THE METROPOLITAN WATER DISTRICT OF SOUTHERN CALIFORNIA

BOARD ACTION

- Board of Directors
  Engineering and Operations Committee

5/13/2014 Board Meeting

7-6

Subject

Appropriate $1.68 million; and authorize final design of two rehabilitation projects on the Colorado River Aqueduct (Approp. 15438)

Executive Summary

This action authorizes final design of two rehabilitation projects along the Colorado River Aqueduct (CRA). The first will replace deteriorated radial gates, while the second will improve curbs and lining along portions of the open canal.

Timing and Urgency

Eight hydraulic radial gates located along the CRA need to be replaced as a result of 70 years of continuous service in the harsh desert environment. The purpose of the gates is to shut down individual reaches of the CRA. The radial gates are opened or closed to divert water into diversion channels or spillways to isolate reaches for maintenance or repairs, and to quickly dewater the aqueduct in case of blockage or an emergency event. Recent inspections identified that the gates' protective coatings are deteriorating and the metallic components have corroded.

In addition, there are several locations along the CRA's 63 miles of open canal which have little freeboard during periods of high flowrates. At these locations, water may overtop the canal's sidewalls or seep through cracks in the canal lining, eroding the soils behind the concrete lining. Soil erosion could potentially damage the canal's earthen embankments and undermine the structural integrity of the sidewalls. Improving the canal's curbs and lining to contain water under high-flow conditions would enhance CRA reliability while supporting maximum available deliveries from the Colorado River.

These projects have been reviewed with Metropolitan's Capital Investment Plan (CIP) prioritization criteria, and are categorized as Infrastructure Reliability projects. Funds for this action are available within Metropolitan's capital expenditure plan for fiscal year 2013/14.

Details

Background

The CRA is a 242-mile-long conveyance system which transports water from the Colorado River to Lake Mathews. It consists of five pumping plants; 124 miles of tunnels, siphons, and reservoirs; 63 miles of canals; and 55 miles of conduits. The aqueduct was constructed in the late 1930s and was placed into service in 1941.

There are a total of 14 hydraulic radial gates located along the CRA. The purpose of these gates is to shut down, isolate, and divert flows from the aqueduct. Each gate is constructed of a steel framework that resembles a slice of pie, with a curved plate that rotates to block flow when the gate is in the closed position. An electric motor actuator is used to pivot the gate upward from the closed to the open position. The electric motor, hoisting mechanism, and radial gate are mounted on a concrete structure. The gates have widths ranging from 10 to 22 feet, and heights ranging from 11 to 19 feet.

Recent inspections have identified that eight gates are corroded and need to be replaced. These eight gates are located at the Rice Wasteway, Vidal Junction Wasteway, Coxcomb Wasteway, Iron Wasteway, Hinds Sand Trap, Eagle Sand Trap, Eagle Wasteway, and Eagle Spillway. The gates have deteriorated from 70 years of continuous use in the harsh desert environment.

Protective coatings on various components of the gates have begun to fail. Several of the gates have a fiberglass laminate applied to the face of the curved plate that is in contact with water. This laminate is deteriorating and has pulled away from the curved plate in several instances. Significant metal loss has also occurred on portions of the gates and their mounting brackets, while existing motor actuators used to open and close the gates have deteriorated. The inspections also identified that the concrete diversion channels are in need of repair. The 10-foot-wide reinforced concrete channels, which vary in length from 200 feet to 1,000 feet, are used to reduce velocities and direct discharge flows away from the gates. Most of the channels are severely cracked and have voids in the subgrade beneath the concrete. Repair of the channels will be included under the radial gate replacement work.

When the CRA was placed into service in 1941, the maximum flowrate of the system was 600 cubic feet per second (cfs), due to the original number of pumps at each pumping plant. The installation of additional pumps in 1959 permitted an increase in the maximum flowrate to 1,605 cfs. At this flow, the depth of water in the canal is approximately 10.25 feet, leaving a freeboard of 1.5 feet below the top of the canal wall. Freeboard is defined as the vertical distance between the maximum water surface and the top of the canal. Freeboard protects the canal water from spilling over the liner and earthen embankment due to wind-driven waves, from superelevation of the water surface due to flow around curves, and from changes in the depth caused by canal settlement or deposition in the waterway.

During the mid-1980s, the CRA pumps were upgraded, which increased the system's maximum flowrate to 1,750 cfs. At this maximum flowrate, the canal freeboard is reduced to less than one foot, increasing the potential at certain locations for water to overtop the canal sidewalls or seep through cracks in the canal lining. These locations are typically found along curves where the velocities are high, at locations where sedimentation occurs, or at low spots where the canal sidewalls may have settled. Overtopping and seepage can undermine the structural integrity of canal sidewalls by eroding the adjacent soil embankment. Overtopping of the canal sidewalls has been observed at several locations between Mile Markers (MM) 28 and 104, which are downstream of Copper Basin Reservoir. Overtopping has also occurred upstream of Freda Siphon from MM 28 to 38, at the Coxcomb Siphon area from MM 88 to 93, and at the Pinto Siphon area from MM 103 to 104.

It is estimated that up to 14 miles of canal may require sidewall extensions to accommodate the system's maximum flowrate. In some areas where overtopping has been observed, staff previously installed approximately 1.5-foot-high steel plates to extend the top of the canal walls as a temporary measure. These temporary plates are deteriorating. A comprehensive permanent solution is needed to reduce the potential for damage to the canal and to ensure that adequate freeboard is available when the CRA is operated at its maximum flowrate. Adding concrete curbs to the top of the sidewalls and repairing cracks in the canal lining will provide additional freeboard and reduce erosion of the adjacent soil embankment.

In April 2013 and March 2012, Metropolitan's Board authorized preliminary design to replace eight radial gates on the CRA and improve canal curbing. Preliminary design for both projects has been completed, and staff recommends proceeding with final design at this time. Staff will continue to monitor the condition of the remaining six radial gates and, if necessary in the future, will return to the Board for authorization to replace those gates.

Project No. 1 - CRA Radial Gate Replacement – Final Design Phase ($790,000)

Planned upgrades include replacement of eight radial gates located in open canal segments of the aqueduct, along with their motor actuators and electrical and control equipment. The work also includes repair of the concrete walls and floors within the diversion channels. The work will be completed over multiple CRA shutdowns.

Final design phase activities will include detailed design; preparation of drawings and specifications for the construction contract; development of a construction cost estimate; receipt of bids; and all other activities in

advance of award of the construction contract. Final design is recommended to be performed by Lee & Ro, Inc., as discussed below.

This action appropriates $790,000 and authorizes final design to replace eight radial gates on the CRA. The requested funds include $482,000 for final design; $142,000 for hazardous material testing, bidding, and project management; $45,000 for third-party value engineering review; and $121,000 for remaining budget. The final design cost as a percentage of the estimated construction cost is approximately 10.7 percent. Engineering Services' goal for design of projects with construction cost greater than $3 million is 9 to 12 percent. The construction cost for this project is anticipated to range from $4 million to $6 million. Staff will return to the Board at a later date for award of the construction contract.

The total estimated cost to complete this project, including the amount expended to date, current funds requested, and future construction cost, is anticipated to range from $6 million to $8 million.

Project No. 2 - CRA Canal Improvements – Final Design Phase ($890,000)

The planned project will extend the sidewalls on the open canal for up to 14 miles between MM 28 and MM 104. Site grading and drainage will be improved at locations where the sidewalls are extended. Existing cracks in the canal liner will be repaired, and flow sensors that monitor flow to prevent overtopping will also be installed.

Final design phase activities will include detailed design; preparation of drawings and specifications for the construction contract; development of a construction cost estimate; receipt of bids; and all other activities in advance of award of the construction contract. Final design is recommended to be performed by Lee & Ro, Inc., as discussed below.

This action appropriates $890,000 and authorizes final design phase activities to improve curbs and lining along the CRA open canal. The requested funds include $548,000 for final design; $167,000 for hazardous material testing, bidding, and project management; $45,000 for third-party value engineering review; and $130,000 for remaining budget. The final design cost as a percentage of the estimated construction cost is approximately 11 percent. Engineering Services' goal for design of projects with construction cost greater than $3 million is 9 to 12 percent. The construction cost for this project is anticipated to range from $4 million to $7 million. Staff will return to the Board at a later date for award of the construction contract.

The total estimated cost to complete this project, including the amount expended to date, current funds requested, and future construction cost, is anticipated to range from $6 million to $9 million.

Agreement for Engineering Design Services (Lee & Ro, Inc.) – No Action Required

Final design for both CRA projects is recommended to be performed by Lee & Ro, Inc., under an existing board-authorized agreement. Based upon the anticipated capital workload over the next two fiscal years, Metropolitan has insufficient technical staff in-house to complete the design within the planned project schedule. Lee & Ro, Inc. was selected through a competitive process via Request for Qualification No. 927. The planned scope of work for both projects includes detailed design and provision of technical assistance during bidding. The estimated cost for these services is $719,000.

No amendment to the existing Lee & Ro, Inc. agreement is required for this work. Lee & Ro, Inc. is a Small Business Enterprise (SBE) firm, and thus achieves 100 percent SBE participation for this agreement.

Summary

This action appropriates $1.68 million and authorizes final design of two rehabilitation projects on the Colorado River Aqueduct. These projects have been evaluated and recommended by Metropolitan's CIP Evaluation Team, and funds are available within the fiscal year 2013/14 capital expenditure plan. See **Attachment 1** for the Financial Statement and **Attachment 2** for the Location Map.

These projects are included under the CRA Reliability Appropriation – FY 2006/07 Through 2011/12 (Approp. 15438), which was initiated in fiscal year 2006/07. With the present action, the total funding for Approp. 15438 will increase from $34,624,000 to $36,304,000.

Project Milestone

April 2015 - Completion of final design for the two projects

Policy

Metropolitan Water District Administrative Code Section 5108: Appropriations

California Environmental Quality Act (CEQA)

CEQA determination for Options #1 and #2:

The proposed action is categorically exempt under the provisions of CEQA and the State CEQA Guidelines. The proposed project involves the funding, final design, and minor alterations, reconstruction or replacement of existing public facilities along with the construction of minor appurtenant structures with no expansion of use and no possibility of significantly impacting the physical environment. In addition, the proposed project involves minor modifications in the condition of land, water, and/or vegetation which does not involve removal of healthy, mature, scenic trees. Accordingly, the proposed action qualifies under Class 1, Class 2, Class 3, and Class 4 Categorical Exemptions (Sections 15301, 15302, 15303, and 15304 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 3, Section 15303; and Class 4, Section 15304 of the State CEQA Guidelines).

CEQA determination for Option #3:

None required

Board Options

Option #1

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

a. Appropriate $1.68 million;
b. Authorize final design to replace radial gates on the Colorado River Aqueduct; and
c. Authorize final design of canal improvements.

Fiscal Impact: $1.68 million in capital funds under Approp. 15438

Business Analysis: This option will protect Metropolitan's assets and enhance the reliability of CRA deliveries.

Option #2

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

a. Appropriate $790,000;
b. Authorize final design to replace radial gates on the Colorado River Aqueduct; and
c. Do not authorize final design of canal improvements.

Fiscal Impact: $790,000 in capital funds under Approp. 15438

Business Analysis: Under this option, staff will continue to monitor the condition of the canal curbing and sidewalls, and will make remedial repairs. This option could lead to more extensive and costly repairs, and an increasing risk of unplanned outages over time.

Option #3

Do not proceed with two rehabilitation projects at this time.

Fiscal Impact: None

Business Analysis: This option would forgo an opportunity to enhance reliability of the CRA. This option may lead to flow limitations through the CRA, more extensive repairs, and additional system shutdowns.

Staff Recommendation

Option #1

4/21/2014

Gordon Johnson *Date*
Manager/Chief Engineer,
Engineering Services

4/25/2014

Jeffrey Kightlinger *Date*
General Manager

Attachment 1 – Financial Statement
Attachment 2 – Location Map

Ref# es12630263

Financial Statement for CRA Reliability Appropriation – FY 2006/07 Through FY 2011/12

A breakdown of Board Action No. 25 for Appropriation No. 15438 for two rehabilitation projects on the Colorado River Aqueduct[1] is as follows:

	Previous Total Appropriated Amount (Apr. 2013)	Current Board Action No. 25 (May 2014)	New Total Appropriated Amount
Labor			
Studies & Investigations	$ 2,246,800	$ -	2,246,800
Final Design	2,511,900	311,000	2,822,900
Owner Costs (Program mgmt., bidding, haz. materials testing)	2,827,090	309,000	3,136,090
Submittals Review & Record Drwgs	560,600	-	560,600
Construction Inspection & Support	2,129,000	-	2,129,000
Metropolitan Force Construction	3,764,600	-	3,764,600
Materials & Supplies	2,995,405	-	2,995,405
Incidental Expenses	138,800	-	138,800
Professional/Technical Services	2,082,000	-	2,082,000
Lee & Ro, Inc.	-	719,000	719,000
Value Engineering Firm	-	90,000	90,000
Equipment Use	25,505	-	25,505
Contracts	14,349,537	-	14,349,537
Remaining Budget	992,763 [2]	251,000	1,243,763
Total	**$ 34,624,000**	**$ 1,680,000**	**$ 36,304,000**

Funding Request

Appropriation Name:	CRA Reliability Appropriation – FY 2006/07 Through FY 2011/12		
Source of Funds:	Revenue Bonds, Replacement and Refurbishment or General Funds		
Appropriation No.:	15438	**Board Action No.:**	25
Requested Amount:	**$** 1,680,000	**Budget Page No.:**	292
Total Appropriated Amount:	**$** 36,304,000	**Total Appropriation Estimate:**	$ 64,826,000

[1] The total amount expended to date on the CRA Radial Gate Replacement project is approximately $49,000. The total cost to complete this project, including the amount authorized to date, current funds requested, and future construction costs, is estimated to range from $6 million to $8 million. The total amount expended to date on the CRA Canal Improvements project is approximately $507,000. The total cost to complete this project, including the amount authorized to date, current funds requested, and future construction costs, is estimated to range from $6 million to $9 million.

[2] Includes previous reallocation of $168,100 to Remaining Budget from the the DW-CV-2T Service Connection Rehabilitation project which was completed under budget; and $25,000 from Remaining Budget to the CRA Disconnect Switches Replacement project to evaluate fire risks at the CRA pumping plants.

Location Map