



- Board of Directors
Engineering and Operations Committee

5/10/2011 Board Meeting

7-3

Subject

Appropriate \$180,000; and authorize final design of repairs to three siphons on the Colorado River Aqueduct (Approp. 15438)

Description

This action authorizes final design to repair recently identified cracks at three siphons on the Colorado River Aqueduct (CRA). The repairs will include installation of new internal seals at multiple locations along the siphons to prevent leakage.

Timing and Urgency

Repairs are needed on the CRA's Freda, Perris Valley, and Mile Marker (MM) 19.58 siphons. Multiple leaks were detected on the Freda siphon during a 19-day shutdown of the CRA in February 2011, while multiple cracks with the potential for leakage were identified on the Perris Valley and MM 19.58 siphons during an inspection in 2007. The leaks and cracks do not immediately jeopardize the structural integrity of the aqueduct. However, continued leakage over time could erode soil, undermine the siphons, and cause more extensive damage. This project will repair the approximately 15 recently discovered leaks, along with the approximately 35 previously identified cracks. Given the CRA's importance to Metropolitan's deliveries, staff recommends moving forward with final design of repairs to the siphons at this time.

This project has been reviewed with Metropolitan's updated Capital Investment Plan (CIP) prioritization criteria, and is categorized as an Infrastructure Upgrade project. The project is budgeted within Metropolitan's CIP for fiscal year 2010/11.

Background

The CRA is a 242-mile-long water conveyance system that was placed into service in 1941. It consists of five pumping plants, 124 miles of tunnels, 63 miles of canals, and 55 miles of conduits, siphons and reservoirs. As the aqueduct traverses the desert, it must cross numerous drainage channels, ravines and other natural depressions. At each crossing, the aqueduct's open channel transitions into a buried conduit (an inverted siphon) which drops below the ground surface and passes beneath the natural surface feature. At the downstream end of the siphon, water reemerges into the open aqueduct. Typically, siphons are cast-in-place reinforced concrete conduits which vary in length from 150 feet to 5 miles. Siphons make up about 12 percent of the aqueduct's total length.

In February 2011, 15 wet spots were observed on the ground surface above the 3-mile-long Freda siphon, which is located 20 miles east of Iron Mountain Pumping Plant. The leakage is likely due to unusually cold weather that produced an extended period of cold water temperatures. Cold water can cause the concrete pipe to shrink, leading to development of hairline cracks. Staff completed temporary repairs to the siphon in March 2011. At that time, the siphon was excavated and the cracks were filled with a rubber sealant as a temporary measure. However, permanent repairs are required to prevent future leaks.

During a 2007 inspection, numerous cracks were identified in the Perris Valley and MM 19.58 double barrel-type siphons, which are located 10 miles east of Lake Mathews and 19 miles west of Intake Pumping Plant,

respectively. The Perris Valley siphon is 1.5 miles long, while the MM 19.58 siphon is 1,600 feet long. Numerous internal circumferential cracks were observed, which varied from 6 to 42 inches long, with crack widths from 1/16 inch to 1 inch.

When the siphons were constructed in the 1930s, expansion joints were not included in the original design. Expansion joints are now typically designed to accommodate length changes caused by thermal expansion and contraction of siphon pipes, which reduces the susceptibility to cracking. While the cracks in the liners do not compromise the structural integrity of the conduits, over time the cracks may propagate through the siphon walls and leak, which could cause damage to the siphons.

Based on the observed wet spots on the ground surface above the Freda siphon and the cracks observed at the Perris Valley and MM 19.58 siphons, staff estimates that approximately 50 cracks will need to be repaired. Repair of the cracks at all three siphons is planned for an upcoming CRA shutdown in February 2012.

Colorado River Aqueduct Siphon Repairs – Final Design Phase (\$180,000)

The scope of the CRA siphon repairs will include installation of circumferential internal seal bands at each crack location. The seals are flexible rubber that are held in place inside the siphon with hydraulically clamped stainless steel bands. This system will provide a water-tight seal around the full inside circumference of the siphon, and will be corrosion resistant. The exact band dimensions will be determined by the length of the cracks.

Final design phase activities will include: development of detailed plans and specifications; acquisition of permits; shutdown planning; preparation of a construction cost estimate; receipt of bids; and all other activities in advance of award of a construction contract. All final design activities will be performed by Metropolitan staff.

This action appropriates \$180,000 in budgeted funds and authorizes final design of the Colorado River Aqueduct Siphon Repairs. The requested funds include \$114,000 for final design; \$5,000 for acquisition of Riverside County discharge permit; \$31,000 for project management and bidding; and \$30,000 for remaining budget. The cost of final design is 8.7 percent of the estimated construction cost. Engineering Services' goal for design of projects costing less than \$3 million is 9 to 15 percent of the total construction cost. The construction cost for this project is anticipated to range from \$1.2 million to \$1.5 million. Staff will return to the Board at a later date for award of a construction contract.

Summary

This action appropriates \$180,000 and authorizes final design to repair the Freda, Perris Valley, and MM 19.58 siphons on the CRA. This work will be performed under Appropriation No. 15438, the CRA Reliability – Phase II Program, which was initiated in fiscal year 2006/07. Past work authorized under Appropriation No. 15438 includes the CRA 6.9 kV Fault Current Protection Upgrades, the Eagle Mountain Standby Generator Replacement, and the CRA 230 kV Disconnect Switches Replacement. The total appropriated amount for this program will increase from \$18,451,000 to \$18,631,000. This project has been evaluated and recommended by Metropolitan's CIP Evaluation Team, and funds have been included in the fiscal year 2010/2011 capital budget. See [Attachment 1](#) for the Financial Statement, and [Attachment 2](#) for the Location Map.

This project is consistent with Metropolitan's goals for sustainability by enhancing reliability of the existing conveyance and distribution system in order to maintain reliable water deliveries in the future.

Project Milestone

August 2011 – Completion of final design

Policy

Metropolitan Water District Administrative Code Section 5108 : Appropriations

California Environmental Quality Act (CEQA)

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. 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, and Class 4 Categorical Exemptions (Sections 15301, 15302, and 15304 of the State CEQA Guidelines). The CEQA determination is: Determine that pursuant to CEQA, the proposed action qualifies under three Categorical Exemptions (Class 1, Section 15301; Class 2, Section 15302; and Class 4, Section 15304).

CEQA determination for Option #2:

None required

Board Options

Option #1

Adopt the CEQA determination and

- a. Appropriate \$180,000; and
- b. Authorize final design of repairs to the Freda, Perris Valley, and MM 19.58 siphons of the CRA.

Fiscal Impact: \$180,000 in budgeted funds under Approp. No. 15438

Business Analysis: This option will enhance CRA reliability, and reduce the risk of unplanned outages and costly emergency repairs.

Option #2

Do not proceed with the siphon repair project at this time.

Fiscal Impact: None

Business Analysis: This option will forego an opportunity to repair the siphons during a scheduled shutdown. Deferral of the repairs could result in additional leakage and damage to the siphons.

Staff Recommendation

Option #1

 Gordon L. Johnson Manager/Chief Engineer, Engineering Services	4/19/2011 Date
 Jeffrey Kichtlinger General Manager	4/25/2011 Date

[Attachment 1 – Financial Statement](#)

[Attachment 2 – Location Map](#)

Financial Statement for CRA Reliability – Phase II Program

A breakdown of Board Action No. 14 for Appropriation No. 15438 for the repair of three siphons on the Colorado River Aqueduct* is as follows:

	Previous Total Appropriated Amount (April 2011)	Current Board Action No. 14 (May 2011)	New Total Appropriated Amount
Labor			
Studies and Investigations	\$ 1,261,800	\$ -	\$ 1,261,800
Final Design	1,477,900	109,000	1,586,900
Owner Costs (Project mgmt, envir. doc., permitting, bidding process)	2,082,390	36,000	2,118,390
Submittal Reviews & Record Drwgs.	216,100	-	216,100
Construction Inspection & Support	788,000	-	788,000
Metropolitan Force Construction	1,351,700	-	1,351,700
Materials and Supplies	2,222,405	-	2,222,405
Incidental Expenses	102,800	5,000	107,800
Professional Services	1,527,000	-	1,527,000
Equipment Use	-	-	-
Contracts	6,333,945	-	6,333,945
Remaining Budget	1,086,960	30,000	1,116,960
Total	\$ 18,451,000	\$ 180,000	\$ 18,631,000

Funding Request

Program Name:	CRA Reliability – Phase II Program		
Source of Funds:	Revenue Bonds, Replacement and Refurbishment or General Funds		
Appropriation No.:	15438	Board Action No.:	14
Requested Amount:	\$ 180,000	Capital Program No.:	15438-I
Total Appropriated Amount:	\$ 18,631,000	Capital Program Page No.:	283
Total Program Estimate:	\$ 47,184,000	Program Goal:	I-Infrastructure Reliability

* This is the initial appropriation for the CRA Siphon Repairs project.

Location Map

