

STATE OF CALIFORNIA
CALIFORNIA NATURAL RESOURCES AGENCY
DEPARTMENT OF WATER RESOURCES
DIVISION OF SAFETY OF DAMS

INSPECTION OF DAM AND RESERVOIR IN CERTIFIED STATUS

Name of Dam Peters Dam No. 33-7 County Marin
 Type of Dam ERTH Type of Spillway Concrete weir and chute
 Water is 24.5 feet below the spillway crest and 39.5 feet below the dam crest.
 Weather Conditions Clear and mild
 Contacts Made Lucy Croy, Conner Pollard, and Carl Sanders during the inspection
 Reason for Inspection Periodic Evaluation

Important Observations, Recommendations or Actions Taken

Overall care and maintenance of the dam and appurtenances is excellent.
 The large redwood log that had drifted into and was caught on the right side of the concrete spillway control weir was removed as requested.
 A small area of eroded concrete on the upper right invert should be repaired to prevent further damage.

Conclusions

From the known information and visual inspection, the dam, reservoir, and the appurtenances are judged safe for continued use.

Observations and Comments

<u>Dam</u>	<p>The visible portion of the upstream face, crest, downstream face, and abutments are in satisfactory condition with no indication of surficial distress or instability. The large boulder rock riprap upstream face protection remains in good condition.</p> <p>Vegetation control remains excellent, and the crest, groins, and downstream face of the embankment are covered with ankle tall grass and other low ground cover that protect against erosion without hindering inspection and monitoring for seepage and other defects. Similar to recent past inspections, rodent control remains satisfactory and few to no indications of rodent activity were observed.</p> <p>The roadway cut and hillside above the outlet tower shows no obvious signs of renewed movement. Past sliding at this location during a winter storm has reportedly caused damage to the outlet valve controls.</p>
<u>Spillway</u>	<p>The spillway approach, control weir, and exit channel were open and clear. The large redwood log that had drifted into and was caught on the right side of the concrete spillway control weir was removed as requested. The upper half of the concrete spillway chute was inspected and found to be in generally very good condition. A small area of eroded concrete on the upper right invert should be repaired to prevent further damage. Due to safety concerns, the lower half of the spillway could not be entered for close examination, but no significant flaws were noted from our safe vantage points. The owner has contracted with AECOM to perform a detailed evaluation of the concrete spillway, and I asked Ms. Croy to forward a copy of AECOM's spillway report to DSOD.</p> <p>The original spillway, now used as a discharge chute for the 60" diameter upper level outlet, remains in satisfactory condition.</p> <p>The current design storm, prepared in 1981, is for a 170,000-year return period producing 19,900 cfs</p>

Photos taken? Yes No
 cc for Owner/Book

Inspected by J. Lowe
 Date of Inspection 13 February 2018
 Date of Report 16 February 2018

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Observations and Comments

(~947 cfs / sq mi) from the 22.1 square mile drainage area. The spillway capacity is ~20,900 cfs which is slightly greater than the peak inflow. Total freeboard is 15 feet and the residual freeboard for the design storm is 2.5 feet. Freeboard is satisfactory.

Outlet

Upstream control for the fully encased normally pressurized outlet is provided by six 30-inch gate valves arrayed along a 48-inch diameter inclined inlet tower at elevations of 345.0', 333.5', 320.0', 295.0', 260.0', and 215.0', and by a 36-inch butterfly valve at elevation 379.5'. Downstream control for the inclined tower is provided by a 36-inch diameter butterfly valve near the left downstream toe of the embankment. A separate high-level outlet controlled on both the upstream and downstream sides by two 60-inch diameter butterfly valves provides additional outlet control.

None of the outlet controls were cycled during this inspection, but all outlet controls were partially cycled during the 5 April 2016 inspection and were found to be in good operating condition at that time. All outlet controls were fully cycled and found to be in satisfactory operating condition during the February 25, 2015 periodic inspection. Mr. Anaya of the MMWD also performed a full head test of the outlet system on January 26, 2016; this is the first time the outlet has been tested under full reservoir head in over fifteen years. I asked Ms. Croy to schedule a full cycling of all valves for the next periodic inspection.

Seepage

No evidence of seepage was observed along the downstream face, abutments, or groins. Seepage from the single toe drain was estimated to be approximately 25 gpm at the 90-degree V-notch weir.

There was approximately 12 gpm seepage from the 60" diameter upper level outlet outfall pipe, and seepage from both the left and right collar drains for the upper level outlet discharge were estimated to be about 1/2 gpm from each drain.

Seepage at all locations was clear, and within historical values. Toe drain seepage measured at the 90-degree V-notch weir is greatly influenced by rainfall and storm water runoff, and has reached values as high as 420 gpm following large storm events.

Instr.

Instrumentation consists of:

- Sixteen (16) survey monuments distributed along the crest and along a row near the mid elevation of the downstream embankment, are designed to measure movement following significant seismic events.
- Seventeen (17) piezometers distributed along the crest, along a row near the mid elevation of the downstream embankment, and on the embankment above and along the downstream toe. Piezometers are designed to measure pore pressures within the embankment and along the abutments.
- One (1) seepage measurement weir located near the valve house adjacent to the outfall of the fish-water release weir.

Design elevations for the piezometers are:

Piezometer Number	Depth to Bottom of Piezometer	Design Tip Elevation	Comments
P-1	35.5	376.3	Clogged circa March 1999, reopened Oct. 2001
P-1A	45.0	370.7	

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P-2	63.3	344.8	
P-3	68.1	340.5	
P-4	93.0	315.9	Replaced by P-4A in 1986.
P-4A	?	?	Piezometer P-4 was replaced by P-4A in 1986.
P-5	88.2	322.1	
P-6	34.1	382.4	
P-6A	?	?	Critical elevation = 280'
P-7	57.6	266.1	
P-8	116.6	216.6	Abandoned and replaced by P-8A in 1986
P-8A	?	?	Critical elevation = 236'
P-9	50.0	268.3	
P-10	74.2	186.6	Critical elevation = 229, monitors pressure at toe
P-10A	91.0	183.4	Critical elevation = 230, monitors pressure at toe
P-10B	70.0	179.8	Critical elevation = 228, monitors pressure at toe
P-11	56.5	177.3	Critical elevation = 220
P-11A	66.4	177.8	Critical elevation = 225
P-11B	39.0	172.2	Critical elevation = 205

The latest instrumentation data was received from the owner on 21 June 2017.

Survey data for the period from September 1982 through February 2017 was reviewed. Settlement, while continuing, is insignificant. The maximum cumulative settlement was reported as -0.178 feet (2.1 inches) at monument M-8 in September of 2014.

Alignment deviation also remains insignificant. Recorded movements are within 0.13 feet (1.6 inches) with a roughly equal distribution of upstream and downstream movement. Based on the distribution, and the small reported displacements, it appears that the results reflect primarily instrument and reading error rather than actual displacement, and that the dam remains stable with regard to alignment.

The seepage measurement weir adjacent to the outfall of the fish-water release weir is designed to measure seepage from the toe drain. Observed seepage rates have varied from no seepage to as high as 1,200 gpm in February of 1982, reportedly the result of a combination of seepage and surface runoff following a period of intense rainfall. Since April of 1983 MMWD has diverted a portion of the surface drainage away from the weir pond, and the maximum reported reading since that time has been 420 gpm in February of 1986. For the January 2007 through February 2017 data period reviewed, the maximum reported seepage was just over 375 gpm in February of 2017, with average annual flow rates less than 75 gpm.

Piezometer water surface elevations for the January 2001 through January 2011 period reviewed are stable with no significant increasing or decreasing trends, and levels remain below "phreatic surface number 3", which has been determined to be the maximum surface (critical elevation) for adequate stability as shown in the DSOD memorandum from V.H. Persson to J. E. Ley dated 27 July 1983.

The owner's conclusion from their June 2017 submittal was that, "The Peters Dam (Kent Lake) piezometers and weir flows are consistent with historic readings". Based on the data submitted I agree with the owner's conclusion. The dam appears to be performing satisfactorily, and no additional instrumentation is believed necessary at this time.

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The upstream face looking towards the spillway entrance (indicated by arrow), above, and looking towards the right abutment, below.



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The downstream face of the main portion of the embankment, above, and the downstream face of the embankment above the original spillway, below. Vegetation control remains excellent.



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The upper half of the concrete spillway chute was inspected and found to be in generally very good condition (above). A small area of eroded concrete on the upper right invert, circled in the bottom photograph, should be repaired to prevent further damage.



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Seepage from the toe drain was estimated to be approximately 25 gpm at the 90-degree V-notch weir (circled above). There was approximately 12 gpm seepage from the 60" diameter upper level outlet pipe, and seepage from both the left and right collar drains for the upper level outlet discharge were estimated to be about 1/2 gpm from each drain (circled below).

