



TECHNICAL MEMORANDUM

DATE: February 22, 2017 Project No.: 295-10-15-05
TO: Ella Wise, Dyett & Bhatia SENT VIA: EMAIL
FROM: Doug Moore, PE, RCE #C58122
REVIEWED BY: Elizabeth Drayer, PE, RCE #C46782
SUBJECT: City of Ceres General Plan Update, Land Use Alternatives - Wastewater Evaluation

Presented in this Technical Memorandum (TM) is an evaluation of the wastewater infrastructure needed for the three General Plan Update (GPU) Land Use Alternatives (LUAs) for the City of Ceres (City). This TM includes the following sections:

- Land Uses
- Current and Projected Wastewater Flows
- Collection System Infrastructure Requirements
- Wastewater Treatment and Export Infrastructure Requirements
- Wastewater Treatment and Export Costs
- Conclusions

LAND USES

The City's existing land uses are shown on Figure 1 and summarized in Table 1. Land uses for buildup of the current General Plan are shown on Figure 2 and summarized in Table 1. The land uses for the GPU LUAs 1, 2 and 3 are shown on Figures 3, 4 and 5, respectively. The land uses for the GPU LUAs 1, 2 and 3 are also in Table 1. The land use data (e.g., GIS mapping and gross area data) were provided by Dyett and Bhatia. The land use regions are shown in Attachment A, also received from Dyett and Bhatia.

Table 1. Land Uses

Existing Land Uses			Current General Plan				Alternative 1			Alternative 2			Alternative 3					
Land Use Designation	Area, acres	Sewered Acres, acres	Land Use Designation	Area, acres	Conversion Factor to Net Area	Net Area, acres	Land Use Designation	Area, acres	Conversion Factor to Net Area	Net Area, acres	Land Use Designation	Area, acres	Conversion Factor to Net Area	Net Area, acres	Land Use Designation	Area, acres	Conversion Factor to Net Area	Net Area, acres
Inside Current SOI (Excluding Whitmore Ranch Specific Plan) (Note: The Inside Current SOI growth area excludes the area within the current city limit.)																		
Ag Residential/Rural Residential	404.7	2.0	Business Park	111.0	0.80	88.8	Business Park	-	0.80	-	Business Park	-	0.80	-	Business Park	-	0.80	-
Agriculture	155.1	-	Community Commercial	40.8	0.80	32.6	Community Commercial	40.8	0.80	32.6	Community Commercial	40.8	0.80	32.6	Community Commercial	40.8	0.80	32.6
Auto Commercial	19.8	-	Community Facilities	15.5	0.80	12.4	Community Facilities	15.5	0.80	12.4	Community Facilities	15.5	0.80	12.4	Community Facilities	15.5	0.80	12.4
Duplex/Two Family Residential	30.5	-	General Industrial	74.6	0.80	59.7	General Industrial	74.6	0.80	59.7	General Industrial	74.6	0.80	59.7	General Industrial	74.6	0.80	59.7
Educational Facility	96.3	-	High Density Residential	37.8	0.80	30.3	High Density Residential	37.8	0.80	30.3	High Density Residential	16.7	0.80	13.3	High Density Residential	37.8	0.80	30.3
General Industrial	104.7	-	Highway Commercial	12.5	0.80	10.0	Highway Commercial	12.5	0.80	10.0	Highway Commercial	12.5	0.80	10.0	Highway Commercial	12.5	0.80	10.0
General/Retail Commercial	11.6	1.0	Industrial Reserve	76.5	1.00	76.5	Industrial Reserve	1.4	1.00	1.4	Industrial Reserve	1.4	1.00	1.4	Industrial Reserve	1.4	1.00	1.4
Hospital/Nursing Facility	1.5	-	Light Industrial	48.1	0.80	38.5	Light Industrial	48.1	0.80	38.5	Light Industrial	48.1	0.80	38.5	Light Industrial	48.1	0.80	38.5
Light Industrial	55.0	-	Low Density Residential	913.8	0.85	776.7	Low Density Residential	913.8	0.85	776.7	Low Density Residential	913.8	0.85	776.7	Low Density Residential	894.6	0.85	760.4
Mixed Use Residential	13.3	-	Medium Density Residential	157.5	0.80	126.0	Medium Density Residential	157.5	0.80	126.0	Medium Density Residential	157.5	0.80	126.0	Medium Density Residential	157.5	0.80	126.0
Mobile Homes	20.9	-	Medium High Density Residential	87.0	0.80	69.6	Medium High Density Residential	87.0	0.80	69.6	Medium High Density Residential	83.0	0.80	66.4	Medium High Density Residential	87.0	0.80	69.6
Multi Family Residential	32.5	-	Neighborhood Commercial	9.9	0.80	7.9	Neighborhood Commercial	9.9	0.80	7.9	Neighborhood Commercial	9.9	0.80	7.9	Neighborhood Commercial	29.0	0.80	23.2
Parks/Open Space/Greenways	2.7	-	Railroad ROW	7.8	1.00	7.8	Railroad ROW	7.8	1.00	7.8	Railroad ROW	7.8	1.00	7.8	Railroad ROW	7.8	1.00	7.8
Public Facility	15.5	-	Regional Commercial	-	0.80	-	Regional Commercial	140.3	0.80	112.3	Regional Commercial	91.9	0.80	73.6	Regional Commercial	140.3	0.80	112.3
Religious Facilities/Institutional	55.3	1.0	Right of Way	1.7	1.00	1.7	Right of Way	1.7	1.00	1.7	Right of Way	1.7	1.00	1.7	Right of Way	1.7	1.00	1.7
Road ROW	19.3	-	Schools	95.1	0.80	76.0												
Single Family Residential	836.9	2.2	Service Commercial	117.2	0.80	93.8	Service Commercial	117.2	0.80	93.8	Service Commercial	190.7	0.80	152.6	Service Commercial	117.2	0.80	93.8
Utilities	2.8	-	Very Low Density Residential	185.9	0.80	148.7	Very Low Density Residential	185.9	0.80	148.7	Very Low Density Residential	185.9	0.80	148.7	Very Low Density Residential	185.9	0.80	148.7
Vacant	143.5	-	Commercial Recreation	29.4	0.80	23.5	Commercial Recreation	-	0.80	-	Commercial Recreation	-	0.80	-	Commercial Recreation	-	0.80	-
Subtotal	2,021.9	6.2	Subtotal	2,021.9		1,680.4	Subtotal	1,946.8		1,605.3	Subtotal	1,946.8		1,605.3	Subtotal	1,946.8		1,604.3
Outside Current SOI																		
Ag Residential/Rural Residential	2,547.7	-	Agriculture	3,513.9	0.80	2,811.1	Agriculture	3,513.9	0.80	2,811.1	Agriculture	3,455.2	0.80	2,764.2	Agriculture	3,388.1	0.80	2,710.5
Agriculture	2,616.4	-	General Industrial	-	0.80	-	General Industrial	-	0.80	-	General Industrial	180.6	0.80	144.5	General Industrial	81.4	0.80	65.2
Auto Commercial	4.6	-	Highway Commercial	6.8	0.80	5.4	Highway Commercial	6.8	0.80	5.4	Highway Commercial	6.8	0.80	5.4	Highway Commercial	6.8	0.80	5.4
Duplex/Two Family Residential	13.9	-	Industrial Reserve	310.0	0.80	248.0	Industrial Reserve	18.7	0.80	15.0	Industrial Reserve	16.3	0.80	13.0	Industrial Reserve	31.2	0.80	25.0
Educational Facility	19.6	-	Low Density Residential	243.2	0.80	194.6	Low Density Residential	243.2	0.80	194.6	Low Density Residential	172.5	0.80	138.0	Low Density Residential	427.6	0.80	342.1
General Industrial	67.4	-	Medium Density Residential	10.7	0.80	8.5	Medium Density Residential	10.7	0.80	8.5	Medium Density Residential	10.7	0.80	8.5	Medium Density Residential	10.7	0.80	8.5
Golf Course	15.5	-	Parks	20.1	0.80	16.1												
Mixed Use Residential	6.0	-	Regional Commercial	-	0.80	-	Regional Commercial	145.8	0.80	116.6	Regional Commercial	121.3	0.80	97.1	Regional Commercial	155.3	0.80	124.3
Mobile Homes	46.5	-	Residential Agriculture	123.3	0.80	98.7	Residential Agriculture	123.3	0.80	98.7	Residential Agriculture	123.3	0.80	98.7	Residential Agriculture	-	0.80	-
Multi Family Residential	8.3	-	Regional Parks	-	0.80	-	Regional Parks	-	0.80	-	Regional Parks	-	0.80	-	Regional Parks	56.2	0.80	44.9
Parks/Open Space/Greenways	31.0	-	Residential Reserve	506.9	0.80	405.6	Residential Reserve	506.9	0.80	405.6	Residential Reserve	506.9	0.80	405.6	Residential Reserve	506.9	0.80	405.6
Religious Facilities/Institutional	0.7	-	Right of Way	11.9	0.80	9.5	Right of Way	11.9	0.80	9.5	Right of Way	11.9	0.80	9.5	Right of Way	11.9	0.80	9.5
Road ROW	1.0	-	Schools	19.6	0.80	15.7												
Service Station	2.2	-	Service Commercial	9.1	0.80	7.2	Service Commercial	9.1	0.80	7.2	Service Commercial	43.1	0.80	34.5	Service Commercial	9.1	0.80	7.2
Single Family Residential	239.3	-	Very Low Density Residential	518.5	0.80	414.8	Very Low Density Residential	518.5	0.80	414.8	Very Low Density Residential	518.5	0.80	414.8	Very Low Density Residential	90.6	0.80	72.5
Utilities	10.3	-	Commercial Recreation	145.8	0.80	116.6	Commercial Recreation	-	0.80	-	Commercial Recreation	-	0.80	-	Commercial Recreation	-	0.80	-
Vacant	7.7	-		-	0.80	-		-	0.80	-		-	0.80	-		-	0.80	-
Subtotal	5,637.9	-	Subtotal	5,439.8		4,351.8	Subtotal	5,148.5		4,118.8	Subtotal	5,206.9		4,165.5	Subtotal	4,815.5		3,852.4
West Landing Specific Plan																		
Ag Residential/Rural Residential	136.4	-	Business Park	72.7	0.80	58.2	Business Park	72.7	0.80	58.2	Business Park	72.7	0.80	58.2	Business Park	72.7	0.80	58.2
Agriculture	320.2	-	Community Commercial	17.1	0.80	13.7	Community Commercial	17.1</										

Table 1. Land Uses

Existing Land Uses			Current General Plan					Alternative 1			Alternative 2			Alternative 3				
Land Use Designation	Area, acres	Sewered Acres, acres	Land Use Designation	Area, acres	Conversion Factor to Net Area	Net Area, acres	Land Use Designation	Area, acres	Conversion Factor to Net Area	Net Area, acres	Land Use Designation	Area, acres	Conversion Factor to Net Area	Net Area, acres	Land Use Designation	Area, acres	Conversion Factor to Net Area	Net Area, acres
Within Current City Limits (Excluding West Landing Specific Plan)																		
Ag Residential/Rural Residential	61.8	104.0	Business Park	23.7	1.00	23.7	Business Park	23.7	1.00	23.7	Business Park	23.7	1.00	23.7	Business Park	23.7	1.00	23.7
Auto Commercial	34.6	34.6	Commercial Recreation	55.5	0.90	49.9	Commercial Recreation	55.5	0.90	49.9	Commercial Recreation	55.5	0.90	49.9	Commercial Recreation	55.5	0.90	49.9
Cemetery	22.1	-	Community Commercial	218.3	1.00	218.3	Community Commercial	218.3	1.00	218.3	Community Commercial	218.3	1.00	218.3	Community Commercial	218.3	1.00	218.3
Duplex/Two Family Residential	38.4	38.4	Community Facilities	245.3	0.80	196.3	Community Facilities	245.3	0.80	196.3	Community Facilities	245.3	0.80	196.3	Community Facilities	245.3	0.80	196.3
Educational Facility	203.2	203.2	Downtown Mixed Use	13.3	1.00	13.3	Downtown Mixed Use	13.3	1.00	13.3	Downtown Mixed Use	13.3	1.00	13.3	Downtown Mixed Use	13.3	1.00	13.3
General Industrial	324.4	324.4	Downtown Office	10.9	1.00	10.9	Downtown Office	10.9	1.00	10.9	Downtown Office	10.9	1.00	10.9	Downtown Office	10.9	1.00	10.9
General/Retail Commercial	173.4	173.4	Downtown Residential	27.4	1.00	27.4	Downtown Residential	27.4	1.00	27.4	Downtown Residential	27.4	1.00	27.4	Downtown Residential	27.4	1.00	27.4
Golf Course	65.5	65.5	General Industrial	335.2	1.00	335.2	General Industrial	335.2	1.00	335.2	General Industrial	335.2	1.00	335.2	General Industrial	387.7	1.00	387.7
Hospital/Nursing Facility	5.8	5.8	High Density Residential	30.3	1.00	30.3	High Density Residential	30.3	1.00	30.3	High Density Residential	30.3	1.00	30.3	High Density Residential	30.3	1.00	30.3
Light Industrial	98.9	98.9	Highway Commercial	82.8	1.00	82.8	Highway Commercial	82.8	1.00	82.8	Highway Commercial	82.8	1.00	82.8	Highway Commercial	82.8	1.00	82.8
Mixed Use Residential	13.5	13.5	Light Industrial	178.0	1.00	178.0	Light Industrial	178.0	1.00	178.0	Light Industrial	178.0	1.00	178.0	Light Industrial	178.0	1.00	178.0
Mobile Homes	79.5	79.5	Low Density Residential	1,626.2	1.00	1,626.2	Low Density Residential	1,626.2	1.00	1,626.2	Low Density Residential	1,626.2	1.00	1,626.2	Low Density Residential	1,626.2	1.00	1,626.2
Multi Family Residential	141.5	141.5	Medium Density Residential	332.1	1.00	332.1	Medium Density Residential	332.1	1.00	332.1	Medium Density Residential	332.1	1.00	332.1	Medium Density Residential	332.1	1.00	332.1
Office	39.4	39.4	Medium High Density Residential	64.6	1.00	64.6	Medium High Density Residential	64.6	1.00	64.6	Medium High Density Residential	64.6	1.00	64.6	Medium High Density Residential	64.6	1.00	64.6
Parks/Open Space/Greenways	156.3	-	Neighborhood Commercial	25.8	1.00	25.8	Neighborhood Commercial	25.8	1.00	25.8	Neighborhood Commercial	25.8	1.00	25.8	Neighborhood Commercial	25.8	1.00	25.8
Public Facility	20.9	20.9	Office	26.4	1.00	26.4												
Public Parking	0.8	-	Parks	174.1	0.90	156.7												
Religious Facilities/Institutional	85.2	85.2	Regional Commercial	95.2	1.00	95.2	Regional Commercial	95.2	1.00	95.2	Regional Commercial	95.2	1.00	95.2	Regional Commercial	95.2	1.00	95.2
Road ROW	1.1	-	Right of Way	1.1	1.00	1.1	Right of Way	1.1	1.00	1.1	Right of Way	1.1	1.00	1.1	Right of Way	1.1	1.00	1.1
Service Station	11.4	11.4	Schools	158.0	1.00	158.0												
Single Family Residential	1,821.2	1,821.2	Service Commercial	39.8	1.00	39.8	Service Commercial	39.8	1.00	39.8	Service Commercial	39.8	1.00	39.8	Service Commercial	39.8	1.00	39.8
Townhomes	13.7	13.7	Very Low Density Residential	196.5	0.90	176.8	Very Low Density Residential	196.5	0.90	176.8	Very Low Density Residential	196.5	0.90	176.8	Very Low Density Residential	144.0	0.90	129.6
Utilities	204.5	-																
Vacant	343.3	-																
Subtotal	3,960.3	3,274.4	Total	3,960.5		3,868.9	Total	3,960.5		3,868.9	Total	3,960.5		3,868.9	Total	3,960.5		3,874.1
Grand Total	12,591.8	3,657.1	Grand Total	12,393.9			Grand Total	12,027.5			Grand Total	12,085.9			Grand Total	11,694.5		

Notes:

- Only about 10% of the industrial reserve and none of the residential reserve are projected to developed at buildout. The specific areas used in this table were developed from the GIS land use mapping.
- Sewered acres for the existing condition within SOI, but excluding Whitmore Ranch Specific Plan, were estimated from GIS.
- The Current General Plan land uses with no areas were received from D&B, and were developed from the land use GIS mapping.

CURRENT AND PROJECTED FUTURE WASTEWATER FLOWS

The City's Sewer System Master Plan (Master Plan) dated July, 2013 reported the following:

- The Average Sanitary Flow (ASF) flow to the City's Wastewater Treatment Plant (WWTP) was 3.03 million gallons per day (mgd), based on influent data from 1999 to 2008.
- The Average Dry Weather Flow (ADWF) flow to the City's WWTP was 3.07 mgd.
- The Peak Day Flow (PDF) was 4.07 mgd.
- In the master plan, wastewater generation rates were based on the amount of flow per equivalent dwelling unit (EDU). Based on an evaluation of recorded influent flows at the City's WWTP in 2007, a wastewater generation rate of 260 gallons per day per EDU (gpd/EDU) was developed.
- EDU densities for various land uses were also provided.
- A peaking factor of 1.5 was established, to determine the peak hourly flow, excluding infiltration and inflow (I/I).
- A unitless EDU factor of 0.87 was developed for Medium, Medium High, and High Density Residential developments.
- To account for infiltration and inflow (I/I), a factor of 1,500 gpd/acre was recommended. I/I accounts for rainfall and groundwater that leaks into the wastewater system.

Based on the City's 1997 General Plan land uses, the Master Plan (Table 2-9) projected the following:

- An ASF of 10.2 mgd at the City's WWTP, with an additional 1.3 mgd from the North Ceres Sewer Service Area (NCSSA) going to the City of Modesto (Modesto).
- A PDF of 15.3 mgd at the City's WWTP, with an additional PDF of 1.9 mgd from the NCSSA to Modesto.
- A Peak Hour Flow (PHF) of 26 mgd from the City, with a PHF of 4.0 mgd from the NCSSA to Modesto.

Table 1, above, presents the land use data in a format suitable for estimating wastewater flows, where gross areas are multiplied by a conversion factor to obtain the net area of development, in acres.

Table 2 presents the wastewater flow factors used for this wastewater flow projection, as discussed below:

- The wastewater flow factors for various land uses were developed from the EDU densities and the EDU factor of 260 gpd/EDU, provided by the Master Plan. For schools, the Master Plan specified 48 students/acre, but no flow factor. Therefore, a generally accepted factor of 25 gpd/student was used, yielding a flow factor of 1,200 gpd/acre. Flow factors for golf courses; hospitals and nursing facilities; parks, open spaces and greenways; and religious facilities were not provided in the Ceres

Sewer Master Plan. Consequently, appropriate flow factors for these land uses were taken from the City of Stockton Wastewater Master Plan (October 2008). Other missing flow factors were inferred from similar land use types. Because of the State-mandated water conservation requirements, the residential flow factor is expected to decrease in the future, but flow factors for future flows should be conservative (slightly high) to allow for variations from the actual historical flows.

- To calculate the PHF, the average day flow was multiplied by the peaking factor of 1.5 specified in the Master Plan and I/I of 1,500 gpd/acre was added. I/I was not included for land uses not receiving sewer service, including Railroad Right of Way, Right of Way, Agriculture, Residential Reserve, and undeveloped Industrial Reserve.

The ASF projection presented in Table 3 was calculated by multiplying the net area for each land use type from Table 1 by the appropriate flow factor from Table 2.

- For the current General Plan land use flow projection in Table 3, ASFs were calculated for all of the Residential Reserve areas and for all of the Industrial Reserve areas. This is the same approach as was used in the Master Plan. This approach provides a reasonable comparison between the ASF calculated in Table 3 for buildout of the current General Plan (9.4 mgd) and the ASF calculated in the Master Plan (10.2 mgd).
- As recommended by Dyett and Bhatia, for the LUAs it was assumed that none of the Residential Reserve and only a small area (about 10 percent) of the Industrial Reserve land uses would develop at buildout. Consequently, the flow projections for the LUAs include no ASF from the Residential Reserve land use and only a small ASF from the small area of Industrial Reserve projected to develop.

As shown in Table 3, the total existing conditions ASF to the City's WWTP is estimated at 3.8 mgd, which includes approximately 1.0 mgd that flows into the City's WWTP, but is subsequently sent to the City of Turlock (Turlock) WWTP. This value also reflects the fact that about 25 percent of the City falls within the NCSSA and the Master Plan projected the ASF from the NCSSA would reach 1.3 mgd at buildout. Wastewater from the NCSSA flows to Modesto's Sutter WWTP. Also, 280 connections within the City are served by local septic systems. The estimated existing ASF of 3.8 mgd is significantly higher than the 2.7 mgd flow reported by the City in 2016, and somewhat higher than the 3.03 mgd ASF reported for 2007 in the Master Plan. However, conservatism in the flow factors designated by the Master Plan are a likely and expected cause of these higher flow estimates.

The buildout PHFs for existing land use, the current General Plan, and each of the growth areas are presented in Table 4. The PHFs are used for planning and sizing the trunk sewers needed to serve the GPU LUAs. As shown in Table 4, the total PHF for the City at buildout of the current General Plan was estimated to be 27.9 mgd, which compares well with the total PHF at buildout estimated in the Master Plan of 30.0 mgd. The PHFs for the LUAs range from 24.6 mgd to 25.0 mgd, with PHFs to the City's WWTP ranging from 20.3 mgd to 20.8 mgd.

Table 2. Sewer Flow Factors

Existing Land Use Flow Factors		Future Land Use Flow Factors	
Existing Land Uses	flow factor, gpd/acre	Future Land Uses	flow factor, gpd/acre
Ag Residential/Rural Residential	104	Agriculture	-
Agriculture	-	Business Park	468
Auto Commercial	36	Commercial Recreation	36
Cemetery	-	Community Commercial	468
Duplex/Two Family Residential	1,560	Community Facilities	988
Educational Facility	-	Downtown Mixed Use	468
General Industrial	1,326	Downtown Office	988
General/Retail Commercial	468	Downtown Residential	2,470
Golf Course	240	General Industrial	1,326
Hospital/Nursing Facility	1,600	High Density Residential	4,185
Light Industrial	1,326	Highway Commercial	468
Mixed Use Residential	2,470	Industrial Reserve	1,326
Mobile Homes	2,470	Light Industrial	1,326
Multi Family Residential	4,810	Low Density Residential	1,560
Office	988	Medium Density Residential	2,149
Parks/Open Space/Greenways	240	Medium High Density Residential	3,110
Public Facility	988	Neighborhood Commercial	468
Public Parking	-	Office	988
Religious Facilities/Institutional	1,600	Parks	240
Road ROW	-	Railroad ROW	-
Service Station	468	Regional Commercial	468
Single Family Residential	1,560	Regional Parks	240
Townhomes	2,470	Residential Agriculture	104
Utilities	-	Residential Reserve	2,340
Vacant	-	Right of Way	-
		Schools	1,200
		Service Commercial	468
		Very Low Density Residential	1,040

Notes:

1. Buildout Condition Flow Factors are based on EDU densities provided in Table 2-2 multiplied by the wastewater generation rate of 260 gpd/EDU, from the City of Ceres Sewer Master Plan (July 2013), prepared by Stantec.
2. EDU densities for land uses not specified in the Master Plan were inferred from similar land uses.
3. A flow factor for Schools was assumed at 1,200 gpd/acre.
4. Flow factors for Golf Course, Hospital/Nursing Facility, Parks/Open Space/Greenway, Religious Facilities/Institutional, Parks, and Regional Parks were not provided in the Ceres Sewer Master Plan. Consequently, appropriate flow factors for these land uses were taken from the City of Stockton Wastewater Master Plan (October 2008).

Table 3. Average Sanitary Flows

Existing Land Uses				Current General Plan			Alternative 1			Alternative 2			Alternative 3		
Land Use Designation	Area, acres	Flow Factor, GPD/acre	Sewer Flows, gpd	Current General Plan	Net Area, acres	Flow Factor, GPD/acre	Sewer Flows, gpd	Land Use Designation	Net Area, acres	Flow Factor, GPD/acre	Sewer Flows, gpd	Land Use Designation	Net Area, acres	Flow Factor, GPD/acre	Sewer Flows, gpd
Inside Current SOI (Excluding Whitmore Ranch Specific Plan) (Note: The Inside Current SOI growth area excludes the area within the current city limit.)															
Ag Residential/Rural Residential	2.0	104	208	Business Park	88.8	468	41,543	Business Park	-	468	-	Business Park	-	468	-
Agriculture	-	-	-	Community Commercial	32.6	468	15,268	Community Commercial	32.6	468	15,268	Community Commercial	32.6	468	15,268
Auto Commercial	-	36	-	Community Facilities	12.4	988	12,254	Community Facilities	12.4	988	12,254	Community Facilities	12.4	988	12,254
Duplex/Two Family Residential	-	1,560	-	General Industrial	59.7	1,326	79,158	General Industrial	59.7	1,326	79,158	General Industrial	59.7	1,326	79,158
Educational Facility	-	-	-	High Density Residential	30.3	4,185	126,661	High Density Residential	30.3	4,185	126,661	High Density Residential	30.3	4,185	126,661
General Industrial	-	1,326	-	Highway Commercial	10.0	468	4,683	Highway Commercial	10.0	468	4,683	Highway Commercial	10.0	468	4,683
General/Retail Commercial	1.0	468	468	Industrial Reserve	76.5	1,326	101,391	Industrial Reserve	1.4	1,326	1,856	Industrial Reserve	1.4	1,326	1,856
Hospital/Nursing Facility	-	1,600	-	Light Industrial	38.5	1,326	51,017	Light Industrial	38.5	1,326	51,017	Light Industrial	38.5	1,326	51,017
Light Industrial	-	1,326	-	Low Density Residential	776.7	1,560	1,211,639	Low Density Residential	776.7	1,560	1,211,639	Low Density Residential	760.4	1,560	1,186,266
Mixed Use Residential	-	2,470	-	Medium Density Residential	126.0	2,149	270,744	Medium Density Residential	126.0	2,149	270,744	Medium Density Residential	126.0	2,149	270,744
Mobile Homes	-	2,470	-	Medium High Density Residential	69.6	3,110	216,382	Medium High Density Residential	69.6	3,110	216,382	Medium High Density Residential	69.6	3,110	216,382
Multi Family Residential	-	4,810	-	Neighborhood Commercial	7.9	468	3,697	Neighborhood Commercial	7.9	468	3,697	Neighborhood Commercial	7.9	468	3,697
Parks/Open Space/Greenways	-	240	-	Railroad ROW	7.8	-	-	Railroad ROW	7.8	-	-	Railroad ROW	7.8	-	-
Public Facility	-	988	-	Regional Commercial	-	468	-	Regional Commercial	112.3	468	52,534	Regional Commercial	73.6	468	34,423
Religious Facilities/Institutional	1.0	1,600	1,600	Right of Way	1.7	-	-	Right of Way	1.7	-	-	Right of Way	1.7	-	-
Road ROW	-	-	-	Schools	76.0	1,200	91,250	Schools	76.0	1,200	91,250	Schools	76.0	1,200	91,250
Single Family Residential	2.2	1,560	3,432	Service Commercial	93.8	468	43,880	Service Commercial	93.8	468	43,880	Service Commercial	152.6	468	71,411
Utilities	-	-	-	Very Low Density Residential	148.7	1,040	154,687	Very Low Density Residential	148.7	1,040	154,687	Very Low Density Residential	148.7	1,040	154,687
Vacant	-	-	-	Commercial Recreation	23.5	36	855	Commercial Recreation	-	36	-	Commercial Recreation	-	36	-
Subtotal	6.2		5,708	Subtotal	1,680.4		2,425,109	Subtotal	1,605.3		2,335,711	Subtotal	1,605.3		2,264,329
Outside Current SOI															
Ag Residential/Rural Residential	-	104	-	Agriculture	2,811.1	-	-	Agriculture	2,811.1	-	-	Agriculture	2,764.2	-	-
Agriculture	-	-	-	General Industrial	-	1,326	-	General Industrial	-	1,326	-	General Industrial	144.5	1,326	191,621
Auto Commercial	-	36	-	Highway Commercial	5.4	468	2,546	Highway Commercial	5.4	468	2,546	Highway Commercial	5.4	468	2,546
Duplex/Two Family Residential	-	1,560	-	Industrial Reserve	248.0	1,326	328,848	Industrial Reserve	15.0	1,326	19,837	Industrial Reserve	13.0	1,326	17,291
Educational Facility	-	-	-	Low Density Residential	194.6	1,560	303,560	Low Density Residential	194.6	1,560	303,560	Low Density Residential	138.0	1,560	215,246
General Industrial	-	1,326	-	Medium Density Residential	8.5	2,149	18,322	Medium Density Residential	8.5	2,149	18,322	Medium Density Residential	8.5	2,149	18,322
Golf Course	-	240	-	Parks	16.1	240	3,852	Parks	16.1	240	3,852	Parks	16.1	240	3,852
Mixed Use Residential	-	2,470	-	Regional Commercial	-	468	-	Regional Commercial	116.6	468	54,573	Regional Commercial	97.1	468	45,421
Mobile Homes	-	2,470	-	Residential Agriculture	98.7	104	10,262	Residential Agriculture	98.7	104	10,262	Residential Agriculture	98.7	104	10,262
Multi Family Residential	-	4,810	-	Regional Parks	-	240	-	Regional Parks	-	240	-	Regional Parks	-	240	10,784
Parks/Open Space/Greenways	-	240	-	Residential Reserve	405.6	2,340	948,997	Residential Reserve	-	2,340	-	Residential Reserve	-	2,340	-
Religious Facilities/Institutional	-	1,600	-	Right of Way	9.5	-	-	Right of Way	9.5	-	-	Right of Way	9.5	-	-
Road ROW	-	-	-	Schools	15.7	1,200	18,840	Schools	15.7	1,200	18,840	Schools	15.7	1,200	18,840
Service Station	-	468	-	Service Commercial	7.2	468	3,391	Service Commercial	7.2	468	3,391	Service Commercial	34.5	468	16,123
Single Family Residential	-	1,560	-	Very Low Density Residential	414.8	1,040	431,418	Very Low Density Residential	414.8	1,040	431,418	Very Low Density Residential	414.8	1,040	431,418
Utilities	-	-	-	Commercial Recreation	116.6	36	4,245	Commercial Recreation	-	36	-	Commercial Recreation	-	36	-
Subtotal	-	-	-	Subtotal	4,351.8		2,074,281	Subtotal	3,713.2		866,601	Subtotal	3,759.9		970,942
West Landing Specific Plan															
Ag Residential/Rural Residential	-	104	-	Business Park	58.2	468	27,237	Business Park	58.2	468	27,237	Business Park	58.2	468	27,237
Agriculture	-	-	-	Community Commercial	13.7	468	6,416	Community Commercial	13.7	468	6,416	Community Commercial	13.7	468	6,416
Duplex/Two Family Residential	0.6	1,560	898	Community Facilities	142.4	988	140,695	Community Facilities	142.4	988	140,695	Community Facilities	142.4	988	140,695
General Industrial	109.2	1,326	144,841	General Industrial	102.1	1,326	135,446	General Industrial	102.1	1,326	135,446	General Industrial	102.1	1,326	135,446
General/Retail Commercial	18.9	468	8,830	High Density Residential	20.8	4,185	87,053	High Density Residential	20.8	4,185	87,053	High Density Residential	20.8	4,185	87,053
Mixed Use Residential	0.7	2,470	1,815	Low Density Residential	150.0	1,560	234,044	Low Density Residential	150.0	1,560	234,044	Low Density Residential	150.0	1,560	234,044
Public Facility	178.0	988	175,869	Medium Density Residential	46.2	2,149	99,312	Medium Density Residential	46.2	2,149	99,312	Medium Density Residential	46.2	2,149	99,312
Religious Facilities/Institutional	1.6	1,600	2,535	Medium High Density Residential	31.1	3,110	96,628	Medium High Density Residential	31.1	3,110	96,628	Medium High Density Residential	31.1	3,110	96,628
Single Family Residential	18.8	1,560	29,388	Neighborhood Commercial	28.3	468	13,250	Neighborhood Commercial	28.3	468	13,250	Neighborhood Commercial	28.3	468	13,250
Utilities	-	-	-	Office	14.7	988	14,557	Office	14.7	988	14,557	Office	14.7	988	14,557
Vacant</															

Table 3. Average Sanitary Flows

Existing Land Uses				Current General Plan			Alternative 1			Alternative 2			Alternative 3					
Land Use Designation	Area, acres	Flow Factor, GPD/acre	Sewer Flows, gpd	Current General Plan	Net Area, acres	Flow Factor, GPD/acre	Sewer Flows, gpd	Land Use Designation	Net Area, acres	Flow Factor, GPD/acre	Sewer Flows, gpd	Land Use Designation	Net Area, acres	Flow Factor, GPD/acre	Sewer Flows, gpd			
Whitmore Ranch Specific Plan																		
Educational Facility	39.4	-	-	Low Density Residential	23.1	1,560	36,077	Low Density Residential	23.1	1,560	36,077	Low Density Residential	23.1	1,560	36,077			
Mixed Use Residential	4.4	2,470	10,948	Medium Density Residential	10.3	2,149	22,046	Medium Density Residential	10.3	2,149	22,046	Medium Density Residential	10.3	2,149	22,046			
Single Family Residential	4.8	1,560	7,542	Medium High Density Residential	4.8	3,110	14,835	Medium High Density Residential	4.8	3,110	14,835	Medium High Density Residential	4.8	3,110	14,835			
Vacant	-	-	-	Parks	6.2	240	1,484	Parks	6.2	240	1,484	Parks	6.2	240	1,484			
				Schools	39.4	1,200	47,307	Schools	39.4	1,200	47,307	Schools	39.4	1,200	47,307			
Subtotal	48.7			Subtotal	83.8		121,749	Subtotal	83.8		121,749	Subtotal	83.8		121,749			
Within Current City Limits (Excluding West Landing Specific Plan)																		
Ag Residential/Rural Residential	104.0	104	10,816	Business Park	23.7	468	11,088	Business Park	23.7	468	11,088	Business Park	23.7	468	11,088			
Auto Commercial	34.6	36	1,260	Commercial Recreation	49.9	36	1,817	Commercial Recreation	49.9	36	1,817	Commercial Recreation	49.9	36	1,817			
Cemetery	-	-	-	Community Commercial	218.3	468	102,185	Community Commercial	218.3	468	102,185	Community Commercial	218.3	468	102,185			
Duplex/Two Family Residential	38.4	1,560	59,847	Community Facilities	196.3	988	193,898	Community Facilities	196.3	988	193,898	Community Facilities	196.3	988	193,898			
Educational Facility	203.2	-	-	Downtown Mixed Use	13.3	468	6,228	Downtown Mixed Use	13.3	468	6,228	Downtown Mixed Use	13.3	468	6,228			
General Industrial	324.4	1,326	430,192	Downtown Office	10.9	988	10,741	Downtown Office	10.9	988	10,741	Downtown Office	10.9	988	10,741			
General/Retail Commercial	173.4	468	81,144	Downtown Residential	27.4	2,470	67,615	Downtown Residential	27.4	2,470	67,615	Downtown Residential	27.4	2,470	67,615			
Golf Course	65.5	240	15,720	General Industrial	335.2	1,326	444,489	General Industrial	335.2	1,326	444,489	General Industrial	335.2	1,326	444,489			
Hospital/Nursing Facility	5.8	1,600	9,239	High Density Residential	30.3	4,185	126,999	High Density Residential	30.3	4,185	126,999	High Density Residential	30.3	4,185	126,999			
Light Industrial	98.9	1,326	131,176	Highway Commercial	82.8	468	38,762	Highway Commercial	82.8	468	38,762	Highway Commercial	82.8	468	38,762			
Mixed Use Residential	13.5	2,470	33,329	Light Industrial	178.0	1,326	236,005	Light Industrial	178.0	1,326	236,005	Light Industrial	178.0	1,326	236,005			
Mobile Homes	79.5	2,470	196,259	Low Density Residential	1,626.2	1,560	2,536,851	Low Density Residential	1,626.2	1,560	2,536,851	Low Density Residential	1,626.2	1,560	2,536,851			
Multi Family Residential	141.5	4,810	680,691	Medium Density Residential	332.1	2,149	713,750	Medium Density Residential	332.1	2,149	713,750	Medium Density Residential	332.1	2,149	713,750			
Office	39.4	988	38,906	Medium High Density Residential	64.6	3,110	200,894	Medium High Density Residential	64.6	3,110	200,894	Medium High Density Residential	64.6	3,110	200,894			
Parks/Open Space/Greenways	-	240	-	Neighborhood Commercial	25.8	468	12,077	Neighborhood Commercial	25.8	468	12,077	Neighborhood Commercial	25.8	468	12,077			
Public Facility	20.9	988	20,687	Office	26.4	988	26,071	Office	26.4	988	26,071	Office	26.4	988	26,071			
Public Parking	-	-	-	Parks	156.7	240	37,611	Parks	156.7	240	37,611	Parks	156.7	240	37,611			
Religious Facilities/Institutional	85.2	1,600	136,262	Regional Commercial	95.2	468	44,545	Regional Commercial	95.2	468	44,545	Regional Commercial	95.2	468	44,545			
Road ROW	-	-	-	Right of Way	1.1	-	-	Right of Way	1.1	-	-	Right of Way	1.1	-	-			
Service Station	11.4	468	5,332	Schools	158.0	1,200	189,657	Schools	158.0	1,200	189,657	Schools	158.0	1,200	189,657			
Single Family Residential	1,821.2	1,560	2,841,150	Service Commercial	39.8	468	18,625	Service Commercial	39.8	468	18,625	Service Commercial	39.8	468	18,625			
Townhomes	13.7	2,470	33,773	Very Low Density Residential	176.8	1,040	183,878	Very Low Density Residential	176.8	1,040	183,878	Very Low Density Residential	176.8	1,040	183,878			
Utilities	-	-	-															
Vacant	-	-	-															
Subtotal	3,274.4		4,725,781	Subtotal	3,868.9		5,203,782	Subtotal	3,868.9		5,203,782	Subtotal	3,868.9		5,203,782	Subtotal	3,874.1	5,224,255
Grand Total	3,657.1		5,114,155	Grand Total	10,686.3		10,732,574	Grand Total	9,972.7		9,435,496	Grand Total	10,019.4		9,468,456	Grand Total	9,710.5	9,415,568
Projected NCSSA Flow to Modesto			1,278,539	Projected NCSSA Flow to Modesto (from Table 2-9 of the Master Plan)			1,300,000	Projected NCSSA Flow to Modesto (from Table 2-9 of the Master Plan)			1,300,000	Projected NCSSA Flow to Modesto (from Table 2-9 of the Master Plan)			1,300,000	Projected NCSSA Flow to Modesto (from Table 2-9 of the Master Plan)		1,300,000
Projected Flow to Turlock			1,000,000	Projected Flow to Turlock			2,000,000	Projected Flow to Turlock			2,000,000	Projected Flow to Turlock			2,000,000	Projected Flow to Turlock		2,000,000
Estimated Flows to Local Septic			72,800	Estimated Flows to Local Septic			72,800	Estimated Flows to Local Septic			72,800	Estimated Flows to Local Septic			72,800	Estimated Flows to Local Septic		72,800
Projected Flow to Ceres WWTP			3,762,817	Projected Flow to Ceres WWTP			9,359,774	Projected Flow to Ceres WWTP			8,062,696	Projected Flow to Ceres WWTP			8,095,656	Projected Flow to Ceres WWTP		8,042,768

Notes:
Only about 10% of the industrial reserve and none of the residential reserve are projected to develop at buildout. The specific areas used in this table were developed from the GIS land use mapping.
For all alternatives, none of the residential reserve is projected to develop.

Table 4. Peak Hour Flows

Existing Land Uses		Current General Plan		Alternative 1		Alternative 2		Alternative 3						
Land Use Designation	Sewer Flow, gpd	Land Use Designation	Sewer Flow, gpd	Land Use Designation	Sewer Flow, gpd	Land Use Designation	Sewer Flow, gpd	Land Use Designation	Sewer Flow, gpd					
Inside Current SOI (Excluding Whitmore Ranch Specific Plan) (Note: The Inside Current SOI growth area excludes the area within the current city limit.)														
Ag Residential/Rural Residential	3,312	Business Park	195,463	Business Park	-	Business Park	-	Business Park	-					
Agriculture	-	Community Commercial	71,838	Community Commercial	71,838	Community Commercial	71,838	Community Commercial	71,838					
Auto Commercial	-	Community Facilities	36,986	Community Facilities	36,986	Community Facilities	36,986	Community Facilities	36,986					
Duplex/Two Family Residential	-	General Industrial	208,282	General Industrial	208,282	General Industrial	208,282	General Industrial	208,282					
Educational Facility	-	High Density Residential	235,393	High Density Residential	235,393	High Density Residential	103,656	High Density Residential	235,393					
General Industrial	-	Highway Commercial	22,033	Highway Commercial	22,033	Highway Commercial	22,033	Highway Commercial	22,033					
General/Retail Commercial	2,202	Industrial Reserve	266,782	Industrial Reserve	4,885	Industrial Reserve	4,885	Industrial Reserve	4,885					
Hospital/Nursing Facility	-	Light Industrial	134,238	Light Industrial	134,238	Light Industrial	134,238	Light Industrial	134,238					
Light Industrial	-	Low Density Residential	2,982,496	Low Density Residential	2,982,496	Low Density Residential	2,982,496	Low Density Residential	2,920,039					
Mixed Use Residential	-	Medium Density Residential	595,103	Medium Density Residential	595,103	Medium Density Residential	595,103	Medium Density Residential	595,103					
Mobile Homes	-	Medium High Density Residential	428,930	Medium High Density Residential	428,930	Medium High Density Residential	409,273	Medium High Density Residential	428,930					
Multi Family Residential	-	Neighborhood Commercial	17,395	Neighborhood Commercial	17,395	Neighborhood Commercial	17,395	Neighborhood Commercial	51,103					
Parks/Open Space/Greenways	-	Railroad ROW	-	Railroad ROW	-	Railroad ROW	-	Railroad ROW	-					
Public Facility	-	Regional Commercial	-	Regional Commercial	247,180	Regional Commercial	161,967	Regional Commercial	247,180					
Religious Facilities/Institutional	3,900	Right of Way	2,537	Right of Way	2,537	Right of Way	2,537	Right of Way	2,537					
Road ROW	-	Schools	250,936	Schools	250,936	Schools	250,936	Schools	250,936					
Single Family Residential	8,448	Service Commercial	206,463	Service Commercial	206,463	Service Commercial	335,997	Service Commercial	206,463					
Utilities	-	Very Low Density Residential	455,136	Very Low Density Residential	455,136	Very Low Density Residential	455,136	Very Low Density Residential	455,136					
Vacant	-	Commercial Recreation	36,507	Commercial Recreation	-	Commercial Recreation	-	Commercial Recreation	-					
	Subtotal	17,862		Subtotal	6,146,521		Subtotal	5,899,833		Subtotal	5,792,760		Subtotal	5,871,085
Outside Current SOI														
Ag Residential/Rural Residential	-	Agriculture	-	Agriculture	-	Agriculture	-	Agriculture	-					
Agriculture	-	General Industrial	-	General Industrial	-	General Industrial	504,197	General Industrial	227,342					
Auto Commercial	-	Highway Commercial	11,978	Highway Commercial	11,978	Highway Commercial	11,978	Highway Commercial	11,978					
Duplex/Two Family Residential	-	Industrial Reserve	865,272	Industrial Reserve	52,195	Industrial Reserve	45,497	Industrial Reserve	87,085					
Educational Facility	-	Low Density Residential	747,224	Low Density Residential	747,224	Low Density Residential	529,835	Low Density Residential	1,313,604					
General Industrial	-	Medium Density Residential	40,273	Medium Density Residential	40,273	Medium Density Residential	40,273	Medium Density Residential	40,273					
Golf Course	-	Parks	29,857	Parks	29,857	Parks	29,857	Parks	29,857					
Mixed Use Residential	-	Regional Commercial	-	Regional Commercial	256,771	Regional Commercial	213,712	Regional Commercial	273,619					
Mobile Homes	-	Residential Agriculture	163,407	Residential Agriculture	163,407	Residential Agriculture	163,407	Residential Agriculture	-					
Multi Family Residential	-	Regional Parks	-	Regional Parks	-	Regional Parks	-	Regional Parks	83,576					
Parks/Open Space/Greenways	-	Residential Reserve	2,031,827	Residential Reserve	-	Residential Reserve	-	Residential Reserve	-					
Religious Facilities/Institutional	-	Right of Way	14,236	Right of Way	14,236	Right of Way	14,236	Right of Way	14,236					
Road ROW	-	Schools	51,811	Schools	51,811	Schools	51,811	Schools	51,811					
Service Station	-	Service Commercial	15,954	Service Commercial	15,954	Service Commercial	75,861	Service Commercial	15,954					
Single Family Residential	-	Very Low Density Residential	1,269,364	Very Low Density Residential	1,269,364	Very Low Density Residential	1,269,364	Very Low Density Residential	221,761					
Utilities	-	Commercial Recreation	181,279	Commercial Recreation	-	Commercial Recreation	-	Commercial Recreation	-					
Vacant	-													
	Subtotal	-		Subtotal	5,422,482		Subtotal	2,653,070		Subtotal	2,950,027		Subtotal	2,371,094
West Landing Specific Plan														
Ag Residential/Rural Residential	-	Business Park	128,154	Business Park	128,154	Business Park	128,154	Business Park	128,154					
Agriculture	-	Community Commercial	30,189	Community Commercial	30,189	Community Commercial	30,189	Community Commercial	30,189					
Duplex/Two Family Residential	2,211	Community Facilities	424,648	Community Facilities	424,648	Community Facilities	424,648	Community Facilities	424,648					
General Industrial	381,109	General Industrial	356,389	General Industrial	356,389	General Industrial	356,389	General Industrial	356,389					
General/Retail Commercial	41,548	High Density Residential	161,783	High Density Residential	161,783	High Density Residential	161,783	High Density Residential	161,783					
Mixed Use Residential	3,826	Low Density Residential	576,108	Low Density Residential	576,108	Low Density Residential	576,108	Low Density Residential	576,108					
Public Facility	530,810	Medium Density Residential	218,291	Medium Density Residential	218,291	Medium Density Residential	218,291	Medium Density Residential	218,291					
Religious Facilities/Institutional	6,179	Medium High Density Residential	191,542	Medium High Density Residential	191,542	Medium High Density Residential	191,542	Medium High Density Residential	191,542					
Single Family Residential	72,339	Neighborhood Commercial	62,344	Neighborhood Commercial	62,344	Neighborhood Commercial	62,344	Neighborhood Commercial	62,344					
Utilities	-	Office	43,937	Office	43,937	Office	43,937	Office	43,937					
Vacant	-	Parks	69,742	Parks	69,742	Parks	69,742	Parks	69,742					
		Regional Commercial	64,091	Regional Commercial	64,091	Regional Commercial	64,091	Regional Commercial	64,091					
		Schools	42,201	Schools	42,201	Schools	42,201	Schools	42,201					
		Very Low Density Residential	44,280	Very Low Density Residential	44,280	Very Low Density Residential	44,280	Very Low Density Residential	44,280					
	Subtotal	1,038,022		Subtotal	2,413,697		Subtotal	2,413,697		Subtotal	2,413,697			

Table 4. Peak Hour Flows

Existing Land Uses		Current General Plan		Alternative 1		Alternative 2		Alternative 3	
Land Use Designation	Sewer Flow, gpd	Land Use Designation	Sewer Flow, gpd	Land Use Designation	Sewer Flow, gpd	Land Use Designation	Sewer Flow, gpd	Land Use Designation	Sewer Flow, gpd
Whitmore Ranch Specific Plan									
Educational Facility	59,134	Low Density Residential	88,804						
Mixed Use Residential	23,070	Medium Density Residential	48,458						
Single Family Residential	18,565	Medium High Density Residential	29,408						
Vacant	-	Parks	11,503	Parks	11,503	Parks	11,503	Parks	11,503
		Schools	130,094	Schools	130,094	Schools	130,094	Schools	130,094
Subtotal	100,769	Subtotal	308,266	Subtotal	308,266	Subtotal	308,266	Subtotal	308,266
Within Current City Limits (Excluding West Landing Specific Plan)									
Ag Residential/Rural Residential	172,224	Business Park	52,169						
Auto Commercial	53,793	Commercial Recreation	77,586						
Cemetery	-	Community Commercial	480,792						
Duplex/Two Family Residential	147,317	Community Facilities	585,225						
Educational Facility	304,763	Downtown Mixed Use	29,303						
General Industrial	1,131,931	Downtown Office	32,420						
General/Retail Commercial	381,793	Downtown Residential	142,484						
Golf Course	121,830	General Industrial	1,169,549	General Industrial	1,169,549	General Industrial	1,169,549	General Industrial	1,352,710
Hospital/Nursing Facility	22,519	High Density Residential	236,021						
Light Industrial	345,154	Highway Commercial	182,378						
Mixed Use Residential	70,234	Light Industrial	620,981						
Mobile Homes	413,575	Low Density Residential	6,244,558						
Multi Family Residential	1,233,309	Medium Density Residential	1,568,844						
Office	117,425	Medium High Density Residential	398,227						
Parks/Open Space/Greenways	-	Neighborhood Commercial	56,823						
Public Facility	62,437	Office	78,688	Office	78,688	Office	78,688	Office	78,688
Public Parking	-	Parks	291,481	Parks	291,481	Parks	291,481	Parks	291,481
Religious Facilities/Institutional	332,138	Regional Commercial	209,588						
Road ROW	-	Right of Way	1,657						
Service Station	25,087	Schools	521,556	Schools	521,556	Schools	521,556	Schools	521,556
Single Family Residential	6,993,599	Service Commercial	87,631						
Townhomes	71,169	Very Low Density Residential	541,025	Very Low Density Residential	541,025	Very Low Density Residential	541,025	Very Low Density Residential	396,449
Utilities	-								
Vacant	-								
Subtotal	12,000,298	Subtotal	13,608,986	Subtotal	13,608,986	Subtotal	13,608,986	Subtotal	13,647,571
Grand Total	13,156,951	Grand Total	27,899,952	Grand Total	24,883,852	Grand Total	25,073,736	Grand Total	24,611,713
Projected NCSSA Flow to Modesto	3,289,238	Projected NCSSA Flow to Modesto (from Table 2-9 of the Master Plan)	4,000,000	Projected NCSSA Flow to Modesto (from Table 2-9 of the Master Plan)	4,000,000	Projected NCSSA Flow to Modesto (from Table 2-9 of the Master Plan)	4,000,000	Projected NCSSA Flow to Modesto (from Table 2-9 of the Master Plan)	4,000,000
Projected Flow to Turlock	1,000,000	Projected Flow to Turlock	2,000,000						
Estimated Flows to Local Septic	266,953	Estimated Flows to Local Septic	266,953	Estimated Flows to Local Septic	266,953	Estimated Flows to Local Septic	266,953	Estimated Flows to Local Septic	266,953
Projected Flow to Ceres WWTP	9,600,760	Projected Flow to Ceres WWTP	23,632,999	Projected Flow to Ceres WWTP	20,616,900	Projected Flow to Ceres WWTP	20,806,783	Projected Flow to Ceres WWTP	20,344,760

Notes:

Only about 10% of the industrial reserve and none of the residential reserve are projected to developed at buildout. The specific areas used in this table were developed from the GIS land use mapping.

For all alternatives, none of the residential reserve is projected to develop.

COLLECTION SYSTEM INFRASTRUCTURE REQUIREMENTS

The City's existing wastewater system is shown on Figure 6. The City's wastewater system includes 132 miles of piping ranging in size from 6 inches to 54 inches in diameter. The wastewater system also includes 14 lift stations. The majority of the wastewater generated in the City's Sewer Service Area flows to the City's WWTP. However, while the NCSSA collection system is maintained by the City, the NCSSA area flows to Modesto's Sutter WWTP, under a 1979 agreement. Approximately 280 developed parcels between Herndon Road and Mitchell Road currently are not provided wastewater service by the City; instead, these parcels have on-site septic tank and leach field systems.

Trunk Sewers from the City to the WWTP

The City's WWTP has been located on East Service Road between Morgan Road and Blaker Road since before 1970. Existing trunk sewers along East Service Road flowing to the WWTP range from 12-inch diameter pipe at the westernmost end to twin 18-inch diameter trunks near the WWTP. Serving the more populous areas north and east of the WWTP, trunk lines range from parallel 18- and 42-inch diameter trunk lines to parallel 24- and 42-inch diameter lines near the WWTP.

The Master Plan evaluated the need for new and improved trunk sewers to serve development at buildout of the General Plan. As shown in Table 4, the PHF to the Ceres WWTP for buildout of the current General Plan is 23.6 mgd, which compares well with the PHF estimated in the Master Plan of 26.0 mgd. PHFs to the Ceres WWTP for the three LUAs range from 20.3 mgd to 20.8 mgd, and average 20.6 mgd (with no flow from Residential Reserve and only a small flow from Industrial Reserve land uses). According to the Master Plan, the limiting available capacity in the largest existing trunk sewers along East Service Road leading to the WWTP is approximately 4.1 mgd for the 36-inch diameter trunk line, and 7.5 mgd for the 42-inch diameter trunk line. Additional peak flows from new development in excess of these capacity limits will require construction of new parallel trunk sewers. Trunk sewer improvements proposed by the Master Plan are shown on Attachment B.

Previously Planned Sewer Improvements

Areas identified for future growth in the 1997 General Plan are comparable to the areas identified for growth under the current GPU, and are focused around the southwest, south, and east parts of the City, as well as the northern part of the City, and within the NCSSA, where the City is responsible for maintaining wastewater infrastructure.

The Master Plan recommended an upgrade to the trunk sewer system along the length of East Service Road by constructing an additional 36-inch diameter trunk line in parallel with existing lines, from Crows Landing Road, west of the WWTP to Central Avenue to the east, as well as replacing the existing trunk with a 48-inch diameter trunk line from Central Avenue to Highway 99, and a 42-inch diameter sewer crossing under Highway 99 to Mitchell Avenue. A series of trunk sewer expansions were also proposed to serve newly developed and re-developed areas, including the following:

- Crows Landing Road
- Redwood Road
- Moffett Avenue
- Central Avenue
- Mitchell Road
- Esmar Road
- Roeding Road
- Whitmore Avenue
- Faith Home Road
- Lower Lateral No. 2
- Gondring Road
- Moore Road
- The area between Moore Road & Moffett Avenue
- Five Lift Stations

Table 5 presents the total planning-level opinion of probable cost of \$41.4 million, which reflects the estimate from the Master Plan for expansion of the collection system and lift station improvements, less work completed since the Master Plan was finalized, and \$2.2 million of in-progress improvements along East Service Road from the WWTP to Crows Landing. This cost reflects improvements needed for future growth. The improvements needed to serve the existing City were estimated in the Master Plan to cost an additional \$17.12 million.

Collection System Upgrades Completed Since the Master Plan

Several new sewers recommended in the Master Plan have recently been constructed along Mitchell Road from East Whitmore Avenue to East Service Road and from Mitchell Road to a crossing under Highway 99. The selected alignment rendered additional trunk line connections recommended for Moffett Avenue and Moore Road unnecessary, being replaced by a potential connection between Mitchell Avenue and Moore Road. The City has also completed approximately 50 percent of the construction of Crows Landing Road trunk lines and is currently constructing \$2.2 million of improvements along East Service Road from the WWTP to Crows Landing.

Since these trunk sewers have already been constructed, the cost of these sewers can be subtracted from the costs included in the Master Plan, as shown in Table 5. A new Barbour's pump station was also constructed, but as this was recommended in the Master Plan to meet existing design criteria, a decrease in costs to meet future development needs was not made in Table 5 to reflect the construction. The cost of the remaining sewers and lift stations needed for buildout is about \$41.4 million.

Sewer Service for GPU LUA 1

As shown on Figure 3, LUA 1 proposes a change in land use at buildout from the existing General Plan in the area southwest of Highway 99 and south of East Service Road. However, a shift in land use from Business Park and Commercial Recreation to Regional Commercial would result in very little impact to the projected wastewater flows from this area, since the flow factors in the Master Plan are the same for Commercial Recreation and Regional Commercial. Therefore, only the 110-acre tributary to the Gondring and East Service Road trunk sewers that convert from Business Park to Regional Commercial would impact the wastewater flows. Overall, the PHF decreases under LUA1 from the current General Plan. In large part, this is due to I/I not being included for land uses not receiving sewer service (including Railroad Right of Way, Right of Way, Agriculture, Residential Reserve, and undeveloped Industrial Reserve). For the areas of change shown on Figure 3, the estimated increase in PHF from the current General Plan to LUA1 is approximately 0.12 mgd,

primarily impacting the Gondring Road and East Service Road trunk sewers. The 0.12 mgd difference is well within the margin of error for the buildout design. Therefore, the estimated cost of improvements for Alternative 1 is the same as the cost estimate provided by the Master Plan, less the improvements already made since the Master Plan was completed in 2013, as shown in Table 5.

**Table 5. Estimated Sewer System Improvement Costs from the Master Plan
(Tables 4-2 and 4-3)**

Improvement Identified in Master Plan	Estimated Percent Complete	Master Plan Cost Estimate, dollars	Estimated Cost Remaining, dollars
Crows Landing Road Trunk Lines	50	1,000,000	500,000
East Service Road Trunk Lines	0	12,100,000	9,900,000
Redwood Road Trunk Lines	0	800,000	800,000
Moffett Avenue Trunk Lines	100	1,200,000	-
Central Avenue Trunk Lines	0	2,000,000	2,000,000
Mitchell Road Trunk Lines	100	1,200,000	-
Esmar Road Trunk Lines	0	3,500,000	3,500,000
Roeding Road Trunk Lines	0	600,000	600,000
Whitmore Avenue Trunk Lines	0	900,000	900,000
Faith Home Road Trunk Lines	0	1,900,000	1,900,000
Lower Lateral No. 2 Trunk Lines	0	1,800,000	1,800,000
Gondring Road Trunk Lines	0	1,400,000	1,400,000
Moore Road Trunk Lines	100	400,000	-
Sewer Trunk Line between Moore Road & Moffett Avenue	75	3,200,000	800,000
Estimating Contingency (30%)		9,600,000	7,230,000
Subtotal Construction Costs		\$41,600,000	\$31,330,000
Design & Administration Cost (20%)		6,400,000	4820,000
Total Trunk Lines		\$48,000,000	\$36,150,000
Five (5) Lift Stations/Pump Stations	0	5,280,000	5,280,000
Grand Total		\$53,280,000	\$41,430,000

Sewer Service for GPU LUA 2

As shown on Figure 4, LUA 2 proposes several changes in land use at buildout from the existing General Plan in the area southwest of Highway 99, south of East Service Road, as far as Blaker Road. These changes include converting the following land uses in the General Plan to Alternative 2 land uses:

- 66 acres from Industrial Reserve to Low Density Residential;
- 73 acres from Business Park to Regional Commercial;
- 37 acres from Business Park to Service Commercial;

- 142 acres from Commercial Recreation to Regional Commercial;
- 25 acres of mainly Commercial Recreation to Service Commercial;
- 136 acres from Low Density Residential to General Industrial;
- 50 acres of Agricultural Residential to General Industrial; and
- 27 acres of Industrial Reserve to Low Density Residential.

Overall, the PHF decreases under LUA2 from the current General Plan. In large part, this is due to I/I not being included for land uses not receiving sewer service. For the areas of change shown on Figure 4, the estimated increase in PHF from the current General Plan to LUA2 is approximately 0.04 mgd under Alternative 2, primarily impacting the Gondring Road, Central Avenue, and East Service Road segments immediately west of Highway 99. The 0.04 mgd difference in PHF is well within the margin of error for the buildout design flows. Therefore, the estimated cost of improvements for LUA2 is the cost estimate provided by the Master Plan, less improvements already made since the Master Plan was completed in 2013, as shown in Table 5.

Sewer Service for GPU LUA 3

As shown on Figure 5, LUA 3 proposes several changes in land use at buildout from the existing General Plan in the area southwest of Highway 99, south of East Service Road, as far as Morgan Road, and a shift from Agriculture, Residential Agriculture, and Very Low Density Residential to General Industrial and Industrial Reserve land uses along a strip east of Faith Home Road. These changes include converting the following land uses in the General Plan to Alternative 3 land uses:

- 66 acres from Industrial Reserve to Low Density Residential;
- 110 acres from Business Park to Regional Commercial;
- 142 acres from Commercial Recreation to Regional Commercial;
- 25 acres of mainly Commercial Recreation to Regional Commercial;
- 67 acres of Industrial Reserve to Low Density Residential;
- 59 acres for Agriculture to Low Density Residential;
- 62 acres of Industrial Reserve to Regional Park;
- 29 acres of Low Density Residential to Neighborhood Community;
- 60 acres of Agriculture to Industrial Reserve;
- 351 acres of Very Low Density Residential to Industrial Reserve;
- 127 acres of Residential Agriculture to Industrial Reserve;
- 122 acres of Very Low Density Residential to General Industrial; and
- 16 acres of Residential Agriculture to General Industrial.

Overall, the PHF decreases under LUA3 from the current General Plan. In large part, this is due to I/I not being included for land uses not receiving sewer service. For the areas of change shown on Figure 5, the estimated increase in PHF from the current General Plan to LUA 3 is approximately 0.72 mgd. Impacts would be similar to those in LUA 1 and LUA 2, with additional

impacts to the proposed Faith Home Road, East Whitmore Avenue, and Esmar Road trunk lines. Additional flows are still well within the margin of error for the buildout design flows. Therefore, the estimated cost of improvements for LUA 3 is the cost estimate provided by the Master Plan, less improvements already made since the Master Plan was completed in 2013, as shown in Table 5.

WASTEWATER TREATMENT AND EXPORT INFRASTRUCTURE REQUIREMENTS

The total ASF from the entire City for each LUA is:

- LUA 1: The ASF is 9.44 mgd
- LUA 2: The ASF is 9.47 mgd
- LUA 3: The ASF is 9.42 mgd

The Master Plan estimated the buildout ASF from the entire City to be 11.5 mgd. The flows from the LUAs are all close to, but slightly lower than, the flow on which the Master Plan was based. This is likely due to the elimination of the flow from land uses not receiving sewer service. Consequently, the wastewater treatment and export planning presented in the Master Plan represents a valid approach for wastewater treatment and export planning for the LUAs. The wastewater treatment and export plan from the Master Plan is described below.

Summary of Master Plan Wastewater Treatment and Export Plan

Discharge from NCSSA to Modesto's Sutter WWTP

It is expected that growth within the NCSSA would continue to be handled by Modesto's Sutter WWTP. Existing facilities substantially have available capacity to serve NCSSA infill development.

City of Ceres WWTP

Significant growth will occur in the flows to the City's WWTP, which the Master Plan envisions to be met by a combination of facility upgrades and the purchase of additional capacity at both Turlock's WWTP and Modesto's Jennings WWTP. The majority of the wastewater generated in the City's Sewer Service Area is treated at the City's WWTP. Some of the flow is partially treated and then pumped to Turlock's WWTP, as discussed further below. To meet future treatment and disposal needs, the Master Plan selected an alternative to maximize discharge to Turlock, equalize flows on-site, and send the remaining peak day flows to Modesto.

Planned improvements to the City's WWTP identified in the Master Plan for new development included increasing influent pumping capacity in the new headworks to accommodate additional flows, construction of 2.0 million gallons of equalization with mixing, and constructing grit removal for the flows to Turlock to prevent deposition of the grit in pipelines and siphons.

With the General Plan PHF to the City's WWTP predicted to be approximately 26 mgd in the Master Plan, and LUA PHFs estimated to be less than 20.8 mgd for all alternatives, the proposed upgrades in the Master Plan should be sufficient to meet the City's capacity requirements at buildout, even if there is significant development of the Residential Reserve and Industrial Reserve land use areas.

Export to Turlock's WWTP

The City does not have sufficient disposal capacity to treat all of its wastewater, and thus, the Master Plan relied upon expanding existing relationships with Turlock and Modesto to treat and dispose of its wastewater. In 2003 and 2007, the City purchased 1.0 mgd each of capacity at Turlock's WWTP, for a total of 2.0 mgd of capacity. In 2003/2004, the City constructed the existing export pump station and pipeline which has a pumping capacity of 2.0 mgd, expandable to approximately 5.9 mgd. For future development, in addition to the improvements necessary at the WWTP to facilitate export, the City would add pumps to the existing Turlock export pump station.

Export to Modesto's Jennings WWTP

The Master Plan proposed to develop facilities and a regulatory framework to begin exporting additional flows from the City to Modesto's Jennings WWTP through a new pipeline, based on the understanding that Modesto's Sutter WWTP serving the NCSSA does not have sufficient capacity to handle additional flows from the City. The proposed buildout flow of wastewater export would be an average of 4.2 mgd, with a peak flow requirement of up to 8.8 mgd. In addition to improvements at the City's WWTP to facilitate export, the new pipeline to convey flows to Modesto's Jennings WWTP and improvements necessary at Modesto's Jennings WWTP to handle the additional flows, would be funded by the City.

Wastewater Treatment and Export for the LUAs

Because the projected PHFs to the City's WWTP are substantially the same as those projected under the 1997 General Plan for all alternatives, with decreases in excess of 2.0 mgd, due to reduction in flow from not including land uses without sewer service, the improvements proposed by the Master Plan are expected to meet the needs of growth under the proposed LUAs. In fact, it may be possible to decrease exports to Turlock's WWTP and Modesto's Jennings WWTP, or to decrease the overall cost of improvements to the City's WWTP slightly. Considering the additional area incorporated into the planning area of the GPU over the 1997 General Plan, however, the expected flow from the LUAs is insufficient to eliminate the need for export to Modesto's Jennings WWTP altogether.

WASTEWATER TREATMENT AND EXPORT COSTS

A new headworks and backup power for the City's WWTP have been constructed since the completion of the Master Planning effort. However, these improvements were recommended by the Master Plan to solve existing capacity issues and not to address future growth. The majority of planned improvements for future growth have yet to be implemented, with the exception of the capacity buy-in at Turlock. Thus, the required infrastructure and associated cost estimate from the Master Plan for remaining future growth is appropriate and sufficient for the LUAs.

Planned improvements identified in the Master Plan included WWTP and disposal capacity improvements, as well as collection system improvements to meet the projected ASF of 10.2 mgd, the PDF of 15.3 mgd, and the PHF of 26 mgd, with corresponding loading. For the WWTP and disposal capacity needs, the Master Plan selected an alternative to expand export of equalized flow to both Modesto and Turlock (discussed above) as the recommended long-range plan, at a cost of

approximately \$100 million (see Table 6). Approximately \$84 million in improvements remain to be completed.

Because the Master Plan PHF and ADF were higher than the flows projected in this analysis, the capacity and cost information from the Master Plan were used to estimate the costs of improvements for the LUAs. Table 6 presents the cost estimate for wastewater treatment and export to meet future buildout needs.

Table 6. Estimated Costs of Planned WWTP Improvements from the Master Plan

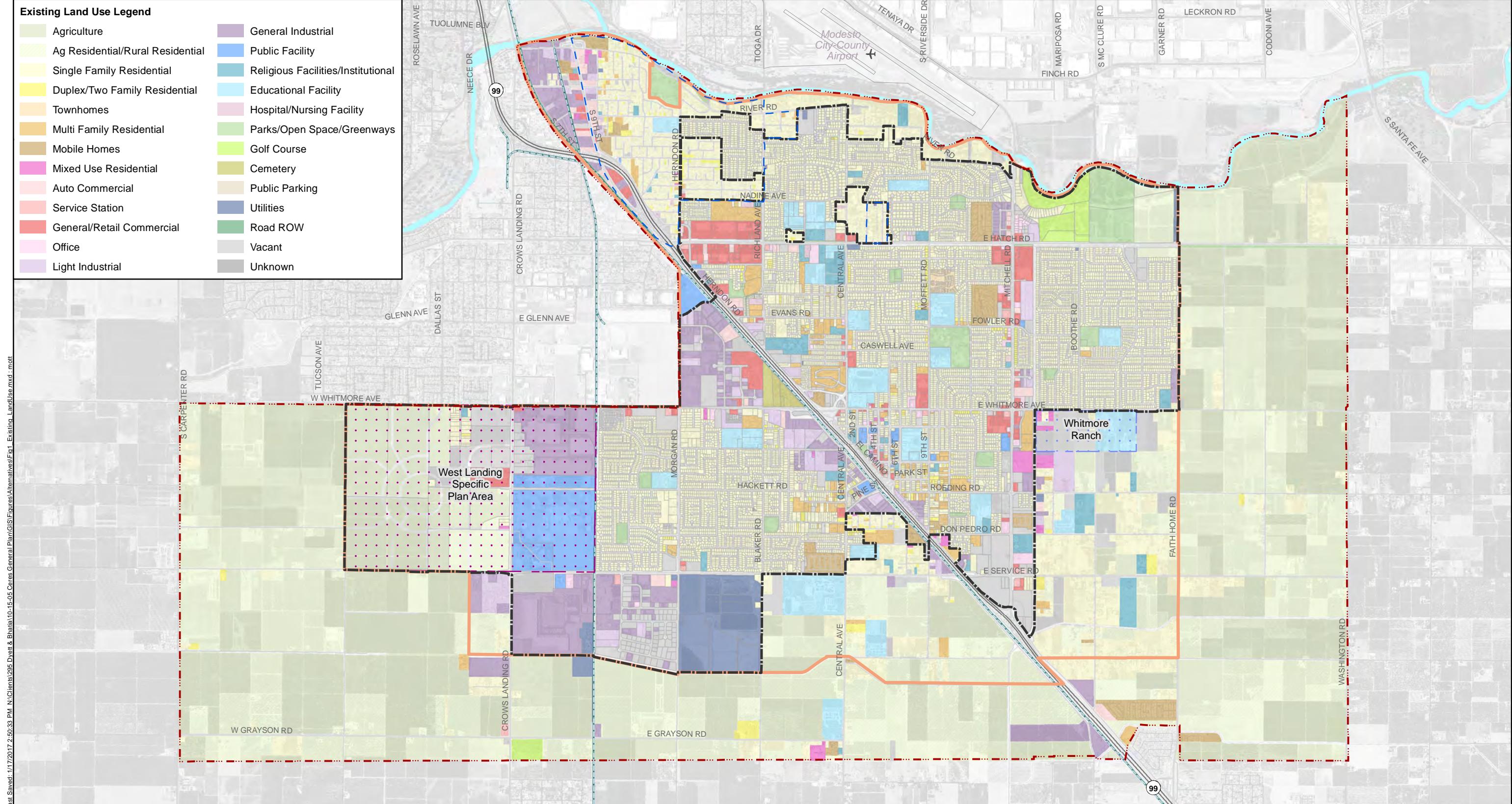
Facility Component	Master Plan Cost Estimate, dollars	Estimated Cost Remaining, dollars
Facilities for Export to Modesto and Turlock	23,550,800	23,550,800
Emergency Storage	3,810,000	3,810,000
Equalization	1,882,500	1,882,500
Capacity Buy-In at Modesto Jennings WWTP	55,020,000	55,020,000
Capacity Buy-In at Turlock WWTP	16,320,000	-
Total Capital Cost	\$100,583,300	\$84,263,300

For the LUAs, the decreased flows and resulting potential for decreased sizes of required infrastructure would slightly decrease the total costs from the total cost estimated in the Master Plan, with LUA 3 having the highest potential cost savings, followed by LUA 1 and then LUA 2.

CONCLUSIONS

Wastewater infrastructure conclusions are provided below:

- Based on the similarity of buildout flow estimates for the three LUAs, the difference in the cost of infrastructure would be very small, and falls within the margin of error of the Master Plan's cost estimates.
- The difference in flows between the 1997 General Plan and the LUAs is greatest for the Inside Current Sphere of Influence (SOI) (Excluding Whitmore Ranch Specific Plan) and Outside Current SOI areas.
- LUA 3 has the lowest PHF of the three alternatives and thus would likely be the preferred alternative from a wastewater infrastructure standpoint, as it is likely to provide the greatest operational flexibility in the future and possibly a reduced infrastructure cost.



Symbology

- Airport
- River
- Railroads
- City Limit
- General Plan Update Planning Limit
- Ceres Sphere of Influence

- Areas Under Consideration for Aquisition
- West Landing Specific Plan Area
- Whitmore Ranch
- Parcels

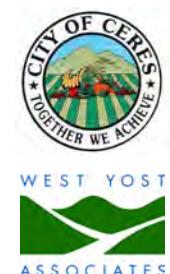
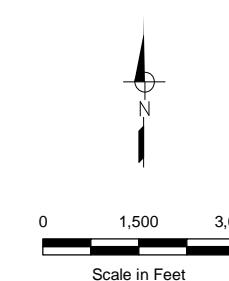
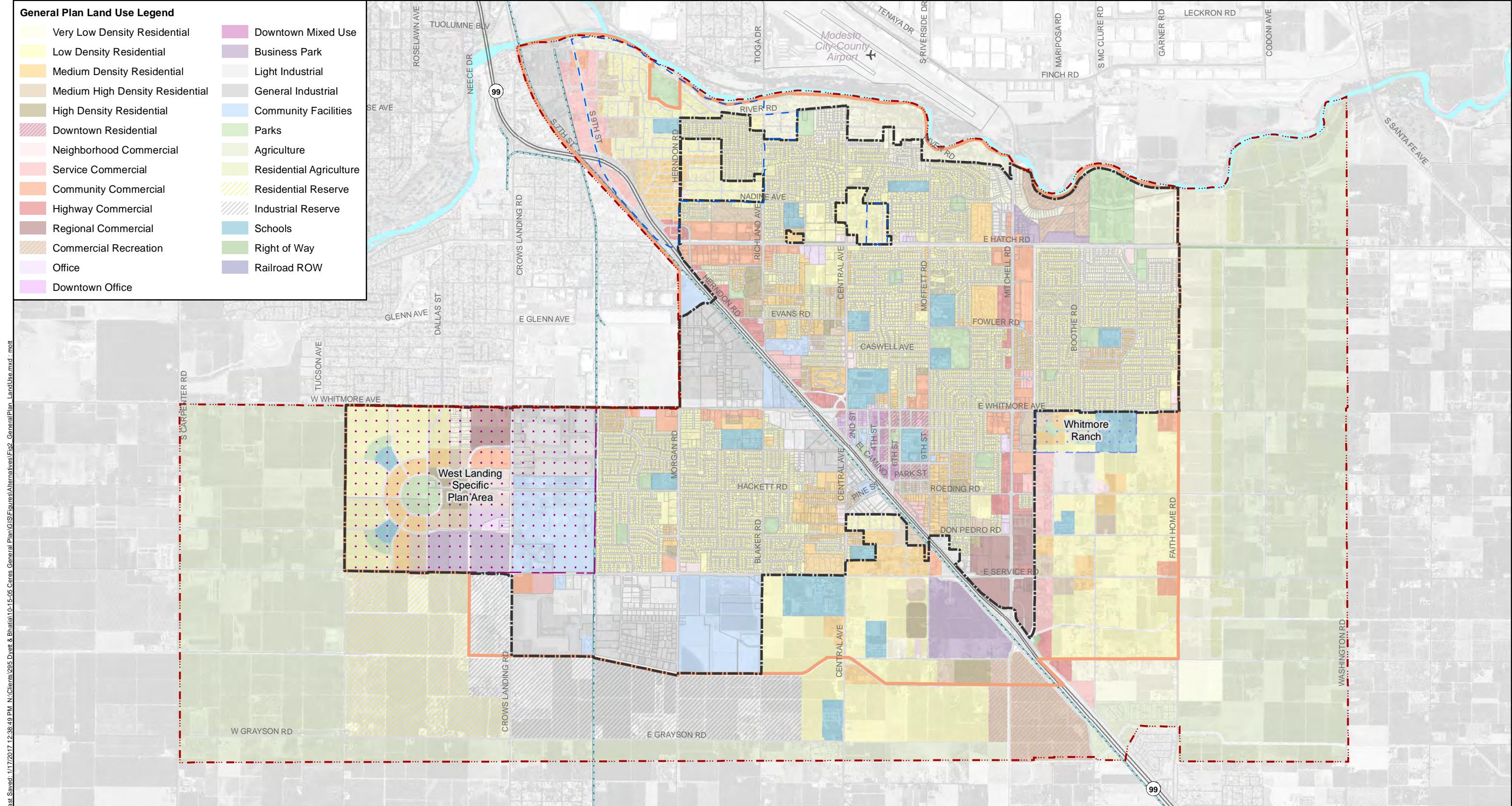


Figure 1

Existing Land Use

Dyett and Bhatia
City of Ceres
General Plan Update



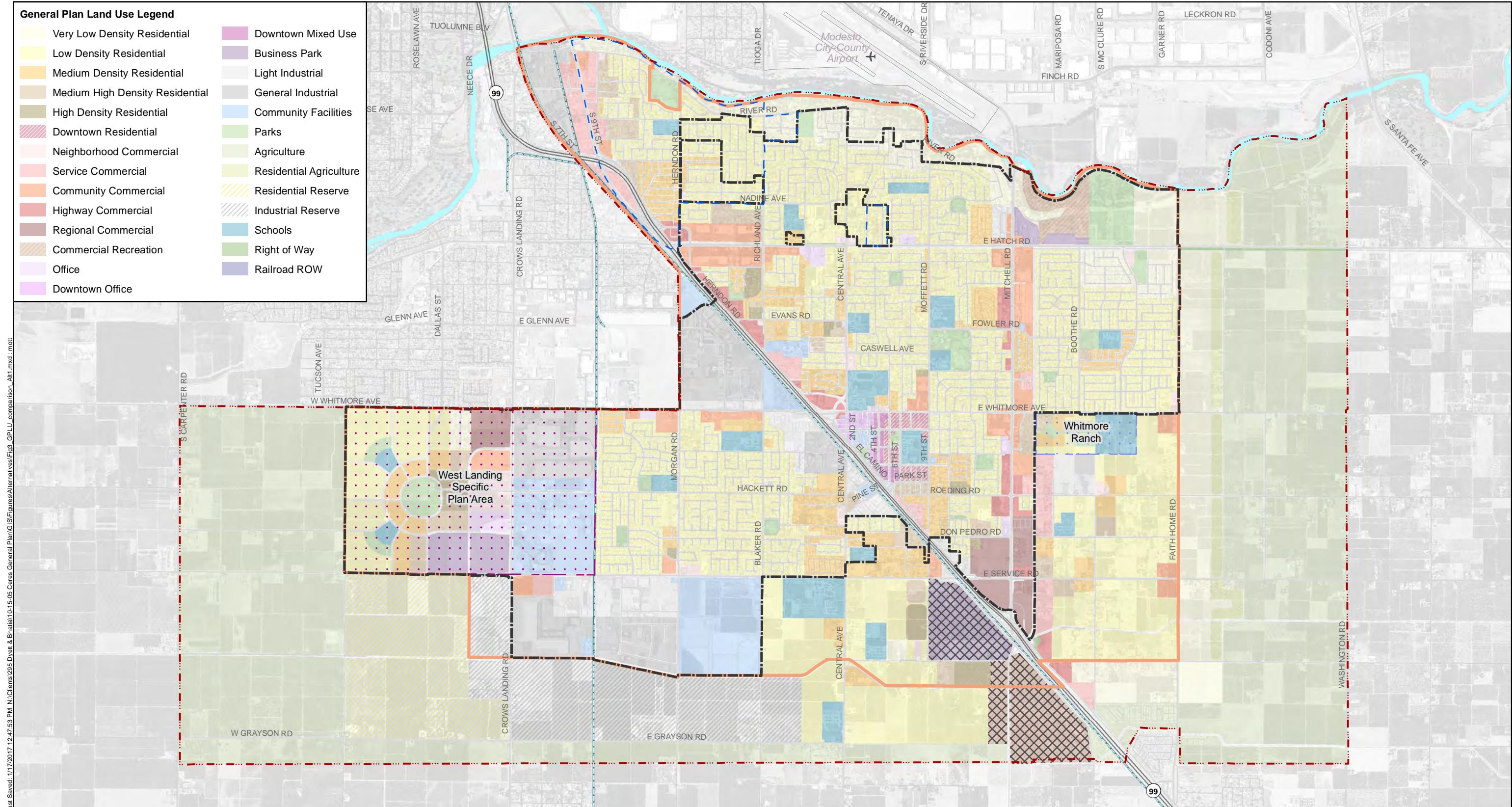
Symbology

-  Airport
-  River
-  Railroads
-  City Limit
-  General Plan Update Planning Limit
-  Ceres Sphere of Influence

Figure 2

General Plan Land Use

Dyett and Bhatia
City of Ceres
General Plan Update



Symbology

- Airport
- River
- Railroads
- City Limit
- General Plan Update Planning Limit
- Ceres Sphere of Influence

- Areas Under Consideration for Aquisition
- West Landing Specific Plan Area
- Whitmore Ranch
- Parcels

Alternative 1 Change Areas

Regional Commercial

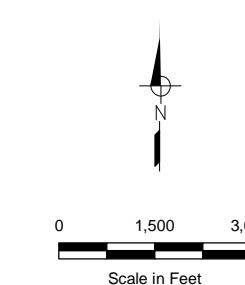
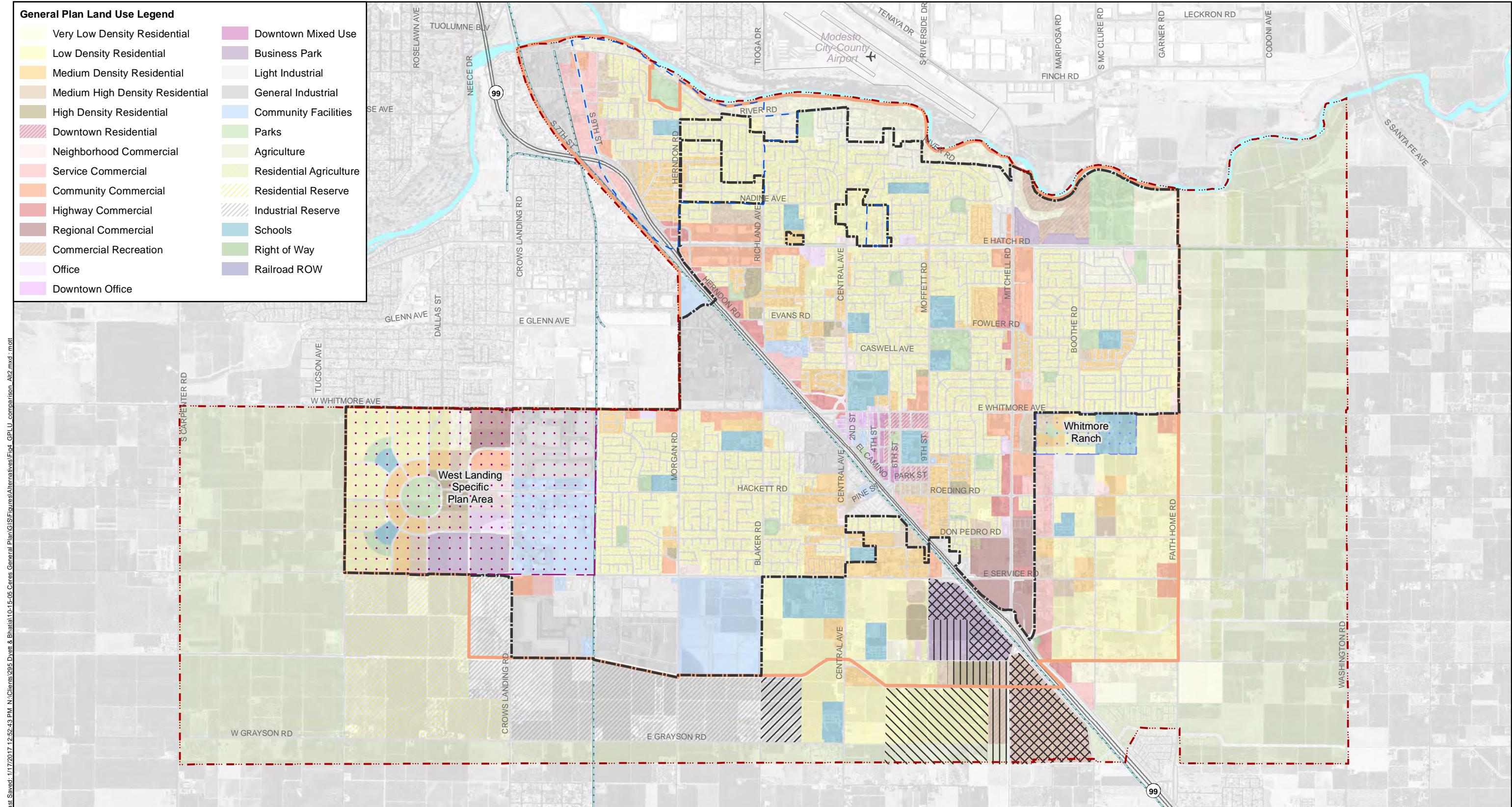


Figure 3
General Plan Land Use Comparison to Alternative 1
Dyett and Bhatia
City of Ceres
General Plan Update



Symbology

- Airport
- River
- Railroads
- City Limit
- General Plan Update Planning Limit
- Ceres Sphere of Influence

- Areas Under Consideration for Acquisition
- West Landing Specific Plan Area
- Whitmore Ranch
- Parcels

Alternative 2 Change Areas

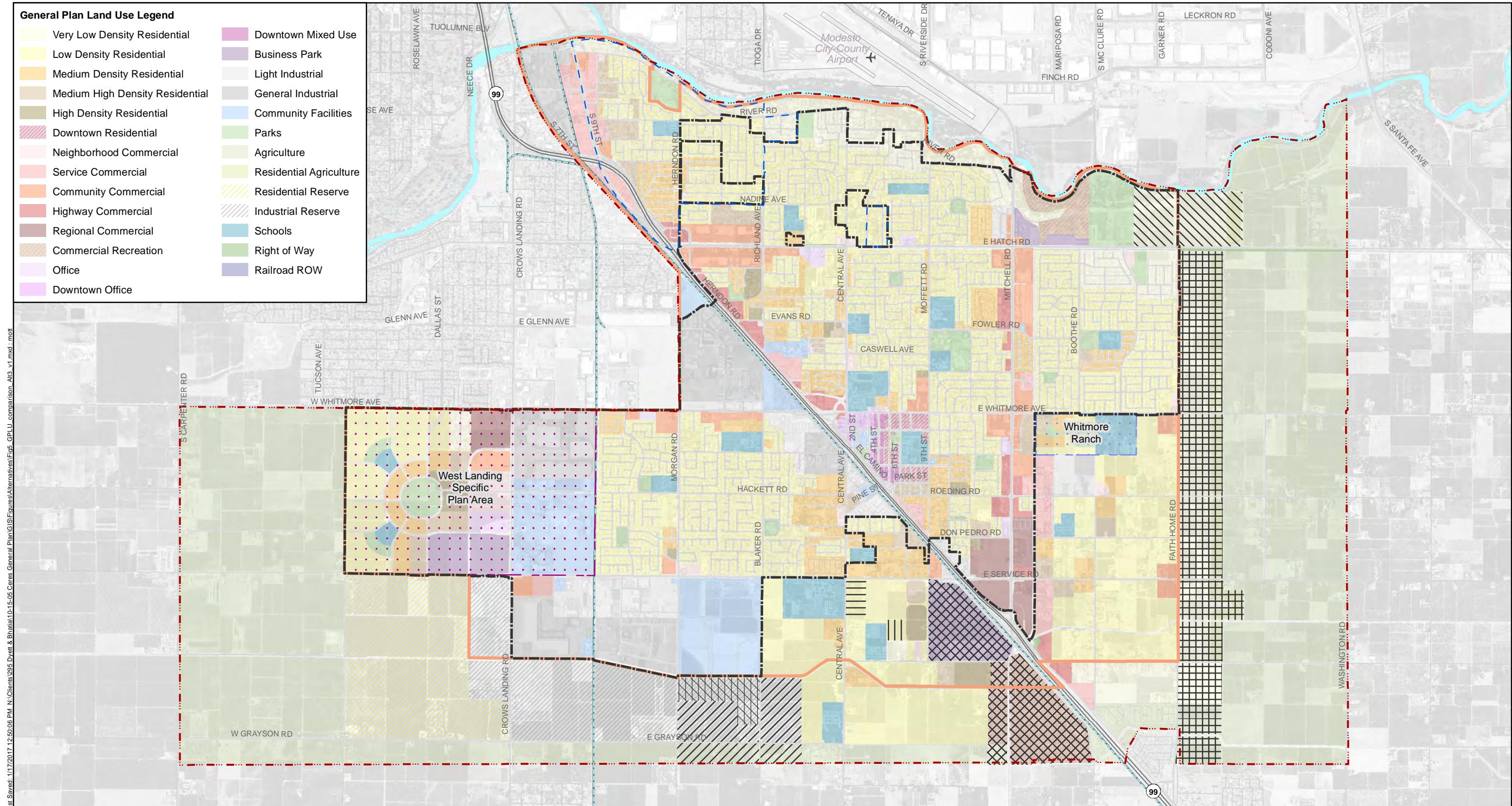
- General Industrial
- Low Density Residential
- Regional Commercial
- Service Commercial



Figure 4

General Plan Land Use Comparison to Alternative 2

Dyett and Bhatia
City of Ceres
General Plan Update



Symbology

- Airport
- River
- Railroads
- City Limit
- General Plan Update Planning Limit
- Ceres Sphere of Influence

- Areas Under Consideration for Aquisition
- West Landing Specific Plan Area
- Whitmore Ranch
- Parcels

- Alternative 3 Change Areas
- General Industrial
- Industrial Reserve
- Low Density Residential
- Parcels

- Medium Density Residential
- Neighborhood Commercial
- Regional Commercial
- Regional Parks

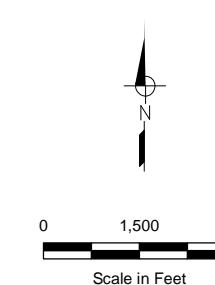
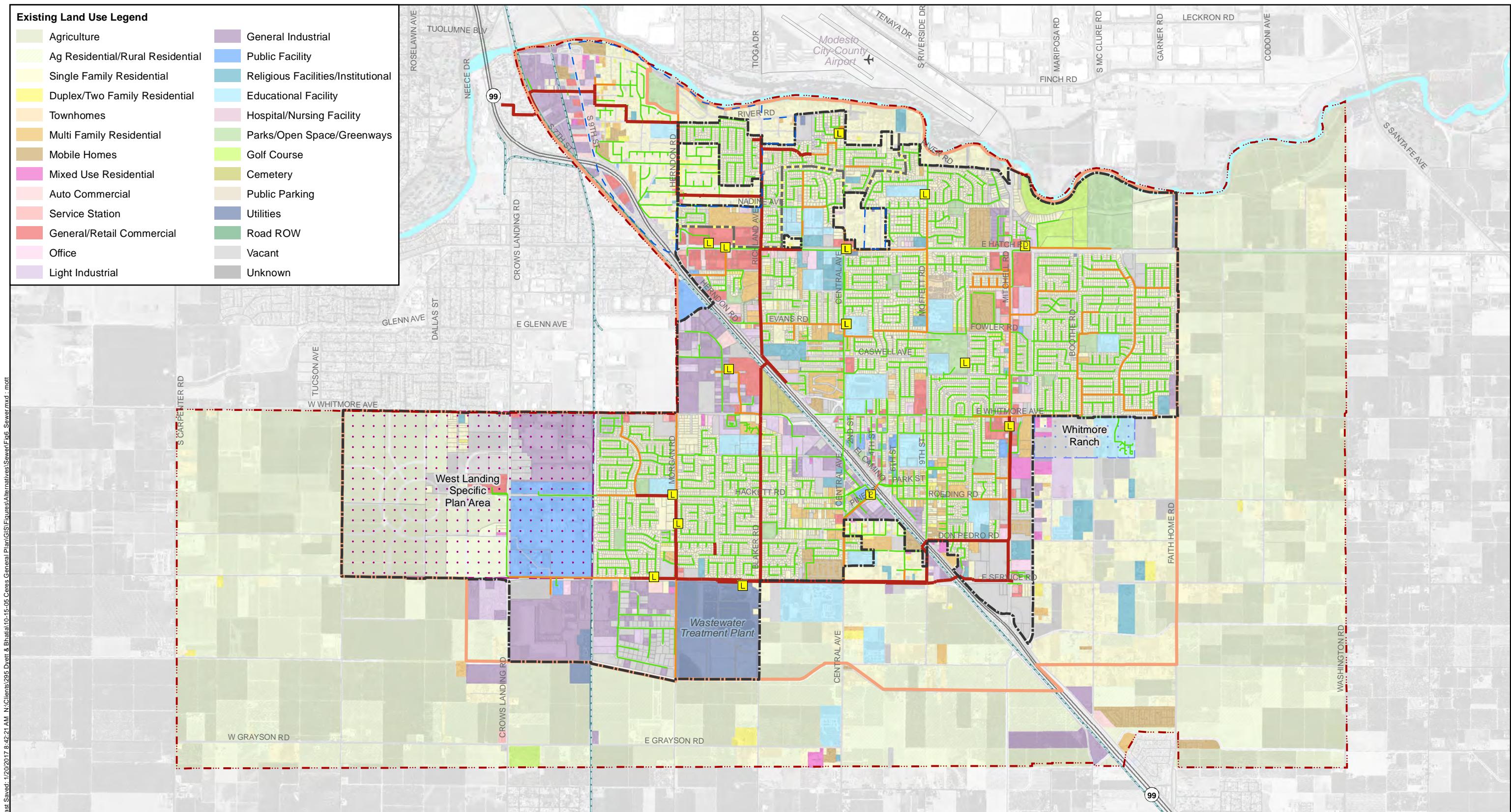


Figure 5
General Plan Land Use Comparison to Alternative 3
Dyett and Bhatia
City of Ceres
General Plan Update



Symbology

Lift Station	North Sewer Boundary Line
Airport	River
Existing City Sewer Mains	Railroads
< 10-inch Diameter	City Limit
10 to 12-inch Diameter	General Plan Update Planning Limit
> 12-inch Diameter	Ceres Sphere of Influence
Areas Under Consideration for Acquisition	
West Landing Specific Plan Area	
Whitmore Ranch	
Parcels	

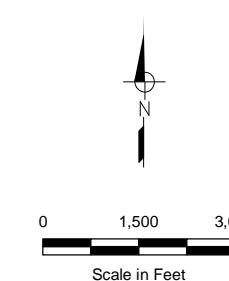
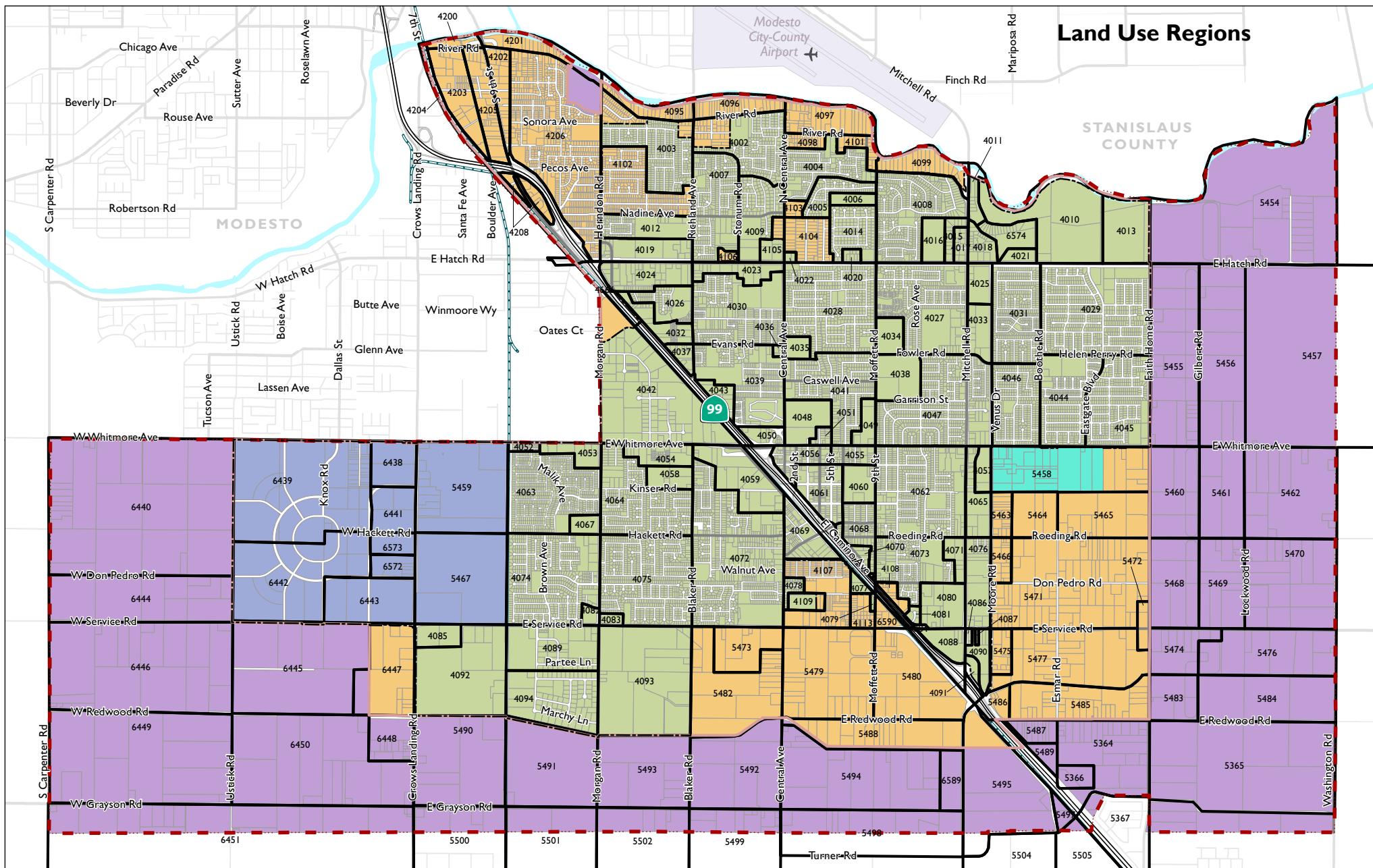


Figure 6
Existing Sewer System
Dyett and Bhatia
City of Ceres
General Plan Update

ATTACHMENT A

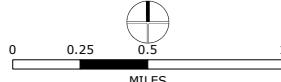
Land Use Regions



Land Use Regions

Legend:

- InsideSOI(noWRSP)
- OutsideSOI
- WestLandingSP
- WhitmoreRanchSP
- WithinCity(noWLSP)
- Traffic Analysis Zones
- City of Ceres
- Sphere of Influence
- Planning Area



Data Source: City of Ceres, 2015; Stanislaus County Geographic Information Systems, 2015; ESRI, 2015; Dyett & Bhatia, 2015.

GENERAL PLAN UPDATE

City of Ceres

ATTACHMENT B

Trunk Sewer Improvements

