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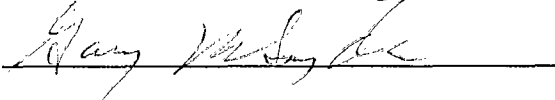
METROPOLITAN WATER DISTRICT OF SOUTHERN CALIFORNIA

7-2

December 10, 1996

To: Board of Directors (Engineering and Operations Committee--Action)
(Finance and Insurance Committee--Action)

From: General Manager 

Submitted by: Gary M. Snyder
Chief Engineer 

Subject: Appropriation No. 15297 for \$1,900,000 to Assess the Condition of
Metropolitan's Prestressed Concrete Cylinder Pipe, and Delegation of Authority
to Award Contracts

RECOMMENDATIONS

It is recommended that your Board authorize the General Manager to have all work performed for the assessment of the condition of Metropolitan's Prestressed Concrete Cylinder Pipe and delegate to the General Manager the authority to award a competitively bid contract, in form approved by the General Counsel and not to exceed \$400,000 for performance of such work.

It is recommended that your Board authorize Appropriation No. 15297 in the amount of \$1,900,000 from the Pay-As-You-Go Fund to finance all estimated costs to assess the condition of Metropolitan's prestressed concrete cylinder pipe.

EXECUTIVE SUMMARY

Approval of these recommendations will appropriate funds and authorize all work for the Prestressed Pipe Assessment Program (Program). Under the Program, staff will conduct field soil resistivity measurements along existing prestressed concrete cylinder pipe to determine corrosivity of the pipe's environment, collect soil samples for chemical analysis, develop acoustic emission and impact echo technologies for application to prestressed concrete cylinder pipe, evaluate hydrophone listening devices to detect distressed pipe sections, and evaluate all data to categorize and rank Metropolitan's existing prestressed concrete cylinder pipe. The total estimated cost of the Program is \$1,900,000, which is anticipated to be completed in June 1999.

CAPITAL FUNDING REQUEST

Project Name: Assess the Condition of Metropolitan's Prestressed Concrete Cylinder Pipe		
Appropriation No. 15297	Funding Request No.: New	Amount: \$1,900,000
Source of Funds: Pay-As-You-Go Fund		
FY 96/97 Budget: No <input type="checkbox"/> Yes <input checked="" type="checkbox"/> @ \$268,000		Capital Program: 5-0602-31 Page No. Reference: 24
<u>Project Justification and Type:</u> (check all applicable)		
<input type="checkbox"/> Meet Water Demands	<input type="checkbox"/> New Facility	<input type="checkbox"/> Replacement
<input type="checkbox"/> Mandated By Law	<input checked="" type="checkbox"/> Improvement	<input type="checkbox"/> Expansion
<input checked="" type="checkbox"/> Asset Protection/Risk Mgt.		
<input checked="" type="checkbox"/> Cost Avoidance		
<input type="checkbox"/> Other _____		

PROJECT DESCRIPTION

Metropolitan owns and operates approximately 170 miles of prestressed concrete cylinder pipe (PCCP) which was installed between 1965 and 1985. Pipe diameters range from 54 to 201 inches, and the pipelines are located in both remote rights-of-way, and dense urban areas. PCCP is fabricated with reinforcing wire that is prestressed to 160,000 psi and operating pressures on some of these pipelines can reach in excess of 280 psi. Because of the vulnerability of PCCP to damage and corrosion to the prestressed wire, which may result in catastrophic failure of the pipe and its location in highly populated areas, it is prudent to have a good inspection and continuous monitoring program.

Although Metropolitan maintains an aggressive corrosion monitoring program for PCCP, conventional monitoring techniques are not always reliable for locating small defects or small severely corroded areas. These deficiencies can lead to a catastrophic failure of the pipe. As a result, it is proposed that staff institute a program to categorize the condition of Metropolitan's PCCP, and to evaluate and develop alternative pipe monitoring techniques and instrumentation. This program would include the following:

- **Soil Resistivity Measurements**—Soil resistivity measurements are conducted to determine the corrosivity of the surrounding soil of a buried structure. These measurements accurately depict the severity of corrosion that will take place on steel. There is no available soils data for approximately 60 percent of Metropolitan's PCCP. This missing data will be obtained and, with existing data, will be used to identify and categorize pipelines at risk due to corrosive soils.
- **Soil Sampling and Analysis**—After the soil resistivity data is analyzed and pipelines are categorized, soil samples will be obtained in the most corrosive areas to determine the soil's chemical content. The chemical analyses will further determine the corrosiveness of the soil to steel; and more importantly, will determine the aggressiveness of the soil to concrete. This analysis is important since PCCP relies on a mortar cover over the prestressing wires to inhibit corrosion.
- **Develop Acoustic Emission (AE) and Impact Echo (IE) Technology for PCCP Inspection**—Acoustic emission and impact echo technologies are used successfully to locate defects in storage vessels and reinforced concrete structures. Staff has modified the two technologies and their instrumentation to locate distressed areas on PCCP. Initial research work has been extremely promising. Additional work is required however, to further advance the application of these technologies for PCCP.
- **Evaluate Hydrophone Listening Devices**—The Bureau of Reclamation is adapting hydrophonic technology, originally developed by the Department of the Navy, for PCCP monitoring. This technology uses listening devices (hydrophones) which are suspended in the flow stream of a pipeline. The hydrophones pick up sounds emanating from the PCCP. The sounds are recorded, processed, and analyzed. Depending on the type and frequency of the sounds emitted, it is possible to determine and locate areas of corrosion, delaminated concrete, and broken prestressed wires. Currently there are only two firms in the USA working with hydrophonic technology. This program will evaluate both firms and their systems to determine their efficacy.

This letter also seeks your Board's approval and delegation of authority to the General Manager to award a competitively bid contract provided that it is in a form approved by the General Counsel and does not exceed \$400,000.

BENEFIT (NARRATIVE FOR DIRECT AND OTHER BENEFITS)

The primary purpose of this Program is to minimize the chance of a catastrophic failure along Metropolitan's PCCP pipelines. Also, if these inspection technologies prove reliable, it will eliminate the need for frequent internal PCCP inspections. This will also minimize the costs associated with the inspections including: pipeline shutdowns; dewatering costs; revenue loss due to lost water sales during shutdowns; and labor of Metropolitan forces while shutting down, dewatering, and inspecting the pipelines.

<u>PROJECT PLAN:</u>						
PHASE	ESTIMATED COST	% COMPLETE	COST THRU Nov. 96	FY 96/97	FY 97/98	FY 98/99
Study	\$ 92,000	15%	\$13,500	—		
Data Collection and Evaluation	\$1,519,000	0%	\$0		—	
Contingency	\$ 289,000	%	\$0			
TOTAL	\$1,900,000		\$13,500			

ALTERNATIVES TO PROPOSED ACTION

The alternative of continuing with only conventional monitoring for PCCP exposes Metropolitan to greater risk of PCCP failure.

CEQA COMPLIANCE/ENVIRONMENTAL DOCUMENTATION

The proposed action is categorically exempt under the California Environmental Quality Act because it consists of data collection, research, experimental management, and resource evaluation activities which do not result in a serious or major disturbance to an environmental resource (State CEQA Guidelines Section 15306).

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(PCCP.doc)
Attachment

FINANCIAL STATEMENT

The breakdown of the total estimated costs to assess the condition of Metropolitan Prestressed Concrete Cylinder Pipe is as follows:

	<u>Estimated Cost</u>
Labor:	
Corrosion Engineering/Technical Service:	
Program Implementation, Data Collection & Categorization, Analysis and Program Administration	\$ 590,000
District Forces: Fabrication/Installation	<u>66,000</u>
Total Labor	\$ 656,000
Materials and Supplies	\$ 115,000
Incidental Expenses	6,000
Operating Equipment Use/Rental	8,000
Consultant Services (A. E. & Hydrophone)	110,000
Contracts (Soil sample)	365,000
Administrative Overhead	351,000
Contingency	<u>289,000</u>
Project Total	\$1,900,000
Projected Expenditure of Funds:	
Through Fiscal Year 1996/97	\$ 268,000
Fiscal Year 1997/98	861,000
Fiscal Year 1998/99	482,000
Contingency	<u>289,000</u>
Total	\$1,900,000
Source of Funds: Pay-As-You-Go Fund	
Capital Program For FY 1996/97 (Program No. 5-0602-31)	
Total Program Estimate	\$1,900,000
Program Estimate for FY 1996/97	\$ 268,000

Class: One--Program directly related to the delivery of water, required for health and safety, or mandated by governmental requirements.

