 | 3,020 | 3,027 | 3,034 | 3,041 | 3,048 | 7.00       |
| 2330      | 3,055 | 3,062 | 3,069 | 3,076 | 3,083 | 3,091 | 3,098 | 3,105 | 3,112 | 3,119 | 7.09       |

COGSWELL RE. JIR  
STORAGE TABLE NO. 21  
SURVEY OF 12-14-84

| ELEVATION | .0    | .1    | .2    | .3    | .4    | .5    | .6    | .7    | .8    | .9    | DIFFERENCE |
|-----------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|------------|
| 2331      | 3,126 | 3,133 | 3,140 | 3,148 | 3,155 | 3,162 | 3,169 | 3,176 | 3,184 | 3,191 | 7.20       |
| 2332      | 3,198 | 3,205 | 3,213 | 3,220 | 3,227 | 3,235 | 3,242 | 3,249 | 3,257 | 3,264 | 7.32       |
| 2333      | 3,271 | 3,279 | 3,286 | 3,294 | 3,301 | 3,308 | 3,316 | 3,323 | 3,331 | 3,338 | 7.45       |
| 2334      | 3,346 | 3,353 | 3,361 | 3,369 | 3,376 | 3,384 | 3,391 | 3,399 | 3,407 | 3,414 | 7.60       |
| 2335      | 3,422 | 3,429 | 3,437 | 3,445 | 3,453 | 3,460 | 3,468 | 3,476 | 3,484 | 3,491 | 7.75       |
| 2336      | 3,499 | 3,507 | 3,515 | 3,523 | 3,531 | 3,539 | 3,547 | 3,555 | 3,562 | 3,570 | 7.90       |
| 2337      | 3,578 | 3,586 | 3,594 | 3,602 | 3,611 | 3,619 | 3,627 | 3,635 | 3,643 | 3,651 | 8.06       |
| 2338      | 3,659 | 3,667 | 3,675 | 3,683 | 3,692 | 3,700 | 3,708 | 3,716 | 3,725 | 3,733 | 8.21       |
| 2339      | 3,741 | 3,749 | 3,758 | 3,766 | 3,774 | 3,783 | 3,791 | 3,799 | 3,808 | 3,816 | 8.35       |
| 2340      | 3,824 | 3,833 | 3,841 | 3,850 | 3,858 | 3,867 | 3,875 | 3,884 | 3,892 | 3,901 | 8.48       |
| 2341      | 3,909 | 3,918 | 3,926 | 3,935 | 3,944 | 3,952 | 3,961 | 3,969 | 3,978 | 3,987 | 8.60       |
| 2342      | 3,995 | 4,004 | 4,013 | 4,021 | 4,030 | 4,039 | 4,048 | 4,056 | 4,065 | 4,074 | 8.72       |
| 2343      | 4,082 | 4,091 | 4,100 | 4,109 | 4,118 | 4,127 | 4,135 | 4,144 | 4,153 | 4,162 | 8.83       |
| 2344      | 4,171 | 4,180 | 4,189 | 4,198 | 4,207 | 4,215 | 4,224 | 4,233 | 4,242 | 4,251 | 8.95       |
| 2345      | 4,260 | 4,269 | 4,278 | 4,287 | 4,296 | 4,306 | 4,315 | 4,324 | 4,333 | 4,342 | 9.07       |
| 2346      | 4,351 | 4,360 | 4,369 | 4,379 | 4,388 | 4,397 | 4,406 | 4,415 | 4,425 | 4,434 | 9.20       |
| 2347      | 4,443 | 4,452 | 4,462 | 4,471 | 4,480 | 4,490 | 4,499 | 4,508 | 4,518 | 4,527 | 9.34       |
| 2348      | 4,536 | 4,546 | 4,555 | 4,565 | 4,574 | 4,584 | 4,593 | 4,603 | 4,612 | 4,622 | 9.49       |
| 2349      | 4,631 | 4,641 | 4,651 | 4,660 | 4,670 | 4,679 | 4,689 | 4,699 | 4,708 | 4,718 | 9.64       |
| 2350      | 4,728 | 4,737 | 4,747 | 4,757 | 4,767 | 4,777 | 4,786 | 4,796 | 4,806 | 4,816 | 9.79       |
| 2351      | 4,825 | 4,835 | 4,845 | 4,855 | 4,865 | 4,875 | 4,885 | 4,895 | 4,905 | 4,915 | 9.94       |
| 2352      | 4,925 | 4,935 | 4,945 | 4,955 | 4,965 | 4,975 | 4,985 | 4,996 | 5,006 | 5,016 | 10.10      |
| 2353      | 5,026 | 5,036 | 5,046 | 5,057 | 5,067 | 5,077 | 5,087 | 5,098 | 5,108 | 5,118 | 10.24      |
| 2354      | 5,128 | 5,139 | 5,149 | 5,159 | 5,170 | 5,180 | 5,191 | 5,201 | 5,211 | 5,222 | 10.38      |
| 2355      | 5,232 | 5,243 | 5,253 | 5,264 | 5,274 | 5,285 | 5,295 | 5,306 | 5,316 | 5,327 | 10.51      |
| 2356      | 5,337 | 5,348 | 5,358 | 5,369 | 5,380 | 5,390 | 5,401 | 5,412 | 5,422 | 5,433 | 10.62      |
| 2357      | 5,443 | 5,454 | 5,465 | 5,476 | 5,486 | 5,497 | 5,508 | 5,519 | 5,529 | 5,540 | 10.73      |
| 2358      | 5,551 | 5,562 | 5,572 | 5,583 | 5,594 | 5,605 | 5,616 | 5,627 | 5,637 | 5,648 | 10.84      |
| 2359      | 5,659 | 5,670 | 5,681 | 5,692 | 5,703 | 5,714 | 5,725 | 5,736 | 5,747 | 5,758 | 10.96      |
| 2360      | 5,769 | 5,780 | 5,791 | 5,802 | 5,813 | 5,824 | 5,835 | 5,846 | 5,857 | 5,869 | 11.09      |

COGSWELL R. LAKE  
STORAGE TABLE NO. 21  
SURVEY OF 12-14-84

| ELEVATION | .0    | .1    | .2    | .3    | .4    | .5    | .6    | .7    | .8    | .9    | DIFFERENCE |
|-----------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|------------|
| 2361      | 5,880 | 5,891 | 5,902 | 5,913 | 5,925 | 5,936 | 5,947 | 5,958 | 5,969 | 5,981 | 11.23      |
| 2362      | 5,992 | 6,003 | 6,015 | 6,026 | 6,037 | 6,049 | 6,060 | 6,071 | 6,083 | 6,094 | 11.37      |
| 2363      | 6,106 | 6,117 | 6,129 | 6,140 | 6,152 | 6,163 | 6,175 | 6,186 | 6,198 | 6,209 | 11.52      |
| 2364      | 6,221 | 6,232 | 6,244 | 6,256 | 6,267 | 6,279 | 6,291 | 6,302 | 6,314 | 6,326 | 11.67      |
| 2365      | 6,337 | 6,349 | 6,361 | 6,373 | 6,385 | 6,397 | 6,408 | 6,420 | 6,432 | 6,444 | 11.81      |
| 2366      | 6,456 | 6,468 | 6,479 | 6,491 | 6,503 | 6,515 | 6,527 | 6,539 | 6,551 | 6,563 | 11.95      |
| 2367      | 6,575 | 6,587 | 6,599 | 6,611 | 6,623 | 6,635 | 6,647 | 6,660 | 6,672 | 6,684 | 12.08      |
| 2368      | 6,696 | 6,708 | 6,720 | 6,732 | 6,745 | 6,757 | 6,769 | 6,781 | 6,793 | 6,806 | 12.21      |
| 2369      | 6,818 | 6,830 | 6,843 | 6,855 | 6,867 | 6,880 | 6,892 | 6,904 | 6,917 | 6,929 | 12.34      |
| 2370      | 6,941 | 6,954 | 6,966 | 6,979 | 6,991 | 7,004 | 7,016 | 7,029 | 7,041 | 7,054 | 12.48      |
| 2371      | 7,066 | 7,079 | 7,091 | 7,104 | 7,117 | 7,129 | 7,142 | 7,155 | 7,167 | 7,180 | 12.63      |
| 2372      | 7,192 | 7,205 | 7,218 | 7,231 | 7,244 | 7,256 | 7,269 | 7,282 | 7,295 | 7,308 | 12.78      |
| 2373      | 7,320 | 7,333 | 7,346 | 7,359 | 7,372 | 7,385 | 7,398 | 7,411 | 7,424 | 7,437 | 12.93      |
| 2374      | 7,450 | 7,463 | 7,476 | 7,489 | 7,502 | 7,515 | 7,528 | 7,541 | 7,554 | 7,567 | 13.08      |
| 2375      | 7,580 | 7,594 | 7,607 | 7,620 | 7,633 | 7,647 | 7,660 | 7,673 | 7,686 | 7,700 | 13.23      |
| 2376      | 7,713 | 7,726 | 7,740 | 7,753 | 7,766 | 7,780 | 7,793 | 7,806 | 7,820 | 7,833 | 13.38      |
| 2377      | 7,847 | 7,860 | 7,874 | 7,887 | 7,901 | 7,914 | 7,928 | 7,941 | 7,955 | 7,968 | 13.52      |
| 2378      | 7,982 | 7,995 | 8,009 | 8,023 | 8,036 | 8,050 | 8,064 | 8,077 | 8,091 | 8,105 | 13.66      |
| 2379      | 8,118 | 8,132 | 8,146 | 8,160 | 8,174 | 8,187 | 8,201 | 8,215 | 8,229 | 8,243 | 13.81      |
| 2380      | 8,256 | 8,270 | 8,284 | 8,298 | 8,312 | 8,326 | 8,340 | 8,354 | 8,368 | 8,382 | 13.95      |
| 2381      | 8,396 | 8,410 | 8,424 | 8,438 | 8,452 | 8,466 | 8,480 | 8,495 | 8,509 | 8,523 | 14.09      |
| 2382      | 8,537 | 8,551 | 8,565 | 8,579 | 8,594 | 8,608 | 8,622 | 8,636 | 8,651 | 8,665 | 14.22      |
| 2383      | 8,679 | 8,693 | 8,708 | 8,722 | 8,736 | 8,751 | 8,765 | 8,780 | 8,794 | 8,808 | 14.36      |
| 2384      | 8,823 | 8,837 | 8,852 | 8,866 | 8,881 | 8,895 | 8,910 | 8,924 | 8,939 | 8,953 | 14.50      |
| 2385      | 8,968 | 8,982 | 8,997 | 9,012 | 9,026 | 9,041 | 9,056 | 9,070 | 9,085 | 9,099 | 14.64      |
| 2386      | 9,114 | 9,129 | 9,144 | 9,158 | 9,173 | 9,188 | 9,203 | 9,218 | 9,232 | 9,247 | 14.78      |
| 2387      | 9,262 | 9,277 | 9,292 | 9,307 | 9,322 | 9,336 | 9,351 | 9,366 | 9,381 | 9,396 | 14.92      |
| 2388      | 9,411 | 9,426 | 9,441 | 9,456 | 9,471 | 9,486 | 9,501 | 9,516 | 9,531 | 9,547 | 15.06      |
| 2389      | 9,562 | 9,577 | 9,592 | 9,607 | 9,622 | 9,638 | 9,653 | 9,668 | 9,683 | 9,698 | 15.21      |
| 2390      | 9,714 | 9,729 | 9,744 | 9,760 | 9,775 | 9,791 | 9,806 | 9,821 | 9,837 | 9,852 | 15.36      |

COBSWELL LAKE VOIR  
 STORAGE TABLE NO. 21  
 SURVEY OF 12-14-84

| ELEVATION | .0     | .1     | .2     | .3     | .4     | .5     | .6     | .7     | .8     | .9     | DIFFERENC |
|-----------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|-----------|
| 2391      | 9,867  | 9,883  | 9,898  | 9,914  | 9,929  | 9,945  | 9,960  | 9,976  | 9,992  | 10,007 | 15.52     |
| 2392      | 10,023 | 10,038 | 10,054 | 10,070 | 10,085 | 10,101 | 10,117 | 10,132 | 10,148 | 10,164 | 15.69     |
| 2393      | 10,179 | 10,195 | 10,211 | 10,227 | 10,243 | 10,259 | 10,275 | 10,291 | 10,306 | 10,322 | 15.86     |
| 2394      | 10,338 | 10,354 | 10,370 | 10,386 | 10,402 | 10,418 | 10,434 | 10,450 | 10,466 | 10,482 | 16.04     |
| 2395      | 10,499 | 10,515 | 10,531 | 10,547 | 10,563 | 10,580 | 10,596 | 10,612 | 10,628 | 10,645 | 16.23     |
| 2396      | 10,661 | 10,677 | 10,694 | 10,710 | 10,726 | 10,743 | 10,759 | 10,776 | 10,792 | 10,809 | 16.41     |
| 2397      | 10,825 | 10,842 | 10,858 | 10,875 | 10,891 | 10,908 | 10,925 | 10,941 | 10,958 | 10,974 | 16.60     |
| 2398      | 10,991 | 11,008 | 11,025 | 11,041 | 11,058 | 11,075 | 11,092 | 11,109 | 11,125 | 11,142 | 16.79     |
| 2399      | 11,159 | 11,176 | 11,193 | 11,210 | 11,227 | 11,244 | 11,261 | 11,278 | 11,295 | 11,312 | 16.98     |
| 2400      | 11,329 | 11,346 | 11,363 | 11,380 | 11,397 | 11,414 | 11,432 | 11,449 | 11,466 | 11,483 | 17.15     |
| 2401      | 11,500 | 11,518 | 11,535 | 11,552 | 11,569 | 11,587 | 11,604 | 11,621 | 11,639 | 11,656 | 17.32     |
| 2402      | 11,673 | 11,691 | 11,708 | 11,726 | 11,743 | 11,761 | 11,778 | 11,796 | 11,813 | 11,831 | 17.49     |
| 2403      | 11,848 | 11,866 | 11,884 | 11,901 | 11,919 | 11,937 | 11,954 | 11,972 | 11,990 | 12,007 | 17.65     |
| 2404      | 12,025 | 12,043 | 12,060 | 12,078 | 12,096 | 12,114 | 12,132 | 12,150 | 12,167 | 12,185 | 17.81     |
| 2405      | 12,203 |        |        |        |        |        |        |        |        |        |           |

Spillway Elevation..... 2385.0  
 Crest Elevation..... 2405.0  
 Assumed High Water Line..... 2398.0



B-2.01 SAN GABRIEL DAM PERTINENT DATA SHEET

Completion date..... July 1939  
 Stream system..... San Gabriel River  
 Drainage area (includes Cogswell Dam (35.2 mi<sup>2</sup>)).....mi<sup>2</sup> 202.7  
 Purpose.....Flood control and water conservation  
 Owner/Operation.....LACDPW

Reservoir:

Elevation

Inlet tower sill.....ft, NVGD 1300.25  
 Minimum water conservation pool.....ft, NVGD 1325.00  
 Spillway crest.....ft, NVGD 1453.00  
 Design surcharge level.....ft, NVGD 1466.00  
 Top of dam.....ft, NVGD 1481.00

Capacity (9-10-86 Survey)

Inlet tower sill.....ac-ft 304  
 Minimum water conservation pool.....ac-ft 2373  
 Spillway crest.....ac-ft 44,183  
 Design Surcharge level.....ac-ft 51,496  
 Top of dam.....ac-ft 60,152<sup>1</sup>

Dam:

Type.....Compacted earthfill and rockfill with concrete cutoff wall  
 Height above original streambed.....ft 310  
 Elevation.....ft 1481  
 Top length.....ft 1500  
 Top width.....ft 40

Spillway:

Type..... Ogee section  
 Length.....ft 456  
 Crest elevation.....ft 1453  
 Discharge at design surcharge level.....ft<sup>3</sup>/s 92,000

Outlets:

Flood control values

Type and size - #1.....48" Hollow jet  
 #2.....84" Hollow jet  
 #3.....129" x 117" \*Pelton needle  
 #4.....129" x 117" \*Pelton needle  
 Elevation of sill - #1.....ft, NVGD 1300.25  
 #2.....ft, NVGD 1300.25  
 #3.....ft, NVGD 1300.25  
 #4.....ft, NVGD 1300.25

Maximum discharge at spillway

crest elevation - #1.....ft<sup>3</sup>/s 656  
 #2.....ft<sup>3</sup>/s 2720  
 #3.....ft<sup>3</sup>/s 5075  
 #4.....ft<sup>3</sup>/s 5075

<sup>1</sup> Actually at elevation 1480; highest elevation for which volume was available.  
 \* Penstock diameter x outlet diameter.

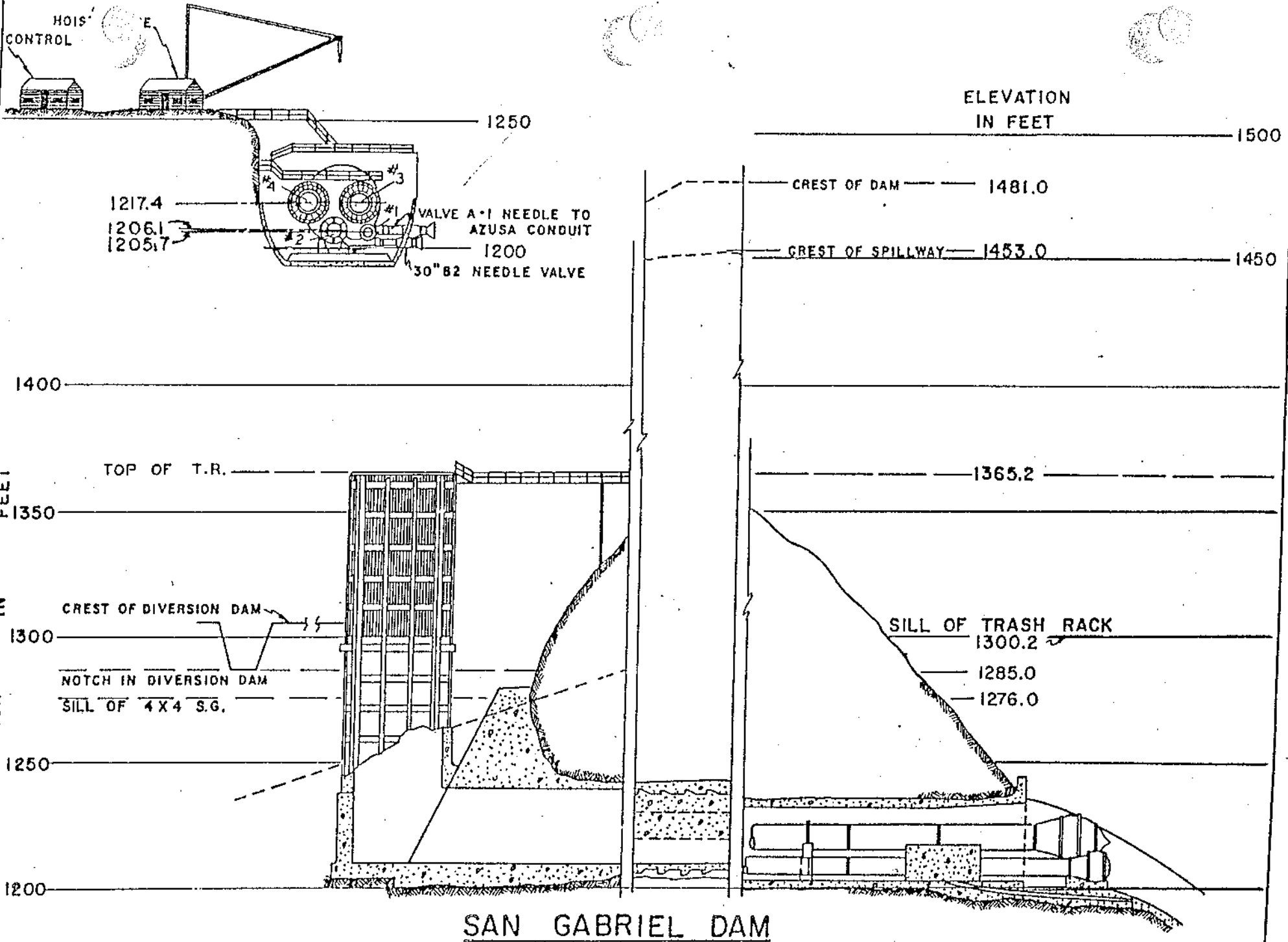
B-2.01 SAN GABRIEL DAM PERTINENT DATA SHEET  
(Continued)

Service values

|                              |   |         |
|------------------------------|---|---------|
| Type and size - #A1.....     | 51" x 39" Pelton needle (Azusa Conduit) |         |
| #B2.....                     | 30" x 24" Pelton needle (Azusa Conduit) |         |
| #S.G.....                    | 72" x 72" Sluice gate                   |         |
| Elevation of sill - #A1..... | ft, NVGD                                | 1300.25 |
| #B2.....                     | ft, NVGD                                | 1300.25 |
| #S.G.....                    | ft, NVGD                                | 1244.50 |

Generators:

|                     |                    |     |
|---------------------|--------------------|-----|
| Number.....         |                    | 2   |
| Generator #1        |                    |     |
| Maximum inflow..... | ft <sup>3</sup> /s | 220 |
| Minimum inflow..... | ft <sup>3</sup> /s | 75  |
| Maximum head.....   | ft                 | 275 |
| Minimum head.....   | ft                 | 165 |
| Outflow into.....   | San Gabriel River  |     |
| Generator #2        |                    |     |
| Maximum inflow..... | ft <sup>3</sup> /s | 82  |
| Minimum inflow..... | ft <sup>3</sup> /s | 30  |
| Maximum head.....   | ft                 | 240 |
| Minimum head.....   | ft                 | 120 |
| Outflow into.....   | Azusa Conduit      |     |



RVSD, JAN, 1974

REVIEWED JAN, 1978

## SAN GABRIEL DAM

Data Revised December 1985

### Runoff Data

Drainage Area - 129,705 acres = 202.6 square miles (including Cogswell Dam).  
104,600 acres = 163.4 square miles (excluding Cogswell Dam).  
Maximum record runoff = 67% from rainfall of 1.03"/hr. at the dam.  
Time of concentration is 1 1/4 to 4 hours.  
Field moisture capacity = 8.00"+.

### Dam Operation Data

No restriction by the State.  
Water may be impounded to Elevation 1453 spillway datum (crest).  
It takes two to four hours to charge the penstocks (2-129", 1-96", 1-51").  
The Azusa Conduit (capacity 75 cfs) may be fed from either the 96" or 51" penstocks. Maximum outlet capacity is 13,470 cfs (#1 valve - 600 cfs; #2 valve - 2,720 cfs; #3 valve - 5,075 cfs; #4 valve - 5,075 cfs) with water surface at the spillway sill, Elevation 1453.00. With Azusa conduit intake closed, measurable discharge through the sandbox is limited to 120 cfs before submerging 25-foot weir.

The gate downstream of the sandbox is operated and maintained by the Pasadena Water Department.

### Storm Operation Procedure

Store water to 25 percent of storage capacity, then release 50 percent of inflow until reservoir water surface reaches 1425.00 feet elevation. The outflow is then increased to equal the inflow and that relationship maintained as long as possible thereafter on the rising stage. If the inflow exceeds the outflow with all valves open maximum, the reservoir is considered out of control and may result in spillway flow. If and when spillway flow starts, the valves are shut off one by one and the reservoir remains out of control until such time as the inflow drops to less than maximum valve discharge. When this occurs, the valves are again opened to gain control of the water and the outflow should continue to exceed the inflow until the storage is reduced to a safe holding level. Operation of this dam has a direct bearing on the condition and capabilities of the Morris Dam Reservoir. Discharge from San Gabriel Dam to the river has to be retained and/or passed through the Morris Dam facilities.

### Channel Restrictions

San Gabriel Dam discharge goes directly into Morris Reservoir. Therefore, operations are restricted to conditions at Morris Dam.

### Water Rights

The San Gabriel Valley River Water Committee (Committee of Nine) has a total water right of 135 cfs, of which 90 was to be taken via the Azusa conduit and the remainder picked up through a diversion at the mouth of the canyon. Work in the tunnel section below Morris Dam has reduced the capacity to 75 cfs at Elevation 1165.00 feet. It is possible to feed up to 90 cfs into the Azusa conduit from the Morris Reservoir.

### Critical Leakage Points

Pilot tunnel under spillway lip.

### Sluicing

Sluice gate is 6' x 6' rectangular gate with sill at Elevation 1244.52 feet, feeding a 7-foot-diameter tunnel. Ogee weir crest ahead of the gate is at Elevation 1250.00 feet. The sluice gate should not be opened when water surface is above Elevation 1325.00 feet. Gate openings at any head should be limited so that the tunnel will not run more than 85 percent depth.

### General Notes

The outlets all draw from a common tunnel, 30 feet in diameter, protected by a riser and trashrack. Valve discharge is measured by Venturi meters on each of the four penstocks. The flow is recorded in the control house with an instantaneous discharge indicator at the operating platform. The following are valid rating levels for each valve: #1 (48") is 80-620 cfs; #2 (84") is 400-3500 cfs; #3 and 4 (117") is 750-5000 cfs each. The backup butterfly Valves Nos. 1-A, 2-A, 3-A, and 4-A should always be opened 100 percent if opened at all. They should never be used to regulate discharge. Valve No. A-1, 51" x 39" pelton needle, may be operated up to 50 percent at high heads before serious vibration is set up in the energy absorber. Water through the Azusa conduit is used by the Pasadena Power House to develop electrical power. The minimum flow used to develop power is around 20 cfs. Lost power due to the District not able or willing to supply water for that purpose is charged against the District by a formula ( $KWH = 23.5 \times Q \times N$ ), N being the number of hours of lost time. Value of the lost power is to be based upon a reasonable value at the time such power is lost.

Power Plant has capability of producing 3000 KWH or 3.0 Mega Watts, however, due to conduit restriction of 74 cfs maximum, only 1800 KWH or 1.8 MW is possible at this date.

The difference in elevation between the sandbox at San Gabriel Dam and the power house is 439.286 feet (33.543 feet difference between sandbox and the power house forebay on the hill and 405.743-foot drop from the forebay to the power house turbine).

SAN GABRIEL RESERVOIR  
STORAGE TABLE NO. 37  
SURVEY OF 09-10-86

12/10/86

| ELEVATION | .0    | .1    | .2    | .3    | .4    | .5    | .6    | .7    | .8    | .9    | DIFFERENCE |
|-----------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|------------|
| 1279      | 0.0   | 0.2   | 0.3   | 0.5   | 0.6   | 0.8   | 1.0   | 1.1   | 1.3   | 1.4   | 0.16       |
| 1280      | 1.6   | 1.7   | 1.9   | 2.1   | 2.2   | 2.4   | 2.5   | 2.7   | 2.8   | 3.0   | 0.16       |
| 1281      | 3.2   | 3.6   | 4.0   | 4.3   | 4.7   | 5.1   | 5.5   | 5.9   | 6.3   | 6.7   | 0.40       |
| 1282      | 7.1   | 7.6   | 8.2   | 8.7   | 9.2   | 9.7   | 10.2  | 10.7  | 11.3  | 11.8  | 0.52       |
| 1283      | 12.3  | 12.9  | 13.6  | 14.2  | 14.9  | 15.5  | 16.1  | 16.8  | 17.4  | 18.1  | 0.64       |
| 1284      | 18.7  | 19.5  | 20.2  | 21.0  | 21.7  | 22.5  | 23.3  | 24.0  | 24.8  | 25.5  | 0.76       |
| 1285      | 26.3  | 27.2  | 28.0  | 28.9  | 29.8  | 30.7  | 31.5  | 32.4  | 33.3  | 34.2  | 0.87       |
| 1286      | 35.0  | 36.0  | 37.0  | 38.0  | 39.0  | 39.9  | 40.9  | 41.9  | 42.9  | 43.9  | 0.98       |
| 1287      | 44.9  | 46.0  | 47.0  | 48.1  | 49.2  | 50.3  | 51.4  | 52.5  | 53.6  | 54.7  | 1.09       |
| 1288      | 55.7  | 56.9  | 58.1  | 59.3  | 60.5  | 61.7  | 62.9  | 64.1  | 65.3  | 66.5  | 1.19       |
| 1289      | 67.6  | 68.9  | 70.2  | 71.5  | 72.8  | 74.1  | 75.4  | 76.7  | 78.0  | 79.3  | 1.29       |
| 1290      | 80.5  | 81.9  | 83.3  | 84.7  | 86.1  | 87.5  | 88.9  | 90.2  | 91.6  | 93.0  | 1.39       |
| 1291      | 94.4  | 95.9  | 97.4  | 98.9  | 100.3 | 101.8 | 103.3 | 104.8 | 106.3 | 107.8 | 1.49       |
| 1292      | 109.3 | 110.8 | 112.4 | 114.0 | 115.6 | 117.2 | 118.8 | 120.4 | 122.0 | 123.6 | 1.60       |
| 1293      | 125.2 | 126.9 | 128.7 | 130.4 | 132.1 | 133.8 | 135.6 | 137.3 | 139.0 | 140.7 | 1.73       |
| 1294      | 142.5 | 144.4 | 146.2 | 148.1 | 150.0 | 151.9 | 153.8 | 155.7 | 157.5 | 159.4 | 1.88       |
| 1295      | 161.3 | 163.4 | 165.5 | 167.6 | 169.6 | 171.7 | 173.8 | 175.9 | 178.0 | 180.0 | 2.08       |
| 1296      | 182.1 | 184.4 | 186.8 | 189.1 | 191.4 | 193.7 | 196.0 | 198.4 | 200.7 | 203.0 | 2.32       |
| 1297      | 205.3 | 207.9 | 210.5 | 213.2 | 215.8 | 218.4 | 221.0 | 223.6 | 226.2 | 228.8 | 2.61       |
| 1298      | 231.4 | 234.3 | 237.3 | 240.2 | 243.2 | 246.1 | 249.1 | 252.0 | 255.0 | 257.9 | 2.94       |
| 1299      | 260.8 | 264.2 | 267.5 | 270.9 | 274.2 | 277.5 | 280.9 | 284.2 | 287.5 | 290.9 | 3.34       |
| 1300      | 294.2 | 298.0 | 301.8 | 305.6 | 309.3 | 313.1 | 316.9 | 320.7 | 324.5 | 328.3 | 3.78       |
| 1301      | 332.0 | 336.3 | 340.6 | 344.9 | 349.2 | 353.4 | 357.7 | 362.0 | 366.3 | 370.6 | 4.28       |
| 1302      | 374.8 | 379.6 | 384.4 | 389.2 | 394.0 | 398.8 | 403.6 | 408.4 | 413.2 | 418.0 | 4.80       |
| 1303      | 422.8 | 428.2 | 433.5 | 438.8 | 444.2 | 449.5 | 454.8 | 460.2 | 465.5 | 470.8 | 5.33       |
| 1304      | 476.2 | 482.0 | 487.9 | 493.7 | 499.6 | 505.4 | 511.3 | 517.2 | 523.0 | 528.9 | 5.85       |
| 1305      | 534.7 | 541.1 | 547.4 | 553.7 | 560.1 | 566.4 | 572.8 | 579.1 | 585.5 | 591.8 | 6.34       |

B-2-6

SAN GABRIEL RESERVOIR  
STORAGE TABLE NO. 37  
SURVEY OF 09-10-86

12/10/86

| ELEVATION | .0    | .1    | .2    | .3    | .4    | .5    | .6    | .7    | .8    | .9    | DIFFERENCE |
|-----------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|------------|
| 1306      | 598.2 | 604.9 | 611.7 | 618.5 | 625.3 | 632.1 | 638.9 | 645.7 | 652.5 | 659.3 | 6.79       |
| 1307      | 666.1 | 673.3 | 680.5 | 687.7 | 694.9 | 702.1 | 709.3 | 716.5 | 723.7 | 730.9 | 7.21       |
| 1308      | 738.1 | 745.7 | 753.3 | 760.9 | 768.5 | 776.0 | 783.6 | 791.2 | 798.8 | 806.3 | 7.58       |
| 1309      | 813.9 | 821.8 | 829.8 | 837.7 | 845.6 | 853.5 | 861.4 | 869.3 | 877.3 | 885.2 | 7.92       |
| 1310      | 893.1 | 901.3 | 909.5 | 917.8 | 926.0 | 934.2 | 942.4 | 950.7 | 958.9 | 967.1 | 8.22       |
| 1311      | 975.3 | 983.8 | 992.3 | 1,001 | 1,009 | 1,018 | 1,026 | 1,035 | 1,043 | 1,052 | 8.50       |
| 1312      | 1,060 | 1,069 | 1,078 | 1,087 | 1,095 | 1,104 | 1,113 | 1,122 | 1,130 | 1,139 | 8.75       |
| 1313      | 1,148 | 1,157 | 1,166 | 1,175 | 1,184 | 1,193 | 1,202 | 1,211 | 1,220 | 1,229 | 8.98       |
| 1314      | 1,238 | 1,247 | 1,256 | 1,265 | 1,274 | 1,284 | 1,293 | 1,302 | 1,311 | 1,320 | 9.19       |
| 1315      | 1,329 | 1,339 | 1,348 | 1,358 | 1,367 | 1,376 | 1,386 | 1,395 | 1,405 | 1,414 | 9.40       |
| 1316      | 1,423 | 1,433 | 1,443 | 1,452 | 1,462 | 1,471 | 1,481 | 1,491 | 1,500 | 1,510 | 9.60       |
| 1317      | 1,519 | 1,529 | 1,539 | 1,549 | 1,559 | 1,569 | 1,578 | 1,588 | 1,598 | 1,608 | 9.80       |
| 1318      | 1,618 | 1,628 | 1,638 | 1,648 | 1,658 | 1,668 | 1,678 | 1,688 | 1,698 | 1,708 | 10.02      |
| 1319      | 1,718 | 1,728 | 1,738 | 1,748 | 1,759 | 1,769 | 1,779 | 1,789 | 1,800 | 1,810 | 10.25      |
| 1320      | 1,820 | 1,831 | 1,841 | 1,852 | 1,862 | 1,873 | 1,883 | 1,894 | 1,904 | 1,915 | 10.50      |
| 1321      | 1,925 | 1,936 | 1,947 | 1,958 | 1,968 | 1,979 | 1,990 | 2,001 | 2,012 | 2,022 | 10.78      |
| 1322      | 2,033 | 2,044 | 2,055 | 2,066 | 2,077 | 2,088 | 2,099 | 2,110 | 2,122 | 2,133 | 11.06      |
| 1323      | 2,144 | 2,155 | 2,166 | 2,178 | 2,189 | 2,200 | 2,212 | 2,223 | 2,234 | 2,246 | 11.34      |
| 1324      | 2,257 | 2,269 | 2,280 | 2,292 | 2,303 | 2,315 | 2,327 | 2,338 | 2,350 | 2,361 | 11.59      |
| 1325      | 2,373 | 2,385 | 2,397 | 2,408 | 2,420 | 2,432 | 2,444 | 2,456 | 2,468 | 2,479 | 11.82      |
| 1326      | 2,491 | 2,503 | 2,515 | 2,527 | 2,539 | 2,551 | 2,563 | 2,575 | 2,587 | 2,600 | 12.04      |
| 1327      | 2,612 | 2,624 | 2,636 | 2,648 | 2,661 | 2,673 | 2,685 | 2,697 | 2,710 | 2,722 | 12.27      |
| 1328      | 2,734 | 2,747 | 2,759 | 2,772 | 2,784 | 2,797 | 2,809 | 2,822 | 2,835 | 2,847 | 12.54      |
| 1329      | 2,860 | 2,873 | 2,885 | 2,898 | 2,911 | 2,924 | 2,937 | 2,950 | 2,963 | 2,976 | 12.90      |
| 1330      | 2,989 | 3,002 | 3,015 | 3,029 | 3,042 | 3,055 | 3,069 | 3,082 | 3,096 | 3,109 | 13.36      |
| 1331      | 3,122 | 3,136 | 3,150 | 3,164 | 3,178 | 3,192 | 3,206 | 3,220 | 3,234 | 3,248 | 13.93      |
| 1332      | 3,262 | 3,276 | 3,291 | 3,305 | 3,320 | 3,334 | 3,349 | 3,363 | 3,378 | 3,392 | 14.55      |
| 1333      | 3,407 | 3,422 | 3,437 | 3,453 | 3,468 | 3,483 | 3,498 | 3,513 | 3,528 | 3,544 | 15.17      |
| 1334      | 3,559 | 3,574 | 3,590 | 3,606 | 3,622 | 3,637 | 3,653 | 3,669 | 3,685 | 3,700 | 15.73      |
| 1335      | 3,716 | 3,732 | 3,748 | 3,765 | 3,781 | 3,797 | 3,813 | 3,829 | 3,846 | 3,862 | 16.20      |

SAN GABRIEL RESERVOIR  
STORAGE TABLE NO. 37  
SURVEY OF 09-10-86

12/10/86

| ELEVATION | .0     | .1     | .2     | .3     | .4     | .5     | .6     | .7     | .8     | .9     | DIFFERENCE |
|-----------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|------------|
| 1336      | 3,878  | 3,895  | 3,911  | 3,928  | 3,944  | 3,961  | 3,977  | 3,994  | 4,011  | 4,027  | 16.57      |
| 1337      | 4,044  | 4,061  | 4,078  | 4,094  | 4,111  | 4,128  | 4,145  | 4,162  | 4,179  | 4,196  | 16.89      |
| 1338      | 4,213  | 4,230  | 4,247  | 4,264  | 4,281  | 4,299  | 4,316  | 4,333  | 4,350  | 4,367  | 17.20      |
| 1339      | 4,385  | 4,402  | 4,420  | 4,437  | 4,455  | 4,473  | 4,490  | 4,508  | 4,525  | 4,543  | 17.58      |
| 1340      | 4,560  | 4,578  | 4,597  | 4,615  | 4,633  | 4,651  | 4,669  | 4,687  | 4,705  | 4,723  | 18.05      |
| 1341      | 4,741  | 4,760  | 4,778  | 4,797  | 4,815  | 4,834  | 4,853  | 4,871  | 4,890  | 4,908  | 18.62      |
| 1342      | 4,927  | 4,946  | 4,966  | 4,985  | 5,004  | 5,023  | 5,043  | 5,062  | 5,081  | 5,100  | 19.25      |
| 1343      | 5,120  | 5,140  | 5,159  | 5,179  | 5,199  | 5,219  | 5,239  | 5,259  | 5,279  | 5,299  | 19.89      |
| 1344      | 5,319  | 5,339  | 5,360  | 5,380  | 5,401  | 5,421  | 5,442  | 5,462  | 5,483  | 5,503  | 20.50      |
| 1345      | 5,524  | 5,545  | 5,566  | 5,587  | 5,608  | 5,629  | 5,650  | 5,671  | 5,692  | 5,713  | 21.02      |
| 1346      | 5,734  | 5,755  | 5,777  | 5,798  | 5,820  | 5,841  | 5,862  | 5,884  | 5,905  | 5,927  | 21.45      |
| 1347      | 5,948  | 5,970  | 5,992  | 6,014  | 6,035  | 6,057  | 6,079  | 6,101  | 6,123  | 6,144  | 21.80      |
| 1348      | 6,166  | 6,188  | 6,211  | 6,233  | 6,255  | 6,277  | 6,299  | 6,321  | 6,343  | 6,365  | 22.11      |
| 1349      | 6,387  | 6,410  | 6,432  | 6,454  | 6,477  | 6,499  | 6,522  | 6,544  | 6,566  | 6,589  | 22.38      |
| 1350      | 6,611  | 6,634  | 6,656  | 6,679  | 6,702  | 6,724  | 6,747  | 6,770  | 6,792  | 6,815  | 22.65      |
| 1351      | 6,838  | 6,861  | 6,883  | 6,906  | 6,929  | 6,952  | 6,975  | 6,998  | 7,021  | 7,044  | 22.92      |
| 1352      | 7,067  | 7,090  | 7,113  | 7,137  | 7,160  | 7,183  | 7,206  | 7,229  | 7,253  | 7,276  | 23.20      |
| 1353      | 7,299  | 7,322  | 7,346  | 7,369  | 7,393  | 7,416  | 7,440  | 7,463  | 7,487  | 7,510  | 23.48      |
| 1354      | 7,534  | 7,557  | 7,581  | 7,605  | 7,629  | 7,653  | 7,676  | 7,700  | 7,724  | 7,748  | 23.75      |
| 1355      | 7,771  | 7,795  | 7,819  | 7,843  | 7,867  | 7,891  | 7,915  | 7,939  | 7,963  | 7,987  | 24.02      |
| 1356      | 8,011  | 8,036  | 8,060  | 8,084  | 8,109  | 8,133  | 8,157  | 8,181  | 8,206  | 8,230  | 24.27      |
| 1357      | 8,254  | 8,279  | 8,303  | 8,328  | 8,352  | 8,377  | 8,401  | 8,426  | 8,450  | 8,475  | 24.51      |
| 1358      | 8,499  | 8,524  | 8,549  | 8,574  | 8,598  | 8,623  | 8,648  | 8,673  | 8,697  | 8,722  | 24.75      |
| 1359      | 8,747  | 8,772  | 8,797  | 8,822  | 8,847  | 8,872  | 8,897  | 8,922  | 8,947  | 8,972  | 24.97      |
| 1360      | 8,997  | 9,022  | 9,047  | 9,072  | 9,097  | 9,122  | 9,148  | 9,173  | 9,198  | 9,223  | 25.19      |
| 1361      | 9,248  | 9,274  | 9,299  | 9,325  | 9,350  | 9,375  | 9,401  | 9,426  | 9,452  | 9,477  | 25.41      |
| 1362      | 9,503  | 9,528  | 9,554  | 9,579  | 9,605  | 9,631  | 9,656  | 9,682  | 9,707  | 9,733  | 25.62      |
| 1363      | 9,759  | 9,785  | 9,810  | 9,836  | 9,862  | 9,888  | 9,914  | 9,939  | 9,965  | 9,991  | 25.83      |
| 1364      | 10,017 | 10,043 | 10,069 | 10,095 | 10,121 | 10,147 | 10,173 | 10,199 | 10,225 | 10,251 | 26.04      |
| 1365      | 10,277 | 10,304 | 10,330 | 10,356 | 10,382 | 10,409 | 10,435 | 10,461 | 10,487 | 10,514 | 26.25      |



SAN GABRIEL RESERVOIR  
STORAGE TABLE NO. 37  
SURVEY OF 09-10-86

12/10/86

| ELEVATION | .0     | .1     | .2     | .3     | .4     | .5     | .6     | .7     | .8     | .9     | DIFFERENCE |
|-----------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|------------|
| 1366      | 10,540 | 10,566 | 10,593 | 10,619 | 10,646 | 10,672 | 10,699 | 10,725 | 10,752 | 10,778 | 26.47      |
| 1367      | 10,804 | 10,831 | 10,858 | 10,885 | 10,911 | 10,938 | 10,965 | 10,991 | 11,018 | 11,045 | 26.69      |
| 1368      | 11,071 | 11,098 | 11,125 | 11,152 | 11,179 | 11,206 | 11,233 | 11,260 | 11,287 | 11,314 | 26.94      |
| 1369      | 11,341 | 11,368 | 11,395 | 11,422 | 11,450 | 11,477 | 11,504 | 11,531 | 11,558 | 11,586 | 27.19      |
| 1370      | 11,613 | 11,640 | 11,668 | 11,695 | 11,723 | 11,750 | 11,778 | 11,805 | 11,833 | 11,860 | 27.47      |
| 1371      | 11,887 | 11,915 | 11,943 | 11,971 | 11,999 | 12,026 | 12,054 | 12,082 | 12,110 | 12,137 | 27.77      |
| 1372      | 12,165 | 12,193 | 12,221 | 12,249 | 12,277 | 12,306 | 12,334 | 12,362 | 12,390 | 12,418 | 28.08      |
| 1373      | 12,446 | 12,474 | 12,503 | 12,531 | 12,560 | 12,588 | 12,616 | 12,645 | 12,673 | 12,701 | 28.39      |
| 1374      | 12,730 | 12,759 | 12,787 | 12,816 | 12,845 | 12,873 | 12,902 | 12,931 | 12,959 | 12,988 | 28.70      |
| 1375      | 13,017 | 13,046 | 13,075 | 13,104 | 13,133 | 13,162 | 13,191 | 13,220 | 13,249 | 13,278 | 29.01      |
| 1376      | 13,307 | 13,336 | 13,366 | 13,395 | 13,424 | 13,453 | 13,483 | 13,512 | 13,541 | 13,571 | 29.30      |
| 1377      | 13,600 | 13,630 | 13,659 | 13,689 | 13,718 | 13,748 | 13,777 | 13,807 | 13,837 | 13,866 | 29.58      |
| 1378      | 13,896 | 13,926 | 13,955 | 13,985 | 14,015 | 14,045 | 14,075 | 14,105 | 14,135 | 14,164 | 29.85      |
| 1379      | 14,194 | 14,224 | 14,255 | 14,285 | 14,315 | 14,345 | 14,375 | 14,405 | 14,435 | 14,465 | 30.12      |
| 1380      | 14,496 | 14,526 | 14,556 | 14,587 | 14,617 | 14,648 | 14,678 | 14,708 | 14,739 | 14,769 | 30.39      |
| 1381      | 14,799 | 14,830 | 14,861 | 14,891 | 14,922 | 14,953 | 14,983 | 15,014 | 15,045 | 15,075 | 30.66      |
| 1382      | 15,106 | 15,137 | 15,168 | 15,199 | 15,230 | 15,261 | 15,292 | 15,323 | 15,354 | 15,384 | 30.93      |
| 1383      | 15,415 | 15,447 | 15,478 | 15,509 | 15,540 | 15,571 | 15,603 | 15,634 | 15,665 | 15,696 | 31.20      |
| 1384      | 15,727 | 15,759 | 15,790 | 15,822 | 15,853 | 15,885 | 15,916 | 15,948 | 15,979 | 16,011 | 31.48      |
| 1385      | 16,042 | 16,074 | 16,106 | 16,138 | 16,169 | 16,201 | 16,233 | 16,265 | 16,296 | 16,328 | 31.77      |
| 1386      | 16,360 | 16,392 | 16,424 | 16,456 | 16,488 | 16,520 | 16,552 | 16,584 | 16,616 | 16,648 | 32.05      |
| 1387      | 16,680 | 16,713 | 16,745 | 16,777 | 16,810 | 16,842 | 16,874 | 16,907 | 16,939 | 16,972 | 32.34      |
| 1388      | 17,004 | 17,036 | 17,069 | 17,102 | 17,134 | 17,167 | 17,200 | 17,232 | 17,265 | 17,297 | 32.62      |
| 1389      | 17,330 | 17,363 | 17,396 | 17,429 | 17,462 | 17,495 | 17,527 | 17,560 | 17,593 | 17,626 | 32.89      |
| 1390      | 17,659 | 17,692 | 17,725 | 17,758 | 17,792 | 17,825 | 17,858 | 17,891 | 17,924 | 17,957 | 33.14      |
| 1391      | 17,990 | 18,024 | 18,057 | 18,091 | 18,124 | 18,157 | 18,191 | 18,224 | 18,257 | 18,291 | 33.37      |
| 1392      | 18,324 | 18,358 | 18,391 | 18,425 | 18,458 | 18,492 | 18,526 | 18,559 | 18,593 | 18,626 | 33.59      |
| 1393      | 18,660 | 18,694 | 18,728 | 18,761 | 18,795 | 18,829 | 18,863 | 18,897 | 18,930 | 18,964 | 33.79      |
| 1394      | 18,998 | 19,032 | 19,066 | 19,100 | 19,134 | 19,168 | 19,202 | 19,236 | 19,270 | 19,304 | 33.99      |
| 1395      | 19,338 | 19,372 | 19,406 | 19,440 | 19,475 | 19,509 | 19,543 | 19,577 | 19,611 | 19,646 | 34.20      |

SAN GABRIEL RESERVOIR  
STORAGE TABLE NO. 37  
SURVEY OF 09-10-86

12/10/86

| ELEVATION | .0     | .1     | .2     | .3     | .4     | .5     | .6     | .7     | .8     | .9     | DIFFERENCE |
|-----------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|------------|
| 1396      | 19,680 | 19,714 | 19,749 | 19,783 | 19,817 | 19,852 | 19,886 | 19,921 | 19,955 | 19,989 | 34.40      |
| 1397      | 20,024 | 20,058 | 20,093 | 20,128 | 20,162 | 20,197 | 20,231 | 20,266 | 20,301 | 20,335 | 34.61      |
| 1398      | 20,370 | 20,405 | 20,440 | 20,474 | 20,509 | 20,544 | 20,579 | 20,614 | 20,649 | 20,683 | 34.83      |
| 1399      | 20,718 | 20,753 | 20,788 | 20,823 | 20,858 | 20,893 | 20,929 | 20,964 | 20,999 | 21,034 | 35.05      |
| 1400      | 21,069 | 21,104 | 21,139 | 21,175 | 21,210 | 21,245 | 21,280 | 21,316 | 21,351 | 21,386 | 35.29      |
| 1401      | 21,422 | 21,457 | 21,493 | 21,528 | 21,564 | 21,599 | 21,635 | 21,670 | 21,706 | 21,741 | 35.53      |
| 1402      | 21,777 | 21,813 | 21,848 | 21,884 | 21,920 | 21,956 | 21,992 | 22,027 | 22,063 | 22,099 | 35.79      |
| 1403      | 22,135 | 22,171 | 22,207 | 22,243 | 22,279 | 22,315 | 22,351 | 22,387 | 22,423 | 22,459 | 36.06      |
| 1404      | 22,495 | 22,532 | 22,568 | 22,604 | 22,641 | 22,677 | 22,713 | 22,750 | 22,786 | 22,822 | 36.35      |
| 1405      | 22,859 | 22,895 | 22,932 | 22,969 | 23,005 | 23,042 | 23,079 | 23,115 | 23,152 | 23,189 | 36.65      |
| 1406      | 23,225 | 23,262 | 23,299 | 23,336 | 23,373 | 23,410 | 23,447 | 23,484 | 23,521 | 23,558 | 36.96      |
| 1407      | 23,595 | 23,632 | 23,670 | 23,707 | 23,744 | 23,781 | 23,819 | 23,856 | 23,893 | 23,930 | 37.29      |
| 1408      | 23,968 | 24,005 | 24,043 | 24,081 | 24,118 | 24,156 | 24,193 | 24,231 | 24,269 | 24,306 | 37.61      |
| 1409      | 24,344 | 24,382 | 24,420 | 24,458 | 24,496 | 24,533 | 24,571 | 24,609 | 24,647 | 24,685 | 37.91      |
| 1410      | 24,723 | 24,761 | 24,799 | 24,838 | 24,876 | 24,914 | 24,952 | 24,990 | 25,029 | 25,067 | 38.21      |
| 1411      | 25,105 | 25,144 | 25,182 | 25,221 | 25,259 | 25,297 | 25,336 | 25,374 | 25,413 | 25,451 | 38.48      |
| 1412      | 25,490 | 25,529 | 25,567 | 25,606 | 25,645 | 25,684 | 25,722 | 25,761 | 25,800 | 25,839 | 38.76      |
| 1413      | 25,877 | 25,916 | 25,956 | 25,995 | 26,034 | 26,073 | 26,112 | 26,151 | 26,190 | 26,229 | 39.03      |
| 1414      | 26,268 | 26,307 | 26,346 | 26,386 | 26,425 | 26,464 | 26,504 | 26,543 | 26,582 | 26,622 | 39.33      |
| 1415      | 26,661 | 26,701 | 26,740 | 26,780 | 26,820 | 26,859 | 26,899 | 26,939 | 26,978 | 27,018 | 39.65      |
| 1416      | 27,058 | 27,097 | 27,137 | 27,177 | 27,217 | 27,257 | 27,297 | 27,337 | 27,377 | 27,417 | 39.99      |
| 1417      | 27,457 | 27,498 | 27,538 | 27,579 | 27,619 | 27,659 | 27,700 | 27,740 | 27,780 | 27,821 | 40.36      |
| 1418      | 27,861 | 27,902 | 27,942 | 27,983 | 28,024 | 28,065 | 28,105 | 28,146 | 28,187 | 28,228 | 40.74      |
| 1419      | 28,268 | 28,310 | 28,351 | 28,392 | 28,433 | 28,474 | 28,515 | 28,556 | 28,597 | 28,639 | 41.13      |
| 1420      | 28,680 | 28,721 | 28,763 | 28,804 | 28,846 | 28,887 | 28,929 | 28,970 | 29,012 | 29,053 | 41.51      |
| 1421      | 29,095 | 29,137 | 29,179 | 29,220 | 29,262 | 29,304 | 29,346 | 29,388 | 29,430 | 29,472 | 41.89      |
| 1422      | 29,514 | 29,556 | 29,598 | 29,640 | 29,683 | 29,725 | 29,767 | 29,809 | 29,852 | 29,894 | 42.26      |
| 1423      | 29,936 | 29,979 | 30,021 | 30,064 | 30,107 | 30,149 | 30,192 | 30,235 | 30,277 | 30,320 | 42.62      |
| 1424      | 30,362 | 30,405 | 30,448 | 30,491 | 30,534 | 30,577 | 30,620 | 30,663 | 30,706 | 30,749 | 42.98      |
| 1425      | 30,792 | 30,836 | 30,879 | 30,922 | 30,965 | 31,009 | 31,052 | 31,095 | 31,139 | 31,182 | 43.32      |

SAN GABRIEL RESERVOIR  
STORAGE TABLE NO. 37  
SURVEY OF 09-10-86

12/10/86

| ELEVATION | .0     | .1     | .2     | .3     | .4     | .5     | .6     | .7     | .8     | .9     | DIFFERENCE |
|-----------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|------------|
| 1426      | 31,225 | 31,269 | 31,313 | 31,356 | 31,400 | 31,444 | 31,487 | 31,531 | 31,575 | 31,618 | 43.66      |
| 1427      | 31,662 | 31,706 | 31,750 | 31,794 | 31,838 | 31,882 | 31,926 | 31,970 | 32,014 | 32,058 | 43.99      |
| 1428      | 32,102 | 32,146 | 32,191 | 32,235 | 32,279 | 32,324 | 32,368 | 32,412 | 32,456 | 32,501 | 44.31      |
| 1429      | 32,545 | 32,590 | 32,634 | 32,679 | 32,724 | 32,768 | 32,813 | 32,857 | 32,902 | 32,947 | 44.62      |
| 1430      | 32,991 | 33,036 | 33,081 | 33,126 | 33,171 | 33,216 | 33,261 | 33,306 | 33,351 | 33,396 | 44.91      |
| 1431      | 33,440 | 33,486 | 33,531 | 33,576 | 33,621 | 33,666 | 33,712 | 33,757 | 33,802 | 33,847 | 45.19      |
| 1432      | 33,892 | 33,938 | 33,983 | 34,029 | 34,074 | 34,120 | 34,165 | 34,211 | 34,256 | 34,302 | 45.47      |
| 1433      | 34,347 | 34,393 | 34,439 | 34,484 | 34,530 | 34,576 | 34,621 | 34,667 | 34,713 | 34,759 | 45.74      |
| 1434      | 34,804 | 34,850 | 34,896 | 34,942 | 34,988 | 35,034 | 35,080 | 35,126 | 35,173 | 35,219 | 46.01      |
| 1435      | 35,265 | 35,311 | 35,357 | 35,403 | 35,450 | 35,496 | 35,542 | 35,588 | 35,635 | 35,681 | 46.28      |
| 1436      | 35,727 | 35,774 | 35,820 | 35,867 | 35,914 | 35,960 | 36,007 | 36,053 | 36,100 | 36,146 | 46.57      |
| 1437      | 36,193 | 36,240 | 36,287 | 36,334 | 36,380 | 36,427 | 36,474 | 36,521 | 36,568 | 36,615 | 46.86      |
| 1438      | 36,662 | 36,709 | 36,756 | 36,803 | 36,850 | 36,898 | 36,945 | 36,992 | 37,039 | 37,086 | 47.18      |
| 1439      | 37,133 | 37,181 | 37,228 | 37,276 | 37,324 | 37,371 | 37,419 | 37,466 | 37,514 | 37,561 | 47.51      |
| 1440      | 37,609 | 37,656 | 37,704 | 37,752 | 37,800 | 37,848 | 37,896 | 37,944 | 37,992 | 38,039 | 47.87      |
| 1441      | 38,087 | 38,136 | 38,184 | 38,232 | 38,280 | 38,329 | 38,377 | 38,425 | 38,473 | 38,522 | 48.26      |
| 1442      | 38,570 | 38,619 | 38,667 | 38,716 | 38,765 | 38,813 | 38,862 | 38,911 | 38,959 | 39,008 | 48.66      |
| 1443      | 39,057 | 39,106 | 39,155 | 39,204 | 39,253 | 39,302 | 39,351 | 39,400 | 39,449 | 39,498 | 49.10      |
| 1444      | 39,547 | 39,597 | 39,647 | 39,696 | 39,746 | 39,795 | 39,845 | 39,894 | 39,944 | 39,993 | 49.55      |
| 1445      | 40,043 | 40,093 | 40,143 | 40,193 | 40,243 | 40,293 | 40,343 | 40,393 | 40,443 | 40,493 | 50.03      |
| 1446      | 40,543 | 40,594 | 40,644 | 40,695 | 40,745 | 40,796 | 40,846 | 40,897 | 40,947 | 40,998 | 50.52      |
| 1447      | 41,048 | 41,099 | 41,151 | 41,202 | 41,253 | 41,304 | 41,355 | 41,406 | 41,457 | 41,508 | 51.02      |
| 1448      | 41,559 | 41,610 | 41,662 | 41,713 | 41,765 | 41,816 | 41,868 | 41,919 | 41,971 | 42,022 | 51.53      |
| 1449      | 42,074 | 42,126 | 42,178 | 42,230 | 42,282 | 42,334 | 42,386 | 42,438 | 42,490 | 42,542 | 52.02      |
| 1450      | 42,594 | 42,647 | 42,699 | 42,752 | 42,804 | 42,857 | 42,909 | 42,962 | 43,014 | 43,067 | 52.50      |
| 1451      | 43,119 | 43,172 | 43,225 | 43,278 | 43,331 | 43,384 | 43,437 | 43,490 | 43,543 | 43,596 | 52.97      |
| 1452      | 43,649 | 43,702 | 43,756 | 43,809 | 43,863 | 43,916 | 43,969 | 44,023 | 44,076 | 44,130 | 53.42      |
| 1453      | 44,183 | 44,237 | 44,291 | 44,345 | 44,398 | 44,452 | 44,506 | 44,560 | 44,614 | 44,668 | 53.86      |
| 1454      | 44,722 | 44,776 | 44,830 | 44,884 | 44,939 | 44,993 | 45,047 | 45,102 | 45,156 | 45,210 | 54.29      |
| 1455      | 45,264 | 45,319 | 45,374 | 45,429 | 45,483 | 45,538 | 45,593 | 45,647 | 45,702 | 45,757 | 54.71      |

SAN GABRIEL RESERVOIR  
STORAGE TABLE NO. 37  
SURVEY OF 09-10-86

12/10/86

| ELEVATION | .0     | .1     | .2     | .3     | .4     | .5     | .6     | .7     | .8     | .9     | DIFFERENCE |
|-----------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|------------|
| 1456      | 45,812 | 45,867 | 45,922 | 45,977 | 46,032 | 46,087 | 46,142 | 46,197 | 46,253 | 46,308 | 55.12      |
| 1457      | 46,363 | 46,418 | 46,474 | 46,529 | 46,585 | 46,640 | 46,696 | 46,752 | 46,807 | 46,863 | 55.53      |
| 1458      | 46,918 | 46,974 | 47,030 | 47,086 | 47,142 | 47,198 | 47,254 | 47,310 | 47,366 | 47,421 | 55.93      |
| 1459      | 47,477 | 47,534 | 47,590 | 47,646 | 47,703 | 47,759 | 47,815 | 47,872 | 47,928 | 47,984 | 56.32      |
| 1460      | 48,041 | 48,097 | 48,154 | 48,211 | 48,267 | 48,324 | 48,381 | 48,437 | 48,494 | 48,551 | 56.69      |
| 1461      | 48,607 | 48,664 | 48,722 | 48,779 | 48,836 | 48,893 | 48,950 | 49,007 | 49,064 | 49,121 | 57.05      |
| 1462      | 49,178 | 49,235 | 49,293 | 49,350 | 49,408 | 49,465 | 49,522 | 49,580 | 49,637 | 49,695 | 57.40      |
| 1463      | 49,752 | 49,810 | 49,867 | 49,925 | 49,983 | 50,041 | 50,099 | 50,156 | 50,214 | 50,272 | 57.76      |
| 1464      | 50,330 | 50,388 | 50,446 | 50,504 | 50,562 | 50,620 | 50,678 | 50,737 | 50,795 | 50,853 | 58.13      |
| 1465      | 50,911 | 50,969 | 51,028 | 51,086 | 51,145 | 51,203 | 51,262 | 51,321 | 51,379 | 51,438 | 58.52      |
| 1466      | 51,496 | 51,555 | 51,614 | 51,673 | 51,732 | 51,791 | 51,850 | 51,909 | 51,967 | 52,026 | 58.92      |
| 1467      | 52,085 | 52,145 | 52,204 | 52,263 | 52,323 | 52,382 | 52,441 | 52,501 | 52,560 | 52,619 | 59.34      |
| 1468      | 52,679 | 52,738 | 52,798 | 52,858 | 52,918 | 52,978 | 53,037 | 53,097 | 53,157 | 53,217 | 59.77      |
| 1469      | 53,276 | 53,337 | 53,397 | 53,457 | 53,517 | 53,577 | 53,638 | 53,698 | 53,758 | 53,818 | 60.22      |
| 1470      | 53,879 | 53,939 | 54,000 | 54,061 | 54,121 | 54,182 | 54,243 | 54,303 | 54,364 | 54,425 | 60.68      |
| 1471      | 54,485 | 54,547 | 54,608 | 54,669 | 54,730 | 54,791 | 54,852 | 54,913 | 54,975 | 55,036 | 61.14      |
| 1472      | 55,097 | 55,158 | 55,220 | 55,282 | 55,343 | 55,405 | 55,466 | 55,528 | 55,590 | 55,651 | 61.61      |
| 1473      | 55,713 | 55,775 | 55,837 | 55,899 | 55,961 | 56,023 | 56,085 | 56,147 | 56,210 | 56,272 | 62.08      |
| 1474      | 56,334 | 56,396 | 56,459 | 56,521 | 56,584 | 56,646 | 56,709 | 56,771 | 56,834 | 56,897 | 62.54      |
| 1475      | 56,959 | 57,022 | 57,085 | 57,148 | 57,211 | 57,274 | 57,337 | 57,400 | 57,463 | 57,526 | 62.99      |
| 1476      | 57,589 | 57,652 | 57,716 | 57,779 | 57,843 | 57,906 | 57,970 | 58,033 | 58,096 | 58,160 | 63.43      |
| 1477      | 58,223 | 58,287 | 58,351 | 58,415 | 58,479 | 58,543 | 58,606 | 58,670 | 58,734 | 58,798 | 63.86      |
| 1478      | 58,862 | 58,926 | 58,990 | 59,055 | 59,119 | 59,183 | 59,248 | 59,312 | 59,376 | 59,441 | 64.29      |
| 1479      | 59,505 | 59,570 | 59,634 | 59,699 | 59,764 | 59,828 | 59,893 | 59,958 | 60,023 | 60,087 | 64.71      |
| 1480      | 60,152 |        |        |        |        |        |        |        |        |        |            |

Spillway Elevation ..... 1453.0  
Crest Elevation ..... 1481.0  
Assumed High Water Line ..... 1466.0

B-3.01 MORRIS DAM PERTINENT DATA SHEET

Completion date..... 1935  
 Stream system..... San Gabriel River  
 Drainage area (14.3 mi<sup>2</sup> uncontrolled).....mi<sup>2</sup> 217  
 Purpose.....Water conservation  
 Owned by.....Metropolitan Water District (MWD)  
 Operated by.....LACDPW

Reservoir:

Elevation

Minimum water conservation pool.....ft, NVGD 1100  
 Maximum long-term storage level.....ft, NVGD 1130  
 Spillway crest.....ft, NVGD 1152  
 Spillway drum gates fully open.....ft, NVGD 1170  
 Design surcharge level.....ft, NVGD 1175  
 Top of dam.....ft, NVGD 1175

Capacity (11-30-83 Survey)

Minimum water conservation pool.....ac-ft 9222  
 Maximum long-term storage level.....ac-ft 16,016  
 Spillway crest.....ac-ft 22,551  
 Spillway drum gates fully open.....ac-ft 28,839  
 Design surcharge level.....ac-ft 30,749  
 Top of dam.....ac-ft 30,749

Dam:

Type..... Concrete gravity  
 Elevation.....ft 1175  
 Height above original streambed.....ft 245  
 Top length.....ft 800  
 Top width.....ft 20

Spillway with drum gates:

Type..... Ogee section  
 Crest elevation.....ft 1453  
 Discharge with WSE at 1175 and gates up.....ft<sup>3</sup>/s 760,000

Outlets:

Flood control values

Type and size\* - #1.....96" x 72" H.T. needle  
 #2.....No valve  
 #3.....48" x 36" H.T. needle  
 #4.....48" x 24" Pelton needle  
 #5.....48" x 36" H.T. needle  
 #6.....96" x 72" H.T. needle

Elevation of outlet

centerline - #1.....ft, NVGD 975.0  
 #3.....ft, NVGD 975.0  
 #4.....ft, NVGD 975.0  
 #5.....ft, NVGD 960.0  
 #6.....ft, NVGD 975.0

\* Penstock diameter x outlet diameter

B-3.01 MORRIS DAM PERTINENT DATA SHEET  
(Continued)

Maximum discharge  
with WSE at 1170  
and spillway gates  
fully open -

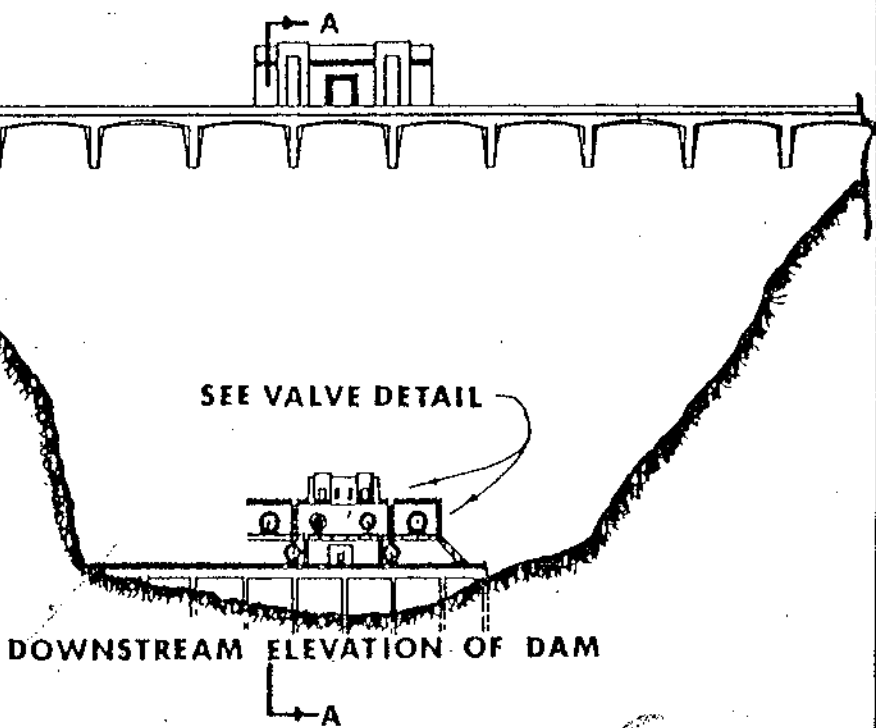
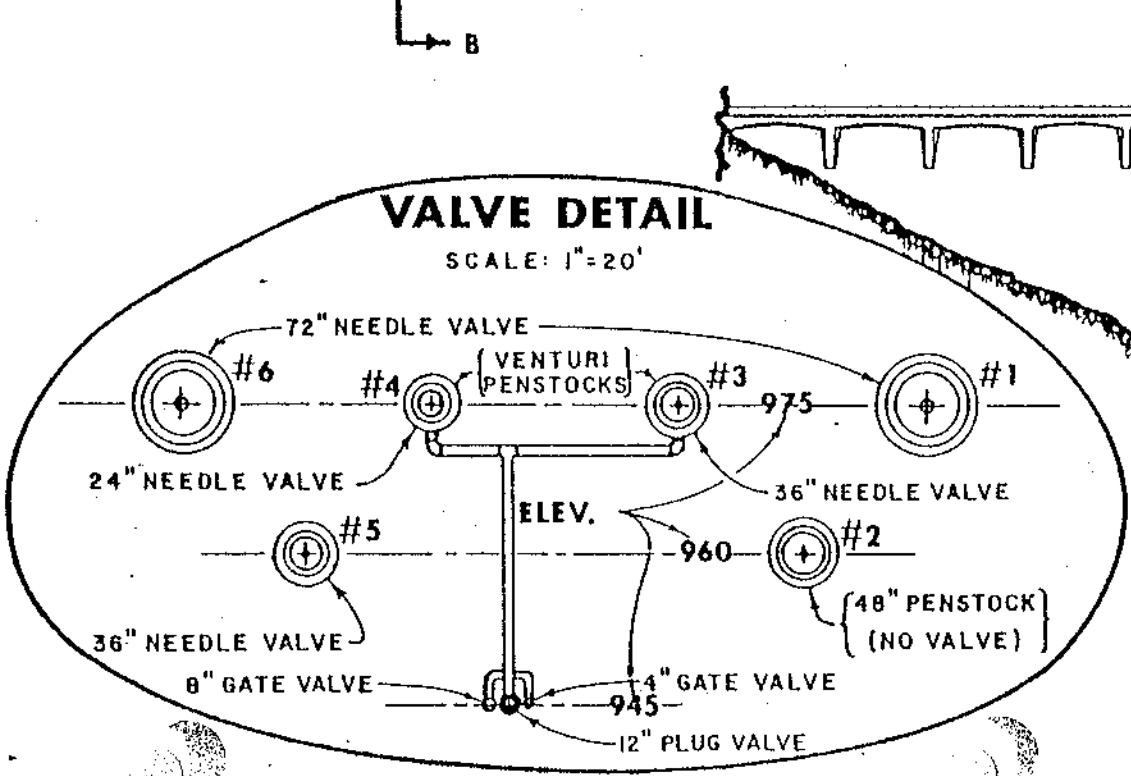
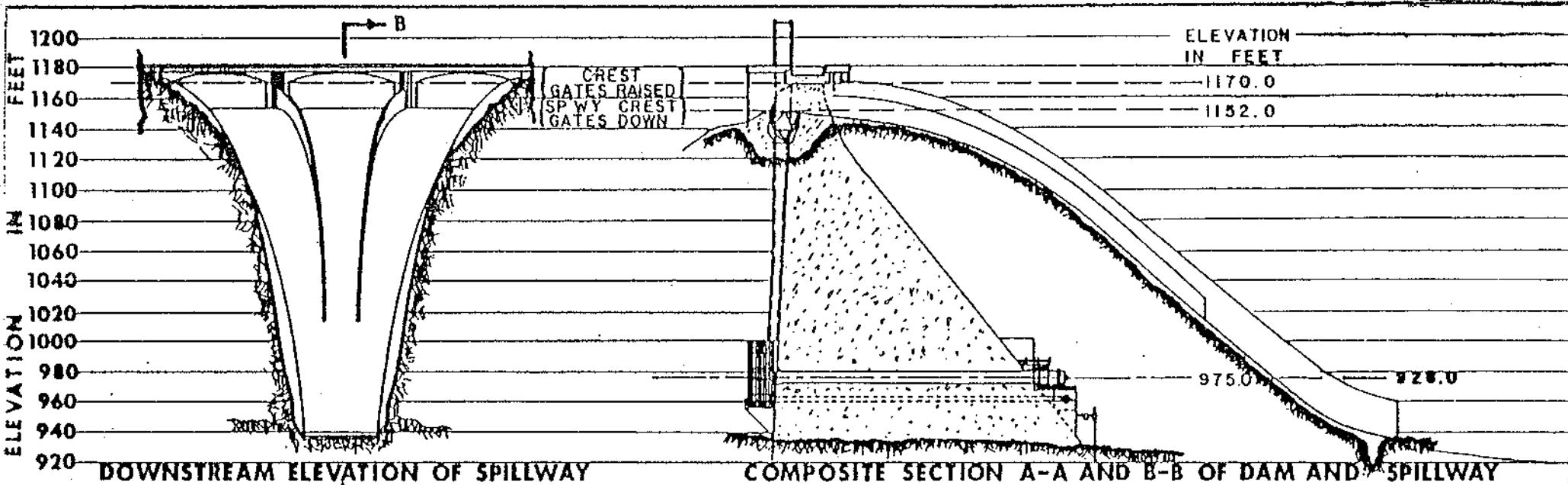
|         |                    |      |
|---------|--------------------|------|
| #1..... | ft <sup>3</sup> /s | 2125 |
| #3..... | ft <sup>3</sup> /s | 485  |
| #4..... | ft <sup>3</sup> /s | 279  |
| #5..... | ft <sup>3</sup> /s | 545  |
| #6..... | ft <sup>3</sup> /s | 2125 |

Service valves

|                         |                |
|-------------------------|----------------|
| Type and size - #A..... | 4" Gate valve  |
| #B.....                 | 8" Gate valve  |
| #C.....                 | 12" Plug valve |

Elevation of inlet  
sill and valve

|                      |          |     |     |
|----------------------|----------|-----|-----|
| centerline - #A..... | ft, NVGD | 973 | 945 |
| #B.....              | ft, NVGD | 973 | 945 |
| #C.....              | ft, NVGD | 973 | 945 |



SCALE: 1"=100'  
REVIEWED JAN. 1976

**MORRIS DAM**

LOS ANGELES COUNTY FLOOD CONTROL DISTRICT

MEMORANDUM

TO: Mr. Mas Nagami

November 8, 1984

FROM: N. C. Datwyler  
Hydraulic Division

File No. 560.41  
Morris Dam and Reservoir  
Operation Plan

Approved  
JLE

12-14

I concur with the operation plan; however, I am concerned over the mud elevation and feel that we are on borrowed time. Arrangements should be made to remove material around the operating valves mechanically or by sluicing in spring 1985.

KWK  
12/7/84

Concur  
MIN  
12/4  
Recommendation

Approve the Operation Plan for Morris Dam.

Background

Morris Dam is owned by the Metropolitan Water District and is operated under the direction of the Flood Control District as permitted by Agreement No. 30961 dated October 11, 1977.

A structural reanalysis of Morris Dam (final report dated July 27, 1983) by International Engineering Company (IECO), concluded that water surface Elevation 1130 feet "represented a safe operating level for the dam to safely sustain a maximum credible earthquake". This operating plan proposes Elevation 1130 feet as the maximum elevation for long-term storage and minimizes the time spent above this elevation.

Operation Plan

Holding Pool

The minimum drawdown elevation is 1100 feet. The maximum elevation for long-term storage is 1130 feet.

Rising Reservoir

Storm inflow will be ponded to Elevation 1152 feet (spillway), no valve releases will be made.

Falling Reservoir

Once inflow is in recession and is no greater than 1700 cfs, minimum releases of inflow plus 300 cfs shall begin and will continue until Elevation 1130 feet is reached.

Water Conservation Pool

Nonstorm spreading releases no less than inflow shall be initiated when Elevation 1130 feet is achieved.

B-3-4



### Operating Restrictions

1. Other than emergency, the spillway gates will remain locked in the down position.
2. Releases from the Nos. 2 and 5 penstocks are restricted to sluicing only.
3. Maximum drawdown is restricted to five feet/day.

### Discussion

Various release schedules were used to route 5-, 10-, 25-, and 50-year runoff events through the dam. As demonstrated by the reservoir routing, valve operations provide little effect for storms greater than a 5-year runoff event, although it will reduce the maximum water surface elevation reached during smaller events. The schedules and their results are shown in Table 1.

An analysis of recent surveys and photographs of Morris Dam have indicated a dramatic migration of debris toward the dam. A detailed survey in the general vicinity of the trashracks has shown that approximately 62 percent of the available inlet area is blocked by debris (see Sketch A). No information exists on the amount of debris inside of the trashracks. A closer analysis has been performed by the Sedimentation Section; a copy of their findings is attached (note to Mr. N. C. Datwyler from T. M. Alexander dated August 15, 1984, File No. 562.41).

As discussed in the note, there are "significant hazards associated with using the valves for storm operation" and a general uncertainty as to the movement of sediment within the reservoir during a storm event. As a result, no regulated storm releases will be made with all storm inflow being ponded up to spillway. Should an event produce spillway flow, valve releases will not be initiated until spillway flows have receded to at least 2,000 cfs. This type of release should, for large events, give a majority of the sediment in the reservoir time to settle and use only one of the two 72-inch valves available. If an emergency should occur downstream, spillway flow may be temporarily suspended by raising the spillway gates, otherwise, the gates are to remain locked in the down position. All valve releases should utilize openings at or near 100 percent to minimize the potential of plugging and excessive wear on the valves from debris. Releases from the lowest penstocks (numbers two and five) are restricted to sluicing only.

When the reservoir is in recession and inflow is reduced to zero, releases may be reduced to a minimum of 300 cfs. This type of release would minimize waste and utilize the long-term sustained infiltration rate in the San Gabriel River and will drawdown the reservoir from spillway to Elevation 1130 in approximately eleven days. If downstream spreading grounds are also used, the conservation dam outflow rate will be increased with a resultant

Mr. Mas Nagami  
Page 3  
November 8, 1984

decrease in drawdown time. The maximum drawdown rate should be restricted to five feet per day. Rates in excess of five feet per day will require the Navy to make special preparations relative to the safety of their facilities and may also have a detrimental effect on the active slide area upstream from the dam.

In an effort to protect a debris cone at Elevation 1080 and minimize the debris shift within the reservoir, the minimum drawdown elevation has been raised from 1060 to 1100. Continued operation with a water surface below Elevation 1100 may, under a fluctuating reservoir, allow the existing sediment banks eroded by storm releases from San Gabriel Dam to move toward the intake of the dam and will also adversely affect the Navy operations.

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Jim Sparks  
Operations Section  
Extension 4191

JS:bmc

cc: Operation and Maintenance (2)  
Water Conservation  
Hydraulic (2) (Mitchell, Files)  
General Files

## MORRIS DAM

Revised January 1982

### Runoff Data

Drainage Area - 211.4 square miles (8.7 square miles uncontrolled and 202.7 square miles controlled by San Gabriel Dam).

### Dam Operation Data

The five needle valves have gate valves as backups which are normally closed. Approximately two hours are required to charge the valves. The No. 4 valve (24-inch Pelton) and the No. 5 (36-inch Hardie Tynes) have venturi meters installed to indicate discharge. Maximum discharge capacity of the outlets is 5,559 cfs; Valve No. 1 = 2,125 cfs, Valve No. 3 = 485 cfs, Valve No. 4 = 279 cfs, Valve No. 5 = 545 cfs, and Valve No. 6 = 2,125 cfs. The No. 2 penstock has a back-up valve only and is used for sluicing. The three spillway crest drum gates are operated either manually or semi-automatically. If set to operate semi-automatically, the gates will start rising when the water surface reaches 1149.0 Elevation and will stay approximately three feet higher than the water surface on the rising stage until the gates are fully up at Elevation 1170.0. The spillway gates can be locked in to stay at any elevation between 1152.0 and 1170.0.

Water can be diverted to the Azusa Conduit from Morris reservoir with water surface above Elevation 1160. Amount of discharge varies as to the head of water above Elevation 1160. At Elevation 1165.00, can divert 90 cfs.

### Storm Operation Procedure

The spillway drum gates are to be used for regulating discharges in excess of 4,000 cfs. Normal operation is for the two outside gates to be fully raised (locked in place) and the center gate operated to regulate and control the discharge. If the discharge exceeds about 18,000 cfs, the capacity of one gate, then all three gates should be used with settings on all three relatively the same.

When all three drum gates are fully raised (Elevation 1170 feet), discharges of up to 4,000 cfs should be made through the valves, when possible, to reduce the pounding on the spillway caused by the water falling 18 feet after flowing over the drum gates.

### Channel Restrictions

Large discharges from the No. 1 valve (72-inch Needle) can damage the access roadway immediately downstream of the valves. Releases of amounts greater than 4,000 cfs should be made through the spillway gates. Any release will temporarily close the dip crossing to the valves for vehicular access.

### Water Rights

The San Gabriel River Water Committee (Committee of Nine) has a right to the first 135 cfs of river flow at the mouth of the canyon. Normally, 90 cfs of this water right was to be diverted to the Azusa Conduit from San Gabriel Dam

or Morris Dam. However, because of the repair to the interior of the tunnel over the years, the tunnel will currently accommodate only 75 cfs. The 60 cfs balance can be taken at the diversion in the river bottom, approximately 1/2 mile downstream of the Canyon Inn (first bridge in the canyon). Maximum capacity of the diversion is 65 cfs.

The San Gabriel Valley Protective Association has a 200,000 acre-foot per year water right which consists of two parts. Part I is for all unregulated flow at the canyon mouth in excess of 135 cfs which would percolate in the San Gabriel Valley. This percolation is determined from the Department of Water Resources Bulletin No. 7. Part II is for all flood waters in excess of the above and in excess of the yearly allotment to the Metropolitan Water District.

The Metropolitan Water District (MWD) has a right to 6 acre-feet/month (called "Purchased Water" in the San Gabriel Canyon monthly water right recapitulation), and to those flood waters in excess of the existing canyon water rights held by the Committee of Nine and the San Gabriel Valley Protective Association. Also, the MWD is required to release 1.0 cfs daily to percolate in the canyon for groundwater supply which the construction of the dam may have stopped.

#### Sluicing

The water surface is to be lowered to Elevation 1133 feet (per agreement with the Navy) and held there long enough for the Navy to secure its variable angle launching ramp. Pontoon floats supporting the lower end of the ramp will become grounded if they are not secured properly.

Water in storage is then released through either of the Nos. 1, 3, 4, or 6 valves to reduce the water surface to Elevation 975 feet. After the water surface has been lowered to Elevation 975 feet, the Nos. 2 and/or 5 penstocks (with valves removed) are used for the final dewatering and sluicing.

#### General Notes

The Navy entered into a contract with the MWD on October 1, 1945. A new agreement was drawn up on July 1, 1968 and is renewable on a yearly basis. The present agreement was scheduled to be updated and revised in 1979. However, no changes have been made to date.

Hydraulic (Remillard) v

LOS ANGELES COUNTY FLOOD CONTROL DISTRICT

MEMORANDUM

TO: Mr. K. W. Kummerfeld

January 4, 1982

FROM: C. F. Eshelby  
Hydraulic Division

File No. 506.121  
Morris Dam and Reservoir  
Storm Operation Plan

Recommendation

It is recommended that the operation plan for Morris Dam described herein be approved.

Approved  
BHH  
2/3

Modification to Dam

Modifications, completed in 1980, were made to Morris Dam so that the dam would comply with the California State Division of Safety of Dams' requirement that it safely pass a storm of modern design. These modifications provided for controlled overtopping of the dam during the PMP event and essentially involved removal of the parapet wall and armoring of the abutments and impact areas below.

Storm Operation Plan

Because of the dam's relatively small discharge capacity (maximum 5,559 cfs), there is essentially no flood control value to the storage space below the spillway crest (Elevation 1152 feet--assumed water surface at spillway during capital event).

The dam preset conditions are:

Valves closed.

Spillway drum gates locked down (Elevation 1152 feet) so that all flows exceeding storage capacity will pass over the spillway.

Following a light storm or during recession, conservation releases will be made at a rate consistent with the requirements of downstream spreading facilities and the Navy. The drawdown rate will be restricted to less than 5 feet of water surface elevation per 24-hour period. The Navy must be given 2-week prior notification for larger rates so it can safely secure its facilities. In no instance, under normal operating conditions, will the water surface be drawn down below Elevation 1060 feet (minimum cushion pool of 5,250 acre-feet). Operating with a water surface below Elevation 1060 feet would, under a fluctuating reservoir, allow the existing sediment banks eroded by storm releases from San Gabriel Dam to move toward the intakes of the dam and would also adversely affect the Navy's operations.

Recommended  
JMT

Mr. K. W. Kummerfeld

Page 2

January 4, 1982

During a major storm, the dam will be allowed to discharge excess flows via the spillway. When the flows are in recession, all water below spillway (Elevation 1152 feet) will be conserved at a rate consistent with all requirements described herein.

As available storage capacity in San Gabriel Dam becomes depleted, the drum gates can be raised to provide an additional 5,000 acre-feet of storage. Use of the drum gates, however, should only be considered late in the storm season when the chances for a large follow-up storm are small. At the end of the storm season, the dam should be full with the goal being to store as much run-off as possible in the canyon system so that water rights releases can be maintained consistently throughout the dry summer months. The gates cannot be raised for water surface elevations less than 1149 feet. ?

With water surface to the top of the drum gates fully raised (Elevation 1170 feet), the reservoir can be drawn down to spillway lip (Elevation 1152 feet) in about 6 days with an outflow rate of about 400 cfs. This type of release would utilize the long-term sustained percolation rate in the San Gabriel River to Firestone Boulevard so that no water is wasted. If the spreading grounds are utilized in addition to the stream bed, the conservation rate can be increased with resultant decrease in the drawdown time.

If, for any reason, releases are required when all three drum gates are fully raised (Elevation 1170 feet), discharges of up to 4,000 cfs should be made through the valves. Use of the gates for these smaller releases causes pounding on the spillway as a result of the water falling 18 feet after flowing over the drum gates, which has a deteriorating effect on the spillway surface. These types of releases should be kept to a minimum.

The drum gates are to be used for regulating discharges in excess of 4,000 cfs. Normal operation is for the two outside gates to be fully raised (locked in place) and the center gate operated to regulate and control the discharge. If the discharge exceeds about 18,000 cfs, the capacity of one gate, then all three gates should be used with the settings on all three relatively the same.

---

Tom Remillard  
Operations Section  
Extension 4190

AMB:elg

Attach.

cc: Dams Investigation Group  
Operation and Maintenance (2) (Seares, East Area)  
Hydraulic (2) (Remillard, Files)  
General Files

MORRIS

RESERVOIR STORAGE TABULATION (ACRE-FEET)

STORAGE TABLE NO. 10

SURVEY OF ~~12-21-81~~

11-20-83

| G.H.  | .0    | .1    | .2    | .3    | .4    | .5    | .6    | .7    | .8    | .9    | DIFF. |
|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 984.  | 0.0   | 0.00  | 0.01  | 0.01  | 0.02  | 0.02  | 0.03  | 0.03  | 0.04  | 0.04  | 0.00  |
| 985.  | 0.05  | 0.07  | 0.10  | 0.12  | 0.15  | 0.17  | 0.20  | 0.22  | 0.25  | 0.27  | 0.02  |
| 986.  | 0.30  | 0.35  | 0.40  | 0.45  | 0.50  | 0.55  | 0.60  | 0.65  | 0.70  | 0.75  | 0.05  |
| 987.  | 0.80  | 0.86  | 0.93  | 0.99  | 1.06  | 1.12  | 1.19  | 1.25  | 1.32  | 1.38  | 0.06  |
| 988.  | 1.45  | 1.53  | 1.61  | 1.69  | 1.77  | 1.85  | 1.93  | 2.01  | 2.09  | 2.17  | 0.08  |
| 989.  | 2.25  | 2.36  | 2.48  | 2.59  | 2.71  | 2.82  | 2.94  | 3.05  | 3.17  | 3.28  | 0.11  |
| 990.  | 3.40  | 3.59  | 3.78  | 3.97  | 4.16  | 4.35  | 4.54  | 4.73  | 4.92  | 5.11  | 0.19  |
| 991.  | 5.30  | 5.61  | 5.92  | 6.23  | 6.54  | 6.85  | 7.16  | 7.47  | 7.78  | 8.09  | 0.31  |
| 992.  | 8.40  | 8.87  | 9.34  | 9.81  | 10.3  | 10.7  | 11.2  | 11.7  | 12.2  | 12.6  | 0.47  |
| 993.  | 13.1  | 13.8  | 14.4  | 15.1  | 15.8  | 16.4  | 17.1  | 17.8  | 18.4  | 19.1  | 0.66  |
| 994.  | 19.7  | 20.6  | 21.5  | 22.4  | 23.3  | 24.2  | 25.1  | 26.0  | 26.9  | 27.8  | 0.89  |
| 995.  | 28.6  | 29.8  | 30.9  | 32.1  | 33.2  | 34.3  | 35.5  | 36.6  | 37.8  | 38.9  | 1.14  |
| 996.  | 40.0  | 41.5  | 42.9  | 44.3  | 45.7  | 47.1  | 48.5  | 49.9  | 51.3  | 52.7  | 1.40  |
| 997.  | 54.1  | 55.8  | 57.4  | 59.1  | 60.8  | 62.4  | 64.1  | 65.8  | 67.5  | 69.1  | 1.67  |
| 998.  | 70.0  | 72.7  | 74.6  | 76.5  | 78.5  | 80.4  | 82.3  | 84.2  | 86.1  | 88.0  | 1.91  |
| 999.  | 89.9  | 92.1  | 94.2  | 96.3  | 98.4  | 100.6 | 102.7 | 104.8 | 106.9 | 109.1 | 2.13  |
| 1000. | 111.2 | 113.5 | 115.8 | 118.1 | 120.3 | 122.6 | 124.9 | 127.2 | 129.5 | 131.8 | 2.28  |
| 1001. | 134.0 | 136.4 | 138.8 | 141.2 | 143.6 | 146.0 | 148.4 | 150.8 | 153.2 | 155.6 | 2.39  |
| 1002. | 157.9 | 160.4 | 162.8 | 165.3 | 167.7 | 170.2 | 172.6 | 175.1 | 177.5 | 180.0 | 2.45  |
| 1003. | 182.4 | 184.9 | 187.4 | 189.9 | 192.4 | 194.9 | 197.4 | 199.8 | 202.3 | 204.8 | 2.48  |
| 1004. | 207.3 | 209.8 | 212.3 | 214.8 | 217.3 | 219.8 | 222.3 | 224.8 | 227.3 | 229.8 | 2.51  |
| 1005. | 232.3 | 234.9 | 237.4 | 239.9 | 242.4 | 245.0 | 247.5 | 250.0 | 252.5 | 255.1 | 2.52  |
| 1006. | 257.6 | 260.2 | 262.7 | 265.3 | 267.8 | 270.4 | 272.9 | 275.5 | 278.0 | 280.6 | 2.55  |
| 1007. | 283.1 | 285.8 | 288.4 | 291.0 | 293.6 | 296.2 | 298.8 | 301.4 | 304.0 | 306.6 | 2.60  |
| 1008. | 309.2 | 311.9 | 314.6 | 317.3 | 320.0 | 322.7 | 325.4 | 328.1 | 330.8 | 333.5 | 2.69  |
| 1009. | 336.1 | 339.0 | 341.8 | 344.6 | 347.4 | 350.3 | 353.1 | 355.9 | 358.7 | 361.6 | 2.82  |
| 1010. | 364.4 | 367.4 | 370.4 | 373.4 | 376.4 | 379.4 | 382.5 | 385.5 | 388.5 | 391.5 | 3.01  |
| 1011. | 394.5 | 397.7 | 401.0 | 404.2 | 407.5 | 410.7 | 414.0 | 417.2 | 420.5 | 423.7 | 3.25  |
| 1012. | 427.0 | 430.5 | 434.0 | 437.6 | 441.1 | 444.6 | 448.1 | 451.6 | 455.2 | 458.7 | 3.52  |
| 1013. | 462.2 | 466.0 | 469.8 | 473.6 | 477.4 | 481.2 | 485.1 | 488.9 | 492.7 | 496.5 | 3.81  |
| 1014. | 500.3 | 504.4 | 508.5 | 512.6 | 516.7 | 520.8 | 524.9 | 529.0 | 533.1 | 537.2 | 4.10  |

| G.H.  | .0    | .1    | .2    | .3    | .4    | .5    | .6    | .7    | .8    | .9    | DIFF. |
|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 1015. | 541.3 | 545.7 | 550.0 | 554.4 | 558.8 | 563.2 | 567.5 | 571.9 | 576.3 | 580.7 | 4.38  |
| 1016. | 585.0 | 589.7 | 594.3 | 598.9 | 603.6 | 608.2 | 612.8 | 617.5 | 622.1 | 626.7 | 4.63  |
| 1017. | 631.3 | 636.2 | 641.1 | 645.9 | 650.8 | 655.6 | 660.5 | 665.4 | 670.2 | 675.1 | 4.86  |
| 1018. | 679.9 | 685.0 | 690.1 | 695.2 | 700.3 | 705.4 | 710.5 | 715.5 | 720.6 | 725.7 | 5.08  |
| 1019. | 730.8 | 736.1 | 741.4 | 746.7 | 752.0 | 757.3 | 762.7 | 768.0 | 773.3 | 778.6 | 5.31  |
| 1020. | 783.9 | 789.4 | 795.0 | 800.5 | 806.1 | 811.6 | 817.1 | 822.7 | 828.2 | 833.8 | 5.54  |
| 1021. | 839.3 | 845.1 | 850.8 | 856.6 | 862.4 | 868.2 | 873.9 | 879.7 | 885.5 | 891.3 | 5.77  |
| 1022. | 897.0 | 903.1 | 909.1 | 915.1 | 921.1 | 927.1 | 933.1 | 939.1 | 945.1 | 951.1 | 6.00  |
| 1023. | 957.1 | 963.3 | 969.5 | 975.8 | 982.0 | 988.2 | 994.4 | 1001. | 1007. | 1013. | 6.22  |
| 1024. | 1019. | 1026. | 1032. | 1039. | 1045. | 1051. | 1058. | 1064. | 1071. | 1077. | 6.41  |
| 1025. | 1083. | 1090. | 1097. | 1103. | 1110. | 1116. | 1123. | 1129. | 1136. | 1143. | 6.57  |
| 1026. | 1149. | 1156. | 1162. | 1169. | 1176. | 1183. | 1189. | 1196. | 1203. | 1209. | 6.69  |
| 1027. | 1216. | 1223. | 1230. | 1236. | 1243. | 1250. | 1257. | 1264. | 1270. | 1277. | 6.79  |
| 1028. | 1284. | 1291. | 1298. | 1305. | 1312. | 1318. | 1325. | 1332. | 1339. | 1346. | 6.88  |
| 1029. | 1353. | 1360. | 1367. | 1374. | 1381. | 1388. | 1395. | 1402. | 1409. | 1416. | 6.97  |
| 1030. | 1423. | 1430. | 1437. | 1444. | 1451. | 1458. | 1465. | 1472. | 1479. | 1486. | 7.05  |
| 1031. | 1493. | 1500. | 1507. | 1515. | 1522. | 1529. | 1536. | 1543. | 1550. | 1557. | 7.15  |
| 1032. | 1565. | 1572. | 1579. | 1586. | 1594. | 1601. | 1608. | 1615. | 1623. | 1630. | 7.25  |
| 1033. | 1637. | 1644. | 1652. | 1659. | 1667. | 1674. | 1681. | 1689. | 1696. | 1703. | 7.35  |
| 1034. | 1711. | 1718. | 1726. | 1733. | 1740. | 1748. | 1755. | 1763. | 1770. | 1778. | 7.46  |
| 1035. | 1785. | 1793. | 1800. | 1808. | 1816. | 1823. | 1831. | 1838. | 1846. | 1853. | 7.56  |
| 1036. | 1861. | 1869. | 1876. | 1884. | 1892. | 1899. | 1907. | 1915. | 1922. | 1930. | 7.67  |
| 1037. | 1938. | 1945. | 1953. | 1961. | 1969. | 1977. | 1984. | 1992. | 2000. | 2008. | 7.78  |
| 1038. | 2015. | 2023. | 2031. | 2039. | 2047. | 2055. | 2063. | 2071. | 2078. | 2086. | 7.88  |
| 1039. | 2094. | 2102. | 2110. | 2118. | 2126. | 2134. | 2142. | 2150. | 2158. | 2166. | 7.97  |
| 1040. | 2174. | 2182. | 2190. | 2198. | 2206. | 2214. | 2222. | 2230. | 2238. | 2246. | 8.06  |
| 1041. | 2255. | 2263. | 2271. | 2279. | 2287. | 2295. | 2303. | 2312. | 2320. | 2328. | 8.15  |
| 1042. | 2336. | 2344. | 2353. | 2361. | 2369. | 2377. | 2385. | 2394. | 2402. | 2410. | 8.24  |
| 1043. | 2418. | 2427. | 2435. | 2443. | 2452. | 2460. | 2468. | 2477. | 2485. | 2493. | 8.33  |
| 1044. | 2502. | 2510. | 2519. | 2527. | 2536. | 2544. | 2552. | 2561. | 2569. | 2578. | 8.43  |
| 1045. | 2586. | 2595. | 2603. | 2612. | 2620. | 2629. | 2637. | 2646. | 2655. | 2663. | 8.55  |
| 1046. | 2672. | 2680. | 2689. | 2698. | 2706. | 2715. | 2724. | 2732. | 2741. | 2750. | 8.68  |
| 1047. | 2759. | 2767. | 2776. | 2785. | 2794. | 2803. | 2811. | 2820. | 2829. | 2838. | 8.82  |
| 1048. | 2847. | 2856. | 2865. | 2874. | 2883. | 2892. | 2901. | 2909. | 2918. | 2927. | 8.96  |
| 1049. | 2936. | 2945. | 2955. | 2964. | 2973. | 2982. | 2991. | 3000. | 3009. | 3018. | 9.09  |
| 1050. | 3027. | 3037. | 3046. | 3055. | 3064. | 3073. | 3083. | 3092. | 3101. | 3110. | 9.21  |



| G.H. | .0     | .1     | .2     | .3     | .4     | .5     | .6     | .7     | .8     | .9     | DIFF. |
|------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|-------|
| 087. | 7139.  | 7153.  | 7167.  | 7182.  | 7196.  | 7211.  | 7225.  | 7240.  | 7254.  | 7269.  | 14.47 |
| 088. | 7283.  | 7298.  | 7313.  | 7327.  | 7342.  | 7357.  | 7372.  | 7386.  | 7401.  | 7416.  | 14.74 |
| 089. | 7431.  | 7446.  | 7461.  | 7476.  | 7491.  | 7506.  | 7521.  | 7536.  | 7551.  | 7566.  | 15.00 |
| 090. | 7581.  | 7596.  | 7611.  | 7626.  | 7642.  | 7657.  | 7672.  | 7687.  | 7703.  | 7718.  | 15.25 |
| 091. | 7733.  | 7749.  | 7764.  | 7780.  | 7795.  | 7811.  | 7826.  | 7842.  | 7857.  | 7873.  | 15.50 |
| 092. | 7888.  | 7904.  | 7920.  | 7935.  | 7951.  | 7967.  | 7983.  | 7999.  | 8014.  | 8030.  | 15.76 |
| 093. | 8046.  | 8062.  | 8078.  | 8094.  | 8110.  | 8126.  | 8142.  | 8158.  | 8174.  | 8190.  | 16.01 |
| 094. | 8206.  | 8222.  | 8238.  | 8255.  | 8271.  | 8287.  | 8304.  | 8320.  | 8336.  | 8352.  | 16.27 |
| 095. | 8369.  | 8385.  | 8402.  | 8418.  | 8435.  | 8451.  | 8468.  | 8484.  | 8501.  | 8518.  | 16.54 |
| 096. | 8534.  | 8551.  | 8568.  | 8585.  | 8601.  | 8618.  | 8635.  | 8652.  | 8669.  | 8685.  | 16.80 |
| 097. | 8702.  | 8719.  | 8736.  | 8753.  | 8770.  | 8787.  | 8805.  | 8822.  | 8839.  | 8856.  | 17.07 |
| 098. | 8873.  | 8890.  | 8907.  | 8925.  | 8942.  | 8959.  | 8977.  | 8994.  | 9011.  | 9029.  | 17.33 |
| 099. | 9046.  | 9064.  | 9081.  | 9099.  | 9116.  | 9134.  | 9152.  | 9169.  | 9187.  | 9204.  | 17.59 |
| 100. | 9222.  | 9240.  | 9258.  | 9276.  | 9293.  | 9311.  | 9329.  | 9347.  | 9365.  | 9383.  | 17.84 |
| 101. | 9400.  | 9419.  | 9437.  | 9455.  | 9473.  | 9491.  | 9509.  | 9527.  | 9545.  | 9563.  | 18.08 |
| 102. | 9581.  | 9600.  | 9618.  | 9636.  | 9655.  | 9673.  | 9691.  | 9710.  | 9728.  | 9746.  | 18.33 |
| 103. | 9765.  | 9783.  | 9802.  | 9820.  | 9839.  | 9858.  | 9876.  | 9895.  | 9913.  | 9932.  | 18.60 |
| 104. | 9951.  | 9969.  | 9988.  | 10007. | 10026. | 10045. | 10064. | 10083. | 10102. | 10121. | 18.90 |
| 105. | 10140. | 10159. | 10178. | 10197. | 10216. | 10236. | 10255. | 10274. | 10293. | 10313. | 19.24 |
| 106. | 10332. | 10352. | 10371. | 10391. | 10410. | 10430. | 10450. | 10469. | 10489. | 10509. | 19.63 |
| 107. | 10528. | 10548. | 10568. | 10588. | 10608. | 10628. | 10649. | 10669. | 10689. | 10709. | 20.04 |
| 108. | 10729. | 10749. | 10770. | 10790. | 10810. | 10831. | 10851. | 10872. | 10892. | 10913. | 20.46 |
| 109. | 10933. | 10954. | 10975. | 10996. | 11017. | 11038. | 11058. | 11079. | 11100. | 11121. | 20.86 |
| 110. | 11142. | 11163. | 11184. | 11206. | 11227. | 11248. | 11269. | 11291. | 11312. | 11333. | 21.24 |
| 111. | 11354. | 11376. | 11397. | 11419. | 11441. | 11462. | 11484. | 11505. | 11527. | 11549. | 21.59 |
| 112. | 11570. | 11592. | 11614. | 11636. | 11658. | 11680. | 11702. | 11724. | 11746. | 11767. | 21.91 |
| 113. | 11789. | 11812. | 11834. | 11856. | 11878. | 11900. | 11923. | 11945. | 11967. | 11989. | 22.22 |
| 114. | 12012. | 12034. | 12057. | 12079. | 12102. | 12124. | 12147. | 12169. | 12192. | 12214. | 22.54 |
| 115. | 12237. | 12260. | 12283. | 12306. | 12328. | 12351. | 12374. | 12397. | 12420. | 12443. | 22.86 |
| 116. | 12466. | 12489. | 12512. | 12535. | 12558. | 12582. | 12605. | 12628. | 12651. | 12674. | 23.20 |
| 117. | 12698. | 12721. | 12745. | 12768. | 12792. | 12815. | 12839. | 12863. | 12886. | 12910. | 23.56 |
| 118. | 12933. | 12957. | 12981. | 13005. | 13029. | 13053. | 13077. | 13101. | 13125. | 13149. | 23.92 |
| 119. | 13173. | 13197. | 13221. | 13245. | 13270. | 13294. | 13318. | 13343. | 13367. | 13391. | 24.29 |
| 120. | 13416. | 13440. | 13465. | 13489. | 13514. | 13539. | 13563. | 13588. | 13613. | 13637. | 24.66 |
| 121. | 13662. | 13687. | 13712. | 13737. | 13762. | 13787. | 13812. | 13837. | 13862. | 13887. | 25.03 |
| 122. | 13912. | 13938. | 13963. | 13989. | 14014. | 14039. | 14065. | 14090. | 14115. | 14141. | 25.38 |

| .H. | .0     | .1     | .2     | .3     | .4     | .5     | .6     | .7     | .8     | .9     | DIFF. |
|-----|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|-------|
| 23. | 14166. | 14192. | 14218. | 14243. | 14269. | 14295. | 14320. | 14346. | 14372. | 14398. | 25.70 |
| 24. | 14423. | 14449. | 14475. | 14501. | 14527. | 14553. | 14579. | 14605. | 14631. | 14657. | 26.00 |
| 25. | 14683. | 14710. | 14736. | 14762. | 14788. | 14815. | 14841. | 14867. | 14893. | 14920. | 26.25 |
| 26. | 14946. | 14972. | 14999. | 15025. | 15052. | 15078. | 15105. | 15131. | 15158. | 15184. | 26.47 |
| 27. | 15211. | 15237. | 15264. | 15291. | 15317. | 15344. | 15370. | 15397. | 15424. | 15450. | 26.66 |
| 28. | 15477. | 15504. | 15531. | 15558. | 15585. | 15611. | 15638. | 15665. | 15692. | 15719. | 26.84 |
| 29. | 15746. | 15773. | 15800. | 15827. | 15854. | 15881. | 15908. | 15935. | 15962. | 15989. | 27.04 |
| 30. | 16016. | 16043. | 16070. | 16098. | 16125. | 16152. | 16180. | 16207. | 16234. | 16261. | 27.26 |
| 31. | 16289. | 16316. | 16344. | 16371. | 16399. | 16426. | 16454. | 16481. | 16509. | 16536. | 27.51 |
| 32. | 16564. | 16591. | 16619. | 16647. | 16675. | 16703. | 16730. | 16758. | 16786. | 16814. | 27.77 |
| 33. | 16841. | 16869. | 16898. | 16926. | 16954. | 16982. | 17010. | 17038. | 17066. | 17094. | 28.04 |
| 34. | 17122. | 17150. | 17179. | 17207. | 17235. | 17263. | 17292. | 17320. | 17348. | 17377. | 28.31 |
| 35. | 17405. | 17434. | 17462. | 17491. | 17519. | 17548. | 17576. | 17605. | 17634. | 17662. | 28.57 |
| 36. | 17691. | 17720. | 17748. | 17777. | 17806. | 17835. | 17864. | 17892. | 17921. | 17950. | 28.81 |
| 37. | 17979. | 18008. | 18037. | 18066. | 18095. | 18124. | 18153. | 18182. | 18211. | 18240. | 29.02 |
| 38. | 18269. | 18298. | 18328. | 18357. | 18386. | 18415. | 18444. | 18474. | 18503. | 18532. | 29.23 |
| 39. | 18561. | 18591. | 18620. | 18650. | 18679. | 18709. | 18738. | 18767. | 18797. | 18826. | 29.42 |
| 40. | 18856. | 18885. | 18915. | 18944. | 18974. | 19004. | 19033. | 19063. | 19092. | 19122. | 29.59 |
| 41. | 19152. | 19181. | 19211. | 19241. | 19271. | 19300. | 19330. | 19360. | 19390. | 19419. | 29.76 |
| 42. | 19449. | 19479. | 19509. | 19539. | 19569. | 19599. | 19629. | 19659. | 19689. | 19719. | 29.94 |
| 43. | 19749. | 19779. | 19809. | 19839. | 19869. | 19899. | 19929. | 19959. | 19990. | 20020. | 30.13 |
| 44. | 20050. | 20080. | 20111. | 20141. | 20171. | 20202. | 20232. | 20262. | 20293. | 20323. | 30.33 |
| 45. | 20353. | 20384. | 20414. | 20445. | 20476. | 20506. | 20537. | 20567. | 20598. | 20628. | 30.57 |
| 46. | 20659. | 20690. | 20721. | 20751. | 20782. | 20813. | 20844. | 20875. | 20906. | 20937. | 30.84 |
| 47. | 20967. | 20998. | 21030. | 21061. | 21092. | 21123. | 21154. | 21185. | 21216. | 21247. | 31.13 |
| 48. | 21279. | 21310. | 21341. | 21373. | 21404. | 21436. | 21467. | 21498. | 21530. | 21561. | 31.41 |
| 49. | 21593. | 21624. | 21656. | 21688. | 21719. | 21751. | 21783. | 21814. | 21846. | 21878. | 31.68 |
| 50. | 21910. | 21941. | 21973. | 22005. | 22037. | 22069. | 22101. | 22133. | 22165. | 22197. | 31.93 |
| 51. | 22229. | 22261. | 22293. | 22325. | 22358. | 22390. | 22422. | 22454. | 22486. | 22518. | 32.16 |
| 52. | 22551. | 22583. | 22615. | 22648. | 22680. | 22712. | 22745. | 22777. | 22810. | 22842. | 32.38 |
| 53. | 22874. | 22907. | 22940. | 22972. | 23005. | 23037. | 23070. | 23103. | 23135. | 23168. | 32.63 |
| 54. | 23201. | 23233. | 23266. | 23299. | 23332. | 23365. | 23398. | 23431. | 23464. | 23497. | 32.90 |
| 55. | 23530. | 23563. | 23596. | 23629. | 23663. | 23696. | 23729. | 23762. | 23795. | 23829. | 33.23 |
| 56. | 23862. | 23896. | 23929. | 23963. | 23996. | 24030. | 24064. | 24097. | 24131. | 24164. | 33.61 |
| 57. | 24198. | 24232. | 24266. | 24300. | 24334. | 24368. | 24402. | 24436. | 24470. | 24504. | 34.02 |
| 58. | 24538. | 24573. | 24607. | 24642. | 24676. | 24710. | 24745. | 24779. | 24814. | 24848. | 34.43 |

| G.H.  | .0     | .1     | .2     | .3     | .4     | .5     | .6     | .7     | .8     | .9     | DIFF. |
|-------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|-------|
| 1159. | 24883. | 24917. | 24952. | 24987. | 25022. | 25057. | 25091. | 25126. | 25161. | 25196. | 34.81 |
| 1160. | 25231. | 25266. | 25301. | 25336. | 25371. | 25406. | 25442. | 25477. | 25512. | 25547. | 35.14 |
| 1161. | 25582. | 25617. | 25653. | 25688. | 25724. | 25759. | 25795. | 25830. | 25865. | 25901. | 35.41 |
| 1162. | 25936. | 25972. | 26007. | 26043. | 26079. | 26114. | 26150. | 26186. | 26221. | 26257. | 35.63 |
| 1163. | 26292. | 26328. | 26364. | 26400. | 26436. | 26472. | 26507. | 26543. | 26579. | 26615. | 35.02 |
| 1164. | 26651. | 26687. | 26723. | 26759. | 26795. | 26831. | 26867. | 26903. | 26939. | 26975. | 35.99 |
| 1165. | 27011. | 27047. | 27083. | 27119. | 27155. | 27191. | 27227. | 27264. | 27300. | 27336. | 36.15 |
| 1166. | 27372. | 27408. | 27445. | 27481. | 27517. | 27554. | 27590. | 27626. | 27663. | 27699. | 36.33 |
| 1167. | 27735. | 27772. | 27808. | 27845. | 27882. | 27918. | 27955. | 27991. | 28028. | 28064. | 36.52 |
| 1168. | 28101. | 28137. | 28174. | 28211. | 28248. | 28284. | 28321. | 28358. | 28395. | 28431. | 36.75 |
| 1169. | 28468. | 28505. | 28542. | 28579. | 28616. | 28653. | 28690. | 28727. | 28764. | 28801. | 37.03 |
| 1170. | 28839. | 28876. | 28913. | 28951. | 28988. | 29025. | 29063. | 29100. | 29137. | 29175. | 37.36 |
| 1171. | 29212. | 29250. | 29288. | 29325. | 29363. | 29401. | 29439. | 29476. | 29514. | 29552. | 37.75 |
| 1172. | 29590. | 29628. | 29666. | 29704. | 29742. | 29781. | 29819. | 29857. | 29895. | 29933. | 38.18 |
| 1173. | 29971. | 30010. | 30049. | 30087. | 30126. | 30165. | 30203. | 30242. | 30281. | 30319. | 38.65 |
| 1174. | 30358. | 30397. | 30436. | 30475. | 30514. | 30554. | 30593. | 30632. | 30671. | 30710. | 39.13 |
| 1175. | 30749. |        |        |        |        |        |        |        |        |        | 0.0   |

SPILLWAY ELEVATION = 1152.0

REST ELEVATION = 1179.0

ASSUMED HIGH WATER LINE = 1179.0

BLF

2- 8-84

B-4.01 WHITTIER NARROWS DAM PERTINENT DATA SHEET

Completion date..... 1957  
 Stream system.....Rio Hondo and San Gabriel River  
 Drainage area.....mi<sup>2</sup> 554  
 Purpose.....Flood control and water conservation  
 Owner/Operator..... LAD COE

Reservoir:

Elevation

Joint flood control and water conservation..ft, NGVD (Rio Hondo) 201.6  
 Joint flood control and water conservation..ft, NGVD (San Gabriel) 213.5  
 Flood control pool.....ft, NGVD 228.5  
 Top of spillway gates (gates closed).....ft, NGVD 229.0  
 Revised spillway surcharge level (1978).....ft, NGVD 238.9  
 Top of dam.....ft, NGVD 239.0

Area

Joint flood control and water conservation.....ac (Rio Hondo) 252  
 Joint flood control and water conservation.....ac (San Gabriel) 89  
 Flood control.....ac 2411  
 Top of spillway gates (gates closed).....ac 2470  
 Revised spillway surcharge level (1978).....ac 3623  
 Top of dam.....ac 3630

Capacity, gross

Joint flood control and water conservation.....ac-ft (Rio Hondo) 2498  
 Joint flood control and water conservation.....ac-ft (San Gabriel) 532  
 Flood control pool.....ac-ft 34,947  
 Top of spillway gates (gates closed).....ac-ft 36,160  
 Revised spillway surcharge level (1978).....ac-ft 66,702  
 Top of dam.....ac-ft 67,060  
 Allowance for sediment.....ac-ft 0

Dam:

Type..... Earthfill  
 Height above original streambed.....ft, NGVD 56  
 Top length.....ft, NGVD 16,960  
 Top width.....ft, NGVD 16  
 Freeboard.....ft, NGVD 0.1

Outlets: (Rio Hondo)

Type of gates..... Tainter  
 Number and size of gates..... 4 - 30'W x 20'H  
 Size of outlets..... 30'W x 19'H  
 Gate sill elevation.....ft, NGVD 184.0  
 Regulated outflow.....ft<sup>3</sup>/s 40,000  
 Maximum capacity (el. 229.0).....ft<sup>3</sup>/s 74,700

Spillway: (San Gabriel)

Type of gates..... Tainter  
 Number and size of gates..... 9 - 50'W x 29'H  
 Gate sill elevation.....ft, NGVD 200.0  
 Top of spillway gates (gates closed) elevation,ft, NGVD 229.0  
 Maximum discharge capacity (el. 239.0).....ft<sup>3</sup>/s 307,900

B-4.01 WHITTIER NARROWS DAM PERTINENT DATA SHEET  
(Continued)

|                                      |                    |         |
|--------------------------------------|--------------------|---------|
| Standard project flood:              |                    |         |
| Duration (inflow).....               | days               | 4       |
| Total volume.....                    | ac-ft              | 198,000 |
| Inflow peak.....                     | ft <sup>3</sup> /s | 40,000  |
| Probable maximum flood:              |                    |         |
| Duration (inflow).....               | days               | 4       |
| Total volume.....                    | ac-ft              | 910,000 |
| Inflow peak.....                     | ft <sup>3</sup> /s | 365,000 |
| Historic maximums:                   |                    |         |
| San Gabriel:                         |                    |         |
| Maximum release.....                 | ft <sup>3</sup> /s | 11,500  |
| Date.....                            |                    | 1-25-69 |
| Maximum water surface elevation..... | ft, NGVD           | 216.5   |
| Date.....                            |                    | 1-25-69 |
| Rio Hondo:                           |                    |         |
| Maximum release.....                 | ft <sup>3</sup> /s | 38,800  |
| Date.....                            |                    | 2-17-82 |
| Maximum water surface elevation..... | ft, NGVD           | 213.5   |
| Date.....                            |                    | 1-25-69 |

B-5.01 PERTINENT DATA SHEET FOR DEBRIS BASINS IN THE SANTA FE DAM WATERSHED

|   | Bradbury<br>Debris<br>Basin | Maddock<br>Debris<br>Basin | Spinks<br>Debris<br>Basin |
|---|-----------------------------|----------------------------|---------------------------|
| First debris season   | 1954-55                     | 1954-55                    | 1958-59                   |
| Uncontrolled drainage area (mi <sup>2</sup> )                           | 0.68                        | 0.25                       | 0.44                      |
| Elevation, bottom (ft, NGVD)  | 912.5                       | 888.6                      | 749.2                     |
| Elevation, port invert (ft, NGVD)                                       | 913.1                       | 891.8                      | 750.0                     |
| Elevation, spillway crest (ft, NGVD)                                    | 920.0                       | 901.0                      | 761.5                     |
| Elevation, crest of dam (ft, NGVD)                                      | 928.0                       | 904.0                      | 765.9                     |
| Width of spillway (ft)  | 58.0                        | 36.0                       | 40.0                      |
| Maximum debris capacity (yd <sup>3</sup> )                              | 90,500                      | 45,900                     | 62,900                    |
| Number of seasons   | 34                          | 34                         | 30                        |
| Total debris deposited, period of record (yd <sup>3</sup> )             | 267,430                     | 56,454                     | 67,086                    |
| Max. seasonal debris production (yd <sup>3</sup> )                      | 70,200<br>(1968-69)         | 16,200<br>(1980-81)        | 16,400<br>(1968-69)       |
| Average annual debris yield (yd <sup>3</sup> /yr)                       | 7866                        | 1660                       | 2236                      |
| Average annual unit debris yield (yd <sup>3</sup> /mi <sup>2</sup> /yr) | 11,567                      | 6642                       | 5082                      |