City of Ceres Sewer System Master Plan

July 2013

Prepared for

City of Ceres

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Executive Summary

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ES.1 PURPOSE

This document encompasses the compiled Sewer System Master Plan for the City of Ceres as developed through a series of City of Ceres Sewer Master Plan Technical Memoranda. Key Technical Memoranda have been formatted into the chapters of this Sewer System Master Plan document and are the basis of this executive summary[1].

The City of Ceres Sewer Master Plan encompasses the City's wastewater collection system and wastewater treatment and disposal facilities. The objectives of the Sewer Master Plan are to evaluate the condition and available capacity of existing facilities, project the need for expanded sewer facilities to meet the demands of planned growth, and after evaluating alternatives provide a plan of the orderly expansion of those facilities. The master plan study area, based on the City's 1997 General Plan boundary, is shown in Figure ES-1.

Based on the recommended improvements, a 10-year Capital Improvement Program (CIP) is developed and presented herein. This document also summarizes alternative approaches for the City to finance and fund facilities expansion, and provides a calculating of the average cost of capacity for the City's use in updating its Public Facilities Fee. As summarized in this Executive Summary, the Sewer Master Plan addresses the following topics:

1. Evaluation of the condition and capacity of existing facilities to continue to serve existing users with identification of available capacity for future connections;
2. Existing wastewater flows and loads are evaluated with future increases projected based on planned future land uses;

[1] The chapters of this Sewer System Master Plan are based on the following technical memoranda:
Technical Memorandum No. 1 – Existing Facilities, November 2010.
Technical Memorandum No. 2 – Future Land Use and Flow and Load Projections, September 2010.
Technical Memorandum No. 3 – Wastewater Treatment and Disposal, July 2011.
Technical Memorandum No. 4 – Collection System Facilities, April 2011.
Technical Memorandum No. 7 – Environmental Constraints and Permit Streamlining Analysis, December 2011.

3. Alternatives are evaluated for expanding the City's wastewater treatment and disposal capacity, with a plan recommended for City implementation;
4. A plan is prepared for the orderly expansion of the City's wastewater collection system to serve new growth areas; and
5. A preliminary evaluation of environmental constraints is preformed to identify potential permitting and environmental approvals necessary for implementing the master plan projects.

ES.2 EXISTING FACILITIES

The capacity and condition of existing City of Ceres wastewater collection system and wastewater treatment and disposal facilities were evaluated with the purpose of identifying capacity deficiencies and the need to replace and/or rehabilitate existing facilities. The existing condition information is summarized with an assessment of facilities replacement or rehabilitation requirements and recommendations made for capital improvements. The existing capacity related capital improvements recommended in this existing facilities analysis are prioritized according to an assessment of the potential risk to the City of failure of the facility (based on existing available data), relative importance of the facility, and the potential environmental and economic effect of the failure of the facility.

Table ES-1 summarizes the recommended capital improvements and costs for rehabilitation and replacement of existing facilities with known or predicted capacity deficiencies. The CIP listed in Table ES-1 is focused on improvements needed to address capacity related or condition deficiencies. Improvements to the City's existing wastewater collection and treatment infrastructure as listed in Table ES-1 consider improvements solely in the light of maintaining service for the existing level of development. Future development, described below, and its impact on the City's wastewater collection, treatment and disposal facilities are considered in this Master Plan. Currently the City is completing or has recently completed improvements to or replacement of the top two recommended CIP projects including:

- New Headworks and Influent Pump Station (completed)
- Barbour's Lift Station Interim Improvements (in progress)

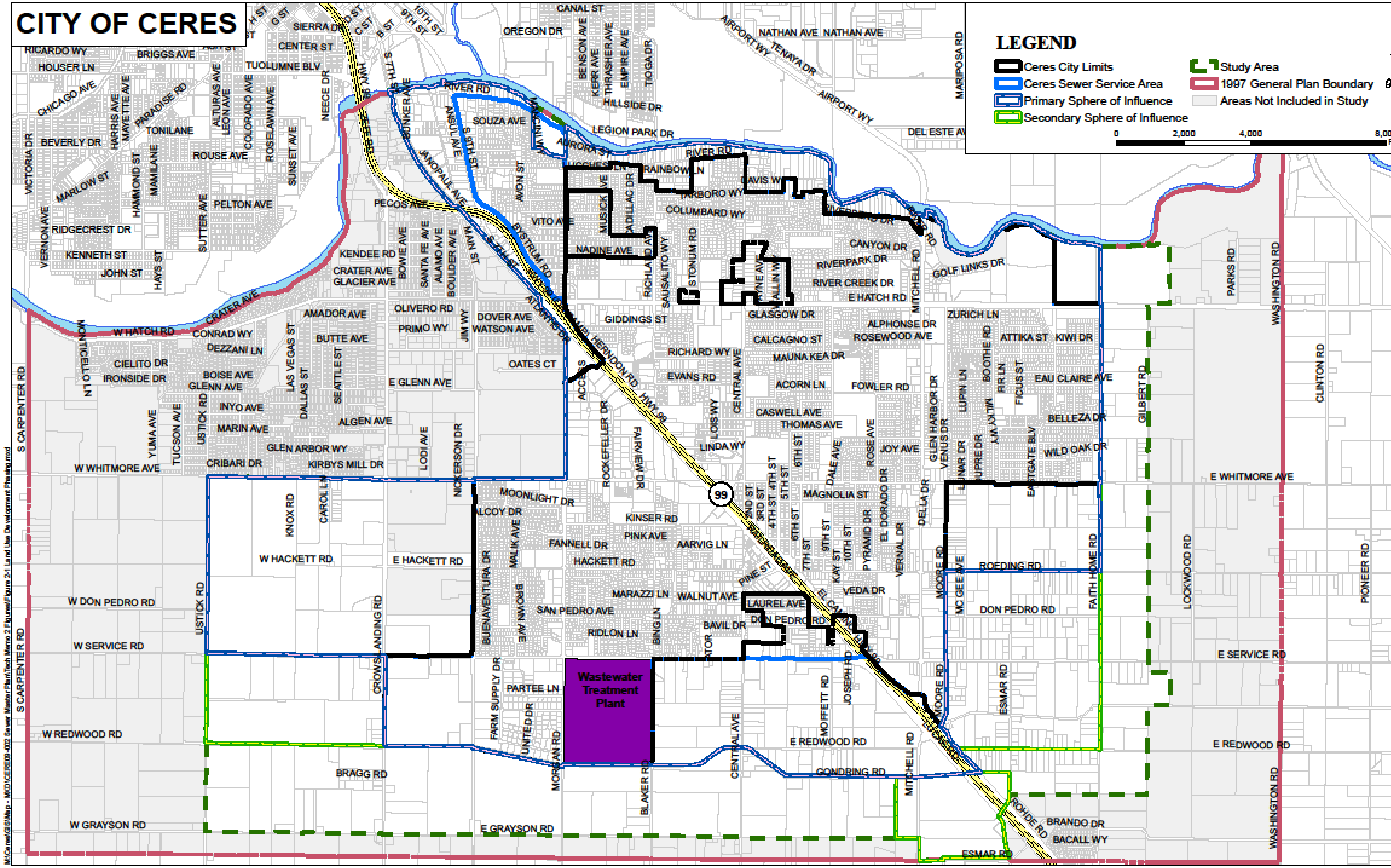

Figure ES-1
Master Plan Study Area

Table ES-1
City of Ceres
Existing Facilities CIP Summary and Prioritization

Priority Ranking (a)	Improvement Description	Total Cost, $ (b)	Improvement Location ©
1	New Headworks and Influent Pump Station	Funded	WWTP
2	Barbour's Lift Station Interim Improvement	Funded	Lift Station
3	Onsite Emergency Power at Barbour and Pine Street Lift Stations	Funded	Lift Station
4A	Lift Station Emergency Backup Power Connections and Portable Generators	$287,000	Lift Station
5B	Pipe upsizing in East Service Road	$2,694,000	Sewer
6A	9th Avenue, Roeding Road, 6th Avenue and Park Street Sewer Relief Project	$1,264,000	Sewer
7A	Pipe upsizing in Central Avenue and Pine Street	$1,130,000	Sewer
8B	Pipe upsizing in Don Pedro Road, East Service Road and Moffett Road	$2,296,000	Sewer
9B	Pipe upsizing in Evans Road	$845,000	Sewer
10B	Pipe upsizing in Mitchell Road, East Whitmore Avenue and Hidden Oak	$1,575,000	Sewer
11B	Pipe upsizing in Central Avenue, Forest Lane and Acorn Lane	$908,000	Sewer
12B	Distribution Box Replacement (for S-1, S-2, and S-3)	$27,000	WWTP
13B	Pipe upsizing in Moffett Road	$498,000	Sewer
14C	Pipe upsizing in Blaker Road	$1,383,000	Sewer
15C	Pipe upsizing in Central Avenue, Hackett Road, Harold Street and Pine Street	$988,000	Sewer
16C	Pipe upsizing in Mitchell Road	$911,000	Sewer
17C	New Valve Boxes at Westpointe, and Central/Evans Lift Stations	$143,000	Lift Station
18C	New Valve Box and Modifications at Paramount Lift Station	$103,000	Lift Station
19C	Pipe upsizing in Hackett Road	$37,000	Sewer
20C	Office/Lab Building Expansion	$468,000	WWTP
21C	Upper Pond Pipeline Relocation (+/- 1,000 lf of 16-in)	$474,000	WWTP
22C	Barbour's Pump Station Relocation	$525,000	Lift Station
23C	Walgreen's Lift Station Relocation	$572,000	Lift Station
	TOTAL (rounded)	**$17,128,000**	

(a) Class Designations:
A CIP addresses predicted overflowing
B CIP addresses predicted surcharging above the recommended criteria, or has an immediate impact on collection system emergency operation
C CIP addresses predicted surcharging below the recommended criteria or a low priority lift station and WWTP deficiency.

(b) May 2010 Costs; ENRCCI = 8761, including allowances for estimating contingency and engineering and administration.

(c) Sewer pipeline, lift station, or Wastewater Treatment Plant (WWTP) component.

ES.2.1 EXISTING WASTEWATER TREATMENT PLANT

Approximately three quarters of the wastewater generated in the existing City of Ceres Sewer Service Area is conveyed to the City of Ceres Wastewater Treatment Plant (Ceres WWTP). The remaining sewer flows (generated in the North Ceres Sewer Service Area, NCSSA) are conveyed to the City of Modesto sewer system north of the Tuolumne River.

The WWTP is located on East Service Road between Morgan Road and Blaker Road on approximately 180 acres. The existing active wastewater treatment process consists of the following elements:

1. Screening of influent raw wastewater followed by pumping to Reactor 1 of the Aerated Ponds.
2. Treatment in the Aerated Ponds consisting of four equal volume reactors in series
3. Pumping of a portion of the treated effluent to the City of Turlock WWTP.
4. Conveyance of treated effluent from Reactor 4 to eight percolation basins for final treatment and disposal.

The overall capacity of the existing wastewater treatment and disposal facilities are limited based primarily on the disposal methods employed. These limitations are based on differing water quality criteria depending on the discharge location, permit or agreement limitations, intrinsic hydraulic capacity of the discharge location, and on the expected performance of the treatment system to meet the water quality requirements;

1. <u>Discharge to on-site percolation disposal.</u> The predicted hydraulic capacity limit (long-term 100-year precipitation season conditions) of existing on-site disposal is limited to 2.8 Mgal/d, however the existing permit limits discharge (understood to be on-site disposal) to 2.5 Mgal/d. To obtain the 2.8 Mgal/d disposal capacity, the City would have to obtain a new permit. The existing permit does not limit effluent BOD_5, however it is anticipated that future permits will limit effluent BOD_5 discharged for on-site disposal to 40 mg/L (30-day average).

2. <u>Discharge to the Turlock WWTP.</u> The existing agreement with the City of Turlock limits the City's export to the Turlock WWTP to 2.0 Mgal/d and contains limits for effluent BOD_5 and TSS of 100 mg/L each.

3. <u>Combined discharge to on-site and Turlock WWTP.</u> Combined hydraulic capacity for on-site disposal and discharge to the Turlock WWTP is from 4.5 Mgal/d (based on on-site permit limit and agreement with turlock) to 4.8 Mgal/d (based on 100-year on-site water balance calculation and the City obtaining a new permit). Depending on the discharge location, effluent water quality requirements are either 40 mg/L BOD_5 for on-site disposal (assuming updated permit requirements), or 100 mg/L BOD_5 and TSS for discharge to the Turlock WWTP.

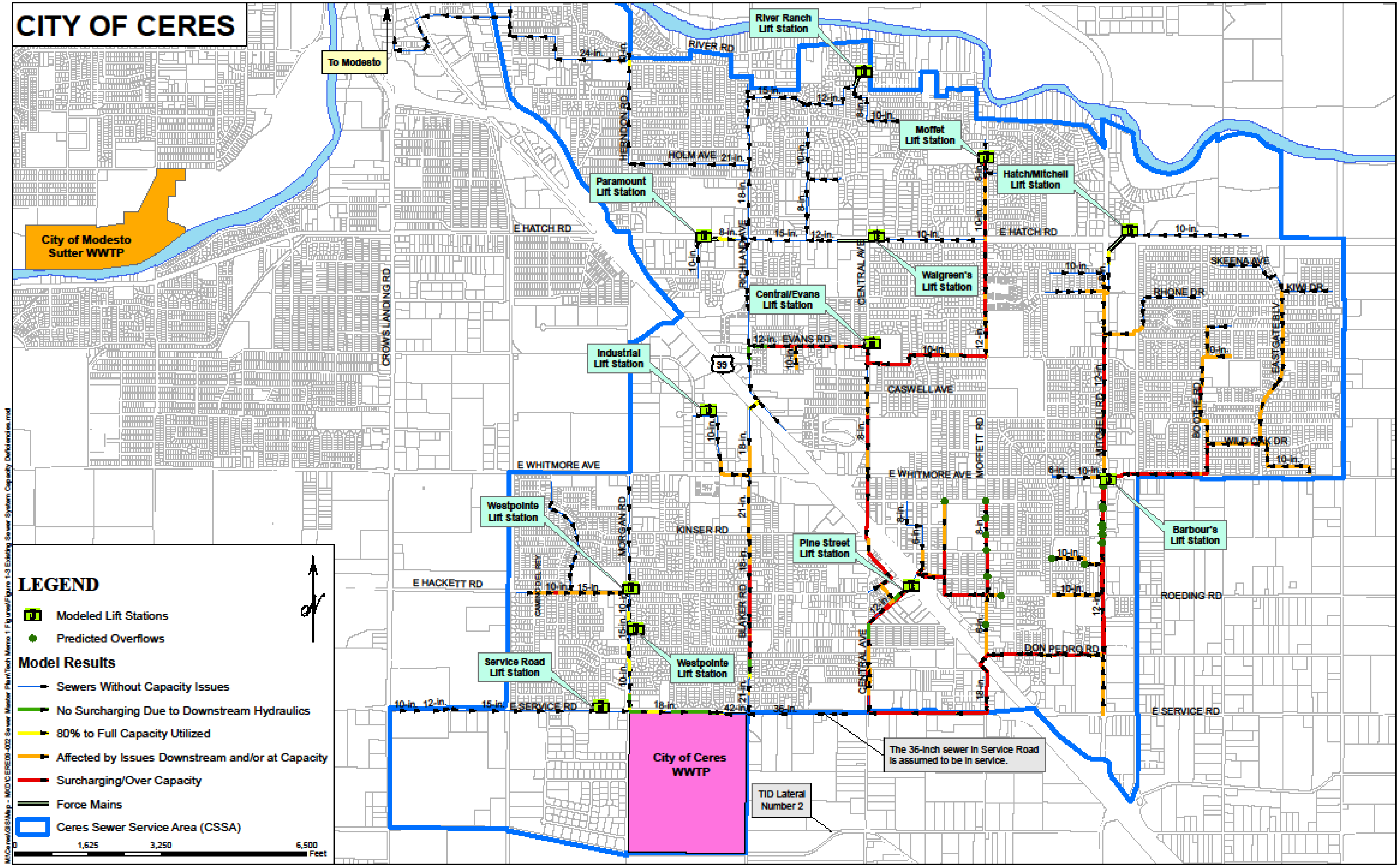

Figure ES-2
Existing Trunk Sewer System Capacity Deficiencies

Depending on the degree of discharge to the Turlock WWTP and the City's ability to update current permit conditions, available capacity in existing facilities is summarized in Table ES-2.

Table ES-2
City of Ceres WWTP
Limiting WWTP Treatment and Disposal Capacity

Discharge Case	Capacity, ADWF (Mgal/d)	Controlling Condition
On-Site under Current Permit	2.5	WDR No. 93-237 Influent Limit
On-Site under New Permit	2.8	On-site Disposal Limit
On-Site with Export to Turlock under Current Permit [(a)]	4.5	WDR No. 93-237 Influent Limit and current Turlock agreement flow limit
On-Site with Export to Turlock under New Permit	4.8	Current Turlock flow limit of 2.0 Mgal/d and on-site limit of 2.8 Mgal/d [(b)]

(a) Based on 2.0 Mgal/d limit to Turlock and 2.5 Mgal/d limit for on-site disposal. Under this scenario, effluent BOD_5 limits for onsite disposal at 40 mg/L and 100 mg/L to Turlock both apply. Limited additional aeration may be necessary to achieve this treatment capacity.

(b) The limit of 4.8 Mgal/d is based on no on-site effluent BOD_5 limit. This capacity is reduced to 3.8 Mgal/d if an on-site effluent BOD_5 limit of 40 mg/L is imposed. This limit also needs to be considered in the context of BOD_5 loading to the effluent disposal ponds and possible future on-site disposal capacity reductions if average effluent BOD_5 exceeds 40 mg/L.

The recommended capital improvement and replacement program for the WWTP is limited to four projects as follows:

- New headworks and influent pump station (completed)
- Distribution box repair/replacement (for Ponds S-1, S-2, and S-3)
- Upper pond (crop irrigation line) pipeline relocation
- Irrigation pump system flow meter

ES.2.2 EXISTING SEWER SYSTEM

The general condition of the City of Ceres sewer system was assessed through a review of existing CCTV records (for the sewer system), discussion of general facilities operation and performance with City staff, and compilation of the City's historic inspection records into a Computerized Maintenance Management System and associated risk assessment and CIP prioritization. As the City implements the CCTV inspection plan, and identifies additional sewers in need of repair or replacement, these specific projects should be added to the City's Capital Improvement and Replacement Program.

Hydraulic capacity of the exiting sewer system was assessed by using a dynamic hydraulic model of the key sewer systems. This assessment was conducted evaluating the system's ability to convey flows under existing conditions and a 10-year, 6-hour design storm. Model simulation results and the locations of potential surcharging and overflows can be seen in Figure ES-3. Blue pipes show areas with no capacity issues. Pipes shown in green indicate pipes that normally would experience surcharging conditions, but because of downstream hydraulics are flowing at conditions less than full capacity. Pipes shown in yellow have between 80 percent and 100 percent of capacity being utilized. Pipes shown in orange are at capacity or are being impacted by problems downstream (i.e. at full capacity because of a bottleneck downstream). Pipes shown in red are experiencing surcharged conditions. In the majority of these surcharging pipes, the level of surcharging is above the criteria recommended. The predicted surcharging and overflows are located in the following areas:

- Upstream of Barbour Lift Station on Mitchell Road,
- Upstream of Barbour Lift Station on East Whitmore Avenue
- North of East Whitmore Avenue on Hidden Oak Lane and Boothe Road,
- Downstream of Barbour Lift Station on Mitchell Road,
- West of Mitchell Road on Don Pedro Road,
- South of Don Pedro Road on Moffett Road,
- Between Moffett Road and Central Avenue on East Service Road,
- South of Kinser Road on Blaker Road,
- South of East Hatch Road on Moffett Road,
- Upstream of Westpointe Lift Station on East Hackett Road,
- Upstream of Central/Evans lift station on Central Avenue, Forrest Road, and Acorn Lane,
- Downstream of Central/Evans lift station on Evans Road,
- Between Central/Evans lift station Pine Street lift station on Central Avenue,
- Upstream of Pine Street lift station in the Ceres downtown sewer area, and
- Downstream of Pine Street lift station on Pine Street and Central Avenue.

Based on City experience, the lift stations in the City, with the exception of Pine Street and Barbour’s lift stations, do not experience any capacity issues during periods of wet weather flow, nor are predicted by the hydraulic model to have capacity issues during the 10 year, 6 hour design storm.

Barbour’s lift station is severely under capacity to accommodate wet weather flow and is predicted to cause overflows during the design storm. Because of this deficiency, the City has proceed with making interim improvements to Barbour’s lift station to address these issues.

ES.3 FUTURE LAND USE AND FLOW AND LOAD PROJECTIONS

Existing development and future approved land were documented and used as the basis for projecting future wastewater flows and loads and the phasing rationale for sewer utility planning. Historical flow and load data were evaluated and projected flows and loads developed for the City of Ceres (City) Wastewater Treatment Plant (WWTP) and anticipated future flows to the City of Modesto from the existing North Ceres Sewer Service Area (NCSSA). Recommended design criteria were established for sizing infrastructure necessary to accommodate wastewater generation from future development.

ES.3.1 EXISTING AND FUTURE LAND USE

The existing level of development was based on the land use estimates and analysis used in the *City of Ceres Preliminary Wastewater System Capacity Analysis* (October 2008) and the *City of Ceres Technical Memorandum Wastewater Collection System Capacity Analysis Update* (August 2009). Existing development included development that was in place as of February 2008 based on the City of Ceres 2008 Zoning Map and 2007 Land Use Inventory Map. Existing developed land uses are assumed to not change in the future with the exception of potential land use densification within any identified redevelopment areas. Existing and future growth area land uses considered in the master plan are shown in Figure ES-3.

Although actual development may not follow this order, for the purpose of planning sewer facilities, future development was assumed to generally proceed sequentially according to the three phases presented below and shown on Figure ES-4.

- Phase I: It is assumed that new development will generally follow infill within the existing City Limits according to General Plan land use designations. Phase I includes all existing development and development of infill within the existing City Limits. This development is assumed to proceed first due to fewer land use entitlement impediments, e.g., does not require annexation into the City of Ceres (a process within the powers and duties of the Stanislaus Local Agency Formation Committee[2] (LAFCO).
- Phase II: Development within the proposed Primary Sphere of Influence (SOI) according General Plan land use designations. This is consistent with the Stanislaus LAFCO policy, where "areas within an adopted Primary Area shall be eligible for annexation...within a zero to ten year period."
- Phase III: Development within the remaining study area according to General Plan land use designations. Phase III includes the proposed Secondary SOI and remaining General Plan land uses excluding agriculture (which has not been included in the study area as it is assumed to not generate wastewater flows to the City's future system).

A summary of future development areas are listed in Table ES-3, according to General Plan land use designations and the phasing described above.

[2] Stanislaus LAFCO Policies and Procedures, December 5, 2001 and last Amended June 23, 2010, Stanislaus LAFCO, Page 29.

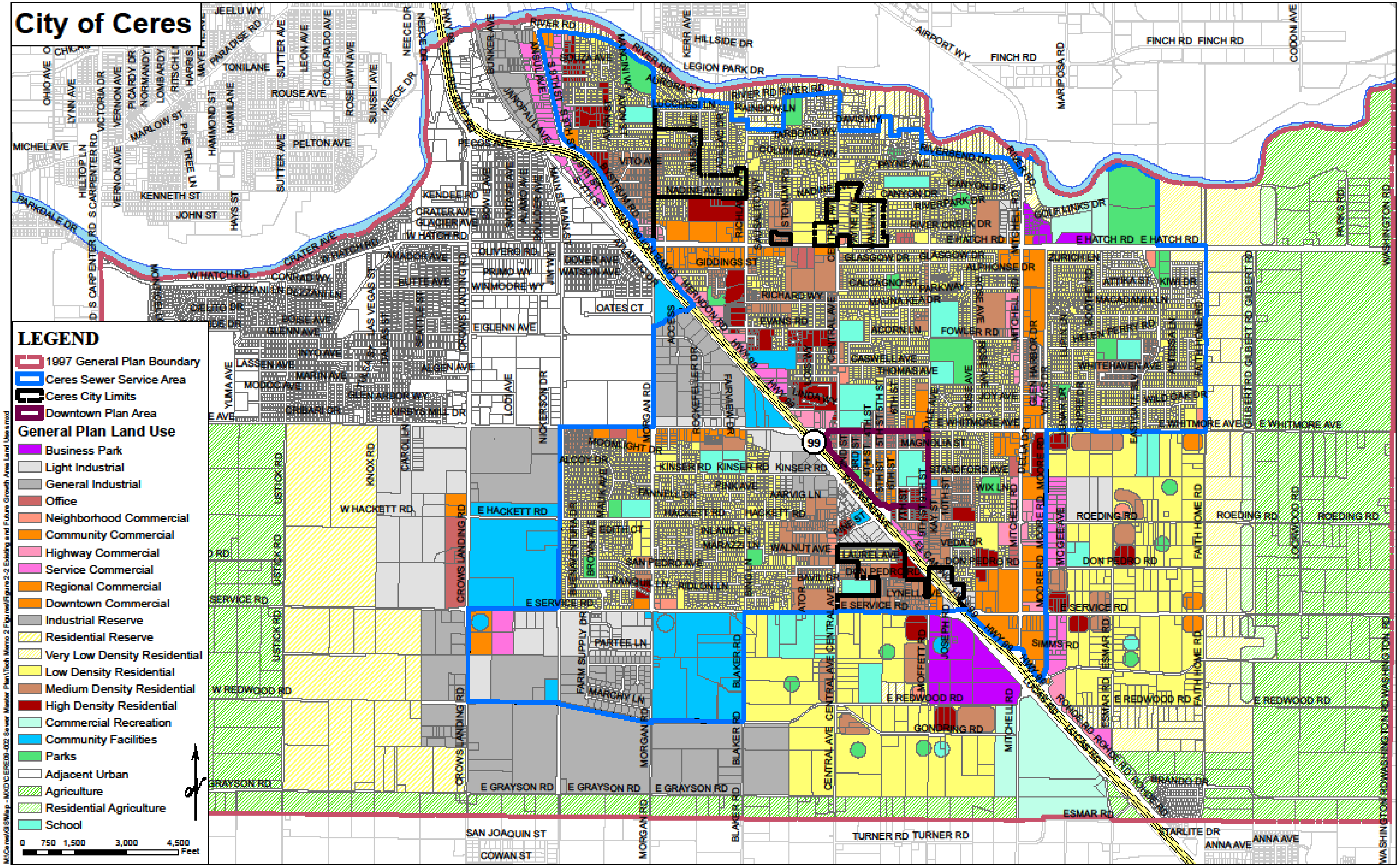

Figure ES-3
Existing and Future Growth Area Land Uses

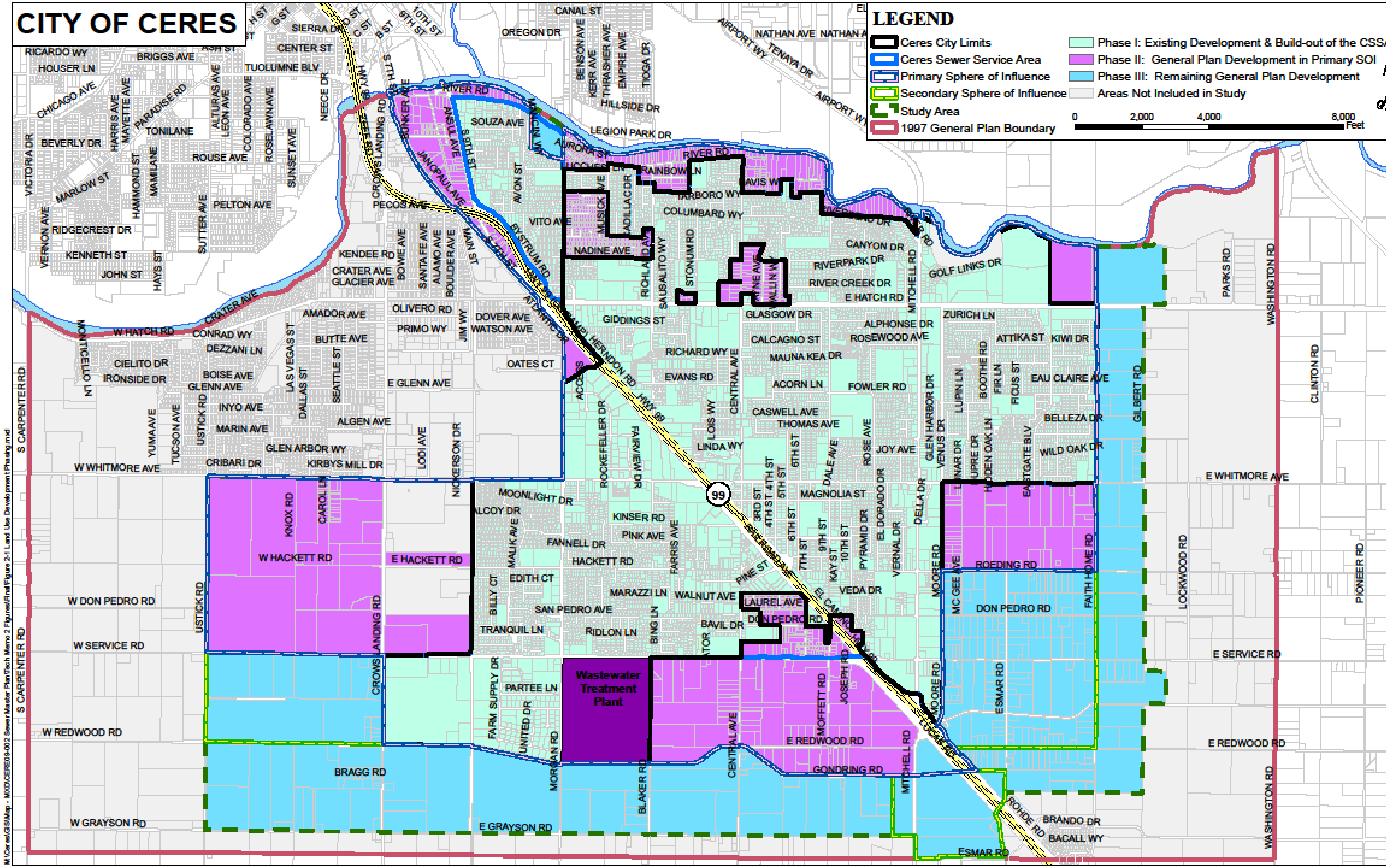

Figure ES-4
Future Land Use Development Phasing

Based on the 1997 General Plan, and compared to the recent land use inventory, the urban area is planned to grow approximately three-fold over current development levels. The top three land use categories projected to contribute to this urban area expansion are:

1. Residential land uses increasing by approximately 3,150 acres or an increase of 150% over existing developed residential land uses
2. Industrial land uses increasing by approximately 1,480 acres or an increase of 585% over existing developed industrial land uses, and
3. Commercial land uses increasing by approximately 440 acres or an increase of 128% over existing developed commercial land uses.

Table ES-3
City of Ceres
Existing and Future Growth Land Use Summary

Land Use	Master Plan Development Phases				
	Phase I		Phase II	Phase III	Total
	Parcels	Acres [(a)]	Acres	Acres	Acres
Commercial					
Community Commercial	188	240.9	22.0	11.8	274.7
Downtown Commercial	91	21.5	---	---	21.5
Highway Commercial	88	88.0	---	13.3	101.3
Neighborhood Commercial	37	26.1	8.4	---	34.5
Office	132	49.8	35.4	---	85.2
Regional Commercial	25	97.4	---	0.4	97.8
Service Commercial	58	71.3	59.5	40.9	171.7
Commercial Recreation	5	31.2	10.6	165.4	207.2
Community Facilities	34	243.0	195.9	---	438.9
Industrial					
Business Park	30	21.6	106.7	---	128.3
Light Industrial	137	204.7	312.5	---	517.2
General Industrial	153	297.7	201.7	---	499.4
Industrial Reserve	---	---		587.5	587.5
Single Family Residential					
Residential Agriculture	---	---	---	121.5	121.5
Very Low Density Residential	538	137.1	242.6	533.2	912.8
Low Density Residential	9,444	1,657.4	518.0	635.4	2,810.8
Multifamily Residential					
Medium Density Residential	1,187	380.2	131.7	36.8	548.7
High Density Residential	399	183.1	30.7	20.8	234.6
Residential Reserve	---	---	315.8	507.6	823.4
Schools	17	157.0	92.4	18.5	267.9
Parks	51	173.9	10.9	54.7	239.5
Adjacent Urban	---	---	---	---	---
Agriculture	---	---	---	---	---
Total	**12,614**	**4,081.9**	**2,294.8**	**2,747.8**	**9,124.5**

(a) Based on net area for land area within existing City of Ceres boundaries and current City Sewer Service Area

For the purposes of this study, future wastewater generation was be defined in terms of the number of Equivalent Dwelling Units (EDU) for each parcel or future development area. An EDU is a unit of measure that normalizes all land use types (commercial, industrial, residential, etc.) to the level of demand created by one single-family housing unit. In terms of wastewater generation, one EDU is equivalent to the average wastewater flow from an average Ceres single-family detached household. EDU density was assigned based on the 1997 General Plan land use densities.

ES.3.2 CURRENT AND PROPOSED FUTURE WASTEWATER GENERATION RATES

For the purpose of the Sewer Master Plan, a sanitary wastewater generation rate of 260 gallons per day per EDU (gpd/EDU) was be used for future development Phases I, II and III. This value is consistent with the wastewater generation rates developed in the hydraulic model for the *City of Ceres Preliminary Wastewater System Capacity Analysis* (October 2008) and is based on an evaluation of the recorded influent flows at the City of Ceres Wastewater Treatment Plant in 2007 as compared with the estimated total EDUs connected to the system at that time. A peaking factor of 1.5 is be applied to the sanitary wastewater generation of all parcels to estimate the peak hourly flow excluding infiltration and inflow (I/I). To account for I/I entering the collection system during rainfall events an I/I factor of 1,500 gallons per day per acre (gpd/acre) was applied to every land area that is assumed to be contributing sewage to the collection system in the future.

The City's WWTP receives wastewater from residential, commercial, institutional, and dry industrial users. To determine historical flows and loads, daily influent flow, weekly biochemical oxygen demand (BOD_5), and daily total suspended solids (TSS) were obtained from City of Ceres WWTP influent records from January 1999 to March 2008. Previous studies conducted at the City suggested the use of BOD_5 and TSS influent characteristics of 270 mg/L each (corresponding to average per-capita loading rates of about 0.23 lbs BOD_5 and TSS per day respectively). However, these concentrations were proposed in the absence of Ceres-specific data[3]. Existing wastewater monitoring data seem to indicate a lower strength of the Ceres wastewater than previously assumed, and suggest low TSS and BOD_5 loading rates on a per-capita basis, as compared to industry standards. Therefore, in the absence of data to confirm what appear to be low loading rates, it is proposed that the recommended Ten-State Standard loading rates be used until the City conducts additional characterization of the wastewater. Table ES-4 summarizes the recommended future flow and load factors used in this study.

Combining the future land use information and EDU factors with the recommended future flow and load criteria, projections of future wastewater flows and loads were prepared for the NCSSA and CSSA, as summarized in Table ES-5.

[3] Wastewater Treatment Facility Expansion Study, Dewante & Stowell, June 1984.

Table ES-4
City of Ceres
Recommended Future Per-EDU Flow and Load Basis

Criteria Designation	Future Land Use Unit Flow [a]
Flow [b]	260 gpd/EDU
BOD [c]	0.20 #pcd
TSS [c]	0.25 #pcd

(a) gpd/EDU = gallons per day per EDU; #pcd = pounds per capita per day.
(b) Unit generation values for residential are based on residential densities as defined in the General Plan and an occupancy rate of 3.38 persons/EDU.
(c) Based on recommended Ten-State Standards loadings for communities where garbage grinders and commonly used.

Table ES-5
City of Ceres
Estimated Flows and Load for Each Land Use Designation

	Phase I		Phase II		Phase III		Cumulative Total	
Land Use	**NCSSA**	**CSSA**	**NCSSA**	**CSSA**	**NCSSA**	**CSSA**	**NCSSA**	**CSSA**
Residential [a] (EDUs)	3,613	12,969	1,295	4,367	14	6,598	4,922	23,934
Commercial [b] (EDUs)	204	777	83	79	---	120	287	976
Industrial [c] (EDUs)	---	2,672	376	2,138	---	---	376	5,459
Office (EDUs)	---	189	---	135	---	---	---	324
School (EDUs)	81	1,313	---	821	---	164	81	2,298
Commercial Recreation (EDUs)	---	4	---	2	---	23	---	29
Community Facilities (EDUs)	1	923	---	538	---	---	1	1,668
Residential Reserve (EDUs)	---	---	---	2,843	---	4,569	---	7,412
Industrial Reserve (EDUs)	---	---	---	---	---	2,996	---	2,996
Total ASF, (EDUs), rounded	**3,899**	**18,847**	**1,754**	**10,923**	**14**	**14,470**	**5,667**	**45,096**
Flow, (Mgal/D)								
Average Sanitary Flow	0.81	3.7	0.46	2.7	0.004	3.8	1.3	10.2
Peak Daily Flow	1.22	5.5	0.69	4.05	0.006	5.7	1.9	15.3
Peak Hourly Flow	3.1	8.9	1.2	7.4	0.011	9.7	4.3	26
Biochemical Oxygen Demand (BOD_5) Load, lbs/day								
Average BOD_5 Load, lbs/day	2,442	8,767	875	4,874	9.5	7,549	3,327	21,190
Total Suspended Solids (TSS) Load, lbs/day								
Average TSS Load, lbs/day	3,053	10,959	1094	6,092	12	9,436	4,159	26,487

(a) Includes Residential Agriculture, Very Low Density Residential, Low Density Residential, Medium Density Residential, and High Density Residential

(b) Includes Community Commercial, Downtown Commercial, Highway Commercial, Neighborhood Commercial Regional Commercial and Service Commercial

(c) Includes Business Park, Light Industrial and General Industrial. Community Commercial, Downtown Commercial, Highway Commercial, Neighborhood Commercial Regional Commercial and Service Commercial Additional industrial acres within the Secondary SOI includes 310 acres of Industrial Reserve.

ES.4 WASTEWATER TREATMENT AND DISPOSAL EXPANSION PLAN

The wastewater treatment and disposal expansion plan addressed the potential range of realistic wastewater treatment and disposal alternatives in the context of wastewater issues relevant to the City of Ceres. Following this initial consideration, or screening, feasible wastewater treatment and disposal alternatives were assembled and evaluated, with recommendations made regarding near-term and long-range planning of Ceres wastewater treatment and disposal. This study included:

- A historical perspective on the existing treatment and disposal techniques employed by the City, prior alternatives evaluated and pursued, and the basis for the existing system.
- Existing and potential future disposal alternatives and anticipated regulatory drivers:
  - Effluent nitrogen and groundwater quality.
  - Potential salinity impacts to groundwater or surface water quality.
  - Groundwater recharge vs. land disposal vs. surface water discharge.
  - Water supply limitations and the possible use of recycled water to supplement future City water needs.
  - State Water Board mandated salt and nutrient management plans.
- Evaluation of wastewater treatment and disposal alternatives,
- Facilities recommendations and phasing considerations including:
  - Existing wastewater treatment plant location, and existing and planned adjacent land uses.
  - Percolation disposal capacity and the likely need to switch to alternative disposal methods over time.
  - Phasing export pumping and pipeline facilities.

Within NCSSA, the City of Ceres owns and maintains the collection system, however collected wastewater is conveyed to the City of Modesto under an agreement originally executed in 1979. . The City of Modesto treats wastewater from the NCSSA at its Water Quality Control (WQC) facilities at Sutter Avenue and Jennings Road. Under the current agreement, the City of Modesto will continue to provide wastewater treatment and disposal service to NCSSA. New development within NCSSA is generally considered infill by the City of Modesto and payment of the Modesto Sewer Capacity Fees is required for new service.

ES.4.1 EXISTING AND FUTURE DISPOSAL METHODS

Wastewater treatment and disposal at the City's existing WWTP are regulated under Waste Discharge Requirements Order No. 93-237 (WDRs). The more significant existing discharge requirements include:

- Limiting the monthly average dry weather influent flow to 2.5 Mgal/d;
- Disposal and storage capacity to contain flows associated with 100-year annual precipitation; and
- Groundwater limitations that do not allow the discharge to cause an exceedance of certain chemical and bacteriological constituents or to cause nuisance taste or odor producing substances.

Existing limited groundwater monitoring data were evaluated with respect to the above requirements and the State's Antidegradation Policy. The limited data indicate that shallow groundwater in the vicinity of the Ceres WWTP is impacted with respect to nitrate. However, the contribution and degree of influence from the disposal activities is not clear. Additional monitoring is warranted, including an assessment of the groundwater source, based on general chemistry and analysis of stable isotopes as recommended.

Many recent WDRs issued for land disposal facilities in the Central Valley contain limits on effluent nitrogen because of widespread nitrate pollution of groundwater. Typically, a monthly average total nitrogen effluent limitation of around 10 mg/L is established based on the drinking water nitrate MCL of 10 mg/L; and the tendency for all nitrogen in groundwater to eventually be in the nitrate form. Based on our experience with aerated pond performance, and the recent Ceres effluent TKN concentrations of 26 mg/L, it is unlikely that the existing treatment process can reliably meet a monthly total nitrogen limitation of around 10 mg/L. Annual averaging of effluent nitrogen data may be possible because of the concentration equalizing effect of the groundwater basin, but even this extraordinary measure may not result in complete, reliable compliance.

Based on recent WDRs, it is likely that the City will have some form of salinity effluent limitations for land disposal and possibly for discharges to Modesto and Turlock. A typical land discharge facility effluent salinity limitation is the potable water supply salinity plus 500 μmho/cm, or background shallow groundwater salinity, whichever is less. Based on the one effluent sample indicating an EC of 1,400 μmho/cm, total dissolved solids of 690 mg/L, and fixed dissolved solids of 590 mg/L, it is likely that the City will have to implement salinity source control. This may involve the City switching from a groundwater potable supply to a surface water supply to achieve compliance with long-term State salinity objectives.

It is anticipated that the Regional Water Quality Control Board will be requesting that the City assess the continued viability of on-site percolation disposal. Likely points of concern are going to be:

- Potential for impacts to shallow groundwater with respect to nitrogen.
- Potential for the City's effluent disposal practices to cause the mobilization of iron, manganese, and possibly arsenic, and
- Impacts to shallow groundwater limiting its suitability for agricultural use.

If further study confirms the existence of significant potential for excessive groundwater degradation or pollution, the City will be required to implement alternative disposal means for approximately 2.5 Mgal/d of existing flows. Based on our experience, the schedule for replacing this capacity will likely not be less than ten years from such confirmation. Therefore, it is recommended that future wastewater disposal expansion alternatives include conveying the existing 2.5 Mgal/d of capacity to the new expanded disposal program.

ES.4.2 WASTEWATER TREATMENT AND DISPOSAL ALTERNATIVES

A potential range of wastewater treatment and disposal alternatives were initially identified, however not all of these potential alternatives can be considered feasible. Of those potential alternatives, ones likely to be feasible were further studied based on the City of Ceres current situation, past studies, and current and anticipated regulatory requirements, and evaluates the potential range and cost of facilities needed to implement these potentially feasible alternatives.

Under current Regional Board policy, regionalization is preferred wherever feasible, therefore this study evaluated several regionalization alternatives with the City of Modesto and City of Turlock. Potentially feasible disposal alternatives identified screened to a likely feasible set of alternatives as presented below:

- Continue to discharge NCSSA wastewater to the City of Modesto.
- Continue to percolate up to 2.5 Mgal/d of effluent on-site until regulatory requirements dictate that this method be discontinued.
- Continue to convey up to 2.0 Mgal/d of equalized effluent flow to Turlock (with the possibility of conveying raw wastewater to Turlock, if cost effective).
- Increased wastewater export to Turlock and/or Modesto based on the best apparent overall project cost, including anticipated Modesto or Turlock costs and City costs for equalization, pumping, and pipelines, and
- Evaluate the potential facilities requirements and costs for the City to produce tertiary effluent for reuse.

The alternatives associated with increasing wastewater flows to the City of Modesto were based on constructing a new sewer outfall to the City of Modesto Jennings Wastewater Treatment Plant. Figure ES-5 depicts a probable alignment for this new export pipeline.

Based on these disposal alternatives, six treatment and disposal alternatives were evaluated as summarized below in Table ES-6.

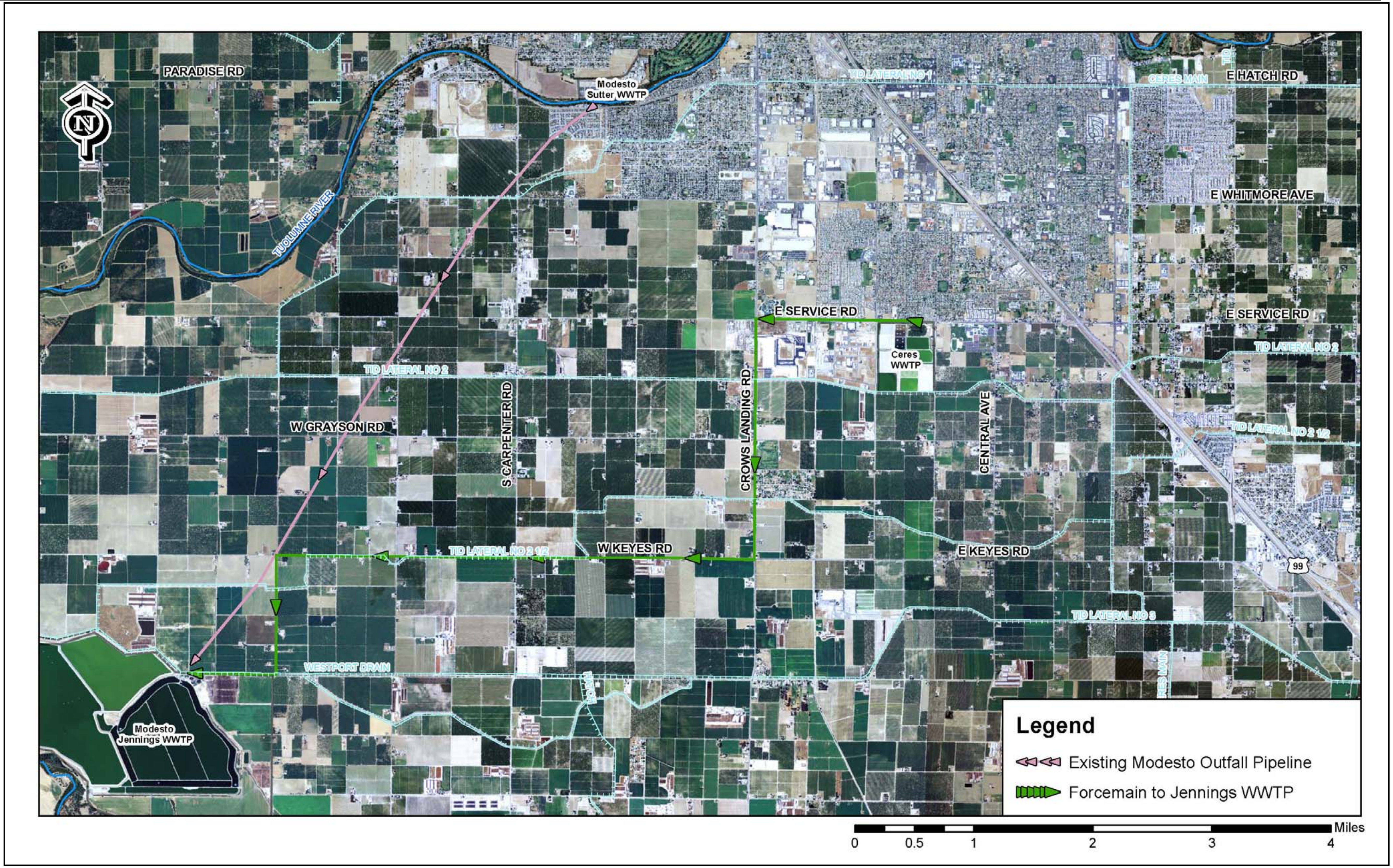

Figure ES-5
Possible Future Export Pipeline to Modesto

Table ES-6
Summary of Treatment and Disposal Alternatives

Alternative	Sub-Alternative Description
Alternative A: Increased Wastewater Export to City of Modesto	
Alternative A-1	Export up to Peak Influent Flow to Modesto Jennings WWTP
Alternative A-2	Export Equalized Flow to Modesto Jennings WWTP
Alternative A-3	Export Equalized Flow to Modesto and Turlock
Alternative B: Increased Wastewater Export to City of Turlock	
Alternative B-1	Export of Equalized Flow to Turlock RWQCF
Alternative B-2	Export up to Peak Influent Flow to Turlock RWQCF
Alternative C: Ceres Production, Storage, and Conveyance of Tertiary Effluent	

These alternatives included a recommendation for approximately 40 Mgal of emergency storage, estimated at a total capital cost of approximately $3,800,000, for each sub-alternative. Emergency storage is recommended in lieu of a parallel pipeline system due to the lower capital and operation and maintenance cost with comparable risk mitigation benefits.

ES.4.3 WASTEWATER TREATMENT AND DISPOSAL FACILITIES RECOMMENDATIONS

Table 5-7 summarizes the estimated total capital cost for each alternative with estimated annual operation and maintenance costs. As a means to compare the six alternatives, Table ES-7 also includes the estimated 30-year net-present-value of total capital cost and operation, maintenance, and facilities replacement. Based on the net present value of capital, O&M, and replacement, the two apparent lowest net-present value alternatives are:

- Alternative A2: Export Equalized Flow to Modesto Jennings WWTP, and
- Alternative A3: Export Equalized Flow to Modesto and Turlock.

The apparent cost difference between these two is about $1,400,000, or about 0.5%.

The two lowest capital cost alternatives are:

- Alternative B1: Export of Equalized Flow to Turlock RWQCF, and
- Alternative B2: Export up to the Peak Influent Flow to Turlock RWQCF.

The lower capital cost of these alternatives is primarily due to the lower assumed average buy-in cost to Ceres for future capacity at the Turlock RWQCF. The apparent cost difference between these two is about $1,300,000 or about 1%.

Considering other factors such as:

- Redundancy and reliability,
- Flexibility for future expansions,
- Flexibility in responding to changes in permit conditions and operating costs, and

- Ability to negotiate a competitive purchase price for capacity between Turlock and Modesto, and
- Uncertainty in future buy-in costs to Modesto or Turlock facilities,

The alternative of expanding export of equalized flow to both Modesto and Turlock (Alternative A3 as depicted in Figure ES-6) is the recommended long-range plan for Ceres wastewater treatment and disposal.

Table ES-7
Total Capital Cost and Net-Present Value Comparison of Alternatives ($M)

Component	Alternative A1	Alternative A2	Alternative A3	Alternative B1	Alternative B2	Alternative C
Ceres Improvements	$33.6	$32.1	$29.3	$40.3	$39.0	$199.2
Buy-in to Modesto	$107.4	$107.4	$55.0	$0	$0	$0
Buy-in to Turlock	$0	$0	$16.3	$33.5	$33.4	$0
Total Capital Cost	$141.0	$139.5	$100.6	$73.8	$72.4	$199.2
Estimated Annual O&M	$7.0	$6.7	$8.6	$11.5	$11.5	$14.2
Net-Present Value Capital and O&M	$282	$277	$276	$309	$307	$488

.

Implementation of the recommended long-range plan is identified with five phases that would be triggered by discrete events such as reaching certain flows or as a result of future regulatory or permit requirements. These events and the resultant improvements are listed below and a phased summary shown graphically in Figure ES-7 with relation to limiting plant capacity. Phased improvements are related to implementing Alternative A3 - Export Equalized Flow to Modesto and Turlock.

Phase 1: Prior to the Peak Influent Flow Exceeding 6.3 Mgal/d

- The existing influent pump station capacity is limited to the reliable pumping capacity of approximately 6.3 Mgal/d (based on one of the existing four pumps being off-line). At the point where monitored peak hour flows are recorded to approach or exceed 6.3 Mgal/d, the City should increase the influent pumping capacity by installing the first set of larger pumps, presumably the two pumps ultimately needed for the discharge to Modesto at 8.8 Mgal/d each. Table 5-8 and Figure ES-7 assume that Phase 1 will occur at an average flow of about 3.4 Mgal/d. Current average flow (based on 2007 data) is 3.07 Mgal/d, however recent (2010 and 2011) average flow has been less than this, possibly due to a high rate of vacancies.

Phase 2: Prior to the Average Influent Flow Exceeding 4.5 Mgal/d or if On-site Disposal Must be Discontinued

- Construct bypass piping around treatment ponds to the existing Turlock export pump station (note, this may require modifications or improvements to influent pumping to accommodate the new head and flow conditions),
- Increase export pump station capacity to the maximum projected 6.0 Mgal/d,

- Purchase Turlock capacity based on funds availability and most-cost effective capacity increment in Turlock facilities,

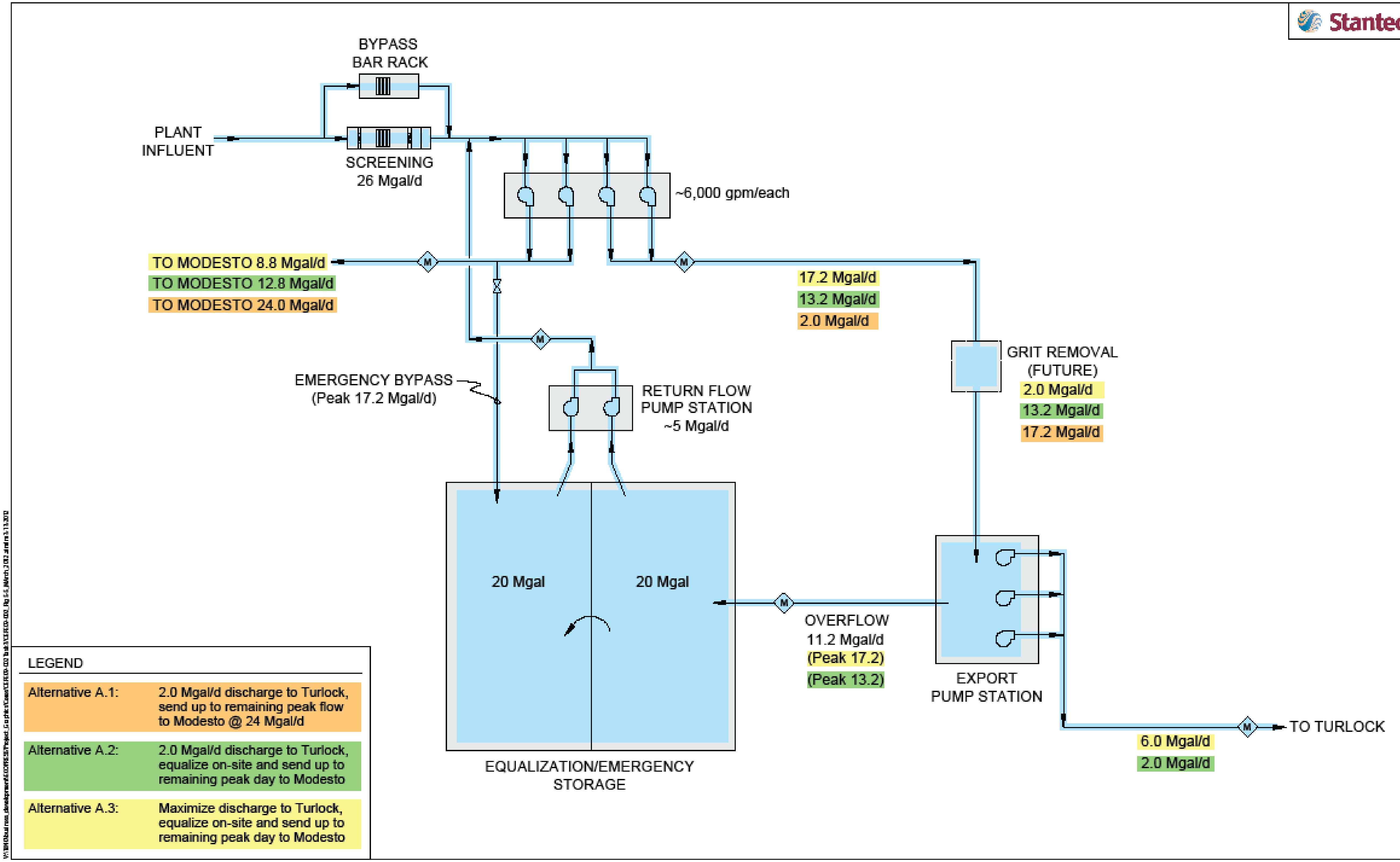

Figure ES-6

Conceptual Flow Diagram for Alternative A:
Increased Wastewater Export to City of Modesto

This phase assumes that the 2.5 Mgal/d on-site disposal continues and that these on-site facilities provide emergency discharge and/or storage as needed to address pumping or force main maintenance and repair. As part of Phase 2, or subsequent based on increasing influent flows, the remaining influent pump station pumps can be replaced with the ultimate 17.2 Mgal/d pumps to equalization and the Turlock Export Pump Station.

Phase 3: After Phase 2 Based on Flow and When On-site Disposal Must be Discontinued

- Construct force main, junction structure, and parallel outfall to Modesto once the maximum capacity (6.0 Mgal/d.) been purchased for Turlock has been utilized,
- Modify influent pumping arrangement to accommodate export to Modesto,
- Purchase Modesto capacity based on funds availability and most-cost effective capacity increment in Modesto facilities (assumed at first 1.0 Mgal/d increment), and
- Convert existing treatment reactors to equalization and emergency storage,

Phase 4: Prior to the Average Influent Flow Exceeding Combined Turlock and Modesto Capacity

Depending on the capacity increments purchased under Phase 2 and Phase 3, Phase 4 would be triggered based on average influent flows as they approach the combined limit of capacity from both Turlock and Modesto. The additional capacity purchased from Turlock and/or Modesto may be based on available Ceres funds and the most cost-effective capacity increment at that time. Table ES-8 assumes that the combined Phase 2 and Phase 3 capacity is 7.0 Mgal/d, with 6.0 Mgal/d of capacity in Turlock and 1.0 Mgal/d in Modesto.

Phase 5: Purchase Remaining Capacity in Modesto

Depending on the capacity increments purchased under Phases 2 through 4, Phase 5 would be triggered based on average influent flows as they approach the combined limit of capacity from both Turlock and Modesto. The additional capacity purchased from Turlock and/or Modesto may be based on available Ceres funds and the most cost-effective capacity increment at that time. Table ES-8 assumes that the combined Phase 2 through 4 capacity is 8.0 Mgal/d, with 6.0 Mgal/d of capacity in Turlock and 2.0 Mgal/d in Modesto, therefore Phase 5 would be based on purchasing 2.2 Mgal/d of capacity in Modesto as the last element.

Grit Removal for Turlock Discharge

This phase will be triggered based on the City's operation and maintenance experience with the 75,200 ft force main and the results of the pond treatment, and/or as required by Turlock due to down-stream process requirements. If evidence arises to require grit removal, e.g., observed grit accumulation in force main crossings under TID canals, then this would be provided prior to equalization.

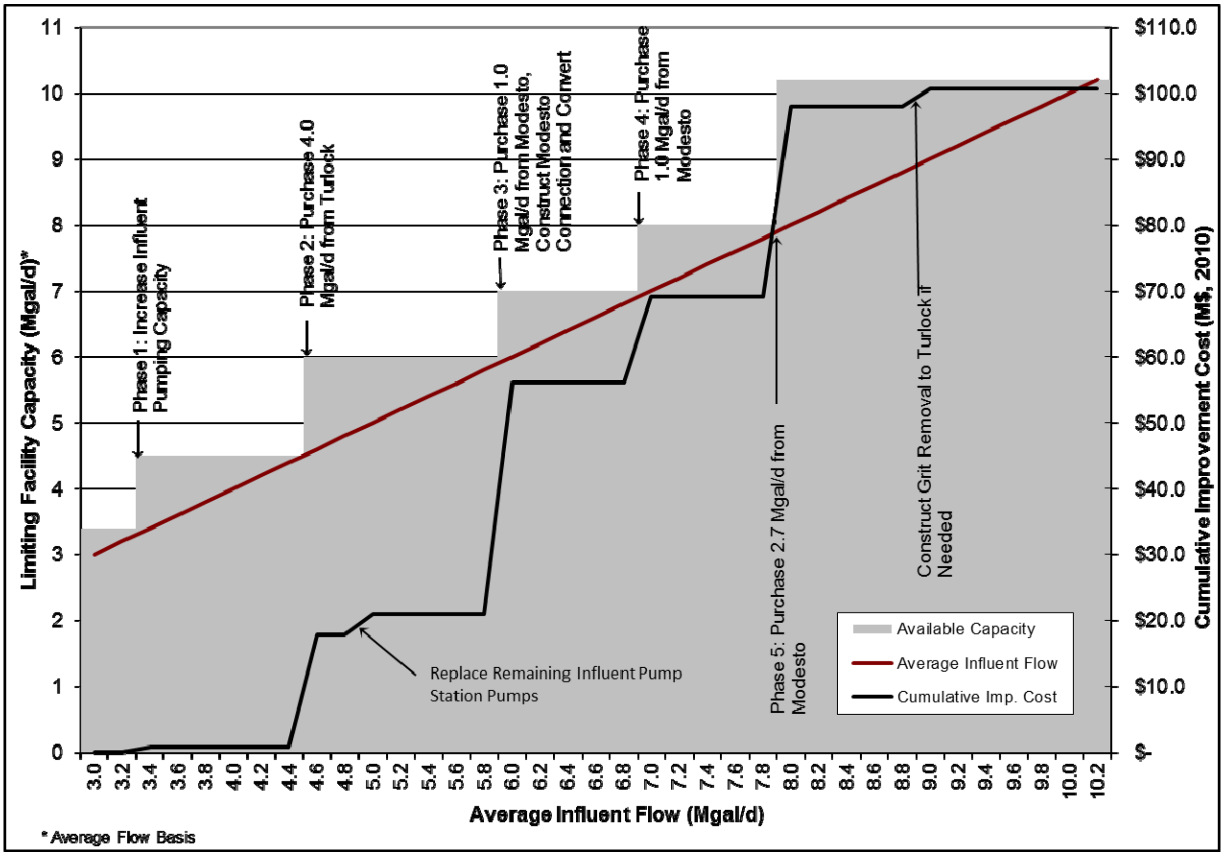

Figure ES-7
Phasing of Treatment and Disposal Improvements

Table ES-8
Phased Capital Cost of Recommended Long-Range Plan

Phase	Flow Trigger (Average, Mgal/d)	Phase Capital Cost ($M)	Cumulative Capital Cost ($M)
1 – Increase Influent Pumping Capacity	3.4 [(a)]	$0.9	$0.9
2 – Purchase 4.0 Mgal/d from Turlock	4.5	$20.1	$21.0
3 – First phase of Export to Modesto (1.0 Mgal/d)	6.0	$35.1	$56.1
4 – Second Phase of Export to Modesto (2.0 Mgal/d)-8	7.0	$13.1	$69.2
5 – Last Phase of Export to Modesto (4.2 Mgal/d)	8.0	$28.8	$98.0
Grit Removal	When Needed	$2.6	$100.6

(a) Assumed average flow trigger for increasing existing peak pumping capacity.

ES.5 COLLECTION SYSTEM MASTER PLAN

The Sewer Master Plan included development of a collection system expansion program, including preferred alignments for future sewer system expansion to serve future growth areas identified based on the 1997 General Plan and recent development project planning. The phasing of the improvements considered alternative alignments and the need to extend service based on the actual location and phasing of new development.

The collection system master plan was approached with an attempt to minimize the need for pumping wastewater, instead opting for the alternative of conveying flows through gravity trunk sewers whenever possible. Use of gravity trunk sewers is preferred to a system of shallow sewers with numerous lift stations. While deeper gravity sewers may require a higher initial capital cost, when properly designed, constructed, and maintained, they provide a greater level of reliability and flexibility. Also, the City strives to reduce the annual operation and maintenance cost of the sewer system, which tends to be higher with more lift stations (as a result of power costs, more frequent replacement of mechanical and electrical equipment, and a higher demand on staff for preventative maintenance). For this program, sewers up to a maximum of twenty to twenty five feet deep were considered at the upper end of cost feasibility for gravity sewers, due to higher costs from trenching, dewatering, and shoring for deeper installations.

Given the location of the existing wastewater treatment plant (WWTP), existing sewer elevations, and regional trends in ground elevations, several growth areas will require conveyance of wastewater through future lift stations. Wastewater from the future southern growth areas cannot be conveyed by gravity to the WWTP since the general topography of the City falls from northeast to southwest and the WWTP is in the southern portion of the City.

Each alternative concept developed in this master plan will require further pre-design and detailed design based on the results of field surveys of the proposed alignments and incorporating project specific requirements including constructability and possible major utility conflicts, and actual locations and timing of future development. Figure ES-7 depicts the proposed future sewer system improvements to extend service to the primary future growth areas within the study boundary.

ES.5.1 EXISTING DEVELOPMENT AND BUILDOUT WITHIN EXISTING SEWER SERVICE AREA

Future development within the existing Ceres Sewer Service Area (CSSA) will consist primarily of infill development of existing vacant parcels and limited changes of existing land use. This infill development is identified as development Phase I and covers approximately 4,082 acres of differing land uses. Average dry-weather flow is predicted to increase by approximately 0.62 Mgal/d (or by approximately 20% over current flows) to the Ceres WWTP and by 0.11 Mgal/d (approximately 16% over current flows) within the North Ceres Sewer Service Area (NCSSA). Existing facilities, as improved according to the proposed CIP in Table ES-1, are generally adequate to accommodate this in-fill development with some specific improvements and confirmation of facilities slope and diameter as summarized below.

Currently un-sewered parcels in the NCSSA consist primarily of residential development on parcels that tend to be half-acre or larger. Wastewater treatment and disposal is currently provided to these residences through on-site septic tank and leach field systems. Future connection of these parcels would likely only occur as a result of septic system failure and/or as a result of future regulatory changes that require connection to a public sewer system.

If connection of these residential parcels becomes necessary in the future, local sewer extensions would be necessary generally consisting of the following:

1. For the parcels west of Stonum Road, service could be provided through the existing 10-inch sewer in Stonum Road that discharges into the 15-inch sewer on the south side of East Hatch Road.

2. For the area between Wallin Way and to the west of Central Avenue, four 8-inch sewer stubs exist under East Hatch Road connected to the 10-inch sewer that discharges into the Walgreen's Lift Station at Central and Hatch Road.

3. Existing facilities in East Hatch Road, including the Walgreen's Lift Station, are anticipated to have available capacity to accommodate potential future extensions of sewer service to these areas. Wastewater from these areas would be conveyed to the City of Modesto through existing sewers in East Hatch Road, Richland Avenue, Holm Avenue, Herndon Road, and Sonora Avenue.

Along the River Road corridor between Herndon Road and Mitchell Road, approximately 280 developed parcels exist that currently are not provided sewer service by the City of Ceres. Of these parcels, approximately 55 parcels are outside of the NCSSA boundary. Existing land uses within the River Road Corridor consist of residential development on parcels from less than one quarter acre to over four acres in size. Wastewater treatment and disposal is currently provided to these residences through on-site septic tank and leach field systems. Future connection of these parcels would likely only occur as a result of septic system failure and/or as a result of future regulatory changes that require connection to a public sewer system. As such, connection of existing residences to the City's system would typically occur as groups of homes request sewer service and plan to construct facilities (which will likely include new sewer lift stations) to make such connection. Below, the River Road Corridor area is grouped into four sub-areas that could be logically served by existing Ceres facilities.

ES.5.2 FUTURE GROWTH AREAS

Future growth areas are depicted in Figure ES-3 for the primary new growth areas of the City. Utilizing the flow criteria described above, the preferred method of extending sewer service to these areas was developed with potential alternatives to be considered in the future. The preferred alternative to serve future growth areas is show in Figure ES-8, based on project phasing and additional development constraints. Figure ES-7 shows the anticipated sewer size and capacity at 70% full depth. Table ES-9 lists the planning level opinion of probable cost for the sewers shown in Figure ES-8.

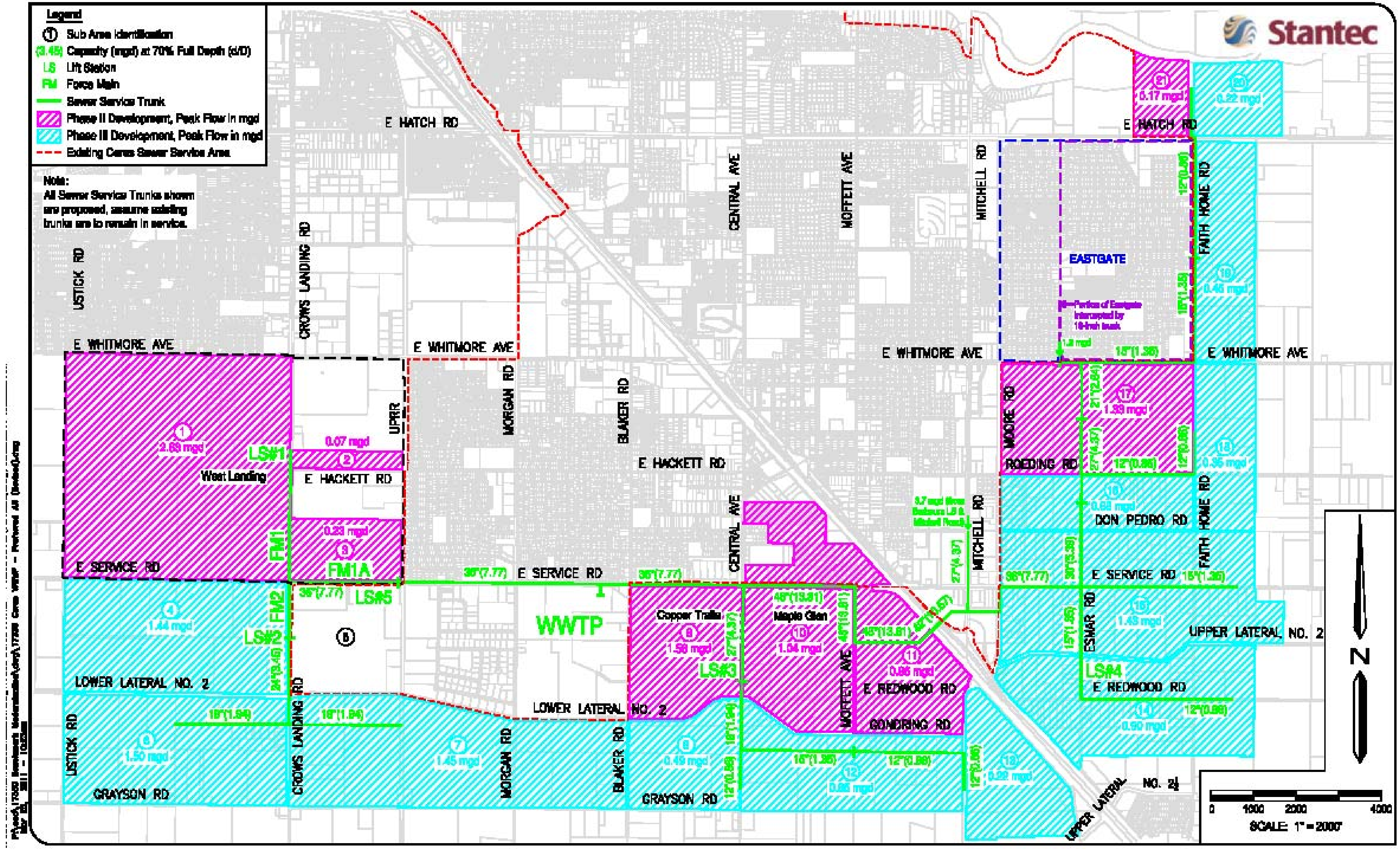

Figure ES-8
Preferred Alternative to Serve Future Growth Areas

Future collection system facilities have been based on gravity sewers where feasible, however four future sewer lift stations (or pump stations where they are accompanied by a force main) are likely to be needed to convey wastewater to the existing WWTP. The anticipated sewer lift stations and peak capacity requirements are summarized in Table ES-10, with the new development sub area(s) to be serve identified.

Table ES-9
City of Ceres
Sewer Trunk Lines - Planning Level Opinion of Probable Cost for Preferred Alternative to Serve Future Growth Areas

Improvement Description	Cost, $ [(a)]
Crows Landing Road Trunk Lines	$1,000,000
Service Road Trunk Lines	$12,100,000
Redwood Road Trunk Lines	$800,000
Moffett Avenue Trunk Lines	$1,200,000
Central Avenue Trunk Lines	$2,000,000
Mitchell Road Trunk Lines	$1,200,000
Esmar Road Trunk Lines	$3,500,000
Roeding Road Trunk Lines	$600,000
Whitmore Avenue Trunk Lines	$900,000
Faith Home Road Trunk Lines	$1,900,000
Lower Lateral No. 2 Trunk Lines	$1,800,000
Gondring Road Trunk Lines	$1,400,000
Moore Road Trunk Lines	$400,000
Sewer Trunk Line between Moore Rd & Moffett Ave	$3,200,000
Estimating Contingency (30%)	$9,600,000
SUBTOTAL – CONSTRUCTION COSTS (rounded)	**$41,600,000**
Design/Administration (20%) (rounded)	$6,400,000
TOTAL (rounded)	**$48,000,000**

ES.5.3 SEWER LIFT STATION IMPROVEMENTS

It is recommended that future sewer lift stations be designed to reliably convey peak wastewater flows and that mechanical and electrical components meet the EPA "Design Criteria for Mechanical, Electrical, and Fluid Systems and Component Reliability"[4]. Recommended minimum design criteria for future lift stations and force mains are contained in the Ten State Standards[5]. It is anticipated that all future sewer lift stations submersible wet-well type systems, which is what the City's existing systems are. Table ES-11 lists the planning level opinion of cost for the anticipated lift stations and force mains.

[4] "Design Criteria for Mechanical, Electrical, and Fluid System Component Reliability", EPA-430-99-74-001.
[5] "Recommended Standards for Wastewater Facilities", Health Education Services Division, 2004 Edition.

Table ES-10
City of Ceres
Future Lift Station Characteristics Summary

Lift (Pump)Station	Peak Capacity (Mgal/d)[a]	Force Main Length (ft)	Growth Areas Served[b]
Lift Station #1 (Pump Station)	2.7	5,700	1 and 2
Lift Station #2 (Pump Station)	4.4	1,350	4, 6 and 7
Lift Station #3	4.2	N/A	8, 9, 10, 12 and 13
Lift Station #4	0.9	N/A	14
Lift Station #5	7.1	N/A	1, 2, 4, 6 and 7

(a) Estimated reliable peak capacity required
(b) See Figure 4-1 of Technical Memorandum No. 4.
N/A = Not Applicable

Table ES-11
City of Ceres
Lift Stations - Planning Level Opinion of Probable Cost for Preferred Alternative to Serve Future Growth Areas

Improvement Description	Cost, $ [a]
Lift Station #1 (Pump Station)	$1,120,000
Lift Station #2 (Pump Station)	$810,000
Lift Station #3	$580,000
Lift Station #4	$210,000
Lift Station #5	$800,000
Estimating Contingency (30%)	$1,060,000
SUBTOTAL – CONSTRUCTION COSTS	**$4,580,000**
Design/Administration (20%)	$700,000
TOTAL	**$5,280,000**

ES.6 SUMMARY OF ENVIRONMENTAL CONSTRAINTS

An assessment of the environmental feasibility of the Master Plan was conducted upon completion of the preliminary alternatives analysis and identification of the preferred alternatives. The purpose of this constraints analysis is to assist the City in identifying key environmental issues that should be given due consideration during the implementation of the Master Plan. Specifically, the purpose of the environmental constraints analysis was to (1) determine whether there are potential liabilities or fatal flaws that would preclude or prohibit project implementation and (2) assess the recommended alternative from an environmental permitting/compliance perspective including potential permitting and mitigation requirements, timelines and costs. The results of the environmental constraints analysis, based on a compiling available desktop information, is summarized below, primarily focusing on environmental compliance with respect to biological resources and waters of the State. Cultural resources, agricultural resources, and other constraints topics, such as land use, were discussed in a summary fashion.

Environmental constraints were analyzed relative to the following proposed infrastructure/actions for the recommended alternative:

- Expansion and Upgrade of the Collection System to Service the 1997 General Plan Build Out Population
- Forcemain (pipeline) from City of Ceres WWTP to Existing Modesto Outfall Export Line
- Parallel Pipeline along Modesto Outfall from Forcemain Tie-in to City of Modesto Jennings WWTP

ES.6.1 RESULTS SUMMARY

In general, a large percentage of the projects described in the Master Plan are situated in roadways and developed corridors, and includes rural areas in Stanislaus County. In addition, the pipelines that connect facilities would be buried and therefore are considered temporary impacts experienced during the construction process. The adoption of a Master Plan is considered a discretionary action and will trigger the need for compliance with the California Environmental Quality Act (CEQA). In addition, the potential projects described in the Master Plan, if implemented will require compliance with CEQA and state and local environmental permitting regulations. If the proposed actions in the Master Plan are federally funded or the final design entails the placement of dredge and fill material in a jurisdictional water of the US, compliance with the National Environmental Policy Act (NEPA) and federal environmental regulations, such as the Endangered Species Act, Clean Water Act Sections 401 and 404 and the National Historic Preservation Act Section106, would be necessary. On projects with minor impacts to wasters of the US, NEPA compliance is typically covered in the previously approved Corps Nationwide Permits. If the project is federally funded, NEPA compliance is met through the federal-cross cutting (or “EQA Plus”) process.

Based on available desktop information, the overall Master plan projects intersect or are near several key biological resources, of key importance relative to permitting timelines, and costs are:

- Swainson’s hawk (state listed as threatened) foraging habitat
- Nesting raptors and other migratory birds (protected under the Migratory Bird Treaty Act)
- Wetlands and waters of the US (protected under the Clean Water Act Section 404)
- Valley Elderberry Longhorn Beetle (federal and state listed as threatened)

Key non-biological resources issues include potential impacts to:

- Agriculture
- Cultural Resources
- Traffic

- Noise
- Land Use
- Air Quality
- Greenhouse Gases
- Growth Accommodation/Induction

Due to the presence of the canals and potential wetlands, the project could require a Clean Water Act section 404 permit and a CDFG streambed alteration agreement. CWA 404 permitting can take from 4 to 12 months, depending on habitat type. The Streambed Alteration Agreement Process is 90 days; however, when application preparation and information requests are added, the typical process can take 4 to 6 months.

The majority of the focus area is comprised of Prime agricultural land. Although the Master Plan, alone, does not remove agricultural land it does serve the population that will convert prime agriculture land to an incompatible use. Based on prime agriculture land identified in the future sewer area to Ceres, as much as 3,260 acres of prime agriculture land could be converted to urban development. Stanislaus County has implemented a Farmland Mitigation Program (FMP), requiring agriculture conservation easements of equal area, or in lieu of fees, be established for the conversion of land in a “most productive agriculture area.” Additionally, the portion of the Master Plan upgrades occurring outside of the sphere of influence and on unincorporated County lands is limited to installation of underground pipelines, and impacts to agriculture production from these upgrades will generally be temporary, with the land returning to agriculture.

Although implementation of the Master Plan and its associated proposed projects will likely result in the need to obtain permits from both federal and state environmental regulatory agencies, planning based on close coordination between the pre-design and environmental team can result in minimized impacts, streamlined permitting efforts, and reduced mitigation costs.

ES.6.2 PLANNING AND DESIGN-RELATED ENVIRONMENTAL CONSIDERATIONS TO REDUCE POTENTIAL IMPACTS AND STREAMLINE THE ENVIRONMENTAL COMPLIANCE PROCESS

Below is a list of planning and design-related considerations to reduce potential impacts and streamline the environmental compliance process, further reduce costs, permitting timelines, and potential permitting and mitigation fees:

- **Include Project-specific details in the Master Plan CEQA document** (or if appropriate, develop a project-specific CEQA document) so that the initial phases of the plan are already covered under CEQA immediately upon completion of the CEQA process. In addition, this method will streamline subsequent projects conducted under subsequent phases of the Masterplan, because they can simply be “tiered” off the Program-level CEQA document referring back to the original EIR for mitigation and impact disclosure.

- **Implement “Pinch Points” along pipelines:** Reduce the construction corridor to the width of the road, where the road/pipeline route crosses canals, drains, wetlands, and/or potential habitat areas.

- **Avoid/Minimize Impacts to Cultural Resources:** No route as currently planned would entail removal of buildings or other potential cultural resources. They will be designed to avoid such structures. The pipelines will be buried and therefore would not permanently impact the cultural aesthetics of an area either. The likelihood of inadvertent cultural resource finds along open country routes are greater than in disturbed roadways; however, cultural resource avoidance should be further considered for both routes.
- **Minimize/Avoid Impacts to Wetlands:** Vernal pools are considered habitat for several listed fairy shrimp species and protocol-level surveys of vernal pools takes two years to complete. If avoidance is infeasible, and impacts have not been mitigated through previous permitting efforts, impacts within 250 feet of the pools will require conservation, preservation, or restoration mitigation. Current credits for vernal pool impacts are approximately $250-325,000. Similarly, seasonal and emergent wetland preservation credits cost approximately $150 - $200,000. Therefore, it is recommended vernal pool and wetland impacts be avoided.
- **Minimize/Avoid Impacts to Swainson's Hawk nests:** No known nests are present within the planned project areas; however, if identified in pre-design surveys, efforts should be conducted to work outside of the breeding season (March 1 through September 15) or appropriate buffering and work hours should be employed to minimize disturbance.
- **Minimize Permanent Impacts to Swainson's Hawk Foraging Habitat:** Mitigation fees for loss of Swainson's Hawk foraging habitat (cropland or annual grassland), currently range from $6,000 to $9,000 per acre. CDFG considers an impact that lasts longer than one year a permanent impact or loss of foraging habitat requiring compensation. These impacts are levied at different ratios depending on the distance from an active nest. Permanent structures, to the extent feasible should be located outside of potential foraging habitat to the extent feasible.
- **Minimize/Avoid Impacts to Valley Elderberry Longhorn Beetle and its habitat:** Apply appropriate buffering to minimize disturbance to this habitat. Removal or adverse effects on this species or its habitat will result in the need for transplantation and compensatory mitigation. This can cost $25,000 or more depending on the size of the plant, number of stems, and presences of VELB exit holes.
- **Conduct rare plant surveys** early and during the appropriate bloom times to facilitate designing to avoid impacts or set up mitigation early in the process.

ES.7 10-YEAR CAPITAL IMPROVEMENT PROGRAM

The projected total cost of improvements to the City of Ceres sewer system, to address current deficiencies and expand the system to meet planned future use, is estimated to be approximately $171,000,000, with approximately $17,128,000 to address improvements to existing facilities, $100,600,000 for wastewater treatment and disposal expansion, and $53,300,000 to expand the wastewater collection system. The timeframe for these improvements will depend on the rate of future development in Ceres. Assuming a rate of increase in wastewater flows consistent with the increase seen from 1990 through 2008, the projected buildout flow of 10.2 Mgal/d would be reached in approximately 90 years. This timeframe is highly dependent upon economic factors and population dynamics and therefore it is no reasonable to set a pre-defined schedule for financing and construction all master plan facilities in this timeframe, therefore the City has requested development of a 10-year Capital Improvement Program (CIP) to address improvements reasonably foreseeable in the near-term. This section presents the proposed CIP based on a risk based analysis of existing facilities and a near-term projection of wastewater flows to the year 2022.

ES.7.1 RISK BASED ANALYSIS AND EXISTING FACILITIES CIP

Recommended capital improvements associated with existing facilities, as summarized in Table ES-1, are prioritized based on a risk based analysis. Additional information regarding facilities replacement and rehabilitation is contained in the Existing Facilities section of the Sewer Master Plan, based on existing facilities age, remaining useful life criteria, and limited condition assessment information available from recent CCTV inspections. Future Facilities Phasing Methodology and Summary

The current draft Sewer Rate Study projects funding capital improvements numbers 1 through 13 through the year 2017. Assuming existing facilities continue to be funded at an annual cost of approximately $1M to $2M per year, the 10-year existing facilities CIP would be as summarized in Table ES-12.

Table ES-12
City of Ceres
Existing Facilities 10-year CIP Summary and Prioritization

Year	Priority Ranking [(a)]	Improvement Description	Total Cost, $ [(b)]
2011/2012	1	New Headworks and Influent Pump Station	Funded (See Table ES-14)
	2	Barbour's Lift Station Interim Improvement	Funded
	3	Onsite Emergency Power at Barbour and Pine Street Lift Stations	Funded
	4A	Lift Station Emergency Backup Power Connections and Portable Generators	$287,000
2012/2013	5B	Pipe upsizing in East Service Road (c)	$978,800
2013/2014	6A	9th Avenue, Roeding Road, 6th Avenue and Park Street Sewer Relief Project	$1,264,000
	7A	Pipe upsizing in Central Avenue and Pine Street	$1,130,000
2014/2015	8B	Pipe upsizing in Don Pedro Road, East Service Road and Moffett Road	$2,296,000
2015/2016	9B	Pipe upsizing in Evans Road	$845,000
	10B	Pipe upsizing in Mitchell Road, East Whitmore Avenue and Hidden Oak	$1,575,000
2016/2017	11B	Pipe upsizing in Central Avenue, Forest Lane and Acorn Lane	$908,000
	12B	Distribution Box Replacement (for S-1, S-2, and S-3)	$27,000
	13B	Pipe upsizing in Moffett Road	$498,000
2017/2018	14C	Pipe upsizing in Blaker Road	$1,383,000
2018/2019	15C	Pipe upsizing in Central Avenue, Hackett Road, Harold Street and Pine Street	$988,000
	16C	Pipe upsizing in Mitchell Road	$911,000
2019/2020	17C	New Valve Boxes at Westpointe, and Central/Evans Lift Stations	$143,000
	18C	New Valve Box and Modifications at Paramount Lift Station	$103,000
	19C	Pipe upsizing in Hackett Road	$37,000
	20C	Office/Lab Building Expansion	$468,000
2020/2021	21C	Upper Pond Pipeline Relocation (+/- 1,000 lf of 16-in)	$474,000
	22C	Barbour's Pump Station Relocation	$525,000
	23C	Walgreen's Lift Station Relocation	$572,000
		TOTAL (rounded)	**$15,413,000**

(a) Class Designations:
A CIP addresses predicted overflowing
B CIP addresses predicted surcharging above the recommended criteria, or has an immediate impact on collection system emergency operation
C CIP addresses predicted surcharging below the recommended criteria or a low priority lift station and WWTP deficiency.

(b) May 2010 Costs; ENRCCI = 8761, including allowances for estimating contingency and engineering and administration.

(c) Project 5B, Pipe Upsizing in East Service Road creates capacity available to serve future users. Of the project cost contained in Table ES-1, approximately 36% of the capacity created and therefore the cost benefits existing users by eliminating capacity deficiencies within and tributary to the project limits.

The costs contained in Table ES-12 are primarily to address existing deficiencies, where costs that benefit future uses have been identified where feasible. Other facilities that provide more of a general benefit for wastewater service, such as the WWTP Office and Lab Building Expansion should be included in the cost for new users to buy-in to existing facilities.

ES.7.2 PROJECTED 10-YEAR CAPITAL IMPROVEMENT PROGRAM FOR MASTER PLAN EXPANSION FACILITIES

Several new facilities or facilities improvements can be identified as necessary to accommodate near-term development, as projected through the year 2022. Table ES-13 summarizes near-term capital improvements necessary to serve new development, with the project or triggers noted.

Table ES-13
City of Ceres
Facilities Expansion 10-year CIP

Year	Improvement Description	Total Cost, $	Project Trigger
2012/2013	Lift Station #1 (Pump Station)	$1,344,000	West Landing
	9,460 feet of 36 inch Sewer in East Service Road	$9,706,000	West Landing
2014/2015	3,700 feet of 36 inch and 2,700 ft of 48 inch Sewer in East Service Road[(a)]	$7,489,800	Existing Deficiency & Development East of Blaker
2016/2017	Replace two influent pump station pumps with 8.8 Mgal/d capacity pumps	$900,000	ADWF = 3.4 Mgal/d[(b)]
	TOTAL (rounded)	**$19,440,000**	

(a) This project would be constructed to address existing deficiencies in the 18-in sewer in East Service Road to accommodate new development. This project is associated with the existing user contribution of project 5B of Table ES-12.

(b) Assuming a 2.6% increase in wastewater flows per year.

ES.8 SUMMARY CAPITAL FINANCING PLAN AND AVERAGE COST CALCULATION

According to the requirements of Government Code Section 66000 et. seq., (the Mitigation Fee Act), public agencies are required to document certain findings regarding the purpose and basis of fees. In the case of the City's sewer system, this Sewer Master Plan provides the background to meet the requirements of the Mitigation Fee Act by providing:

1. Identification of the purpose of the fees to be charged by the City for expanding sewer service;

2. Identification of the use of the fee revenues, e.g., by identifying the capital improvements needed to accommodate future connections to the City's sewer system;

3. A reasonable relationship between the fee and the type of development paying the fee, e.g., on an EDU basis;

4. A reasonable relationship between the need for the fee and the type of development paying the fee, e.g., evaluating existing available capacity and projecting facilities improvements to serve future users (future development); and

5. A reasonable relationship between the amount of the fee and the estimated cost of facilities needed to provide sewer service.

The below calculations contain the basis for the reasonable relationship between the amount of the fee and the estimated cost of facilities as contained in this Master Plan.

ES.8.1 FACILITIES FINANCING AND FEE CALCULATION METHODOLOGIES

The Alternative A3 improvements are anticipated to benefit about 27,500 future EDUs in the Ceres Sewer Service Area (CSSA). The total capital cost for new wastewater treatment and disposal facilities is approximately $100.6 million, which includes replacement capacity for approximately 1.07 Mgal/d of existing flows (based on retaining 2.0 Mgal/d of the existing 3.07 Mgal/d flow by continued export to Turlock under existing agreements). Replacement capacity for 1.07 Mgal/d represents approximately 4,100 EDUs based on 260 gallons per day per EDU, therefore the average cost per EDU for future wastewater treatment and disposal facilities is approximately $3,200 (2010 cost basis), e.g., $100.6 million /(27,500 + 4,100 EDUs). Actual cost per EDU will depend significantly on the actual costs from Turlock and Modesto, as well as the actual cost of facilities as they are phased and constructed. An important element of facilities phasing and financing is that they must be constructed and operational prior to connection of future EDUs, therefore there is a lag in revenue meeting expenses if connection fees are the only source used to construct future facilities.

In order to allow for facilities to be constructed in an orderly fashion prior to their need, the City should consider the following strategies:

- Be sure to include the cost of remaining capacity in existing facilities in the calculation of any future connection charges or facilities fees.
- Utilize up-front developer contributions, typically in the form of a development agreement, for the financing and/or construction of improvements needed.
- Utilize reimbursement agreements, when possible or feasible, to allow for construction of facilities phases in cost-effective capacity increments in anticipation of future development

ES.8.2 BUY-IN TO EXISTING FACILITIES

Existing City of Ceres sewer facilities will continue to provide benefit to existing users, has available capacity to serve future users, and will provide benefit to future connections. Existing facilities that provide this benefit, and their estimated depreciated replacement cost and prorated value of available capacity, are contained in Table ES-14[6].

Table ES-14
City of Ceres
Estimated Value of Available Capacity in Existing Facilities

Facility	Depreciated Replacement Cost	Estimated Capacity/Benefit (Mgal/d)	Available Capacity (Mgal/d)	Prorated Value of Available Capacity
Main Trunk Sewer – Service Road.	$674,000	6.9	3.8	$371,000
Headworks and Influent Pump Station	$4,240,000	10.2	7.1	$2,951,000
WWTP 1975 Facilities	$1,292,000	10.2	7.1	$899,000
WWTP Land[(a)]	$9,500,000	10.2	7.1	$6,613,000
WWTP 2000 Expansion	$1,450,000	4.5	1.4	$451,000
Export Pump Station	$1,361,000	5.9	5.3	$1,223,000
Export Pipeline	$5,646,000	5.9	5.3	$5,072,000
City of Turlock Agreements				
Initial 1 Mgal/d Capacity	$1,092,000	1.0	0.40	$437,000
Second 1 Mgal/d Capacity	$2,600,000	1.0	1.00	$2,600,000
			TOTAL (rounded)	**$20,617,000**

(a) Estimated land value based on June 14, 2010 PFF Study by PMC, not depreciated.

The available capacity in the export pump station and pipeline and initial 1 Mgal/d capacity in Turlock is based on current influent average flows of 3.07 Mgal/d and available on-site disposal of 2.5 Mgal/d, resulting in a committed capacity to existing users in the Turlock facilities of approximately 0.6 Mgal/d.

ES.8.3 AVERAGE COST PER EDU FOR MASTER PLAN FACILITIES

The City's sewer service area is divided into two distinct areas;

1. North Ceres Sewer Service Area; and
2. Main City sewer service area which drains to the Ceres WWTP.

The available capacity and required facilities improvement to serve future planned growth vary significantly between these areas; therefore calculation of average cost per EDU should consider the differences between these areas.

[6] Adapted from ECO:LOGIC Engineering, October 28, 2008.

North Ceres Sewer Service Area

Existing facilities substantially have available capacity to serve infill development within the NCSSA, except where sewer extensions and minor improvements are expected to extend service as described above; therefore the average cost per EDU for sewer capacity is based on any buy-in to existing wastewater collection facilities and the cost of capacity from the City of Modesto.

Main City Sewer Service Area

The master plan facilities identified in this Sewer Master Plan primarily benefit new connections to the Main City Sewer Service Area, which excludes the NCSSA. The total number of new EDUs anticipated to benefit from the master plan facilities is approximatelyt 27,500. The total cost of the master plan facilities to serve future users is $143,300,000 (based on 89% of Alternative A3 from Table ES-7, Table ES-9, and Table ES-11), resulting in an average facilities expansion cost per EDU of approximately $5,210. The estimated cost of existing facilities with capacity to accommodate future users or benefitting future users is $20,617,000, and considering these facilities to equally benefit the approximately 27,500 future EDUs, the average cost to buy-in to these facilities is approximately $750. Combining these costs as seen in Table ES-15, the estimated average cost of sewer capacity per EDU is $5,960, not including any cost for financing. It is recommended that the City consider this average cost of capacity per EDU as the base cost per EDU in the City's Wastewater Facilities Impact Fee, plus any cost not included in the above calculations. Cost allocations to non-residential uses would be calculated based on the General Plan floor area ratios and an estimated 75 gallons per day per 1,000 square foot floor area (see Table 2-2 of Technical Memorandum No. 2). Any deviations in the actual cost of facilities from these estimated costs should be considered in future updates to the City's Wastewater Facilities Impact Fee.

Table ES-15
City of Ceres
Main City Calculation of Average Cost of Capacity

System Component	Estimated Cost	Benefitting Future EDUs	Cost per Future EDU
Sewer Trunk Lines	$48.00 M	27,500	$1,745
Lift Stations	$5.28 M	27,500	$192
Wastewater Treatment and Disposal	$100.6M		
Expansion for future users	$90.05M	27,500	$3,274
Replacement Capacity	$10.55M	-	-
Buy-in to Existing Facilities	$20.6M	27,500	$749
		TOTAL (rounded)	**$5,960**

ES.8.4 FUTURE FEE REVIEW AND INDEXING

Connection fees should be reviewed by the City periodically, including adjustments where appropriate. Such adjustments can be routine adjustments associated with rising costs of construction, such as adjusting the fee associates with an index as described below. Also, as each major project proceeds and costs are known with more certainty, including the means and cost of financing improvements, connection fees should be reviewed and adjusted.

The discussion regarding project phasing and possible cost associated with project financing illustrates the degree to which such financing can impact the average cost of facilities, and therefore the connection fee. Most sewer improvements and wastewater treatment and disposal facilities expansion will likely require some sort of long-term debt financing, with connection fee revenues providing initial capital or contributing to debt service as they are available, or up-front developer contributions and oversizing. Therefore, as the City proceeds with each major improvement project described in this Master Plan, the cost of the facilities should be updated and the connection fee calculation revised. This review is of particular importance where most financing mechanisms will likely have to be backed by a sewer user fee pledge for debt service as mentioned above. At a minimum, it is recommended that the City review the connection fee at the following milestones:

- Upon completion of a development projection and facilities financing plan consistent with that projection and the City's current financial capabilities.
- At each Phase of WWTP improvements, in particular when negotiating capacity and buy-in to City of Modesto or Turlock facilities; and
- During design and financing of the export pipeline to the Modesto Jennings WWTP.

Indexing is used to provide for automatic adjustment of fees to account for inflationary cost increases. The connection fee enabling ordinance can provide for an automatic fee adjustment on a prescribed date each year, or every other year or third year, etc. Annual indexing revisions are generally preferred over less frequent adjustments; to minimize the magnitude of the change and insure that revenue more closely follows expenses. One approach involves adjustment based on an accepted cost indicator such as the CPI (Consumer Price Index) or the Engineering News Record (ENR) Construction Cost Index. The latter is preferred since it more closely reflects cost changes in the construction industry, which are used as the basis for computing City connection fees. This approach provides the most accurate adjustment, although the incremental change (increase or decrease) is not known beyond the current year.

An alternative approach is to have the fee increased a fixed amount each adjustment period. The incremental amount is set to approximate the inflationary adjustment expected in the next several years. The advantage to this approach is that the adjustment amount is known in advance and can be set to a round number, simplifying accounting.

The preferred approach for the City is an annual adjustment based on the ENR Construction Cost Index (ENR-CCI). The cost estimates in this Master Plan have been prepared based on costs at a mid 2010 index value of 8761. Since that time, the ENR CCI has increased to 9437 (January 2013). Based on our experience with actual construction costs for wastewater facilities in the Central Valley of California, this approximate 8% increase had not been observed. Therefore, based on the City's desire to set a more recent base level, adjustments of the costs in this Master

City of Ceres Sewer System Master Plan
Chapter 1

Existing Facilities

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1.1 PURPOSE

This chapter summarizes existing City of Ceres Sewer facilities including the existing collection system and wastewater treatment and disposal facilities. Existing condition information is summarized with an assessment of facilities replacement or rehabilitation requirements and recommendations made for capital improvements. This document references existing capacity estimates as developed and reported in the October 2008 City of Ceres Preliminary Wastewater Capacity Analysis and the August 20, 2009 Wastewater Collection System Capacity Analysis Update prepared by ECO:LOGIC Engineering now Stantec.

1.2 WASTEWATER TREATMENT PLANT

Approximately one quarter of the wastewater generated in the existing City of Ceres Sewer Service Area is conveyed to the City of Ceres Wastewater Treatment Plant (Ceres WWTP). The remaining sewer flows (generated in the North Ceres Sewer Service Area, NCSSA) are conveyed to the City of Modesto sewer system north of the Tuolumne River. Table 1-1 summarizes the major facility components that make up the Ceres WWTP.

Table 1-1
City of Ceres
Wastewater Treatment Plant Major Facility Component

Facility Component	Characteristics	Approx. Year Installed
Influent Pump Station and Headworks [a]		
Grinders	3 24-in x 42-in Channel Grinders	2001
Influent Pumps	2 – 1,475 gpm, 800 RPM Submersible Solids-Handling	2001
	2 – 1,560 gpm, 800 RPM Submersible Solids Handing	2001
Headworks Odor Control	Organic Media Biofilter, 2,500 cfm airflow capacity	2001
Raw Wastewater Force Mains		
Influent Flow Measurement	14-in Magnetic	2001
Force Main	16-in ACP, approx. 1,000 lf	1976
Force Main	16-in C905 PVC, approx 1,200 lf	2001
Aerated Treatment Ponds		
	Reactor 1: 10 Mgal volume, Surface Aeration: 3@40Hp & 2 @ 50Hp	1976 [b]
	Reactor 2: 10 Mgal volume, Surface Aeration: 4@30Hp	1976 [b]
	Reactor 3: 10 Mgal volume, Surface Aeration: 3@30Hp	1976 [b]
	Reactor 4: 10 Mgal volume, Surface Aeration: 1@15Hp & 1@30Hp	1976 [b]
Effluent Filters (not used)		
	4 – Single-media sand w/ 0.61 acre area each (slow-sand type operation)	1976
Chlorine Contact		
	Chlorinators (not used)	1976
	Channel 100 ft x 25 ft x 6 ft concrete channel	1976
Final Effluent Pumping/Piping		
Landscape Irrigation	2 centrifugal pumps @ 300 gpm each & 1 jockey @ 100 gpm	1976
Upper Ponds U-1 & U-2	2 centrifugal pumps @350 gpm each (Crop Irrigation Pumps)	1987
Percolation Ponds S-1, 2, & 3	12-in gravity flow line from Reactor 4	1976
Percolation Pond S-4	14-in gravity flow line from chlorine contact channel	1976
Percolation Ponds N-2 & N3	16-in gravity flow line from chlorine contact channel	1976
Final Effluent Flow Metering		
Upper Ponds U-1 & U-2	16-in Magnetic (F-4)	2001
Percolation Ponds S-1, 2, & 3	12-in Magnetic (F-1)	2001
Percolation Pond S-4	14-in Magnetic (F-2)	2001
Percolation Ponds N-2 & N3	16-in Magnetic (F-3)	2001

Facility Component	Characteristics	Approx. Year Installed
Export Pump Station and Force Main		
Preliminary Screening	2 – 16-in Dia. 6 Mgal/d capacity 0.75-in sst wedgewire slot	2004
Pumping	3 – 1,390 gpm, 1,750 RPM, VFD Submersible Solids-Handling	2004
Force Main	75,000 lf, 18-in DIP	2004
Flow Metering	14-in Magnetic	2004
On-Site Disposal	**(Total of 108 acres of percolation pond)**	
Percolation Pond S -4	12.7 acres	1976
Percolation Pond N -2	13.0 acres (historic infiltration well site)	1976
Percolation Pond N -3	14.1 acres (historic infiltration well site)	1976
Percolation Pond S -1	11.8 acres	1976
Percolation Pond S -2	13.5 acres	1976
Percolation Pond S -3	10.7 acres	1976
Upper Pond U -1	16.3 acres	1987
Upper Pond U -2	15.6 acres	1987
Landscape Irrigation	20-acres (sprinkler irrigation)	1976
Power Systems		
Headworks	TID Service: 200 Amp, 480V, 3Ø	1976
	Backup Power: 130kw 480V, 3Ø Diesel Generator	2007
Pond Aeration	TID Service: 800 Amp, 480V, 3Ø	2001
	Backup Power: 200kw 480V, 3Ø Diesel Generator	2001
Main Plant	TID Service: 600 Amp, 480V, 3Ø	1976
	Backup Power: 130 kW, 480V 3Ø Diesel Generator	2007
Auxiliary Facilities		
	Office/Lab Building	1976
	Equipment Building	1976
	Maintenance Shed	2003
	Equipment Storage Bays (3)	1976 (1&2) & 2006 (#3)
	Fresh Water Well	1976 [(b)]
	Groundwater Monitoring Wells (MW-1 through MW-7)	1976 (MW-1-3), 2010 (MW-4-7)

(a) Existing headworks structure originally constructed prior to 1970, modified as part of 1976 and 2001 improvements.

(b) Structure constructed under 1975 design with mechanical and electrical equipment improvements in 2001.

The WWTP is located on Assessors Parcel Nos. 041-008-001, 002, 028, 029, 032-034, 040, 043, 044, 048, and 049 totaling approximately 180 acres. The overall layout of existing WWTP facilities is depicted in Figure 1-1 and an existing Process Flow Diagram is shown in Figure 1-2.

The existing active wastewater treatment process consists of the following elements:

1. Grinding of influent raw wastewater followed by pumping to Reactor 1 of the Aerated Ponds.
2. Treatment in the Aerated Ponds consisting of four equal volume reactors in series
3. Pumping of a portion of the treated effluent to the City of Turlock WWTP.
4. Conveyance of treated effluent from Reactor 4 to eight percolation basins for final treatment and disposal. See the attached Process Flow Diagram which depicts how effluent is conveyed to these facilities (Figure 1-2).

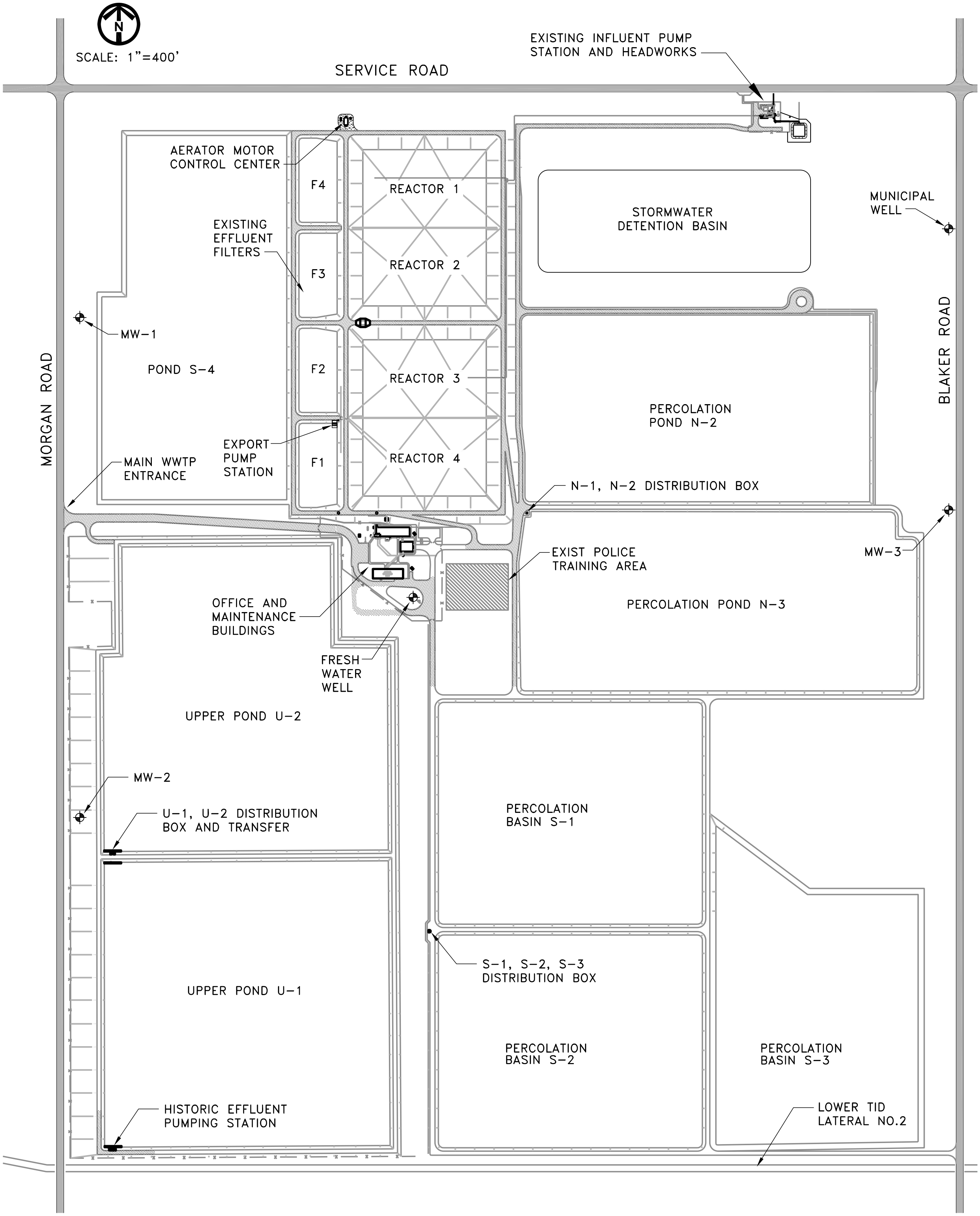

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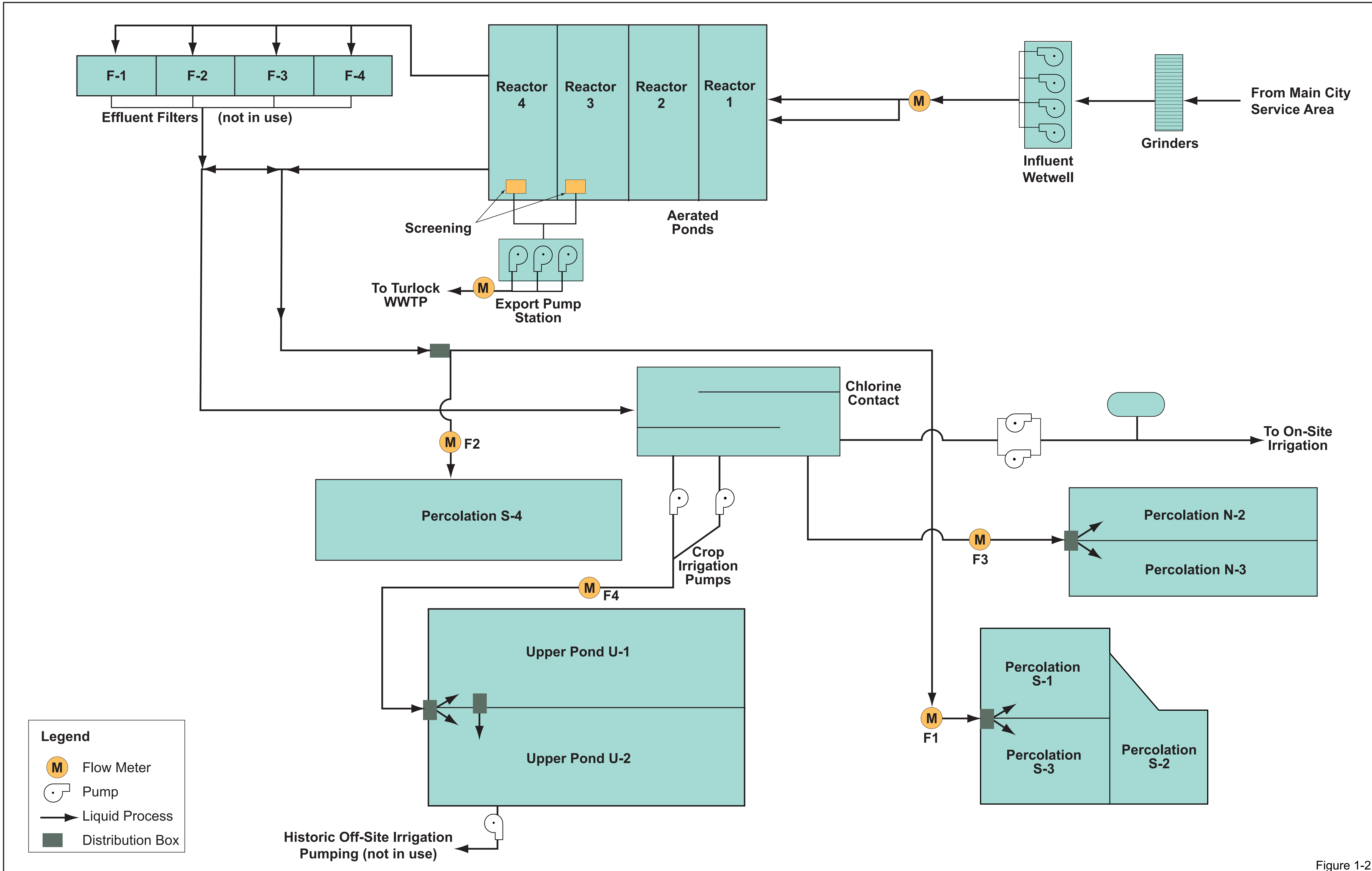
FIGURE 1-1 CITY OF CERES EXISTING WWTP FACILITIES SITE MAP



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City of Ceres WWTP
Existing Process Flow Diagram

Several process elements of the WWTP were constructed in the late 1970s in response to the construction of infiltration wells in Percolation Ponds N-1 and N-2. These process elements were intended to provide additional treatment for removal or inactivation of pathogens through filtration and disinfection prior to discharge to the infiltration wells. Due to plugging and maintenance issues with the infiltration wells, they were removed some time in the mid 1980s. The treatment elements of the existing wastewater treatment plant that are not currently used or are not used as originally designed include:

A. Effluent filters consisting of four filters (F1 through F4) with an effective surface area of 0.61 acres per filter. The design filtration rate for these filters is 0.5 Mgal/d/acre (approximately 0.008 gpm/ft^2)[1], and the filters were designed to operate at rates much lower than a typical slow sand filter (0.05 to 0.1 gpm/ft^2). Since the infiltration wells were removed, filtration of the treated effluent has not been necessary.

B. Chlorine contact chamber arranged to receive effluent directly from Reactor 4 of the Aerated Pond or combined filtered effluent from Filters F1 through F4. The chlorine contact chamber was designed to achieve disinfection to a total coliform standard of 23 MPN/100 ml at an average flow of 1.6 Mgal/d and a chlorine dose of 6-10 ppm (mg/L)[2]. Currently, this facility is not used for chlorination as removal of the infiltration wells and updated permit requirements[3] do not require chlorination of effluent for percolation disposal.

1.2.1 EXISTING FACILITIES CONDITION ASSESSMENT SUMMARY

The following sections summarize the general condition of existing Ceres WWTP major facilities. The general condition of these facilities is based on ECO:LOGIC's experience with these facilities and input from City staff on any condition concerns or known performance issues.

Overall the City WWTP facilities are in generally good condition, functioning at or near their original design conditions, and are adequately serving the functions needed.

1.2.1.1 Influent Pump Station and Headworks

The general condition of the following influent pump station and headworks facilities are described in this section:

- Influent Pump Station and Headworks Structure
- Grinders
- Influent Pumps
- Headworks Odor Control
- Electrical Service, Motor Control Center, and Backup Power
- Site Improvements and Drainage

[1] City of Ceres Wastewater Treatment Facilities O&M Manual, Revised November 2002. Harris & Associates with 2002 Revisions by ECO:LOGIC Engineering.
[2] City of Ceres Wastewater Treatment Facilities O&M Manual, Revised November 2002. Harris & Associates with 2002 Revisions by ECO:LOGIC Engineering.
[3] Order No. 93-237, Waste Discharge Requirements for City of Ceres Wastewater Treatment Plant, Stanislaus County, California Regional Water Quality Control Board, Central Valley Region, (See Appendix A).

The overall condition and service of the existing headworks and influent pump station is good, however its replacement is necessary in order to accommodate the hydraulic requirements of the new 40-in sewer in Service Road (constructed in 2005). Also, during the latest Central Valley Regional Water Quality Control Board (Regional Board) inspection the likely need for screening was indicated by Regional Board staff. Such screening is required to meet the discharge specifications of modern permits. Due to these requirements, the City is implementing construction of a new Headworks and Influent Pump Station.

Influent Pump Station and Headworks Structure

The influent pump station structure was constructed prior to 1970, with major modifications made around 1976 under the 1975 Wastewater Treatment Facilities design prepared by Harris & Associates. Subsequent modifications made in 2001 were pursuant to the Wastewater Treatment Plant 2000 Expansion project. Modifications made in 2001 consisted of improving the wetwell entrance geometry and covering the influent channel for odor control purposes. Although this structure is more than 40 years old, it is still in serviceable condition with limited concrete cracking or exposure of aggregate.

Grinders

Three grinders (manufactured by Disposable Waste Systems Inc.) are installed in the influent channel upstream of the influent pumps. During the 2001 modifications, the channel frames for these units were replaced with stainless steel. After 2001, the hydraulic drive units on these grinders were replaced with totally enclosed fan-cooled motors. Although requiring frequent maintenance, the grinders continue to function and assist in protecting the influent pumps.

Influent Pumps

The four existing Paco submersible solids handling pumps were installed in 2001 with new discharge elbows, guide rails, and cables. The City maintains these pumps in good condition and no immediate repairs or replacement is indicated.

Headworks Odor Control

The existing headworks odor control system consists of; ventilation ducting, ventilation fan, humidity control system, discharge ducting, biofilter basin and media (rock, wood chips, and organic media), irrigation system, and drainage. The headworks odor control system was constructed in 2001 and is currently in good condition. Based on City experience, the organic media has a typical life of about five years (before excessive compaction, degradation, and short-circuiting occur). The existing media is about five years old and is showing signs of excessive compaction. It is recommended that the media be replaced within 12 to 18 months. Biofilter media replacement is anticipated to cost approximately $12,000 based on the City's expense in replacing this media in 2005.

Electrical Service, Motor Control Center and Backup Power

The existing condition of the Headworks electrical service, motor control center, and backup power are characterized as follows:

- Electrical Service: The existing electrical service to the Headworks and Influent Pump Station consists of a pole mounted transformer and adjacent pole mounted 200 Amp main breaker. Service to this site is 480 Volt, 3 phase and is supplied by the Turlock Irrigation District. The existing electrical service is functional, however the main breaker is located near Service Road on wooden poles. It is recommended that the existing service be relocated as part of the new Headworks and Influent Pump Station Project.
- Motor Control Center: The existing motor control center (MCC-2) for the influent pumps, grinders, and sample pump was installed around 1976. Modifications to MCC-2 were made in 2001 to replace the three existing influent pumps and add a fourth. Additional motor controls and VFD were provided in 2001 for the odor control biofilter. The existing motor controls are functional and are anticipated to provide normal service for the next ten years with routine preventative maintenance.
- In 2007, the City replaced the existing propane backup generator at the Headworks and Influent Pump Station with a diesel powered generator. The existing generator is new and is anticipated to provide good service for at least the next ten years with preventative maintenance.

Site Improvements and Drainage

Site improvements at the Headworks and Influent Pump Station consist of fencing, paving, lighting, and drainage. Fencing and paving are in good condition at the site, but most will be replaced during construction of the new Headworks and Influent Pump Station. Drainage at this site is natural towards the adjacent stormwater pond to the south. The site shows limited erosion impacts from drainage to this direction. Under the new Headworks and Influent Pump Station project, drainage improvements will be provided, with paved and rip-rapped swales directing stormwater to the adjacent stormwater pond. Where stormwater can come into contact with wastewater, these flows will be directed to the headworks influent channel.

1.2.1.2 Raw Wastewater Force Mains

Raw wastewater is conveyed to the Aerated Pond system via two parallel 16-in force mains. One force main (the northern of the two) was installed in approximately 1976 and is Asbestos Cement pipe (ACP). The internal condition of this pipeline is currently not known, however the City has not experienced leaking or broken pipe issues with this pipeline. The second force main (the southern of the two) was installed in 2001 and is polyethylene wrapped, cement mortar lined, ductile iron pipe (DIP). In the coarse Ceres soils (and at the existing burial depth of 24 to 36 inches), external corrosion is not anticipated to be severe. Internal corrosion of the cement in the ACP and of the cement lining in the DIP is possible, and should be inspected periodically (once every 10 years).

1.2.1.3 Aerated Treatment Ponds

This section describes the general condition of the following aerated treatment pond elements:

- Aerated Pond Basins and Liners
- Wooden baffles
- Solids
- Pond Piping
- Aeration
- Aeration Power Systems

Aerated Pond Basins and Liners

The aeration pond basins were constructed in approximately 1976 of earthen embankments with asphalt concrete paving on all perimeter roads and concrete aprons within the ponds extending to a depth of approximately 9-ft (vertically) from the top of embankment. Below the concrete apron, the pond was lined with bentonite clay. The earthen embankments, asphalt paving, and concrete aprons are all in good and serviceable condition. The condition of the bentonite clay liner is unknown.

Wooden Baffles

The two reactors in each pond are separated by a wooden baffle. These baffles are constructed of redwood timbers and planks. The sub-surface condition of the baffles is not known, however based on a review of the exposed elements, it does not appear that any planks are missing and the exposed timbers are in a somewhat deteriorated but serviceable condition. Continued monitoring of the condition of these baffles is warranted. If severe deterioration becomes evident (e.g., loss of planks or failure of any support structure timbers) complete removal of the baffles is recommended with replacement consisting of a membrane (e.g., Hypalon™) baffle.

Solids

Over time, wastewater solids accumulate in the bottom of aerated pond treatment systems. These accumulated solids are periodically (every 5 to as long as 30 years) removed from the treatment ponds through dredging or pond dewatering and solar drying. The City of Ceres recently dredged all four Reactors of the aerated pond system in 2009. The total cost for dredging, solids dewatering, and solids disposal was approximately $1,200,000. This was the first time that the ponds have been cleaned in over 30 years. As future flows and wastewater loadings increase, the frequency of required cleaning will increase, however it is not anticipated that cleaning of the Ceres ponds will be needed within the next five to ten years.

Pond Piping

Pond piping consists of piping between Reactors 2 and 3 and effluent piping from Reactor 4 (to the sand filters, Percolation Ponds S-1 through S-3, and to the Chlorine Contact basin. Existing piping is thought to be in serviceable condition, however hydraulic limits exist between Reactors 2 and 3. To accommodate additional flows, an overflow weir was constructed in 2001.

The treatment ponds were originally constructed with a 16-in bypass line to allow discharge directly into the head end of Reactor 1 or the tail end of Reactor 3. The condition of this bypass line is unknown, however it is insufficient to convey peak flows. It may be possible to convey flows during average or low-flow periods, during emergencies or required cleaning operations, however the condition of the pipeline and valves needs to be verified prior to conducting such temporary by-passes.

No immediate improvements are deemed necessary on the pond piping.

Aeration

All pond aeration was replaced in 2001 and is in currently serviceable condition. No extraordinary repair or replacement is indicated for this equipment. Table 1-2 shows the location and type of aeration currently installed in the Aerated Pond system.

Table 1-2
City of Ceres
Aerated Pond Aerator Type and Size

Reactor	Aerator Type and Power
Reactor 1	Floating Surface Aerators, 2 @ 50Hp, 3 @ 40Hp
Reactor 2	Floating Surface Aerators, 4 @ 30 Hp
Reactor 3	Floating Surface Aerators, 3 @ 30 Hp
Reactor 4	Floating Surface Aerators, 1 @ 15 Hp, 1 @ 30 Hp

Aeration Power Systems

As part of the Wastewater Treatment Plant 2000 Expansion (constructed in 2001), a new electrical service and motor control center (MCC-3) was added to the WWTP. The new electrical service was an 800 Amp, 480 Volt, 3 phase service from TID. Backup power consisting of a 200 kW diesel generator and automatic transfer switch was also provided. MCC-3 controls all fourteen aerators in the aerated pond system and allow for eight spare buckets. The aeration system power system is in good condition, and provided regular preventative maintenance will continue to provide reliable service into the near future.

1.2.1.4 Effluent Filters

The four effluent filters were constructed as part of the Wastewater Treatment Facilities 1975 project some time in 1976. The earth and concrete lined basins are in good condition and continue to contain the sand from their last use (with the sand being in generally good condition with limited to no accumulation of weeds or debris) some time from the mid 1980s. The condition of the underdrain system is currently unknown and should be investigated with CCTV if these pipelines are to be used for any future purpose. Existing gate valves in the distribution boxes are considered inoperable, and the main outlet valve from Reactor 4 is known to be non-functional, and therefore a siphon has to be set up utilizing the 10-in emergency overflow pipeline if effluent is to be diverted to the sand filter area. If the sand filters are to be used in the future, then this valve would have to be replaced.

1.2.1.5 Chlorine Contact Chamber

The chlorine contact channel is constructed of concrete block and reinforced concrete (walkways and elevated slab sections) and is in generally good condition. Although the chlorine contact channel is not used for disinfection, all effluent diverted to percolation disposal ponds N-2, N-3, U-1, and U-2 is conveyed through the channel. All equipment previously used for chlorine addition is either non-existent or inoperable.

1.2.1.6 Final Effluent Pumping, Piping, and Flow Metering

Final effluent facilities consist of pumping (to percolation ponds U-1 and U-2 through the Crop Irrigation Pumps, and for landscape irrigation), gravity and force main pipelines, effluent flow metering, and distribution boxes. The condition of these facilities is summarized below.

Final Effluent Piping and Distribution Boxes

Final effluent piping and distribution boxes vary in age from being installed pre-1976 to 1987 for the upper ponds. Pipe material varies depending on operating conditions and age. Generally the effluent piping has provided continuous and good service, however CCTV inspection is recommended in the near future. During construction of the upper ponds in the late 1980s, the existing Crop Irrigation force main was routed to the distribution box for ponds U-1 and U-2, with a tee and blind flange for possible future conveyance to TID. The existing force main crosses to the west side of Morgan Road near the entrance to the WWTP, then crosses back to the upper ponds near the pond U-1 and U-2 distribution box. As industrial development occurs west of the WWTP and/or improvements are made to Morgan Road, the City may wish to relocate this pipeline to within the WWTP boundary.

The existing distribution boxes are in excellent to fair condition, with the following deficiencies noted:

- Existing slide gates for the U-1 and U-2 distribution box are in good condition, however they are medium to light duty canal gate type. When these gates are scheduled for replacement, they should be replaced with heavy-duty type sluice gates with gear operators.
- The existing S-1, S-2, and S-3 distribution box is experiencing structural failure. The City has conducted temporary repairs: however, the slide gate for pond S-3 is not fully functional due to failure of the concrete at the top wall mounting bracket. Replacement of this structure is warranted, including replacement of any existing damaged or inoperable gate elements.

Final Effluent Flow Meters

The final effluent flow meters (4) were installed as part of the WWTP 2000 Expansion in 2001. The vaults, flow meters, and accessories are in good condition and with regular maintenance will provide continued service into the future. Currently there is no flow metering on the landscape irrigation system, and annual disposal/recycled water use via this means is based on estimated pumping. It is recommended that a totalizing flow meter be installed in the landscape irrigation system to track this discharge and effluent reuse.

1.2.1.7 Export Pump Station and Force Main

The export pump station and force main was constructed primarily during 2004 and began discharging effluent to the City of Turlock WWTP shortly thereafter. The general condition of these facilities is summarized below.

Export Pump Station Influent Screening System

The export pump station influent screening system consists of the wire-wrapped screens and piping, and the air-scour cleaning system. These facilities have been well maintained for their six year existence and continue to provide good service. Regular maintenance should continue on these facilities to keep them operable into the foreseeable future. Regular maintenance of the air-scour system is recommended per the system manufacturer's recommendations and periodic (every one to five years) inspection and exercising of the screen systems and lift capabilities is recommended.

Export Pump Station Structure

The reinforced concrete export pump station structure is still in near-new condition. Periodic review of the pump station structure is warranted, including:

- Review of the interior surface of the wet well for evidence of material loss or concrete erosion
- Structure stability and contact with the aerated pond earthen structure, e.g., for any evidence of settlement or structure movement.

Export Pump Station Pumping Equipment, Power Systems, and MCC

The existing export pump station equipment consists of three submersible solids handling pumps with a full speed capacity of approximately 1,390 gallons per minute at 61 ft total dynamic head. The pumps are equipped with 30 Hp inverter duty motors and are controlled. 480 volt, 3 phase power is supplied to the Export Pump station from MCC-3 through a 250 amp circuit. Each pump is controlled with a Variable Frequency Drive (VFD) based on operator set discharge rate. The pump motor controls are contained in pedestal cabinets adjacent to the pump station with integral cabinet air conditioning. Effluent samples are collected in a composite sampler fed a continuous flow from the pump station wet well through a 2 Hp self priming sample pump. These facilities were installed and brought on-line in 2004.

All existing facilities are operational and functioning according to their design intent. With regular maintenance this equipment will continue to provide good service at this facility.

Export Pipeline, Flow Metering, and Appurtenances

The export pump station pipeline, flow metering, and appurtenances are in near-new condition. The force main pipeline is polyethylene wrapped, cement mortar lined, DIP, installed without additional corrosion control (e.g., passive sacrificial anodes or impressed current). Because of the site soil conditions, the existing pipeline protective system is anticipated to provide a long service life for this pipeline, however periodic inspection of the following is recommended:

- Evidence of excessive external corrosion.
- Internal cleaning and inspection of condition of lining.

1.2.1.8 On-Site Disposal

On-site disposal of treated effluent occurs in the eight existing percolation ponds and through landscape irrigation of the WWTP grounds.

Percolation Ponds

The ponds were constructed at various times, however all are well maintained. Maintenance typically involves maintenance of the perimeter roads, pond interior embankments and rip-rap, and percolation surface maintenance. Percolation surface maintenance consisting of annual disking to control weeds and break up surface crusts, and periodic deep ripping to limit the formation of low-permeability precipitate and/or compaction layers should continue to maintain the existing percolation rates to the extent feasible. No existing condition issues were observed with these facilities.

Landscape Irrigation

Maintenance of the landscape irrigation system requires staff effort to repair and replace irrigation piping and sprinklers, however the benefits to the City include;

1. Maintaining a significant disposal/recycled use component of the facility.
2. Maintaining the visual appearance of this facility given its close proximity to residential, commercial, and industrial development, at a potentially reduced cost.

No immediate major condition concerns have been identified for the existing landscape irrigation system, other than the required staff time to maintain this system in proper operation.

1.2.1.9 Auxiliary Facilities

Auxiliary facilities at the Ceres WWTP include the office/lab building, equipment building, maintenance shed, three equipment storage bays, and the fresh water well.

Office/Lab Building

The office/lab building was built with the WWTP 1975 project around 1976 and is of concrete masonry unit construction. The City has kept this structure well maintained, including refurbishment of the roof fascia, roof maintenance and repair, and general structure and grounds maintenance. No existing deficiencies were noted or reported for this structure. Because of the age of this structure, any modifications should consider the potential for lead-based paint and asbestos containing materials.

Currently the city has nine staff working from the existing office lab building. The Existing space does not provide for work station space or sufficient locker room facilities for this level of staffing. To provide adequate space for this level of staffing, the following improvements are recommended:

- Addition of at least four work stations
- Expansion of locker and restroom facilities to include:
  - A minimum of 10 lockers
  - Two showers, and
  - A changing area

Additional work station space and locker room facilities can be provided by expanding the western end of the existing building to the north. It is estimated that an additional 1,000 square feet of building space could be necessary for this additional use[4].

Equipment Building, Maintenance Shed, and Equipment Storage Bays

These facilities were constructed during various stages and generally consist of metal or timber construction with metal exteriors. No existing condition deficiencies were observed or noted.

Fresh Water Well

The fresh water well was constructed with the WWTP 1975 project around 1976. The fresh water well supplies water to the office lab building for use in sinks and toilets. The well appears to be constructed with an eight inch casing and equipped with a submersible well pump and hydropneumatic tank. No condition concerns have been experienced by City staff with this facility, and the above-ground equipment appears to be in generally good condition. As this is the sole source of fresh water at the site, the City should monitor production from this well as well as basic water quality (bacteriological consisting of total and fecal coliform). Small submersible well pumps, as installed in this well, will typically have a service life from seven to fifteen years (depending on water quality and operation). When this pump is replaced, it is recommended that the City perform a CCTV inspection of the well and assess its specific capacity under normal pumping conditions.

Since current occupancy at the site is less than the non-community water system threshold of 24 people for more than six months of the year, this water source is not regulated as a Public Water system; however, the City should monitor and maintain this supply for meeting acute bacteriological requirements, as well as provide bottled water on-site for drinking purposes.

[4] Based on 200 ft^2 per work station and 200 ft^2 in the locker room area.

Groundwater Monitoring Wells

The City currently has seven groundwater monitoring wells (MW-1 through MW-7) located around the WWTP. MW-1, MW-2, and MW-3 were installed during the construction of the WWTP 1975 project. MW-4 through MW-7 were recently installed in 2010. All monitoring wells are in serviceable to new condition, however periodic maintenance of the surface completions may be necessary to insure that they remain useful as background and compliance monitoring points.

1.2.2 Existing Facilities Capacity Assessment Summary

The overall capacity of the existing wastewater treatment and disposal facilities are limited based primarily on the disposal methods employed. These limitations are based on differing water quality criteria depending on the discharge location, permit or agreement limitations, intrinsic hydraulic capacity of the discharge location, and on the expected performance of the treatment system to meet the water quality requirements;

1. Discharge to on-site percolation disposal. The predicted hydraulic capacity limit (long-term 100-year precipitation season conditions) of existing on-site disposal is limited to 2.8 Mgal/d, however the existing permit limits discharge (understood to be on-site disposal) to 2.5 Mgal/d. To obtain the 2.8 Mgal/d disposal capacity, the City would have to obtain a new permit. The existing permit does not limit effluent BOD_5, however it is anticipated that future permits will limit effluent BOD_5 discharged for on-site disposal to 40 mg/L (30-day average). (see Appendix A containing Order No. 93-237).
2. Discharge to the Turlock WWTP. The existing agreement with the City of Turlock limits the City's export to the Turlock WWTP to 2.0 Mgal/d and contains limits for effluent BOD_5 and TSS of 100 mg/L each.
3. Combined discharge to on-site and Turlock WWTP. Combined hydraulic capacity for on-site disposal and discharge to the Turlock WWTP is from 4.5 Mgal/d (based on on-site permit limit and agreement with turlock) to 4.8 Mgal/d (based on 100-year on-site water balance calculation and the City obtaining a new permit). Depending on the discharge location, effluent water quality requirements are either 40 mg/L BOD_5 for on-site disposal (assuming updated permit requirements), or 100 mg/L BOD_5 and TSS for discharge to the Turlock WWTP.

Depending on the degree of discharge to the Turlock WWTP and the City's ability to update current permit conditions, available capacity in existing facilities is summarized in Table 1-3, as documented in the October 2008 City of Ceres Preliminary Wastewater Capacity Analysis.

The limiting factor for existing treatment and disposal system capacity is first disposal based on the current permit followed by treatment capabilities for on-site disposal to meet anticipated water quality requirements of 40 mg/L BOD_5. If discharge to the Turlock WWTP is maximized, existing WWTP capacity is limited to 4.5 Mgal/d. Theoretically, by discharging more effluent to Turlock, the treatment capacity increases due to the higher five-day biochemical oxygen demand (BOD_5) limits for the discharge to Turlock than limits expected to be imposed under future permit requirements for on-site disposal.

Table 1-3
City of Ceres WWTP
Limiting WWTP Treatment and Disposal Capacity

Discharge Case	Capacity, ADWF (Mgal/d)	Controlling Condition
On-Site under Current Permit	2.5	WDR No. 93-237 Influent Limit
On-Site under New Permit	2.8	On-site Disposal Limit
On-Site with Export to Turlock under Current Permit [(a)]	4.5	WDR No. 93-237 Influent Limit and current Turlock agreement flow limit
On-Site with Export to Turlock under New Permit	4.8	Current Turlock flow limit of 2.0 Mgal/d and on-site limit of 2.8 Mgal/d [(b)]

(a) Based on 2.0 Mgal/d limit to Turlock and 2.5 Mgal/d limit for on-site disposal. Under this scenario, effluent BOD_5 limits for onsite disposal at 40 mg/L and 100 mg/L to Turlock both apply. Limited additional aeration may be necessary to achieve this treatment capacity.

(b) The limit of 4.8 Mgal/d is based on no on-site effluent BOD_5 limit. This capacity is reduced to 3.8 Mgal/d if an on-site effluent BOD_5 limit of 40 mg/L is imposed. This limit also needs to be considered in the context of BOD_5 loading to the effluent disposal ponds and possible future on-site disposal capacity reductions if average effluent BOD_5 exceeds 40 mg/L.

1.2.3 WWTP Capital Improvement and Replacement Program

The recommended capital improvement and replacement program for the WWTP is limited to five projects as follows:

- New headworks and influent pump station (currently designed and funded)
- Distribution box repair/replacement (for Ponds S-1, S-2, and S-3)
- Upper pond (crop irrigation line) pipeline relocation
- Irrigation pump system flow meter

1.2.3.1 Existing Facilities Improvement and Replacement CIP Costs

A planning level opinion of probable cost for the new WWTP CIPs is summarized in Tale 1-4. Additional already planned improvements include the new headworks and influent pump station and irrigation pump system flow meter.

Table 1-4
City of Ceres
WWTP Existing Facilities Improvement and Replacement CIP Costs

Improvement Description	Cost, $ [(a)]
Distribution Box Replacement (for S-1, S-2, and S-3)	$17,500
Upper Pond Pipeline Relocation (+/- 1,000 lf of 16-in)	$304,000
Office/Lab Building Expansion (~1,000 sq. ft.) [(b)]	$300,000
Estimating Contingency (30%)	$186,500
SUBTOTAL – CONSTRUCTION COSTS (rounded)	**$808,000**
Design/Administration (20%)	$161,600
TOTAL (rounded)	**$969,600**

(a) May 2010 Costs; ENRCCI = 8761.

(b) Based on an estimated $300/ft^2 construction cost.

1.2.4 Recommended Additional WWTP Studies and Analysis

Additional studies and analysis are recommended for the WWTP facilities as mentioned above and further described below including:

- Influent wastewater characterization and monitoring
- CCTV inspection of: 16-in ACP force main, effluent pipelines, export pump station force main, and fresh water well
- Aerated pond effluent characterization and kinetic rate analysis
- Percolation pond operation and maintenance monitoring
- Groundwater monitoring

1.2.4.1 Influent Wastewater Characterization and Monitoring

Prior to conducting preliminary design of improvements to the wastewater treatment process, it is recommended that the City conduct additional monitoring and characterization of influent wastewater. The City's monitoring and reporting program (MRP) provides the minimum level of monitoring required. As the need to change or expand the treatment process approaches, it is recommended that the City increase the influent monitoring from the minimum requirements to include additional constituents and more frequent sampling in order to properly characterize the influent and provide much higher quality data for use in the design process. Expanding this monitoring to the recommended level, as presented in Table 1-5, will allow the City to assess potential water quality impacts and necessary treatment requirements and methods for future capacity expansions. Since influent flow and quality are highly variable over time, grab sampling does not adequately characterize the wastewater, and in order for the recommended sampling to be useful for making decisions regarding treatment, impacts, or future design, composite sampling should be conducted. Moreover, flow proportional composite sampling more accurately characterizes wastewater than time proportional composite sampling. Where hold times allow, 7-day flow proportional composite sampling should be utilized thereby providing more realistic data regarding the concentrations and loads of various constituents.

The City currently uses composite refrigerated auto-samplers for some of their monitoring requirements. Although relatively old, these samplers appear functional; however, sampling is controlled by number of aliquots over a period of time. The City should evaluate the existing auto samplers to determine if it is feasible to modify sampling controls to accept input from the influent flow meter and allow for extended (multiple day long) monitoring periods.

Treatment Based Parameters

In order to evaluate the influent wastewater for future expansions and or modifications of treatment, the following monitoring is recommended. In order to characterize the strength of the wastewater and determine treatment requirements, a weekly flow proportional composite sample should be monitored for BOD_5 and total suspended solids (TSS) at a minimum. The pH of the influent is recommended to be monitored monthly, and can be conducted on unpreserved samples collected during the monthly sampling. It is not necessary to have the pH analyzed by a laboratory, and it is best to measure pH as soon as the sample is collected. The City can use an electrode type pH meter to conduct the monthly monitoring. The pH meter should be calibrated directly (same day) before each monitoring event per the manufacturers guidelines. A calibration log, including the date, meter type, serial number, standards used and their expiration date, readings prior to calibration and after calibration, and the name of the operator. The meter should be stored and factory serviced and calibrated per the manufacturers guidelines, and the dates of factory service, if applicable, should be recorded on the calibration log.

The following monitoring is not currently necessary, but is presented should future water quality concerns require that the treatment method include nitrification and denitrification for nitrogen removal. The BOD_5 and TSS monitoring should be conducted three times weekly and should begin prior to the design phase and as soon as the need for nitrogen removal is made evident to ensure adequate characterization. In addition, total kjeldahl nitrogen (TKN) and alkalinity should be monitored weekly on one of the composite samples collected for BOD_5 and TSS. More detailed characterization, including chemical oxygen demand (COD) and volatile suspended solids (VSS), will need to be conducted during the design phase of a nitrification denitrification treatment component.

Table 1-5
Recommended Influent Monitoring Parameters and Frequency Including the Required Monitoring

Constituent	Units	Method	Hold Time	Type of Sample	Sampling Frequency
Flow	gpd	Meter	NA	Meter	Continuously
Monthly Average Flow	gpd/mo	Calculation	NA	Calculation	Monthly
BOD_5	mg/l	SM 5210 B	6 hr, 24 hr max	Composite	weekly
Total Suspended Solids (TSS)	mg/l	SM 2540 D	7 d	Composite	weekly
pH	standard units	Field Measurement	Immediately	Grab	Monthly
Total Dissolved Solids (TDS)	mg/l	EPA 160.1	7 d	7-Day Composite	Monthly
Fixed Dissolved Solids (FDS)	mg/l	SM 2540 E	7 d	7-Day Composite	Monthly
Sodium	mg/l	EPA 200.7	180 d	7-Day Composite	Monthly
Chloride	mg/l	EPA 300.0	28 d	7-Day Composite	Monthly
Total Kjeldahl Nitrogen (TKN)	mg/l	EPA 351.4	28 d	7-Day Composite	Quarterly
Ammonia as Nitrogen	mg/l	EPA 350.1	28 d	7-Day Composite	Quarterly
Total Alkalinity (including alkalinity series)	mg/l	EPA 310.1	14 d	7-Day Composite	Quarterly

1.2.4.2 CCTV Inspection of: 16-in ACP Force Main, Effluent Pipelines, Export Pump Station Force Main, and Fresh Water Well

The existing 16-in Raw Wastewater Force Main from the influent pump station to Reactor 1 has been in service since approximately 1976, likewise the existing effluent pipelines have been in service (in some cases) since before 1976. It is recommended that the condition of these pipelines be assessed through internal CCTV inspection.

Although the export pump station force main is relatively new, it will continue to be more of a critical element of the City's wastewater system, therefore pro-active inspection of this facility is recommended including periodic CCTV inspection on a ten year basis (or more frequent if needed).

If repairs or replacement of any of the facilities are warranted based on such CCTV inspections, they should be incorporated into the City's budgets.

1.2.4.3 Aerated Pond Effluent Characterization and Kinetic Rate Analysis

Aerated treatment ponds are, at first appearances, simple treatment processes that require comparatively little operator attention and process manipulation to achieve an effective level of treatment. However, the physical, chemical, and biochemical processes that occur in aerated treatment ponds are numerous and influenced by the characteristics of the influent wastewater and the ambient conditions. Historically, aerated treatment ponds have been designed assuming a completely stirred tank reactor (CSTR) assuming first-order kinetics on the destruction of influent Biochemical Oxygen Demand (BOD)[5].

As mixing in a treatment pond increases, zones of low oxygen concentrations are reduced and eliminated. If mixing energy is sufficient, anaerobic processes in the pond bottom and corners are limited and algae growth is limited due to higher turbidity and restricted light penetration. Under this case, the CSTR assumption is applicable, however overall waste stabilization is accomplished primarily by aerobic bacteria in suspension according to kinetic rates more akin to activated sludge (with the solids retention time equal to the hydraulic retention time of the basin)[6]. The existing aeration power in the first two reactors of the treatment ponds is anticipated to maintain suspended solids concentrations in the order of 30 to near 140 mg/L[7], which is within the lower range of likely suspended solids in these reactors considering lack of any solids recycle. Therefore, an assessment of the overall kinetic rates for waste stabilization (carbonaceous biochemical demand, or CBOD) in the first two reactors (and Reactors 3 and 4 as they are and may continue to be important elements of the treatment process) should be conducted over time in coordination with the influent characterization conducted above.

[5] Andy Shilton, Ed, Pond Treatment Technology, IWA Publishing 2005.
[6] C.P. Leslie Grady, et. al. Biological Wastewater Treatment, 2nd Ed., Marcel Dekker, Inc. 1999.
[7] Linvil G. Rich, High Performance Aerated Lagoon Systems, American Academy of Environmental Engineers, 1999.

During a period of at least 12 months, it is recommended that prior to conducting preliminary design of improvements to the wastewater treatment process, the City conduct additional monitoring and characterization coordinated with the influent wastewater characterization recommended above. The recommended process and effluent characterization is summarized in Table 1-6.

Table 1-6
Recommended Process and Effluent Monitoring Parameters and Frequency

Constituent	Units	Sample Locations	Method	Hold Time	Type of Sample	Sampling Frequency
BOD_5	mg/l	Effluent from Reactors 1, 2, 3, & 4	SM 5210 B	6 hr, 24 hr max	24-hr Composite	weekly
Total $CBOD_5$	mg/l	Effluent from Reactors 1, 2, 3, & 4	SM 5210 B	6 hr, 24 hr max	24-hr Composite	weekly
Filtered[(a)] $CBOD_5$	mg/l	Effluent from Reactors 1, 2, 3, & 4	SM 5210 B	6 hr, 24 hr max	24-hr Composite	monthly
Total Suspended Solids (TSS)	mg/l	Effluent from Reactors 1, 2, 3, & 4	SM 2540 D	7 d	24-hr Composite	weekly
pH	standard units	Effluent from Reactors 1, 2, 3, & 4	Field Measurement	Immediately	Grab	weekly
Total Kjeldahl Nitrogen (TKN)	mg/l	Effluent from Reactors 1, 2, 3, & 4	EPA 351.4	28 d	24-hr Composite	weekly
Ammonia, as Nitrogen	mg/l	Effluent from Reactors 1, 2, 3, & 4	EPA 350.1	28 d	24-hr Composite	weekly
Temperature	Deg. C	Effluent from Reactors 1, 2, 3, & 4	Field Measurement	Immediately	Grab	weekly

(a) With prior filtration through a 0.45 μm filter.

1.2.4.4 Percolation Pond Operation and Maintenance Monitoring

While percolation disposal continues to be a major element of the City's wastewater disposal process, maintaining capacity in these facilities is critical. Also, as water quality concerns in the Central Valley are increasing, including the potential for salinity impacts, optimizing the performance of these facilities to limit evaporation will become more important in the future. The City is mindful of maintaining percolation capacity, since it has experienced declines in disposal capacity in the past and has had to modify operations and expand disposal area to over come these declines. Most notable is the need to control the rise of shallow groundwater levels associated with reduced use of groundwater for irrigation in the area. Three irrigation district wells are operated, depending on groundwater level, to prevent ground water mounding below and the disposal ponds and to allow for percolation disposal. This fluctuation in groundwater may be conducive to the formation of caliche (calcium carbonate cemented sediment) at the water table that would greatly impede percolation capacity.

The City currently monitors several factors associated with disposal capacity, including flow, pond and groundwater level, and irrigation district pump operation. In order to monitor the effectiveness of the City's current operation and maintenance strategy in maintaining percolation rates, it is recommended that the following data (including that currently collected by the City) be collected and maintained:

- Daily discharge to each basin (or set of basins): Where multiple basins are included on a single flow meter, efforts should be made to isolate individual basins while filling (e.g. fill U-1 then fill U-2)
- Beginning and end of discharge to individual basins,
- Daily water depths in each disposal basin: units should be consistent i.e. hundredths of a foot or inches.
- At least monthly groundwater levels in the interior monitoring wells (MW-2 and MW-3). The City may wish to evaluate installing pressure transducers in one or more of the monitoring wells for more detailed elevation data.
- Volume of water pumped by each of the irrigation district wells per week, or capacity and hours of operation if operated at a continuous flow rate.
- Records of all disking and deep ripping, with photos and descriptions of soil conditions prior to, during, and after these activities.
- Additional notes and observations (monthly or on occurrence) to include anecdotal performance changes, levee condition, seepage from the bank or from the bottom of the pond, algae/weed build up and any control methods, or any other abnormalities or changes in function.
- Periodic (once every five to ten years or less frequent as necessary and determined by initial investigations and pond performance) soil evaluations and testing potentially including:
  - Soil morphology for visual signs of compaction, clay pans or dense zones, salt/carbonate precipitation and/or cementation, etc.
  - Chemical Parameters, as necessary, such as Cation Exchange Capacity and exchangeable cations (i.e. exchangeable sodium percentage), pH, conductivity, carbonate content.
  - Physical Parameters, as necessary, such as organic carbon content, bulk density, hydraulic conductivity, etc.
- Hydrogeologic investigations including (stress-) testing of percolation capacity in individual basins or groups of basins, and aquifer stress testing.

1.2.4.5 Groundwater Monitoring

For all land disposal systems, whether through irrigation with recycled water or percolation disposal, the primary regulatory concern is impacting shallow groundwater quality. Currently the City's Monitoring and Reporting Program requires limited sampling and analysis of groundwater for reporting purposes. Recently the City's groundwater monitoring network was updated to allow a better understanding of the water quality surrounding the City's WWTP. Therefore, continued quarterly monitoring for the constituents listed in Table 1-7 is recommended.

Table 1-7
City of Ceres
Recommended Groundwater and Surface Water Monitoring Program

Constituent	Units	Method (c)	Type of Sample	Sampling Frequency
Depth to Groundwater	+/- 0.01	NA	Measurement	Quarterly
Groundwater Elevation (a)	+/- 0.01	NA	Calculated	Quarterly
pH	pH Units	NA	Grab	Quarterly
Specific Conductance	μS/cm	NA	Grab	Quarterly
Oxidation Reduction Potential	mV	NA	Grab	Quarterly
Temperature	ºC	NA	Grab	Quarterly
Nitrate and Nitrite as Nitrogen	mg/L	300.0	Grab	Quarterly
Total Kjeldahl Nitrogen	mg/L	351.4	Grab	Quarterly
Fixed Dissolved Solids	mg/L	SM 2540 C,E	Grab	Quarterly
Total Dissolved Solids	mg/L	160.1	Grab	Quarterly
δ^{18}O and δ^{2}H (d)	Permil, VSMOW	Isotope MS	Grab	Quarterly
Dissolved As, Fe, Mo, and Mn (d)	mg/L	*	Grab	Quarterly (c)
Standard Minerals (b) (d)	mg/L	*	Grab	Quarterly (c)

(a) Groundwater elevation shall be determined based on depth-to-water measurements from a surveyed measuring point elevation on the well (north quadrant of the PVC well casing).

(b) Standard minerals include at least the following compounds: boron, calcium, iron, magnesium, manganese, potassium, sodium, chloride, sulfate, total alkalinity (including alkalinity series), and hardness.

(c) Standard minerals and metals shall be monitored quarterly for the first eight sampling events; then the sampling and reporting frequency shall be reduced to current MRP required parameters and frequency.

(d) All water samples collected for metals and stable isotope analysis will be filtered using a maximum 0.45 micron filter prior to any required preservation.

* EPA method 200.7 for boron, calcium, iron, magnesium, manganese, molybdenum, potassium, and sodium. EPA method 206.2 for arsenic. EPA method 130.2 for hardness. EPA method 310.1 for alkalinity series. EPA method 300.0 for chloride and sulfate.

1.3 SEWER SYSTEM

This section discusses the existing capacity assessment and condition summary (based on existing information) for the City of Ceres Sewer System.

1.3.1 EXISTING FACILITIES CONDITION ASSESSMENT SUMMARY

The general condition of the City of Ceres sewer system was assessed through a review of existing CCTV records (for the sewer system), discussion of general facilities operation and performance with City staff, and compilation of the City's historic inspection records into the Computerized Maintenance Management System and associated risk assessment and CIP prioritization (summarized in Appendix 1-B of Technical Memorandum No. 1). Major existing sewer condition concerns have already been identified by the City and are the primary reason for the recent Sanitary Sewer Connection project in Service Road and the planned construction of a new headworks and influent pump station at the WWTP to allow use of these new sewers into the future. These projects have been, primarily, to replace the existing 21 and 24-in sewer in Service Road from Central Avenue to the WWTP.

At the City implements the CCTV inspection plan, and identifies additional sewers in need of repair or replacement, these specific projects should be added to the City's Capital Improvement and Replacement Program. For such identified repair and replacement projects, estimated costs should be based on the results of the inspection. In the mean time, the City should continue to fund depreciation of the sewer system in the operating budget to allow for funding of such future projects.

1.3.1.1 Lift Stations

On February 26, 2010, ECO:LOGIC Engineering now Stantec visited the City to perform a condition assessment of the thirteen lift stations in the City's sewer system. The City maintains the lift stations in good condition by weekly cleaning and preventive maintenance. Major rehabilitation of the lift stations is not necessary at this time. Condition related deficiencies observed were minor and include:

- Exposure of aggregate in the concrete wet well surfaces,
- Corrosion on inside surface of the wet well hatches,
- Check valves with removed valve mechanism,
- Leaking base elbow joints,
- Heavy concrete valve vault covers without spring assistance,
- Worn valve vault covers, and
- Worn wet well hatches.

The lift station condition assessment summary is presented in Table 1-8. Immediate remedial action on most of the station deficiencies is not necessary. Recommended improvements listed in Table 1-8 should be incorporated into the City's regular maintenance program as a replacement and upgrade element.

In addition to the condition related deficiencies, Stantec noted that none of the stations had adequate provisions for emergency back up power. Installation of on site emergency power supply is recommended for the City's most critical pump stations. Installation of emergency power connections at the non-critical pump stations is also recommended.

Table 1-8
City of Ceres
Lift Station Condition Assessment Summary

Lift Station Name	No. of Pumps	Year of Pump Installation [(a)]	Pump Station Type	Pump Capacity (gpm) [(a)]	TDH (feet) [(a)]	Pump Motor Size (hp) [(a)]	Typical Run Time (hr/day) [(b)]	Typical Available Storage Time (hr) [(b)]	Criticality (score) [(c)]	Condition (score) [(d)]	Noted Deficiencies	Recommended Improvements
Morgan	2	1987	Submerged in wet well	500	16	5	4.5	8	4	2	▪ Base elbow leak on one pump	▪ Install connection for emergency power
Westpointe	2	1993	Submerged in wet well	1,100	(a)	20	5	8	3	1	▪ Vertical check valves in wet well ▪ Surface corrosion on inside of hatch	▪ Install separate valve vault for check valves ▪ Install connection for emergency power
Industrial	2	1980	Submerged in wet well	300	18	5	0.75	24	5	1	▪ None	▪ Install connection for emergency power
Central/Evans	2	1978	Submerged in wet well	700	20	10	6	8	2	2	▪ Slight exposure of aggregate in concrete of wet well	▪ Install separate valve vault for check valve ▪ Install connection for emergency power
Paramount	2	1996	Submerged in wet well	300	20	3.4	5	8	3	2	▪ Slight exposure of aggregate in concrete of wet well ▪ Vertical check valves in wet well ▪ Hatch in poor condition	▪ Install separate valve vault for check valves ▪ Replace hatch ▪ Disconnect old force main ▪ Install manhole for 90° sewer junction upstream of wet well ▪ Install connection for emergency power
Walgreen's	2	1993	Submerged in wet well	405	30	5	0.5	12	5	1	▪ Vertical check valves in wet well	▪ Relocate lift station out of traffic lanes ▪ Install separate valve vault for check valves ▪ Install connection for emergency power
Moffett	2	1986	Submerged in wet well	573	22.4	5.5	5	7	3	1	▪ Slight corrosion on control panel box ▪ Heavy concrete valve vault lids	▪ Replace valve vault lids ▪ Install connection for emergency power
Barbour	2	1988	Submerged in wet well	955	25	10	22	0.5	1	1	▪ Hatch hinges need frequent repair from heavy traffic ▪ Check valves in wet well ▪ Check valve missing valve mechanism ▪ Pumps undersized for upstream peak flows ▪ Outfall sewers undersized for peak pump operation	▪ Upsize station (wet well and pumps) ▪ Move wet well for easier access ▪ Install on-site emergency back up power
Pine St.	2	2001	Submerged in wet well	900	23	9.6	15	1	1	2	▪ Moderate exposure of aggregate in concrete of wet well ▪ High run times and low storage times	▪ Upsize station (wet well and pumps) ▪ Install on-site emergency back up power
Service Road	2	1998	Submerged in wet well	600	18	6	4	7	3	1	▪ None	▪ Install connection for emergency power
K-Mart	2	1999	Submerged in wet well	450	15.5	3	0.5	4	4	1	▪ Worn valve vault cover	▪ Install new valve vault cover ▪ Install connection for emergency power
River Ranch	2	2001	Submerged in wet well	325	16	3	0.5	12	4	1	▪ None	▪ Install connection for emergency power
Hatch/Mitchell	2	2005	Submerged in wet well	190	19	3	1	24	5	1	▪ None	▪ Remove mixer ▪ Install connection for emergency power

(a) Information provided by the City
(b) Typical run time and available storage time estimates were provided by the City staff during the condition assessment.
(c) Criticality is rated as 5 for least critical and 1 for most critical.
(d) Condition is rated as 5 for worst condition and 1 for best condition.

1.3.2 EXISTING FACILITIES CAPACITY ASSESSMENT SUMMARY

In October 2008, ECO:LOGIC Engineering now Stantec completed the *City of Ceres Preliminary Wastewater System Capacity Analysis*. This document identified numerous areas within the existing sewer system that are predicted to experience manhole surcharging and overflows during a 10 year, 6 hour design storm. The predictions in this document were further confirmed in the 2009 update of the capacity analysis.

The purpose of this section is to summarily discuss the capacity deficiencies of the gravity sewer system and its lift stations.

1.3.2.1 Gravity Sewers Capacity Summary

Wastewater collection systems can generally accommodate some degree of surcharging during peak flow conditions. However, once a manhole surcharges, it takes very little additional flow for an overflow to occur. Sewer systems are typically designed to accommodate peak flows somewhere between 50 to 80 percent full. For modeling of a system's response to a design storm, some surcharging may be acceptable. Criteria for acceptable levels of maximum surcharging in model simulations were developed in the *City of Ceres Preliminary Wastewater System Capacity Analysis* (October 2008). These criteria are included below in Table 1-9.

Table 1-9
City of Ceres
Recommended Acceptable Manhole Surcharging
During Design Storm (10-year/6-hour) Conditions

Manhole Depth [(a)]	Acceptable Level of Manhole Surcharging
4 feet or less	None
Greater than 4 feet	Not to exceed 4 feet below ground surface

(a) Manhole depth as measured from the crown of the pipe to the rim of the manhole.

Under existing conditions, a 10-year, 6-hour design storm is predicted to generate a peak flow of 7.0 Mgal/d at the WWTP with an additional peak flow of 2.8 Mgal/d directed to Modesto. Model simulation results and the locations of potential surcharging and overflows can be seen in Figure 1-3. Blue pipes show areas with no capacity issues. Pipes shown in green indicate pipes that normally would experience surcharging conditions, but because of downstream hydraulics are flowing at conditions less than full capacity. Pipes shown in yellow have between 80 percent and 100 percent of capacity being utilized. Pipes shown in orange are at capacity or are being impacted by problems downstream (i.e. at full capacity because of a bottleneck downstream). Pipes shown in red are experiencing surcharged conditions. It is important to note that the pipeline stretches shown in red and orange are causing surcharging of wastewater in the upstream manholes. In the majority of these surcharging pipes, the level of surcharging is above the criteria recommended in Table 1-9. The predicted surcharging and overflows are located in the following areas:

- Upstream of Barbour Lift Station on Mitchell Road,
- Upstream of Barbour Lift Station on East Whitmore Avenue
- North of East Whitmore Avenue on Hidden Oak Lane and Boothe Road,
- Downstream of Barbour Lift Station on Mitchell Road,
- West of Mitchell Road on Don Pedro Road,
- South of Don Pedro Road on Moffett Road,
- Between Moffett Road and Central Avenue on East Service Road,
- South of Kinser Road on Blaker Road,
- South of East Hatch Road on Moffett Road,
- Upstream of Westpointe Lift Station on East Hackett Road,
- Upstream of Central/Evans lift station on Central Avenue, Forrest Road, and Acorn Lane,
- Downstream of Central/Evans lift station on Evans Road,
- Between Central/Evans lift station Pine Street lift station on Central Avenue,
- Upstream of Pine Street lift station in the Ceres downtown sewer area, and
- Downstream of Pine Street lift station on Pine Street and Central Avenue.

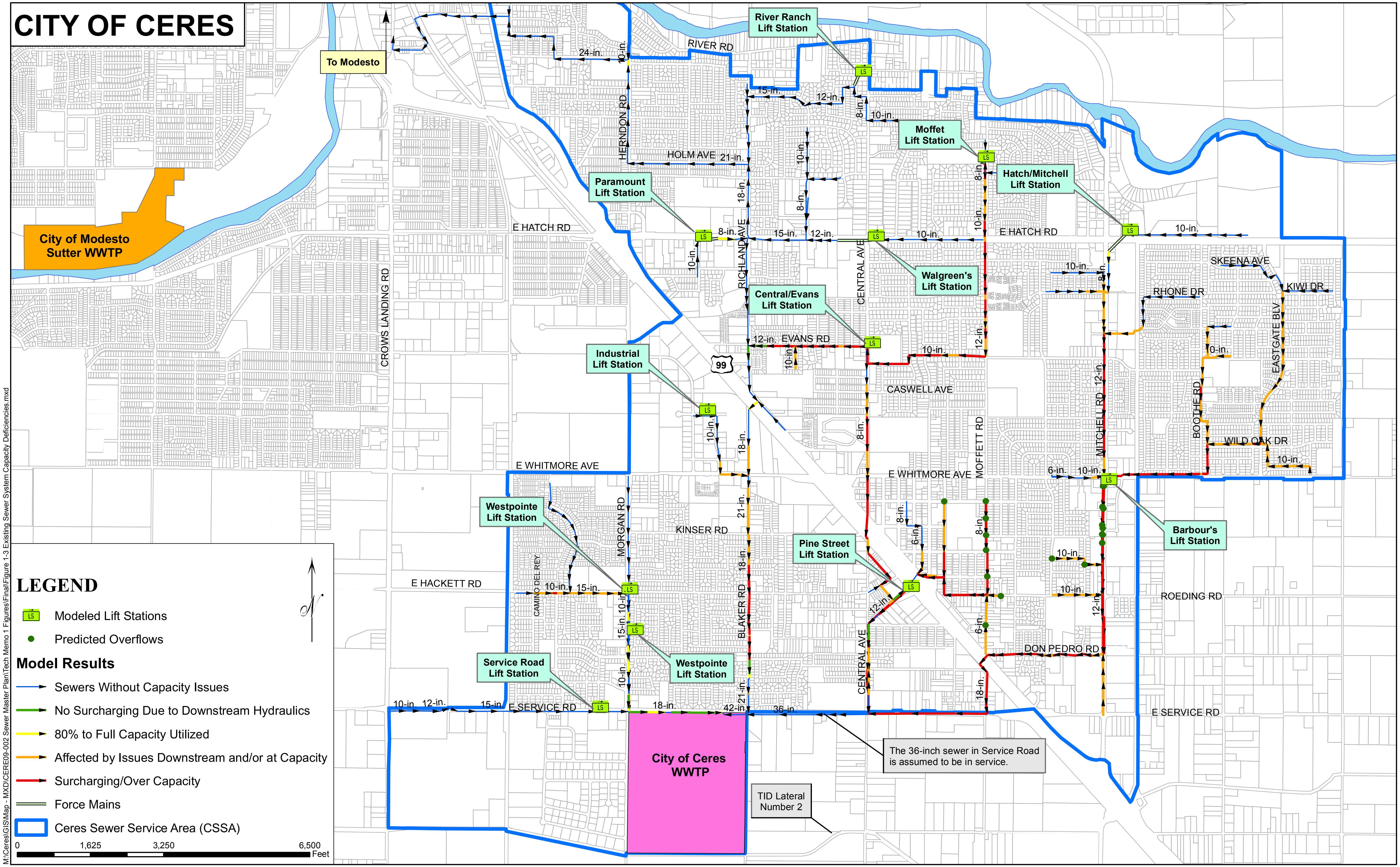

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Figure 1-3
Existing Trunk Sewer System Capacity Deficiencies

1.3.2.2 Lift Stations Capacity Summary

Based on City experience, the lift stations in the City, with the exception of Pine Street and Barbour’s lift stations, do not experience any capacity issues during periods of wet weather flow, nor are predicted by the hydraulic model to have capacity issues during the 10 year, 6 hour design storm.

During wet weather, Pine Street lift station experiences high run times because it is under capacity for peak wet weather flows. However, the capacity issue at Pine Street is not significant and it should be sufficiently alleviated by the inflow and infiltration reduction resulting from the gravity sewer improvements recommended below in the capital improvement and replacement program (CIRP).

Barbour’s lift station is severely under capacity to accommodate wet weather flow and is predicted to cause overflows during the design storm. Barbour’s lift station has severely limited capacity and immediate action is required. In July of 2009, ECO:LOGIC now Stantec completed a study on the impact of converting the Barbour’s lift station and downstream sewer to a pump station and force main. A summary of the study and the capital improvements required for retrofitting Barbour lift station as a pump station and force main are summarized below in the CIRP.

1.3.3 SEWER CAPITAL IMPROVEMENT AND REPLACEMENT PROGRAM

This section includes a discussion of necessary capital improvement projects (CIPs) to the existing gravity sewers and lift stations of the existing wastewater collection system. These improvements are separated into two distinct tiers based on the severity of the predicted or known deficiency.

- Tier 1 improvements are necessary to eliminate predicted overflows.
- Tier 2 improvements are necessary to eliminate surcharging of the existing collection system.

Predicted overflows and surcharging in the sewer system is identified above on Figure 1-3.

1.3.3.1 Tier 1 Sewer CIP Descriptions

Tier 1 improvements are necessary to eliminate predicted overflows. Following are discussions of the areas. The locations are identified in Figure 1-4. A detailed summary of gravity pipeline segments is listed in Table 1-10. This table identifies the pipeline segments, segment capacity, segment design flow, and new pipeline sizes for each segment.

Replacement of the undersized pipelines can be accomplished using various construction techniques, such as open cut and replacement, pipe bursting, pipe reaming, or a combination.

For cost estimating, pipe bursting was assumed to be most appropriate in most cases. During final design, the most cost-effective approach should be selected, based on the individual projects’ characteristics and parameters. The cost estimates included in the summaries below are presented in more detail in Appendix B.

Pipe upsizing for relief in 9th Avenue, Roeding Road, 6th Avenue and Park Street

The targeted pipelines north of SR99 are existing 8-inch. These pipelines exist in Magnolia Street, Roeding Road., 6th Street, and Park Street. These pipelines should be increased to 10-inch, 12-inch and 15-inch. Additionally, 118 linear feet of 8-inch pipe should be installed between manholes N10-074 to N10-073 on Magnolia Street to connect these manholes and divert flow from sewers west of 9th Street to the Magnolia Street sewer. The total length of remedial pipeline, including the new installation is 3,926 L.F. The estimated cost is $884,000.

Pipe upsizing in Central Avenue and Pine Street

The targeted pipelines south of SR99 (and downstream of the existing Pine Street Lift Station) are existing 12-inch. These pipelines exist in Central Avenue and Pine Street. These pipelines should be increased to 15-inch and 18-inch. The total length of remedial pipeline is 3,047 L.F. The estimated cost is $790,080.

Table 1-10
City of Ceres
Recommended Tier 1 Sewer Improvements Location and Criteria

Tier 1 Improvements							
Location	Segment		Existing Size (in)	Upgrade Size (in)	Quantity (LF)	Existing Capacity (Mgal/d)	Design Flow (Mgal/d)
	U/S MH	D/S MH					
Central/Pine (Figure 1-4)	O9-035	P9-002	12	15	72	1.25	1.84
	P9-002	P9-010	12	15	368	1.26	1.80
	P9-010	P9-016	12	15	300	1.26	1.79
	P9-016	P9-019	12	15	305	1.08	1.76
	P9-019	P9-031	12	15	350	1.07	1.75
	P9-031	P9-033	12	15	177	1.03	1.79
	P9-033	P9-044	12	15	250	1.57	1.78
	P9-044	P9-060	12	18	261	1.01	1.78
	P9-060	Q9-002	12	18	320	0.99	2.62
	Q9-002	Q9-004	12	18	321	1.03	2.61
	Q9-004	Q9-013	12	18	323	1.54	2.61
Magnolia/ Roeding/ 6th/Park (Figure 1-4)	N10-074	N10-073	---	8	118	---	0.40
	N9-041	O9-006	8	10	570	0.42	0.76
	O9-006	O9-014	8	10	562	0.42	0.77
	P10-001	P9-005	8	12	222	0.45	0.94
	P9-005	P9-004	8	12	186	0.32	0.94
	P9-004	P9-003	8	12	546	0.39	0.94
	P9-003	O9-027	8	12	392	0.44	1.23
	O9-027	O9-026	8	15	361	0.33	1.50
	O9-026	O9-019	8	15	247	0.67	1.50
	O9-014	O9-027	8	12	561	0.42	1.25
	O9-017	O9-019	6	10	161	0.09	0.13

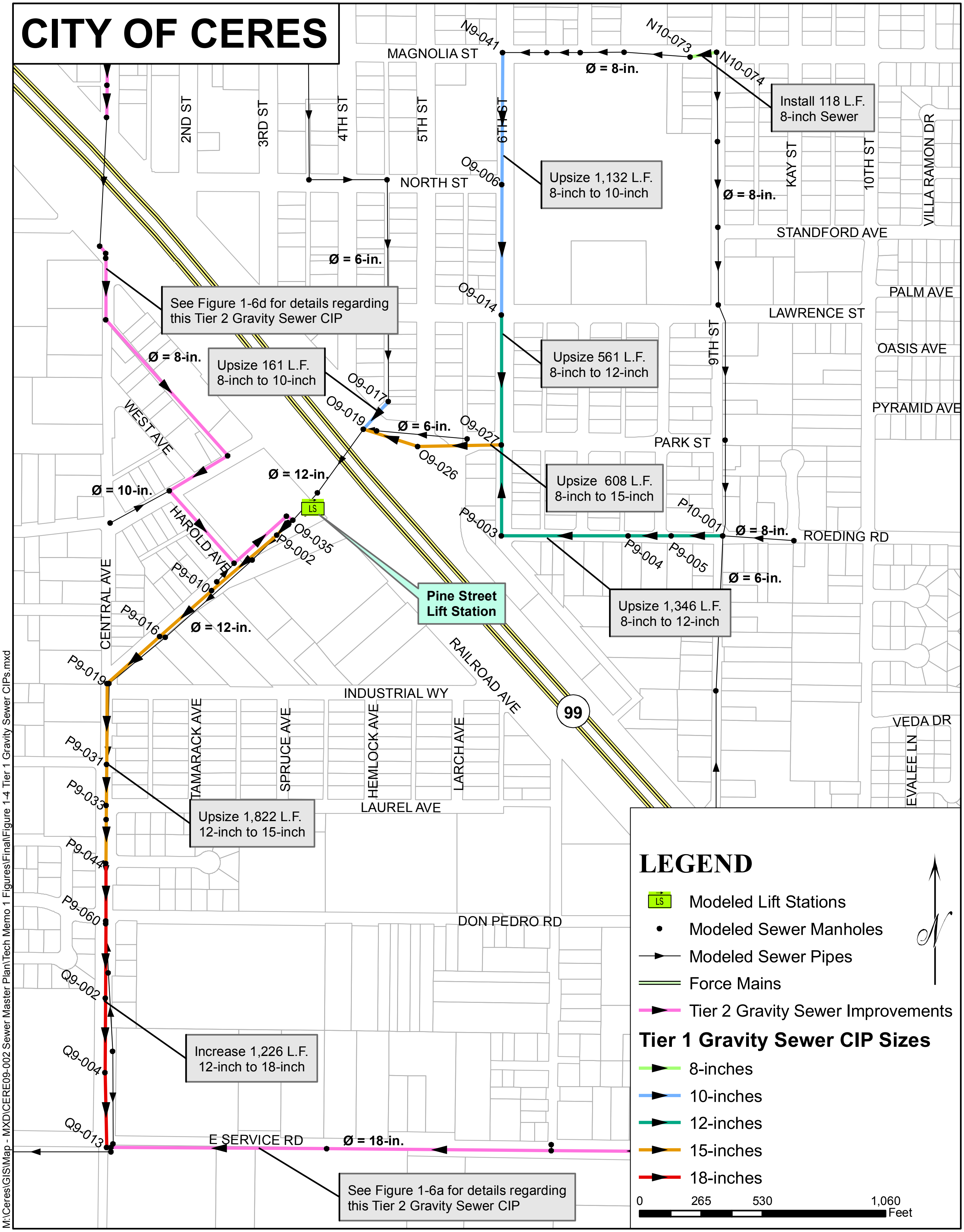

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Figure 1-4
Tier 1 Gravity Sewer Capital Improvement Projects

Conversion of Barbour's lift station to pump station

The existing Barbour's Lift Station has significant capacity limitations. Not only are the pumps significantly undersized for upstream peak wet weather flows, but the outfall sewers are undersized for peak pump discharge. It is recommended that the lift station be converted to a pump station and the downstream relief sewer be converted to a force main. This conversion is currently being designed as an interim improvement.

For the conversion of the Barbour's lift station into a pump station, wastewater would be pumped through a 3,700-foot force main to a manhole at the intersection of Mitchell and Don Pedro Road. This would require the replacement of the existing pumps with significantly larger pumps (one duty and one standby) at the lift station. The existing parallel gravity sewer downstream would remain in place to provide local service to connections along Mitchell Road and tributary sewer lines.

The new pumps would pump to the existing 12-inch relief sewer that flows parallel to the gravity service in Mitchell Road. The 12-inch relief sewer would be converted into a force main by removing the manholes on the line and replacing them with sections of 12-inch C 900 PVC pipe to match the existing pressure rated PVC already in place.

To accommodate existing peak flows, two 2,800 gpm submersible pumps, one lead and one lag, would be installed in the new wet well. The relief sewer would be converted to a force main with check, shut off, and air release valves. To prevent manhole erosion at the downstream connection point, energy dissipation may be needed based on the degree and frequency of high velocity discharges.

The proposed interim improvements to the lift station and force main include:

- Upsizing of duty and standby pumps
- Replacement of pump station piping (including new manifold piping and valves)
- Construction of a new separate valve box
- Removal of manholes in relief sewer and replacement with C900 PVC pipe
- Provision for valved discharge from the new force main to the gravity sewer downstream of Barbour Lift Station
- Provision for the City to consider VFD on one or more of the pumps depending on ultimate pump selection and control strategy.

Wastewater flows from the Eastgate subdivision may eventually be diverted to a new trunk sewer line on the eastern side of the City. This would remove these flows from the sewer on East Whitmore Avenue tributary to the Barbour's lift station, reducing the peak flow at Babrbour's Lift Station to approximately 1,700 gpm,. Should diversion of flow occur before the completion of the Barbour's lift station conversion, the pumps to be installed at the station could be reduced in size to accommodate these smaller peak flows. Technical Memorandum 4 of this master plan will further discuss diversion of wastewater flows from the Eastgate subdivision.

Ultimately, the current wet well should be relocated out of the street to a neighboring sidewalk and driveway. This will eliminate traffic related wear and tear to the wet well hatch and will also provide the City with easy entry without disrupting the flow of traffic. The new location will also allow for construction of a larger wet well to provide more storage time in the event of power failure. The relocation of the Barbour's pump station should be considered as a Tier 2 improvement. The approximate new location of the pump station wet well is shown in Figure 1-5.

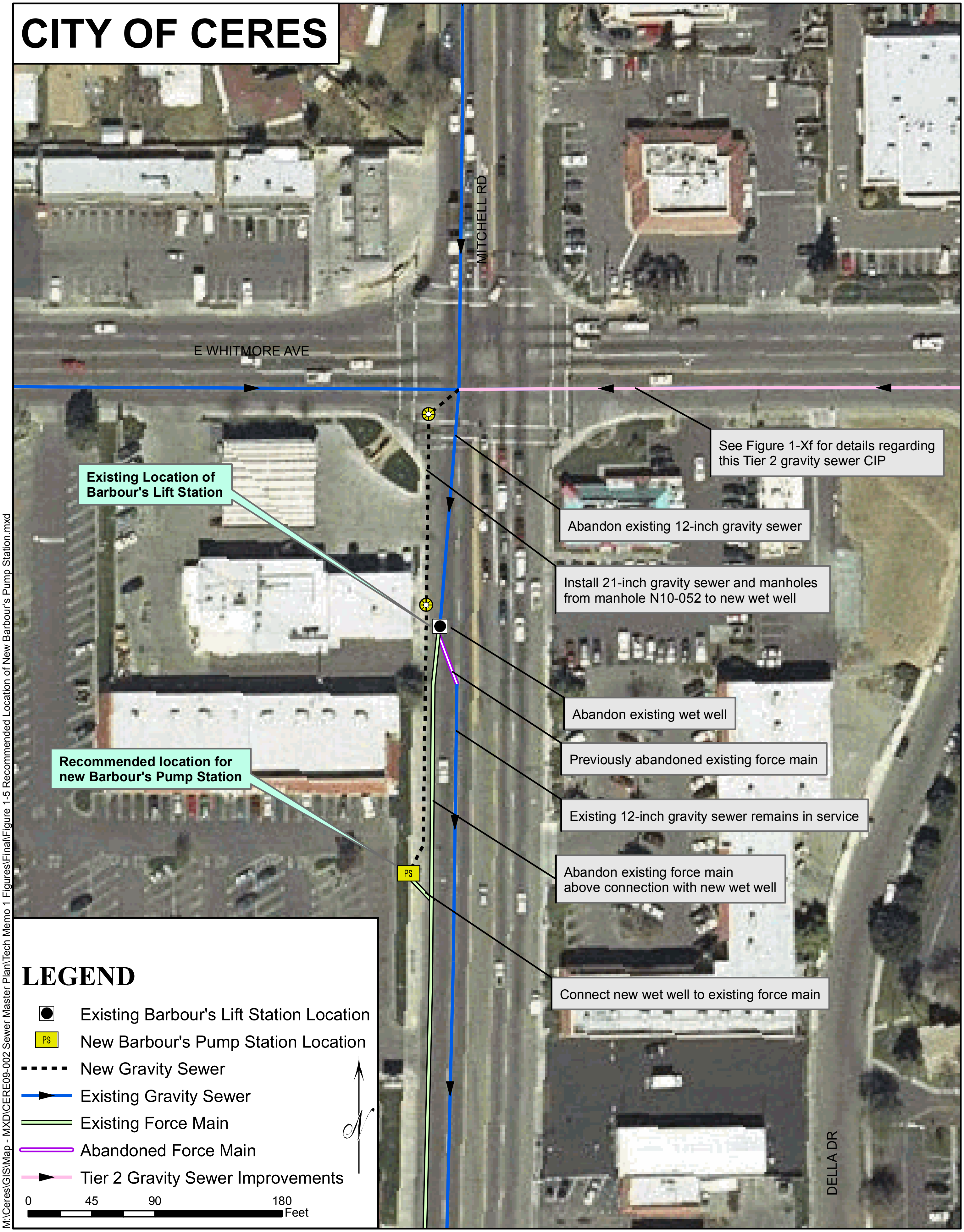

Figure 1-5
Recommended Location of New Barbour's Pump Station

1.3.3.2 Tier 2 Sewer CIP Descriptions

Tier 2 improvements are necessary to eliminate predicted surcharges. Following are discussions of the areas. The locations are identified in Figures 1-6a through 1-6g. A detailed summary of gravity pipeline segments is listed in Table 1-11. This table identifies the pipeline segments, segment capacity, segment design flow, and new pipeline sizes for each segment."

Replacement of the undersized pipelines can be accomplished using various construction techniques, such as open cut and replacement, pipe bursting, pipe reaming, or a combination.

For cost estimating, pipe bursting was assumed to be most appropriate in most cases. During final design, the most cost-effective approach should be selected, based on the individual projects' characteristics and parameters. The cost estimates included in the summaries below are presented in more detail in Appendix B.

Pipe upsizing in Don Pedro Road, East Service Road and Moffett Road:

Existing sewer pipelines are 18-inch in Don Pedro, Moffett Road, and East Service Road, and under peak flow conditions are indicated to surcharge. These pipelines should be increased to 21-inch, 24-inch, 27-inch and 36-inch to accommodate current flows within the Phase I growth boundary. The total length of remedial pipeline is 6,360 L.F. The estimated cost is $3,489,000 for these improvements from the intersection of Don Pedro and Mitchell Road to East Service Road and Central Avenue. The need for pipe upsizing in Don Pedro Road and Moffett Road could be reduced or eliminated if the City, prior to initiating this project, constructs a trunk sewer to serve future development on the east side of the City and conveys flows south in Mitchell Road to this new sewer. In this case, the pipe upsizing in East Service Road would be part of the new trunk sewer with an estimated cost of $1,884,000. Further discussion of the impacts of a new trunk sewer are discussed in the fourth chapter of this master plan.

Pipe upsizing in Blaker Road:

The targeted pipelines are existing 18-inch. These pipelines are in Blaker Road. These pipelines should be increased to 24-inch. The total length of remedial pipeline is 2,518 L.F. The estimated cost is $967,000.

Pipe upsizing in Evans Road:

The targeted pipelines are existing 12-inch. These pipelines are in Evans Road. These pipelines should be increased to 15-inch. The total length of remedial pipeline is 2,464 L.F. The estimated cost is $591,000.

Pipe upsizing in Central Avenue, Forest Lane and Acorn Lane:

The targeted pipelines are existing 10-inch. These pipelines are in Central Avenue (North of Highway 99), Evans Road, Forest Lane, and Acorn Lane. These pipelines should be increased to 12-inch and 15-inch. The total length of remedial pipeline is 3,194 L.F. The estimated cost is $635,000.

Pipe upsizing in Central Avenue, Hackett Road, Harold Street and Pine Street:

The targeted pipelines upstream of the existing Pine Street Lift Station are existing 8-inch and 10-inch. These pipelines are in Central Avenue, Hackett Road, Harold Avenue, and Pine Street. These pipelines should be increased to 10-inch and 12-inch. The total length of remedial pipeline is 4,110 L.F. The estimated cost is $691,000.

Pipe upsizing in Moffett Road:

The targeted pipelines are existing 10-inch. These pipelines are in Moffett Road. These pipelines should be increased to 12-inch. The total length of remedial pipeline is 1,812 L.F. The estimated cost is $348,000.

Pipe upsizing in Mitchell Road:

The targeted pipelines are existing 10-inch and 12-inch. These pipelines are in Mitchell Road. These pipelines should be increased to 12-inch and 15-inch. The total length of remedial pipeline is 2,753 L.F. The estimated cost is $637,000.

Pipe upsizing in Mitchell Road, East Whitmore Avenue and Hidden Oak Lane:

The targeted pipelines are existing 12-inch. These pipelines are in East Whitmore Avenue, and Hidden Oak Lane. These pipelines should be increased to 18-inch. The total length of remedial pipeline is 2,985 L.F. The estimated cost is $1,102,000. This project will likely be affected should the City construct a new trunk sewer on the east side of the City and divert flow from the Eastgate subdivision to this new infrastructure. Further discussion of the impact of diverting flow from the Eastgate subdivision is included in the Chapter 4.

Pipe upsizing in Hackett Road:

The targeted pipeline is existing 10-inch. The pipeline is in Hackett Road. The pipeline should be increased to 12-inch. The total length of remedial pipeline is 107 L.F. The estimated cost is $26,000.

These Tier 2 gravity sewer CIPs are prioritized later in the chapter according to the level of surcharging which they are experiencing in relation to the surcharging criteria presented above in Table 1-9.

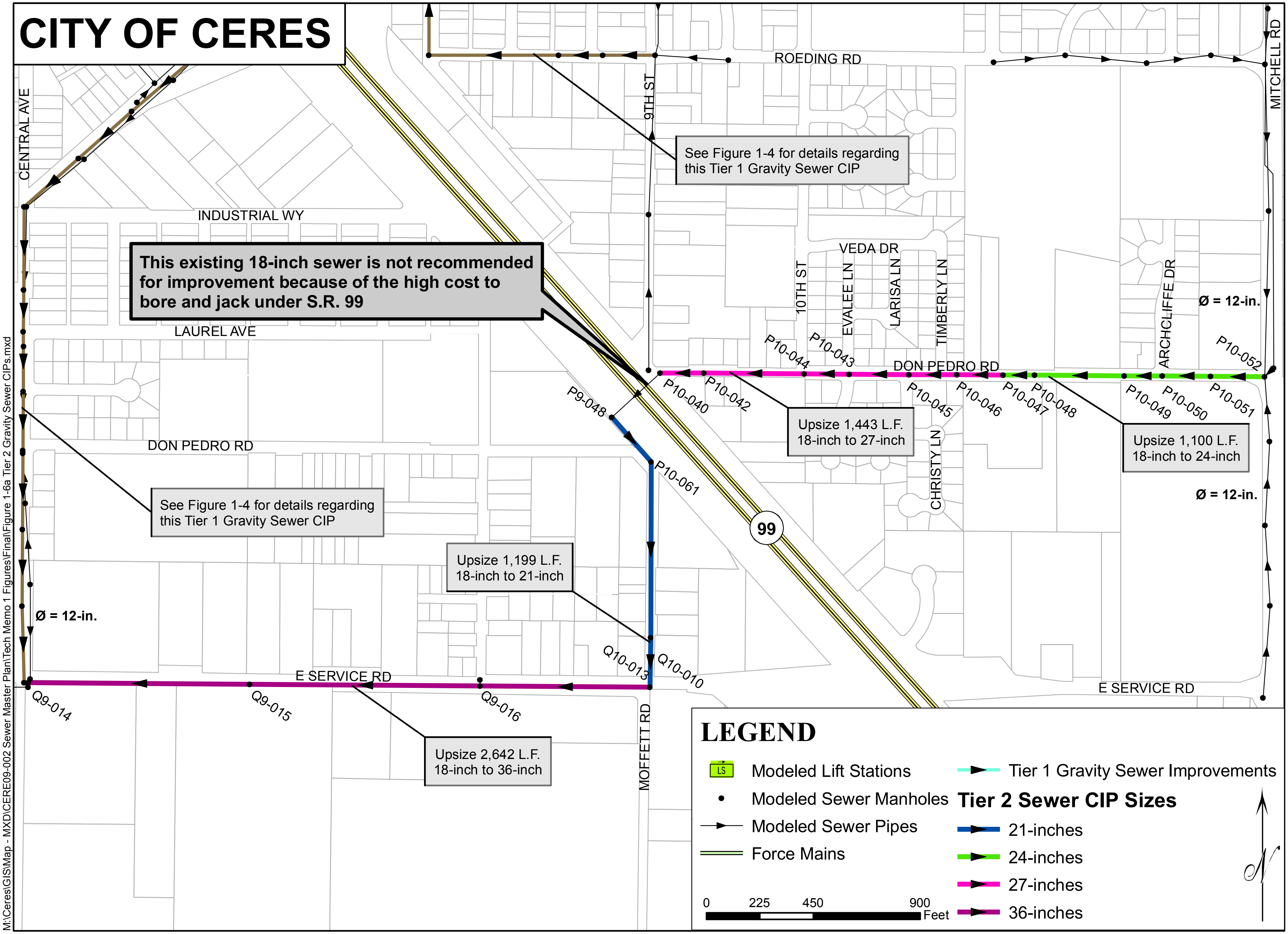

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Figure 1-6a
Tier 2 Gravity Sewer Capital Improvement Projects -
Pipe upsizing in Don Pedro Road, East Service Road and Moffett Road

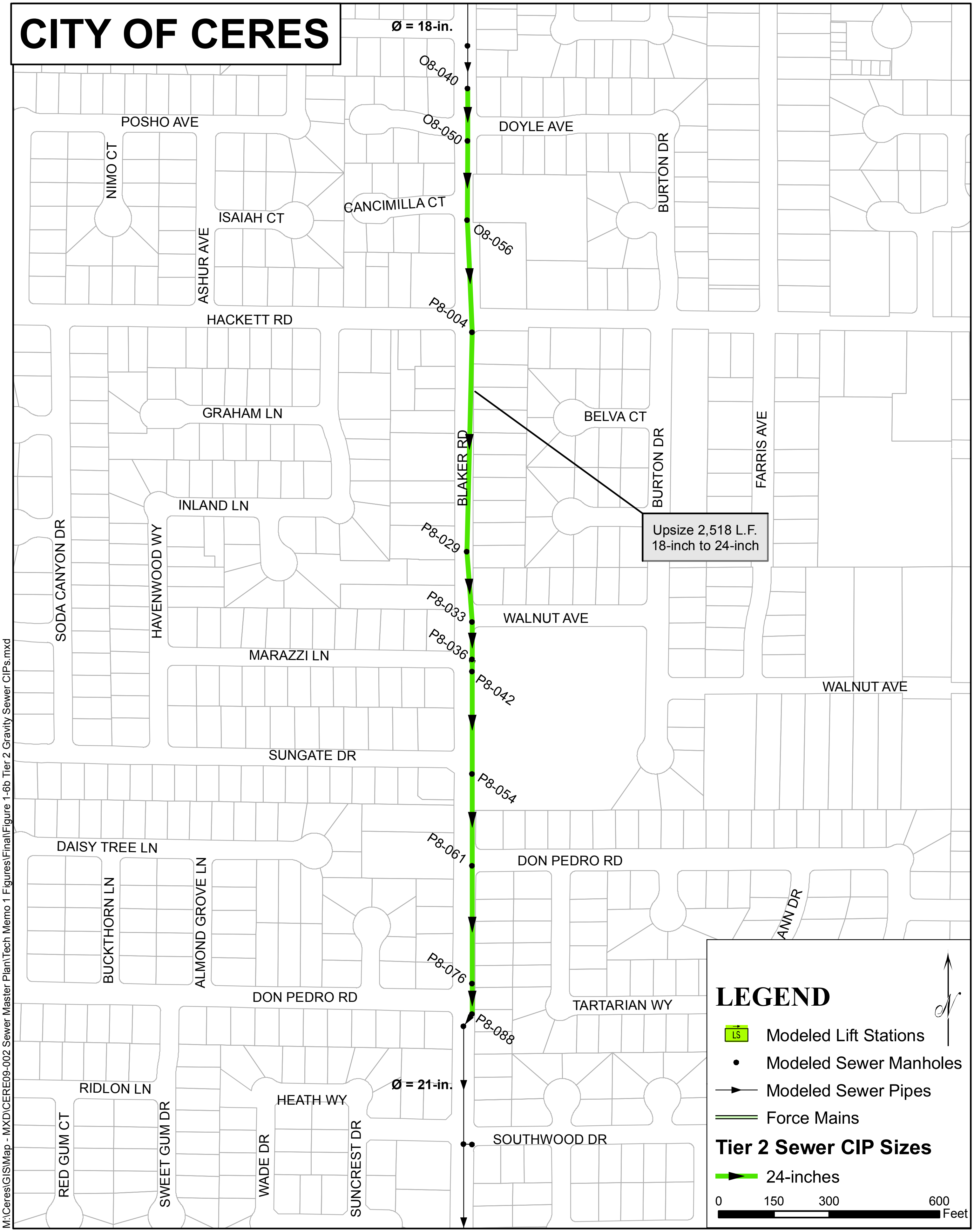

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Figure 1-6b
Tier 2 Gravity Sewer Capital Improvement Projects - Pipe Upsizing in Blaker Road

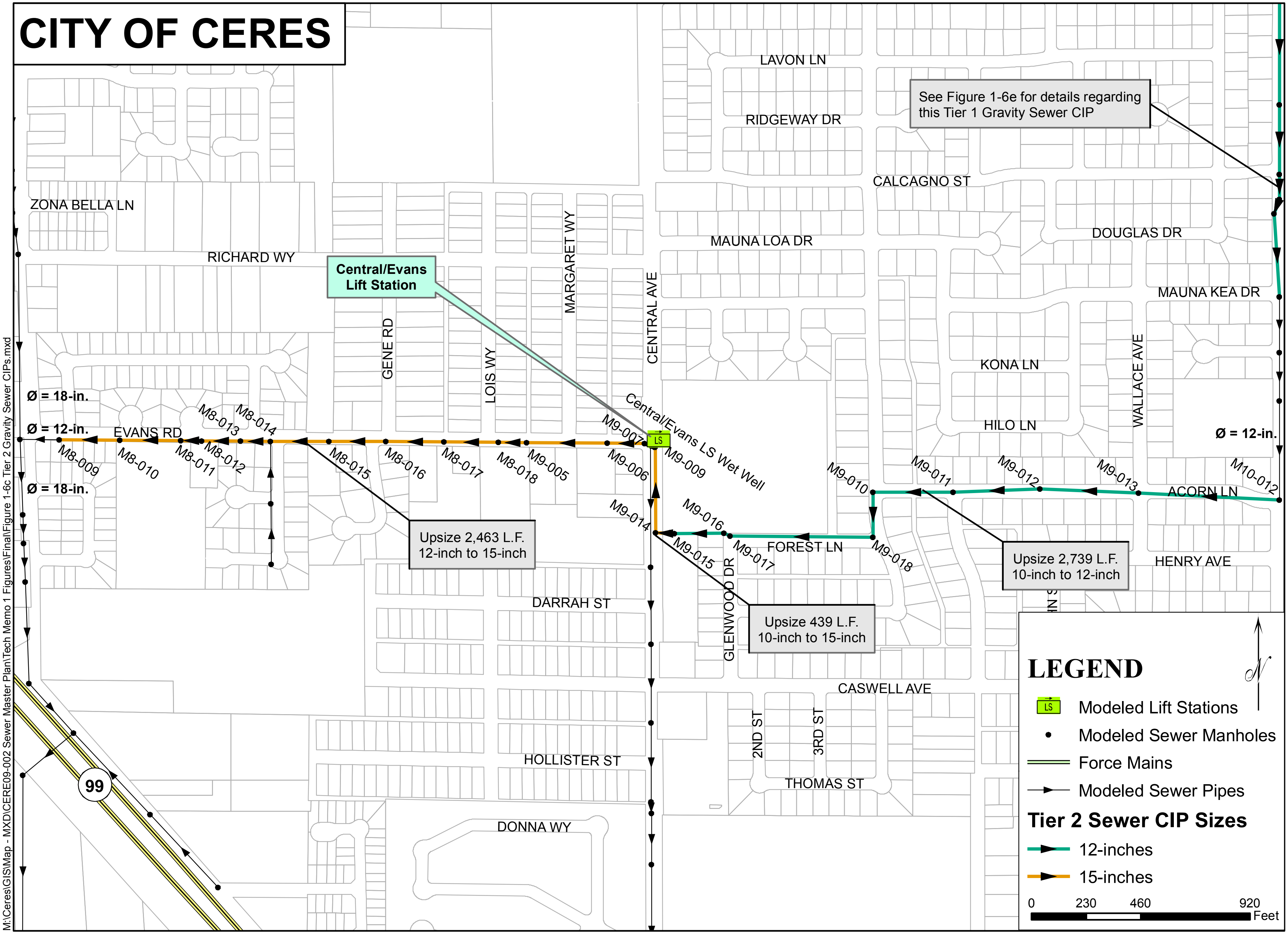

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Figure 1-6c
Tier 2 Gravity Sewer Capital Improvement Projects -
Pipe upsizing in Evans Road, and Central Avenue, Forest Lane and Acorn Lane

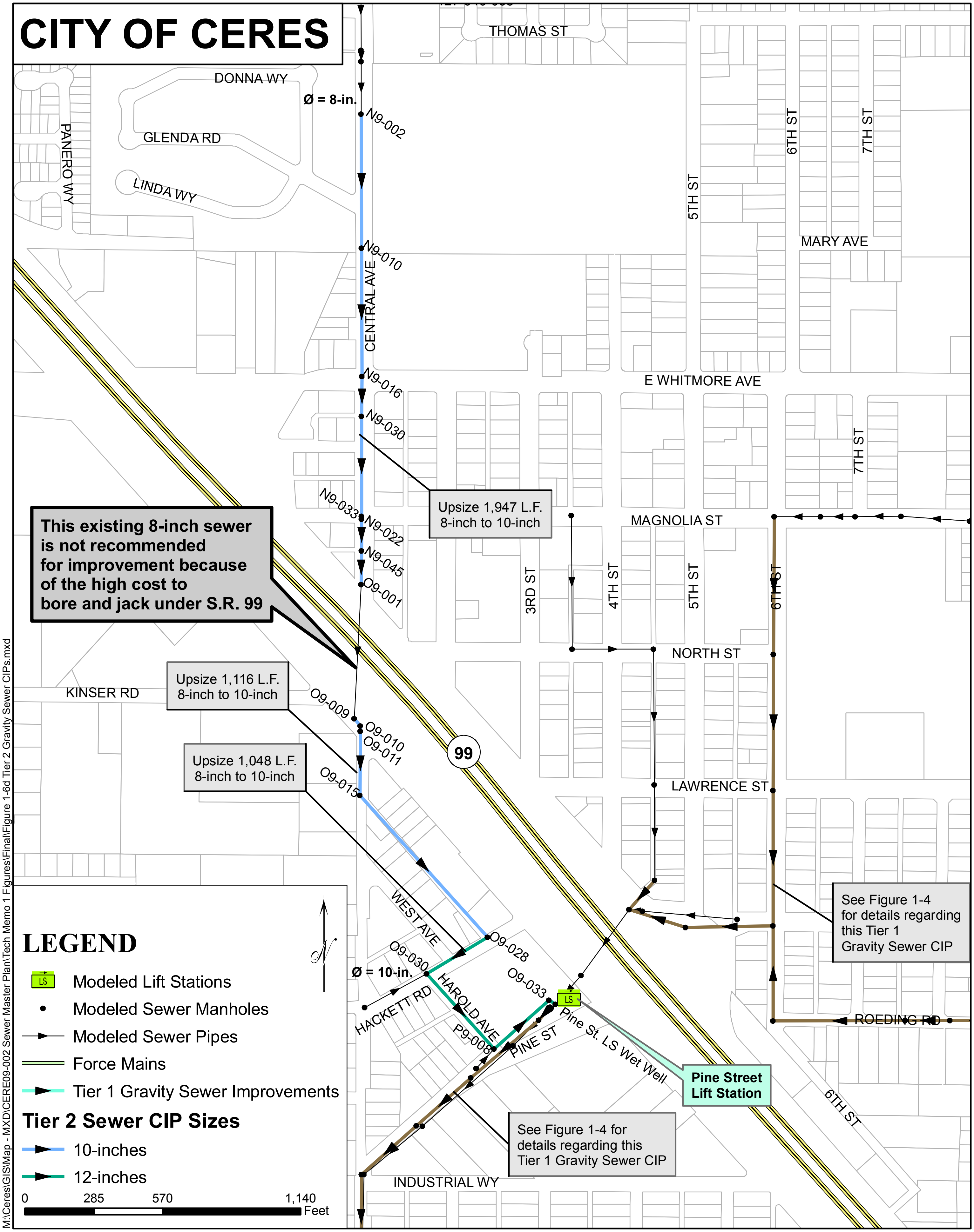

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Figure 1-6d
Tier 2 Gravity Sewer Capital Improvement Projects - PIpe upsizing in Central Avenue, Hackett Road, Harold Street and Pine Street

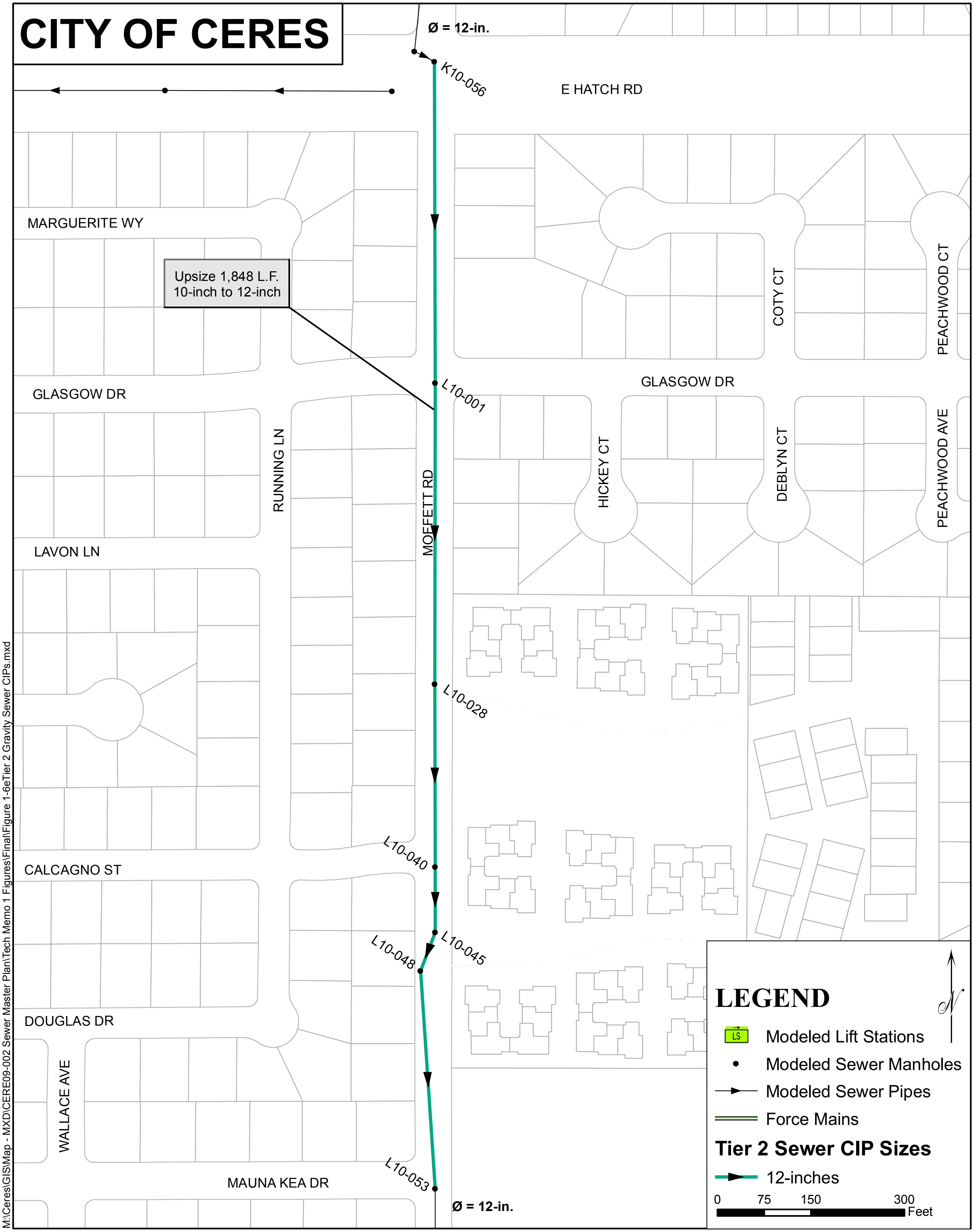

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Figure 1-6e
Tier 2 Gravity Sewer Capital Improvement Projects - Pipe upsizing in Moffett Road

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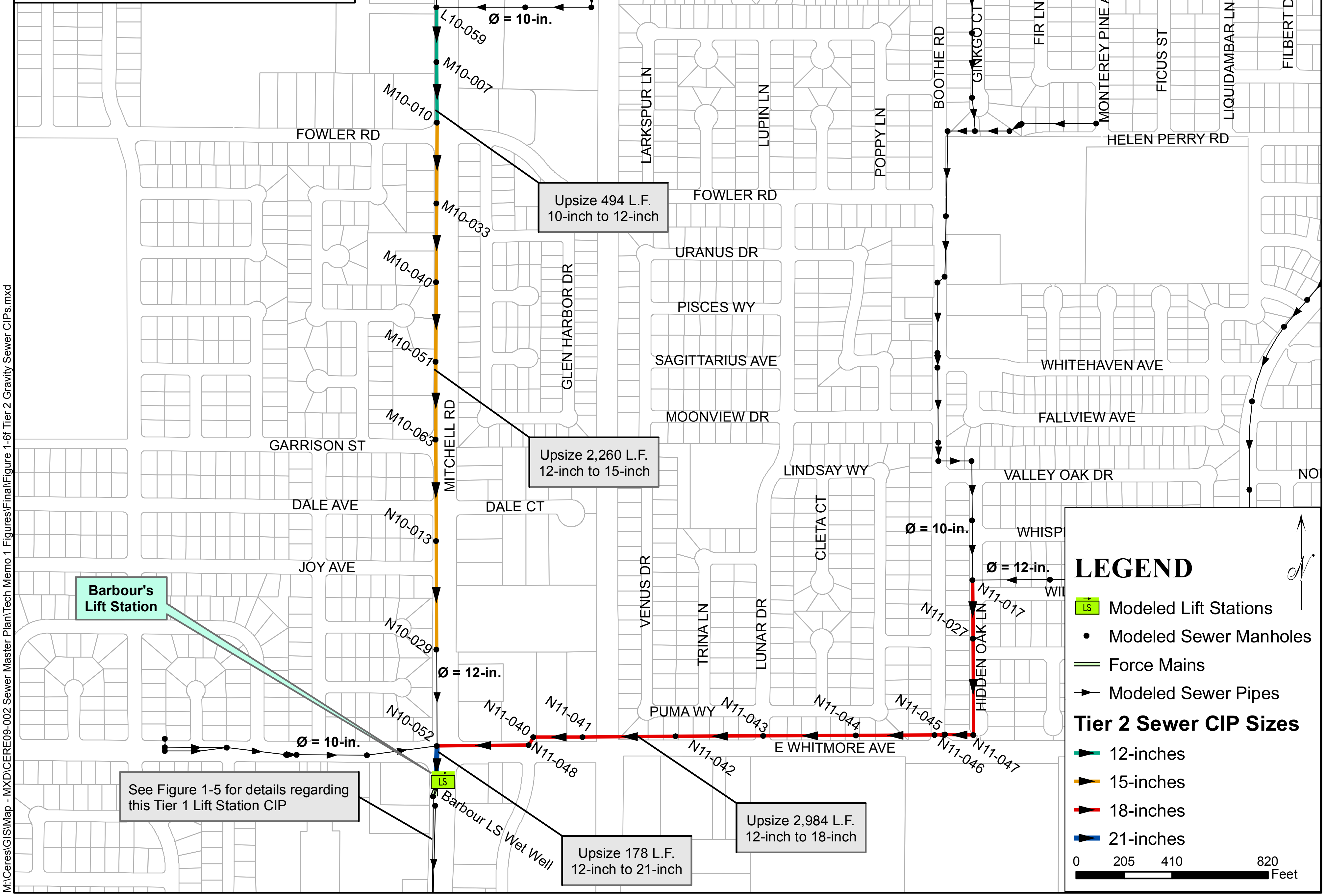

Figure 1-6f
Tier 2 Gravity Sewer Capital Improvement Projects - Pipe upsizing in Mitchell Road, and Mitchell Road, East Whitmore Avenue and Hidden Oak Lane

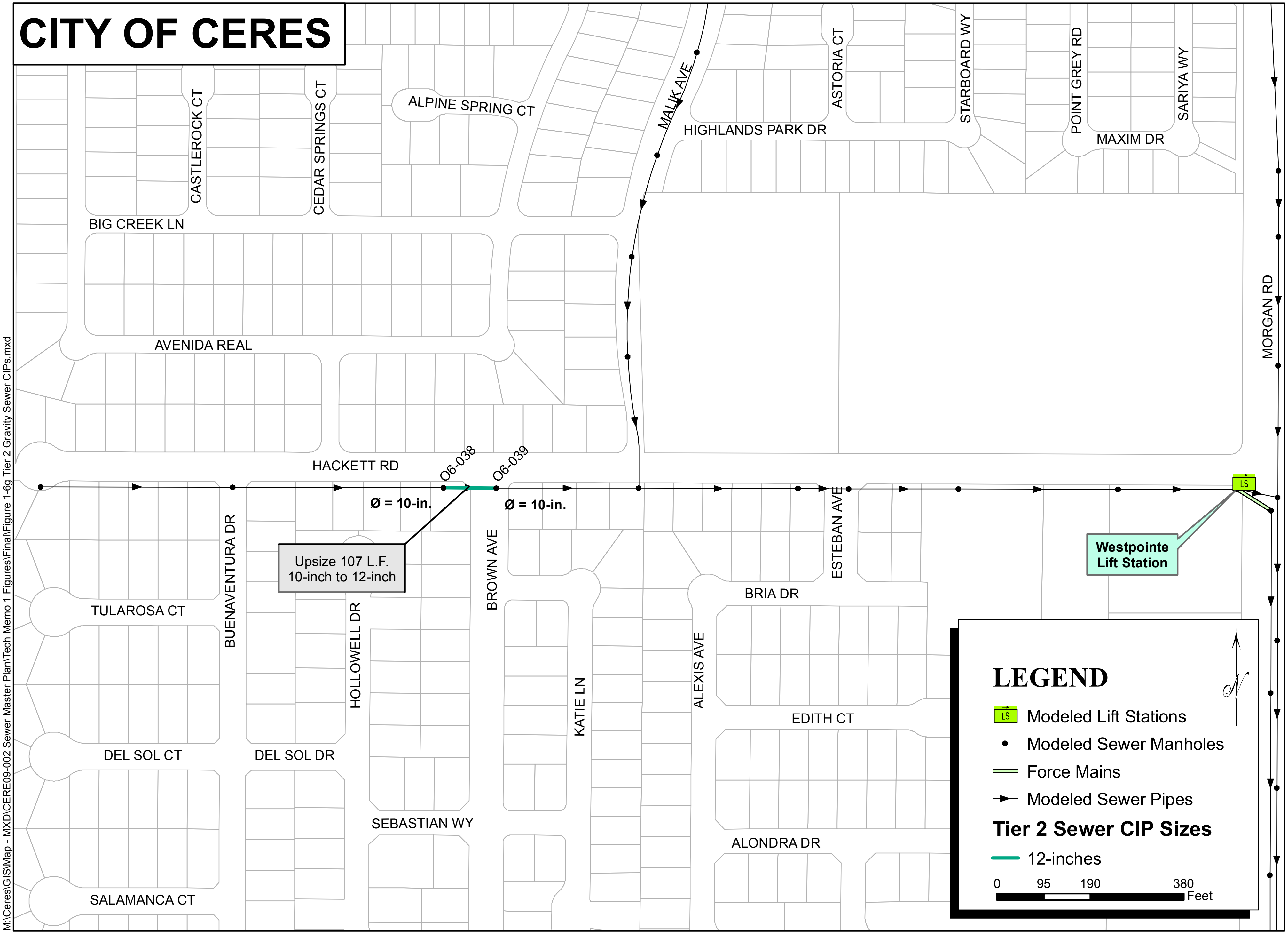

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Figure 1-6g
Tier 2 Gravity Sewer Capital Improvement Projects - Pipe upsizing in Hackett Road

Table 1-11
City of Ceres
Recommended Tier 2 Sewer Improvements Location and Criteria

Tier 2 Improvements							
Location	**Segment**		**Existing Size (in)**	**Upgrade Size (in)**	**Quantity (LF)**	**Existing Capacity (Mgal/d)**	**Design Flow (Mgal/d)**
	U/S MH	**D/S MH**					
Don Pedro/ East Service/ Moffett (Figure 1-6a)	P10-052	P10-051	18	24	228	2.44	3.13
	P10-051	P10-050	18	24	203	1.71	3.07
	P10-050	P10-049	18	24	160	2.85	3.04
	P10-049	P10-048	18	24	377	2.00	3.00
	P10-048	P10-047	18	24	133	2.30	3.00
	P10-047	P10-046	18	27	195	2.98	3.00
	P10-046	P10-045	18	27	203	-1.71[(a)]	3.05
	P10-045	P10-044	18	27	251	2.83	3.07
	P10-044	P10-043	18	27	190	2.14	3.08
	P10-043	P10-042	18	27	422	1.56	3.08
	P10-042	P10-040	18	27	184	-1.63[(a)]	3.08
	P9-048	P10-061	18	21	251	2.90	3.08
	P10-061	Q10-010	18	21	738	2.57	3.08
	Q10-010	Q10-013	18	21	210	-1.69[(a)]	3.09
	Q10-013	Q9-016	18	36	716	2.35	3.09
	Q9-016	Q9-015	18	36	968	2.35	3.13
	Q9-015	Q9-014	18	36	932	2.21	3.13
Evans (Figure 1-6c)	M9-007	M9-006	12	15	156	0.77	1.33
	M9-006	M9-005	12	15	340	0.79	1.24
	M9-005	M8-018	12	15	119	1.29	1.21
	M8-018	M8-017	12	15	228	0.98	1.18
	M8-017	M8-016	12	15	245	0.71	1.15
	M8-016	M8-015	12	15	238	0.86	1.14
	M8-015	M8-014	12	15	247	0.42	1.13
	M8-014	M8-013	12	15	126	0.39	1.19
	M8-013	M8-012	12	15	164	0.44	1.19
	M8-012	M8-011	12	15	89	0.80	1.18
	M8-011	M8-010	12	15	256	0.94	1.18
	M8-010	M8-009	12	15	255	0.92	1.19

(a) Flow counter to slope direction.

Tier 2 Improvements							
Location	Segment		Existing Size (in)	Upgrade Size (in)	Quantity (LF)	Existing Capacity (Mgal/d)	Design Flow (Mgal/d)
	U/S MH	D/S MH					
Mitchell/ East Whitmore/ Hidden Oak (Figure 1-6f)	N11-017	N11-027	12	18	251	0.88	1.17
	N11-027	N11-047	12	18	413	0.85	1.17
	N11-047	N11-046	12	18	121	1.06	1.27
	N11-046	N11-045	12	18	45	2.70	1.31
	N11-045	N11-044	12	18	339	1.02	1.32
	N11-044	N11-043	12	18	397	1.03	1.33
	N11-043	N11-042	12	18	375	1.01	1.45
	N11-042	N11-041	12	18	400	1.04	1.46
	N11-041	N11-040	12	18	210	0.99	1.47
	N11-040	N11-048	12	18	40	1.05	1.47
	N11-048	N10-052	12	18	394	1.19	1.49
	N10-052	Barbour's LS Wet Well	12	21	178	0.88	3.90
Central/ Forest/ Acorn (Figure 1-6c)	M10-012	M9-013	10	12	594	0.57	0.76
	M9-013	M9-012	10	12	415	0.67	0.81
	M9-012	M9-011	10	12	364	0.71	0.81
	M9-011	M9-010	10	12	338	0.55	0.81
	M9-010	M9-018	10	12	189	0.91	0.88
	M9-018	M9-017	10	12	601	0.70	0.89
	M9-017	M9-016	10	12	29	0.57	0.91
	M9-016	M9-015	10	12	208	0.66	0.92
	M9-015	M9-014	10	15	79	1.16	0.93
	M9-014	M9-009	10	15	360	0.48	1.00
	M9-009	Central/Evans LS Wet Well	10	15	17	0.65	1.67
Moffett (Figure 1-6e)	K10-056	L10-001	10	12	515	0.54	0.55
	L10-001	L10-028	10	12	483	0.58	0.64
	L10-028	L10-040	10	12	293	0.32	0.63
	L10-040	L10-045	10	12	105	0.85	0.65
	L10-045	L10-048	10	12	66	0.68	0.65
	L10-048	L10-053	10	12	350	0.54	0.65

Tier 2 Improvements							
Location	Segment		Existing Size (in)	Upgrade Size (in)	Quantity (LF)	Existing Capacity (Mgal/d)	Design Flow (Mgal/d)
	U/S MH	D/S MH					
Blaker (Figure 1-6b)	O8-040	O8-050	18	24	143	2.31	2.32
	O8-050	O8-056	18	24	215	2.30	2.33
	O8-056	P8-004	18	24	305	2.35	2.34
	P8-004	P8-029	18	24	597	1.04	2.49
	P8-029	P8-033	18	24	192	2.32	2.49
	P8-033	P8-036	18	24	102	1.93	2.61
	P8-036	P8-042	18	24	33	4.62	2.61
	P8-042	P8-054	18	24	279	1.87	2.63
	P8-054	P8-061	18	24	249	1.80	2.65
	P8-061	P8-076	18	24	320	2.18	2.70
	P8-076	P8-088	18	24	84	2.90	2.71
Mitchell (Figure 1-6f)	L10-059	M10-007	10	12	234	0.66	0.71
	M10-007	M10-010	10	12	260	0.81	0.92
	M10-010	M10-033	12	15	346	0.86	0.94
	M10-033	M10-040	12	15	339	0.86	0.94
	M10-040	M10-051	12	15	341	0.87	0.95
	M10-051	M10-063	12	15	334	0.87	0.95
	M10-063	N10-013	12	15	435	0.86	1.13
	N10-013	N10-029	12	15	464	0.84	1.13
Central/Hackett/ Harold/Pine (Figure 1-6d)	N9-002	N9-010	8	10	555	0.37	0.30
	N9-010	N9-016	8	10	531	0.41	0.28
	N9-016	N9-030	8	10	165	0.40	0.41
	N9-030	N9-033	8	10	415	0.39	0.39
	N9-033	N9-022	8	10	12	0.43	0.43
	N9-022	N9-045	8	10	130	0.41	0.42
	N9-045	O9-001	8	10	139	0.37	0.41
	O9-009	O9-010	8	10	40	0.44	0.41
	O9-010	O9-011	8	10	20	0.37	0.41
	O9-011	O9-015	8	10	266	0.39	0.47
	O9-015	O9-028	8	10	789	0.39	0.46
	O9-028	O9-030	8	12	293	0.42	0.46
	O9-030	P9-008	10	12	418	0.65	0.65
	P9-008	O9-033	10	12	304	0.80	0.80
	O9-033	Pine St. LS Wet Well	10	12	33	2.28	1.41

Tier 2 Improvements							
Location	Segment		Existing Size (in)	Upgrade Size (in)	Quantity (LF)	Existing Capacity (Mgal/d)	Design Flow (Mgal/d)
	U/S MH	D/S MH					
Hackett (Figure 1-6g)	O6-038	O6-039	10	12	107	0.44	0.52

Relocation of the Barbour's Pump Station:

As previously mentioned, the current wet well for the Barbour's pump station should ultimately be relocated out of the street to a neighboring sidewalk and driveway. This will eliminate traffic related wear and tear to the wet well hatch and will also provide the City with easy entry without disrupting the flow of traffic. The new location will also allow for construction of a larger wet well to provide more storage time in the event of power failure.

Emergency Backup Power Connections at Barbour and Pine Street Lift Stations:

Barbour and Pine Street lift stations are the most critical stations in the City's sewer system. In the event of a power failure at either of these stations, the storage time of the wet well is very short, an hour for Pine Street and half an hour for Barbour. For this reason, the risk of sanitary sewer overflow (SSO) during a power failure is highly likely.

Currently the City has is in the process of installing emergency backup power connections at Barbour's and Pine Street lift stations. This will greatly reduce the time to activate back up power in the event of a power failure and greatly reduce the risk of an SSO at the lift station from power failure. The City has already allocated funds for this project.

It is recommended that the City purchase two portable generators that can be left at Pine Street and Barbour's lift stations during extended power outages.

Ultimately, the City should consider installing automatic on-site emergency back-up power at both lift stations.

Lift Station Emergency Backup Power Connections:

None of the remaining lift stations in the City are as critical as Barbour and Pine Street lift stations, nor do they have the same low storage time. The wet wells in the remaining lift stations are capable of storing a few hours of upstream wastewater flow until power is restored. However, for power failures longer than a few hours, back up power would need to be provided to prevent an SSO.

In the event of an extended power failure, City staff should be able to provide emergency power to the lift stations on a rotating basis, using only one or two generators. To make this process more time efficient, it is recommended that a connection for emergency power be installed at each of the remaining lift stations.

New Valve Boxes at Select Lift Stations:

Westpointe, Central/Evans, and Paramount lift stations each have shutoff or check valves mounted vertically in the wet well, impairing operation and making access to the valves more difficult. Vertical mounting of the valves can limit performance by allowing rags and debris to accumulate behind the valve door after it has closed, which over time can prevent the valve from opening completely, restricting pump discharge capacity.

It is recommending that at these three lift stations exterior valve boxes be constructed and the check valves moved for easier access and better long-term performance.

Modifications at Paramount Lift Station:

The force main at Paramount lift station conveys wastewater to the elbow of the old lift station force main, where it is conveyed through the old force main to the outfall manhole. Wastewater is prevented from flowing back into the old wet well by the check valve for the old force main. In the event of a valve failure, wastewater would be pumped into the old wet well, flow by gravity to the existing wet well, essentially pumping in a circle.

The sewer junction immediately upstream of Paramount lift station is a tee joint which is located underground. It is not standard practice to have sewer junctions underground without access to them through a manhole. Any failure at the junction would go unnoticed for a long period of time and would require costly repairs once it was identified.

It is recommended that these issues be resolved by cutting the old force main between the elbow and the old wet well and capping it with a blind flange. A manhole should be installed at the sewer junction.

Relocation of Walgreen's Lift Station:

Walgreen's lift station is currently located in the northbound Central Avenue to eastbound E. Hatch Road turn lane. It is recommended that relocation of the Walgreen's Lift Station be considered to reduce the cost of routine maintenance and eliminate the need for traffic control to access the lift station wet well. Possible locations include:

- Further east on the south end of the southernmost lane,
- Within the sidewalk on the northeast corner of the intersection of Central Avenue and E. Hatch Road, or
- Within the sidewalk on the northwest corner of the intersection.

During relocation it is recommended that the shutoff and check valves be removed from the wet well and installed in a new separate valve box.

1.3.3.3 Tier 1 and Tier 2 Sewer CIP Costs

Planning level opinions of probable cost for recommended existing system Tier 1 gravity sewer CIPs not already funded by the City are provided in Tables 1-12. Specific details regarding each project and a detailed cost breakdown are provided in Appendix B.

The pipe costs include pipe material, excavation, laying and joining, backfill, manholes, testing, cleanup, and contractor's overhead and profit. This estimate also includes a 30% contingency for unknown conditions and a 10% allowance for design and administration. All costs have been estimated at a current Engineering News-Record Construction Cost Index (ENRCCI) of 8,761 (May 2010).

Table 1-12
City of Ceres
Preliminary Opinion of Probable Cost for Tier 1 Gravity Sewer CIPs

Improvement Description	Cost, \$ [(a)]
9th Avenue, Roeding Road, 6th Avenue and Park Street Sewer Relief Project	$884,000
Pipe upsizing in Central Avenue and Pine Street	$790,000
Estimating Contingency (30%)	$502,000
SUBTOTAL – CONSTRUCTION COSTS (rounded)	**$2,176,000**
Design/Administration (10%)	$218,000
TOTAL (rounded)	**$2,394,000**

(a) May 2010 Costs; ENRCCI = 8761.

Planning level opinions of probable cost for recommended Tier 2 gravity sewer CIPs for the existing system are provided in Tables 1-13. Specific details regarding each project and a detailed cost breakdown for each CIP are provided in Appendix B.

The pipe costs include pipe material, excavation, laying and joining, backfill, manholes, testing, cleanup, and contractor's overhead and profit. This estimate also includes a 30% contingency for unknown conditions and a 10% allowance for design and administration. All costs have been estimated at a current Engineering News-Record Construction Cost Index (ENRCCI) of 8,761 (May 2010).

Table 1-13
City of Ceres
Preliminary Opinion of Probable Cost for Tier 2 Gravity Sewer CIPs

Improvement Description	Cost, $ [(a)]
Pipe upsizing in Don Pedro Road, East Service Road and Moffett Road	$3,489,000
Pipe upsizing in Blaker Road	$967,000
Pipe upsizing in Evans Road	$591,000
Pipe upsizing in Central Avenue, Hackett Road, Harold Street and Pine Street	$691,000
Pipe upsizing in Central Avenue, Forest Lane and Acorn Lane	$635,000
Pipe upsizing in Moffett Road	$348,000
Pipe upsizing in Mitchell Road	$637,000
Pipe upsizing in Mitchell Road, East Whitmore Avenue and Hidden Oak	$1,102,000
Pipe upsizing in Hackett Road	$26,000
Estimating Contingency (30%)	$2,546,000
SUBTOTAL – CONSTRUCTION COSTS (rounded)	**$11,032,000**
Design/Administration (10%)	$1,103,000
TOTAL (rounded)	**$12,135,000**

(a) May 2010 Costs; ENRCCI = 8761.

Planning level opinions of probable cost for recommended Tier 2 lift station CIPs for the existing system are provided in Tables 1-14. These improvements consist of providing for emergency power connections or on-site backup generation, and improving the discharge piping and valve configurations.

The costs for relocating the Barbour's pump station and Walgreen's lift station include the cost of mobilization and demobilization, traffic control, by pass pumping, installation of a new influent 21-inch sewer and upstream manhole, discharge and manifold piping, acquisition of the appropriate easements for the new valve box and wet well, a new valve box and a new cast-in-place concrete wet well. The pumps and guide rails, flow meter, instrumentation, and motor control center can be relocated from the current pump station location and reused.

The costs for emergency power include materials and labor. The costs for the new valve boxes and lift station modifications include costs for mobilization and demobilization, manifold piping,, excavation, laying and joining, backfill, manholes, valve boxes, testing, cleanup, and contractor's overhead and profit.

The estimate for these projects also includes a 30% contingency for unknown conditions and a 10% allowance for design and administration. All costs have been estimated at a current Engineering News-Record Construction Cost Index (ENRCCI) of 8,761 (May 2010).

Table 1-14
City of Ceres
Preliminary Opinion of Probable Cost for Tier 2 Lift Station CIPs

Improvement Description	Cost, $ (a)
Barbour's pump station relocation	$367,000
Lift Station Emergency Backup Power Connections	$76,000
Emergency Backup Portable Generator	$125,000
New Valve Boxes at Westpointe, and Central/Evans Lift Stations (b)	$100,000
New Valve Box and Modifications at Paramount Lift Station	$72,000
Walgreen's lift station relocation and new valve box	$400,000
Estimating Contingency (30%)	$342,000
SUBTOTAL – CONSTRUCTION COSTS (rounded)	**$1,482,000**
Design/Administration (10%)	$148,000
TOTAL (rounded)	**$1,630,000**

(a) May 2010 Costs; ENRCCI = 8761.
(b) Approximately $50,000 per site.

1.3.4 RECOMMENDED ADDITIONAL SEWER STUDIES AND ANALYSIS

Prior to initiating any of the Tier 2 and the Tier 1 sewer capital improvement projects, it is recommended that the City further assess the condition of the existing collection system. Condition assessment would include performing closed-circuit television (CCTV) inspections and structurally rating the existing sewer infrastructure as well as cleaning major sewer pipelines. The City could perform this assessment during one summer or split the work over a several year period. In addition, the City should also evaluate whether to perform the condition assessment on all 141 miles of pipeline or the approximately 29 miles of major pipelines. Depending on the length of pipeline assessed, a condition assessment of the system would cost approximately $290,000 to $1,400,000, or $58,000 to $282,000 per year for five years. Appendix 1-D to Technical Memorandum No. 1 contains the recommended CCTV inspection plan for the City based on risk assessment, existing available condition assessment information and City input on CCTV prioritization.

In addition to condition assessment in known or suspected deteriorated areas, it is also recommended that additional dry and wet weather flow monitoring data be collected prior to initiating capital improvement projects to address these capacity issues. Additional data will refine the leakage rates and improve the accuracy of modeling simulations, which may decrease the degree of capital improvements required.

Additional surveying, specifically of manholes along stretches of sewer targeted for CIPs should be completed prior to any CIP, to confirm manhole and sewer elevations assumed in the datum adjustment implemented in the 2008 *City of Ceres Wastewater System Capacity Analysis* by ECO:LOGIC Engineering now Stantec.

1.4 EXISTING FACILITIES CIP PRIORITIZATION

The existing capacity related capital improvements recommended in this existing facilities analysis are prioritized in this section according to an assessment of the potential risk to the City of failure of the facility (based on existing available data), relative importance of the facility, and the potential environmental and economic effect of the failure of the facility. Additional capital replacement information and prioritization is contained in Appendix 1- B to Technical Memorandum No. 1 with program recommendations included below.

1.4.1 RISK ASSESSMENT METHODOLOGY

An initial capital replacement and rehabilitation program schedule and prioritization is summarized in Appendix 1-B. This information is based on existing facilities age, remaining useful life criteria, and limited condition assessment information available from recent CCTV inspections. The existing facilities replacement and rehabilitation program schedule and prioritization has been developed in the Nexgen software, with input from City staff on the relative critical nature of the facilities and input regarding potential impacts if the system fails. Factors that contribute to the priority ranking include:

- Risk of failure or overflow
- Relative age of the facility
- Relative area served by the facility
- Permit conditions and requirements

The primary strength of the Nexgen software tool is to allow a rapid update of the rehabilitation and replacement program based on updated condition information. As the City proceeds with implementing the CCTV inspection program outlined in Appendix 1-D, the condition information should be loaded into the database for the inspected assets and the replacement program and schedule updated. As with condition information resulting from inspections, new facilities size and installation date should also be updated in the database based on implementation of capacity related improvements prioritized below. With accurate and updated information, the replacement and rehabilitation CIP can be updated and used to plan and budget future expenses for these activities. The recommended CCTV program contained in Appendix 1-D of Technical Memorandum No. 1 provides additional detail to maximize the benefits of this risk assessment system set up for the City's use.

1.4.2 CIP SUMMARY AND PRIORITIZATION

Table 1-15 summarized the recommended capital improvements and costs for rehabilitation and replacement of existing facilities with known or predicted capacity deficiencies. This CIP is focused on these improvements needed to address capacity related deficiencies. Appendix 1-B of Technical Memorandum No. 1 provides a graphical presentation of preliminary facilities rehabilitation and replacement costs. The Appendix 1-B graphs will be updated as the City confirms sewer condition and begins to predict actual sewer rehabilitation or replacement schedules. Prioritization of the capacity related improvements has been done based on the above methodology. Currently the City is in the process of implementing improvements or replacement of the top two recommended CIP projects including:

- New Headworks and Influent Pump Station
- Barbour's Lift Station Interim Improvements

The remaining gravity sewer CIPs were prioritized according to surcharging criteria presented above in Table 1-9. Sewers predicted to overflow by the hydraulic model were given highest priority as well as classified as a Tier 1 improvement, requiring immediate action. In Table 1-15 the top priority improvements associated with known capacity deficiencies and predicted potential for overflow are identified as priority class A. Remaining sewers were classified as Tier 2, not requiring immediate action, and prioritized so that sewers predicted to surcharge within 4 feet of the rim of the manhole were given highest priority, identified as class B in Table 1-15.

Remaining sewer lift station CIPs were classified as Tier 2 improvements. Improvements to the emergency backup power for the lift stations were given higher priority than Tier 2 gravity sewer improvements because of the immediate impact on emergency operation of the collection system. The remaining Tier 2 sewer lift station improvements were generally classified lower than the Tier 2 gravity sewer improvements. All of these improvements are identified as class C priority in Table 1-15.

It should be noted that for all the improvements to the City's existing wastewater collection and treatment infrastructure that this document considers these improvements solely in the light of the existing level of development. Future development, described in the second chapter, and its impact on the City's wastewater treatment plant will be considered and addressed in the third chapter. The impact of future development on the wastewater collection system will be considered and addressed in the fourth chapter. While it is anticipated that the locations of the improvements discussed in this memorandum will remain unchanged, it is possible that the addition of future wastewater flows may alter the details (such as the diameter of the new sewers to be installed) of the recommended improvements. It is also possible that the construction of new infrastructure may eliminate the need for some of these existing system improvements. It is recommended that the City consider future development and its impact on the existing wastewater collection and treatment system before implementing these existing system improvements.

Table 1-15
City of Ceres
Existing Facilities CIP Summary and Prioritization

Priority Ranking [(a)]	Improvement Description	Total Cost, $ [(b)]	Improvement Location [(c)]
1	New Headworks and Influent Pump Station	Funded	WWTP
2	Barbour's Lift Station Interim Improvement	Funded	Lift Station
3	Onsite Emergency Power at Barbour and Pine Street Lift Stations	Funded	Lift Station
4A	Lift Station Emergency Backup Power Connections and Portable Generator	$287,000	Lift Station
5B	Pipe upsizing in East Service Road	$2,694,000	Sewer
6A	9th Avenue, Roeding Road, 6th Avenue and Park Street Sewer Relief Project	$1,264,000	Sewer
7A	Pipe upsizing in Central Avenue and Pine Street	$1,130,000	Sewer
8B	Pipe upsizing in Don Pedro Road, East Service Road and Moffett Road	$2,296,000	Sewer
9B	Pipe upsizing in Evans Road	$845,000	Sewer
10B	Pipe upsizing in Mitchell Road, East Whitmore Avenue and Hidden Oak	$1,575,000	Sewer
11B	Pipe upsizing in Central Avenue, Forest Lane and Acorn Lane	$908,000	Sewer
12B	Distribution Box Replacement (for S-1, S-2, and S-3)	$27,000	WWTP
13B	Pipe upsizing in Moffett Road	$498,000	Sewer
14C	Pipe upsizing in Blaker Road	$1,383,000	Sewer
15C	Pipe upsizing in Central Avenue, Hackett Road, Harold Street and Pine Street	$988,000	Sewer
16C	Pipe upsizing in Mitchell Road	$911,000	Sewer
17C	New Valve Boxes at Westpointe, and Central/Evans Lift Stations	$143,000	Lift Station
18C	New Valve Box and Modifications at Paramount Lift Station	$103,000	Lift Station
19C	Pipe upsizing in Hackett Road	$37,000	Sewer
20C	Office/Lab Building Expansion	$468,000	WWTP
21C	Upper Pond Pipeline Relocation (+/- 1,000 lf of 16-in)	$474,000	WWTP
22C	Barbour's Pump Station Relocation	$525,000	Lift Station
23C	Walgreen's Lift Station Relocation	$572,000	Lift Station
	TOTAL (rounded)	**$17,128,000**	

(a) Class Designations:
A CIP addresses predicted overflowing
B CIP addresses predicted surcharging above the recommended criteria, or has an immediate impact on collection system emergency operation
C CIP addresses predicted surcharging below the recommended criteria or a low priority lift station and WWTP deficiency.

(b) May 2010 Costs; ENRCCI = 8761, including allowances for estimating contingency and engineering and administration.

(c) Sewer pipeline, lift station, or Wastewater Treatment Plant (WWTP) component.

City of Ceres Sewer System Master Plan
Chapter 2

Future Land Use and Flow and Load Projections

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Reviewed By: Neal Colwell, P.E.

2.1 PURPOSE

The purpose of this chapter is to document the existing developed and future approved land uses to be the basis for projecting future wastewater flows and loads and the phasing rationale for sewer utility planning. This chapter also presents an overview of the methods used to estimate wastewater flows from the three phases of future development. It summarizes historical flow and load data and projected flows and loads for the City of Ceres (City) Wastewater Treatment Plant (WWTP) and anticipated future flows to the City of Modesto from the existing North Ceres Sewer Service Area (NCSSA). This memo establishes current (2010) design criteria for sizing infrastructure necessary to accommodate wastewater generation from future development. It also establishes equivalent design loading criteria, which will be used for projecting future wastewater loading conditions.

This memo is organized into three major sections:

- Existing and Future Land Use
- Current and Proposed Future Wastewater Generation Rates
- Wastewater Treatment Future Flows and Loads

2.2 EXISTING AND FUTURE LAND USE

The purpose of this section is to present an overview of the existing and future land use designations that will be used to estimate wastewater flows. Documentation of existing developed land uses was provided by the City of Ceres in the existing zoning map and land use inventory as discussed below. Existing land use is assumed to be current as of April 2010. Future land uses were based on land use designations contained in the City's 1997 General Plan land use diagram (provided in GIS map format by West Yost & Associates).

2.2.1 EXISTING DEVELOPMENT

The existing level of development is based on the land use estimates and analysis used in the *City of Ceres Preliminary Wastewater System Capacity Analysis* (October 2008) and the *City of Ceres Technical Memorandum Wastewater Collection System Capacity Analysis Update* (August 2009). Existing development includes development that was in place as of February 2008 based on the City of Ceres 2008 Zoning Map and 2007 Land Use Inventory Map. Existing developed land uses are assumed to not change in the future with the exception of potential land use densification within any identified redevelopment areas (as described below).

2.2.2 FUTURE GROWTH AND PHASING

Although actual development may not follow this order, for the purpose of planning sewer facilities, future development is assumed to generally proceed sequentially according to the three phases presented below and shown on Figure 2-1.

- Phase I: It is assumed that new development will generally follow infill within the existing City Limits according to General Plan land use designations. Phase I includes all existing development and development of infill within the existing City Limits. This development is assumed to proceed first due to fewer land use entitlement impediments, e.g., does not require annexation into the City of Ceres (a process within the powers and duties of the Stanislaus Local Agency Formation Committee[1] (LAFCO).
- Phase II: Development within the proposed Primary Sphere of Influence (SOI) according to General Plan land use designations. This is consistent with the Stanislaus LAFCO policy, where "areas within an adopted Primary Area shall be eligible for annexation...within a zero to ten year period."
- Phase III: Development within the remaining study area according to General Plan land use designations. Phase III includes the proposed Secondary SOI and remaining General Plan map land uses excluding agriculture (which has not been included in the study area as it is assumed to not generate wastewater flows to the City's future system).

2.2.2.1 Phase I: Infill of the Existing Sewer Service Area

Phase I includes existing land uses (as described above) and infill development and redevelopment within the existing sewer service area based on vacant and planned community parcels within the service area as identified in the April 1, 2010 vacant land inventory provided by the City. Future land use designations are assigned according to the City of Ceres General Plan (1997) land use map. Redevelopment of existing development will only be assumed if:

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[1] Stanislaus LAFCO Policies and Procedures, December 5, 2001 and last amended June 23, 2010, Stanislaus LAFCO, Page 29.

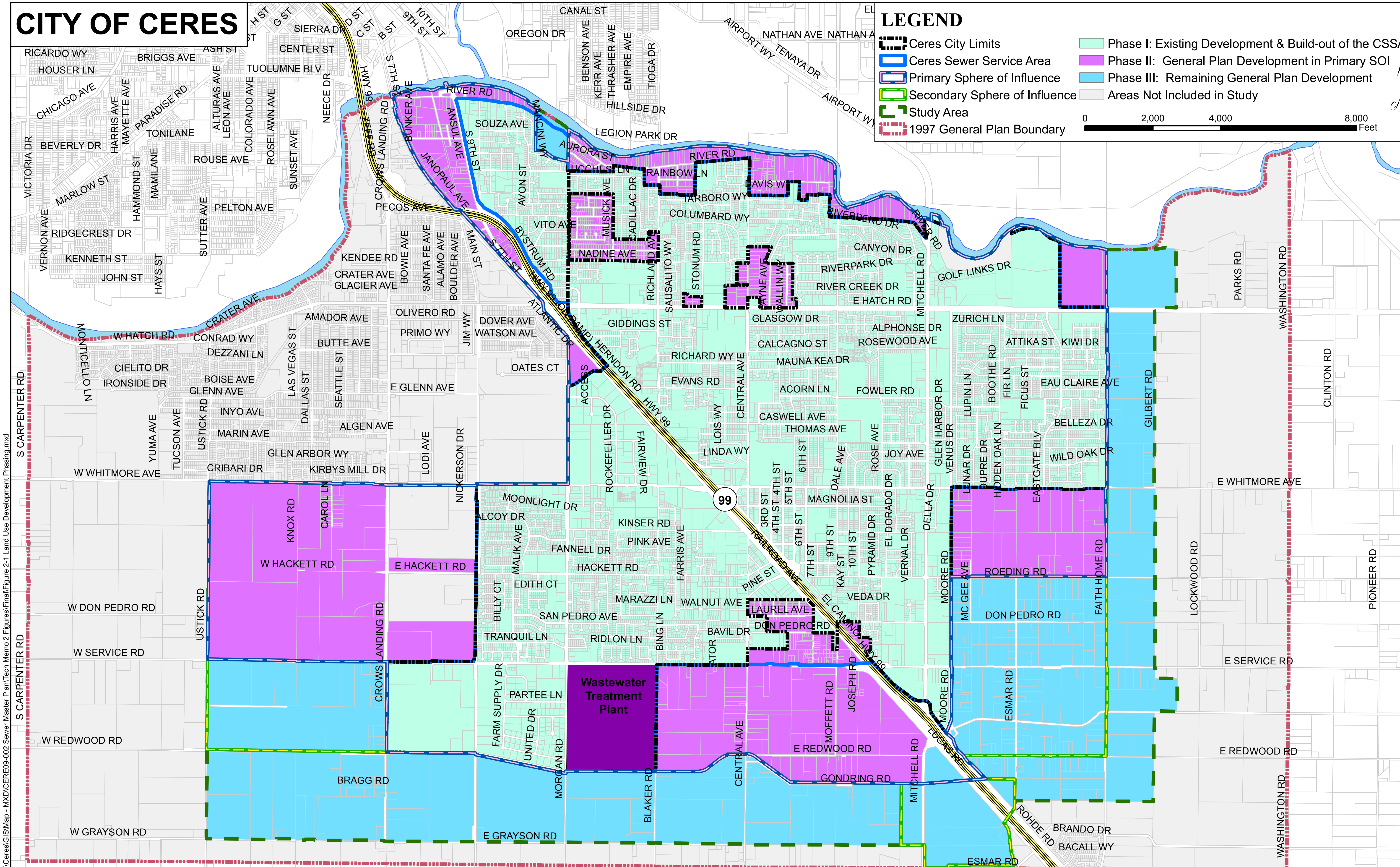
- An area is specifically described for redevelopment in the draft Ceres Redevelopment Agency future land use plan where there is a "densification" of land use (e.g., conversion of current land use or land use designation to a higher density level of development that would result in higher water demands or wastewater generation), or
- As indicated and documented by City staff.

2.2.2.2 Phase II: Future General Plan Development within the Primary SOI

This phase will plan for infrastructure to serve all areas outside of the existing service area within the proposed Primary SOI. Planned land uses within this area will be based on the 1997 General Plan (or modifications provided by the City). The City has identified certain county parcels on the western side of the General Plan area within the Primary SOI, which are expected to be annexed by the City and develop according to the General Plan, but are currently served by the City of Modesto sewer and will continue to be so, even after annexation. These parcels can be seen on Figure 2-1.

2.2.2.3 Phase III: Future General Plan Development within the Secondary SOI and Study Area

This phase is proposed to include development of all planned land use outside the existing sewer service area and proposed Primary SOI, generally consisting of the proposed Secondary SOI and the Study Area as identified in Figure 2-1. Phase III excludes areas designated as agricultural land use in the General Plan, as these areas are assumed to not generate wastewater discharged to the City's system. It is assumed that these areas will develop after Phase II land use areas have developed. Wastewater generated from this phase will be assumed to discharge into new infrastructure to be recommended as capital improvements in the Master Plan. This infrastructure will be phased to the extent possible with the development of the rest of the General Plan area.



M:\Ceres\GIS\Map - MXD\CERE09-002 Sewer Master Plan\Tech Memo 2 Figures\Final\Figure 2-1 Land Use Development Phasing.mxd

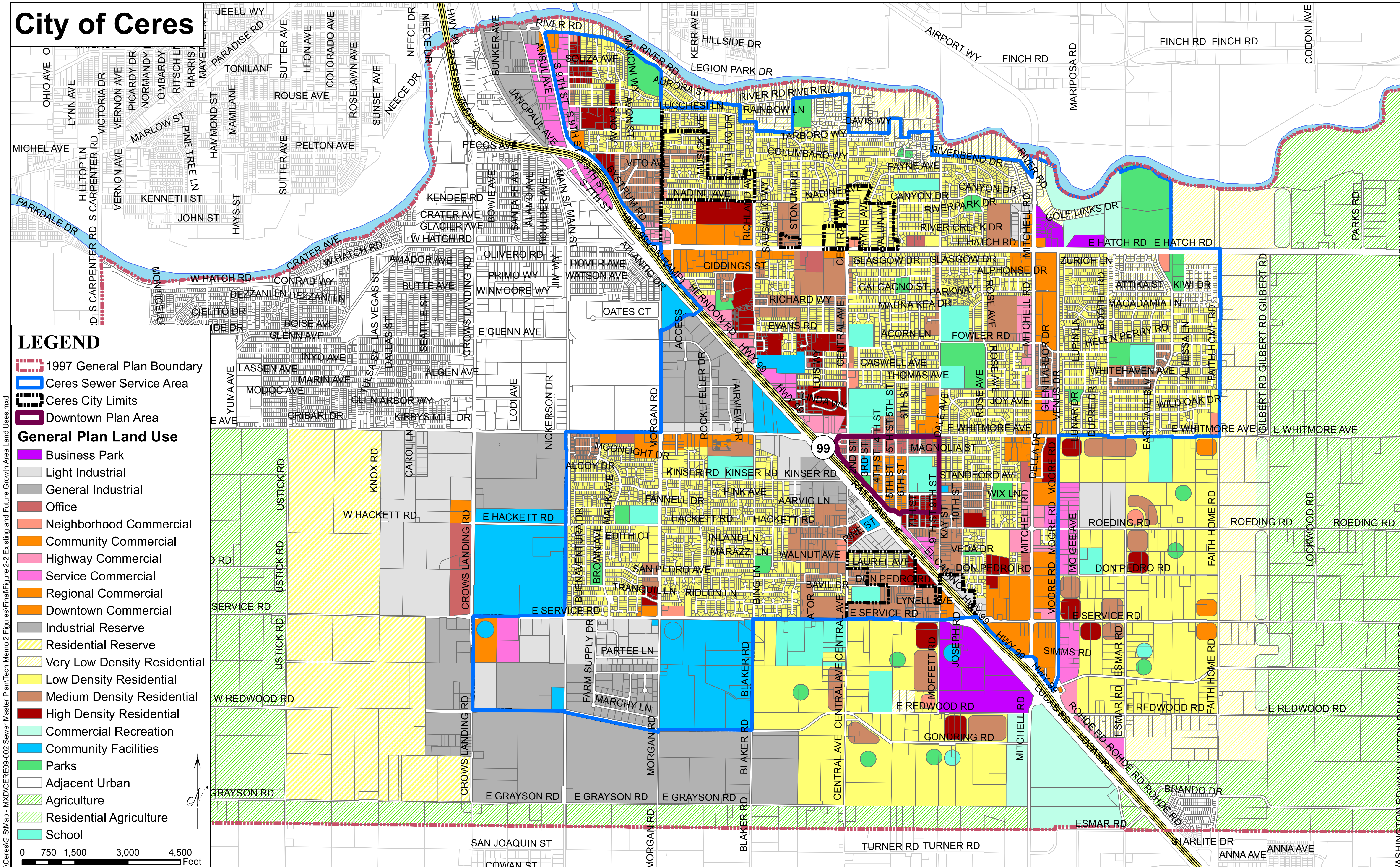
Figure 2-1
Future Land Use Development Phasing

2.2.3 Land Use Categories Figure and Summary Table

A summary of future development areas are listed in Table 2-1, according to General Plan land use designations and the phasing described above. Figure 2-2 depicts current land use designations and planned land uses based on the 1997 General Plan, used as the basis of developing future growth areas in Table 2-1.

Based on the 1997 General Plan, and compared to the recent land use inventory, the urban area is planned to grow approximately three-fold over current development levels. The top three land use categories projected to contribute to this urban area expansion are:

1. Residential land uses increasing by approximately 3,150 acres or an increase of 150% over existing developed residential land uses,
2. Industrial land uses increasing by approximately 1,480 acres or an increase of 585%, over existing developed industrial land uses, and
3. Commercial land uses increasing by approximately 440 acres of an increase of 128% over existing developed commercial land uses.



ECO:LOGIC Engineering
City of Ceres Sewer Master Plan

Figure 2-2
Existing and Future Growth Area Land Uses

Table 2-1
City of Ceres
Existing and Future Growth Land Use Summary

Land Use	Master Plan Development Phases				
	Phase I		Phase II	Phase III	Total
	Parcels	Acres [(a)]	Acres	Acres	Acres
Commercial					
Community Commercial	188	240.9	22.0	11.8	274.7
Downtown Commercial	91	21.5	---	---	21.5
Highway Commercial	88	88.0	---	13.3	101.3
Neighborhood Commercial	37	26.1	8.4	---	34.5
Office	132	49.8	35.4	---	85.2
Regional Commercial	25	97.4	---	0.4	97.8
Service Commercial	58	71.3	59.5	40.9	171.7
Commercial Recreation	5	31.2	10.6	165.4	207.2
Community Facilities	34	243.0	195.9	---	438.9
Industrial					
Business Park	30	21.6	106.7	---	128.3
Light Industrial	137	204.7	312.5	---	517.2
General Industrial	153	297.7	201.7	---	499.4
Industrial Reserve	---	---		587.5	587.5
Single Family Residential					
Residential Agriculture	---	---	---	121.5	121.5
Very Low Density Residential	538	137.1	242.6	533.2	912.8
Low Density Residential	9,444	1,657.4	518.0	635.4	2,810.8
Multifamily Residential					
Medium Density Residential	1,187	380.2	131.7	36.8	548.7
High Density Residential	399	183.1	30.7	20.8	234.6
Residential Reserve	---	---	315.8	507.6	823.4
Schools	17	157.0	92.4	18.5	267.9
Parks	51	173.9	10.9	54.7	239.5
Adjacent Urban	---	---	---	---	---
Agriculture	---	---	---	---	---
Total	**12,614**	**4,081.9**	**2,294.8**	**2,747.8**	**9,124.5**

(a) Based on net area for land area within existing City of Ceres boundaries and current City Sewer Service Area

2.3 CURRENT AND PROPOSED FUTURE WASTEWATER GENERATION RATES

The purpose of this section is to present an overview of the methods used to estimate wastewater flows for Phases I, II and III of future development. Estimated flows will be used in the hydraulic model to determine the ability of the existing system to accommodate Phase I development, and to size capital improvements driven by Phase I development. The information will also be used to size new infrastructure to accommodate Phase II and III development.

2.3.1 EQUIVALENT DWELLING UNIT DENSITY DEFINITIONS

For the purposes of this study, future wastewater generation will be defined in terms of the number of Equivalent Dwelling Units (EDU) for each parcel or future development area. An EDU is a unit of measure that normalizes all land use types (commercial, industrial, residential, etc.) to the level of demand created by one single-family housing unit. In terms of wastewater generation, one EDU is equivalent to the average wastewater flow from an average Ceres single-family detached household. For example, a one-acre commercial land use parcel designated as ten EDUs, would have the equivalent wastewater generation of ten average single-family detached dwelling units.

EDU density will be assigned based on the 1997 General Plan (General Plan) land use densities. A summary of these EDU density assignments is listed in Table 2-2. In developing the average EDU density assignments in Table 2-2, it should be noted that the following assumptions were made:

- Areas zoned as Community Commercial, Neighborhood Commercial, Service Commercial, Highway Commercial, Regional Commercial, and Downtown Commercial were combined into one category and identified as "Commercial".
- Areas zoned as Business Park, Light Industrial, and General Industrial were combined into one category and identified as "Industrial".
- Areas zoned as Office and Community Facilities were assumed to have equivalent EDU densities.
- EDU factors for Commercial, Industrial, and Business Park were developed based on the General Plan floor-area ratios (FAR) and assumed wastewater generation rates as outlined in the 2008 Public Facilities Fee Study and the EDU wastewater generation rates as described below.
- Residential Reserve was assigned a density of nine EDUs per acre based on analysis of the Ceres West Specific Plan (CWSP) by the City. In the analysis, nine EDUs per acre were applied to the parcels in the CWSP and this produced a wastewater generation comparable to the land uses specified in the CWSP.

Table 2-2
City of Ceres
General Plan Land Use Designations EDU Density Definitions

Land Use	General Plan Density (EDUs/acre or FAR) [a]	EDU Density to be Used in Ceres Master Plan (units/acre)
Commercial [b]	up to 0.5 FAR	1.8
Office	1.0	3.8
Community Facilities [c]	up to 0.5 FAR	3.8
Industrial [d]	up to 0.65 FAR	5.1
Commercial Recreation [e]	1.0 to 6.0	0.14
Industrial Reserve	---	5.1
Parks/Open Space	---	0
Schools[f]	---	48[f]
Residential Agriculture	0.2 to 0.5	0.4
Very Low Density Residential	Up to 4.5	4
Low Density Residential	Up to 7.0	6
Medium Density Residential	7.0 to 15.0	9.5
High Density Residential	15.0 to 25.0	18.5
Residential Reserve	---	9

(a) EDUs = Equivalent Dwelling Units based on General Plan Dwelling Units (DUs), and FAR= floor area ratio per General Plan and 2008 Public Facilities Fee Study.
(b) Commercial includes all commercial subgroups (Community, Highway, Neighborhood, Regional, and Service).
(c) Community Facilities are assumed at an average FAR of 0.35 and 75 gpd/1,000 sf.
(d) Industrial areas are assumed to have the same density as commercial since no heavy/wet industrial users discharge to the system.
(e) Based on an average FAR of 0.02 and 50 gpd/1000 sf.
(f) Existing school populations were based on actual school enrollment records. Future school density is provided in students per acre. Future student population/acre has been developed from existing student populations and areas.

2.3.2 Future Sewer System Wastewater Generation Rates and Peaking Factors

After land use parcels have been assigned EDUs based on the above density definitions, a wastewater generation rate per EDU will be used in conjunction with the number of EDUs for each land use block to determine a total wastewater generation for that block. A peaking factor will be applied to the wastewater generation to account for daily peak dry weather flows from each land use area. Finally, to account for inflow and infiltration during a design storm event, a flow component will be added to the peak dry weather flow. These flow components are described in more detail below.

2.3.2.1 Average Flow Basis

For the purpose of the Sewer Master Plan, a sanitary wastewater generation rate of 260 gallons per day per EDU (gpd/EDU) will be used for future development Phases I, II and III. This value is consistent with the wastewater generations rates developed in the hydraulic model for the *City of Ceres Preliminary Wastewater System Capacity Analysis* (October 2008) and is based on an evaluation of the recorded influent flows at the City of Ceres Wastewater Treatment Plant in 2007 as compared with the estimated total EDUs connected to the system at that time. Based on an average occupancy of 3.38 people per dwelling unit[2], the average wastewater generation rate per capita is estimated to be 77 gallons per capita per day (gpcd) for the equivalent wastewater generating population. This average wastewater generation rate includes the population equivalent from existing Ceres commercial, institutional, and dry industry land uses. The determination of the average wastewater generation rate per EDU and per capita is summarized in Table 2-3. It should be noted that the average wastewater generation rate per permanent population is estimated to be approximately 90 gpcd (based on a total Ceres wastewater flow of 3.77 Mgal/d and reported population of approximately 42,000[3]).

Table 2-3
City of Ceres
WWTP Flow and Unit Generation Rate Summary

Parameter	Value
2007 Average Dry Weather Flow (Mgal/d)[(a)]	3.07
Approx. EDUs Discharging to Ceres WWTP[(b)]	11,730
Flow Per EDU (gpd/EDU)	260
Average Occupancy [(c)]	3.38
Approx. Per-capita Wastewater Flow (gpcd)	77

(a) 2007 Average Dry Weather flow to the City of Ceres WWTP.
(b) Estimated total EDUs discharging to Ceres WWTP in 2007.
(c) Based on Ceres Census data.

Because multifamily residential units often have lower occupancy rate than single family residential units, the sewer master plan will be using an EDU factor for multifamily residential land use designations. According to the *Public Facilities Fee Nexus Study for the City of Ceres* by PMC[4], single family and multifamily EDU factors should be used when determining EDU numbers for residential land uses. These factors were determined from data from the 2000 census and are summarized below in Table 2-4.

[2] Public Facilities Fee Nexus Study for the City of Ceres - Final Report, PMC, November 10, 2008. Table 1-2, based on Based on U.S. Census 2000, H33 & H30 Tables Summary File 3.
[3] California Department of Finance, Table E-1: City/County Population Estimates.
[4] Public Facilities Fee Nexus Study for the City of Ceres - Final Report, PMC, November 10, 2008.

Table 2-4
City of Ceres
Single and Multi-Family Residential EDU Factor

Residential Land Use	EDU Factor
Residential Agriculture Very Low Density Residential Low Density Residential	1.00
Medium Density Residential High Density Residential	0.87

2.3.2.2 Future Impact of Water Conservation

The per-capita wastewater flow estimated in Table 2-3 is similar to the rate that ECO:LOGIC now Stantec has observed for many small to medium sized communities in the Central Valley of California. Previous criteria, including the per-capita wastewater flow rate of the 1983 City of Ceres Sewer Study, tended to be 100 gpcd (based on population). This reduction in per-capita wastewater flows is expected, as plumbing code requirements and water use management measures continue to reduce the amount of water used in the typical home.

The potential exists for future average per-capita wastewater flows to continue to decrease as new homes with water saving fixtures are constructed, existing homes replace old water using fixtures with newer higher efficiency ones, and as the City implements various water conservation measures. The degree of reduction in wastewater flows is currently unknown and cannot reliably be predicted, therefore it is recommended that no reduction allowance be considered for per capita or EDU flows for planning of future sewer facilities.

2.3.2.3 Sewer Design Flow Basis

A peaking factor of 1.5 will be applied to the sanitary wastewater generation of all parcels to estimate the peak hourly flow excluding infiltration and inflow (I/I). This peaking factor was determined from analysis of modeled peak and average daily flow for dry weather flow scenarios based on flow measurements collected in 2007-2008 and 2009. A graph of peaking factor, determined as peak-hour daily flow divided by average daily flow, plotted against average daily flow is shown on Figure 2-3. The data indicates a mean peaking factor of 1.35 with a very slight decrease as flow increases; however this decrease is so slight that a constant peaking factor is recommended. To account for the variability in peaking factors and the desire to plan sewer facilities to accommodate extreme flow conditions, a peaking factor of 1.5 is recommended, representing the 95th percentile of the plotted points. The results of this analysis are consistent with diurnal pattern peaks observed by V&A flow monitoring in 2007-2008 and 2008-2009.

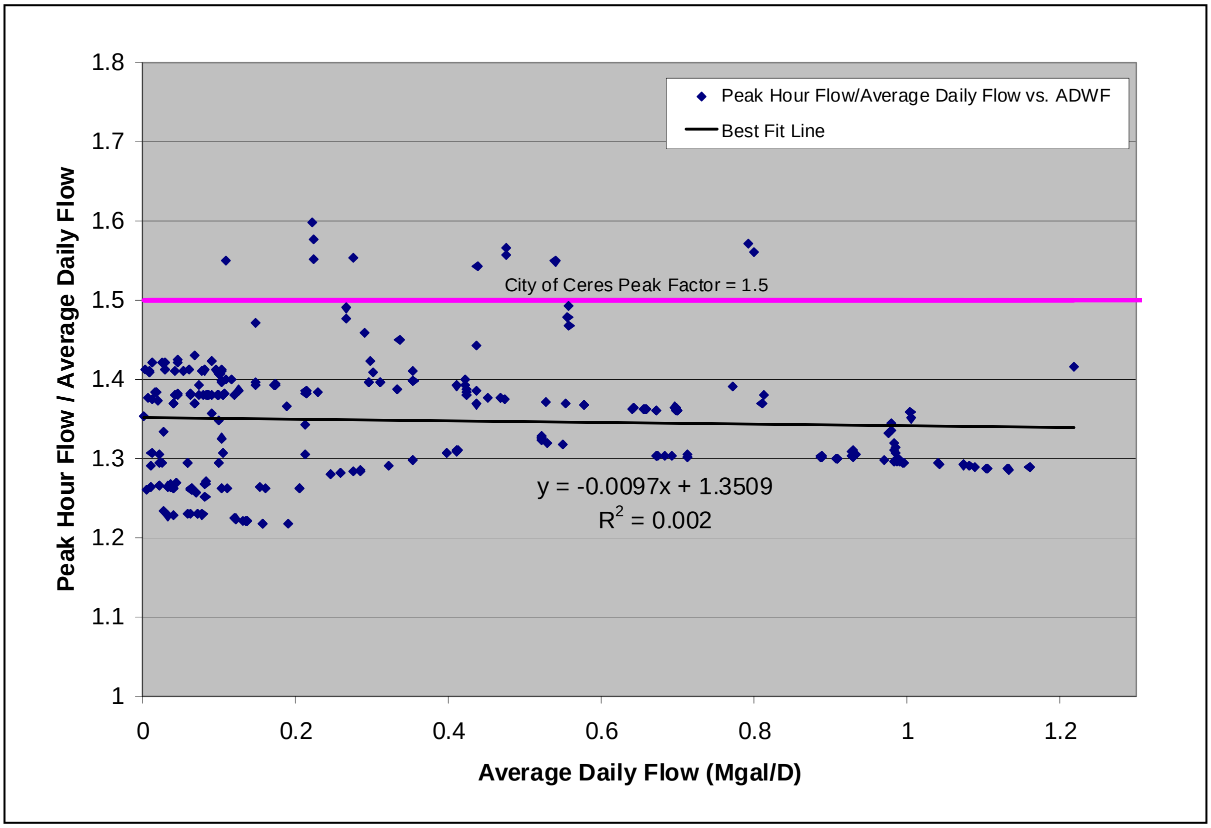


Figure 2-3
City of Ceres
Average-day to Peak Hour Peaking Factor Analysis

To account for I/I entering the collection system during rainfall events an I/I factor of 1,500 gallons per day per acre (gpd/acre) will be applied to every land area that is assumed to be contributing sewage to the collection system in the future. This I/I factor was developed from the hydraulic modeling of a 10 year, 6 hour storm by dividing the peak predicted I/I flow rate for each 2008 and 2009 flow monitoring basin by the total area tributary to the flow monitoring location. A graphical representation of the predicted inflow rate for each flow-monitoring basin, plotted against the area of the basin, is shown below in Figure 2-4. Basins 1, 3, 4 and 6 experience a higher I/I influence than the other basins, ranging from just over 2,500 gpd/acre to almost 4,000 gpd/acre. Basins 1 and 3, in particular, may be experiencing more significant I/I due to their age and proximity to the river. Basin 6 is the oldest portion of the sewer system and a significant I/I component is expected in this area due to: a) facilities age and condition, b) use of older materials and construction/testing methods, and c) lower level of service for storm drainage in this area. The significant I/I component experienced in Basin 4 is contrary to what would be expected because of the age of the sewer, however, it's proximity to the river could be the explanation. In lieu of applying the higher I/I rates observed in certain City sewers, the average rate observed in the majority of the sewer basins will be utilized based on the following judgment:

- Future sewers will continue to be constructed with modern materials and modern construction, inspection, and testing methods,
- New development will include modern storm drainage systems, minimizing the storm-period impact to the sanitary sewer, and
- The City will continue to implement preventative and corrective maintenance on the sewer system thereby minimizing the deterioration of the sewer and resultant high I/I rates.

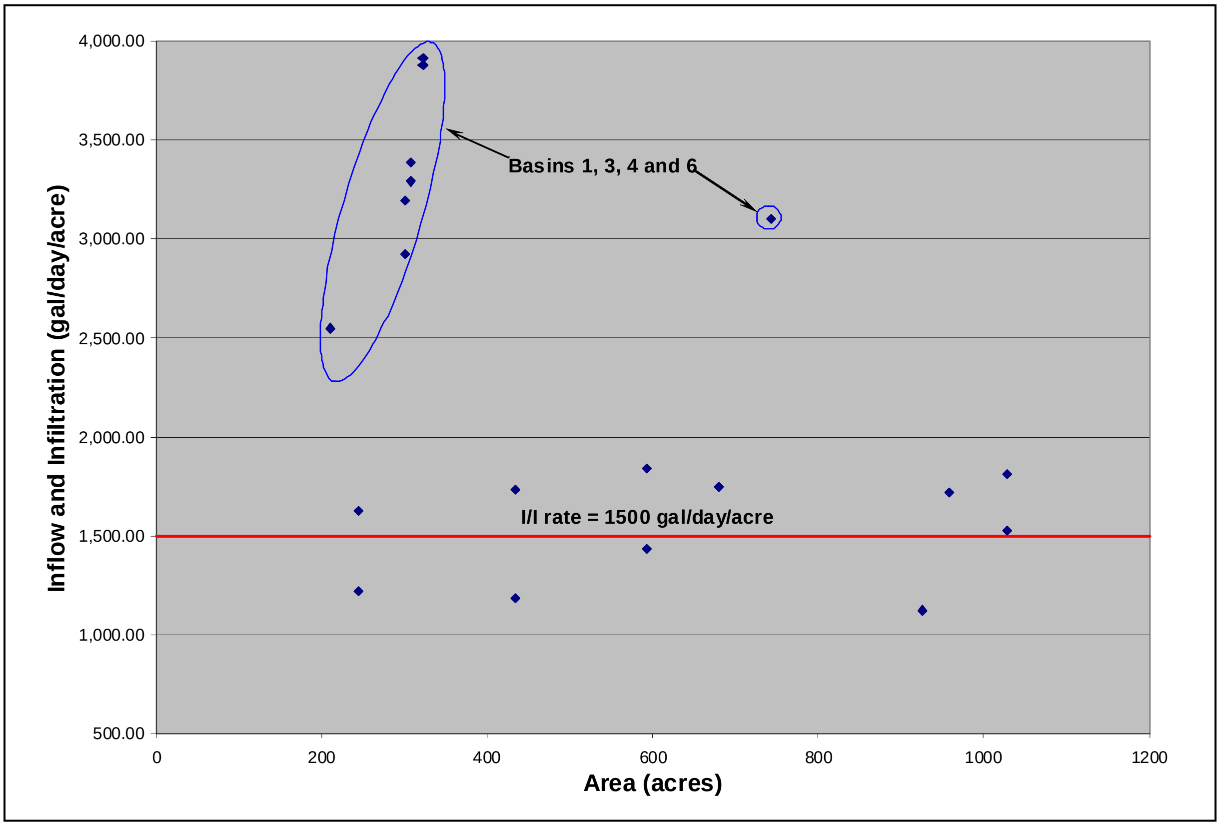


Figure 2-4
City of Ceres
Rain Dependent Inflow and Infiltration Rate Analysis

2.3.2.4 Sewer Design Flow Criteria Summary

These three components of peak flow (wastewater generation, peaking factor, and I/I factor) will be combined according to the following equation to determine the peak wastewater generation rate per tributary area:

$$Q_p = (Q_{ADWF} \text{ x EDU Density}_{tributary} \text{ x EDU Factor x } PF_{hour} + Q_{I/I}) \text{ x Area}_{tributary}$$

Q_p	= peak wastewater generation rate per tributary area in gpd.
Q_{ADWF}	= sanitary wastewater generation rate: 260 gpd/EDU
EDU Factor	= Residential EDU factor: See Table 2-4
EDU Density_{parcel}	= EDU density per tributary area in EDU/acre. See Table 2-2
PF_{hour}	= Peak Factor of 1.5
$Q_{I/I}$	= I/I flow in gpd/acre. See Figure 2-4
Area_{parcel}	= tributary area in acres

For the purposes of this master plan, future flows will be predicted according to the above flow equation with the appropriate Ceres-specific flow criteria. Capital improvements to the gravity sewer based on these projected flows will be designed to a criterion of no more than 70% of full depth under design flow conditions. This provides for an additional 40% factor of safety.

2.3.2.5 Future Sewer Average and Design Peak Flow Summary

Table 2-5 shows a summary of average and peak flows within the City's Sewer Service Area. Flows shown are incremental for each phase.

Table 2-5
City of Ceres
Future Sewer Average and Design Flow Summary

	Average Dry Weather Flow			Peak Design Storm Flow [b]	
Development Phase	**To Modesto WWTP**	**To Ceres WWTP**	**Total**	**To Modesto WWTP**	**To Ceres WWTP**
Phase I Development					
Existing Development [a]	0.70	3.07	3.77	2.8	7.0
Future Development	0.11	0.62	0.73	0.30	1.9
Phase II Future Development	0.46	2.7	3.16	1.2	6.7
Phase III Future Development	0.004	3.8	3.80	0.011	9.7
Total	**1.3**	**10.2**	**11.46**	**4.3**	**25.3**

(a) Flow numbers based on hydraulic modeling from the 2009 City of Ceres Wastewater Collection System Capacity Analysis Update

(b) Peak design storm flow for future development is based on the peak flow equation presented in Section 2.3.2.4

2.4 WASTEWATER TREATMENT FUTURE FLOWS AND LOADS

The purpose of this section is to summarize historical data and projected flows and loads for the City's WWTP.

2.4.1 HISTORICAL CERES WWTP FLOWS AND LOADS

The City's WWTP receives wastewater from residential, commercial, institutional, and dry industrial users. To determine historical flows and loads, daily influent flow, weekly biochemical oxygen demand (BOD_5), and daily total suspended solids (TSS) were obtained from City of Ceres WWTP influent records from January 1999 to March 2008. Wastewater characteristics data is not known to exist for the flows to the City of Modesto from the NCSSA. These data are compared to recommended standard per-capita loading rates and the wastewater strength that would be expected under such standard rates. The flow data for this period indicated an increase in wastewater flows and total suspended solids loading, however relatively constant BOD_5 loading. Current conditions are based on the most recent complete monitoring dataset from 2007.

2.4.1.1 Historical Flow Conditions

In assessing the wastewater treatment capacity of pond systems, such as the City's, several wastewater flow and loading characteristics are important to distinguish. Important flow conditions for this analysis are described in Table 2-6.

Average dry weather flow (ADWF) is intended to represent the wastewater flow not associated with wet winter months and associated infiltration (groundwater seepage) and inflow (storm or rainwater influences). Average Sanitary Flow (ASF) is "spent water" entering the sewer not including infiltration or inflow. In the case of Ceres, little summer infiltration is experienced, due to the porous soils and low groundwater levels, therefore ADWF is equivalent to the average sanitary flow as described below. Flow factors of importance for projecting required facilities capacity include; average monthly influent flow, ASF, and maximum dry weather monthly flow (MDWMF). These flows are depicted at the Ceres WWTP for January 1999 through March 2008 in Figure 2-5. Average monthly influent flow during this period ranged from 2.64 to 3.17 million gallons per day (Mgal/d). Recent (through March 2008) average monthly influent flow was approximately 3.0 Mgal/d.

Table 2-6
City of Ceres
WWTP Flow Components [a]

Flow Component	Current Flow (Mgal/d) [b]	Description
Average Dry Weather Flow (ADWF)	3.07	ADWF represents the flow for system regulations by the Regional Water Quality Control Board (RWQCB), and for system capacity assessments by the City. Currently, the City's ADWF is regulated by the maximum month flow during dry season (often interpreted as the months of May through September). ADWF can be regulated as the 5-month average flow during this period.
Average Sanitary Flow (ASF)	3.03	ASF represents the base sanitary flow generated from residences, businesses, and industry. Often this flow corresponds to the ADWF that occurs in the summer months, unless surrounding agricultural irrigation causes significant infiltration and inflow (I&I) during summer months. In Ceres, there is no significant summer I&I, therefore the ASF is roughly equivalent to the ADWF.
Maximum Dry Weather Monthly Flow (MDWMF)	3.17	MDWMF is used to determine flow compliance under the current Waste Discharge Requirements (WDR's) Permit issued by the RWQCB. Though unstated in the City's current WDRs (Order No, 98-163), RWQCB often interprets the dry weather period of the year to be from May through September. Based on this interpretation, MDWMF is expected to occur in May under heavy late spring rain conditions as a result of residual I&I from the preceding rainy season.
Peak Day Flow	4.07	Peak Day Flow is the peak influent flow during a 24-hour period. It is important to understand the Peak Day Flow in order to assess the requirements for flow equalization that may be needed for certain treatment processes and to minimize costly down-stream processes. Influent flow data from 1999 through 2007 suggest a Peak Day Flow factor of 1.45 times the ADWF.

(a) Flow calculated based on WWTP influent data 1999 - 2008

(b) Mgal/d = million gallons per day

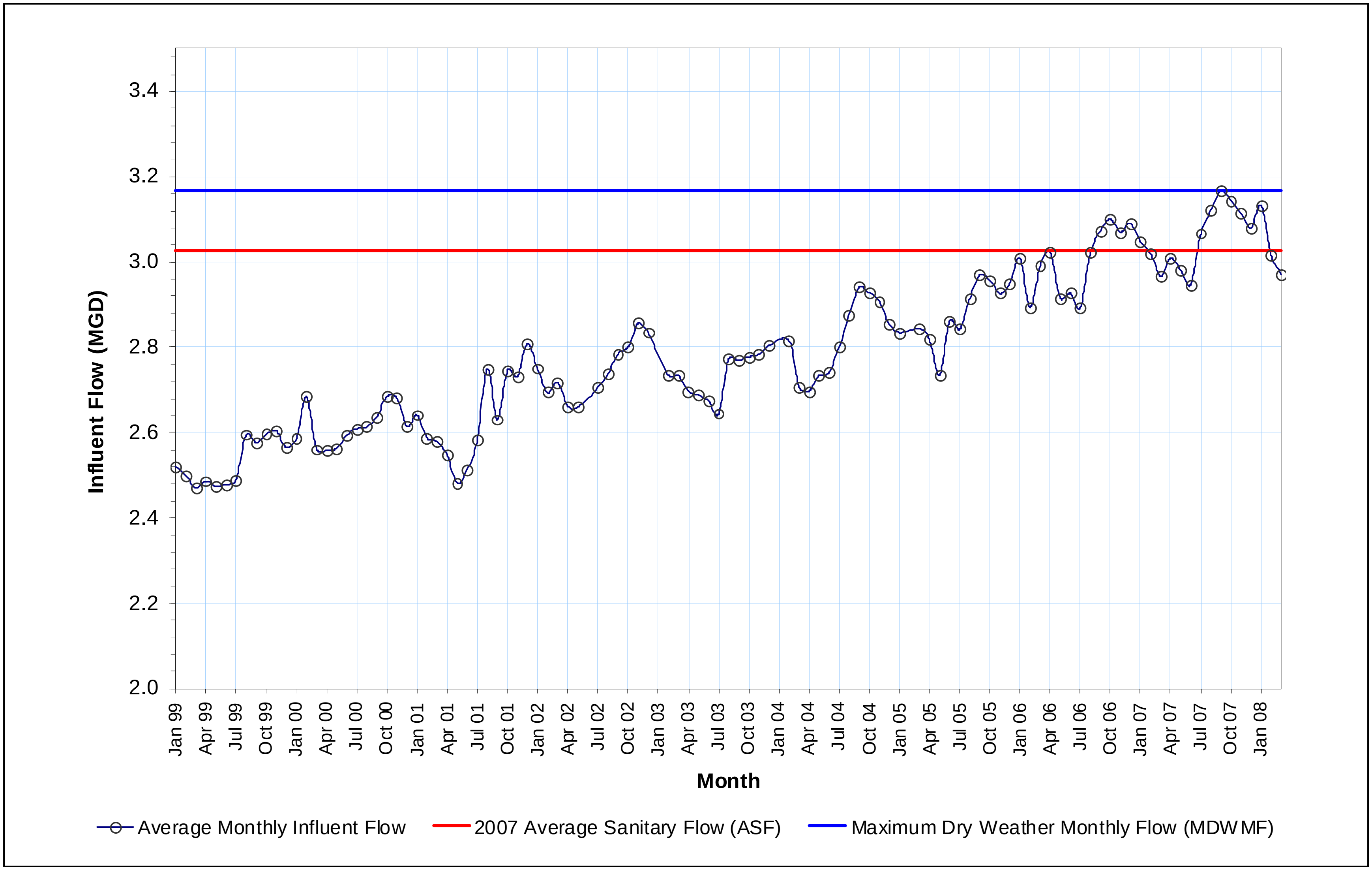


Figure 2-5
City of Ceres
Average Monthly, Average Annual, and MDWWF WWTP Influent Flow

2.4.1.2 Historical Loading Conditions

The organic loading capacity of the Ceres WWTP is measured as the 5-day biochemical oxygen demand at 20ºC (BOD_5). BOD_5 is the measure of dissolved oxygen required by naturally occurring bacteria to oxidize wastewater organics over a five day period. Influent BOD_5 for the City is measured from time composite samples collected weekly from the influent pump station wet well. Existing sampling equipment consists of a continuous sample pump with an intake located on a wall in the wet well at the headworks of the WWTP. The composite sampler consists of a dipper style sampler that deposits a fixed sample volume into a 2.5 gallon refrigerated composite sample bottle.

Influent BOD_5 loading, in pounds per day (lbs/d), for 1999 to 2008 is presented in Figure 2-6. Average and four-sample (one month) rolling averages are also provided to determine the variation in organic loading throughout the year. The average influent BOD_5 load is about 5,335 lbs/d during this period, with one month rolling averages from approximately 3,700 to 7,200 lbs/d. The most recent average influent BOD_5 loading is approximately 5,250 lbs/d for 2007. During this same period, the average monthly influent flow appeared to increase from approximately 2.64 to 3.17 Mgal/d, while the average BOD_5 loading appeared to remain relatively constant (see Figure 2-6). The period from 1999 to 2007 was a significant growth period in the City of Ceres, as demonstrated by the increase in wastewater flows, however loading rates indicate only a moderate increase until 2002, with loading being relatively constant from 2002 through 2007. This would indicate that wastewater strength was decreasing during this period, counter to what would be expected with population growth and anticipated results of more water conserving fixtures being used in the service area.

Based on an estimated population of 34,200 served by the Ceres WWTP in 2007 (based on a proportioning the total City population according to flow proportions in the NCSSA and the remaining Ceres Sewer Service Area (CSSA)), the 2007 average influent BOD_5 loading of 5,250 lbs/d represents approximately 0.15 lbs of BOD_5 per capita per day. For comparison, the Ten-State Standards recommend designing wastewater facilities based on an average organic loading of 0.17 or 0.22 lbs of BOD_5 per capita per day (with the latter being for service areas containing garbage grinders)[5]. Comparison with the Ten-State Standards per-capita loading recommendations suggests that the Ceres wastewater BOD_5 characteristics are low, therefore warranting further confirmation prior to design or preliminary design of any wastewater treatment facilities improvements.

The City also monitors Total Suspended Solids (TSS) in the influent on a daily (excluding weekends) basis. TSS is a measure of the solids which will need to settle out of wastewater during the treatment process. In a pond treatment plant such as the City's, removal of TSS will be a factor in the capacity of the plant, as longer settling times to remove higher quantities of TSS will require higher pond areas and more land for these ponds. Influent TSS loading, in pounds per day (lbs/d), for 1999 to 2008 are provided in Figure 2-7. Average and five sample (one week) rolling averages are also provided to determine the variation in solids loading throughout

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[5] Recommended Standards for Wastewater Facilities, Great Lakes-Upper Mississippi River Board of State Public Health and Environmental Managers, 2004 Edition.

the year. During this period the average influent TSS is about 4400 lbs/d, with an apparent increase from about 3,000 lbs/d to near 4,500 lbs/d. Unlike BOD_5, TSS loading appears to have continued to increase since 1999 suggesting TSS concentrations were pacing with increasing influent flows, however at a somewhat slower rate of increase.

The most recent average influent TSS loading is 4,960 lbs/d for 2007 with an average per capita loading of approximately 0.14 lbs of TSS per capita per day. Ten-State Standards recommend designing wastewater facilities based on an average organic loading of 0.20 or 0.25 lbs of suspended solids (equivalent to TSS as discussed herein) per capita per day (with the latter being for service areas containing garbage grinders)[6]. It is important to note that the expected standard (from industry experience) is that suspended solids loading (in lbs/day) tends to exceed BOD5 loading, in particular in communities where garbage grinders are used). Based on the relatively low influent concentrations and apparent low per-capita loading rates for Ceres, it is suspected that the suspended solids concentration of influent samples may not be representative, i.e., the sample pump is tending to draw fewer suspended solids than actually exist in the influent wastewater. Prior to around 2006, the City relocated the sample point from the corner of the wet well, to its current location, which is anticipated to improve the accuracy of the results and reduce the maintenance requirements to keep this piping clear, however there may still be some settling of wastewater solids in the wet well prior to sample withdrawal. If this is the case, then the existing monitoring data may be under representing TSS and BOD_5 if the influent.

[6] Recommended Standards for Wastewater Facilities, Great Lakes-Upper Mississippi River Board of State Public Health and Environmental Managers, 2004 Edition.

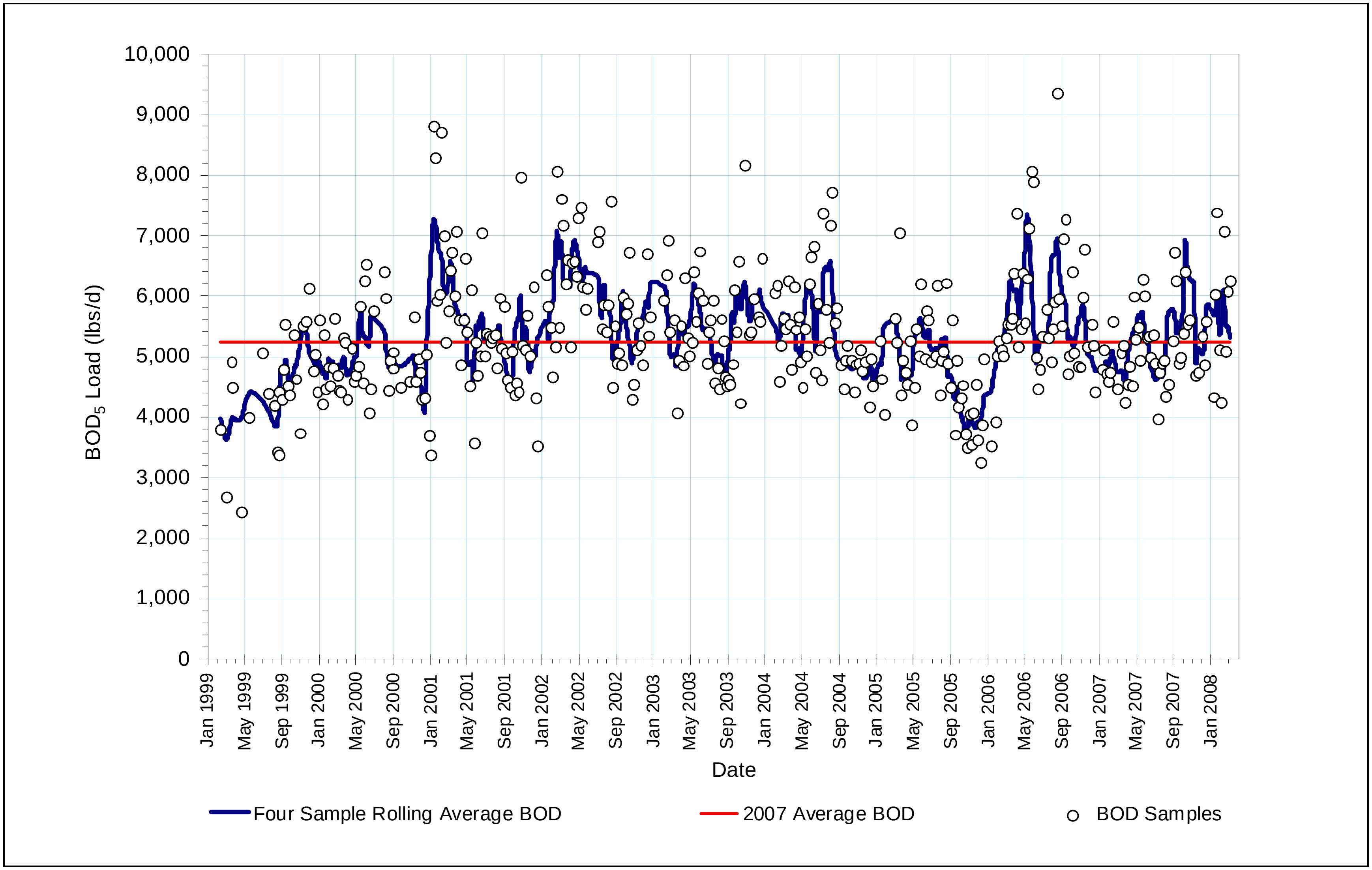

Figure 2-6
City of Ceres
WWTP Historical Influent BOD_5 Loading

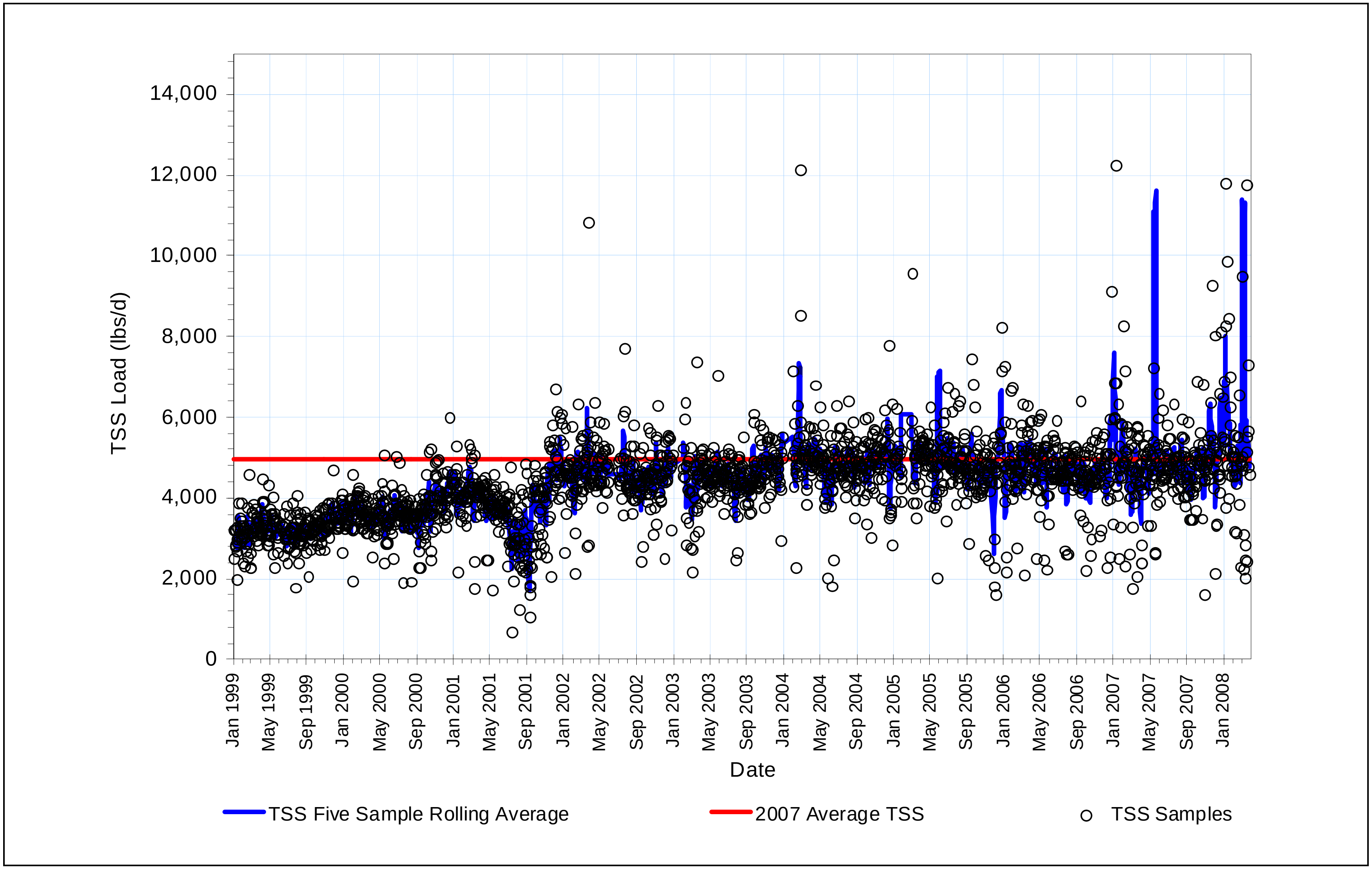

Figure 2-7
City of Ceres
WWTP Historical Influent TSS Loading

A summary of the current monitoring data for flows and loads at the plant is displayed in Table 2-7.

Table 2-7
City of Ceres
Existing WWTP Flows and Loads Summary

Constituent [(a)]	Results of Existing Monitoring Data
Flow (Mgal/d)	
Average Dry Weather Flow (ADWF)	3.07
Average Sanitary Flow (ASF)	3.03
Maximum Dry Weather Monthly Flow (MDWMF)	3.17
Peak Daily Flow (PDF)	4.07
Peak Hour Flow (PHF)[(c)]	6.3
Constituent [(b)]	
Average BOD_5 (mg/l)	207
Average BOD_5 (lbs/d)	5,250
Maximum BOD_5 (lbs/d)	10,000
Average TSS (mg/l)	196
Average TSS (lbs/d)	4,960
Maximum TSS (lbs/d)	40,000

(a) Mgal/d = million gallons per day; mg/l = milligrams per liter; lbs/d = pounds per day.
(b) Current constituents loading based on weekly data from 2007.
(c) Based on three pumps running at the existing influent pump station. Actual peak hour influent flow may differ from this value.

2.4.2 PROJECTED FUTURE WASTEWATER TREATMENT FLOWS AND LOADS

This section discusses the criteria to be used to determine future flows and loads at the City's WWTP and to the City of Modesto from the NCSSA. They will be used to identify and size future improvements to accommodate treatment of future development. Although data is not available for flows and loads from the NCSSA, it is assumed that characteristics are similar to the remainder of the City.

2.4.2.1 Future Flow and Load Basis

Projected influent flow was developed based on the per EDU basis described above. Projected loads have been developed based upon recommended standards on a per-capita basis for projected residential occupancy as described below. Wastewater unit flows used to develop total flows for the various land use types are shown in Table 2-8. Projected per capita BOD and TSS loads used to develop total loads are also shown in Table 2-8.

Previous studies conducted at the City suggested the use of BOD5 and TSS influent characteristics of 270 mg/L each (corresponding to average per-capita loading rates of about 0.23 lbs BOD5 and TSS per day respectively). However, these concentrations were proposed in the absence of Ceres-specific data[7]. Existing wastewater monitoring data seem to indicate a lower strength of the Ceres wastewater than previously assumed, and suggest low TSS and BOD_5 loading rates on a per-capita basis, as compared to industry standards. Therefore, in the absence of data to confirm what appear to be low loading rates, it is proposed that the recommended Ten-State Standard loading rates be used until the City conducts additional characterization of the wastewater.

Table 2-8
City of Ceres
Recommended Future Per-EDU Flow and Load Basis

Criteria Designation	Future Land Use Unit Flow [(a)]
Flow [(b)]	260 gpd/EDU
BOD [(c)]	0.20 #pcd
TSS [(c)]	0.25 #pcd

(a) gpd/EDU = gallons per day per EDU; #pcd = pounds per capita per day.
(b) Unit generation values for residential are based on residential densities as defined in the General Plan and an occupancy rate of 3.38 persons/EDU.
(c) Based on recommended Ten-State Standards loadings for communities where garbage grinders and commonly used.

Since the recommended BOD_5 and TSS loading rates already account for the loading to commercial and institutional uses associated with that population, recommended future loading is applied to the projected residential population based on projected residential EDUs and average occupancy per EDU.

2.4.2.2 Potential Future Influence of Water Conservation

The City is assuming that future unit water use will be reduced by a total of 15%, with approximately 10% reduction resulting from the metering of single-family residential customers, and 5% reduction from reduced unaccounted for water loss (e.g., leaks, flushing water, and unmetered construction and fire fighting water)[8]. Currently the City has not estimated what fraction of the 10% reduction in per-capita (or per unit) water use will be from conservation on indoor water uses. Indoor water use is the fraction of residential water use for such activities as toilet flushing, showers and baths, faucets, clothes washing, and dishwashing. This water typically constitutes the source of the "spent water" discharged by a single-family residence to the sanitary sewer. Based on the current estimated per-capita wastewater generation rate of 76 gallons per capita per day (assuming this is equivalent to the per-capita indoor water use), there might be the potential for up to a 40% reductions in indoor water use from conservation[9]. It is not

[7] Wastewater Treatment Facility Expansion Study, Dewante & Stowell, June 1984.
[8] Polly Boissevain, West Yost & Associates, Personal Communication, June 10, 2010.
[9] Water Use and Conservation, Amy Vickers, Water Plow Press, June 2002.

know whether this potential could reasonably be achieved without extraordinary measures, however the potential impacts to the wastewater system are introduced below.

Recent (since 1999) influent and flow monitoring suggests that the influent wastewater strength to the Ceres WWTP has been decreasing. This is contrary to what would be expected as less water is used in the home. The potential for future wastewater strength to increase exists depending on the results of changes in the California Building Code (plumbing code requirements for low water use fixtures) and the extent of the City's implementation of water demand management measures under the Urban Water Management Act related to indoor water use. If wastewater strength increases, in particular with respect to salinity or priority pollutant concentration for constituents with numeric limits at the City of Modesto WWTP or City of Turlock WWTP there is the potential risk that source control measures or changes in process and disposal management would be required in the future.

To counter the potential for impacts from future increased wastewater strength, it is recommended the City consider the following approaches:

1. Focus waster conservation efforts on efficiencies in water delivery and outdoor use (e.g., water conservation for landscape irrigation).

2. Plan for and consider the use of recycled water as an element of the City's water overall water conservation program.

These two strategies would be in lieu of significantly reducing indoor water use.

2.4.2.3 Future Wastewater Treatment Flows and Loads Summary

A summary of the existing and projected flows to the City of Ceres Wastewater Treatment Plant and from the NCSSA is presented in Table 2-9 for each development area and land use type. Phase I development is estimated to produce an average sanitary flow of approximately 3.7 Mgal/d to the Ceres WWTP site and 0.8 Mgal/d to the City of Modesto. For Phase II, additional development is expected to produce a total average flow of 6.7 Mgal/d to the Ceres WWTP site and 1.3 Mgal/d to the City of Modesto. At build-out of Phase III the total average influent flow to the Ceres WWTP site is projected to be 10.5 Mgal/d and approximately 1.3 discharged from the NCSSA to the City of Modesto system. Overall the build-out total wastewater average sanitary flow from the City of Ceres is projected to be 11.8 Mgal/d.

Projected influent loading conditions were also determined based on historical loads and the assumption that the City's wastewater BOD_5 and TSS concentrations will remain at typical historical strength, approximately 207 and 196 mg/l respectively.

A summary of the projected flows and loads for each future development area is also provided in Table 2-9.

Table 2-9
City of Ceres
Estimated Flows and Load for Each Land Use Designation

	Phase I		Phase II		Phase III		Cumulative Total	
Land Use	**NCSSA**	**CSSA**	**NCSSA**	**CSSA**	**NCSSA**	**CSSA**	**NCSSA**	**CSSA**
Residential [a] (EDUs)	3,613	12,969	1,295	4,367	14	6598	4,922	23,934
Commercial [b] (EDUs)	204	777	83	79	---	120	287	976
Industrial [c] (EDUs)	---	2,672	376	2,138	---	---	376	5,459
Office (EDUs)	---	189	---	135	---	---	---	324
School (EDUs)	81	1,313	---	821	---	164	81	2,298
Commercial Recreation (EDUs)	---	4	---	2	---	23	---	29
Community Facilities (EDUs)	1	923	---	538	---	---	1	1,668
Residential Reserve (EDUs)	---	---	---	2,843	---	4,569	---	7,412
Industrial Reserve (EDUs)	---	---	---	---	---	2,996	---	2,996
Total ASF, (EDUs), rounded	**3,899**	**18,847**	**1,754**	**10,923**	**14**	**14,470**	**5,667**	**45,096**
Flow, (Mgal/D)								
Average Sanitary Flow	0.81	3.7	0.46	2.7	0.004	3.8	1.3	10.2
Peak Daily Flow	1.22	5.5	0.69	4.5	0.006	5.7	1.9	15.3
Peak Hourly Flow	2.8	9.0	1.2	7.4	0.011	9.7	4.0	26
Biochemical Oxygen Demand (BOD_5) Load, lbs/day								
Average BOD_5 Load, lbs/day	2,442	8,767	875	4,874	9.5	7,549	3,327	21,190
Total Suspended Solids (TSS) Load, lbs/day								
Average TSS Load, lbs/day	3,053	10,959	1,094	6,092	12	9,436	4,159	26,487

(a) Includes Residential Agriculture, Very Low Density Residential, Low Density Residential, Medium Density Residential, and High Density Residential

(b) Includes Community Commercial, Downtown Commercial, Highway Commercial, Neighborhood Commercial Regional Commercial and Service Commercial

(c) Includes Business Park, Light Industrial and General Industrial. Community Commercial, Downtown Commercial, Highway Commercial, Neighborhood Commercial Regional Commercial and Service Commercial Additional industrial acres within the Secondary SOI includes 310 acres of Industrial Reserve.

City of Ceres Sewer System Master Plan
Chapter 3

Wastewater Treatment and Disposal

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3.1 INTRODUCTION AND PURPOSE

The purpose of this chapter is to present 1) the potential range of realistic wastewater treatment and disposal alternatives, 2) fundamental considerations related to wastewater issues for the City of Ceres (City), 3) assessment of feasible wastewater treatment and disposal alternatives, and 4) recommendations regarding near-term and long-range planning of Ceres wastewater treatment and disposal. The planning concepts outlined in this memo are the result of a reconnaissance assessment of alternatives presented to the City to be carried forward into the Sewer Master Plan. This memo includes:

- A historical perspective on the existing treatment and disposal techniques employed by the City, prior alternatives evaluated and pursued, and the basis for the existing system.
- Existing and potential future disposal alternatives and anticipated regulatory drivers:
  - Effluent nitrogen and groundwater quality.
  - Potential salinity impacts to groundwater or surface water quality.
  - Groundwater recharge vs. land disposal vs. surface water discharge.
  - Water supply limitations and the possible use of recycled water to supplement future City water needs.
  - State Water Board mandated salt and nutrient management plans.
- Evaluation of wastewater treatment and disposal alternatives,
- Facilities recommendations and phasing considerations including:
  - Existing wastewater treatment plant location, and existing and planned adjacent land uses.
  - Percolation disposal capacity and the likely need to switch to alternative disposal methods over time.

- Phasing export pumping and pipeline facilities.

3.2 HISTORICAL PERSPECTIVE ON CERES WASTEWATER TREATMENT AND DISPOSAL

The City of Ceres wastewater treatment plant (WWTP) has been at its current location since before 1970. In 1975, the City designed major improvements to the WWTP, including constructing new treatment ponds, effluent filtration, disinfection facilities, effluent piping, and additions and modifications to percolation disposal facilities. The 1975 improvements constitute the majority of the facilities that exist and are in use today. These facilities were designed with a treatment capacity of about 1.9 Mgal/d with a disposal capacity of about 1.3 Mgal/d.

3.2.1 NORTH CERES SEWER SERVICE AREA

In 1979, the Cities of Ceres and Modesto entered into an agreement for the City of Modesto to continue to provide wastewater treatment and disposal services to the North Ceres Sewer Service Area (NCSSA). NCSSA is generally located east of 9th Street, west of Mitchell Road, and north of Hatch Road. Since 1979, the agreement between the Cities has been amended twice, with the latest amendment signed in 2007. Within NCSSA, the City of Ceres owns and maintains the collection system. Collected wastewater from this service area flows in a westerly direction, where it is discharged into the City of Modesto trunk sewer system at a manhole at 9th Street and Hosmer Avenue, and conveyed to Modesto's Water Quality Control (WQC) facilities for treatment and disposal. Under the current agreement, the City of Modesto will continue to provide wastewater treatment and disposal service to NCSSA. New development within NCSSA is generally considered infill by the City of Modesto and payment of the Modesto Sewer Capacity Fees is required for new service.

Existing services within NCSSA are charged for sewer service based on the rates developed by the Cities of Modesto and Ceres for this area. Existing NCSSA connections have already paid for capacity at the Modesto facilities, including trunk sewer conveyance, treatment, and disposal; therefore, it is unlikely to be cost effective for NCSSA connections to pay for sewer service in another facility when service in the existing Modesto facility is satisfactory. Consequently, it is assumed that NCSSA would continue to discharge to Modesto under the current agreement.

3.2.2 1984 EXPANSION STUDY

In 1984, the City conducted a study of alternatives to expand its wastewater treatment and disposal capacities. The immediate need was to expand disposal capacity to accommodate wet weather wastewater flows occurring at that time[1]. The plan also addressed expanding the facilities to serve an anticipated average flow of 7.9 Mgal/d based on the 1978 General Plan and 1983 Sewer System Study[2]. The 1984 Expansion Study recommended the following improvements and facilities expansions:

- Construct two 17-acre percolation ponds immediately to correct the wet weather flow disposal deficiency existing at that time.

[1] City of Ceres Wastewater Treatment Facility Expansion Study, June 1984, Dewante & Stowell.
[2] City of Ceres Sewer System Study, July 1983, Dewante & Stowell.

- Expand treatment and disposal service capacities by a) building an overland flow treatment process with chlorine disinfection, and b) discharging the effluent to the Westport Drain which flows to the San Joaquin River.

Because of perceived obstacles to this use of the Westport Drain, alternatives evaluated in the 1984 Expansion Study included:

- Percolation pond expansion
- Export to Modesto

Possible disposal methods that were considered in the 1984 Expansion study and eliminated from further consideration based on regulatory issues, cost, environmental impact, and/or public acceptance, were:

- Export to Modesto's Sutter plant, due to pipeline cost.
- Export directly to Modesto's Jennings plant, due to pipeline cost.
- Export to Turlock's plant, due to pipeline cost.
- Direct discharge to San Joaquin River, due to pipeline cost.
- Discharge to Tuolumne River, not allowed by regulatory agencies.
- Discharge to TID's Lower Lateral No. 2, not allowed by TID and discouraged by the California Department of Health Services.
- Evaporation ponds, due to land costs, public acceptance, environmental impact, and pipeline costs.
- Infiltration wells, due to poor performance of previous City infiltration wells, and discouragement by regulatory agencies.
- Crop irrigation, due to land costs, public acceptance, environmental impact, and pipeline costs.

Most, if not all, of the reasons for eliminating these alternatives are still valid today and can guide the assessment of practicable alternatives to be considered in the Master Plan.

3.2.3 1987 Construction of Ponds U-1 and U-2

As recommended in the 1984 Expansion Study, the City constructed ponds U-1 and U-2 in 1987, increasing the percolation area by approximately 32 acres, and resulting in the existing estimated on-site disposal capacity of approximately 2.5 Mgal/d (based on permit limits). These facilities were constructed on land already owned by the City and effectively maximized disposal capacity on this site.

3.2.4 City Pursuit of Discharge to Modesto and Expansion of Land Disposal

Through the late 1990s, the City further evaluated the alternative of discharging to the Westport Drain. This alternative was plagued with evolving regulatory requirements for both the City and TID, the owner of the drain, which ultimately made effluent discharge to the Westport Drain infeasible. Excluding alternatives based on effluent discharge to the Westport Drain, the next highest ranking alternatives were pursued:

- Export to Modesto: The City discussed the possibility of constructing a pipeline from the existing WWTP to the City of Modesto pipeline to the Jennings facility. This alternative was not feasible at that time due to a lock of available capacity in City facilities.
- Expanded Land Disposal: Expanding disposal capacity via construction of additional percolation ponds was pursued by the City with the intent of increasing the City's disposal capacity by approximately 1.0 Mgal/d, to meet the immediate foreseen disposal need at that time. 90 acres of land adjacent to the existing WWTP were available for expansion of the disposal ponds; however during the permitting process for this expansion, the Regional Board would not permit an expansion of the existing percolation system.

3.2.5 2003 Export Pump Station and Pipeline to Turlock

Because neither export to Modesto nor expanded land disposal could be cost-effectively implemented, the City had to pursue other alternatives. In 2003, the City of Ceres approached the City of Turlock regarding the possibility of implementing a disposal alternative previously eliminated in the 1984 Expansion Study: discharge by export to Turlock's wastewater treatment plant. The two cities came to an agreement on the terms of Ceres' discharge, and Ceres purchased 1.0 Mgal/d of capacity in the Turlock facility, with an option to purchase a second 1.0 Mgal/d of capacity. In 2003/2004, Ceres constructed the existing export pump station and pipeline which has a pumping capacity of 2.0 Mgal/d, expandable to approximately 5.9 Mgal/d. The initial 1.0 Mgal/d of treatment capacity in the Turlock RWQCF cost the City $1.09M. In January 2007, the City of Ceres entered into an agreement to purchase a second 1.0 Mgal/d capacity at a cost of $2.6M. The export pump station and pipeline cost the City approximately $6.1M.

The capital cost to export, treat, and dispose of 2.0 Mgal/d of equalized flow wastewater at Turlock was approximately $9.8 M, essentially $5 per gallon of equalized flow capacity. Typically, tertiary treatment costs in excess of $20 per gallon of capacity at flow capacities of around 10 Mgal/d. The $5 per gallon cost was possible for several reasons including the flow equalization features and partial treatment provided by the ponds at the Ceres WWTP and the low pump station and pipeline project costs. Because of the low cost and satisfactory nature of the current 2.0 Mgal/d service at Turlock, it is unlikely that this capacity can be replaced cost effectively by other or new facilities. Therefore, it is assumed that this 2.0 Mgal/d discharge capacity will continue to be used by the City as part of its wastewater treatment and disposal "portfolio".

3.3 EXISTING AND FUTURE DISPOSAL METHODS

Existing and potential future effluent disposal methods are presented in Figure 3-1 with the likely level of treatment identified. The facilities and permits needed are listed for each disposal method, with potential critical regulatory concerns identified. Figure 3-1 depicts the relative ranking of these alternatives based on capital and operation and maintenance (O&M) costs. Potential flow requirements discussed below are based on Future Land Use and Flow and Load Projections Chapter2 for the Ceres Sewer System Master Plan. This section identified those potential future disposal methods that are likely feasible for the City of Ceres based on current conditions and existing and anticipated future regulatory requirements.

3.3.1 EXISTING PERCOLATION DISPOSAL AND WATER QUALITY

Wastewater treatment and disposal at the City's existing WWTP are regulated under Waste Discharge Requirements Order No. 93-237 (WDRs). These WDRs were prepared pursuant to the requirements of the Porter-Cologne Water Quality Control Act (Porter-Cologne) and the Water Quality Control Plan (Basin Plan) for the California Regional Water Quality Control Board, Central Valley Region, which includes Resolution No. 68-16, the State's anti-degradation policy. Because the City of Ceres WWTP discharges to land, it is not subject to the National Pollution Discharge Elimination System (NPDES) requirements for discharges to surface water. The more significant existing discharge requirements are summarized in Table 3-1.

The State's anti-degradation policy, limits degradation of water quality (including shallow groundwater quality) to a water quality objective, provided that "best practicable treatment or control" (BPTC) measures are being implemented in order to minimize the degradation to the extent practicable, or background water quality, whichever is higher.

Table 3-1
Existing WWTP Discharge Requirements Summary

Element	Requirement [a]
Monthly Average Dry Weather Discharge Flow Limit	2.5 Mgal/d
Available Storage and Disposal Capacity	Adequate to handle 100-year precip. season
Groundwater Limitations, "The discharge shall not cause underlying groundwater to:"	Exceed background concentrations (this applied to all constituents in effluent) Exceed drinking water standards Exceed 2.2 MPN/100ml for coliform (7-day) Contain nuisance taste or odor-producing substances Contain chemical constituents which adversely affect agricultural use

(a) Based on WDRs Order No. 93-237.

Treatment / Disposal	What is Needed to Expand Disposal	Increasing Capital O&M Cost →						
		No Treatment by City	**Primary or Secondary**	**Secondary Disinfected**	**Secondary BNR, Disinfected**	**Tertiary Disinfected, (Title 22)**	**Tertiary BNR, Disinfected**	**Tertiary BNR, Disinfected, and Advanced Treatment**
Export to Modesto	Capacity at Modesto facility	NCSSA* (Existing agreement)						
Export to Turlock	Capacity at Turlock facility	N/A	Under existing agreement*					
Percolation	Additional land and permit	N/A	Under existing permit		May be needed if nitrogen and pathogens are issues			
Landscape Irrigation Recycling	Storage and distribution plus recycling requirements	N/A	N/A	N/A	N/A	Required for recycling *+		
Crop Recycling	Additional land, storage, and permit	N/A	N/A	For non-food crop*		For food crop*		
New Surface Water Discharge (Tuolumne River or San Joaquin River)	Assimilative capacity and NPDES permit	N/A	N/A	Not likely feasible*	Not likely feasible*	May be suitable depending on recycled water characteristics*	May be suitable depending on recycled water characteristics*	May be required depending on assimilative capacity*

* Potential salinity concerns. + May be necessary to off-set water use on limited availability ▭ = Existing Methods BNR = Biological nutrient removal
N/A = Treatment level insufficient for disposal method requirements

Figure 3-1
Range of Potential Treatment and Disposal Means

Since adoption of the WDRs in 1993, several amendments to Porter-Cologne and the Basin Plan have been enacted. When WDRs are updated (typically every 15 years, i.e., the City's WDRs are due for updating), discharge requirements will be included base on Basin Plan amendments, updated State and Regional Water Board policies, and amendments to Porter-Cologne. In addition, it is anticipated that further revisions to State policy, regulations and WDRs are forthcoming specific to disposal by percolation to groundwater based on recent general policy statements and draft regulations circulated by various State agencies. Therefore, analysis of wastewater treatment and disposal alternatives should consider not only the existing permit requirements but likely future permit requirements based on existing and anticipated future regulations and policies.

The following sub-sections discuss specific water quality constituents of potential concern for the Ceres WWTP and their potential applicability in defining plausible alternatives for wastewater treatment and disposal. This discussion includes our assessment of existing modern permit requirements as well as likely future requirements that we anticipate applying to the City of Ceres.

Effluent BOD_5 and TSS Limits: The City's current WDRs have no effluent limits for 20ºC 5-day biochemical oxygen demand (BOD_5) or total suspended solids (TSS or SS). Virtually all modern permits (whether for land disposal or surface water discharge under NPDES requirements) have effluent limits for at least BOD_5, if not also TSS. These limitations are typically included as a means to assure that treatment is being achieved consistent with the capabilities of the systems employed, as well as to protect receiving water quality and prevent nuisance. For example, current Federal regulations applicable to NPDES discharges allow for the following effluent BOD_5 and SS limits for pond treatment systems[3]:

30-day average effluent BOD_5 <45 mg/L
7-day average effluent BOD_5 < 65 mg/L
30-day average effluent SS < 45 mg/L
7-day average effluent SS < 65 mg/L

Recent (since 2007) land disposal WDRs adopted by the Regional Water Board have typically contained monthly average and daily maximum effluent limitations on BOD_5 of 40 mg/L and 80 mg/L, as minimum performance standards for municipal facilities. In addition to these limits, many permits have limited the BOD_5 loading rate to percolation disposal areas to no more than 100 lbs/acre per day.

Effluent Nitrogen and Groundwater Quality: The City's current WDRs have narrative groundwater limitations that apply to effluent nitrogen, as well as all other effluent constituents such as salts, refractory organics, metals, etc. The City's most recent groundwater monitoring data are summarized in Table 3-2. Figure 3-2 depicts the most recent groundwater elevation contours from May 2010, during the 2nd Quarter 2010 sampling event.

[3] 40 CFR 133.105 a) and b)

Table 3-2
Recent Ceres WWTP Groundwater Quality Information

Parameters	Monitoring Location							
	MW-1	**MW-2**	**MW-3**	**MW-4**	**MW-5**	**MW-6**	**MW-7**	**Effluent**
pH (Lab)	7.3	7.4	7.4	7.2	6.9	7.3	6.9	7.9
Lab EC (μS/cm)	**1,320**	**1,790**	**1,420**	**1,250**	**1,380**	**1,390**	**1,080**	**1,400**
TDS (mg/l)	**720**	**1,080**	**820**	**850**	**930**	**790**	**630**	**690**
FDS (mg/l)	**630**	**850**	**660**	**550**	**570**	**650**	**530**	**590**
Total Hardness as $CaCO_3$ (mg/l)	223	409	336	379	580	388	258	156
As (mg/l)	0.012	0.005	0.005	0.002	0.003	0.003	0.002	0.007
B (mg/l)	0.4	0.5	0.4	0.1	0.1	0.2	0.2	0.3
Ca (mg/l)	58	103	87	99	112	101	72	41
Fe (mg/l)	**0.51**	0.05	<0.05	0.05	<0.05	0.12	<0.05	0.05
K (mg/l)	13	4	6	4	5	6	4	15
Mg (mg/l)	19	37	29	32	73	33	19	13
Mn (mg/l)	**2.31**	**0.27**	0.03	<0.01	<0.01	0.01	<0.01	<0.01
Na (mg/l)	**176**	**251**	**183**	**129**	68	**146**	**122**	**171**
Nitrate as N (mg/l)	<0.1	**20**	3	**41**	**60**	4	6	0.1
TKN (mg/l)	6	<1	<1	<10	<1	<1	<1	26
Alkalinity as $CaCO_3$ (mg/l)	300	450	310	300	310	390	200	330
HCO_3 as $CaCO_3$ (mg/l)	370	540	370	370	370	470	250	400
SO_4 (mg/l)	70	55	48	96	160	21	38	34
Cl (mg/l)	**184**	**234**	**244**	63	32	**201**	**188**	**203**

Bold data indicates an exceedance of a water quality goal.
NM – Not Measured.

Comparing groundwater nitrate in Table 3-2 with the water quality goal of 10 mg/L (Table 3-3), it appears that in May 2010, MW-2, MW-4, and MW-5 exceeded the primary PMCL of 10 mg/L. Based on the groundwater elevation contour for this one sampling event, it would appear that water quality in MW-1 through MW-3 is likely most influenced from the effluent disposal activities. The water quality at MW-4 and MW-5 probably has some influence from the wastewater disposal activities, but also is likely influenced by other overlying activities such as TID Lateral No. 2 and current and historical agricultural activities.

Table 3-3
Water Quality Goals

Parameter	Water Quality Goal
pH	6.5 – 8.4 [a]
Specific Conductance (μS/cm)	700 [b]
Nitrate as N (mg/L)	10 [c]
Nitrite as N (mg/L)	1 [c]
Total Dissolved Solids (mg/L)	450 [b]
Total Coliform Organisms (MPN/100ml)	2.2 [a]
Arsenic (mg/L)	0.010 [c]
Barium (mg/L)	1 [c]
Boron (mg/L)	0.7 [b]
Iron (mg/L)	0.3 [d]
Manganese (mg/L)	0.05 [d]
Sodium (mg/L)	69 [b]
Chloride (mg/L)	106 [b]
Sulfate (mg/L)	250 [d]

(a) Region 5 Basin Plan objective.
(b) Agricultural water quality goal.
(c) Primary Maximum Contaminant Limit (PMCL).
(d) Secondary Maximum Contaminant Limit (SMCL).

Nitrate levels in MW-6 and MW-7 are both below the MCL and likely indicate shallow groundwater quality underlying developed portions of the City, with some potential for being influenced by the disposal activities and historical land use activities.

These limited data indicate that shallow groundwater in the vicinity of the Ceres WWTP is impacted with respect to nitrate. However, the contribution and degree of influence from the disposal activities is not clear from these data. Additional monitoring is warranted, including an assessment of the groundwater source, based on general chemistry and analysis of stable isotopes as recommended in Chapter1.

Many recent WDRs issued for land disposal facilities in the Central Valley contain limits on effluent nitrogen because of widespread nitrate pollution of groundwater. Typically, a monthly average total nitrogen effluent limitation of around 10 mg/L is established based on the drinking water nitrate MCL of 10 mg/L; and the tendency for all nitrogen in groundwater to eventually be in the nitrate form. Based on our experience with aerated pond performance, and the recent Ceres effluent TKN concentrations of 26 mg/L, it is unlikely that the existing treatment process can reliably meet a monthly total nitrogen limitation of around 10 mg/L. Annual averaging of effluent nitrogen data may be possible because of the concentration equalizing effect of the groundwater basin, but even this extraordinary measure may not result in complete, reliable compliance.

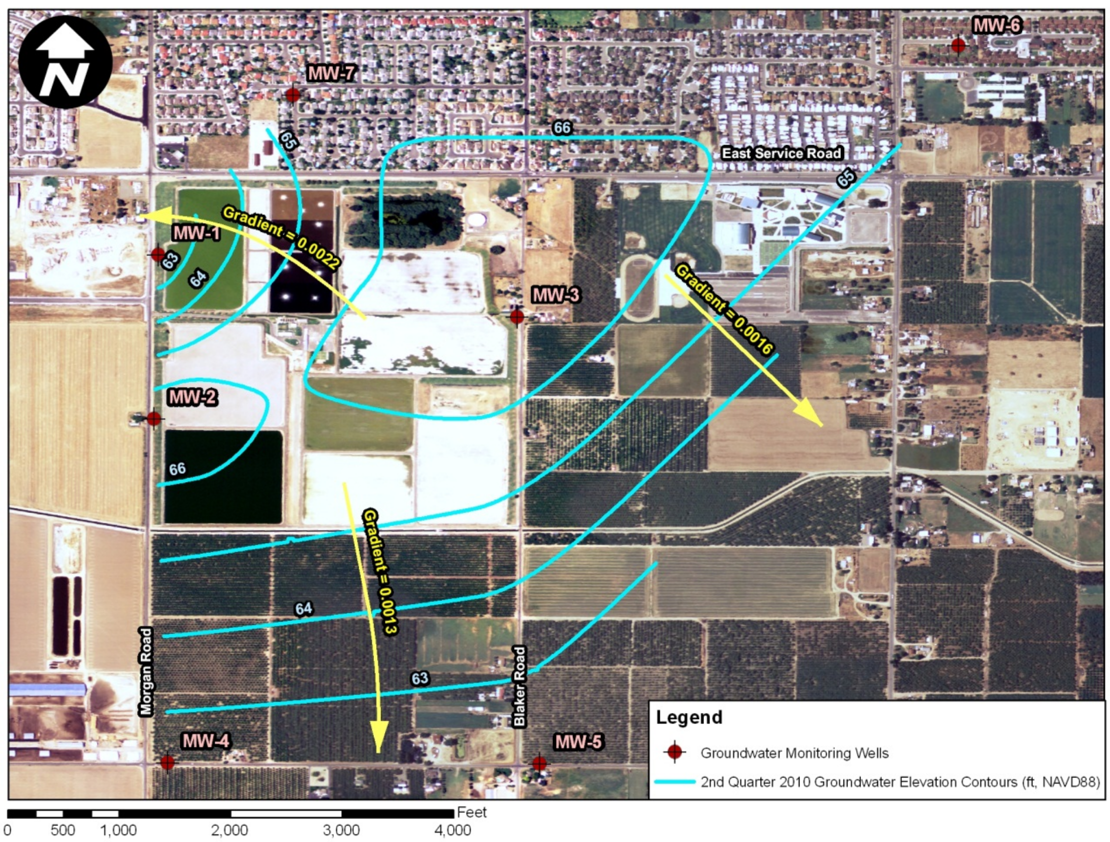

Figure 3-2
Ceres WWTP Groundwater Contours 2nd Quarter 2010

Potential Salinity Impacts to Groundwater or Surface Quality: Based on recent WDRs, it is likely that the City will have some form of salinity effluent limitations for land disposal and possibly for discharges to Modesto and Turlock. A typical land discharge facility effluent salinity limitation is the potable water supply salinity plus 500 μmho/cm, or background shallow groundwater salinity, whichever is less. Based on the one effluent sample indicating an EC of 1,400 μmho/cm, total dissolved solids of 690 mg/L, and fixed dissolved solids of 590 mg/L, it is likely that the City will have to implement salinity source control. This may involve the City switching from a groundwater potable supply to a surface water supply to achieve compliance with long-term State salinity objectives.

The following existing salinity requirements at Modesto and Turlock (Table 3-4) have the potential to influence facilities alternatives and program requirements in Ceres.

Table 3-4
Existing Modesto and Turlock Discharge Salinity Requirements

Permit	Salinity Limit
Modesto (R5-2008-0059)	1,341 μmhos/cm, monthly average [(a)]
Turlock (R5-2010-0002)	979 μmhos/cm, annual average [(b)]

(a) Interim effluent limit in Order No. R5-2008-0059.
(b) Interim effluent limit in Order No. R5-2010-0002.

We anticipate that the Regional Board will be requesting that the City assess the continued viability of on-site percolation disposal. Likely points of concern are going to be:

- Potential for impacts to shallow groundwater with respect to nitrogen.
- Potential for the City's effluent disposal practices to cause the mobilization of iron, manganese, and possibly arsenic, and
- Impacts to shallow groundwater limiting its suitability for agricultural use.

If further study confirms the existence of significant potential for excessive groundwater degradation or pollution, the City will be required to implement alternative disposal means for approximately 2.5 Mgal/d of existing flows. Based on our experience, the schedule for replacing this capacity will likely not be less than ten years from such confirmation. Therefore, it is recommended that future wastewater disposal expansion alternatives include conveying the existing 2.5 Mgal/d of capacity to the new expanded disposal program.

3.4 WASTEWATER TREATMENT AND DISPOSAL ALTERNATIVES

Figure 3-1 depicts the potential range of wastewater treatment and disposal alternatives, however not all of these potential alternatives can be considered feasible. This section identifies which alternatives are considered feasible based on the City of Ceres current situation, past studies, and current and anticipated regulatory requirements, and evaluates the potential range and cost of facilities needed to implement these potentially feasible alternatives.

Under current Regional Board policy, regionalization is preferred wherever feasible. Regionalizing with the City of Modesto and City of Turlock should provide greater economies of scale than Ceres constructing its own treatment and disposal facilities. The best apparent alternative between export to the City of Modesto or only to the City of Turlock will depend on the extent of economies of scale between these facilities and the relative cost of future capacity.

3.4.1 SUMMARY OF FUTURE DISPOSAL ALTERNATIVES

Potentially feasible disposal alternatives were identified from a potential range of alternatives presented to City staff during a wastewater treatment and disposal alternatives workshop (as documented in the September 15, 2010 memo regarding Potential WWTP Disposal and Treatment Alternatives). Potential future disposal alternatives are presented below:

- Continue to discharge NCSSA wastewater to the City of Modesto.
- Continue to percolate up to 2.5 Mgal/d of effluent on-site until regulatory requirements dictate that this method be discontinued.
- Continue to convey up to 2.0 Mgal/d of equalized effluent flow to Turlock (with the possibility of conveying raw wastewater to Turlock, if cost effective).
- Increased wastewater export to Turlock and/or Modesto based on the best apparent overall project cost, including anticipated Modesto or Turlock costs and City costs for equalization, pumping, and pipelines, and
- Evaluate the potential facilities requirements and costs for the City to produce tertiary effluent for reuse.

Based on these disposal alternatives, six treatment and disposal alternatives are evaluated below. These six alternatives are summarized in Table 3-5.

Table 3-5
Summary of Treatment and Disposal Alternatives

Alternative	Sub-Alternative Description
Alternative A: Increased Wastewater Export to City of Modesto	
Alternative A-1	Export up to Peak Influent Flow to Modesto Jennings WWTP
Alternative A-2	Export Equalized Flow to Modesto Jennings WWTP
Alternative A-3	Export Equalized Flow to Modesto and Turlock
Alternative B: Increased Wastewater Export to City of Turlock	
Alternative B-1	Export of Equalized Flow to Turlock RWQCF
Alternative B-2	Export up to Peak Influent Flow to Turlock RWQCF
Alternative C: Ceres Production, Storage, and Conveyance of Tertiary Effluent	

These alternatives include a recommendation for approximately 40 Mgal of emergency storage, estimated at a total capital cost of approximately $3,800,000, for each sub-alternative.

Emergency storage is recommended in lieu of a parallel pipeline system due to the lower capital and operation and maintenance cost with comparable risk mitigation benefits.

3.4.2 Alternative A: Increased Wastewater Export to City of Modesto

The options contained in Alternative A are based on exporting raw or equalized wastewater or primary effluent from the existing Ceres plant to the City of Modesto Jennings plant (see Figure 3-1). A sub-alternative includes also increasing export to Turlock up to the expandable capacity of existing facilities, with remaining future flows being exported to Modesto. This alternative is consistent with the City of Modesto's determination that additional Ceres flows cannot be accommodated at the Modesto Sutter Plant. Figure 3-4 depicts a conceptual flow-diagram for the three sub-alternatives of Alternative A described below. Alternative A was considered following evaluation of pumping to a gravity sewer or using a force main. At current electricity costs, the force main option is more cost-effective over 30 years, however as power costs increase (above about $0.33/kw-hr), pump lifting to a gravity sewer becomes more cost effective (see Table A-11 in Appendix C). Prior to designing these facilities, the long-term cost-benefit of a force main vs. gravity sewer should be revisited. This alternative would include the following elements common to each sub-alternative:

- Additional pumping capacity in the planned new headworks structure to accommodate the flows as described by the sub-alternatives,
- Site piping to discharge directly to the existing Turlock export pump station,
- Grit removal for discharge to Turlock (if needed),
- Approximately 48,300 feet of force main or gravity sewer to Modesto's Jennings WWTP,
- Lining, access ramp, redwood baffle removal, and drain sump and return pumping improvements to existing treatment basins for use as equalization and/or emergency storage, and
- NCSSA discharge continuing to occur to the Sutter plant and up to 2.0 Mgal/d from the Ceres WWTP continuing to be discharged to the Turlock plant.

The proposed approach for the City of Ceres' export to the Jennings WWTP should be based on a separate pipeline conveying wastewater separately to the Modesto Facility. The City of Modesto cannot accommodate a parallel Ceres facility in the Jennings WWTP outfall alignment, therefore the alternative alignment in Figure 3-3 is proposed. This alignment is based on staying within existing County right-of-way (ROW) to limit or avoid acquiring new ROW. This alignment results in a pipeline length from the Ceres WWTP to the Modesto Jennings WWTP of about 48,300 ft., consisting of:

1 Connection to discharge piping at the City's influent pump station at East Service Road,

2 Pipeline alignment west on East Service Road to Crows Landing Road (potential conflicts include railroad ROW and other existing and planned City utilities),

3 Pipeline alignment south on Crows Landing Road to West Keys Road (potential conflict between Grayson and W. Keys with crossing under TID Lateral No. 2),

4 Pipeline alignment west on West Keys Road to Jennings Road (potential conflicts include crossing TID lateral No. 2 east of Carpenter Rd. and running parallel to Lateral No. 2 with a crossing at or near Jennings Rd., likely limited to the north side of the road),

5 Pipeline alignment in Jennings Road to the Jennings WWTP Entry Road (potential conflicts include the TID drain at the entrance to the Jennings WWTP), and

6 Pipeline alignment west down Jennings WWTP Entry Road to the point of connection with Modesto Facilities with junction structure as needed.

In order to accommodate the Ceres wastewater flows, the City of Modesto would have to provide the following improvements (See response No. 2 in Modesto's November 30, 2010 letter in Appendix E):

- Additions to the Jennings WWTP phased improvements to accommodate the Ceres wastewater flows, including addition of primary treatment facilities at the Jennings WWTP.

- Ceres buy-in to any Modesto wastewater treatment, storage, disposal, and reuse facilities that would benefit Ceres.

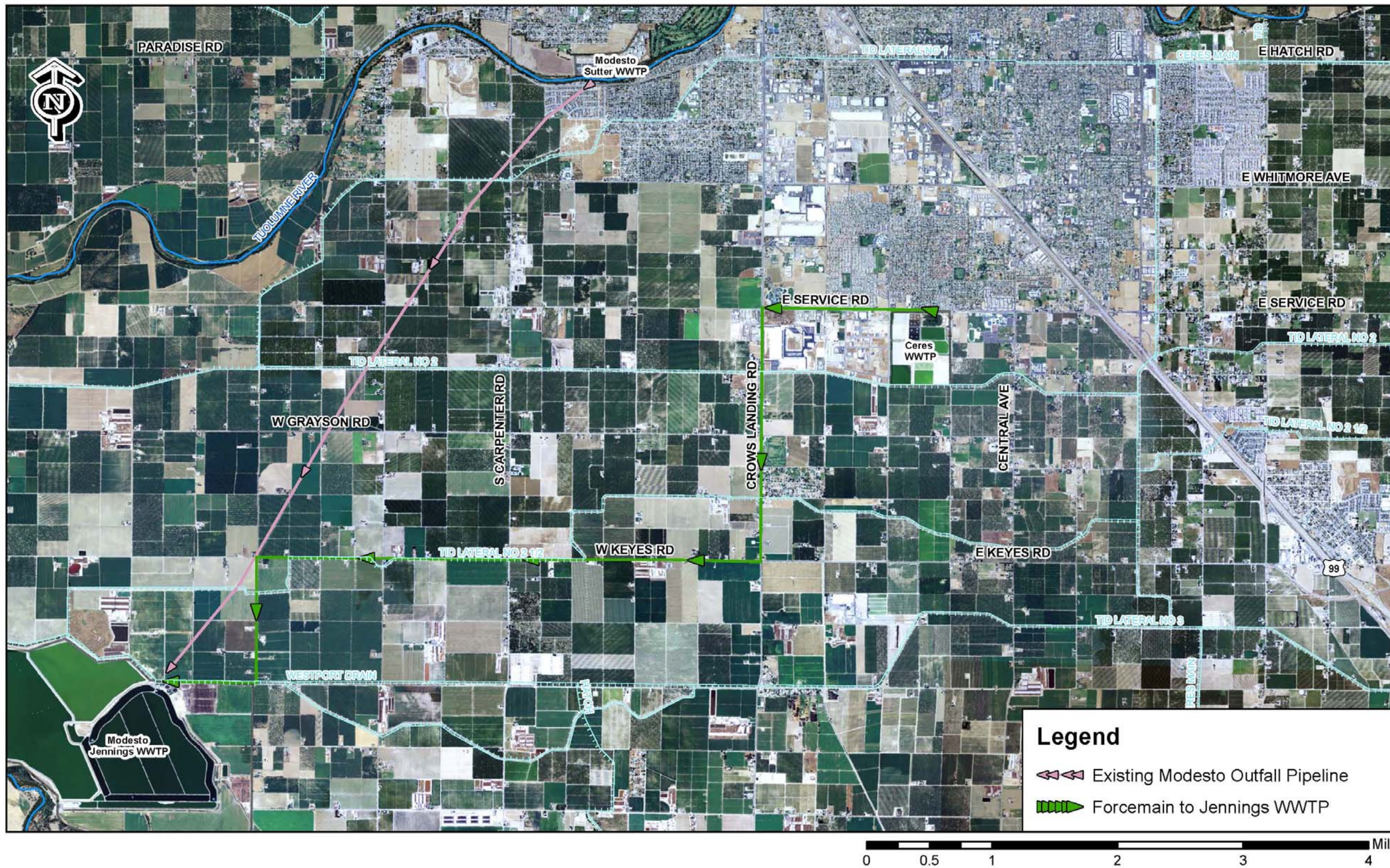

Figure 3-3
Possible Future Export Pipeline to Modesto

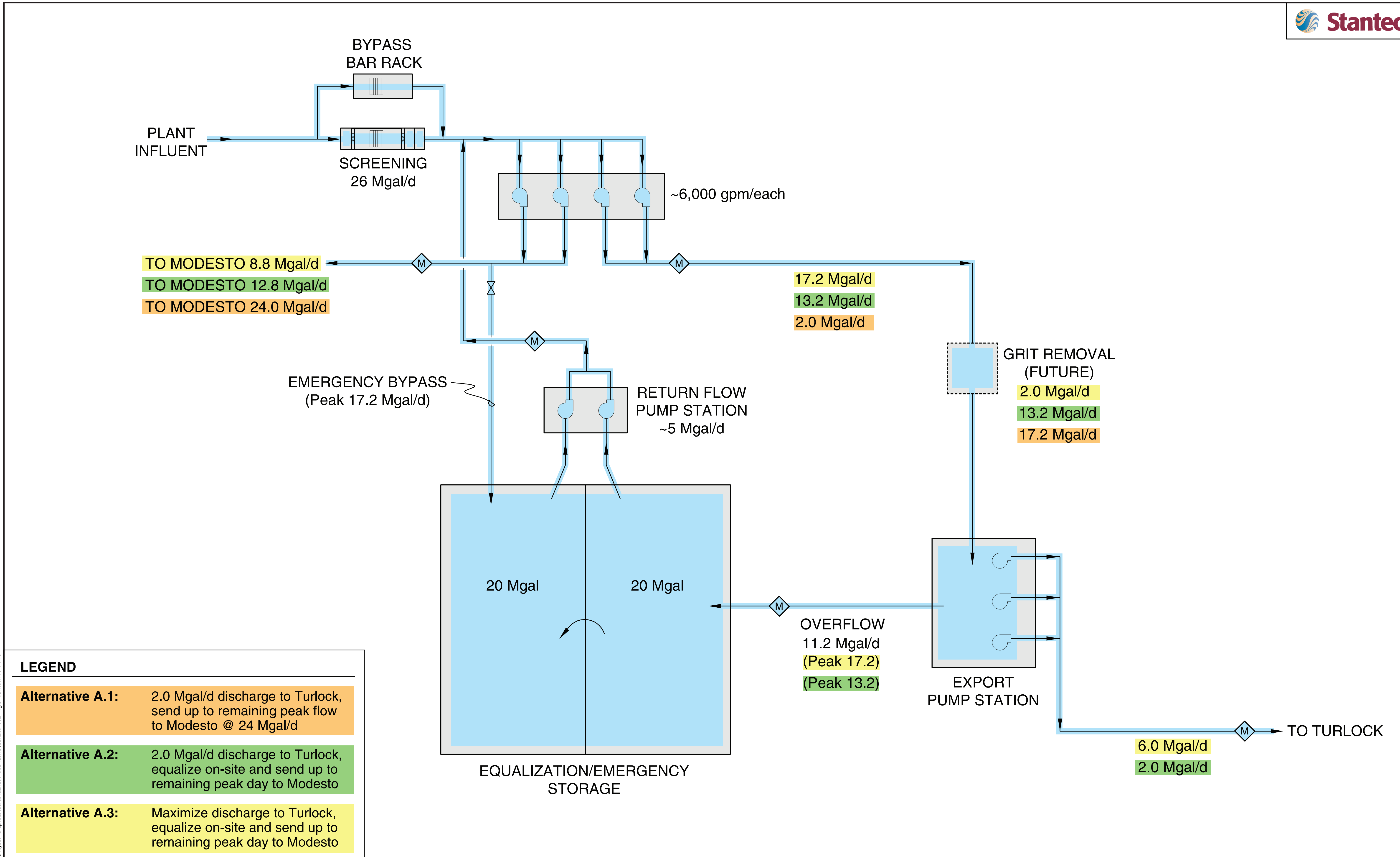

Figure 3-4
Conceptual Flow Diagram for Alternative A:
Increased Wastewater Export to City of Modesto

Alternative A1: Export up to Peak Influent Flow to Modesto Jennings WWTP

Alternative A1 maintains a constant pumping rate of 2.0 Mgal/d to Turlock and pumping all remaining flows up to the peak hour flow rate of 24 Mgal/d to Modesto through a new force main and parallel outfall to the Jennings WWTP. In addition to the common improvements listed above, this alternative would include the following components:

- At least two new pumps in the new headworks structure capable of pumping up to 24 Mgal/d into a new force main to the Modesto outfall pipelines.
- Approximately 48,300 ft of 36-in force main, with flow meter, junction structure, and other appurtenances, from the Ceres WWTP site to the Jennings WWTP site.
- New pumps in the new headworks structure to convey a constant flow rate of 2.0 Mgal/d to the existing Turlock export pump station.
- Grit removal (if needed) for the export to Turlock (due to pipeline length and siphons), and
- Additional site piping to convey flow from the headworks structure directly to the existing Turlock export pump station, with piping to connect to emergency storage.

Under this alternative, the City of Ceres would buy-in to the Modesto facilities for an average flow capacity of about 8.2 Mgal/d, with a peak flow requirement of up to 24 Mgal/d. Due to wastewater characteristics and flow and load variability, Modesto may have to provide additional flow equalization and additional preliminary treatment at the Jennings site. Based on information contained in Note (a) of Table 3 from the Regional Wastewater System Feasibility Study by EKI, dated 1 April 2011, the estimated cost to Ceres to buy-in to existing and future Modesto facilities at an average flow of 8.2 Mgal/d and a peak of 24 Mgal/d of essentially raw sewage is approximately $13,100,000 per Mgal/d, or $107,400,000, with approximately 13% attributable to current development as replacement capacity for the existing percolation disposal utilized by current development. The total capital cost for Alternative A1 is estimated to be approximately $141,000,000 as outlined in Tables A-2 and A-3 of Appendix C (excluding the additional cost for mixing and odor control if equalization is used).

Alternative A2: Export Equalized Flow to Modesto Jennings WWTP

Alternative A2 considers Ceres converting a portion of one of the existing reactor basins into flow equalization, maintaining a constant pumping rate of 2.0 Mgal/d to Turlock, and pumping all remaining future flows up to the peak day flow rate of 12.8 Mgal/d to Modesto through a new force main. In addition to the common improvements listed above, this alternative would include the following components:

- At least 2 new pumps in the new headworks structure capable of pumping up to 12.8 Mgal/d into a new force main to the Modesto outfall pipelines.
- Approximately 48,300 ft of 30-in force main, with flow meter, junction structure, and other appurtenances, from the Ceres WWTP site to the Jennings WWTP site.

- New pumps in the new headworks structure to convey a peak flow rate of up to 13.2 Mgal/d to the equalization storage and the existing Turlock export pump station.
- Approximately 2.0 Mgal of equalization with mixing.
- Grit removal (if needed) for the export to Turlock (due to pipeline length and siphons), and
- Additional site piping to convey flow from the headworks structure directly to the existing Turlock export pump station, with piping to connect to emergency and equalization storage.

Under this alternative, the City of Ceres would buy-in to the Modesto facilities for an average flow capacity of about 8.2 Mgal/d, with a peak flow requirement of up to 12.8 Mgal/d. Based on information contained in Note (a) of Table 3 from the Regional Wastewater System Feasibility Study by EKI, dated 1 April 2011, the estimated cost to Ceres to buy-in to existing and future Modesto facilities at an average flow of 8.2 Mgal/d and a peak of 12.8 Mgal/d of essentially raw sewage is approximately $13,100,000 per Mgal/d, or $107,400,000, with approximately 13% attributable to current development as replacement capacity for the existing percolation disposal utilized by current development. The total capital cost for Alternative A2 is estimated to be approximately $139,600,000 as outlined in Tables A-2 and A-4 of Appendix C (including the additional cost for mixing and odor control in equalization).

Alternative A3: Export Equalized Flow to Modesto and Turlock

Alternative A3 considers Ceres converting a portion of one of the existing reactor basins into flow equalization, increasing the constant pumping rate to Turlock to 6.0 Mgal/d, and pumping all remaining future flows up to the peak day flow rate of 8.8 Mgal/d to Modesto through a new force main. In addition to the common improvements listed above, this alternative would include the following components

- At least 2 new pumps in the new headworks structure capable of pumping up to 8.8 Mgal/d into a new force main to the Modesto outfall pipelines.
- Approximately 48,300 ft of 24-in force main, with flow meter, junction structure, and other appurtenances, from the Ceres WWTP site to the Jennings WWTP site.
- New pumps in the new headworks structure to convey a peak flow rate of up to 17.2 Mgal/d to the equalization storage and the existing Turlock export pump station.
- Approximately 2.0 Mgal of equalization with mixing.
- Grit removal (if needed) for the export to Turlock (due to pipeline length and siphons),
- New pumps in the Turlock export pump station to convey a constant flow rate of approximately 6.0 Mgal/d, and
- Additional site/plant piping to convey flow from the headworks structure directly to the existing Turlock export pump station, with piping to connect to emergency storage.

If additional flows are diverted to the City of Turlock (up to approximately 6.0 Mgal/d to maximize capabilities of the existing 18-in force main), then the average flow capacity required may be initially 1.7 Mgal/d until effluent disposal to the on-site percolation basins has to be discontinued. Depending on how equalization is used, the quality of the wastewater exported to Modesto and/or Turlock could also be equalized with respect to load and could initially be considered equivalent to primary effluent (e.g., settleable solids removed).

During equalization in the approximately 2.0 Mgal of equalization storage (segregated from the 40 Mgal of emergency storage, but likely constructed within the existing basin structures), the Ceres raw wastewater flow will be equalized and load components of BOD and TSS will also be equalized. The extent of this anticipated load equalization is not known and should be evaluated in the future based on additional Ceres wastewater characterization and specific alternatives for the basin design. Therefore the peak load and flow impact to the Modesto Jennings WWTP and Turlock RWQCF will be reduced. Specifically forecasting that reduction is beyond the scope of this Master Plan, however at buildout the quality of the wastewater exported to those facilities will likely more resemble raw wastewater with preliminary treatment (screening) than primary effluent. As a study conducted subsequent to this Master Plan, it is recommended that the City further evaluate anticipated reductions in flow and load based on a variety of equalization basin designs, and work with Modesto and Turlock to base the specific capacity charges with those agencies on the benefit gained from the level of equalization provided by the Ceres facilities.

Lacking additional detailed analysis of load equalization performance of proposed facilities and specific cost information from Modesto or Turlock, this Master Plan evaluation is based on the more conservative assumption that the Ceres wastewater will ultimately more resemble raw wastewater than primary effluent.

Under this alternative, the City of Ceres would buy-in to the Modesto facilities for an average flow capacity of about 4.2 Mgal/d, with a peak flow requirement of up to 8.8 Mgal/d, and purchase an additional 4.0 Mgal/d of equalized flow capacity from Turlock. Based on information contained in Note (a) of Table 3 from the Regional Wastewater System Feasibility Study by EKI, dated 1 April 2011, the estimated cost to Ceres to buy-in to existing and future Modesto facilities at an average flow of 4.2 Mgal/d of essentially raw sewage with a peak of 8.8 Mgal/d is approximately $13,100,000 per Mgal/d, or $55,000,000 and the cost for an additional 4.0 Mgal/d of equalized capacity at Turlock is $4,080,000 per Mgal[4] or $16,300,000. The total cost of treatment, storage, and disposal capacity in Modesto and Turlock is $71,300,000, with approximately 13% attributable to current development as replacement capacity for the existing percolation disposal utilized by current development. The total capital cost for Alternative A3 is estimated to be approximately $100,600,000 as outlined in Tables A-2 and A-5 of Appendix 3-A (including the additional cost for mixing and odor control in equalization).

3.4.3 Alternative B: Increased Wastewater Export to City of Turlock

This alternative consists of exporting all influent flow as raw or equalized wastewater or primary effluent from the existing Ceres plant to the City of Turlock Regional Wastewater Treatment Plant. This alternative is based on the successful collaboration of these two cities to date.

[4] City of Turlock Correspondence October 28, 2010, See Appendix E.

NCSSA would continue to discharge to the Modesto Sutter plant. This increases Ceres' pumping costs, but limits the number of export pipelines. As with Alternative A, Ceres could provide preliminary treatment possibly with equalization of its wastewater, which can be done at the existing Ceres plant site or elsewhere if needed. Figure 3-5 depicts a conceptual flow-diagram for this alternative based on the two sub-alternatives described below. Due to the pipeline length and ground elevations, this alternative must be based on a pump station/force-main combination. The following elements are common to each sub-alternative:

- New pumping in the planned new headworks structure to accommodate the flows as described by the sub-alternatives.
- Site piping to discharge directly to the existing (or expanded) Turlock export pump station,
- Grit removal for discharge to Turlock (if needed),
- Approximately 75,200 ft of parallel force main to Turlock RWQCF sized according to the flow requirements of the sub-alternative,
- Lining, access ramp, redwood baffle removal, and drain sump and return pumping improvements to existing treatment basis for use as equalization and/or emergency storage.
- Expanded export pump station and pumping as described under each sub-alternative.
- Piping modifications at the Turlock RWQCF as described by the City of Turlock (Appendix E).

Based on information from the City of Turlock, Alternative B would require additional expansion of the Turlock Regional Water Quality Control Facility (RWQCF) beyond the currently planned expansion to 20 Mgal/d. If the City of Ceres pursued Alternative B, additional planning studies would be necessary to better understand the cost and feasibility of expanding the Turlock facility to accommodate additional Ceres flows and loads beyond an approximately 6.0 Mgal/d average flow.

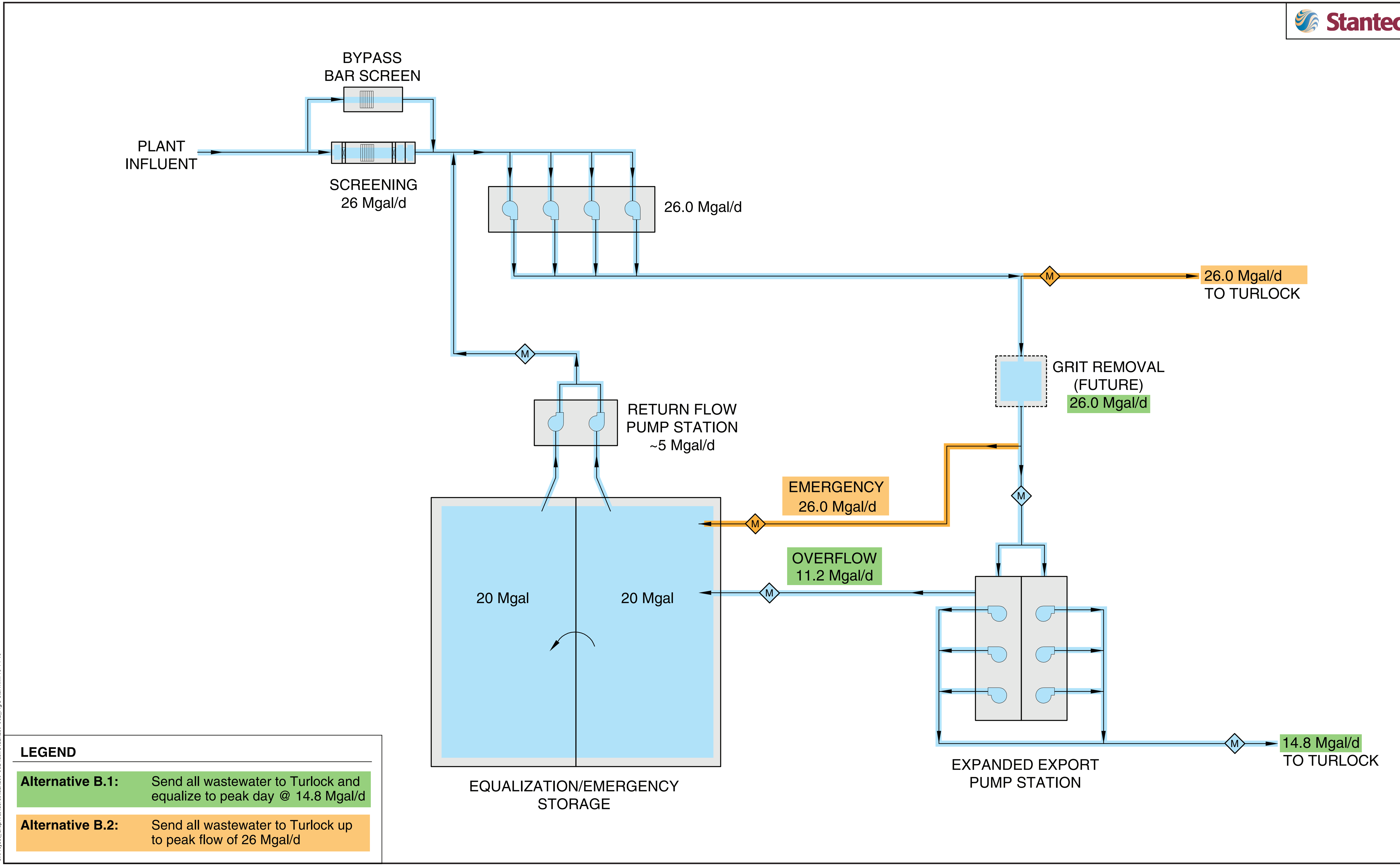

Figure 3-5
Conceptual Flow Diagram for Alternative B: Increased Wastewater Export to City of Turlock

Alternative B1: Export of Equalized Flow to Turlock RWQCF

Alternative B1 consists of increasing export of wastewater to the City of Turlock RWQCF based on discharging equalized raw wastewater through an expanded Export Pump Station and second parallel force main to the Turlock plant for final treatment and disposal. Ceres would discharge an average of 10.2 Mgal/d with an equalized peak of 14.8 Mgal/d after on-site disposal is discontinued. In addition to the common improvements listed above, this alternative would include the following components:

- Four new pumps in the new headworks structure capable of pumping up to 26 Mgal/d to on-site equalization.
- Pumping improvements to the existing export pump station structure to provide at least 7.4 Mgal/d pumping capacity (half the 14.8 Mgal/d peak capacity requirement).
- New export pump station structure adjacent to the existing structure with pumping equipment capable of at least 7.4 Mgal/d pumping (to complete the required 14.8 Mgal/d peak pumping capacity)
- Approximately 75,200 ft of 24-in parallel force main, with flow meter and other appurtenances, from the Ceres WWTP site to the Turlock RWQCF.
- Approximately 2.0 Mgal of equalization with mixing and odor control, and
- Additional site/plant piping to convey flow from the headworks structure directly to the existing Turlock export pump station, with piping to connect to emergency storage.

Under this alternative, the City of Ceres would buy-in to the Turlock facilities for an average flow capacity of about 10.2 Mgal/d (an additional 8.2 Mgal/d over current committed capacity), with a peak flow requirement of up to 14.8 Mgal/d. Assuming the average cost to Ceres to buy-in to existing and future Turlock facilities is similar the current rate for raw sewage of approximately $4,080,000 per Mgal/d for equivalent primary effluent, the total cost for 8.2 Mgal/d would be $33,500,000. Approximately 13% of the new capacity acquired from Turlock would be attributable to current development as replacement capacity for the existing utilized percolation disposal. The total capital cost for Alternative B1 is estimated to be approximately $73,800,000 as outlined in Tables A-2 and A-6 of Appendix C (including the additional cost for mixing and odor control in equalization).

Alternative B2: Export up to Peak Influent Flow to Turlock RWQCF

Alternative B2 consists of exporting all influent wastewater directly to the City of Turlock, providing only emergency storage on the existing Ceres WWTP site. Expanded export pump facilities would be required including expanding the export pump station and providing a second parallel force main to the Turlock plant for final treatment and disposal. Ceres would discharge an average of 10.2 Mgal/d with a peak of 26 Mgal/d based on projected peak-hour influent flows. In addition to the common improvements listed above, this alternative would include the following components:

- Four new pumps in the new headworks structure capable of pumping up to 26 Mgal/d to the expanded export pump station.
- Pumping improvements to the existing export pump station structure to provide at least 13 Mgal/d pumping capacity (half of the 26 Mgal/d peak capacity requirement).
- New export pump station structure adjacent to the existing structure with pumping equipment capable of at least 13 Mgal/d pumping (to complete the required 26 Mgal/d peak pumping capacity)
- Approximately 75,200 ft of 30-in parallel force main, with flow meter and other appurtenances, from the Ceres WWTP site to the Turlock RWQCF, and
- Additional site/plant piping to convey flow from the headworks structure directly to the existing Turlock export pump station, with piping to connect to emergency storage.

As with Alternative B1, the City of Ceres would buy-in to the Turlock facilities for an average flow capacity of about 10.2 Mgal/d (an additional 8.2 Mgal/d over current committed capacity), with a peak flow requirement of up to 26 Mgal/d. Due to wastewater characteristics and flow and load variability, Turlock may have to provide flow equalization. Assuming the average cost to Ceres to buy-in to existing and future Turlock facilities is similar the current rate of approximately $4,080,000 per Mgal/d of raw wastewater, the total cost for 8.2 Mgal/d would be $33,500,000. Approximately 13% of the new capacity acquired from Turlock would be attributable to current development as replacement capacity for the existing utilized percolation disposal. The total capital cost for Alternative B1 is estimated to be approximately $72,400,000 as outlined in Tables A-2 and A-7 of Appendix C.

3.4.4 ALTERNATIVE C: CERES PRODUCTION, STORAGE, AND CONVEYANCE OF TERTIARY EFFLUENT

As an alternative to Ceres expanding via export to Modesto and/or Turlock, this alternative considers the likely facilities requirements and costs for the City of Ceres to produce tertiary effluent consistent with the requirements of California Title 22 for unrestricted recycled use. This alternative is based on the assumption that effluent reuse opportunities will exist as part of a regional recycled use project (e.g., the North Valley Regional Recycled Water Project currently being considered by the Cities of Modesto and Turlock to deliver recycled water to the Del Puerto Water District for irrigation purposes). A current limitation to assessing the feasibility of this alternative, compared to Alternatives A and B, is the limited information available regarding recycled water use opportunities, facilities needs and costs, and use management requirements to meet current nutrient and salt management plan elements (an important 2009 Recycled Water Policy requirement). Therefore, this alternative is assessed based on the anticipated facilities requirements and costs directly attributable to Ceres to produce, store, and convey Title 22 tertiary effluent to the City of Modesto Jennings WWTP site (assumed distribution site for any regional recycled water project). It is assumed that existing Ceres WWTP land will be used to the extent available for required facilities, and that additional land for storage will be acquired near Ceres facilities. It is possible that additional effluent conveyance costs and use area improvements costs could be incurred by the City for this alternative, which should be studied in the context of an overall program if this initial feasibility assessment or future conditions indicate it as being potentially viable.

Figure 3-6 depicts a conceptual flow diagram for Alternative C based on the oxidation ditch process followed by tertiary filtration and ultra-violet disinfection (which has been found to be a cost-effective process train for facilities in the 8 to 10 Mgal/d capacity range). If the City considers pursuing this alternative, other process trains could be considered based on overall life-cycle costs, regulatory and permit requirements, and Ceres-specific wastewater characteristics. Figure 3-7 presents a preliminary site layout based on the following process elements and capacity:

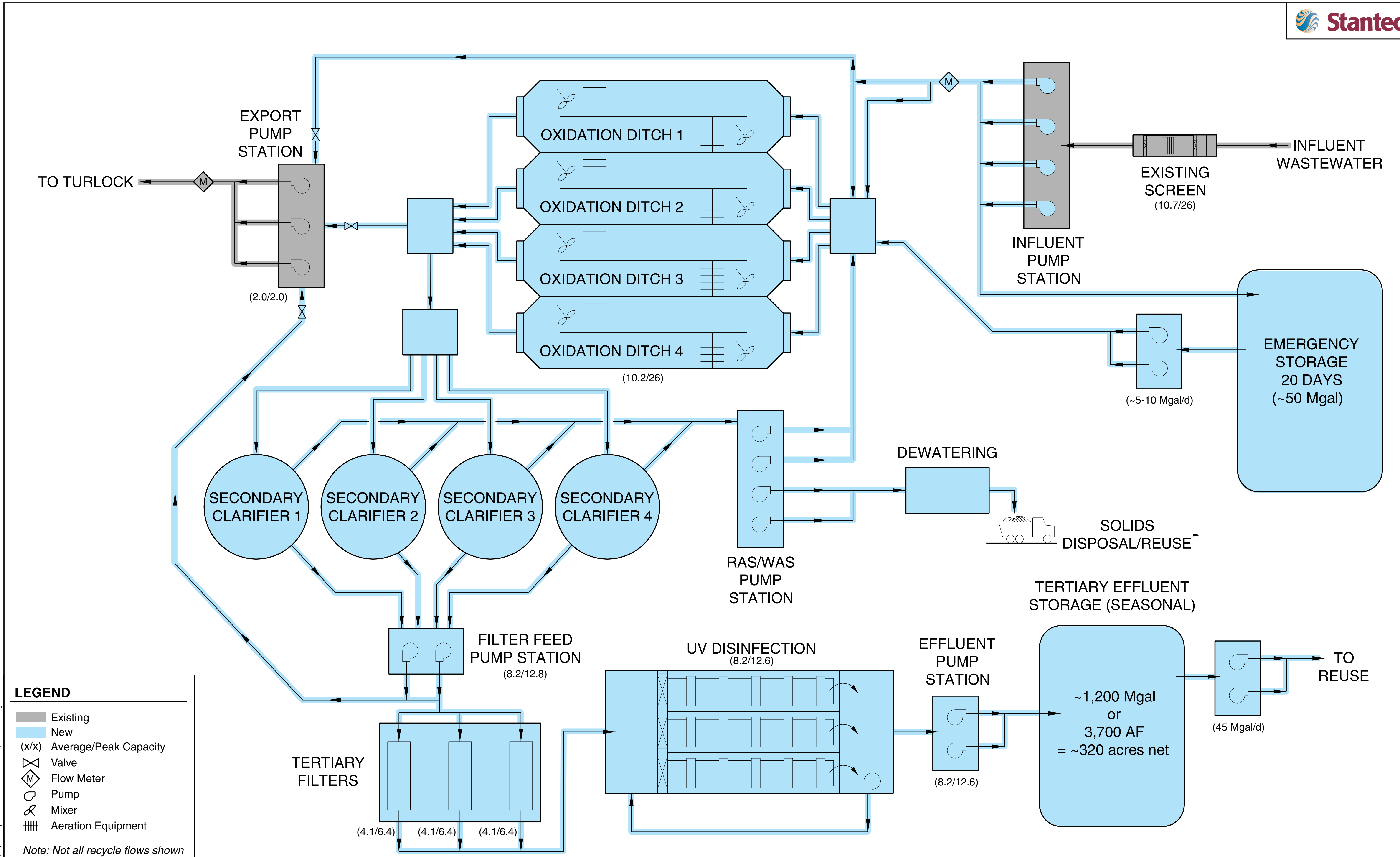

Figure 3-6

Conceptual Flow Diagram for Alternative C: Ceres Production, Storage, and Conveyance of Tertiary Effluent

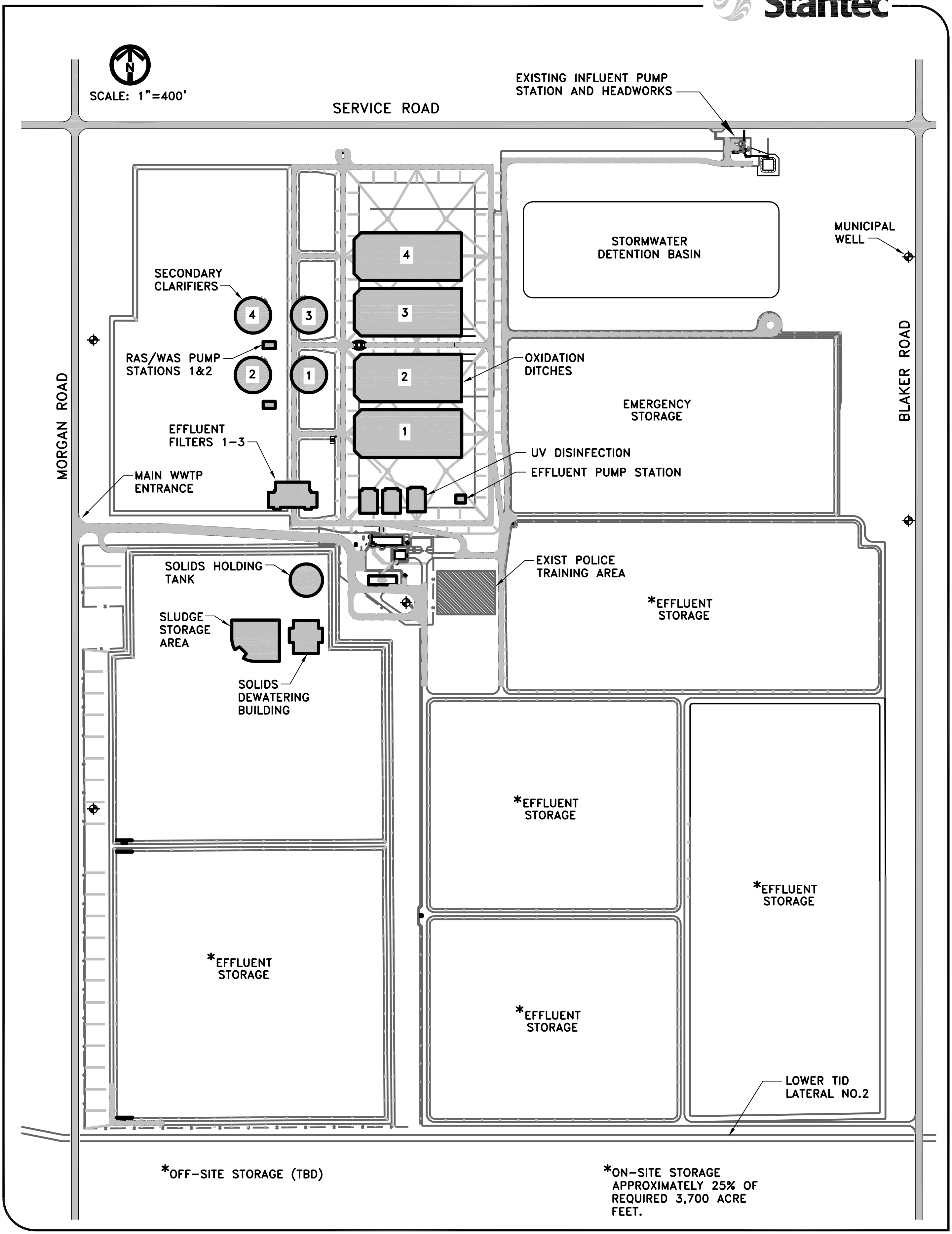

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FIGURE 3-7 CONCEPTUAL SITE LAYOUT FOR ALTERNATIVE C: CERES PRODUCTION, STORAGE, AND CONVEYANCE OF TERTIARY EFFLUENT

Influent Pumping and Preliminary Treatment: Screening and pumping of the influent wastewater would be provided by the planned new headworks and influent pump station with new pumping equipment and motor control center provided to accommodate the peak influent flow requirement of 26 Mgal/d.

Grit Removal (Optional): Grit removal could be considered depending on the down-stream facilities. Under the conceptual process shown in Figure 3-5 grit removal is not included. Grit would be removed through the extended-aeration secondary process with the waste-activated sludge. Facilities preliminary design might indicate that grit removal could have cost savings advantages.

Grit removal, like other preliminary treatment unit processes, is primarily employed for the purpose of "removing problem wastewater characteristics that could other-wise impeded operation or unduly increase maintenance of downstream process equipment."[5] As such, grit removal could be considered, as with many process alternatives, during preliminary design of facilities if Ceres elects to pursue Alternative C. In this case, the consideration for grit removal would include a cost evaluation for such a unit process compared with the estimated cost reduction associated with reduced maintenance of downstream equipment. In a system that does not have a grit removal unit process or primary treatment (which will also remove grit), grit will primarily be removed through the settling process in the secondary clarifier.

Emergency Storage: Section 60341 et. seq. of Title 22 contains requirements for treatment system reliability and/or emergency storage. Generally, the reliability requirements of Title 22 allow for standby unit processes with short-term (24 hour) emergency storage, e.g., standby primary, secondary, tertiary, and disinfection facilities, or provisions for long-term storage. Generally, for smaller facilities, long-term storage is more cost-effective than providing full redundancy in unit processes with short-term storage. This conceptual project is based on providing the Title 22 long-term storage alternative of 20-days based on ultimately four treatment trains (e.g., average ADWF treatment capacity of approximately 2.5 Mgal/d each train), or approximately 50 Mgal of emergency storage at the future flow of 10.2 Mgal/d and four treatment trains. Note that the required emergency storage volume will go down the more treatment trains are used. Emergency storage facilities will require return pumping, which have been planned with a capacity from 2 to 5 Mgal/d.

Biological/Secondary Treatment: Numerous secondary or biological treatment processes are suitable for the Ceres treatment facility at an average flow requirement of 8.2 to 10.2 Mgal/d, including conventional extended aeration activated sludge, oxidation ditch, or membrane bio-reactor processes (which includes tertiary filtration integral to the biological process). The flow capacity of 8.2 to 10.2 will depend on whether the 2.0 Mgal/d discharge to Turlock (assumed to continue) must be raw wastewater or can be secondary effluent. The conceptual facilities are based on an oxidation ditch process with conventional secondary clarifiers and a return and waste activated sludge pumping facility. This conceptual system is based on four treatment trains, though more could be considered based on phasing and initial cost considerations. If influent

[5] Design of Municipal Wastewater Treatment Plants, Volume I, WEF Manual of Practice No. 8, Water Environment Federation and American Society of Civil Engineers, 1991, Page 389.

raw wastewater is not bypassed around these facilities to the Export Pump Station, the anticipated future capacity requirements are 10.2 Mgal/d average with a peak day of 14.8 Mgal/d.

Tertiary Filtration Facilities: As with the secondary or biological process, tertiary filtration can be achieved with a variety of approved processes including; conventional mono, dual, or mixed media gravity or pressure filters, approved membrane filter processes (micro-, ultra-, nano-, or reverse-osmosis filtration), or other approved filters such as cloth filters. For recycled water use on crop irrigation, continuous backwash filter systems have been proven to be cost-effective compliance systems. The conceptual facilities are based on providing four continuous backwash filter units, with a fifth standby unit, with a nominal average dry weather capacity of approximately 2.0 Mgal/d each, capable of providing a combined peak capacity of 12.8 Mgal/d. The tertiary filtration system would be fed through a secondary effluent or filter feed pump system with a peak capacity of 12.8 Mgal/d.

Disinfection: Title 22 allows for disinfection utilizing chlorine meeting the prescribed residual chlorine concentration and modal contact time or through alternative means demonstrated to achieve a 5-log inactivation or removal of MS2 bacteriophage or polio virus. Due to potential effluent salinity concerns, disinfection utilizing ultraviolet radiation (UV) is presented in the conceptual facilities in lieu of chlorine, however other disinfection processes could be considered in the future such as combined ozone/UV. The conceptual disinfection facilities is based on four duty UV disinfection channels with a standby channel designed to accommodate an ADWF of 2.0 Mgal/d and a peak day flow of 3.2 Mgal/d each.

Solids Dewatering and Disposal: Solids will be generated from the biological process and from tertiary filtration. The proposed dewatering facilities would be a mechanical dewatering process such as a belt filter press or centrifuge process. Other solids streams would be diverted to the solids dewatering facilities such as scum. Solids dewatering is envisioned as an on-site process within an enclosed building with active odor control and chemical addition/conditioning as required. Solids disposal will occur off site at a nearby landfill, biomass electricity generation facility, or through additional treatment and disposal at a biosolids reuse facility.

Effluent Pumping: Final disinfected effluent would be pumped to seasonal storage prior to ultimate reuse. Effluent pumping facilities would have a peak flow capacity of 12.8 Mgal/d and force-main piping to effluent storage facilities.

Effluent Storage and Conveyance Facilities: After treatment, tertiary effluent will most likely have to be stored during the wet winter months. Recycling requires large storage facilities to retain the effluent and incident precipitation generated during the wet season, since irrigation disposal is generally limited to the dry season. Utilizing local crop irrigation water use assumptions and the Regional Board 1-in-100 year annual precipitation storm criteria, a reconnaissance crop irrigation water balance for an average flow of 8.2 Mgal/d was developed and is contained in Appendix D. Based on these preliminary calculations, approximately 2,000 acres of net irrigable area would be required to recycle all effluent during a wet winter year, with approximately 1,200 Mgal (or about 3,700 acre-feet) of seasonal storage. Considering typical recycled water use set-back requirements (even for tertiary disinfected effluent), land irregularity, and access roads etc., total irrigation land requirements is anticipated to exceed approximately 2,600 acres. Under a wet winter scenario, recycled water use is likely to be restricted to the months of April through October, when crop evapotranspiration exceeds precipitation. Therefore, effluent storage and conveyance facilities are anticipated to consist of the following elements (with connection to a regional recycled water system with at least 2,600 acres available for Ceres flows):

- 3,700 acre-feet of lined effluent storage (requiring approximately 490 acres of land[6]).
- Recycled water pumping with a capacity of approximately 45 Mgal/d (to meet the peak recycled use demand period in July), and
- Approximately 42,000 ft of 60-in gravity conveyance to the Modesto Jennings WWTP site.

Figure 3-8 shows areas that might be considered for effluent storage near the existing WWTP site. Actual land area required for effluent storage will depend on the most economical storage basin depth, required setbacks to property lines, and setback requirements to domestic and municipal water supply wells, minimum of 500 ft for municipal wells.

It may be possible to convert the City’s current reactor basins into aeration basins for an activated sludge process, and if the City considers implementing Alternative C, this should be evaluated for potential costs savings vs. process reliability. The additional monitoring recommended in Chapter1 should assist with such an assessment, by further characterizing influent wastewater characteristics and the potential treatment capabilities of these existing basins. However, it is recommended that planning costs be based on a more conventional treatment process appropriate for this size facility such as the oxidation ditch.

Planning level capital costs for Alternative C total approximately $199,300,000 including treatment, storage, and conveyance facilities as outlined in Table A-8 of Appendix C. Capital cost for any improvements to reclamation land required to meet recycled water use regulations has been excluded from this cost, as it is assumed that recycled water end-user would be responsible for such capital costs.

[6] Based on a storage land use factor of 65% considering likely required potable well setbacks.

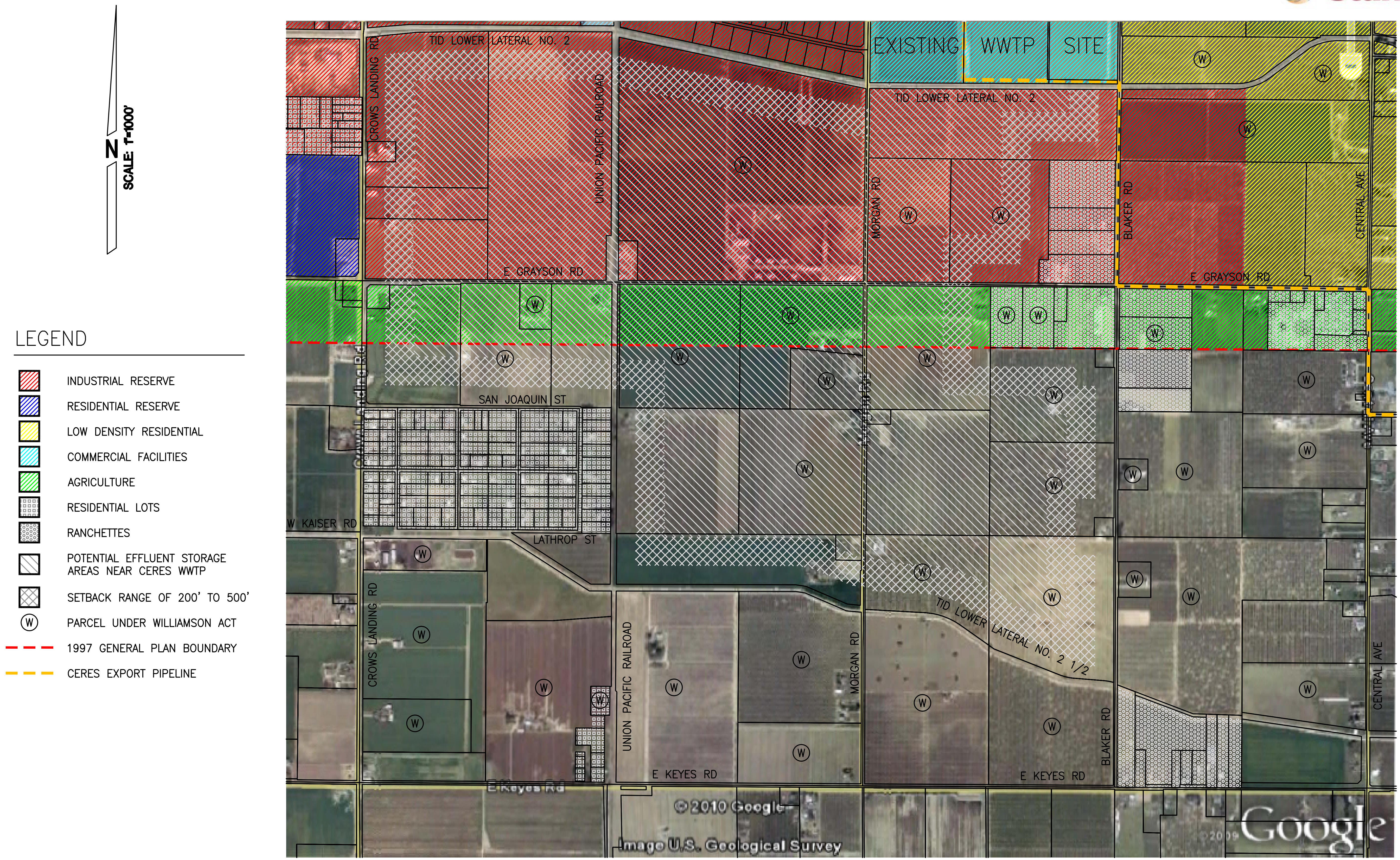

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Figure 3-8
Area of Potential Effluent Storage Near Ceres WWTP

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3.5 FACILITIES RECOMMENDATIONS AND PHASING

Table 3-6 summarizes the estimated total capital cost (as presented above) for each alternative with estimated annual operation and maintenance costs.

3.5.1 RECOMMENDED LONG-RANGE PLAN FOR WASTEWATER TREATMENT AND DISPOSAL

As a means to compare the six alternatives, Table 3-6 includes the estimated 30-year net-present-value of total capital cost and operation, maintenance, and facilities replacement. The net-present-value of operation and maintenance is based on 30-years with a net discount rate of 2.7%. Facilities replacement cost is based on a 40-year facility life and straight-line depreciation. Based on the net present value of capital, O&M, and replacement, the two apparent lowest net-present value alternatives are:

- Alternative A2: Export Equalized Flow to Modesto Jennings WWTP, and
- Alternative A3: Export Equalized Flow to Modesto and Turlock.

The apparent cost difference between these two is about $1,400,000, or about 0.5%.

The two lowest capital cost alternatives are:

- Alternative B1: Export of Equalized Flow to Turlock RWQCF, and
- Alternative B2: Export up to Peak Influent Flow to Turlock RWQCF.

The lower capital cost of these alternatives is primarily due to the lower assumed average buy-in cost to Ceres for future capacity at the Turlock RWQCF. The apparent cost difference between these two is about $1,300,000 or about 1%.

Considering other factors such as:

- Redundancy and reliability,
- Flexibility for future expansions,
- Flexibility in responding to changes in permit conditions and operating costs, and
- Ability to negotiate a competitive purchase price for capacity between Turlock and Modesto, and
- Uncertainty in future buy-in costs to Modesto or Turlock facilities,

The alternative of expanding export of equalized flow to both Modesto and Turlock (Alternative A3) is the recommended long-range plan for Ceres wastewater treatment and disposal.

Table 3-6
Total Capital Cost and Net-Present Value Comparison of Alternatives ($M)*

Component	Alternative A1	Alternative A2	Alternative A3	Alternative B1	Alternative B2	Alternative C
Ceres Improvements	$33.6	$32.1	$29.3	$40.3	$39.0	$199.2
Buy-in to Modesto	$107.4	$107.4	$55.0	$0	$0	$0
Buy-in to Turlock	$0	$0	$16.3	$33.5	$33.4	$0
Total Capital Cost	$141.0	$139.5	$100.6	$73.8	$72.4	$199.2
Estimated Annual O&M	$7.0	$6.7	$8.6	$11.5	$11.5	$14.2
Net-Present Value Capital and O&M	$282	$277	$276	$309	$307	$488

* See of A-1 of Appendix C for detail.

3.5.2 TRIGGERS FOR IMPLEMENTING THE RECOMMENDED LONG-RANGE PLAN

Five events have been identified that would trigger facilities improvements or expansion under the recommended long-range plan. These events and the resultant improvements are listed below and a phased cost summary is contained in Table 3-7 and are shown graphically in Figure 3-9 with relation to limiting plant capacity. Phased improvements are related to implementing Alternative A3 - Export Equalized Flow to Modesto and Turlock.

Phase 1: Prior to the Peak Influent Flow Exceeding 6.3 Mgal/d

- The existing influent pump station capacity is limited to the reliable pumping capacity of approximately 6.3 Mgal/d (based on one of the existing four pumps being off-line). At the point where monitored peak hour flows are recorded to approach or exceed 6.3 Mgal/d, the City should increase the influent pumping capacity by installing the first set of larger pumps, presumably the two pumps ultimately needed for the discharge to Modesto at 8.8 Mgal/d each. Table 3-7 and Figure 3-9 assume that Phase 1 will occur at an average flow of about 3.4 Mgal/d.

Phase 2: Prior to the Average Influent Flow Exceeding 4.5 Mgal/d or if On-site Disposal Must be Discontinued

- Construct bypass piping around treatment ponds to the existing Turlock export pump station (note, this may require modifications or improvements to influent pumping to accommodate the new head and flow conditions),
- Increase export pump station capacity to the maximum projected 6.0 Mgal/d,
- Purchase Turlock capacity based on funds availability and most-cost effective capacity increment in Turlock facilities,

This phase assumes that the 2.5 Mgal/d on-site disposal continues and that these on-site facilities provide emergency discharge and/or storage as needed to address pumping or force main maintenance and repair. As part of Phase 2, or subsequent based on increasing influent flows, the remaining influent pump station pumps can be replaced with the ultimate 17.2 Mgal/d pumps to equalization and the Turlock Export Pump Station.

Phase 3: After Phase 2 Based on Flow and When On-site Disposal Must be Discontinued

- Construct force main, junction structure, and parallel outfall to Modesto once the maximum capacity (6.0 Mgal/d.) been purchased for Turlock has been utilized,
- Modify influent pumping arrangement to accommodate export to Modesto,
- Purchase Modesto capacity based on funds availability and most-cost effective capacity increment in Modesto facilities (assumed at first 1.0 Mgal/d increment), and
- Convert existing treatment reactors to equalization and emergency storage,

Phase 4: Prior to the Average Influent Flow Exceeding Combined Turlock and Modesto Capacity

Depending on the capacity increments purchased under Phase 2 and Phase 3, Phase 4 would be triggered based on average influent flows as they approach the combined limit of capacity from both Turlock and Modesto. The additional capacity purchased from Turlock and/or Modesto may be based on available Ceres funds and the most cost-effective capacity increment at that time. Table 3-7 assumes that the combined Phase 2 and Phase 3 capacity is 7.0 Mgal/d, with 6.0 Mgal/d of capacity in Turlock and 1.0 Mgal/d in Modesto.

Phase 5: Purchase Remaining Capacity in Modesto

Depending on the capacity increments purchased under Phases 2 through 4, Phase 5 would be triggered based on average influent flows as they approach the combined limit of capacity from both Turlock and Modesto. The additional capacity purchased from Turlock and/or Modesto may be based on available Ceres funds and the most cost-effective capacity increment at that time. Table 3-7 assumes that the combined Phase 2 through 4 capacity is 8.0 Mgal/d, with 6.0 Mgal/d of capacity in Turlock and 2.0 Mgal/d in Modesto, therefore Phase 5 would be based on purchasing 2.2 Mgal/d of capacity in Modesto as the last element.

Grit Removal for Turlock Discharge

This phase will be triggered based on the City’s operation and maintenance experience with the 75,200 ft force main and the results of the pond treatment, and/or as required by Turlock due to down-stream process requirements. If evidence arises to require grit removal, e.g., observed grit accumulation in force main crossings under TID canals, then this would be provided prior to equalization.

Table 3-7
Phased Capital Cost of Recommended Long-Range Plan

Phase	Flow Trigger (Average, Mgal/d)	Phase Capital Cost ($M)	Cumulative Capital Cost ($M)
1 – Increase Influent Pumping Capacity	3.4 [(a)]	$0.9	$0.9
2 – Purchase 4.0 Mgal/d from Turlock	4.5	$20.1	$21.0
3 – First phase of Export to Modesto (1.0 Mgal/d)	6.0	$35.1	$56.1
4 – Second Phase of Export to Modesto (2.0 Mgal/d)	7.0	$13.1	$69.2
5 – Last Phase of Export to Modesto (4.2 Mgal/d)	8.0	$28.8	$98.0
Grit Removal	When Needed	$2.6	$100.6

(a) Assumed average flow trigger for increasing existing peak pumping capacity.

3.5.3 COMMENTS ON CAPACITY CHARGE REVENUES AND CAPITAL IMPROVEMENT PHASING

The Alternative A3 improvements are anticipated to benefit about 27,500 future EDUs in the Ceres Sewer Service Area (CSSA). With a total capital cost of $100.6 million for new facilities and a capacity buy-in cost for replacing treatment and disposal capacity for existing users of approximately $9,300,000 (at 13% of the total cost of new capacity associated with replacing approximately 1.07 Mgal/d of existing flow displaced upon loss of the total of 2.5 Mgal/d of on-site disposal capacity), the average cost per EDU for future wastewater treatment and disposal facilities is approximately $3,400 (2010 cost basis) for expanded wastewater treatment and disposal and associated facilities. Actual cost per EDU will depend significantly on the actual costs from Turlock and Modesto, as well as the actual cost of facilities as they are phased and constructed. An important element of facilities phasing and financing is that they must be constructed and operational prior to connection of future EDUs, therefore there is a lag in revenue meeting expenses if connection fees are the only source used to construct future facilities. Figure 3-10 depicts this revenue lag if capital revenues for facilities expansion are limited to only this average cost per EDU.

In order to allow for facilities to be constructed in an orderly fashion prior to their need, the City should consider the following strategies:

- Be sure to include the cost of remaining capacity in existing facilities in the calculation of any future connection charges or facilities fees.
- Utilize up-front developer contributions, typically in the form of a development agreement, for the financing and/or construction of improvements needed.

- Utilize reimbursement agreements, when possible or feasible, to allow for construction of facilities phases in cost-effective capacity increments in anticipation of future development.

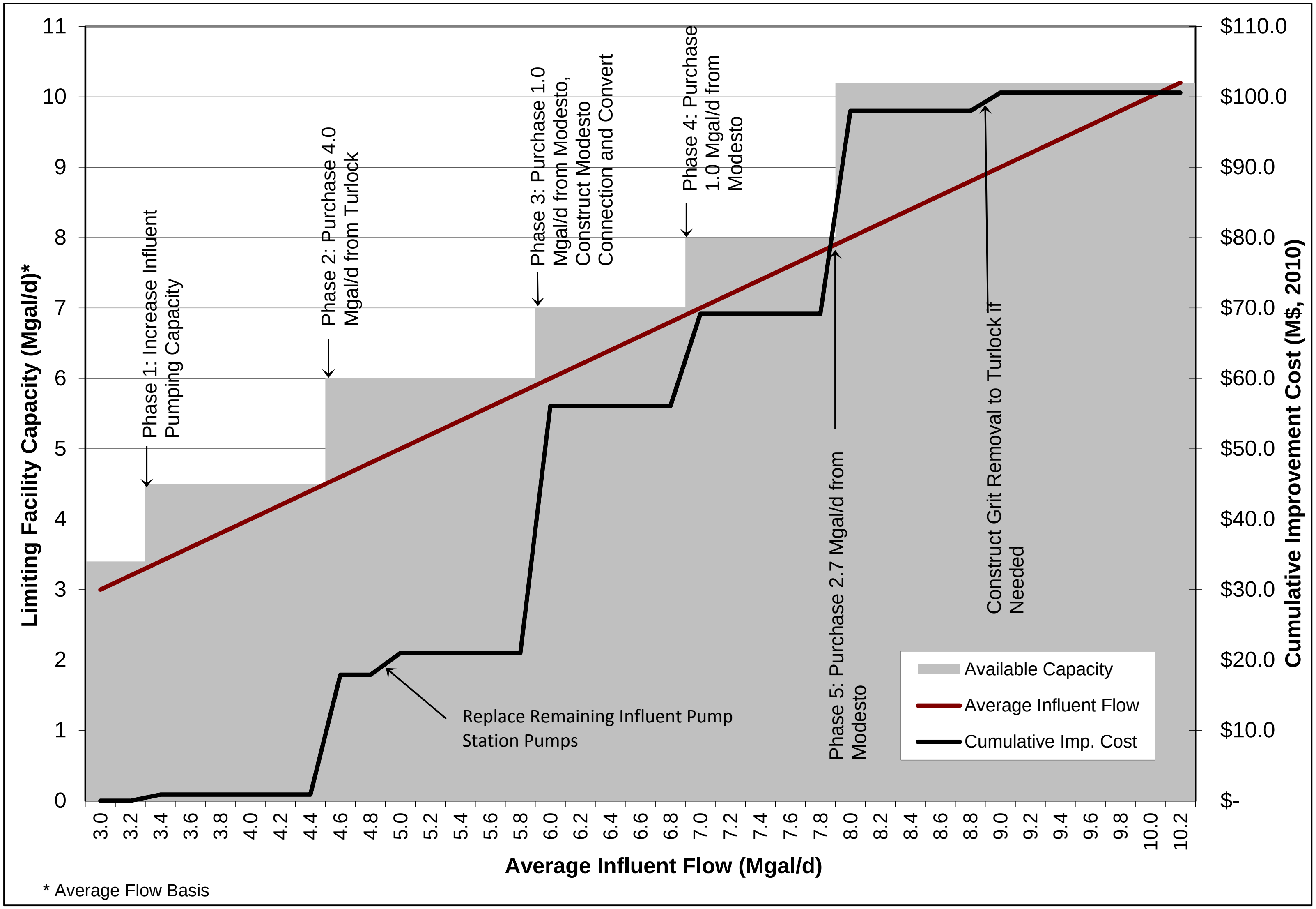

Figure 3-9
Phasing of Improvements and Capacity

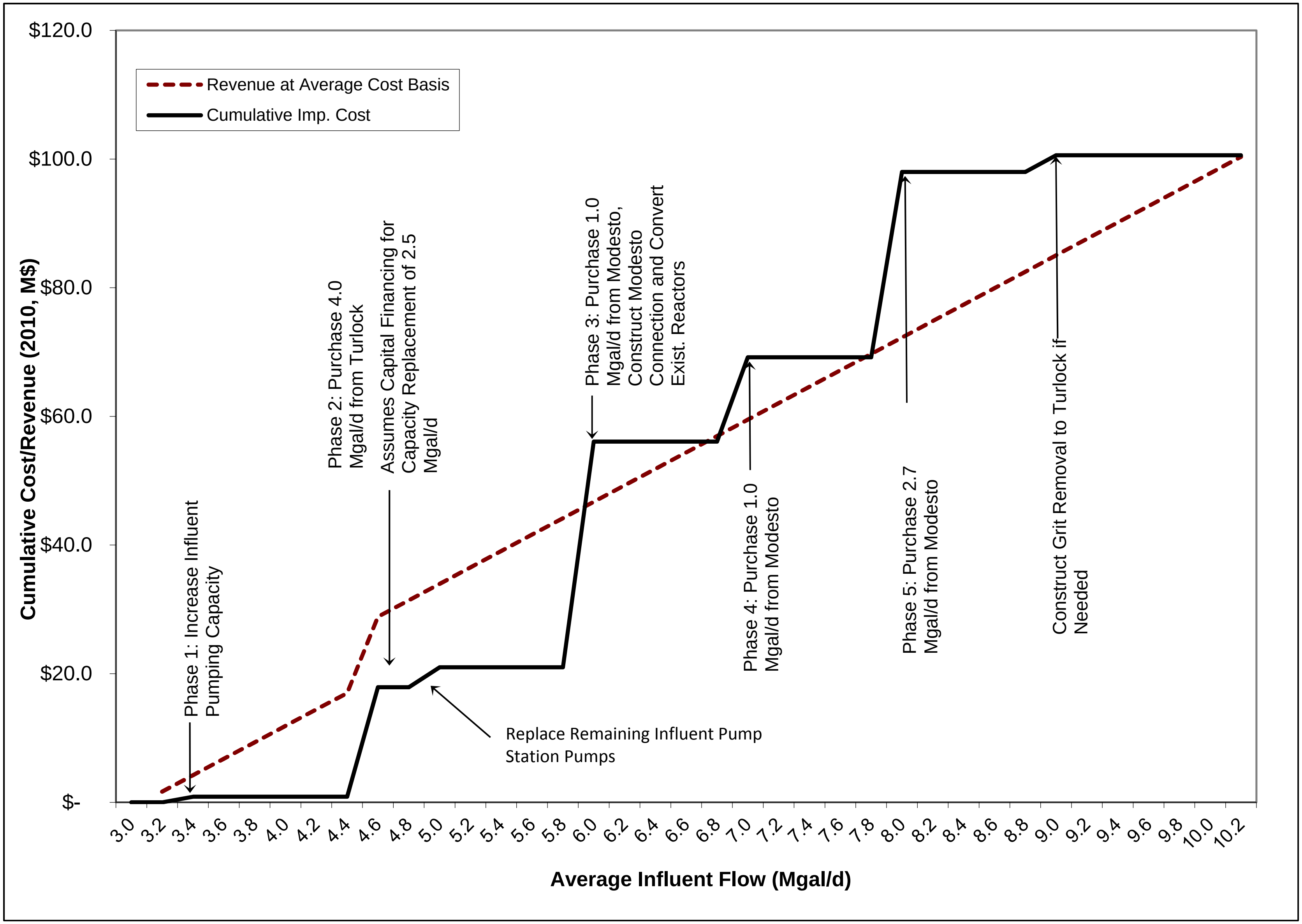

Figure 3-10
Projected Improvements Cost and Cumulative Revenues

City of Ceres Sewer System Master Plan
Chapter 4

Collection System Facilities

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Reviewed By: Neal Colwell, P.E.

4.1 PURPOSE

This chapter summarizes the collection system expansion program. Included in this document is a summary of the preferred alignments considered for future expansion to serve future growth areas identified in the City of Ceres Sewer System Master Plan Chapter 2 – Future Land Use and Flow and Load Projections by Stantec formerly ECO:LOGIC Engineering. Also included are the phasing of the improvements, discussion of alternative alignments, and opinions of probable cost of the identified improvements.

4.2 METHODOLOGY

Engineering planning of the future expansion of the Ceres Sewer System has been approached with an attempt to minimize the need for pumping wastewater, instead opting for the alternative of conveying flows through gravity trunk sewers whenever possible. Use of gravity trunk sewers is preferred to a system of shallow sewers with numerous lift stations. While deeper gravity sewers may require a higher initial capital cost, when properly designed, constructed, and maintained, they provide a greater level of reliability and flexibility. Also, the City strives to reduce the annual operation and maintenance cost of the sewer system, which tends to be higher with more lift stations (as a result of power costs, more frequent replacement of mechanical and electrical equipment, and a higher demand on staff for preventative maintenance). For this program, sewers up to a maximum of twenty to twenty five feet deep are considered at the upper end of cost feasibility for gravity sewers, due to higher costs from trenching, dewatering, and shoring for deeper installations.

The analysis relies on a USGS quad map of the City of Ceres, City GIS showing existing manhole invert and rim elevations, and some topographic survey data of key constraints.

Given the location of the existing wastewater treatment plant (WWTP), existing sewer elevations, and regional trends in ground elevations, several growth areas will require conveyance of wastewater through future lift stations. Wastewater from the future southern growth areas cannot be conveyed by gravity to the WWTP since the general topography of the City falls from northeast to southwest and the WWTP is in the southern portion of the City.

Future sewer system improvements are planned using current City Standard Specifications including the minimum velocity of flow of 2.0 feet per second and Manning's "n" of 0.012. The minimum pipe slope for planned gravity sewer trunks is consistent with the minimum slopes prescribed in the City of Ceres Standards, which lists a minimum slope up to an 18-inch trunk line. The minimum slope of lines larger than 18-inches was calculated using Manning's Equation with the same criteria given previously. All trunk lines were planned using minimum slopes. The maximum capacity of each trunk line was determined using Manning's Equation. Capital improvements are based on sizing facilities to accommodate projected flows at gravity sewers to be no more than 70% of full depth under peak design flow conditions. All peak flow rates were determined using the land use designations from the 1997 General Plan and the Peak Flow equation from the City of Ceres Sewer System Master Plan Chapter 2 – Future Land Use and Flow and Load Projections.

Each alternative concept developed in this master plan will require further pre-design and detailed design based on the results of field surveys of the proposed alignments and incorporating project specific requirements including constructability and possible major utility conflicts, and actual locations and timing of future development. Figure 4-1 depicts the proposed future sewer system improvements to extend service to the primary future growth areas within the study boundary. Figure 4-2 depicts the potential future service areas in the northern part of the study area.

4.3 SUMMARY

The expansion of the existing sewer system to serve future growth areas can be achieved by using available capacity in existing facilities, adding new sewer trunk lines, new lift stations and diverting flow from existing over-capacity lines into new sewer trunk lines. The phasing of the expansion is dependent on the location and timing of future development within future City growth areas. Existing sewer trunk lines have a limited capacity to convey existing peak flows, including infill development and build-out expansion of the sewer system. It will be necessary to construct new sewer trunk lines to serve future growth areas; and these trunk lines will be directed toward the current WWTP site.

4.4 EXISTING DEVELOPMENT & BUILD-OUT WITHIN EXISTING CERES SEWER SERVICE AREA

Future development within the existing Ceres Sewer Service Area (CSSA) will consist primarily of infill development of existing vacant parcels and limited changes of existing land use. This infill development is identified as Phase I in Chapter 2 and covers approximately 4,082 acres of differing land use as detailed in Table 2-1 of Chapter 2. Average dry-weather flow is predicted to increase by approximately 0.62 Mgal/d (or by approximately 20% over current flows) to the Ceres WWTP and by 0.11 Mgal/d

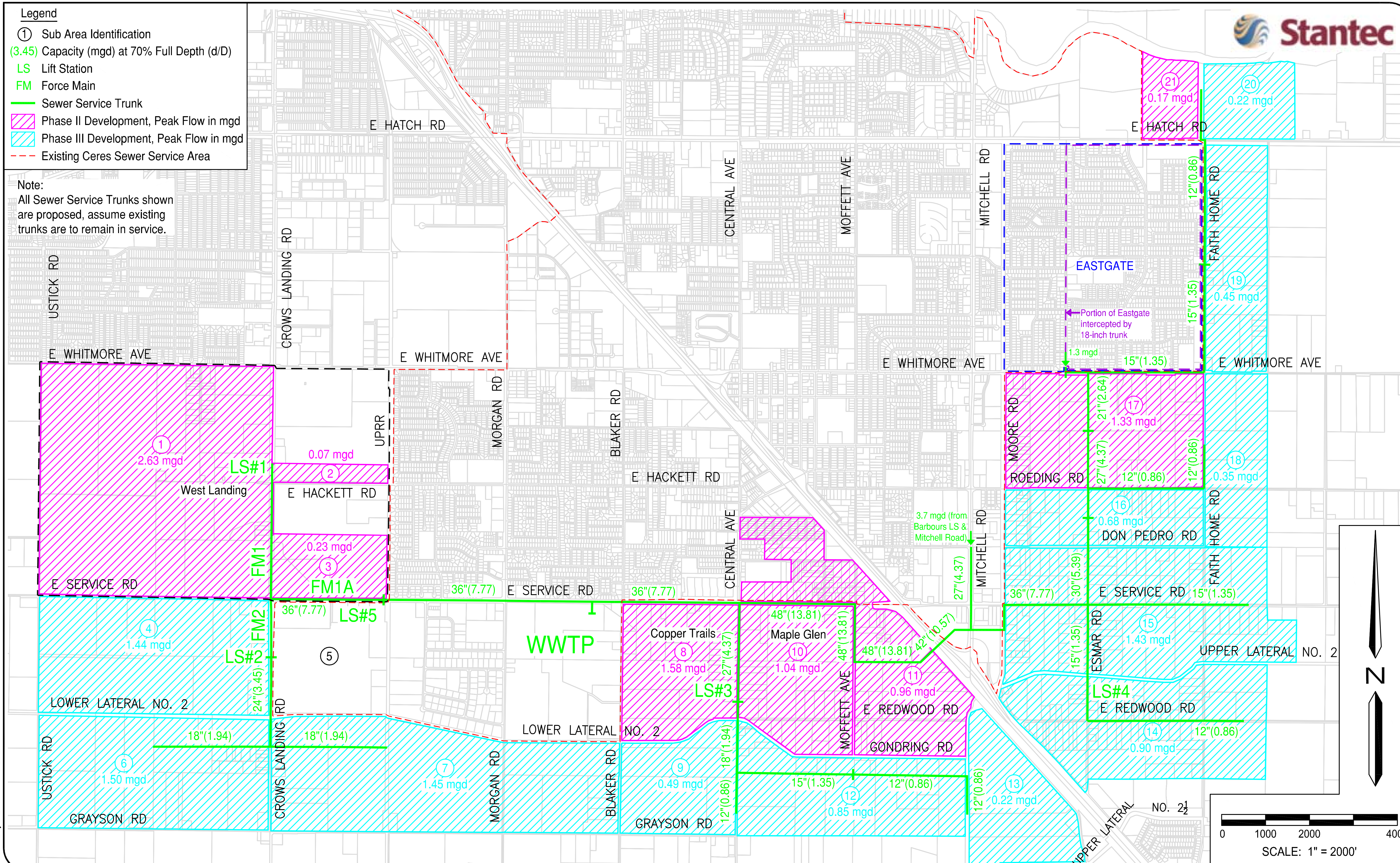

Figure 4-1
Preferred Alternative to Serve Future Growth Areas

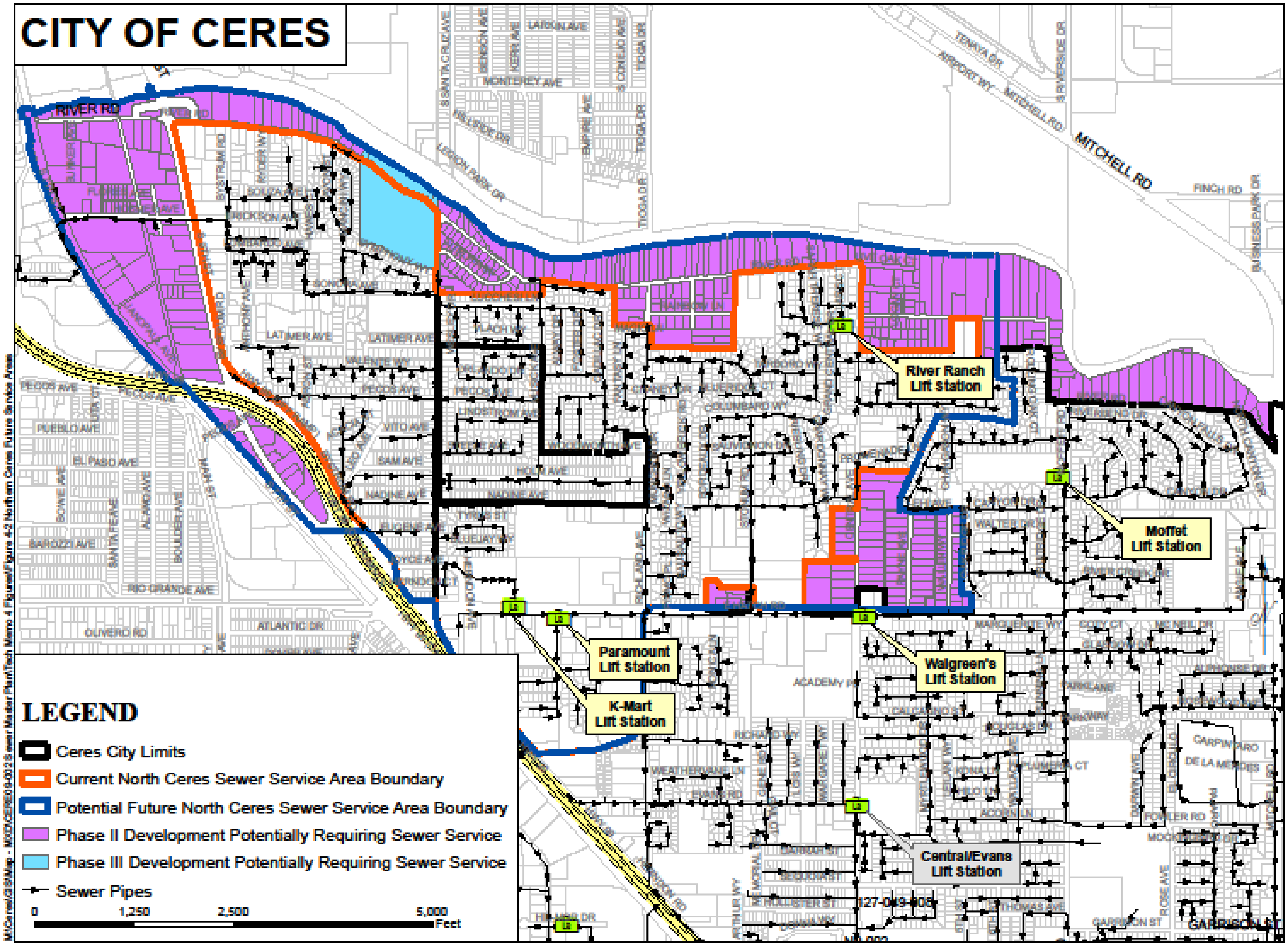

Figure 4-2
Northern Ceres Future Service Areas

(approximately 16% over current flows) within the North Ceres Sewer Service Area (NCSSA). Existing facilities, as improved according to the Capital Improvements listed in Chapter 1, are generally adequate to accommodate this in-fill development with some specific improvements and confirmation of facilities slope and diameter as discussed below. The below potential future service areas in the northern part of the City are identified in Figure 4-2.

4.4.1 East Hatch Road Phase II Development Areas

Two existing developed areas located along East Hatch Road are currently not served by the CSSA. These areas are within the NCSSA and generally consist of the following, as shown on Figure 2-1 of Chapter 2:

- Seven parcels on the north side of East Hatch Road west of Stonum Road and east of the end of Truckee Way.
- Eighty one parcels on the north side of East Hatch Road including:
    - Two parcels due south of Chardonnay Court,
    - Twenty six parcels on the east and west sides of Central Avenue from East Hatch to near the intersection with Nadine Avenue,
    - Twenty eight parcels on Payne Avenue between East Hatch Road and Lehi Avenue,
    - Twenty six parcels on Wallin Way between East Hatch Road and Lehi Avenue,
    - One parcel on East Hatch Road between Wallin Way and the end of Oak Ridge Court.

These parcels consist primarily of residential development on parcels that tend to be half-acre or larger. Wastewater treatment and disposal is currently provided to these residences through on-site septic tank and leach field systems. Future connection of these parcels would likely only occur as a result of septic system failure and/or as a result of future regulatory changes that require connection to a public sewer system.

If connection of these residential parcels becomes necessary in the future, local sewer extensions would be necessary generally consisting of the following:

1. For the parcels west of Stonum Road, service could be provided through the existing 10-inch sewer in Stonum Road that discharges into the 15-inch sewer on the south side of East Hatch Road.
2. For the area between Wallin Way and to the west of Central Avenue, four 8-inch sewer stubs exist under East Hatch Road connected to the 10-inch sewer that discharges into the Walgreen’s Lift Station at Central and Hatch Road.

Existing facilities in East Hatch Road, including the Walgreen's Lift Station, are anticipated to have available capacity to accommodate potential future extensions of sewer service to these areas. Wastewater from these areas would be conveyed to the City of Modesto through existing sewers in East Hatch Road, Richland Avenue, Holm Avenue, Herndon Road, and Sonora Avenue.

4.4.2 River Road Corridor

Along the River Road corridor between Herndon Road and Mitchell Road, approximately 280 developed parcels exist that currently are not provided sewer service by the City of Ceres. Of these parcels, approximately 55 parcels are outside of the NCSSA boundary. Existing land uses within the River Road Corridor consist of residential development on parcels from less than one quarter acre to over four acres in size. Wastewater treatment and disposal is currently provided to these residences through on-site septic tank and leach field systems. Future connection of these parcels would likely only occur as a result of septic system failure and/or as a result of future regulatory changes that require connection to a public sewer system. As such, connection of existing residences to the City's system would typically occur as groups of homes request sewer service and plan to construct facilities (which will likely include new sewer lift stations) to make such connection. Below, the River Road Corridor area is grouped into four sub-areas that could be logically served by existing Ceres facilities.

Herndon Road or Lucchesi Lane Connection:

Approximately 85 parcels north of Lucchesi Lane could be served by existing sewers in Herndon Road or Musick Avenue. The existing 10-inch sewer in Herndon Road is anticipated to have available capacity to serve this sub-area with flow being conveyed to the City of Modesto through the sewer in Sonora Avenue. Alternatively, portions of this sub-area could be served by the 8-inch sewer in Lucchesi Lane, with the 6-inch sewer in Musick Avenue likely being upsized to an 8-inch as well.

Richland Avenue Connection:

Through sewer line extensions, and likely construction of one or more new lift stations, the existing 18-inch sewer in Richland Avenue is anticipated to have available capacity to serve the more than 73 parcels along the nearby segment of River Road and the Rainbow Lane and Thompson Road vicinity. Sewer service to this area would be provided by the Richland Avenue sewer, which conveys wastewater along the Holm Avenue, Herndon Road, and Sonora Avenue corridor to the City of Modesto.

Central Avenue Connection:

Existing parcels along River Road, Live Oak Court, Logan Court, and Davis Way could be served by the extension of sewer facilities in Central Avenue. Sewer service could be provided through an existing 10-inch sewer in Tuolumne Bend Lane and Ehlers Drive and the River Ranch Lift Station or through an extension of the 12-inch sewer stub at Central Avenue and Park West

Drive. Service to this sub-area can be conveyed by existing sewers through the Tarboro Way, Stonum Road, and Richland Avenue corridors.

Moffett Road, Canyon Falls, and North Canyon Drive Connections:

The easternmost end of the River Road Corridor, from near Openshaw Road, is outside of the North Ceres Sewer Service Area and would be served by the Main City sewer system. Approximately 55 parcels would be served through sewer line extensions, likely including construction of one or more lift stations, from existing 8-inch sewers in Moffett Road, Canyon Falls Drive, or North Canyon Drive. If a connection were made at the northern end of Moffett Road, wastewater would also be pumped through the Moffett Road Lift Station. Due to the limited number of existing connections in this area, it is anticipated that the existing 8-inch sewers would have sufficient available capacity to serve this sub-area of the River Road Corridor. However, sewer size, slope, and invert elevations would have to be confirmed to assess if other improvements are necessary.

4.5 SUMMARY OF FUTURE GROWTH AREAS

Future growth areas are depicted in Figure 4-1 for the primary new growth areas of the City. This section discusses the preferred method of extending sewer service to these areas and potential alternatives to be considered in the future, based on project phasing and additional development constraints.

4.5.1 EAST SERVICE ROAD SEWER TRUNK CORRIDORS

Because of the location of existing City facilities, East Service Road will continue to be the primary trunk sewer corridor conveying wastewater to the WWTP. Existing facilities in East Service Road will be used to the extent available capacity exists to serve the future growth areas, however additional parallel trunk sewers will have to be constructed in anticipation of new development as discussed below.

4.5.2 WEST OF WWTP

The new sewer service area to the west of the WWTP includes Areas 1-7, excluding Area 5; these sub areas will need certain improvements prior to the construction of local collector sewer system improvements. There will need to be a 36-inch trunk line constructed from the WWTP headworks to a location west of the Union Pacific Railroad tracks before Lift Station #1, Lift Station #2 or Lift Station #5 will have the ability to serve these areas. This 36-inch trunk line will initially receive the discharge from FM1 and FM1A, the force mains from Lift Station #1. The force mains, FM1 and FM1A, from Lift Station #1 and the 36-inch trunk line on East Service Road from the Union Pacific Railroad crossing to the WWTP are required in order to develop both Areas 1 and 2. The force main from Lift Station #1 will be constructed from Lift Station #1 to the intersection of Crows Landing Road and East Service Road, then east on East Service Road to the termination of the 36-inch trunk line (west of the Union Pacific Railroad tracks) previously mentioned. This recommendation of a lift station in Area 1 with a force main connecting to the City Sewer System is also proposed in the West Landing Specific Plan by

Wood Rodgers dated August 2010. Due to the possible phasing of these areas, Lift Station #1, FM1 and FM1A will most likely be a priority for future development of these areas. Once Area 4, 6 or 7 are ready for development; Lift Station #2, Lift Station #5, FM2 and the 36-inch trunk line on East Service Road from Crows Landing Road to Lift Station #5 can be constructed. With the construction of Lift Station #5 and the 36-inch trunk line from Crows Landing Road to Lift Station #5, FM1A will no longer be necessary and will be abandoned. Both FM1 and FM2 will release into the newly constructed 36-inch trunk line at Crows Landing Road and East Service Road, the wastewater will flow by gravity to Lift Station #5 near the intersection of the Union Pacific Railroad tracks and East Service Road. From there it will be lifted into the previously constructed 36-inch trunk line on East Service Road and flow by gravity from Lift Station #5 to the WWTP.

4.5.3 East of WWTP to State Highway 99

The sub areas east of the WWTP include Areas 8-21; these new sewer service areas will each need certain improvements completed prior to beginning more local collector system improvements within each sub area. Existing 36-inch and 42-inch sewers in East Service Road east of the headworks have available capacity to serve new development. The limiting available capacity in these sewers is approximately 4.1 Mgal/d for the 36-inch trunk line and 7.5 Mgal/d for the 42-inch trunk line. Additional peak flows in excess of this will require construction of new parallel trunk sewers. A 36-inch trunk line (paralleled with the existing 42-inch trunk) from the WWTP headworks to the intersection of East Service Road and Blaker Road and a 36-inch trunk line (paralleled with the existing 36-inch trunk) on East Service Road from Blaker Road to Central Avenue will need to be constructed in order to serve ultimate future growth in Areas 8-21. From Central Avenue, a 48-inch trunk line on East Service Road is needed to serve the areas east of this point. A 27-inch trunk line is required in Central Avenue to serve future development areas south of East Service Road.

Area 11 will be served by the 48-inch trunk line constructed in East Service Road and Moffett Road. This construction would also begin the sewer extension planned and designed by GDR Engineering, Inc. The plans called for the City of Ceres to extend sewer services beginning at the intersection of Central Avenue and East Service Road and proceed east on Service Road, south on Moffett Avenue, east across Area 11, northeast across State Highway 99, east through Mitchell Road and ending construction at Moore Road just south of Service Road. The size and slope of the proposed trunk line has changed in this document but the overall alignment has remained the same. The GDR alignment allows for future development of Areas 14-21 and may provide relief for existing over capacity trunk lines at Moffett Avenue.

If the 27-inch trunk line is constructed south on Central Avenue to Lift Station #3, Areas 8 and 10 can be developed. From Lift Station #3 trunk lines can extend south on Central Avenue to serve Area 9, then proceed east, parallel with Gondring Road, to serve Area 12 followed by Area 13. Lift Station #3 is essential in serving Areas 8, 9, 10, 12 and 13 and must be completed prior to developing those sub areas.

4.5.4 Sewer Trunk Improvements East of State Highway 99

The sub areas east of State Highway 99 include Areas 14-21; the ultimate flow from these areas will be conveyed through the proposed 36-inch trunk line on East Service Road (paralleled with the existing 36-inch trunk and 42-inch trunk) and the 48-inch/42-inch (GDR alignment) trunk lines. The GDR alignment is needed initially in order to begin development of these areas. At Mitchell Road, just north of State Highway 99, a 27-inch trunk line will extend north to intercept the flow from the existing Barbours Lift Station at Don Pedro Road. This 27-inch trunk can only be constructed after the 42-inch trunk line across the highway is completed. A 36-inch trunk line will extend east from Mitchell Road to Moore Road, north on Moore Road, east on Service Road to the intersection at Esmar Road. Completing this 36-inch trunk line enables possible future development for Areas 14-21. As shown on Figure 4-1, once the 36-inch trunk lines is completed on Service Road there are many phasing possibilities for further development.

In order to serve Area 14, a 15-inch trunk line needs to be constructed south on Esmar Road and a 12-inch trunk line east on Redwood Road. A lift station near the intersection of Upper Lateral No. 2 and Esmar Road will need to be constructed prior to serving Area 14 due to lower elevations towards the southern portions of Area 14. This lift station (LS #4) may be located where it is used most efficiently since some of Area 14 may not require a lift station but may be able to flow using gravity trunk lines only.

Another possibility would be to serve the rest of Area 15 by extending a 15-inch trunk line east on East Service Road. This would allow the rest of Area 15 to be developed prior to running additional trunk lines north. The phasing of this entire area (Areas 14-21) would control which trunk line is a priority. The last possibility is to extend a 30-inch trunk line north on Esmar Road to serve the northern areas such as Area 16, 17 and 18. This 30-inch trunk line will extend into Area 16; a transition to a 27-inch trunk line will take place where the flow is reduced to allow this reduction in pipe size. The 27-inch trunk line will extend into Area 17; a transition to a 21-inch trunk line will take place where the flow is reduced to allow this reduction in pipe size. The 21-inch trunk line will extend to Whitmore Avenue, where it will be directed both east and west. The trunk line directed east will serve Areas 19, 20 and 21 and directed west to intercept the existing flow from the Eastgate area. The City may determine that the Eastgate flow is a priority and may choose to extend the 30-inch, 27-inch and 21-inch trunk lines north on Esmar Road immediately in order to relieve the existing Barbours lift station, and subsequently postpone the trunk lines which will serve Areas 14, 15 and 18 until those areas are developed.

The trunk line extended east on Whitmore Avenue will be a 15-inch trunk line. The trunk line will extend east on Whitmore Avenue and then north on Faith Home Road to Area 20 and 21. This 15-inch trunk line will extend north on Faith Home Road; a transition to a 12-inch trunk line will take place where the flow is reduced to allow this reduction in pipe size. These trunk lines will serve Areas 19, 20 and 21 and will be constructed based on the phasing of the future development in this area. If Area 20 or 21 is developed prior to Area 19 then the 15-inch and 12-inch trunk lines must be constructed in order to serve Area 20 or 21. However if Area 19 is developed beforehand then a 15-inch trunk line may only extend to serve Area 19. The extension of the trunk line would then follow based on future development plans.

4.5.5 AREA 1, 2 & 3 (WEST LANDING SPECIFIC PLAN)

The West Landing Specific Plan area will be served primarily by the City of Ceres; a certain number of smaller areas within the Specific Plan area will be served by the City of Modesto. The City of Ceres will serve Areas 1, 2 and 3 (Figure 4-1) within the West Landing Specific Plan area. This area is identified in the 1997 General Plan as having a potential future land use consisting of Residential Reserve, Office, Light Industrial, General Industrial, Community Facilities and Community Commercial. The peak flow generated from Area 1 is estimated at 2.63 Mgal/d, 0.07 Mgal/d from Area 2 and 0.23 Mgal/d from Area 3. As shown in Figure 4-1, a lift station is proposed in the eastern portion of Area 1, which is recommended in the West Landing Specific Plan by Wood Rodgers dated August 2010. Wastewater from both Areas 1 and 2 will be directed to Lift Station #1. Flow from Area 3 can be directed to the existing 10-inch and 12-inch trunk lines on East Service Road.

4.5.6 AREA 4

This area is identified in the 1997 General Plan as having a potential future land use consisting of Residential Reserve and Industrial Reserve. Area 4 is generally bounded on the north by East Service Road and Area 1, on the east by Crows Landing Road, Ustick Road to the west, and TID Lower Lateral No. 2 to the south. The peak flow generated from this area is estimated to be 1.44 Mgal/d. As shown in Figure 4-1, the wastewater from this area will be directed by gravity to Lift Station #2 on Crows Landing Road. There are no existing trunk lines on Crows Landing Road capable of serving Area 4 therefore a new trunk line is proposed to serve the development in this area.

4.5.7 AREA 5

Area 5 is primarily a Winco Distribution Center but has some areas still undeveloped. It is within the existing Ceres Sewer Service Area, the Winco facility is served by the existing 10-inch and 12-inch trunk lines on East Service Road. The assumption is in the future the undeveloped areas of Area 5 will connect to the same trunk line as the Winco facility consequently the future trunk lines described in this chapter will not be necessary for the development of those areas. This area is generally bound to the north by East Service Road, Crows Landing Road on the west, the Union Pacific Railroad to the east and TID Lower Lateral No. 2 to the south. This area is identified in the 1997 General Plan as having a potential future land use consisting of Regional Commercial, Service Commercial, Light Industrial, and Industrial Reserve. Area 5 is considered a Phase 1 (Existing Development & Build-out to the CSSA) development according to the City of Ceres Sewer System Master Plan Chapter 2 – Future Land Use and Flow and Load Projections.

4.5.8 AREA 6

Area 6 is generally bounded on the north by TID Lower Lateral No. 2, on the east by Crows Landing Road, Ustick Road to the west, and Grayson Road to the south. This area is identified in the 1997 General Plan as having a potential future land use consisting of Residential Reserve and Industrial Reserve. Area 6 is located in the southwestern portion of the City’s future growth areas and has generally the lowest elevations according to USGS Quad Map for the City of

Ceres. The peak flow generated from this area is estimated to be 1.50 Mgal/d. As shown in Figure 4-1, an 18-inch sewer trunk line will be required to serve Area 6. An 18-inch trunk line parallel with Lower Lateral No. 2 will connect to a 24-inch trunk line in Crows Landing Road which eventually discharges into Lift Station #2. There are no existing trunk lines on Crows Landing Road capable of serving Area 6 therefore the proposed trunk line is needed for development in this area.

4.5.9 AREA 7

This area has typically lower elevations, with respect to the rest of the future growth areas, similar to that of Area 6. This area is identified in the 1997 General Plan as having a potential future land use consisting of Industrial Reserve. Area 7 is generally bounded on the north by TID Lower Lateral No. 2, on the west by Crows Landing Road, Blaker Road to the east, and Grayson Road to the south. The peak flow generated from this area is estimated to be 1.45 Mgal/d. As shown in Figure 4-1, an 18-inch sewer trunk line will be required to serve Area 7. The 18-inch trunk line parallel with Lower Lateral No. 2 will connect to a 24-inch trunk line in Crows Landing Road which eventually discharges into Lift Station #2. Existing ground elevation in Area 7 generally falls from the east to the west therefore it is optimal to serve this area with a trunk line from Crows Landing Road versus a trunk line on Blaker Road or Central Avenue. There are no existing trunk lines on Crows Landing Road capable of serving Area 7 therefore the proposed trunk line is needed for development in this area.

4.5.10 AREA 8 (COPPER TRAILS NEIGHBORHOOD MASTER PLAN)

This area currently has Central Valley High School located in the northeast portion and according to the 1997 General Plan has a potential future land use consisting of Low Density Residential, Medium Density Residential, Parks, and School. Area 8 is generally bounded on the north by East Service Road, on the east by Central Avenue, Blaker Road to the west, and TID Lower Lateral No. 2 to the south. The peak flow generated from this area is estimated to be 1.58 Mgal/d. As shown in Figure 4-1, some of the northern portions of Area 8 may be served by the 36-inch trunk line heading west on East Service Road. There will be two parallel 36-inch trunk lines on East Service Road, at the time of development it should be determined which line is more appropriate to serve this area. Most of Area 8 will need to be served by Lift Station #3 on Central Avenue. The Copper Trails Neighborhood Master Plan illustrates the sewer services and the location of the lift station. Due to the depth of the existing trunk lines and the general topography of Area 8, most of the area will need to be directed toward Lift Station #3 on Central Avenue.

4.5.11 AREA 9

This area is identified in the 1997 General Plan as having a potential future land use consisting of Low Density Residential and Industrial Reserve. Area 9 is generally bounded on the north by TID Lower Lateral No. 2, on the west by Blaker Road, Central Avenue to the east, and Grayson Road to the south. The peak flow generated from this area is estimated to be 0.49 Mgal/d. A 12-inch sewer trunk line will be required to serve Area 9. As shown in Figure 4-1, a 12-inch and 18-inch sewer trunk line will be constructed on Central Avenue and connect to Lift Station #3.

There are no existing trunk lines on Central Avenue capable of serving Area 9 therefore the proposed trunk line is needed for development in this area.

4.5.12 AREA 10 (MAPLE GLEN NEIGHBORHOOD MASTER PLAN)

The peak flow generated from this area is estimated to be 1.04 Mgal/d. As shown in Figure 4-1, some of the area may be served by the 48-inch trunk line heading west on East Service Road and north on Moffett Avenue. This area is identified in the 1997 General Plan as having a potential future land use consisting of Parks, School, Neighborhood Commercial, Low, Very Low, Medium, and High Density Residential. Area 10 is generally bounded on the north by East Service Road, on the west by Central Avenue, Moffett Avenue to the east, and TID Lower Lateral No. 2/Gondring Road to the south. This area has preliminary plans entitled the Maple Glen Neighborhood Master Plan with design concepts for a future layout. The preliminary layout is considered in this document and utilizes the sewer design concept in the Master Plan by routing the sewer through Lift Station #3, the lift station referenced in the Copper Trails Neighborhood Master Plan. The Maple Glen Neighborhood Master Plan illustrates that the entire area may be directed toward Lift Station #3 on Central Avenue. Certain northern portions of this area may be served by the 48-inch trunk line in East Service Road but it is not required to serve this entire area. Due to the depth of the existing trunk lines and the general topography of Area 10 most of the area will need to be directed toward Lift Station #3 on Central Avenue.

4.5.13 AREA 11

This area is adjacent to State Highway 99, with potential future land use consisting of High Density Residential, Community Facilities, Medium Density Residential, Low Density Residential, Business Park, and Commercial. Area 11 is generally bounded on the northeast by State Highway 99, on the west by Moffett Avenue and Central Avenue, and TID Lower Lateral No. 2/Gondring Road and East Service Road to the south. The peak flow generated from this area is estimated to be 0.96 Mgal/d. As shown in Figure 4-1, a 42-inch and 48-inch sewer trunk line will be constructed through Area 11 and on both Moffett Avenue and East Service Road; the trunk line eventually discharges into the WWTP. The wastewater from this area can be served by the proposed 42-inch and 48-inch trunk lines.

4.5.14 AREA 12

This area is identified in the 1997 General Plan as having a potential future land use consisting of mostly Low Density Residential with some areas of Parks, Medium Density Residential and School. Area 12 is generally bounded on the north by TID Lower Lateral No. 2/Gondring Road, on the west by Central Avenue, and Grayson Road (extension of the existing road) to the south. The peak flow generated from this area is estimated to be 0.85 Mgal/d. As shown in Figure 4-1, a 15-inch and 12-inch sewer trunk line will be constructed parallel with Gondring Road and eventually discharge into Lift Station #3. The wastewater from this area can be served by the 15-inch and 12-inch trunk line. There are no existing trunk lines on Gondring Road or Central Avenue capable of serving Area 12 therefore the proposed trunk line is needed for development in this area.

4.5.15 Area 13

This area is adjacent to State Highway 99, with potential future land use consisting of Commercial Recreation. Area 13 is generally bounded on the northeast by State Highway 99, on the west by Mitchell Avenue, and Esmar Road/TID Upper Lateral No. 2 ½ to the south. The peak flow generated from this area is estimated to be 0.22 Mgal/d. As shown in Figure 4-1, a 12-inch sewer trunk line will be required to serve Area 13. The 12-inch trunk line eventually discharges into Lift Station #3. There are no existing trunk lines on Mitchell Road capable of serving Area 13 therefore the proposed trunk line is needed for development in this area.

4.5.16 Area 14

Considering only the eastern portion of the City's future growth areas (Areas 14-21), this area is the southernmost area and therefore the lowest in elevation according to the USGS Quad Map for the City of Ceres. This area is identified in the 1997 General Plan as having a potential future land use consisting of Highway Commercial, Low and Very Low Density Residential, Regional Commercial, Residential Agriculture and Service Commercial. Area 14 is generally bounded on the north by TID Upper Lateral No. 2, on the west by State Highway 99, and TID Upper Lateral No. 2 ½ to the south. The peak flow generated from this area is estimated to be 0.90 Mgal/d. As shown in Figure 4-1, a 15-inch sewer trunk line will be required to serve Area 14. A 12-inch trunk line will extend east on Redwood Road to provide service. Due to the general topography of the land and a possible canal crossing a lift station may be required on Esmar Road at a location determined appropriate. The wastewater from this area will be serviced though Lift Station #4 and the 15-inch trunk line on Esmar Road.

4.5.17 Area 15

This area is the junction point for the trunk lines coming in from the northern and southern future growth areas northeast of Highway 99. The trunk lines converge in Area 15 before flowing to the west. Area 15 is identified in the 1997 General Plan as having a potential future land use consisting of mostly Low Density Residential with some areas of Very Low, Medium and High Density Residential, Parks, School, Residential Agriculture, Community Commercial and Service Commercial. The Area is generally bounded on the north by Don Pedro Road, on the west by Moore Road, and TID Upper Lateral No. 2 to the south. The peak flow generated from this area is estimated to be 1.43 Mgal/d. As shown in Figure 4-1, 15-inch, 30-inch and 36-inch will be constructed through Area 15. These sewer trunk lines will be sufficient to serve this entire area. The local collector sewers will enter the various trunk lines at locations determined most optimal, which may depend on phasing of the development and layout of future lots.

4.5.18 Area 16

This area is identified in the 1997 General Plan as having a potential future land use consisting of High, Medium and Low Density Residential, Parks, School and Service Commercial. Area 16 is generally bounded on the north by Roeding Road, on the west by Moore Road, on the east by Faith Home Road, and Don Pedro Road to the south. The peak flow generated from this area is estimated to be 0.68 Mgal/d. As shown in Figure 4-1, a 27-inch and 30-inch sewer trunk line will be constructed on Esmar Road and a 12-inch trunk line on Roeding Road; these trunk lines will serve this area. Local collector sewers may enter either trunk line at locations determined most ideal, which may depend on phasing of the development and layout of future lots.

4.5.19 AREA 17

This area is considered a Phase II development and may be developed prior to the areas to the south, which may affect phasing of future development. A possible solution to developing Area 17 before the areas to the south is discussed later in this document. This area is identified in the 1997 General Plan as having a potential future land use consisting of Community Commercial, High, Medium, and Low Density Residential, Light Industrial, Neighborhood Commercial, Parks, School and Service Commercial. Area 17 is generally bounded on the north by East Whitmore Avenue, on the west by Moore Road, on the east by Faith Home Road, and Roeding Road to the south. The peak flow generated from this area is estimated to be 1.33 Mgal/d. As shown in Figure 4-1, a 15-inch, 21-inch and 27-inch sewer trunk line will be constructed on a future extension of Esmar Road and Whitmore Avenue; these trunk lines will be sufficient to serve this area. The sewer services will enter the various trunk lines at locations determined most ideal, which may depend on phasing of the development and layout of future lots.

4.5.20 AREA 18

This area is identified in the 1997 General Plan as having a potential future land use consisting of Residential Agriculture and Very Low Density Residential. Area 18 is generally bounded on the north by East Whitmore Avenue, on the west by Faith Home Road, and Don Pedro Road to the south. The peak flow generated from this area is estimated to be 0.35 Mgal/d. As shown in Figure 4-1, a 12-inch sewer trunk line will be required to serve Area 18. The 12-inch trunk line will be constructed on Roeding Road and Faith Home Road to serve this area. The 15-inch trunk line on Whitmore Avenue may also be used to serve the northern portions of this area.

4.5.21 AREA 19

Area 19 is generally bounded on the north by East Hatch Road, on the west by Faith Home Road, on the east by Gilbert Road, and East Whitmore Avenue to the south. This area is identified in the 1997 General Plan as having a potential future land use consisting of Residential Agriculture and Very Low Density Residential. The peak flow generated from this area is estimated to be 0.45 Mgal/d. As shown in Figure 4-1, a 15-inch and 12-inch sewer trunk line will be constructed on Faith Home Road; these trunk lines will serve Area 19.

4.5.22 AREA 20 & 21

Area 20 is generally bounded on the north by the Tuolumne River, on the west by Faith Home Road, and East Hatch Road to the south. Area 21 is generally bounded on the north by the Tuolumne River, on the east by Faith Home Road, and East Hatch Road to the south. This area is identified in the 1997 General Plan as having a potential future land use consisting of Residential Agriculture and Very Low Density Residential. The peak flow generated from these areas is estimated to be 0.39 Mgal/d. As shown in Figure 4-1, a 12-inch sewer trunk line will be required to serve Area 20 and 21. The 12-inch trunk line will be constructed on Faith Home Road.

4.5.23 EASTGATE AREA

The Eastgate Area is generally bounded on the north by East Hatch Road, on the east by Faith Home Road, on the west by Moore Road, and East Whitmore Avenue to the south. The peak flow generated from the easterly portion of the Eastgate area (shown in Figure 4-1) is estimated to be 1.32 Mgal/d. As shown in Figure 4-1, a 15-inch sewer trunk line will be required to divert flow away from the Mitchell Road corridor and Barbours Lift Station. By running a sewer trunk line north on Esmar Road and extending through Area 17 it is possible to intercept wastewater currently draining to the Barbours Lift Station at the intersection of Whitmore Avenue and Boothe Road. This diversion will lower the demand on the Barbours Lift Station and make the City less reliant on the lift station since most of the Eastgate area will now be served by a continuous gravity trunk line to the WWTP.

Some wastewater will still flow through the Barbours Lift Station from the Eastgate area because not all the Eastgate trunk lines flow through East Whitmore Avenue. However, the new 27-inch trunk line extending north on Mitchell Road will intercept the remaining flow from the Barbours Lift Station at Don Pedro Road. The flow is approximately 3.7 Mgal/d at peak flow and includes the remaining Eastgate wastewater and other areas west of the Eastgate area. There will be no wastewater from the Barbours Lift Station flowing through the existing trunk lines west on Don Pedro Road. These sewer improvements would eliminate the need for the Tier 2 Improvement noted in the City of Ceres Sewer System Master Plan Figure 1-6a.

4.6 SEWER LIFT STATION IMPROVEMENTS

Future collection system facilities have been based on gravity sewers where feasible, however four future sewer lift stations (or pump stations where they are accompanied by a force main) are likely to be needed to convey wastewater to the existing WWTP. This section describes the anticipated sewer lift stations and Table 4-1 summarizes anticipated peak capacity, force main length (if any), and future growth areas served by the lift station.

It is recommended that future sewer lift stations be designed to reliably convey peak wastewater flows and that mechanical and electrical components meet the EPA “Design Criteria for Mechanical, Electrical, and Fluid Systems and Component Reliability”[1]. Recommended minimum design criteria for future lift stations and force mains are contained in the Ten State Standards[2]. It is anticipated that all future sewer lift stations submersible wet-well type systems, which is what the City’s existing systems are, and will include the following major components:

1. Minimum of duplex submersible pumps sized to convey peak flow with the largest unit out of service.

2. Reinforced concrete wet-well.

[1] “Design Criteria for Mechanical, Electrical, and Fluid System Component Reliability”, EPA-430-99-74-001.
[2] “Recommended Standards for Wastewater Facilities”, Health Education Services Division, 2004 Edition.

3. Necessary discharge piping, valves, and appurtenances in a separate vault where appropriate and feasible.

4. Electrical and instrumentation systems including:

    a. Pedestal style motor control center,

    b. Pressure transducer wet well monitoring with ultrasonic level sensor backup,

    c. Flow monitoring and recording,

    d. Variable frequency drive (VFD) for lift stations with a pump station capacity more than approximately 1.4 Mgal/d.

    e. Two separate independent power sources, or manual transfer switch and connection for mobile backup power unit if more than 1 hour of storage is provided, or automatic transfer switch and dedicated backup generator.

    f. Telemetry with SCADA to integrate into the City's existing systems, including appropriate alarms.

5. Site improvements including:

    a. Lift station location outside of traveled lanes,

    b. Site security and fencing,

    c. Space for maintenance equipment and backup generators as necessary, and

    d. Space for odor control systems as needed.

Table 4-1
City of Ceres
Future Lift Station Characteristics Summary

Lift (Pump)Station	Peak Capacity (Mgal/d)[a]	Force Main Length (ft)	Growth Areas Served[b]
Lift Station #1 (Pump Station)	2.7	5,700	1 and 2
Lift Station #2 (Pump Station)	4.4	1,350	4, 6 and 7
Lift Station #3	4.2	N/A	8, 9, 10, 12 and 13
Lift Station #4	0.9	N/A	14
Lift Station #5	7.1	N/A	1, 2, 4, 6 and 7

(a) Estimated reliable peak capacity required
(b) See Figure 4-1.
N/A = Not Applicable

4.6.1 LIFT STATION #1 (WEST LANDING LIFT STATION)

As shown in Figure 4-1, a lift station will be required near Crows Landing Road, the eastern portion of Area 1. The estimated peak flow through this lift station is approximately 2.7 Mgal/d. This lift station is suggested in the West Landing Specific Plan. A lift station is needed west of the WWTP due to the topography of the land and the substantial new development expected from the West Landing Specific Plan. There is currently a lift station on East Service Road near Morgan Road but due to its location and size it will not be sufficient to handle the future growth areas identified previously. Also due to the invert elevation of the WWTP head works influent sewer, a force main approximately 5,700 feet long will be needed from Lift Station #1 to a location west of the Union Pacific Railroad tracks. From there the wastewater will be conveyed to the WWTP using a 36-inch gravity trunk line.

4.6.2 LIFT STATION #2 (CROWS LANDING ROAD LIFT STATION)

As shown in Figure 4-1, a lift station is required near Crows Landing Road, between Areas 4 and 5. The estimated peak flow through this lift station is approximately 4.4 Mgal/d. Due to the topography of the land falling from north to south, Lift Station #2 is needed north of Lower Lateral No. 2 in order to avoid constructing new sewer trunk lines too deep. The lift station will serve Areas 4, 6 and 7. From Lift Station #2 the wastewater will be pumped through a force main (FM2) approximately 1,350 feet north on Crows Landing Road to East Service Road. At the intersection, the force main (FM2) will release into a 36-inch trunk line and gravity flow east on East Service Road to Lift Station #5, west of the Union Pacific Railroad tracks. At the intersection of East Service Road and Crows Landing Road, FM1 (force main coming from Lift Station #1) will also release into the 36-inch trunk line and eliminate FM1A. At Lift Station #5, the wastewater will be lifted into the previously mentioned 36-inch gravity trunk line and carry the wastewater to the WWTP.

4.6.3 LIFT STATION #3 (COPPER TRAILS LIFT STATION)

As shown in Figure 4-1, a lift station is required near Central Avenue, north of Lower Lateral No. 2. The estimated peak flow through this lift station is approximately 4.2 Mgal/d. Due to the topography of the land falling from north to south and extensive development expected to the south, a lift station is needed in this area. Lift Station #3 will serve Areas 8, 9, 10, 12 and 13. The Copper Trails Master Plan suggests a lift station in the same general location as shown in Figure 4-1.

4.6.4 LIFT STATION #4 (ESMAR ROAD LIFT STATION)

As shown in Figure 4-1, a lift station is required near Esmar Road and Lower Lateral No. 2. The estimated peak flow through this lift station is approximately 0.9 Mgal/d. Due to the topography of the land falling from north to south a lift station is needed in this area. Lift Station #4 will serve Area 14. The location can be determined when phasing and the layout of future development is confirmed.

4.6.5 LIFT STATION #5 (EAST SERVICE ROAD LIFT STATION)

As shown in Figure 4-1, a lift station is required near East Service Road and the Union Pacific Railroad crossing. The estimated peak flow through this lift station is approximately 7.1 Mgal/d. Due to the topography of the land and the invert at WWTP headworks a lift station is needed in this area in order to gravity flow the wastewater to the WWTP. Lift Station #5 will eliminate the need for the force main (FM1A) on East Service Road. The 36-inch trunk line on East Service Road from Crows Landing Road to the Union Pacific Railroad crossing will flow into Lift Station #5. Due to the anticipated depth of this 36-inch trunk line, Lift Station #5 is needed in order to lift the wastewater into the previously constructed 36-inch trunk on East Service Road from the Union Pacific Railroad crossing to the WWTP. The location can be determined when phasing and the layout of future development is confirmed.

4.6.6 BARBOURS LIFT STATION IMPROVEMENTS

Expansion of the existing Barbours Lift Station may be required if future flows from Areas 17, 18, 19, 20, and 21 are conveyed (either as part of interim phasing improvements or as a long-term conveyance strategy) west on East Whitmore Avenue to the Mitchell Road corridor. However, if the gravity trunk line on Esmar Road is extended through Area 17 to Whitmore Avenue, some of the existing Eastgate flow can be diverted from the Barbours Lift Station through this trunk line and the current lift station capacity may be satisfactory. If phasing and sequencing of new development leads to expansion of Barbours Lift Station, this could be considered as part of the lift station relocation recommendation in Chapter 1.

4.7 ALTERNATIVES TO RECOMMENDED IMPROVEMENTS

Alternatives to the above recommended improvements were considered. Below, these alternatives are discussed and may be considered as part of a phasing program to extend service to certain future growth areas depending on development timing and sequencing.

4.7.1 ROUTING AREAS 19, 20 AND 21 TO EXISTING BARBOURS LIFT STATION LOCATION

To serve Areas 19, 20, and 21, an alternative may be to connect the trunk line on East Whitmore Avenue to the existing Barbours lift station. The existing over-capacity 12-inch trunk line on East Whitmore Avenue will need to be paralleled with an 18-inch trunk line in order to meet the design criteria of a maximum of 70% full depth under peak flow conditions for new and existing sewer trunk lines. However with this additional flow, an expansion of the pumping capacity of the existing Barbours lift station may be required. This would enable Areas 19, 20, and 21 to be developed prior to developing the areas to the south of East Whitmore Avenue (e.g. Areas 15, 16, 17 and 18). If this is part of a long-term strategy it would also reduce the size of the trunk lines required in that same area in the future.

4.7.2 ROUTING AREA 17 NORTH TO EXISTING BARBOURS LIFT STATION LOCATION

Future growth Area 17 is indicated by the Stanislaus County Local Agency Formation Commission (LAFCO) to be within the primary sphere of influence of the City of Ceres, and therefore within the Phase II growth area boundary. If Area 17 develops prior to Areas 15 or 16 (which are in the Phase III growth areas) it may not be feasible to construct trunk sewers through these areas to serve Area 17 and beyond, thus requiring Area 17 to be served through facilities in the Mitchell Road corridor, including expansion of the existing Barbours Lift Station. By routing the Area 17 trunk lines north then west to the existing Barbours lift station, the City could extend service to Area 17 with the other Phase II development, subsequently reducing the initial cost of sewer improvements required to serve Area 17 by delaying the need for the trunk line that extends north on Esmar Road until the Phase III growth areas are developed. The consequence in routing the Area 17 trunk lines to the existing Barbours lift station is that the lift station will need to be expanded in order to handle the additional flow, including adding gravity sewer capacity in the trunk lines entering the lift station. As shown in Figure 4-1, a new trunk line is proposed to be constructed on Mitchell Road to intercept the wastewater exiting the existing Barbours lift station force main at Don Pedro Road. The size of this trunk line is dependent on how much of future growth Areas 17 through 21 is conveyed through the existing Barbours Lift Station.

4.8 COLLECTION SYSTEM CIP

Expansion of the Ceres collection system to serve future growth areas will consist of extension of existing City facilities to these new growth areas, improvements and expansion of the existing sewer systems, and “in-development” improvements needed to collect wastewater and convey it to the City’s trunk system. This section identifies the planning level probable cost of “master plan” collection system improvements to serve future growth areas as identified in Figure 4-1. Additional “in-development” improvements are also necessary, but are not included in this analysis as they are typically designed and constructed by the various land developments that occur within the growth areas. Also, sewer facilities needed to extend service to existing parcels along the River Road corridor are not included, as these improvements are considered equivalent to “in-development” improvements and are highly dependent on the number, location, and timing of existing parcels needing to connect in this area. The total planning level opinion of probable cost for master plan collection system improvements is $53,280,000.

4.8.1 GRAVITY SEWER COSTS

Table 4-2 summarizes the planning level opinion of probable cost for gravity sewer improvements needed to extend service to new growth areas according to the proposed program shown in Figure 4-1.

Table 4-2
City of Ceres
Sewer Trunk Lines - Planning Level Opinion of Probable Cost for Preferred Alternative to Serve Future Growth Areas

Improvement Description	Cost, $ [(a)]
Crows Landing Road Trunk Lines	$1,000,000
Service Road Trunk Lines	$12,100,000
Redwood Road Trunk Lines	$800,000
Moffett Avenue Trunk Lines	$1,200,000
Central Avenue Trunk Lines	$2,000,000
Mitchell Road Trunk Lines	$1,200,000
Esmar Road Trunk Lines	$3,500,000
Roeding Road Trunk Lines	$600,000
Whitmore Avenue Trunk Lines	$900,000
Faith Home Road Trunk Lines	$1,900,000
Lower Lateral No. 2 Trunk Lines	$1,800,000
Gondring Road Trunk Lines	$1,400,000
Moore Road Trunk Lines	$400,000
Sewer Trunk Line between Moore Rd & Moffett Ave	$3,200,000
Estimating Contingency (30%)	$9,600,000
SUBTOTAL – CONSTRUCTION COSTS (rounded)	**$41,600,000**
Design/Administration (20%) (rounded)	$6,400,000
TOTAL (rounded)	**$48,000,000**

(a) See more detailed cost estimate in Appendix F

4.8.2 LIFT STATION COSTS

Table 4-3 summarizes our planning level opinion of probable cost for new lift station (and force main improvements where applicable) needed in conjunction with the proposed program shown in Figure 4-1. Table 4-3 does not include the possible cost of relocating (and increasing the capacity of) Barbours Lift Station, which is identified in Table 1-15 of Chapter 1.

Table 4-3
City of Ceres
Lift Stations - Planning Level Opinion of Probable Cost for Preferred Alternative to Serve Future Growth Areas

Improvement Description	Cost, $ [a]
Lift Station #1 (Pump Station)	$1,120,000
Lift Station #2 (Pump Station)	$810,000
Lift Station #3	$580,000
Lift Station #4	$210,000
Lift Station #5	$800,000
Estimating Contingency (30%)	$1,060,000
SUBTOTAL – CONSTRUCTION COSTS	**$4,580,000**
Design/Administration (20%)	$700,000
TOTAL	**$5,280,000**

(a) See more detailed cost estimate in Appendix G

City of Ceres Sewer System Master Plan
Chapter 5

Environmental Constraints and Permit Streamlining Analysis

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Reviewed By: Neal Colwell, PE

5.1 INTRODUCTION

Stantec was retained by the City of Ceres (City) to prepare a Sewer System Master Plan (Master Plan) including an assessment of the environmental feasibility of the Master Plan. This Chapter presents potential environmental issues associated with the recommended alternative as proposed in the Master Plan, including Chapter 3 Wastewater Treatment and Disposal and Chapter 4 Collection System Facilities. The purpose of this constraints analysis is to assist the City in identifying key environmental issues that should be given due consideration during the implementation of the Master Plan. Specifically, the purpose is to (1) determine whether there are potential liabilities or fatal flaws that would preclude or prohibit project implementation and (2) assess the recommended alternative from an environmental permitting/compliance perspective including potential permitting and mitigation requirements, timelines and costs. This constraints analysis primarily focuses on environmental compliance with respect to biological resources and waters of the State, since they are often the key components with respect to regulatory compliance timing and costs. Cultural resources, agricultural resources, and other constraints topics, such as land use, are also discussed in a summary fashion.

Environmental constraints were analyzed relative to the following proposed infrastructure/actions for the recommended alternative:

- Expansion and Upgrade of the Collection System to Service the 1997 General Plan Build Out Population
- Forcemain (pipeline) from City of Ceres WWTP to Existing Modesto Outfall Export Line
- Parallel Pipeline along Modesto Outfall from Forcemain Tie-in to City of Modesto Jennings WWTP

The intent of this analysis is to compile available desktop information, consider these resources during the Master planning phase and provide some insight into environmental issues the City will need to address during the pre-design, environmental review and permitting process.

In general, a large percentage of the projects described in the Master Plan are situated in roadways and developed corridors, and includes rural areas in Stanislaus County. In addition, the pipelines that connect facilities would be buried and therefore are considered temporary impacts experienced during the construction process. The adoption of a Master Plan is considered a discretionary action and will trigger the need for compliance with the California Environmental Quality Act (CEQA). In addition, the potential projects described in the Master Plan, if implemented will require compliance with CEQA and state and local environmental permitting regulations. If the proposed actions in the Master Plan are federally funded or the final design entails the placement of dredge and fill material in a jurisdictional water of the US, compliance with the National Environmental Policy Act (NEPA) and federal environmental regulations, such as the Endangered Species Act, Clean Water Act Sections 401 and 404 and the National Historic Preservation Act Section106, would be necessary.

The overall project intersects or is near several key biological resources, of key importance relative to permitting timelines, and costs are:

- Swainson’s hawk (state listed as threatened) foraging habitat
- Nesting raptors and other migratory birds (protected under the Migratory Bird Treaty Act)
- Wetlands and waters of the US (protected under the Clean Water Act Section 404)
- Valley Elderberry Longhorn Beetle (federal and state listed as threatened)

Key non-biological resources issues include potential impacts to:

- Agriculture
- Cultural Resources
- Traffic
- Noise
- Land Use
- Air Quality
- Greenhouse Gases
- Growth Accommodation/Induction

This constraints analysis is based on literature and database searches in 2011. The data and findings of this memo should be verified with field surveys. In addition, technical assistance and pre-planning consultations with the regulatory agencies should be sought during pre-design of potential projects.

5.2 METHODS

Stantec reviewed the project-specific details included in the Master Plan and assessed, using desktop information, the potential for environmental constraints and permit streamlining options.

5.2.1 Study Area

Geographic Information System (GIS) data from existing public databases were compiled and analyzed to identify potential constraints and to assist in project planning. This analysis focuses on the area within the General Plan Boundary, particularly the future service areas, and a one mile buffer around the proposed export pipeline to the City of Modesto Jennings WWTP. The pipeline alignments and area of analysis are depicted in the Figure 5-1.

5.2.2 Literature Search

The documents reviewed for this environmental constraints analysis include:

- City of Ceres Wastewater Treatment Plant Expansion Project Draft Supplemental EIR (1999)
- City of Ceres General Plan (1997)
- West Landing Specific Plan Project Draft EIR (2010)
- West Ceres Specific Plan Opportunities and Constraints Analysis (2008)
- City of Modesto Wastewater Master Plan Update Draft EIR (2006)
- Stanislaus County GIS data (2011)
- Wetland Delineation/ Jurisdictional Waters Report for the Hughson-Grayson 115-KV Transmission Line and Substation Project, Ceres, California: Part 2 - The Lateral 2 ½ Alignment (TID, 2010)

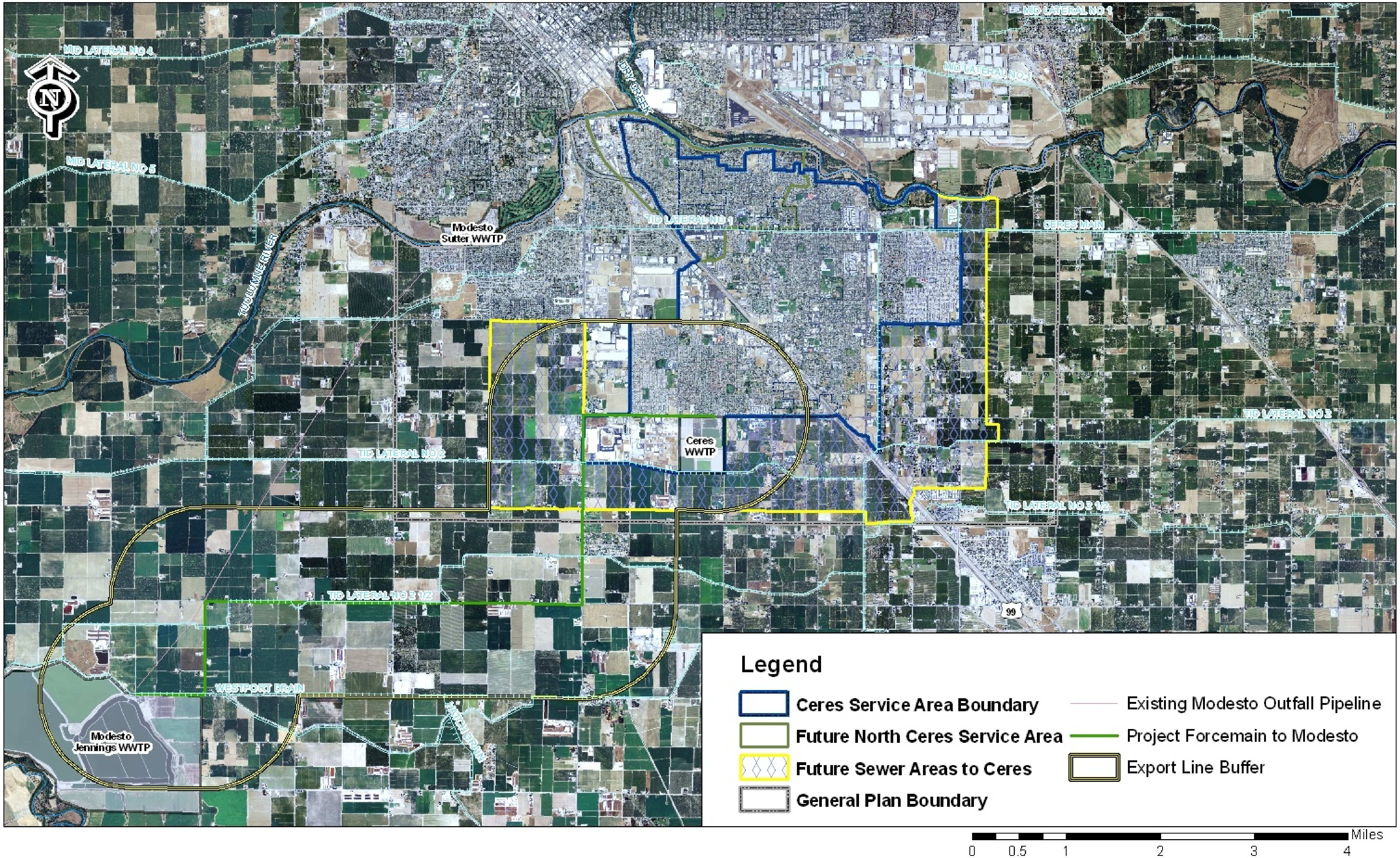


Figure 5-1
Proposed Project Components and Area of Analysis

5.2.3 Baseline Data Assessment

Geographic Information System (GIS) data layers were obtained from a number of sources. Data included in these layers were compared with the project infrastructure locations to evaluate potential environmental factors and the environmental liability of the project as a whole.

GIS data layers were obtained from the City of Ceres, USFWS, CDFG, Natural Resource Conservation Service (NRCS), USGS, California Department of Conservation Land Use Conservation Division, and the Stanislaus County Geographic Information System (GIS). GIS layers obtained include the following:

- City of Ceres Planning Department General Plan Land Use Designations and Zoning (City of Ceres, 1996)
- Department of Conservation Important Farmland Map (CA Dept. of Conservation, 2011)
- National Wetlands Inventory (USFWS, 2011)
- Stanislaus County Hydrology (Stanislaus County, 2011)
- Registered rare and endangered species locations (CNDDB -CDFG, 2011)
- Soil Survey Data (NRCS, 2008)

Data included within these layers were compared with the location of the project alternatives to determine potential biological/environmental constraints associated with the Master Plan.

5.3 RESULTS

5.3.1 Biological Resources

A query of the California Natural Diversity Database (CNDDB; California Dept. Fish and Game, updated February 2011) was conducted to assess the presence of special-status species of concern and/or their potential habitat. Only two species were identified in the vicinity of the project area: the Swainson’s hawk (Buteo swainsoni); and the valley elderberry long horn beetle (Desmocerus californicus dimorphus) (Figure 5-2). Although there are several locations where valley elderberry longhorn beetles exist and where Swainson’s hawks have nested in the vicinity of the project, there is only one occurrence of each within the general plan boundary and a 1 mile buffer of the proposed export line. Both of the occurrences are located adjacent to the Tuolumne River near a golf course in the existing (developed) City of Ceres service area.

5.3.1.1 Valley Elderberry Longhorn Beetle

The valley elderberry longhorn beetle (beetle), Federally listed as Threatened, is found only within the Central Valley of California and in association with blue elderberry (Sambucus mexicana) bushes. Although there has been discussion of, and scientific support for, delisting the beetle since approximately 2006, it is practical to plan for the continued threatened status until such time as the beetle is formally delisted. The beetle generally prefers established elderberry bushes for egg laying, and the elderberry generally occurs in riparian habitats within the Central Valley. Moreover, all occurrences in the vicinity of the City of Ceres listed in the CNDDB are associated with the Tuolumne River. Generally, the projects associated with the City's Master Plan will be located well away from the Tuolumne River, and for the most part will not be affected by the beetle. However, projects conducted near riparian environments should be surveyed for the presence of blue elderberry and if present, then for the beetle.

If blue elderberry and the beetle are identified in a project area, the USFWS conservation guidelines should be followed. Particularly, ground disturbance within 20 feet of the drip line of elderberry bushes with stems larger than 1-inch in diameter at ground surface should be avoided, and ground disturbance within 20 to 100 feet from the drip line should be restored or revegetated. If impacts cannot be avoided, compensational habitat, at a 1:1 ratio, will need to be created (on or off site) as mitigation. This compensational habitat can be obtained through fees or credits in a mitigation bank.

5.3.1.1 Swainson's Hawk

The Swainson's hawk, State of California listed as Threatened, is a migratory bird of prey that breeds in California. Typically, it nests in tall trees near grasslands and/or agriculture areas, particularly field crops (e.g. hay, grain, annual vegetables), where it forages for rodents. Generally, the future sewer area and the 1-mile buffer along the proposed export pipelines represents potential Swainson's hawk foraging habitat, since these areas are currently utilized for agriculture, including field crops, with the exception of orchards which are not considered foraging habitat. Therefore, preconstruction surveys should be conducted to determine if nests are located within the project area.

The majority of the projects associated with the Master Plan would provide only temporary disruptions to foraging habitat, due to the installation of below ground infrastructure generally within the right of way of existing roads. However, there is a cumulative impact where the development requiring expansion of the collection system, and export system, will likely remove foraging habitat. It is presumed that such habitat removal has been or will be mitigated through the planning and development phases of specific projects for this planned growth.

Only one nest has been identified within the general plan boundary, and there is no construction activity in the Master Plan near this location. If additional nests are identified, a plan shall be developed by a qualified biologist to prevent disturbance during the breeding period, extending from March 1 through September 15.

Although not anticipated, should activities associated with the Master Plan require conversion of field crops to another use, such forageing habitat loss should be mitigated according to DFG guidelines. Specifically, compensational habitat will need to be provided at a ratio determined by the distance to a nest, and as follows:

Distance to Nest	Ratio of Compensation Converted
<1 mile	3:2
1 to 5 miles	3:4
5 to 10 miles	1:2
>10 miles	none required

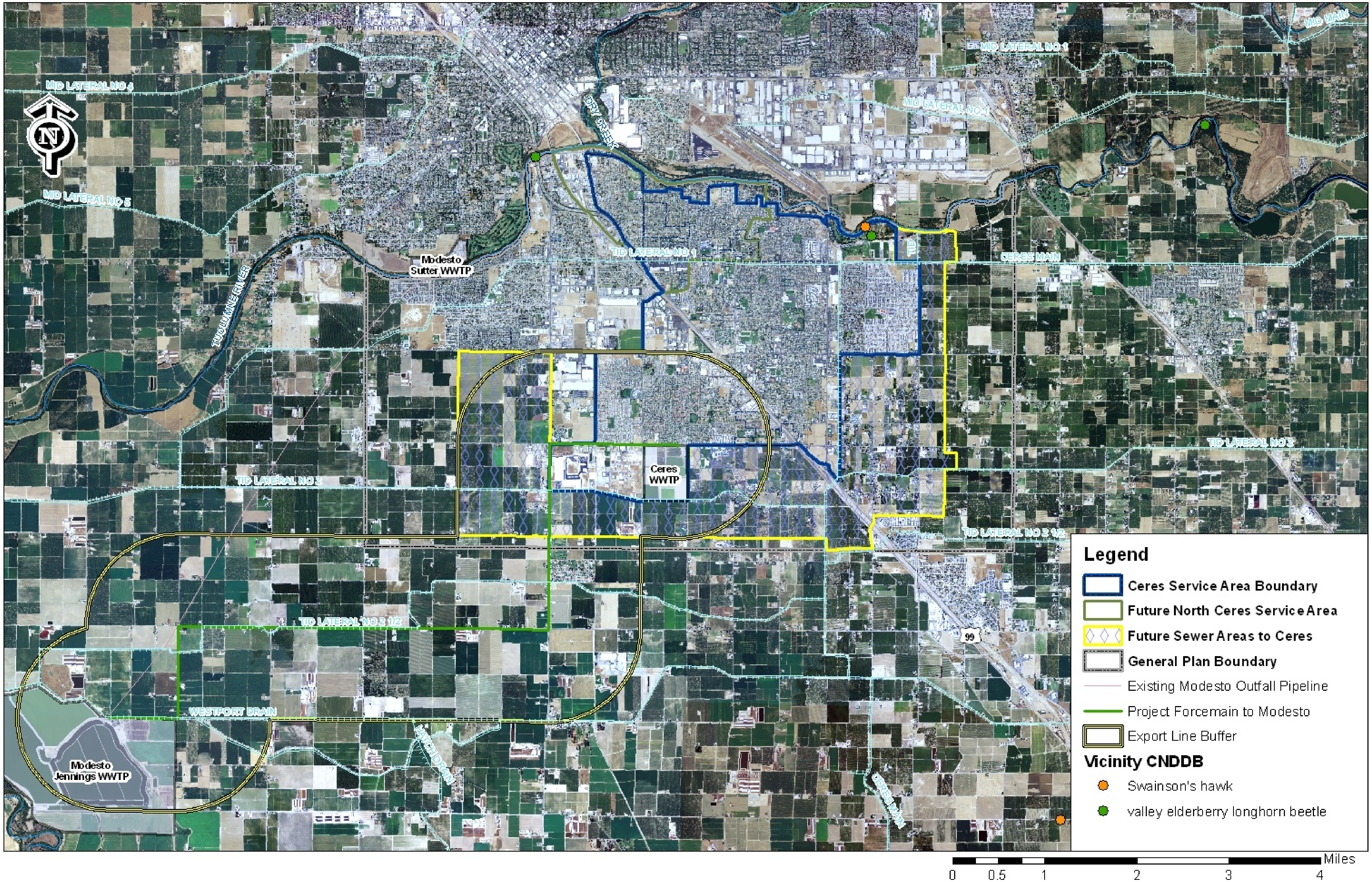


Figure 5-2
Biologic Resources in the Vicinity of the City of Ceres and within the Focus Area of the Master Plan Improvements

5.3.2 Waters of the State

The presence of waters of the state can affect a project in many ways including water quality concerns, hydrology concerns, and habitat concerns. The USFWS National Wetland Inventory (NWI) map and Stanislaus County GIS coverage of hydrologic features were reviewed to assess potential issues with waters of the state. There are freshwater emergent wetlands and freshwater ponds identified within the general plan boundary and within 1 mile of the proposed export pipelines, while irrigation canals appear to be the only waters that will be crossed by the projects (Figure 5-3). These irrigation canals are operated by Turlock Irrigation District (TID) for the purposes of irrigation and not for the transfer of water between waters of the State. In a recent Jurisdictional Delineation Report, TID requested that these canals not be considered jurisdictional due to intermittent flow and lack of a significant nexus; however, a determination would be necessary for the Master Plan for additional canals not included in the TID report. Thus, a survey of pipeline alignments where they cross irrigation canals should be conducted, prior to the pre-design process, by a qualified professional to determine if the canals are jurisdictional waters or potentially support habitat.

Several freshwater ponds are mapped on the NWI adjacent to or in proximity to the collection system and export pipeline alignments. Generally, these appear to be storm water retention/disposal ponds and/or irrigation ponds. However, limiting construction activities to the existing paved area may be necessary to avoid any impacts to these ponds. Additionally, emergent wetlands were identified; however, their location, away from anticipate construction activity, allows for these areas to be easily avoided. Since the scope of the NWI is such that it may falsely identify or fail to identify wetlands, a survey of the project area should be conducted, prior to the pre-design process, by a qualified professional to determine if wetlands are present.

Due to the presence of the canals and potential wetlands, the project could require a Clean Water Act section 404 permit and a CDFG streambed alteration agreement. CWA 404 permitting can take from 4 to 12 months, depending on habitat type. The Streambed Alteration Agreement Process is 90 days; however, when application preparation and information requests are added, the typical process can take 4 to 6 months.

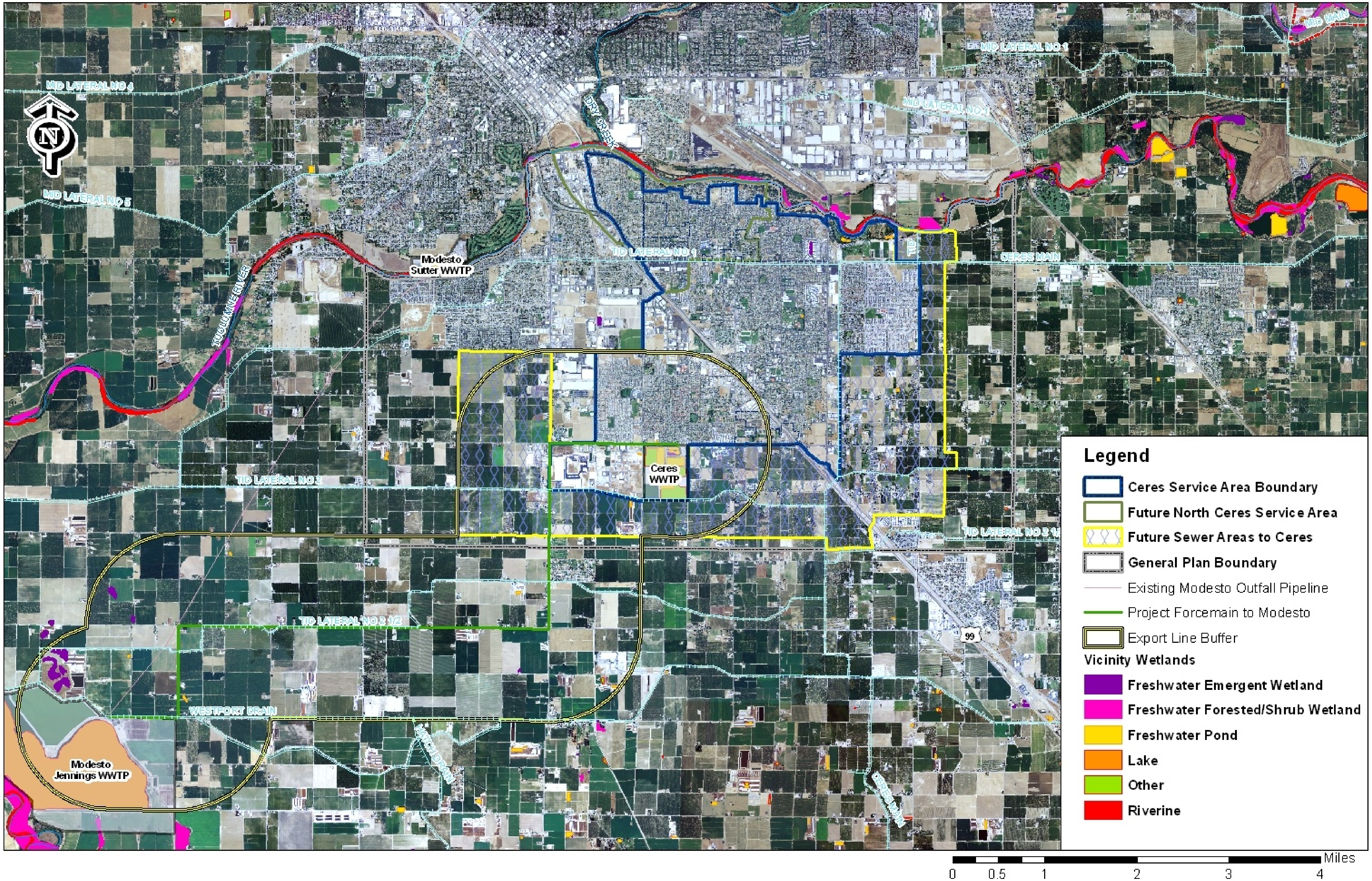


Figure 5-3

Potential Waters of the State in the Vicinity of the City of Ceres and within the Focus Area of the Master Plan Improvements

5.3.3 Conversion of Agriculture Land

The majority of the focus area is comprised of Prime agricultural land. Although the Master Plan, alone, does not remove agricultural land it does serve the population that will convert prime agriculture land to an incompatible use. Based on prime agriculture land identified in the future sewer area to Ceres, as much as 3,260 acres of prime agriculture land could be converted to urban development (Figure 5-4). Stanislaus County has implemented a Farmland Mitigation Program (FMP), requiring agriculture conservation easements of equal area, or in lieu of fees, be established for the conversion of land in a “most productive agriculture area.” Additionally, the portion of the Master Plan upgrades occurring outside of the sphere of influence and on unincorporated County lands is limited to installation of underground pipelines, and impacts to agriculture production from these upgrades will generally be temporary, with the land returning to agriculture.

Although the project is not susceptible to the Stanislaus County FMP, it will convert prime agriculture. The City has made a public disclosure, in the 1997 General Plan, and its EIR, that it would have a significant and unavoidable impact on the environment through conversion of prime agriculture land. The City will need to fully disclose any modifications to the General Plan with respect to conversion of prime agriculture land.

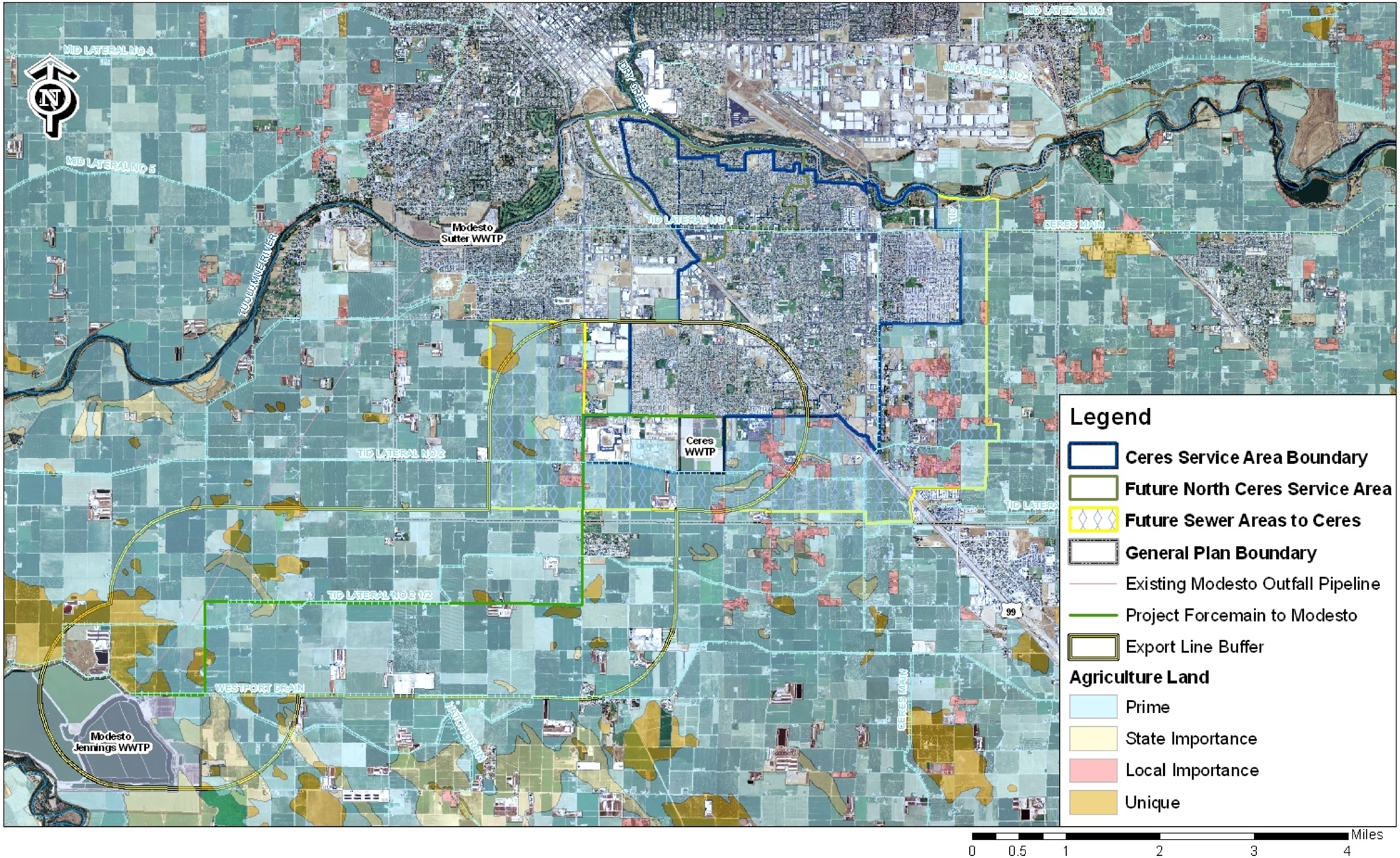


Figure 5-4
Important Agriculture Land in the Vicinity of the City of Ceres and within the Focus Area of the Master Plan Improvements

5.4 ENVIRONMENTAL COMPLIANCE AND POTENTIAL PERMIT REQUIREMENTS

The adoption of the Master Plan and the approval of the defined projects are discretionary actions conducted by a public agency and, therefore, require compliance with the California Environmental Quality Act (CEQA). The City must designate a CEQA Lead Agency (the City) and draft a CEQA document to assess and disclose all potential significant environmental impacts related to the project. One efficient approach is to develop a Program-level EIR for the entire Master Plan and include specific details of specific projects where there is a level of certainty regarding siting, design, and implementation schedule. All subsequent phases of the Master Plan can comply with CEQA by “tiering” off the Program-level EIR, once subsequent phase project-specific details are further defined. This approach is one of three possible CEQA compliance options (Appendix A) and it is up to the Lead Agency and their Legal Council to decide the appropriate level of CEQA disclosure.

In addition, because the project couldentail federal funding (e.g., grants or low-interest loans from federally funded programs) and will likely approvals from federal environmental regulatory agencies, a “federal nexus”, then the project will need to comply with the National Environmental Policy Act (NEPA), or a “CEQA Plus” process defined by the funding agency. This process facilitates the federal agency’s compliance with NEPA. Early planning coordination between the environmental compliance specialists, project engineers and regulatory agencies, should result in minimized impacts and therefore reduced mitigation requirements under NEPA and CEQA.

Although implementation of the Master Plan and its associated proposed projects will likely result in the need to obtain permits from both federal and state environmental regulatory agencies, planning based on close coordination between the pre-design and environmental team can result in minimized impacts, streamlined permitting efforts, and reduced mitigation costs.

Table 5-1 presents approximate environmental compliance timelines for key environmental regulations.

Table 5-1
Key State and Federal Environmental Regulations that may be Triggered by the Proposed Project

Regulations	Jurisdictional Agency	Permit Name	Trigger	Estimated Accelerated Timeline	Permit Prerequisites for Approval
Federal Regulations					
NEPA	EPA	❒ NEPA Compliance and Record of Decision	Federal Nexus – SRF Funds (EPA), Waters of the US Impacts (Corps), ESA-listed Species Consultations (USFWS/NMFS)	9-14 Months	
CWA 404	Corps	❒ Individual Permit (IP) ❒ Nationwide 12 (utilities)	Dredge or Fill Material in Waters of the U.S.	4-12 Months	FESA Section 7 NHPA Section 106 CWA 401
FESA Section 7 MBTA, and Eagle Protection Act	USFWS and NOAA Fisheries	❒ Section 7 Formal Consultations	Potential for “take” of Federally listed habitat or Individuals (i.e., VELB, Nesting Raptors)	9-12 months (BA review period = 180 days)	
NHPA Section 106	SHPO	❒ Section 106 Consultations	Potential Impacts to Cultural Resources eligible for listing or listed on the Natural Historic Resources Register	3-6 months	
Federal/State Regulations					
CWA 401	RWQCB	❒ 401 Certification	Potential Water Quality impacts to surface waters	6-9 months (note agency timeline is 90 days; longer periods typical	CEQA NOD
SWRCB - Statewide General Construction Stormwater Discharge (GCSD) Permit (Order No. 2009-0009-DWQ)	SWRCB	❒ General Construction Stormwater Permit	Any construction project over 1 acre (Grading > 1 acre)	Covered with NOI submittal 60 days	Stormwater Pollution Prevention Plan must be kept on site
Low Threat Dewatering and other low threat discharges to surface waters (order # 5-00-175)	RWQCB – Central Valley Region	❒ Dewatering Permit	Dewatering or well development – flow requirements- typically temporary construction (Note: Regional Board is currently updating this general permit – tentative order has been published)	1-3 months (~30 day Regional Board review of NOI)	NOI and demonstration of coverage under general permit stipulations
State Regulations					
CEQA	Ceres (Lead Agency)	❒ CEQA Compliance and NOD	Discretionary Action	12-18 Months (from the date of a complete PD)*	
CEQA Guidelines	CNPS/CDFG	❒ CEQA Compliance and NOD	Impacts to CNPS List 1 or 2 Species	Embedded in CEQA timeline	
CESA	CDFG	❒ 2081 MOU	Potential for “take” of state-listed Individuals (i.e., Swainson’s Hawk)	6-12 months	CEQA
CDFG Code Section 1602	CDFG	❒ Stream or Lakebed Alteration Agreement	Impacts to streambed, lakebed, riparian area or floodplain (includes boring under streams)	3-6 months (note agency timeline is 90 days, however, longer periods are typical to deem application complete)	CEQA NOD
Local Regulations					
Stanislaus County General Plan Consistency	Stanislaus County	❒ Land Use Designation Change/ or General Plan Amendment	Change in land use designation	Not likely necessary	CEQA

Note: If the project is controversial and/or the project description is altered during the process, the DEIR could end up being re-circulated and the timeline would end up being 18 months or more.

The state authorizations would be required for potential impacts to state regulated resources (i.e. streams, riparian habitat, and state-listed species) and as a part of CEQA. The federal permits are triggered because:

1. The project could likely be federally funded with EPA money in the State Water Quality Resources Control Board (SWQCB) Division of Financial Assistance (DFA) federal – State Revolving Fund program. The federal money in the SRF program triggers the need for the funding agency (in this case the SWQCB acting on behalf the EPA) to ensure compliance with federal environmental regulations including but not limited to the Clean Water Act (CWA) Section 401 and 404, National Historic Preservation Act Section 106, Federal Endangered Species Act Section 7. Depending on the level of potential impacts these permits can take six to 12 months to obtain.
2. The magnitude and linear configuration of the project (~9 miles) does not allow for complete avoidance of the placement of dredge and fill material in waters of the US, including wetlands, especially when the Corps has potential jurisdiction over roadside swales that exhibit an ordinary high water mark (OHWM) or wetland characteristics.
3. The potential to encounter valley elderberry longhorn beetle is low; however, its presence would trigger the need for FESA Section 7 or 10 consultations for an assessment of the potential to adversely affect the beetle and/or its habitat. Note: In the absence of a federal nexus (funding or Corps), these consultations would need to be conducted under Section 10 of the FESA. Section 10 is a longer consultation process because it occurs between a federal and non-federal agency and requires the completion and approval of a Habitat Conservation Plan (HCP), approximately a minimum of 2 years.

If the City seeks funding through the State Revolving Fund (SRF) program (which has an EPA component), then the following tasks must be completed for the SRF Environmental Review Unit:

- Section 106 Compliance Documentation – An updated records search will be conducted with search results to be included on a map detailing all known sites within the project footprint. Native American consultations/correspondence will be completed to meet Section 106 compliance. The results of the updated records search and responses to Native American correspondence must be forwarded to the State Board Division of Financial Assistance SRF ERU for Section 106 compliance with the National Historic Preservation Act.
- Section 7 Compliance Documentation – An up to date California Natural Diversity Data Base (CNDDB) species list and map will be developed detailing all known special-status species within 5 miles of the project area. A current U.S. Fish and Wildlife Service (USFWS) list of endangered, threatened and candidate species with potential to occur in the project area will be downloaded from the USFWS website. A species table, including potential for special-status species to occur in the project area, will be developed and forwarded to the State Board Division of Financial Assistance SRF ERU for Section 7 compliance with the Endangered Species Act.
- Clean Air Act – Project-specific air emissions data will be developed to fill in the Evaluation Checklist table and verify the de minimus finding. The results of the air emissions data related to these projects will be forwarded to the State Board Division of Financial Assistance SRF ERU for compliance with the Clean Air Act.

The SRF Environmental Review Unit will also require a finalized SRF CEQA Plus environmental checklist.

5.5 RESOURCE –SPECIFIC CONSTRAINTS SUMMARY

The key biological, land use, and cultural constraints relative to the core proposed project will most likely revolve around the resources listed below.

Key Biological Issues that will likely require mitigation:

- Impacts to Wetlands and Waters of the U.S. (if crossed or impacted)
- Valley Elderberry Longhorn Beetle Habitat (if present)
- Swainson's Hawk Habitat
- Nesting raptors and migratory birds

Key Cultural Issues:

- Impacts to Potential Cultural Resources (inadvertent finds)

Key Land Use Issues:

- Conversion of Agriculture land

5.6 POTENTIAL ENVIRONMENTAL MITIGATION COSTS

General level order of magnitude cost estimates were prepared to provide some insight into the cost of environmental mitigation for the potential impacts identified.

5.6.1 Wetlands/Waters of the US

Compensation is not typically required for temporary impacts if a restoration plan is implemented (primarily for the pipeline). For the purpose of the projects currently identified in the Master Plan, we assume the placement of fill in waters of the US will be avoided or minimized by directional drilling under streams or waterways and complete restoration of temporarily disturbed areas. In lieu fees for impacts to riverine habitat, wetlands, and vernal pools currently range from $150,000 to $325,000/acre.

5.6.2 ESA Listed Species

Mitigating impacts to federally listed species habitat depends on the habitat quality. In lieu fees of $25,000 per tree have been applied for impacts to Valley Elderberry Longhorn Beetle habitat; however, this number varies greatly with the size and number of stems on the elderberry bush. This fee may be levied for impacts along the pipeline corridors and development along the Tuolumne River. The ratio will depend on habitat quality and the results of protocol-level surveys. It is currently assumed that ESA species impacts will be avoided by design and no firm cost in lieu type fees levied by the agencies. Loss of Swainson's Hawk foraging habitat would require a compensatory mitigation, which currently costs approximately $8,000/acre (range $6,000-$9000).

5.6.3 Cultural Resources

Estimating mitigation costs for cultural resources impacts are difficult to accurately predict at this stage. The project will be primarily in roadways so it is assumed there will not be any significant finds. However, if significant resources (e.g., tribal sites, burials,) are found that requires extensive documentation, excavation and data recovery the costs could range from $30,000 to over $500,000.

For the purpose of this estimate, again since most work will occur primarily in roadways, it is likely that cultural resource mitigation costs could be zero.

5.7 PLANNING AND DESIGN-RELATED ENVIRONMENTAL CONSIDERATIONS TO REDUCE POTENTIAL IMPACTS AND STREAMLINE THE ENVIRONMENTAL COMPLIANCE PROCESS

Below is a list of planning and design-related considerations to reduce potential impacts and streamline the environmental compliance process, further reduce costs, permitting timelines, and potential permitting and mitigation fees:

- **Include Project-specific details in the Master Plan CEQA document** (or if appropriate, develop a project-specific CEQA document) so that the initial phases of the plan are already covered under CEQA immediately upon completion of the CEQA process. In addition, this method will streamline subsequent projects conducted under subsequent phases of the Masterplan, because they can simply be "tiered" off the Program-level CEQA document referring back to the original EIR for mitigation and impact disclosure.
- **Implement "Pinch Points" along pipelines:** Reduce the construction corridor to the width of the road, where the road/pipeline route crosses canals, drains, wetlands, and/or potential habitat areas.
- **Avoid/Minimize Impacts to Cultural Resources:** No route as currently planned would entail removal of buildings or other potential cultural resources. They will be designed to avoid such structures. The pipelines will be buried and therefore would not permanently impact the cultural aesthetics of an area either. The likelihood of inadvertent cultural resource finds along open country routes are greater than in disturbed roadways; however, cultural resource avoidance should be further considered for both routes.
- **Minimize/Avoid Impacts to Wetlands:** Vernal pools are considered habitat for several listed fairy shrimp species and protocol-level surveys of vernal pools takes two years to complete. If avoidance is infeasible, and impacts have not been mitigated through previous permitting efforts, impacts within 250 feet of the pools will require conservation, preservation, or restoration mitigation. Current credits for vernal pool impacts are approximately $250-325,000. Similarly, seasonal and emergent wetland preservation credits cost approximately $150 - $200,000. Therefore, it is recommended vernal pool and wetland impacts be avoided.

- **Minimize/Avoid Impacts to Swainson's Hawk nests:** No known nests are present within the planned project areas; however, if identified in pre-design surveys, efforts should be conducted to work outside of the breeding season (March 1 through September 15) or appropriate buffering and work hours should be employed to minimize disturbance.
- **Minimize Permanent Impacts to Swainson's Hawk Foraging Habitat:** Mitigation fees for loss of Swainson's Hawk foraging habitat (cropland or annual grassland), currently range from $6,000 to $9,000 per acre. CDFG considers an impact that lasts longer than one year a permanent impact or loss of foraging habitat requiring compensation. These impacts are levied at different ratios depending on the distance from an active nest. Permanent structures, to the extent feasible should be located outside of potential foraging habitat to the extent feasible.
- **Minimize/Avoid Impacts to Valley Elderberry Longhorn Beetle and its habitat:** Apply appropriate buffering to minimize disturbance to this habitat. Removal or adverse affects on this species or its habitat will result in the need for transplantation and compensatory mitigation. This can cost $25,000 or more depending on the size of the plant, number of stems, and presences of VELB exit holes.
- **Conduct rare plant surveys** early and during the appropriate bloom times to facilitate designing to avoid impacts or set up mitigation early in the process.

5.8 COMPLIANCE TIMELINE

Below is the proposed environmental compliance timeline. The Master Plan itself need only comply with CEQA, however, prior to the implementation of each specific project in the Master Plan (and depending on the final design of each project), the City will likely need to demonstrate compliance with multiple federal, state, and local regulations (see Table 5-1).

A Programmatic Master Plan EIR would typically take 12 -18 months to complete. Prior to project implementation, the City will likely need to complete the environmental permitting process. These permit applications could run concurrent with the EIR process and therefore the total estimated timeline for a Programmatic EIR with project-specific details covering initial specific projects and permits is 12-18 months.

Permitting timelines can be accelerated if the City:

1. Includes project-specific details into the Master Plan CEQA document (or if feasible uses a focused EIR or project-specific IS/MND for CEQA compliance),
2. Initiates studies and consultations early in the CEQA process;
3. Adheres to the avoidance and minimization measures listed above to streamline the CWA Section 404 and the FESA Section 7 compliance processes;
4. Capitalizes on close coordination between the City, design team, and environmental compliance team to facilitate minor design adjustments (i.e. avoiding wetlands) that save time and money.

sufficient evidence that an EIR should be prepared. Also, if all impacts cannot be fully mitigated, which would be identified in the Initial Study, the City would then need to prepare an EIR.

Appendix A

Order No. 93-237, Waste Discharge Requirements for City of Ceres Wastewater Treatment Plant, Stanislaus County, California Regional Water Quality Control Board, Central Valley Region

STATE OF CALIFORNIA - Environmental Protection Agency

PETE WILSON, Governor

CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
CENTRAL VALLEY REGION
3443 Routier Road, Suite A
Sacramento, CA 95827-3098
PHONE: (916) 255-3000
FAX: (916) 255-3015

7 December 1993

CERTIFIED MAIL
P 430 798 085

Mr. John Wilson
City of Ceres
P.O. Box 217
Ceres, CA 95307

TRANSMITTAL OF ADOPTED WASTE DISCHARGE REQUIREMENTS FOR CITY OF CERES, WASTEWATER TREATMENT PLANT, STANISLAUS COUNTY

Enclosed is an official copy of Order No. 93-237 as adopted by the California Regional Water Quality Control Board, Central Valley Region, at its 3 December 1993 meeting.

Kenneth D. Landau

KENNETH D. LANDAU
Senior Engineer

SPD:ldj

Enclosure

CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
CENTRAL VALLEY REGION

ORDER NO. 93-237

WASTE DISCHARGE REQUIREMENTS
FOR
CITY OF CERES
WASTEWATER TREATMENT PLANT
STANISLAUS COUNTY

The California Regional Water Quality Control Board, Central Valley Region, (hereafter Board) finds that:

1. The City of Ceres (hereafter Discharger), operates a wastewater treatment and disposal facility. The property (Assessor's Parcel No. 41-083-4000) is owned by the City of Ceres.

2. Waste Discharge Requirements Order No. 75-279, adopted by the Board on 21 November 1975, prescribes requirements for a discharge from the City of Ceres for disposal by ponding and irrigation.

3. Order No. 75-279 is neither adequate nor consistent with current plans and policies of the Board.

4. Order No. 79-53 established wastewater reclamation requirements for treated effluent from the City to be used for off-site crop irrigation. The contract to supply irrigation water to the neighbor expired and will not be renewed by the City. Order 79-53 was rescinded by the Board on 4 December 1992.

5. The Discharger discharges 2.2 million gallons per day of aerated lagoon effluent to conventional evaporation/percolation ponds. Total average daily design flow is 2.5 million gallons per day. Turlock Irrigation District is proposing to build a 49.9 MW power plant near the City's wastewater treatment plant. The power plant is designed to use 0.3 million gallons per day treated effluent from the City.

6. The facility is in Section 22, T4S, R9E, MDB&M, with surface water drainage to the San Joaquin River, as shown in Attachment A, which is attached hereto and part of the Order by reference.

7. The Board adopted a Water Quality Control Plan, Second Edition, for the Sacramento-San Joaquin Basin (hereafter Basin Plan), which contains water quality objectives for all waters of the Basin. These requirements implement the Basin Plan.

8. The beneficial uses of the San Joaquin River are municipal, industrial, and agricultural supply; recreation; esthetic enjoyment; navigation; and preservation and enhancement of fish, wildlife, and other aquatic resources.

9. The beneficial uses of underlying ground water are domestic, industrial, and agricultural supply.

10. The action to update waste discharge requirements for this facility is exempt from the provisions of the California Environmental Quality Act (CEQA), in accordance with Title 14, California Code of Regulations (CCR), Section 15301.

11. This discharge is exempt from the requirements of Title 23, CCR, Section 2510, et seq. (hereafter Chapter 15). The exemption, pursuant to Section 2511(b), is based on the following:

    a. The Board is issuing waste discharge requirements, and

    b. The discharge complies with the Basin Plan, and

    c. The wastewater does not need to be managed according to 22 CCR, Division 4, Chapter 30, as a hazardous waste.

12. The Board has notified the Discharger and interested agencies and persons of its intent to prescribe waste discharge requirements for this discharge and has provided them with an opportunity for a public hearing and an opportunity to submit their written views and recommendations.

13. The Board, in a public meeting, heard and considered all comments pertaining to the discharge.

IT IS HEREBY ORDERED that Order No. 75-279 is rescinded and the City of Ceres, its agents, successors, and assigns, in order to meet the provisions contained in Division 7 of the California Water Code and regulations adopted thereunder, shall comply with the following:

A. Discharge Prohibitions:

1. Discharge of wastes to surface waters or surface water drainage courses is prohibited.

2. Bypass or overflow of untreated or partially treated waste is prohibited.

3. Discharge of waste classified as 'hazardous' or 'designated', as defined in Sections 2521(a) and 2522(a) of Chapter 15, is prohibited.

B. **Discharge Specifications:**

1. The monthly average dry weather discharge flow shall not exceed 2.5 million gallons/day.

2. Objectionable odors originating at this facility shall not be perceivable beyond the limits of the property owned by the Discharger.

3. As a means of discerning compliance with Discharge Specification No. 2, the dissolved oxygen content in the upper zone (1 foot) of wastewater in ponds shall not be less than 1.0 mg/l.

4. The treatment facilities shall be designed, constructed, operated, and maintained to prevent inundation or washout due to floods with a 100-year return frequency.

5. Ponds shall be managed to prevent breeding of mosquitos. In particular,

   a. An erosion control program should assure that small coves and irregularities are not created around the perimeter of the water surface.

   b. Weeds shall be minimized through control of water depth, harvesting, or herbicides.

   c. Dead algae, vegetation, and debris shall not accumulate on the water surface.

6. Public contact with wastewater shall be precluded through such means as fences, signs, and other acceptable alternatives.

7. Ponds shall have sufficient capacity to accommodate allowable wastewater flow and design seasonal precipitation and ancillary inflow and infiltration during the

nonirrigation season. Design seasonal precipitation shall be based on total annual precipitation using a return period of 100 years, distributed monthly in accordance with historical rainfall patterns. Freeboard shall never be less than two feet (measured vertically to the lowest point of overflow).

8. On or about **1 October** of each year, available pond storage capacity shall at least equal the volume necessary to comply with Discharge Specification 7.

C. **Sludge Disposal:**

1. Collected screenings, sludges, and other solids removed from liquid wastes shall be disposed of in a manner that is consistent with Chapter 15, Division 3, Title 23, of the California Code of Regulations and approved by the Executive Officer.

2. Any proposed change in sludge use or disposal practice from a previously approved practice shall be reported to the Executive Officer and U.S. Environmental Protection Agency (EPA) Regional Administrator at least 90 days in advance of the change.

3. Use and disposal of sewage shall comply with existing Federal and State laws and regulations, including permitting requirements and technical standards included in 40 CFR 503.

   If the State Water Resources Control Board and the Regional Water Quality Control Boards are given the authority to implement regulations contained in 40 CFR 503, this Order may be reopened to incorporate appropriate time schedules and technical standards. The Discharger must comply with the standards and time schedules contained in 40 CFR 503 whether or not they have been incorporated into this Order.

4. The Discharger is encouraged to comply with the State Guidance Manual issued by the Department of Health Services titled *Manual of Good Practice for Landspreading of Sewage Sludge.*

5. By **30 January** of each year, the Discharger shall submit a sludge disposal plan describing the annual volume of sludge generated by the plant and specifying the disposal practices.

D. Ground Water Limitations:

The discharge shall not cause underlying ground water to:

1. Contain waste constituents in concentrations statistically greater than background water quality. (For purposes of comparison, background water quality shall be determined when background monitoring provides sufficient data. Quality determined in this manner establishes "water quality protection standards.")

2. Contain chemicals, heavy metals, or trace elements in concentrations that adversely affect beneficial uses or exceed maximum contaminant levels specified in 22 CCR, Division 4, Chapter 15.

3. Exceed a most probable number of total coliform organisms of 2.2/100 ml over any seven-day period.

4. Exceed concentrations of radionuclides specified in 22 CCR, Division 4, Chapter 15.

5. Contain taste or odor-producing substances in concentrations that cause nuisance or adversely affect beneficial uses.

6. Contain concentrations of chemical constituents in amounts that adversely affect agricultural use.

E. Provisions:

1. The Discharger shall comply with the Monitoring and Reporting Program No. 93-237, which is part of this Order, and any revisions thereto as ordered by the Executive Officer.

2. The Discharger shall comply with the "Standard Provisions and Reporting Requirements for Waste Discharge Requirements", dated 1 March 1991, which are attached hereto and by reference a part of this Order. This attachment and its individual paragraphs are commonly referenced as "Standard Provision(s)."

3. In the event of any change in control or ownership of land or waste discharge facilities described herein, the Discharger shall notify the succeeding owner or operator of the existence of this Order by letter, a copy of which shall be immediately forwarded to this office.

4. At least **90 days** prior to termination or expiration of any lease, contract, or agreement involving disposal or reclamation areas or off-site reuse of effluent, used to justify the capacity authorized herein and assure compliance with this Order, the Discharger shall notify the Board in writing of the situation and of what measures have been taken or are being taken to assure full compliance with this Order.

5. The Discharger shall use the best practicable cost-effective control technique currently available to limit mineralization to no more than a reasonable increment.

6. The Discharger must comply with all conditions of this Order, including timely submittal of technical and monitoring reports as directed by the Executive Officer. Violations may result in enforcement action, including Regional Board or court orders requiring corrective action or imposing civil monetary liability, or in revision or rescission of this Order.

7. The City of Ceres as owner of the real property at which the discharge will occur, is ultimately responsible for ensuring compliance with these requirements.

8. A copy of this Order shall be kept at the discharge facility for reference by operating personnel. Key operating personnel shall be familiar with its contents.

9. If reclaimed water is used for construction purposes, it shall comply with the most current edition of "Guidelines for Use of Reclaimed Water for Construction Purposes". Other uses of reclaimed water not specifically authorized herein shall be subject to the approval of the Executive Officer and shall comply with 22 CCR, Division 4.

10. The Board will review this Order periodically and will revise requirements when necessary.

I, WILLIAM H. CROOKS, Executive Officer, do hereby certify the foregoing is a full, true, and correct copy of an Order adopted by the California Regional Water Quality Control Board, Central Valley Region, on 3 December 1993.

William H. Crooks

WILLIAM H. CROOKS, Executive Officer

9/27/93:SPD:gs/ldj

CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
CENTRAL VALLEY REGION

MONITORING AND REPORTING PROGRAM NO. 93-237

FOR
CITY OF CERES
WASTEWATER TREATMENT PLANT
STANISLAUS COUNTY

Specific sample station locations shall be established under direction of the Board's staff and a description of the stations shall be attached to this Order.

EFFLUENT MONITORING

Effluent samples shall be collected at the discharge to ponds.

Constituents	Units	Type of Sample	Sampling Frequency
20°C BOD_5	mg/l	Grab	Monthly
Nitrates (as NO_3)	mg/l	Grab	Monthly
Specific Conductivity	μmhos/cm	Grab	Monthly
Chloride	mg/l	Grab	Monthly
Flow	mgd	Cumulative	Daily

WASTEWATER POND MONITORING

The freeboard on all percolation/evaporation ponds shall be observed and recorded twice monthly. The minimum freeboard observed during each month at each pond shall be reported together with the dates when the freeboard was observed.

WATER SUPPLY MONITORING

A sampling station shall be established where a representative sample of the municipal water supply can be obtained. Water supply monitoring shall include at least the following:

Constituents	Units	Sampling Frequency
Standard Minerals	mg/l	Yearly
Electrical Conductivity @ 25°C	μmhos/cm	Yearly
Total Dissolved Solids	mg/l	Yearly

GROUND WATER MONITORING

The ground water monitoring program shall consist of the three on-site monitoring wells. Ground water samples shall be collected from all wells and analyzed as follows:

Constituents	Units	Sampling Frequency
Specific Conductivity	μmhos/cm	Quarterly
pH	pH Units	Quarterly
Nitrate (as NO_3)	mg/l	Quarterly
Chloride	mg/l	Quarterly
Groundwater Elevation	Feet, MSL(1)	Quarterly

[1] Ground water elevations shall be reported to the nearest 0.01 foot above mean sea level.

REPORTING

In reporting the monitoring data, the Discharger shall arrange the data in tabular form so that the date, the constituents, and the concentrations are readily discernible. The data shall be summarized in such a manner to illustrate clearly the compliance with waste discharge requirements.

Monthly monitoring reports shall be submitted to the Regional Board by the **20th day** of the following month.

The results of any monitoring done more frequently than required at the locations specified in the Monitoring and Reporting Program shall be reported to the Board.

Upon written request of the Board, the Discharger shall submit a report to the Board by **30 January** of each year. The report shall contain both tabular and graphical summaries of the monitoring data obtained during the previous year. In addition, the Discharger shall discuss the compliance record and the corrective actions taken or planned which may be needed to bring the discharge into full compliance with the waste discharge requirements.

The Discharger shall implement the above monitoring program as of the date of this Order.

Ordered By: William H. Crooks

WILLIAM H. CROOKS, Executive Officer

3 December 1993
(Date)

9/27/93:SPD:gs/ldj

INFORMATION SHEET

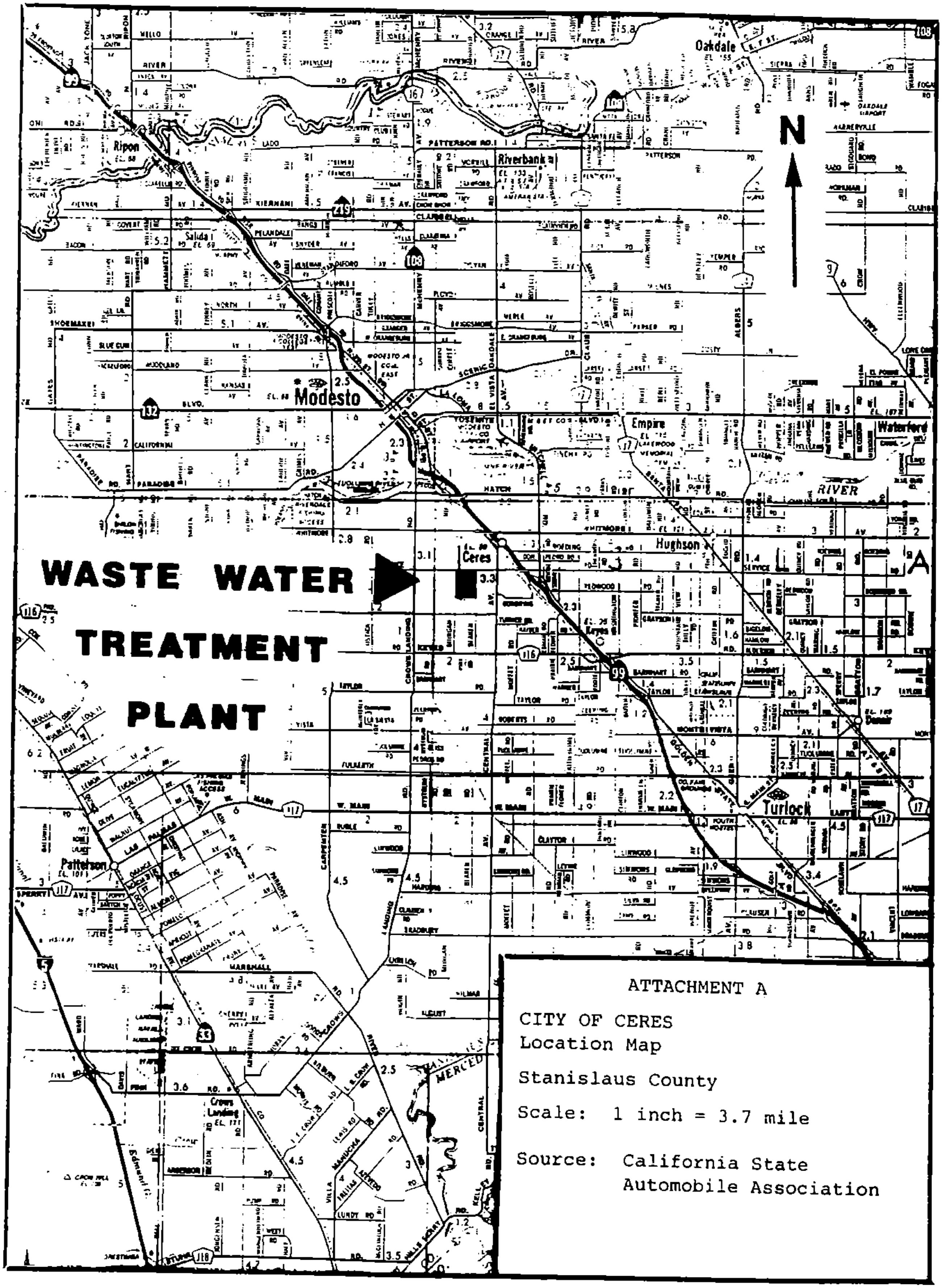
CITY OF CERES
WASTEWATER TREATMENT PLANT
STANISLAUS COUNTY

The City of Ceres operates a wastewater treatment plant in Section 22, T4S, R9E, MDB&M.

Influent passes through a "Muffin Monster" grinder, through aerated facultative ponds, followed by disposal to evaporation/percolation ponds.

Total average daily design flow for the plant is 2.5 million gallons per day (mgd). Turlock Irrigation District is proposing to have a 49.9 MW power plant built near the treatment plant. The power plant is designed to use 0.3 mgd treated effluent from the City.

Local soils are typical of valley fill areas (i.e., silty sand underlain by a thin hardpan layer, then more silts). Local ground waters are maintained 6 to 10 feet below ground surface by the irrigation district through pumps at each section corner. These pumped waters are discharged to irrigation water canals for further use as irrigation water. Residences are widely separated. The surrounding area is devoted to agriculture.



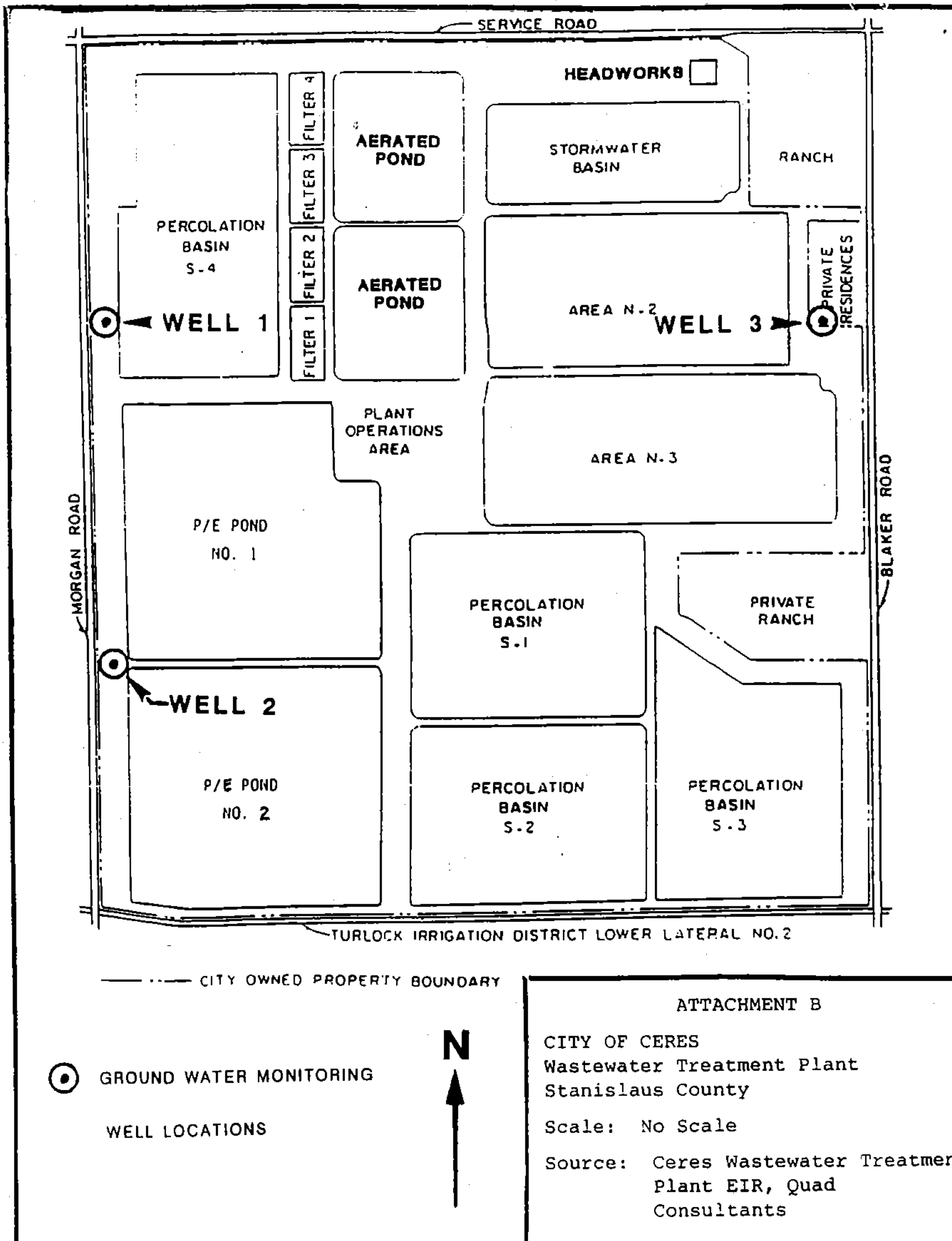
ATTACHMENT A

CITY OF CERES
Location Map

Stanislaus County

Scale: 1 inch = 3.7 mile

Source: California State
Automobile Association



ATTACHMENT B

CITY OF CERES
Wastewater Treatment Plant
Stanislaus County

Scale: No Scale

Source: Ceres Wastewater Treatment Plant EIR, Quad Consultants

Appendix B

Existing Sewer CIP Cost Estimate Details

Table 1-C-1

City of Ceres Sewer System Master Plan

Preliminary Opinion of Probable Cost for Existing System Deficiencies

Tier 1 Improvements

Stantec Consulting Services, Inc.

		DATE CREATED:	5/19/2010
PROJECT:	CITY OF CERES SEWER MASTER PLAN PRELIMINARY COST ESTIMATE	**UPDATED:**	5/19/2010
		PREPARED BY:	NJW
JOB NUMBER:	CERE09-002		
		CHECKED BY:	NTC
DESCRIPTION:	Existing System Deficiencies - Tier 1 Gravity Sewer Improvements	**CURRENT ENR CCI:**	8,761

Tier 1 Improvements

Location	Segment		Existing	Upgrade	Construction	Quantity	Unit	Unit	Subtotal
	U/S MH	D/S MH	Size (in)	Size (in)	Method			Cost	
9th/Roeding/ 6th/Park (Figure 1-2)	N10-074	N10-073	---	8	Open Cut	118	LF	$160	$18,880
	P10-001	O9-027	8	12	Pipe Bursting	1,346	LF	$240	$323,040
	N9-041	O9-014	8	10	Pipe Bursting	1,132	LF	$200	$226,400
	O9-014	O9-027	8	12	Pipe Bursting	561	LF	$192	$107,712
	O9-027	O9-019	8	15	Open Cut	608	LF	$300	$182,400
	O9-017	O9-019	6	10	Pipe Bursting	161	LF	$160	$25,760
								Subtotal	**$884,192**
Central/Pine (Figure 1-2)	O9-035	P9-044	12	15	Pipe Bursting	1822	LF	$240	$437,280
	P9-044	Q9-013	12	18	Pipe Bursting	1225	LF	$288	$352,800
								Subtotal	**$790,080**
SUBTOTAL									**$1,674,272**
Estimating Contingency						30 %			$502,282
SUBTOTAL CONSTRUCTION COSTS									**$2,176,554**
Design/Administration						10 %			$217,655
TOTAL CONSTRUCTION COSTS									**$2,394,209**

Notes:

1. Unit cost = $20/inch diameter for open cut; $16/inch diameter for pipe bursting
2. Unit cost = $50,000 each for canal crossing
3. Unit cost = $100,000 each for SR 99 crossing
4. OCR = Open Cut and Replace

Table 1-C-3

City of Ceres Sewer System Master Plan

Preliminary Opinion of Probable Cost for Existing System Deficiencies

Tier 2 Improvements

Stantec Consulting Services, Inc.

		DATE CREATED:	5/19/2010
PROJECT:	CITY OF CERES SEWER MASTER PLAN PRELIMINARY OPINION OF PROBABLE COST	**UPDATED:**	5/19/2010
		PREPARED BY:	NJW
JOB NUMBER:	CERE09-002		
		CHECKED BY:	NTC
DESCRIPTION:	Existing System Deficiencies - Tier 2 Gravity Sewer Improvements	**CURRENT ENR CCI:**	8,761

Tier 2 Improvements

Location	Segment		Existing	Upgrade	Construction	Quantity	Unit	Unit	Subtotal
	U/S MH	D/S MH	Size (in)	Size (in)	Method			Cost	
Don Pedro/ East Service/ Moffett (Figure 1-3a)	P10-052	P10-047	18	24	Pipe Bursting	1101	LF	$384	$422,784
	P10-047	P10-040	18	27	Open Cut	1445	LF	$540	$780,300
	P9-048	Q10-013	18	21	Pipe Bursting	1199	LF	$336	$402,864
	Q10-013	Q9-014	18	36	Open Cut	2616	LF	$720	$1,883,520
								Subtotal	**$3,489,468**
Evans (Figure 1-3c)	M9-007	M8-009	12	15	Pipe Bursting	2463	LF	$240	$591,120
								Subtotal	**$591,120**
Mitchell/ East Whitmore/ Hidden Oak (Figure 1-3f)	N11-017	N11-047	12	18	Pipe Bursting	664	LF	$288	$191,232
	N11-047	N10-052	12	18	Open Cut	2321	LF	$360	$835,560
	N10-052	Barbour's LS Wet Well	12	21	Open Cut	178	LF	$420	$74,760
								Subtotal	**$1,101,552**
Central/ Forest/Acorn (Figure 1-3c)	M10-012	M9-010	10	12	Pipe Bursting	1711	LF	$192	$328,512
	M9-010	M9-015	10	12	Pipe Bursting	1027	LF	$192	$197,184
	M9-015	Central/ Evans LS Wet Well	10	15	Pipe Bursting	456	LF	$240	$109,440
								Subtotal	**$635,136**
Moffett (Figure 1-3e)	K10-056	L10-053	10	12	Pipe Bursting	1812	LF	$192	$347,904
								Subtotal	**$347,904**
Blaker (Figure 1-3b)	O8-040	P8-088	18	24	Pipe Bursting	2519	LF	$384	$967,296
								Subtotal	**$967,296**

Table 1-C-3

City of Ceres Sewer System Master Plan

Preliminary Opinion of Probable Cost for Existing System Deficiencies

Tier 2 Improvements

Stantec Consulting Services, Inc.

		DATE CREATED:	5/19/2010
PROJECT:	CITY OF CERES SEWER MASTER PLAN PRELIMINARY OPINION OF PROBABLE COST	**UPDATED:**	5/19/2010
		PREPARED BY:	NJW
JOB NUMBER:	CERE09-002		
		CHECKED BY:	NTC
DESCRIPTION:	Existing System Deficiencies - Tier 2 Gravity Sewer Improvements	**CURRENT ENR CCI:**	8,761

Tier 2 Improvements

Location	Segment		Existing	Upgrade	Construction	Quantity	Unit	Unit	Subtotal
	U/S MH	D/S MH	Size (in)	Size (in)	Method			Cost	
Mitchell	L10-059	M10-010	10	12	Pipe Bursting	494	LF	$192	$94,848
(Figure 1-3f)	M10-010	N10-029	12	15	Pipe Bursting	2259	LF	$240	$542,160
								Subtotal	**$637,008**
	N9-002	O9-001	8	10	Pipe Bursting	1947	LF	$160	$311,520
Central/Hackett/	O9-009	O9-028	8	10	Pipe Bursting	1115	LF	$160	$178,400
Harold/Pine	O9-028	O9-030	8	12	Pipe Bursting	293	LF	$192	$56,256
(Figure 1-3d)	O9-030	Pine St. LS Wet Well	10	12	Pipe Bursting	755	LF	$192	$144,960
								Subtotal	**$691,136**
Hackett (Figure 1-3g)	O6-038	O6-039	10	12	Open Cut	107	LF	$240	$25,680
								Subtotal	**$25,680**

SUBTOTAL		**$8,486,300**
Estimating Contingency	30 %	$2,545,890
SUBTOTAL CONSTRUCTION COSTS		**$11,032,190**
Design/Administration	10 %	$1,103,219
TOTAL CONSTRUCTION COSTS		**$12,135,409**

Notes:
1. Unit cost = $20/inch diameter for open cut; $16/inch diameter for pipe bursting
2. Unit cost = $50,000 each for canal crossing
3. Unit cost = $100,000 each for SR 99 crossing
4. OCR = Open Cut and Replace

Table 1-C-4
City of Ceres Sewer System Master Plan
Preliminary Cost Estimate for Existing System Deficiencies Improvements

Stantec Consulting Services, Inc.

		DATE CREATED:	6/14/2010
PROJECT:	CITY OF CERES SEWER MASTER PLAN PRELIMINARY COST ESTIMATE	**UPDATED:**	6/14/2010
		PREPARED BY:	NJW
JOB NUMBER:	CERE09-002		
		CHECKED BY:	NTC
DESCRIPTION:	Existing System Deficiencies - Tier 1 Lift Station Improvements	**CURRENT ENR CCI:**	8,761

ITEM NO.	DESCRIPTION	QTY.	UNIT	UNIT PRICE	TOTAL
1	Barbour's Pump Station Relocation	1	EA.	$367,000.00	$367,000
2	Lift Station Emergency Backup Power Connections (b)	11	EA.	$6,900.00	$75,900
3	Emergency Backup Portable Generator	1	EA.	$125,100.00	$125,100
4	New Valve Boxes (c)	2	EA.	$50,000.00	$100,000
5	New Valve Box and Lift Station Modifications (d)	1	EA.	$72,000.00	$72,000
6	Walgreen's Lift Station Relocation and New Valve Box	1	EA.	$400,000.00	$400,000
	SUBTOTAL				**$1,140,000**
	Estimating Contingency	30	%		$342,000
	SUBTOTAL CONSTRUCTION COSTS				**$1,482,000**
	Design/Administration	10	%		$148,200
	TOTAL CONSTRUCTION COSTS				**$1,630,200**

Notes:
(a) Onsite emergency power at Barbour's and Pine St. lift stations.
(b) Emergency power connections at the remaining City lift stations.
(c) New valve boxes at Westpointe and Central/Evans lift stations.
(d) Lift station modifications and new valave box at Paramount lift station.

Appendix C

Alternative Cost Tables

Table A-1
City of Ceres Sewer System Master Plan
Preliminary Opinion of Probable Cost for
Wastewater Treatment and Disposal Alternatives

Stantec

PROJECT: CITY OF CERES SEWER MASTER PLAN

JOB NUMBER: CERE09-002

DESCRIPTION: Treatment and Disposal Alternative Cost Summary

DATE CREATED: 5/19/2010
UPDATED: 1/3/2011
PREPARED BY: NTC
CHECKED BY: MJH
CURRENT ENR CCI: 8,857

Facility Component	Notes	Alternative A1	Alternative A2	Alternative A3	Alternative B1	Alternative B2	Alternative C
Facilities for Export to Modesto		$29,761,200	$26,446,000				
Facilities for Export to Modesto and Turlock				$23,550,800			
Facilities for Export to Turlock					$34,633,200	$35,168,000	
Emergency Storage		$3,810,000	$3,810,000	$3,810,000	$3,810,000	$3,810,000	
Equalization			$1,882,500	$1,882,500	$1,882,500		
Ceres Treatment Facilities							$97,454,500
Effluent Storage and Conveyance Facilities							$101,804,500
Capacity Buy-in							
Modesto		$107,420,000	$107,420,000	$55,020,000			
Turlock				$16,320,000	$33,456,000	$33,456,000	
Total Capital Cost		$140,991,200	$139,558,500	$100,583,300	$73,781,700	$72,434,000	$199,259,000
Estimated O&M Costs							
Operation Costs	1,2	$6,088,764	$5,948,764	$7,863,356	$10,540,592	$10,540,592	$9,200,000
Maintenance and Replacement Costs	3	$839,280	$803,463	$731,083	$1,008,143	$974,450	$4,981,475
Total O&M Cost		$6,928,044	$6,752,227	$8,594,439	$11,548,735	$11,515,042	$14,181,475
Net Present Value Capital and O&M	4	$282,204,617	$277,188,252	$275,762,619	$309,178,049	$307,143,599	$488,318,155

Notes:
1. Estimated annual operation cost for alternative, includes annual service cost from Modesto and/or Turlock, see Table A-10.
2. Estimated Ceres tertiary treatment based on 200% cost of current annual operation expense at 3.0 Mgal/d plus service cost to Turlock at $0.002/gal.
3. Estimated annual maintenance and replacement cost based on average facility life of 40 years and straight-line depreciation.
4. Net present value of capital and annual O&M costs for 30-year period at 2.7%

Table A-2
City of Ceres Sewer System Master Plan
Preliminary Opinion of Probable Cost for
Wastewater Treatment and Disposal Alternatives

Stantec

		DATE CREATED:	5/19/2010
PROJECT:	CITY OF CERES SEWER MASTER PLAN	**UPDATED:**	5/19/2010
		PREPARED BY:	NTC
JOB NUMBER:	CERE09-002		
		CHECKED BY:	
DESCRIPTION:	Treatment and Disposal Alternatives A & B	**CURRENT ENR CCI:**	8,857
	Conversion of Existing Basins to Emergency/Equalization Storage		

Improvements for Emergency Storage Use

Improvement	Capacity	Units	Quantity	Unit	Unit Cost	Subtotal
Access Ramp	N/A		2	EA	$50,000	$100,000
Asphalt Lining on Bottom	N/A		380,000	SF	$2.5	$950,000
Remove Redwood Baffles	N/A		2	EA	$10,000	$20,000
Drain/Sump Improvements	N/A		2	EA	$50,000	$100,000
Return Flow Pump Station	5	Mgal/d	1	LS	$495,000	$1,370,000
					Subtotal	**$2,540,000**
Additional Improvements for Equalization						
Aeration Mixing		200	200	Hp	$1,000	$200,000
Equalization Basin Cover 1			23,000	SF	$35	$805,000
Equalization Basin Odor Control			1	LS	$250,000	$250,000
					Subtotal	**$1,255,000**
SUBTOTAL						**$3,795,000**
Estimating Contingency			30 %			$1,138,500
SUBTOTAL CONSTRUCTION COSTS						**$4,933,500**
Design/Administration			20 %			$759,000
TOTAL CONSTRUCTION COSTS						**$5,692,500**

Notes:
1.Planning level cost of aluminum geodesic dome system at $35 per square foot, excludes ventilation and odor treatment

Table A-3
City of Ceres Sewer System Master Plan
Preliminary Opinion of Probable Cost for
Wastewater Treatment and Disposal Alternatives

Stantec

		DATE CREATED:	5/19/2010
PROJECT:	CITY OF CERES SEWER MASTER PLAN	**UPDATED:**	1/3/2011
		PREPARED BY:	NTC
JOB NUMBER:	CERE09-002		
		CHECKED BY:	
DESCRIPTION:	Treatment and Disposal Alternatives A1 Maximize Disposal to Modesto	**CURRENT ENR CCI:**	8,857

Facilities for Export to Modesto

Improvement	Note	Capacity	Units	Quantity	Unit	Unit Cost	Subtotal
Pumps to Modesto	1	24	Mgal/d	2	EA	$175,000	$2,220,000
Pumps to Turlock Export P.S.	1	2	Mgal/d	2	EA	$175,000	$270,000
Grit Removal for Turlock Discharge		2	Mgal/d	1	LS	$444,000	$630,000
Additional Plant Piping		N/A		1	LS	$700,000	$700,000
36-in Force Main to Modesto		24	Mgal/d	48,300	FT	$360	$17,388,000
Junction Structure at Jennings	3	24	Mgal/d	1	LS	$50,000	$50,000
						Subtotal	**$21,258,000**

Capacity Charge (Buy-in) at Modesto

Modesto Buy-in	4	24	Mgal/d	8.2	Mgal/d	$13,100,000	$107,420,000
						Subtotal	**$107,420,000**
SUBTOTAL							**$128,678,000**
Estimating Contingency	5		30%				$6,377,400
SUBTOTAL CONSTRUCTION COSTS							**$135,055,400**
Design/Administration	5		10%				$2,125,800
TOTAL CONSTRUCTION COSTS							**$137,181,200**

Notes:
1. Installed pumping equipment estimated at 40% of total cost of pumping facilities
2. Unit cost = based on 10 foot average depth
3. Estimated lump sum cost for junction structure at Modesto pipelines, including gates and junction manholes.
4. Assuming $13.1/gpd for City of Modesto for average 8.2 Mgal/d flow and peak of 24 Mgal/d raw wastewater.
5. Estimating contingency and design/administration applied only to Ceres improvements.

Table A-4
City of Ceres Sewer System Master Plan
Preliminary Opinion of Probable Cost for
Wastewater Treatment and Disposal Alternatives

Stantec

DATE CREATED: 5/19/2010
PROJECT: CITY OF CERES SEWER MASTER PLAN **UPDATED:** 1/3/2011

PREPARED BY: NTC
JOB NUMBER: CERE09-002

CHECKED BY: MJH

DESCRIPTION: Treatment and Disposal Alternatives A2
Equalize to Modesto
CURRENT ENR CCI: 8,857

Facilities for Export to Modesto

Improvement	Note	Capacity	Units	Quantity	Unit	Unit Cost	Subtotal
Pumps to Modesto	1	12.8	Mgal/d	2	EA	$175,000	$770,000
Pumps to Turlock Export P.S.	1	13.2	Mgal/d	2	EA	$175,000	$790,000
Grit Removal for Turlock Discharge		13.2	Mgal/d	1	LS	$444,000	$1,620,000
Additional Plant Piping		N/A	N/A	1	LS	$1,170,000	$1,170,000
30-in Force Main to Modesto		12.8	Mgal/d	48,300	FT	$300	$14,490,000
Junction Structure at Jennings	3	12.8	Mgal/d	1	LS	$50,000	$50,000
						Subtotal	**$18,890,000**
Capacity Charge (Buy-in) at Modesto							
Modesto Buy-in	4	12.8	Mgal/d	8.2	Mgal/d	$13,100,000	$107,420,000
						Subtotal	**$107,420,000**
SUBTOTAL							**$126,310,000**
Estimating Contingency	5		30%				$5,667,000
SUBTOTAL CONSTRUCTION COSTS							**$131,977,000**
Design/Administration	5		10%				$1,889,000
TOTAL CONSTRUCTION COSTS							**$133,866,000**

Notes:
1. Installed pumping equipment estimated at 40% of total cost of pumping facilities
2. Unit cost = based on 10 foot average depth
3. Estimated lump sum cost for junction structure at Modesto pipelines, including gates and junction manholes.
4. Based on $13.1/gpd from the City of Modesto for average 8.2 Mgal/d flow and peak of 12.8 Mgal/d raw wastewater.
5. Estimating contingency and design/administration applied only to Ceres improvements.
6. Cost does not include equalization, contained in Table A-2.

Table A-5
City of Ceres Sewer System Master Plan
Preliminary Opinion of Probable Cost for
Wastewater Treatment and Disposal Alternatives

Stantec

DATE CREATED: 5/19/2010
PROJECT: CITY OF CERES SEWER MASTER PLAN
UPDATED: 1/3/2011

PREPARED BY: NTC
JOB NUMBER: CERE09-002
CHECKED BY:

DESCRIPTION: Treatment and Disposal Alternatives A3
Maximize Turlock Existing Facilities and Equalize to Modesto
CURRENT ENR CCI: 8,857

Facilities for Export to Modesto and Turlock

Improvement	Note	Capacity	Units	Quantity	Unit	Unit Cost	Subtotal
Pumps to Modesto	1	8.8	Mgal/d	2	EA	$175,000	$620,000
Pumps to Turlock Export P.S.	1	17.2	Mgal/d	2	EA	$175,000	$920,000
Grit Removal for Turlock Discharge		17.2	Mgal/d	1	LS	$444,000	$1,850,000
Additional Plant Piping		N/A	N/A	1	LS	$1,290,000	$1,290,000
24-in Force Main to Modesto		8.8	Mgal/d	48,300	FT	$240	$11,592,000
Junction Structure at Jennings	3	8.8	Mgal/d	1	LS	$50,000	$50,000
Pumps to Turlock		6	Mgal/d	3	EA	$175,000	$500,000
						Subtotal	**$16,822,000**
Capacity Charge (Buy-in) at Modesto and Turlock							
Modesto Buy-in	4	4.2	Mgal/d	4.2	Mgal/d	$13,100,000	$55,020,000
Turlock Buy-in	5	4	Mgal/d	4	Mgal/d	$4,080,000	$16,320,000
						Subtotal	**$71,340,000**
SUBTOTAL							**$88,162,000**
Estimating Contingency	6		30%				$5,046,600
SUBTOTAL CONSTRUCTION COSTS							**$93,208,600**
Design/Administration	6		10%				$1,682,200
TOTAL CONSTRUCTION COSTS							**$94,890,800**

Notes:
1. Installed pumping equipment estimated at 40% of total cost of pumping facilities
2. Unit cost = $19/inch diameter.
3. Estimated lump sum cost for junction structure at Modesto pipelines, including gates and junction manholes.
4. Based on $13.1/gpd from the City of Modesto for average 8.2 Mgal/d flow and peak of 12.8 Mgal/d raw wastewater.
5. Based on $4.08/gpd from the City of Turlock for constant 6.0 Mgal/d flow raw wastewater.
6. Estimating contingency and design/administration applied only to Ceres improvements.
7. Cost does not include equalization, contained in Table A-2.

Table A-6
City of Ceres Sewer System Master Plan
Preliminary Opinion of Probable Cost for
Wastewater Treatment and Disposal Alternatives

Stantec

DATE CREATED: 5/19/2010
PROJECT: CITY OF CERES SEWER MASTER PLAN
UPDATED: 1/3/2011

PREPARED BY: NTC
JOB NUMBER: CERE09-002

CHECKED BY:

DESCRIPTION: Treatment and Disposal Alternatives B1
Equalize to Turlock Only
CURRENT ENR CCI: 8,857

Improvement	Note	Capacity	Units	Quantity	Unit	Unit Cost	Subtotal
Facilities for Export to Turlock							
Pumps to Turlock Export P.S.	1	26	Mgal/d	4	EA	$175,000	$1,160,000
Grit Removal for Turlock Discharge		10.2	Mgal/d	1	LS	$444,000	$1,420,000
Additional Plant Piping		N/A	N/A	1	LS	$1,400,000	$1,400,000
24-in Parallel Force Main to Turlock	2	24	in dia.	75,200	FT	$240	$18,048,000
Expanded Export Pump Station		14.8	Mgal/d	1	LS	$495,000	$2,710,000
						Subtotal	**$24,738,000**
Capacity Charge (Buy-in) at Turlock							
Additional Turlock Buy-in	3	14.8	Mgal/d	8.2	Mgal/d	$4,080,000	$33,456,000
						Subtotal	**$33,456,000**
SUBTOTAL							**$58,194,000**
Estimating Contingency	4		30%				$7,421,400
SUBTOTAL CONSTRUCTION COSTS							**$65,615,400**
Design/Administration	4		10%				$2,473,800
TOTAL CONSTRUCTION COSTS	5						**$68,089,200**

Notes:
1. Installed pumping equipment estimated at 40% of total cost of pumping facilities
2. Unit cost = $19/inch diameter.
3. Based on $4.08/gpd from the City of Turlock for average 10.2 Mgal/d flow and peak of 14.8 Mgal/d raw wastewater.
4. Estimating contingency and design/administration applied only to Ceres improvements.
5. Cost does not include equalization, contained in Table A-2.

Table A-7

City of Ceres Sewer System Master Plan
Preliminary Opinion of Probable Cost for
Wastewater Treatment and Disposal Alternatives

Stantec

DATE CREATED: 5/19/2010
UPDATED: 1/3/2011

PROJECT: CITY OF CERES SEWER MASTER PLAN

PREPARED BY: NTC

JOB NUMBER: CERE09-002

CHECKED BY:

DESCRIPTION: Treatment and Disposal Alternatives B2
Pump Peak-hour to Turlock Only

CURRENT ENR CCI: 8,857

Improvement	Note	Capacity	Units	Quantity	Unit	Unit Cost	Subtotal
Facilities for Export to Turlock							
Pumps to Turlock Export Force Main	1	26	Mgal/d	4	EA	$175,000	$1,160,000
Additional Plant Piping		N/A	N/A	1	LS	$1,400,000	$1,400,000
30-in Parallel Force Main to Turlock	2	30	in dia.	75,200	FT	$300	$22,560,000
						Subtotal	**$25,120,000**
Capacity Charge (Buy-in) at Turlock							
Additional Turlock Buy-in	3	26	Mgal/d	8.2	Mgal/d	$4,080,000	$33,456,000
						Subtotal	**$33,456,000**
SUBTOTAL							**$58,576,000**
Estimating Contingency	4		30%				$7,536,000
SUBTOTAL CONSTRUCTION COSTS							**$66,112,000**
Design/Administration	4		10%				$2,512,000
TOTAL CONSTRUCTION COSTS	5						**$68,624,000**

Notes:
1. Installed pumping equipment estimated at 40% of total cost of pumping facilities
2. Unit cost = $19/inch diameter.
3. Based on $4.08/gpd from the City of Turlock for average 10.2 Mgal/d flow and peak of 26 Mgal/d raw wastewater.
4. Estimating contingency and design/administration applied only to Ceres improvements.
5. Cost does not include equalization, contained in Table A-2.

Table A-8
City of Ceres Sewer System Master Plan
Preliminary Opinion of Probable Cost for
Wastewater Treatment and Disposal Alternatives

Stantec

DATE CREATED: 5/19/2010
UPDATED: 1/3/2011

PROJECT: CITY OF CERES SEWER MASTER PLAN

PREPARED BY: NTC

JOB NUMBER: CERE09-002

CHECKED BY:

DESCRIPTION: Treatment and Disposal Alternative C
City Owned and Operated Tertiary Treatment Facility

CURRENT ENR CCI: 8,857

Ceres Treatment Facilities

Improvement	Note	Capacity	Units	Quantity	Unit	Cost at Unit Capacity	Subtotal
Influent Pump Station		10.2	Mgal/d	-	EA		
Influent Pumps		8.2	Mgal/d	1	LS	$175,000	$600,000
Headworks Grit Removal		8.2	Mgal/d	1	LS	$444,000	$1,280,000
Oxidation Ditches		8.2	Mgal/d	1	LS	$4,332,000	$14,380,000
Secondary Clarifiers w splitter box		8.2	Mgal/d	1	LS	$1,906,000	$9,240,000
RAS/WAS Pump Station		8.2	Mgal/d	1	LS	$387,000	$1,460,000
Filter Feed Pump Station		8.2	Mgal/d	1	LS	$241,000	$910,000
Flocculation System		8.2	Mgal/d	1	LS	$164,000	$720,000
Tertiary Filtration		8.2	Mgal/d	1	LS	$1,385,000	$6,580,000
UV Disinfection		8.2	Mgal/d	1	LS	$1,333,000	$7,180,000
Chemical Facilities		8.2	Mgal/d	1	LS	$577,000	$3,920,000
Solids Dewatering		8.2	Mgal/d	1	LS	$2,846,000	$13,230,000
Effluent Pump Station		8.2	Mgal/d	1	LS	$495,000	$1,870,000
Admin Building, Lab, Maintenance		8.2	Mgal/d	1	LS	$909,000	$3,090,000
Emergency Storage		50	Mgal	50	Mgal	$40,000	$2,000,000
Emergency Return Pump Station		10.2	Mgal/d	1	LS	$750,000	$750,000
						Subtotal	**$67,210,000**

Effluent Storage and Conveyance Facilities

Improvement	Note	Capacity	Units	Quantity	Unit	Cost at Unit Capacity	Subtotal
Effluent Storage	1	3700	AF	3700	AF	$7,000	$25,900,000
Recycled Water Pump Station		45	Mgal/d	1	LS	$247,500	$2,730,000
Recycled Water Transmission Main	2	N/A		42000	LF	$990	$41,580,000
Recycled Use Land Improvements	3	2600	Acres	2600	Acre		$0
						Subtotal	**$70,210,000**

SUBTOTAL		**$137,420,000**
Estimating Contingency	30%	$41,226,000
SUBTOTAL CONSTRUCTION COSTS		**$178,646,000**
Design/Administration	15%	$20,613,000
TOTAL CONSTRUCTION COSTS		**$199,259,000**

Notes:
1. Includes a land cost of $25,000 per acre.
2. Based on 42,000 LF of 60-in gravity conveyance to Modesto Jennings WWTP site.
3. Recycled use land improvements not included in this analysis.

Table A-9
City of Ceres Sewer System Master Plan
Preliminary Opinion of Probable Cost for
Wastewater Treatment and Disposal Alternatives

Stantec

DATE CREATED: 5/19/2010
PROJECT: CITY OF CERES SEWER MASTER PLAN **UPDATED:** 10/21/2010

PREPARED BY: NTC
JOB NUMBER: CERE09-002

CHECKED BY:

DESCRIPTION: Treatment and Disposal Alternatives **CURRENT ENR CCI:** 8,857
Unit Process Costs at Avg. Unit Capacity (4-10 Mgal/d)

Unit Process Costs

Improvement	Note	Unit Capacity	Unit	Unit Cost	Escalation Factor
Influent Pump Station		1	Mgal/d	$ 725,000	0.63
Influent Pumping Equipment		1	Mgal/d	$ 175,000	0.58
Headworks		1	Mgal/d	$ 888,000	0.50
Mechanical Aeration/Mixing		1	Hp	$ 1,000	
Oxidation Ditch	2	1	Mgal/d	$ 4,332,000	0.57
Denitrification Basins		1	Mgal/d	$ 1,362,000	0.57
Secondary Clarifiers w splitter box	3	1	Mgal/d	$ 1,906,000	0.75
RAS/WAS Pump Station	3	1	Mgal/d	$ 387,000	0.63
Dissolved Air Flotation		1	Mgal/d	$ 1,420,000	0.45
Filter Feed Pump Station		1	Mgal/d	$ 241,000	0.63
Flocculation System		1	Mgal/d	$ 164,000	0.70
Tertiary Filtration		1	Mgal/d	$ 1,385,000	0.74
UV Disinfection		1	Mgal/d	$ 1,333,000	*0.80*
Chlorine Disinfection		1	Mgal/d	$ 600,000	0.65
Chemical Facilities		1	Mgal/d	$ 577,000	0.91
Solids Dewatering	3	1	Mgal/d	$ 2,846,000	0.73
Effluent Pump Station		1	Mgal/d	$ 495,000	0.63
Effluent Pumping Equipment		1	Mgal/d	$ 175,000	0.58
Admin Building, Lab.		1	Mgal/d	$ 909,000	0.58
Export Pipeline Cost		N/A	in/dia	$ 10.0	N/A

Notes:
1. Capacity based on unit process flow/load capacity unless noted otherwise
2. Based on typical municipal strength wastewater without nitrification/denitrification
3. Based on ADWF capacity.
4. Escalation factor adapted from EPA/430/9/80-003 Construction Cost for Municipal Wastewater Treatment Plants: 1973-1978.

Table A-10
City of Ceres Sewer System Master Plan
Preliminary Opinion of Probable Cost for
Wastewater Treatment and Disposal Alternatives

Stantec

DATE CREATED: 5/19/2010
PROJECT: CITY OF CERES SEWER MASTER PLAN
UPDATED: 1/3/2011

PREPARED BY: NTC
JOB NUMBER: CERE09-002
CHECKED BY:

DESCRIPTION: Treatment and Disposal Alternatives
Unit Capacity Charge and O&M Costs
CURRENT ENR CCI: 8,857

Estimated Capacity Charges

Facility	Note		Unit	Unit Cost	Cost per Mgal/d
Raw Wastewater to Modesto	1		1,000 gal	$ 13,100	$ 13,100,000
Eq. Primary Effluent to Modesto	2		1,000 gal	$ 12,300	$ 12,300,000
Tertiary Effluent to Regional System	7		1,000 gal	$ -	$ -
Raw Wastewater to Turlock	1		1,000 gal	$ 4,080	$ 4,080,000
Eq. Primary Effluent to Turlock	2		1,000 gal	$ 2,750	$ 2,750,000

Estimated Unit Operating Expenses

Element	Note		Unit	Cost/Unit	Annual Cost/Mgal/d
Modesto Raw Wastewater	1		1,000 gal	$ 1.19	$ 440,000
Modesto Eq. Primary	2		1,000 gal	$ 1.19	$ 440,000
Tertiary System Conveyance	3		1,000 gal	$ 0.11	$ 50,000
Turlock Raw Wastewater	1		1,000 gal	$ 2.67	$ 980,000
Turlock Eq. Primary	2		1,000 gal	$ 2.47	$ 910,000
Modesto Export Pumping	4		1,000 gal	$ 0.12	$ 50,000
Turlock Export Pumping	4		1,000 gal	$ 0.11	$ 50,000
Ceres Tertiary Plant	5		1,000 gal	$ 2.45	$ 900,000

Estimated Unit Maintenance Expenses

Annual Pipeline Maintenance Cost	6		1,000 ft	$ 460	N/A

Notes:
1. Estimated capacity and annual operation cost for unequalized raw wastewater.
2. Estimated capacity and annual operation cost for equalized equivalent primary effluent.
3. Estimated annual conveyance and recycled system cost to Ceres.
4. At $0.15/kw-hr at 143 ftTDH to Modesto and 130ft TDH to Turlock
5. Based on 200% of current Ceres treatment operation cost.
6. 20% of EPA 430/9-81-004, Figure 3.43 adjusted to ENR of 8857.
7. Capacity cost in Regional System assumed to be $0.

Table A-11
City of Ceres Sewer System Master Plan
Preliminary Opinion of Probable Cost for
Wastewater Treatment and Disposal Alternatives

Stantec

DATE CREATED: 5/19/2010
PROJECT: CITY OF CERES SEWER MASTER PLAN
UPDATED: 10/21/2010

PREPARED BY: NTC
JOB NUMBER: CERE09-002

CHECKED BY:

DESCRIPTION: Treatment and Disposal Alternative A
Gravity Sewer vs. Force Main Evaluation
CURRENT ENR CCI: 8,857

Improvement	Note	Average Capacity	Units	Quantity	Unit	Unit Cost	Subtotal
Modesto Gravity Sewer Alternative							
54-in Gravity Sewer to Modesto	2	8.2	Mgal/d	48,300	FT	$886	$42,793,800
Junction Structure at Jennings	3	8.2	Mgal/d	1	LS	$50,000	$50,000
30-year NPV Operating Cost	2		$/yr	30	yr	$76,880	$1,567,041
						Subtotal	**$44,410,841**
Modesto Force Main Alternative							
36-in Force Main to Modesto	1	8.2	Mgal/d	48,300	FT	$360	$17,388,000
Junction Structure at Jennings	1	8.2	Mgal/d	1	LS	$50,000	$50,000
30-year NPV Operating Cost	2		$/yr	30	yr	$243,454	$4,962,297
						Subtotal	**$22,400,297**

Lowest 30-year Capital and O&M Cost = **Modesto Force Main Alternative**

Notes:
1. Based on peak flow 24 and average flow of 8.2 Mgal/d assuming insignificant difference in pumping equipment cost.
2. Net present value of capital and annual O&M costs for 30-year period at 2.7%
3. Operating cost based on 8.2 Mgal/d at 24 hrs/d and $0.15/kw-hr average.

Appendix D

Reconnaissance Reclamation 100 Year Water Balance

CITY OF CERES FILE:_______ 10/21/2010 16:59

WATER BALANCE, 100 YEAR RAINFALL EVENT 8.20 mgd AADWF Treatment Capacity Flow, Clay-Lined 12 ft deep Storage Reservoirs, Reclamatio

INPUT DATA

STORAGE RESERVOIRS		IRRIGATION AREA CHARACTERISTICS		CLIMATOLOGICAL FACTORS	
SITE AREA (AC)……	317.3	IRRIGATION AREA (AC)……	2023	PRECIP/AVG PRECIP RATIO……	1.82
CATCHMENT AREA (AC)……	302.1			OCT-APR EVAP/AVG EVAP RATIO……	0.88
WATER SURFACE (AC)……	298.5	IRRIGATION EFFICIENCY (DECIMAL FRACT)……	0.75	MAY-SEP EVAP/AVG EVAP RATIO……	0.95
BOTTOM SURFACE (AC)……	286.7			LAND PRECIP COLLECTED (FRAC)……	0.9
FULL DEPTH (FT)……	12.0				
STORAGE AVAILABLE (MG)……	1143.9				

PARAMETER / MONTH	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	ANNUAL
DAYS IN MONTH	31	30	31	31	28	31	30	31	30	31	31	30	365
AVG EVAPOTRANSPIRATION (IN)1	3.33	1.60	0.86	0.90	1.73	3.38	5.04	6.45	7.54	8.02	7.11	5.19	51.15
AVG PRECIP (IN)1	0.62	1.46	2.00	2.87	2.46	1.63	0.87	0.69	0.13	0.02	0.14	0.15	13.04
CROP COEFFICIENT	0.65	0.64	0.58	0.58	0.59	0.76	0.88	0.87	0.78	0.83	0.79	0.68	
ACTUAL ET	2.15	1.02	0.49	0.52	1.02	2.55	4.44	5.61	5.88	6.62	5.58	3.53	39.41
PERCOLATION (IN)	12.6	12.2	12.6	12.6	11.4	12.6	12.2	12.6	12.2	12.6	12.6	12.2	148.9
I/I VOLUME PER MGD of ADWF (MG)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
INFLUENT- EXCLUDING I/I (MGD)	8.20	8.20	8.20	8.20	8.20	8.20	8.20	8.20	8.20	8.20	8.20	8.20	

CALCULATIONS	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	ANNUAL
WASTEWATER VOLUME (MG)	254.2	246.0	254.2	254.2	229.6	254.2	246.0	254.2	246.0	254.2	254.2	246.0	2993.0
SUPPLEMENTAL IRRIGATION WATER (MG)	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
EVAPORATION (IN)	2.9	1.4	0.8	0.8	1.5	3.0	4.4	6.1	7.2	7.6	6.8	4.9	47.4
PRECIPITATION (IN)	1.1	2.7	3.6	5.2	4.5	3.0	1.6	1.3	0.2	0.0	0.3	0.3	23.7
STORAGE RESERVOIRS	0.22	0.36	0.56	0.75	0.92	1.09	1.21	1.17	0.99	0.73	0.44	0.25	
PERCOLATION (IN)	2.81	4.38	7.07	9.54	10.53	13.83	14.87	14.76	12.07	9.29	5.57	3.06	107.8
PERC VOLUME (MG)	21.90	34.09	55.11	74.31	82.04	107.77	115.84	115.00	94.03	72.39	43.41	23.81	839.7
EVAP. VOLUME (MG)	22.83	11.03	5.98	6.31	12.22	24.02	36.00	49.63	57.61	60.63	53.10	38.46	377.8
PRECIP. VOLUME (MG)	9.25	21.79	29.85	42.83	36.71	24.33	12.98	10.30	1.94	0.30	2.09	2.25	194.6
RESERVOIR DISPOSAL POTENTIAL (MG)	35.47	23.33	31.24	37.79	57.55	107.47	138.86	154.33	149.70	132.73	94.42	60.02	1022.9
IRRIGATION													
EVAPOTRANSPIRATION (IN)	1.89	0.89	0.44	0.46	0.90	2.25	3.90	5.33	5.59	6.29	5.30	3.35	36.6
FORCED PERC (IN)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
TOTAL IRRIG DEMAND (IN)	1.02	0.00	0.00	0.00	0.00	0.00	3.09	5.43	7.13	8.33	6.73	4.10	35.8
IRRIGATION DEMAND (MG)	55.8	0.0	0.0	0.0	0.0	0.0	170.0	298.7	392.1	458.0	369.9	225.6	1970.1
STORAGE													
BEGINNING STORAGE (MG)	0.0	162.9	385.6	608.5	824.9	997.0	1143.7	1080.9	882.1	586.3	249.7	39.6	
STORAGE GAIN (MG)	162.9	222.7	223.0	216.4	172.1	146.7	-62.9	-198.8	-295.8	-336.5	-210.1	-39.6	
FINAL STORAGE (MG)	162.9	385.6	608.5	824.9	997.0	1143.7	1080.9	882.1	586.3	249.7	39.6	0.0	

MAXIMUM STORAGE REQUIRED (MG)…… 1144

TOTAL AVAILABLE STORAGE (MG)…… 1144

SUMMARY

ANNUAL INFLOW (MG)		ANNUAL OUTFLOW POTENTIAL (MG)		OVERALL BALANCE	
WASTEWATER+ SUPP. WATER……	2993	EVAPORATION……	378	UNUSED DISPOSAL CAPACITY (MG)……	0
INFLOW AND INFILTRATION……	0	PERCOLATION……	840	(MUST NOT BE NEGATIVE)	
PRECIPITATION INTO RESERVOIR……	195	IRRIGATION……	1970	UNUSED STORAGE CAPACITY (MG)……	0
TOTAL	3188	TOTAL	3188	(MUST NOT BE NEGATIVE)	

Appendix E

Responses from Cities of Turlock and Modesto

CITY OF TURLOCK INC. 1908 1908 - 2008 CENTENNIAL

John S. "Steve" Wilson
DIVISION MANAGER
jwilson@turlock.ca.us

MUNICIPAL SERVICES
WQC DIVISION

156 S. BROADWAY, SUITE 270 | TURLOCK, CALIFORNIA 95380 | PHONE 209-668-5599 EXT 4443 | FAX 209-668-5569

October 28, 2010

City of Ceres
Public Works Department
2220 Magnolia Street
Ceres, CA 95307
ATTN: Glenn Gebhardt, Public Works Director/City Engineer

RE: Response to Questions in Correspondence dated September 30, 2010.

Dear Mr. Gebhardt:

Staff is in receipt of your letter dated September 30, 2010, regarding questions pertaining to the potential exportation of wastewater from Ceres to the Turlock Regional Water Quality Control Facility (RWQCF). Outlined below are responses to your questions:

- What is the ability for the RWQCF to accommodate peak and/or equalized flow from Ceres?

The current Facility capacity is 20.0 MGD. It is important to note that capacity is also measured by Biochemical Oxygen Demand (BOD) and Total Suspended Solids (TSS). The Facility BOD and TSS capacities are 60,000 Lbs./Day and 85,000 Lbs./Day respectively (2007 Capacity Assessment Study).

The RWQCF is currently in the design phase of a plant expansion that will increase the BOD treatment capacity to 103,750 Lbs./Day to match the 20 MGD flow rating. Alternative 1a. (6.0 MGD of Primary treated flow) and Alternative 1b. (6.0 MGD of raw sewage) could be accommodated once the expansion is complete. A new Agreement would be required. Alternatives 2a. and 2b. (10.2 MGD options) would require a treatment facility expansion beyond the 20.0 MGD flow, BOD and TSS capacities as well as the execution of a new agreement.

- What are the desired wastewater characteristics to match the requirements of existing and/or planned treatment processes?

Per Section 6.4 of the Turlock Municipal Code (TMC) and customary residential BOD (100 to 250 mg/l) and TSS (100 to 200 mg/l) concentrations. Attached, please find a copy of the pertinent TMC Section.

- What other facilities would be required of Ceres to facilitate integration into the existing or planned RWQCF facilities?

Alternatives 1b., 2a. and 2b. would require the Ceres discharge point along with associated flow monitoring and sampling equipment be moved so that the influent flow is directed to the RWQCF headworks. This is due to the change in character of the influent from primary treated to raw sewage which will result in the need for additional treatment. The City of Turlock will move the discharge point. However, the cost of this change would be Ceres' responsibility.

- What are the planning level estimated capacity and O&M costs to Ceres for pipeline maximization of equalized flow (6.0 MGD) and all flow alternatives to the RWQCF?

Attached please find charts with preliminary capacity and monthly O&M rate charges for 4.0 MGD of primary treated water (Alt. 1a.), 4.0 MGD of raw sewage (Alt. 1b.), 8.2 MGD of primary treated water (Alt. 2a) and 8.2 MGD of raw sewage (Alt. 2b.). The capacity charges will escalate quarterly based on the San Francisco Region ENR. The O&M charges are based on City Council approved rate schedules. The O&M charges would increase should the City Council approve a new rate schedule.

Alternatives 1b., 2a. and 2b. will require additional treatment (change in discharge point in the RWQCF) due to the increased BOD and TSS loading; this causes. the increase in the capacity and monthly O&M charges for Alternatives 1b., 2a. and 2b. Alternatives 2a. and 2b. would require capacity in excess of the 20 MGD rating of the RWQCF. A facility expansion would be necessary to accommodate these scenarios – this could affect the preliminary capacity charges and O&M charges provided to you.

- Other constraints or limitations to providing disposal service to Ceres?

    a. Discharge permit amendments?

    Turlock will be required to amend its Permit once the RWQCF effluent flow exceeds 20.0 MGD (see e-mail from RWQCB). Please note that more restrictive concentrations of effluent Electrical Conductivity (EC) and Total Dissolved Solids (TDS) will be required in future N.P.D.E.S. Permits.

    b. CEQA?

    Ceres may have to conform to CEQA requirements. As long as the treated flow is below 20.0 MGD, Turlock will not.

    c. Service Agreements?

    Would be required and must be approved by City Council.

    d. Water quality limitations under current permit?

    Per current Agreement.

    e. Facilities planning, design and construction schedule constraints?

    The RWQCF is currently under an expansion project to increase the BOD treatment capacity to match the 20.0 MGD treatment rating. The project is in the 90% design phase. No other constraints have been identified at this time.

    f. Jurisdictional hurdles?

    None envisioned from City of Turlock.

Should you have any other questions regarding this issue, please contact me at 668-5599 Ext. 4443.

Sincerely,

JWilson

John S. "Steve" Wilson
Water Quality Control Division Manager

cc: Dan Madden, Municipal Services Director

Enclosures: Turlock City Code Section 6-4-303 Prohibited Discharges
E-mail from RWQCB
Capacity Charge Charts (4)

City of Ceres - 8.2 MGD

Primary Treated

Wastewater Capacity Charges

	MGD	mg / L	lbs / day	Production Days	Charge
Flow	8.2			30	$ 19,433,174.28
BOD		100	6,839	30	$ 2,786,264.17
TSS		100	6,839	30	$ 353,674.40
TOTAL WASTEWATER CAPACITY CHARGES					**$ 22,573,112.85**

Monthly Sewer Use Charges

	Monthly Use	Units	Charge	Units	Monthly Charge
Production Days	30	days			
FLOW	246.00	MG	$ 2.44	/ 1,000 gals	$ 600,240.00
BOD	100	mg/L			$ -
TSS	100	mg/L			$ -
Reserve Capacity Charge					$ 8,094.49
Admin Charge					$ 7.63
TOTAL MONTHLY SEWER USE CHARGES					**$ 608,342.12**

Estimated Wastewater Capacity Charge **$ 22,573,112.85**

Total Monthly Utility Bill **$608,342.12**

Date: November 10, 2010

11/10/2010

City of Ceres - 4 MGD

Raw Sewage

Wastewater Capacity Charges

	MGD	mg / L	lbs / day	Production Days	Charge
Flow	4			30	$ 12,416,850.99
BOD		250	8,340	30	$ 3,482,041.23
TSS		200	6,672	30	$ 412,374.67
TOTAL WASTEWATER CAPACITY CHARGES					**$ 16,311,266.89**

Monthly Sewer Use Charges

	Monthly Use	Units	Charge	Units	Monthly Charge
Production Days	30	days			
FLOW	120.00	MG	$ 2.44	/ 1,000 gals	$ 292,800.00
BOD	250	mg/L	$ 0.07	/ 1,000 gals	$ 8,400.00
TSS	200	mg/L	$ 0.12	/ 1,000 gals	$ 14,400.00
Reserve Capacity Charge					$ 4,643.53
Admin Charge					$ 7.63
TOTAL MONTHLY SEWER USE CHARGES					**$ 320,251.16**

Estimated Wastewater Capacity Charge **$ 16,311,266.89**

Total Monthly Utility Bill **$320,251.16**

Date: November 10, 2010

City of Ceres - 4 MGD

Primary Treated

Wastewater Capacity Charges

	MGD	mg / L	lbs / day	Production Days	Charge
Flow	4			30	$ 9,479,597.21
BOD		100	3,336	30	$ 1,359,153.25
TSS		100	3,336	30	$ 172,524.10
TOTAL WASTEWATER CAPACITY CHARGES					**$ 11,011,274.56**

Monthly Sewer Use Charges

	Monthly Use	Units	Charge	Units	Monthly Charge
Production Days	30	days			
FLOW	120.00	MG	$ 2.44	/ 1,000 gals	$ 292,800.00
BOD	100	mg/L			$ -
TSS	100	mg/L			$ -
Reserve Capacity Charge					$ 3,948.53
Admin Charge					$ 7.63
TOTAL MONTHLY SEWER USE CHARGES					**$ 296,756.16**

Estimated Wastewater Capacity Charge	**$ 11,011,274.56**
Total Monthly Utility Bill	**$296,756.16**

Date: November 10, 2010

City of Ceres - 8.2 MGD

Raw Sewage

Wastewater Capacity Charges

	MGD	mg / L	lbs / day	Production Days	Charge
Flow	8.2			30	$ 25,454,544.54
BOD		250	17,097	30	$ 7,138,184.52
TSS		200	13,678	30	$ 845,368.08
TOTAL WASTEWATER CAPACITY CHARGES					**$ 33,438,097.13**

Monthly Sewer Use Charges

	Monthly Use	Units	Charge	Units	Monthly Charge
Production Days	30	days			
FLOW	246.00	MG	$ 2.44	/ 1,000 gals	$ 600,240.00
BOD	250	mg/L	$ 0.07	/ 1,000 gals	$ 17,220.00
TSS	200	mg/L	$ 0.12	/ 1,000 gals	$ 29,520.00
Reserve Capacity Charge					$ 9,519.24
Admin Charge					$ 7.63
TOTAL MONTHLY SEWER USE CHARGES					**$ 656,506.87**

Estimated Wastewater Capacity Charge **$ 33,438,097.13**

Total Monthly Utility Bill **$656,506.87**

Date: November 10, 2010

CITY OF MODESTO

Utility Planning & Projects Department

1010 Tenth Street
Suites 4500 & 4600
P.O. Box 642
Modesto, CA 95353

Administration
(209) 577-5213
(209) 577-5477 Fax

Capital Improvement Services:

Capital Planning
(209) 577-5215
(209) 522-1780 Fax

Construction Administration
(209) 577-5452
(209) 577-4302 Fax

Engineering Design
(209) 577-5215
(209) 522-1780 Fax

Hearing and Speech Impaired Only
TDD 1-800-735-2929

November 30, 2010

Mr. Glenn Gebhardt
Public Works Director/City Engineer
City of Ceres
2220 Magnolia Street
Ceres, CA 95307

RE: Ceres Wastewater Export to City of Modesto Regional Wastewater Facilities

Dear Mr. Gebhardt:

I am responding to your letter of September 30, 2010 where you requested the City of Modesto's input on several potential scenarios for exporting Ceres' wastewater to our wastewater facilities. Listed below are our responses to the potential scenarios:

1. Export raw wastewater to the Sutter Avenue Facility for treatment and disposal.

   The export of raw wastewater from Ceres to the Sutter Avenue Facility is problematic due to the following capacity constraints:

   a. *Modesto's Sutter Avenue Facility does not anticipate flows greater than the service area's build-out flows as identified in our master plan. Specific areas of concern related to additional flow would be the City's headworks and solids handling facilities.*
   b. *Additionally, there are capacity limitations in the Primary Outfall above the master-planned improvements. Any additional flow will require a new outfall to the Modesto's Jennings Road Facility.*

2. Export raw wastewater or equivalent primary effluent (based on some degree of primary treatment if flow equalization is provided) through the Modesto pipelines to the Jennings Road Facility for secondary or tertiary treatment and disposal or reuse.

Mr. Glenn Gebhardt
Public Works Director/City Engineer
City of Ceres

November 30, 2010

Export of raw wastewater to the Jennings Road facility is feasible if the following is taken into account:

a. *Modesto's Phase 2 BNR/Tertiary Treatment project's preliminary design report (PDR) anticipates a modular approach to the phased improvement and expansion of the tertiary facility. This helps make future expansions easier to plan for and implement.*
b. *Although planned for mainly the build-out of the City of Modesto's Sphere of Influence (SOI), the PDR does allow for new primary facilities adjacent to the planned Phase 2-5 treatment facilities for potential regionalization. So it is feasible, albeit expensive, to export raw wastewater to the Jennings Road treatment facilities.*
c. *For expansions beyond those considered in the master plan, Modesto will need to re-analyze the phasing of the Jennings Road treatment facilities.*
d. *As mentioned in 1b above, the capacity constraints in the Primary Outfall line between the Sutter Avenue facility and the Jennings Road facility is limited, and a new pipeline would need to be constructed for flows above the master-planned improvements.*

3. Export of secondary to tertiary effluent to the Jennings Road Facility for disposal or recycled use.

This is feasible with the following considerations:

a. *Since the Jennings MBR facilities are designed in a modular fashion, Modesto will need to re-analyze the phasing of the Jennings Road treatment facilities for exported secondary effluent.*
b. *As part of the Phase 2 project design, the City has sized an effluent discharge pipeline from the tertiary facilities to the Modesto's San Joaquin River outfall for Phases 2-5 (or 27.5 MGD). Additional tertiary-treated flows that need to be*

Mr. Glenn Gebhardt
Public Works Director/City Engineer
City of Ceres

November 30, 2010

discharged into the river may need an additional discharge pipe from the new treatment facilities to the river.

c. *Any facilities (pump stations and pipelines) that are needed for any tertiary-treated water sales will also need to be sized to accommodate the additional flows.*

I hope this letter helps provide you with the information you need. Please contact me should you have any questions or need more information.

Sincerely,

for Nicholas Pinhey
Director of Utility Planning and Projects

NP:jr

Appendix F

Detailed Preliminary Planning Level Opinion of Probable Cost for Preferred Gravity Sewer Alternative

Table A-1: Detailed Preliminary Planning Level Opinion of Probable Cost for Preferred Gravity Sewer Alternative

Street Location	Size (in)	Construction Method	Quantity	Unit	Unit Cost	Subtotal
Crows Landing Road	24	Open Cut	2050	LF	$456	$934,800
	N/A	Canal Crossing	1	EA	$50,000	$50,000
					Subtotal	**$984,800**
Service Road	15	Open Cut	3700	LF	$285	$1,054,500
	36	Open Cut	12600	LF	$684	$8,618,400
	48	Open Cut	2650	LF	$912	$2,416,800
					Subtotal	**$12,089,700**
Redwood Road	12	Open Cut	3600	LF	$228	$820,800
					Subtotal	**$820,800**
Moffett Avenue	48	Open Cut	1300	LF	$912	$1,185,600
					Subtotal	**$1,185,600**
Central Avenue	12	Open Cut	950	LF	$228	$216,600
	18	Open Cut	1650	LF	$342	$564,300
	27	Open Cut	2250	LF	$513	$1,154,250
	N/A	Canal Crossing	1	EA	$50,000	$50,000
					Subtotal	**$1,985,150**
Mitchell Road	12	Open Cut	900	LF	$228	$205,200
	27	Open Cut	1900	LF	$513	$974,700
					Subtotal	**$1,179,900**
Esmar Road	15	Open Cut	2650	LF	$285	$755,250
	21	Open Cut	1350	LF	$399	$538,650
	27	Open Cut	2000	LF	$513	$1,026,000
	30	Open Cut	2000	LF	$570	$1,140,000
	N/A	Canal Crossing	1	EA	$50,000	$50,000
					Subtotal	**$3,509,900**
Roeding Road	12	Open Cut	2650	LF	$228	$604,200
					Subtotal	**$604,200**
Whitmore Avenue	15	Open Cut	3150	LF	$285	$897,750
					Subtotal	**$897,750**
Faith Home Road	12	Open Cut	5000	LF	$228	$1,140,000
	15	Open Cut	2450	LF	$285	$698,250
	N/A	Canal Crossing	1	EA	$50,000	$50,000
					Subtotal	**$1,888,250**
Lower Lateral No. 2	18	Open Cut	5400	LF	$342	$1,846,800
					Subtotal	**$1,846,800**
Gondring Road	12	Open Cut	2600	LF	$228	$592,800
	15	Open Cut	2650	LF	$285	$755,250
					Subtotal	**$1,348,050**
Moore Road	36	Open Cut	600	LF	$684	$410,400
					Subtotal	**$410,400**
Sewer Trunk b/t Moore Road & Moffett Avenue	36	Open Cut	800	LF	$684	$547,200
	42	Open Cut	1450	LF	$798	$1,157,100
	48	Open Cut	1500	LF	$912	$1,368,000
	N/A	Canal Crossing	1	EA	$50,000	$50,000
	N/A	SR 99 Crossing	1	EA	$100,000	$100,000
					Subtotal	**$3,222,300**
					Total	**$31,973,600**
				30% Contingency		*$9,592,080*
				Subtotal		**$41,565,680**
Notes:						
1. Unit cost = $19/inch diameter for open cut				*20% Design/Admin*		*$6,394,720*
2. Unit cost = $50,000 each for canal crossing						
3. Unit cost = $100,000 each for SR 99 crossing				**Grand Total**		**$47,960,400**

Appendix G

Planning Level Opinion of Probable Cost for Collection System Lift Station Improvements

Table B-1
City of Ceres Sewer System Master Plan
Planning Level Opinion of Probable Cost for
Collection System Lift Station Improvements

Stantec

PROJECT:	CITY OF CERES SEWER MASTER PLAN	**DATE CREATED:**	12/28/2010
		UPDATED:	4/30/2011
JOB NUMBER:	CERE09-002	**PREPARED BY:**	NTC
		CHECKED BY:	
DESCRIPTION:	Lift Station No. 1 To Serve Areas 1 and 2	**CURRENT ENR CCI:**	8,857

Lift (Pump) Station Improvements

Improvement	Note	Capacity	Units	Quantity	Unit	Unit Cost	Subtotal
Lift Station Civil and Mechanical		2.7	Mgal/d	1	LS	$175,000	$330,000
Electrical and Instrumentation	1	N/A	N/A	1	LS		$83,000
Dedicated Backup Generator & ATS	2	N/A	N/A	1	LS		$21,000
						Subtotal	**$434,000**

Force Main Improvements

Improvement	Note	Capacity	Units	Quantity	Unit	Unit Cost	Subtotal
Force Main Improvements	3	N/A	ft	5700	LF	$120	$684,000
						Subtotal	**$684,000**
SUBTOTAL							**$1,118,000**
Estimating Contingency	4		30%				$335,400
SUBTOTAL CONSTRUCTION COSTS							**$1,453,400**
Design/Administration	4		20%				$223,600
TOTAL COST							**$1,677,000**

Notes:
1. Based on 20% of estimated lift station civil and mechanical costs.
2. Assumed to add 25% to electrical and instrumentation cost.
3. Unit cost = $10/inch diameter.
4. Estimating contingency and design/administration.

Table B-2
City of Ceres Sewer System Master Plan
Planning Level Opinion of Probable Cost for
Collection System Lift Station Improvements

Stantec

DATE CREATED: 12/28/2010
PROJECT: CITY OF CERES SEWER MASTER PLAN
UPDATED: 4/30/2011

PREPARED BY: NTC
JOB NUMBER: CERE09-002

CHECKED BY:

DESCRIPTION: Lift Station No. 2
To Serve Areas 4, 6 and 7
CURRENT ENR CCI: 8,857

Lift (Pump) Station Improvements

Improvement	Note	Capacity	Units	Quantity	Unit	Unit Cost	Subtotal
Lift Station Civil and Mechanical		4.4	Mgal/d	1	LS	$175,000	$450,000
Electrical and Instrumentation	1	N/A	N/A	1	LS		$113,000
Dedicated Backup Generator & ATS	2	N/A	N/A	1	LS		$29,000
						Subtotal	**$592,000**
Force Main Improvements							
Force Main Improvements	3	N/A	ft	1350	LF	$160	$216,000
						Subtotal	**$216,000**
SUBTOTAL							**$808,000**
Estimating Contingency	4		30%				$242,400
SUBTOTAL CONSTRUCTION COSTS							**$1,050,400**
Design/Administration	4		20%				$161,600
TOTAL COST							**$1,212,000**

Notes:
1. Based on 20% of estimated lift station civil and mechanical costs.
2. Assumed to add 25% to electrical and instrumentation cost.
3. Unit cost = $10/inch diameter.
4. Estimating contingency and design/administration.

Table B-3
City of Ceres Sewer System Master Plan
Planning Level Opinion of Probable Cost for
Collection System Lift Station Improvements

Stantec

DATE CREATED: 12/28/2010
PROJECT: CITY OF CERES SEWER MASTER PLAN
UPDATED: 4/30/2011

PREPARED BY: NTC
JOB NUMBER: CERE09-002

CHECKED BY:

DESCRIPTION: Lift Station No. 3
To Serve Areas 8, 9, 10, 12 and 13
CURRENT ENR CCI: 8,857

Lift (Pump) Station Improvements

Improvement	Note	Capacity	Units	Quantity	Unit	Unit Cost	Subtotal
Lift Station Civil and Mechanical		4.2	Mgal/d	1	LS	$175,000	$440,000
Electrical and Instrumentation	1	N/A	N/A	1	LS		$110,000
Dedicated Backup Generator & ATS	2	N/A	N/A	1	LS		$28,000
						Subtotal	**$578,000**

Force Main Improvements

Improvement	Note	Capacity	Units	Quantity	Unit	Unit Cost	Subtotal
Force Main Improvements	3	N/A		0	LF	$140	$0
						Subtotal	**$0**
SUBTOTAL							**$578,000**
Estimating Contingency	4		30%				$173,400
SUBTOTAL CONSTRUCTION COSTS							**$751,400**
Design/Administration	4		20%				$115,600
TOTAL COST							**$867,000**

Notes:
1. Based on 20% of estimated lift station civil and mechanical costs.
2. Assumed to add 25% to electrical and instrumentation cost.
3. Unit cost = $10/inch diameter.
4. Estimating contingency and design/administration.

Table B-4
City of Ceres Sewer System Master Plan
Planning Level Opinion of Probable Cost for
Collection System Lift Station Improvements

Stantec

DATE CREATED: 12/28/2010
PROJECT: CITY OF CERES SEWER MASTER PLAN
UPDATED: 4/30/2011

PREPARED BY: NTC
JOB NUMBER: CERE09-002

CHECKED BY:

DESCRIPTION: Lift Station No. 4
To Serve Area 14
CURRENT ENR CCI: 8,857

Improvement	Note	Capacity	Units	Quantity	Unit	Unit Cost	Subtotal
Lift (Pump) Station Improvements							
Lift Station Civil and Mechanical		0.9	Mgal/d	1	LS	$175,000	$170,000
Electrical and Instrumentation	1	N/A	N/A	1	LS		$43,000
Dedicated Backup Generator & ATS	2	N/A	N/A	-	LS		$0
						Subtotal	**$213,000**
Force Main Improvements							
Force Main Improvements	3	N/A		0	LF	$140	$0
						Subtotal	**$0**
SUBTOTAL							**$213,000**
Estimating Contingency	4		30%				$63,900
SUBTOTAL CONSTRUCTION COSTS							**$276,900**
Design/Administration	4		20%				$42,600
TOTAL COST							**$319,500**

Notes:
1. Based on 20% of estimated lift station civil and mechanical costs.
2. Assumed to add 25% to electrical and instrumentation cost.
3. Unit cost = $10/inch diameter.
4. Estimating contingency and design/administration.

Table B-5
City of Ceres Sewer System Master Plan
Planning Level Opinion of Probable Cost for
Collection System Lift Station Improvements

Stantec

DATE CREATED: 12/28/2010
UPDATED: 4/30/2011

PROJECT: CITY OF CERES SEWER MASTER PLAN

PREPARED BY: NTC

JOB NUMBER: CERE09-002

CHECKED BY:

DESCRIPTION: Lift Station No. 5
To Serve Areas 1, 2, 4, 6 and 7

CURRENT ENR CCI: 8,857

Lift (Pump) Station Improvements

Improvement	Note	Capacity	Units	Quantity	Unit	Unit Cost	Subtotal
Lift Station Civil and Mechanical		7.1	Mgal/d	1	LS	$175,000	$610,000
Electrical and Instrumentation	1	N/A	N/A	1	LS		$153,000
Dedicated Backup Generator & ATS	2	N/A	N/A	1	LS		$39,000
						Subtotal	**$802,000**
Force Main Improvements							
Force Main Improvements	3	N/A		0	LF	$200	$0
						Subtotal	**$0**
SUBTOTAL							**$802,000**
Estimating Contingency	4		30%				$240,600
SUBTOTAL CONSTRUCTION COSTS							**$1,042,600**
Design/Administration	4		20%				$160,400
TOTAL COST							**$1,203,000**

Notes:
1. Based on 20% of estimated lift station civil and mechanical costs.
2. Assumed to add 25% to electrical and instrumentation cost.
3. Unit cost = $10/inch diameter.
4. Estimating contingency and design/administration.

Appendix H

Additional Possible CEQA Compliance Options

Additional Possible CEQA Compliance Options

CEQA COMPLIANCE OPTIONS

The purpose of this section is to briefly describe potential CEQA compliance options relative to the Master Plan adoption and project implementation. The City as the Lead Agency under CEQA will ultimately decide on the appropriate level of CEQA analysis for the Master Plan and possible projects included therein. The three potential CEQA compliance method options include the development of the following:

1. Project Specific Initial Study/Mitigated Negative Declaration (IS/MND),
2. Focused Project Specific Environmental Impact Report (EIR), and
3. Master Plan EIR (PEIR) with project-specific details for near-term projects and program-level assessments for longer term options.

Each CEQA compliance method has its own strengths and weakness (benefits and detractions) relative to project liabilities, schedules, and overall budgets. Below is a brief outline of the strengths and weaknesses associated with the development of each type of CEQA document.

Master Plan Programmatic EIR (PEIR)

The option described in this constraints analysis for the City to consider is the preparation of a Programmatic EIR (also called a Master Plan EIR) that essentially takes a look at the "whole of the project" and each alternative addressed in the Master Plan. This would allow full disclosure up front of all potential future phases of the Master Plan. It would allow the City to address cumulative impacts from multiple phases of the program. This document is typically prepared to quell the argument that the agency is piece-mealing or phasing the whole project into several small projects.

CEQA Guidelines 15165 state “where individual projects are, or a phased project is, to be undertaken and where the total undertaking comprises a project with significant environmental effect, the Lead Agency shall prepare a single program EIR for the ultimate project as described in Section 15168. Where an individual project is a necessary precedent for action on a larger project, or commits the Lead Agency to a larger project, with significant environmental effect, an EIR must address itself to the scope of the larger project. Where one project is one of several similar projects of a public agency, but is not deemed a part of a larger undertaking or a larger project, the agency may prepare one EIR for all projects, or one for each project, but shall in either case comment upon the cumulative effect.”

Although the scope of the Master Plan EIR is different than the project specific EIR, the process and timeline (described above) are essentially the same. However, if additional sites and projects are included in the Master Plan EIR in contrast to the project specific EIR, additional field studies, surveys, and environmental permits may be required which could increase the overall timeline of meeting all aspects of environmental compliance (CEQA and environmental permits). A Program EIR can include project-specific details for the initial project phases so specific projects (i.e. the

WWTP expansion) are adequately covered under CEQA. This eliminating the need for “tiered” CEQA documents for the initial projects covered under the Master Plan.

Use of a Master Plan EIR can provide the following advantages:

- Provides an occasion for a more exhaustive consideration of effects and alternatives than would be practical in an EIR on an individual action
- Considers cumulative impacts that might be slighted in a case-by-case analysis
- Avoids duplicative reconsideration of basic policy considerations
- Allows the Lead Agency to consider broad policy alternatives and program wide mitigation measures at an early time when the agency has greater flexibility to deal with basic problems or cumulative impacts
- Lessens the risk of successful legal challenge by interested stakeholders of the CEQA document to be prepared by the City
- Allows for all phases of the Master Plan to be addressed in one document, rather than being done separately over time through project specific MNDs and EIRs, possibly saving time and money over the long term
- Reduces the risk being accused of piece-mealing or phasing a project into several small projects, which is a common response to mitigated negative declarations from resource agencies and environmental groups and can be a main theme in litigation
- Allows for flexibility to “tier” off the Master Plan EIR project-specific negative declarations of impacts because all significant impacts have already been addressed in the PEIR, saving time and money
- Allows for project-specific CEQA coverage for initial phases of the Master Plan

Use of a PEIR can provide the following disadvantages:

- Requires more up front studies to adequately assess each phase from both an engineering and environmental viewpoint
- Though CEQA documents do not legally have a timeline related to their validity, most CEQA documents are generally considered valid for a time period of 5 to 10 years (if the baseline environmental or regulations do not change significantly) so if several phases are planned within that time period, the preparation of a PEIR could save time and money
- Entails an overall minimum time frame for completion of 12-18 months

<u>Biggest Issue:</u> In addition to circuit court judges generally tending to favor the preparation of an EIR over an MND, the development of a Master Plan EIR could potentially save the City time and money if the Master Plan phases assessed in this type of EIR will be implemented in a reasonable amount of time and the scope of the projects, area assessed, or mitigation measures do not change significantly.

Focused Project-Level Environmental Impact Report (EIR)

An EIR is an appropriate disclosure document if any one or combination of the following criteria is met:

- There are substantial environmental impacts associated with the project requiring disclosure
- There are significant and unavoidable environmental impacts that require overriding considerations
- There is substantial public controversy over the project
- Numerous permits from state and federal agencies are required for project construction (a Clean Water Act 404 and 401 permit, CDFG Streambed Alteration Agreement, and CDFG California ESA 2081MOU)

The public disclosure process for an EIR includes the following notable aspects:

- The Lead Agency would be the City. Responsible Agencies will likely include the County, the Air Board, the Water Board, and CDFG, City of Modesto, among others
- The City would be required to publish a Notice of Preparation (NOP) and project description for public review for a minimum of 30 days
- A public EIR scoping meeting is required to incorporate public and agency concerns into the EIR impact evaluation. This may result in changes to the EIR scope or additional studies may be required
- The City will develop a Draft EIR with the public's concerns adequately addressed
- The Draft EIR is then circulated to the public and responsible agencies through the CA State Clearinghouse. It is also published at the City and County offices for a minimum of a 45 day review period (rather than 30 days with an IS/MND)
- The lead agency provides a venue (public hearing) for addressing comments and responds to written comments received during the 45 day public review period
- The overall time frame for completion is approximately 12 months.

<u>Biggest Issue:</u> In many legal challenges involving CEQA compliance of municipal projects, circuit court judges generally tend to favor preparation of EIRs because the agency has attempted to involve the public during the CEQA process. This is in contrast to preparation of IS/MNDs that do not require public involvement during the development of the document. Water and wastewater projects often generate controversy if expansion is included. While this fact alone is not cause for preparation of an EIR, it needs to be considered in the bigger context and the desired project schedule. Project specific documents would not be sufficient if the City intends to adopt the Master Plan because the resolution to adopt is a discretionary action subject to CEQA. In this case a programmatic EIR, with project-specific details where feasible, and options for "tiering" or developing smaller CEQA compliance documents based on the Program EIR for future projects would be more appropriate.

Mitigated Negative Declaration (MND)

The first option includes the preparation of an Initial Study/Mitigated Negative Declaration (IS/MND) for the first project or first set of projects that are envisioned in the Master Plan. The IS/MND would provide a general analysis of the other alternatives developed in the Master Plan in the cumulative impacts section. Further project-specific environmental analyses (other CEQA documents) would be completed for future phases once specific details are known about specific projects; however, since those projects will not occur in the “reasonably foreseeable future”, a current assessment is not feasible.

The public disclosure process for an IS/MND includes the following notable aspects:

- The Lead Agency would be the City. Responsible Agencies will likely include the County, the Air Board, the Water Board, and CDFG, City of Modesto, among others
- Unlike an EIR, with an IS/MND there is no requirement to provide the public with a Notice of Preparation (NOP), which is circulated for a minimum of 30 days.
- There is no required public scoping meeting.
- The public review period once the IS/MND document is circulated to state agencies through the CA State Clearinghouse and is circulated at the City and County offices is 30 days (rather than 45 days with an EIR)
- One public hearing is required prior to adoption of the CEQA IS/MND and Mitigation Monitoring and Reporting Program (MMRP)
- The overall time frame for completion approximately 6 to 9 months, excluding any necessary field surveys and environmental permits
- The risks of successful litigation are higher with an IS/MND when compared to an EIR because there is less public participation in the overall project scoping and CEQA process
- An IS/MND is only applicable if the project will have no potentially significant impacts to the environment that cannot be mitigated to less than significant levels.
- The IS/MND must include all proposed projects that will occur in the “reasonably foreseeable future”.

<u>Biggest Issue:</u> The threshold for challenging an IS/MND in court is fairly low when compared to an EIR. Project opponents merely need to meet the “fair argument” test or provide substantial evidence that environmental impacts maybe occurring that are not being adequately or properly disclosed. If a fair argument can be raised on the basis of “substantial evidence” in the record that the project may have a significant adverse environmental impact, even if evidence also exists to the contrary, then an EIR can be legally required. Substantial evidence includes facts, reasonable assumptions predicated by facts, and expert opinion supported by facts. It does not include argument, speculation, unsubstantiated opinion or narrative evidence which is clearly inaccurate or erroneous. Letters or comments from stakeholders with appropriate qualifications or from state responsible agencies (CDFG, RWQCB and others) that meet this threshold would provide