SECTION 9

CAPITAL IMPROVEMENT PROGRAM

9-1 Introduction

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 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 report, establish a basis and prioritize each of the projects.

The recommended CIP is shown in Table 9-1. Project locations are shown on Figure 9-1.

9-2 Cost Estimates

Cost estimates have been prepared for each recommended project, based upon information from recent similar projects. The pipeline replacement costs are based upon $30 per diameter inch per ft. The City of Manhattan Beach is largely occupied, and there are many existing utilities to consider. 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 9,760 for February 2010.

It should be noted that some of the improvements recommended herein are conceptual in nature based on existing planning information available. 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.

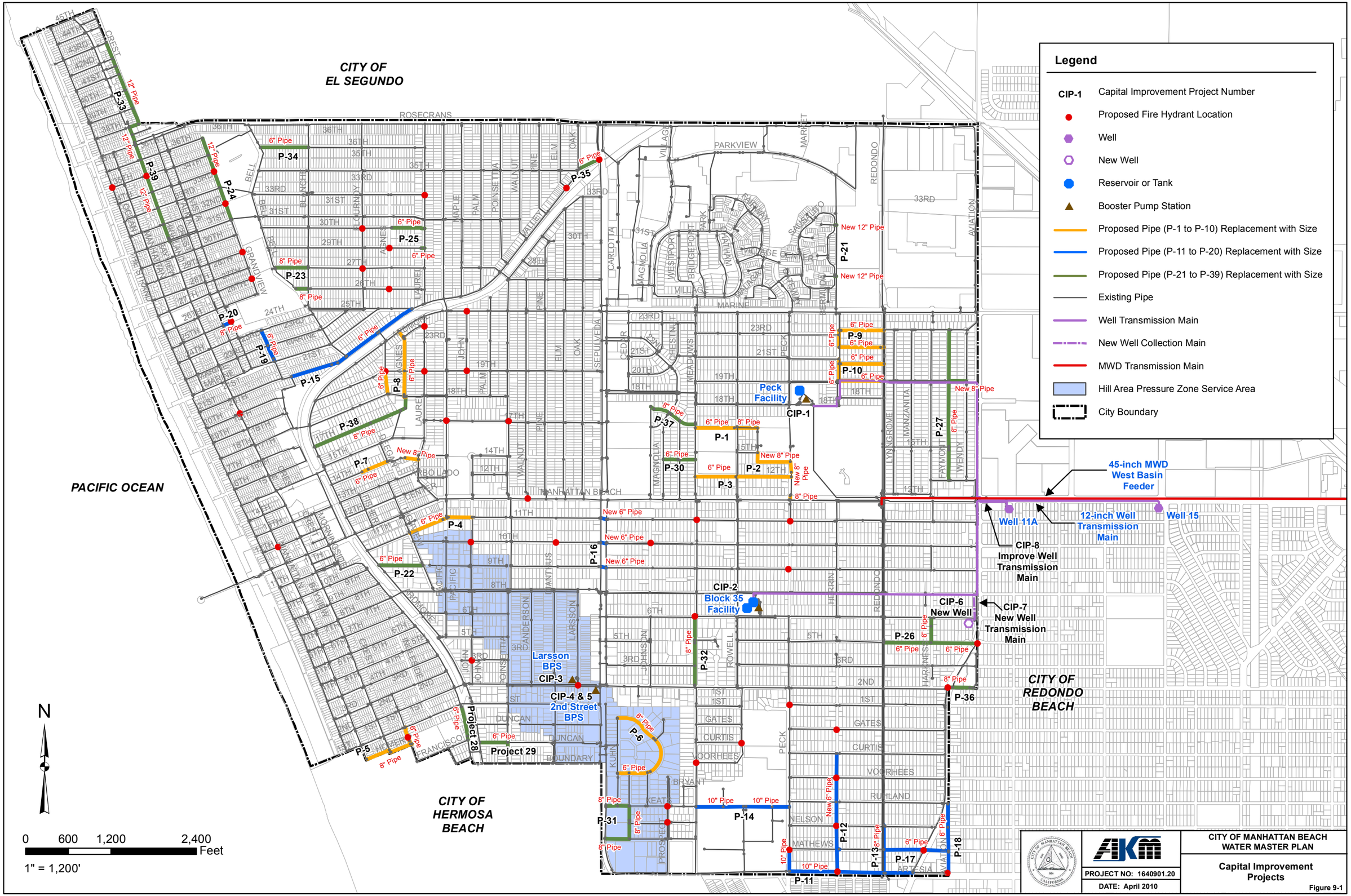
The cost estimates that follow were generated by estimating the quantities of required items for each improvement, and applying typical unit prices to obtain the total estimated construction costs. An amount equal to approximately 35 percent is added to the construction cost estimates to cover contingencies, 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 9-1.

9-3 Project Priorities

The primary consideration in establishing project priorities for the capital improvement program list must always be given to the health, safety and welfare of the public and the customers.

In general, the projects necessary to improve the existing system are scheduled earlier in the order of supply, pumping and storage. Fire protection rates as a high priority, but is usually dependent on the supply and storage, as well as the distribution system.

Supply improvements rate in the order of benefit to the overall system, and reliability during emergencies such as multiple sources.


CITY OF EL SEGUNDO
PACIFIC OCEAN
CITY OF HERMOSA BEACH
CITY OF REDONDO BEACH
ROSECRANS
MANHATTAN BEACH
MARINE
PARKVIEW
REDONDO
AVIATION
Peck Facility
CIP-1
Larsson BPS
CIP-3
CIP-4 & 5
2nd Street BPS
CIP-2
Block 35 Facility
CIP-6
New Well
CIP-7
New Well Transmission Main
CIP-8
Improve Well Transmission Main
Well 11A
12-inch Well Transmission Main
Well 15
45-inch MWD West Basin Feeder
Project 28
Project 29
P-1
P-2
P-3
P-4
P-5
P-6
P-7
P-8
P-9
P-10
P-11
P-12
P-13
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P-34
P-35
P-36
P-37
P-38
P-39
New 12" Pipe
New 8" Pipe
New 6" Pipe
12" Pipe
10" Pipe
8" Pipe
6" Pipe
N
0 600 1,200 2,400 Feet
1" = 1,200'
Legend
CIP-1 Capital Improvement Project Number
Proposed Fire Hydrant Location
Well
New Well
Reservoir or Tank
Booster Pump Station
Proposed Pipe (P-1 to P-10) Replacement with Size
Proposed Pipe (P-11 to P-20) Replacement with Size
Proposed Pipe (P-21 to P-39) Replacement with Size
Existing Pipe
Well Transmission Main
New Well Collection Main
MWD Transmission Main
Hill Area Pressure Zone Service Area
City Boundary
CITY OF MANHATTAN BEACH WATER MASTER PLAN
Capital Improvement Projects
PROJECT NO: 1640901.20
DATE: April 2010
Figure 9-1

Pumping improvements rate in the order of ability to augment fire flows, capacity to maintain adequate storage levels in the reservoirs, and redundancy of power and pumps to withstand emergencies.

Storage improvements rank in the order of fire protection, operational capability to meet average and peak flows, and emergencies.

With these guidelines, the projects recommended in this report and their estimated costs were examined and sorted. Based on the criteria described herein, it is recommended that the capital improvement projects are implemented in general accordance with the schedule shown on Table 9-1. Each project is shown with its total estimated project cost. The City should review this schedule and adjust it annually to respond to changed conditions and to take advantage of concurrent construction such as street paving projects or adjacent infrastructure work.

9-4 Capital Improvement Projects

CIP No. 1 - Replacement of Peck Reservoir

Peck Reservoir (7.5 mg) was originally constructed in 1957. It has 4-inch thick 1-1/2:1 side slopes and 4-inch thick reinforced concrete floor. It was constructed with interior reinforced concrete columns and cast-in-place reinforced concrete roof. Its roof was replaced with a metal roof and new cast-in-place reinforced concrete column braces were added in 2000. The slopes and the floor have experienced cracking, which require frequent repairs, and the metal roof is only in fair condition despite being in service for only nine years. At the end of the roof's useful life, which is expected to be in ten years (2020), it should be replaced with a new reservoir.

Because the City will have groundwater supply capability equaling or exceeding one average day demand, which is storage in the groundwater basin, above ground storage criterion is set at one average day demand (6 mg). Allowing 25 percent for submergence, 8 million gallons of storage is recommended for the ultimate system, provided equally at the Block 35 facility and the Peck site so that each facility can be operated similarly when the other is out. Estimated cost of this improvement is $8.1 million.

CIP No. 2 - Replacement of Block 35 Ground Level Reservoir

Block 35 Ground Level Reservoir (2 mg) was originally constructed in 1948. It has an inner wall with 69.17 ft diameter, and an outer wall with 140 ft diameter. The inner wall top is at elevation 182.8 feet, while the outer wall top is at elevation 191.58 feet. The overflow elevation is at 190 feet. Due to leakage at the wall/floor joint at high water levels, the reservoir is operated at half full level. This is the facility where most of the blending takes place, and from where water is pumped into the system. Therefore, its integrity is essential for proper operation of the system. It is at the end of its useful life, and should be replaced with a new reservoir by 2017. It is recommended that a 4 million gallon tank to be constructed to provide a total operational storage of 6 million gallons (average day demand) in conjunction with the proposed Peck Reservoir. The estimated cost of implementation of this project is $8.1 million.

CIP No. 3 - Replacement of Larsson Pump Station

Larsson Pump Station dates back to 1948, when the pump station had a single 10 horsepower (HP) pump. A 7.5 HP pump was added in 1954. It appears that the pump station was reconstructed in a below ground 8 feet wide and 17 feet long precast concrete box with three pumps. The pump station was upgraded in 1982

by adding variable frequency drives and replacing the pumps. It was upgraded again in 1999 with three new pumps and variable frequency drives. A 60 KW diesel standby generator in an underground vault and an automatic transfer switch were added during this improvement project. The existing structure has several cracks, and is in poor condition.

The existing three pumps are rated at 580 gpm, and can deliver a maximum of 2,100 gpm. With a maximum day demand of 378 gpm, the fire flow available is approximately 1,700 gpm if Second Street Pump Station is out of service. This is only 85 percent of the single family residential fire flow of 2,000 gpm, and 42.5 percent of the commercial fire flow of 4,000 gpm. The fire flow available during the peak hour demand of 713 gpm is significantly lower.

It is recommended that Larsson Pump Station be replaced with a new facility that can provide a total of 4,400 gpm. A preliminary design report should be prepared to develop the final design flows, pump selection, pump station layout, and standby power needs. This project is currently scheduled for 2011, with an estimated implementation cost of $4,050,000.

CIP No. 4 - 2nd Street Booster Pump Station - Install solid state controller

The 2nd Street Booster Pump Station is located in a vault structure underneath the sidewalk adjacent to 2nd Street. It is equipped with an 80 horsepower natural gas powered horizontal centrifugal split case booster water pump that supplies backup water system pressure and primary fire protection to the City's upper Hill Area Pressure Zone.

The pump station's pressure switch type control system is slow to respond to system pressure changes resulting in premature starting and stopping of the station, replacement parts are not readily available, and the control system has exceeded its anticipated service life.

It is recommended that a new solid state type control system be installed to mitigate excessive starting and stopping of the station, and extend the station's service life. The project is currently scheduled for 2010, with an estimated implementation cost of $270,000.

CIP No. 5 - 2nd Street Booster Pump Station - Install seismic vibration isolators under engine

The 2nd Street Booster Pump Station's booster pump and natural gas engine experiences excessive vibration when running. This excessive vibration can be felt when standing on the sidewalk above the pump station's vault structure and inside an adjacent office building. The excessive vibration will reduce the service life of the vault, engine and pumping equipment if left unchecked.

It is recommended that seismic vibration isolators be installed under the engine and pump assembles to mitigate excessive vibration, and extend the life of the booster pump station. The project is currently scheduled for 2010, with an estimated implementation cost of $135,000.

CIP No. 6 - New Well

The City's water supply criteria include local sources to meet the ultimate average day demand (3,940 gpm). The City's Well 11A produces approximately 2,300 gpm. This is greater than the original intended capacity of the well (1,800 gpm). Well 15 is currently being rehabilitated, and is expected to produce approximately 1,200. However, when the two wells are operated simultaneously, Well 15 produces very little water due to the high downstream pressure resulting from the operation of Well 11A, and the small size of the well

collection line extending from Well 11A to Block 35 Reservoir. A separate project is recommended to mitigate this problem. In order to meet the source of supply criteria, a new well should be constructed so that the three wells can supply a minimum of 4,000 gpm.

One possible location for the new well is the abandoned Well 13 site at the corner of 6th Street and Aviation Boulevard. This well was abandoned prior to 1978 due to saltwater intrusion and water quality problems. Over the past 30 years, much work has been done by regional agencies to clean up the West Coast Groundwater Basin, particularly the seawater intrusion barriers. The water quality should be tested at the abandoned well site to determine if it would now be feasible to construct a new well at this location and whether or not some sort of treatment would be needed prior to introduction of its production into the City's system. If feasible, a new well should be drilled and constructed at this location. If it is determined that the old Well 13 Site cannot be used, an alternative site must be located.

The estimated cost of drilling and equipping the new well, currently scheduled for 2012, is $5,832,000.

CIP No. 7 - Well discharge pipe from New Well to the new well collection line

This project is necessary to convey the production of the new well to the new well collection line described under CIP No. 8. The exact location of the new well is yet not known. For this Master Plan, it is assumed that it will be located at the abandoned Well 13 Site. The well discharge pipe would then be on Aviation Boulevard extending 500 feet from 6th Street to 8th Street where it will tie into the new 18-inch well collection line (CIP No. 8). The recommended size is 12-inches. Assuming the capacity of the new well is about 1,600 gpm, the velocities in the pipe will be about 4.5 fps. The estimated implementation cost of this project, scheduled for 2013, is $328,050.

CIP No. 8 - New well collection line from Well 11A to Block 35

The well collection line from Well 11A to Block 35 will need to be upsized in order to convey the water at reasonable velocities from Well 11A, Well 15, and the new well. It is currently 12-inches in diameter from Well 11A to 8th Street. At 8th Street and Aviation Blvd, the pipe reduces to 10-inches and continues west to the Block 35 Facility. It is recommended that these portions of the well collection line, 5,000 feet in length, be replaced with an 18-inch pipe. The velocities would range from 2 fps to 6 fps, depending on the number of wells in operation at one time. The estimated implementation cost of the project, currently scheduled for 2013, is $4,920,750.

CIP No. 9 - Install new fire hydrants

Per the fire hydrant spacing criterion established (see Section 7-10), fire hydrants must be spaced at an average of 450 feet in single family residential areas, 400 feet in multi-family residential areas, and 350 feet in all other areas. There are many portions of the existing system where this criterion is not met. Typically, one hydrant can provide 1,000 gpm to 1,500 gpm. If additional fire flow is needed, more than one hydrant must be used. This means that multiple hydrants must be within a reasonable distance from the fire location. It is recommended that additional fire hydrants be installed throughout the system to meet the spacing criteria. It is estimated that approximately 593 additional hydrants are needed.

The system analysis with maximum day plus fire flow identified the need to install 48 fire hydrants, which should be addressed first. Some of the hydrants should be installed at proper spacing as distribution system pipes are replaced due to size or condition. Remainder should be scheduled by the City staff annually.

Approximately 18 additional hydrants are budgeted annually through 2021, increasing to 30 per year thereafter.

CIP No. 10 - Pipe replacement program (annual)

The pipe replacement program serves two purposes. The first is to address fire flow deficiencies in the existing system due to small pipe sizes. The second is to replace pipe due to age and condition. Table 9-2 details the recommendations for pipe replacements due to fire flow deficiencies identified in the hydraulic model. Most of the pipes are currently 4 inches in diameter and cannot provide the required fire flows and residual pressures.

The City criteria require that the residual pressures at the hydrant be 20 psi. The hydraulic model does not include laterals from the mainline to the hydrants. It is estimated that there can be a loss of up to 10 psi through a lateral and hydrant at 1,000 gpm. The system evaluation is therefore based on providing 30 psi at the nearest mainline junction in the model.

In addition to the 48 hydrants identified through maximum day plus fire flow analyses, the system is not capable of providing 30 psi pressure at the nearest junction for the following areas:

- Crest Drive, between Moonstone Street and 45th Street
- The intersection of Vista Avenue and 34th Street
- The intersection of Vista Avenue and 30th Street
- Miracosta High School

Since the residual pressures in these areas range just below the 30 psi criteria, between 27 psi and 29 psi, these pipes are considered to be sufficient.

The current land use near the intersection of 36th Street and Grandview Avenue consists of low density residential; however, the General Plan shows the land use in this area as high density residential. The model indicates that the Project 24 improvements will help provide 2,000 gpm at 30 psi at the nearby nodes, which satisfies the fire flow criteria for single family residential. Due to the high elevations, the system cannot provide the high density residential fire flows of 3,000 gpm at 30 psi without creating a new pumped zone.

The land use along Crest Avenue between 38th Street and Moonstone Street appears to currently consist of high density residential; however, the General Plan shows it as commercial. The model shows that the Project 33 improvements will help provide 3,000 gpm at 30 psi at the nearby nodes, which satisfies the high density residential fire flow criteria but not the commercial fire flow requirement (4,000 gpm at 30 psi) without creating a new pumped zone.

A total of $3.45 million has been allocated for pipe replacements each year. The total length of pipe replacement recommended due to fire flow deficiencies is 40,432 feet. To the extent possible, pipe replacement program should address the fire flow deficiencies, which can be completed during the first 6 years of the pipe replacement program.

Table 9-1
Capital Improvement Program

CIP No.	Project Description	Facility Location Description	Date of Construction for Existing Facility	Justification	Recommended Replacement Year	Recommended Facilities				Construction Cost ($)	Eng. & Admin. Cost ($)	Total Project Cost ($)
						Firm Capacity (gpm)	Res Size (MG)	Pipe Size (in)	Pipe Length (ft)			
CIP-1	Replacement of Peck Reservoir		1957	Age / Condition	2020		4.0			6,000,000	2,100,000	8,100,000
CIP-2	Replacement of Block 35 Reservoir	8th St and Rowell Ave	1948	Age / Condition	2017		4.0			6,000,000	2,100,000	8,100,000
CIP-3	Replacement of Larsson Pump Station	2nd St and Larsson St	1949	Age / Condition	2011	4,400				3,000,000	1,050,000	4,050,000
CIP-4	2nd Street Booster Pump Station - Install solid state controller	2nd St and Sepulveda Blvd	1977	Age / Condition	2010					200,000	70,000	270,000
CIP-5	2nd Street Booster Pump Station - Install seismic vibration isolators under engine	2nd St and Sepulveda Blvd	1977	Age / Condition	2010					100,000	35,000	135,000
CIP-6	New well at Well Site 13	6th St and Aviation Blvd	-	Supply	2012					4,320,000	1,512,000	5,832,000
CIP-7	New well collection line from Well Site 13 to 8th St	Aviation Blvd	-	Supply	2013			12	500 (approximate)	243,000	85,050	328,050
CIP-8	New well collection line from Well 11A to Block 35	Manhattan Beach Blvd, Aviation Blvd, 8th St	-	Supply	2013			18	5,000	3,645,000	1,275,750	4,920,750
CIP-9	Install new fire hydrants	Varies	-	Criteria	18/yr through 2021, 30/yr thereafter					3,000,000	1,050,000	4,050,000
CIP-10	Pipe replacement program (annually) - small diameter cast iron pipe	Varies	-	Age / Condition Fireflow	$3.45 M/yr 1.5 miles/yr through 2021, 2.5 miles/yr thereafter			6 thru 18	220,600	79,416,000	27,795,600	107,211,600
									Total	**105,924,000**	**37,073,400**	**142,997,400**

Table 9-2
Recommended Pipeline Replacements

Pipe Priority Number	Location Description	Model Pipe ID	Model U/S Node	Model D/S Node	Installation Date	Length (ft)	Existing Size (in)	Replace-ment Size (in)	Unit Cost ($/ft)	Construction Cost ($)	Total Cost ($)
P-1	17th Street, between Meadows Avenue and Rowell Avenue.	24240-24250	24240	24250	1949	548	4	6	180	$98,573	$133,074
		24220-24240	24220	24240	1949	333	4	8	240	$79,886	$107,847
				Project Length		**880**		**Project Cost**		**178,460**	**240,921**
P-2	North of Manhattan Beach Boulevard, West of Peck Avenue. Connect to 15th Street at Manhattan Beach Preschool.	21580-22050	21580	22050	1951	56	4	8	240	$13,558	$18,303
		23100-23710	23100	23710	N.A.	280	New	8	240	$67,200	$90,720
		23710-23711	23710	23720	N.A.	700	New	8	240	$168,000	$226,800
				Project Length		**1,036**		**Project Cost**		**248,758**	**335,823**
P-3	12th Street between Meadows Avenue and Peck Avenue.	22890-22910	22890	22910	1948	571	4	6	180	$102,807	$138,789
		22880-22890	22880	22890	N.A.	778	4	6	180	$139,982	$188,976
				Project Length		**1,349**		**Project Cost**		**242,789**	**327,766**
P-4	11th Street, between John Street and Highview Avenue.	19870-20380	19870	20380	1956	504	4	6	180	$90,749	$122,511
		20720-20650	20720	20650	1947	333	4	6	180	$59,947	$80,929
		20430-20530	20430	20530	1949	57	4	6	180	$10,201	$13,771
		20590-20720	20590	20720	1947	20	4	6	180	$3,524	$4,758
		20380-20430	20380	20430	1956	3	4	8	240	$672	$907
				Project Length		**916**		**Project Cost**		**165,093**	**222,876**
P-5	Homer Street, between Manhattan Avenue and Morningside Drive. Morningside Drive between 1st Street and Francisco Street.	11650-11490	11650	11490	1926	339	4	6	180	$61,038	$82,401
		11850-11630	11850	11630	1926	295	4	6	180	$53,105	$71,692
		12050-12200	12050	12200	1926	63	4	6	180	$11,412	$15,406
		12200-12440	12200	12440	1953	148	4	6	180	$26,654	$35,983
		11880-11850	11880	11850	1926	21	4	6	180	$3,805	$5,137
		11850-12050	11850	12050	1926	44	4	6	180	$7,911	$10,680
		11620-11650	11620	11650	1926	37	4	6	180	$6,669	$9,003
		11630-11620	11630	11620	1926	14	4	6	180	$2,527	$3,412
				Project Length		**962**		**Project Cost**		**173,122**	**233,715**

Table 9-2
Recommended Pipeline Replacements (Continued)

Pipe Priority Number	Location Description	Model Pipe ID	Model U/S Node	Model D/S Node	Installation Date	Length (ft)	Existing Size (in)	Replace-ment Size (in)	Unit Cost ($/ft)	Construction Cost ($)	Total Cost ($)
P-6	Ronda Drive, Between Kuhn Drive and Longfellow Drive. Longfellow Drive, between Kuhn Drive and Ronda Drive.	12650-12170	12650	12170	1953	619	4	8	240	$148,603	$200,614
		11320-11300	11320	11300	1953	260	4	8	240	$62,441	$84,295
		11300-11280	11300	11280	1953	161	4	8	240	$38,657	$52,187
		12090-11330	12090	11330	1953	518	4	8	240	$124,262	$167,754
		12170-12090	12170	12090	1953	36	4	8	240	$8,657	$11,687
		11330-11320	11330	11320	1953	42	4	8	240	$9,994	$13,491
				Project Length		**1,636**		**Project Cost**		**392,614**	**530,028**
P-7	14th Street, between Laurel Avenue and east of Ardmore Avenue.	23160-23250	23160	23250	1952	288	4	6	180	$51,820	$69,957
		23110-23160	23110	23160	1952	94	4	6	180	$16,965	$22,903
		23530-23330	23530	23330	N.A.	200	New	8	240	$48,000	$64,800
				Project Length		**582**		**Project Cost**		**116,785**	**157,660**
P-8	Agnes Road, between Ardmore Avenue and 18th Street. Flournoy Road between 19th Street and 18th Street.	27960-28200	27960	28200	1990	109	4	6	180	$19,669	$26,553
		25850-26750	25850	26750	1954	322	4	6	180	$57,890	$78,151
		26720-27920	26720	27920	1926	450	4	6	180	$81,011	$109,365
		25550-25540	25550	25540	1958	19	6	8	240	$4,538	$6,127
		25540-25670	25540	25670	1958	19	6	8	240	$4,675	$6,312
		27920-27960	27920	27960	1926	23	4	6	180	$4,149	$5,601
		25780-26720	25780	26720	1926	328	4	6	180	$59,121	$79,813
				Project Length		**1,271**		**Project Cost**		**231,053**	**311,921**
P-9	22nd and 23rd Street between Herrin Avenue and Redondo Avenue. Herrin Avenue, between 22nd Avenue and 23rd Avenue.	27580-27590	27580	27590	1952	586	4	6	180	$105,392	$142,279
		28250-28220	28250	28220	1952	606	4	6	180	$109,168	$147,377
		28040-28230	28040	28230	1952	66	4	6	180	$11,900	$16,065
		27590-28040	27590	28040	1952	172	4	6	180	$30,881	$41,689
		27570-27580	27570	27580	1952	50	4	6	180	$9,058	$12,228
		28230-28250	28230	28250	1952	30	4	6	180	$5,315	$7,176
				Project Length		**1,510**		**Project Cost**		**271,714**	**366,813**
P-10	19nd and 21st Street between Herrin Avenue and Redondo Avenue. Herrin Avenue, between 19th Avenue and 21st Avenue.	26260-26270	26260	26270	1952	50	4	6	180	$9,005	$12,157
		26390-27110	26390	27110	1952	236	4	6	180	$42,516	$57,397
		26390-26260	26390	26260	1952	586	4	6	180	$105,457	$142,366
		27120-27100	27120	27100	1952	606	4	6	180	$109,028	$147,188
		27110-27120	27110	27120	1952	29	4	6	180	$5,279	$7,127
		26400-26390	26400	26390	1952	20	4	6	180	$3,632	$4,904
		27110-27200	27110	27200	1952	68	4	6	180	$12,256	$16,546
				Project Length		**1,595**		**Project Cost**		**287,174**	**387,685**

Table 9-2
Recommended Pipeline Replacements (Continued)

Pipe Priority Number	Location Description	Model Pipe ID	Model U/S Node	Model D/S Node	Installation Date	Length (ft)	Existing Size (in)	Replace-ment Size (in)	Unit Cost ($/ft)	Construction Cost ($)	Total Cost ($)
P-11	Peck Avenue, between Matthews Avenue and Artesia Boulevard. Artesia Boulevard, between Peck Avenue and Aviation Boulevard.	10150-10260	10150	10260	1949	301	6	10	300	$90,339	$121,958
		10140-10150	10140	10150	1953	5	6	10	300	$1,614	$2,179
		10090-10070	10100	10070	N.A.	385	6	10	300	$115,500	$155,925
		10140-10141	10140	10061	N.A.	680	6	10	300	$204,000	$275,400
		10141-10060	10061	10060	N.A.	1,328	6	10	300	$398,517	$537,998
				Project Length		**2,700**		**Project Cost**		**809,970**	**1,093,460**
P-12	Herrin Avenue, between Curtis Avenue and Artesia Boulevard.	11580-11200	11580	11200	N.A.	340	New	6	180	$61,200	$82,620
		11200-11090	11200	11090	N.A.	340	New	6	180	$61,200	$82,620
		11100-10600	11090	10600	N.A.	340	New	6	180	$61,200	$82,620
		10600-10310	10600	10310	N.A.	340	New	6	180	$61,200	$82,620
		10310-10061	10310	10061	N.A.	340	New	6	180	$61,200	$82,620
				Project Length		**1,700**		**Project Cost**		**306,000**	**413,100**
P-13	Redondo Avenue, between Nelson Avenue and Artesia Boulevard.	10300-10660	10300	10660	1953	341	4	8	240	$81,732	$110,338
		10060-10300	10060	10300	1953	331	4	8	240	$79,409	$107,202
				Project Length		**671**		**Project Cost**		**161,141**	**217,540**
P-14	Miracosta High School between Meadows Avenue and Peck Avenue.	10870-10840	10870	10840	1953	368	8	10	300	$110,496	$149,170
		10860-10850	10860	10850	1953	284	6	10	300	$85,062	$114,834
		10860-10870	10860	10870	1953	35	8	10	300	$10,434	$14,086
		10840-10820	10840	10820	1953	240	8	10	300	$71,898	$97,062
		10850-10830	10850	10830	N.A.	385	6	10	300	$115,500	$155,925
				Project Length		**1,311**		**Project Cost**		**393,390**	**531,077**
P-15	21st Street between Manor Drive and Blanche Road. Valley Drive between Blanche Road and 25th Street.	27390-28160	27390	28160	1938	542	4	6	180	$97,492	$131,614
		27160-27320	27160	27320	1938	143	4	6	180	$25,792	$34,819
		27320-27370	27320	27370	1938	5	4	6	180	$851	$1,149
		27370-27390	27370	27390	1938	7	4	6	180	$1,242	$1,677
		28160-28180	28160	28180	1938	26	4	6	180	$4,599	$6,209
		28190-29580	28190	29580	1953	559	4	6	180	$100,703	$135,949
		26500-27090	26500	27090	N.A.	595	4	6	180	$107,149	$144,651
		27090-27160	27090	27160	N.A.	91	4	6	180	$16,463	$22,225
				Project Length		**1,968**		**Project Cost**		**354,290**	**478,292**

Table 9-2
Recommended Pipeline Replacements (Continued)

Pipe Priority Number	Location Description	Model Pipe ID	Model U/S Node	Model D/S Node	Installation Date	Length (ft)	Existing Size (in)	Replace-ment Size (in)	Unit Cost ($/ft)	Construction Cost ($)	Total Cost ($)
P-16	9th Street, 10th Street, and 11th Street across Sepulveda Boulevard.	20520-20410	20520	20410	N.A.	80	New	6	180	$14,400	$19,440
		19510-19420	19510	19420	N.A.	75	New	6	180	$13,500	$18,225
		18630-18600	18630	18600	N.A.	75	New	6	180	$13,500	$18,225
				Project Length		**230**		**Project Cost**		**41,400**	**55,890**
P-17	Matthews Avenue, between Redondo Avenue and Aviation Boulevard.	10240-10300	10240	10300	1953	554	4	8	240	$132,938	$179,467
		10220-10240	10220	10240	1953	354	4	6	180	$63,799	$86,129
		10300-10290	10300	10290	1953	6	4	8	240	$1,493	$2,015
				Project Length		**915**		**Project Cost**		**198,230**	**267,611**
P-18	Aviation Way, between Ruhland Avenue and Artesia Boulevard.	10220-10580	10220	10580	1953	333	4	6	180	$59,915	$80,885
		10090-10080	10090	10080	1953	17	4	6	180	$3,116	$4,206
		10080-10210	10080	10210	1953	290	4	6	180	$52,121	$70,363
		10210-10220	10210	10220	1953	22	4	6	180	$3,875	$5,232
		10580-11020	10580	11020	1953	324	4	6	180	$58,408	$78,851
				Project Length		**986**		**Project Cost**		**177,435**	**239,537**
P-19	Grandview Avenue, between Marine Avenue and 24th Street.	27190-27240	27190	27240	1958	42	4	6	180	$7,472	$10,087
		27600-28240	27600	28240	1958	239	4	6	180	$43,016	$58,072
		27240-27600	27240	27600	1958	196	4	6	180	$35,231	$47,562
				Project Length		**476**		**Project Cost**		**85,720**	**115,721**
P-20	25th Street, between Alma Avenue and Vista Drive.	28660-28700	28660	28700	1925	14	4	8	240	$3,408	$4,601
		28660-28510	28660	28510	1954	115	6	8	240	$27,643	$37,318
				Project Length		**129**		**Project Cost**		**31,051**	**41,919**
P-21	Sausalito Circle and Santa Rosa Court. Sausalito Circle and Cordoba Court.	33302-31020	33302	31020	N.A.	30	New	12	360	$10,800	$14,580
		33301-32670	33301	32670	N.A.	30	New	12	360	$10,800	$14,580
				Project Length		**60**		**Project Cost**		**21,600**	**29,160**
P-22	9th Street, between Ardmor Avenue and Highview Avenue.	18780-18860	18780	18860	1956	621	4	6	180	$111,749	$150,862
				Project Length		**621**		**Project Cost**		**111,749**	**150,862**
P-23	27th Street, between Bell Avenue and Blanche Road.	31300-31320	31300	31320	1954	463	4	8	240	$111,079	$149,957
	26th Street, between Bell Avenue and Blanche Road.	30450-30400	30450	30400	N.A.	174	4	8	240	$41,748	$56,360
				Project Length		**637**		**Project Cost**		**152,827**	**206,317**

Table 9-2
Recommended Pipeline Replacements (Continued)

Pipe Priority Number	Location Description	Model Pipe ID	Model U/S Node	Model D/S Node	Installation Date	Length (ft)	Existing Size (in)	Replace-ment Size (in)	Unit Cost ($/ft)	Construction Cost ($)	Total Cost ($)
P-24*	Grandview Avenue, between 31st Street and 36th Street	32810-32930	32810	32930	1926	12	6	12	360	$4,162	$5,618
		32930-33490	32930	33490	1959	229	6	12	360	$82,386	$111,221
		33890-34280	33890	34280	1959	241	6	12	360	$86,893	$117,306
		34310-34930	34310	34930	1959	236	6	12	360	$85,061	$114,832
		34950-34960	34950	34960	1925	3	6	12	360	$990	$1,337
		34930-34950	34930	34950	1925	3	6	12	360	$979	$1,322
		34280-34290	34280	34290	1926	2	8	12	360	$630	$851
		33860-33890	33860	33870	1926	4	8	12	360	$1,487	$2,007
		33510-33860	33510	33860	1959	232	6	12	360	$83,408	$112,601
		33490-33500	33490	33500	1926	3	8	12	360	$983	$1,327
		34960-35400	34960	35400	1959	252	6	12	360	$90,659	$122,389
		33500-33510	33500	33510	N.A.	3	8	12	360	$1,080	$1,458
		34290-34310	34290	34310	N.A.	3	8	12	360	$1,080	$1,458
		33870-33890	33870	33890	N.A.	2	8	12	360	$720	$972
				Project Length		**1,224**		**Project Cost**		**440,518**	**594,699**
P-25	30th Street, between Agnes Road and Laurel Avenue. 29th Street, west of Laurel Avenue.	31890-31900	31890	31900	1957	50	4	6	180	$8,977	$12,118
		32580-32590	32580	32590	1955	465	4	6	180	$83,666	$112,949
				Project Length		**515**		**Project Cost**		**92,642**	**125,067**
P-26	5th Street, between Redondo Avenue and Aviation Boulevard. Harkness Street, between 5th Street and 6th Street.	15240-15250	15240	15250	1953	663	4	6	180	$119,419	$161,216
		15240-15960	15240	15960	1953	234	4	6	180	$42,160	$56,915
		15240-15221	15240	15221	1953	655	4	6	180	$117,873	$159,129
		15960-16130	15960	16130	1953	121	2	6	180	$21,708	$29,306
				Project Length		**1,673**		**Project Cost**		**301,160**	**406,566**
P-27	Faymont Avenue, Between 23rd Street and 12th Street. 19th Street, between Faymont Avenue and Wendy Way.	23910-26290	23910	26290	1950	924	4	6	180	$166,252	$224,440
		26290-28310	26290	28310	1950	717	4	6	180	$129,074	$174,250
		22760-23800	22760	23800	1950	429	4	6	180	$77,191	$104,208
		23800-23820	23800	23820	1950	31	4	6	180	$5,544	$7,484
		23820-23860	23820	23860	1950	8	4	6	180	$1,454	$1,963
		23860-23910	23860	23910	1950	8	4	6	180	$1,372	$1,852
		26290-26250	26290	26250	N.A.	250	New	8	240	$60,000	$81,000
				Project Length		**2,366**		**Project Cost**		**440,887**	**595,198**

* Cannot provide total fire flow demand for land use provided in General Plan. Restrict future development in these areas.

Table 9-2
Recommended Pipeline Replacements (Continued)

Pipe Priority Number	Location Description	Model Pipe ID	Model U/S Node	Model D/S Node	Installation Date	Length (ft)	Existing Size (in)	Replace-ment Size (in)	Unit Cost ($/ft)	Construction Cost ($)	Total Cost ($)
P-28	Valley Drive, between 1st Street and Francisco Street.	12240-12820	12240	12820	1953	415	4	6	180	$74,736	$100,894
		12110-12240	12110	12240	1953	58	4	6	180	$10,447	$14,104
				Project Length		**473**		**Project Cost**		**85,183**	**114,997**
P-29	Duncan Avenue, between Ardmore Avenue and Poinsettia Avenue.	11970-12070	11970	12070	1953	29	4	6	180	$5,143	$6,943
		11970-12000	11970	12000	1953	392	4	6	180	$70,603	$95,314
		12120-12070	12120	12070	1953	12	4	6	180	$2,158	$2,914
		11710-11970	11710	11970	1953	64	4	6	180	$11,522	$15,554
				Project Length		**497**		**Project Cost**		**89,426**	**120,725**
P-30	Easement, north of Manhattan Beach Boulevard, between Magnolia Avenue and Meadows Avenue.	23410-23380	23410	23380	1947	205	4	6	180	$36,941	$49,871
		23370-23360	23370	23360	1947	6	4	6	180	$1,134	$1,531
		23360-23350	23360	23350	1947	215	4	6	180	$38,752	$52,315
		23380-23370	23380	23370	1947	25	4	6	180	$4,455	$6,014
				Project Length		**452**		**Project Cost**		**81,283**	**109,732**
P-31	Keats Street and Tennyson Street, between PCH and Chabela Drive. Chabela Drive, between Keats Street and Tennyson Street.	10470-10410	10470	10410	1953	338	6	8	240	$81,125	$109,518
		10410-10680	10410	10680	1976	217	6	8	240	$51,984	$70,178
		10680-10760	10680	10760	1976	50	6	8	240	$12,043	$16,258
		10760-10970	10760	10970	1976	197	6	8	240	$47,220	$63,747
		10980-10990	10980	10990	1953	159	6	8	240	$38,249	$51,636
		10990-10940	10990	10940	1953	163	6	8	240	$39,170	$52,880
				Project Length		**1,124**		**Project Cost**		**269,791**	**364,218**
P-32	Meadows Avenue, between 2nd Street and 6th Street.	15230-15550	15230	15550	1956	41	6	8	240	$9,797	$13,226
		14030-14640	14030	14640	1953	271	6	8	240	$65,042	$87,807
		14640-15210	14640	15210	1956	316	6	8	240	$75,948	$102,530
		15550-16430	15550	16430	1956	338	6	8	240	$81,046	$109,412
				Project Length		**966**		**Project Cost**		**231,833**	**312,974**
P-33*	Crest Drive between 43rd Street and 38th Sreet, and 38th Street Between Crest Drive and Highland Avenue.	35480-35940	35480	35940	1979	140	8	12	360	$50,526	$68,210
		35940-36190	35940	36190	1979	240	8	12	360	$86,404	$116,645
		36190-36300	36190	36300	1979	274	8	12	360	$98,658	$133,188
		36300-36360	36300	36360	1979	240	8	12	360	$86,411	$116,655
		36360-36400	36360	36400	1979	124	8	12	360	$44,626	$60,245
		36400-36500	36400	36500	1979	116	8	12	360	$41,929	$56,604
		36500-36570	36500	36570	1979	240	8	12	360	$86,245	$116,431
				Project Length		**1,374**		**Project Cost**		**494,798**	**667,978**

* Cannot provide total fire flow demand for land use provided in General Plan. Restrict future development in these areas.

Table 9-2
Recommended Pipeline Replacements (Continued)

Pipe Priority Number	Location Description	Model Pipe ID	Model U/S Node	Model D/S Node	Installation Date	Length (ft)	Existing Size (in)	Replace-ment Size (in)	Unit Cost ($/ft)	Construction Cost ($)	Total Cost ($)
P-34	36th Street, between Bell Avenue and Blanche Road.	35250-35260	35250	35260	1940	678	4	6	180	$121,981	$164,674
				Project Length		**678**		**Project Cost**		**121,981**	**164,674**
P-35	Valley Drive, between Oak Avenue and Sepulveda Boulevard.	34810-34640	34810	34640	1953	296	4	6	180	$53,357	$72,032
				Project Length		**296**		**Project Cost**		**53,357**	**72,032**
P-36	2nd Street, between Aviation Place and Aviation Boulevard.	13510-13490	13490	13500	1953	43	6	8	240	$10,318	$13,929
		13560-13501	13560	13501	1956	309	6	8	240	$74,045	$99,960
		13580-13560	13580	13560	N.A.	14	6	8	240	$3,396	$4,585
		13501-13500	13501	13500	N.A.	224	6	8	240	$53,645	$72,420
				Project Length		**589**		**Project Cost**		**141,403**	**190,894**
P-37	17th Street between Meadows Avenue and west of Magnolia Avenue.	24920-24860	24920	24860	1949	218	6	8	240	$52,382	$70,716
		24590-24370	24590	24370	1949	226	6	8	240	$54,120	$73,062
		24660-24590	24660	24590	1949	7	6	8	240	$1,608	$2,171
		24800-24660	24800	24660	1949	150	6	8	240	$35,899	$48,464
		24860-24800	24860	24800	1949	37	6	8	240	$8,878	$11,985
		24930-24920	24930	24920	1949	7	6	8	240	$1,642	$2,216
		24930-25000	24930	25000	N.A.	60	New	8	240	$14,400	$19,440
				Project Length		**704**		**Project Cost**		**168,929**	**228,054**
P-38	17th Street, between Ardmore Avenue and 18th Street.	24990-25550	24990	25550	1958	152	6	8	240	$36,360	$49,086
		23900-24390	23900	24390	1958	855	6	8	240	$205,238	$277,072
		24900-24990	24900	24990	1958	74	6	8	240	$17,741	$23,950
		24390-24900	24390	24900	1958	461	6	8	240	$110,520	$149,202
				Project Length		**1,541**		**Project Cost**		**369,859**	**499,310**

Table 9-2
Recommended Pipeline Replacements (Continued)

Pipe Priority Number	Location Description	Model Pipe ID	Model U/S Node	Model D/S Node	Installation Date	Length (ft)	Existing Size (in)	Replace-ment Size (in)	Unit Cost ($/ft)	Construction Cost ($)	Total Cost ($)
P-39	Highland Avenue, between 38th Street and 30th Street.	35310-35320	35310	35320	1926	9	6	12	360	$3,226	$4,355
		35320-35330	35320	35330	1926	3	8	12	360	$1,256	$1,696
		32700-33430	32700	33430	1925	237	8	12	360	$85,144	$114,944
		33840-33450	33840	33450	1935	237	8	12	360	$85,324	$115,187
		33840-34170	33840	34170	1935	235	8	12	360	$84,719	$114,370
		34800-35300	34800	35300	1925	205	8	12	360	$73,966	$99,854
		35340-35490	35430	35480	1979	254	6	12	360	$91,267	$123,211
		32050-32130	32050	32130	1925	15	8	12	360	$5,267	$7,110
		35300-35310	35300	35310	1926	8	6	12	360	$2,812	$3,796
		32130-32150	32130	32150	N.A.	10	8	12	360	$3,600	$4,860
		32150-32200	32150	32200	N.A.	28	8	12	360	$10,080	$13,608
		33450-33430	33450	33430	N.A.	7	8	12	360	$2,340	$3,159
		35330-35340	35330	35340	N.A.	4	8	12	360	$1,440	$1,944
		35340-35360	35340	35360	N.A.	29	6	12	360	$10,440	$14,094
		35360-35430	35360	35430	N.A.	227	6	12	360	$81,691	$110,283
		32200-32680	32200	32680	N.A.	203	8	12	360	$73,080	$98,658
		32680-32700	32680	32700	N.A.	8	8	12	360	$2,880	$3,888
		34800-34170	34800	34170	1925	100	8	12	360	$36,000	$48,600
					Project Length	**1,818**			**Project Cost**	**654,530**	**883,616**
					Grand Total	**37,073**			**Grand Total**	**$9,189,946**	**$12,406,427**