



TECHNICAL MEMORANDUM

DATE: December 12, 2017 Project No.: 425-10-16-04.006
SENT VIA: EMAIL
TO: City of Stockton, Municipal Utilities Department
FROM: Patrick Johnston, PE, RCE #59028
REVIEWED BY: Doug Moore, PE, RCE #58122
SUBJECT: Stockton General Plan Update—Potable Water Master Plans Supplement

This Technical Memorandum (TM) presents the Supplement for the Stockton General Plan Update (GPU) to the City of Stockton's Water Master Plan (2008) and California Water Service Company's (Cal Water) Water Master Plan (2009). Where appropriate, information related to the Service Area of the Cal Water is also included in this TM. This TM includes the following Sections:

- Summary
 - Demand Projection Summary by Development Area
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- Demand Projection Estimates by Development Area
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 - City of Stockton Municipal Utilities District (COSMUD) Infrastructure Evaluation
 - Water Storage Capacity
 - Pumping Facility Capacity
 - Distribution Pipeline Capacity

- Cal Water Infrastructure Evaluation
 - Water Storage Capacity
 - Pumping Facility Capacity
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- Cost Evaluations by Service Area
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The analyses and conclusions presented in this TM are based on generalized land use data and preliminary engineering evaluations. All these evaluations should be refined and updated through detailed evaluations of each specific development project.

SUMMARY

A summary of this TM is presented below. The development of the summary data is presented in the following sections of this TM. The 2040 land uses are shown on Figure 1 as well as the COSMUD Service Areas and the Cal Water Service Area, and the General Plan Update buildout land use map is provided in Attachment A.

Demand Projection Summary by Development Area

The estimated Average Day Demands, Maximum Day Demands and Peak Hour Demands are summarized in Table 1 and discussed below:

- The total Average Day Demands are estimated to increase from about 48.6 million gallons per day (mgd) for existing land uses to 66.3 mgd for the 2040 land uses.
- The total Maximum Day Demands are estimated to increase from about 85.0 mgd for existing land uses to 115.4 mgd for the 2040 land uses.
- The total Peak Hour Demands are estimated to increase from about 137.3 mgd for existing land uses to 196.1 mgd for the 2040 land uses.

Demand Projection Summary by Service Area

Demands within the City are distributed between the service areas for COSMUD and Cal Water as described below:

- For the existing land uses, the COSMUD service area contains 52 percent of the demands, while the Cal Water service area contains 48 percent of the demands.
- The ratio is different with the 2040 land uses, with the COSMUD service area containing 61 percent of the demands and the Cal Water service area containing 39 percent of the demands.

Table 1. Summary of Water Demand Estimates

<i>Land Use</i>	<i>Demand (mgd)</i>		
	<i>Existing</i>	<i>Net New</i>	<i>2040</i>
Average Day Demand			
Study Areas	2.09	2.42	4.51
Approved/Pending Development Projects Within City Limit	2.05	5.15	7.20
Approved/Pending Development Projects Outside City Limit but Within Sphere of Influence	0.34	7.27	7.61
Remaining City Outside of Study Areas and Outside of Approved/Pending Projects(e)	44.16	2.84	46.99
Total	48.63	17.68	66.32
Maximum Day Demand			
Study Areas	3.68	4.27	7.95
Approved/Pending Development Projects Within City Limit	3.49	8.78	12.27
Approved/Pending Development Projects Outside City Limit but Within Sphere of Influence	0.57	12.36	12.94
Remaining City Outside of Study Areas and Outside of Approved/Pending Projects	77.27	4.96	82.23
Total	85.01	30.37	115.38
Peak Hour Demand			
Study Areas	5.95	6.99	12.94
Approved/Pending Development Projects Within City Limit	7.16	17.87	25.03
Approved/Pending Development Projects Outside City Limit but Within Sphere of Influence	1.18	25.45	26.63
Remaining City Outside of Study Areas and Outside of Approved/Pending Projects	123.01	8.51	131.53
Total	137.30	58.83	196.13

Required New Infrastructure Evaluations Summary

Preliminary infrastructure evaluations were performed for water storage facilities, booster pumping facilities, and the pipeline facilities for the COSMUD and Cal Water Service Areas. These infrastructure evaluations were developed by:

- Estimating the water demands for the GPU 2040 level of development within the COSMUD and Cal Water Service Areas. The 2040 level of development is significantly less than full buildout of the land uses in the GPU.
- Comparing the 2040 estimated water demands with the demands in the COSMUD and Cal Water WMPs. The COSMUD and Cal Water WMPs were based on full buildout the 2035 General Plan.
- The required infrastructure needed for the 2040 level of development was estimated by comparison with the infrastructure identified in the WMPs, but revised based on the changes in water demands.

For COSMUD:

- The 2035 buildout average day demands from the COSMUD WMP were 98.2 mgd. The 2040 average day demands from this study are 39.9 mgd, representing a decrease of approximately 60 percent.
- The required new storage is 24.9 mg for the 2040 GPU development. For comparison, the required new storage from the WMP for buildout of the 2035 General Plan is 142.9 mg.
- Potentially, no new booster pumping capacity is needed for the 2040 GPU development, depending on the existing booster pumps ability (depending on location) to serve the new development. For comparison, the required new pumping capacity from the WMP for buildout of the 2035 General Plan is 150,087 gpm.
- Water distribution piping will be needed for many of the new growth areas. However, in comparison to the buildout of the 2035 General Plan, significant reductions of the water distribution piping should occur for some study areas.

For Cal Water:

- The 2035 buildout average day demands from the Cal Water WMP were 35.1 mgd. The 2040 average day demands from this study are 26.4 mgd, representing a decrease of approximately 25 percent.
- The required new storage is 0.5 mg for the 2040 GPU development. For comparison, the required new storage from the WMP for buildout of the 2035 General Plan is 13.5 mg.
- The required new booster pumping capacity needed for the 2040 GPU development is 3,057 gpm. For comparison, the required new pumping capacity from the WMP for buildout of the 2035 General Plan is 13,925 gpm.
- The existing water distribution piping, along with recent and ongoing system improvements should be adequate for the GPU 2040 development.

Cost Evaluations Summary

Preliminary infrastructure cost estimates for water storage facilities and booster pumping facilities were developed for the COSMUD and Cal Water Service Areas.

For COSMUD:

- The 2040 GPU required new water storage is 24.9 mg, which has an estimated cost of \$37.9 million. For comparison, from the WMP (for buildout of the 2035 General Plan), the required new storage was estimated to be 109.2 mg, which has an estimated cost of \$166.4 million.
- No new booster pumping capacity was needed for the 2040 GPU land uses (if the locations of the existing booster pumps will result in adequate service to the new development). For comparison, from the WMP (for buildout of the 2035 General Plan), the required new booster pumping was estimated to be 150,087 gpm, which has an estimated cost of \$65.5 million.

Cal Water:

- The 2040 GPU required new water storage is 0.5 mg, which has an estimated cost of \$0.8 million. For comparison, from the WMP (for buildout of the 2035 General Plan), the required new storage was estimated to be 13.5 mg, which has an estimated cost of \$21.5 million.
- The 2040 GPU required new booster pumping capacity of 3,057 gpm, which has an estimated cost of \$2.2 million. For comparison, from the WMP (for buildout of the 2035 General Plan), the required new booster pumping was estimated to be 13,925 gpm, which has an estimated cost of \$9.8 million.

DEMAND PROJECTION ESTIMATES BY DEVELOPMENT AREA

GPU Land Uses by Development Area

The land use data for this evaluation was provided by Placeworks, and is provided in Attachment A (including the buildout land use map, the dwelling unit data, acreage data, and 2040 percent development data). The land use data has been reorganized in Table 2 to be suitable for water demand estimating. The reorganized land use data includes existing land use data, net new land use data for 2040, and 2040 land use data. For single family and multi-family residential land uses, Table 2 includes both the dwelling unit data and the acreage data. For commercial and industrial land uses, Table 2 includes only acreage data. All the water demands were based on gross areas shown in Table 2.

Table 2. Land Use Data

Study Area or Development Name	Single Family (Dwelling Units)			Single Family (Gross Acres)			Multi Family (Dwelling Units)			Multi Family (Gross Acres)			Commercial (Gross Acres)			Industrial (Gross Acres)			Total Area (Gross Acres)		
	Existing	Net New	2040	Existing	Net New	2040	Existing	Net New	2040	Existing	Net New	2040	Existing	Net New	2040	Existing	Net New	2040	Existing	Net New	2040
Study Areas																					
Study Area 1 - Eight Mile Rd Area	121	1,379	1,500	17.2	232.1	249.3	96	1,198	1,294	8.4	73.2	81.6	17.9	0.6	18.5	4.0	0.0	4.0	47.5	305.9	353.4
Study Area 2 - Pacific Ave Corridor	22	0	22	4.3	0.0	4.3	114	110	224	3.5	4.7	8.2	115.8	3.6	119.4	0.1	0.0	0.1	123.7	8.3	132.1
Study Area 3 - West Ln and Alpine Rd Area	208	77	285	38.7	51.6	90.2	94	680	774	5.8	29.9	35.7	68.4	6.2	74.6	54.5	0.0	54.5	167.4	87.7	255.1
Study Area 4 - Port/Waterfront	54	17	71	8.0	11.2	19.2	288	1,770	2,058	8.6	26.7	35.3	10.3	2.9	13.2	44.3	5.6	49.9	71.1	46.5	117.6
Study Area 5 - El Dorado/Center Corridors	45	0	45	5.5	0.0	5.5	359	1,196	1,555	8.3	17.2	25.5	8.1	1.8	9.9	9.9	0.0	9.9	31.8	19.0	50.8
Study Area 6 - Miner/Weber Corridors ^(a)	47	0	47	4.4	0.0	4.4	219	1,248	1,467	4.8	18.0	22.8	6.5	3.4	9.9	7.2	0.0	7.2	22.9	21.3	44.3
Study Area 7 - Wilson Way Corridor	12	0	12	1.6	0.0	1.6	6	234	240	0.2	6.8	7.1	2.1	5.1	7.2	14.9	0.0	14.9	18.9	12.0	30.9
Study Area 8 - I-5/Highway 4 Interchange	8	0	8	1.0	0.0	1.0	1	659	660	0.1	38.0	38.1	0.9	0.9	1.8	13.2	0.0	13.2	15.2	38.9	54.1
Study Area 9 - Railroad Corridor at California St	19	0	19	2.3	0.0	2.3	23	1,340	1,363	1.3	19.3	20.6	4.8	1.5	6.3	7.0	0.0	7.0	15.4	20.7	36.2
Study Area 10 - I-5 and Charter Way Area	228	86	314	42.8	57.9	100.7	29	98	127	4.1	4.2	8.3	26.3	2.6	28.9	4.6	2.7	7.3	77.8	67.4	145.2
Study Area 11 - Charter Way/MLK Jr Blvd Corridor	5	0	5	0.3	0.0	0.3	0	396	396	0.0	7.7	7.7	2.9	0.4	3.3	0.0	0.0	0.0	3.2	8.2	11.3
Study Area 12 - Airport Way Corridor	53	0	53	7.2	0.0	7.2	4	108	112	0.4	4.7	5.1	6.8	10.2	17.0	89.5	13.1	102.6	103.9	28.0	131.9
Study Area 13 - Mariposa and Charter Area	12	0	12	3.9	0.0	3.9	77	0	77	5.9	0.0	5.9	5.6	1.5	7.2	0.0	0.0	0.0	15.5	1.5	17.0
Study Area 14 - East Weston Ranch ^(b)	1	0	1	1.1	0.0	1.1	0	0	0	0.0	0.0	0.0	4.9	14.8	19.8	0.0	0.0	0.0	6.1	14.8	20.9
Study Area 15 - South of French Camp Rd	89	0	89	75.7	0.0	75.7	9	0	9	6.1	0.0	6.1	0.0	0.0	0.0	0.1	0.0	0.1	81.8	0.0	81.8
Study Area 16 - E French Camp Rd Area	59	0	59	122.7	0.0	122.7	4	0	4	9.1	0.0	9.1	0.1	0.0	0.1	0.2	0.0	0.2	132.2	0.0	132.2
Subtotal (Study Areas)	983	1,558	2,541	336.9	352.8	689.7	1,323	9,036	10,359	66.8	250.5	317.3	281.5	55.6	337.1	249.5	21.4	270.8	934.6	680.2	1,614.8
Approved/Pending Development Projects Within City Limit																					
Westlake Villages	0	2,630	2,630	0.0	680.0	680.0	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	680.0	680.0
Delta Cove	0	1,164	1,164	0.0	132.7	132.7	0	381	381	0.0	47.6	47.6	0.0	2.6	2.6	0.0	0.0	0.0	0.0	182.9	182.9
North Stockton Projects III	235	2,220	2,455	38.0	355.0	393.0	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	38.0	355.0	393.0
Cannery Park	0	981	981	0.0	272.0	272.0	0	210	210	0.0	16.0	16.0	0.0	104.0	104.0	0.0	0.0	0.0	0.0	392.0	392.0
Nor Cal Logistics Center	0	0	0	0.0	0.0	0.0	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Crystal Bay	0	951	951	0.0	19.4	19.4	0	392	392	0.0	78.7	78.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	98.1	98.1
Sanctuary	0	5,452	5,452	0.0	1,026.0	1,026.0	0	1,618	1,618	0.0	67.4	67.4	0.0	35.5	35.5	0.0	0.0	0.0	0.0	1,128.9	1,128.9
Tidewater Crossing	310	-310	0	869.6	-869.6	0.0	0	0	0	0.0	0.0	0.0	0.0	16.0	16.0	0.0	0.0	0.0	869.6	-853.6	16.0
Open Window ^(c)	0	0	0	0.0	0.0	0.0	9	1,391	1,400	0.0	11.9	11.9	12.9	-1.0	11.9	0.0	0.0	0.0	12.9	10.9	23.8
Weston Ranch Town Center	0	0	0	0.0	0.0	0.0	0	0	0	0.0	0.0	0.0	0.0	41.5	41.5	0.0	0.0	0.0	0.0	41.5	41.5
Subtotal (Approved/Pending Projects Within City Limit)	545	13,088	13,633	907.6	1,615.5	2,523.1	9	3,992	4,001	0.0	221.6	221.6	12.9	198.6	211.5	0.0	0.0	0.0	920.5	2,035.7	2,956.2
Approved/Pending Development Projects Outside City Limit but Within Sphere of Influence																					
Mariposa Lakes	5	8,955	8,960	151.0	939.3	1,090.3	3	1,553	1,556	0.0	585.0	585.0	0.0	150.0	150.0	0.0	0.0	0.0	151.0	1,674.3	1,825.3
Airpark 599	0	0	0	0.0	0.0	0.0	0	0	0	0.0	0.0	0.0	0.0	128.0	128.0	0.0	0.0	0.0	0.0	128.0	128.0
Tra Vigne ^(d)	0	1,244	1,244	0.0	846.4	846.4	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	846.4	846.4
Subtotal (Approved/Pending Projects Outside City Limit but Within Sphere of Influence)	5	10,199	10,204	151.0	1,785.7	1,936.7	3	1,553	1,556	0.0	585.0	585.0	0.0	278.0	278.0	0.0	0.0	0.0	151.0	2,648.7	2,799.7
Remaining City Outside of Study Areas and Outside of Approved/Pending Projects ^(e)	76,463	1,501	77,964	13,870.5	1,270.5	15,141.0	33,183	0	33,183	1,915.9	0.0	1,915.9	546.6	0.0	546.6	1,783.8	0.0	1,783.8	18,116.8	1,270.5	19,387.3
Grand Total	77,996	26,346	104,342	15,266.0	5,024.6	20,290.5	34,518	14,581	49,099	1,982.7	1,057.1	3,039.8	841.0	532.1	1,373.1	2,033.2	21.4	2,054.6	20,122.9	6,635.1	26,758.0

Water Demand Factors

The 2008 COSMUD WMP and the 2009 Cal Water WMP provided water demand factors for both existing land uses (Figures 3-8 through 3-16 of the COSMUD WMP and Figures 3-10 through 3-22 of the Cal Water WMP) and for future land uses (Table 3-8 of the COSMUD WMP and Table 3-11 of the Cal Water WMP) for use in estimating demands in the water distribution system. Demand factors used for estimating water distribution system demands are intentionally conservative, meaning they are higher than the corresponding actual demands may be, to allow for a range of different demands within a land use category. For example, actual commercial demands would be very low for rental storage units to very high for restaurants. To allow for this range of actual possible demands, conservative (high) demand factors are used for estimating water demands, resulting in pipeline sizes that can accommodate either low or high actual demands.

The gross area demand factors used in this GPU water demand estimate are summarized in Table 3, which includes factors for single family residential, multi-family (including a higher factor for downtown multi-family) residential, commercial, and industrial land uses.

Average Day Demands by Development Area

The Average Day Demand estimates are calculated in Table 4. Average Day demands are the estimate of the water used by the residents and businesses in the water system service area. The Average Day Demands are calculated by multiplying the appropriate land use data by the appropriate demand factor. The following Average Day Demands are calculated for existing, net new, and 2040 land use conditions:

- Average Day Demand from exiting land uses: 48.6 mgd
- Average Day Demand from net new land uses: 17.7 mgd
- Average Day Demand from 2040 land uses: 66.3 mgd

Maximum Day Demands by Development Area

The Maximum Day demand estimates are calculated in Table 5. Maximum Day demands are the estimate of the water used by the residents and businesses in the water system service area on the day of the year when the demands are the highest. The Maximum Day demands are calculated by multiplying the Average Day Demands by the appropriate maximum day peaking factor (see Table 3). The Maximum Day peaking factor for the COSMUD service area is 1.7. The Maximum Day peaking factor for the Cal Water service area is 1.8. The following Maximum Day demands are calculated for existing, net new, and 2040 demands:

- Maximum Day demand from exiting land uses: 85.0 mgd
- Maximum Day demand from net new land uses: 30.4 mgd
- Maximum Day demand from 2040 land uses: 115.3 mgd

Table 3. Water Demand Factors and Peaking Factors

Land Use Category	Units	Factor
City of Stockton and Cal Water Demand Factors		
Single Family Residential	gpd/ gross acre	2,232
Multi-Family Residential	gpd/ gross acre	4,642
Multi-Family Residential (Downtown)	gpd/ gross acre	13,927
Commercial	gpd/ gross acre	2,053
Industrial	gpd/ gross acre	1,785
City of Stockton Peaking Factors		
Maximum Day Peaking Factor (Maximum Day to Average Day)		1.7
Peak Hour Peaking Factor (Peak Hour to Average Day)		3.5
Cal Water Peaking Factors		
Maximum Day Peaking Factor (Maximum Day to Average Day)		1.8
Peak Hour Peaking Factor (Peak Hour to Average Day)		2.5

Table 4. Average Day Demand

Study Area Name	Water District	Percent Cal Water	Percent City	Single Family, gpd			Multi Family, gpd			Commercial, gpd			Industrial, gpd			Total, gpd		
				Existing	Net New	2040	Existing	Net New	2040	Existing	Net New	2040	Existing	Net New	2040	Existing	Net New	2040
Study Areas																		
Study Area 1 - Eight Mile Rd Area	No District	0%	100%	38,425	517,995	556,420	39,109	339,673	378,782	36,693	1,238	37,931	7,200	0	7,200	121,427	858,907	980,333
Study Area 2 - Pacific Ave Corridor	California Water	95%	5%	9,689	0	9,689	16,141	21,943	38,084	237,866	7,382	245,248	135	0	135	263,831	29,325	293,157
Study Area 3 - West Ln and Alpine Rd Area	California Water	90%	10%	86,297	115,113	201,409	27,109	138,818	165,926	140,544	12,704	153,248	97,252	0	97,252	351,201	266,634	617,835
Study Area 4 - Port/Waterfront	California Water	100%	0%	17,756	25,082	42,838	39,899	310,294	350,193	21,051	6,040	27,091	79,152	9,920	89,073	157,858	351,336	509,195
Study Area 5 - El Dorado/Center Corridors	California Water	100%	0%	12,357	0	12,357	38,412	132,726	171,138	16,645	3,706	20,351	17,646	0	17,646	85,060	136,432	221,492
Study Area 6 - Miner/Weber Corridors	California Water	100%	0%	9,805	0	9,805	22,438	166,973	189,411	13,401	6,896	20,297	12,795	0	12,795	58,439	173,869	232,308
Study Area 7 - Wilson Way Corridor	California Water	100%	0%	3,679	0	3,679	1,151	31,767	32,918	4,318	10,522	14,840	26,666	0	26,666	35,814	42,289	78,103
Study Area 8 - I-5/Highway 4 Interchange	California Water	100%	0%	2,301	0	2,301	635	176,391	177,027	1,832	1,832	3,664	23,521	0	23,521	28,289	178,224	206,513
Study Area 9 - Railroad Corridor at California St	California Water	100%	0%	5,132	0	5,132	6,207	89,381	95,588	9,816	3,062	12,878	12,478	0	12,478	33,633	92,443	126,076
Study Area 10 - I-5 and Charter Way Area	California Water	100%	0%	95,618	129,215	224,834	18,890	19,551	38,441	54,035	5,258	59,293	8,216	4,859	13,075	176,759	158,883	335,642
Study Area 11 - Charter Way/MLK Jr Blvd Corridor	California Water	100%	0%	630	0	630	0	35,911	35,911	5,930	894	6,824	0	0	0	6,560	36,805	43,365
Study Area 12 - Airport Way Corridor	California Water	80%	20%	16,017	0	16,017	1,634	21,837	23,471	13,974	20,902	34,875	159,884	23,376	183,261	191,510	66,115	257,625
Study Area 13 - Mariposa and Charter Area	California Water	100%	0%	8,800	0	8,800	27,566	0	27,566	11,521	3,180	14,701	0	0	0	47,887	3,180	51,067
Study Area 14 - East Weston Ranch	City of Stockton	0%	100%	2,534	0	2,534	0	0	0	10,151	30,452	40,602	0	0	0	12,685	30,452	43,137
Study Area 15 - South of French Camp Rd	No District	0%	100%	168,856	0	168,856	28,345	0	28,345	0	0	0	116	0	116	197,317	0	197,317
Study Area 16 - E French Camp Rd Area	No District	0%	100%	273,929	0	273,929	42,440	0	42,440	240	0	240	335	0	335	316,944	0	316,944
Subtotal (Study Areas)				751,827	787,406	1,539,233	309,975	1,485,266	1,795,240	578,016	114,067	692,083	445,397	38,156	483,553	2,085,215	2,424,894	4,510,109
Approved/Pending Development Projects Within City Limit																		
Westlake Villages	City of Stockton	0%	100%	0	1,517,661	1,517,661	0	0	0	0	0	0	0	0	0	0	1,517,661	1,517,661
Delta Cove	City of Stockton	0%	100%	0	296,234	296,234	0	220,925	220,925	0	5,298	5,298	0	0	0	0	522,457	522,457
North Stockton Projects III	City of Stockton	0%	100%	84,810	792,309	877,119	0	0	0	0	0	0	0	0	0	84,810	792,309	877,119
Cannery Park	City of Stockton	0%	100%	0	607,065	607,065	0	74,276	74,276	0	213,544	213,544	0	0	0	0	894,885	894,885
Nor Cal Logistics Center	City of Stockton	0%	100%	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Crystal Bay	City of Stockton	0%	100%	0	43,298	43,298	0	365,346	365,346	0	0	0	0	0	0	0	408,644	408,644
Sanctuary	City of Stockton	0%	100%	0	2,289,883	2,289,883	0	312,888	312,888	0	72,954	72,954	0	0	0	0	2,675,725	2,675,725
Tidewater Crossing	City of Stockton	0%	100%	1,940,866	-1,940,866	0	0	0	0	0	32,853	32,853	0	0	0	1,940,866	-1,908,013	32,853
Open Window	California Water	100%	0%	0	0	0	0	165,749	165,749	26,491	-2,053	24,437	0	0	0	26,491	163,696	190,186
Weston Ranch Town Center	City of Stockton	0%	100%	0	0	0	0	0	0	0	85,111	85,111	0	0	0	85,111	85,111	85,111
Subtotal (Approved/Pending Development Projects Within City Limit)				2,025,676	3,605,584	5,631,260	0	1,139,184	1,139,184	26,491	407,706	434,197	0	0	0	2,052,167	5,152,474	7,204,641
Approved/Pending Development Projects Outside City Limit but Within Sphere of Influence																		
Mariposa Lakes	No District	0%	100%	337,010	2,096,381	2,433,392	0	2,715,721	2,715,721	0	307,996	307,996	0	0	0	337,010	5,120,099	5,457,109
Airpark 599	No District	0%	100%	0	0	0	0	0	0	0	262,823	262,823	0	0	0	0	262,823	262,823
Tra Vigne	No District	0%	100%	0	1,889,150	1,889,150	0	0	0	0	0	0	0	0	0	0	1,889,150	1,889,150
Subtotal (Approved/Pending Development Projects Outside City Limit but Within Sphere of Influence)				337,010	3,985,531	4,322,541	0	2,715,721	2,715,721	0	570,819	570,819	0	0	0	337,010	7,272,071	7,609,082
Remaining City Outside of Study Areas and Outside of Approved/Pending Projects		50%	50%	30,956,888	2,835,553	33,792,441	8,894,162	0	8,894,162	1,122,394	0	1,122,394	3,184,912	0	3,184,912	44,158,357	2,835,553	46,993,910
Grand Total				34,071,402	11,214,074	45,285,476	9,204,137	5,340,171	14,544,308	1,726,900	1,092,592	2,819,492	3,630,310	38,156	3,668,466	48,632,749	17,684,993	66,317,741
Total Cal Water				15,663,904	1,669,236	17,333,140	4,623,119	1,291,995	5,915,114	1,087,328	74,504	1,161,832	1,981,260	33,481	2,014,741	23,355,611	3,069,215	26,424,826
Total City of Stockton				18,407,498	9,544,838	27,952,336	4,581,018	4,048,176	8,629,194	639,572	1,018,088	1,657,660	1,649,050	4,675	1,653,725	25,277,138	14,615,778	39,892,916

Note: The water demands, analyses, and conclusions presented in this TM are based on generalized land use data and preliminary engineering evaluations. All these evaluations should be refined and updated through detailed evaluations of each specific development project.

Table 5. Maximum Day Demand

Study Area Name	Water District	Percent Cal Water	Percent City	Maximum Day Factor	Single Family, gpd			Multi Family, gpd			Commercial, gpd			Industrial, gpd			Total, gpd		
					Existing	Net New	2040	Existing	Net New	2040	Existing	Net New	2040	Existing	Net New	2040	Existing	Net New	2040
Study Areas																			
Study Area 1 - Eight Mile Rd Area	No District	0%	100%	1.70	65,322	880,592	945,914	66,485	577,444	643,929	62,378	2,105	64,483	12,241	0	12,241	206,425	1,460,142	1,666,567
Study Area 2 - Pacific Ave Corridor	California Water	95%	5%	1.80	17,393	0	17,393	28,973	39,388	68,361	426,969	13,250	440,219	243	0	243	473,577	52,639	526,216
Study Area 3 - West Ln and Alpine Rd Area	California Water	90%	10%	1.79	154,471	206,051	360,522	48,524	248,484	297,008	251,574	22,739	274,314	174,081	0	174,081	628,650	477,274	1,105,925
Study Area 4 - Port/Waterfront	California Water	100%	0%	1.80	31,961	45,148	77,109	71,818	558,529	630,347	37,891	10,872	48,763	142,474	17,857	160,331	284,144	632,406	916,550
Study Area 5 - El Dorado/Center Corridors	California Water	100%	0%	1.80	22,243	0	22,243	69,141	238,907	308,048	29,961	6,670	36,631	31,762	0	31,762	153,108	245,577	398,685
Study Area 6 - Miner/Weber Corridors	California Water	100%	0%	1.80	17,648	0	17,648	40,389	300,551	340,940	24,121	12,413	36,535	23,032	0	23,032	105,190	312,965	418,155
Study Area 7 - Wilson Way Corridor	California Water	100%	0%	1.80	6,623	0	6,623	2,071	57,181	59,252	7,772	18,939	26,712	47,999	0	47,999	64,465	76,121	140,586
Study Area 8 - I-5/Highway 4 Interchange	California Water	100%	0%	1.80	4,142	0	4,142	1,143	317,505	318,648	3,298	3,298	6,596	42,338	0	42,338	50,921	320,802	371,723
Study Area 9 - Railroad Corridor at California St	California Water	100%	0%	1.80	9,238	0	9,238	11,173	160,885	172,058	17,668	5,512	23,180	22,461	0	22,461	60,540	166,397	226,937
Study Area 10 - I-5 and Charter Way Area	California Water	100%	0%	1.80	172,113	232,588	404,701	34,002	35,191	69,194	97,262	9,465	106,727	14,788	8,746	23,534	318,166	285,990	604,156
Study Area 11 - Charter Way/MLK Jr Blvd Corridor	California Water	100%	0%	1.80	1,134	0	1,134	0	64,640	64,640	10,674	1,609	12,283	0	0	0	11,808	66,249	78,057
Study Area 12 - Airport Way Corridor	California Water	80%	20%	1.78	28,511	0	28,511	2,909	38,871	41,779	24,874	37,205	62,078	284,594	41,610	326,204	340,887	117,685	458,573
Study Area 13 - Mariposa and Charter Area	California Water	100%	0%	1.80	15,840	0	15,840	49,619	0	49,619	20,738	5,723	26,461	0	0	0	86,197	5,723	91,920
Study Area 14 - East Weston Ranch	City of Stockton	0%	100%	1.70	4,309	0	4,309	0	0	0	17,256	51,768	69,023	0	0	0	21,564	51,768	73,332
Study Area 15 - South of French Camp Rd	No District	0%	100%	1.70	287,055	0	287,055	48,186	0	48,186	0	0	0	197	0	197	335,438	0	335,438
Study Area 16 - E French Camp Rd Area	No District	0%	100%	1.70	465,680	0	465,680	72,148	0	72,148	409	0	409	569	0	569	538,805	0	538,805
Subtotal (Study Areas)					1,303,683	1,364,379	2,668,062	546,580	2,637,576	3,184,157	1,032,846	201,569	1,234,415	796,779	68,213	864,992	3,679,889	4,271,738	7,951,626
Approved/Pending Development Projects Within City Limit																			
Westlake Villages	City of Stockton	0%	100%	1.70	0	2,580,024	2,580,024	0	0	0	0	0	0	0	0	0	0	2,580,024	2,580,024
Delta Cove	City of Stockton	0%	100%	1.70	0	503,598	503,598	0	375,573	375,573	0	9,006	9,006	0	0	0	0	888,176	888,176
North Stockton Projects III	City of Stockton	0%	100%	1.70	144,178	1,346,924	1,491,102	0	0	0	0	0	0	0	0	0	144,178	1,346,924	1,491,102
Cannery Park	City of Stockton	0%	100%	1.70	0	1,032,010	1,032,010	0	126,269	126,269	0	363,025	363,025	0	0	0	0	1,521,304	1,521,304
Nor Cal Logistics Center	City of Stockton	0%	100%	1.70	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Crystal Bay	City of Stockton	0%	100%	1.70	0	73,607	73,607	0	621,088	621,088	0	0	0	0	0	0	0	694,694	694,694
Sanctuary	City of Stockton	0%	100%	1.70	0	3,892,801	3,892,801	0	531,910	531,910	0	124,022	124,022	0	0	0	0	4,548,733	4,548,733
Tidewater Crossing	City of Stockton	0%	100%	1.70	3,299,472	-3,299,472	0	0	0	0	0	55,850	55,850	0	0	0	3,299,472	-3,243,622	55,850
Open Window	California Water	100%	0%	1.80	0	0	0	0	298,348	298,348	47,683	-3,696	43,987	0	0	0	47,683	294,652	342,335
Weston Ranch Town Center	City of Stockton	0%	100%	1.70	0	0	0	0	0	0	0	144,689	144,689	0	0	0	0	144,689	144,689
Subtotal (Approved/Pending Projects Within City Limit)					3,443,650	6,129,493	9,573,143	0	1,953,188	1,953,188	47,683	692,895	740,578	0	0	0	3,491,333	8,775,576	12,266,909
Approved/Pending Development Projects Outside City Limit but Within Sphere of Influence																			
Mariposa Lakes	No District	0%	100%	1.70	572,917	3,563,848	4,136,766	0	4,616,726	4,616,726	0	523,593	523,593	0	0	0	572,917	8,704,168	9,277,085
Airpark 599	No District	0%	100%	1.70	0	0	0	0	0	0	0	446,800	446,800	0	0	0	0	446,800	446,800
Tra Vigne	No District	0%	100%	1.70	0	3,211,554	3,211,554	0	0	0	0	0	0	0	0	0	0	3,211,554	3,211,554
Subtotal (Approved/Pending Projects Outside City Limit but Within Sphere of Influence)					572,917	6,775,403	7,348,320	0	4,616,726	4,616,726	0	970,393	970,393	0	0	0	572,917	12,362,521	12,935,439
Remaining City Outside of Study Areas and Outside of Approved/Pending Projects		50%	50%	1.75	54,167,524	4,961,574	59,129,098	15,562,764	0	15,562,764	1,963,934	0	1,963,934	5,572,874	0	5,572,874	77,267,095	4,961,574	82,228,669
Grand Total					59,487,773	19,230,849	78,718,622	16,109,345	9,207,490	25,316,835	3,044,463	1,864,857	4,909,320	6,369,653	68,213	6,437,866	85,011,234	30,371,409	115,382,643
Total Cal Water					27,420,042	2,932,701	30,352,743	8,098,917	2,323,888	10,422,805	1,926,513	133,623	2,060,136	3,483,213	59,891	3,543,104	40,928,685	5,450,103	46,378,788
Total City of Stockton					32,067,732	16,298,148	48,365,880	8,010,428	6,883,602	14,894,029	1,117,950	1,731,234	2,849,184	2,886,439	8,322	2,894,761	44,082,549	24,921,306	69,003,855

Note: The water demands, analyses, and conclusions presented in this TM are based on generalized land use data and preliminary engineering evaluations. All these evaluations should be refined and updated through detailed evaluations of each specific development project.

Peak Hour Demands by Development Area

The Peak Hour demand estimates are calculated in Table 6. Peak Hour demands are the estimate of the water used by the residents and businesses in the water system service area for the single hour during the year when the demands are the highest. The Peak Hour demands are calculated by multiplying the Average Day Demands by the appropriate peak hour peaking factor. The Peak Hour peaking factor for the COSMUD service area is 3.5. The Peak Hour peaking factor for the Cal Water service area is 2.5. The following Peak Hour demands are calculated for existing, net new, and 2040 demands:

- Peak Hour demand from exiting land uses: 137.3 mgd
- Peak Hour demand from net new land uses: 58.8 mgd
- Peak Hour demand from 2040 land uses: 196.1 mgd

Demand Projection Estimates by Service Area

Demands within the City are distributed between the service areas for COSMUD and Cal Water. For the existing land uses, the COSMUD service area contains 52 percent of the demands, while the Cal Water service area contains 48 percent of the demands. The ratio is different with the 2040 land uses, with the COSMUD service area containing 61 percent of the demands and the Cal Water service area containing 39 percent of the demands.

The majority of the Study Areas are within the Cal Water Service Area. However, the Eight Mile Study area constitutes about 22 percent of the demands for all of the study areas, and is assigned to the COSMUD Service Area. The majority of the approved or pending development projects within the City limits or outside of the City limits are within the COSMUD Service Area, or are expected to be served by COSMUD. The result of this is that, while the existing demands are split almost evenly between the COSMUD and Cal Water Service Areas, the 2040 land use demands are more skewed to the COSMUD Service Area. Overall, 85 percent of the increases in demands from new development occur within areas that will be served by COSMUD.

As stated above, the demand analyses presented in this TM are based on generalized land use data and preliminary engineering evaluations. All these demand analyses should be refined and updated through detailed evaluations of each specific development project.

Table 6. Peak Hour Demand

Study Area Name	Water District	Percent Cal Water	Percent City	Peak Hour Factor	Single Family, gpd			Multi Family, gpd			Commercial, gpd			Industrial, gpd			Total, gpd		
					Existing	Net New	2040	Existing	Net New	2040	Existing	Net New	2040	Existing	Net New	2040	Existing	Net New	2040
Study Areas																			
Study Area 1 - Eight Mile Rd Area	No District	0%	100%	3.50	134,487	1,812,984	1,947,471	136,880	1,188,856	1,325,736	128,425	4,334	132,759	25,201	0	25,201	424,993	3,006,174	3,431,167
Study Area 2 - Pacific Ave Corridor	California Water	95%	5%	2.55	24,708	0	24,708	41,160	55,956	97,115	606,558	18,824	625,381	345	0	345	672,770	74,779	747,549
Study Area 3 - West Ln and Alpine Rd Area	California Water	90%	10%	2.60	224,371	299,293	523,664	70,482	360,926	431,408	365,415	33,029	398,444	252,855	0	252,855	913,123	693,248	1,606,371
Study Area 4 - Port/Waterfront	California Water	100%	0%	2.50	44,390	62,706	107,095	99,747	775,735	875,482	52,627	15,100	67,727	197,881	24,801	222,682	394,645	878,341	1,272,986
Study Area 5 - El Dorado/Center Corridors	California Water	100%	0%	2.50	30,893	0	30,893	96,030	331,815	427,845	41,613	9,264	50,877	44,114	0	44,114	212,650	341,079	553,729
Study Area 6 - Miner/Weber Corridors	California Water	100%	0%	2.50	24,512	0	24,512	56,095	417,432	473,528	33,502	17,241	50,743	31,989	0	31,989	146,097	434,673	580,771
Study Area 7 - Wilson Way Corridor	California Water	100%	0%	2.50	9,198	0	9,198	2,877	79,418	82,295	10,795	26,305	37,100	66,666	0	66,666	89,535	105,723	195,258
Study Area 8 - I-5/Highway 4 Interchange	California Water	100%	0%	2.50	5,753	0	5,753	1,588	440,979	442,567	4,580	4,580	9,160	58,802	0	58,802	70,724	445,559	516,283
Study Area 9 - Railroad Corridor at California St	California Water	100%	0%	2.50	12,831	0	12,831	15,518	223,451	238,969	24,539	7,656	32,195	31,196	0	31,196	84,083	231,107	315,190
Study Area 10 - I-5 and Charter Way Area	California Water	100%	0%	2.50	239,046	323,038	562,084	47,226	48,877	96,102	135,087	13,146	148,233	20,539	12,148	32,687	441,897	397,209	839,106
Study Area 11 - Charter Way/MLK Jr Blvd Corridor	California Water	100%	0%	2.50	1,575	0	1,575	0	89,777	89,777	14,825	2,235	17,060	0	0	0	16,401	92,012	108,413
Study Area 12 - Airport Way Corridor	California Water	80%	20%	2.70	43,247	0	43,247	4,412	58,961	63,373	37,730	56,434	94,164	431,688	63,116	494,804	517,076	178,512	695,588
Study Area 13 - Mariposa and Charter Area	California Water	100%	0%	2.50	22,000	0	22,000	68,915	0	68,915	28,803	7,949	36,751	0	0	0	119,718	7,949	127,667
Study Area 14 - East Weston Ranch	City of Stockton	0%	100%	3.50	8,871	0	8,871	0	0	0	35,527	106,580	142,107	0	0	0	44,397	106,580	150,978
Study Area 15 - South of French Camp Rd	No District	0%	100%	3.50	590,996	0	590,996	99,206	0	99,206	0	0	0	406	0	406	690,609	0	690,609
Study Area 16 - E French Camp Rd Area	No District	0%	100%	3.50	958,752	0	958,752	148,540	0	148,540	841	0	841	1,172	0	1,172	1,109,305	0	1,109,305
Subtotal (Study Areas)					2,375,630	2,498,021	4,873,651	888,674	4,072,184	4,960,858	1,520,866	322,676	1,843,542	1,162,854	100,065	1,262,919	5,948,024	6,992,946	12,940,970
Approved/Pending Development Projects Within City Limit																			
Westlake Villages	City of Stockton	0%	100%	3.50	0	5,311,815	5,311,815	0	0	0	0	0	0	0	0	0	0	5,311,815	5,311,815
Delta Cove	City of Stockton	0%	100%	3.50	0	1,036,819	1,036,819	0	773,238	773,238	0	18,541	18,541	0	0	0	0	1,828,599	1,828,599
North Stockton Projects III	City of Stockton	0%	100%	3.50	296,837	2,773,080	3,069,917	0	0	0	0	0	0	0	0	0	296,837	2,773,080	3,069,917
Cannery Park	City of Stockton	0%	100%	3.50	0	2,124,726	2,124,726	0	259,966	259,966	0	747,404	747,404	0	0	0	0	3,132,096	3,132,096
Nor Cal Logistics Center	City of Stockton	0%	100%	3.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Crystal Bay	City of Stockton	0%	100%	3.50	0	151,543	151,543	0	1,278,710	1,278,710	0	0	0	0	0	0	0	1,430,253	1,430,253
Sanctuary	City of Stockton	0%	100%	3.50	0	8,014,591	8,014,591	0	1,095,109	1,095,109	0	255,339	255,339	0	0	0	0	9,365,039	9,365,039
Tidewater Crossing	City of Stockton	0%	100%	3.50	6,793,030	-6,793,030	0	0	0	0	114,985	114,985	0	0	0	0	6,793,030	-6,678,045	114,985
Open Window	California Water	100%	0%	2.50	0	0	0	0	414,372	414,372	66,227	-5,133	61,093	0	0	0	66,227	409,239	475,465
Weston Ranch Town Center	City of Stockton	0%	100%	3.50	0	0	0	0	0	0	0	297,889	297,889	0	0	0	0	297,889	297,889
Subtotal (Approved/Pending Projects Within City Limit)					7,089,867	12,619,544	19,709,411	0	3,821,395	3,821,395	66,227	1,429,025	1,495,252	0	0	0	7,156,093	17,869,964	25,026,058
Approved/Pending Development Projects Outside City Limit but Within Sphere of Influence																			
Mariposa Lakes	No District	0%	100%	3.50	1,179,535	7,337,335	8,516,870	0	9,505,024	9,505,024	0	1,077,986	1,077,986	0	0	0	1,179,535	17,920,345	19,099,880
Airpark 599	No District	0%	100%	3.50	0	0	0	0	0	0	0	919,881	919,881	0	0	0	0	919,881	919,881
Tra Vigne	No District	0%	100%	3.50	0	6,612,024	6,612,024	0	0	0	0	0	0	0	0	0	0	6,612,024	6,612,024
Subtotal (Approved/Pending Projects Outside City Limit but Within Sphere of Influence)					1,179,535	13,949,358	15,128,894	0	9,505,024	9,505,024	0	1,997,867	1,997,867	0	0	0	1,179,535	25,452,250	26,631,785
Remaining City Outside of Study Areas and Outside of Approved/Pending Projects																			
Grand Total					103,586,003	37,580,022	141,166,025	27,591,361	17,398,603	44,989,964	4,956,822	3,749,569	8,706,391	10,724,824	100,065	10,824,889	137,297,039	58,828,259	196,125,298
Total Cal Water					46,909,612	4,892,323	51,801,935	13,784,759	3,247,017	17,031,776	3,025,097	191,097	3,216,194	5,783,703	87,442	5,871,145	64,743,901	8,417,880	73,161,781
Total City of Stockton					56,676,391	32,687,699	89,364,090	13,806,602	14,151,586	27,958,187	1,931,726	3,558,471	5,490,197	4,941,121	12,623	4,953,744	72,553,138	50,410,379	122,963,518

Note: The water demands, analyses, and conclusions presented in this TM are based on generalized land use data and preliminary engineering evaluations. All these evaluations should be refined and updated through detailed evaluations of each specific development project.

INFRASTRUCTURE EVALUATIONS

The difference in demands that results from the changes in development areas causes changes in the required infrastructure in the Capital Improvement Programs from the WMPs. There are different changes for the COSMUD Service Area and the Cal Water Service Area.

The infrastructure evaluations and conclusions presented below are preliminary. These evaluations and conclusions should be verified through the preparation of updates to the COSMUD and Cal Water WMPs when the GPU process is completed and the final land uses have been adopted.

COSMUD Infrastructure Evaluation

The decreases in projected demands from the COSMUD WMP, within the COSMUD Service Area, change the infrastructure needs for water storage capacity, pumping facility capacity and distribution pipeline capacity. The projected demands in the COSMUD WMP and for this study are:

- Average Day Demand – 2035 WMP: 98.2 mgd. This study for 2040: 39.9 mgd
- Maximum Day Demand – 2035 WMP: 166.9 mgd. This study for 2040: 69.0 mgd
- Peak Hour Demand – 2035 WMP: 343.7 mgd. This study for 2040: 123.0 mgd

The demands estimated for the 2040 land uses are approximately 60 percent lower than the demands from the COSMUD WMP.

Water Storage Capacity

Required storage volume decreases are based on decreased need for operational and emergency storage due to the lower projected demands. Required fire flow storage would not change with the decrease in demands. The operational storage requirement is 25 percent of maximum day demands. The emergency storage requirement is 100 percent of the average day demands.

Based on the COSMUD WMP (based on the 2035 General Plan buildout):

- The current total available storage is 33.7 mg, according to the COSMUD WMP.
- The required total storage at buildout of the 2035 General Plan is 142.9 mg.
- The required new storage is 109.2 mg.

Based on the current GPU 2040 land use demands:

- The current total available storage is 33.7 mg (according to the COSMUD WMP).
- The required total storage for the 2040 development is 58.6 mg.
- The required new storage is 24.9 mg.

Thus, the required new storage for 2040 development is 24.9 mg, which is a reduction of 84.3 mg from the storage needed for buildout of the 2035 General Plan.

Pumping Facility Capacity

Sufficient water system pumping capacity should be provided to meet the greater of these two demand conditions:

1. A maximum day demand concurrent with a maximum fire flow event with the largest pump at each booster pump station in standby mode with well pumps assumed to operate at firm groundwater pumping capacity.
2. A peak hour demand with the largest pump at each booster pump station in standby mode with well pumps assumed to operate at firm groundwater pumping capacity,

Given that the peak hour demands are significantly larger than the maximum fire flow demands, the second set of conditions will control the decrease in required pumping facility capacity.

Based on the COSMUD WMP (based on the 2035 General Plan buildout):

- The current total available pumping capacity is 88,592 gpm (according to the COSMUD WMP).
- The required total pumping capacity at buildout of the 2035 General Plan is 238,679 gpm.
- The required new pumping capacity is 150,087 gpm.

Based on the GPU 2040 land use demands:

- The current total available pumping capacity is 88,592 gpm (according to the COSMUD WMP).
- The required total pumping capacity for the 2040 development is 85,416 gpm.
- As the current pumping capacity exceeds the required pumping capacity, no new pumping capacity may be needed. However, pumping capacity may be still needed if the existing booster pumps are not in the correct locations to effectively serve the 2040 development.

Thus, there is potentially no new required pumping capacity for 2040 development (unless additional pumping is needed based on the locations of the new development). This represents a reduction of 150,087 gpm from the pumping capacity needed for buildout of the 2035 General Plan.

Distribution Pipeline Capacity

The COSMUD distribution system is split into the North and South areas. Each area was evaluated separately regarding the effect of the lower projected demands for the 2040 land uses. The COSMUD WMP does not provide specific projected demands for each study area or development project, which means that direct comparisons of the demands for specific areas are not possible. However, qualitative assessments have been made of the difference in required distribution and transmission pipelines within these areas by comparing the land uses. The areas where significant differences have been identified are discussed below.

- Within Study Area 1, the Eight Mile Road Area, the 2040 land uses show no new development north of Eight Mile Road. The COSMUD WMP was based on all of this area developing by 2035. It can be assumed that most of the distribution and transmission pipelines within Study Area 1 (north of Eight Mile Road) will not be needed. No specific amount of pipelines or dollar value was identified in the COSMUD WMP for this Study Area.
- Within Study Area 15, the South of French Camp Road Area, the 2040 land uses show this area as Open Space/Agriculture, whereas the 2035 land uses showed this area as Residential Estate. It can be assumed that all of the distribution and transmission pipelines within Study Area 15 shown in the COSMUD WMP will not be needed. No specific amount of pipelines or dollar value was identified in the COSMUD WMP for this Study Area.
- Within Study Area 16, the East of French Camp Road Area, the 2040 land uses show this area as Open Space/Agriculture, whereas the 2035 land uses showed this area as Residential Estate. It can be assumed that all of the distribution and transmission pipelines within Study Area 15 shown in the COSMUD WMP will not be needed. No specific amount of pipelines or dollar value was identified in the COSMUD WMP for this Study Area.
- For the Tra Vigne development project, the 2040 land uses show this area as Residential Estate, whereas the 2035 land uses showed this area with portions of higher density housing land uses. It can be assumed that the lower housing density for the 2040 land uses will result in lower demands. The developed area will not change, meaning that there would be no expected change in the extent of the distribution and transmission pipeline network planned for this area. However, the lower demands could result in smaller diameter pipelines being needed throughout this area.

Other changes in land uses within Study Areas or development areas are not expected to result in significant changes in the required COSMUD distribution or transmission pipelines planned for these areas.

Cal Water Infrastructure Evaluation

The decrease in projected demands within the Cal Water Service Area change the infrastructure needs for water storage capacity, pumping facility capacity, and distribution pipeline capacity.

- Average Day Demand – 2035 WMP: 35.1 mgd. This study for 2040: 26.4 mgd
- Maximum Day Demand – 2035 WMP: 63.1 mgd. This study for 2040: 46.4 mgd
- Peak Hour Demand – 2035 WMP: 87.7 mgd. This study for 2040: 73.2 mgd

Water Storage Capacity

Required storage volume decreases are based on decreased need for operational and emergency storage due to the lower projected demands. Required fire flow storage would not change with the decrease in demands. The operational storage requirement is 25 percent of maximum day demands. The emergency storage requirement is 100 percent of the average day demands.

Based on the Cal Water WMP (based on the 2035 General Plan buildout):

- The current total available storage is 38.4 mg (according to the Cal Water WMP).
- The required total storage at buildout of the 2035 General Plan is 51.9 mg.
- The required new storage is 13.5 mg.

Based on the current GPU 2040 land use demands:

- The current total available storage is 38.4 mg (according to the Cal Water WMP).
- The required total storage for the 2040 development is 38.9 mg.
- The required new storage is 0.5 mg.

Thus, the required new storage for 2040 development is 0.5 mg, which is a reduction of 13.0 mg from the storage needed for buildout of the 2035 General Plan.

Pumping Facility Capacity

Sufficient water system pumping capacity should be provided to meet the greater of these two demand conditions:

1. A maximum day demand concurrent with a maximum fire flow event with the largest pump at each booster pump station in standby mode with well pumps assumed to operate at firm groundwater pumping capacity.
2. A peak hour demand with the largest pump at each booster pump station in standby mode with well pumps assumed to operate at firm groundwater pumping capacity.

Given that the peak hour demands are significantly larger than the maximum fire flow demands, the second conditions will control the decrease in required pumping facility capacity.

Based on the Cal Water WMP (based on the 2035 General Plan buildout):

- The current total available pumping capacity is 47,012 gpm (according to the Cal Water WMP).
- The required total pumping capacity at buildout of the 2035 General Plan is 60,937 gpm.
- The required new pumping capacity is 13,925 gpm.

Based on the GPU 2040 land use demands:

- The current total available pumping capacity is 47,012 gpm (according to the Cal Water WMP)
- The required total pumping capacity for the 2040 development is 50,069 gpm
- The required new pumping capacity is 3,057 gpm.

Thus, the required new pumping capacity for 2040 development is 3,057 gpm, which is a reduction of 10,868 gpm from the pumping capacity needed for buildout of the 2035 General Plan.

Distribution Pipeline Capacity

The Cal Water distribution system generally covers the downtown area of the City with a well-looped, grid system that provides adequate capacity in the inner downtown area where most of the changes in development are expected to occur. Cal Water has been and will continue to upgrade their distribution system. These upgrades will help Cal Water supply the future water demand. The projects that are included in the Cal Water WMP are expected to be adequately sized to support the 2040 land uses, as there is no change expected in the fire flow demands, and there is relatively little change in the peak hour demands. No changes to the pipeline CIP are expected.

The infrastructure analyses presented in this TM are based on generalized land use data and preliminary engineering evaluations. All these analyses should be refined and updated through detailed evaluations of each specific development project.

COST EVALUATIONS BY SERVICE AREA

Preliminary infrastructure cost estimates for water storage facilities and booster pumping facilities were developed for the COSMUD and Cal Water Service Areas. The cost analyses presented in this TM are based on generalized land use data and preliminary engineering evaluations. All these analyses should be refined and updated through detailed evaluations of each specific development project.

COSMUD

The COSMUD costs for water storage for the 2040 land uses are estimated to decrease from the costs for buildout of the 2035 General Plan, as summarized below:

- The 2035 General Plan buildout new storage is 109.2 mg, which has an estimated cost of \$166.4 million (based on \$1.52 per gallon of storage).
- The 2040 GPU required new storage is 24.9 mg, which has an estimated cost of \$37.9 million (based on \$1.52 per gallon of storage).
- The reduction is estimated storage costs from 2035 buildout to 2040 development land uses is \$128.5 million.

The COSMUD costs for pumping capacity for the 2040 land uses are estimated to decrease from the costs for buildout of the 2035 General Plan, as summarized below:

- The 2035 General Plan buildout new pumping capacity is 150,087 gpm, which has an estimated cost of \$65.5 million (based on \$303,000 per mgd of pumping capacity).
- The 2040 GPU required new pumping capacity is 0 gpm, which has no cost.
- The reduction is estimated pumping capacity costs from 2035 buildout to 2040 development land uses is \$65.5 million.

Costs were taken from the COSMUD WMP, which were developed with a July 2008 ENR index of 8293, and then adjusted to current dollars using a December 2016 ENR index of 10530.

The infrastructure evaluation also showed an expected reduction of required pipeline projects within certain study areas. As these pipeline projects are not listed in the COSMUD WMP by the study areas, it is not possible to estimate the amount of reduction in pipeline projects, or the associated costs from the available information.

Cal Water

The Cal Water costs for water storage for the 2040 land uses are estimated to decrease from the costs for buildout of the 2035 General Plan, as summarized below:

- The 2035 General Plan buildout new storage is 13.5 mg, which has an estimated cost of \$21.5 million (based on \$1.60 per gallon of storage).
- The 2040 GPU required new storage is 0.5 mg, which has an estimated cost of \$0.8 million (based on \$1.60 per gallon of storage).
- The reduction is estimated storage costs from 2035 buildout to 2040 development land uses is \$20.7 million.

The Cal Water costs for pumping capacity for the 2040 land uses are estimated to decrease from the costs for buildout of the 2035 General Plan, as summarized below:

- The 2035 General Plan buildout new pumping capacity is 13,925 gpm, which has an estimated cost of \$9.8 million (based on \$490,000 per mgd of pumping capacity).
- The 2040 GPU required new pumping capacity is 3,057 gpm, which has an estimated cost of \$2.2 million (based on \$490,000 per mgd of pumping capacity).
- The reduction is estimated pumping capacity costs from 2035 buildout to 2040 development land uses is \$7.7 million.

Costs were taken from the Cal Water WMP, which were developed with an ENR CCI of 8549 (20 Cities Average), and then adjusted to current dollars using a December 2016 ENR index of 10530.

RECOMMENDED FUTURE ACTIONS

The recommended actions to address potable water infrastructure needs are addressed in this section.

Water Distribution Systems

The projected land uses for 2040 are different that the buildout land uses from the 2035 General Plan. Consequently, the water infrastructure identified in the previous master plans (City and Cal Water) may no longer be appropriate. This could result in some water infrastructure being undersized, which could lead to inadequate water deliveries or inadequate water pressures. Some water infrastructure could be oversized, which could lead to operational problems and unnecessary infrastructure capital and operation & maintenance expenditures.

The previous water master plans (City and Cal Water) and associated water system models should be updated based on the 2040 land uses, and appropriately sized infrastructure should be developed and included in the City's and Cal Water's Capital Improvement Plans. The City's and Cal Water's Development Impact Fees should be revised based on the updated water master plans to ensure the City and Cal Water collect enough money to construct the required infrastructure.

COSMUD Northern and Southern Systems

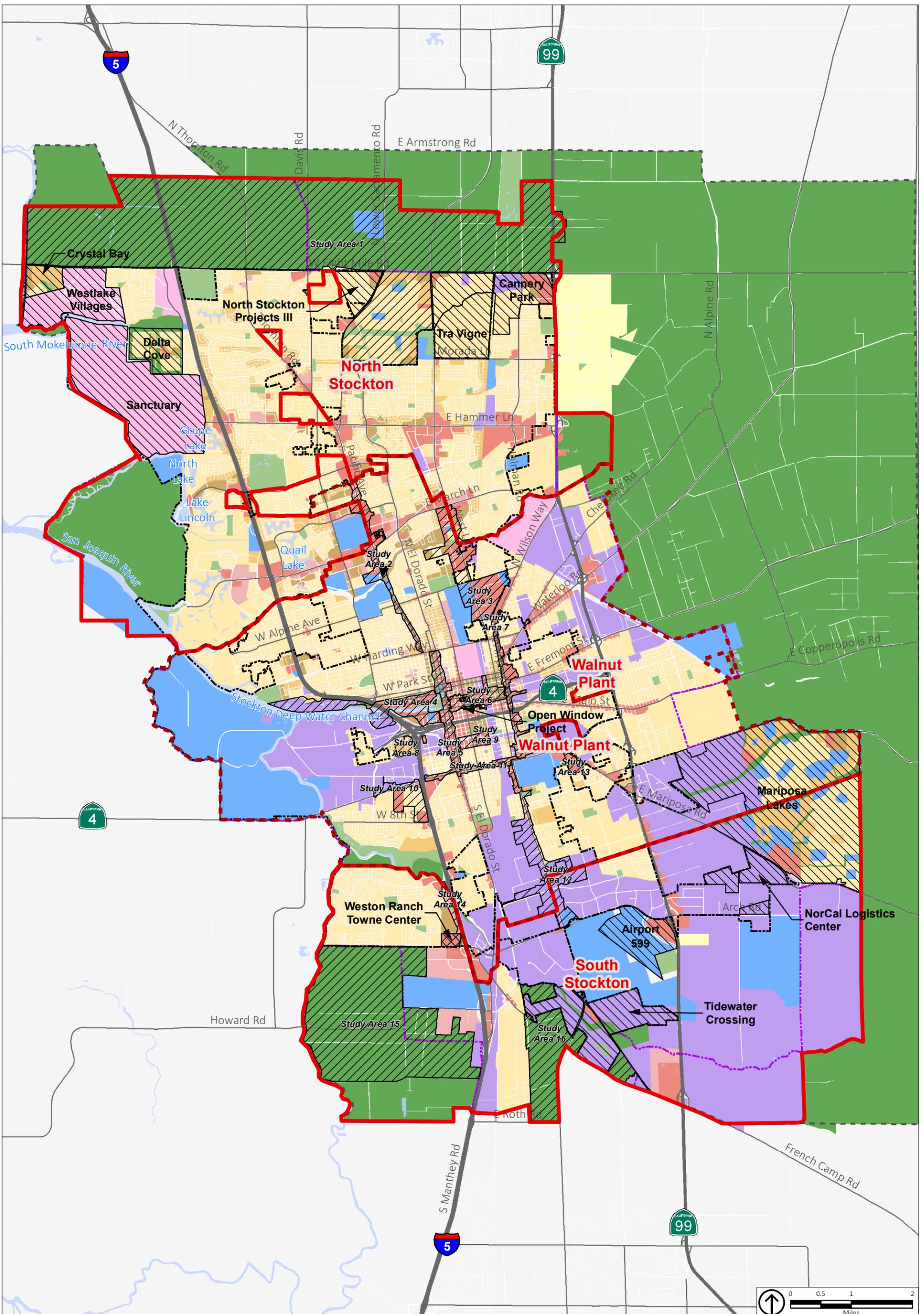
The COSMUD water system includes a northern system and a southern system, essentially separated by the Cal Water system serving the center of the City. Since the completion of the Delta Water Treatment Project, COSMUD operates the two systems essentially as two separate, distinct systems. There is an eastern connection between the two systems, but the connection is kept closed. Evaluating the northern and southern COSMUD systems as if they were operated as a single system would allow the storage and pumping facilities to be evaluated collectively.

To allow the northern and southern COSMUD systems to be operated as a single system, it is recommended that:

- A western connection between the northern and southern COSMUD systems be constructed,
- The water provided by Stockton East Water District (SEWD) to the southern COSMUD system be treated to the same standards as the water in the northern COSMUD system. This could be done by either SEWD or COSMUD, and
- The eastern connection be opened.

Future Development-Specific Potable Water Improvements

This TM is a high-level assessment of required potable water facilities for the Study Areas and Approved/Pending Development Projects. These water demands and associated facility requirements are sized based on generalized land use data and preliminary engineering evaluations. These evaluations do not assess specific facilities needed for the Study Areas and Pending/Approved Development Projects. It is difficult to size potable water facilities without knowing the layout of the development and site-specific constraints. As specific developments occur, the specific potable water infrastructure serving the developments should be reviewed and verified using the updated water system models. The required infrastructure should be evaluated and identified as needed for the specific development projects.



Source: City of Stockton, June & August 2017.

- Major Development Areas
- Study Areas
- General Plan Planning Area
- City Limit
- Sphere of Influence
- Cal Water Service Area Boundary
- City of Stockton Water Service Area Boundary

- Residential Estate
- Low Density Residential
- Medium Density Residential
- High Density Residential
- Mixed Use
- Commercial
- Administrative Professional
- Industrial
- Economic and Education Enterprise
- Institutional
- Parks and Recreation
- Open Space/Agriculture

Figure 1
**2017 Preferred 2040 Land Uses
and Development Areas**



ATTACHMENT A

Land Use Data Received from Placeworks

Acreage Gross or Net	Study Area Name	Single Family Net New 2040	Single Family Net New 2040	Single Family Net New 2040 + Existing	Single Family Net New 2040 + Existing	Multi Family Net New 2040	Multi Family Net New 2040	Multi Family Net New 2040 + Existing	Multi Family Net New 2040 + Existing	Commercial Net New 2040 + Existing	Commercial Net New 2040 + Existing	Industrial Net New 2040	Industrial Net New 2040 + Existing							
		Units	Acres	Units	Acres	Units	Acres	Units	Acres	Units	Acres	Total Square Feet	0.3 FAR Sq Ft	0.5 FAR Sq Ft	5.0 FAR Sq Ft	0.3 FAR Acres	0.5 FAR Acres	5.0 FAR Acres	Sq Ft	Acres
Gross	Study Area 1 - Eight Mile Rd Area	1,379	646	1,500	663	1,198	209	1,294	217	39,408	39,408	0	0	15	0	0	241,408	20	0	105,400
Net	Study Area 2 - Pacific Ave Corridor	0	0	22	4	110	19	224	22	93,961	93,961	0	0	17	0	0	1,560,846	103	0	1,980
Net	Study Area 3 - West Ln and Alpine Rd Area	77	13	285	52	680	120	774	125	323,399	323,399	0	0	102	0	0	975,325	163	0	1,423,576
Net	Study Area 4 - Port/Waterfront	17	3	71	11	1,770	33	2,058	42	2,040,010	6,100	0	2,033,911	2	0	31	2,865,512	62	580,859	1,739,495
Net	Study Area 5 - El Dorado/Center Corridors	0	0	45	6	1,196	22	1,555	30	1,310,216	0	0	1,310,216	0	0	21	2,158,663	53	0	258,300
Net	Study Area 6 - Miner/Weber Corridors ^(a)	0	0	47	4	1,248	22	1,467	27	1,463,025	0	0	1,463,025	0	0	14	2,152,972	33	0	187,300
Net	Study Area 7 - Wilson Way Corridor	0	0	12	2	234	27	240	28	606,716	103,753	0	502,963	19	0	5	1,321,076	65	0	390,342
Net	Study Area 8 - I-5/Highway 4 Interchange	0	0	8	1	659	47	660	48	388,671	0	0	388,671	0	0	4	388,671	4	0	344,300
Net	Study Area 9 - Railroad Corridor at California St	0	0	19	2	1,340	24	1,363	25	1,299,279	0	0	1,299,279	0	0	24	1,365,999	26	0	182,658
Net	Study Area 10 - I-5 and Charter Way Area	86	15	314	58	98	42	127	46	133,864	133,864	0	0	42	0	0	377,363	77	83,678	203,939
Net	Study Area 11 - Charter Way/MLK Jr Blvd Corridor	0	0	5	0	396	15	396	15	323,733	9,597	0	314,135	6	0	7	703,670	38	0	0
Net	Study Area 12 - Airport Way Corridor	0	0	53	7	108	19	112	19	205,461	135,225	70,236	0	14	4	0	272,544	48	1,368,744	3,709,140
Net	Study Area 13 - Mariposa and Charter Area	0	0	12	4	0	0	77	6	80,944	80,944	0	0	25	0	0	93,560	28	0	0
Net	Study Area 14 - East Weston Ranch ^(b)	0	0	1	1	0	0	0	0	430,677	0	430,677	0	0	26	0	430,677	26	0	0
Net	Study Area 15 - South of French Camp Rd	0	0	89	76	0	0	9	6	0	0	0	0	0	0	0	0	0	0	1,700
Net	Study Area 16 - E French Camp Rd Area	0	0	59	123	0	0	4	9	0	0	0	0	0	0	0	5,100	17	0	4,900
Net	Outside of Study Areas ^(c)	1,501	246	77,964	14,117	0	0	33,183	1,916	0	0	0	0	0	0	0	23,811,089	1,607	0	46,620,901
	Grand Total	3,059	923	80,505	15,131	9,036	600	43,542	2,583	8,739,364	926,252	500,913	7,312,200	242	31	105	38,724,475	2,371	2,033,281	55,173,931

^(a) Excludes Open Window approved project.

^(b) Excludes Weston Ranch Town Center approved project.

^(c) Excludes approved/pending projects.

Acreage Gross or Net	Approved/Pending Projects Details	Net New						Full Build (2040)					
		Single Family Units	Single Family Acres	Multi-Family Units	Multi-Family Acres	Commercial Square Feet	Commercial Acres	Single Family Units	Single Family Acres	Multi-Family Units	Multi-Family Acres	Commercial Square Feet	Commercial Acres
Approved within city limit													
Gross	Westlake Villages	2,630	680	0		0		2,630	680	0		0	
Gross	Delta Cove	1,164	133	381	48	31,000	3	1,164	133	381	48	31,000	2.6
Gross	North Stockton Projects III	2,220	355	0		0		2,455	393	0		0	
Gross	Cannery Park	981	272	210	16	1,078,762	104	981	272	210	16	1,078,762	104
Gross	Nor Cal Logistics Center	0	0	0	0	0	0	0	0	0	0	0	0
Gross	Crystal Bay	951	19	392	79	0		951	19	392	79	0	0
Gross	Sanctuary	5,452	1,026	1,618	67	692,256	36	5,452	1,026	1,618	67	692,256	36
Gross	Tidewater Crossing	-310	-870	0		186,200	16	0	0	0	0	186,200	16
Net	Open Window ^(a)	0	0	1,391	12	-68,800	-1	0	0	1,400	12	290,000	12
Gross	Weston Ranch Town Center	0	0	0	0	481,000	41	0	0	0	0	481,000	41
Approved/pending outside city limit, inside SOI													
Gross	Mariposa Lakes	8,955	939	1,553	585	1,009,503	150	8,960	1,090	1,556	585	1,009,503	150
Gross	Airpark 599	0	0	0	0	1,678,500	128	0	0	0	0	1,678,500	128
Gross	Tra Vigne ^(b)	1,244	846	0	0	0	0	1,244	846	0	0	0	0

^(a) The Master Development Plan for Open Window is approved for 1,034 units, with an option to expand the capacity to 1,400 units if the General Plan Update increases the maximum densities in the Downtown, which is being considered as part of this General Plan Update.

^(b) Pending; not approved.

2040 Development Study Area

	Net New Single Family Units (full buildout)	Percent applied to 2040	Net New Single Family Units (2040)	Net New Multi-Family Units (full buildout)	Percent applied to 2040	Net New Multi-Family Units (2040)	Net New Commercial Square Feet (full buildout)	Percent applied to 2040	Net New Commercial Square Feet (2040)	Net New Industrial Square Feet (full buildout)	Percent applied to 2040	Net New Industrial Square Feet (2040)
Study Area 1 – Eight Mile Rd Area	3,940	35%	1,380	3,420	35%	1,200	197,000	20%	39,000	0	0%	0
Study Area 2 – Pacific Ave Corridor	0	0%	0	440	25%	110	188,000	50%	94,000	0	0%	0
Study Area 3 – West Ln and Alpine Rd Area	80	100%	80	2,720	25%	680	1,294,000	25%	323,000	0	0%	0
Study Area 4 – Port/Waterfront	20	100%	20	2,210	80%	1,770	6,800,000	30%	2,040,000	2,323,000	25%	581,000
Study Area 5 – El Dorado/Center Corridors	0	0%	0	1,500	80%	1,200	4,367,000	30%	1,310,000	0	0%	0
Study Area 6 – Miner/Weber Corridors ^(a)	0	0%	0	1,560	80%	1,250	2,926,000	50%	1,463,000	0	0%	0
Study Area 7 – Wilson Way Corridor	0	0%	0	940	25%	230	1,213,000	50%	607,000	0	0%	0
Study Area 8 – I-5/Highway 4 Interchange	0	0%	0	820	80%	660	777,000	50%	389,000	0	0%	0
Study Area 9 – Railroad Corridor at California St	0	0%	0	1,680	80%	1,340	5,197,000	25%	1,299,000	0	0%	0
Study Area 10 – I-5 and Charter Way Area	90	100%	90	980	10%	100	535,000	25%	134,000	98,000	85%	84,000
Study Area 11 – Charter Way/MLK Jr Blvd Corridor	0	0%	0	790	50%	400	1,619,000	20%	324,000	0	0%	0
Study Area 12 – Airport Way Corridor	0	0%	0	430	25%	110	274,000	75%	205,000	5,475,000	25%	1,369,000
Study Area 13 – Mariposa and Charter Area	0	0%	0	570	0%	0	324,000	25%	81,000	0	0%	0
Study Area 14 – East Weston Ranch ^(b)	0	0%	0	610	0%	0	574,000	75%	431,000	0	0%	0
Study Area 15 – South of French Camp Rd	0	0%	0	0	0%	0	0	0%	0	0	0%	0
Study Area 16 – E French Camp Rd Area	0	0%	0	0	0%	0	0	0%	0	0	0%	0
Outside of Study Areas ^(c)	16,360	9%	1,500	29,810	0%	0	19,487,000	0%	0	126,805,000	0%	0
Grand Total^(d)	20,480		3,060	48,470		9,040	45,773,000		8,739,000	134,701,000		2,033,000

^(a) Excludes Open Window approved project.

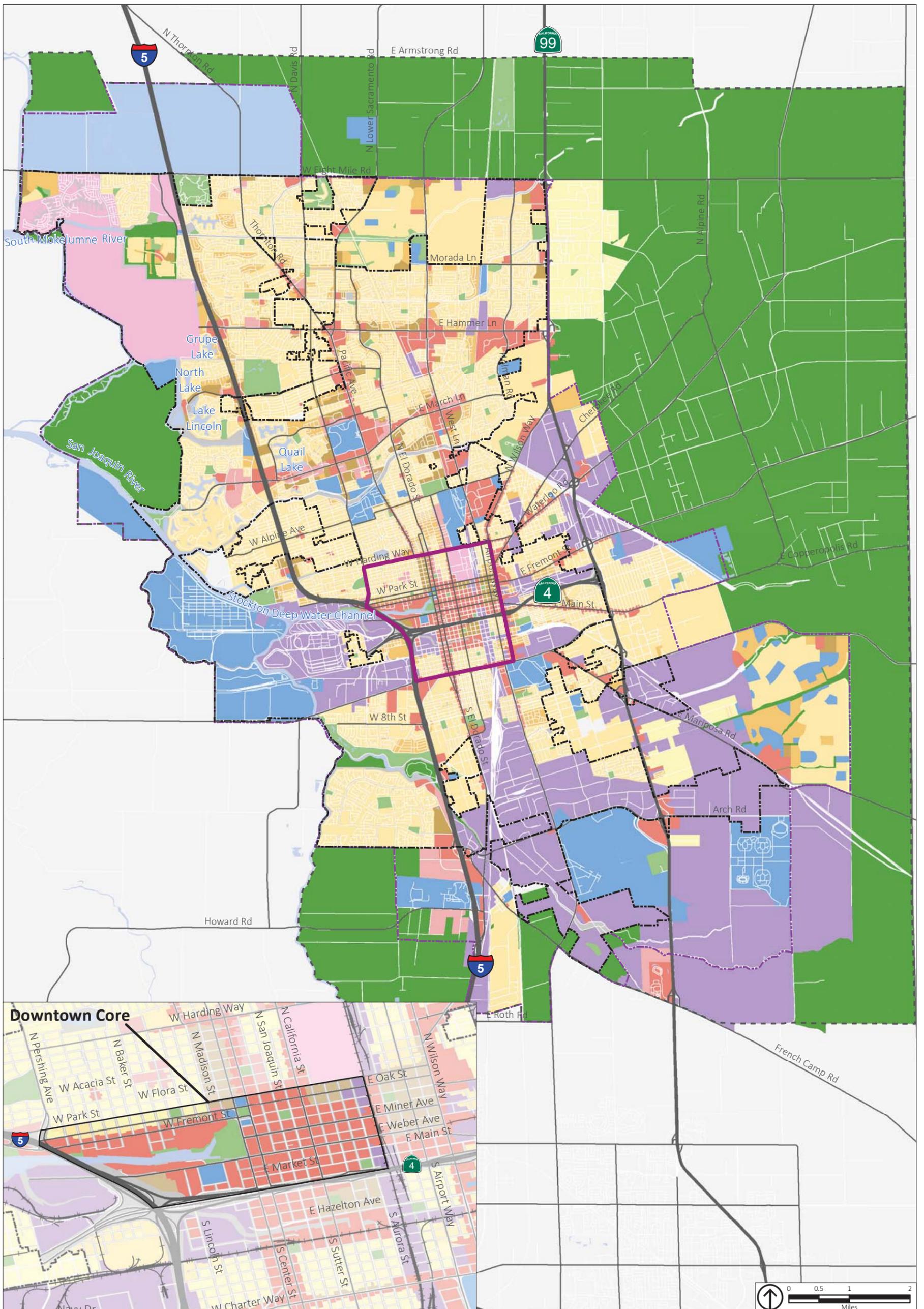
^(b) Excludes Weston Ranch Town Center approved project.

^(c) Excludes approved/pending projects

^(d) Numbers do not always add up due to rounding.

The "full buildout" of the proposed General Plan assumes the maximum development of every parcel, combined with approved and pending developments throughout the Planning Area. The 2040 land uses are based on realistic land use demand projections. The full buildout of the General Plan would result in almost three times more new housing units and over 24 times more new non-residential development than estimated for 2040. Therefore, it is extremely unlikely that the full buildout would occur by the year 2040. Full buildout may not occur until well beyond the useful lifespan of the proposed infrastructure (for example, the lifespan of concrete structures is typically 50 to 75 years). Consequently, this infrastructure planning was based on the estimated 2040 level of development. This table is included in this TM to document the relationship between the buildout land uses and the 2040 land uses.

Source: PlaceWorks, 2017.



Source: City of Stockton, 2017; PlaceWorks, 2017.

- | | | | | |
|----------------------------|-----------------------------|-----------------------------------|----------------------------|---------------------------|
| Residential Estate | Mixed Use | Economic and Education Enterprise | City Limit | Greater Downtown Boundary |
| Low Density Residential | Commercial | Institutional | Sphere of Influence | |
| Medium Density Residential | Administrative Professional | Parks and Recreation | General Plan Planning Area | |
| High Density Residential | Industrial | Open Space/Agriculture | | |

Figure 3-3
Proposed General Plan Land Use Map