MWD
METROPOLITAN WATER DISTRICT OF SOUTHERN CALIFORNIA

BOARD ACTION

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

October 14, 2003 Board Meeting

9-2

Subject

Authorize $3.585 million for investigations, designs and construction of improvements to facilities on the Colorado River Aqueduct (Approps. 15373 and 15374)

Description

The Colorado River Aqueduct (CRA) is a 242-mile-long conveyance system designed to transport water from Lake Havasu on the Colorado River to Lake Mathews. The CRA consists of five pumping plants, 124 miles of tunnel, 63 miles of concrete-lined canal, 55 miles of cut-and-cover conduit, inverted siphons, reservoirs, and pumping plant piping. The CRA, which has been in operation for more than 60 years, has a maximum capacity of 1,800 cfs.

Four programs have been established within Metropolitan's Capital Investment Plan (CIP) to refurbish the CRA. The four programs include the Conveyance Reliability Program, the Pumping Plant Reliability Program, the Electric/Power System Reliability Program and the Discharge Containment Program. As a result of investigations conducted during the winter 2002/03 aqueduct shutdown, additional studies and rehabilitation projects have been identified. It is recommended that these studies and designs proceed at this time so that repairs can be made to critical facilities during an upcoming 2004/05 CRA shutdown.

CRA Conveyance Reliability Program (Approp. 15373)

The following studies and designs are recommended for the CRA conveyance facilities:

- **Vulnerability Study of CRA Tunnels ($486,000)**
  Cracks of various magnitudes were found inside several segments of the CRA tunnels, which indicate a distressed condition. A detailed study will assess the vulnerability of the existing tunnels, and remediation alternatives will be evaluated. Assessment of existing ground conditions, a tunnel structural analysis, and alternatives to improve existing tunnel reliability and consideration of environmental constraints will be addressed as deliverables in this study.

- **Eagle Mountain Pumping Plant Sand Traps Inflow Study ($74,000)**
  At the Eagle Mountain Pumping Plant, water flows from the CRA canal through sand traps to the pumping units. The sand traps are required to prevent sand and debris from entering the pumping plant. Flow through the sand traps flow is uneven, which reduces removal efficiency. A hydraulic study is required to determine the cause of the uneven flow and to identify potential solutions.

- **Canal Lining, Siphons, Sand Traps and Iron Mountain Tunnel Monitoring Designs ($316,000)**
  A segment of the CRA canal (mile marker 33.4) was found to deviate from its vertical profile, and leaks were detected inside some concrete siphons. The concrete sand traps at Hinds, Eagle Mountain and Iron Mountain plants have deteriorated over time. A crack inside a tunnel section close to the Iron Mountain Pumping Plant requires monitoring devices to be installed to provide data for determining feasible repair solutions. At a future board meeting, authorization will be sought for final design, which will provide repair solutions for the canal lining, siphons and sand traps, and will install a monitoring system at Iron Mountain Tunnel.

- **Head Gates Rehabilitation Design ($425,000)**
  The head gates at the five pumping plants provide the only means to control outflow from the plants. The head gates and their driving components were part of the original pumping plant construction and have shown signs of wear and aging. Replacement of the head gate motors, drive assemblies, cabling, and protective coating are essential to maintain long-term reliability.

- **Blow-off Valve Flange Replacement Design and Construction ($2.16 million)**
  A cast iron flange on the Big Morongo Siphon ruptured in March 2003. During investigations of additional cast iron outlets, numerous deficiencies were identified. An action plan was developed to prioritize repair and replacement of the existing blow-offs. The work has been divided into four phases. Phase 1 repairs addressed the blow-offs with the highest priority, and were completed by Metropolitan staff in August 2003. Staff will perform Phase 2 repairs in January 2004. Phase 3 repairs will be performed during the upcoming 2004/05 shutdown by construction contract. Award of the Phase 3 construction contract will be recommended to Metropolitan's Board in June 2004. Phase 4 work will involve a study of the remaining non-cast iron blow-offs to determine if any repairs are necessary.

  The requested funds are for design of Phase 2 and Phase 3 repairs ($357,000), construction of Phase 2 repairs by Metropolitan forces ($1.7 million), and study for Phase 4 of the replacement program ($103,000).

CRA Pumping Plant Reliability Program (Approp. 15374)

- **Gene Pumping Plant Heavy Equipment Service Pit Design and Construction ($124,000)**
  Heavy construction equipment is serviced at Gene Pumping Plant, where the increased demand for maintenance requires the service area to be expanded. A new equipment pit will improve access to construction equipment, minimize safety hazards and control hazardous spills if they occur. The requested funds are for final design and construction of a new service pit for heavy equipment at Gene Pumping Plant. Construction of the new service pit will be via a competitively bid construction contract. The estimated amount of the contract is $90,000, which will permit the contract to be awarded by Metropolitan's Chief Executive Officer under Metropolitan's Administrative Code.

These projects have been evaluated and recommended by Metropolitan's Capital Investment Plan Evaluation Team, and funds for all projects, except for the Blow-off Valve Flange Replacement Project, have been included in the fiscal year 2003/04 capital budget. Because the Big Morongo Siphon rupture occurred late in the previous fiscal year, the scope of the Blow-off Valve Flange Replacement Project was not identified prior to adoption of the fiscal year 2003/04 budget, and the recommended work ($2.16 million) is unbudgeted. Upon board approval, the fiscal year 2003/04 spending plan will be adjusted to reflect the change.

Design will be performed by a combination of Metropolitan staff and consultants. The final design cost as a percentage of the estimated total construction cost for these projects is approximately 12 percent. Engineering Services' goal for design of construction projects less than $10 million is 9 to 15 percent.

The percentage of remaining budget out of the total amount requested in this action is 15 percent.

See **Attachment 1** for the Detailed Report, and **Attachment 2** for the Financial Statements.

Policy

Metropolitan Water District Administrative Code § 5108: Capital Project Appropriation

California Environmental Quality Act (CEQA)

CEQA determinations for Option #1:

The six proposed projects previously identified in the two CIP programs have been evaluated pursuant to CEQA and the State CEQA Guidelines. Each project has its own CEQA determination as noted below.

- **Vulnerability Study of CRA Tunnels**
  The proposed project is exempt under the provisions of CEQA and the State CEQA Guidelines, since it involves only a vulnerability analysis associated with feasibility and planning studies for possible future

action, as well as basic data collection and resource evaluation activities which do not result in a serious or major disturbance to an environmental resource. This activity 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 project qualifies both as a feasibility and planning studies exemption (Section 15262 of the State CEQA Guidelines) and as a categorical exemption (Class 6, Section 15306 of the State CEQA Guidelines).

The CEQA determination is: Determine that pursuant to CEQA, the proposed project qualifies under both a feasibility and planning studies exemption and a Class 6 Categorical Exemption (Sections 15262 and 15306 of the State CEQA Guidelines).

- **Eagle Mountain Pumping Plant Sand Traps Inflow Study**
  The proposed project is categorically exempt under the provisions of CEQA and the State CEQA Guidelines. The proposed project 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 project 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 project qualifies under 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 project qualifies under two Categorical Exemptions (Class 1, Section 15301 and Class 6, Section 15306 of the State CEQA Guidelines).

- **Canal Lining, Siphons, Sand Traps and Iron Mountain Tunnel Monitoring Designs**
  The proposed project is categorically exempt under the provisions of CEQA and the State CEQA Guidelines. The proposed project consists of basic data collection and resource evaluation activities, 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 project qualifies as a Class 6 Categorical Exemption (Section 15306 of the State CEQA Guidelines).

  The CEQA determination is: Determine that pursuant to CEQA, the proposed project qualifies under a Categorical Exemption (Class 6, Section 15306 of the State CEQA Guidelines).

- **Head Gates Rehabilitation Design**
  The proposed project is categorically exempt under the provisions of CEQA and the State CEQA Guidelines. The project involves the funding, final design, minor alterations and replacement of existing public facilities with no expansion of use and no possibility of significantly impacting the physical environment. Accordingly, the proposed project 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 project qualifies under two Categorical Exemptions (Class 1, Section 15301 and Class 2, Section 15302 of the State CEQA Guidelines).

- **Blow-off Valve Flange Replacement Design and Construction**
  The proposed project is categorically exempt under the provisions of CEQA and the State CEQA Guidelines. Phases 1, 2, and 3 of the project involve 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, Phases 1, 2, and 3 of the proposed project qualify under Class 1, Class 2, Class 3 and Class 4 Categorical Exemptions (Sections 15301, 15302, 15303 and 15304 of the State CEQA Guidelines). Phase 4 of the proposed project involves funding a study only,

with future board action considering funding, final design, and construction. This study would consist of basic data collection and resource evaluation activities, 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, Phase 4 of the proposed project qualifies as a Class 6 Categorical Exemption (Section 15306 of the State CEQA Guidelines).

The CEQA determination is: Determine that pursuant to CEQA, Phases 1, 2, and 3 of the proposed project qualify 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) and Phase 4 of the proposed project qualifies under a Categorical Exemption (Class 6, Section 15306 of the State CEQA Guidelines).

- **Gene Pumping Plant Heavy Equipment Service Pit Design and Construction**
  The proposed project is categorically exempt under the provisions of CEQA and the State CEQA Guidelines. The project involves the funding, final design, and construction of a new service pit at existing public facilities, along with the construction or installation of minor appurtenant structures with no expansion of use and no possibility of significantly impacting the physical environment. Accordingly, the proposed project qualifies under Class 1 and Class 3 Categorical Exemptions (Sections 15301 and 15303 of the State CEQA Guidelines).

  The CEQA determination is: Determine that pursuant to CEQA, the proposed project qualifies under two Categorical Exemptions (Class 1, Section 15301 and Class 3, Section 15303 of the State CEQA Guidelines).

CEQA determination for Option #2:

None required

Board Options/Fiscal Impacts

Option #1

Adopt the CEQA determinations and

a. Appropriate $3.585 million in budgeted and non-budgeted funds; and
b. Authorize completion of all work described in this letter for the following projects:
   - Vulnerability Study of CRA Tunnels
   - Eagle Mountain Pumping Plant Sand Traps Inflow Study
   - Canal Lining, Siphons, Sand Traps and Iron Mountain Tunnel Monitoring Designs
   - Head Gates Rehabilitation Design
   - Blow-off Valve Flange Replacement Design and Construction
   - Gene Pumping Plant Heavy Equipment Service Pit Design and Construction

Fiscal Impact: $3.585 million of budgeted and non-budgeted CIP funds under the following appropriations:

- Appropriation 15373 (CRA Conveyance Reliability): $1.301 million budgeted
- Appropriation 15373 (CRA Conveyance Reliability): $2.16 million non-budgeted
- Appropriation 15374 (CRA Pumping Plant Reliability): $124,000 budgeted

Option #2

Do not perform studies, designs, or construction of the improvements at the CRA facilities described within this action. This option increases the risk of maintaining reliable operation of the CRA and increases the potential of environmental and public disturbance if a blow-off flange ruptures.

Fiscal Impact: No immediate impact; will increase costs if repairs are needed in the future.

Staff Recommendation

Option #1

Roy L. Wolfe 9/15/2003
Roy L. Wolfe *Date*
Manager, Corporate Resources

Ronald R. Gastelum 9/24/2003
Ronald R. Gastelum *Date*
Chief Executive Officer

Attachment 1 – Detailed Report

Attachment 2 – Financial Statements for the Conveyance and Pumping Plant Reliability Programs

BLA #2434

Detailed Report

Four programs have been established within Metropolitan's Capital Investment Plan (CIP) to refurbish the Colorado River Aqueduct (CRA). Two of the programs are the Conveyance Reliability Program (Approp. 15373) and the Pumping Plant Reliability Program (Approp. 15374). Investigations conducted during the CRA shutdowns of October 2002 and February 2003 identified several deteriorated and distressed conveyance components. Staff has prioritized projects for the rehabilitation of the CRA system based on system operation requirements. It is recommended that repairs be conducted on some of the critical facilities during an upcoming 2004/05 CRA shutdown.

CRA Conveyance Reliability Program (Approp. 15373)

During the two shutdowns of the CRA in winter 2002/03, deterioration was detected at various locations including the tunnels, canal lining, siphons, conduits, concrete sand traps at three pumping plants, and head gates at five pumping plants. In March 2003, a rupture at the Big Morongo Siphon of a cast iron blow-off flange caused a water spillage. This incident prompted an investigation and repair program for blow-off structures in the CRA system. After analyzing data from the shutdown and blow-off investigations, the following projects have been identified for further study and design:

Vulnerability Study of CRA Tunnels

During the 2002/03 shutdown inspections, longitudinal cracks and transverse cracks were found inside several tunnels such as the Iron Mountain Tunnel, San Jacinto Tunnel, West Eagle Mountain Tunnel, and other locations. This study will determine the severity of these cracks and their impact on tunnel serviceability. Preliminary design of repairs will be performed. A specialized geotechnical consultant will be required to provide ground characterization, tunnel configuration research, stress analysis, and propose alternatives to ensure reliability of the existing tunnels.

Project Milestone

October 2004 – Complete tunnel study

Eagle Mountain Pumping Plant Sand Traps Inflow Study

Sand traps are used to prevent sand and debris from flowing into three of the CRA pumping plants from the canal. Uniform flow distribution is necessary for efficient operation of the sand traps. At the Eagle Mountain Pumping Plant, the non-uniform flow distribution through the sand traps causes uneven build-up of sediment. The sediment build-up has reduced the maximum flow capacity through the trap, restricted the storage capacity of sand, and increased operating costs for sand cleaning.

The hydraulic study will determine the cause of the uneven flow through the sand traps and identify potential solutions. Once the study is completed, a recommendation will be developed for future action.

Project Milestone

July 2004 – Complete hydraulic study

Canal Lining, Siphons, Sand Traps and Iron Mountain Tunnel Monitoring Designs

The investigations conducted on the concrete conveyance structures revealed deficiencies along the concrete canal lining, siphons, and concrete sand traps at Hinds, Eagle Mountain and Iron Mountain pumping plants. The deteriorated areas have been identified as follows:

- The profile of a canal section (mile marker 33.4) is lower than the original alignment, which eliminates freeboard and causes overflows under routine operation.
- Leaks and major cracks were identified inside several concrete siphons, which require special internal seals for repair.

- Concrete aging and deterioration has resulted in large cracks in the concrete support structures within the sand traps at the 3 pumping plants. Localized structural collapse is possible if the deteriorated concrete sections are left as-is without repair.
- Significant cracking was observed inside the Iron Mountain Tunnel. It is recommended that a monitoring system be designed and installed to measure crack propagation inside the tunnel. The monitoring device will provide data to determine the cause of tunnel distress.

This project includes the design of new segments of concrete lining to replace the existing out-of-alignment canal section, an internal seal system for the deteriorated siphons, structural strengthening of the existing sand traps, and selection of a monitoring system for Iron Mountain Tunnel.

Project Milestones

February 2004 – Request Board approval of final design

April 2004 – Advertise contract

June 2004 – Award construction contract

Head Gates Rehabilitation Design

The head gates provide the only means to control outflow from each pumping plant. All of the control motors, shafts, gears and gate assemblies are part of the original CRA construction dating to the 1930s. During the 2002/03 shutdown, one of the gate assemblies failed at Iron Mountain Pumping Plant. Investigations revealed that the gate structural assemblies were subject to corrosion and over-stressing by the drive shafts. In addition, the motor drive and gears have been operated beyond the design life. A failure in the head gate system will impair the ability for the pumping plant to control water outflow and impact overall system reliability.

This project includes the design of new motor drives, control units, gate assemblies, cables, and protective coating for the existing head gates.

Project Milestones

November 2003 – Complete final design

March 2004 – Award construction contract

Blow-off Valve Flange Replacement Design and Construction

A cast iron blow-off flange on the Big Morongo Siphon ruptured in March 2003. Investigations were conducted to determine the cause of failure, to identify the risk potential for other existing blow-offs, and to establish a rehabilitation program to eliminate future problems. The cast iron blow-off flanges were identified as the flanges with the highest risk due to the brittle nature of the material.

The rehabilitation program assessed blow-off structures based on their construction material, proximity to sensitive areas and internal water pressure. Repair work has been divided into four phases. Phase 1 repairs addressed the flanges with the highest priority, with work completed by Metropolitan staff in August 2003. Staff will perform Phase 2 repairs in January 2004. Phase 3 work will be performed during the upcoming 2004/05 shutdown by construction contract. Award of the Phase 3 construction contract will be recommended to Metropolitan's Board in June 2004. Phase 4 work will involve a study of the remaining non-cast iron blow-offs to determine if any repairs are necessary.

Staff recommends that the board appropriate funds of $2.16 million for final design of Phase 2 and Phase 3 repairs, construction by Metropolitan forces of Phase 2 repairs, and study of Phase 4 repairs. This project is unbudgeted within fiscal year 2003/04. Timing of the flange investigations following the Big Morongo Siphon rupture did not permit this work to be included within the fiscal year 2003/04 capital budget.

Project Milestones

January 2004 – Complete Phase 2 construction by Metropolitan

June 2004 – Award Phase 3 construction contract and start Phase 4 study

April 2005 – Complete Phase 3 construction

CRA Pumping Plant Reliability Program (Approp. 15374)

Gene Pumping Plant Heavy Equipment Service Pit Design and Construction

More than 50 percent of Metropolitan's heavy construction equipment within the desert region is being serviced at Gene Pumping Plant. Currently, there is no service pit for heavy construction equipment at Gene plant. The removal and replacement of vehicle components and fluids requires a properly equipped service pit. A new service pit will minimize safety hazards, control hazardous spills, and improve equipment access during repair.

This project includes design and construction via a competitively bid contract of a service pit at the Gene Pumping Plant. The estimated amount of the construction contract is $90,000, which will permit the contract to be awarded by Metropolitan's Chief Executive Officer under Metropolitan's Administrative Code.

Project Milestone

September 2004 – Complete construction

Financial Statement for CRA Conveyance Reliability Program

A breakdown of Board Action No. 5 for Appropriation No. 15373 for the CRA Conveyance Reliability Program described in this board action is as follows:

	Previous Board Action No. 4 (Jan. 2003)	Current Board Action No. 5 (Oct. 2003)	New Total Appropriated Amount
Labor			
Studies and Investigations	$ 1,225,000	$ 393,000	$ 1,618,000
Design and Specifications	340,000	710,000	1,050,000
Owner Costs (Program management, bidding process)	1,635,000	278,000	1,913,000
Construction Inspection and Support	2,450,000	0	2,450,000
Metropolitan Force Construction	1,650,000	1,250,000	2,900,000
Materials and Supplies	590,000	62,000	652,000
Incidental Expenses	30,000	78,000	108,000
Professional/Technical Services	900,000	220,000	1,120,000
Equipment Use	6,450	87,000	93,450
Contracts	15,723,550	0	15,723,550
Remaining Budget	690,000	383,000	1,073,000
Total	**$ 25,240,000**	**$ 3,461,000**	**$ 28,701,000**

Funding Request

Program Name:	Colorado River Aqueduct Conveyance Reliability Program		
Source of Funds:	Construction Funds (General Obligation, Revenue Bonds, Pay-Go Fund)		
Appropriation No.:	15373	**Board Action No.:**	5
Requested Amount:	$ 3,461,000	**Capital Program No.:**	01204
Total Appropriated Amount:	$28,701,000	**Capital Program Page No.:**	E-18
Program Estimate:	$32,728,000**	**Program Goal:**	I-Infrastructure Reliability

Financial Statement for CRA Pumping Plant Reliability Program

The financial statement for Board Action No. 4 authorizing final design and construction for one CRA Pumping Plant Reliability Program project as described in this board action (Approp. 15374) is as follows:

	Previous Board Action No. 3 (Jan. 2003)	Current Board Action No. 4 (Oct. 2003)	New Total Appropriated Amount
Labor			
Studies and Investigations	$ 560,000	$ 0	$ 560,000
Design and Specifications	1,005,200	9,500	1,014,700
Owner Costs (Program management, bidding process)	1,141,200	3,600	1,144,800
Construction Inspection and Support	595,000	4,800	599,800
Metropolitan Force Construction	1,970,000	0	1,970,000
Materials and Supplies	2,015,000	0	2,015,000
Incidental Expenses	25,800	1,000	26,800
Equipment Use	35,200	0	35,200
Contracts	170,000	90,000	260,000
Remaining Budget	1,139,600	15,100	1,154,700
Total	**$ 8,657,000**	**$ 124,000**	**$ 8,781,000**

Funding Request

Program Name:	Colorado River Aqueduct Conveyance Reliability Program		
Source of Funds:	Construction Funds (General Obligation, Revenue Bonds, Pay-Go Fund)		
Appropriation No.:	15374	**Board Action No.:**	4
Requested Amount:	$ 124,000	**Capital Program No.:**	01204
Total Appropriated Amount:	$ 8,781,000	**Capital Program Page No.:**	E-21
Program Estimate:	$ 71,203,000	**Program Goal:**	I-Infrastructure Reliability