MWD
METROPOLITAN WATER DISTRICT OF SOUTHERN CALIFORNIA

BOARD ACTION

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

October 12, 2004 Board Meeting

9-2

Subject

Appropriate $6.31 million; and award two contracts to replace filter media in the amount of $2,717,518 to Carbon Activated Corp. for the Jensen Improvements Program (Approp. 15371), and $2,208,850.71 to ERS Industrial Services, Inc. for the Mills Improvements Program (Approp. 15381)

Description

In response to the U.S. Environmental Protection Agency's Stage 1 Disinfectants/Disinfection By-Products (D/DBP) Rule that became effective in 2002, Metropolitan installed ozone facilities at the Henry J. Mills Filtration Plant and is in the process of installing ozone facilities at the Joseph Jensen Filtration Plant. The Mills ozone facilities became operational in October 2003; the Jensen ozone facilities are currently under construction with a scheduled completion date of June 2005.

The ozone process at the Jensen and Mills plants requires the use of biological filtration. Biological filtration is a new process step that: (1) reduces the formation of chlorinated disinfection by-products, (2) removes ozone disinfection by-products, (3) reduces the decay rate of chloramines, and (4) reduces the ability of microorganisms to re-grow in the distribution system. Biological filtration is initiated by halting the continuous application of chlorine onto the filters which are downstream of ozonation. Specifically, chlorine is not added to the treatment process until after the filters.

When biological filtration commenced at the Mills plant in November 2003, the plant effluent turbidity increased and a number of colored water complaints were received from consumers. An immediate investigation revealed that soluble manganese was being released from the filters which, when chlorinated in the filter effluent conduit, produced a manganese precipitate that imparted turbidity and a yellowish or brownish color to the water. Although no violation of a health-based primary drinking water standard occurred, manganese exceeded the aesthetic-based secondary drinking water standard. Resumption of filter inlet chlorination stopped both the release of manganese from the filters and the associated consumer complaints but resulted in elevated DBPs, as compared to no inlet chlorination.

Subsequent testing determined that the ferric chloride coagulant used at the Mills plant since 1994 contained manganese as a trace constituent. The manganese in the ferric chloride gradually accumulated onto the filter media (when chlorine was being continuously applied) and later was rapidly released when chlorine was discontinued. Routine monitoring for manganese at the plant effluent did not reveal this impending issue, and no previously published studies are known which described similar problems. A survey of Metropolitan's other treatment plants using ferric chloride also revealed manganese accumulation on the filter media. In response, the primary coagulant is being switched to aluminum sulfate (alum) at all Metropolitan plants, wherever feasible, to prevent further accumulation of manganese. Once a higher purity ferric chloride product can be obtained, the treatment plants will likely return to ferric chloride coagulation. Although other primary coagulants exist, ferric chloride has been found to be a more effective primary coagulant for DBP precursor removal in State Water Project supplies.

A number of bench-, pilot-, and demonstration-scale tests were conducted to evaluate methods to either remove the manganese from the filter media or to control the manganese release to acceptable levels. Unfortunately, no method other than replacement of the filter media at Jensen and Mills will assure performance without unacceptably constraining plant operations.

Unacceptably high concentrations of manganese remain on the filter media at Jensen and Mills, and without mitigation, consumers would receive colored water when biological filtration is initiated. Staff recommends removal and replacement of the manganese-contaminated filter materials. At the Mills plant, all filter materials within Modules 3 and 4 should be replaced due to the high levels of manganese detected. At Jensen, partial media replacement will be conducted, as lower manganese levels were detected in the media compared to the Mills plant. For Jensen, approximately 50 percent of the filter materials will be replaced. Replacement of the manganese-containing filter media with new media will then allow all of the benefits of ozone coupled with biological filtration to be realized with the use of either alum or ferric chloride containing negligible manganese.

Although filter media replacement at Jensen and Mills is recommended at this time, staff continues to investigate alternative solutions that may eliminate the need to replace filter media at the remaining plants (Skinner, Weymouth, and Diemer). Staff will report to the Board any developments that may impact this filter media replacement strategy.

Jensen Improvements Program: Jensen Filter Materials Replacement ($3,530,000)

The Jensen Filter Materials Replacement Project consists of removal and disposal of the existing anthracite coal and upper one-half of the silica sand layer from 40 filter units in Modules 1, 2 and 3; installation of new anthracite and silica sand in all 40 filters; and other appurtenant work.

Specifications No. 1508, the Joseph Jensen Filtration Plant Modules 1, 2, and 3 Filter Materials Replacement Project, was advertised for bids in June 2004. Four bids were received on July 27, 2004. The low bid from Carbon Activated Corp., in the amount of $2,717,518, complies with the requirements of the specifications. For this project, Metropolitan requires Small Business Enterprise (SBE) participation of at least 26 percent of the total construction bid. Carbon Activated Corp. is an SBE firm and thus achieves 100 percent participation.

This action appropriates $3.53 million in budgeted funds under the Jensen Improvements Program and awards a construction contract to Carbon Activated Corp. for replacement of filter materials in Modules 1, 2, and 3 at the Jensen plant.

Mills Improvements Program: Mills Filter Materials Replacement ($2,780,000)

The Mills Filter Materials Replacement Project consists of removal and disposal of the existing anthracite coal, sand, and gravel filter material from 32 filter units in Modules 3 and 4; cleaning of filter beds; installation of new filter media in all 32 filters; and other appurtenant work. Modules 1 and 2 are not currently in service and therefore do not require materials replacement; the need to replace the materials in these filters will be reevaluated when the modules are brought back on-line.

Specifications No. 1509, the Henry J. Mills Filtration Plant Modules 3 and 4 Filter Materials Replacement Project, was advertised for bids in June 2004. Three bids were received on July 29, 2004. The low bid from ERS Industrial Services, Inc., in the amount of $2,208,850.71, complies with the requirements of the specifications. For this project, Metropolitan requires SBE participation of at least 26 percent of the total construction bid. ERS Industrial Services, Inc. is an SBE firm and thus achieves 100 percent participation.

This action appropriates $2.78 million in budgeted funds under the Mills Improvements Program and awards a construction contract to ERS Industrial Services, Inc. for replacement of filter materials in Modules 3 and 4 at the Mills plant.

The Jensen Filter Materials Replacement Project (Approp. 15371) and the Mills Filter Materials Replacement Project (Approp. 15381) have been evaluated and recommended by Metropolitan's Capital Investment Plan Evaluation Team and funds have been included in the fiscal year 2004/2005 capital budget. See **Attachment 1** for the Detailed Report, **Attachment 2** for the Abstracts of Bids, **Attachment 3** for the Financial Statement for Jensen, **Attachment 4** for the Financial Statement for Mills, and **Attachment 5** for the Location Map.

Policy

Metropolitan Water District Administrative Code § 5108: Capital Project Appropriation
Metropolitan Water District Administrative Code § 8113: Construction Contract Award

California Environmental Quality Act (CEQA)

CEQA determination for Option #1:

The proposed actions are categorically exempt under the provisions of CEQA and the State CEQA Guidelines. The overall activities involve the funding, design, minor alterations and replacement of existing public facilities with negligible or no expansion of use and no possibility of significantly impacting the physical environment. Accordingly, the proposed actions qualify under Class 1 and Class 2 Categorical Exemptions (Sections 15301 and 15302 of the State CEQA Guidelines).

The CEQA determination is: Determine that pursuant to CEQA, the proposed actions qualify under two Categorical Exemptions (Class 1, Section 15301 and Class 2, Section 15302 of the State CEQA Guidelines).

CEQA determination for Option #2:

None required

Board Options/Fiscal Impacts

Option #1

Adopt the CEQA determination and

a. Appropriate $6.31 million in budgeted funds;
b. Award a construction contract for $2,717,518 to Carbon Activated Corp. for partial replacement of filter media at the Jensen filtration plant Modules 1, 2, and 3; and
c. Award a construction contract for $2,208,850.71 to ERS Industrial Services, Inc. for replacement of filter media at the Mills filtration plant Modules 3 and 4.

Fiscal Impact: $3.53 million of budgeted funds under Approp. 15371; $2.78 million of budgeted funds under Approp. 15381

Option #2

Reject all bids and attempt to receive more favorable bids.
Fiscal Impact: None

Staff Recommendation

Option #1

Roy L. Wolfe 9/14/2004
Roy L. Wolfe *Date*
Manager, Corporate Resources

Ronald R. Gastelum 9/20/2004
Ronald R. Gastelum *Date*
Chief Executive Officer

Attachment 1 – Detailed Report

Attachment 2 – Abstracts of Bids

Attachment 3 – Financial Statement for Jensen Improvements Program

Attachment 4 – Financial Statement for Mills Improvements Program

Attachment 5 – Joseph Jensen and Henry J. Mills Filtration Plants Location Map

BLA #2981

Detailed Report

The Joseph Jensen Filtration Plant was placed into service in 1972 with an initial capacity of 350 million gallons per day (mgd). The plant was expanded in the early 1990s to its current capacity of 750 mgd. The Jensen plant exclusively treats California State project water supplies and delivers treated water to Metropolitan's Central Pool portion of the distribution system in addition to portions of Ventura County.

The Henry J. Mills Filtration Plant was placed into service in 1978 with an initial capacity of 75 mgd. The plant was expanded twice and is currently rated to treat 160 mgd, the design capacity of the existing Mills plant ozonation facilities. The Mills plant exclusively treats California State project water and delivers treated water to Eastern Municipal Water District and Western Municipal Water District of Riverside County.

The Jensen and Mills Improvements Programs were established to ensure plant reliability and to comply with drinking water and environmental regulations.

Background

Stage 1 of the Disinfectants/Disinfection By-Products (D/DBP) Rule, which was promulgated by the U.S. Environmental Protection Agency became effective on January 1, 2002. The Rule includes two components: (1) new and reduced maximum contaminant levels (MCLs) for disinfection by-products, and (2) implementation of a treatment technique (e.g., ozone disinfection or total organic carbon removal) for many surface waters. Water utilities must comply with both components of the rule. For the Mills and Jensen plants, Metropolitan committed to ozone disinfection as an alternative to the total organic carbon (TOC) removal portion of the D/DBP Rule. This commitment requires that the ozone technology (an alternative "treatment technique") be installed and operational no later than June 30, 2005. The ozone technology must limit the levels of certain DBPs to one-half the Stage 1 D/DBP Rule MCLs [i.e., total trihalomethanes (TTHMs) must be no more than 40 micrograms per liter (μg/L) and haloacetic acids (HAAs) no more than 30 μg/L].

Metropolitan has retrofitted the Mills plant with ozonation facilities to meet the "treatment technique" component of Stage 1 of the D/DBP Rule. Retrofit of the Jensen plant with ozonation facilities is currently underway. Upon completion, the water treatment process will include raw water ozonation, coagulation, flocculation, sedimentation, biological filtration, and final disinfection using chlorine and ammonia. The oxidation retrofit projects are designed to use biological filtration to minimize the presence of many ozone disinfection by-products and to produce biologically stable water.

Manganese Release from Filters

To implement the Mills ozone operational strategy, chlorination upstream of the filters ("filter influent chlorination") was halted in November 2003 to promote biologically active filters and control DBP formation. This operational switch caused manganese to be released from the filters into the finished water. The manganese had been deposited over time in the filters from the ferric chloride coagulant, while continued filter influent chlorination had previously prevented the release of the manganese. Following the operational switch, higher turbidity levels due to excessive manganese resulted in a yellowish or brownish color in the Mills plant finished water, and consumer complaints were received. Manganese is regulated by a secondary MCL, established to address issues of aesthetics (discoloration), not health concerns. Other potential consumer complaints from manganese could include brownish staining of laundry, deposits on plumbing fittings and cooking utensils, and objectionable tastes in beverages and food. Staff reinstated filter influent chlorination in December 2003 at the Mills plant, and consumer complaints stopped.

Manganese is a common metallic element found in the earth's crust and is present in our raw water supply at very low levels (typically less than 5 ppb). A more significant source of manganese is also introduced into raw water when ferric chloride is used in the coagulation process. Ferric chloride has been used at Metropolitan's treatment plants to more efficiently remove arsenic and the precursors that form DBPs. Ferric chloride is typically made by dissolving "spent" steel in acid. If the spent steel contains excessive manganese, the ferric chloride product will

also contain excessive manganese. The ferric chloride purchased by Metropolitan has contained elevated levels of manganese.

Due to the practice of filter influent chlorination, soluble manganese from the ferric chloride coagulant was absorbed onto the filter media and then slowly oxidized and accumulated. When filter influent chlorination was halted at the Mills plant, insoluble manganese held within the filters changed to the soluble form and was released from the filters. Routine monitoring for manganese at the Mills plant effluent did not reveal this impending issue, and no previous studies are known which describe similar problems. Subsequent testing revealed that the Mills filters contain high levels of manganese throughout the filter media and the supporting filter gravel materials. The Jensen filters contain high levels of manganese only in the top anthracite coal layer, due to the lower applied ferric chloride dosages, shorter duration of ferric chloride coagulation, and other plant-specific conditions. Because the ferric chloride coagulant is also being used at the Diemer, Skinner, and Weymouth plants, testing is currently being conducted on those plants' filter media. In response to the Mills incident, staff has modified Metropolitan's ferric chloride supply contracts to require substantially less manganese within the product supplied to all filtration plants. In addition, the coagulant used at the Jensen and Mills plants has been switched from ferric chloride to alum to prevent further manganese accumulation.

To comply with the D/DBP Rule, Metropolitan provided the California Department of Health Services with evidence of Metropolitan's financial commitment and accompanying project schedules to build the Jensen and Mills ozone facilities. Under this commitment, the Mills plant was to begin meeting a treatment technique for DBP precursors by October 2003, coincident with the completion of the ozone facilities. Because of the return to filter influent chlorination, the Mills plant is unable to switch to biological filtration and cannot meet the originally intended treatment technique (which avoided enhanced coagulation by limiting trihalomethanes and haloacetic acids to low levels) until the manganese issue is resolved. The Mills plant remains in compliance with the D/DBP Rule via enhanced coagulation, but ultimately, through the use of both ozonation and biological filtration, the Mills plant will instead comply with the originally intended option.

The Jensen ozone facilities are required to be on-line by July 2005, at which time the Jensen plant will meet the lower MCLs. Similarly, halting the filter influent chlorination would allow release of accumulated manganese from the Jensen filters unless a preemptive action is taken.

Evaluation of Alternatives and Recommendations

Staff evaluated several alternatives that would allow the Jensen and Mills filters to become biologically active over time without generating manganese-related consumer complaints. Alternatives evaluated to address the accumulated manganese include: (1) acid washing the filter materials in place to remove the manganese; (2) adding a metered reducing agent to slowly release the manganese from the filters; (3) adding a sequestering agent to keep the manganese in soluble form; and (4) removing and replacing the manganese-contaminated filter materials. Tests of Alternatives 1, 2, and 3 were not acceptable for a variety of reasons and were eliminated from further consideration. By modifying the ferric chloride supply contracts to reduce manganese and/or switching to alum, the source of incoming manganese has been greatly reduced. At this time, staff recommends removing and replacing the manganese-contaminated filter media.

Jensen Improvements Program

Jensen Filter Materials Replacement ($3,530,000)

Project Description

This project consists of removal and disposal of existing anthracite coal and the upper one-half of the silica sand layer in all 40 filter units in Modules 1, 2, and 3; furnishing and installing new filter media; and other appurtenant work. Replacement of the manganese-contaminated filter media with fresh media will allow use of biological filtration coupled with ozonation to control DBPs. The Jensen ORP is scheduled to be completed by July 1, 2005, while the Jensen media replacement is scheduled to be completed in June 2005 to allow use of biological filtration in the ozonation process and compliance with the D/DBP Rule.

Bid Results and Business Outreach

As shown in Attachment 2, four bids were received and opened under Specifications No. 1508. The low bid from Carbon Activated Corp. in the amount of $2,717,518 complies with the requirements of the specifications. The engineer's estimate for this project was $3,986,000. Staff investigated the cause of the difference between the low bid and the engineer's estimate, and attribute the difference to lower filter media removal costs and lower disposal costs. For this project, Metropolitan requires Small Business Enterprise (SBE) participation of at least 26 percent of the total construction bid. Carbon Activated Corp. is a SBE and thus achieves 100 percent participation.

Cost Estimate

Attachment 3 shows the financial statement for the Jensen Filter Materials Replacement Project. Metropolitan staff will perform construction management and inspection of this project. The cost of these services as a percentage of the total construction cost is approximately 12.5 percent. The Engineering Services goal for inspection of construction contracts of less than $10 million is 9 to 15 percent. This percentage is higher than that for the Mills plant filter materials replacement project, due to the longer duration of the contract for the Jensen plant and the larger volume of media requiring continuous inspection during placement.

Project Milestones

- November 2004 – Issue Notice to Proceed to contractor
- July 2005 – Completion of materials replacement contract

Mills Improvements Program

Mills Filter Materials Replacement ($2,780,000)

Project Description

This project consists of removal and disposal of existing anthracite coal, sand, and gravel filter media from 32 filter units in Modules 3 and 4; cleaning of filter beds; furnishing and installing new filter media; and other appurtenant work. Replacement of the manganese-contaminated filter media with fresh media will allow use of biological filtration coupled with ozonation to control DBPs. The filter media in Modules 1 and 2 has less manganese and is not being replaced at this time, as Modules 1 and 2 are not currently in service. The need to replace the filter media in these modules will be reevaluated when the modules are brought back on-line.

Bid Results and Business Outreach

As shown in Attachment 2, three bids were received and opened under Specifications No. 1509. The low bid from ERS Industrial Services, Inc. in the amount of $2,208,850.71 complies with the requirements of the specifications. The engineer's estimate was $3,320,000. Staff investigated the cause of the difference between the low bid and the engineer's estimate, and attribute the difference to lower filter media removal costs and lower disposal costs. For this project, Metropolitan requires SBE participation of at least 26 percent of the total construction bid. ERS Industrial Services, Inc. is a SBE and thus achieves 100 percent participation.

Cost Estimate

Attachment 4 shows the financial statement for the Mills Filter Materials Replacement Project. Metropolitan staff will perform construction management and inspection of this project. The cost of these services as a percentage of the total construction cost is approximately 9.4 percent. The Engineering Services goal for inspection of construction contracts of less than $10 million is 9 to 15 percent.

Project Milestones

- November 2004 – Issue Notice to Proceed to contractor
- May 2005 – Completion of materials replacement contract

The Metropolitan Water District of Southern California

Abstract of Bids Received on July 27, 2004 at 2:00 P.M.

Specifications No. 1508

Joseph Jensen Filtration Plant Modules 1, 2, & 3 Filter Materials Replacement

The contract consists of removal and disposal of the existing anthracite and half of the underlying silica sand filter material from 40 filter units in Modules 1, 2, and 3; providing and installing new filter anthracite and silica sand in all 40 filters; and other appurtenant work as specified in Specifications No. 1508.

Engineer's Estimate: $3,986,000

Bidder and Location	Total	SBE $	SBE %	Met SBE*
Carbon Activated Corp. – Compton, CA	$2,717,518	$2,717,518	100%	Yes
ERS Industrial Services, Inc. – Fremont, CA	$2,792,619	N/A	N/A	N/A
Kiewit Pacific Co. – Santa Fe Springs, CA	$3,855,217	N/A	N/A	N/A
ABHE & Svoboda, Inc. – Prior Lake, MN	$3,898,290	N/A	N/A	N/A

* SBE (Small Business Enterprise) Participation set at 26 percent
N/A – Not Applicable

The Metropolitan Water District of Southern California

Abstract of Bids Received on July 29, 2004 at 2:00 P.M.

Specifications No. 1509

Henry J. Mills Filtration Plant Modules 3 & 4 Filter Materials Replacement

The contract consists of removal, disposal, and replacement of the filter materials from 32 filter units in Modules 3 and 4 and other appurtenant work as specified in Specifications No. 1509.

Engineer's Estimate: $3,320,000

Bidder and Location	Total	SBE $	SBE %	Met SBE*
ERS Industrial Services, Inc. – Fremont, CA	$2,208,850.71	$2,208,850.71	100%	Yes
ABHE & Svoboda, Inc., – Alpine, CA	$2,672,720	N/A	N/A	N/A
Kiewit Pacific Co. – Santa Fe Springs, CA	$2,830,989	N/A	N/A	N/A

* SBE (Small Business Enterprise) Participation set at 26 percent
N/A – Not Applicable

Financial Statement for Jensen Improvements Program

A breakdown of Board Action No. 6 for Appropriation No. 15371 for the removal and replacement of filter media is as follows:

	Previous Total Appropriated Amount (Apr. 2004)	Current Board Action No. 6 (Oct. 2004)	New Total Appropriated Amount
Labor			
Studies and Investigations	$ 450,000	$ 2,000	$ 452,000
Design and Specifications	895,000	38,000	933,000
Owner Costs (Program management)	473,000	40,000	513,000
Construction Inspection and Support	455,000	338,000	793,000
Metropolitan Force Construction	882,000	40,000	922,000
Materials and Supplies	1,550,000	0	1,550,000
Incidental Expenses	77,000	5,000	82,000
Professional/Technical Services	550,000	0	550,000
Equipment Use	80,000	0	80,000
Contracts	3,100,000	2,748,000	5,848,000
Remaining Budget	1,248,000	321,000	1,569,000
Total	**$ 9,760,000**	**$ 3,532,000**	**$13,292,000**

Funding Request

Program Name:	Jensen Improvements Program		
Source of Funds:	Construction Funds (Revenue Bonds, Replacement and Refurbishment Fund)		
Appropriation No.:	15371	**Board Action No.:**	6
Requested Amount:	$ 3,532,000	**Capital Program No.:**	15371-I
Total Appropriated Amount:	$ 13,292,000	**Capital Program Page No.:**	E-41
Program Estimate:	$ 45,770,000	**Program Goal:**	I-Infrastructure Reliability

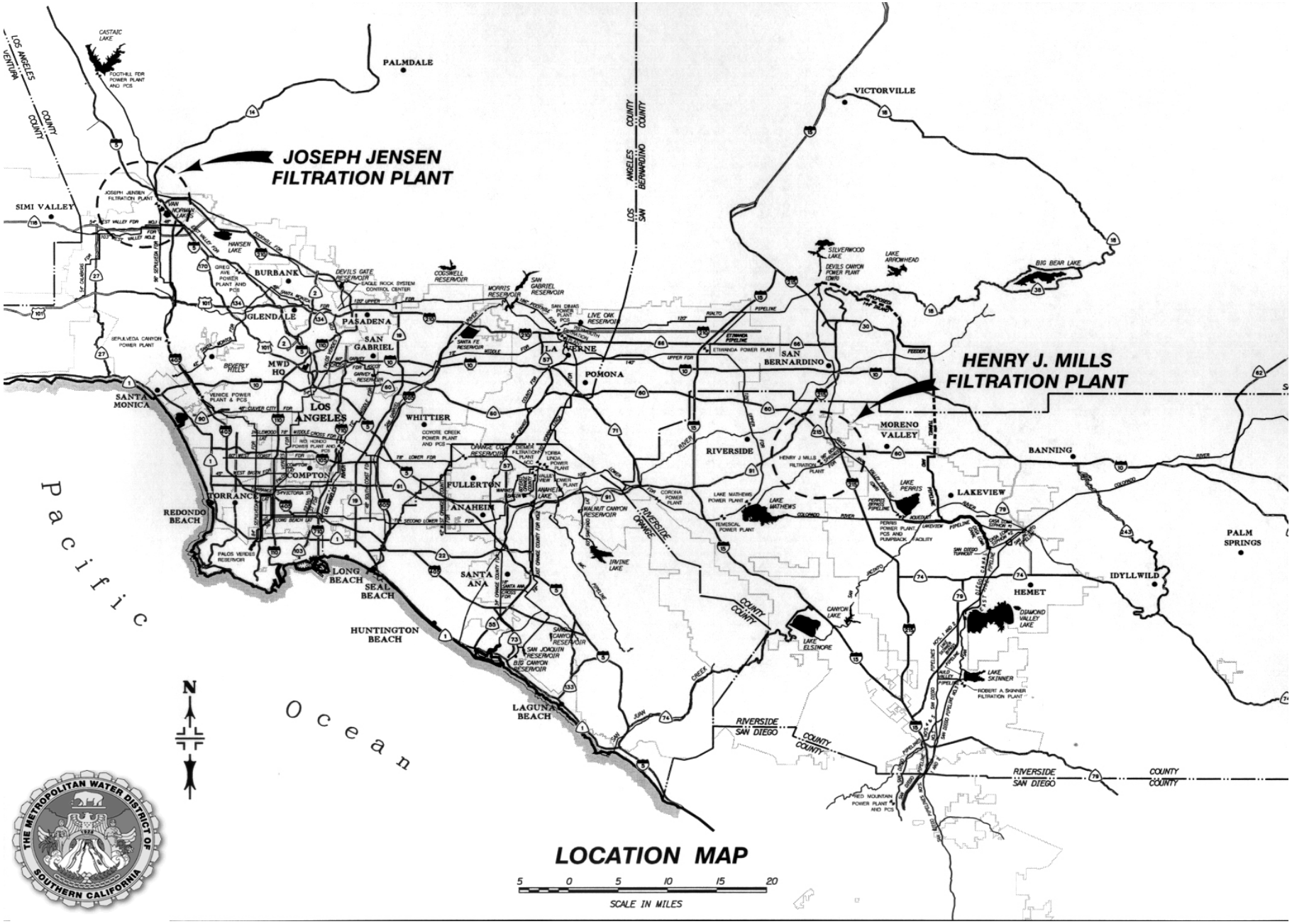
Financial Statement for Mills Improvements Program

A breakdown of Board Action No. 4 for Appropriation No. 15381 for the removal and replacement of filter materials is as follows:

	Previous Total Appropriated Amount (Sept. 2002)	Current Board Action No. 4 (Oct. 2004)	New Total Appropriated Amount
Labor			
Studies and Investigations	$ 109,000	$ 2,000	$ 111,000
Design and Specifications	475,000	38,000	513,000
Owner Costs (Program management)	140,000	30,000	170,000
Construction Inspection and Support	10,000	182,000	192,000
Metropolitan Force Construction	85,000	32,000	117,000
Materials and Supplies	75,000	0	75,000
Incidental Expenses	7,000	5,000	12,000
Professional/Technical Services	21,000	0	21,000
Equipment Use	8,000	0	8,000
Contracts	115,000	2,239,000	2,354,000
Remaining Budget	151,000	253,000	403,000
Total	**$ 1,196,000**	**$ 2,781,000**	**$3,977,000**

Funding Request

Program Name:	Mills Improvements Program		
Source of Funds:	Construction Funds (Revenue Bonds, Replacement and Refurbishment Fund)		
Appropriation No.:	15381	**Board Action No.:**	4
Requested Amount:	$ 2,781,000	**Capital Program No.:**	15381-I
Total Appropriated Amount:	$ 3,977,000	**Capital Program Page No.:**	E-50
Program Estimate:	$ 9,410,000	**Program Goal:**	I-Infrastructure Reliability


JOSEPH JENSEN FILTRATION PLANT
HENRY J. MILLS FILTRATION PLANT
LOCATION MAP
SCALE IN MILES
5 0 5 10 15 20
N
Pacific Ocean
PALMDALE
VICTORVILLE
SIMI VALLEY
BURBANK
GLENDALE
PASADENA
SAN GABRIEL
LA VERNE
POMONA
SAN BERNARDINO
SANTA MONICA
LOS ANGELES
WHITTIER
COMPTON
TORRANCE
REDONDO BEACH
FULLERTON
ANAHEIM
SANTA ANA
LONG BEACH
SEAL BEACH
HUNTINGTON BEACH
LAGUNA BEACH
RIVERSIDE
MORENO VALLEY
BANNING
LAKEVIEW
HEMET
IDYLLWILD
PALM SPRINGS
BIG BEAR LAKE
LAKE ARROWHEAD
SILVERWOOD LAKE
LAKE PERRIS
LAKE MATHEWS
IRVINE LAKE
CANYON LAKE
LAKE ELSINORE
DIAMOND VALLEY LAKE
LAKE SKINNER
LOS ANGELES COUNTY
VENTURA COUNTY
SAN BERNARDINO COUNTY
RIVERSIDE COUNTY
ORANGE COUNTY
SAN DIEGO COUNTY
RIVERSIDE SAN DIEGO COUNTY
THE METROPOLITAN WATER DISTRICT OF SOUTHERN CALIFORNIA