



- Board of Directors
Engineering and Operations Committee

10/9/2012 Board Meeting

7-6

Subject

Appropriate \$950,000; and authorize (1) Phase 1 of a program to rehabilitate the main pumps on the Colorado River Aqueduct; and (2) refurbishment of pump suction joint at Iron Mountain Pumping Plant (Approp. 15481)

Executive Summary

This action authorizes the initiation of a comprehensive long-term program that will execute projects to enhance the reliability, improve performance, and extend the service life of the main pumps and support systems at the five Colorado River Aqueduct (CRA) pumping plants. This action also authorizes refurbishment of a pump suction joint at Iron Mountain Pumping Plant.

Timing and Urgency

Metropolitan staff performs regular maintenance on the nine main pumps at each CRA pumping plant. These pumps were installed in four phases between 1941 and 1959. In the mid-1980s, a major rehabilitation effort was undertaken to rehabilitate portions of the pumps. Since that time, the pumps have been in nearly continuous operation. Recent field inspections have identified that the pumps and related equipment are showing signs of deterioration. In addition, the frequency of repairs is increasing. Staff recommends initiating the CRA Main Pump Reliability Program to conduct a comprehensive assessment of the pumps and perform rehabilitation work to maintain pumping plant reliability.

Two initial projects have been identified. The first will conduct a comprehensive condition assessment of the pumps and their ancillary systems. The second project will refurbish the suction joint for one pump at Iron Mountain Pumping Plant. This joint is corroded and must be refurbished to prevent leakage that could require the pump to be removed from service. Proceeding with the project at this time will allow the repair work to be completed during a planned February 2013 shutdown.

These projects have been reviewed with Metropolitan's updated 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 2012/13.

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.

Each of the five pumping plants has nine main pumps. These pumps were installed in several phases over time to meet increasing water demands. At each plant, Pumping Units Nos. 1 through 3 commenced operation in 1941. Units Nos. 4 and 5 came on-line in 1956, while Unit No. 6 was added in 1958. The final units, Nos. 7 through 9, commenced operation in 1959. At that time, the hydraulic capacity of the CRA totaled 1,605 cubic feet per second (cfs). In 1962, Metropolitan initiated a program to increase pump capacity at Gene, Iron Mountain,

Eagle Mountain, and Hinds pumping plants. Pump unit performance was improved by enlarging the impeller diameters and modifying the angle of the vanes at the impeller discharge. These modifications, combined with the addition of curbing at selected canal locations, and the reduction of biological fouling of concrete surfaces, resulted in an approximate 10 percent increase in hydraulic capacity. Further improvements in disinfecting the system commenced in 1977. At the present time, the CRA's hydraulic capacity is approximately 1,800 cfs.

Metropolitan staff performs regular maintenance on each pumping unit's mechanical and electrical equipment. In the mid-1980s, a major rehabilitation effort was undertaken on the 45 main pumps based upon findings from detailed inspections which indicated that the pumps were approaching the end of their expected service life. The rehabilitation work included extensive testing and evaluation of the pumps and motors; replacement of impellers; refurbishment of the pump casings; refurbishment of the discharge valves; and rehabilitation of the motor fire protection systems and motor transformers.

The 45 main CRA pumps have performed well over the past 25 years since the rehabilitation work was completed. Recent field reports and performance measurements indicate that the pumps and related systems have begun to deteriorate. Increased wear on the pumps is expected as the units are run for extended periods to meet current water delivery projections. Based on these reports, coupled with the 25 years of near-continuous operation, staff recommends initiation of the CRA Main Pump Reliability Program. The objectives of the program are to complete a comprehensive condition assessment of the main pumps and support systems; develop a strategy for monitoring of pump performance using modern technology; and implement projects necessary to maintain reliability and extend the service life of the main pumps and support systems at each CRA pumping plant.

Project No. 1 - CRA Main Pump Investigations (\$380,000)

Under the planned program, staff will perform site investigations to assess the condition of the CRA main pumps and related systems at all five pumping plants. These investigations will include inspection of the pump suction piping, suction valve, erection joints, pump casing, impeller, and discharge valve. All inspection activities will be performed by Metropolitan staff during planned CRA shutdowns or equipment outages that will be scheduled at each pumping plant. Dewatering and disassembly of major equipment items and piping will be performed to allow internal inspections. Planned activities include: detailed visual inspections; materials testing; assessment of new technologies for equipment and performance monitoring; review of compiled operation and maintenance data; preparation of conceptual design reports for improvements; and preparation of conceptual-level cost estimates. The activities will also include pump and motor performance testing to determine operating efficiency, which is a measure of the pump's overall condition.

Based on the results from these investigations, staff will identify improvements which will address reliability of the main pump units and related systems. Projects identified through this effort will be recommended for evaluation and inclusion in Metropolitan's CIP. A program plan will also be developed for executing the projects. The plan will consider project priorities and available shutdown opportunities, and will identify cost-effective options to complete the work.

This action appropriates \$380,000 and authorizes site engineering investigations and preparation of a comprehensive plan of improvements for the CRA Main Pump Reliability Program. The requested funds include \$246,000 for the technical activities described above; \$10,000 for preparation of environmental documentation; \$49,000 for project management and planning; and \$75,000 for remaining budget. All work will be performed by Metropolitan staff. Staff will return to the Board at a later date for authorization to proceed with the design of specific projects identified during the investigations.

Project No. 2: Pipe Joint Refurbishment at Iron Mountain Pumping Plant – Metropolitan Force Construction (\$570,000)

At the Gene, Iron Mountain, Eagle Mountain, and Hinds pumping plants, the nine main pump units are supplied with water from a common 16-foot-diameter suction manifold. Each pump draws water from this manifold through its own 6-foot-diameter suction pipe. A valve is installed in this suction pipe so that the pump can be isolated from the common manifold to perform inspections and repairs. Each valve has an adjacent pipe joint

which was used for construction assembly and for future disassembly and removal of the valve. The joints for Pumping Units Nos. 1 through 5 consist of a pipe sleeved within another pipe, along with rings of packing and a follower gland that compresses the packing to seal the joint. The joints on Pumping Units Nos. 6 through 9 consist of sleeve-type pipe couplings. These joints were designed to be leak-tight. However, after 70 years of continuous service, the joints have begun to show signs of deterioration, including leakage. Although the volume of leakage is presently low, it is causing the joints to corrode. This corrosion could eventually result in failure of the joint, leading to potential outage of the CRA.

In February 2006, Metropolitan's Board authorized final design for refurbishment of the suction joints at Gene, Iron Mountain, Eagle Mountain, and Hinds pumping plants. The work is being phased in order to complete a pilot refurbishment project at one of the four plants. Final design for repair of the joints at Iron Mountain Pumping Plant has been completed, and staff recommends moving forward with refurbishment of one joint by Metropolitan forces during a planned February 2013 shutdown. This initial joint repair at Iron Mountain Pumping Plant will serve as a pilot for future repairs at the other pumping plants.

Planned work includes blasting and removing the coating on the interior of the suction piping and valve disc, welding an internal butt strap that spans the joint, and recoating the interior of the suction piping and valve disc. Following the shutdown, Metropolitan forces will blast and recoat the exterior of the suction valve, joint, and exposed piping. Lessons learned from the construction will aid in development of design criteria, dewatering and access plans, required shutdown durations, and the number of joints which may be addressed per shutdown for the remaining 35 pump units. Staff anticipates that future refurbishment work will be performed by a general contractor during upcoming CRA shutdowns.

This action appropriates \$570,000 and authorizes Metropolitan force construction for the refurbishment of one suction joint at Iron Mountain Pumping Plant. The requested funds include \$274,000 for Metropolitan force construction; \$140,000 for procurement of materials, supplies, and equipment use; \$42,000 for technical support from design staff during construction and for preparation of record drawings; \$34,000 for hazardous material testing and project management; and \$80,000 for remaining budget. All work will be performed by Metropolitan staff.

Summary

This action appropriates \$950,000 for initiation of the CRA Main Pump Reliability Program and refurbishment of one pump suction joint at Iron Mountain Pumping Plant. This work has been evaluated and recommended by Metropolitan's CIP Evaluation Team, and funds are available within the fiscal year 2012/13 capital expenditure plan. See [Attachment 1](#) for the Financial Statement and [Attachment 2](#) for the Location Map.

This work is included within capital Appropriation No. 15481, the CRA Main Pump Reliability Program. This is the initial action for Appropriation No. 15481.

Project Milestones

March 2013 – Completion of joint refurbishment

October 2013 – Completion of investigation for CRA main pumps

Policy

Metropolitan Water District Administrative Code Section 5108: Appropriations

California Environmental Quality Act (CEQA)

CEQA determination for Option #1:

Project No. 1 - CRA Main Pump Investigations

The proposed action is categorically exempt under the provisions of CEQA and the State CEQA Guidelines. The proposed action involves the funding of a study and minor modifications to existing public facilities with negligible or no expansion of use and no possibility of significantly impacting the physical environment. In

addition, the proposed action consists of basic data collection and resource evaluation activities which does 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 for both Class 1 and Class 6 Categorical Exemptions (Sections 15301 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 1, Section 15301 and Class 6, Section 15306 of the State CEQA Guidelines).

Project No. 2: Pipe Joint Refurbishment at Iron Mountain Pumping Plant – Metropolitan Force Construction

The proposed action is categorically exempt under the provisions of CEQA and the State CEQA Guidelines. The overall activities involve the funding, design, minor alterations and replacement of existing public facilities with negligible or no expansion of use and no possibility of significantly impacting the physical environment. Accordingly, the proposed action qualifies under Class 1 and Class 2 Categorical Exemptions (Sections 15301 and 15302 of the State CEQA Guidelines).

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

CEQA determination for Option #2:

None required

Board Options

Option #1

Adopt the CEQA determination and

- a. Appropriate \$950,000;
- b. Authorize Phase 1 of the CRA Main Pump Reliability Program; and
- c. Authorize refurbishment of one suction joint at Iron Mountain Pumping Plant.

Fiscal Impact: \$950,000 in capital funds under Approp. 15481

Business Analysis: This option will initiate refurbishment activities to extend the service life of the main pumping units and related systems at each of the CRA pumping plants.

Option #2

Do not proceed with the CRA pump reliability projects at this time.

Fiscal Impact: None

Business Analysis: This option would defer refurbishment of the main pumps and related systems at each pumping plant, which may increase the risk of unplanned outages of the CRA.

Staff Recommendation

Option #1



Gordon Johnson
Manager/Chief Engineer
Engineering Services

9/17/2012

Date



Jeffrey Kightlinger
General Manager

9/25/2012

Date

Attachment 1 – Financial Statement

Attachment 2 – Location Map

Ref# es12620184

Financial Statement for CRA Main Pump Reliability Program

A breakdown of Board Action No. 1 for Appropriation No. 15481 for the CRA Main Pump Reliability Program¹ is as follows:

	New Total Appropriated Amount
Labor	
Studies & Investigations	\$ 246,000
Final Design	-
Owner Costs (Program mgmt. & haz. materials testing)	93,000
Submittals Review & Record Drwgs	42,000
Construction Inspection & Support	-
Metropolitan Force Construction	274,000
Materials & Supplies	75,000
Incidental Expenses	-
Professional/Technical Services	-
Equipment Use	65,000
Contracts	-
Remaining Budget	155,000
Total	\$ 950,000

Funding Request

Program Name:	CRA Main Pump Reliability Program		
Source of Funds:	Revenue Bonds, Replacement and Refurbishment or General Funds		
Appropriation No.:	15481	Board Action No.:	1
Requested Amount:	\$ 950,000	Capital Program No.:	15481-I
Total Appropriated Amount:	\$ 950,000	Capital Program Page No.:	294
Total Program Estimate:	\$ 27,664,000	Program Goal:	I-Infrastructure Reliability

¹ This is the initial action for the CRA Main Pump Reliability Program.

Location Map

