



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

4/11/2017 Board Meeting

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**8-3**

**Subject**

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Adopt CEQA determination and appropriate \$23.73 million; and authorize: (1) full-scale control and electrical system upgrades at Hiram W. Wadsworth Pumping Plant; (2) \$15,993,000 agreement with Glenmount Global Solutions; and (3) increase of \$630,000 to agreement with Power-Tech Engineers, Inc., for a new not-to-exceed total of \$1,974,000 (Appropriation No. 15467)

**Executive Summary**

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This action authorizes the replacement of control and electrical protection systems for eight pump/turbine units at Hiram W. Wadsworth Pumping Plant at Diamond Valley Lake (DVL). These systems automatically control all operations of the pump/turbine units, enabling the pumping plant to manage flows between DVL, the Inland Feeder, and the San Diego Canal. The existing control and electrical protection systems have deteriorated and individual components have begun to fail.

**Timing and Urgency**

The pump/turbine units at Wadsworth pumping plant are operated by an automated control system which has been in continuous service for 17 years. Major components of this complex system are failing or have become obsolete, and need to be replaced. As the individual components fail, the plant's pumping capability and electrical generating capacity will progressively diminish. Staff recommends moving forward expeditiously to replace the pumping plant's control and electrical protection systems in order to maintain full operational control and reliability of the facility. These new systems will be compatible with the Supervisory Control and Data Acquisition (SCADA) upgrades that are planned for the entire distribution system.

This project has been reviewed with Metropolitan's Capital Investment Plan (CIP) prioritization criteria and is included in the System Reliability Program. Funds for this action are available within Metropolitan's capital expenditure plan for fiscal year 2016/17.

**Details**

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**Background**

DVL is Southern California's largest surface water reservoir, with a maximum storage capacity of 810,000 acre-feet. DVL was completed in 2000 and is located south of the city of Hemet in Riverside County.

The Wadsworth pumping plant, which is located adjacent to DVL, has three primary operating modes. The plant can pump water into DVL or can control water as it flows out of the lake by either generating power with the pump/turbine units or bypassing these units with pressure-reducing sleeve valves. A complex and proprietary control system that is unique to this facility operates all aspects of the pump/turbine units, along with the electrical equipment that protects against electrical faults or hydraulic surges. The pumping plant's control system also interfaces with Metropolitan's system-wide SCADA network so the facility may be remotely operated from the Operations Control Center in Eagle Rock.

The pump/turbines at Wadsworth pumping plant are designed to be operated only by the automated control system. While manual operation may be possible in limited circumstances, the complexity of the facility would create a significant risk of damage to the mechanical and electrical equipment. As a result, manual operation of

the pump/turbine units is not recommended. The bypass sleeve valves that release water from the lake are also designed to be operated automatically, but are capable of manual operation. Water may therefore be withdrawn from the lake under manual mode. Following completion of the Inland Feeder in September 2009, DVL has been filled exclusively with water from the East Branch of the State Water Project, flowing by gravity through the Inland Feeder. Water withdrawn from DVL has primarily been released into the San Diego Canal through the pump/turbine units. The power generated by Wadsworth pumping plant was certified in 2010 as renewable energy and is sold under contract to the state Department of Water Resources through 2020. For calendar years 2012 through 2016, the average annual revenue from hydroelectric generation at Wadsworth pumping plant was approximately \$2.27 million.

After 17 years of continuous service, critical components of the pumping plant's control and electrical protection systems are obsolete or failing, while spare parts are no longer available. For example, the plant requires 120 communication modules (specialized circuit boards) to operate at full capacity. These modules have begun to fail at an increasing rate, and are no longer available commercially. Currently, only seven of the nine pump/turbine units are available for operation due to failure of control system equipment and the lack of spare parts. Unless a comprehensive upgrade of the control and electrical protection systems is performed, additional pump/turbine units will become unavailable, restricting Metropolitan's operational capabilities at DVL.

The planned upgrades will restore the reliable operation of hydroelectric generation and pumping at Wadsworth pumping plant. The upgrades will:

- Follow modern, open industry standards;
- Be consistent with Metropolitan's electrical protection and control system practices;
- Be compatible with planned upgrades to Metropolitan's system-wide SCADA system;
- Minimize the use of proprietary components and software code; and
- Provide improved documentation so the facility can be operated, maintained, and modified by Metropolitan staff over an extended service life.

In 2010, Metropolitan's Board authorized initial investigations to assess the control and electrical protection systems at the pumping plant. This assessment confirmed that numerous system components were beginning to fail and/or had become obsolete. In 2012, the Board authorized preliminary design to rehabilitate the control and electrical protection systems. In 2014, the Board authorized final design and prototype testing to upgrade those systems for a single pump/turbine. The prototype testing was recently completed successfully, and staff recommends moving forward to upgrade the remaining eight pump/turbine units. This action authorizes replacement of the existing control and electrical protection systems at the pumping plant with industry-standard equipment, based on the successful prototype test. Staff will return to the Board in late 2018 for the final action on this project to authorize procurement of an uninterruptible power supply (UPS) unit.

#### **Wadsworth Pumping Plant Control and Electrical System Upgrades – Full-Scale Installation/Construction (\$23,730,000)**

The scope of work will include installation of control and electrical protection upgrades for eight pump/turbine units, the adjacent pressure-reducing valves, and all related pumping plant systems. The planned activities include installation of new programmable logic controllers (PLCs), input/output (I/O) modules, monitoring equipment, electronic drive controllers, and cables for the eight pump/turbine units; programming and SCADA system integration activities; start-up and testing; and preparation of complete record drawings and operating manuals.

Due to the unique and highly specialized nature of the upgrades, staff recommends that the programming, system integration, and furnishing of control equipment be performed by a firm with demonstrated technical experience in this type of work. Glenmount Global Solutions (GGS) is recommended to serve as integrator and equipment supplier for the upgrades, and to perform testing of the eight units. The equipment to be furnished by GGS includes PLCs, I/O modules, monitoring and protection equipment (e.g., vibration monitors and protective relays), network switches and cables, and electronic power controllers including load commutated inverters, drive controllers, and automatic voltage regulators.

Staff recommends that Power-Tech Engineers, Inc., provide specialized technical support to Metropolitan, witness the pump/turbine performance testing, and compile test reports. Power-Tech Engineers, Inc. will be responsible for primary review of project submittals including the equipment provided by GGS, witnessing of the pump/turbine performance testing, and review of requests for information.

Metropolitan staff will be responsible for overall project management and will integrate the control system upgrades with Metropolitan's SCADA system, provide technical oversight, and prepare O&M manuals. Staff will also perform quality assurance/quality control review of the system design, perform factory and installation inspection, and perform construction-related portions of the work. The construction includes equipment installation, termination of field wiring, installation of conduits, and shutdowns and establishment of clearances so the upgrades may proceed as the facility continues to operate.

This action appropriates \$23.73 million and authorizes installation and construction of control and protection upgrades for Wadsworth pumping plant. The requested funds include \$15,993,000 for GGS to provide the services described above; \$630,000 for Power-Tech Engineers, Inc. to provide technical support; \$3.19 million for construction by Metropolitan forces; \$1.19 million for startup and testing; \$1,037,000 for review of submittals, preparation of O&M manuals and record drawings, and project management; and \$1.69 million for remaining budget.

#### **Agreement to Provide Control System Equipment and Programming (Glenmount Global Solutions)**

GGS was previously selected for this project through a multi-step competitive process. GGS specializes in the design and deployment of plant control and electrical protection systems, and has performed work similar to this project for other owners. Based on its qualifications, experience, and performance during the prototype phase of the project, staff recommends that GGS perform installation and programming of the full-scale upgrades. The planned subcontractor/subconsultants under this agreement are GE Power Systems, Schweitzer Engineering Laboratories, Inc., and GE Bently Nevada. No Small Business Enterprise (SBE) participation level was established for this agreement due to the complex and specialized nature of the work.

This action authorizes an agreement with GGS in an amount not to exceed \$15,993,000 to serve as integrator and equipment supplier for the control and electrical protection upgrades at eight pump/turbine units at Wadsworth pumping plant.

#### **Amendment to Agreement for Specialized Technical Support (Power-Tech Engineers, Inc.)**

Power-Tech Engineers, Inc. provided technical support during the prototype phase of this project. Power-Tech Engineers, Inc. specializes in large pump/generation plant design and commissioning, and is recommended to provide continued support during the full-scale upgrades. Power-Tech Engineers, Inc. was previously selected through a competitive process and is an SBE firm.

This action authorizes an increase of \$630,000 to the existing agreement with Power-Tech Engineers, Inc., for a new not-to-exceed total of \$1,974,000, to provide technical oversight for the full-scale upgrades to the control and electrical protection systems at Wadsworth pumping plant. No subconsultants are planned under this agreement.

#### **Summary**

This action appropriates \$23.73 million and authorizes full-scale installation and construction of control and electrical protection system upgrades at Wadsworth pumping plant, authorizes an agreement with GGS, and authorizes an increase to the existing agreement with Power-Tech Engineers, Inc.

The total estimated cost to complete the control and electrical protection system upgrades, including the amount appropriated to date, current funds requested, and future completion costs, is approximately \$34.7 million.

This project has been evaluated and recommended by Metropolitan's CIP Evaluation Team, and funds have been included in the fiscal year 2016/17 capital expenditure plan. See [Attachment 1](#) for the Financial Statement and [Attachment 2](#) for the Location Map.

This project is included within capital Appropriation No. 15467, the Water Operations Control Appropriation, which was initiated in fiscal year 2010/11. With the present action, the total funding for Appropriation No. 15467 will increase from \$19.58 million to \$43.31 million.

### ***Project Milestone***

June 2019 – Completion of the Wadsworth pumping plant control and electrical system upgrades

### **Policy**

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Metropolitan Water District Administrative Code Section 5108: Appropriations

Metropolitan Water District Administrative Code Section 8121: General Authority of the General Manager to Enter Contracts

### **California Environmental Quality Act (CEQA)**

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#### **CEQA determination for Option #1:**

The proposed actions are exempt under the provisions of CEQA and the State CEQA Guidelines. The activities involve the funding, design, and minor alterations of existing public facilities, located at the same site and with the same purpose, with negligible or no expansion of use and no possibility of significantly impacting the physical environment. Accordingly, the proposed actions qualify under a Class 1 Categorical Exemption (Section 15301 of the State CEQA Guidelines).

The CEQA determination is: Determine that the proposed actions are categorically exempt from CEQA pursuant to Section 15301 of the State CEQA Guidelines.

#### **CEQA determination for Option #2:**

None required

### **Board Options**

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#### **Option #1**

Adopt the CEQA determination that the proposed actions are categorically exempt, and

- a. Appropriate \$23.73 million;
- b. Authorize \$15,993,000 agreement with Glenmount Global Solutions;
- c. Authorize increase of \$630,000 to an agreement with Power-Tech Engineers, Inc., for a new not-to-exceed total of \$1,974,000; and
- d. Authorize full-scale control and electrical system upgrades at Wadsworth pumping plant.

**Fiscal Impact:** \$23.73 million of capital funds under Appropriation No. 15467

**Business Analysis:** This option will restore operational capability and enhance the reliability of Wadsworth pumping plant.

#### **Option #2**

Do not proceed with the upgrades at Wadsworth pumping plant at this time.

**Fiscal Impact:** None initially. Over time, the ability to generate hydroelectric power while withdrawing water from Diamond Valley Lake will diminish, along with the capability to pump water into the lake.

**Business Analysis:** This option would forego an opportunity to address the increasing failure of components within the control and electrical protection systems, and to maintain operability and reliability of Wadsworth pumping plant.



## Financial Statement for Water Operations Control Appropriation

A breakdown of Board Action No. 6 for Appropriation No. 15467 for control and electrical upgrades<sup>1</sup> at Wadsworth pumping plant is as follows:

	<b>Previous Total Appropriated Amount (Mar. 2017)</b>	<b>Current Board Action No. 6 (Apr. 2017)</b>	<b>New Total Appropriated Amount</b>
Labor			
Studies & Investigations	\$ 1,048,076	\$ -	\$ 1,048,076
Final Design	1,636,000	-	1,636,000
Owner Costs (Program mgmt. & O & M manuals)	948,000	519,000	1,467,000
Submittals Review & Record Drwgs	303,000	520,000	823,000
Construction Inspection & Support	340,000	1,194,000	1,534,000
Metropolitan Force Construction	964,000	2,909,000	3,873,000
Materials & Supplies	1,028,121	275,000	1,303,121
Incidental Expenses	21,000	-	21,000
Professional/Technical Services	67,589	-	67,589
Glenmount Global Solutions	7,025,000	15,993,000	23,018,000
Power-Tech Engineers, Inc.	1,344,000	630,000	1,974,000
Equipment Use	-	-	-
Contracts	2,500,000	-	2,500,000
Remaining Budget	2,355,214	1,690,000	4,045,214
<b>Total</b>	<b>\$ 19,580,000</b>	<b>\$ 23,730,000</b>	<b>\$ 43,310,000</b>

### Funding Request

<b>Appropriation Name:</b>	Water Operations Control Appropriation		
<b>Source of Funds:</b>	Revenue Bonds, Replacement and Refurbishment or General Funds		
<b>Appropriation No.:</b>	15467	<b>Board Action No.:</b>	6
<b>Requested Amount:</b>	\$ 23,730,000	<b>Budget Page No.:</b>	261
<b>Total Appropriated Amount:</b>	\$ 43,310,000	<b>Total Appropriation Estimate:</b>	\$ 119,300,000

<sup>1</sup>The total amount expended to date on control and electrical protection upgrades at Wadsworth pumping plant is approximately \$10.47 million. The total estimated cost to complete the upgrades, including the amount appropriated to date, current funds requested, and future completion costs, is approximately \$34.7 million.

# Distribution System

