- **Board of Directors**
  Engineering and Capital Programs Committee

April 8, 2008 Board Meeting

8-2

Subject

Appropriate $2.87 million; and authorize six Colorado River Aqueduct rehabilitation projects (Approps. 15373 and 15438)

Description

This action authorizes six rehabilitation projects on the Colorado River Aqueduct (CRA): (1) final design for rehabilitation of dam sluiceways and reservoir outlet gates at the Gene Wash and Copper Basin reservoirs; (2) preliminary design of new storage buildings at Gene pumping plant; (3) preliminary design of upgrades to a flow and chlorine monitoring station at Mile 12; (4) preliminary design of upgrades to sand trap cleaning equipment at the Iron Mountain, Eagle Mountain, and Hinds pumping plants; (5) preliminary design to replace emergency generators at all five CRA pumping plants; and (6) an electrical reliability study at Intake pumping plant. The work will be performed by Metropolitan staff. These projects are categorized as Infrastructure Upgrade projects and are budgeted within Metropolitan's Capital Investment Plan (CIP).

Background

The CRA is a 242-mile-long conveyance system that transports water from Lake Havasu to Lake Mathews. The CRA consists of five pumping plants, 92 miles of tunnels, 63 miles of concrete-lined canal, 55 miles of cut-and-cover conduits, 32 miles of inverted siphons, and several reservoirs. The CRA provides the only means for Metropolitan to convey water from the Colorado River to Southern California. A location map appears in **Attachment 2**.

Rehabilitation of the CRA was initiated in 2001. The program includes a comprehensive multi-year effort to assess the various components of the CRA, prioritize upgrades, and execute projects. The four elements of the CRA rehabilitation program have focused on the water conveyance system (canals, siphons, tunnels and infrastructure), the pumping plants (mechanical and structural upgrades), the electrical system (transmission lines, switchgear, and motors), and on compliance with environmental regulations (discharge prevention). Over $81 million have been expended to date to complete approximately 70 percent of work identified thus far on the CRA rehabilitation program. Identified projects will be completed by 2011.

Six rehabilitation projects are recommended to proceed at this time. Each project has been evaluated and recommended by Metropolitan's CIP Evaluation Team, and funds have been included in the capital budget for fiscal year 2007/08. These projects are consistent with Metropolitan's goals for sustainability by improving the reliability of the existing CRA conveyance system in order to maintain reliable water supplies in the future.

Project No. 1 - Dam Sluiceways and Outlets Rehabilitation – Final Design Phase ($1,890,000)

In November 2006, Metropolitan's Board authorized preliminary design of upgrades to the Gene Wash and Copper Basin dams' sluiceways and the Copper Basin Reservoir outlet gates to ensure operational reliability. The Gene Wash and Copper Basin Reservoirs, which were constructed in 1937, help maintain continuous flow in the CRA when the Intake or Gene pumping plants are shut down or in limited operation for short periods. In the event of an emergency, the sluiceway at each dam would be opened to lower the reservoir elevation. Each sluiceway consists of a 4-foot-diameter pipe embedded at the base of the dam, a gate valve, and an energy dissipating discharge valve. Under normal operation, the sluiceways are closed and the outlet gates at Copper Basin Reservoir are relied upon to regulate flow in the CRA. The reservoir outlet gates consist of three 10-foot-high slide gates positioned side-by-side at the mouth of the Whipple Mountain Tunnel.

Although these facilities have operated satisfactorily for over 70 years, the valves have reached the end of their useful life. The valves are leaking and have deteriorated beyond repair; spare parts for electrical equipment are not available; and communications and control equipment are obsolete. Additionally, the steep slopes adjacent to the Copper Basin Reservoir outlet gates and the Copper Basin Dam sluiceway valve house experience rock falls, creating a potential safety hazard to maintenance personnel.

Preliminary design has been completed to upgrade equipment and improve operational safety at the dam sluiceways and the Copper Basin Reservoir outlet. Staff recommends proceeding with final design at this time to implement the upgrades. Work at the dam sluiceways will include upgrading the valve house electrical system; refurbishing the gate valves and converting them from hydraulic to electric actuation; replacing the energy dissipating valves; installing a 2-ton crane at the top of the dam for equipment removal; replacing a 120-foot-high vertical ladder with a stairway from the dam crest to the valve house at the base of the dam; and other safety-related improvements. Work at the Copper Basin Reservoir outlet includes overhauling the slide gate gearing system; replacing the existing electrical building; slope stabilization to mitigate further sloughing of loose rocks; and installing a data and telecommunication system to operate and monitor the slide gate remotely. These improvements will help ensure safe and reliable water deliveries through these portions of the CRA.

This action appropriates $1.89 million in budgeted funds and authorizes final design phase activities for the Dam Sluiceways and Outlets Rehabilitation project. The design will be performed by Metropolitan staff. Work activities include preparation of plans and specifications, coordination with the State Division of Safety of Dams, preparation of an engineer's estimate, and all activities in advance of award of a construction contract. The final design cost as a percentage of the estimated total construction cost is approximately 11 percent. Engineering Services' goal for design of projects with estimated construction cost greater than $3 million is 9 to 12 percent. The construction cost for this project is anticipated to range from $12 million to $15 million. Staff will return to the Board at a later date for award of the construction contract.

Project Milestone

April 2009 – Completion of final design

Project No. 2 - Gene Storage Building Replacement – Preliminary Design Phase ($186,000)

At Gene pumping plant, which is the headquarters for maintenance of the CRA, three buildings were used until recently to store equipment such as boats, pumps, road maintenance tools and water quality test equipment. Their combined size was approximately 7,000 square feet. The largest building was taken out of service and demolished in 2007 due to structural deficiencies. The two remaining buildings have also deteriorated and are in need of replacement. One of the buildings dates to the original construction of the CRA and was relocated from an original construction camp in the 1960s. The other building is of uncertain age and was salvaged from the Diamond/Domenigoni Valley before Diamond Valley Lake was filled. Rehabilitation of these two remaining buildings, which have corroded metal siding and roofing, and deteriorated timber frames, would involve substantial modifications to bring them up to current building codes. Even if these buildings could be rehabilitated, they would still not have sufficient space for the tools and equipment that were stored in the first building. Staff recommends that the two existing structures be replaced with two new larger pre-fabricated steel buildings.

The two new buildings will have storage space of 7,000 square feet, which will be approximately equal to the size of the three original buildings. The replacement buildings will be installed on new concrete slab foundations. Minor grading will be performed at the site to facilitate access and allow for proper drainage.

This action appropriates $186,000 in budgeted funds and authorizes preliminary design phase activities for the Gene Storage Building Replacement project. Under preliminary design, the layout and location of the buildings will be determined, hazardous materials testing will be conducted, utility needs and site work will be identified, a preliminary construction cost estimate will be developed, and environmental documentation will be prepared. All preliminary design work will be performed by Metropolitan staff. Staff will return to the Board at a later date for authorization of final design.

Project Milestone

December 2008 – Completion of preliminary design

Project No. 3 - Mile 12 Flow and Chlorine Monitoring Station Upgrades – Preliminary Design Phase ($255,000)

One of the CRA's critical points for monitoring flow rates and chlorine levels is located at mile marker 12 (Mile 12). The information collected at Mile 12 is used to adjust flow rates at the pumping plants and reservoir outlet gates, and to adjust chlorine injection rates at Copper Basin Reservoir. Mile 12 facilities include a set of flow meters, chlorine analyzers, data collection and communications equipment; and solar panels and batteries. Due to the age of the equipment and its extreme operating environment, the introduction of chlorine at Copper Basin Reservoir, and the need for a more reliable power supply, staff recommends several improvements to the Mile 12 facilities. These improvements include replacement of aging flow meters with new equipment which is compatible with other flow meters throughout the CRA; extension of an electrical service line to Mile 12; and relocation of the data and communications equipment from an underground vault to a new building. Relocating this sensitive electrical equipment into a building will provide a controlled environment and better location for maintenance.

This action appropriates $255,000 in budgeted funds and authorizes preliminary design phase activities for the Mile 12 Flow and Chlorine Monitoring Station Upgrades project. The work includes field investigations; developing the features and location of the communications building; determining the alignment of the electrical service line; preparation of environmental documentation; and development of a preliminary construction cost estimate. All activities will be performed by Metropolitan staff. Staff will return to the Board at a later date for authorization of final design.

Project Milestone

December 2008 – Completion of preliminary design

Project No. 4 - Sand Trap Equipment Upgrades – Preliminary Design Phase ($180,000)

In the CRA canals upstream of the Iron Mountain, Eagle Mountain and Hinds pumping plants, rectangular settling basins capture entrained desert sand before it is conveyed into the pumping plants, where it may erode the pumps. These sand traps cover approximately one-half acre, and have a traveling crane with a trash-pump cleaning apparatus to remove accumulated sand. The cleaning apparatus' mechanical and electrical systems and protective coatings, which have been in operation since original construction of the CRA, have reached the end of their useful life. The electric motors and trash pumps have begun to fail, and the electrical systems suffer frequent failures. Replacement parts are no longer available for these 70-year-old components. Staff recommends refurbishing the cleaning equipment and electrical systems at the three CRA sand traps. Under this project, the trash pumps will be replaced; the electrical and control systems will be modernized; and the entire apparatus will be repainted.

This action appropriates $180,000 in budgeted funds and authorizes preliminary design phase activities for the Sand Trap Equipment Upgrades project. The work includes field investigations, identifying the electrical and mechanical components that need replacement; determining new equipment sizes and ratings; preparation of environmental documentation, and development of a preliminary construction cost estimate. All activities will be performed by Metropolitan staff. Staff will return to the Board at a later date for authorization of final design.

Project Milestone

December 2008 – Completion of preliminary design

Project No. 5 - Replacement of Emergency Standby Generators – Preliminary Design Phase ($217,000)

Each of the five CRA pumping plants and their surrounding facilities is equipped with an emergency standby diesel generator for onsite electrical power generation in the event of loss of power. The standby diesel engine generators were installed in the 1960s and must be manually started in the event of a power outage. Manual start-up of these engines requires sending an operator to each generator to manually operate valves; check engine fluid

levels; latch levers; prime injectors; start the engine; and check the tachometer, voltage output, and frequency output. This start-up routine results in a relatively lengthy time-delay between loss of power and commencement of power generation. During this delay, critical pumping plant auxiliary systems cannot operate. These systems include lighting, the potable water treatment and delivery system, and sump pumps which prevent flooding of the pumping plants.

Staff recommends proceeding with preliminary design to replace the emergency generators at all five CRA pumping plants, and to upgrade appurtenant equipment to meet current fire code and environmental regulations. Upgrades will include a fuel unloading area with spill containment, a canopy roof, and additional alarms, valves, and meters. The replacement generators will include control systems capable of automatic start-up upon loss of normal power, automatic transfer back to normal power once the normal source is reestablished, and remote status monitoring.

This action appropriates $217,000 in budgeted funds and authorizes preliminary design phase activities for replacement of the standby generators at each of the five CRA pumping plants. The work includes field investigations; selection of generator placement sites; preparation of environmental documentation; and development of a preliminary construction cost estimate. All activities will be performed by Metropolitan staff. Staff will return to the Board at a later date for authorization of final design.

Project Milestone

August 2008 – Completion of preliminary design

Project No. 6 - Intake Power and Communications Line Relocation – Study ($142,000)

The existing Intake 2.4 kV power pole line extends approximately 2 miles over mountainous terrain from Gene pumping plant to Intake pumping plant. This wood-pole line, which was installed in the 1950s, supports the primary source of power for Gene Wash Dam, Intake's access gate, the Black Metal Mountain communication towers, and Intake Village. The power pole line has deteriorated substantially over the years. Its cross arms, insulators and pole extensions require frequent repairs. Some poles are inaccessible by motor vehicle, making repairs difficult and lengthy. In order to ensure reliable power service to critical Metropolitan facilities, staff recommends moving the pole line and cables to a new alignment that is more accessible. In addition, staff recommends relocating an existing fiber-optic cable line which shares some of the same poles as the power line, and serves the same facilities, onto the new power pole line. Consolidating these two services on one pole line will improve the efficiency of maintenance and repair activities.

This action appropriates $142,000 in budgeted funds and authorizes a study for the Intake Power and Communications Line Replacement project. The work includes studying alternate alignments, field investigations, and a topographic survey of the selected alignment. All activities will be performed by Metropolitan staff. Staff will return to the Board at a later date for authorization of preliminary and final design.

Project Milestone

November 2008 – Completion of study

See **Attachment 1** for the Financial Statements.

Policy

Metropolitan Water District Administrative Code Section 5108: Appropriations

California Environmental Quality Act (CEQA)

CEQA determinations for Option #1:

Project No. 1 - Dam Sluiceways and Outlets Rehabilitation – Final Design Phase

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).

Project No. 2 - Gene Storage Building Replacement – Preliminary Design Phase;
Project No. 3 - Mile 12 Flow and Chlorine Monitoring Station Upgrades – Preliminary Design Phase;
Project No. 4 - Sand Trap Equipment Upgrades – Preliminary Design Phase;
Project No. 5 - Replacement of Emergency Standby Generators – Preliminary Design Phase; and
Project No. 6 - Intake Power and Communications Line Relocation – Study

The proposed actions are categorically exempt under the provisions of CEQA and the State CEQA Guidelines. The proposed actions 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, the proposed actions qualify as a Class 6 Categorical Exemption (Section 15306 of the State CEQA Guidelines).

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

CEQA determinations for Option #2:

Project No. 1 - Dam Sluiceways and Outlets Rehabilitation – Final Design Phase;
Project No. 3 - Mile 12 Flow and Chlorine Monitoring Station Upgrades – Preliminary Design Phase; and
Project No. 5 - Replacement of Emergency Standby Generators – Preliminary Design Phase

The CEQA determinations are: Same as in Option #1

Project No. 2 - Gene Storage Building Replacement – Preliminary Design Phase;
Project No. 4 - Sand Trap Equipment Upgrades – Preliminary Design Phase; and
Project No. 6 - Intake Power and Communications Line Relocation – Study

The CEQA determination is: None required

CEQA determinations for Option #3:

Project No. 1 - Dam Sluiceways and Outlets Rehabilitation – Final Design Phase; and
Project No. 3 - Mile 12 Flow and Chlorine Monitoring Station Upgrades – Preliminary Design Phase

The CEQA determinations are: Same as in Option #1

Project No. 2 - Gene Storage Building Replacement – Preliminary Design Phase;
Project No. 4 - Sand Trap Equipment Upgrades – Preliminary Design Phase;
Project No. 5 - Replacement of Emergency Standby Generators – Preliminary Design Phase; and
Project No. 6 - Intake Power and Communications Line Relocation – Study

The CEQA determination is: None required

CEQA determination for Option #4:

None required

Board Options

Option #1

Adopt the CEQA determinations and

a. Appropriate $2.87 million in budgeted funds; and
b. Authorize six CRA reliability projects:
   - Final design for rehabilitation of the Gene Wash Dam and Copper Basin Dam sluiceways and reservoir outlet structures;
   - Preliminary design for replacement of equipment storage buildings at Gene pumping plant;
   - Preliminary design for upgrades to the Mile 12 flow and chlorine monitoring station;
   - Preliminary design for upgrades to the sand traps at Iron Mountain, Eagle Mountain, and Hinds pumping plants;
   - Preliminary design for replacement of emergency generators at all five CRA pumping plants; and
   - A study of alignments to relocate the Intake pumping plant power and communications line.

Fiscal Impact: $2.07 million in budgeted funds under Approp. 15373 and $800,000 in budgeted funds under Approp. 15438

Business Analysis: These projects will enhance CRA reliability, improve operational efficiency and workplace safety, and protect Metropolitan's assets.

Option #2

Adopt the CEQA determinations and

a. Appropriate $2,362,000 in budgeted funds; and
a. Authorize three CRA reliability projects:
   - Final design for rehabilitation of the Gene Wash Dam and Copper Basin Dam sluiceways and reservoir outlet structures;
   - Preliminary design for upgrades to the Mile 12 flow and chlorine monitoring station; and
   - Preliminary design for replacement of emergency generators at all five CRA pumping plants; and
b. Do not authorize three projects at this time:
   - Preliminary design for replacement of equipment storage buildings at Gene pumping plant;
   - Preliminary design for upgrades to the sand traps at Iron Mountain, Eagle Mountain, and Hinds pumping plants; and
   - A study of alignments to relocate the Intake pumping plant power and communications line.

Fiscal Impact: $1.89 million in budgeted funds under Approp. 15373, and $472,000 in budgeted funds under Approp. 15438

Business Analysis: Rehabilitation of the Gene Wash Dam and Copper Basin Dam sluiceways and reservoir outlet structures would ensure reliable operation of the two main reservoirs along the CRA. Upgrades to the Mile 12 flow and chlorine monitoring station would ensure that flow rates at the pumping plants and reservoir outlet gates are adjusted correctly to prevent water spills. Replacement of emergency generators at the CRA pumping plants would ensure that critical systems such as domestic and fire water pumps, and motor cooling water systems continue operating during a power outage. For the remaining projects, staff will continue to monitor the facilities and would return to the Board should problems occur.

Option #3

Adopt the CEQA determinations and

a. Appropriate $2,145,000 in budgeted funds; and
b. Authorize two CRA reliability projects:
   - Final design for rehabilitation of the Gene Wash Dam and Copper Basin Dam sluiceways and reservoir outlet structures; and
   - Preliminary design for upgrades to the Mile 12 flow and chlorine monitoring station; and
c. Do not authorize four projects at this time:
   - Preliminary design for replacement of equipment storage buildings at Gene pumping plant;
   - Preliminary design for upgrades to the sand traps at Iron Mountain, Eagle Mountain, and Hinds pumping plants;

- Preliminary design for replacement of emergency generators at all five CRA pumping plants; and
- A study of alignments to relocate the Intake pumping plant power and communications line.

Fiscal Impact: $1.89 million in budgeted funds under Approp. 15373, and $255,000 in budgeted funds under Approp. 15438

Business Analysis: Under this option, only those projects that result in an immediate improvement to water delivery reliability would proceed. Lack of new storage space at Gene pumping plant may lead to more rapid deterioration of materials and equipment stored outdoors or in deteriorated buildings. A failure of emergency generators in the event of a power outage will limit the plant's access to fire water and cooling water, leading to potential damage of the main pumps and transformers, and prolonged plant outage. For the remaining projects, staff will continue to monitor the facilities and would return to the Board should problems occur.

Option #4

Do not authorize the six CRA reliability projects.

Fiscal Impact: None

Business Analysis: For this option, staff will continue to monitor the facilities and incur increased maintenance costs. The existing facilities will continue to function at a reduced level of reliability, and staff will return to the Board for funding as problems occur. This action does not provide a consistent level of reliability throughout the CRA system.

Staff Recommendation

Option #1

Roy L. Wolfe — 3/20/2008

Roy L. Wolfe — *Date*
Manager, Corporate Resources

Jeffrey Kightlinger — 3/24/2008

Jeffrey Kightlinger — *Date*
General Manager

Attachment 1 – Financial Statements

Attachment 2 – Location Map

BLA #6019

Financial Statement for CRA Conveyance Reliability Program

A breakdown of Board Action No. 12 for Appropriation No. 15373 for final design of the Dam Sluiceways and Outlets Rehabilitation project, and for preliminary design of the Sand Trap Equipment Upgrades project, is as follows:

	Previous Total Appropriated Amount (Sept. 2007)		Current Board Action No. 12 (Apr. 2008)	New Total Appropriated Amount
Labor				
Studies and Investigations	$ 3,047,400	*	$ 134,900	$ 3,182,300
Final Design	1,726,600	*	1,565,100	3,291,700
Owner Costs (Program mgmt., envir. doc., permitting, value engr.)	4,106,000	*	306,600	4,412,600
Construction Inspection and Support	5,023,220		-	5,023,220
Metropolitan Force Construction	7,483,870		-	7,483,870
Materials and Supplies	1,660,300		-	1,660,300
Incidental Expenses	324,400		63,400	387,800
Professional Services	3,793,000		-	3,793,000
Right of Way	10,000		-	10,000
Equipment Use	101,450		-	101,450
Contracts	40,203,861		-	40,203,861
Remaining Budget	3,837,899	*	-	3,837,899
Total	**$ 71,318,000**		**$ 2,070,000**	**$ 73,388,000**

* Includes previous allocation of $498,000 from remaining budget to Aqueduct, Reservoir, and Discharge Line Isolation Gates project for Studies and Investigations ($100,700), Final Design ($352,600), and Owner Costs ($44,700).

Funding Request

Program Name:	CRA Conveyance Reliability Program		
Source of Funds:	Revenue Bonds, Replacement and Refurbishment or General Funds		
Appropriation No.:	15373	**Board Action No.:**	12
Requested Amount:	**$** 2,070,000	**Capital Program No.:**	15373-I
Total Appropriated Amount:	**$** 73,388,000	**Capital Program Page No.:**	E-16
Total Program Estimate:	**$** 93,580,000	**Program Goal:**	I-Infrastructure Reliability

Financial Statement for CRA Reliability – Phase II Program

A breakdown of Board Action No. 2 for Appropriation No. 15438 for the replacement of emergency standby generators at all five CRA pumping plants, for the Gene Storage Building Replacement project, the Mile-12 Flow and Chlorine Monitoring Station Upgrades project, and the Intake Power and Communications Line Replacement project, is as follows:

	Previous Total Appropriated Amount (Sept. 2006)	Current Board Action No. 2 (Apr. 2008)	New Total Appropriated Amount
Labor			
Studies and Investigations	$ 252,000	$ 518,600	$ 770,600
Final Design	-	-	-
Owner Costs (Program mgmt., envir. doc.)	47,000	168,900	215,900
Construction Inspection and Support	-	-	-
Metropolitan Force Construction	-	-	-
Materials and Supplies	-	-	-
Incidental Expenses	1,400	11,000	12,400
Professional Services	-	-	-
Equipment Use	-	-	-
Contracts	-	-	-
Remaining Budget	46,600	101,500	148,100
Total	**$ 347,000**	**$ 800,000**	**$ 1,147,000**

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.:**	2
Requested Amount:	**$** 800,000	**Capital Program No.:**	15438-I
Total Appropriated Amount:	**$** 1,147,000	**Capital Program Page No.:**	E-21
Total Program Estimate:	**$** 7,252,600	**Program Goal:**	I-Infrastructure Reliability

CRA Rehabilitation Projects