



● **Board of Directors**  
***Engineering and Operations Committee***

12/12/2017 Board Meeting

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8-3

**Subject**

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Adopt CEQA determination and appropriate \$2.86 million; and authorize: (1) comprehensive assessments of the spillways and dam structures at Lake Mathews and Lake Skinner; (2) preliminary design of upgrades to the dam monitoring systems at both lakes; and (3) agreement with AECOM with a not-to-exceed amount of \$1.53 million for technical support (Appropriation No. 15419)

**Executive Summary**

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This action authorizes comprehensive assessments of the spillways and appurtenant structures at Lake Mathews and Lake Skinner, and preliminary design of upgrades to the dam monitoring systems at both facilities. The spillway assessments are required by the California Division of Safety of Dams (DSOD). This action also authorizes a professional services agreement to provide specialized technical support for these projects.

**Timing and Urgency**

Following the recent incidents at Oroville Dam, DSOD is now requiring that dam owners in California assess the condition of dam spillways to confirm that they meet minimum safety standards. In July 2017, DSOD issued an initial list of 93 dams requiring comprehensive spillway assessments to evaluate hydraulic capacity, geotechnical stability, structural integrity, and potential erosion from dam releases. Of the 20 Metropolitan facilities that are permitted by DSOD, two have been directed to undergo the comprehensive assessments: Lake Mathews and Lake Skinner. Staff recommends moving forward expeditiously with these assessments in order to complete the field work and technical studies by summer 2018, so that draft reports may be submitted to DSOD prior to the deadline of December 2018.

Lake Mathews and Lake Skinner are monitored continuously by dam monitoring equipment that is intended to provide early warning signs of dam distress. The current monitoring systems were installed during the dams' original construction in 1938 (Lake Mathews) and 1973 (Lake Skinner). Several of the dams' piezometers and weirs no longer function reliably. These items measure pore water pressure and seepage flow, respectively. New monitoring systems are recommended in order to reliably monitor dam performance. The upgrades will be prioritized and completed in stages.

These projects have been reviewed with Metropolitan's Capital Investment Plan (CIP) prioritization criteria and are included in the Distribution System Reliability Program. Funds for this action are available within Metropolitan's capital expenditure plan for fiscal year 2017/18.

**Details**

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**Background**

Metropolitan's distribution system includes 24 structures that are classified as dams by DSOD. They are regulated under 20 operating permits. The dams range in height from 18 feet to 285 feet, retain reservoirs with capacities of 18 to 810,000 acre-feet, and range from 6 to 80 years old. Most of Metropolitan's dams are located within populated areas that are subject to high levels of seismic activity.

Lake Mathews was constructed in the 1930s and is located in Riverside County, south of the city of Riverside. The original facilities included the main dam embankment, a 250-foot-long concrete-lined spillway, the lake's first outlet tower, and a forebay with its own outlet tower. In 1961, the main dam embankment was raised and two dikes were constructed to increase the lake volume to its current maximum capacity of 182,000 acre-feet. In 2004, a second outlet tower was added. The upstream watershed is 40 square miles in area and drains into the lake through Cajalco Creek. Much of the water served to Metropolitan's member agencies is conveyed through the Upper and Lower Feeders from Lake Mathews to the F. E. Weymouth and Robert B. Diemer Water Treatment Plants, respectively.

Lake Skinner was constructed in the 1970s and is located north of the city of Temecula, in Riverside County. Its maximum storage capacity is 44,000 acre-feet. Lake Skinner has two adjacent spillway structures that release flows into Tualota Creek: a concrete-lined primary spillway that was designed to handle normal flood flows from the upstream 52-square-mile watershed, and a concrete-lined emergency spillway that was designed to handle excess flood flows. Water is delivered from the lake through its outlet tower to the Robert A. Skinner Water Treatment Plant and to the San Diego Canal.

### **Project No. 1 - Assessment of Dam Structures at Lake Mathews and Lake Skinner – Study (\$2,000,000)**

In July 2017, DSOD began requiring dam owners in California to conduct detailed evaluations of appurtenant dam structures, such as spillways, to confirm that these structures meet minimum safety standards. DSOD prioritized the evaluations based on the age of each dam, its capacity, and the downstream hazard classification. Subsequently, owners of 93 dams were notified to submit work plans to investigate the condition of their spillways. Lake Mathews and Lake Skinner were included in this notification, as both facilities are categorized by DSOD as extremely high hazard dams. The classifications do not reflect the condition of the dams or their appurtenant structures, but are based on the size of the dams' reservoirs and the population that could potentially be impacted by a dam failure. In its most recent annual inspections, DSOD acknowledged that both dams and their spillways are in satisfactory condition.

Metropolitan submitted the required work plans for re-evaluation of the spillways at Lake Mathews and Lake Skinner, and received approval of those plans in September 2017. Details of the approved work plans are provided below.

**Phase 1 – Research and Review of Available Information:** This phase will include identifying and cataloging historical reports, reviewing design reports, evaluating construction documents and quality control data, and assessing post-construction modifications, inspection reports, and maintenance records.

**Phase 2 – Structural and Geotechnical Investigations:** This phase will focus on investigating the condition of structural elements of the existing spillway structures and the condition of the soil and rock adjacent to and beneath those structures.

- Spillway Structures – Visual inspections of the spillway structures are planned to identify signs of concrete degradation, cracking, or spalling, and to examine the condition of waterstops and joints, subdrain system, and weep holes. The investigations will include scanning with ground-penetrating radar and concrete coring to determine slab thickness, the condition of reinforcing steel, and to characterize the foundation bedrock weathering and hardness. Video pipe inspection is planned to determine the condition of weep holes and drain pipes.
- Adjacent Soil and Bedrock – Visual inspections and aerial mapping of the surrounding soil and rock conditions are planned to identify areas of potential erosion of downstream earthen features and landslides which may constrain spillway releases. Detailed geologic mapping is planned to identify rock discontinuities such as joints, shears, faults, and bedding in the adjacent rock formations. Field investigations such as trenching, drilling, and coring are planned to determine the soil and rock characteristics such as degree of weathering and rock hardness. Laboratory testing is planned to establish physical properties that will be used in subsequent technical analyses.

**Phase 3 – Analyses and Evaluations:** This phase will include technical analyses to confirm hydraulic capacity, geotechnical stability, and structural integrity of the spillways. The evaluations will take into account the

spillways' current condition, and will compare that condition with current design practices and performance guidelines. For each dam, a comprehensive spillway assessment report will be prepared and submitted to DSOD for review and approval.

**Phase 4 – Remedial Measures:** This phase will include development of remedial measures, if necessary.

As part of these comprehensive assessments, re-evaluation of the outlet tower and conduit at Lake Skinner is recommended to identify potential risks and vulnerabilities of lowering the reservoir pool after a major seismic event. Due to its integral role in withdrawing water from the reservoir, the four-phased spillway work plan will be expanded to include the Lake Skinner outlet tower and conduit.

Staff recommends moving forward expeditiously with the initial three phases of the comprehensive assessments of both dams in order to meet the December 2018 deadline established by DSOD for submittal of the draft assessment reports. Staff will return to the Board at that time, if necessary, for authorization of Phase 4 activities.

This action appropriates \$2 million and authorizes assessments of dam structures at Lake Mathews and Lake Skinner. Requested funds include: \$126,000 for aerial surveys and mapping; \$1.13 million for specialized investigations by AECOM, as discussed below; \$25,000 for peer review by an independent specialty firm; \$540,000 for technical review, preparation of environmental documentation, DSOD consultations, and project management by Metropolitan staff; and \$179,000 for remaining budget. The agreements with specialty firms to perform peer review and conduct aerial surveys will be executed under the General Manager's Administrative Code authority to enter into agreements of \$250,000 or less.

**Project No. 2 – Dam Monitoring System Upgrades at Lake Mathews and Lake Skinner – Preliminary Design Phase (\$860,000)**

Metropolitan relies on extensive instrumentation and regular inspections as a cornerstone of its dam monitoring program. The instrumentation provides warning signs of dam distress and provides real-time monitoring of the embankments and foundations.

Extensive monitoring equipment has been installed at Lake Mathews over the last 79 years, including 80 piezometers, 13 weirs, and 5 strong motion accelerographs. Over the last 44 years, the monitoring equipment installed at Lake Skinner has included 71 piezometers, 7 weirs, and 6 strong motion accelerographs. Recent inspections have noted that several of the piezometers and weirs at these facilities no longer function reliably and require rehabilitation or replacement.

Since the original construction of these dams, there have been significant advances in dam instrumentation technology, with improvements in accuracy, timeliness, and communication of data. Today's industry practice is for extensive data to be collected on a frequent schedule, with minimal delays in transmitting the data to the reviewing office. Under the subject project, staff will identify potential upgrades to the monitoring systems at both dams that will employ state-of-the-art equipment, similar to the installation at Diamond Valley Lake.

Condition assessments will be conducted at both dams to develop a staged replacement schedule. Based on the results of the condition assessments, staff will return to the Board to authorize installation of automated dam monitoring systems at each dam.

Planned preliminary design phase activities include: (1) conducting field surveys and condition assessments of the existing dam monitoring instruments; (2) development of final design criteria; (3) value engineering; (4) DSOD permitting; and (5) development of cost estimates. Specialized support for the condition assessments will be provided by AECOM, as discussed below. A specialty firm will perform the third-party value engineering under an agreement planned to be executed under the General Manager's Administrative Code authority to award contracts of \$250,000 or less. All other activities will be performed by Metropolitan staff.

This action appropriates \$860,000 and authorizes preliminary design of upgrades to the dam monitoring systems at Lake Mathews and Lake Skinner. Requested funds include \$400,000 for the field investigations and technical activities by AECOM; \$385,000 for consultations with DSOD, technical review, value engineering, development of a cost estimate, preparation of environmental documentation, and project management; and \$75,000 for remaining budget. Staff will return to the Board at a later date to authorize final design.

### **Specialized Technical Support (AECOM) – New Agreement**

Technical support for assessment of the dam structures and monitoring systems is recommended to be performed by AECOM under a new professional services agreement. AECOM was prequalified to provide specialized engineering support via Request for Qualifications No. 1131, and was selected for this project based on its specific expertise with similar dam installations. The planned scope of work includes geotechnical field investigations, hydraulic and structural analyses for the spillway evaluations, seismic assessments of the outlet works, and condition assessments of the existing dam monitoring systems. The estimated cost for these services is \$1.53 million.

For this agreement, Metropolitan established a Small Business Enterprise participation level of 25 percent. AECOM has agreed to meet this level of participation. The planned subconsultants for this agreement are listed in **Attachment 2**.

#### **Summary**

This action appropriates \$2.86 million, authorizes comprehensive assessments of the dam structures at Lake Mathews and Lake Skinner, authorizes preliminary design of upgrades to the dam monitoring systems at both lakes, and authorizes a professional services agreement for technical support. These projects have been evaluated and recommended by Metropolitan's CIP Evaluation Team, and funds are available within fiscal year 2017/18 capital expenditure plan. See **Attachment 1** for the Financial Statement, **Attachment 2** for the listing of Subconsultants for Agreement with AECOM, and **Attachment 3** for the Location Map.

These projects are included within capital Appropriation No. 15419, Dam Rehabilitation and Safety Improvements Appropriation, which was initiated in fiscal year 2006/07. With the present action, the total funding for Appropriation No. 15419 will increase from \$7.45 million to \$10.31 million.

#### ***Project Milestones***

May 2018 – Completion of preliminary design of dam monitoring upgrades at Lake Mathews and Lake Skinner  
November 2018 – Completion of comprehensive spillway assessments at Lake Mathews and Lake Skinner

#### **Policy**

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Metropolitan Water District Administrative Code Section 5108: Appropriations

Metropolitan Water District Administrative Code Section 8121: General Authority of the General Manager to Enter Contracts

#### **California Environmental Quality Act (CEQA)**

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##### **CEQA determination for Option #1:**

##### **Project No. 1 - Assessment of Dam Structures at Lake Mathews and Lake Skinner - Study**

The proposed action is categorically exempt under the provisions of CEQA and the State CEQA Guidelines. The proposed action consists of basic data collection and resource evaluation activities, some of which involve minor alterations to land, which do not result in a serious or major disturbance to an environmental resource. This may be strictly for information gathering purposes, or as part of a study leading to an action which a public agency has not yet approved, adopted, or funded. Accordingly, the proposed action qualifies under Class 4 and Class 6 Categorical Exemption (Section 15304 and 15306 of the State CEQA Guidelines).

The CEQA determination is: Determine that pursuant to CEQA, the proposed action qualifies under two Categorical Exemptions (Class 4, Section 15304, and Class 6, Section 15306 of the State CEQA Guidelines).

##### **Project No. 2 – Dam Monitoring System Upgrades at Lake Mathews and Lake Skinner – Preliminary Design Phase**

The proposed action is categorically exempt under the provisions of CEQA and the State CEQA Guidelines. The proposed action consists of basic data collection and resource evaluation activities, minor alteration of existing

facilities, and installation of new equipment and facilities, some of which involve minor alterations to land, which do not result in a serious or major disturbance to an environmental resource. Accordingly, the proposed action qualifies under Class 1, Class 3, Class 4, and Class 6 Categorical Exemptions (Sections 15301, 15303, 15304 and 15306 of the State CEQA Guidelines).

The CEQA determination is: Determine that pursuant to CEQA, the proposed action qualifies under four Categorical Exemptions (Class 1, Section 15301; Class 3, Section 15303; Class 4, Section 15304; and Class 6, Section 15306 of the State CEQA Guidelines).

**CEQA determination for Option #2:**

None required

**Board Options**

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**Option #1**

Adopt the CEQA determination that the proposed actions are categorically exempt from CEQA, and

- a. Appropriate \$2.86 million;
- b. Authorize comprehensive assessments of the spillways and dam structures at Lake Mathews and Lake Skinner;
- c. Authorize preliminary design of upgrades to the dam monitoring systems at both lakes; and
- d. Authorize agreement with AECOM with a not-to-exceed amount of \$1.53 million for technical support.

**Fiscal Impact:** \$2.86 million of capital funds under Appropriation No. 15419

**Business Analysis:** This option will comply with the requirements of DSOD, reduce the risk of potential failure of critical Metropolitan facilities, and enhance water delivery reliability to member agencies.

**Option #2**

Do not proceed with the projects at this time.

**Fiscal Impact:** None

**Business Analysis:** Under this option, Metropolitan would be unable to submit the two dam assessment reports to DSOD prior to the deadline of December 2018. Under recently enacted dam safety legislation, Metropolitan may be subject to fines or enforcement actions.

**Staff Recommendation**

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Option #1

  
 Gordon Johnson  
 Manager/Chief Engineer  
 Engineering Services

11/20/2017  
 Date

  
 Jeffrey Kightlinger  
 General Manager

11/22/2017  
 Date

**Attachment 1 – Financial Statement**

**Attachment 2 – Subconsultants for Agreement with AECOM**

**Attachment 3 – Location Map**

Ref# es12659548

## **Financial Statement for Dam Rehabilitation & Safety Improvements Appropriation**

A breakdown of Board Action No. 7 for Appropriation No. 15419<sup>1</sup> is as follows:

	<b>Previous Total Appropriated Amount (Sep. 2017)</b>	<b>Current Board Action No. 7 (Dec. 2017)</b>	<b>New Total Appropriated Amount</b>
Labor			
Studies & Investigations	\$ 1,124,908	\$ 622,000	\$ 1,746,908
Owner Costs (Program mgmt., permitting)	586,200	219,000	805,200
Final Design	300,000	-	300,000
Submittals Review & Record Drwgs.	76,000	-	76,000
Metropolitan Force Construction	890,000	-	890,000
Construction Inspection & Support	-	-	-
Materials & Supplies	314,000	-	314,000
Incidental Expenses (Permit fees)	22,000	85,000	107,000
Professional/Technical Services	2,537,102	-	2,537,102
AECOM	-	1,530,000	1,530,000
Value engineering firm	-	75,000	75,000
Aerial survey firm	-	50,000	50,000
Peer review firm	-	25,000	25,000
Contracts	1,138,354	-	1,138,354
Remaining Budget	461,436 <sup>2</sup>	254,000	715,436
<b>Total</b>	<b>\$ 7,450,000</b>	<b>\$ 2,860,000</b>	<b>\$ 10,310,000</b>

### **Funding Request**

<b>Appropriation Name:</b>	Dam Rehabilitation & Safety Improvements		
<b>Source of Funds:</b>	Revenue Bonds, Replacement and Refurbishment or General Funds		
<b>Appropriation No.:</b>	15419	<b>Board Action No.:</b>	7
<b>Requested Amount:</b>	\$ 2,860,000	<b>Budget Page No.:</b>	225
<b>Total Appropriated Amount:</b>	\$ 10,310,000	<b>Total Appropriation Estimate:</b>	\$ 8,900,000

<sup>1</sup> This is the initial action to assess dam structures and upgrade the dam monitoring systems at Lake Mathews and Lake Skinner.

<sup>2</sup> Includes previous reallocation of \$513,340 from Remaining Budget for additional field investigations and specialized analysis to assess dam safety at four of Metropolitan's dams.

**The Metropolitan Water District of Southern California**

**Subconsultants for Agreement with AECOM**

<b>Subconsultant and Location</b>
Pacific Coast Locators, La Crescenta, CA
Geovision, Corona, CA
Smith Emery, Los Angeles, CA
Penhall Co., Anaheim, CA
BC2 Environmental, Orange, CA

# Distribution System

