



- Board of Directors
Engineering and Operations Committee

3/12/2013 Board Meeting

7-1

Subject

Appropriate \$800,000; and authorize seismic assessments of four hydroelectric power plants and pressure control structures (Approp. 15458)

Executive Summary

This action authorizes detailed seismic assessments of four hydroelectric plants and pressure control structures within Metropolitan's distribution system. Seismic upgrades would reduce the risk of significant damage to these buildings in the event of a major earthquake.

Timing and Urgency

Metropolitan has an ongoing program to evaluate the seismic stability of its facilities in order to maintain reliable water deliveries and to meet current seismic design practices and code requirements. Although Metropolitan facilities have always been designed to meet codes that were in place at the time of their construction, seismic upgrades are necessary as industry practices and building codes are periodically updated. Staff recently conducted initial seismic assessments of the buildings and tanks at the Sepulveda Canyon Control Facility, the Foothill and the Greg Avenue Hydroelectric Plants, and the Carbon Creek Pressure Control Structure, and concluded that these structures may be vulnerable to damage in the event of a significant earthquake. Due to the importance of these structures in controlling flows and pressure within the distribution system, and in generating power, staff recommends proceeding with detailed seismic assessments of these facilities.

These projects have been reviewed with Metropolitan's Capital Investment Plan prioritization criteria, and are categorized as Infrastructure Rehabilitation projects. Funds for this action are available within Metropolitan's capital expenditure plan for fiscal year 2012/13.

Details

Background

In the early 1970s, Metropolitan embarked on a program to develop hydroelectric power generation plants throughout the distribution system. This program focused primarily on the retrofit of existing pressure control structures with hydroelectric turbines. Thirteen pressure control structures were ultimately converted into hydroelectric power plants, based on assessments which considered current economic conditions in the 1970s and then-available generation equipment. Sixteen small hydroelectric power plants have been developed to date, ranging in capacity from 1 MW to 40 MW. These plants have produced \$23 million in average annual revenue over the past five years, and are a reliable source of clean, green energy.

The original hydroelectric plants were constructed as turnkey installations in accordance with the building codes of the early 1970s. Industry knowledge of earthquakes and seismic design has greatly improved over the years, leading to the development of more stringent, seismic codes. To minimize the risk of damage to the distribution system during a major earthquake, staff initiated a seismic assessment program in 2003 to identify and upgrade structures which are potentially at risk. Through this effort, several hydroelectric plants and pressure control structures have been identified to be in need of structural upgrades.

Of the 16 hydroelectric plants and 29 pressure control structures within Metropolitan's distribution system, 41 were found to be structurally adequate and four were found to be in need of seismic upgrades. These four are the Sepulveda Canyon Control Facility, the Foothill and Greg Avenue Hydroelectric Plants, and the Carbon Creek Pressure Control Structure. The preliminary assessments identified seismic deficiencies such as exterior walls, column, and roof connections which require bracing to resist lateral loads. At the Sepulveda Canyon Control Facility, the potential for liquefaction of an alluvium layer at the bottom of the facility's slope could induce vertical settlement and lateral displacement at the structure's foundation. Staff recommends moving forward with detailed seismic assessments to develop suitable and cost-effective structural strengthening concepts at these four facilities.

Project No. 1 - Sepulveda Canyon Control Facility Seismic Assessment (\$440,000)

The Sepulveda Canyon Control Facility consists of a pressure control structure, hydroelectric plant, and two water storage tanks. The facility is located near the top of the Sepulveda Pass, immediately west of the San Diego Freeway (I-405) near the J. Paul Getty Museum. The pressure control structure was constructed in the early 1970s to reduce pressure in the 9-foot-diameter Sepulveda Feeder as it conveys treated water from the Jensen plant. The two water tanks have a combined capacity of 18 million gallons of water and are used to regulate flows through the pipeline. The hydroelectric plant, which was constructed in 1982, takes advantage of excess pressure in the Sepulveda Feeder to generate up to 8.6 MW of electricity with its single turbine. When the hydroelectric plant is not operating, flow is diverted through the pressure control structure to maintain continuous treated water deliveries into the Central Pool, and to service connections for the city of Los Angeles and West Basin Municipal Water District.

The pressure control facility is a reinforced concrete structure located on top of a large pad that was constructed by filling a steeply sloped V-shaped ravine. The pad is approximately 120 feet above the toe of the slope. The site is located within one mile of the Santa Monica Fault, which is capable of generating a 6.8 magnitude earthquake. Preliminary slope analyses indicate that the fill could slide down the slope during a major earthquake, causing significant damage to the pressure control structure, the water tanks, and the hydroelectric plant. A seismic-induced failure of the pressure control structure could result in interruption of water deliveries to the Central Pool and loss of daily revenues of up to \$4,500.

Metropolitan's Board authorized preliminary design of seismic upgrades for the two water tanks in 2011. Under the initial stage of that effort, staff developed an up-to-date estimate of potential ground accelerations which would be produced by a major earthquake at the site. This information was used to identify the slope vulnerability which could affect the entire Sepulveda Canyon Control Facility. This project will consolidate all seismic upgrade efforts for the facility.

Planned activities for the seismic assessment include comprehensive structural modeling of the pressure control structures, hydroelectric power plant, and tanks; evaluation of retrofit options to address identified deficiencies; geotechnical site investigation; and slope stability analyses including an integrated finite element model to assess options for slope strengthening in order to minimize vertical settlement and lateral displacement. The geotechnical investigations and slope analyses are recommended to be performed by URS Corporation, as discussed below. All other work will be performed by Metropolitan staff.

This action appropriates \$440,000 and authorizes detailed seismic assessments to upgrade the Sepulveda Canyon Control Facility. Requested funds include \$245,000 for the geotechnical investigations and slope stability analyses; \$100,000 for structural analyses and development of conceptual design drawings; \$65,000 for field surveys, development of preliminary cost estimates, and project management; and \$30,000 for remaining budget.

Project No. 2 – Foothill and Greg Avenue Hydroelectric Plants, and Carbon Creek Pressure Control Structure Seismic Assessments (\$360,000)

The Foothill Pressure Control Structure was constructed in 1975 and the hydroelectric plant was added in 1981. The facility is located on the Foothill Feeder, immediately downstream of the Department of Water Resources' Castaic Lake. The Foothill Feeder conveys untreated State Water Project flows from Castaic Lake to the Joseph Jensen Water Treatment Plant in Granada Hills.

The Foothill Hydroelectric Plant is constructed of a precast concrete roof which is supported by exterior columns. The structure features a main level and a basement level. The structure is 192 feet long by 56 feet wide and 14 feet high. The basement level extends 45 feet below ground and contains a single turbine/generator which can produce up to 9.1 MW of electricity. When the hydroelectric plant is not operating, flow is diverted through the pressure control structure to maintain continuous water deliveries to the Jensen plant. The Foothill Hydroelectric Plant is located within 13 miles of the San Andreas Fault, which is capable of generating a magnitude 8.1 earthquake. A seismic-induced failure of the control structure could result in interruption of water deliveries to the Jensen plant and loss of daily revenues of up to \$7,500.

The Greg Avenue Hydroelectric Plant was constructed in 1979. The plant is located on the corner of Greg Avenue and San Fernando Road within the San Fernando Valley. Treated water from the Jensen plant reaches the facility through the East Valley Feeder, and is then delivered to the cities of Los Angeles, Beverly Hills, Glendale and Burbank.

The Greg Avenue Hydroelectric Plant is constructed of a pitched wood roof which is supported by reinforced masonry exterior walls. The structure is 68 feet long by 33 feet wide and 14 feet high. This facility has three major features: a hydroelectric plant which can produce up to 1 MW of electricity with its single turbine; a control structure which can regulate flow through its three 24-inch motor-operated sleeve valves; and a pumping station which can pump up to 60 cfs into the Sepulveda Feeder or, if required, can pump west to Calleguas and Las Virgenes Municipal Water Districts. When the hydroelectric plant is not operating, flow is diverted through the pressure control structure in order to maintain continuous water deliveries from the Jensen plant. The Greg Avenue Hydroelectric Plant is located approximately five miles from the Sierra Madre Fault, which is capable of generating a 7.1 magnitude earthquake. A seismic-induced failure of the Greg Avenue Hydroelectric Plant could result in interruption of water deliveries to the Santa Monica Feeder, and loss of daily revenues of up to \$1,500.

The Carbon Creek Pressure Control Structure was constructed in 1972. The structure is located south of the intersection of East Orangethorpe Avenue and North Community Drive in the city of Placentia. This control structure maintains operating pressure and controls flows on the Second Lower Feeder, while maintaining water deliveries from the Robert B. Diemer Water Treatment Plant into the Central Pool.

The Carbon Creek Pressure Control Structure is constructed of a reinforced concrete roof which is supported by reinforced concrete exterior walls. The 111-foot-long by 55-foot-wide structure contains a main level and a basement. The basement extends 28 feet below the structure to connect the Second Lower Feeder to the pressure control valves. The Carbon Creek Pressure Control Structure is located four miles from the Whittier Fault, which is capable of generating a 6.8 magnitude earthquake. A seismic-induced failure of the structure could result in interruption of water deliveries into the Central Pool.

Planned activities for the seismic assessment of these three facilities include comprehensive structural analyses of the buildings and evaluation of retrofit options to address identified deficiencies. All work will be performed by Metropolitan staff.

This action appropriates \$360,000 and authorizes detailed seismic assessments of the Foothill and Greg Avenue Hydroelectric Plants, and the Carbon Creek Pressure Control Structure. Requested funds include \$270,000 for structural analyses and development of conceptual design drawings; \$55,000 for field surveys, development of preliminary cost estimates, and project management; and \$35,000 for remaining budget.

Specialized Geotechnical Services – URS (No Action Required)

The geotechnical investigations and slope stability analyses are recommended to be performed by URS Corporation under an existing board-authorized agreement. Geotechnical services are a technical specialty for which Metropolitan does not maintain in-house expertise. The planned scope will include drilling test borings, taking soil samples for laboratory testing, assessing potential seismic hazards such as landslides, and conducting slope stability analyses. URS was selected through a competitive process via Request for Qualifications No. 931. For this agreement, Metropolitan has established a Small Business Enterprise participation level of 18 percent. The estimated cost for these services is \$245,000.

These projects are included within capital Appropriation No. 15458, the Hydroelectric Plant Improvements Program, which was initiated in fiscal year 2008/09. Other projects authorized under Appropriation No. 15458 include the Hydroelectric Plant Assessment Survey, the San Dimas Hydroelectric Plant Needle Valve Rehabilitation project, and the San Dimas and Venice Hydroelectric Plant Rehabilitation projects. With the present action, the total funding for Appropriation No. 15458 will increase from \$3,717,000 to \$4,517,000. See [Attachment 1](#) for the Financial Statement and [Attachment 2](#) for the Location Map.

Project Milestone

May 2014 – Completion of the detailed seismic assessments

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 proposed action 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 action 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 action qualifies under a Categorical Exemption (Class 6, Section 15306 of the State CEQA Guidelines).

CEQA determination for Option #2:

None required

Board Options

Option #1

Adopt the CEQA determination and

- a. Appropriate \$800,000; and
- b. Authorize seismic assessments of the Sepulveda Canyon Control Facility, Foothill and Greg Avenue Hydroelectric Plants, and the Carbon Creek Pressure Control Structure.

Fiscal Impact: \$800,000 of capital funds under Approp. 15458

Business Analysis: This option will enhance reliability of the distribution system.

Option #2


Do not authorize the seismic assessments at this time.

Fiscal Impact: None

Business Analysis: This option would forego an opportunity to upgrade the four facilities and reduce the risk of unplanned outages and loss of revenue.

Staff Recommendation

Option #1



Gordon Johnson
Manager/Chief Engineer,
Engineering Services

2/20/2013
Date



Jeffrey Knightlinger
General Manager

2/25/2013
Date

Attachment 1 – Financial Statement

Attachment 2 – Location Map

Ref# es12620442

Financial Statement for Hydroelectric Power Plant Improvements Program

A breakdown of Board Action No. 5 for Appropriation No. 15458 for seismic assessment of the Sepulveda Canyon Control Facility; Foothill and Greg Avenue Hydroelectric Plants, and the Carbon Creek Pressure Control Structure¹, is as follows:

	Previous Total Appropriated Amount (Mar. 2012)	Current Board Action No. 5 (Mar. 2013)	New Total Appropriated Amount
Labor			
Studies & Investigations	\$ 1,057,000	\$ 370,000	\$ 1,427,000
Owner Costs (Project mgmt, envir. doc.)	514,000	\$ 120,000	634,000
Final Design	654,000	-	654,000
Metropolitan Force Construction	917,942	-	917,942
Professional/Technical Services	-	245,000	245,000
Materials & Supplies	55,000	-	55,000
Incidental Expenses	7,000	-	7,000
Equipment Use	27,000	-	27,000
Contracts	10,000	-	10,000
Remaining Budget	475,058	\$ 65,000	540,058
Total	\$ 3,717,000	\$ 800,000	\$ 4,517,000

Funding Request

Program Name:	Hydroelectric Power Plant Improvements Program		
Source of Funds:	Revenue Bonds, Replacement and Refurbishment or General Funds		
Appropriation No.:	15458	Board Action No.:	5
Requested Amount:	\$ 800,000	Capital Program No.:	15458
Total Appropriated Amount:	\$ 4,517,000	Capital Program Page No.:	60
Total Program Estimate:	\$ 16,178,200	Program Goal:	R-Reliability

¹This action is the initial appropriation for seismic upgrade of the Foothill and Greg Avenue Hydroelectric Plants, and the Carbon Creek Pressure Control Structure. The total amount expended to date on the Sepulveda Canyon Control Facility is approximately \$38,240.

Distribution System

