CITY OF MARTINEZ **CITY COUNCIL AGENDA**
February 15, 2012

TO:	Mayor and City Council
FROM:	Tim Tucker, City Engineer
SUBJECT:	Water Treatment Plant Master Plan approval
DATE:	February 8, 2012

RECOMMENDATION:

Approve the 2012 Water Treatment Plant Master Plan.

BACKGROUND:

On March 16, 2011 the City of Martinez Council authorized an agreement for the development of a Water Treatment Plant Master Plan (Plan). Carollo Engineers has now completed the Plan. Our Water Treatment Plant and Engineering staff oversaw the study. On January 13, 2012 the Council's Water System Subcommittee reviewed the report and recommend the full Council approve the Plan. The Plan focused on the condition of existing facilities and water treatment plant performance. Projects were ranked based on a risk assessment. Projects were weighed based on risk and logistics.

The Plan is on file in the office of the City Engineer. Attachment 1 is the Executive Summary of the Plan. This Summary provides a brief description of the major projects along with a table listing a preliminary schedule of implementation and cost.

FISCAL IMPACT:

The Plan identified approximately $16.5M in improvements over the next fifteen years. Projects will be budgeted depending on available funds and priorities throughout the entire water system. Water rates control the funding for Water System Capital Improvement Program (CIP) projects. Annually approximately $900,000 is generated for projects. In addition there is approximately $7M in unrestricted fund balance. A portion of the fund balance is available for CIP projects and the remaining portion kept in reserves for emergencies or drought impacts. Lastly the Water System has the ability to issue debt service. The Council is currently considering generating $4M through the sale of Certificate of Participation bonds.

ACTION:

Motion approving the 2012 Water Treatment Plant Master Plan.

APPROVED BY:
City Manager

Chapter 1

EXECUTIVE SUMMARY

1.1 BACKGROUND

The City of Martinez contracted Carollo Engineers to develop its Water Treatment Plant Master Plan (WTPMP). The Martinez WTP is a municipal drinking water plant that provides water to the City of Martinez. The WTP treats raw water from the Contra Cost Water District (CCWD) canal, which originates from the San Francisco-Bay Delta. The plant was constructed in 1948 and was upgraded in 1967 (expansion) and in 1990 (addition of ozone). The objective of the WTPMP is to evaluate the condition and performance of the plant and to identify capital improvement program (CIP) projects necessary to continue reliable service for the next fifteen years.

1.2 APPROACH

The WTPMP develops comprehensive solutions related to both the condition of the existing facility and the water treatment plant performance. To this end, evaluations of the facility and water treatment were conducted in parallel, and a risk assessment was developed to prioritize needs. Specific projects were recommended to address these needs, including cost estimates and recommended timing for implementation.

The existing facilities evaluation included a visual condition assessment as well as desktop analyses. The desktop analyses addressed process pipes, seismic issues and the adequacy of the plant power and instrumentation systems.

Drinking water regulations were reviewed with respect to the WTP performance, including rules that have recently been promulgated. These rules address several complex and interrelated issues with regard to filtration, total organic carbon (TOC) removal, disinfectant residual, and disinfection by-product formation, including bromide. Based on the information reviewed for this project the WTP meets or exceeds all applicable water quality regulations. Discussion of this analysis is provided in Chapter 4 with detailed regulations contained in Appendix C.

The risk assessment was based upon industry guidelines for management of water treatment plant assets. Risk was quantified by estimating the likelihood and consequence of failure for each WTP asset.

1.3 FINDINGS AND RECOMMENDATIONS

The following sections describe the major issues identified, the associated risks, and the recommended actions. These are presented in the recommended order for project

implementation. In addition to these major projects, the WTPMP addresses many routine rehabilitation and replacement (R&R) needs. These are detailed in Chapter 6.

1.3.1 Electrical

The WTP main plant electrical distribution system assets were installed in 1967 and have reached the end of their useful lives. The aging electrical distribution system limits operational reliability in several ways. First, the switchgear, switchboards, motor control centers, and cables are increasingly prone to failure. Second, the existing protective devices do not allow failures to be isolated, so small faults become plant-wide outages. Third, parts are becoming increasingly difficult to obtain, making maintenance more difficult and prolonged. If the main plant electrical distribution system is not upgraded in the near future, operational reliability and personnel safety will decline. The assets associated with this system were found to have the highest risk of all plant assets.

The upgrades were packaged into two alternatives, a partial and complete option. To improve reliability and maintainability at a moderate cost, the partial upgrade is recommended for immediate implementation. This alternative includes the replacement of the oldest electrical equipment, including motor control centers (MCCs) A, B, C, and G and their associated conduit; the 750kVA PG&E transformer; and the main plant switchboard.

1.3.2 Instrumentation and Control

Much of the instrumentation at the plant is new or like new and replacement parts or equivalent units are readily available, with a few exceptions. Several of the assets included in this project are of high risk due to their impact on safety (the Direct Feed Ammoniator) and process control (the filter effluent level transmitter). The WTP also has need of improved controls and data recording. The plant currently communicates with seventeen of its twenty-two remote pump stations using tone telemetry. Troubleshooting and maintenance is difficult for this system, and replacement parts for the installed system are not available. Failure of the tone telemetry system would result in communication loss to the remote sites.

As with the electrical recommendation, the instrumentation and control project needs were packaged into two alternatives, partial and complete. The partial alternative is recommended for completion in 2012. The remaining assets in the full alternative, namely the remote site communication, are recommended for completion in 2017. This is because of many other project needs with higher risk. The probable cost for upgrading from tone telemetry to radio is approximately $20,000 per site. As an alternative to completing the instrumentation and control project in 2017, this could be phased in over the course of several years, converting the most critical sites first.

1.3.3 Reclaimed Water Pump Pad

Two of the three backwash pumps are mounted on a concrete pad that is cantilevered over Reclaimed Water Basin 1. This cantilevered pad has significant cracks and, because the cantilever has no redundant support, may fail suddenly. This presents a safety and operational concern. Plant staff has decided to mitigate this problem with the conversion to submersible pumps, which have already been procured. A project is needed to replace the cantilevered pump pad with guide rails and pipe connections for the new pumps. It is recommended that the iron bolts on the aluminum guardrails surrounding the reclaimed water basin be replaced when the pad replacement project occurs.

1.3.4 Chemical Room Concrete Repair and Tank Relocating

Cracks were observed in the Chemical Room wall and ceiling that reflect rebar corrosion from rain or washwater penetration. On the other side of this wall, two cast-in-place concrete tanks contain polymer and alum for the coagulation process are contributing to structural deterioration. Furthermore, the county health department has indicated intent to potentially regulate these concrete tanks as underground storage tanks in the next permitting cycle, which will create difficulties with compliance. These needs are high risk due to safety and pending permitting issues, and they affect the integrity of the structure. We recommend relocation of the caustic and alum tanks and to repair the concrete ceiling and walls in the Chemical Room. Elastomeric coating is recommended for the deck above the chemical room to prevent further leakage.

1.3.5 1948 Building Seismic Retrofit

The 1948 Filter Building was found to have two different lateral force resisting systems that contribute to seismic deficiencies, as well as shear stress and reinforcing steel detailing deficiencies. This structure is not adequate for immediate occupancy following a seismic event. The structure has a high risk associated with failure due to safety and reliable operations. We recommended adding shear walls in the 1948 Building.

1.3.6 Tier 2 Analysis of 1967 Structure

The glass and metal superstructure of the 1967 Filter Basins was evaluated as a steel-braced frame structure. It was found non-compliant with the supplemental criteria ASCE31 Tier 1 Screening Checklist due to deficient beam to column connections. A Tier 2 analysis, which will involve a more detailed investigation, is recommended for this structure and not others because the deficiencies identified in the Tier 1 analysis are unconfirmed.

1.3.7 Washwater Supply Tank

The Washwater Supply Tank was built in 1948, and the tank was not designed for seismic loads. Seismic deficiencies are amplified by its location on a slope with a 10 feet embankment differential. The tank has a high risk associated with failure because it is

required for backwashing the filters, a critical plant process, and it has no redundancy. We recommend changing the roof design and raising the soil grade surrounding it to even level.

1.3.8 Clearwell

The Clearwell is a rectangular buried tank built in 1948. Potential seismic concerns include sloshing and sliding, with a particular concern regarding the contraction joints in the foundation. In addition, the 24-inch inlet and outlet pipes have rigid connections to the Clearwell. These problems present a high risk because failure of the clearwell would render the plant unable to deliver treated water, and restoring the clearwell to service after failure would be very difficult and may take months. A project is recommended at the clearwell to alleviate discontinuities in the foundation in order to increase shear transfer. The most cost effective approach is estimated to be retrofit with a composite fiber membrane that would span across contraction joints connecting the two sides. As part of this project, flexible piping connections are recommended be installed on the inlet and outlet pipes.

1.3.9 Filter Gallery Pipe Supports

Many of the pipes at the WTP are braced only for vertical, or gravity, loads and not seismic lateral loads. The pipes of most concern are the 30-inch and 36-inch pipes in the filter gallery. These pipes show evidence of movement in past seismic events. These pipes are overhead in a narrow space, creating concern for safety as well as process reliability. Additional pipe supports are recommended in the Filter Gallery for seismic loads.

1.3.10 RCP Replacement with Steel Pipe

Reinforced Concrete Pipe (RCP) is the most rigid pipe material and does not perform well in an earthquake. The RCPs from the Filtered Water Junction box to the Clearwell and from the Clearwell to the Finished Water Pump Station have no redundancy. As with the clearwell structure, failure of these pipes would result in the plant being unable to produce treated water and significant downtime before the pipes could be restored to service. A project is therefore recommended to replace the RCP with steel pipe.

1.3.11 Ozone Equipment

Many of the major components in the ozone generation system are at or nearing the end of their useful life. Three alternatives were evaluated for both capital and long-term operational costs. The alternative to continue with the current system had the lowest present worth cost, therefore a project is recommended to replace the aging components.

1.3.12 Future Projects

Planning level replacement cost estimates were made to address R&R needs of assets that are currently in good condition but that will likely need replacement within the fifteen-year planning horizon. The costs were included in the recommended CIP. Also, based on the

results of the process piping analysis, an annual allotment of $100,000 is recommended for process piping work, be it condition monitoring, rehabilitation, or replacement.

1.4 CONCLUSION

The WTPMP resulted in a 15-year CIP with initial years of large projects, followed by an anticipated decline in annual expenditures. This plan reflects the need for a significant rehabilitation and replacement effort commensurate with the large projects of the WTP past. While those projects were driven by capacity (1967) and technology (1990), this effort will be driven by the reinvestment needs of existing assets that have simply deteriorated with age. The City faces this need with many other water providers nationwide.

The City currently has two potable water interties with CCWD, one of which relies on the WTP facilities to function. These interties have historically been used to facilitate plant maintenance or to mitigate raw water quality deficiencies (e.g., algae blooms at the Terminal Reservoir). The cost and feasibility of providing additional interties and/or a Terminal Reservoir pipe bypass should be evaluated.

The City is advised to update the WTPMP CIP on a biennial basis to refine the project outlook and to better chart the future of reliable drinking water for Martinez.

Table 1.1 Recommended CIP Summary
Water Treatment Plant Master Plan
City of Martinez

Risk[1]	Code	Project	Recommended Year of Implementation	Estimated Project Cost[2]
2.68	E1	Electrical Improvements: Partial Upgrade	2012	$2,244,000
2.67	IC1	Instrumentation Control System: Partial Upgrade	2012	$605,000
2.28	C6	Reclaimed Water Pump Pad	2012	$36,000
1.64	C1	Chemical Room Concrete Repair and Tank Relocating	2012	$705,000
1.52	S1	1948 Building Seismic Retrofit	2012	$181,000
NA	S2	Tier 2 Evaluation of the 1967 Plant 2 Structure	2012	$40,000
0.38	C2	Flocculation Paddles	2012	$190,000
0.31	C8	Elbow in 1948 FWPS	2012	$6,000
NA	C11	Finished Water Pump No. 4 Piping	2012	$14,000
NA	C10	Roofing throughout Plant	2013	$281,000
0.94	S4	Clearwell Seismic Retrofit	2013	$327,000
0.87	S3	Backwash Water Tank Seismic Retrofit	2013	$366,000
0.84	S5	Filter Gallery Pipe Supports	2013	$243,000
0.19	C3	Sedimentation Basin Mechanism Coating	2013	$44,000
NA	C9	Plumbing and Paint in 1948 Building	2013	$200,000
0.64	P2	Ozone Equipment	2014	$1,099,000
0.60	C4	Settled Water Contactor Miscellaneous	2015	$559,000
NA	S6	RCP Replacement with Steel Pipe	2015	$524,000
NA	P1	Relocate Alum Feed Points	2016	$25,000
NA	E2	Electrical Improvements: Remaining Elements from Full Upgrade	2016	$1,600,000
NA	IC2	Instrumentation Improvements: Remaining Elements from Full Upgrade	2017	$1,199,000
			5-Year CIP Total	**$10,488,000**
NA	F1	Miscellaneous Assets	2017-2027	$5,068,000
NA	F2	Ongoing Process Pipe Monitoring and Rehabilitation	2017-2027	$1,000,000
			6-15 Year CIP Total	**$6,068,000**

Notes:
(1) Risk is a unitless metric developed through methodology described in Chapter 5. Higher magnitude reflects greater risk.
(2) Costs shown are planning level estimates in July 2011 dollars, San Francisco ENR CCI of 10179.