CITY OF SEAL BEACH
WATER MASTER PLAN UPDATE

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Submitted to

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SECTION 1

EXECUTIVE SUMMARY

1-1 History and Background

The City of Seal Beach was incorporated in 1915 and has been in operation under its own charter since 1964. It covers an area of 11.2 square miles along the Pacific coast in the northwest corner of Orange County. The City's total population was 24,168 in 2010 according to Census information. The California State Department of Finance estimated the City's population to be 24,215 in 2011.

1-2 Objectives and Scope of Work

The objective of this master plan is to evaluate the City's water supply system with the most current information and provide a framework for undertaking the construction of new and replacement facilities in an efficient manner.

1-3 Study Area

The City of Seal Beach is primarily a residential community located along the California coastline in western Orange County. It is bordered to the north by the City of Los Alamitos and the unincorporated Rossmoor community; to the east by the Cities of Garden Grove, Westminster, and Huntington Beach; to the south by the Pacific Ocean and City of Huntington Beach; and to the west by the City of Long Beach (Los Angeles County).

Topographical Description

The City is relatively flat, except in the Marina Hill Community, where the highest ground elevation is approximately 57 feet above mean sea level (amsl) along Crestview Avenue, between Crest Drive and Bayside Drive. The lowest ground elevation is sea level along the beach frontage.

Geology

The 1986 Orange County Hydrology Manual classifies the soils into four (4) hydrologic soil groups: "A", "B", "C", and "D". Several soil types underlie the study area, with the predominant soil type being silty-loam soils (Soil Group C), which impede downward movement of water.

Climate

The study area has a Mediterranean-like climate, enjoying plenty of sunshine throughout the year. The period of April through November is warm to hot and dry with high temperatures of 82 - 84°F and lows of 53 - 65°F. The coolest months are typically December and January, with an average minimum temperature of 46°F. Heaviest precipitation generally occurs between October and March. The average rainfall between the 1989/1999 fiscal year and the 2006/20007 fiscal year is 10.61 inches.

Land Use

Excluding the U.S. Naval Weapons Station, the City of Seal Beach is primarily a residential community with supporting commercial as well as light industrial and institutional land uses. The City is mostly developed with a mix of residential, commercial, industrial, and public land uses.

According to the 2011 California Department of Finance Housing Estimates, the total number of housing units within the City is 14,558 with a 10.59 percent vacancy rate.

Population

Since its incorporation in 1915, the City of Seal Beach has grown from a population of 250 to 24,215 in 2011 (California Department of Finance, Demographic Research Unit).

1-4 Water Use

Historic Water Production

The City purchases imported water from Metropolitan Water District of Southern California (MWD) through Municipal Water District of Orange County (MWDOC) and the West Orange County Water Board (WOCWB). The imported water supplements the groundwater that the City obtains from the Orange County Groundwater Basin through its four wells.

The total annual water purchase and groundwater from July 2001 to June 2011 is shown in Table 1-1. Over the last ten fiscal years, the annual imported water purchase has averaged 1,249 acre feet per year (AFY) {1.11 million gallons per day (mgd); 774 gallons per minute (gpm); 1.72 cubic feet per second (cfs)}, and the annual groundwater production has averaged 2,756 AFY {2.46 mgd; 1,708 gpm; 3.81 cfs}.

Table 1-1
Historical Imported Water Production and Groundwater Purchase (Annual)

				Groundwater											Total Water Use	
	Imported Water			Beverly Manor		Leisure		Bolsa Chica		Lampson		Total				
Fiscal Year	(AFY)	(mgd)	(%)	(AFY)	(mgd)	(AFY)	(mgd)	(AFY)	(mgd)	(AFY)	(mgd)	(AFY)	(mgd)	(%)	(AFY)	(mgd)
2001-2002	1,361	1.21	32%	790	0.71	690	0.62	1,434	1.28	-	-	2,914	2.60	68%	4,275	3.82
2002-2003	1,051	0.94	25%	954	0.85	502	0.45	1,639	1.46	-	-	3,095	2.76	75%	4,146	3.70
2003-2004	1,173	1.05	27%	1,076	0.96	400	0.36	1,664	1.49	-	-	3,140	2.80	73%	4,313	3.85
2004-2005	1,505	1.34	38%	847	0.76	378	0.34	1,247	1.11	-	-	2,472	2.21	62%	3,978	3.55
2005-2006	1,408	1.26	36%	942	0.84	168	0.15	1,408	1.26	-	-	2,518	2.25	64%	3,927	3.51
2006-2007	1,141	1.02	27%	1,191	1.06	265	0.24	1,706	1.52	-	-	3,162	2.82	73%	4,303	3.84
2007-2008	919	0.82	23%	1,019	0.91	444	0.40	1,645	1.47	-	-	3,107	2.77	77%	4,026	3.59
2008-2009	1,180	1.05	30%	701	0.63	510	0.45	1,521	1.36	-	-	2,731	2.44	70%	3,911	3.49
2009-2010	1,456	1.30	40%	436	0.39	340	0.30	1,445	1.29	-	-	2,221	1.98	60%	3,678	3.28
2010-2011	1,294	1.16	37%	405	0.36	453	0.40	1,208	1.08	139	0.12	2,203	1.97	63%	3,498	3.12
Average	**1,249**	**1.11**	**31%**	**836**	**0.75**	**415**	**0.37**	**1,492**	**1.33**	**139**	**0.12**	**2,756**	**2.46**	**69%**	**4,005**	**3.58**

**Water Data from Seal Beach Water Department*

Since the 2006-2007 fiscal year, the City's total water use has declined from 4,303 AFY to 3,498 AFY. This reduction is primarily due to a conscientious water conservation effort by the City and its residents

Water Consumption versus Water Purchase/Production

The City's consumption records from July 2009 to June 2010 were reviewed for the purposes of this master plan. The Citywide average consumption was estimated at 3,615 AFY {3.22 mgd, 2,240 gpm, 4.99 cfs}.

Unaccounted for water is the difference between the purchase/production and the sum of the individual customers' consumption. The City typically purchases and produces more water than the quantity measured by the customer meters. Unaccounted for water may be partly due to the differences in the accuracies of the large meters which measure purchase and production, and the thousands of small customer meters which measure sales. Water losses can also be due to unmeasured uses such as water main flushing and other maintenance related tasks and water leaks.

The water purchase and production records from July 2009 to June 2010 totaled 3,678 AFY {3.28 mgd, 2,278 gpm, 5.08 gpm}. During this study period, approximately 1.7 percent of the water supply was unaccounted for. This is well within the 10 percent or less industry standard for unaccounted for water.

Monthly Demand Variations

Typical of most Southern California communities, the City's water consumption exhibits a distinct seasonal pattern. Peak and low monthly consumption occur during the dry summer months and wet winter months, respectively. The highest and lowest monthly demand factors are 1.36 in August 2007 and 0.59 in February 2010, respectively.

Hourly Demand Variations

The total system diurnal curve exhibits two peaks. The main peak factor is approximately 1.93 and occurs in the early morning around 1:15 a.m. This peak factor is attributed to high irrigation water usage within the Leisure World community, which provides the majority of the irrigation between 12:00 a.m. and 5:00 a.m. to minimize any inconvenience to the community residents. The second peak factor is approximately 1.39 and occurs around 7:00 a.m. which is typical for a primarily residential community. Two diurnal curves were developed for this study.

Currently, heavy water usage occurs in the Leisure World community for irrigation between 12:00 a.m. and 5:00 a.m. The demands remain relatively constant throughout the remainder of the day between 6:00 a.m. and 12:00 a.m. The peak hour demand is approximately 3.84 times the daily average at about 12:45 a.m.

The demand pattern for the remainder of the City is quite typical of predominately residential service areas, with the peak demands occurring between 6:00 a.m. and 9:00 a.m. The peak hour demand for this portion of the system is 1.68 times the daily average and occurs at about 7:00 a.m.

System Demand and Peaking Factors

Typically, a water system is designed to meet the maximum demands placed on it. The system components must be designed to cope with these demands as they occur. Maximum month and maximum day demands are important factors in sizing a system's supply capability. Maximum day demands usually dictate the design criteria for both system transmission and storage needs. Peak hour criterion is a measure of the

system's overall adequacy with respect to its transmission and distribution elements. The City of Seal Beach's water system demands utilized in this study are shown in Table 1-2.

Table 1-2
Water System Demands and Peaking Factors

Demand Descripti	Existing Demand (gpm)	(mgd)	(AFY)	Peaking Factor
Average Day	2,169	3.12	3,498	1.00
Max Month	3,036	4.37	4,897	1.40
Max Week	3,687	5.31	5,947	1.70
Max Day	4,120	5.93	6,646	1.90
Peak Hour	7,960	11.46	12,839	3.67

Ultimate Demands

The City has identified one (1) planned area in Old Town community southwest of Marina Drive and First Street. The Bay City Partners LLC currently owns this property and proposes constructing a development that includes 48 residential units and 6.4 acres of open space land.

Because the City is nearly developed, large increases in population and water demands are not expected. It is expected that any incremental increase in population and therefore water demands will be offset by the City's proactive and rigorous conservation efforts (See Section 4-10). Therefore, the ultimate demands are expected to be similar to the existing demands for this study.

Water Conservation

Water conservation will continue to be an important issue as California's water storage and supply remain at critically low levels and as legislative mandates for reduced water consumption become law. The Water Conservation Act of 2009 (SBx7-7), was adopted in November 2009 to reduce the agricultural and urban water use throughout the State of California. The goal is to reach a 20 percent overall reduction in urban per capita water use statewide on or before December 31, 2020.

Per the City's *2010 Urban Water Management Plan*, the baseline daily per capita water use is set at 151.7 gallons per day per capita (gpcd). The City's 2020 target is 139.5 gpcd. This is an eight percent decrease in per capita water use. To achieve this target, the City plans to continue its water conservation effort with its existing demand management measures.

1-5 Water Supply

Sources of Supply

The City's potable water supply consists of imported water from Metropolitan Water District of Southern California (MWD) through Municipal Water District of Orange County (MWDOC) and the West Orange County

Water Board (WOCWB) and groundwater from the Orange County Groundwater Basin through the City's four (4) wells.

Imported Water Supply

MWD is the purveyor of imported water for most of Southern California. It provides supplemental water to 26 member public agencies through a regional distribution network of canals, pipelines, reservoirs, treatment plants, pump stations, hydropower plants and other appurtenances

Imported water is supplied to Seal Beach by the Municipal Water District of Orange County (MWDOC) via the West Orange County Water Board (WOCWB), which is a joint powers agency formed in 1955 for the purpose of providing a dependable imported water supply to its member agencies. The City of Huntington Beach operates the WOCWB system under contract to the Board, and communicates with MWDOC and MWD for the requested flows.

Groundwater Supply

The City of Seal Beach has four (4) active wells, which provide groundwater from the Main Orange County Groundwater Basin. The groundwater basin is approximately 229,000 acres in size and has historically provided over 300,000 AFY to the residents of Orange County.

1-6 Existing Water System

The City of Seal Beach's domestic water system consists of the following:

- 73.4 Miles of pipe ranging in size from 4-inches to 20-inches in diameter
- 2 Booster pump stations (Navy and Beverly Manor)
- 2 Forebay reservoirs with a total capacity of 7 million gallons (Navy and Beverly Manor)
- 4 Active wells (Leisure World, Beverly Manor, Bolsa Chica, and Lampson Avenue)
- 1 Imported water supply connection (West Orange County Water Board {WOCWB} through Metropolitan Water District OC-35 Connection)
- Emergency connections with the City of Long Beach, the City of Huntington Beach, the City of Westminster, and the Golden State Water Company
- Partially completed SCADA system
- 680 fire hydrants
- Approximately 5,677 potable water services

Pressure Zones

Aside from the Marina Hill community, the study area is generally characterized by flat terrain. Therefore, multiple pressure zones are not required. The City's water system is a single zone closed system without a free-water surface. System pressure is maintained through the pressure at the imported water supply connection, and the pumping at varying speeds based upon demand at the (2) booster pump stations, Bolsa Chica Well, and Lampson Avenue Well.

Transmission and Distribution System

The potable water system includes 387,690 feet (73.4 miles) of transmission and distribution system pipes ranging in size from 4-inches to 20-inches in diameter. Less than 2 percent of these mains are 4-inches in diameter. Approximately 6 percent of the system was constructed before 1960. Approximately 55 percent of the system was installed during the 1960's, and 22 percent in the 1970's. Approximately 75% of the system is asbestos cement pipe (ACP).

Emergency Connections

The City has emergency connections with the City of Long Beach, the City of Huntington Beach, the City of Westminster, and the Golden State Water Company. These emergency connections should not be relied on as primary sources of supply, but only for emergencies.

Wells

The City of Seal Beach has four (4) active wells, which pump groundwater from the Main Orange County Groundwater Basin. A summary of the existing groundwater supply is provided in Table 1-3.

Table 1-3
Existing Groundwater Supply Sources

Source	Type	Pump Stages	Design		Disinfection	Driver	
			Capacity	TDH (ft)			
Bolsa Chica Well	Local	5	3,000 gpm (4.32 mgd)	300	On-site Sodium Hypochlorite Generator	400 HP Electric Motor w/Variable Speed Drive	525 HP Natural Gas Engine
Beverly Manor Well	Local	4	2,100 gpm (3.02 mgd)	252	On-site Sodium Hypochlorite Generator	N/A	100 HP Natural Gas Engine
Leisure World Well	Local	3	3,600 gpm (5.18 mgd)	153	Sodium Hypochlorite Generator at Beverly Manor Booster Station	250 HP Electric Motor	N/A
Lampson Avenue Well	Local	4	3,000 gpm (4.32 mgd)	512	On-site Sodium Hypochlorite Generator at Lampson Avenue Station	500 HP Electric Motor w/Variable Speed Drive	N/A

Booster Pump Stations

The City's water system relies greatly on its two existing booster pump stations to provide adequate system pressures. The two storage reservoirs act as forebay storage to the booster pump stations.

Navy Booster Station **–** The Navy Booster Station pressurizes the distribution system in the Old Town and Marina Hill communities during high demand periods. The Navy Booster Station was constructed in 1963 and upgraded in 2007. The pump station and reservoir are located within the U.S. Naval Weapons Station, east of Seal Beach Boulevard and north of Bolsa Avenue.

Beverly Manor Booster Station – Beverly Manor Booster Station is located south of the San Diego Freeway and west of Seal Beach Boulevard. The Beverly Manor Pump Station was constructed in 1969. It is located in the same structure as the Beverly Manor Well.

Reservoirs

The City of Seal Beach owns two forebay reservoirs with a total capacity of 7 MG and a usable capacity of 6.3 MG.

1-7 Service Criteria

Performance criteria is established to evaluate the adequacy of various water system components through a systematic analysis and to identify necessary improvements to the system for inclusion in a Capital Improvement Program (CIP). Some criteria, such as service pressures, storage capacity, and sources of supply are based upon experience and their application is at the discretion of the water purveyor. For the City, these criteria are generally in accordance with the California Code of Regulations, Title 22. Other criteria, such as water quality and fire protection, are based on federal, state and local jurisdictional requirements. A summary of the service criteria for Seal Beach's system is listed in Table 1-4.

Table 1-4
Service Criteria

Description	Criteria	Existing Requirement
1. Source of Supply		
a. Total	Maximum Day Demand	4,120 gpm (5.93 mgd)
b. Local Supply	Average Day Demand	2,169 gpm (3.12 mgd)
2. Reservoir Capacity		
a. Operational Storage	35% of Maximum Day Demand (includes an increase of 15% for submergence over the reservoir outlet pipe)	2.38 MG
b. Emergency Storage	Seventy Percent of Seven (7) Average Day Demand less local groundwater well capacity	N.A.
c. Fire Suppression	Includes an increase of 15% for submergence over the reservoir outlet pipe	
Single Family Residential	2,000 gpm for 2 hours (plus 15%)	0.28 MG
Multi-Family Residential	3,000 gpm for 4 hours (plus 15%)	0.83 MG
Schools	3,500 gpm for 4 hours (plus 15%)	0.97 MG

Commercial / Industrial	4,000 gpm for 4 hours (plus 15%)	1.10 MG
3. Booster Pump Stations	Firm Capacity including well capacity directly pumped into the system, must deliver Maximum Day Demand plus Fire Flow Demand or Peak Hour Demand, whichever is greater	
	Stand-by pump equal in size to the largest duty pump	
	Flow meters, suction and discharge pressure gauges, and telemetry equipment for alarm and status notification at each station	
	Provisions for emergency power at all stations	
4. Minimum Pipe Size	6-inch	
5. Maximum Velocities	6 fps at peak flows (5 fps for PVC)	
	10 fps at Fire Flow Demand	
6. Static Pressures	Minimum 50 psi	
	Desired 60-80 psi	
	Maximum 100 psi	
7. Dynamic Pressures	Minimum 40 psi during Maximum Day Demand	
8. Fire Flow Demands		
a. Single Family Residential	2,000 gpm for 2 hours with 20 psi residual pressure at fire hydrant	0.24 MG
b. Multi-Family Residential	3,000 gpm for 4 hours with 20 psi residual pressure at fire hydrant	0.72 MG
c. Schools	3,500 gpm for 4 hours with 20 psi residual pressure at fire hydrant	0.84 MG
d. Commercial / Industrial	4,000 gpm for 4 hours with 20 psi residual pressure at fire hydrant	0.96 MG

Water Quality

The quality of water served by the City has to be in accordance with the Federal standards as well as the State of California Department of Public Health (CDPH) standards as set forth in Title 22 of the California Code of Regulations.

The basic water quality standards are established by the Safe Drinking Water Act (SDWA), which was passed by the Congress in 1974. Amendments to the SDWA were enacted in 1986 and 1996. The SDWA mandated the U.S. Environmental Protection Agency (EPA) to develop primary drinking water standards or maximum contaminant levels (MCL'S) in public water supplies.

The CDPH has the responsibility for the State's drinking water program. It is accountable to the EPA for enforcement of the SDWA and for adoption of standards that are at least as stringent as that of the EPA. Since California conducts independent risk assessments, some of its standards are more stringent than the standards of the Federal Government.

Water quality requirements are described in detail in Section 7 of this report.

1-8 Hydraulic Model

A computer model of the City's water system was utilized to aid in the evaluation of the adequacy of the existing facilities.

The features included in the water model are as follows:

- 73.4 miles of transmission and distribution mains, 4-inches to 20-inches in diameter
- 2 Booster pump stations (Navy and Beverly Manor), 5 pumps total
- 4 Active wells (Leisure World, Beverly Manor, Bolsa Chica, and Lampson Avenue), 4 pumps total
- 2 Forebay reservoirs with a total capacity of 7 million gallons (Navy and Beverly Manor)
- 1 altitude valve (Navy Reservoir)
- 1 WOCWB connection
- 680 fire hydrants

The demand distribution, diurnal curves, friction coefficients, and pressure controls, were inputted in the City's model to perform the hydraulic analyses.

Model Calibration

The existing water system model was calibrated by closely matching the demands and pressures to field measured values. The resulting model can be used to analyze the system under various operating conditions. The selected calibration day was Monday June 6, 2011.

Demands - The total system demand was set to 3,068 gpm, which was the calculated daily production for the calibration day.

Pressure Controls - The Bolsa Chica Well and the Lampson Avenue Well were operated during the calibration day. The Navy Booster Pump Station is operated to maintain pressure in the south part of the City during the high demand periods.

Field Data – Supervisory Control and Data Acquisition (SCADA) data and pressure information was collected from June 3, 2011 to June 13, 2011 and used in calibrating the 24-hour extended period simulation. Pressure data loggers were installed on fire hydrants at 12 locations throughout the system. The selected locations were scattered throughout the service area in order to obtain representative pressure measurements in all areas of the system.

Calibration Results - The difference between measured pressures and the model output range from 0.2 psi to 3.4 psi. The average difference for all pressure readings was 1.8 psi. The percentage differences ranged from 0.3 percent to 5.2 percent. On average, the percentage difference was 2.9 percent. Typically, pressure differences of 5 percent and less are considered to be good indicators of the model's overall accuracy

Hydrant Flow Testing- Hydrant flow testing was conducted in the field on Wednesday, February 1, 2012 to further refine the calibrated model. The field testing was performed at seven (7) hydrants by City and AKM staff. Portable pressure gauges were set up on two (2) nearby hydrants in the vicinity of the flow hydrant. The static pressures were recorded at each flow hydrant and the nearby hydrants. When the flow hydrant was opened, the available flows were recorded and the residual pressures were recorded at the two (2) nearby hydrants. The model was adjusted to reflect the conditions of the hydrant flow testing day. The City-wide demands, facility flows, facility pressures, and hydrant flows were input into the model to reflect the actual real-time field results. Following the field flow testing, the recorded pressures were compared to the model results. If the difference in the pressure drop between the field results and the model results were less than 5 psi, the model was considered to be representative of the existing system. The model is considered to be representative of the existing system.

1-9 System Evaluation

The established system criteria, calibrated system computer model, and condition assessment were utilized in analyzing the system, and evaluating its adequacy. The system model was utilized to analyze the existing system under average day, maximum day, peak hour, and maximum day plus fire flow conditions.

Existing system deficiencies were identified and mitigation projects were formulated based upon the results of the model runs and input from City staff. Proposed projects were added in the hydraulic model to test the operation of the system after their implementation.

A capital improvement program was developed as a result of these analyses. Recommended projects and cost estimates are discussed in Section 10 of this Master Plan Report.

Source of Supply

The criterion for source of supply is providing one maximum day demand (4,120 gpm). The City is fortunate to have access to groundwater from the Orange County Main Groundwater Basin, which is managed by OCWD. One hundred percent (100%) of the City's maximum day demands can be supplied by a combination of the four (4) groundwater wells, even if imported water is unavailable.

If groundwater is unavailable, the City can supply the maximum day demands with the maximum available imported water supply from WOCWB (10 cfs or 4,488 gpm), which is 109 percent of the maximum day demand.

Storage

For a water system such as the City's, three (3) categories of storage are of importance: fire suppression, operational, and emergency. The total storage is summarized below:

Fire Suppression	1.10 MG
Operational	2.38 MG
Emergency (Available from Groundwater)	0 MG
Total	**3.48 MG**

The two existing reservoirs have a total usable volume of 6.3 MG, which is significantly greater than the required total storage. To further increase its reliability, the City has the capability of utilizing its emergency connections with the City of Long Beach, the City of Huntington Beach, and the Golden State Water Company.

The City currently does not require any additional storage. Whenever either reservoir is scheduled to be replaced, the City should reevaluate its water usage, operations, and redevelopment plans to determine if additional storage may be required.

Model Runs and System Pressures

The hydraulic model was utilized to analyze the existing system under average day, maximum day, peak hour, and maximum day plus fire flow conditions.

The hydraulic model was used to analyze six (6) scenarios, which consisted of different combinations of the City's water sources: Lampson Avenue Well, Bolsa Chica Well, WOCWB turnout, and the Beverly Manor Booster Pump Station (supplied by Beverly Manor Well and Leisure World Well). All analyses were run with the Navy Booster Pump Station in operation. The pressure ranges for each of these scenarios under average day, maximum day, and peak hour maximum day demands is summarized in Table 1-5.

Table 1-5
Scenario System Pressures

		Average Day Demands		Maximum Day Demands		Peak Hour Maximum Day Demands	
Scenario	Facilities in Operation	Pressure Range (psi)	Satisfy 40 psi Requirement?	Pressure Range (psi)	Satisfy 40 psi Requirement?	Pressure Range (psi)	Satisfy 40 psi Requirement?
1	Beverly Manor Booster Pump Station WOCWB Connection	48-77 psi	Yes	47-76 psi	Yes	38-67 psi	Low pressures are experienced in the Marina Hill area only during the early morning hours due to the high irrigational usage by the Leisure World Community.
2	Beverly Manor Booster Pump Station Bolsa Chica Well	49-78 psi	Yes	48-77 psi	Yes	42-71 psi	Yes
3	Lampson Avenue Well Bolsa Chica Well	48-77 psi	Yes	46-76 psi	Yes	32-68 psi	Low pressures are experienced in the Marina Hill area only during the early morning hours due to the high irrigational usage by the Leisure World Community.
4	Lampson Avenue Well Beverly Manor Pump Station	48-77 psi	Yes	46-76 psi	Yes	38-68 psi	Low pressures are experienced in the Marina Hill area only during the early morning hours due to the high irrigational usage by the Leisure World Community.
5	Bolsa Chica Well WOCWB Connection	48-77 psi	Yes	46-75 psi	Yes	38-67 psi	Low pressures are experienced in the Marina Hill area only during the early morning hours due to the high irrigational usage by the Leisure World Community.
6	Lampson Avenue Well WOCWB Connection	48-77 psi	Yes	46-75 psi	Yes	39-69 psi	Low pressures are experienced in the Marina Hill area only during the early morning hours due to the high irrigational usage by the Leisure World Community.

Average Day Demand - Pressures during average day demands were above the City's dynamic pressure criteria (40 psi) throughout the service area.

Maximum Day Demand - The maximum day demand for each of the 6 scenarios did not indicate any hydraulic deficiencies. System pressures range from 46 psi in the Marina Hill area to 77 psi near the Aquatic Park.

Maximum Day Peak Hour Demand – The maximum day peak hour pressures are slightly less than the 40 psi criteria. These low pressures occur in the Marina Hill area during peak hour irrigation usage in Leisure World at around 1:15 a.m., when the majority of the residents are asleep. During the typical residential peak hour at 7:00 a.m., the hydraulic model indicates that the system is capable of providing the 40 psi requirement in the Marina Hill area. Should low pressures become a common occurrence, the City may consider utilizing a third source of water during the maximum month water usage periods.

Maximum Day Demand plus Fire Flow - The fire flow criterion requires a residual pressure of 20 psi at the fire hydrant outlet. The maximum day demand plus fire flow scenarios revealed one (1) deficiency in the system where the required residual pressure could not be met.

Since the analyses were conducted for the maximum day period, the model was set up with the Beverly Manor Well, Beverly Manor Booster Pump Station, Navy Booster Pump Station and the MWD connection in operation. During a fire flow event, the low pressures at the Lampson Avenue Well or Bolsa Chica Well would be less than their emergency settings of 40 psi and 38 psi, respectively. As discussed in Section 8-5, the facilities will respond to provide the necessary water. For the fire flow analysis, the model was also set up with the Lampson Avenue Well placed into operation.

Fire flow was applied at each hydrant in accordance with the California Fire Code (Table 105.1) and the criteria established in Section 7-11. In summary, the fire flow applied in a single family residential area is 2,000 gpm; in a multi- family residential area is 3,000 gpm; near a school is 3,500 gpm; in a commercial or industrial area is 4,000 gpm. If two land uses are present in the same area, the higher fire flow was used.

For most of the model analyses, fire flow was taken at more than one hydrant. This is especially necessary in commercial and industrial areas where the criterion is 4,000 gpm. The maximum day plus fire flow run resulted in one deficiency. The residential fire flow demand of 2,000 gpm cannot be provided at the 6-inch dead end on Harvard Lane, north of Dartmouth Circle. To improve the fire flow demands at this location, it is recommended that the City provide the following improvements:

- Provide an emergency connection with the City of Long Beach at College Park Drive, west of the San Gabriel River
- Replace 471 feet of 6-inch with 8-inch pipe

<u>Transmission and Distribution System</u>

The existing distribution pipes are generally well looped throughout the system, providing redundancy as well as reliability.

The system velocities are generally within an acceptable range during the average and maximum day demand periods. During maximum day demands, the maximum velocity is almost 6.2 ft/s near the northern Leisure World connection and meter, which is slightly greater than the 6 ft/s criteria.

Minor velocity deficiencies are experienced during maximum day plus fire flow analyses. The existing 8-inch suction and discharge pipes at Navy Booster Pump Station may experience velocities greater than the 10 fps criteria, if a 4,000 gpm fire flow is required in the southern portion of the City. Other velocity deficiencies may occur at dead end pipes during a fire flow event.

The expected useful life of the City's water facilities are discussed in Section 9-5. Approximately 29,189 feet (5.5 miles or 8% of the total system) of pipe are currently older than the expected useful life. An aggressive annual replacement program is needed to tend to the aging pipes. Many of the pipes in the Old Town community may be over 90 years old. The replacement program for these pipes have been broken down into two (2) phases. Phase 1 is of greater priority and consists of 4,152 feet of pipe, which the City has identified being in poor condition. Phase 2 consists of the remaining 24,795 feet of pipe in the Old Town community. The Phase 2 projects should be scheduled on a yearly basis, to accommodate the City's available budget. The City may take advantage of concurrent construction such as street paving or adjacent infrastructure work when determining the priority of the Phase 2 improvements. There is 1,213 feet of pipe outside the Old Town community that have exceeded their expected useful lives. These pipes have been addressed directly in the Capital Improvement Program. The City should verify the pipe material and condition of the pipes that have exceeded their expected useful lives before initiating the pipeline replacement.

Water Age Analysis

The existing system model was used to determine the age of the water in the system. Water that remains in a reservoir or in an oversized pipe for an extended period of time may be susceptible to water quality problems such as trihalomethanes, haloacetic acids, and nitrification.

The hydraulic model was utilized to determine the water age in the system. The existing water system was analyzed with average day demands. The average water age in the Navy Reservoir and Beverly Manor Reservoir were estimated as 80 hours (3.3 days) and 84 hours (3.5 days) respectively. The model estimated that the greatest average water age was approximately 126 hours (5.3 days) in the Sunset Beach community. From the introduction into the City's system from the City's wells, it is anticipated that it will take approximately 5.3 days to circulate the water to the Sunset Beach community, which is located the furthest from the City's wells.

The City is in compliance with all Federal and State water quality standards, including those for TTHM and HAA5, which indicate that the City does not have any problems water age in the system.

1-10 Capital Improvement Program

The Capital Improvement Program (CIP) consists of projects that will enhance the system to meet the established criteria, properly maintain the system's assets, and replace the facilities that have reached the end of their expected useful lives. The goal of the CIP is to provide the City with a long-range planning tool that will allow construction of the recommended projects in an orderly manner to improve the existing system and provide for any future growth. In order to accomplish this goal, it is necessary to determine the estimated cost of the needed water system improvements identified in this study, establish a basis and prioritize each of the projects. The recommended CIP is shown in Table 1-6. Project locations are shown on Figure 1-1.

Cost estimates have been prepared for each recommended project, based upon information from recent similar projects. The pipeline replacement costs are generally based upon $50 per diameter inch per foot for the Old Town area and $35 per diameter inch per foot for the remaining areas of the City. The City of Seal Beach is mostly developed, and there are many existing utilities to consider in future pipeline replacement projects. Therefore, the costs of replacing water facilities will be generally higher than in an area that is undeveloped. Construction costs can be expected to fluctuate as changes occur in the economy. These costs should therefore be reevaluated and updated annually based upon Engineering News Record (ENR) Index for the Los Angeles area (ENRLA), with the base ENRLA Index of 10,300 for June 2012.

It should be noted that some of the improvements recommended herein are conceptual in nature based on existing planning information. Therefore, they should not be considered as absolute for final design. Further analysis and refinement will be necessary prior to commencing work on the final plans, specifications and estimates package for each project. **Detailed preliminary design studies should be prepared to select the final design projects.**

The cost estimates that follow were generated by estimating the quantities of required items for each improvement, and applying typical unit prices to obtain the total estimated construction costs. An amount equal to 40 percent is added to the construction cost estimates to cover contingencies, project design, administration, and construction duration services. The resultant sum is the total estimated project cost. Cost estimates for each recommended project are shown in Table 1-6. The total Capital Improvement Program cost is estimated at $33,531,000.

Table 1-6
Capital Improvement Program

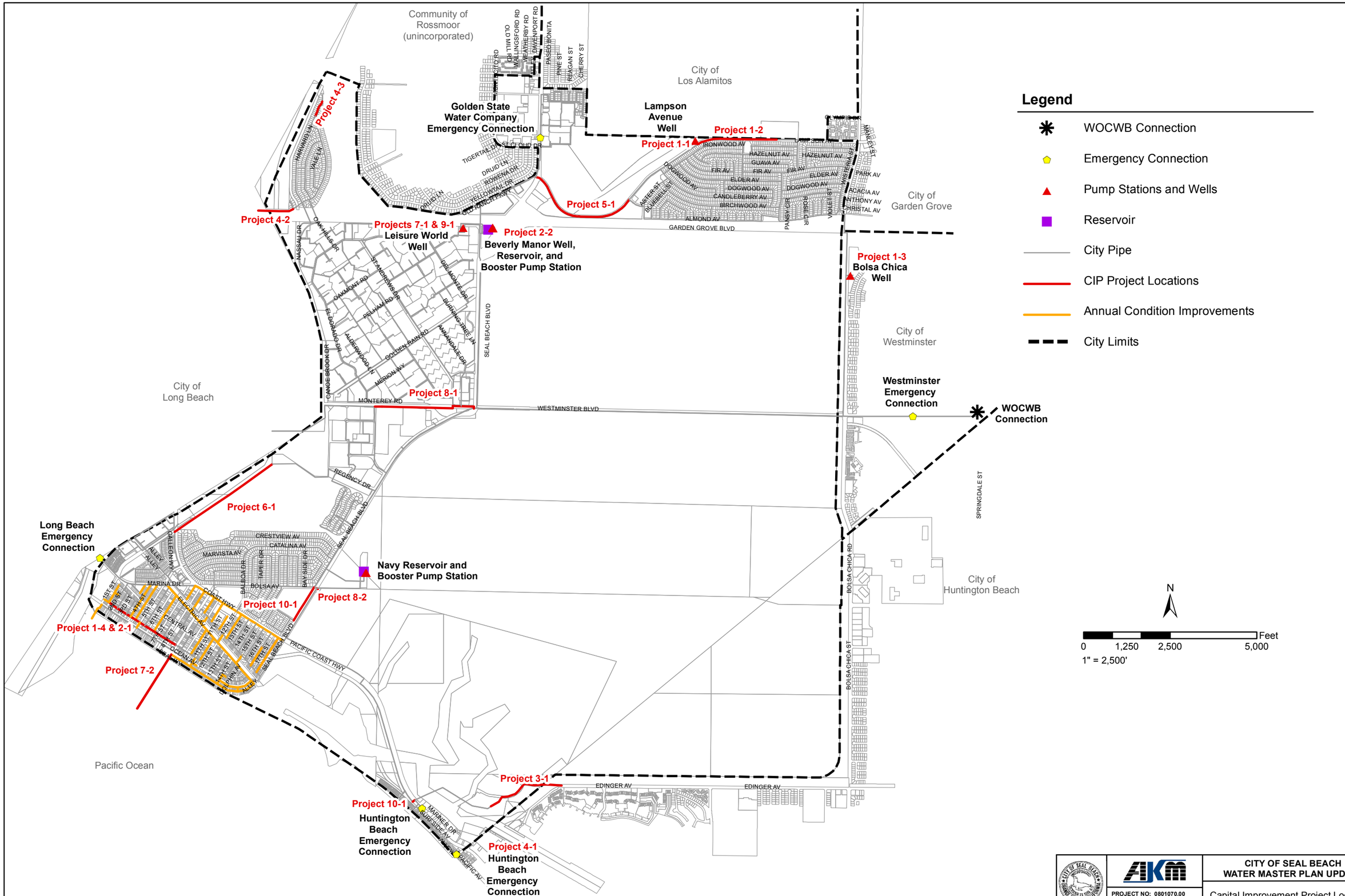
Year of Implementation	Project ID	Location	Justification	Pipe ID	Year of Construction	Material	Existing Size (in)	Ult. Size (in)	Length (ft)	Unit Cost ($)		Construction Cost ($)	Total Cost ($)
2012	1-1	Lampson Avenue Well 750KW Emergency Generator	Source of Supply Reliability	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	300,000	Each	**$300,000**	**$420,000**
2012	1-2	Lampson Avenue Well Discharge Piping - Lampson Avenue, between Lampson Avenue Well and east of Heather Street	Source of Supply Reliability	New	N.A.	N.A.	N.A.	12	1,326	35	Diam/in/LF	$556,920	$779,688
								8	979	35	Diam/in/LF	$274,120	$383,768
				Totals					**2,305**			**$831,040**	**$1,163,456**
2012	1-3	Bolsa Chica Well SCADA Improvement	Asset Maintenance	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	30,000	Each	$30,000	$42,000
		Bolsa Chica Well 400 HP Motor Replacement	Asset Maintenance	1995	N.A.	N.A.	N.A.	N.A.	N.A.	125,000	Each	$125,000	$175,000
				Totals					**0**			**$155,000**	**$217,000**
2012-2013	1-4 & 2-1	Old Town Water Line Replacement, Phase 1 -Ocean Alley Improvement	Age/ Condition	P3662	1903	CIP	6	8	127	50	Diam/in/LF	$50,858	$71,202
				P3260	1903	CIP	4	8	140	50	Diam/in/LF	$56,035	$78,449
				P3660 P3552 P3550 P3530 P3492 P3490 P3480 P3370 P3362 P3360 P3310 P3482	1903	ACP	8	8	2,042	50	Diam/in/LF	$816,964	$1,143,749
				Totals					**2,310**			**$923,857**	**$1,293,400**
2013	2-2	Beverly Manor Reservoir Access Hatch and Ladder	Asset Maintenance	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	40,000	Each	$40,000	$56,000
		Beverly Manor Booster Pump Station and Well Improvements	Asset Replacement	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	3,200,000	Each	$3,200,000	$3,200,000
		Leisure World Well SCADA Improvements	Asset Maintenance	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	50,000	Each	$50,000	$70,000
		Totals							**0**			**$3,290,000**	**$3,326,000**

Table 1-6 (Continued)
Capital Improvement Program

Year of Implementation	Project ID	Location	Justification	Pipe ID	Year of Construction	Material	Existing Size (in)	Ult. Size (in)	Length (ft)	Unit Cost ($)		Construction Cost ($)	Total Cost ($)
2014	3-1	Sunset Aquatic Park Connection	Secondary supply to unreliable waterline under Anaheim Bay, possibly transfer service to Huntington Beach	New	N.A.	N.A.	N.A.	12	2,000	35	Diam/in/LF	$840,000	$1,176,000
								12" Bridge Crossing	400	1,000	LF	$400,000	$560,000
								Connection	N.A.	100,000	Each	$100,000	$140,000
		Totals							**2,400**			**$1,340,000**	**$1,876,000**
2015	4-1	Huntington Beach Automatic Connection	Redundancy	N.A.	N.A.	N.A.	N.A.	Connection	N.A.	200,000	Each	**$200,000**	**$280,000**
2015	4-2	College Park West Emergency Connection to Long Beach system	Provide service during outage of City supply pipes	New	N.A.	N.A.	N.A.	8	700	35	Diam/in/LF	$196,000	$274,400
								8" Bridge Crossing	400	1,000	LF	$400,000	$560,000
								Connection	N.A.	100,000	Each	$100,000	$140,000
		Totals							**1,100**			**$696,000**	**$974,400**
2015	4-3	Harvard Lane, north of College Park Drive	Fire Flow Deficiency	P6014	1971	ACP	6	8	471	35	Diam/in/LF	**$131,897**	**$184,656**
2016	5-1	Lampson Avenue, between Seal Beach Boulevard and Basswood Street	Age/ Condition	P1000 P1010 P1020 P1030 P1040	1979	Mortar Lined Steel Cylinder	12	16	3,406	35	Diam/in/LF	**$1,907,631**	**$2,670,683**
2017	6-1	Pacific Coast Highway and OCFCD Los Alamitos Retarding Basin	Age/ Condition	P7430 P7440 P7450 P7452	1968	Mortar Lined Steel Cylinder	18	18	3,420	35	Diam/in/LF	**$2,154,715**	**$3,016,601**
2018	7-1	Leisure World Well Discharge Piping	Age/ Condition	N.A.	1962	ACP	12	12	77	35	LF	$32,340	$45,276
				N.A.	1962	N.A.	N.A.	Sand Separator	N.A.	100,000	Each	$100,000	$140,000
		Totals							**77**			**$132,340**	**$185,276**
2018	7-2	Old Town Water Line Replacement, Phase 1 - Pier Fire Line	Condition	P3060	1974	Mortar Lined Steel	6	8	1,842	50	Diam/in/LF	$736,967	**$1,031,754**
2019	8-1	Westminster Boulevard Water Line Replacement, from Seal Beach Boulevard to Apollo Drive	Condition	P7340 P7350 P7342 P7364	1968	ACP	12	12	725	35	Diam/in/LF	$304,419	$426,187
				P7360 P7362 P7364	1968	Mortar Lined Steel Cylinder	18	18	2,249	35	Diam/in/LF	$1,416,870	$1,983,618
		Totals							**2,974**			**$1,721,289**	**$2,409,805**

Table 1-6 (Continued)
Capital Improvement Program

Year of Implementation	Project ID	Location	Justification	Pipe ID	Year of Construction	Material	Existing Size (in)	Ult. Size (in)	Length (ft)	Unit Cost ($)		Construction Cost ($)	Total Cost ($)
2020	9-1	Leisure World Well Pump and 250 HP Motor Replacement	Asset Maintenance	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	300,000	Each	$300,000	$420,000
2021	10-1	Aged Water Line Replacement, Outside Old Town	Age/ Condition (CIP)	P4902	1972	CIP	10	10	1,137	35	Diam/in/LF	$398,006	$557,208
				P8090	1968	CIP	10	10	76	35	Diam/in/LF	$26,600	$37,240
		Totals							**1,213**			**$424,606**	**$594,448**
Annual	Annual	Old Town Water Line Replacement - Phase 2 Annual Condition Replacements	Age/ Condition (CIP)	Varies	Varies		4	8	422	50	Diam/in/LF	$168,650	$236,110
							6	8	11,821	50	Diam/in/LF	$4,728,583	$6,620,016
							8	8	9,425	50	Diam/in/LF	$3,769,826	$5,277,757
							12	12	3,127	50	Diam/in/LF	$1,876,233	$2,626,726
		Totals							**24,795**			**$10,543,292**	**$14,760,609**
								Grand Total	**45,842**			**$24,864,778**	**$33,530,689**



	CITY OF SEAL BEACH WATER MASTER PLAN UPDATE
PROJECT NO: 0801070.00	Capital Improvement Project Locations
DATE: July 2012	Figure 1-1