

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

October 8, 2002 Board Meeting

8-2

Subject

Authorize \$20.5 million in budgeted CIP funds to implement Phase I of the Water System Control Master Plan (Approps. 15397, 15398 and 15399)

Description

The Water System Control Master Plan (Master Plan) was developed to provide a comprehensive, long-term roadmap for upgrading, controlling and integrating our water delivery processes. The Master Plan is part of Metropolitan's overall Information Technology Strategic Plan (ITSP) and has been divided into three distinct phases. Phase I, the foundation of the Master Plan, will upgrade equipment and provide improvements to Metropolitan's conveyance, distribution and treatment processes so that they can be monitored and remotely controlled via the Supervisory Control and Data Acquisition (SCADA) system. Options under Phase II will provide for better integration of the conveyance, treatment and distribution control system processes with business and operational processes. Options under Phase III will focus on optimizing key processes. This board letter seeks authorization and funding to begin implementing Phase I.

Metropolitan's existing SCADA system utilizes an array of instruments, equipment, computers and programs to remotely monitor and control water system processes. While multiple benefits have been obtained from our current SCADA system, implementing the Master Plan will allow us to meet the challenges of increased water system complexities, demands and restrictions while increasing control and reliability, reducing risk and streamlining the processes associated with our core business. The Master Plan provides a phased approach to integrating an enterprise-wide water system control philosophy whereby business, engineering, operations and information technology (IT) processes are implemented in support of business drivers.

While many aspects of the water system are controlled through SCADA, a number of processes are still controlled manually, in part due to aging equipment and instrumentation which is decades old and was not originally installed with features that allow automatic control. Phase I of the Master Plan will replace much of the older equipment and provide for such control of appropriate processes. This is an important improvement to the existing system to ensure control, reliability and quality are maintained as our water system operations become increasingly complex (e.g., ozone treatment process) to meet more stringent and exacting regulations, and to enable more streamlined and optimized business and operational processes.

A number of required and related capital projects are included in Phase I of the Master Plan. The projects have been grouped together into three Capital Investment Plan (CIP) programs: the Control System Enhancement Program (CSEP, Approp. 15397); the Distribution System Control and Equipment Upgrade Program (Approp. 15398); and the Treatment Plants Control and Equipment Upgrade Program (Approp. 15399). Studies will be conducted during Phase I and may result in the identification of additional Phase I projects. The Board will be approached in the near-term for authorization to enter into professional agreements in support of these studies. As additional projects are identified, they will be brought to the Board for approval as required. The programs were reviewed and recommended by the CIP evaluation team and the ITSP consultants, and are included in Metropolitan's fiscal year 2002/03 capital budget.

Attachment 1 provides the Detailed Report and **Attachment 2**, **Attachment 3** and **Attachment 4** provide the Financial Statements for each of the appropriations.

Policy

Metropolitan Water District Administrative Code § 5108: Capital Project Appropriation

California Environmental Quality Act (CEQA)

CEQA determination for Option #1:

The proposed action is categorically exempt under the provisions of CEQA. The proposed action involves the funding to implement Phase I of the Master Plan, i.e., the carrying out of minor modifications to existing public facilities with no expansion of use and no possibility of significantly impacting the physical environment. In addition, the proposed action will 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. As such, 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 for both Class 1 and Class 6 Categorical Exemptions (Sections 15301 and 15306 of the State CEQA Guidelines).

CEQA determination for Option #2:

None required

Board Options/Fiscal Impacts

Option #1

Adopt the CEQA determination and authorize funds in the amount of \$11.0 million for the Control System Enhancement Program (Approp. 15397), \$8.10 million for the Distribution System Control and Equipment Upgrade Program (Approp. 15398) and \$1.40 million for the Treatment Plants Control and Equipment Upgrade Program (Approp. 15399).

Fiscal Impact: \$20.5 million of budgeted CIP funds under Approps. 15397, 15398 and 15399, as originally included as part of the capital budget estimate (CIP indices 01223-I, 02306-S and 02307-W, respectively).


Option #2

Do not authorize funds to upgrade equipment and provide for system control of water operation processes.

Fiscal Impact: Do not realize benefits of technology, while increasing risk of equipment and process failures and associated ability to meet regulations and business requirements.

Staff Recommendation

Option #1

 _____ Roy L. Wolfe Manager, Corporate Resources	9/20/2002 _____ Date
 _____ Ronald R. Gastelum Chief Executive Officer	9/22/2002 _____ Date

Attachment 1 – Detailed Report

Attachment 2 – Financial Statement – Appropriation No. 15397

Attachment 3 – Financial Statement – Appropriation No. 15398

Attachment 4 – Financial Statement – Appropriation No. 15399

Detailed Report

Background

This board action seeks authorization and funding to begin implementing Phase I of the Water System Control Master Plan (Master Plan). The Master Plan was developed to provide a comprehensive, long-term roadmap for upgrading control, integration and optimization of our water delivery processes. Under this plan, a number of projects were identified and grouped into three related Phase I CIP programs: the Control System Enhancement Program (CSEP, Approp. 15397); the Distribution System Control and Equipment Upgrade Program (Approp. 15398); and the Treatment Plants Control and Equipment Upgrade Program (Approp. 15399).

The Supervisory Control and Data Acquisition (SCADA) system is a combination of field instruments and equipment, computers, and software that allows for instantaneous monitoring of water system status; remote control of equipment; automated control of processes (e.g., chemical feed process for water treatment); and networking of multiple processes/systems. It also archives vital information used by Planning, Operations, Accounting, Finance, and Conservation to perform water scheduling and billing, power scheduling, water quality analyses, etc.

In 1995, a contract was awarded to Systems Integrated, Inc., to provide one enterprise-wide SCADA system. Deployment of this SCADA infrastructure was completed in 1998. Benefits of this original implementation include: elimination of 39 separate control systems from three different vendors and the resulting implementation of one single enterprise-wide SCADA system; implementation of the Automatic Meter Reading System and the Water Information System, allowing for improved water billing and data accessibility for member agencies; implementation of several water quality, operational and regulatory reporting tools. The current infrastructure has also provided control and data retrieval for numerous water system processes, the ability to automate those not yet addressed and the ability to view and manage the distribution system from one central location, as well as other benefits. Activities that remain to be implemented include: completion of process control development, networking of processes, and development of a data warehouse and interface that makes SCADA system data available for business functions and process optimization.

In a number of instances, significant equipment replacements are required prior to control implementation. Much of this existing equipment is more than 25 years old and cannot be readily adapted for remote operation, monitoring, and data retrieval. Consequently, the equipment will first need to be replaced before computerized control functions can be implemented. Initial studies indicate that equipment improvements are needed throughout the water system.

Phase I work will upgrade processes and equipment and provide improvements to Metropolitan's conveyance, distribution and treatment processes so that they can be monitored and remotely controlled via the SCADA system. Phase I objectives include: upgrade of distribution system and treatment plant equipment and systems; implementation and integration of control system programs for the distribution system, Colorado River Aqueduct (CRA) system and treatment plants; improved SCADA communications reliability and security; and improved reporting capabilities to support streamlined business practices. Along with the project during Phase I, staff and consultants will also conduct studies to determine remaining requirement details and solutions to be implemented as final projects in Phase I, as well as projects in Phases II and III.

These Phase I projects will provide increased control of our core business; increased reliability and standardization, which will result in reduced maintenance; reduced risk through redundancy and system improvements; and increased emergency response abilities through information accessibility, monitoring and increased decision making resources. Phase I projects also allow us to address the increasing complexities, demands and restrictions in water acquisition, conveyance, treatment, distribution and energy management, while preparing for integration with business applications and the optimization of these systems from a business perspective. An example of this is supplying scheduled maintenance/equipment outage data to the SCADA and scheduling system in order to plan for optimal water distribution and power recovery. Ultimately, an enterprise-wide approach to process engineering, information technology applications, and operations practices in support of a global business vision will be implemented.

Scope

The Master Plan covers efforts in three new programs and incorporates several existing capital programs. These new programs consist of the Control System Enhancement Program (CSEP), the Distribution System Control and Equipment Upgrade Program and the Treatment Plants Control and Equipment Upgrade Program. The CSEP focuses on control system and IT issues, while the latter two programs cover necessary upgrades to equipment and instrumentation required to support computer-based control, data acquisition, integration and optimization. Funding for these issues related to the CRA is being addressed under the existing CRA, Conveyance Reliability Program. The following tables present the projects for each of the programs proposed in this board letter.

Under the CSEP, 11 projects have been identified to date and are outlined below. Additional projects may be identified as a result of studies to be conducted as part of Phase I. Details on the following projects are contained in the Master Plan.

Table 1. Control System Enhancement Program (CSEP), Project Detail

No.	Project Title	Description	Estimated Budget
1	Control System Data Storage and Reporting	Storage/archival of SCADA data in a data warehouse. Includes reporting capability. Will handle the existing and future data.	\$335,000
2	Real Time Operation Modeling	An array of water system models used to statically, and potentially dynamically, simulate the water delivery system. Used for control system design and testing, simulations and scenarios, training, disaster recovery, etc.	\$3,422,000
3	Plant Influent Redundant Flow Metering and Splitting	Enhance existing control methods to accommodate redundant flow measurement, as flow readings are the primary driver in most water system automation.	\$167,000
4	Enhanced Distribution System Control Project	This project provides the SCADA programming that will unify distribution system processes together to be controlled as one comprehensive system.	\$176,000
5	CRA Control Integration	Upon completion of the pump station upgrades, as part of the Colorado River Aqueduct (CRA) reliability program, this project will tie together the pump plants and allow the CRA to be controlled as one system.	\$344,000
6	Oxidation Demonstration Plant (ODP) Control System Replacement	The existing Oxidation Demonstration Plant (ODP) control system needs to be replaced to allow for further research to be done more efficiently and for information to be collected and shared as part of the enterprise-wide SCADA system.	\$733,000
7	Control Communications Frame Relay Conversion	To eliminate the risk and reliability issues associated with leased telephone line communications, the remote SCADA field communications system will be replaced with one that is owned and maintained by Metropolitan.	\$496,000
8	Power Management Systems	To investigate, select and install hydroelectric plant power management systems as part of the enterprise-wide SCADA system.	\$608,000

No.	Project Title	Description	Estimated Budget
9	Programmable Logic Controller (PLC) standardization	Metropolitan currently has 100 installations of PLCs controlling various areas of the water system. These installations are comprised of 18 different models and 10 different manufacturers. Many of these are no longer supported. This project will standardize PLC installations, programming and security.	\$713,000
10	Automatic Meter Reading (AMR) Remote Terminal Unit (RTU) Upgrade Project, Phase II	Phase II is the second of two projects and will replace the remaining approximately 350 AMR RTU units with current, supported technology. These units provide distribution system and billing meter flow readings. Present units are no longer manufactured and are running on outdated analog communications technology that the industry is phasing out.	\$2,607,000
11	CSEP Implementation	An oversight project that will house program management activities, a number of studies and implementation efforts, designed to coordinate implementation of the existing projects with those mentioned above, as well as provide direction and preparation for Phases II and III of the Master Plan.	\$1,399,000
	Total		\$11,000,000

The Distribution System Control and Equipment Upgrade Program presently contains the following projects:

Table 2. Distribution System Control and Equipment Upgrade Program, Project Detail

No.	Project Title	Description	Estimated Budget
1	Distribution System Equipment and Instrumentation Upgrades	Study to determine appropriate distribution system requirements with respect to equipment, instrumentation and standardization. Includes upgrade and/or installation of equipment and instruments, and SCADA programming as required.	\$5,800,000
2	Enhanced Distribution System Control, Phase I	Upgrade selected distribution system processes and equipment and integrate with the SCADA system. This project is a precursor to the Enhanced Distribution System Control project under the CSEP (Table 1, Item 4).	\$2,300,000
	Total		\$8,100,000

The Treatment Plants Control and Equipment Upgrade Program presently contains the following projects:

Table 3. Treatment Plants Control and Equipment Upgrade, Project Detail

No.	Project Title	Description	Estimated Budget
1	Treatment Process Assessments	Study to determine the appropriate level of standardization for treatment processes, equipment and instrumentation. Will result in project recommendations.	\$250,000
2	Treatment Plant Chemical Feed System Standardization and Controls	Study to determine the appropriate level of standardization for the chemical feed systems at all five treatment plants. Will result in project recommendations.	\$250,000
3	Replace Outdated Instrumentation and Investigate Upgrades	Current SCADA control and monitoring is hampered by outdated instrumentation. This project will replace outdated water quality monitoring instruments at all five treatment plants. This project will also investigate standardization, improved procurement (such as life-cycle costing) and systematic upgrade requirements for Water Quality instrumentation. May result in project recommendations.	\$400,000
4	Instrumentation/Control System Changes for Treatment Plants	Evaluation to determine the appropriate level of standardization and upgrades of the control system at the five treatment plants. This project is primarily for the programming related to the instrumentation and control upgrades.	\$500,000
	Total		\$1,400,000

The projects derived from the plan have been reviewed and recommended by the ITSP consultant and the CIP Review Team and are included as part of the fiscal year 2002/03 budget. Initial studies and preliminary design efforts will allow us to refine the scope for Phase I and subsequent Phases II and III. As initial studies are concluded, project scopes and associated budgets will be adjusted accordingly.

The following table provides a cost summary estimate for Phase I broken down by program: Control System Enhancement Program, Distribution System Control and Equipment Upgrade, and the Treatment Plants Control and Equipment Upgrade Program.

Table 4. Cost summary estimate for Control System Enhancement Program, Distribution System Control and Equipment Upgrade, and Treatment Plants Control and Equipment Upgrade Program

Category	Control System Enhancement Program	Distribution System Control and Equipment Upgrade Program	Treatment Plants Control and Equipment Upgrade Program	Total
Study	\$ 350	\$ 70	\$ 444	\$ 864
Design	880	643	172	1,695
Equipment	4,201	2,737	262	7,200
Software	2,415	1,265	135	3,815
Installation	1,706	2,562	239	4,507
Remaining Budget	1,448	823	148	2,419
Total	\$11,000	\$8,100	\$1,400	\$20,500

In Thousands of dollars

		- Preliminary - Water System Control Master Plan Implementation																			
		2003				2004				2005				2006							
ID	Task Name	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	
1	Control System Enhancement Program																				
2	CSEP Implementation																				
3	CSEP Implementation Study																				
4	SCADA Phase II Feasibility Study																				
5	Power Management Systems																				
6	Real Time Operation Modeling																				
7	Control System Data Storage and Reporting																				
8	Plant Influent Redundant Flow Metering and Splitting																				
9	Enhanced Distribution System Control Project																				
10	CRA Control Integration																				
11	Oxidation Demonstration Plant (ODP) Control System Replacement																				
12	Control Communications Frame Relay Conversion																				
13	Programmable Logic Controller (PLC) Standardization																				
14	Auto. Meter Reading / Remote Terminal Unit Upgrade Project, Phase II																				
15	Distribution System Control and Equipment Upgrade Program																				
16	Distribution System Equipment and Instrumentation Upgrades																				
17	Enhanced Distribution System Control - Phase 1																				
18	Treatment Plants Control and Equipment Upgrade Program																				
19	Treatment Process Assessments (Study Phase)																				
20	Treatment Plant Chemical Feed System Stand. and Controls (Study Phase)																				
21	Instrumentation / Control System Changes for Treatment Plants																				
22	Replace Faulty Instrumentation and Investigate Upgrades																				

Tables 5 through 21 provide a detailed description of each project identified in Phase I.

Project Description – Phase I

Table 5. Control System Data Storage and Reporting

Project Summary	
Program Title:	Control System Enhancement Program (CSEP, Approp. 15397)
Project Title:	Control System Data Storage and Reporting
Total Project Estimate:	\$335,000
Project Driver(s):	Reliability, Customer Service, Regulatory

Project Description

Determine control system data, storage and reporting needs and deploy the tools to provide storage, retrieval, standard and ad hoc reports for control system data customers. Customers include Water Systems Operations, Water Quality, Information Technology, Engineering, Finance, Conservation, and potentially Member Agencies and Regulators. This project is also a necessary precursor to future water system operation optimization, and the expansion of the Real Time Operations Modeling work.

Upon completion of an initial study, we will deploy a “data warehouse,” a commercial off-the-shelf product that can store large volumes of data, and provides a standardized interface for other applications to access the data. Later phases may include purchase or development of new applications for exploitation of the historical operational data made available by this project.

Background

The SCADA servers currently store water system operation data in a vendor-proprietary form, not readily accessible outside the SCADA network. Older data is copied to magnetic tape on a weekly basis. If this archived data is later required, SCADA staff must manually locate the appropriate tape and retrieve its contents. This current data storage method is inefficient and makes it difficult to perform analysis of historical data.

Currently a limited amount of historical data is stored in the system, primarily water quality plant data. New regulations such as the Interim Enhanced Surface Water Treatment Rule require the capture and analysis of large volumes of data. Advances in technology and the reduction of disk storage costs now enable large-scale data warehouses, capable of storing large amounts of data captured by the SCADA system. Such data warehouses provide a centralized repository and standardized access for enterprise-wide applications to exploit the data, replacing the existing vendor-proprietary storage. This permits simple, reliable access to the data for existing and future applications, including reporting, billing, modeling and forecasting. It also allows storage of large volumes of data needed to comply with future more stringent regulations. In addition, it improves the operational decision-making.

Preliminary Project Summary Estimate*:

Category	Total
Study	\$20,000
Design	42,000
Equipment	110,000
Software	69,000
Installation	36,000
Remaining Budget	58,000
Project Total	\$335,000

* The work on this project will be performed by a combination of internal staff and consultant labor. The distribution of internal and external labor along with refined cost estimates will be determined during the development of the detailed project work plan.

Project Description – Phase I

Table 6. Real Time Operations Modeling

Project Summary	
Program Title:	Control System Enhancement Program (CSEP, Approp. 15397)
Project Title:	Real Time Operations Modeling
Total Project Estimate:	\$3,422,000
Project Driver(s):	Cost Efficiency, Reliability

Project Description	
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This project will develop a set of interacting software applications to simulate the water delivery system using dynamic modeling and static hydraulic modeling. The models will be capable of starting model runs from preset conditions or by loading real-time conditions (e.g., flow and hydraulic grade from the SCADA system). Other models will be developed to maximize power generation, integrate Diamond Valley Lake into the distribution system, and adjust the delivery of State project water.

The real-time operations models to be developed will comprise a series of databases used by the hydraulic analysis software, pre- and post-processing to generate user-friendly screens and reports. The models will employ links to the SCADA system to acquire real-time data, and to the data warehouse for historical operational data.

The initial effort will be a study to determine requirements. Subsequent modeling software and programming effort are needed to implement the real time operation models.

Background	
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Water System Operations currently models mass-balance spreadsheets to perform short-term planning. These steady-state models provide precision on a weekly and monthly time basis. They can, for example, estimate the blend percentage within the Central Pool and Lake Skinner area, the number of CRA pumps necessary to meet demands, the storage volumes in Lake Mathews and Lake Skinner, the amount of State project water to be brought in on the East and West Branches, and to track demand.

Recent changes in the power industry new water management programs and conveyance facilities create a need to understand and analyze the distribution of water on a weekly, daily, and hourly basis. These changes dramatically increase the complexity of short-term planning and operations, and drive the need for more precise time resolution of the required models.

Preliminary Project Summary Estimate*:

Category	Total
Study	\$50,000
Design	370,000
Equipment	700,000
Software	940,000
Installation	757,000
Remaining Budget	605,000
Project Total	\$3,422,000

* The work on this project will be performed by a combination of internal staff and consultant labor. The distribution of internal and external labor along with refined cost estimates will be determined during the development of the detailed project work plan.

Project Description – Phase I

Table 7. Plant Influent Redundant Flow Metering and Splitting

Project Summary	
Program Title:	Control System Enhancement Program (CSEP, Approp. 15397)
Project Title:	Plant Influent Redundant Flow Metering and Splitting
Total Project Estimate:	\$167,000
Project Driver(s):	Customer Service, Regulatory

Project Description
<p>This project will provide two benefits to the Treatment Plants. First, it will provide redundant plant influent flow calculation, based on meters other than the primary influent flow meter(s). This will allow for a fallback flow reading for the many chemical feed and water quality processes that currently rely on a single flow signal through the Control System. The second aspect of this project is to provide the computer controls to utilize secondary flow meters that may be installed at the treatment plants, where applicable. The scope of this project includes the necessary programming effort.</p>

Background
<p>Most of the primary treatment plant chemical feed processes are based on the plant influent flow rate. This flow value is determined by flow meter and is transmitted to the SCADA system via a single transmitter, electronic circuit, communications circuit, and control computer (Remote Terminal Unit). Some plants have more than one meter/transmitter tied to specific parts of the plants but do not individually serve the whole plant. In essence, the water treatment process and thus water quality are tied to this single line element. If the transmitter, or any other component in the sequence fails, the chemical feed processes fail to control as intended.</p>

Preliminary Project Summary Estimate*:

Category	Total
Study	\$ 0
Design	13,000
Equipment	5,000
Software	112,000
Installation	12,000
Remaining Budget	25,000
Project Total	\$167,000

* The work on this project will be performed by a combination of internal staff and consultant labor. The distribution of internal and external labor along with refined cost estimates will be determined during the development of the detailed project work plan.

Project Description – Phase I

Table 8. Enhanced Distribution System Control Project

Project Summary	
Program Title:	Control System Enhancement Program (CSEP, Approp. 15397)
Project Title:	Enhanced Distribution System Control Project
Total Project Estimate:	\$176,000
Project Driver(s):	Reliability

Project Description
<p>Provide networked distribution system automation, as identified in the Water System Control Master Plan (WSCMP). Aspects include development of distribution system sub-system logic, function descriptions, network control programming and transfer of control to the Operations Control Center.</p> <p>This project provides the SCADA programming that will unify distribution system processes together to be controlled as one comprehensive system.</p>

Background
<p>As conceived, the original Distribution System Automation Project was to provide a basic level of monitoring and control. Now that the WSCMP has more fully documented Water System Operations requirements, it is apparent that additional automation is warranted. This project will provide SCADA programming necessary to bring the distribution system to the level of automation and uniformity of control specified in the WSCMP.</p>

Preliminary Project Summary Estimate*:

Category	Total
Study	\$ 0
Design	10,000
Equipment	10,000
Software	128,000
Installation	5,000
Remaining Budget	23,000
Project Total	\$176,000

* The work on this project will be performed by a combination of internal staff and consultant labor. The distribution of internal and external labor along with refined cost estimates will be determined during the development of the detailed project work plan.

Project Description – Phase I

Table 9. CRA Control Integration

Project Summary	
Program Title:	Control System Enhancement Program (CSEP, Approp. 15397)
Project Title:	CRA Control Integration
Total Project Estimate:	\$344,000
Project Driver(s):	Customer Service, Regulatory

Project Description

Individual plants will be automated to provide plant-wide, standalone automation as part of the Colorado River Aqueduct (CRA) reliability program and the included retrofit activities. Once plants are individually automated, this project will link operation of all five pumping plants together to allow operation as a system. Aspects include development of integrated CRA system logic, function descriptions, network control programming and providing ability to transfer control to the Operations Control Center (OCC). The objective is to keep the CRA at maximum capacity by utilizing automation to manage system dynamics.

The initial effort will be to study the automation requirements of a typical CRA plant, as the plant is automated during the CRA Retrofit project. Information gained from this phase will determine the capacity of network connections required to support the monitoring and control of processes within the plant and others like it. As the CRA Retrofit project completes plant automation, this project will network the plants with each other, and with OCC to permit centralized control.

Background

Current operation of the CRA system requires that pumping plant operations be manually sequenced among the plants. This results in lower capacity and efficiency than is possible were the processes to be fully automated. Further, the present level of semi-automation makes it difficult to transfer CRA operations to OCC for centralized control.

The proposed functions are necessary to improve the CRA system to the level of automation and uniformity of control specified in the Water System Control Master Plan. This project will tie the pump plants together through computer networking, and allow the OCC to centrally control CRA as one system.

Preliminary Project Summary Estimate*:

Category	Total
Study	\$ 10,000
Design	35,000
Equipment	35,000
Software	170,000
Installation	44,000
Remaining Budget	50,000
Project Total	\$344,000

* The work on this project will be performed by a combination of internal staff and consultant labor. The distribution of internal and external labor along with refined cost estimates will be determined during the development of the detailed project work plan.

Project Description – Phase I

Table 10. Oxidation Demonstration Plant (ODP) Control System Replacement

Project Summary

Program Title:	Control System Enhancement Program (CSEP, Approp. 15397)
Project Title:	Oxidation Demonstration Plant (ODP) Control System Replacement
Total Project Estimate:	\$733,000
Project Driver(s):	Customer Service, Regulatory

Project Description

The Oxidation Demonstration Plant (ODP) has been operating since 1991. The original Westinghouse Distributed Control System (DCS) has been the primary control system since that time. Over the last 12 years, the ODP has seen several regulatory and other research projects installed and tested, including ozone and Peroxone, UV, micro-filtration, bio-filtration, enhanced coagulation, corrosion testing and a host of smaller studies.

Each time a new project is installed, the control system must be altered to accommodate the new project requirement. The Westinghouse DCS has reached the end of its life cycle. Parts and service are becoming difficult to find, and the ability to make system changes is limited. Additionally, the DCS does not tie into Metropolitan’s standard control system, so collection of data is initially constrained to the ODP. It is proposed that the existing DCS at the ODP be replaced. Subsequent to an initial study, we would retrofit hardware, software and programming.

This project will replace the existing ODP DCS with Metropolitan’s new SCADA platform and integrate ODP operations into the District as a whole. This could include integration of existing programmable logic controllers on a case-by-case basis, with the SCADA system acting as an interface for monitoring and control. The effort will require a retrofit of hardware, software and programming.

Background

The ODP is Metropolitan’s primary research facility and is used to test emerging technologies and improve the District’s ability to meet upcoming water quality regulations. In several instances, research performed at the ODP has actually changed the direction and language of pending regulations and compliance methods at both the federal and state levels. As regulations, compliance technologies and the methods of testing become more complex, a modern integrated control and data acquisition system has become crucial for ODP.

Preliminary Project Summary Estimate*:

Category	Total
Study	\$ 30,000
Design	42,000
Equipment	265,000
Software	221,000
Installation	74,000
Remaining Budget	101,000
Project Total	\$733,000

* The work on this project will be performed by a combination of internal staff and consultant labor. The distribution of internal and external labor along with refined cost estimates will be determined during the development of the detailed project work plan.

Project Description – Phase I

Table 11. Control Communications Frame Relay Conversion

Project Summary	
Program Title:	Control System Enhancement Program (CSEP, Approp. 15397)
Project Title:	Control Communications Frame Relay Conversion
Total Project Estimate:	\$496,000
Project Driver(s):	Customer Service, Regulatory, Reliability

Project Description
<p>Our current control system communications is mostly based on public telephone frame-relay circuits. The digital microwave backbone system project currently underway will interconnect major sites such as the Operations Control Center (OCC), pump plants, treatment plants, and Union Station. Individual structures, such as pressure control structures, hydroelectric generation facilities, will remain on the public frame-relay system. This condition makes our ability to control and monitor our system reliant on outside vendors and their contractors.</p> <p>Upon completion of a short study, this project will install a two-way, one-watt unlicensed radio system to interconnect facilities currently serviced by the frame-relay system. Present estimates indicate that approximately 150 radios (including repeaters) will be required for distribution and conveyance RTUs. Security issues will be addressed and integration with the AMR RTU radio system will be investigated.</p>

Background
<p>In remote areas, service of frame-relay circuits is often subleased to third- and fourth-tier providers who have no knowledge of the importance of communications over these circuits. Lacking an understanding of their criticality, the providers may take these circuits out of service with no prior notification to the District. The resulting communication failures can lead to loss of monitoring and control, especially for unmanned facilities such as flow control structures and hydroelectric plants.</p> <p>It is well recognized that privately owned circuits are more reliable than those operated over public communications systems. The two-way radios planned for use in this project are a proven solution to the communication problems intrinsic with publicly owned systems. They offer security and reliability, with the additional advantage of low operating cost.</p>

Preliminary Project Summary Estimate*:

Category	Total
Study	\$ 10,000
Design	20,000
Equipment	271,000
Software	20,000
Installation	102,000
Remaining Budget	73,000
Project Total	\$496,000

* The work on this project will be performed by a combination of internal staff and consultant labor. The distribution of internal and external labor along with refined cost estimates will be determined during the development of the detailed project work plan.

Project Description – Phase I

Table 12. Power Management Systems

Project Summary

Program Title:	Control System Enhancement Program (CSEP, Approp. 15397)
Project Title:	Power Management Systems
Total Project Estimate:	\$608,000
Project Driver(s):	Customer Service, Reliability, Cost Efficiency/ Productivity

Project Description

Metropolitan presently derives approximately \$20,000,000 in annual income (2% of total income) through electrical power generation. Though this level of generation is larger than many power plants in the US, Metropolitan lacks the sophisticated and dedicated control and management systems these smaller facilities employ. Metropolitan can make significant gains in efficiency, cost recovery, control and planning through the use of more complete instrumentation, and the sophisticated control, management and interface tools now available.

This project will first investigate the commercial off-the-shelf power management systems available in the marketplace, and review their performance at facilities comparable to Metropolitan. It is anticipated that Metropolitan will seek consultant help to identify and rank the alternatives.

Once the most cost-effective power management system has been identified, the project will purchase and integrate the tool into Metropolitan’s enterprise-wide SCADA system.

Background

Coordination of water delivery based on variable electricity rates for both power purchase and power recovery from hydroelectric plants could provide significant savings to Metropolitan and potentially its member agencies. Power Management tools at Metropolitan are currently based on manual input into spreadsheets. The equipment used to monitor and control our power generation systems is antiquated and leads to inefficiencies. Data on these systems is collected manually in the field. Evaluation of how power management and data retrieval can be integrated with our planned power billing system can also be evaluated.

Preliminary Project Summary Estimate*:

Category	Total
Study	\$ 20,000
Design	20,000
Equipment	315,000
Software	30,000
Installation	143,000
Remaining Budget	80,000
Project Total	\$608,000

* The work on this project will be performed by a combination of internal staff and consultant labor. The distribution of internal and external labor along with refined cost estimates will be determined during the development of the detailed project work plan.

Project Description – Phase I

Table 13. Programmable Logic Controller (PLC) Standardization

Project Summary	
Program Title:	Control System Enhancement Program (CSEP, Approp. 15397)
Project Title:	Programmable Logic Controller (PLC) Standardization
Total Project Estimate:	\$713,000
Project Driver(s):	Customer Service, Reliability

Project Description

Metropolitan currently employs 100 installations of programmable logic controllers (PLCs), which control various aspects of the water system. These devices are well suited for local control of processes, and tend to be highly reliable, though they are less flexible than the SCADA system Metropolitan uses for overall control. These PLCs have been installed over the course of many years, and many predate the present SCADA system.

This project will first survey the PLC marketplace and standardize on one or two models that are currently manufactured and supported by reputable and well-established manufacturers. In parallel with this survey, the project will review PLCs now in place at Metropolitan to determine (or recreate, if necessary) their requirements and programming.

On a case-by-case basis, the PLCs will be upgraded or their functionality re-implemented in the existing SCADA system. Given the confined scope and limited duration of this project, it is a likely candidate for outsourcing.

Background

The existing PLC installations comprise 18 different models from ten different manufacturers. Each PLC model requires a specific control system interface to permit communication with the SCADA system. Due to their age, in many cases the units and their operating software are no longer built or supported by their manufacturers. The degree of documentation available on these units and their programming varies; some have none at all.

Many of these units control critical processes, such as hydroelectric plants, emergency generators, treatment plant flocculation systems and desert drinking water systems. In one situation, it took several months to track down the operating software for an outdated PLC that required repair. This project seeks to reduce the risk of unexpected failure of the PLCs.

Preliminary Project Summary Estimate*:

Category	Total
Study	\$ 0
Design	45,000
Equipment	360,000
Software	110,000
Installation	104,000
Remaining Budget	94,000
Project Total	\$713,000

* The work on this project primarily performed by external labor. The distribution of internal and external labor along with refined cost estimates will be determined during the development of the detailed project work plan.

Project Description – Phase I

Table 14. Automatic Meter Reading (AMR) Remote Terminal Unit (RTU) Upgrade Project

Project Summary

Program Title:	Control System Enhancement Program (CSEP, Approp. 15397)
Project Title:	Automatic Meter Reading (AMR) Remote Terminal Unit (RTU) Upgrade Project
Total Project Estimate:	\$2,607,000
Project Driver(s):	Reliability

Project Description

The Automatic Meter Reading (AMR) Remote Terminal Unit (RTU) Upgrade project is the second phase of the AMR RTU Upgrade. The RTU units provide data readings for the SCADA distribution system and water-billing meters. The current units are outdated and no longer manufactured, and run on an analog cellular communications system. The purpose of this project is to replace approximately 350 AMR RTU units with new units based on currently supported digital communications technology.

The industry is transitioning to digital communications, due to its higher reliability and better communications quality. The replacement of these units will result in better communications within the AMR system, and more reliable operations. The new system operates on a communications network that is independent of any outside service provider. Advances in technology will now permit near-real time retrieval of AMR data, compared to the once-per-day retrieval now possible.

Background

The existing AMR system employs an outdated commercially available analog cellular telephone service to report system status and billing information. Project 103052 (previously funded) is implementing and commissioning approximately 25% replacement of the aging AMR System.

This project is designed to replace the remaining 75% of the units that were not upgraded in Project 103052 of the AMR RTU Upgrade project. When this project is completed, the AMR system will have been fully upgraded to a modern, more cost-effective communications technology.

Preliminary Project Summary Estimate*:

Category	Total
Study	\$ 10,000
Design	51,000
Equipment	2,070,000
Software	91,000
Installation	185,000
Remaining Budget	200,000
Project Total	\$2,607,000

* The work on this project will be performed by a combination of internal staff and consultant labor. The distribution of internal and external labor along with refined cost estimates will be determined during the development of the detailed project work plan.

Project Description – Phase I

Table 15. Control System Enhancement Program (CSEP) Implementation

Project Summary

Program Title:	Control System Enhancement Program (CSEP, Approp. 15397)
Project Title:	Control System Enhancement Program (CSEP) Implementation
Total Project Estimate:	\$1,399,000
Project Driver(s):	Cost Efficiency/Productivity, Risk Management, Customer Service, Reliability, Regulatory

Project Description

An oversight project that will house program management activities, a number of studies and implementation efforts, designed to coordinate implementation of the existing projects with those mentioned in the CSEP program, as well as provide direction and preparation for future phases of the Water System Control Master Plan (WSCMP).

This effort involves program management, planning, integration, implementation, quality assurance measures, studies and coordination measures. Quality control, system integration and deployment, training infrastructures, coordination activities and performance measures are included in this project.

The project also includes completion of additional studies identified under the WSCMP. The studies currently identified are as follows:

- SCADA upgrade/replacement Feasibility Study
- Enterprise-wide Control System Integration Planning
- Detailed Redundant Communications Requirements
- Detailed Control System Options Evaluation and Recommendations.

Background

This system is affected by a variety operational, engineering and water quality, business and IT activities and needs. To maintain system-wide efficiency and effectiveness, broad coordination issues need to be studied, planned, managed, implemented and evaluated at a high level.

Preliminary Project Summary Estimate*:

Category	Total
Study	\$ 200,000
Design	232,000
Equipment	60,000
Software	524,000
Installation	244,000
Remaining Budget	139,000
Project Total	\$1,399,000

* The work on this project will be performed by a combination of internal staff and consultant labor. The distribution of internal and external labor along with refined cost estimates will be determined during the development of the detailed project work plan.

Project Description – Phase I

Table 16. Distribution System Equipment and Instrumentation Upgrades

Project Summary	
Program Title:	Distribution System Control and Equipment Upgrade Program (Approp. 15398)
Project Title:	Distribution System Equipment and Instrumentation Upgrades
Total Project Estimate:	\$5,800,000
Project Driver(s):	Reliability, Risk Management, Customer Service, Regulatory, Compliance, Cost Efficiency/Productivity

Project Description

This project begins with a study to determine appropriate distribution system requirements with respect to equipment, instrumentation and standardization. Includes upgrade and/or installation of equipment and instruments, and SCADA programming as required.

In the course of ongoing automation efforts, it has been determined that multiple systems and processes are not in a condition to be automated. Additionally, Metropolitan is currently delineating new automation requirements. In order to meet these expanding requirements, various systems require upgrade and/or new installation of instrumentation and control equipment necessary to provide automation.

This will be a staged effort. The first stage will be to evaluate existing automation capabilities against Metropolitan’s automation objectives. The second and following stages, based on priority, will be to install required instrumentation and equipment (new or upgraded). Additional funding may be requested if required once the scope and requirements are determined by the first stage.

Background

Automation system requires that instrumentation, communications, signal processing and electromechanical equipment be in place to enact the commands of the control system. The infrastructure of the supervisory control computer system is in place, as part of previous efforts; however, in many cases, the integrated equipment needed to complete controllability are not.

Preliminary Project Summary Estimate*:

Category	Total
Study	\$ 50,000
Design	581,000
Equipment	2,622,000
Software	563,000
Installation	1,415,000
Remaining Budget	569,000
Project Total	\$5,800,000

* The work on this project will be performed by a combination of internal staff and consultant labor. The distribution of internal and external labor along with refined cost estimates will be determined during the development of the detailed project work plan.

Project Description – Phase I

Table 17. Enhanced Distribution System Control

Project Summary	
Program Title:	Distribution System Control and Equipment Upgrade Program (Approp. 15398)
Project Title:	Enhanced Distribution System Control, Phase I
Total Project Estimate:	\$2,300,000
Project Driver(s):	Risk Management, Customer Service, Regulatory

Project Description	
<p>This project provides for individual distribution system automation requirements. The requirements for automating distribution system control structures were identified during the field survey of the distribution system conducted as part of the requirements document and are included in the Water System Control Master Plan (WSCMP). Aspects of automating the individual control structures to be implemented as a part of this project include uniform Hydroelectric Plant (HEP) automatic flow transfers, flow control, grade control, hydraulic valve control, auto-adjusting limits, distribution system chemical feeds, and HEP one-button start/stop and high-pressure jacking functionality.</p>	

Background	
<p>Basic (and partial) distribution system automation of control structures is currently underway as part of the SCADA implementation program. Concurrently, the WSCMP is in final review, within which the above requirements were identified. These requirements, taken as a whole, are above and beyond the planned scope original SCADA project. These functions are required to take the distribution system to the level of automation and uniformity of control specified in the WSCMP. This project is necessary to bring all elements of the distribution system to a baseline level so that the next step of network control can begin. To complete this effort specific hardware, software, and instrumentation components are required. Therefore, this project must be done in close coordination with the Distribution System Equipment and Instrumentation Upgrades.</p>	

Preliminary Project Summary Estimate*:

Category	Total
Study	\$ 20,000
Design	62,000
Equipment	115,000
Software	702,000
Installation	1,147,000
Remaining Budget	254,000
Project Total	\$2,300,000

* The work on this project will be performed by a combination of internal staff and consultant labor. The distribution of internal and external labor along with refined cost estimates will be determined during the development of the detailed project work plan.

Project Description – Phase I

Table 18. Treatment Process Assessments

Project Summary

Program Title:	Treatment Plants Control and Equipment Upgrade Program (Approp. 15399)
Project Title:	Treatment Process Assessments
Total Project Estimate:	\$250,000
Project Driver(s):	Reliability

Project Description

The initial study will define project requirements and scope for the optimal level of standardization for the treatment processes to be achieved at the treatment facilities. Due to the differences in facility age and the process design, the level of effort for this project will vary from plant to plant and will be determined during the initial study. The assessment effort will focus on the level of automation and standardization of systems, processes, instrumentation and programming. Subject to the outcome of the study, the future stages of this project will complete the automation of the treatment process at each of the five treatment plants.

The following areas will be evaluated: automated calculations of the filter loading rates and volume of water treated; automated selection of filters and automated adjustments of rise rates based on temperatures; and consideration of optimizing backwash duration based on water clarity; solids removal from sedimentation basins; flocculator staging; basins selection; reclamation plant operations; and sludge processing operations.

Background

At this time, the level of process optimization varies between processes and between facilities. This is primarily the result of differences in the design of the treatment processes; age of the facility, and the degree of automation. The approach proposed for this study is evaluation by process. Each process will be evaluated on a plant-by-plant basis to determine the differences. Once the process assessment is complete, an evaluation will be made to determine whether or not a standardized process across all plants is a viable alternative. The standardized process may include new instrumentation, valves, meters, pumps, piping, and other appurtenant equipment.

Once a standard is developed and installed for the process, a standardized program that achieves an optimal level of automation can be implemented. This work will include programming changes. Standardized processes and optimal level of automation will contribute to increased efficiency for software, hardware and physical asset maintenance.

Preliminary Project Summary Estimate*:

Category	Total
Study	\$180,000
Design	31,000
Equipment	0
Software	0
Installation	0
Remaining Budget	39,000
Project Total	\$250,000

* The work on this project will be performed by a combination of internal staff and consultant labor. The distribution of internal and external labor along with refined cost estimates will be determined during the development of the detailed project work plan.

Project Description – Phase I

Table 19. Treatment Plant Chemical Feed System Standardization and Controls

Project Summary

Program Title:	Treatment Plants Control and Equipment Upgrade Program (Approp. 15399)
Project Title:	Treatment Plant Chemical Feed System Standardization and Controls - Study
Total Project Estimate:	\$250,000
Project Driver(s):	Reliability

Project Description

The initial study will define project requirements and scope for the optimal level of standardization for the chemical feed system to be achieved at the treatment facilities. Due to the differences in facility age and the system design, the level of effort for this project will vary from plant to plant and will be determined during the initial study. The assessment effort will focus on the level of automation and standardization of systems, processes, instrumentation and programming. Subject to the outcome of the study, the future phases of this project will complete the automation of the chemical feed systems at each of the five treatment plants.

Improvements to the operation, monitoring and control of the chemical feed systems at each filtration plant will result from this project. The following areas will be evaluated: chemical unloading facilities; storage tanks; mixing tanks; feed tanks; transfer pumps and valves; piping manifolds; flow meters; pumps and motor controllers; application feed point equipment; and associated instrumentation. The project scope will likely include the installation of new instrumentation, new control valves, equipment, the editing of existing control programs and/or the writing of new control programs.

Background

At this time, the chemical feed systems vary between processes and between facilities. This is primarily the result of differences in the respective age of the facilities; changing design standards and local operations procedures. The approach proposed for this study is evaluation by chemical feed system process. Each system will be evaluated on a plant-by-plant basis to determine the differences. Once the individual system assessment is complete, an evaluation will be made to determine whether or not a standardized feed system for all plants is a viable alternative. The standardize feed system may include new instrumentation, valves, meters, pumps, piping, and other appurtenant equipment.

Once a standard is developed and installed for the feed system, a standardized program that achieves an optimal level of automation can be implemented. This work will include programming changes. Standardized feed systems and optimal level of automation will contribute to increased efficiency for software, hardware and physical asset maintenance.

Preliminary Project Summary Estimate*:

Category	Total
Study	\$224,000
Design	26,000
Equipment	0
Software	0
Installation	0
Remaining Budget	0
Project Total	\$250,000

* The work on this project will be performed by a combination of internal staff and consultant labor. The distribution of internal and external labor along with refined cost estimates will be determined during the development of the detailed project work plan.

Project Description – Phase I

Table 20. Replace Faulty Instrumentation and Investigate Upgrades

Project Summary	
Program Title:	Treatment Plants Control and Equipment Upgrade Program (Approp. 15399)
Project Title:	Replace Outdated Instrumentation and Investigate Upgrades
Total Project Estimate:	\$400,000
Project Driver(s):	Regulatory

Project Description	
<p>Replace outdated water quality monitoring instruments at Metropolitan’s five water treatment plants and investigate the most cost effective way to systematically upgrade all water quality monitoring instrumentation over a 10-year period. These on-line monitoring instruments are essential to safely operating the complex treatment processes that make up the water treatment plants. As new treatment technologies are implemented to meet the ever-increasing water quality regulations, the reliance on these instruments to maintain quality assurance for the treatment processes increase substantially.</p>	

This work is the first phase of an overall program that will provide for scheduled upgrades of on-line water quality monitoring instruments to assure continued treatment process compliance with drinking water regulations, meet automation goals and standardize equipment use. They are the first line of defense in indicating problems or failures within individual treatment processes. This early warning system provided by these devices allows operators time to take the necessary corrective actions to avoid significant water quality incidents. The water quality monitoring equipment includes turbidity meters, chlorine analyzers, ammonia analyzers, dissolved oxygen meters, PH meters, temperature probes and electrical conductivity analyzers.

Background	
<p>This project is necessary to assure continued regulatory compliance by accurately monitoring the individual unit processes at the treatment plants and to meet the Metropolitan’s goal of compliance with all primary drinking water standards. There are three primary reasons for this project: (1) outdated water quality monitoring instrumentation must be replaced or added to ensure continued quality assurance and compliance with drinking water regulations; (2) the equipment needs to be standardized to one or two brands to ensure effectiveness of maintenance programs; and (3) the equipment needs to be upgraded to make effective use of Metropolitan’s automation initiatives including the digital signal processing capabilities.</p>	

The consistent use of high quality standardized instruments will help assure compliance with regulations while reducing maintenance and calibration efforts. An investigation is required to determine the most cost-effective way to properly upgrade all water quality monitoring instrumentation at the five treatment plants.

Preliminary Project Summary Estimate*:

Category	Total
Study	\$ 10,000
Design	10,000
Equipment	241,000
Software	30,000
Installation	69,000
Remaining Budget	40,000
Project Total	\$400,000

* The work on this project will be performed by a combination of internal staff and consultant labor. The distribution of internal and external labor along with refined cost estimates will be determined during the development of the detailed project work plan.

Project Description – Phase I

Table 21. Instrumentation/Control System Changes for Treatment Plants

Project Summary

Program Title:	Treatment Plants Control and Equipment Upgrade Program (Approp. 15399)
Project Title:	Instrumentation/Control System Changes for Treatment Plants
Total Project Estimate:	\$500,000
Project Driver(s):	Cost Efficiency, Risk Management, Customer Support, Reliability

Project Description

This project complements the Distribution System Equipment and Instrumentation Upgrade project and is specific to control system enhancement efforts at the treatment plants. Additionally, this project includes incorporating the status reporting of several systems that currently are not tied into the SCADA system for improved monitoring capabilities. In the Water System Control Master Plan, standardized installation and replacement of needed or aging primary and secondary instrumentation and measuring devices were identified as requirements. In order to utilize new and changed instrumentation in the control system, this project will make the needed programming changes, upon completion of an initial assessment.

Background

Many of the current instruments and measuring devices at the treatment plants are outdated, or require excessive maintenance to keep them useable. This affects Operations' labor efficiency and ability to accurately and reliably control various processes or systems within the treatment plants. In other cases, sufficient instrumentation is not available to remotely control or automate unit processes. This effort contributes to Metropolitan's ability to maintain expanded facilities with minimal increases to staffing levels.

Preliminary Project Summary Estimate*:

Category	Total
Study	\$ 30,000
Design	105,000
Equipment	21,000
Software	105,000
Installation	170,000
Remaining Budget	69,000
Project Total	\$500,000

* The work on this project will be performed by a combination of internal staff and consultant labor. The distribution of internal and external labor along with refined cost estimates will be determined during the development of the detailed project work plan.

FINANCIAL STATEMENT

The following are estimated cost breakdowns of Board Action No. 1 for Appropriation Nos. 15397, 15398 and 15399 to upgrade control, data acquisition, integration and optimization of Metropolitan’s conveyance, treatment and distribution processes as defined in the Water System Control Master Plan. The projects include control improvements for the distribution system, CRA system and treatment plants, improved SCADA communications reliability and security, data warehousing, reporting, business support and preparation for Phases II and III.

Cost Breakdown for the Control System Enhancement Program
(Appropriation No. 15397)

	BOARD ACTION NO. 1 (Oct. 2002)
Labor and Additives	1,783,500
Materials & Supplies	3,271,900
Incidental Expenses	139,100
Professional & Technical	2,752,800
Operating Equipment	650,000
Administrative Charges	954,400
Remaining Budget	1,448,300
Total	\$11,000,000

FUNDING REQUEST

Program Name:	Control System Enhancement Program				
Source of Funds:	Both Revenue Bonds and Pay-As-You-Go Fund				
Appropriation No.:	15397	Board Action No.:	1	Budget:	\$ 11,000,000
Requested Amount:	\$ 11,000,000		Capital Program No.:	01223	
Total Appropriated Amount:	\$ 11,000,000		Capital Program Page No.:	E-17	
Total Program Estimate:	\$ 11,000,000		Program Category:	Infrastructure	

FINANCIAL STATEMENT

Cost Breakdown for the Distribution System Control and Equipment Upgrade Program
(Appropriation No. 15398)

**BOARD ACTION
NO. 1
(Oct. 2002)**

Labor and Additives	3,637,500
Materials & Supplies	2,269,700
Incidental Expenses	314,800
Professional & Technical	218,500
Operating Equipment	279,900
Administrative Charges	556,800
Remaining Budget	822,800
Total	\$8,100,000

FUNDING REQUEST

Program Name:	Distribution System Control and Equipment Upgrade				
Source of Funds:	Pay-As-You-Go Fund				
Appropriation No.:	15398	Board Action No.:	1	Budget:	\$ 8,100,000
Requested Amount:	\$ 8,100,000	Capital Program No.:	02306		
Total Appropriated Amount:	\$ 8,100,000	Capital Program Page No.:	E-34		
Total Program Estimate:	\$ 8,100,000	Program Category:	Supply & Delivery Reliability		

FINANCIAL STATEMENT

Cost Breakdown for the Treatment Plants Control and Equipment Upgrade Program
(Appropriation No. 15399)

	BOARD ACTION NO. 1 (Oct. 2002)
	<hr/>
Labor and Additives	849,300
Materials & Supplies	219,200
Incidental Expenses	15,700
Professional & Technical	0
Operating Equipment	5,100
Administrative Charges	162,300
Remaining Budget	148,400
Total	\$1,400,000

FUNDING REQUEST

Program Name:	Treatment Plants Control and Equipment Upgrade				
Source of Funds:	Pay-As-You-Go Fund				
Appropriation No.:	15399	Board Action No.:	1	Budget:	\$ 1,400,000
Requested Amount:	\$ 1,400,000		Capital Program No.:	02307	
Total Appropriated Amount:	\$ 1,400,000		Capital Program Page No.:	E-70	
Total Program Estimate:	\$ 1,400,000		Program Category:	Regulatory – Water Quality	