August 2019

City of Grover Beach
Water System Master Plan

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City of Grover Beach

Water System Master Plan

August 2019

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List of Acronyms

ADD	Average Day Demand
AFY	Acre Feet per Year
APN	Assessor Parcel Number
BPS	Booster Pump Station
CCR	California Code of Regulations
CIP	Capital Improvement Project
DDW	Division of Drinking Water
EWCIP	Existing Water Capital Improvement Project
FWCIP	Future Water Capital Improvement Project
GIS	Geographic Information System
GPCD	Gallons per Capita Day
GPD	Gallons per Day
GPDU	Gallons per Day per Unit
GPM	Gallons per Minute
MCL	Maximum Contaminant Level
MDD	Maximum Day Demand
MDD+FF	Maximum Day Demand plus Fire-flow
MG	Million Gallons
MGD	Million Gallons per Day
MKN	Michael K. Nunley & Associates, Inc
NA	Not Available
OCSD	Oceano Community Services District
PHD	Peak Hour Demand
PRV	Pressure Reducing Valve
PSI	Pound per Square Inch
PVC	Poly Vinyl Chloride
SCADA	Supervisory Control and Data Acquisition
SF	Square Feet
SLOCOG	San Luis Obispo Council of Governments
SMVGB	Santa Maria Valley Groundwater Basin
TBD	To Be Determined
UWMP	Urban Water Management Plan
WMP	Water Master Plan

Previous Studies and Reports

The following reports, studies, and other resources were reviewed during preparation of this Water Master Plan report.

1. Recycled Water Facilities Planning Study Prepared for the SSLOCSD & The City of Arroyo Grande dated December 2016 and prepared by Water Systems Consulting.

2. 2015 Draft Urban Water Management Plan for the City of Grover Beach dated July 2018 and prepared by Water Systems Consulting.

3. Commercial Medical Cannabis Ordinance Revised Initial Study – Negative Declaration dated March 2017 and prepared by Rincon Consultants.

4. Urban Water Management Plan 2015 Update Zone 3 A Wholesale Water Agency San Luis Obispo County Flood Control and Water Conservation District dated June 2016 and prepared by Wallace Group.

5. 2050 Regional Growth Forecast for San Luis Obispo County dated June 2017 and prepared by Beacon Economics and San Luis Obispo Council of Governments staff.

6. Sewer Lift Station and Forcemain System Design for the Holiday Inn Express Grover Beach dated September 11, 2015 and prepared by Omega Engineering Consultants, Inc.

7. Grover Beach Lift Station and New Le Sage Drive Force Main report dated January 13, 2017 and prepared by Garing, Taylor & Associates, Inc.

8. Water & Sewer Daily Average Flow Calculations for Tract 3211 El Camino Real Development 1598 El Camino, Grover Beach California report dated September 7, 2018 and prepared by Garing, Taylor & Associates, Inc.

9. City of Grover Beach 2006 Water Master Plan dated February 2007 and prepared by Garing, Taylor, and Associates, Inc.

SECTION 1 INTRODUCTION

1.1 Purpose and Scope

The purpose of this Water Master Plan (WMP) was to evaluate the City of Grover Beach (City) existing water distribution system and identify necessary capital improvements to meet customer water demands over a 30-year planning horizon. A summary of the tasks undertaken to complete the WMP are provided below:

Data Collection and Review

Water system data included the following information:

- City of Grover Beach General Plan (Adopted February 16, 2010)
- Approved Development Plans (West Grand Avenue Master Plan, Ramona Specific Plan, etc.)
- Population estimates from the San Luis Obispo Council of Governments (SLOCOG)
- AutoCAD mapping for the existing water system
- Hydraulic models for the existing water system (to provide background information for development of updated model)
- Daily water production information for 2013 through 2017
- Monthly water billing information per customer (with address) for 2013 through 2017
- Water quality records for 2013 through 2017
- Well pump curves, as-builts and pumping records
- Booster pump station (BPS) pump curves and as-builts
- Storage tank level settings and as-builts
- Pressure reducing station set points and as-builts
- 2015 Draft Urban Water Management Plan
- Operations permits and correspondence from Division of Drinking Water

Water Demand

Existing Average Day Demand (ADD) was determined using historical billing and production records from 2013 to 2017. Existing Maximum Day Demand (MDD) was determined via production records provided by City staff. Year 2050 ADD was estimated using updated per capita and land use specific demand factors within City limits in coordination with the City's 2015 Urban Water Management Plan.

Water Supply Portfolio

MKN conducted a supply analysis that evaluated the City's existing supply capacity as it relates to current average and peak water demands including consideration of redundancy.

Design Criteria

MKN developed criteria for evaluating the City's existing water supply, storage, and distribution system facilities to serve existing and future demand conditions.

Updated Hydraulic Model of Distribution System

As the basis of the hydraulic model update, a Geographic Information System (GIS) database was developed for the City water distribution system from the existing AutoCAD atlas and EPANET hydraulic model. Pipe characteristics, facility elevations, and water demands were derived in the GIS database and imported into the hydraulic model. Bentley's WaterCAD CONNECT Edition hydraulic modeling software was used to simulate the operation of the water production and distribution system. The hydraulic model was calibrated using results of fire hydrant flow tests performed by City staff.

Improvements and Recommendations

The hydraulic and storage analyses were performed to analyze the adequacy of existing distribution piping and water storage structures under existing and future demand scenarios. Upgrades were recommended based on identified deficiencies.

There are three critical areas within the City that present significant uncertainty for the City's utility infrastructure planning process including:

- El Camino Real - Commercial, residential, and hotel projects have been proposed, but utility service has not been master planned for this area.
- Industrial Area Medical Cannabis Uses and Septic Conversions - This area in the vicinity of Farroll Road is mainly served by on-site septic systems, but could be served with City utilities in the future after development occurs. Based on City Ordinance 17-05 (Adopted May 15, 2017), the City will allow establishment of commercial medical cannabis uses in industrial areas zoned Industrial (I), Coastal Industrial (CI), and Coastal Industrial Commercial (CIC). Water and sewer impacts have not been considered in current planning efforts.
- Grover Beach Lodge and Conference Center – The development of this project at the end of Grand Avenue could result in attracting additional hotels and commercial uses along Grand Avenue.

The City's existing water distribution system facilities were evaluated to determine available capacity or identify necessary improvements to serve these potential future demands.

Capital Improvement Program Cost and Prioritization

A capital improvement program was developed to meet two objectives: (1) identify improvements necessary to correct hydraulic deficiencies in the existing system, and (2) identify improvements necessary to meet the demands of new development. Planning-level cost opinions and prioritization for these facilities were also provided.

SECTION 2 LAND USE AND POPULATION

This section provides an overview of the existing land uses, existing population and growth, and potential development within the City.

2.1 General

The City of Grover Beach is an incorporated city of 13,560[1] residents located in southern San Luis Obispo County with the neighboring communities of City of Pismo Beach to the north, the City of Arroyo Grande to the east, and the communities of Oceano and Halcyon to the south. The City, a general law city, currently incorporates 2.3 square miles of land with primarily residential and commercial land uses. City topography varies from sea level to greater than 200 feet above mean sea level.

2.2 Land Use

The City includes approximately 5,000 parcels. **Figure 2-1** and **Table 2-1** show the current General Plan land uses throughout the City.

Table 2-1: Gross Acreage By General Plan Land Use Category

Land Use Category	Gross Acres	Percent of Total
Low Density Residential	346	23%
Medium Density Residential	169	11%
High Density Residential	126	8%
Central Business District – Mixed Use	37	2%
Visitor Serving Mixed-Use	56	4%
Neighborhood Serving Mixed-Use	8	0%
Retail and Commercial Services	39	3%
Industrial	74	5%
Public/Quasi-Public	40	3%
Parks and Recreation	16	1%
Open Space and Resource Conservation	197	13%
Urban Reserve	39	3%
Rights-Of-Way and Other Land	375	25%
Total:	**1,522**	**100%**

Notes:
1. City of Grover Beach General Plan Land Use Diagram, 2009.

2.3 Population

As identified in the San Luis Obispo Council of Governments - 2050 Regional Growth Forecast for San Luis Obispo County (SLOCOG 2050 Growth Plan), the City has been one of the slowest-growing cities in the region between 2000 and 2016. The population within Grover Beach has increased by just 330 persons since 2000, which is an annual growth rate of just 0.16 percent per year. Since the City's sphere of influence is the City limits, any future development within the City will most likely consist of infill or redevelopment. The SLOCOG 2050 Growth Plan reviewed three growth scenarios (low, medium, and high) throughout the County. **Table 2-2** provides a summary of projected City population through year 2050.

[1] California Department of Finance Table 2 E-5 City/County Population and Housing Estimates, 1/1/2018

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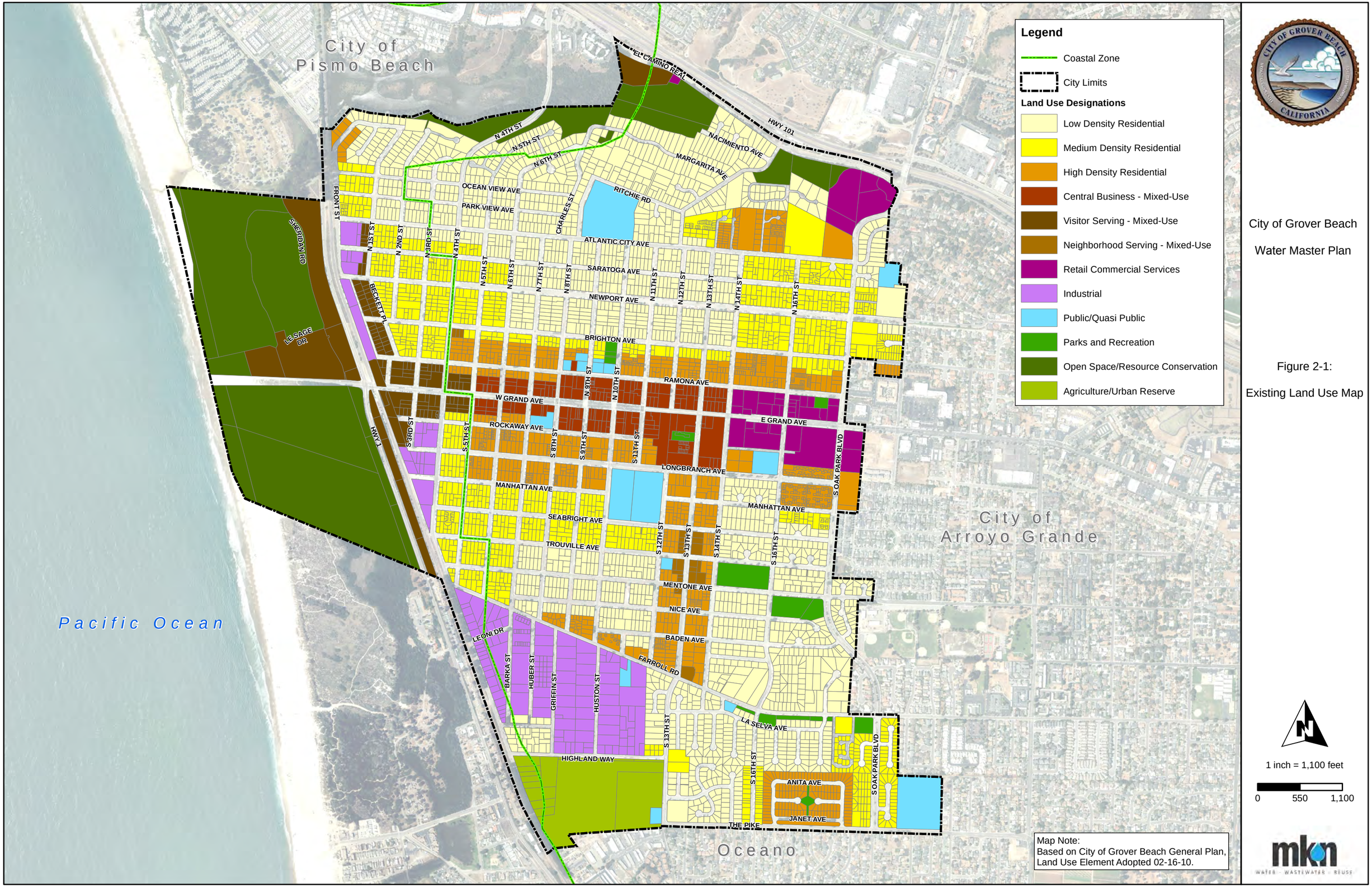

City of Grover Beach

Water Master Plan

Figure 2-1:

Existing Land Use Map

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Table 2-2: SLOCOG 2050 Regional Growth Forecast for City of Grover Beach										
Growth Scenario	Year									Compound Annual Growth Rate (%)
	2010	2015	2020	2025	2030	2035	2040	2045	2050	
Low	13,156	13,340	13,665	14,013	14,276	14,448	14,465	14,411	14,378	0.21
Medium	13,156	13,340	13,751	14,183	14,536	14,804	14,934	15,001	15,091	0.35
High	13,156	13,340	14,009	14,697	15,331	15,907	16,402	16,870	17,376	0.76

Notes:
1. U.S. Census Bureau (2010 Census), State of California Department of Finance (2015), Beacon Economics (forecast years).

For purposes of developing the 2019 Regional Transportation Plan and Sustainable Communities Strategy, as described in the SLOCOG 2050 Growth Plan, the SLOCOG Board of Directors adopted the medium growth scenario for regional population projections.

2.4 Future Development

To estimate the City's potential future residential, commercial and industrial development, MKN worked with the City's Community Development Department to identify properties and/or areas with future development potential within City limits. Estimates were based on the SLOCOG 2050 Growth Plan medium growth scenario. The City provided a detailed inventory of potential residential, commercial, and industrial development, including the following:

- Vacant Residential Properties
- Vacant Commercial and Industrial Properties
- Underutilized Residential Properties
- Pending Development Projects
- Underutilized West Grand Avenue Corridor Lots
- Urban Reserve Area (Strawberry Field Properties)

Table 2-3 provides a summary of vacant residential property within the City. The table includes assessor parcel number (APN), property location, zoning, lot size, potential dwelling units and estimated population (using household densities per City's General Plan - Land Use Element).

Table 2-3: Vacant Residential Property Inventory					
APN	**Location**	**Zoning**	**Parcel Size (Acres)**	**Residential Units**	**Estimated Population**
060-490-001	900 N 5th	CPR1	0.14	1	2
060-490-002	906 N 5th	CPR1	0.18	1	2
060-490-037	835 Pacifica	CPR1	0.14	1	2
060-482-034	811 N 1st	CR1	0.15	1	2
060-483-002	836 N 1st	CR1	0.17	1	2
060-501-026	885 N 6th	CR1	0.09	1	2
060-501-027	NA N 6th	CR1	0.17	1	2
060-502-015	933 N 6th	CR1	0.17	1	2
060-142-028	200 Block N 4th	CR2	0.17	2	4
060-327-002	500 Block Mentone	CR2	0.17	2	4
060-012-021	1032 Margarita	R1	0.28	1	2.5
060-020-020	850 N 12th	R1	0.24	1	2.5
060-153-014	300 Block N 8th	R1	0.17	1	2.5
060-163-021	347 N 11th	R1	0.17	1	2.5
060-337-007	800 Block Nice	R1	0.15	1	2.5
060-338-010	600 Block S 8th	R1	0.10	1	2.5
060-369-011	1600 Block Baden	R1	0.25	1	2.5
060-503-022	862 Charles	R1	0.14	1	2.5
060-522-005	300 Block Ocean View	R1	0.14	1	2.5
060-532-003	645 Ocean View	R1	0.14	1	2.5
060-543-007	Huber	R1	0.50	1	2.5
060-561-073	1358 Farroll	R1	0.19	1	2.5
060-574-002	Farroll	R1	1.13	5	12.5
060-089-002	408 Saratoga	R2	0.17	2	5
060-123-034	1600 Block Saratoga	R2	0.15	1	2.5
060-123-035	1600 Block Saratoga	R2	0.15	1	2.5
060-184-007	1600 Block Newport	R2	0.32	3	7.5
060-565-002	1207 South 13th Street	R2	1.02	9	22.5
060-565-003	1219 South 13th Street	R2	0.86	9	22.5
060-031-005R3	1700 Block Atlantic City	R3	3.40	68	204
060-033-011	1513 Cabrillo	R3	0.11	1	3
060-033-012	1535 Cabrillo	R3	0.11	1	3
060-176-060	1500 Block Brighton	R3	0.23	4	12
060-176-077	1500 Block Ramona	R3	0.11	1	3
060-271-030	500 Block Longbranch	R3	0.17	3	9
060-277-014	773 Manhattan	R3	0.16	3	9
060-352-018	920 S 10th	R3	0.17	5	15
			Total	**140**	**387**

Notes:

1. Allowable densities and persons per household values from pages LU-16 and LU-17 of the City of Grover Beach General Plan - Land Use Element.
2. Assumptions included 2.0 persons per dwelling unit for commercially zoned properties as directed by City staff, 2.5 for R1 and R2 zoned properties, and 3.0 for R3 zoned properties.
3. CPR1= Coastal Planned Low Density Residential, CR1= Coastal Low Density Residential, CR2= Coastal Medium Density Residential, R1= Low Density Residential, R2= Medium Density Residential, R3= High Density Residential.

Table 2-4 provides a summary of the vacant commercial and industrial property within the City. The table includes APN, property location, zoning, lot size, and estimated commercial development potential.

Table 2-4: Vacant Commercial and Industrial Property Inventory

Assessor Parcel Number	Location	Zoning	Parcel Size (SF)	Floor Area Ratio	Allowable Commercial / Industrial Development (SF)
060-211-031	Grand Avenue	CVS	14,810	0.5	7,405
060-214-002	146 North 4th Street	VS	15,246	0.5	7,623
060-214-004	147 5th Street	VS	7,841	0.5	3,920
060-214-005	401 Grand Avenue	VS	4,792	0.5	2,396
060-214-006	401 Grand Avenue	VS	4,792	0.5	2,396
060-214-007	Grand Avenue	VS	5,227	0.5	2,614
060-214-008	Grand Avenue	VS	5,227	0.5	2,614
060-214-009	483 West Grand Avenue	VS	10,019	0.5	5,009
060-215-001	402 Grand Avenue	CVS	5,663	0.5	2,831
060-215-002	Grand Avenue	CVS	5,227	0.5	2,614
060-215-003	430 Grand Avenue	CVS	5,227	0.5	2,614
060-215-006	4th Street	CVS	7,841	0.5	3,920
060-215-007	4th Street	CVS	7,841	0.5	3,920
060-228-003	Grand Avenue	CB	12,197	0.5	6,098
060-309-002	191 South Oak Park Bl	RC	77,537	0.5	38,768
060-543-016	Huber Street	I	65,340	0.5	32,670
060-544-006	964 Griffin	I	31,363	0.5	15,682
060-544-008	978 Griffin Street	I	31,799	0.5	15,899
060-545-028	Griffin Avenue	I	39,640	0.5	19,820
060-546-006	999 Huston Street	I	36,155	0.5	18,077
060-546-007	1073 Huston Street	I	35,719	0.5	17,860
060-546-009	Huston Street	I	37,897	0.5	18,949
060-541-001	Farroll Road	I	28,750	0.5	14,375
060-541-006	550 Farroll Road	CI	43,560	0.5	21,780
				Total	**269,854**

Note:
1. Floor Area Ratio factors based on values from pages LU-17 through LU-19 of the City of Grover Beach General Plan - Land Use Element.
2. CVS= Coastal Visitor Serving, VS= Visitor Serving, CB= Central Business, RC= Retail Commercial, I= Industrial, CI= Coastal Industrial.

Table 2-5 provides a summary of the underutilized residential properties within the City. The table includes APN, property location, zoning, lot size, potential dwelling units and estimated population (using household densities per City's General Plan - Land Use Element).

Table 2-5: Underutilized Residential Properties Inventory						
APN	Location	Zoning	Parcel Size (Acres)	Total Units Built as of July 2018	Total Units Remaining as of July 2018	Estimated Population
060-574-003	1591 Farroll	R1	1.97	1	8	20
060-031-005	1700 Block Atlantic City	R2	6.5	1	57	142.5
060-154-033	238 N 7th	R3	0.34	1	6	18
060-293-006	370 S 13th	R3	0.63	0	12	36
060-293-011	1200 Block Longbranch	R3	0.35	0	7	21
060-357-016	1200 Block Baden	R3	0.3	1	5	15
			Total	**4**	**95**	**253**

Notes:
1. Allowable densities and persons per household values from pages LU-16 and LU-17 of the City of Grover Beach General Plan - Land Use Element.
2. Assumptions included 2.0 persons per dwelling unit for commercially zoned properties, 2.5 for R1 and R2 zoned properties, and 3.0 for R3 zoned properties.
3. R1= Low Density Residential, R2= Medium Density Residential, R3= High Density Residential.

Table 2-6 provides a summary of pending development projects within the City. The table includes APN, property location, zoning, lot size, potential dwelling units and estimated population (using household densities per City's General Plan - Land Use Element), commercial development, and hotels.

Table 2-6: Pending Development Projects Inventory							
APN	Location	Zoning	Status	Development Type			
				Residential Units	Estimated Population	Commercial Square Footage	Hotel Rooms
060-086-007	340 Saratoga Avenue	CR2	Under Construction	1	2.5	0	0
060-076-008	165 Saratgoa Avenue	CR2	Under Construction	1	2.5	0	0
060-451-015	1125 Ritchie Road	R1	Under Construction	1	2.5	0	0
060-241-024	1258 Ramona	CBO	Under Construction	2	4	0	0
060-145-005	344 N. 5th Street	R2	Under Construction	2	5	0	0
060-124-057	1773 Newport Avenue	R2	Under Construction	3	7.5	0	0
060-074-006	83 Newport Avenue	CC	Under Construction	3	6	1,034	0
060-213-013	200 S. 4th Street	I	Under Construction	2	4	3,052	0
060-357-022	1210 Nice Avenue	R3	Under Construction	2	6	0	0
060-246-016	1400 Ramona Avenue	CBO	Under Construction	15	30	536	0
060-011-036	950 El Camino Real	CVS	Under Construction	0	0	0	134

Table 2-6: Pending Development Projects Inventory							
APN	Location	Zoning	Status	Development Type			
				Residential Units	Estimated Population	Commercial Square Footage	Hotel Rooms
060-309-005	300 blk Oak Park	R3	Under Construction	3	9	0	0
060-325-022	495 Mentone Avenue	CR2	Approved	1	2.5	0	0
060-282-006	410 S. 9th Street	R2	Approved	1	2.5	0	0
060-490-031	858 N. 5th Street	CPR1	Approved	1	2.5	0	0
060-014-058	129 Sand Castle	R1	Approved	1	2.5	0	0
060-133-014	266 Front Steet	CC	Approved	1	2	1,148	0
060-237-007	152 N. 11th Street	CBO	Approved	3	6	2,300	0
060-297-017	461 S. 13th Street	R3	Approved	6	18	0	0
060-237-018	1176 Ramona Avenue	CBO	Approved	16	32	0	0
060-271-009	557 Manhattan	R3	Approved	2	6	0	0
060-083-002	247 Newport	CR2	Approved	1	2	0	0
060-288-016	557 S. 10th Street	R2	Approved	1	2	0	0
060-545-038	Huston Street	I	Approved	0	0	30,000	0
060-546-001		I					
060-546-020		I					
060-546-003		I					
060-545-029	910 Huston Street	I	Approved	0	0	6,300	0
060-131-020	Front Street	CIC	Approved	0	0	52,790	0
060-381-010	55 W. Grand Avenue	CVS	Approved	0	0	4,000	144
060-201-009	105 W. Grand Avenue	CVS	Approved	0	0	2,855	20
060-152-003	260 N. 5th Street	R3	In Process	1	3	0	0
060-031-028	1628 Laguna Court	R1	In Process	1	2.5	0	0
060-545-030	Huston Street	I	In Process	0	0	114,000	0
060-545-031		I					
060-546-004		I					
060-546-005		I					
060-546-019		I					

Table 2-6: Pending Development Projects Inventory							
APN	Location	Zoning	Status	Development Type			
				Residential Units	Estimated Population	Commercial Square Footage	Hotel Rooms
060-174-042	267 N. 14th Street	R3	In Process	2	6	0	0
060-031-022 060-031-021	1598 El Camino Real	RC	In Process	7	14	4000	151
			Total	**80**	**183**	**222,015**	**449**

Notes:
1. Allowable densities and persons per household values from pages LU-16 and LU-17 of the City of Grover Beach General Plan - Land Use Element.
2. Assumptions included 2.0 persons per dwelling unit for commercially zoned properties, 2.5 for R1 and R2 zoned properties, and 3.0 for R3 zoned properties.
3. CVS= Coastal Visitor Serving, VS= Visitor Serving, CB= Central Business, CBO= Central Business Open, RC= Retail Commercial, I= Industrial, CI= Coastal Industrial. R1= Low Density Residential, R2= Medium Density Residential, R3= High Density Residential, CC= Coastal Commercial, CIC= Coastal Industrial Commercial.

For potential development associated with the West Grand Avenue Corridor Underutilized Lots, the City directed MKN to assume 200 units with a mix of hotel and multi-family residential uses with an average occupancy of 2.0 persons per unit, totaling 400 people within the limits of the West Grand Avenue Master Plan area (as shown on **Figure 2-2**).

The only remaining undeveloped area within the City's General Plan is the Urban Reserve located south of Highland Way and east of Highway 1. The following tables (**Table 2-7** through **Table 2-9**) identify the properties associated with the Urban Reserve development area, and the potential development opportunities.

Table 2-7: Pending Urban Reserve Development Inventory		
Assessor Parcel Number	Existing Land Use	Area (Ac)
060-591-001	Agriculture / Urban Reserve	1.0
060-591-009		0.6
060-591-006		1.9
060-591-017		9.4
060-591-014		0.7
060-591-008		0.8
060-591-004		0.5
060-591-003		0.4
060-591-011		0.2
060-591-016		21.1
060-591-005		0.4
060-591-007		1.4
060-591-002		0.5
	Total	**39**

Table 2-8 provides a summary of the potential residential development associated with the Urban Reserve area in accordance with the City's General Plan.

Table 2-8: Potential Urban Reserve Residential Development						
Land Use Category	**Percent of Total Gross Acreage[1]**	**Calculated Acreage**	**Allowable Lot Density (units / gross acre)**	**Estimated Number of Units**	**Persons per Household**	**Estimated Population**
Low Density Residential[2]	50%	19	5	97	2.5	242
Medium Density Residential[2]	17%	7	9	59	2.5	148
High Density Residential[2]	6%	2	20	47	3.0	140
					Total	**530**

Notes:
1. Total acreage of the project site before subdivision (including Urban Reserve property estimated at 39 Acres).
2. Acreage exclusive of affordable housing inclusionary requirements.
3. Allowable densities and persons per household values from pages LU-16 and LU-17 of the City of Grover Beach General Plan - Land Use Element.
4. Assumptions included 2.5 for R1 and R2 zoned properties, and 3.0 for R3 zoned properties.
5. Information based on Table LU-15.1 of the City of Grover Beach General Plan - Land Use Element.

Table 2-9 provides a summary of the potential commercial development associated with the Urban Reserve Area in accordance with the City's General Plan.

Table 2-9: Potential Urban Reserve Commercial Development			
Land Use Category	**Percent of Total Gross Acreage[1]**	**Estimated Area (Acre)**	**Estimated Area (Square Footage)**
Neighborhood Serving Mixed Use	1 acre per 1,000 residents of project	0.5	23,105
Office and Light Industrial[5]	10%	3.9	168,956
Developed Parkland[2, 4]	5 acres per 1,000 residents of project	2.7	115,524
Public/Quasi-Public[3, 4]	As determined by service provider	TBD	

Notes:
1. Total acreage of the project site before subdivision (Strawberry Field property estimated at 39 Acres).
2. Acreage of parkland exclusive of drainage detention basins.
3. Includes school sites, city facilities such as police and fire stations, storm drainage facilities.
4. These uses will require Airport Land Use Commission Review.
5. Could include mixed use or live-work projects.

Figure 2-2 shows the location of the potential residential and commercial development associated with vacant properties, underutilized residential properties, pending development projects, underutilized West Grand Avenue Corridor lots, and the Urban Reserve Area.

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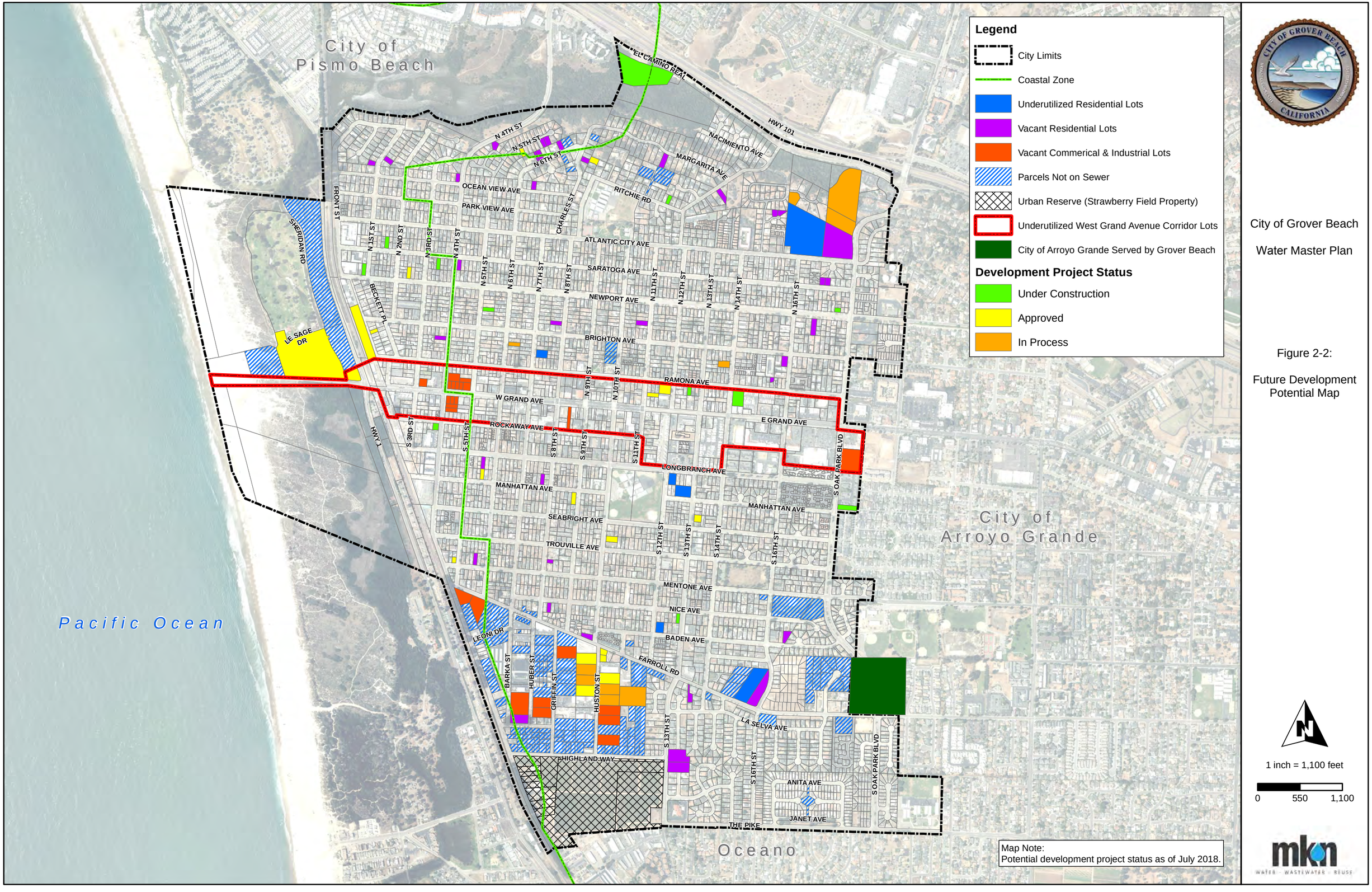

City of Grover Beach

Water Master Plan

Figure 2-2:

Future Development Potential Map

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Table 2-10 provides a summary of the projected future population of the City in the year 2050. The estimated population is based on potential development associated with the vacant properties, underutilized residential properties, pending development projects, underutilized West Grand Avenue Corridor lots, and the Urban Reserve Area.

Table 2-10: Future City Population Year 2050		
Category	**Source**	**Persons**
City 2018 Population	California Department of Finance Table E-5	13,560
Vacant Residential Properties	City Inventory	387
Residential Underutilized Properties	City Inventory	253
Pending Development Projects	City Inventory	183
West Grand Avenue Corridor Underutilized Lots	West Grand Avenue Master Plan	400
Urban Reserve Area	General Plan	530
	Total	**15,313**
SLOCOG 2050 Low Growth Population Estimate		14,378
SLOCOG 2050 Medium Growth Population Estimate		15,091
SLOCOG 2050 High Growth Population Estimate		17,376

The City's projected future population appears to be higher than the Medium Growth Population Estimate from the SLOCOG 2050 Growth Plan. A total future population of 15,313 people was used for analysis in the WMP.

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SECTION 3 EXISTING AND PROJECTED WATER DEMANDS

This section provides an overview of historical water usage, water demand conditions, and future water usage projections.

3.1 Historical Water Supply

The City operates two active and two standby production wells that extract groundwater from the adjudicated Santa Maria Valley Groundwater Basin. The production wells and current pump capacity[2] in gallons per minute (gpm) are summarized as follows:

- Active
  - Well No. 1 (620 gpm)
  - Well No. 4 (700 gpm)
- Standby
  - Well No. 2 (560 gpm)
  - Well No. 3 (730 gpm)

In addition to the two active wells, the City receives treated surface water from Lopez Lake through a water treatment facility owned and operated by the County of San Luis Obispo (County). Water is delivered to existing City storage tanks via a turnout on the Lopez Pipeline located at the intersection of El Camino Real and North Oak Park Boulevard. The City typically receive 800 acre feet per year (AFY) of water from the County. Additional details about the City's supply sources and capacities are discussed in detail in Sections 5. **Table 3-1** provides a summary of the City's historical water production.

Table 3-1: Historical Water Production

Calendar Year	Groundwater (AF)	Lopez (AF)	Total (AF)	Total (MG)	Average Day Production (MGD)
2017	497.97	752.31	1250.28	407.40	1.12
2016	434.22	775.41	1209.63	394.16	1.08
2015	474.81	777.25	1252.06	407.99	1.12
2014	523.51	837.06	1360.57	443.34	1.21
2013	994.86	801.71	1796.57	585.41	1.60

Notes:
1. AF = Acre feet, MG = Million gallons, MGD = Million gallons per day.
2. The annual average day water supply is estimated by dividing the total water supply for the year by 365 days.

3.2 Historical Water Demand

Based on the City's billing records for calendar years 2013 to 2017, it is estimated on average that 63% of the total water sold is used for single family, 18% for multi-family residential, with approximately 12% percent for commercial/institutional, 6% for irrigation/other uses, and 1% for industrial (**Figure 3-1**).

[2] Based on 2016 pump tests completed by the City.

Figure 3-1: Annual Average Water Usage by Type (2013 – 2017)

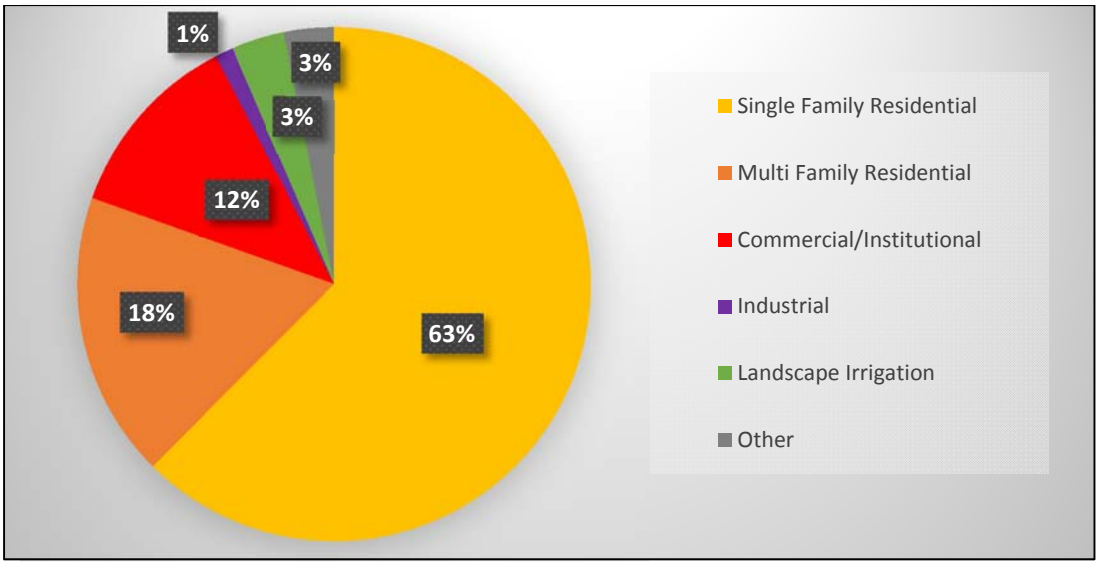

Table 3-2 through **Table 3-6** summarizes the total historical usage for residential, commercial, industrial, landscape and other uses from calendar year 2013 through 2017.

Table 3-2: Historical Usage from Billing Information							
Calendar Year	Average Day (MGD)						
	Single Family Residential	Multi-Family Residential	Commercial / Institutional	Industrial	Landscape Irrigation	Other	Total
2017	0.59	0.17	0.12	0.01	0.02	0.02	0.93
2016	0.59	0.17	0.12	0.01	0.03	0.02	0.95
2015	0.59	0.18	0.14	0.01	0.03	0.03	0.98
2014	0.78	0.22	0.13	0.01	0.05	0.05	1.24
2013	0.86	0.24	0.14	0.01	0.05	0.05	1.34

Table 3-3 provides an overview of the historical per capita water usage for the City from calendar year 2013 through 2017. Population based on City's Division of Drinking Water Large Water System Annual Reports from 2013-2017.

Table 3-3: Historical Per Capita Water Usage			
Calendar Year	Population[1]	Residential Per Capita Water Use[2] (gpcd)	Gross Per Capita Water Use[3] (gpcd)
2017	13,505	56	69
2016	13,505	57	70
2015	13,505	57	73
2014	13,156	76	95
2013	13,156	83	102

Notes:
1. Residential Per Capita Water Use = Sum of single family and multi-family water use only divided by population.
2. Population values based on City Large Water System Annual Reports submitted to State Drinking Water Program.
3. Gross Per Capita Water Use = Sum of all uses divided by population.
4. gpcd = gallons per day per capita.

Tables 3-4 provides an overview of the historical number of water connections for the City from calendar year 2013 through 2017.

Table 3-4: Historical Number of Water Connections							
Calendar Year	Single Family Residential	Multi-Family Residential	Commercial / Institutional	Industrial	Landscape Irrigation	Other	Total
2017	4,366	429	291	36	78	78	5,278
2016	4,360	426	280	35	76	79	5,256
2015	4,299	418	285	34	76	79	5,191
2014	4,263	423	357	36	73	78	5,230
2013	4,274	427	281	35	74	78	5,169

Tables 3-5 provides an overview of the historical average day water usage per connection type for the City from calendar year 2013 through 2017.

Table 3-5: Historical Average Water Usage per Connection by Connection Type						
Calendar Year	Average Day Usage (GPD/Conn)					
	Single Family Residential	Multi-Family Residential	Commercial / Institutional	Industrial	Landscape Irrigation	Other
2017	135	397	399	301	293	308
2016	135	410	419	306	410	308
2015	138	422	489	390	385	366
2014	183	513	367	390	726	640
2013	201	557	485	370	691	614

3.3 Non-Revenue Water

Based on comparison of historical annual production and consumption reports (provided by the City) not all of the water supplied to the distribution system generates revenue for the City. This water loss is commonly referred to as Non-Revenue Water and can generally be accounted for as part of a system wide water audit. Based on the American Water Works Association (AWWA) Manual of Water Supply Practices M36 - Water Audits and Loss Control Programs non-revenue water includes unbilled authorized consumption, apparent losses, and real losses as defined below:

- Unbilled Authorized Consumption – Typically authorized consumption by the utility that does not generate revenue and consists of the following:
  - Unbilled Metered Consumption: Includes all uses that are metered but do not generate revenue for the utility. Such use is typically associated with metered operational uses by the water utility, such as flushing programs that utilize temporary meters to track usage.
  - Unbilled Unmetered Consumption: Includes authorized uses by the utility that are not metered including reservoir draining, water quality testing, flushing water mains (hydrant flushing), storm inlets, culverts and sewers, firefighting and training, fire flow tests performed by the utility, street cleaning, landscaping/irrigation in public areas, and construction sites in the City.
- Apparent Losses – The nonphysical losses that occur when water is successfully delivered to the customer but is not measured or recorded accurately, and consisting of the following:
  - Unauthorized Consumption: Consumption that is not explicitly or implicitly authorized by the utility, commonly known as water theft
  - Customer Metering Inaccuracies: Inaccuracies in registering water consumption by retail customer meters.

- Systematic Data Handling Errors: Errors caused by accounting omissions, errant computer programming, data gaps, and data entry; inaccurate estimates used for accounts that fail to produce meter readings, and billing adjustments that manipulate billed consumption so as to generate a rightful financial credit in such a way that billed consumption does not reflect actual consumption.

- ❑ Real Losses – Physical water losses from the pressurized system (water mains and customer service connections) and the utility's storage tanks, up to the point of customer consumption. In metered systems this is the customer meter, whereas in unmetered situations this is the first point of consumption (stop tap/tap) within the property.

Based on review of recent water production and consumption data (2013 to 2017), the City's non-revenue water volume has ranged from 12% to 16% of total water produced annually. **Table 3-6** compares total production and consumption from 2013 to 2017 and estimates the potential loss in revenue since the City was not able to charge for the lost water.

Table 3-6: Historical Non-Revenue Water

Calendar Year	Total Supply (AF)	Total Metered Sales (AF)	Non-Revenue Water		
			Total Volume (AF)	Percent of Total Supply	Estimated Loss Revenue[1]
2017	1250	1045	205	16%	$228,000
2016	1210	1061	149	12%	$166,000
2015	1252	1099	153	12%	$171,000
2014[2]	1361	1395	-34	-2%	-
2013	1797	1506	290	16%	$323,000

Notes:
1. Estimated revenue loss was calculated based on total volume of non-revenue water multiplied by $5.10/unit, which represents the City's current monthly charge per 100 Cubic Feet (HCF) or Unit. HCF or 1 unit = 748 gallons.
2. Unknown data discrepancy shown on 2014 water system report to the State.

To reduce the non-revenue water volume, it recommended the City implement the following to address unbilled authorized consumption, apparent losses, and real losses experienced by the water system:

- ❑ Review data handling issues with meter reading and/or billing software
- ❑ Complete annual calibration and volumetric testing of production well meters
- ❑ Develop a GIS-based meter map and database of existing meters to track installation date, manufacturer, serial number, etc.
- ❑ Implement a proactive meter replacement program with annual representative accuracy testing for existing meters
- ❑ Prepare and validate annual water audits using the AWWA water audit software

3.4 Existing Water Demand and Peaking Factors

During review of the City's water billing data, discrepancies between historical water production and water consumed became apparent. In addition, the reporting capabilities of the City's existing water billing software limited review and analysis. One major reporting limitation was that the City could not export individual water user accounts by customer usage type, limiting MKN's ability to allocate demand throughout the City based on billing data. Based on these factors, and the historical non-revenue water conditions calculated in **Table 3-6**, water production information was considered to most accurately depict the City's water usage and was used to estimate existing demand conditions.

To allocate existing demands throughout the water system based on production values, MKN developed land use based water usage factors as shown in **Table 3-7**. MKN developed usage factors using the following steps:

- Determined the total quantity of existing developed acreage for each of the City's water usage categories;
- Identified the typical percentage of total water usage (based on billing information) for each category;
- Calculated existing water usage for each category; and
- Calculated the usage factors.

Table 3-7: Water Use Factors

Water Usage Category	Currently Developed Parcels (Ac)	% of Total Water Use Based on Billing Information	Average Day Demand Based on Production (GPD)	Usage Factor (GPD/Ac)
Single Family Residential	336	62%	690,104	2,054
Multi-Family Residential	284	18%	198,333	698
Commercial / Institutional	143	12%	131,834	922
Industrial	56	1%	12,669	226
Irrigation and Other	6	6%	66,277	10,322
Total	**825**	**100%**	**1,099,217**	**14,222**

For the purpose of this report, the last three years of water production data was used to estimate existing ADD for the City and is summarized in **Table 3-8** below.

Table 3-8: Average Day Demand (Based on Production)

Calendar Year	Average Day Demand	
	MGD	AFY
2017	1.12	1,250
2016	1.08	1,210
2015	1.12	1,252
3-year average	**1.10**	**1,237**

Water use fluctuates according to time of day and with seasonal characteristics such as outdoor temperature and precipitation. Water demands are typically highest in July and August, and lowest in the months of January and February. The three demand conditions used to assess the distribution system were average day demand (ADD), maximum day demand (MDD), and peak hour demand (PHD), which are described in detail below.

3.4.1 Average Day Demand

The ADD is the total annual water usage averaged over the course of a year. This demand was determined by using daily production records. For the City, a representative ADD was determined to be 1.10 MGD based on review of production records from 2015 to 2017.

3.4.2 Maximum Day Demand

The MDD represents the demand associated with the 24-hour period exhibiting the single highest demand for the entire year. For most agencies, MDD typically occurs during the summer as a result of increased irrigation demand, but can vary. A peaking factor for MDD is most commonly determined by identifying the maximum day of production and comparing the maximum day to the average day production for that year. Based on water production records from 2015 to 2017, a MMD of 2.72 MGD was observed on December 6, 2015 with an average annual production of 1.12 for

calendar year 2015. This yields a MDD peaking factor of 2.43. For this WMP, this peaking factor of 2.43 was multiplied by the ADD for a MDD of 2.68 MGD.

3.4.3 Peak Hour Demand

The PHD is generally determined by calculating the highest hourly demand within a water system based on monitoring tank levels and pumping records. The City does not have a supervisory control and data acquisition (SCADA) system to monitor and record hourly fluctuations in system demands. To determine PHD conditions for the City, MKN selected a PHD peaking factor of 1.5 times MDD per California Code of Regulations (CCR) Title 22. Using this approach, the PHD for the City was estimated to be 4.03 MGD.

Table 3-9 provides a summary of existing demand conditions and peaking factors used for the WMP.

Table 3-9: Existing Demands & Peaking Factors

Demand Condition	Demand		Peaking Factor	Source
	MGD	GPM		
Average Day	1.10	767	NA	Daily City water production values
Maximum Day	2.68	1,864	2.43	Maximum day of production December 6, 2015
Peak Hour	4.03	2,796	1.5 X MDD	CCR Title 22

Table 3-10 provides a summary of the existing demand conditions per pressure zone within the City.

Table 3-10: Existing Demand by Pressure Zone

Zone	Demand Condition (GPM)		
	Average Day Demand (ADD)	Maximum Day Demand (MDD)	Peak Hour Demand (PHD)
Gravity	517	1,256	1,884
Boosted	233	566	849
PRV	14	34	51
Lopez	3	7	11
Total	**767**	**1,864**	**2,796**

3.5 Future Water Demand Factors

To develop demand factors associated with future hotel, commercial, and industrial development, MKN compared water usage data from 2017 for a select set of existing hotels, commercial, and industrial users within the City. **Table 3-11** provides a summary of calculated demand factors for existing hotels, commercial, and industrial users for comparison to the proposed demand factors in **Table 3-12**.

Based on the City's 2015 UWMP and State-mandated water conversion regulations, the City's required water use target for year 2020 was calculated to be 117 gpcd. MKN assumed the City would continue to implement water conservation measures for the near future and selected 117 gpcd to calculate future residential water demands.

Table 3-11: Calculated Demand Factors from 2017 Water Billing Data					
Demand Type	**Subtype**	**Unit**	**Unit Total**	**Average Day Demand (GPD)**	**Demand Factor (GPDU)**
Hotel	Hotel	Room	78	8,330	107
	Inn	Room	21	1,379	66
				Average	**86**
Restaurant	Restaurant	SF	9600	3,986	0.42
	Restaurant	SF	1400	1,223	0.87
	Restaurant	SF	1400	791	0.57
				Average	**0.62**
Commercial Service / Retail	Commercial Service	SF	4500	430	0.10
	Retail Commercial	SF	27000	2,839	0.11
	Retail Commercial	SF	2300	420	0.18
	Retail Commercial	SF	5700	295	0.05
	Commercial Service	SF	4400	378	0.09
	Retail Commercial	SF	3500	18	0.01
	Commercial Service	SF	3000	195	0.06
	Retail Commercial	SF	2900	189	0.07
	Retail Commercial	SF	3100	288	0.09
	Commercial Service	SF	1900	151	0.08
	Commercial Service	SF	4100	722	0.18
	Commercial Service	SF	3800	80	0.02
				Average	**0.09**
Industrial	Manufacturing	SF	7000	434	0.06
	Automotive Service	SF	6600	178	0.03
	Manufacturing	SF	13000	277	0.02
	Water Treatment Services	SF	5300	3,200	0.60
	Automotive and Other	SF	14500	935	0.06
				Average	**0.16**

A typical demand factor for hotels is included **Table 3-12**. However, future demands for the hotel projects currently under construction, approved, and/or pending have already been developed by other engineering firms associated with the hotel development projects. These project specific demand values were used for future demand projections.

The typical demand factors, based on historical water usage, appear to be consistent with the proposed demand factors identified in **Table 3-12**, which MKN used to project future demand conditions. To estimate water demands associated with future residential, commercial, and industrial development, MKN utilized the following demand factors as shown in **Table 3-12:**

Table 3-12: Future Water Demand Factors			
Demand Type	**Unit**	**Demand Factor (GPDU)**	**Source**
Residential	Person	117	City 2015 UWMP 2020 GPDC
Hotel	Room	100	Historical City water billing information
Restaurant	Square Foot (SF)	0.65	
Commercial Service / Retail	Square Foot (SF)	0.10	
Industrial	Square Foot (SF)	0.10	

Notes:
1. GPDU= gallons per day per unit.
2. gpcd = gallons per day per capita.

3.6 Future Water Demand

To estimate the City's 2050 water demand, MKN used the vacant property inventories (residential, commercial, and underutilized property), pending development projects, West Grande Avenue redevelopment, and buildout of the Urban Reserve Area to project future demands, which are summarized in **Table 3-13**.

Table 3-13: Additional Future Water Demand					
Demand Type	**Development Type**	**Unit**	**Demand Factor (GPDU)**	**Unit Total**	**Average Day Demand (GPD)**
Residential	Vacant Residential Properties	Persons	117	387	45,279
	Residential Underutilized Properties		117	253	29,543
	Pending Development Projects		117	183	21,353
	West Grand Avenue Corridor Underutilized Lots		117	400	46,800
	Urban Reserve		117	530	62,058
			Subtotal	**1,752**	**204,213**
Hotel	Under Construction[1]	Rooms	-	134	16,080
	Approved[2]		-	164	41,511
	In Process[3]		-	151	110,880
			Subtotal	**449**	**166,230**
Commercial	Under Construction	Square Foot	0.10	1,570	157
	Approved		0.10	6,303	630
	Approved (Restaurant)[2]		-	4,000	-
	In Process (Restaurant)[3]		-	4,000	-
	Vacant Commercial Properties		0.10	94,743	9,474
	Urban Reserve		0.10	192,061	19,206
			Subtotal	**302,677**	**29,468**
Industrial	Under Construction	Square Foot	0.10	3,052	305
	Approved		0.10	89,090	8,909
	In Process		0.10	114,000	11,400
	Vacant Industrial Properties		0.10	175,111	17,511
			Subtotal	**381,253**	**38,125**
				Additional Demand	**438,855**
				Existing Demand	**1,100,000**
				Total Future Demand	**1,538,855**

Notes:

1. Water demand based on a percentage of estimated wastewater flow presented in the "Sewer Lift Station and Forcemain System Design for the Holiday Inn Express Grover Beach" report dated September 11, 2015 and prepared by Omega Engineering Consultants, Inc.
2. Water demand based on a percentage of estimated wastewater flow presented in the "Grover Beach Lift Station and New Le Sage Drive Force Main" report dated January 13, 2017 and prepared by Garing, Taylor & Associates, Inc. Flow estimate includes approved 4,000 square foot restaurant.
3. Water demand based on the "Water & Sewer Daily Average Flow Calculations For Tr 3211 El Camino Real Development 1598 El Camino, Grover Beach California" report dated September 7, 2018 and prepared by Garing, Taylor & Associates, Inc. Flow estimate includes pending 4,000 square foot restaurant and seven single family residential lots.

Tables 3-14 provides a summary of future demands conditions and peaking factors used for the WMP.

Table 3-14: Future Water Demands & Peaking Factors			
Demand Condition	Demand		Peaking Factor
	MGD	GPM	
Average Day	1.54	1,069	NA
Maximum Day	3.74	2,598	2.43
Peak Hour	5.61	3,897	1.5 X MDD

Table 3-15 provides a summary of the future demand conditions per pressure zone within the City.

Table 3-15: Future Demands by Pressure Zone			
Zone	Demand Condition (GPM)		
	Average Day Demand (ADD)	Maximum Day Demand (MDD)	Peak Hour Demand (PHD)
Gravity	696	1691	2537
Boosted	305	741	1112
PRV	14	34	51
Lopez	54	131	197
Total	**1,069**	**2,598**	**3,897**

3.7 Commercial Medical Cannabis Ordinance

The City's commercial medical cannabis ordinance applies to land within the Industrial (I), Coastal Industrial (CI), and Coastal Industrial Commercial (CIC) zones within the City limits. The City's entire Industrial zone and a portion of the CI zone are located south of Farroll Road, west of Messina Court, north of Highland Way, and east of South 4th Street. The remaining portions of the CIC zone is located south of Rockaway Avenue, west of South 4th Street, north of Trouville Avenue, and east of the Union Pacific Railroad (UPRR). The CIC zone is located south of Atlantic City Avenue, west of Front and 1st Street, north of Ramona Avenue, and east of the UPRR tracks. **Figure 3-2** provides an overview of the allowable commercial cannabis development areas within the City.

To determine the potential increase in future industrial water demands based on commercial cannabis cultivation within the City's industrial zones, MKN reviewed the "Commercial Medical Cannabis Ordinance Revised Initial Study – Negative Declaration" report dated March 2017 and prepared by Rincon Consultants, Inc. Based on the Environmental Checklist (Section 18 of the Negative Declaration) it was assumed that future commercial cannabis cultivation would only occur on currently vacant industrial parcels since cultivation operations would require new buildings and facilities as opposed to retrofitting existing facilities. **Table 3-16** provides a summary of the potential future water demands associated with commercial cannabis cultivation within the City.

Table 3-16: Future Industrial Cannabis Water Demand				
Development Type	Area (SF)[1]	Average Day Demand (GPD)		
		Typical Industrial Use[2]	Indoor Cultivation[3]	Indoor Cultivation with Water Management and Conservation Measures[4]
Vacant Industrial Properties	175,111	17,511	20,848	10,424

Notes:
1. Allowable buildable square footage for vacant industrial parcels as identified in Table 3-11.
2. Typical industrial parcel water user factor Table 3-9.
3. Assumed 5,186 GPD per acre of greenhouse per Commercial Medical Cannabis Ordinance Revised Initial Study – Negative Declaration report.
4. Assumes 50% reduction in water use per Commercial Medical Cannabis Ordinance Revised Initial Study – Negative Declaration report.
5. ADD values within this table are for cultivation activities only and do not include potential domestic water usage by employees.

As identified in **Table 3-16**, future water system demands from commercial cannabis cultivation are lower than typical industrial water demand based on duty factors. For the WMP update typical industrial water users were included in the hydraulic analysis for vacant industrial parcels.

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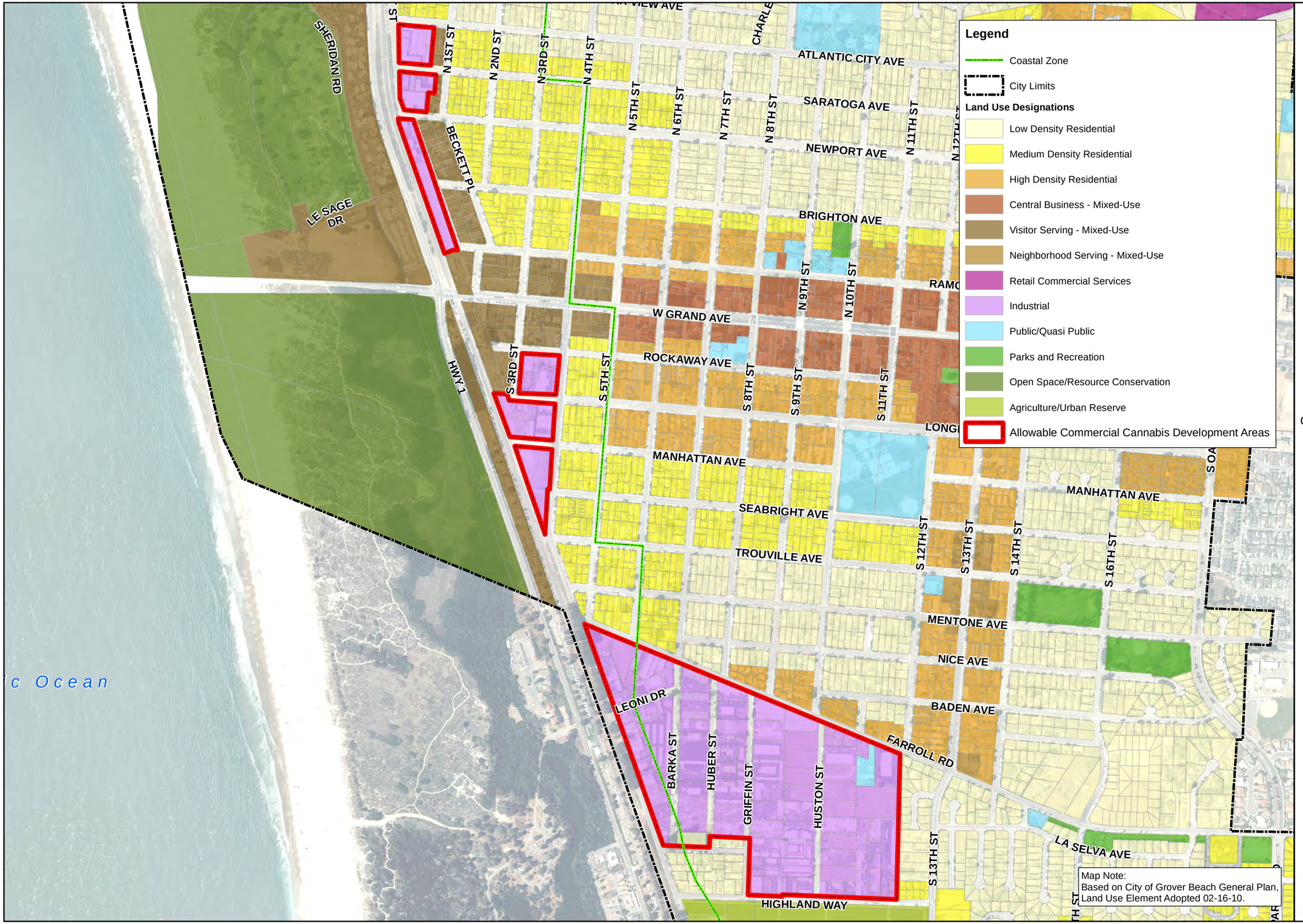

City of Grover Beach

Water Master Plan

Figure 3-2:

Allowable Commercial Cannabis Development Areas

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SECTION 4 EXISTING SYSTEM OVERVIEW

This section provides an overview of the City's existing water distribution system facilities including production wells, water mains, storage tanks, water treatment facilities, and agency interconnections.

4.1 Overview

The City provides potable water from existing groundwater and surface water supplies. Since the topography of the City varies from sea level to as high as 200 feet as shown on **Figure 2-1**, there is a gravity zone to serve customers at lower elevations and a boosted zone to serve customers near the elevation of the existing storage facilities. The water distribution system consists of 57 miles of distribution mains, three storage reservoirs, one booster station, and approximately 5,200 service connections. The City's existing water production facilities include four wells with onsite chlorination facilities and blending of well water with surface water at the existing reservoir site. The City receives surface water from the Lopez Project, which includes the Lopez Reservoir, the Lopez Terminal Reservoir, the Lopez Water Treatment Plant and the Lopez Pipeline. Detailed descriptions of the City's existing water system facilities are provided below. A hydraulic grade line schematic of the existing water distribution system is shown in **Figure 4-2**.

4.2 Water Production Wells

The City has four existing groundwater wells, which include Wells No. 1, No. 2 and No. 3 that draw water from the Paso Robles formation and Well No. 4, which is a deep well drawing water from the Careaga formation. Currently Wells No. 1 and No. 4 are active and Wells No. 2 and No. 3 are inactive/standby. All wells are located within the Santa Maria Valley Groundwater Basin (SMVGB). The SMVGB is an adjudicated basin and the City has an allocation of 1,407 AFY of groundwater from the basin per the Santa Maria Valley Water Conservation District vs. City of Santa Maria, et al. Case No. 770214 Judgment After Trial (Judgment) for the SMVGB. **Table 4-1**[3] provides a summary of the parties and uses that are entitled to a portion of the safe yield of the SMVGB.

Table 4-1: Santa Maria Valley Groundwater Basin Allocation of Safe Yield

Use	Annual Allocation (AFY)
Applied Irrigation	4,970
Subsurface Flow to Ocean	200
City of Arroyo Grande[1]	1,323
City of Grover Beach[1]	1,407
City of Pismo Beach	700
Oceano Community Services District	900

Notes:
1. Per the Judgment, the Cities of Arroyo Grande and Grover Beach have increased their entitlements by 121 AFY and 209 AFY respectively based on the conversion of irrigated agricultural lands to urban use.

Additional groundwater is pumped by two irrigation wells that provide non-potable water for use on a California State Parks golf course and a large park within the City.

[3] Table 5-2 from the 2015 City of Grover Beach Urban Water Management Plan

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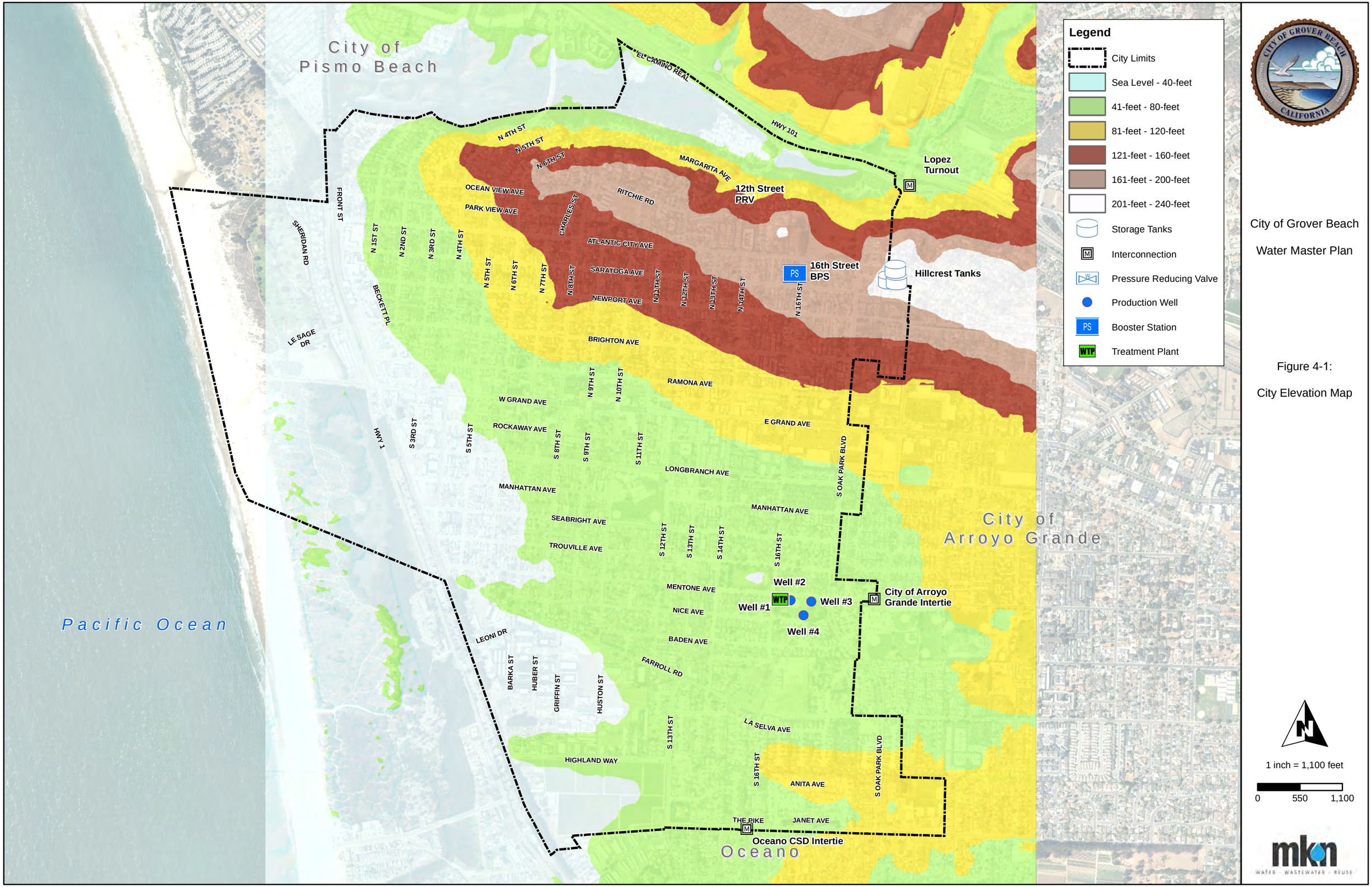

City of Grover Beach

Water Master Plan

Figure 4-1:

City Elevation Map

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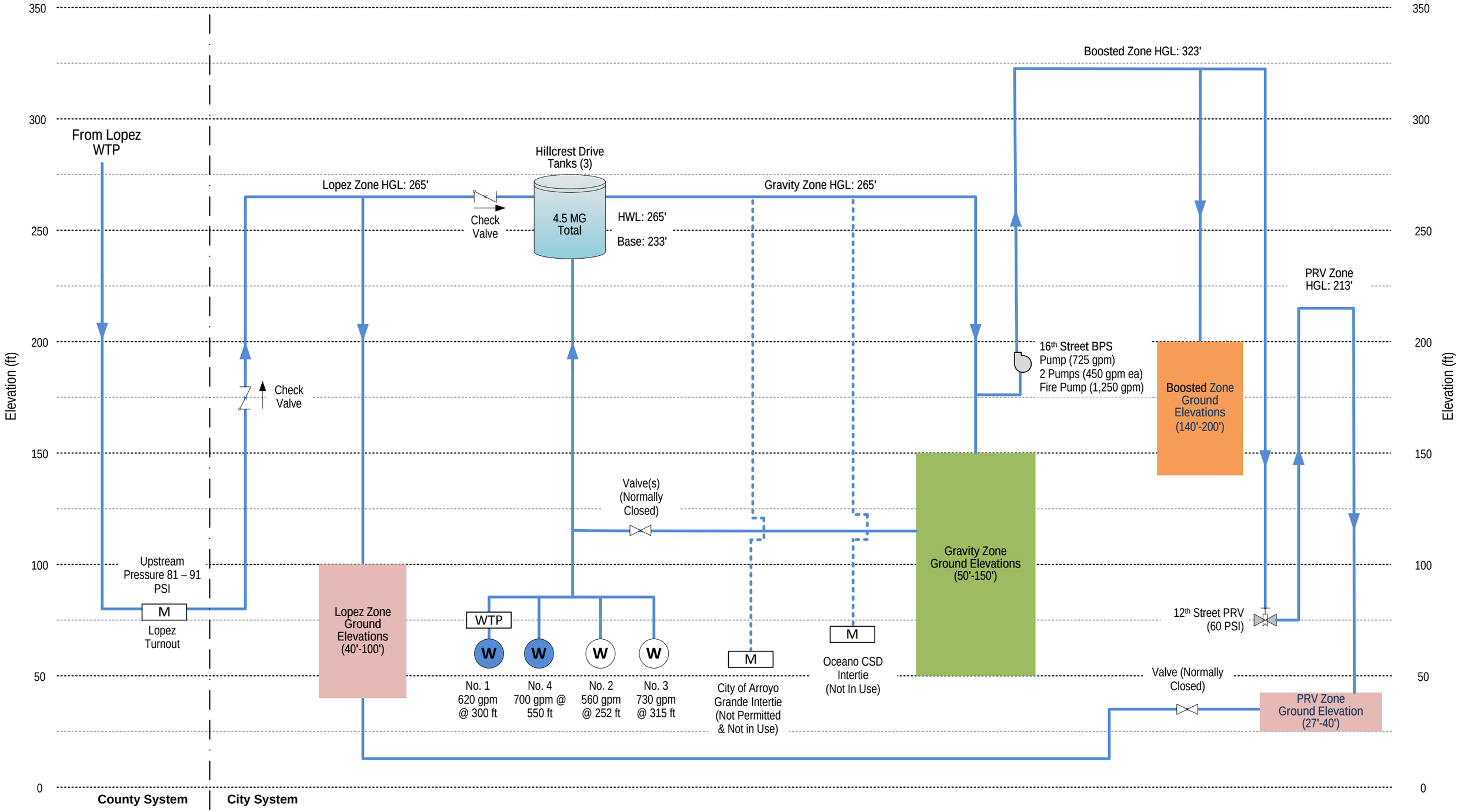

LEGEND

Storage Tank | Booster Pump Station | W Active Well | W Inactive Well | Pressure Reducing Valve

M Interconnection | WTP Water Treatment Plant | Check Valve | Isolation Valve

City of Grover Beach - Water Master Plan
Figure 4-2: Hydraulic Grade Line Schematic

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Table 4-2 provides a detailed summary of the existing production wells with respect to pumps, motors and well specifications.

Table 4-2: City Production Wells Summary				
Well Specifications				
Parameter	Well No. 1	Well No. 2	Well No. 3	Well No. 4
Status	Active	Standby	Standby	Active
Date Drilled	1951	1951	1959	1978
Date Refurbished	NA	NA	NA	NA
Well Depth (ft)	178	180	178	549
Casing Diameter (in)	16	16	16	14
Casing Material	Steel	Steel	Steel	Steel
Conductor Casing Diameter (in)	24	24	24	24
Conductor Casing Depth (ft)	25	25	26	190
Annular Seal (ft)	25	25	35	190
Perforations Start (ft)	34 - 178	39	58	205
Permanent Standby Generator	No	No	Yes	No
Portable Generator Power Receptacle	Yes	No	No	No
Pump Characteristics				
Pump Type	Vertical Turbine	Vertical Turbine	Vertical Turbine	Vertical Turbine
Pump Manufacturer	Peerless	Peerless	Goulds	Peerless
Pump Model #	10MA	12	NA	12MB
Impeller Code	T84363 / LC	783002	NA	2624331
Pump Serial #	569751	152163	FR369375	236475
Number of Stages	10	4	4	10
Pump Performance Flow				
Design Flowrate (gpm)	600	750	1000	1200
Current Individual Pump Operation Flowrate (gpm)[1]	620	560	730	700
Tested Flowrate (gpm)[2]	530[3]	560	-	530[3]
TDH (ft)	300	252	315	550
Discharge Pressure (PSI) based on City Information	110	108	116	110
Motor Characteristics				
Motor Type	US Motors	US Motors	Johnson Gear	General Electric
Model #	S333A	NA	NA	5KS444DT60058
Serial/Catalog #	H060V2SL6	885770	145126	NA
Total Horsepower (HP)	60	60	125	150
Speed (rpm)	1780	1760	1760	1790
Phase/Voltage	3/460	3/440	-	3/460

Notes:
1. Pump production information as provided by City staff.
2. Pumping capacity for Wells No. 1, No. 2, and No. 4 based on well pump tests completed in February 2018 by Pumping Efficiency Testing Services.
3. Reduced production capacity of Wells No. 1 and No. 4 observed during February 2018 testing when wells run together.

4.3 Treatment System

Currently the City disinfects groundwater at Well No. 1 and No. 4 through injection of sodium hypochlorite in the discharge line and groundwater is pumped directly to the City's storage tanks.

The City also has an ion exchange treatment facility located at the groundwater well site. However, the ion exchange treatment plant has not been operated since 2013. The ion exchange treatment facility is located at the Well No. 1 site and consists of three ion exchange vessels, one brine storage tank, one waste storage tank, and a control building. When in operation only two of the vessels are in service at a time and the third vessel is in regeneration/standby mode. The following is a description of the treatment process as presented in the City 2017 Sanitary Survey Report prepared by the State Water Resources Control Board (SWRCB):

> *During operation, water passes through the resin beds and exits the finished water line. After the resin has been saturated which typically occurs after operating for three to four hours or producing water with nitrate levels above 6.67 mg/L as N, the vessel goes into regeneration mode. This consists of a backwash and brine wash for twenty minutes. The purpose of the brine wash is to exchange the nitrate ions on the resin bead with chloride ions. The backwash water and rinse water containing high nitrates are stored in the waste storage tank and sent to the sewer. The treatment plant is equipped with an online nitrate analyzer but it is non-operational. (SWRCB, March 2017)*

4.4 Lopez Water

The Lopez Reservoir is operated by San Luis Obispo County Flood Control and Water Conservation District Zone 3 (District Zone 3). The City receives treated surface water from the Lopez Water Treatment Plant via a turnout vault located at the intersection of North Oak Park Boulevard and El Camino Real. The interconnection consists of a concrete vault with two 10-inch by 6-inch reducers, 6-inch flow meter, 6-inch long body motor operated butterfly valve (controlled by the flow meter to adjust delivery flow rates to the City), and upstream/downstream pressure gauges. A small portion of the City is served downstream of the interconnection and this service area is referred to as the Lopez Zone in the WMP.

4.5 Booster Pump Station and Pressure Reducing Valve

The booster pump station (BPS) is located within a concrete masonry unit (CMU) building in a residential neighborhood on 16th Street south of Atlantic City Avenue. The BPS receives water from the gravity zone (at approximately 30 PSI) through a 10-inch suction line. There are pressure reducing valves installed on the discharge side of each pump to maintain system pressure at 60 PSI into the boosted zone. The boosted zone includes an area from North 6th Street to 20th Street and Brighton Avenue to Margarita Avenue and this service area is referred to as the Boosted Zone in the WMP. The location of the BPS and zone boundary is shown on **Figure 4-3**. The BPS is equipped with three jockey pumps and one fire pump as summarized in **Table 4-3**.

Table 4-3: Existing Booster Pump Station

Pump	Type	Flowrate (gpm)	Head (ft)	Horsepower	Install Date
No. 1	Lead	475	107	20	1981
No. 2	Lag	725	101	25	1982
No. 3	Jockey	475	107	20	1981
No. 4	Fire	1250	95	40	1982

Pump No. 1 was originally equipped with a variable frequency drive (VFD), but was converted to a constant speed drive after VFD failure. Currently Pump No. 1 is in continuous operation (on hand) with the fire pump set to auto to provide additional flow during emergencies. Pumps No. 2 and No. 3 are started once a year to ensure that the pumps are operational. A diesel generator is maintained at the BPS site to provide auxiliary power during emergencies.

There is a pressure reducing valve (PRV) located on North 12th Street, which reduces system pressures from the boosted zone to 60 PSI to serve customers on Nacimiento Avenue. At the time of this report a new 12-inch pipeline on El Camino Real was constructed to serve the new hotel at 950 El Camino Real. The 12-inch pipeline, which receives treated water from the Lopez Interconnection, was connected to the existing distribution system that serves customers on Nacimiento Avenue. However, isolation valves at this connection point are currently closed and customers on Nacimiento Avenue will continue to be served from the North 12th Street PRV. This service area is referred to as the PRV Zone in the WMP.

4.6 Storage Facilities

The City owns and operates three welded steel storage tanks at the Hillcrest Reservoir site. Reservoir No. 1 is equipped with a separate inlet for City groundwater and Lopez water and separate outlet into a 16-inch distribution main. Nitrate blending usually occurs in Reservoir No. 1. Reservoir No. 2 is equipped with a separate inlet for City groundwater and Lopez water (not currently in use) and separate outlet into a 16-inch distribution main. Reservoir No. 3 is equipped with a separate inlet for City groundwater and Lopez water (not currently in use) and separate outlet into a shared 16-inch distribution main. **Table 4-4** provides a summary of the storage facilities:

Table 4-4: Existing Storage Facilities

Reservoir	Year Installed	Base Elevation (feet)	Overflow (feet)	Height (feet)	Diameter (feet)	Size (MG)	Material	Last Inspection / Cleaning	Last Coated
No. 1	1963	233.5	25.5	32	90	1.5	Steel	1999	1999
No. 2	1978	225.5	33.5	40	81	1.5	Steel	2008	2008
No. 3	1987	222.0	37.0	40	82	1.5	Steel	-	-

The Gravity Zone is the portion of the City (service area) that is solely provided system pressure via gravity through the existing storage facilities.

4.7 Distribution and Transmission Pipelines

The existing water distribution system contains over 48 miles of water mains ranging from 2-inch to 16-inch in size. Inventories of the existing water distribution system (base on the City's existing AutoCAD mapping) are provided in the following tables. **Table 4-5** summarizes the water distribution system by pipe size:

Table 4-5: Water Distribution System Inventory by Pipe Size

Diameter (Inches)	Length		
	Feet	Miles	%
2	16,009	3.0	6
4	6,090	1.2	2
6	108,142	20.5	42
8	88,996	16.9	35
10	14,269	2.7	6
12	15,635	3.0	6
14	3,844	0.7	2
16	2,580	0.5	1
Total	**255,566**	**48**	**100**

Table 4-6 summarizes the water distribution system by pipe material:

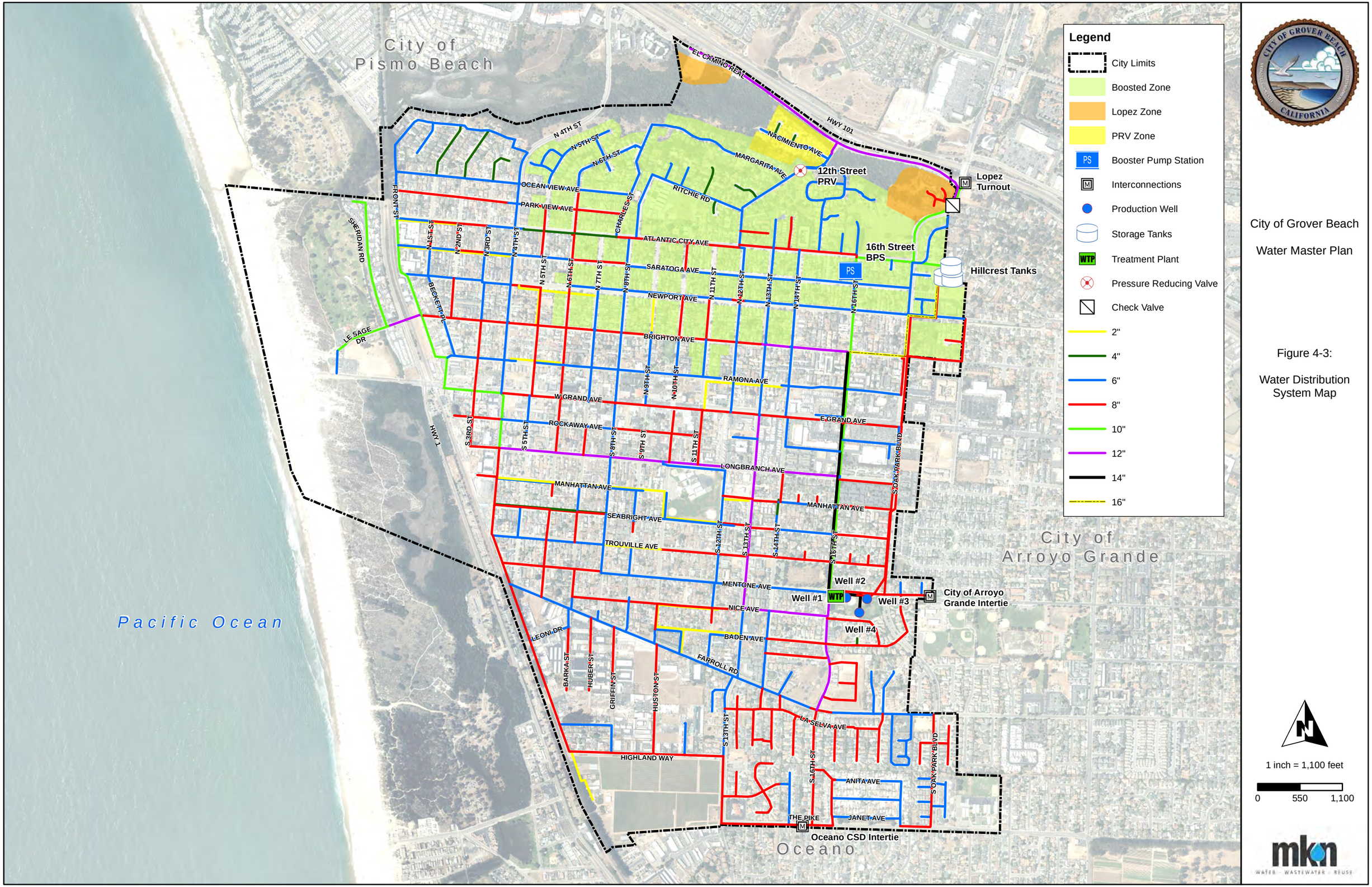
Table 4-6: Water Distribution System Inventory by Pipe Material			
Material	**Length**		
	Feet	Miles	%
Asbestos Cement	64,999	12.3	25
Ductile Iron	127	0.02	0.05
Polyvinyl Chloride	174,430	33.0	68
Steel	16,009	3.0	6
Total	255,566	48	100

4.8 Agency Interconnections

In addition to the existing water distribution system facilities, the City has an emergency interconnection with both the City of Arroyo Grande and the Oceano Community Services District (OCSD). Based on the design of the interconnection the City has the ability to supply water to OCSD, but does not have the ability to receive water from OCSD. With the City of Arroyo Grande interconnection the City can receive water from Arroyo Grande, but the interconnection is not permitted by the Division of Drinking Water (DDW). Neither connection has been used in the past 25 years.[4]

The existing water supply, treatment, storage and distribution system facilities are shown in **Figure 4-3**.

[4] System Number 4010004-2017 Sanitary Survey State Water Resources Control Board March 9, 2017.



City of Grover Beach

Water Master Plan

Figure 4-3:

Water Distribution System Map

1 inch = 1,100 feet

0 550 1,100

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SECTION 5 WATER SUPPLY PORTFOLIO

This section provides an overview of the City available water supply sources.

5.1 Overview

As described in Sections 3 and 4 the City extracts groundwater from the adjudicated Santa Maria Valley Groundwater Basin (SMVGB) and receives surface water from Lopez Lake through the County's Lopez pipeline.

5.2 Groundwater

Santa Maria Valley Groundwater Basin

Based on the City's 2015 Urban Water Management Plan (2015 UWMP):

> *The SMVGB underlies the Santa Maria Valley in the coastal portion of northern Santa Barbara and southern San Luis Obispo Counties. The SMVGB also underlies Nipomo and Tri-Cities Mesa, Arroyo Grande Plain, and Arroyo Grande and Pismo Creek Valleys, of which the City draws from the Tri-Cities Mesa portion of the SMVGB. The SMVGB is bounded by the San Luis and Santa Lucia Ranges on the north, the San Rafael Mountains on the east, and Solomon Hills and San Antonio Creek Valley Groundwater Basin on the south, and the Pacific Ocean on the west. The SMVGB is approximately 288 square miles (184,000 acres). (Water System Consulting, Inc., July 2018)*
>
> *Groundwater is found in alluvium, sand dunes, and the Orcutt, Paso Robles, Pismo, and Careaga formations. Groundwater is unconfined throughout most of the SMVGB except in the coastal portion where it is confined. Specific yield of sediments in the SMVGB ranges from 3 to 21 percent, with a mean specific yield of approximately 12 percent for parts of the SMVGB in San Luis Obispo County. (Ibid)*
>
> *Natural recharge in the basin comes from seepage losses from major streams, percolation of rainfall, and subsurface flow. Percolation of flow in Pismo Creek provides recharge for the northern portion of the SMVGB. Percolation of flow in Arroyo Grande Creek and other tributary flows to the creek provide recharge for the Tri-Cities Mesa, Arroyo Grande Plain, and Arroyo Grande Valley portions of the SMVGB. Incidental recharge results from deep percolation of urban and agricultural return water and septic tank effluent. Some subsurface flow comes from consolidated rocks surrounding the SMVGB and from the neighboring San Antonia Creek Valley Groundwater Basin. (Ibid)*

SMVGB Safe Yield

The estimated safe yield of the SMVGB is at 9,500 AFY, with a City allocation of 1,407 AFY. **Table 5-1** provides a summary of the agencies and uses that are entitled to the safe yield of the SMVGB.

Table 5-1: Santa Maria Valley Groundwater Basin Safe Yield

Use	Annual Entitlement (AFY)
Applied Irrigation	4,970
Subsurface Flow to Ocean	200
City of Arroyo Grande	1,323
City of Grover Beach	1,407
City of Pismo Beach	700
Oceano CSD	900
Total	**9,500**

Notes:
1. Per the Judgement, the Cities of Arroyo Grande and Grover Beach have increased their entitlements by to 121 AFY and 209 AFY respectively based on the conversion of irrigated agricultural lands to urban use.

Agricultural Conversion Credit

As described in the City's 2015 UWMP a 209 AFY agricultural conversion credit is included in the City's current entitlement of SMVGB water.

5.3 Surface Water

The following provides a description of Lopez surface water as presented in the County of San Luis Obispo's Flood Control and Water Conservation District Zone 3 (Zone 3) Final Urban Water Management Plan Update 2015:

> *Lopez Reservoir has a storage capacity of approximately 49,388 acre-feet (AF) and provides water for municipal supply, recreational and environmental uses. Lopez Reservoir covers an area of about 918 acres, and is located primarily within the Arroyo Grande Creek drainage area consisting of a 67 square mile (43,000 acre) watershed which drains into Lopez Reservoir. The dam and reservoir were constructed on Arroyo Grande Creek, approximately 8 miles upstream from the community of Arroyo Grande and approximately 13 miles from the mouth of the creek (where it discharges to the Pacific Ocean). Construction on the project started in May 1967, and was completed in January 1969. The dam is constructed of select fill materials with a length of 1,120 feet, and a vertical height of 166 feet. A seismic retrofit of the dam was completed in 2002. A 20-inch diameter buried steel transmission main with a total length of 16 miles carries water from the dam to the 844 AF terminal reservoir and then from the water treatment plant to Contract Agencies. The water treatment plant has the capacity to treat up to 6 million gallons per day (mgd). (Wallace Group, June 2016)*

The safe yield of Lopez Reservoir is 8,730 AFY, which reflects the sustainable water supply during drought condition and as described in the Zone 3 Final Urban Water Management Plan Update 2015:

> *The safe yield is derived from two historical studies: Lopez Project Hydrology Review conducted in June 1962 and Hydrologic Balance of Arroyo Grande Groundwater Basin conducted in November 1962. The reservoir is operated to stay within the safe yield. 4,530 AFY (roughly 52% of the safe yield of the reservoir) has been apportioned by agreements to Contract Agencies. The remaining 4,200 AFY is reserved for downstream users including releases to maintain stream flows and groundwater recharge. The District is currently developing a Habitat Conservation Plan (HCP) to manage the downstream releases from Lopez Dam in a manner to ensure adequate flows for groundwater recharge and for the endangered species in the Arroyo Grande Creek. The releases are adjusted (increased or decreased) as necessary in response to changing agricultural needs and/or changes in weather conditions or other factors that may influence surface flows within the creek system. This management has generally resulted in annual releases less than 4,200 AF; the remaining water has been periodically offered to the Contract Agencies as surplus water. (Ibid)*

Historical usage and projected surface water supply from the Lopez Reservoir for the Contract Agencies are summarized in **Table 5-2**.

Table 5-2: Lopez Reservoir Water Contract Entitlements					
Contract Agency	Annual Entitlement (AFY)				
	2010	2015	2020	2025	2030
City of Arroyo Grande	2,246	1,857	2,290	2,290	2,290
City of Grover Beach	773	773	800	800	800
City of Pismo Beach	842	219	896	896	896
Oceano Community Services District	203	0	303	303	303
County Service Area 12	125	113	241	241	241
Downstream Releases	3,153	3,800	4,200	4,200	4,200
Available Surplus Water[1]	1,388	1,968	0	0	0
Total	**8,730**	**8,730**	**8,730**	**8,730**	**8,730**

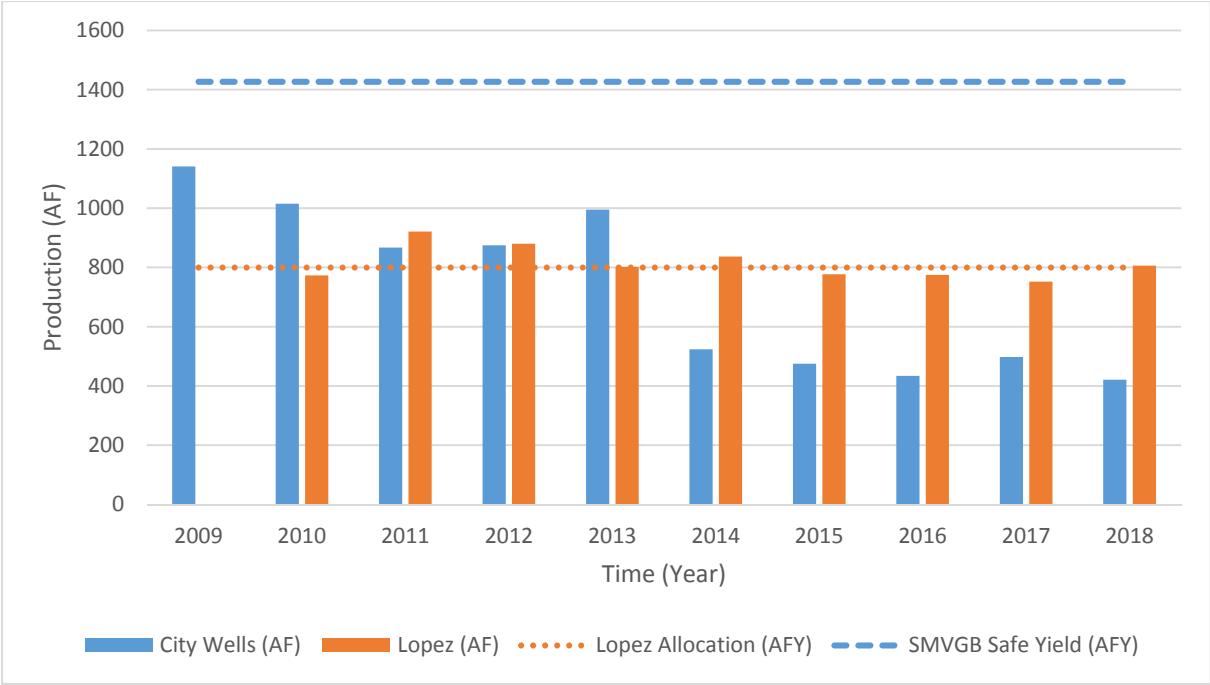
Notes:
1. Values based on Zone 3 Final Urban Water Management Plan Update 2015 Table 6-A.
2. It is assumed that in the future, 4,200 AFY will be reserved for downstream releases and no surplus water will be available to Contract Agencies. In actuality, when less water is released from Lopez Reservoir for downstream releases, surplus water may be made available to Contract Agencies per the Judgement.

Table 5-3 and **Figure 5-1** provides a summary of the City's historical water supply and trends from groundwater and surface water sources.

Table 5-3: Historical Water Supply 2009 - 2018			
Year	City Wells (AFY)	Lopez (AFY)	Total (AFY)
2009	1141	-[1]	1141
2010	1015	773	1788
2011	867	921	1788
2012	875	880	1755
2013	995	802	1797
2014	524	837	1361
2015	475	777	1252
2016	434	775	1209
2017	498	752	1250
2018	421	806	1227

Notes:
1. The City did not receive water from the County for calendar year 2009 based on State reporting records provided by the City.

Figure 5-1: Historical Water Supply Chart



As identified in the City's 2015 UWMP, during normal, single, and multiple dry years it was assumed that 96%-100% of the City's water supply would be available to serve future City demands through 2035 (summarized in **Table 5-4** below).

Table 5-4: Historical and Projected Water Supply Conditions

Supply Source	Normal Year (1992)	Single Dry Year (2013)	Multiple Dry Years		
			2013	2014	2015
Groundwater	1407	1407	1407	1407	1407
Lopez Project	800	800	800	800	720
Total	2207	2207	2207	2207	2127
Percent of Normal		100%	100%	100%	96%

Notes:
1. Based on Table 6-4 from City's 2015 UWMP.
2. Groundwater supplies are based on the City's allocation from the Judgement.
3. Lopez Project supplies are based on the data provided in the Zone 3 2015 UWMP adjusted for the City's calendar years with the lowest historical allocations.

However, as presented in the City's 2015 UWMP (Table 6-8) under a three-year minimum supply scenario the City could experience reduced groundwater production of 475 AFY and Lopez deliveries of 720 AFY. Under these extreme conditions only 1195 AFY supply would be available. Sections 8 and 9 of the WMP provide detail evaluation of existing available water supply, well pumping capacities, and facility redundancy to serve existing and future City water demands.

5.4 Central Coast Blue Recycled Water Project

In an effort to protect the Northern Cities Management Area (NCMA) section of the SMVGB from seawater intrusion, the City and regional stakeholders are advancing Central Coast Blue - a regional recycled water project that will utilize treated wastewater which is currently discharged to the ocean to increase groundwater supplies, and secure a sustainable, drought-resistant local water supply. Central Coast Blue is tended to a critical component of the future drinking water supply portfolio for the stakeholder agencies and will help protect against the threat of seawater intrusion into their groundwater supplies and future droughts in the State of California.

The project is a multi-agency collaboration between the City of Pismo Beach, the South San Luis Obispo County Sanitation District (SSLOCSD) and the other NCMA agencies. The project would involve recharge of the SMVGB with purified water via injection wells. Recycled water would be sourced from two of the region's wastewater treatment facilities, the Pismo Beach Wastewater Treatment Plant (PBWWTP) and the SSLOCSD WWTP. Prior to the injection to the SMVGB, water would be treated at a proposed Advanced Treatment Plant (ATP) constructed at the SSLOCSD WWTP or another site to be determined.

The project would be phased with Phase I involving advanced treatment of effluent from the PBWWTP for injection into the SMVGB with a Phase II expansion of the ATP to treat effluent from the SSLOCSD WWTP.

Project alternatives include expansion of the recycled water distribution system to include both groundwater recharge and serving selected agricultural irrigation/areas. **Table 5-5** provides a summary of the anticipated recycled water available as described in the SSLOCSD & City of Arroyo Grande Recycled Water Facilities Planning Study (Facilities Planning Study) prepared by Water Systems Consulting, Inc.

Table 5-5: Central Coast Blue Recycled Water Alternatives Yield Summary

Recycled Water Production	Onsite ATP Facility		Offsite ATP Facility	
	Groundwater Recharge	Hybrid[2]	Groundwater Recharge	Hybrid
	Phase 1			
Recycled Water Injected (AFY)	900	943	900	943
Yield (After Injection) AFY	657	812	657	812
	Phase 2			
Recycled Water Injected (AFY)	3,530	3,658	3,530	3,658
Yield (After Injection) AFY	2,577	3,031	2,577	3,031

Notes:
1. Per the Facilities Planning Study, the recycled water injection values presented in this table assume average annual WWTP flows reduced by the estimated recovery rates through microfiltration and reverse osmosis processes.
2. Hybrid Facility refers to a facility that would provide water for both groundwater recharge and irrigation.

At the time this WMP was prepared, the City and the other project stakeholders have not determined supply or cost sharing allocations. Preliminary planning and design are currently underway.

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SECTION 6 DESIGN CRITERIA

This section provides a summary of the design criteria used to analyze the City's existing water distribution system and proposed improvements to serve existing and future demands.

6.1 Water Supply Evaluation

Adequacy of the City's water supply was assessed based on the ability of the City's annual allocations to meet existing and future demands. An evaluation was also performed to evaluate the ability to meet system demands in the event of a system failure. For evaluating source capacity deficiencies, MKN used the requirements from the current version of the CCR Title 22, Chapter 16, Article 2. Permit Requirements, §64554 New and Existing Source Capacity, which states:

- At all times, a public water system's water source(s) shall have the capacity to meet the system's maximum day demand (MDD).
- For systems with 1,000 or more service connections, the system shall be able to meet four hours of peak hourly demand (PHD) with source capacity, storage capacity, and/or emergency source connections.
- Both the MDD and PHD requirements shall be met in the system as a whole and in each individual pressure zone.

In addition to the State's requirement, the City's supply sources were evaluated to meet MDD under the following scenarios:

- Scenario 1 - All water supplies intact
- Scenario 2 - Reduced or minimal delivery from Lopez Water supply
- Scenario 3 - The largest groundwater well is out of service

6.2 Storage Facilities Evaluation

To analyze the adequacy of a City's storage facilities to serve existing and future demands, three criteria are typically considered: equalization (or operational), emergency, fire storage. These are defined as follows:

Equalization Storage

Equalization storage (also known as operational storage) is the volume of storage required to meet short-term peak day demands that are in excess of production, ideally without using water maintained for emergency or fire storage. Equalization volume criteria for this report are based on the recommendations found in the AWWA Water Distribution Systems Handbook[5] as summarized in the table below:

Table 6-1: Typical Values for Equalization Volume

Type of Operation	Equalization volume needed as a fraction of MDD (%)
Constant pumping	0.10 – 0.25
Follow demand (constant speed)	0.05 – 0.15
Off-peak pumping	0.25 – 0.50
Variable speed pumping	0

The City's current operation can be described as constant speed pumping. The well pumps are manually operated by City staff based on tank level and Lopez Water is delivered at a constant rate throughout the day, and the available

[5] American Water Works Association, Water Distribution Systems Handbook, Mays, 2000.

storage is reduced at night to allow buffer for Lopez Water delivery during times of low demand. Based on this, a conservative factor of 0.25% of MDD was used for equalization storage requirements.

Emergency Storage

Emergency storage is the volume of storage recommended to ensure ongoing supply in the event of a water supply emergency. Typically, the emergency storage requirement is calculated by multiplying the population by 50 gallons per day for three days. Storage requirement criteria will vary for existing and future population and demands. These are described and analyzed in the storage section.

Fire Storage

Fire storage is the volume of storage recommended to meet fire-flow requirements for the duration of the event. Fire services for the City are provided by the Five Cities Fire Authority. The Five Cities Fire Authority uses the 2016 California Fire Code Appendix B and BB to determine flow requirements for residential and non-residential uses within the City. MKN reviewed and utilized approximate building square footage information (developed by CalFire and County of San Luis Obispo) to identify existing building square footage for all structures within the City. However, information related to building material type/construction was not available. For the fire flow analysis it was assumed that residential material construction for homes larger than 3,600 square feet was Type V-B Unprotected Wood Frame (typically single family homes and garages that often have exposed wood so there is no fire resistance) and commercial/industrial buildings were Type II-B Unprotected Non-Combustible (common type of non-combustible construction used in commercial buildings). The following fire-flow requirements were used for the storage and distribution evaluation criteria for this study.

Table 6-2: Fire Flow Requirements by Land Use

Land Use	Required Flow (gpm)	Duration (hours)	Required Flow with Sprinkler System (gpm)
Residential Single Family[1]	1,000	1	500
Residential Multi-Family[1]	1,000	1	500
Commercial[2]	3,750	3	Reduced by 25%, not to be less than 1,000 gpm
Commercial Service[2]	3,750	3	
Industrial[3]	3,750	4	
School[4]	4,000	4	Reduced by 75%, not to be less than 1,500 gpm

Notes:

1. For residential dwellings less than 3,600 square feet in fire area 1,000 gpm was assumed. For residential dwellings greater than 3,600 square feet Type V-B construction and fire flow requirements as defined in Table B105.1(2) of the 2016 California Fire Code Appendix B were applied.
2. Most commercial structures within the City are less than 33,000 square feet and assumed to be of Type II-B construction. Two large commercial structures exist (47,000 sf and 80,000 sf). Fire flow requirements as defined in Table BB105.1 of the 2016 California Fire Code Appendix BB were applied.
3. Most industrial structures within the City are less than 22,000 square feet and assumed to be of TYPE II-B construction. Single largest structure is 41,000 sf. Fire flow requirements as defined in Table BB105.1 of the 2016 California Fire Code Appendix BB were applied.
4. Fire flow requirement as defined in Table BB105.1 of the 2016 California Fire Code Appendix BB were applied.

The fire storage requirement for the City should be based on the most stringent requirement. In this case, the City's requirement for School properties will govern. A 4,000 gpm fire flow rate for a duration of four hours provides a minimum fire storage requirement of 960,000 gallons. It is assumed that future fire storage requirements will not change.

6.3 Distribution System Evaluation

To analyze the adequacy of distribution pipelines to serve existing and future demands, the following criteria were applied as objectives:

- ADD conditions:
  - Minimum system pressure of 40 FPS
  - Maximum system pressure of 125 PSI
  - Headloss limited to 10 feet per 1000 feet of pipe
- MDD conditions:
  - Minimum system pressure of 40 PSI
  - Maximum velocities of 5 FPS
  - Headloss limited to 10 feet per 1000 feet of pipe
- MDD+FF conditions:
  - Minimum system pressure of 40 PSI
  - Minimum residual pressure of 20 PSI
  - Maximum velocities of 10 FPS
- PHD condition:
  - Minimum system pressure of 40 PSI

The City's minimum pipe size based on adopted design standards, is 8-inch.

Booster Pump Station

The BPS operation was simulated as described in Section 4 and the ability to provide flow and pressure was evaluated using the hydraulic model. The evaluation for the BPS is summarized in **Table 6-3**:

Table 6-3: Booster Pump Station Evaluation

Scenario	Criteria
Zone Reliability	Must be able to meet PHD with one only one pump in service.
Fire Flow Reliability	Must be able to meet MDD plus fire flow.

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SECTION 7 HYDRAULIC COMPUTER MODEL

This section provides an overview of the water distribution system hydraulic model developed for this project.

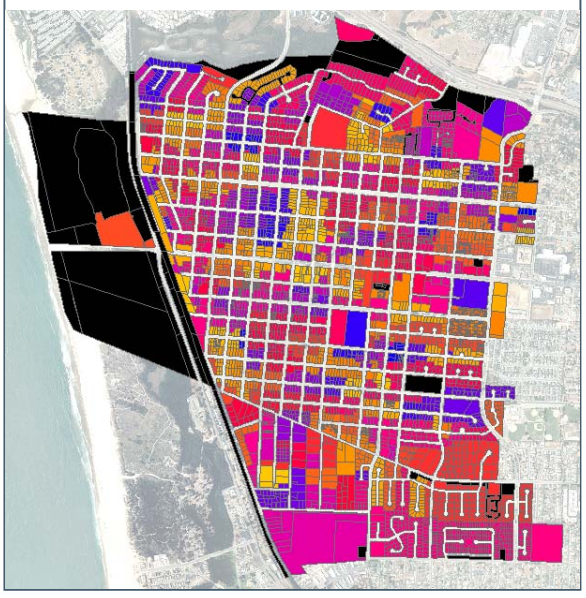
7.1 Model Development

A hydraulic model was prepared using WaterCAD software (by Bentley Systems) to simulate the operation of the water system. WaterCAD incorporates the Hazen-Williams formula as a basis for calculating flow distribution and pressure throughout the water system. All necessary information is imported from GIS or manually added to the hydraulic model and used to evaluate average day, maximum day, peak hour demands, simulated fire flow conditions, water main capacity, and system pressures throughout the City under existing and future demand scenarios. A representative model of the existing distribution system and pumping facilities was developed using the following information:

- The City's AutoCAD Water Atlas which provides the following:
  - Pipe geometry
  - Pipe material
  - Installation date of pipelines
- The City's AutoCAD topographic map used for ground/node elevation
- Wall maps for tank site and booster pump station piping layouts with notes by City Staff
- Typical operating conditions based on field visits and discussion with City Staff
- Pump curve information (when available)
- Conceptual plans for proposed 8-inch water main upgrades (2019 Community Development Block Grant project) on Trouville Avenue (South 10th Street to South 13th Street), Seabright Avenue (South 13th Street to South 14th Street), Manhattan Avenue (South 13th Street to South 14th Street, Malibu Court, Jalama Court, Rincon Court, Stinson Court, and Dover Court

The existing water system was mapped using an ESRI GIS geodatabase and integrated with the City's parcel basemap. Pipe characteristics and average day demands (from each parcel) were recorded in the water GIS database and imported into the hydraulic model.

Figure 7-1: Water Demand Allocation



7.1.1 Water Demand Allocation

Each parcel was flagged as being an existing water customer and/or potential future water customer. In addition, each parcel was coded with a pressure node identification number based on the proximity of the node to adjacent parcels. **Figure 7-1** depicts the demand areas (colored polygons) assigned to nodes in the hydraulic model.

This process allowed for automated assignment of calculated demands to model nodes throughout the water system. Once the demand allocation process was completed, MKN imported the existing and future ADD into the water model. To allocate existing water demands throughout the distribution system, existing average annual demands were assigned using the land use duty factors as described in **Table 3-7**. **Figure 7-2** provides an overview of the water distribution system hydraulic model features.

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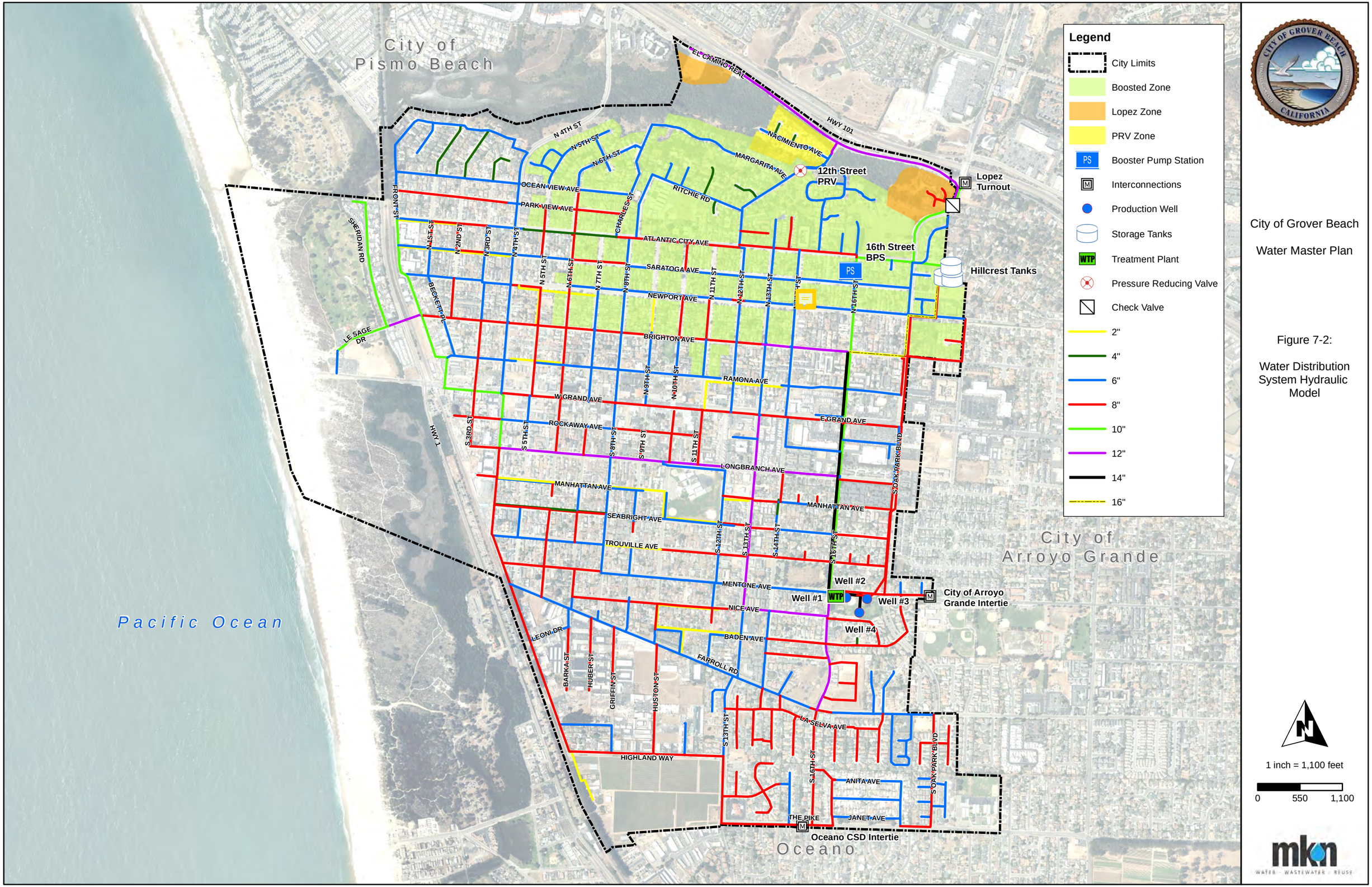

City of Grover Beach

Water Master Plan

Figure 7-2:

Water Distribution System Hydraulic Model

1 inch = 1,100 feet

0 550 1,100

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7.1.2 Model Scenarios

The following model simulations were completed as part of the WMP project to evaluate pipeline capacities to serve existing and future demands:

- Existing conditions with 1) existing system; and 2) existing system including capital improvements
  - Average Daily Demand
  - Max Day Demand
  - Max Day Plus Fire-flow
  - Peak Hour Demand
- Future conditions with 1) existing system; and 2) existing system including capital improvements
  - Average Daily Demand
  - Max Day Demand
  - Max Day Plus Fire-flow
  - Peak Hour Demand

To evaluate MDD plus fire flow conditions, MKN configured an automated system-wide fire flow analysis tool within WaterCAD. All nodes within the model were assigned with a required fire flow based on land use classification (**Table 6-2**). In addition a minimum system-wide residual pressure of 20 PSI was required during any fire flow event. When the simulation was performed, a single fire flow was simulated at each system node while checking that residual system pressure remained greater than 20 PSI. If the minimum residual pressure was not maintained at a specific node location, WaterCAD identified the available fire flow while maintaining 20 PSI residential pressure. This reduction in fire flow was used to identify existing system deficiencies.

7.1.3 Model Settings

After the water system network and existing and future demands were imported into WaterCAD, the following parameters were configured in the hydraulic model:

- Pipeline Hazen-Williams roughness coefficient factors
- Typical storage tank operating levels
- Booster pump station controls
- Lopez Interconnection flow
- Nacimiento Avenue pressure reducing valve (PRV) set point

As described earlier, WaterCAD incorporates the Hazen-William formula for pressure pipe system calculations. **Table 7-1** provides a summary of the Hazen-Williams roughness coefficient factors that were applied to all pipelines within the hydraulic model based on pipeline material type.

Table 7-1: Hazen-Williams Pipe Roughness Factors

C-Factor	Material
135	Asbestos Cement
140	Ductile Iron
140	Polyvinyl Chloride
100	Steel

Table 7-2 provides a summary of the typical tank operating levels at the Hillcrest Reservoir site.

Table 7-2: Storage Facilities Typical Operating Levels					
Storage Facility	Base Elevation (feet)	Low Condition		High Condition	
		Level (feet)	Elevation (feet)	High Level (feet)	Elevation (feet)
Reservoir No. 1	233.5	13.5	247	25.0	258.5
Reservoir No. 2	225.5	21.5	247	33.0	258.5
Reservoir No. 3	222.0	25.0	247	36.5	258.5
Notes: 1. Elevations are based on the City's AutoCAD topographic map.					

The booster pump station (BPS) is located on 16th Street south of Atlantic City Avenue, and receives water from the gravity zone (at approximately 30 PSI). Pressure reducing valves installed on the discharge side of each pump maintain system pressure at 60 PSI into the boosted zone. Based on discussions with City Staff, it was assumed that only pumps No. 2 and No. 4 are typically in operation and therefore were the only pumps used in the hydraulic analysis (**Table 7-3**).

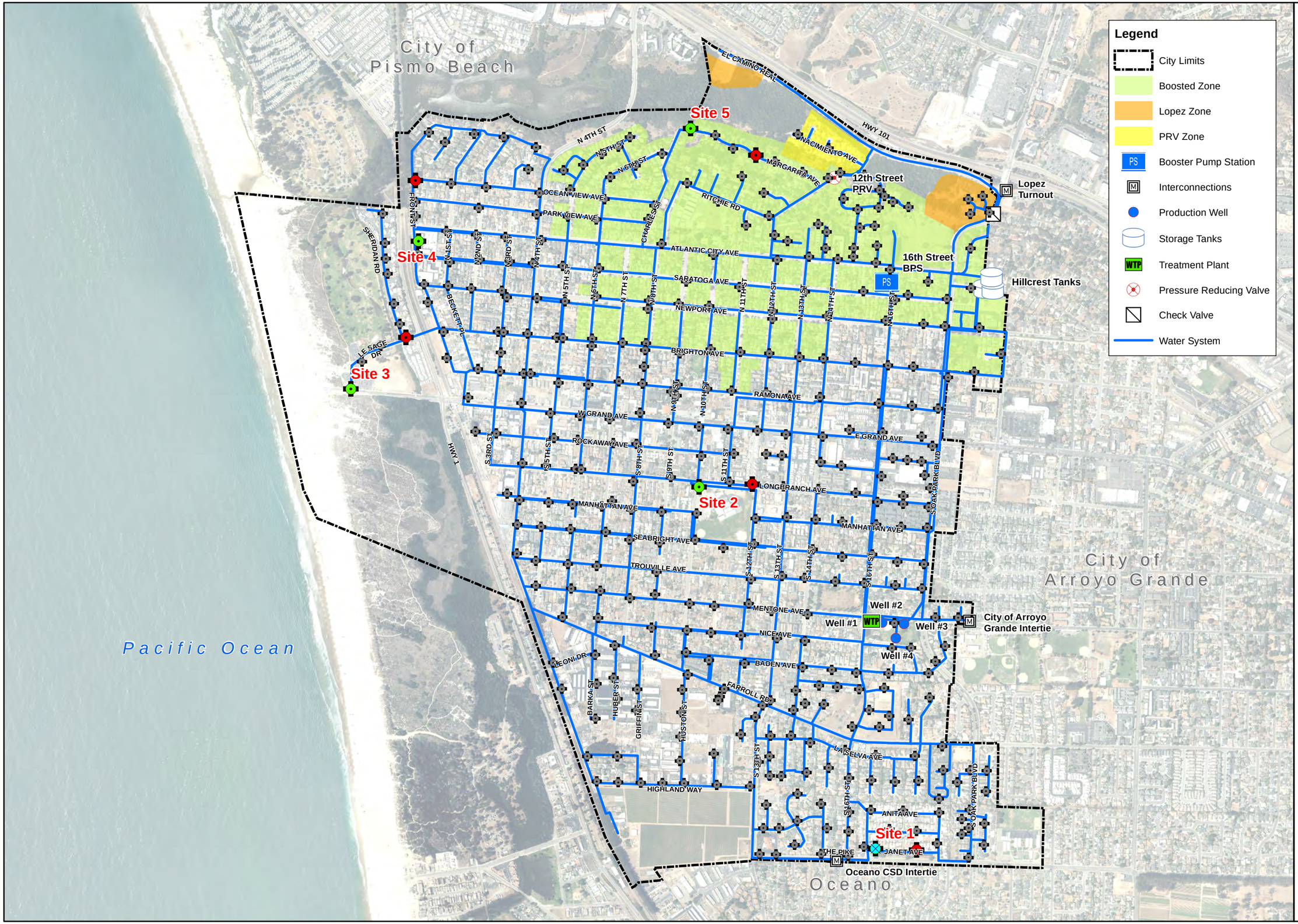
Table 7-3: Booster Pump Station Settings			
Pump	Type	Flowrate (gpm)	Head (ft)
No. 2	Lag	725	101
No. 4	Fire	1250	95

The Lopez Interconnection was modeled as a fixed head reservoir with a hydraulic grade of 275 feet and a flow control valve feature set at a flowrate of 495 gpm (based on an allocation of 800 acre-feet per year). The 12th Street PRV was modeled as a PRV feature with a pressure setting of 60 PSI in the hydraulic model.

7.2 Hydraulic Model Calibration

The hydraulic model was calibrated using fire flow testing information acquired by City Staff at five locations as shown on **Figure 7-3** on March 6, 2019. The following conditions were observed for field testing:

- Testing was conducted from 10:30 AM to 3:30 PM
- Production wells were OFF
- Tanks No. 2 and No. 3 were isolated from the system, so flow could only come from Tank No. 1
- Lopez Interconnection was active
- Level at Tank No. 1 was 35.23 feet at beginning of testing and 34.80 feet at end of testing, resulting in a 0.43 foot level drop
- At the Booster Pump Station, Pump No. 2 was ON and Fire Pump was on AUTO



City of Grover Beach

Water Master Plan

Figure 7-3:

Fire Flow Testing Location Map

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Table 7-4 provides a comparison between the measured pressures collected by City staff during the fire flow testing and observed pressures in the hydraulic model. Based on the results of the comparison, measured and modeled pressures deviated between 6 - 11 PSI within the gravity zone and 10 - 20 PSI in the boosted zone under static conditions prior to opening hydrants. In each case the model provided more conservative pressure predictions than field observations. Elevations within the hydraulic model were based on the City's existing city-wide topographic mapping, which is consistent with other elevation data including County DEM and Google Earth. Deviations in static pressures within the gravity zone could be attributed to use and accuracy of pressure equipment and actual system demands at a specific time of day compared with estimates of annual average demands. Pump curve information was not available for the existing BPS, but the design points of the pumps were used in the model.

Measured and modeled pressures deviated between 2 – 4 PSI when comparing the relative pressure drop during fire flow testing in the field and when simulated in the hydraulic model.

These deviations in pressure are acceptable for the hydraulic model. The water model was considered "calibrated" based on the results of the testing and was used to complete the hydraulic analysis for existing and future demand conditions.

Table 7-4: Hydrant Tests for Model Calibration

Site	Location	Static Conditions (PSI)			Fire Flow Testing					
					Field			Model		Delta[1] (PSI)
		Field	Model	Delta[1]	Flow (GPM)	Residual (PSI)	Pressure Drop	Residual (PSI)	Pressure Drop	
1	111 Janet Avenue	86	80	**6**	770	-	-	-	-	-
	231 Janet Avenue	88	78	**10**	-	82	6	74	4	**2**
2	10th Street & Longbranch	88	82	**6**	530	-	-	-	-	-
	Longbranch & 12th Street	90	82	**8**	-	86	4	80	2	**2**
3	West Grande Avenue	116	103	**13**	780	-		-		-
	La Sage & Park Lane	116	103	**13**	-	110	6	99	4	**2**
4	Front Avenue	110	99	**11**	848	-		-		-
	670 Front Street	106	100	**6**	-	99	7	96	4	**3**
5	901 Margarita Avenue	120	100	**20**	780	-		-		-
	1031 Margarita Avenue	110	100	**10**	-	121	11	93	7	**4**

Notes:
1. "Delta" represents the difference between observed (field) and modeled pressure.

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SECTION 8 EXISTING DEMANDS - HYDRAULIC ANALYSIS AND CONDITION ASSESSMENT

8.1 Supply Facilities

The City's existing water supply consists of two sources – the Santa Maria Valley Groundwater Basin (SMVGB) and surface water from the Lopez Project. A detailed description of supply sources is included in Section 4 and 5. As presented in **Table 8-1,** a review of the City's available water supply allocation indicates a surplus of 970 AFY to meet existing City demands. These values represent normal year conditions. Dry year conditions and actual availability of water are briefly discussed in Section 5.

Table 8-1: Water Supply Allocation & Existing Demand

Source	Allocation (AFY)
Santa Maria Valley Groundwater Basin	1,407
Surface Water	800
Total Water Supply Allocation	**2,207**
Existing Average Annual Demand	1,237
Supply Surplus / (Deficit)	**970**

MKN reviewed the ability of the City's existing supply/production facilities to deliver water to the distribution system. As described in Section 6.1 and as required by the State, the City's production facilities should at all times have the capacity to meet the system's MDD. It is recommend that the City have redundant supply facilitates to provide water if a production facility is temporarily out of service. As part of the production facility evaluation MKN acquired the following information:

- Pump design information (design point) from the City
- Available pump testing data from the City
- Typical pump operation (single well, multiple well in operation, etc)
- Pump curve information (when available) from pump vendors

Following review of this information, MKN observed several discrepancies between actual production values and design information with an observed describe in pump capacity. These observations were based on pump testing data and how the typically operation of the wells (Well No. 1 and Well No. 4 together, Well No. 1 only, Well No. 4 only). For the production facility evaluation MKN developed two tables to present available production capacity. MKN also ran several model simulations and observed that existing 8-inch ACP well transmission pipeline (from Mentone Avenue to the Hillcrest Reservoirs) is a significant restriction for conveying the full design capacity (3,550 gpm) of the wells to the existing tank site. In addition, at 1864 gpm (existing MDD conditions) the existing 8-inch ACP well transmission pipeline would experience 270 feet of headloss. Pumps are typically designed to perform at specific head and flow conditions. With respect to the City wells and transmission line an increase in system head (high pipeline headloss) would reduce the pumping capacity of the production facilities.

The adequacy of the existing water production facilities to meet existing demands and provide system redundancy are presented in **Table 8-2** (based on design information) and **Table 8-3** (based on available pump testing or City information).

Table 8-2: Ability of Production Facilities (Design Data) to Meet Existing Demands								
Criteria	Production Capacity (GPM) Based On Well Design						Maximum Day Demand (GPM)	Source Capacity Surplus / (Deficit) (GPM)
	Well No. 1	Well No. 2	Well No. 3	Well No. 4	Lopez	Total Capacity		
Meet MDD with all supplies	600	750	1000	1200	495	**4045**	1,864	**2,181**
Meet MDD with largest active well out of service	600	750	1000	-	495	**2845**	1,864	**981**
Meet MDD with Lopez WTP out of service	600	750	1000	1200	-	**3550**	1,864	**1,686**

Table 8-2 indicates the City has adequate production capacity, if the existing wells and pumps function as designed, to meet MDD. As noted previously in this section, the existing 8-inch ACP well transmission pipeline would experience significant headloss at higher flows therefore reducing the pumping capacity of the wells.

Table 8-3: Ability of Production Facilities (Pump Test Data) to Meet Existing Demands								
Criteria	Production Capacity (GPM) Based On 2018 Pump Tests[1]						Maximum Day Demand (GPM)	Source Capacity Surplus / (Deficit) (GPM)
	Well No. 1[2]	Well No. 2	Well No. 3[3]	Well No. 4[2]	Lopez	Total Capacity		
Meet MDD with all supplies	530	560	730	530	495	**2845**	1,864	**981**
Meet MDD with typical supplies in operation	530	560	-	530	495	**2115**	1,864	**251**
Meet MDD with largest active well out of service	620	560	730	-	495	**2405**	1,864	**541**
Meet MDD with Lopez WTP out of service	530	560	730	530	-	**2350**	1,864	**486**
Meet MDD with Lopez WTP and Well No. 3 out of service	530	560	-	530	-	**1620**	1,864	**(244)**

Notes:
1. Pumping capacity for Wells No. 1, No. 2, and No. 4 based on well pump tests completed in February 2018 by Pumping Efficiency Testing Services.
2. Pumping capacity is reduced to 530 gpm for each well when Wells No. 1 and No. 4 run simultaneously.
3. Pump testing data was not available for Well No. 3 at the time the master plan was developed and value based on City records.

As shown in **Table 8-3**, the City will have a production capacity surplus of 981 gpm with all production facilities online; a production capacity surplus of 251 gpm with typical production facilities online; a production capacity surplus of 541 gpm with Wells No. 1, No. 2, No. 3, the Lopez Interconnection in operation and Well No. 4 offline; a production capacity surplus of 486 gpm if all four wells are in operation and the Lopez Interconnection offline; and a production capacity deficit of 244 gpm with Wells No. 1, No. 2, No. 4, in operation and the Lopez Interconnection and Well No. 3 offline.

As stated earlier the existing 8-inch well transmission pipeline experiences significant headloss during high production conditions. It is recommended that the City completes additional pump testing to confirm maximum production capacity of the existing well field, evaluate potential modification of the existing well site piping and system operation, and determine need for an additional production well.

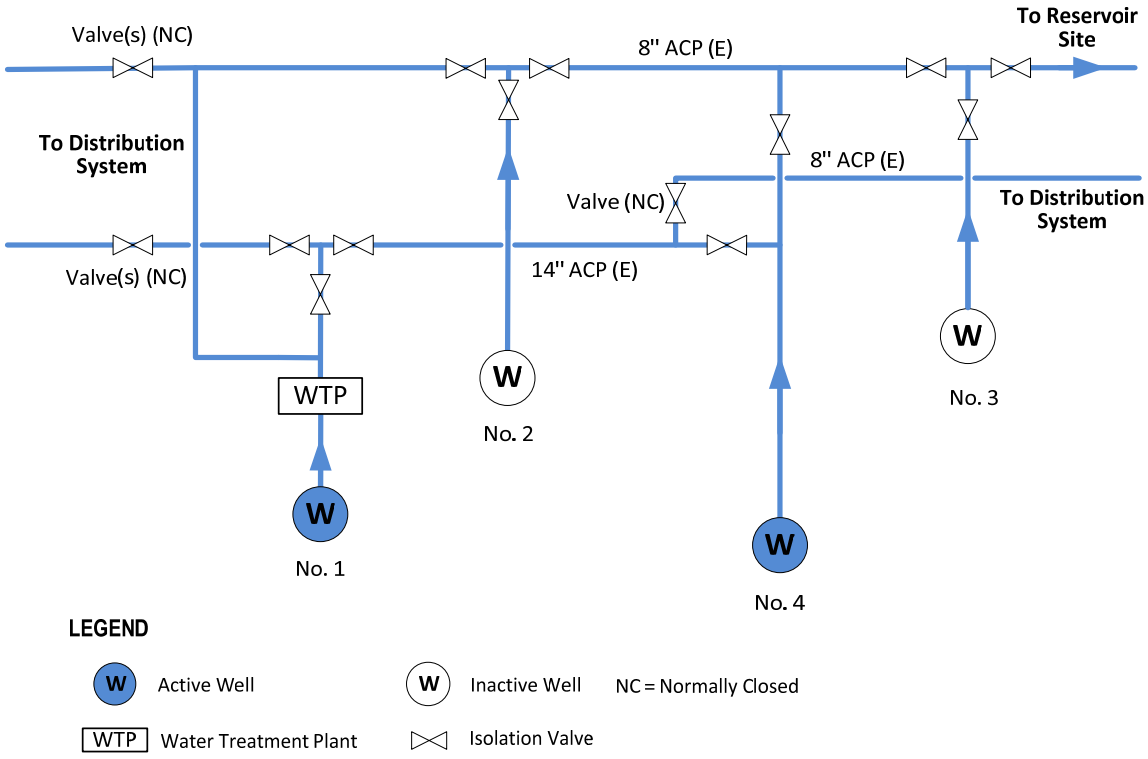
8.2 Treatment System

The City adds the following at Wells No. 1 and No. 4 by chemical injection into the discharge lines:

- Sodium Hypochlorite (Wells No. 1 and 4)
- Ammonium Sulfate (Well No. 4 only)
- Sodium Hydroxide (Well No. 1 only)
- Orthophosphate (Well No. 1 only)

Currently the City pumps groundwater directly to the Hillcrest Reservoir site and **Figure 8-1** provides an overview of the existing well transmission line and valve configuration based on information provided by City staff.

Figure 8-1: Well Site Piping Layout



The City also has an existing ion exchange treatment facility located at the groundwater well site that can treat groundwater from Wells No. 1, No. 2. and No. 3. Water from No. 3 can be sent to the ion exchange treatment facility plant by closing the easterly valve and turning all wells off. After treatment water can go straight to the distribution system or can be sent to the reservoir site to blend with Lopez water. The ion exchange treatment plant has not been operated since 2013. For the WMP, MKN reviewed historical (2013 to 2018) nitrate concentration sampling data collected at Well No. 1, Well No. 4, and the outlet of Hillcrest Reservoir No. 1 (presented in **Figure 8-2)**. This graph shows a slow, long-term reduction in nitrate concentration. However, nitrate concentrations at Well No. 1 are at or slightly below the nitrate MCL (10 ppm) and require a blending source (Lopez water) to reliably stay below the MCL.

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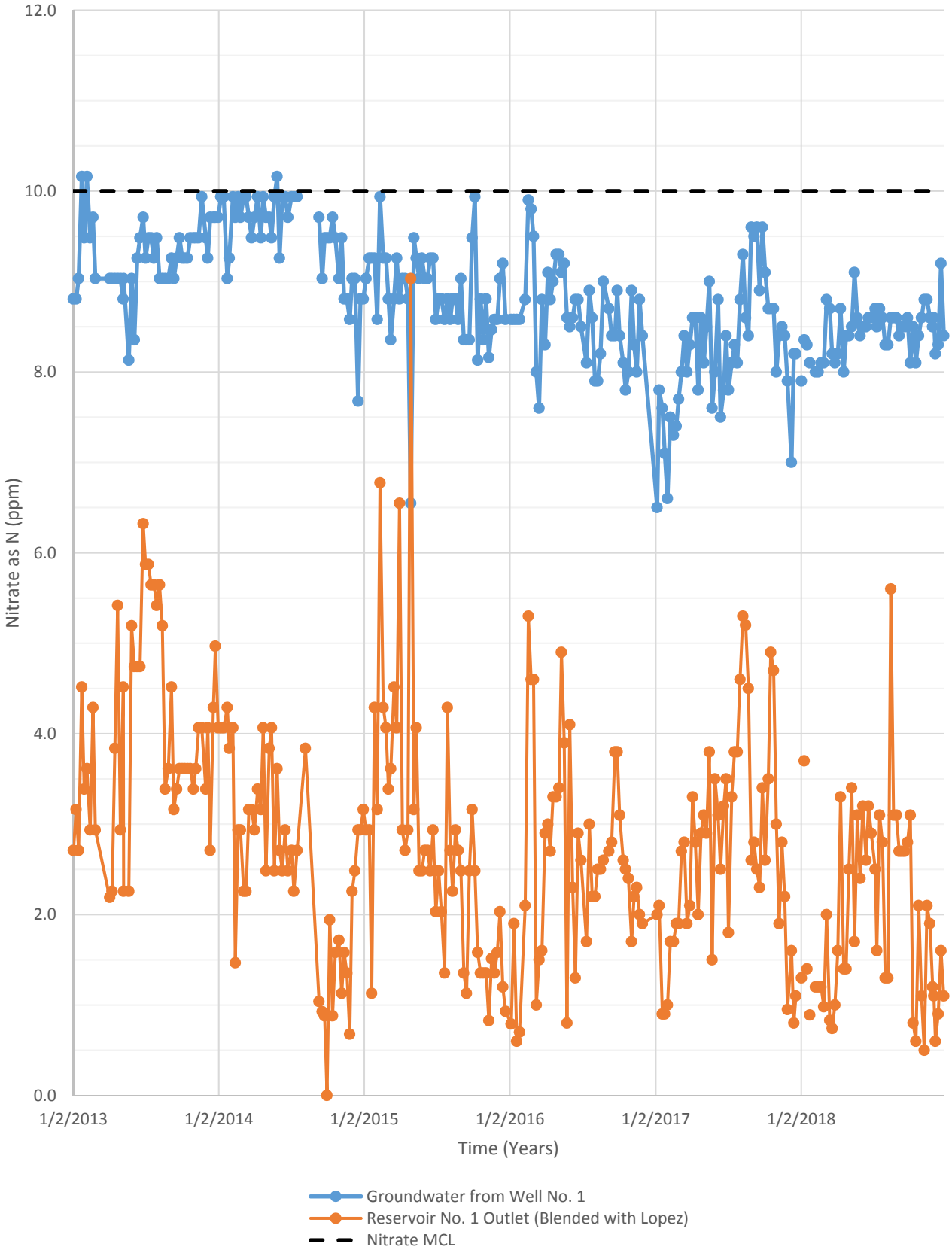
Figure 8-2: Nitrate as N Measured at Well No. 1 and Reservoir 1 Outlet (After Blending with Lopez)



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8.3 Storage Facilities

As described in Section 4.6, the City currently owns and operates three welded steel storage tanks at the Hillcrest Reservoir Site. The available storage volumes are summarized in **Table 8-4** below.

Table 8-4: Available Storage Volume

Reservoir	Base Elevation (feet)	Operating Depth[1] (feet)	Operating Elevation (feet)	Diameter (feet)	Available Volume (gallons)
No. 1	233.5	21.0	258.5	90	1,141,478
No. 2	225.5	29.0	258.5	81	1,232,796
No. 3	222.0	32.5	258.5	82	1,401,610
				Total	**3,775,884**

Notes:
1. All tanks have side outlet piping to the distribution system. Total useable operating depth was assumed at bottom of side outlet piping (approximately one foot from floor of each tank).

The storage requirements to serve existing demands are summarized in **Table 8-5** below. Definitions and descriptions of the criteria used for the various storage components (fire, emergency, and equalization) are described in Section 6.2. The analysis suggests a storage surplus of approximately 112,000 gallons to serve existing City demands.

Table 8-5: Storage Recommendations for Existing Demands

Storage Type	Criteria	Storage Volume (Gallons)
Fire Storage	4,000 gpm x 4 hours	960,000
Emergency Storage	50 gpcd x 3 days x 13,560 pp	2,034,000
Equalization Storage	0.25 x MDD of 2.68	670,000
Total Recommended Storage		**3,664,000**
Total Available Storage		3,775,884
Surplus/(Deficit)		111,884

8.4 Booster Pump Station

The BPS was evaluated under the following conditions:

- Existing PHD with largest booster pump out of service (Pump No. 2 offline)
- Existing MDD plus Fire flow (with fire pump only)

It should be noted that the Grover Heights Elementary school is located within the boosted zone and requires 4000 gpm during a fire flow event (**Table 6-2**). However, MKN evaluated the BPS with Grover Heights Elementary school with and without sprinklers. **Table 8-6** provides a summary of the BPS evaluation to serve existing demands within the boosted zone.

Table 8-6: Booster Pump Station Evaluation under Existing Demands							
GHE Without Sprinkler System							
Criteria	**BPS CAPACITY (GPM)**						**Capacity Surplus / (Deficit) (GPM)**
	Pump No. 1	**Pump No. 2**	**Pump No. 3**	**Pump No. 4**	**Total Capacity**	**Demand (gpm)**	
Existing PHD with largest booster pump out of service	475	-	475	-	950	900	50
Existing MDD plus Fire flow	-	-	-	1200	1200	4600[2]	(3400)
GHE With Sprinkler System							
Existing PHD with largest booster pump out of service	475	-	475	-	950	900	50
Existing MDD plus Fire flow	-	-	-	1200	1200	2100[3]	(900)

Notes
1. GHE = Grover Heights Elementary.
2. School fire flow availability of 4000 gpm required if GHE does not have a sprinkler system.
3. School fire flow availability of 1500 gpm required if GHE has a sprinkler system.

As shown in **Table 8-6**, the BPS will have a pumping surplus of 50 gpm if Pumps No. 1 and No. 3 are in operation to serve PHD with Pump No. 2 offline. However, the BPS will have a pumping deficit of 3,400 gpm during MDD plus fire flow conditions. If the City requires that Grover Heights Elementary School install a sprinkler system the required fire flow can be reduced to 1500 for the school, but the BPS will still have a pumping deficit of 900 gpm under existing conditions.

8.5 Distribution and Transmission Pipelines

The City's existing water distribution system contains over 57 miles of distribution mains ranging from 2-inch to 16-inch in size and a variety of pipe material. For existing ADD, MDD and PHD condition simulations the existing water distribution pipelines are sufficient to meet the pressure and flow requirements as defined in Section 6.3. **Figure 8-3** provides an overview of typical system pressures during existing ADD conditions. System deficiencies are primarily determined based on the ability of the existing water distribution system to provide the required flows and pressures throughout the City during MDD plus fire flow conditions. The following should be noted:

- During MDD plus fire flow simulations it was observed that the water surface elevation/level within the Hillcrest Reservoirs must be maintained at an elevation of 252 feet (30 feet tank level) or higher to provide sufficient fire flows throughout the City
- Maximum flow from the Lopez Interconnection to serve the Lopez zone is limited to 516 gpm[6] in the model

Figure 8-4 identifies the required fire flow throughout the distribution system based on land use and **Figure 8-5** identifies the system-wide fire flow availability at 20 PSI residual pressure.

The results of the hydraulic analysis and observed deficiencies under existing demand fire flow conditions are presented in the following tables. **Table 8-7** provides a summary of residential fire flow deficiencies.

[6] According to the existing 9/19/2000 contract between the City of Grover Beach and the SLO Flood Control and Water Conservation District (District) Article 9 D.

City of Pismo Beach

City of Arroyo Grande

Oceano

Pacific Ocean

EL CAMINO REAL

HWY 101

HWY 1

N 4TH ST

N 5TH ST

N 6TH ST

NACIMIENTO AVE

MARGARITA AVE

12th Street PRV

Lopez Turnout

OCEAN VIEW AVE

PARK VIEW AVE

RITCHIE RD

CHARLES ST

FRONT ST

SHERIDAN RD

N 1ST ST

N 2ND ST

N 3RD ST

N 4TH ST

ATLANTIC CITY AVE

16th Street BPS

Hillcrest Tanks

N 5TH ST

N 6TH ST

N 7TH ST

N 8TH ST

N 11TH ST

N 12TH ST

N 13TH ST

N 14TH ST

N 16TH ST

SARATOGA AVE

NEWPORT AVE

BECKETT PL

LE SAGE DR

BRIGHTON AVE

RAMONA AVE

W GRAND AVE

E GRAND AVE

ROCKAWAY AVE

S 3RD ST

S 5TH ST

S 8TH ST

S 9TH ST

S 11TH ST

N 9TH ST

N 10TH ST

S OAK PARK BLVD

LONGBRANCH AVE

MANHATTAN AVE

SEABRIGHT AVE

TROUVILLE AVE

S 12TH ST

S 13TH ST

S 14TH ST

S 16TH ST

MENTONE AVE

Well #2

Well #1

Well #3

Well #4

City of Arroyo Grande Intertie

NICE AVE

BADEN AVE

LEONI DR

BARKA ST

HUBER ST

GRIFFIN ST

HUSTON ST

FARROLL RD

LA SELVA AVE

HIGHLAND WAY

ANITA AVE

JANET AVE

THE PIKE

Oceano CSD Intertie

Legend

- City Limits

Pressure Ranges (PSI)

- 10 - 40
- 41 - 60
- 61 - 80
- 81 - 100
- 101 - 120
- Boosted Zone
- Lopez Zone
- PRV Zone
- Booster Pump Station
- Interconnections
- Production Well
- Storage Tanks
- Nitrate Removal Plant
- Water Distribution System

1 inch = 1,100 feet

0 550 1,100

City of Grover Beach

Water Master Plan

Figure 8-3:

Typical System Pressure during ADD Conditions

mkn WATER · WASTEWATER · REUSE

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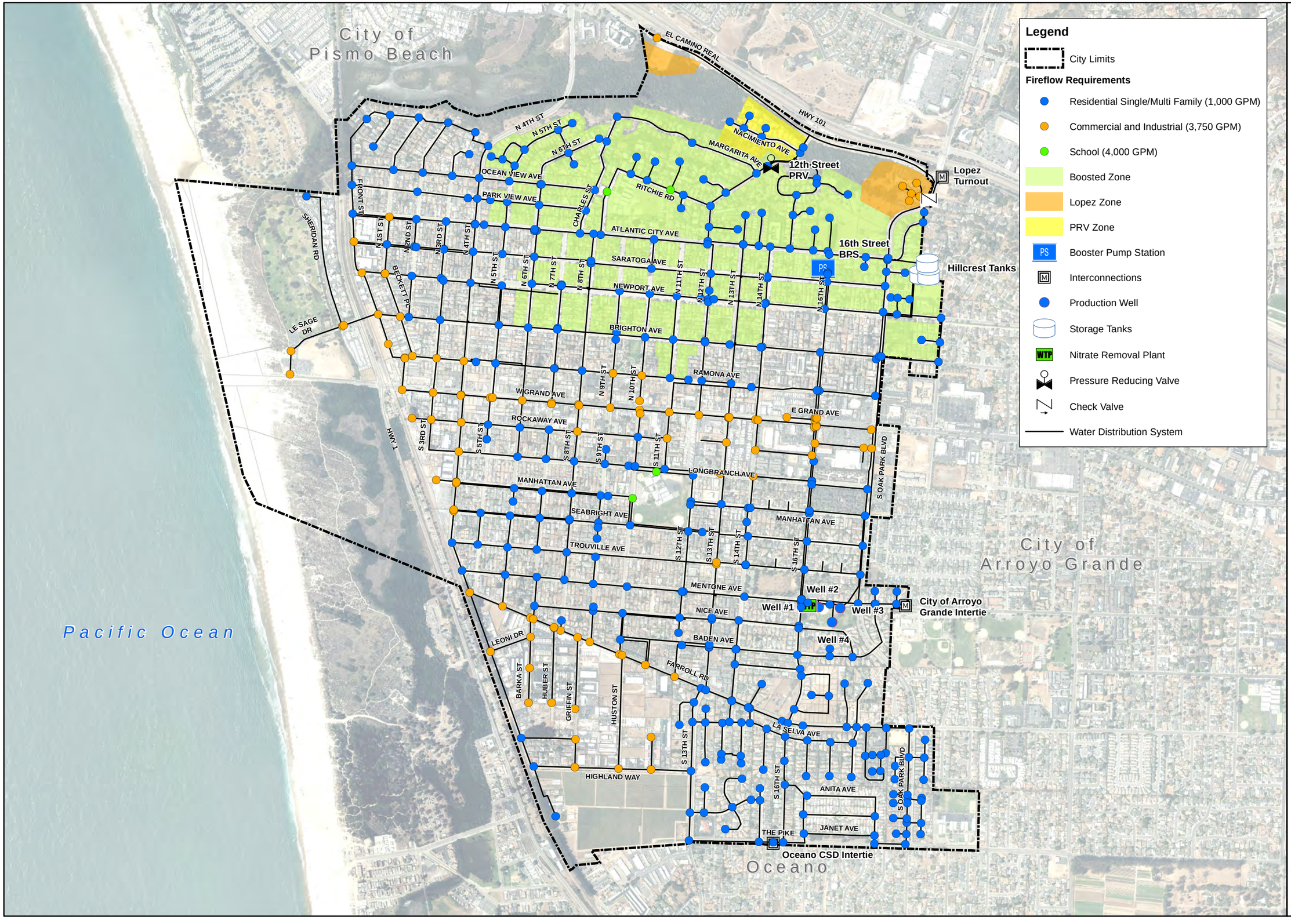

City of Grover Beach

Water Master Plan

Figure 8-4:

Required Fire Flow Based on Land Use

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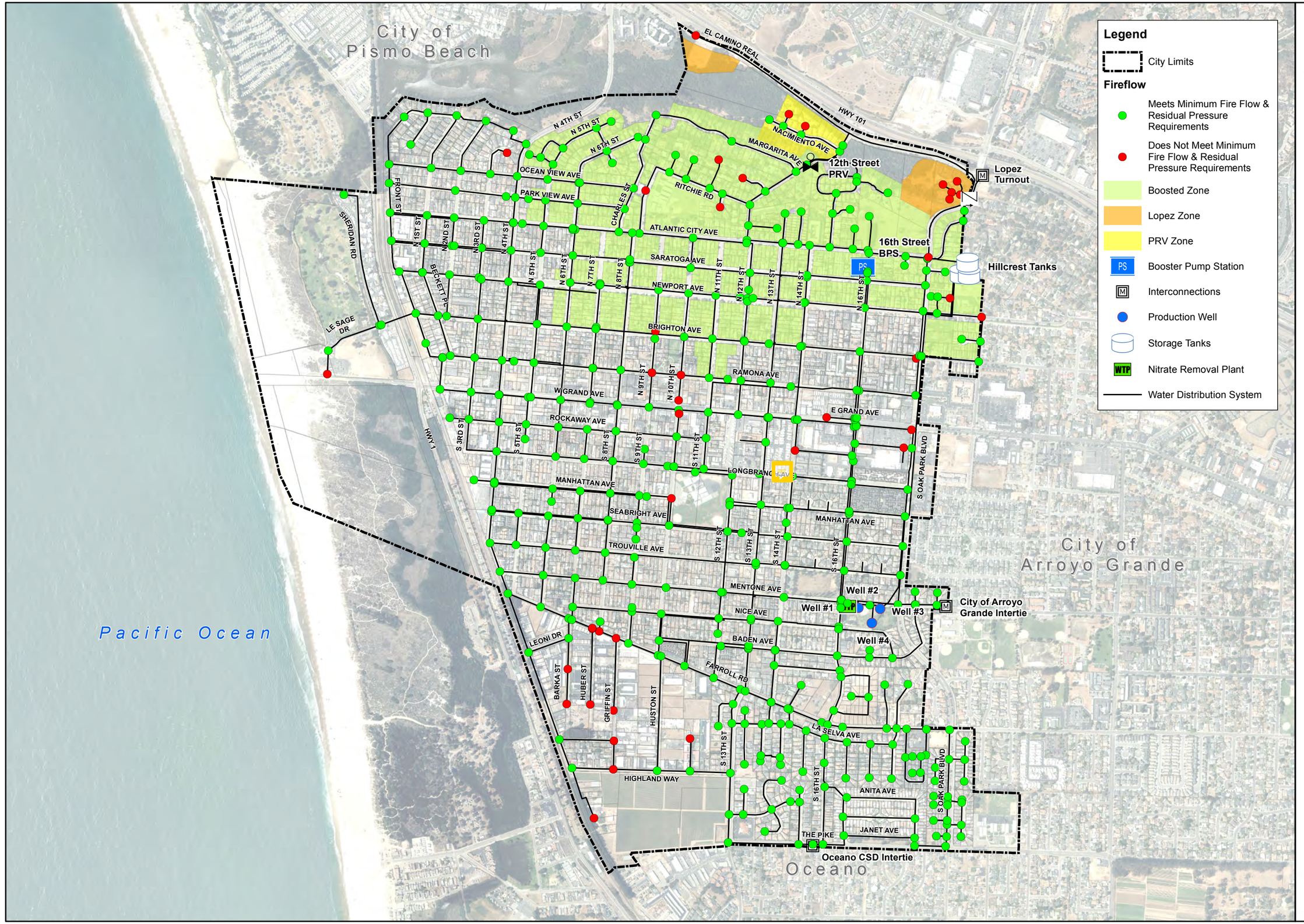

City of Grover Beach

Water Master Plan

Figure 8-5:

Fire Flow Availability at 20 PSI Residual Pressure

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Table 8-7: Existing Deficiencies - Residential Fire Flow			
Deficiency Identification	**Location**	**Pressure Zone**	**Available Fire Flow (gpm) at 20 PSI Residual Pressure**
R-1	N 9th St and Brighton Ave	Boosted	93
R-2	Atlantic City Ave and N Oak Park Blvd	Lopez	508
R-3	Sharon Ln	Boosted	595
R-4	Angello Terrace	Boosted	682
R-5	Ritchie Ct	Boosted	821
R-6	Courtland St	Boosted	961
R-7	N Oak Park Blvd and Brighton Ave	Gravity	943
R-8	S 4th St	Gravity	71
R-9	N 3rd St at Ocean View Av	Gravity	471
R-10	Owens Ct at Nacimiento Ave	PRV	811
R-11	Mono Ct at Nacimiento Ave	PRV	933

Notes:
1. R = Residential including single and multi-family land uses.
2. Residential single and multi-family land uses requires 1000 gpm fire flow.

Table 8-8 provides a summary of commercial and industrial fire flow deficiencies.

Table 8-8: Existing Deficiencies - Commercial and Industrial Fire Flow			
Deficiency Identification	**Location**	**Pressure Zone**	**Available Fire Flow (gpm) at 20 PSI Residual Pressure**
CI-1	El Camino Real	Lopez	508
CI-2	N Oak Park Blvd	Lopez	508
CI-3	N 10th Ave at W Grande Ave	Gravity	1,667
CI-4	Ramona Ave at N 10th St	Gravity	1,750
CI-5	1161-1165 Highland Way	Gravity	2,064
CI-6	E Grande Ave at N 16th St	Gravity	2,161
CI-7	S Oak Park Blvd south of E Grande Ave	Gravity	3,505
CI-8	Le Sage Dr	Gravity	2,422
CI-9	Huber St	Gravity	3,479
CI-10	Griffin St	Gravity	2,604
CI-11	Barca St	Gravity	2,677
CI-12	Ramona Ave at N 9th Ave and	Gravity	2,806
CI-13	Calvin Ct at Griffin St	Gravity	2,976
CI-14	S 14TH St at Rockaway Ave	Gravity	3,127
CI-15	Farroll Rd	Gravity	3,475
CI-16	S 10th St at W Grande Ave	Gravity	3,591
CI-17	S Oak Park Blvd at E Grande Ave	Gravity	3,669

Notes:
1. CI = Commercial and industrial land uses.
2. Commercial and industrial land use requires 3750 gpm fire-flow.
3. Users within the Lopez Zone have limited peak flow capacity of 516 gpm.

Table 8-8 provides a summary of school fire flow deficiencies.

Table 8-9: Existing Deficiencies - School Fire Flow				
Deficiency Identification	**Location**	**Pressure Zone**	**Available Fire Flow (gpm) at 20 PSI Residual Pressure**	**Notes**
S-1	N 8th St	Boosted	1,242	Existing BPS, suction and discharge piping do not have sufficient capacity to deliver 4000 gpm fire-flow to GHE
S-2	S 10th St and Manhattan Ave	Gravity	1,861	

Notes:
1. S = School land use.
2. GHE = Grover Heights Elementary.
3. School land use requires 4000 gpm fire-flow.
4. Fire flows at school sites model as 2000 gpm demand from two hydrant locations adjacent to facility.

Table 8-10 provides a summary of the recommended upgrades to address system deficiencies associated with existing MDD plus fire flow conditions. The table includes the fire flow deficiencies identified in the previous tables, pressure zone, and brief description of the proposed improvements.

Table 8-10: Recommended Improvements to Address Existing Demand Fire Flows						
Improvement	Model Deficiency Addressed	Pressure Zone	Proposed Improvement			
			Description	Diameter (inches)	Length (feet)	Facility
1	R-1	Boosted	Increase pipe size (from 2-inch to 8-inch)	8	514	-
2	R-3	Boosted	Increase pipe size (from 4-inch to 8-inch)	8	387	-
3	R-4	Boosted		8	344	-
4	R-5	Boosted		8	172	-
5	R-7	Gravity	New pipe segment to loop system	8	30	-
6	R-8	Gravity	Increase pipe size (from 2-inch)	8	732	-
7	R-9	Gravity	Increase pipe size (from 4-inch to 8-inch)	8	457	-
8	R-10	PRV		8	166	-
9	R-11	PRV		8	121	-
10	CI-1 / R-2	Lopez	Reduced fire-flow requirement to 2800 gpm assuming hotel has sprinkler system	New control valve on Lopez fill line at Hillcrest Reservoir No. 1 to allow flow back to Lopez Zone during emergencies		
11	CI-2	Lopez	Increase pipe size (from 8-inch to 10-inch)	10	171	-
12	CI-3 / CI-4 / CI-12 / C-16	Gravity	New pipe segment to loop system	8	164	-
13	CI-5	Gravity	Increase pipe size from 6-inch to 10-inch	10	424	-
14	CI-6	Gravity	New pipe segment to loop system	8	62	-
15	CI-7	Gravity	Increase pipe size (from 6-inch to 8-inch)	8	256	-
16	CI-9 / CI-15	Gravity	New pipe segment to loop system	8	440	-
17	CI-10 / CI-13	Gravity		8	440	-
18	CI-11	Gravity		8	330	-
19	CI-14	Gravity		8	330	-
20	CI-17	Gravity		8	65	-
21	S-1 / R-6	Boosted	Reduce fire-flow requirement to 1500 gpm assuming school will install sprinkler system	Install new fire pump to serve existing MDD plus fire flow		
22	S-2	Gravity	New pipe segment to loop system	8	400	-
Improvements to be installed by Grover Beach Lodge project						
-	CI-8	Gravity	Increase pipe size from 6-inch to 10-inch and install new pipe segment to loop system	10	1800	-

8.6 Condition Assessment

In addition to the hydraulic analysis of the existing water distribution system facilities, MKN completed site visits on August 15, 2018 to the City's storage tanks, booster pump station and well site to complete a visual inspection (including photos) to confirm and supplement as-built information and document existing conditions and deficiencies. The field assessments included discussions with City staff with respect to operational issues, age of facilities, and staff observation. Notes from the visual condition assessment of the water system facilities are documented below. Facilities were not reviewed for code compliance. Site photos from the condition assessment are included in Appendix C.

8.6.1 Groundwater Wells

The following summarizes the observations and recommendations from the condition assessment for the groundwater well facilities.

Well No. 1 Building Interior Condition:

- ❑ Address minor corrosion issues on piping and valves with spot repair and recoating.
- ❑ Pump not anchored to pedestal – level pump base and install anchor bolts.
- ❑ Consider review of existing electrical system. Consider electrical upgrades and upgrade to enclosures appropriate for use in wet areas.
- ❑ Provide secondary containment for ammonium sulfate storage tank, or remove if not used.
- ❑ Provide spray shields for chemical injection.

Well No. 1 Building Exterior Condition:

- ❑ Provide emergency eyewash facilities.
- ❑ Seal wall pipe penetrations to prevent pest entry.
- ❑ Improve protection of chemical quills to prevent damage to quill (enclosure, permanent shield, etc).
- ❑ Label all chemical lines.
- ❑ Provide secure location and permanent mounting base for chemical feed pumps. Protect from sun and weather and accidental contact (tripping, etc).
- ❑ Provide secure location for caustic storage tank to maintain appropriate temperature (70-100F) to prevent crystallization. Consider insulation and/or heat trace on piping. Review and follow safety requirements for storage of caustic.
- ❑ Provide secure location for hypochlorite storage out of sun, as sun will degrade chemical.
- ❑ Ensure all bulk storage vessels are properly labeled (orthophosphate).
- ❑ Review and replace/improve chemical suction and delivery systems, sun shielding, and containment piping as necessary.
- ❑ Provide seismic restraint for chemical tanks.
- ❑ Eliminate containment of hypochlorite overflow in open bottle for safety.
- ❑ Improve security of chemical storage to prevent public access and/or vandalism. While federal regulations only broadly address site selection and preparation issues, some state and local agencies have specific construction requirements for hazardous materials storage and handling facilities. These requirements are typically part of fire regulations and/or building codes. In the absence of specific requirements, the location for storage and handling systems should be selected to limit access to unauthorized personnel and to allow containment in the event of accidental spillage.
- ❑ Consider alarms for chemical feed systems to protect against failure of disinfection.
- ❑ Consider installation of emergency generator.

Well No. 2 Building Interior Condition:

- ❑ Address minor corrosion issues on piping and valves with spot repair and recoating.
- ❑ Pump not anchored to pedestal – level pump base and install anchor bolts.

- ❑ Consider review of existing electrical system. Consider electrical upgrades and upgrade to enclosures appropriate for use in wet areas.
- ❑ Anchor pipe supports and piping.

Well No. 2 Building Exterior Condition:

- ❑ Seal wall pipe penetrations to prevent pest entry.

Well No. 3 Building Interior Condition:

- ❑ Address minor corrosion issues on piping and valves with spot repair and recoating.
- ❑ Pump not anchored to pedestal – level pump base and install anchor bolts.
- ❑ Consider review of existing electrical system. Consider electrical upgrades and upgrade to enclosures appropriate for use in wet areas.
- ❑ Anchor pipe supports and piping.

Well No. 3 Building Exterior Condition:

- ❑ Seal wall pipe penetrations to prevent pest entry.

Well No. 4 Building Interior Condition:

- ❑ Address minor corrosion issues on piping and valves with spot repair and recoating.
- ❑ Pump not anchored to pedestal – level pump base and install anchor bolts.
- ❑ Address heavy corrosion of ferrous materials in electrical room.
- ❑ Consider review of existing electrical system. Consider electrical upgrades and upgrade to enclosures appropriate for use in wet areas.
- ❑ Repair exclusion screening on louvered openings.
- ❑ Provide containment for ammonium sulfate storage tank.
- ❑ Provide spray shields for chemical injection.

Well No. 4 Building Exterior Condition:

- ❑ Provide emergency eyewash facilities.
- ❑ Seal wall pipe penetrations to prevent pest entry.
- ❑ Improve protection of chemical quills to prevent damage to quill (enclosure, permanent shield, etc)
- ❑ Label all chemical lines.
- ❑ Review electrical system and use of GFCI protected circuits where appropriate.
- ❑ Provide secure location and permanent mounting base for chemical feed pumps. Protect from sun and weather and accidental contact (tripping, etc).
- ❑ Provide secure location for hypochlorite storage.
- ❑ Provide seismic restraint for chemical tanks.
- ❑ Eliminate containment of hypochlorite overflow in open bottle for safety.

- Provide secondary containment of hypochlorite. Currently pump suction line and tank drain is external to containment vessel – place fill connection within secondary containment and eliminate drain and other wall penetrations in secondary containment vessel.
- Ensure all bulk storage vessels are properly labeled.
- Review and replace/improve chemical suction and delivery systems, sun shielding, and containment piping as necessary.
- Improve security of chemical storage to prevent public access and/or vandalism. While federal regulations only broadly address site selection and preparation issues, some state and local agencies have specific construction requirements for hazardous materials storage and handling facilities. These requirements are typically part of fire regulations and/or building codes. In the absence of specific requirements, the location for storage and handling systems should be selected to limit access to unauthorized personnel and to allow containment in the event of accidental spillage.
- Consider alarms for chemical feed systems to protect against failure of disinfection.
- Consider installation of emergency generator.

8.6.2 Hillcrest Reservoirs

The following summarizes the observations and recommendations from the condition assessment for the storage facilities.

Hillcrest Reservoir No. 1:

- Constructed in 1963
- Previous tank inspection and exterior coating completed in 1999 (20 years)
- Review condition of external level gauge. Repair or replace as necessary.
- Some staining present at interface of roof and tank shell. Some loose and failing coatings present on tank exterior. Recommend coating inspection to assess condition of internal and exterior coatings.
- Significant metal loss was observed on the tank chime. Recommend repair and recoating and sealing with appropriate caulking.
- Address minor corrosion issues on piping and valves with spot repair and recoating.
- Installation of bollards to protect tank inlet and outlet piping is recommended.
- Consider flexible couplings at tank penetrations to minimize risk of failure resulting in loss of supply and damage to surrounding properties due to seismic events.
- Review condition and capacity of overflow and emergency drainage handling facilities.

Hillcrest Reservoir No. 2:

- Constructed in 1978
- Previous tank inspection and exterior coating completed in 2008 (11 years)
- Minor corrosion present on tank exterior. Recommend coating inspection to assess condition of internal and exterior coatings.
- Significant metal loss was observed on portions of the tank chime. Recommend repair and recoating and sealing with appropriate caulking.
- Address minor corrosion issues on piping and valves with spot repair and recoating.

- Installation of bollards to protect tank inlet and outlet piping is recommended.
- Consider flexible couplings at tank penetrations to minimize risk of failure resulting in loss of supply and damage to surrounding properties due to seismic events.
- Review condition and capacity of overflow and emergency drainage handling facilities.

Hillcrest Reservoir No. 3:

- Constructed in 1987
- Previous tank inspection and exterior coating not completed (coatings assumed to be 32 years old)
- Coating appears to be in poor condition with significant staining present throughout the tank exterior. Aerial photography indicates probable failure of roof coatings. Coating inspection is recommended to assess condition of internal and exterior coatings.
- Significant metal loss was observed on portions of the tank chime. Repair, recoating and sealing with appropriate caulking are recommended.
- Address minor corrosion issues on piping and valves with spot repair and recoating.
- Installation of bollards to protect tank inlet and outlet piping is recommended.
- Consider flexible couplings at tank penetrations to minimize risk of failure resulting in loss of supply and damage to surrounding properties due to seismic events.
- Review condition and capacity of overflow and emergency drainage handling facilities.

8.6.3 16th Street Booster Pump Station

The following summarizes the recommendations from the condition assessment for the 16th Street booster pump station.

- Address minor corrosion issues on piping and valves with spot repair and recoating.
- Install shaft guard on jockey pumps
- Consider review of existing electrical system. Consider electrical upgrades and upgrade to enclosures appropriate for use in wet areas
- Consider configuring pumps for lead/lag/backup cycling configuration to maximize pump life
- Plan for rehabilitation and/or replacement of valves and ClaVals older than 10 years

Access to the 12th Street PRV was not available during the preparation of the WMP so a detailed condition assessment of the facility was not completed.

Since the existing nitrate removal system is currently offline a detailed condition assessment of the facility was not completed for the WMP. However, if the City elects to reinstate the facility in the future, it is recommended that condition assessment be performed prior to startup.

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SECTION 9 FUTURE DEMANDS - HYDRAULIC ANALYSIS

9.1 Supply Facilities

As presented in **Table 9-1,** a review of the City's available water supply allocation indicates a surplus of 482 AFY to meet future City demands. The future average annual demand is based on additional demands associated with residential, hotel, commercial, and industrial development projected through 2050 within the City. These values represent normal year conditions. Dry year conditions and actual availability of water are briefly discussed in Section 5.

Table 9-1: Water Supply Allocation & Future Demand	
Source	**Allocation (AFY)**
Santa Maria Valley Groundwater Basin	1,407
Surface Water	800
Total Water Supply Allocation	**2,207**
Future Average Annual Demand	1,725
Supply Surplus / (Deficit)	**482**

MKN reviewed the ability of the City's existing supply/production facilities to deliver water to the distribution system. As described in Section 6.1 and as required by the State, the City's production facilities should at all times have the capacity to meet the system's MDD. It is recommend that the City have redundancy in supply facilities to maintain capacity to provide water if a production facility is temporarily out of service. The adequacy of the existing water production facilities to meet future demands and provide system redundancy are presented in **Table 9-2** (based on design information) and **Table 9-3** (based on available pump testing or City information).

Table 9-2: Ability of Production Facilities (Design Data) to Meet Future Demands								
Criteria	**Production Capacity (GPM) Based On Well Design**						**Maximum Day Demand (GPM)**	**Source Capacity Surplus / (Deficit) (GPM)**
	Well No. 1	**Well No. 2**	**Well No. 3**	**Well No. 4**	**Lopez**	**Total Capacity**		
Meet MDD with all supplies	600	750	1000	1200	495	**4045**	2,597	**1,448**
Meet MDD with largest active well out of service	600	750	1000	-	495	**2845**	2,597	**248**
Meet MDD with Lopez WTP out of service	600	750	1000	1200	-	**3550**	2,597	**953**

As noted in Section 8-1, the existing 8-inch ACP well transmission pipeline cannot convey the fully pumping capacity of the wells to the Hillcrest Reservoir site.

Table 9-3: Ability of Production Facilities (Pump Test Data) to Meet Future Demands								
Criteria	Production Capacity (GPM) Based On 2018 Pump Tests[1]						Maximum Day Demand (GPM)	Source Capacity Surplus / (Deficit) (GPM)
	Well No. 1[2]	Well No. 2	Well No. 3[3]	Well No. 4[2]	Lopez	Total Capacity		
Meet MDD with all supplies	530	560	730	530	495	**2845**	2,597	**248**
Meet MDD with typical supplies in operation	530	560	-	530	495	**2115**	2,597	**(482)**
Meet MDD with largest active well out of service	620	560	730	-	495	**2405**	2,597	**(192)**
Meet MDD with Lopez WTP out of service	530	560	730	530	-	**2350**	2,597	**(247)**
Meet MDD with Lopez WTP and Well No. 3 out of service	530	560	-	530	-	**1620**	2,597	**(977)**

Notes:
1. Pumping capacity for Wells 1, 2, and 4 based on well pump tests completed in February 2018 by Pumping Efficiency Testing Services.
2. Pumping capacity is reduced to 530 gpm for each well when Wells No. 1 and No. 4 run simultaneously.
3. Pump testing data was not available for Well No. 3 at the time the master plan was developed and value based on City records.

As shown in **Table 9-3**, the City will have a production capacity surplus of 248 gpm with all production facilities online; a production capacity deficit of 482 gpm with typical production facilities online; a production capacity deficit of 192 gpm with Wells No. 1, No. 2, No. 3, Lopez Interconnection in operation and Well No. 4 offline; a production capacity deficit of 247 gpm with all four wells are in operation and the Lopez Interconnection offline; and a production capacity deficit of 977 gpm with Wells No. 1, No. 2, No. 4, in operation and the Lopez Interconnection and Well No. 3 offline.

As stated in Section 8-1, the existing 8-inch well transmission pipeline experiences significant headloss during high production conditions. It is recommended that the City completes additional pump testing to confirm maximum production capacity of the existing well field, potential modification of the existing well site piping and system operation, and need for an additional production well.

9.2 Storage Facilities

The storage requirements to serve existing demands is summarized in **Table 9-4** below. The analysis suggests a storage deficit of approximately 416,000 gallons to serve future City demands.

Table 9-4: Storage Recommendations for Existing Demands		
Storage Type	**Criteria**	**Storage Volume (Gallons)**
Fire Storage	4,000 gpm x 4 hours	960,000
Emergency Storage	50 gpcd x 3 days x 15,313 pp	2,296,950
Equalization Storage	0.25 x MDD of 3.74	935,000
Total Recommended Storage		**4,192,000**
Total Available Storage		3,775,884
Surplus/(Deficit)		**(416,116)**

9.3 Booster Pump Station

The BPS was evaluated under the following conditions:

- ❑ Future PHD with largest booster pump out of service (Pump No. 2 offline)
- ❑ Future MDD plus Fire flow (with fire pump only)

Table 9-5 provides a summary of the BPS evaluation to serve future demands within the boosted zone.

Table 9-5: Booster Pump Station Evaluation under Future Demands							
GHE Without Sprinkler System							
Criteria	**BPS CAPACITY (GPM)**						**Capacity Surplus / (Deficit) (GPM)**
	Pump No. 1	**Pump No. 2**	**Pump No. 3**	**Pump No. 4**	**Total Capacity**	**Demand (gpm)**	
Existing PHD with largest booster pump out of service	475	-	475	-	950	1163	(213)
Existing MDD plus Fire flow	-	-	-	1200	1200	4775	(3575)
GHE With Sprinkler System							
Existing PHD with largest booster pump out of service	475	-	475	-	950	1163	(213)
Existing MDD plus Fire flow	-	-	-	1200	1200	2275	(1075)

As shown in **Table 9-5**, the BPS will have a deficit of 213 gpm if Pumps No. 1 and No. 3 are in operation to serve PHD with Pump No. 2 offline. The BPS will have a deficit of 3,575 gpm during MDD plus fire flow conditions. If the City requires that Grover Heights Elementary school install a sprinkler system the required fire flow can be reduced to 1500 for the school, but the BPS will still have will have a deficit of 1,075 gpm during future conditions.

9.4 Distribution and Transmission Pipelines

For future ADD, MDD and PHD condition simulations the existing water distribution pipelines are sufficient to meet the pressure and flow requirements as defined in Section 6.3. System deficiencies are based primarily on the ability of the existing water distribution system to provide the required flows and pressures throughout the City during MDD plus fire flow conditions. The following should be noted:

- ❑ Model results assume improvements to correct existing MDD plus fire flow deficiencies are completed prior to the addition of future demands within the model

- Hillcrest Reservoirs must be maintained at an elevation of 252 feet (30 feet tank level) or higher to provide sufficient fire flows throughout the City
- Maximum flow from the Lopez Interconnection to serve the Lopez zone is limited to 516 gpm in the model

Based on the future MDD plus fire flow evaluation, no additional pipeline deficiencies were identified/triggered by the additional demands associated with future development.

SECTION 10 RECOMMENDED IMPROVEMENTS AND OPINION OF PROBABLE COSTS

10.1 Capital Improvement Projects

The following capital improvements are recommended to address deficiencies associated with existing and future demands as identified in this report.

10.1.1 Supply Facilities

Existing Conditions

The City's existing production facilities include four groundwater wells (two active and two standby) and the Lopez Interconnection. As required by the State, the City's production facilities should at all times have the capacity to meet the system's MDD. For existing demand conditions and typical production facility operation (Well No. 1, Well No. 2, Well No. 4 and Lopez active) the City can meet this requirement from a pumping capacity standpoint, but experiences reductions in well production based on results City pump test data. These reductions could be attributed to the hydraulic restriction of the existing 8-ACP well transmission pipeline.

As described in Section 8, it is recommended that the City complete additional pump testing and analysis to confirm maximum production capacity of the existing well field, evaluate potential modification of the existing well site piping and system operation, and determine need for an additional production well.

In addition to the hydraulic analysis of the existing water production facilities, MKN completed a site visit at the well site to complete a visual inspection to document existing conditions and deficiencies. Based on the condition assessment MKN identified significant upgrades for Wells No. 1 and No. 4 to improve facility reliability, safety, and operation. Minor upgrades were also recommended for Wells No. 2 and No. 3. The recommended improvements to address existing condition deficiencies include the following:

- Well No. 1: Electrical system upgrades; chemical storage and delivery improvements; and miscellaneous site improvements as noted in condition assessment
- Well No. 2: Address minor corrosion issues on piping and valves, level and anchor pump to pedestal, seal wall pipe penetrations, and miscellaneous piping improvements
- Well No. 3: Address minor corrosion issues on piping and valves, level and anchor pump to pedestal, and seal wall pipe penetrations
- Well No. 4: New electrical, chemical, and pump buildings/structures; chemical storage and delivery improvements; and miscellaneous site improvements as noted in condition assessment

The recommended supply improvements to address existing demand deficiencies are shown in **Table 10-4**.

Future Conditions

For future demands, the City will be required to operate all production facilities (four groundwater wells and Lopez Interconnection) to serve future MDD conditions. Supply redundancy will be inadequate if a major well or the Lopez Interconnection is offline. Currently Wells No. 2 and No. 3 are on standby status and will require improvements to increase the reliability, safety, and operability to serve future demands. The major deficiencies for Wells No. 2 and No. 3 were noted during the condition assessment, but are only recommended to be addressed to serve future demands. In addition to the future improvements to Well No. 2 and No. 3, MKN recommends the installation of a new well transmission pipeline from the existing well site to the Hillcrest Reservoir site. This new pipeline would be sized to reduce system headloss and allow the City to serve future MDD conditions. The recommended improvements to address future condition deficiencies include the following:

- Well No. 2: Upgrade existing electrical system
- Well No. 3: Upgrade existing electrical system, pump, and motor
- Construction of a new 16-inch C900 PVC well transmission pipeline from the existing well site to the Hillcrest Reservoir site
- Well No. 4: Permanent standby generator (see discussion in Section 10.1.3)

The recommended supply improvements to address future demand deficiencies are included in **Table 10-7**.

10.1.2 Treatment Facilities

As described in Section 8.2, the City must have access to a blending source (Lopez water) or reinstate the existing ion exchange treatment facility to meet the nitrate MCL. As directed by City staff, MKN has included a preliminary cost opinion to rehabilitate and reinstate the ion exchange treatment facility if needed to serve future demands. The recommended improvements to the ion exchange treatment facility include replacing the resin media, disinfecting the facility, and performing repairs to return the facility to manual operation to treat groundwater during emergency conditions. The recommended treatment improvements to address future demand deficiencies are included in **Table 10-7**.

10.1.3 Storage Facilities

Existing Conditions

The City owns three welded steel storage tanks at the Hillcrest Reservoir site. Nitrate blending occurs in Reservoir No. 1. As described in Section 6.2, the City's existing storage facilities should meet existing equalization, emergency and fire flow storage requirements. For existing demand conditions, the City will have a storage surplus of approximately 112,000 gallons.

In addition to the hydraulic analysis of the existing water storage facilities, MKN completed a site visit at the reservoir site to complete a visual review and document existing conditions and deficiencies. Based on the condition assessment MKN identified minor improvements for Reservoir No. 1 and Reservoir No. 2, with more significant improvements needed for Reservoir No. 3. The recommended improvements to address existing condition deficiencies include the following:

- Reservoir No. 1: Coating inspection, minor coating repair, chime repair, flexible coupling fittings installation and bollard installation
- Reservoir No. 2: Coating inspection, minor coating repair, chime repair, flexible coupling fittings installation and bollard installation
- Reservoir No. 3: Coating inspection, exterior/interior tank recoating, chime repair, flexible coupling fittings installation and bollard installation
- Hydraulic capacity evaluation of the existing reservoir site overflow drainage system

The recommended storage improvements to address existing demand deficiencies are shown in **Table 10-4**.

Future Conditions

For future demand conditions, the City will have a storage deficit of approximately 416,000 gallons. Since space is limited at the existing reservoir site it is recommended that the City install a permanent standby generator at Well No. 4 (see Section 10.1.1). This would allow the City to meet the future storage deficit during a power outage.

The recommended storage improvements to address future demand deficiencies are shown in **Table 10-7**.

10.1.4 Distribution and Transmission Pipelines

Existing Conditions

The recommended improvements for the water distribution system address pipeline deficiencies for existing demands during MDD plus fire flow conditions. The criteria used for the hydraulic analysis is outlined in Sections 6 and 7. The overall recommended improvements to address existing fire flow deficiencies included the following:

- Increase small dead-end water mains (typically 2-inch and 4-inch) to 8-inch
- Install additional pipe segments to loop distribution system
- New control valve on Lopez fill line at Hillcrest Reservoir No. 1 to allow flow back to Lopez Zone during emergencies (the Lopez Zone can only receive a maximum of 516 gpm from the existing interconnection based on the current delivery agreement with the County)

In addition to the fire flow deficiencies, small areas of the City's water distribution system include existing substandard 2-inch water mains. In some locations the City has installed new and larger water mains that will only require service conversions from the existing 2-inch water mains, while other locations will require installation of new water mains and services. Historically, City replaced these existing 2-inch pipelines and services as City road improvement projects are completed. For the WMP, MKN identified the remaining 2-inch water mains that require replacement and included them in the capital improvement plan.

The recommended water distribution system improvements to address existing demand deficiencies are shown in **Table 10-5**.

Future Conditions

Once the existing water distribution system improvements are completed, no additional water distribution system improvements are required to serve future demands per the analysis completed for this WMP.

10.1.5 Booster Pump Station

Existing Conditions

The existing BPS is located on 16th Street south of Atlantic City Avenue and primarily serves residential customers and the Grover Heights Elementary School. The existing pumps were installed in the 1980's and have not been replaced since the construction of the facility. For existing demands, the BPS was evaluated under the following conditions:

- PHD with largest booster pump out of service (Pump No. 2 offline)
- MDD plus Fire flow (with fire pump only)

The largest fire flow demand in the boosted zone is 4000 gpm (without sprinklers) to serve the GHE. Following review of preliminary hydraulic analysis with City staff, MKN assumed GHE will install sprinkler systems. Under this assumption the required fire flow to the school would be 1500 gpm. Under existing demand conditions the facility is deficient to serve MDD plus fire flow demands. In addition the existing facility will be deficient to serve future peak hour demands. To serve existing/future demands within the boosted zone, pump and electrical improvements will be required. The improvements would be sized to serve future demands and would include three booster pumps (600 gpm each) with VFDs sized to operate two pumps in parallel to serve peak demands and a new fire pump (2300 gpm) to serve MDD plus fire flow with a permanent standby generator sized to operate the new pumps during a power outage.

Future Conditions

After the BPS improvements are completed to address existing demand deficiencies, no additional improvements are required to serve future demands per the analysis completed for this WMP

The recommended booster station improvements are shown in **Table 10-5**.

10.2 Maintenance and Operation Improvements

The following section identifies potential maintenance and operational tasks that the City could implement to extend the useful life of their existing water supply, storage and distribution facilities and more efficiently manage future facilities. Opinions of cost for these options are included in **Table 10-6**.

10.2.1 Asset Management Strategy

It is recommended that the City review options for implementing an Asset Management Strategy. This would include integrating a Computerized Maintenance Management System (CMMS), asset inventory and condition/capacity assessment and Geographic Information Systems (GIS). The City has completed a preliminary asset inventory, capacity assessment and GIS development as part of this Water Master Plan update. Some common asset management software programs that the City may consider reviewing include Cityworks, Cartegraph, Lucity, Accela and Infro/Hanson.

10.2.2 Updating the City Geographic Information System (GIS) and Hydraulic Model

MKN recommends the City update and maintain their GIS water distribution database, atlas and hydraulic model on a semi-annual basis and the updates should include new piping, valves, pumps, hydrant flow data, and replacements. The water distribution GIS can be expanded to include sample stations, air-vacuum and blow-off valves and integration with asset management and automated work-order systems. For most asset management implementations an agency's GIS database is the central repository for asset information. Maintaining the master plan hydraulic model would allow the City to model potential flushing, water quality or major changes in water demand simulations outside the scope of the 2019 Water Master Plan update.

10.2.3 Meter Testing and Replacement Program Development

Improvement to the existing meter testing and replacement program is recommended. Regular meter replacement is recognized as an important revenue protection technique, since old meters frequently record less flow than may be consumed. Meter maintenance could be scheduled and managed as part of an asset management strategy.

The cost opinion included in **Table 10-6** is adequate for a consultant to assist the City with evaluating options and to develop a meter testing and replacement program. Meter replacement would be budgeted and performed annually following the completion of the study.

10.2.4 Valves and Hydrants

MKN recommends that the City adopt a formal flushing and valve exercising program if that program is not currently in place. Valves and hydrants should be exercised yearly to ensure functionality and improve water quality throughout the system. When problems with the operation of these appurtenances are detected, then they should be scheduled for replacement. Valve and hydrant maintenance could be scheduled and managed as part of and asset management strategy (opinion of cost not included in WMP).

10.2.5 Air-Vacuum and Blowoff Valves

These appurtenances are frequently neglected in many water systems, and may ultimately fail to protect the pipelines. Regular inspection on a yearly basis is therefore recommended. Air-Vacuum and Blowoff Valves maintenance could be scheduled and managed as part of and asset management strategy (opinion of cost not included in WMP).

10.3 Capital Improvements Summary

The following provides a summary of typical improvement lifecycle, opinion of probable cost assumptions, and detailed costs for the required water supply, storage, and distribution system improvements.

10.3.1 Typical Lifecycle

Table 10-1 presents a general estimate of the life that can be expected for main water system facilities.

Table 10-1: Replacement Facility Expected Life

Facility	Expected Life
Pipelines	80 years
Pump Stations (except pumps and electrical)	60 years
Electrical and control facilities at pump stations and storage facilities	20 years
Pumps	25 years
Welded steel storage tanks (except coating)	50 years
Tank coatings	12 years

10.3.2 Opinion of Probable Cost

This section provides a cost opinion for capital improvements. Cost opinions are based on the following assumptions:

- Except where other data are available, cost opinions are generally derived from bid prices from similar water utility projects, with adjustments for inflation, size, complexity, and location.
- Construction cost opinions were developed in May 2019. Use 20-Cities Engineering News-Record (ENR) Construction Cost Index (CCI) May 2019 = 11230.01 to escalate estimated cost to present value.
- Engineering, project administration, and construction management were estimated at 30 percent of total construction costs.
- Construction contingency was estimated at 30 percent of total construction costs.
- Cost opinions are “budget-level” and may not fully account for site-specific conditions or design decisions that will affect the actual costs.

The opinions of probable cost prepared by MKN represent our judgment and are supplied for the general guidance of the City. Assumptions have been stated based on the information available at the time of preparation. Since MKN has no control over the cost of labor and material, or over competitive bidding or market conditions, MKN does not guarantee the accuracy of such opinions as compared to contractor bids or actual project costs. **Table 10-2** contains the unit cost for water infrastructure improvements.

Table 10-2: Construction Cost Criteria	
Item Description	**Budgetary Cost($/LF)**
8-inch pipeline	$150
10-inch pipeline	$165
16-inch pipeline	$275
8-inch isolation valve	$2,500
10-inch isolation valve	$3,500
Blowoff Assembly	$4,000
2-inch Service Conversion	$3,500/service
Engineering, Project Administration, and Construction Management	30%
Construction Contingency	30%

Notes:
1. Pipeline costs are based on work in existing streets and include excavation, installation of pipe, backfill, pavement removal and repair, normal appurtenances, and traffic control.
2. Water main improvements on dead-end streets assumed installation of one new isolation valve at point of connection, one new blowoff assembly and pavement repair.
3. Water main upgrades within distribution system assumed installation of two new isolation valves at point of connections and pavement repair.

In addition to the construction cost opinion, each project has been assigned a priority ranking to identify why and when the improvement should be completed. The following describes the priority ranking for capital projects:

- Priority 1: Recommended to replace pieces of equipment that are at the end of their service/design life, major equipment defects/failures, and address fire flow deficiencies.
- Priority 2: Recommended to improve the operation and reliability of existing facilities.
- Priority 3: Recommended to address minor deficiencies within the distribution system such as replacement of water mains that do not meet the City's current design standard and addressing minor deficiencies identified during the condition assessment.

Table 10-3 provides an overall summary of the opinion of probable costs associated with the required water supply, storage, and distribution system improvements to serve existing and future demands within the City.

Table 10-3: WMP Cost Summary	
Improvement	**Estimated Project Cost**
To Address Existing Demand Deficiencies	
Supply	$1,310,000
Storage	$1,309,000
Distribution System (Fire Flow Deficiencies)	$2,748,000
Distribution System (6-inch or Smaller)	$2,620,000
Operations and Maintenance (Allowance)	$200,000
Subtotal Existing	**$8,187,000**
To Address Future Demand Deficiencies	
Supply	$3,822,000
Subtotal Future	**$3,822,000**
Total	**$12,009,000**

Tables 10-4 through **10-7** provide a detailed summary of the individual capital improvement projects and opinions of probable cost (including engineering, project administration, construction management, and construction contingency) for the required water supply, storage, and distribution improvements to serve existing and future demands. Project locations are shown on **Figure 10-1** (existing deficiencies) and **Figure 10-2** (future deficiencies).

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Table 10-4: Capital Improvements for Existing Demands - Water Supply and Storage

Project	Improvement	Limits	Deficiency	Recommended Improvement	Priority	Construction Cost ($)	Engineering, Project Administration, and Construction Management ($)	Contingency Cost ($)	Opinion of Cost ($)
Water Supply									
EX-WSCIP-1	Well Field Capacity Evaluation	Mentone Ave Well Site	Diminished well production capacity based on pumps tests and City information	Well production capacity evaluation to confirm capacity and identify needed well and pump improvements	Priority 1	-	$75,000	-	$75,000
EX-WSCIP-2	Well No. 1 Facility Improvements	Mentone Ave Well Site	Various deficiencies observed during visual condition assessment	Electrical system upgrades; chemical storage and delivery improvements; and miscellaneous site improvements as noted in condition assessment to improve facility reliability and operation	Priority 1	$340,000	$102,000	$102,000	$544,000
EX-WSCIP-3	Well No. 2 Facility Improvements	Mentone Ave Well Site	Various deficiencies observed during visual condition assessment	Address minor corrosion issues on piping and valves, level and anchored pump to pedestal, seal wall pipe penetrations, and miscellaneous piping improvements	Priority 3	$25,000	$8,000	$8,000	$41,000
EX-WSCIP-4	Well No. 3 Facility Improvements	Mentone Ave Well Site	Various deficiencies observed during visual condition assessment	Address minor corrosion issues on piping and valves, level and anchored pump to pedestal, and seal wall pipe penetrations	Priority 3	$10,000	$3,000	$3,000	$16,000
EX-WSCIP-5	Well No. 4 Facility Improvements	Mentone Ave Well Site	Various deficiencies observed during visual condition assessment and hydraulic analysis	New electrical, chemical, and pump buildings/structures; chemical storage and delivery improvements; and miscellaneous site improvements as noted in condition assessment to improve facility reliability and operation	Priority 1	$396,000	$119,000	$119,000	$634,000
								Water Supply Subtotal	**$1,310,000**
Storage									
EX-STCIP-1	Reservoir No. 1 Repairs	Hillcrest Tank Site	Various deficiencies observed during visual condition assessment	Coating inspection, minor coating repair, chime repair, flexible coupling fittings installation and bollard installation	Priority 3	$65,000	$20,000	$20,000	$105,000
EX-STCIP-2	Reservoir No. 2 Repairs	Hillcrest Tank Site	Various deficiencies observed during visual condition assessment	Coating inspection, minor coating repair, chime repair, flexible coupling fittings installation and bollard installation	Priority 3	$60,000	$18,000	$18,000	$96,000
EX-STCIP-3	Reservoir No. 3 Rehabilitation	Hillcrest Tank Site	Various deficiencies observed during visual condition assessment	Coating inspection, exterior/interior tank recoating, chime repair, flexible coupling fittings installation and bollard installation	Priority 1	$680,000	$204,000	$204,000	$1,088,000
EX-STCIP-4	Reservoir Site Overflow Drainage Analysis	Hillcrest Tank Site	Reservoir site located in residential neighborhood. Failure of overflow drainage system could flood adjacent homes	Overflow analysis to determine offsite drainage system capacity	Priority 3	-	$20,000	-	$20,000
								Storage Subtotal	**$1,309,000**
								Total	**$2,619,000**

Notes:
EX-WSCIP = Existing Water Supply Capital Improvement Project
EX-STCIP = Existing Storage Capital Improvement Project
Costs rounded to the nearest $1,000.
Engineering and Administration costs estimated at 30%. Construction contingency estimated at 30%
Construction cost opinions were developed in May 2019. Use 20-Cities ENR CCI May 2019 = 11230.01 to escalate estimated cost to present value.

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Table 10-5: Capital Improvements for Existing Demands - Water Distribution System

Water System Improvements to Address Fire Flow Deficiencies

Project	Improvement	Limits	Recommended Improvement			Priority	Construction Cost ($)	Engineering, Project Administration, and Construction Management ($)	Contingency Cost ($)	Opinion of Cost ($)
			Diameter (inches)	Length (feet)	Facility					
EX-WDCIP-1	N 9th St and Brighton Ave Water Main Upgrade	Boosted Zone	8	514	-	Priority 1	$84,000	$26,000	$26,000	$136,000
EX-WDCIP-2	Sharon Ln Water Main Upgrade	Boosted Zone	8	387	-	Priority 1	$65,000	$20,000	$20,000	$105,000
EX-WDCIP-3	Angello Terrace Water Main Upgrade	Boosted Zone	8	344	-	Priority 1	$59,000	$18,000	$18,000	$95,000
EX-WDCIP-4	Ritchie Ct Water Main Upgrade	Boosted Zone	8	172	-	Priority 1	$33,000	$10,000	$10,000	$53,000
EX-WDCIP-5	N Oak Park Blvd and Brighton Ave Water System Extension	Gravity Zone	8	30	-	Priority 1	$10,000	$3,000	$3,000	$16,000
EX-WDCIP-6	S 4th St south of Highland Way Water Main Upgrade	Gravity Zone	8	732	-	Priority 1	$117,000	$36,000	$36,000	$189,000
EX-WDCIP-7	N 3rd St at Ocean View Ave Water Main Upgrade	Gravity Zone	8	457	-	Priority 1	$76,000	$23,000	$23,000	$122,000
EX-WDCIP-8	Owens Ct at Nacimiento Ave Water Main Upgrade	PRV Zone	8	166	-	Priority 1	$32,000	$10,000	$10,000	$52,000
EX-WDCIP-9	Mono Ct at Nacimiento Ave Water Main Upgrade	PRV Zone	8	121	-	Priority 1	$25,000	$8,000	$8,000	$41,000
EX-WDCIP-10	Lopez Zone Improvements	Lopez Zone	-	-	New control valve and piping modifications on fill line at Hillcrest Reservoir No. 1 to allow flow back to Lopez Zone during emergencies	Priority 1	$70,000	$21,000	$21,000	$112,000
EX-WDCIP-11	El Camino Real Water System Extension	Lopez Zone	10	171	-	Priority 1	$36,000	$11,000	$11,000	$58,000
EX-WDCIP-12	N 10th St Ave and S 10th St at W Grande Ave Water System Extension	Gravity Zone	8	164	-	Priority 1	$30,000	$9,000	$9,000	$48,000
EX-WDCIP-13	1161-1165 Highland Way Water Main Upgrade	Gravity Zone	10	424	-	Priority 1	$78,000	$24,000	$24,000	$126,000
EX-WDCIP-14	E Grande Ave at N 16th St Water System Extension	Gravity Zone	8	62	-	Priority 1	$15,000	$5,000	$5,000	$25,000
EX-WDCIP-15	S Oak Park Blvd at E Grande Ave Water Main Upgrade	Gravity Zone	8	256	-	Priority 1	$44,000	$14,000	$14,000	$72,000
EX-WDCIP-16	Huber St Water System Extension	Gravity Zone	8	440	-	Priority 1	$71,000	$22,000	$22,000	$115,000
EX-WDCIP-17	Griffin St Water System Extension	Gravity Zone	8	440	-	Priority 1	$71,000	$22,000	$22,000	$115,000
EX-WDCIP-18	Barca St Water System Extension	Gravity Zone	8	330	-	Priority 1	$55,000	$17,000	$17,000	$89,000
EX-WDCIP-19	S 14th St at Rockaway Ave Water System Extension	Gravity Zone	8	330	-	Priority 1	$55,000	$17,000	$17,000	$89,000
EX-WDCIP-20	S Oak Park Blvd south of E Grand Ave Water System Extension	Gravity Zone	8	65	-	Priority 1	$15,000	$5,000	$5,000	$25,000
EX-WDCIP-21	16th Street BPS Improvements	Boosted Zone	-	-	Three booster pumps (600 gpm each) with VFDs with two in operation to serve existing/future PHD and a new fire pump (2300 gpm) and a new standby generator	Priority 1	$600,000	$180,000	$180,000	$960,000
EX-WDCIP-22	Grover Beach Elementary Water System Extension	Gravity Zone	8	400	-	Priority 1	$65,000	$20,000	$20,000	$105,000
									Fire Flow Subtotal	$2,748,000

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Water System Improvements to Replace Mains Smaller than 6-inch										
Project	Improvement	Limits	Recommended Improvement			Priority	Construction Cost ($)	Engineering, Project Administration, and Construction Management ($)	Contingency Cost ($)	Opinion of Cost ($)
			Diameter (inches)	Length (feet)	Number of Services					
EX-WDCIP-23	Atlantic City Ave Service Lateral Conversion	Front St to N 2nd St	-	-	24	Priority 3	$84,000	$26,000	$26,000	$136,000
EX-WDCIP-24	Saratoga Ave Service Lateral Conversion	Front St to N 4th St	-	-	40	Priority 3	$140,000	$42,000	$42,000	$224,000
EX-WDCIP-25	Newport St Water Main Upgrade and Service Lateral Conversion	N 5th St to 6th St	8	375	18	Priority 3	$125,000	$38,000	$38,000	$201,000
	Newport St Service Lateral Conversion	N 4th St to and 5th St / N 6th St and 5th St	-	-	20	Priority 3	$70,000	$21,000	$21,000	$112,000
	N 5th St Service Lateral Conversion	Newport Ave and Brighton Ave	-	-	14	Priority 3	$49,000	$15,000	$15,000	$79,000
EX-WDCIP-26	Ramona Ave Water Main Upgrade and Service Lateral Conversion	N 4th St to 6th St	8	300	30	Priority 3	$155,000	$47,000	$47,000	$249,000
EX-WDCIP-27	h St Water Main Upgrade and Service Lateral Conversion	Grand Ave to Ramona Ave	8	400	12	Priority 3	$107,000	$33,000	$33,000	$173,000
	Ramona St Water Main Upgrade and Service Lateral Conversion	N 11th St to 12th St, and N 13th St to 14th St	8	500	40	Priority 3	$220,000	$66,000	$66,000	$352,000
EX-WDCIP-28	Manhattan Ave Water Main Upgrade and Service Lateral Conversion	S 4th St to 9th St / S 12th St to 13th St	8	400	29	Priority 3	$167,000	$51,000	$51,000	$269,000
EX-WDCIP-29	N 10 St and Seabright Ave Service Lateral Conversion	S 10th St to 12th St	-	-	25	Priority 3	$88,000	$27,000	$27,000	$142,000
EX-WDCIP-30	Trouville Ave Water Main Upgrade and Service Lateral Conversion	S 4th St to 9th St / S 12th St to 13th St	8	800	18	Priority 3	$188,000	$57,000	$57,000	$302,000
EX-WDCIP-31	Baden Ave Water Main Upgrade and Service Lateral Conversion	S 11th St to 12th St	8	375	10	Priority 3	$97,000	$30,000	$30,000	$157,000
	Nice Ave, 10th St, Baden Ave Service Lateral Conversion	Nice Ave, 10th St, Baden Ave	-	-	40	Priority 3	$140,000	$42,000	$42,000	$224,000
									Mains Smaller Than 6-inch Subtotal	$2,620,000
									Total	**$5,368,000**

Notes:
EX-WDCIP = Existing Water Distribution Capital Improvement Project
Costs rounded to the nearest $1,000.
Engineering and Administration costs estimated at 30%. Construction contingency estimated at 30%
Construction cost opinions were developed in May 2019. Use 20-Cities ENR CCI May 2019 = 11230.01 to escalate estimated cost to present value.

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City of Pismo Beach

City of Arroyo Grande

Oceano

Pacific Ocean

EX-WDCIP-7
EX-WDCIP-8 & 9
EX-WDCIP-2, 3, & 4
EX-WDCIP-11
EX-WDCIP-23
EX-WDCIP-24
EX-WDCIP-25
EX-WDCIP-1
EX-WDCIP-27
EX-WDCIP-26
EX-WDCIP-12
EX-WDCIP-14
EX-WDCIP-15
EX-WDCIP-28
EX-WDCIP-22
EX-WDCIP-20
EX-WDCIP-19
EX-WDCIP-30
EX-WDCIP-29
EX-WDCIP-31
EX-WDCIP-16, 17, & 18
EX-WDCIP-6
EX-WDCIP-13
EX-WDCIP-21
EX-WDCIP-5
EX-STCIP-1, 2, 3, & 4
EX-WDCIP-10
EX-WSCIP-1, 2, 3, 4, & 5

12th Street PRV
16th Street BPS
Lopez Turnout
Hillcrest Tanks
Well #1
Well #2
Well #3
Well #4
City of Arroyo Grande Intertie
Oceano CSD Intertie

EL CAMINO REAL
HWY 101
N 4TH ST
N 5TH ST
N 6TH ST
NACIMIENTO AVE
MARGARITA AVE
OCEAN VIEW AVE
PARK VIEW AVE
RITCHIE RD
CHARLES ST
FRONT ST
SHERIDAN RD
N 1ST ST
N 2ND ST
N 3RD ST
N 4TH ST
ATLANTIC CITY AVE
N 5TH ST
N 6TH ST
N 7TH ST
N 8TH ST
SARATOGA AVE
NEWPORT AVE
N 11TH ST
N 12TH ST
N 13TH ST
N 14TH ST
N 16TH ST
BECKETT RD
LE SAGE DR
BRIGHTON AVE
RAMONA AVE
W GRAND AVE
E GRAND AVE
N 9TH ST
N 10TH ST
S OAK PARK BLVD
S 3RD ST
S 5TH ST
ROCKAWAY AVE
S 8TH ST
S 9TH ST
S 11TH ST
LONGBRANCH AVE
MANHATTAN AVE
SEABRIGHT AVE
TROUVILLE AVE
S 12TH ST
S 13TH ST
S 14TH ST
S 16TH ST
MENTONE AVE
NICE AVE
BADEN AVE
FARROLL RD
LEONI DR
BARKA ST
HUBER ST
GRIFFIN ST
HUSTON ST
LA SELVA AVE
HIGHLAND WAY
ANITA AVE
JANET AVE
THE PIKE
HWY 1

Legend

- PS — BPS Improvements (EX-WDCIP-21)
- Production Well Improvements (EX-WSCIP-1 to 5)
- Storage Tank Improvements (EX-STCIP-1 to 4 & EX-WDCIP-10)
- Water System Improvements to Address Fire Flow Deficiencies (EX-WDCIP-1 to 22)
- Water System Improvements to Replace Mains Smaller than 6-inch (EX-WDCIP-23 to 31)

Notes:

EX-WSCIP = Existing Water Supply Capital Improvement Project
EX-STCIP = Existing Storage Capital Improvement Project
EX-WDCIP = Existing Water Distribution Capital Improvement Project

1 inch = 1,100 feet

0 550 1,100

City of Grover Beach

Water Master Plan

Figure 10-1:

CIP for Existing Demand Deficiencies

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Table 10-6: Operation and Maintenance Improvements			
Project	**Improvement**	**Description**	**Opinion of Cost ($)**
OM-1	Asset Management Strategy Allowance	Initial selection and purchase of asset management software, implementation, training, and first five years of data hosting by selected software vendor.	$100,000
OM-2	Updating the City Geographic Information System (GIS) and Hydraulic Model Allowance	Complete annual updates of existing water GIS and hydraulic model. Assumes five years of support ($10,000 per year allowance)	$50,000
OM-3	Meter Testing and Replacement Program Allowance	Develop analysis and recommendations for meter testing, replacement and integration with asset management implementation.	$50,000
		Total	**$200,000**

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Table 10-7: Capital Improvements for Future Demands

Project	Improvement	Limits	Deficiency	Recommended Improvement	Priority	Construction Cost ($)	Engineering, Project Administration, and Construction Management ($)	Contingency Cost ($)	Opinion of Cost ($)
F-WSCIP-1	Well No. 2 Facility Improvements	Mentone Ave Well Site	Well is currently on standby status and existing electrical system is inadequate to provide reliable operation to serve future demands	Upgrade existing electrical system to improve facility reliability and operation to serve future demands	Priority 2	$100,000	$30,000	$30,000	$160,000
F-WSCIP-2	Well No. 3 Facility Improvements	Mentone Ave Well Site	Well is currently on standby status and existing electrical system is inadequate to provide reliable operation to serve future demands	Upgrade existing electrical system, pump, and motor to improve facility reliability and operation to serve future demands	Priority 2	$225,000	$68,000	$68,000	$361,000
F-WSCIP-3	Nitrate Treatment Facility Startup	Mentone Ave Well Site	Currently offline	Replace resin media, disinfect and perform minor repairs to return to manual operation to treat groundwater during emergency conditions	Not recommended if blending with Lopez is available	$600,000	$180,000	$180,000	$960,000
F-WSCIP-4	Well No. 4 Permanent Standby Generator	Mentone Ave Well Site	Insufficient physical storage to serve future operational, emergency, and fire flow demands	Install permanent standby generator to supplement physical storage deficiency	Priority 2	$150,000	$45,000	$45,000	$240,000
F-WSCIP-5	Well Field Piping and Transmission Main Improvements	Mentone Ave Well Site to Hillcrest Tank Site	Insufficient pipeline capacity to convey full well production to tank site	Install 4500 feet of 16-inch water main and well site piping improvements to convey full well production capacity to tanks (3550 gpm)	Priority 2	$1,313,000	$394,000	$394,000	$2,101,000
								Total	**$3,822,000**

Notes:
F-WSCIP = Future Water Supply Capital Improvement Project
Costs rounded to the nearest $1,000.
Engineering and Administration costs estimated at 30%. Construction contingency estimated at 30%
Construction cost opinions were developed in May 2019. Use 20-Cities ENR CCI May 2019 = 11230.01 to escalate estimated cost to present value.

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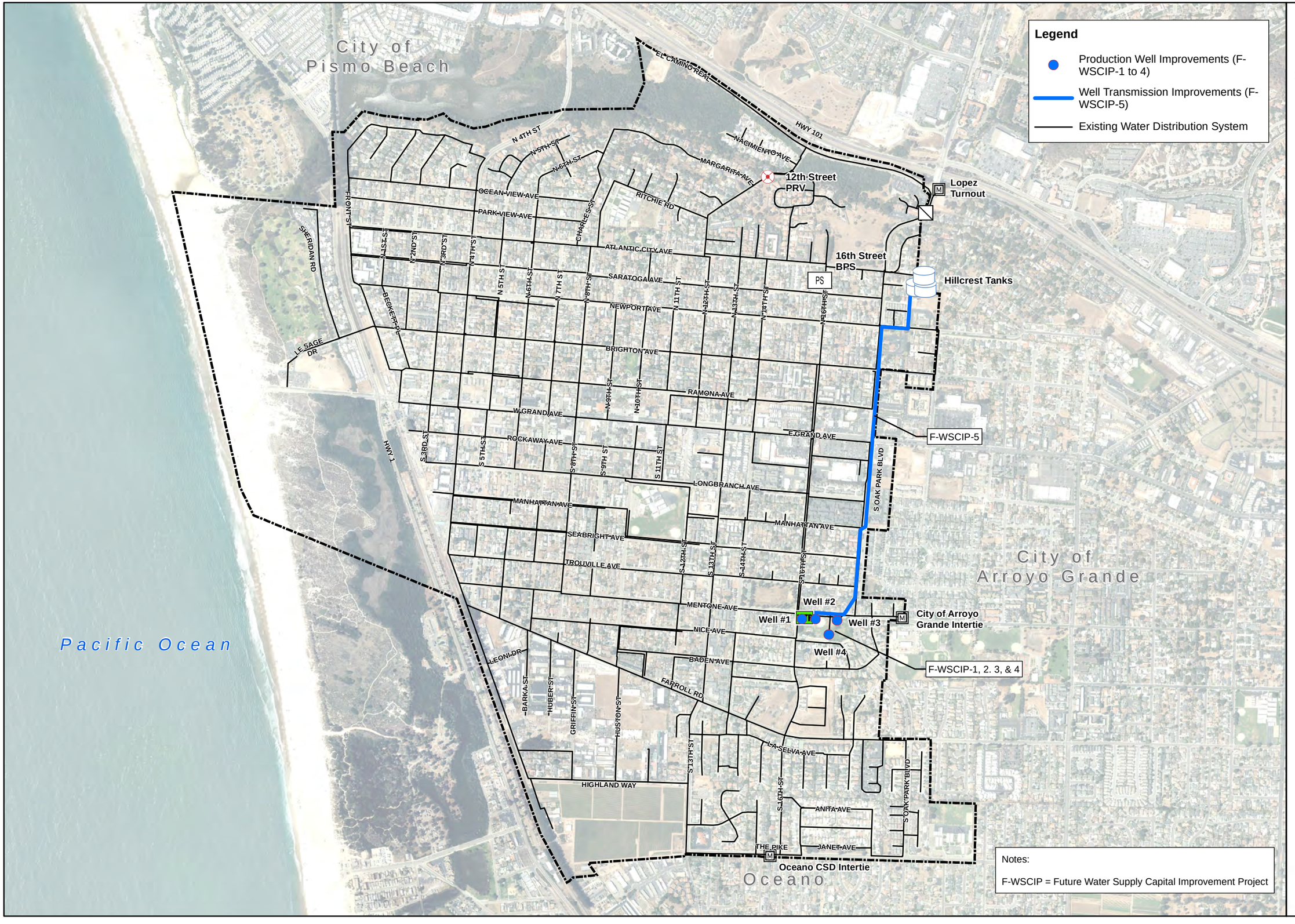

City of Grover Beach

Water Master Plan

Figure 10-2:

CIP for Future Demand Deficiencies