

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 0.5 feet below the spillway crest and 15.5 feet below the dam crest.
 Weather Conditions Clear and mild
 Contacts Made Alex Anaya and Ronnie Chasteen during the inspection
 Reason for Inspection Periodic Evaluation

Important Observations, Recommendations or Actions Taken

Overall care and maintenance of the dam and appurtenances has improved significantly over the past three years. Mr. Anaya has addressed all safety and maintenance concerns expeditiously and comprehensively, and none other than normally scheduled maintenance is required at this time. The following are some of the issues resolved by Mr. Anaya since the previous inspection on February 25, 2015:

- Vegetation control along the downstream face has improved significantly, and is now excellent. Tall and dense bushes and emerging trees throughout the embankment and downstream groins have been cleared to open these important areas to improved monitoring for seepage and other defects. I called Mr. Carl Sanders to thank him for the excellent work he and his crew performed in correcting all vegetation control deficiencies.
- Small willow trees and woody bushes that had taken root within construction joints along the upper level outlet outfall chute have been removed to prevent damage to the concrete chute invert and sidewalls.
- On January 26, 2016, the outlet control was run under full head for the first time in over fifteen years. Mr. Anaya's outlet valve operation plan and documentation of the full head outlet operation is attached to this report.

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 along the downstream face has improved significantly, and is now excellent. Tall and dense bushes and emerging trees throughout the embankment and downstream groins have been cleared to open these important areas to improved monitoring for seepage and other defects. I called Mr. Carl Sanders to thank him for the excellent work he and his crew performed in correcting all vegetation control deficiencies.</p> <p>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</p>
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Photos taken? Yes X No _____
 cc for Owner/Book

Inspected by J. Lowe
 Date of Inspection 5 April 2016
 Date of Report 6 April 2016

[Handwritten signature and date: J. Lowe, 6 Apr 2016]
[Handwritten initials: W. D. 11/16]

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Observations and Comments

	controls.
<u>Spillway</u>	<p>The approach, control section, and exit channel were clear and unobstructed. The concrete walls and floor remain in good condition, with no significant indications of structural or physical deterioration.</p> <p>The original spillway, now used as a discharge chute for the 60" diameter upper level outlet, is in satisfactory condition. Small willow trees and woody bushes that had taken root within construction joints along the upper level outlet outfall chute have been cleared to prevent damage to the concrete chute invert and sidewalls.</p> <p>Total freeboard is 15 feet and the residual freeboard for the design storm is 2.5 feet. Freeboard is satisfactory.</p>
<u>Outlet</u>	<p>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.</p> <p>All of the outlet controls were partially cycled during this inspection, and all were found to be in good operating order. All outlet controls were fully cycled and found to be in satisfactory operating condition during the February 25, 2015 periodic inspection. Mr. Anaya 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 head in over fifteen years. Mr. Anaya's outlet valve operation plan and documentation of the full head outlet operation is attached to this report.</p>
<u>Seepage</u>	<p>No evidence of seepage was observed along the downstream face, abutments, or groins. Seepage from the single toe drain was estimated to be approximately 40 gpm at the 90-degree V-notch weir.</p> <p>There was no seepage from the 60" diameter upper level outlet discharge, and seepage from both the left and right collar drains for the upper level outlet discharge was only a slight trickle.</p> <p>Seepage over both the V-notch weir and the right and left collar drains was clear and within historic volumes.</p>
<u>Instr.</u>	<p>Instrumentation consists of:</p> <ul style="list-style-type: none">• 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.

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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	
P-2	63.3	344.8	
P-3	68.1	340.5	
P-4	93.0	345.9	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	246.6	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 December 16, 2015; survey data covers the reporting period between September 1982 and November 2015.

Survey data for the period from September 1982 through January 2015 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 is also 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. Measured seepage rates have varied from 0.0 gpm 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 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 2006 through July 2015 data period reviewed, the maximum reported seepage was just over 300 gpm in January of 2015, 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.

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In their December 16, 2015 instrumentation data submittal letter the owner reports, "*The Peters Dam (Kent Lake) piezometers and weir flows are consistent with historic readings. Peters Dam (Kent Lake) is trending toward stabilization: Settlement of -0.18 ft (maximum) and alignment of -0.13 feet (downstream direction; maximum).*"

Based on the data submitted the dam appears to be performing satisfactorily, and no additional instrumentation is believed necessary at this time.



The upstream face as viewed from the right abutment. The large boulder rock riprap upstream face protection remains in good condition. The spillway entrance through the left abutment is circled.

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The downstream face as viewed from the right abutment, above, and from the left abutment, below. As is evident from the photographs, vegetation control is now excellent.

