



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

11/10/2015 Board Meeting

7-1

**Subject**

Appropriate \$960,000; and authorize design and repair of expansion joints on pump delivery lines along the Colorado River Aqueduct (Approp. 15483)

**Executive Summary**

This action authorizes design to repair 16 expansion joints located on the pump delivery lines at Metropolitan's Colorado River Aqueduct (CRA) pumping plants. Due to their deteriorated condition, three of these joints will be repaired by Metropolitan forces during an upcoming CRA shutdown in early 2016. The remaining 13 expansion joints will be repaired by a construction contractor during future shutdowns of the CRA.

**Timing and Urgency**

Each of the five CRA pumping plants has nine main pumps that lift water through a series of delivery pipelines to the downstream aqueduct. A scheduled inspection of the delivery pipelines in February 2014 revealed corrosion and varying levels of metal loss in 16 expansion joints out of the total of 57 joints at all five pumping plants. The most significant deterioration was observed in three joints at Hinds and Intake Pumping Plants. Staff recommends that these three expansion joints be repaired by Metropolitan forces during an upcoming CRA shutdown, and that design proceed at this time for future repair of the additional 13 joints. The remaining 41 expansion joints are presently in good condition and will continue to be monitored.

This project has been reviewed with Metropolitan's Capital Investment Plan (CIP) prioritization criteria and is included in the CRA Reliability Program. Funds for this action are available within Metropolitan's capital expenditure plan for fiscal year 2015/2016.

**Details**

**Background**

Each of the five CRA pumping plants has nine pump units within its pump house. Each pump discharges through a 6-foot-diameter steel pipe section, which contains one expansion joint. Three of these 6-foot-diameter pipelines then converge into a single 10-foot-diameter steel delivery line. Each pumping plant has three aboveground 10-foot-diameter delivery lines that convey water from the pump house up to the headgate structure at the top of the hill. The 10-foot-diameter pump delivery lines were installed in several phases. The first line (delivery line No. 1) was completed in 1941 and the other two lines were installed in the 1950s. To protect the delivery lines from corrosion, the first line was internally coated with coal tar enamel, while the other two were lined with cement mortar. Depending on the plant, the 10-foot-diameter delivery lines vary in length from 500 feet to 2,000 feet between the pump house and the headgate structure. Each line has two to four expansion joints. There are a total of 57 expansion joints among the five pumping plants. The expansion joints are approximately 2 feet long, 10 feet in diameter, and vary in wall thickness from 0.375 inches to 0.687 inches, depending on internal pressure. The expansion joints allow the pipelines to expand and contract due to temperature fluctuation. Allowing this movement prevents thermal stresses from damaging the pipelines. Each expansion joint wall is recessed up to one inch below the delivery lines' interior wall. This gap subjects the expansion joint wall to increased water turbulence, corrosion, and pitting, which if not addressed, could lead to leakage of the pipeline.

In June 2013, a leak was discovered on a delivery line expansion joint at Gene Pumping Plant. The leak was caused by corrosion-induced metal loss, and the expansion joint was repaired by Metropolitan forces with a welded steel patch. In 2014, staff conducted ultrasonic tests on the delivery line expansion joints at all five pumping plants. The investigation revealed three expansion joints (two at Intake and one at Hinds) with metal loss greater than 70 percent; nine joints with metal loss between 50 and 69 percent; four with metal loss less than 49 percent; and 41 with no apparent metal loss. Staff recommends that repairs proceed during an upcoming shutdown for the three most deteriorated expansion joints to reduce the risk of damage to the delivery lines in the event of a pressure transient within the line. Staff also recommends that design commence to repair the 13 additional expansion joints without delay. These additional repairs will be performed by a construction contractor during future scheduled shutdowns of the CRA.

A comprehensive condition assessment of the delivery lines' interior and exterior coatings, and the need for modification of pipe supports for all delivery lines, is currently underway. Staff will return to the Board for authorization to initiate a project that will execute phased repairs to extend the service life of the delivery lines at each of the pumping plants.

### **Expansion Joint Rehabilitation – Design and Construction (\$960,000)**

The planned scope of work consists of final design to rehabilitate 16 expansion joints located at the Intake, Gene, Iron Mountain, Eagle Mountain, and Hinds Pumping Plants. The scope of work also includes construction by Metropolitan forces to rehabilitate the three most deteriorated joints, which are located at Hinds and Intake Pumping Plants, during a scheduled CRA shutdown in early 2016. The design work includes preparation of drawings, shutdown planning, development of a construction cost estimate, and preparation of environmental documentation.

Planned repair activities include fabrication and installation of a cylindrical steel plate at the three locations to reinforce the existing expansion joint walls. The exterior walls will be sandblasted and finished with an epoxy coating. The work will be logistically challenging due to the location of the 10-foot-diameter pipelines high above the steep, rocky slopes.

For the remaining 13 expansion joints, staff will return to the Board to award a construction contract in late 2016. That work will be performed during two future CRA shutdowns.

This action appropriates \$960,000, authorizes design to repair 16 expansion joints on pump delivery lines at each CRA pumping plant, and authorizes construction to repair three of those joints by Metropolitan forces. The requested funds include \$486,000 for steel plate fabrication and repair of the three joints; \$100,000 for shutdown activities, which include dewatering and return of the CRA back to service; \$181,000 for design; \$68,000 for project management and receipt of bids to repair the 13 joints; and \$125,000 for remaining budget. Metropolitan staff will perform all design and procurement activities. The final design cost as a percentage of the total estimated construction cost is approximately 9 percent. Engineering Services' goal for design of projects with construction cost less than \$3 million is 9 to 15 percent.

The total estimated cost to complete the expansion joint repairs, including the current funds requested and future construction costs, is estimated to range from \$2 million to \$2.5 million.

This project is included within capital Appropriation No. 15483, the CRA Reliability Appropriation – FY 2012/13 Through FY 2017/18, which was initiated in fiscal year 2012/13. With this action, the total funding for Appropriation No. 15483 will increase from \$3.5 million to \$4.46 million.

This project has been evaluated and recommended by Metropolitan's CIP Evaluation Team, and funds are available within the fiscal year 2015/16 capital expenditure plan. See [Attachment 1](#) for the Financial Statement and [Attachment 2](#) for the Location Map.

***Project Milestones***

February 2016 – Completion of repairs for the initial three expansion joints

April 2016 – Completion of design to repair the remaining 13 expansion joints

**Policy**

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Metropolitan Water District Administrative Code Section 5108: Appropriations

**California Environmental Quality Act (CEQA)**

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**CEQA determination for Option #1:**

The proposed action is categorically exempt under the provisions of CEQA and the State CEQA Guidelines. The overall activities involve funding, design, minor alterations and replacement of existing public facilities; and minor modifications in the condition of land, water, and/or vegetation which do not involve removal of healthy, mature, scenic trees; and basic data collection activities. In addition, these activities involve negligible or no expansion of use and no possibility of significantly impacting the physical environment. Accordingly, the proposed action qualifies under Class 1, Class 2, Class 4, and Class 6 Categorical Exemptions (Sections 15301, 15302, 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 2, Section 15302; Class 4, Section 15304, and Class 6, Section 15306).

**CEQA determination for Option #2:**

None required

**Board Options**

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**Option #1**

Adopt the CEQA determination that the proposed action is categorically exempt, and

- a. Appropriate \$960,000; and
- b. Authorize design to repair 16 expansion joints on pump delivery lines along the CRA, and authorize construction to repair three of those joints.

**Fiscal Impact:** \$960,000 of capital funds under Approp. 15483

**Business Analysis:** This option will enhance reliability of the CRA.

**Option #2**

Do not proceed with the repairs at this time.

**Fiscal Impact:** None

**Business Analysis:** This option would forgo an opportunity to enhance reliability of CRA deliveries, and could lead to outages of the aqueduct and more extensive repairs in the future.

## **Staff Recommendation**

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Option #1



10/22/2015  
Date

Gordon Johnson  
Manager/Chief Engineer  
Engineering Services



10/28/2015  
Date

Jeffrey Kightlinger  
General Manager

**Attachment 1 – Financial Statement**

**Attachment 2 – Location Map**

Ref# es12639748

### **Financial Statement for CRA Reliability Appropriation – FY 2012/13 Through FY 2017/18**

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A breakdown of Board Action No. 2 for Appropriation No. 15483 to repair pump delivery lines<sup>1</sup> on the Colorado River Aqueduct is as follows:

	<b>Previous Total Appropriated Amount (Oct. 2012)</b>	<b>Current Board Action No. 2 (Nov. 2015)</b>	<b>New Total Appropriated Amount</b>
<b>Labor</b>			
Studies & Investigations	\$ 75,000	\$ -	\$ 75,000
Final Design	270,000	181,000	451,000
Owner Costs (Program mgmt.)	130,000	68,000	198,000
Submittals Review & Record Drwgs.	20,000	-	20,000
Construction Inspection & Support	375,000	-	375,000
Metropolitan Force Construction	235,000	524,000	759,000
Materials & Supplies	100,000	4,000	104,000
Incidental Expenses	-	-	-
Professional/Technical Services	-	-	-
Equipment Use	5,000	58,000	63,000
Contracts	1,866,000	-	1,866,000
Remaining Budget	424,000	125,000	549,000
<b>Total</b>	<b>\$ 3,500,000</b>	<b>\$ 960,000</b>	<b>\$ 4,460,000</b>

### **Funding Request**

<b>Appropriation Name:</b>	CRA Reliability Appropriation – FY 2012/13 Through FY 2017/18		
<b>Source of Funds:</b>	Revenue Bonds, Replacement and Refurbishment or General Funds		
<b>Appropriation No.:</b>	15483	<b>Board Action No.:</b>	2
<b>Requested Amount:</b>	\$ 960,000	<b>Budget Page No.:</b>	282
<b>Total Appropriated Amount:</b>	\$ 4,460,000	<b>Total Appropriation Estimate:</b>	\$ 49,100,000

<sup>1</sup> This is the initial appropriation to repair the delivery line expansion joints. The total estimated cost to complete this project, including the current funds requested and future construction costs, is estimated to range from \$2 million to \$2.5 million.

## Location Map

