Los Osos Wastewater Project
Preliminary Engineering Report

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CHAPTER 1: PROJECT SUMMARY

1.1. BACKGROUND

The community of Los Osos, California is an unincorporated community situated about mid-way on the coastline of San Luis Obispo County, at the southern end of Morro Bay and adjacent to the Morro Bay National Estuary and State Marine Reserve. It is surrounded by Morro Bay, the Pacific Ocean, Montana de Oro State Park, open space preserves, and prime agricultural lands. The population of the community is approximately 15,000 residents. Drinking water is obtained by means of well extraction from the Los Osos groundwater basin, a multi-level aquifer underlying the Los Osos community. The basin is comprised of an upper and a lower aquifer separated by an impermeable layer of clay, which thereby restricts the vertical movement of groundwater.

The physical development of Los Osos began in the late 19th Century with the division of land into a grid of long, narrow residential lots located on wide streets. By the early 1960's, a community of summer homes and retreats had been developed. The community's permanent population grew steadily during the 1970's and into the mid-1980's, with the absence of a central wastewater collection and treatment system. Consequently, sanitation needs were met primarily through individual septic systems with septic pits, leachfields and similar methods. Today, wastewater treatment for the community continues to consist of privately owned, individual septic systems serving each developed property, or in some cases multiple properties.

The Regional Water Quality Control Board – Central Coast Region (RWQCB) determined in 1983 that contamination in excess of the State standards had occurred in the groundwater basin (upper aquifer) at least partially due to use of the septic systems throughout the community. Therefore, in January 1988, the State Water Resources Control Board approved an amendment to the Water Quality Control Plan, Central Coastal Basin. The amendment contained the discharge moratorium established by the RWQCB for a portion of the Los Osos area known as the "Prohibition Zone" (Figure 2-2). By prohibiting discharge from additional individual and community sewage disposal systems, the moratorium effectively halted new construction or major expansions of existing development until the water pollution problem was solved. In effect, the regulatory actions necessitated the development of a community wastewater system to collect, treat, and dispose/reuse the wastewater.

1.2. EARLY PROJECT EFFORTS BY COUNTY

Since the establishment of the Prohibition Zone, there have been many attempts to rectify the situation through construction of a wastewater project. The County produced a plan and Environmental Impact Report (EIR) by 1987 for a wastewater treatment system that was composed of conventional collection, treatment and disposal technologies, with the treatment plant site located in a rural area northeast of the community near the westerly end of Turri Road. The County prepared a Supplemental EIR in 1988 and began the design process. However, the project was delayed by litigation and other issues. By the mid-1990's the planned treatment plant site was moved to a partially developed area on the eastern side of the Los Osos community. This site change necessitated preparation of a second supplemental EIR (1997). For a variety of reasons, the conventional wastewater collection and treatment system evaluated by the 1997 supplemental EIR, did not enjoy community-wide support. Overriding concerns with the project related to project costs and feasibility of the effluent disposal plan.

1.3. LOS OSOS COMMUNITY SERVICES DISTRICT

Community opposition to the County's planned project led to the formation of the "Solutions Group," a coalition of community members with a vision for an alternative sewer project. The plan included a STEP collection system, facultative pond treatment, and community amenities, such as a park, in the project description. In 1998, the community voted to establish a community services district with wastewater authority and elected members of the "Solutions Group" to the Board of Directors. The Los Osos Community Services District (LOCSD) prepared a project EIR, began the design process, and purchased a treatment plant site located in the west-central portion of the community (referred to as both the "Tri-W" and "Mid-Town" site). By the time the LOCSD certified the EIR in 2001, the alternative technologies had been removed in favor of a conventional gravity collection system and extended aeration treatment process.

The LOCSD did not receive final approval of the Coastal Development Permit (CDP) and start construction until mid-2005. By that time, there was growing community opposition to the project, focused primarily on project costs and the Mid-Town treatment plant site. In the fall of 2005, the voters in Los Osos recalled a majority of the LOCSD board members in a special election. The new board immediately halted construction on the wastewater project. In August 2006, the LOCSD rescinded certification of the 2001 EIR and filed for federal bankruptcy protection due to default on construction and financing contracts.

In response to the community vote to effectively stop the wastewater project, which was in construction, the RWQCB began to take regulatory enforcement action against individual property owners for violation of the septic tank discharge prohibition. The RWQCB initial sent Cease and Desist orders to 45 property owners and has subsequently sent a Notice of Violation to all property owners within the prohibition zone. The RWQCB established a deadline of January 1, 2011, after which property owners will face fines if substantial progress has not been made to complete the project.

1.4. CURRENT COUNTY EFFORTS UNDER AB 2701 (BLAKESLEE, 2006)

After the recall and suspension of construction, California Assemblyman Sam Blakeslee attempted to resolve the dispute between the State Water Board, which was the funding agency, and the LOCSD. When a compromise could not be reached, Assemblyman Blakeslee proposed special legislation, Assembly Bill (AB) 2701, to authorize transfer of wastewater authority from the LOCSD to the County of San Luis Obispo. AB 2701 was passed unanimously by the California State legislature and signed into law by Governor Arnold Schwarzenegger. It became effective on January 1, 2007.

Among its key provisions, AB 2701 required that the County determine whether property owners would authorize local assessments pursuant to Proposition 218, which is commonly referred to as the "Right to Vote on Taxes Act" and which is incorporated into the California State Constitution. The County's first task was the development of a Rough Screening Report and a Fine Screening Report. These documents focused on identifying a set of viable project alternatives and cost estimates for those alternatives. The cost estimates were the basis for the Proposition 218 assessment vote.

In October, 2007, the assessments were approved with 80% of property owner ballots in support. The assessments have since been established as liens on properties in an amount that varies by property but is equivalent to $24,941 per single family dwelling unit and total $126,722,296. Consequently, project funding has been substantially secured for the Los Osos Wastewater Project (LOWWP). A separate assessment ballot process for vacant properties is planned prior to the final implementation of the wastewater project. However, the liens assessed to developed properties in the 2007 proceedings represent approximately 78% of the total capital cost of the proposed project, including capitalized interest.

Following the successful Proposition 218 vote, the County completed a co-equal environmental review process to meet the requirements of the California Environmental Quality Act (CEQA) and the National Environmental Policy Act (NEPA). The project draft EIR was released in November, 2008, and the final EIR was adopted by the County Board of Supervisors on September 29, 2009. The County has also applied for all state and federal environmental permits; however, as a result of the "due-diligence" provisions of AB 2701, is waiting for final issuance of key permits, including the Coastal Development Permit, before proceeding with final design or project bids.

1.5. SUMMARY OF APPROVED PROJECT

The final approved project description in the EIR process consists of the following components:

Collection System

A gravity collection system is planned for Los Osos. A full collection system design was completed by the Los Osos CSD in 2004, prior to their cessation of the project and the passage of AB 2701. This existing design is the basis of the current planning and environmental permitting process. The collection system will consist of the following:

- Approximately 45 miles of pipelines, plus service laterals
- Nine major duplex and triplex pump stations, all with stand-by power
- Thirteen "pocket" pump stations
- A 2.5 mile force main to convey raw wastewater from the service area to the treatment plant

Treatment Facility

The planned treatment facility will be located on approximately 38 acres of the Giacomazzi property, located 2 miles east of the community core and behind the Los Osos cemetery. The property is currently zoned agricultural. However, the soil is poor quality and is not regularly farmed. The treatment facility will be design for an average daily flow of 1.2 MGD and will consist of the following:

- Headworks and bar screens covered for odor control
- Extended aeration secondary treatment process designed to meet total nitrogen limit of 7 mg/L.
- Tertiary filter process with ultraviolet disinfection designed to meet California Title 22 standards for tertiary recycled water
- Mechanical sludge dewatering (belt filter press or screw press) enclosed in a building for odor control

Recycled Water Reuse Program

Recycled wastewater will be reused within the community or surrounding agricultural land overlying the groundwater basin. It will either be discharged through leachfields or directly reused for urban or agricultural irrigation. The reuse program will consist of the following:

- 50 acre-feet of storage at the treatment plant site
- A recycled water main running from the treatment plant site, through the adjacent agricultural area, to reuse sites within the community
- 8 acres of leachfields at the Broderson site, with an annual capacity of 450 acre-feet
- Utilize one acre of existing leachfieds in the Bayridge Estates sub-division with an annual capacity of 32 acre-feet
- Provide recycled water to Los Osos schools, parks, golf course, and cemetery
- Provide recycled water main turn-outs to adjacent farmlands and develop reuse agreements for approximately 100 to 200 acre-feet per year.

Conservation Program

The project will also implement a water conservation program with a goal of reducing indoor water consumption to 50 gallons per capita per day, which is more than a 25% reduction over current use estimates. The conservation program will be accomplished through subsidized, mandatory residential and commercial fixture retrofits, appliance rebates, education, and water efficiency audits.

Figure 1.1 Vicinity Map

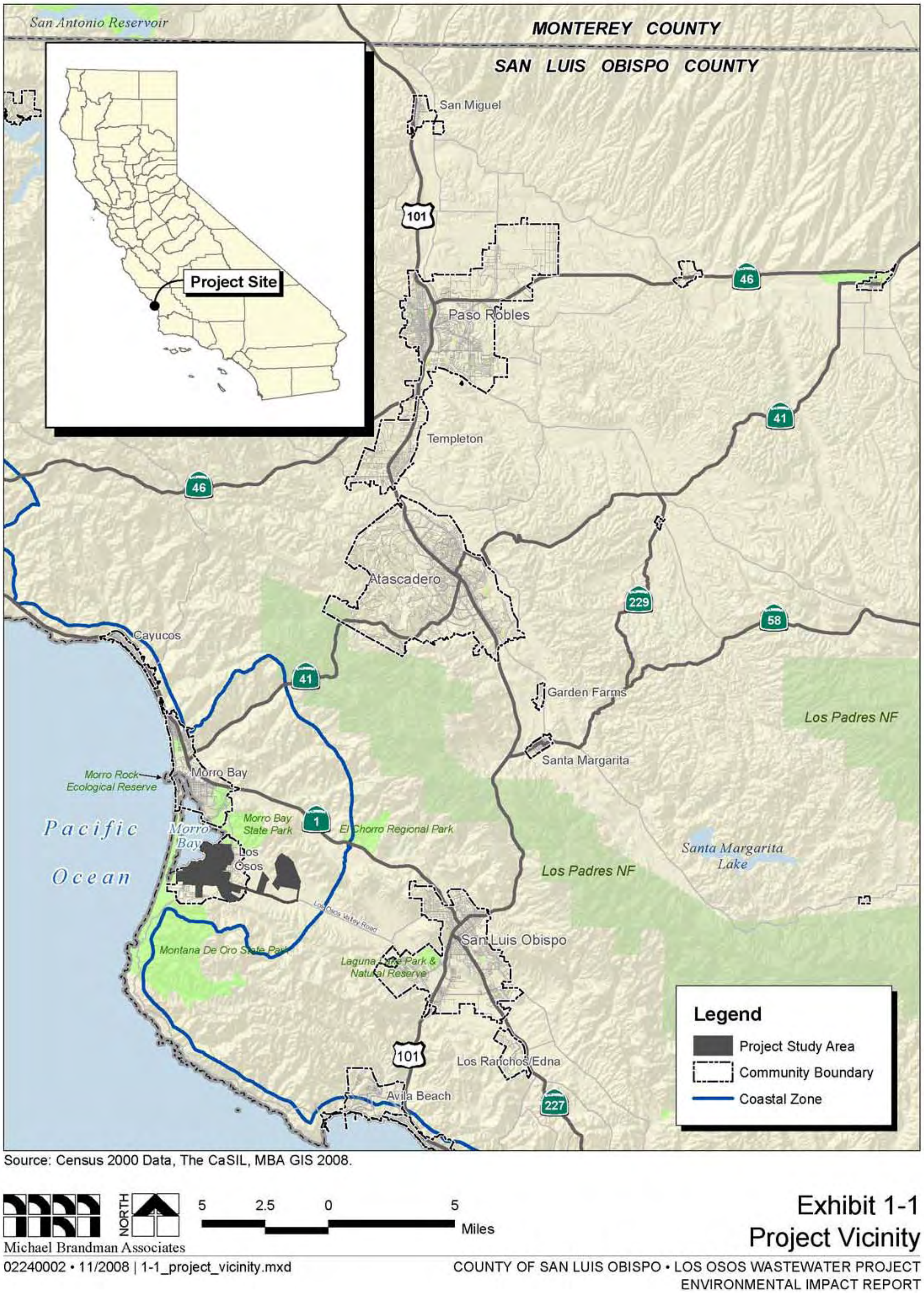
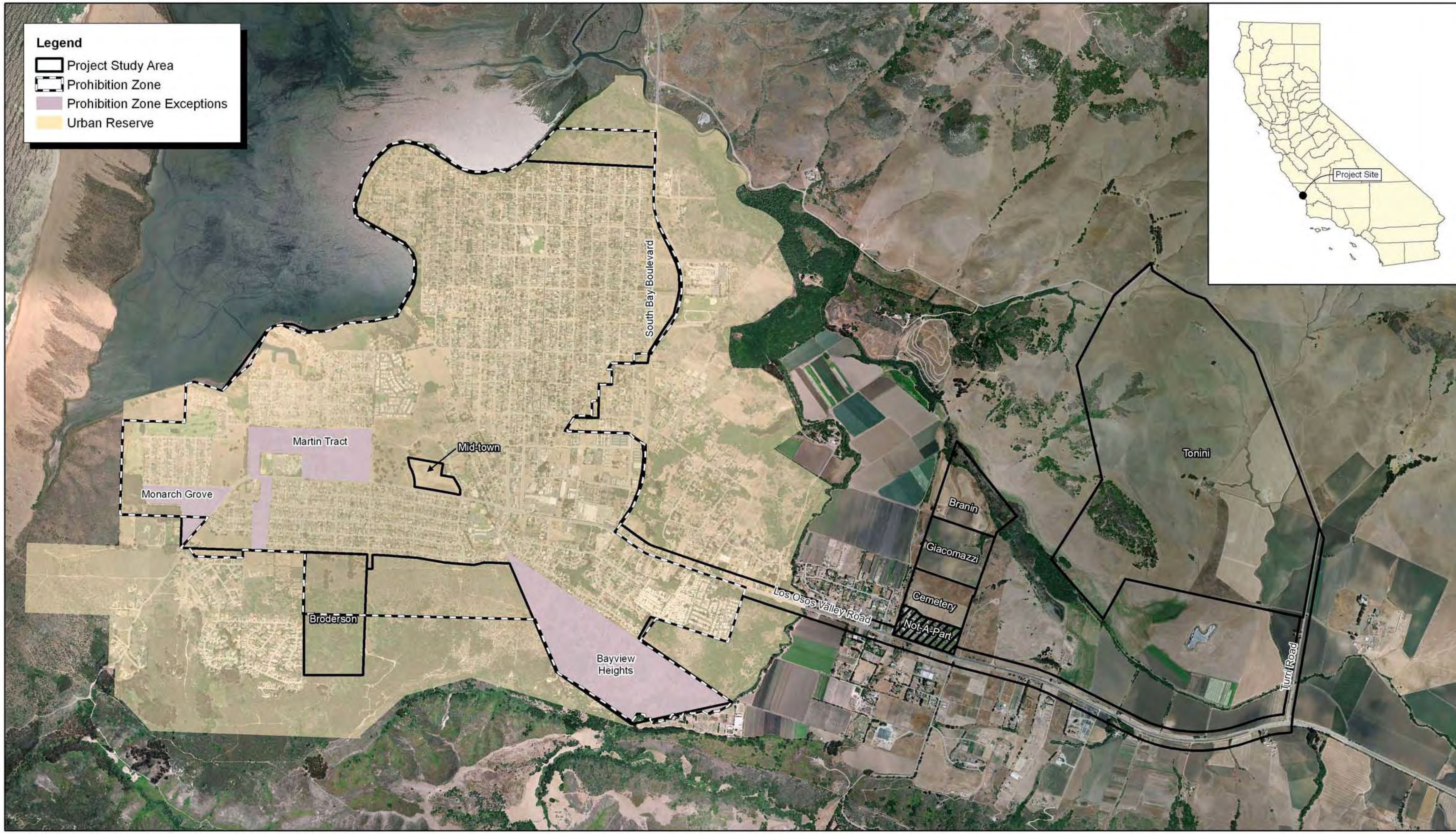


Figure 1.2 Project Setting



Source: AirPhoto USA, San Luis Obispo County GIS Data, and MBA GIS Data.

Michael Brandman Associates

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Exhibit 1-2
Project Setting

COUNTY OF SAN LUIS OBISPO • LOS OSOS WASTEWATER PROJECT
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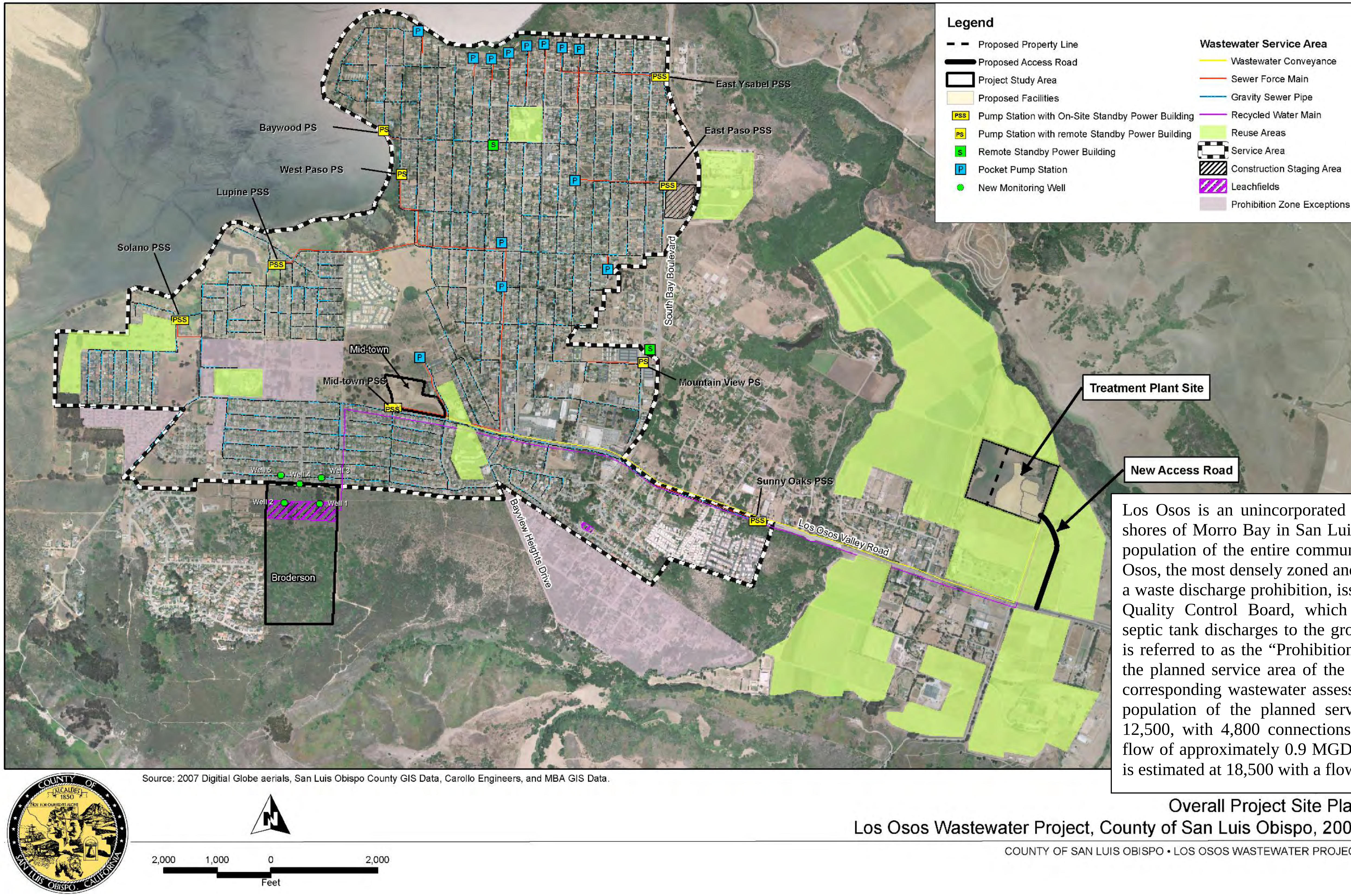
Figure 1.3 Project Diagram



Los Osos is an unincorporated community located on the shores of Morro Bay in San Luis Obispo County, Ca. The population of the entire community is 14,500. Within Los Osos, the most densely zoned and developed areas are under a waste discharge prohibition, issued by the Regional Water Quality Control Board, which requires the cessation of septic tank discharges to the groundwater basin. This area is referred to as the “Prohibition Zone.” It is the basis for the planned service area of the wastewater project and the corresponding wastewater assessment district. The current population of the planned service area is approximately 12,500, with 4,800 connections and an estimated start-up flow of approximately 0.9 MGD. The build-out population is estimated at 18,500 with a flow of 1.2 MGD.

CHAPTER 2: PROJECT PLANNING AREA

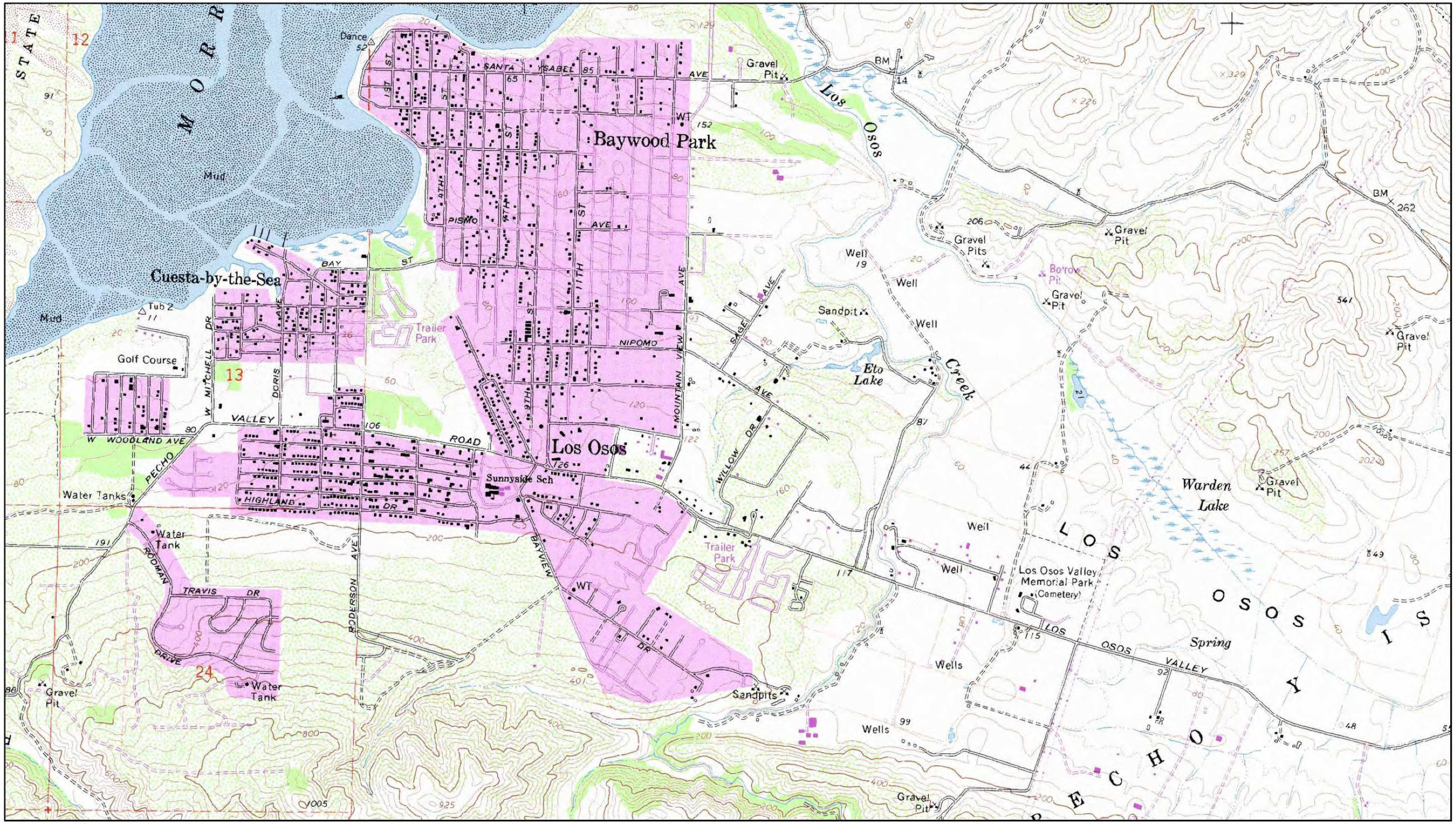
2.1. INTRODUCTION

Los Osos is an unincorporated community located on the shores of Morro Bay in San Luis Obispo County, Ca. The population of the entire community is 14,500. Within Los Osos, the most densely zoned and developed areas are under a waste discharge prohibition, issued by the Regional Water Quality Control Board, which requires the cessation of septic tank discharges to the groundwater basin. This area is referred to as the "Prohibition Zone." It is the basis for the planned service area of the wastewater project and the corresponding wastewater assessment district. The current population of the planned service area is approximately 12,500, with 4,800 connections and an estimated start-up flow of approximately 0.9 MGD. The build-out population is estimated at 18,500 with a flow of 1.2 MGD.

2.2. LOCATION

The planned project facilities will be located both inside and outside the wastewater service area. Facilities in the service area include gravity sewer collectors, force mains, pump stations, recycled water mains, and recycled water reuse and disposal systems. The wastewater treatment plant, recycled water storage, and delivery pipelines will be located approximately one to two miles east of the service area. The following figures provide an overview of the community and facilities location.

Figure 2.1 Los Osos Area Topography



Source: USGS 7.5-minute Topographic Map

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Topographic Map

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Figure 2.2 Los Osos Planning Areas

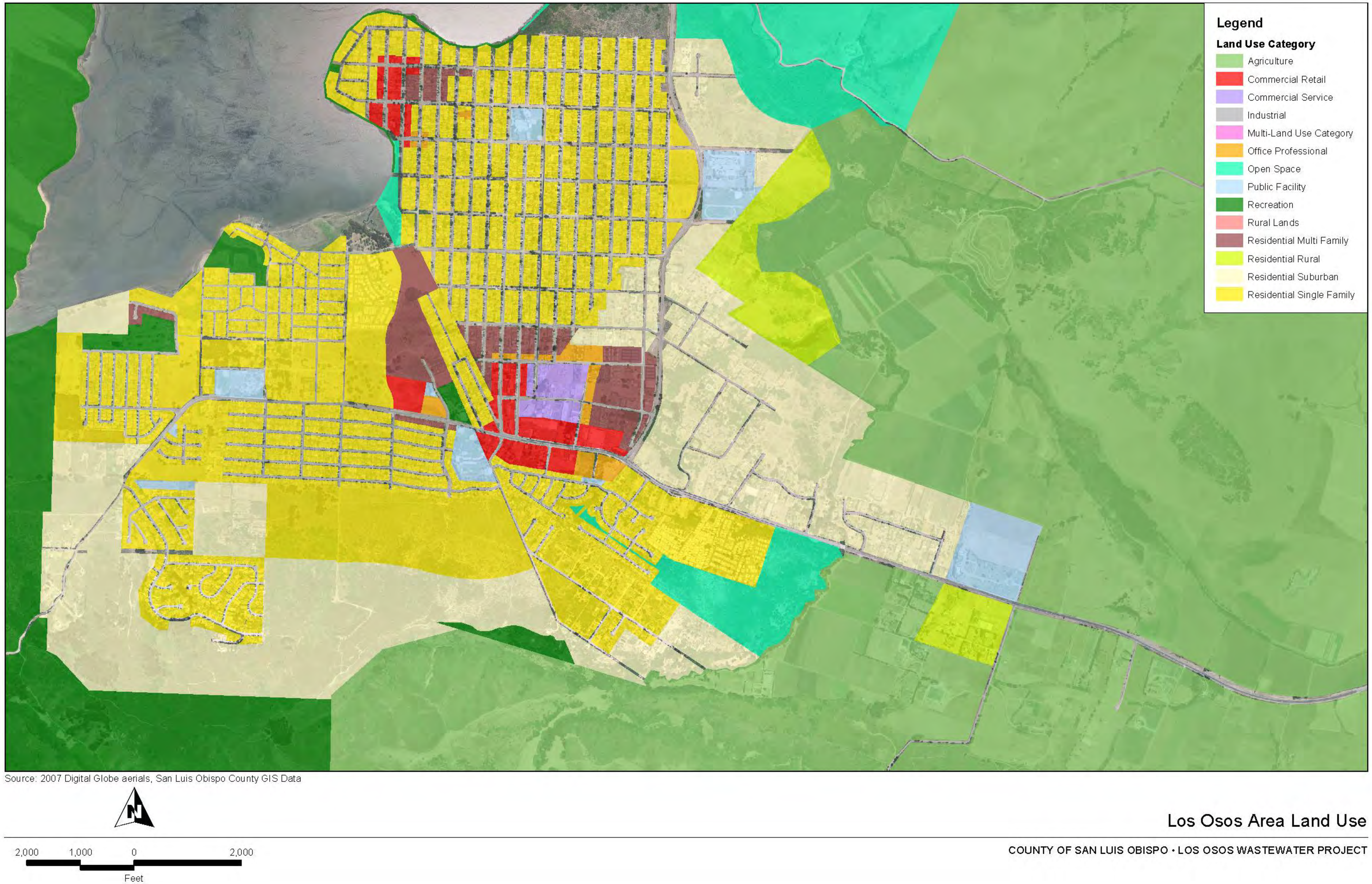
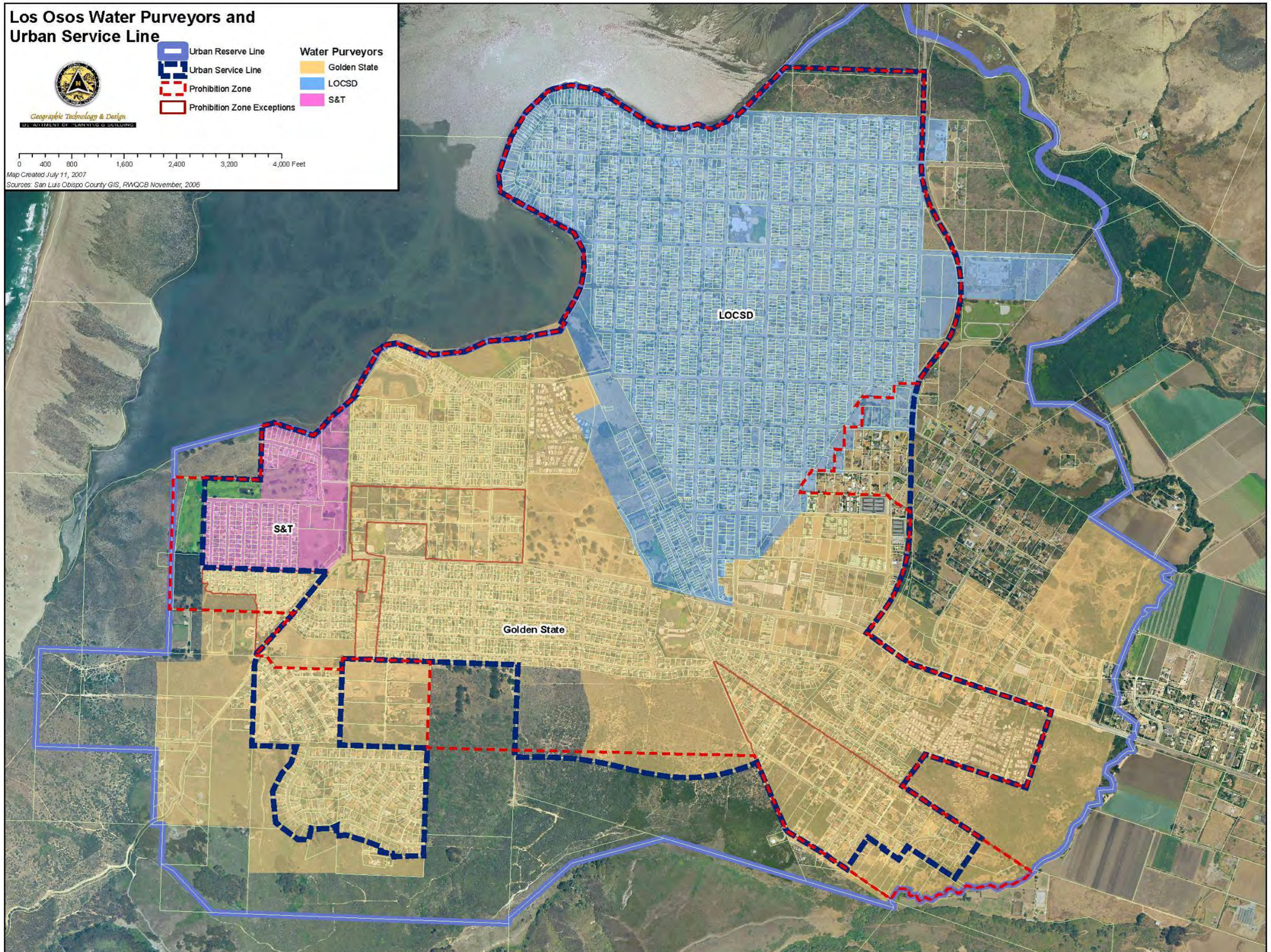


Figure 2.3 Los Osos Water Purveyors, Urban Services Line, and Prohibition Zone



2.3. ENVIRONMENTAL RESOURCES PRESENT

An EIR has been prepared for the project in accordance with the California Environmental Quality Act (CEQA) which evaluates the potential environmental impacts associated with a wastewater collection, treatment, and disposal system for the community of Los Osos. The County of San Luis Obispo, as the lead agency for the EIR, certified it on September 29, 2009. An Environmental Assessment in accordance with the National Environmental Policy Act (NEPA) has also been prepared. CEQA requires that all state and local government agencies consider the environmental consequences of projects over which they have discretionary authority before taking action. The EIR is unique in that it examines a range of alternatives on a co-equal basis in order to maximize flexibility during project selection.

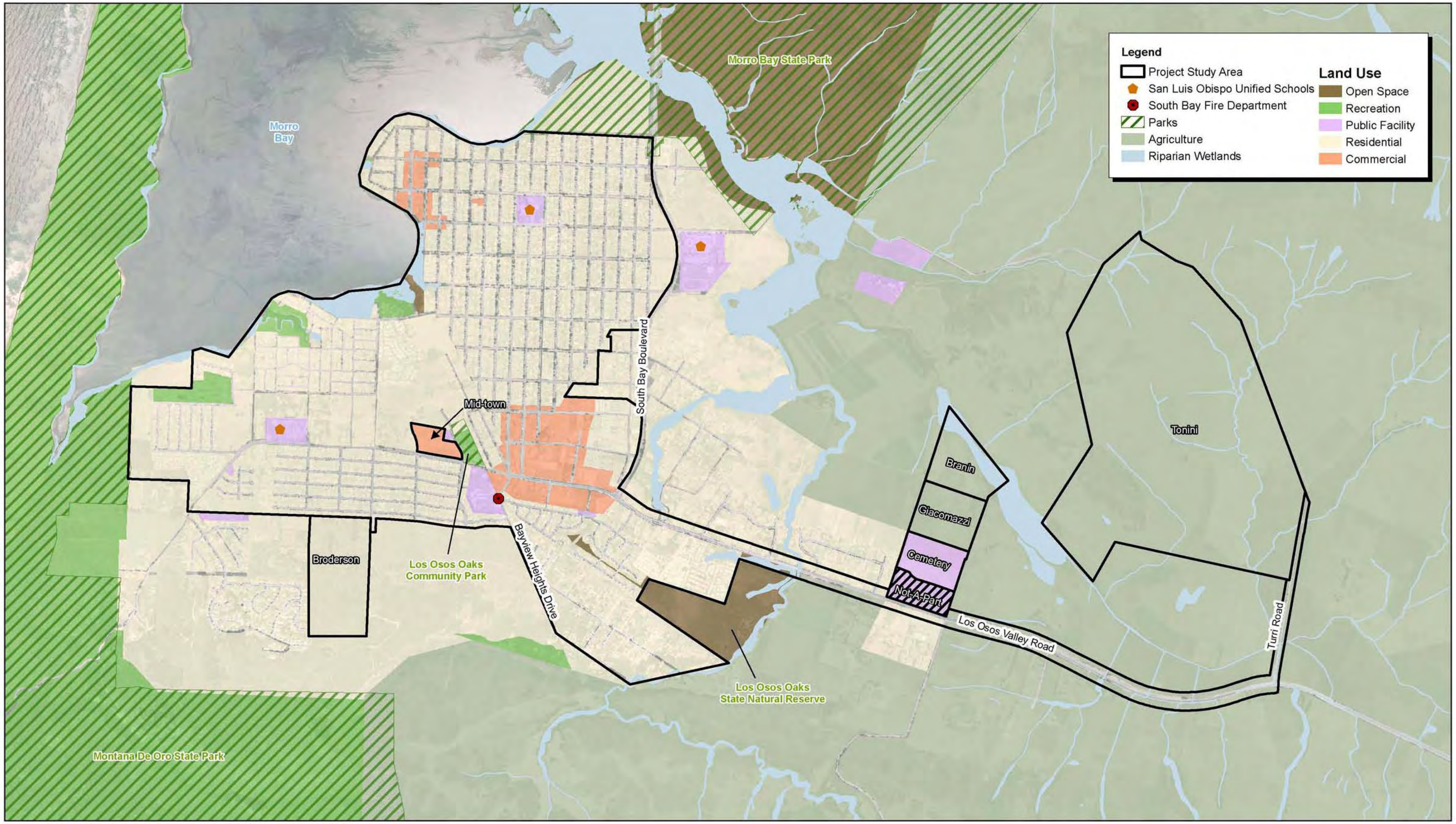
The EIR is intended to serve as an informational document for the public agency decision-makers and the public regarding the objectives, impacts, and components of the proposed project. The document addresses the potential significant adverse environmental impact that may be associated with this project, as well as identifies appropriate feasible mitigation measures and design features that may be adopted to reduce or eliminate these impacts. It identifies environmental sensitivities in the project study area, and it establishes mitigation measures and guidelines to address project-level environmental impacts that may result from specific project implementation for construction and operational consideration. The EIR evaluates the direct, indirect, and cumulative impacts of the proposed project, as well as project alternatives in accordance with the provisions set forth in CEQA and the CEQA Guidelines.

The EIR contains numerous subsections describing potential impacts of the proposed project alternatives analyzed for the project. These subsections include:

- Land Use and Planning
- Groundwater Quality and Water Supply
- Drainage and Surface Water Quality
- Geology
- Biological Resources
- Cultural Resources
- Public Health and Safety
- Traffic and Circulation
- Air Quality (and Greenhouse Gasses)
- Noise
- Agricultural Resources
- Visual Resources
- Environmental Justice

Appendix K of the EIR includes an extensive analysis of climate change impacts through the estimation and review of potential greenhouse gas emissions. The EIR concludes that in the context of overall community carbon footprint, the available collection, treatment, and disposal alternatives are relatively close from the perspective of climate change impact.

Figure 2.4 Environmental Setting



Source: AirPhoto USA, San Luis Obispo County GIS Data, and MBA GIS Data.

Michael Brandman Associates

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Exhibit 4-1
Environmental Setting Map

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Figure 2.5 Special Status Species Habitat

Exhibit 5.5-1
Special Status Species Habitat

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Figure 2.6 Jurisdictional Waters and Wetlands

Source: AirPhoto USA and San Luis Obispo County GIS.

Michael Brandman Associates
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Exhibit 5.5-2
Jurisdictional Waters and Wetlands

COUNTY OF SAN LUIS OBISPO • LOS OSOS WASTEWATER PROJECT
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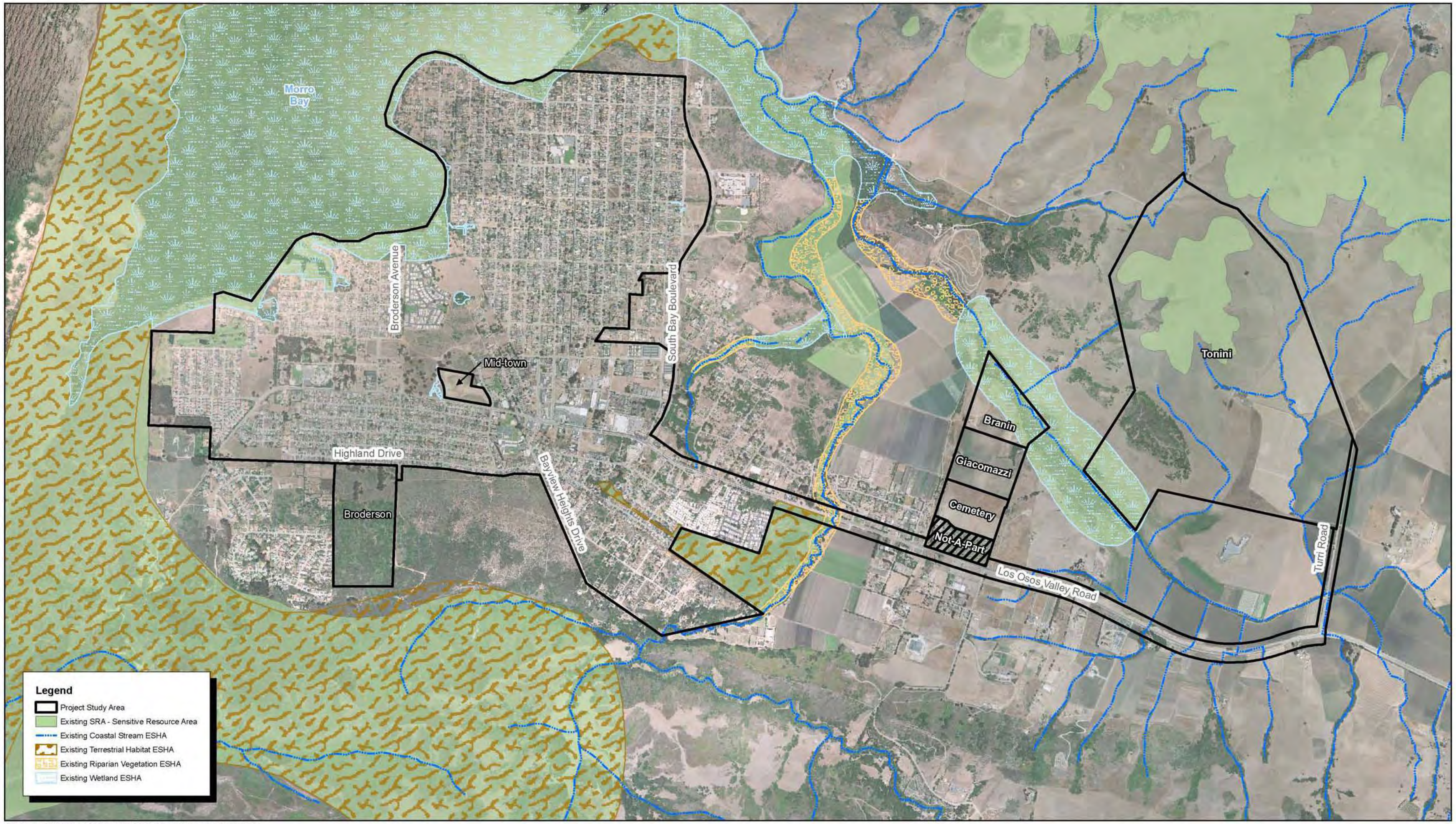
Figure 2.7 SRA and ESHA Lands



Source: AirPhoto USA and San Luis Obispo County GIS.

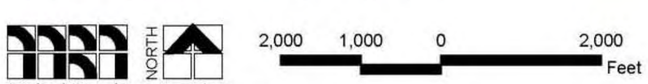


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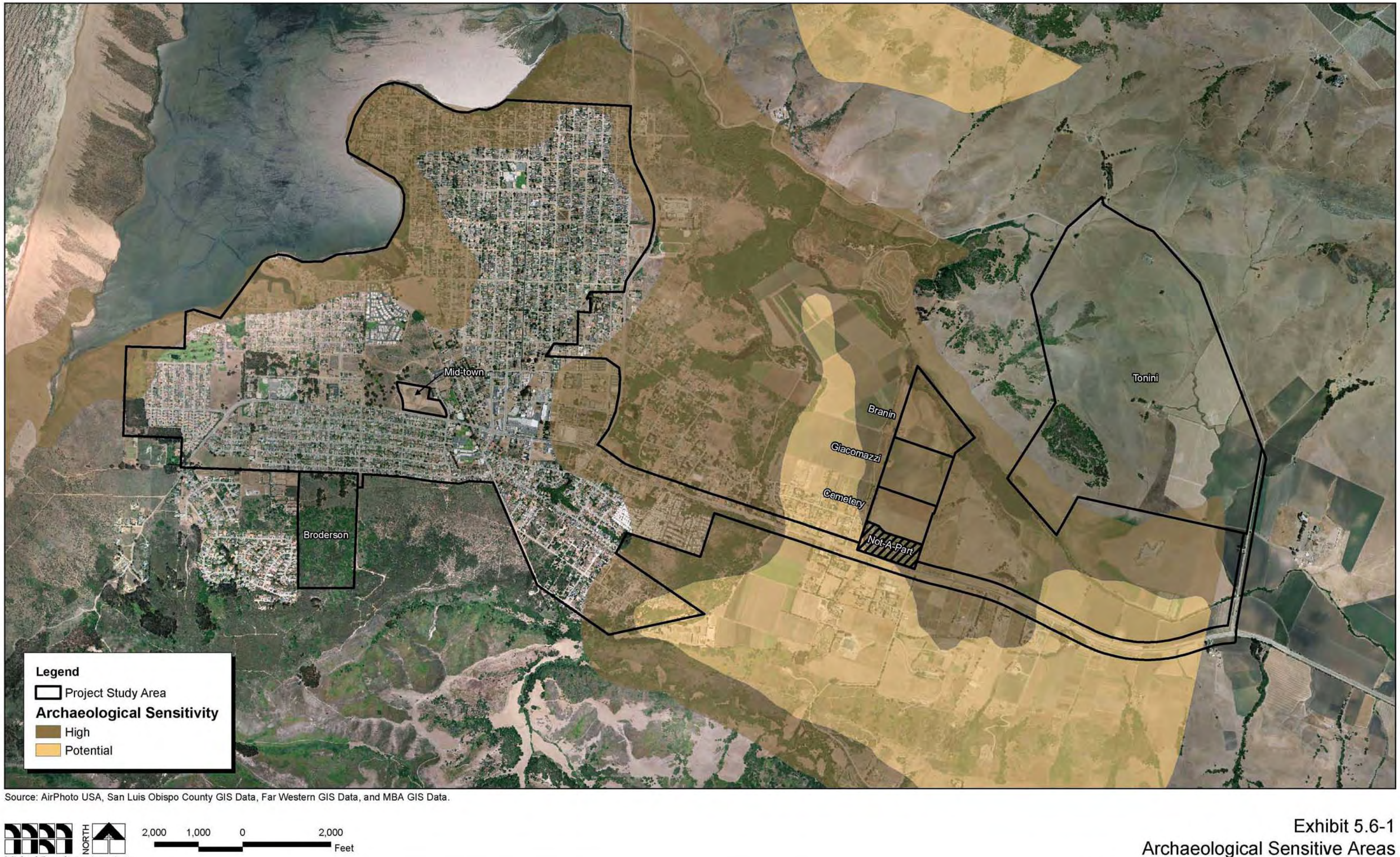
Exhibit 5.5-3
SRA and ESHA Lands

COUNTY OF SAN LUIS OBISPO • LOS OSOS WASTEWATER PROJECT
ENVIRONMENTAL IMPACT REPORT

Figure 2.8 Archaeological Sensitive Areas



Source: AirPhoto USA, San Luis Obispo County GIS Data, Far Western GIS Data, and MBA GIS Data.

Exhibit 5.6-1
Archaeological Sensitive Areas

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COUNTY OF SAN LUIS OBISPO • LOS OSOS WASTEWATER PROJECT
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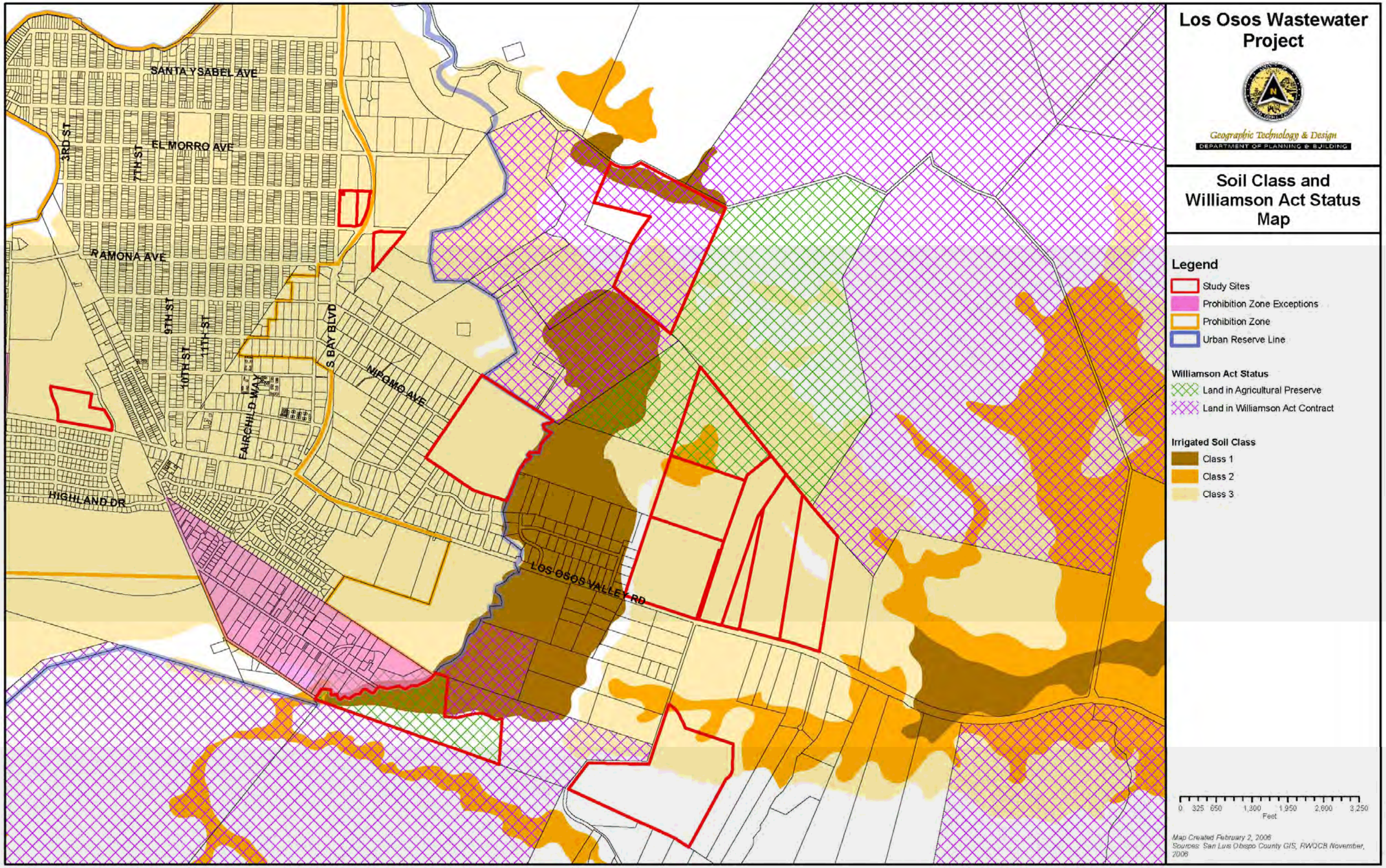
Figure 2.9 Agricultural Soils and Williamson Act Status



2.4. GROWTH AREAS AND POPULATION TRENDS

The current population of the community of Los Osos is approximately 14,200 residents, of which approximately 12,500 reside within the proposed wastewater project area. Since 1988, very little new housing has been constructed within the Prohibition Zone, and there is a backlog of construction demand in the community. The removal of the discharge moratorium within the Prohibition Zone will lead to a certain amount of new growth. However, not all of this development is expected to occur immediately. Although the discharge moratorium will be removed after completion of the project, further development in the Prohibition Zone will be subject to numerous other regulatory requirements such as compliance with Coastal Development Permit conditions which call for addressing water supply and endangered species habitat issues prior to connection to the wastewater project.

As shown in Table 2.1, the growth that has occurred within Los Osos between Year 1990 and Year 2000 includes an increase in 117 residential units, but a decrease in population of 223 people. Table 2.1 also includes an estimate of the build-out population for the community.

Table 2.1: Year 1990, Year 2000, and Build-out Population and Housing Data for Community of Los Osos

Community of Los Osos	Year 1990 [1]	Year 2000 [1]	Estimated Build-out
Population	14,377	14,154	19,713
Housing	6,094	6,214	8,284

[1] Draft Environmental Impact Report for the Los Osos Community Services District, Wastewater Facilities Project, Page 61, November 2000

The proposed project will provide a new wastewater system that will allow infill housing and population growth within the Prohibition Zone. This increase in housing and population would occur on currently vacant or underdeveloped lots scattered throughout the community. Many of these lots are currently served by roads which contain utilities within the rights-of-way that can serve additional development.

Land use and zoning in Los Osos is regulated by the County of San Luis Obispo, primarily through a General Plan document entitled the Estero Area Plan. The portions of the Estero Area Plan that impact Los Osos will be updated following the implementation of the proposed wastewater project. The current Estero Area Plan projects the ultimate population of the Los Osos community to be over 28,000 residents. However, many of the properties historically slated for development have been acquired for permanent open space and create a “green-belt” around Los Osos. More current estimates compiled by the County as part of the Estero Area Plan update process projected the build-out population at 19,713 (2004 draft). Estimates of the future population within the prohibition zone vary by source, but generally fall in the range of 17,800 (SLO County Planning) to 18,428 (Wastewater Project Team). For the purpose of the wastewater project, the more conservative build-out population of 18,428 was utilized for the collected area. See Section 4.c for discussion of growth capacity of the wastewater system.

2.5. ECONOMIC DEMOGRAPHICS

The community of Los Osos is a predominantly residential community of 14,251 residents (U.S. Census 2000) located along the central Coast of California on the southern edge of Morro Bay in San Luis Obispo County. It is combined with Baywood Park to form the Census designated place of Baywood-Los Osos. There is a small business district concentrated over just a few blocks along Los Osos Valley Road on the southeast side of the town, with several additional shops servicing the Baywood section of Los Osos. The remaining sections of town are almost entirely residential. There is no heavy or light industry within Los Osos.

Employment status for the active members of the labor force is provided in Table 2.2. In Year 1999, there were 11,538 residents aged 16 years or older; 7,250 (68%) of which were active within the labor force.

Table 2.3 provides statistical data on Year 1999 income per household within the community of Los Osos. Median household income is shown as **$46,558**. A total of 190 families and 1,205 individuals were living below the poverty level in Year 1999.

Table 2.2 Employment Status – Los Osos, CA[1]

Occupation	Number	Percent
Management, professional, and related occupations	2,660	38.4
Service Occupations	1,258	18.2
Sales and office occupations	1,657	23.9
Farming, fishing, and forestry occupations	73	1.1
Construction, extraction, and maintenance occupations	654	9.4
Production, transportation, and material moving occupations	629	9.1
Armed Forces	28	0.2
Unemployed	291	2.5
Total	**7,250**	**68**

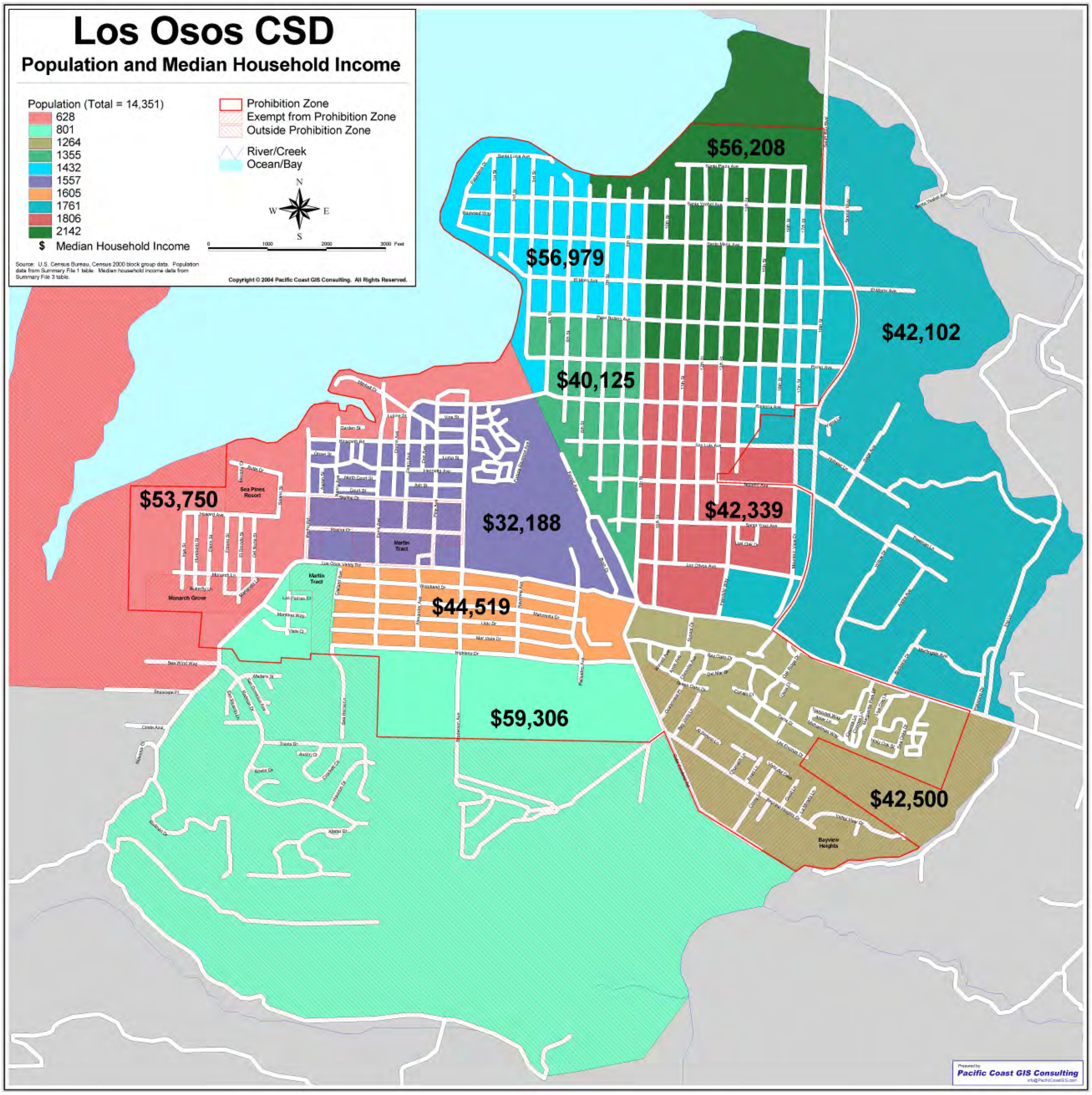
[1] U.S. Bureau of the Census, Census 2000

Table 2.3 Household Income – Los Osos, CA[1]

Income Range	Number	Percent
Households	5,908	100
Less than $10,000	296	5.0
$10,000 to $14,999	322	5.5
$15,000 to $24,999	793	13.4
$25,000 to $34,999	791	13.4
$35,000 to $49,999	914	15.5
$50,000 to $74,999	1,269	21.5
$75,000 to $99,999	792	13.4
$100,000 to $149,000	484	8.2
$150,000 to $199,999	100	1.7
$200,000 or more	147	2.5
Median Household Income	**$46,558**	**--**

[1] U.S. Bureau of the Census, Census 2000

Figure 2.10 Population and Median Household Income



CHAPTER 3: EXISTING FACILITIES

A number of small neighborhood septic systems, and one decentralized tertiary reclamation facility, currently exist in Los Osos. These facilities are described below:

- Four mobile home parks exist within the proposed collection area, each of which has neighborhood septic systems, including laterals to each unit and collector sewers within each park. The mobile home parks will be connected to the project and the septic system abandoned.
- The subdivision of Vista De Oro includes 73 single family lots that are connected to a gravity sewer system, followed by a neighborhood septic system. This subdivision will be connected to the project and the septic system abandoned.
- The subdivision of Bayridge Estates includes 147 single family lots that are connected to a gravity sewer system, followed by a neighborhood septic system. This subdivision will be connected to the project and the septic tanks abandoned. The existing leachfields will be used to discharge recycled water from the project.
- The subdivision of Monarch Grove includes 83 single family lots that are connected to a tertiary wastewater treatment facility, which is regulated under adopted wastewater discharge requirements. The Sea Pines golf resort is also served by this decentralized facility. The current project does not include a connection to Monarch Grove and Sea Pines.

In addition to the above facilities, approximately 3,000 linear feet of gravity sewer pipeline was installed in 2005 prior to the cessation of construction activities on the Los Osos Community Services District project. These installed facilities are consistent with the planned gravity sewer system contemplated in this report.

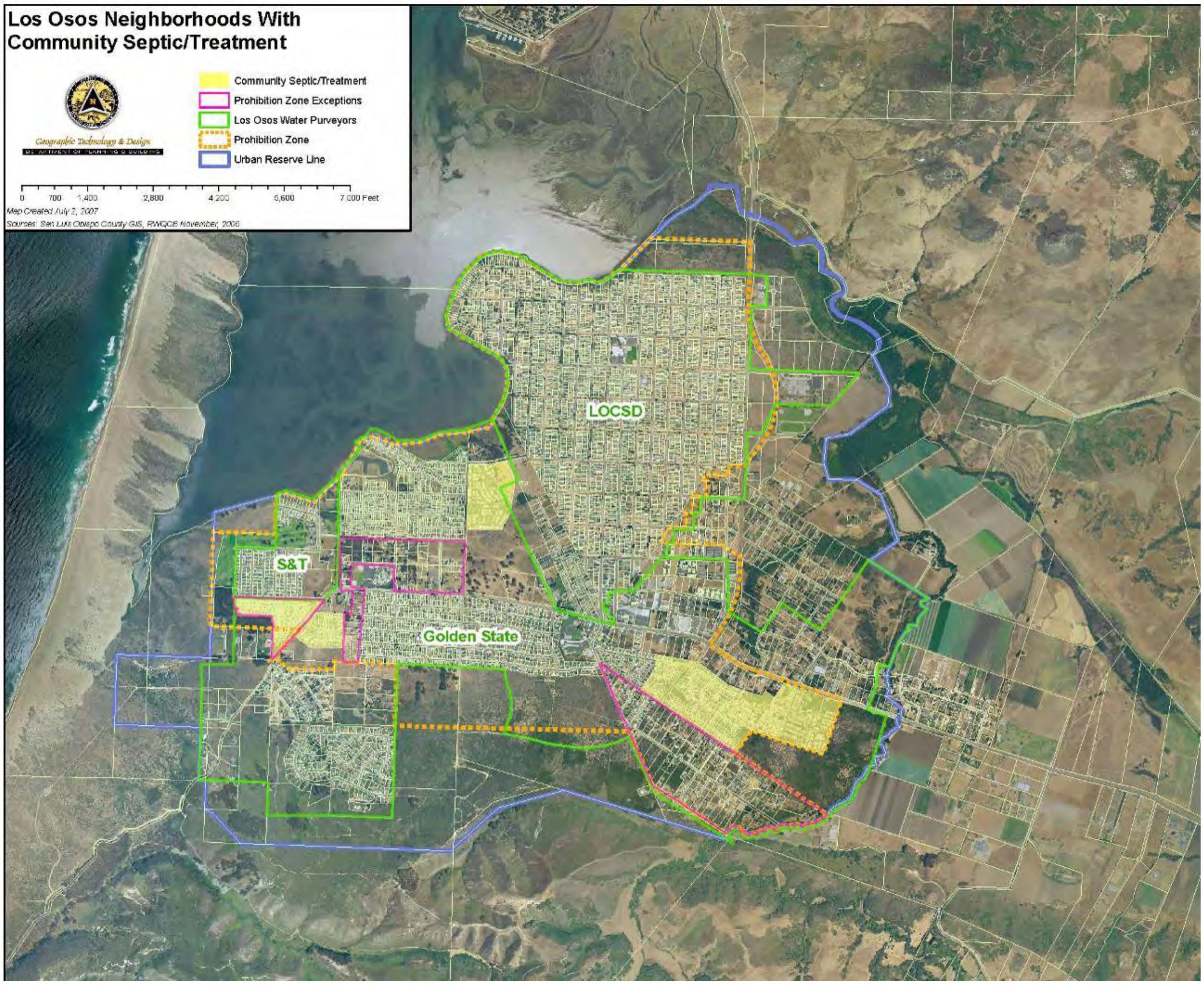
a. Location Map. See Figure 3-1.

b. History. There are no existing sewage facilities in Los Osos, beyond the few thousand feet of gravity sewer collectors. All facilities associated with this project will be new construction.

c. Condition of Facilities. The existing gravity sewer collectors are expected to be in acceptable condition for continued use as part of the wastewater project. However, they will be inspected during the construction phase of the project and any necessary repairs will be made prior to connection to the project.

d. Financial Status of any Existing Facilities. The existing facilities are owned the by Los Osos CSD and will be transferred to the County for use in the project according to the transfer provisions authorized in AB 2701.

Figure 3.1 Location of Existing Neighborhood Septic and Sewer Systems



CHAPTER 4: NEED FOR PROJECT

4.1. INTRODUCTION

Beginning as early as 1971, the RWQCB and other health agencies became concerned with the safety of the Los Osos community sanitary system. Concern arose from the high level of variance in depth to the ground water, which in certain areas is shallow enough to flood leach fields during wet weather. Additionally, many of the smaller lots do not contain sufficient land area to accommodate leach fields. As a result, these areas depend solely on deeper seepage pits which may discharge directly into the ground water. To compound matters, the Los Osos area draws its potable water supply from the groundwater. The RWQCB responded in June, 1971, by adopting an interim Basin Plan which contained a provision prohibiting septic system discharge in the area after 1974.

In 1983 the RWQCB determined that contamination in excess of State standards had occurred in the groundwater basin (upper aquifer) with a substantial effect from the use of septic systems throughout the community and followed with a regulatory mandate to cease and desist.

The RWQCB issued Resolution No. 83-13 and made the following findings:

- Previous studies (Brown and Caldwell, 1983) indicated that the quality of water derived from the shallow aquifer underlying the community was deteriorating, particularly as it relates to increasing concentrations of nitrates in excess of State standards.

- The current method of wastewater disposal by individual septic tank systems located in areas of high groundwater are a major contributing factor to this degradation of water quality.

- Continuation of this method of waste disposal could result in health hazards to the community and the continued degradation of groundwater quality is in violation of the Porter-Cologne Act.

Further, the RWQCB resolution established discharge prohibitions for a portion of the Los Osos area that became known as the Prohibition Zone. The action set a deadline for 1988, beyond which most new septic system discharges from new construction or remodels were prohibited. These regulatory actions created a moratorium, effectively halting new construction or major expansions of existing development until the water pollution problem was solved.

The need and primary purpose of the project is development of infrastructure for a wastewater collection, treatment and disposal system to serve the community of Los Osos in the designated Prohibition Zone in order to comply with the RWQCB mandate. In addition to meeting the RWQCB regulatory requirements, the project will provide a number of water quality and water supply benefits.

- The primary benefit of the LOWWP is compliance with the Regional Water Quality Control Board directives to alleviate groundwater contamination, primarily nitrates, which have occurred at least partially because of the use of septic systems throughout the community of Los Osos.

- The LOWWP provides an opportunity to begin the process of mitigating seawater intrusion, reducing nitrate contamination, and setting long term goals for achieving a sustainable water supply.

- Developing a wastewater project in Los Osos will lead to the removal of the discharge moratorium instituted by the RWQCB, returning community growth and development decisions to local officials and allowing for local control of water resources.

- Alleviating groundwater contamination will provide an additional direct benefit to the Morro Bay National Estuary and State Marine Reserve located adjacent to the Los Osos community.

- Properly implemented future measures for effluent disposal will enhance opportunities for water purveyors to improve the local water resources.

The need for the project has never been more acute than the present time. Over 25 years and approximately $50 million have been spent with no solution to the septic tank pollution. The current County efforts, authorized through unprecedented action by the state legislature, are likely the last chance for a locally led solution. The currently favorable bidding climate, availability of federal stimulus funding, and pending RWQCB fines are all factors that point to the need to implement this project within the next several months.

4.2. HEALTH, SANITATION AND SECURITY

Nitrates are the primary constituent of concern in sewage. Excessive nitrate levels can lead to health problems in humans and can cause algal blooms in surface water, which consume large quantities of dissolved oxygen resulting in adverse impacts to aquatic life. Bacteria, such as fecal coliform, and viruses are additional constituents of concern as they pose potential health risks to humans both from direct contact with contaminants in the surface water and through the consumption of shellfish.

In 1995, a study issued in by the RWQCB titled “Assessment of Nitrate Contamination in Ground Water Basins of the Central Coast Region Preliminary Working Draft,” illustrated significant increases in nitrate concentrations over time in both the lower and upper aquifers. According to a letter from the RWQCB on July 10, 1998, 107 monitoring wells with more than 1,100 data points were used in the construction of the contour maps included in the study. The RWQCB letter stated:

Monitoring data indicates much of the shallow groundwater in the most densely developed areas exceeds 45mg/l, the drinking water standard for nitrate. For this reason, many of the shallow water supply wells have been removed from service and demand shifted to the deeper aquifer. Dependence upon the deeper aquifer exacerbates the surface water problems because the community's water supply, formerly from the upper aquifer, is now drawn from the deeper aquifer and recharged (after use) to the upper aquifer causing ground water levels to rise and flood more septic systems. Increasing surface water impacts including: restriction of portions of shellfish harvesting areas because of rising bacteria levels: water surround the Los Osos area periodically do not meet bacteria standards for water contact recreation (such as swimming, wading, kayaking and small boat sailing): and the public is increasingly exposed to surface wastewater.

4.3. SYSTEM OPERATIONS AND MAINTENANCE

Existing system O&M considerations are not a factor in determining the need for the project, as there are no existing sewage facilities in Los Osos, beyond the few thousand feet of gravity sewer collectors. All facilities associated with this project will be new construction.

4.4. GROWTH/BUILD-OUT FLOWS AND LOADS PROJECTIONS

Estimates of the projected wastewater flows and loads for this project were presented in the Rough Screening Report and Fine Screening Report. The Fine Screening Report recommended an I/I allowance of 0.3 million gallons per day (mgd) additional flow for the average monthly wet weather flow for a gravity system. I/I estimates for the collection system are the main source of uncertainty in calculating the future treatment facility influent volume. Updates to the I/I estimates were included in the Flows and Loads Technical Memorandum (Carollo Engineers, 2008) which resulted in a reduction of PHWWF to 2.5 mgd for a gravity system. The full text of the final Flows and Loads Technical Memorandum is included in the Appendices.

There is some uncertainty in the anticipated per capita wastewater flows in the Prohibition Zone. Wastewater from the Prohibition Zone is currently discharged onsite from septic tanks at each home. Therefore, the volume and quality cannot be directly measured. Instead, dry weather wastewater flows were estimated based on wintertime water use. This assumes that limited exterior occurs during the wintertime. According to the Flows and Loads TM and the Rough Screening Analysis, the 2006 water consumption rates for the approximately 8,500 residents served by the LOCSD were about 66 gallons per capita per day. Assuming minimal exterior water use, 66 gallons per capita per day is a reasonable current estimate of the Los Osos per capita wastewater flow. Because Los Osos is not a vacation community and because there is no seasonal industry, this figure is expected to be fairly constant throughout the year. With the estimated build-out population of 18,428, this yields a baseline dry-weather wastewater generation rate of 1.2 mgd.

As a condition of approval in the Coastal Development Permit, the project will also implement a water conservation program with a goal of reducing indoor water consumption to 50 gallons per capita per day, which is more than a 25% reduction over current use estimates. The conservation program will be accomplished through subsidized, mandatory residential and commercial fixture retrofits, appliance rebates, education, and water efficiency audits. Ongoing monitoring and public outreach programs will be adopted to ensure that the water conservation goals are maintained. Based on this conservation level, the dry weather flow value is expected to drop below 1.0 mgd at build-out. However, to be conservative, the project will be designed for the base flow rate of 1.2 mgd and assume a more moderate conservation level of 0.1 mgd.

A summary of flow estimates are presented in the table below. These are conservative flow estimates provided for treatment facility sizing. Estimates were calculated based on assumptions derived from varying literature data and previous experience with I/I as well as information specific to the current water use in Los Osos (see Final Flows and Loads Technical Memorandum, November 2008, for additional detail). Average daily flow, even during periods of sustained high groundwater, is expected to be substantially less than 120 gallons per capita per day as indicated. As a result, excessive I/I is not anticipated in accordance with SRF guideline IX.A.5. The final peak daily flow (ADWWF) for process design is assumed to be 1.4 mgd.

Table 4.1: Projected Wastewater Generation Rates

Wastewater Generation Estimate (mgd)[1]	Conservation (mgd)	$I/I_{average}$ (mgd)	ADWWF [2] (mgd)	PHWWF [3] (mgd)
1.2	0.1 - 0.3	0.3	1.4	2.5

[1] Based on Buildout Population of 18,500 people and 66 gallons per capita per day wastewater generation rate.
[2] ADWWF = Average Day Wet Weather Flow = Wastewater Generation Estimate - Conservation + $I/I_{average.}$ ADWWF serves as a basis for sizing wastewater collection and treatment facilities.
[3] PHWWF = Peak Hour Wet Weather Flow

The Rough Screening Report listed influent concentrations from a gravity collection system for the future wastewater treatment facility. These values are considered valid and will be used for treatment facilities sizing for a gravity collection system. They are shown in the table below.

Table 4.2: Gravity Collection System Wastewater Characteristics

Gravity Collection System	BOD5 [1] (mg/l)	SS [1] (mg/l)	total – N [1] (mg/l)
Average Day	340	390	56
Peak Day	350	400	58

[1] BOD5 = 5 Day Biological Oxygen Demand SS = suspended solids N = Nitrogen

CHAPTER 5: ALTERNATIVES CONSIDERED

5.1. INTRODUCTION

Project alternatives have received extensive analysis in previous and current efforts to complete a wastewater project in Los Osos. The County's current efforts under AB 2701 started with a broad range of alternatives. The alternatives were narrowed through the engineering screening process with the Rough Screening and Fine Screening Reports. These reports maintained the widest possible range of alternatives, while eliminating those that were non-viable or redundant. The primary engineering and cost alternatives analysis was completed in the Fine Screening Report with in subsequent public discussions through the Technical Advisory Committee. Capital costs were developed in April, 2007 dollars (ENR Index 7879) with inflation factors and associated project soft costs included in the final calculations. A series of 12 technical memoranda were also used to evaluate various alternatives in more detail and support the EIR development. Finally, the selection of an alternative for each of the project components is a result of the environmental process and the co-equal analysis in the project EIR. The EIR analyzed several alternatives on a co-equal basis and identified the environmentally superior project. Then, through the formal decision making process at the County Planning Commission and Board of Supervisors, the environmental, economic and social factors were all considered together to reach a final approved project description.

5.2. APPROACH TO ALTERNATIVES ANALYSIS

The primary goal of the project is to construct and operate a community wastewater collection, treatment, and disposal system and thereby comply with the RWQCB's Resolution 83-13. Eliminating discharges from onsite septic systems, as directed by the RWQCB, will also help accomplish the project's second primary goal: alleviating groundwater contamination, primarily nitrate contamination that has occurred at least partially because of the use of septic systems throughout the community.

The sustainability of water resources is also an important issue because of seawater intrusion that is contaminating the lower aquifer of the Los Osos groundwater basin. While the focus of the project is to solve the wastewater problem, and thereby alleviate groundwater contamination, the wastewater project also creates opportunities for the water purveyors to improve the local water resources.

Screening Analysis

When the County assumed responsibility for the project in January, 2007, it had already embarked on an alternatives review process based on policies established by the County Board of Supervisors in June 2006. The Project Team began by preparing the "Potential Viable Project Alternatives Rough Screening Analysis Report" (Carollo Engineers, March, 2007). The Rough Screening Report focused on potential alternatives for each component of the wastewater project. The project components included the collection system, treatment technologies, treatment facility sites, effluent reuse and disposal, and solids treatment and disposal. The Rough Screening Report categorized alternatives as being infeasible or potentially viable.

The project component alternatives that passed through the rough screening analysis were screened further detail, including developing cost estimates, in the "Potential Viable Project Alternatives Fine Screening Analysis Report" (Carollo Engineers, August, 2007).

A key issue addressed in the Fine Screening Report was the relationship between the wastewater project and water supply benefits. All of the potable water for the community is obtained from its underlying groundwater basin. The basin consists, generally, of an unconfined, upper aquifer, which is contaminated with high nitrate levels at least partially because of the use of septic systems, and a confined, lower aquifer which is being impacted to seawater intrusion as a result of over pumping. The seawater intrusion has progressed to the central area of the community and required the shut-down of several production wells. On March, 27, 2007, the San Luis Obispo County Board of Supervisors certified a Level of Severity III for Los Osos, the highest water resource problem level in the County's Resource Management System (RMS).

The Fine Screening Report recognizes that the wastewater project has the ability to provide important water supply benefits and to help mitigate seawater intrusion. By replacing the existing septic tanks, the project will address the nitrate contamination and be a critical factor in increasing the supply from the upper aquifer. The effluent reuse and disposal alternatives also have the opportunity to mitigate seawater intrusion in the lower aquifer. The report analyzed and categorized project alternatives based on their respective level of seawater intrusion mitigation, while considering capital costs and the feasibility of implementation.

Three other important considerations in the Fine Screening Report were sustainability, future adaptability and project costs. Sustainability, a stated goal for the Los Osos community, is defined in the Fine Screening Report as minimizing the project's energy consumption and reusing the treated wastewater effluent as a resource to benefit the community. To the extent possible, project facility alternatives that provide flexibility to meet future regulatory requirements or provide capacity to serve the build-out population were preferred. To evaluate project costs, the engineering consultant developed conceptual-level capital and maintenance cost estimates and identified the apparent low cost alternatives.

The potential project components which passed the fine screening process, meeting the goals of the project at the lowest life-cycle costs, were combined into complete projects, known as "Viable Project Alternatives" (VPA). Each VPA was one that is considered permitable, constructible, and fundable. They included all of the project components, including collection system, wastewater treatment facility, treatment plant site, effluent reuse/disposal system, and solids processing and disposal system.

<u>Technical Advisory Committee</u>

In March, 2007 the San Luis Obispo County Board of Supervisors appointed fourteen local experts and laypersons to the Los Osos Wastewater Project Technical Advisory Committee (TAC). The TAC was divided into three sub-committees by the following disciplines: engineering/water resources, finance, and environmental. The TAC's first priority was to provide an evaluation of the Pros and Cons of the "Viable Project Alternatives." They began by agreeing upon five core values and the major criteria for each.

Table 5.1: Los Osos Wastewater Project Core Community Values

Core Values	Major Criteria
Affordability	• Capital and construction cost • O&M costs • Financing factors • Grant eligibility • Engineering and project management costs
Environmental Stewardship	• Environmental impacts • Potential risks due to system failure • Carbon footprint
Flexibility	• Flexibility to meet future needs and opportunities, including: expansion, future higher regulations, regional opportunities, etc. • Potential alternative energy opportunities
Sustainability	• Restoring and protecting our groundwater resources • Mitigating seawater intrusion and achieving groundwater balance in the basin • Minimizing energy use • Minimizing sludge production
Community	• Impacts on individual homeowners, residents, and businesses • Stakeholder support • Community acceptance
Controllability	• Risk of third party decisions, policies • Financial risks associated with wastewater projects • Design for maximum system control
Source: Los Osos Wastewater Project Technical Advisory Committee, San Luis Obispo County Department of Public Works, Pro/Con Analysis on Project Component Alternatives, August 2007.	

Basing their analysis of the draft Fine Screening Report, their own experience, and public comments received in writing and at the open public meetings, the TAC prepared a report entitled "Pro/Con Analysis on Project Component Alternatives" (LOWWP Technical Advisory Committee, August 2007). The TAC's detailed comments were carried forward into the screening process used to identify the project alternatives detailed in the Draft Environmental Impact Report (DEIR) prepared for the project (Michael Brandman Associates, November 2008). During 2008, a series of preliminary engineering Technical Memoranda were prepared by the County's engineering consultants to support the environmental analysis. The TAC reviewed each of these in a public forum, receiving public input, and providing formal comments.

Engineering Technical Memoranda

In early 2008, the County engineering consultant developed a series of twelve Technical Memoranda. These memoranda provided additional analysis of issues and alternatives that were identified in the screening process as need further study. They also supported the environmental analysis that was being conducted in parallel. The Technical Memoranda cover the following range of issues:

- Onsite Treatment
- Decentralized Treatment
- Low Pressure Collection System
- Flows and Loads
- Out-of-Town Conveyance
- Partially Mixed Facultative Pond Options
- Imported Water
- Solids Handling Options
- Effluent Reuse and Disposal Alternatives
- Septage Receiving Station Option
- Regional Treatment
- Greenhouse Gas Emissions Inventory

Each Technical Memorandum advanced the level of detail provided in previous documents. Draft memoranda were reviewed by the TAC and the public in community meetings, with formal comments received by the County. The environmental consultant also reviewed the draft memoranda and provided comments and questions. The final Technical Memoranda were revised in response to the comments received.

Environmental Review

The County completed a co-equal environmental review process to meet the requirements of the California Environmental Quality Act (CEQA) and the National Environmental Policy Act (NEPA). The project draft EIR was released in November, 2008, and the final EIR was adopted by the County Board of Supervisors on September 29, 2009. The environmental documents evaluate the potential impacts associated with a range of alternatives for wastewater collection, treatment, and disposal systems for Los Osos. CEQA requires that all state and local government agencies consider the environmental consequences of projects over which they have discretionary authority before taking action. The project EIR is unique under CEQA in that it examines a range of alternatives on a co-equal basis in order to maximize flexibility during project selection.

An EIR is intended to serve as an informational document for the public agency decision-makers and the public regarding the objectives, impacts, and components of the proposed project. The document addresses the potential significant adverse environmental impacts that may be associated with this project, as well as identifies appropriate feasible mitigation measures and design features that may be adopted to reduce or eliminate these impacts. It identifies environmental sensitivities in the project study area and establishes mitigation measures and guidelines to address project-level environmental impacts that may result from construction and operation of the project.

The EIR for the Los Osos project contains numerous subsections describing potential impacts of the proposed project alternatives analyzed for the project. These subsections include:

- Land Use and Planning
- Groundwater Quality and Water Supply
- Drainage and Surface Water Quality
- Geology
- Biological Resources
- Cultural Resources
- Public Health and Safety
- Traffic and Circulation
- Air Quality (and Greenhouse Gasses)
- Noise
- Agricultural Resources
- Visual Resources
- Environmental Justice

Appendix K of the EIR also includes an extensive analysis of climate change impacts through the estimation and review of potential greenhouse gas emissions. The EIR concludes that in the context of overall community carbon footprint, the available collection, treatment, and disposal alternatives are relatively close from the perspective of climate change impact.

The EIR evaluation included the direct, indirect, and cumulative impacts of the proposed project, as well as project alternatives in accordance with the provisions set forth in CEQA and the CEQA Guidelines. It provided a comprehensive environmental document that allowed the County of San Luis Obispo to approve the environmentally superior alternative. The County certified a Final EIR based on the alternatives identified through this process and made findings that support the final project decision.

5.3. ALTERNATIVES DESCRIPTION

The project alternatives in the following components: collection system, treatment technologies, effluent reuse and disposal, solids treatment and disposal, and treatment facility sites.

a. Collection System.

The Rough and Fine Screening Reports, Technical Memoranda, and project EIR reviewed of a number of collection system technologies, including conventional gravity sewers, Septic Tank Effluent Pump/Septic Tank Effluent Gravity (STEP/STEG) collection, vacuum, and low pressure grinder pump systems.

Gravity: A conventional gravity system was designed and permitted as part of the previous LOCSD Project. The system is a mostly passive central sewer system that uses gravity to move waste to the treatment facility. Based on topography, it is necessary to utilize lift stations throughout the collection system. The system transports both liquids and solids to the treatment facility.

STEP/STEG: A STEP/STEG collection system retains the use of septic tanks. The septic tanks serve to settle solids and provide a primary level of treatment. The effluent from the tanks is conveyed to an in-street collection system via pumping (STEP system) or gravity (STEG system) through small diameter pipes. The in-street collection system also has relatively small diameter pipes because the waste stream is relatively free of solids. STEP/STEG wastewater lacks dissolved oxygen (anaerobic) compared to wastewater collected by other systems, which includes a small amount of dissolved oxygen (aerobic).

Vacuum: Vacuum sewer systems use an on-site vacuum valve pit package and then a pressure differential, instead of gravity, to move wastewater to a vacuum station and on to the treatment plant. Differential air pressure is used as the motive force to transport sewage. The main lines are under a vacuum of 16 to 20-inches mercury (-0.5 to –0.7 bar) created by vacuum pumps located at the vacuum station.

The vacuum system requires a normally closed vacuum/gravity interface valve at each entry point to seal the lines so that vacuum is maintained. The interface valves, located in a valve pit, open when a predetermined amount of sewage accumulates in the collecting sump. When the valve is opened, the pressure differential between atmospheric pressure and the vacuum in the mains provides the energy required to open the vacuum interface valves, evacuate the sump contents, and propel the sewage toward the vacuum station.

Low Pressure Grinder Pump: A low pressure collection system consists of individual sumps at each customer location that collect waste and contain a grinder pump. The low pressure system is also classified as a central sewer system. The waste is conveyed from the grinder pump sumps to an in-street collection system via pumping through small diameter pipes and on to the treatment plant. The in-street collection system also has relatively small diameter pipes because the solids in the waste stream have been broken down by the grinder pumps.

Combined Gravity, Vacuum and Low Pressure Collection System: The combined system consists of gravity, vacuum, and/or low pressure collection grinder pump systems depending on the localized topography throughout the system. The combined system allows for optimization of construction and operation and maintenance costs as compared to a dedicated system. The previous designed gravity system would serve as the starting point for this alternative. Vacuum and low pressure could be incorporated in locations where topography, groundwater, or other site-specific conditions dictate, based on a value-engineering process to reduce costs.

b. Treatment Process. The Rough and Fine Screening Reports, Technical Memoranda, and project EIR reviewed of a number of wastewater treatment management alternatives and treatment processes. The management alternatives included centralized, decentralized, onsite and regional treatment. The treatment processes evaluated include extended aeration/activated sludge, attached growth fixed media, and advanced treatment ponds.

(1) Centralized Treatment. The treatment process options considered for a centralized treatment facility included a broad range of potential process, divided into the three following categories.

- Extended Aeration/Activated Sludge
  - Extended Aeration Modified Ludzak-Ettinger (MLE)
  - Membrane Bio-reactor (MBR)
  - BIOLAC® Wastewater Treatment Process
  - Sequencing Batch Reactor (SBR)
  - Oxidation Ditch
- Attached-Growth Fixed Media
  - Trickling Filters
  - Rotating Biological Contactors (RBCs)
  - Packed-Bed Filters
- Advanced Wastewater Treatment Ponds
  - Advanced Integrated Wastewater Pond System (AIWPS)®
  - Facultative Ponds with Constructed Wetlands
  - Partially Mixed Facultative Ponds (e.g., Nelson Air Diffusion System (ADS)®, Advanced Integrated Pond System (AIPS)®)

Extended Aeration/Activated Sludge. These processes remove carbonaceous pollutants and convert ammonia in the raw wastewater to nitrate. The process typically operates without primary sedimentation, using raw wastewater as its source. This system is called “extended aeration” to distinguish it from the conventional activated sludge treatment process, which is usually preceded by primary sedimentation. If necessary for the selected disposal/reuse alternative, filtration (except for the MBR system) and disinfection would be required in addition to the extended aeration/activated sludge secondary treatment process to produce Title 22 unrestricted reuse tertiary recycled water.

- Extended Aeration Modified Ludzak-Ettinger (MLE) Processes. To meet nitrogen removal objectives of 7 to 10 mg/L required for most reuse/disposal alternatives, the extended aeration process must be modified by addition of anoxic tanks and internal recycle pumping. When modified in this way, this process is called the modified Ludzack-Ettinger (MLE) process, after its inventor. Extended aeration MLE has a proven history in wastewater treatment and is capable of meeting BOD, suspended solids, and nitrogen water quality objectives. The extended aeration MLE process requires approximately 4 to 6 acres. The compact size of the system facilitates siting and minimizes land acquisition costs.

- Membrane Bio-Reactor (MBR). A membrane bio-reactor (MBR) system, was selected for the prior LOCSD Project treatment alternative due to the compact footprint. It is an activated sludge system similar to extended aeration MLE. However, polymeric membranes are used for separation of treatment organisms from the flow stream, instead of gravity sedimentation tanks. A membrane bio-reactor is used instead of secondary sedimentation tanks to remove the microorganisms from the flow stream. The membranes remove significantly more solids than sedimentation resulting in higher secondary effluent quality. Due to the high quality of the membrane effluent, only disinfection is required in addition to the MBR process to produce Title 22 unrestricted use recycled water. MBR facilities have a proven history in wastewater treatment and are capable of meeting BOD, suspended solids, nitrogen, turbidity, and coliform water quality objectives. The MBR treatment process requires approximately 4 acres, somewhat less than extended aeration MLE. The compact size of the system facilitates siting and minimizes land acquisition costs.

- BIOLAC® Wastewater Treatment System. The BIOLAC® process is a proprietary activated sludge process developed by Parkson Corporation. The BIOLAC® system is similar to the extended aeration MLE process with multiple "cells" in a large, lined earthen basin to facilitate biological treatment of the wastewater. The BIOLAC® system is typically designed for a microorganism solids residence time (SRT) of approximately 50 days compared to an SRT of approximately 6 to 15 days for the MLE process. The longer SRT reduces effluent BOD levels and provides almost complete nitrification/denitrification. Parkson Corporation claims over 500 BIOLAC® installations throughout North America treating municipal and industrial wastewater and is likely capable of meeting BOD, suspended solids and nitrogen water quality objectives. The BIOLAC® treatment process requires approximately 10 acres.

- Sequencing Batch Reactor (SBR). A sequencing batch reactor (SBR) is an activated sludge system that relies on a series of tanks. Each tank sequentially fills, aerates, settles and decants the wastewater to achieve the desired water quality objectives. SBRs have a proven history in wastewater treatment and are capable of meeting BOD, suspended solids and nitrogen water quality objectives. The SBR treatment process requires approximately 6 acres. The compact size of the system facilitates siting and minimizes land acquisition costs.

- Oxidation Ditch. An oxidation ditch system is an activated sludge system that consists of a ring or oval-shaped channel equipped with mechanical aeration devices. Oxidation ditches typically operate with long detention and solids retention times. The oxidation ditch system has a proven history in wastewater treatment and is capable of meeting BOD, suspended solids, and nitrogen water quality objectives. The oxidation ditch treatment process requires approximately 8 acres. The land requirement is greater than MLE, MBR, or SBR processes because surface aeration in the oxidation ditch process typically limits tank depth to approximately 12 feet.

Attached-Growth Fixed Media. These processes use media such as plastic or rock to support microbial growth. Wastewater is spread over the media, where the soluble organic matter is metabolized by the microorganisms and the colloidal organic matter is adsorbed on the film. Attached-growth processes require primary sedimentation tanks and would required add-on denitrification facilities to meet the expected 7 mg/L total nitrogen requirement. If necessary for the selected disposal/reuse alternative, filtration and disinfection would be required in addition to the attached-growth fixed media secondary treatment process to produce Title 22 unrestricted reuse tertiary recycled water.

- Trickling Filters. Trickling filters are an aerobic attached-growth biological treatment process that may include nitrification (the conversion of ammonia to nitrate) but are not typically employed to obtain low levels of nitrogen. If low levels of effluent nitrogen are required, typically multi-stage filters including methanol addition would be required. The trickling filter process has a proven history in wastewater treatment and is capable of meeting BOD and suspended solids, but has generally not been used to meet low levels of nitrogen. To meet secondary treatment levels for suspended solids, a supplemental contact tank is usually required. The trickling filter process requires approximately five acres. The compact size of the system facilitates siting and minimizes land acquisition costs. The tricking filter process usually includes towers 20 to 30 feet high, which can be a visual obstruction.

- Rotating Biological Contactors (RBCs). Rotating biological contactors are an aerobic attached-growth biological treatment process that may include nitrification (the conversion of ammonia to nitrate) but are not typically employed to obtain low levels of nitrogen. RBCs consist of a series of closely spaced circular disks submerged in wastewater and rotated slowly through it. As with trickling filters, clarification is required after the RBCs. RBCs have a proven history in wastewater treatment, although historically not as widely used as trickling filters, and are capable of meeting BOD and suspended solids limits. As with trickling filters, RBC systems are generally not capable of meeting low levels of nitrogen.

The RBC process requires approximately 4 to 6 acres. The compact size of the system facilitates siting and minimizes land acquisition costs.

- Packed-Bed Filters. Packed bed filters utilize hanging synthetic fibers as a fixed substrate for aerobic growth in pre-manufactured fiberglass pods with nominal dimensions of 8 feet by 16 feet. These pod-packed-bed filters are commonly used for commercial and small residential applications that utilize STEP/STEG collection. Packed-bed filters are a very new treatment process and there is little experience with long-term operation of this technology in municipal treatment plants. Most experience with the process is with small scale or on-site systems. According to the Los Osos Wastewater Management Plan Update (Ripley Pacific Company, July 2006), approximately 410 pod filters are required to accommodate a flow of 1.3 mgd at an application rate of 25 gallons per day per square foot (gpd/sf). A packed-bed filter system requires approximately 4 to 6 acres. The cost to distribute and collect process flow from this quantity of filters is likely impractical and would result in a relatively high construction costs.

Advanced Wastewater Treatment Ponds. Advanced wastewater treatment ponds is a broad term to classify large earthen or concrete basins used to stabilized domestic wastewater by natural biological processes that occur in shallow ponds. Numerous variations of treatment ponds exist to optimize suspended solids, BOD, fecal microorganisms and ammonia removal. Descriptions are provided for several types of relatively common pond systems. If necessary for the selected disposal/reuse alternative, coagulation, filtration, and disinfection would be required in addition to the advanced pond secondary treatment process to produce Title 22 unrestricted reuse tertiary recycled water.

- Advanced Integrated Wastewater Pond System (AIWPS®). The Advanced Integrated Wastewater Pond System was assessed for use in Los Osos in the Wastewater Facilities Project, Draft Project Report (Oswald Engineering Associates, January 2000). AIWPS is generally differentiated from AIPS technology by including shallow high-rate algal ponds. AIPS is similar to partially mixed facultative ponds with some adjustments. The advanced facultative and initial high rate ponds remove about 40 percent of the plant influent nitrogen by incorporation into algae. The algal mass is removed in the algal settling pond and dissolved air flotation unit. The flow is then conveyed to another set of high rate ponds where approximately 55 percent of the plant influent nitrogen is removed by another algal biomass. A second set of settling ponds and dissolved air flotation are required to remove this algal biomass. Effluent nitrogen is predicted to be approximately 8 mg/L. Filtration would be required to achieve the water quality objective of 7 mg/L total nitrogen (Oswald Engineering Associates, January 2000). Advanced Integrated Wastewater Pond Systems have a proven history of BOD and suspended solids removal, but have generally not been used to meet low levels of nitrogen. Documented nitrogen removal performance data is limited and acceptance by the RWQCB to meet the waste discharge requirements is questionable. The AIWPS® treatment process requires approximately 64 acres for the treatment ponds and emergency storage ponds as recommended by Oswald Engineering Associates, Inc. The significant area required, assuming nitrogen removal is required at some point in time, would severely limit the potential treatment plant sites.

- Facultative Ponds with Constructed Wetlands. Facultative organisms function with or without dissolved oxygen. Facultative ponds are generally aerobic, however, these ponds do operate in a facultative manner and have an anaerobic zone. Dissolved oxygen is supplied by algae living within the pond and atmospheric transfer through wind action. Treatment in a facultative pond is provided by settling of solids and reduction of organic oxygen demanding material by bacterial activity. Facultative ponds are usually four to eight feet in depth and can be viewed as having three layers. The top six to eighteen inches is aerobic where aerobic bacteria and algae exist in a symbiotic relationship. The aerobic layer is important in maintaining an oxidizing environment in which gases and other compounds leaving the lower anaerobic layer are oxidized. The middle two to four feet is partly aerobic and partly anaerobic, in which facultative bacteria decompose organic material. The bottom one to two feet is where accumulated solids are decomposed by anaerobic bacteria. Aerobic reactions in facultative ponds are limited because they do not have mechanical aeration. Facultative and anaerobic reactions need more time than aerobic reactions to provide the same degree of treatment. The detention time of facultative ponds is typically over 120 days. This process utilizes constructed wetlands for the final step to provide nitrogen removal.

  This system has been used at many facilities to meet BOD and suspended solids requirements for all disposal/reuse alternatives. However, the wetlands provide limited control and have water quality impacts resulting from wildlife contact. Nitrogen levels of 8 to 10 mg/L may be achieved but filtration would be required to comply with turbidity limits for reuse alternatives and achieve nitrogen levels of approximately 7 mg/L. Permitting this system would be problematic for most reuse/disposal alternatives due to the limited control and likely variations in effluent quality. The facultative ponds and constructed wetlands treatment process requires approximately 60 to 90 acres. The area required limits the potential treatment plant sites.

- Partially Mixed Facultative Ponds. Partially mixed facultative ponds include proprietary designs such as Nelson Air Diffusion System (ADS)®

and Advanced Integrated Pond System (AIPS)®. Specific design requirements will be considered during detailed evaluation and design, if applicable. Partially mixed facultative ponds can be viewed as a combined biological process that oxidizes organic oxygen demanding material and a physical operation that allows settling of organic and inorganic solids. Mechanical aeration provides dissolved oxygen needed for aerobic organisms in the pond to convert and oxidize the organic material in the wastewater. It also provides the physical mixing necessary to distribute dissolved oxygen, suspend the organic material and bring the organisms into contact with the organic material. Mixing must not be so great as to prevent the settling of solids for both sedimentation and for facultative and anaerobic degradation. Partially mixed facultative ponds provided with adequate aeration can be deeper and smaller than facultative ponds. Typical partial mix ponds are 10 to 16 feet deep and have a detention time of 30 to 60 days. This system has been used at many facilities to meet BOD and suspended solids requirements for all disposal/reuse alternatives. Nitrogen levels of 8 to 10 mg/L may be achieved but the system offers limited control. Filtration would be required to comply with turbidity limits for reuse alternatives and achieve nitrogen levels of approximately 7 mg/L. The partially mixed facultative pond treatment process requires approximately 20 acres. A dual power aerated lagoon would require slightly less area. The area may limit the potential treatment plant sites.

(2) Decentralized Treatment. Decentralized treatment is a wastewater management strategy that utilizes several cluster, or neighborhood, collection and treatment facilities within a larger community. They typically utilize STEP/STEG collection systems and packed bed filters, or other packaged designs, for the treatment process. This option reduces the amount and costs of pipeline for collection and effluent distribution. The County included this option in the alternatives considered and evaluated it through a series of technical memoranda. The County released a draft technical memoranda that identified issues and requirements that were specific to a decentralized treatment alternative for Los Osos. The County then retained Pio Lombardo, of Lombardo Associates, Inc., a nationally recognized expert on decentralized treatment, to develop a conceptual plan and cost estimates for Los Osos. The County then completed a final technical memorandum on the subject and incorporated it into the environmental analysis for the project EIR.

The decentralized conceptual plan developed by Pio Lombardo included seven collection and treatment zones located throughout the community. The system included a STEP/STEG collection system with a recirculating media filter followed by Nitrex denitrification filter treatment process. The denitrification filter would be necessary to meet the 7 mg/L total nitrogen requirements. Tertiary filtration and disinfection would also be provided to produce Title 22 recycled water for unrestricted reuse. The recycled water would be distributed to the individual residences for irrigation use or percolation through existing leachfields.

(3) Onsite Treatment. Onsite treatment is a wastewater management strategy that utilizes individual, onsite treatment facilities at each individual home or business. This option does not require a collection system and typically uses a package treatment process. Due to the existing pollution problem of high nitrogen levels in the groundwater, an additional denitrification process would also be required on each system. The treated effluent is used for sub-surface irrigation or discharged to a leachfield. The County included this option in the alternatives considered and evaluated it through in a technical memorandum and incorporated it into the environmental analysis for the project EIR.

(4) Regional Treatment. Regional treatment is a wastewater management strategy that combines the treatment facility for multiple communities or wastewater authorities. This option allows for cost sharing for construction and operation of the treatment facilities and may realize some economies of scale. The County included this option in the alternatives considered and evaluated it through in a technical memorandum and incorporated it into the environmental analysis for the project EIR. The other wastewater agencies considered for regional treatment are the Morro Bay/Cayucos Sanitary District and/or the California Mens Colony, a state prison. A regional treatment facility with Los Osos and one of these agencies would require a capacity of 2.4 mgd, a facility with Los Osos and both of these agencies would require a capacity of 3.7 mgd. Several alternative locations were evaluated, as well as, the pipeline routes to convey wastewater from each service area to the treatment facility. A regional treatment plant would present unique opportunities and challenges for water supply management related to the reuse of the treated effluent.

c. Effluent Reuse and Disposal.

The Rough and Fine Screening Reports, Technical Memoranda, and project EIR reviewed of a number of effluent reuse/disposal alternatives, including unrestricted urban and agricultural reuse, percolation ponds, sub-surface leachfields, sprayfields, creek discharge, constructed terminal wetlands, and direct groundwater injection.

Unrestricted Urban Reuse. Unrestricted urban reuse is the practice of using treated wastewater to irrigate landscaping in areas where public access is not restricted and requires tertiary disinfected recycled water in accordance with CA Title 22. Urban reuse would reduce pumping from the groundwater basin for potable uses, thus helping with overall groundwater management. Urban reuse was considered in Wastewater Facilities Project Final Project Report (Montgomery Watson Americas, March 2001) for irrigation of schools, parks and golf courses. The Final Project Report indicated that there are not nearly enough potential sites for water reuse in the community of Los Osos to accept all of the treated effluent. The irrigation flow for large urban water users was estimated to be 132 acre-feet/year. In terms of residential use of reclaimed water, approximately half of the water use in Los Osos is for outside irrigation, so there is significant potential for water reuse.

Unrestricted Agricultural Reuse. Unrestricted agricultural reuse is the practice of using treated wastewater to irrigate food crops that can be eaten raw and where the irrigation water comes in contact with the crop. This requires tertiary disinfected recycled water in accordance with CA Title 22. Agricultural reuse in areas overlying the Los Osos groundwater basin would reduce pumping from the groundwater basin and provide some benefit to overall groundwater management. The extent of the agricultural reuse depends on demand from growers. The recycled water could provide irrigation for as much as 600 to 800 acres, if up to 150 days (650 acre-feet) of seasonal storage is provided.

Percolation Ponds. Percolation ponds are open ponds where water is stored and percolated into the ground. The pond bottoms are managed to maintain percolation rates by drying, ripping and conditioning the soils. Site requirements for this strategy are similar to those for leachfields in that they function best with permeable soil and sufficient depth to groundwater. A percolation pond could be as large as several acres. Construction of a percolation pond involves the excavation of the pond itself and trenches for supply pipes. The area converted to a percolation pond would be permanently lost to agricultural production or habitat. Due to aesthetic issues, percolation ponds would have to be located downwind, and therefore east, of residential areas. Based on the previous WDRs developed for Los Osos, both suspended solids and BOD would be limited to a monthly average of 60 mg/L and a daily maximum of 100 mg/L. Total nitrogen would be limited to a monthly average of 7 mg/L and a daily maximum of 10 mg/L.

Leachfields. Leachfields are operated by subsurface spreading and percolation, so there is no open water. There are limited areas within the groundwater basin that would be appropriate for subsurface leachfields. The Broderson Site, identified as the disposal option for the LOCSD project, has a capacity of 448 acre feet per year, which is much less than the effluent flow projected for the future wastewater treatment facility. Harvest wells could be used to effectively double the site's capacity, but this route requires a separate plan for collecting, treating and disposing of the harvest water. Other potential leachfields sites in the community include the existing large septic system that serves the Bayridge Estates subdivision and disposes of approximately 33 acre feet per year. Additional potential leachfield sites could be constructed on ranch and agricultural lands east of the community in the vicinity of the potential treatment plant locations. The capacity of a disposal leachfield greatly depends on the permeability of the soil and the depth to the underlying groundwater. For example, the Broderson Site was identified as a favorable location because of the permeability of the underlying soils (mostly dune sand) and its connectivity with the shallow aquifer. By contrast, soils associated with agricultural fields generally exhibit slower percolation rates. Construction of a leachfield involves the excavation of trenches and the installation of percolation and supply pipe. Based on the previous WDRs developed for Los Osos, both suspended solids and BOD would be limited to a monthly average of 60 mg/L and a daily maximum of 100 mg/L. Total nitrogen would be limited to a monthly average of 7 mg/L and a daily maximum of 10 mg/L.

Sprayfields. Sprayfield disposal is the practice of spraying effluent on lands to grow a crop which requires large amounts of water. Water is disposed through evapotranspiration and percolation. Care must be taken to ensure that runoff is reduced and contained. The capacity of sprayfields to accept treated wastewater would be greatest during the dry season. Spraying of fields during the rainy season would accelerate erosion and sedimentation as well as the volume of runoff conveyed by natural drainage courses. Additionally, most WDR's prohibit spraying immediately before, during, or immediately after a rainfall event. Since the capacity of the sprayfields is reduced during the rainy season, a portion of the treated wastewater would need to be stored. Under this strategy, treated wastewater would be sprayed on grazing land east of town where it would percolate into the ground or simply evaporate into the air. If the use of sprayfields is the sole disposal strategy, about 600 acres would be needed. There are several large holdings east of the community used for grazing which may be potentially suitable. The viability of this strategy depends, in part, on the ability to purchase, or negotiate contractual arrangements for the use of sufficient acreage to accommodate the desired level of disposal.

Creek Discharge. Creek discharge is the practice of disposing wastewater to a surface water body, such as a creek. Discharge to surface waters would be regulated by an NPDES permit and would have to meet the strict requirements of the California Toxics Rule for metals and organics. There are several creeks in the Los Osos area, including Los Osos Creek, which runs along the southern, eastern and northern edges of the community. Los Osos Creek empties into Morro Bay, which borders the community on its western edge. All the creeks in the Los Osos area, as well as Morro Bay, are subject to total maximum daily loads (TMDLs), since they are classified as impaired water bodies. The creeks and Morro Bay are also designated as having body contact recreation as a beneficial use, which requires Disinfected Tertiary treatment. Due to impairment and the TMDLs, nitrate (as nitrogen) would likely be limited to an average of 2.2 mg/L (Montgomery Watson Americas, Inc., 2001). Since Los Osos Creek has been issued a TMDL for sediments, pathogens, nutrients and dissolved oxygen, the treatment facility would be issued a waste load allocation for these constituents.

Constructed Terminal Wetlands. Wetlands serve an important role in improving water quality, providing flood protection and important habitat. Constructed wetlands can be used for treatment, for mitigation for destruction of wetlands elsewhere or for creation of habitat. They are also considered as a disposal method if it is necessary to release recycled water to maintain the wetland. A terminal wetland has no discharge to surface waters and is designed to evaporate and percolate wastewater effluent for disposal. This is essentially a variant of the percolation pond strategy in which the pond (or ponds) consists of newly constructed wetlands or the expansion/augmentation of existing wetlands. Wetlands have both aesthetic and biological value, in addition to possessing certain water purifying qualities. A constructed wetland could be combined with larger conservation/restoration efforts such as those undertaken by the Morro Bay National Estuary Program or other regional efforts to improve/restore water quality and biodiversity. The most suitable sites, therefore, would be those adjacent to existing wetlands where the opportunity for expansion or augmentation currently exists.

Direct Groundwater Injection. Groundwater injection is the practice of injecting wastewater into a groundwater aquifer, usually deep underground. Groundwater injection can be considered to be water reuse and is regulated by the California of Department of Health Services (DHS). Disinfected tertiary treatment is required as a minimum. However, all groundwater injection projects that have been implemented in California have been required to add membranes, such as reverse osmosis, to the treatment process. Treatment by reverse osmosis requires a disposal option for the concentrated brine that results from the process. Based on the DHS published draft regulations for planned direct and indirect recharge of groundwater, BOD will be limited to the concentration of dissolved oxygen in the effluent and total nitrogen will likely be limited to an average of 5 mg/L and a maximum of 10 mg/L. The DHS requires extensive monitoring and testing to protect public health, and there are strict guidelines for distance to nearest wells, time of travel to nearest well, depth to groundwater, percolation rate versus application rate, treatment level and water quality.

d. Solids Handling.

The Rough and Fine Screening Reports, Technical Memoranda, and project EIR reviewed of a number of biosolids treatment technologies and handling alternatives, including hauling off-site for treatment or disposal of dewatered sub-Class B (unclassified), digested Class B, or heat dried Class B and the recycling of composted Class B, composted Class A, or digested and composted Class A.

Sub-Class B Biosolids. This is the solids treatment and disposal alternative planned for the Tri-W Project. Sub-Class B biosolid production includes two unit processes: thickening followed by mechanical dewatering or solar drying. This alternative results in minimal construction of on-site treatment facilities but has relatively high disposal costs due to increased tipping fees charged by off-site facilities. Biosolids hauled to the off-site facilities receive further treatment by a contract operator prior to recycling/disposal. Sub-Class B gives the community the flexibility to add more treatment equipment in the future to upgrade to Class A or B biosolids for hauling or local recycling.

Digested Class B Biosolids. Digested Class B biosolids is similar to the previous alternative with the addition of a digestion treatment process. Digestion would occur between the thickening and dewatering operations to further stabilize the sludge and reduce the overall volume. The digestion process is assumed to produce Class B biosolids. Class B biosolids have more options for off-site recycling/disposal than

Sub-Class B biosolids, however, the capital and operating costs associated with digestion are greater than those costs associated with producing a Sub-Class B biosolids. Digested Class B gives the community the flexibility to add more treatment equipment in the future to upgrade to Class A biosolids for local recycling.

Heat Dried Class B Biosolids. Thermal drying to produce heat dried Class B biosolids uses a mechanical dryer instead of a digester. Heat drying occupies a smaller site footprint and facilitates containment of the treatment system for odor control. In the future, should the decision be made to produce Class A biosolids the Class B dryer would need significant modifications and may ultimately entail the purchase of a new dryer. Alternatively, a dryer sized to produce Class A biosolids could be purchased initially, and operated at a reduced level to make Class B biosolids. Then, should the decision be made to produce Class A, a new dryer would not have to be purchased.

Composted Class B Biosolids. Composted Class B biosolids expands upon hauling of Sub-Class B biosolids with the addition of a composting process after the dewatering process. The composting process will allow the community to produce Class B biosolids, increasing the hauling options for off-site recycling/disposal.

Composted Class A Biosolids. Composted Class A biosolids is similar to the option of composted Class B biosolids. The major differences are the time that the biosolids are required to remain in the composting facility, and the required temperature for composting. This extra time and temperature requirement necessitates only a slightly larger composting facility. The final biosolids product, however, can have been treated to the Class A level. This would allow for the greatest range of options for recycling/disposal of the biosolids including local recycling within the community. If local recycling is pursued, marketability and public acceptance of the biosolids should be investigated as part of the planning process. Additional screening of the biosolids will likely be required to remove the majority of plastics and hair that the public will likely find objectionable.

Digested/Composted Class A Biosolids. Digested/composted Class A biosolids are similar to the above recycling option except that digestion is included between the thickening and dewatering operations to further stabilize the sludge and reduce the overall volume. This alternative has the most complex operations requirements and significant capital investment. As with the above recycling option, marketability and public acceptance of the biosolids should be investigated as part of the planning process for local recycling.

e. Treatment Facility Site.

Andre 2. The Andre property is a narrow, triangular shaped parcel bordering LOVR. The site slopes gently downward to the north and contains one dwelling. Access is currently provided from the adjacent parcel in common ownership. There is one group of large trees that follows an ephemeral drainage that crosses the northerly portion of the site. The useable area of site is about 9 acres, but narrow triangular shape limits development flexibility. Access to the site is from LOVR, which is adjacent.

Branin. The Branin property is an irregularly shaped 42.2 acre parcel north of LOVR and west of Clark Valley Road. The site is adjacent to Warden Lake which consists of native wetland and riparian vegetation. The site slopes to the north and contains two ephemeral drainages. Access to the site is provided by a dirt road that wraps around the Cemetery Property and provides access to surrounding farming operations.

Cemetery Property. The Cemetery Property consists of a rectangular 47.4 parcel north of Los Osos Valley Road (LOVR) and west of Clark Valley Road. The Los Osos Mortuary and Memorial Park occupies the southerly portion of the site (about 19 acres). The site slopes gently downward to the north; the westerly boundary slopes downward to the west to a dirt road that provides access to surrounding farming operations. There are no large trees or other natural features. Access is provided from LOVR by way of a level, unimproved road bordering on the east that intersects LOVR opposite Clark Valley Road.

Giacomazzi. The Giacomazzi property is a rectangular 38.2-acre parcel north of LOVR and west of Clark Valley Road. The site slopes gently downward to the north and east toward an ephemeral drainage that extends along the easterly portion of the site to Warden Lake (offsite). The channel supports a small oak woodland along its northerly reaches adjacent to the Branin property. There is a collection of farm-related buildings along the western border with numerous tall trees surround the buildings. The level areas of the site have been plowed, but are not regularly cultivated with crops. Access to the site is provided by way of an unimproved road bordering on the east that intersects LOVR opposite Clark Valley Road.

Gorby. The Gorby property is an irregular 51.7 acre parcel south of LOVR on the east bank of Los Osos Creek. The southerly half of the parcel is steeply sloped and heavily wooded and is not suitable for building. The northern half is level and contains a residence and equestrian farm with paddocks and riding arenas. This area is Class 1 agricultural soil. The level area contains approximately 20 – 25 acres of buildable land. However, the parcel is adjacent to Los Osos Creek on its longest side and creek setbacks would significantly reduce the buildable area. Additional constraints are that the parcel is within a 100 year floodplain and is proximate to a presumed seismic fault. Access to the site is by an unimproved road across neighboring agricultural parcel from LOVR opposite Sombrero Road.

Mid-Town (aka Tri-W). The Mid-Town property is a rectangular 11 acre parcel north of LOVR and west of Palisades Avenue within the urban area of Los Osos. The parcel is owned by the LOCSD and was purchased as the treatment facility site for the LOCSD project. The parcel was graded in 2005 by the LOCSD's contractor and is gently sloping. A large amount of urban runoff passes through the site, which required a drainage basin as part of the LOCSD plans. The entire parcel is located on

Los Osos dune sands, which is designated as environmentally sensitive. The parcel is served by all urban utility services and access if from the adjacent LOVR or Palisades Avenue.

Morosin/FEA. The Morosin property is an irregular 81.2 acre parcel south of LOVR on the east side of Clark Valley Road. The southerly half of the parcel is steeply sloped and heavily wooded and is not suitable for building. The northern half is gently sloped and suitable for building. The parcel contains a church and parking area on the northeastern portion. PG&E easements for high-voltage powerlines restrict the western 400 – 500 feet of the parcel. The useable area is approximately 35 acres. Access is from the adjacent Clark Valley Road.

Robbins 1. The Robbins 1 property consists of a mostly rectangular 41.1 acre parcel abutting the north side of LOVR east of Clark Valley Road. The site contains at least one dwelling and slopes to the north toward Warden Lake. Large mature trees surround the farm buildings. The site may be used for grazing and the buildable portion of the site is about 30 acres. Access to the site is from LOVR, which is adjacent.

Robbins 2. The Robbins 2 property is a mostly rectangular 43.5 acre parcel abutting the north side of LOVR east of Clark Valley Road. The site slopes to the north toward Warden Lake. The site may be used for grazing and the buildable portion of the site is about 35 acres. Access to the site is from LOVR, which is adjacent.

Tonini. The Tonini property is an irregular 645 acre parcel on Turri Road, north of LOVR. Portions of the parcel are Class 2 agricultural soil and are used for row crops. The upland areas are used for grazing. The parcel contains a historic ranch complex with a residence, barn and other out-buildings. There are approximately 175 acres of flat to gently sloped areas suitable for building. Access to the site is from Turri Road.

5.4. EVALUATION CRITERIA

The evaluation criteria for the project components include life-cycle costs, environmental impacts, greenhouse gas emission/carbon footprint, energy use, property owner/customer impacts, future growth capacity, water quality, water conservation and reuse, and benefits/impacts to the treatment process. Extensive discussion and evaluation of the alternatives are presented in the Rough and Fine Screening Reports, selected Technical Memoranda, and the project EIR. The following is a summary of key evaluation considerations for each project component.

a. Collection System. The Rough Screening Report includes several case studies for each of the alternative collection system technologies. These case studies identified operational issues and were used to develop long-term operations and maintenance cost estimates in the Fine Screening Report. The Fine Screening Report focuses on gravity and STEP/STEG alternatives and developed detailed estimates of both capital and operations and maintenance costs. The report includes an in-depth evaluation of the issues related to retrofitting the existing properties from septic systems to a community-wide collection system. Subsequent to the rough and fine screening analysis the County conducted detailed evaluations the collection system alternatives related to key issues in several of the project technical memoranda.

The Low Pressure Collection System technical memorandum evaluated low pressure, grinder pump systems to a similar level of detail as that provided for the gravity and STEP/STEG alternatives in the Fine Screening Report. The technical memorandum includes an expanded case study of similar systems and considered on-lot impacts, construction methods, and pump performance. A detailed estimate of both capital and operations and maintenance costs was also developed.

The Flows and Loads technical memorandum provided detailed estimates of the anticipated flows to the treatment facility from both the gravity and STEP/STEG collection system alternatives. A key evaluation factor was the potential impacts of infiltration and inflow.

The Out of Town Conveyance technical memorandum evaluated potential pipeline routes and construction methods for delivering raw wastewater to treatment facility locations east of the wastewater service area. Alternative pump station locations were evaluated and an estimate of both capital and operations and maintenance costs was also developed.

The Greenhouse Gas Emissions technical memorandum estimated the greenhouse gas emission of all of the project components, including collection system alternatives. For the collection system, besides the indirect emissions resulting from electricity consumption, key emission sources were from septic tank venting and septage hauling associated with the STEP/STEG system.

The overall engineering evaluation in the rough and fine screening analysis and the technical memoranda provided detailed evaluations of many issues which may have significant impact on costs, future flexibility, operations, and maintenance. The key issues include:

- Individual property (on-lot) construction costs and impacts
- Individual property (on-lot) operation and maintenance requirements
- Operations and maintenance costs – including RWQCB monitoring and maintenance requirements
- Conveyance to out-of-town treatment facility alternatives and cost estimates
- Life cycle costs from individual properties to treatment facility
- Impacts and benefits to treatment facility associated with varying influent quality from each collection system
- Greenhouse gas emissions from each collection system
- Easement requirements

The project EIR provides additional evaluation of the collection system alternatives and is included with the project financing application. The key areas of analysis in the EIR that relate to the collection system include groundwater, biological, and cultural resources.

b. Treatment Process.

The approach to evaluating treatment process alternatives in the Rough Screening Report includes:

- Fatal Flaw Analysis - An alternative will be removed from consideration if it has a characteristic that will clearly impede its implementation, from either a cost, regulatory, institutional or technical standpoint.
- Elimination of Redundancy - An alternative will be removed from consideration if it is equivalent to the alternative that has already been developed for the LOCSD's Tri-W Project.
- Removal of Equivalent Alternatives - An alternative will be removed from consideration if there is another alternative that is clearly superior in one respect, even if they are otherwise comparable.

The Fine Screening Report focused on seven treatment alternatives and developed detailed cost estimates of both capital and operations and maintenance costs. The report includes evaluation of treatment capabilities to meet the expected nitrogen limit of 7 mg/L and upgrade to tertiary treatment. Overall, the rough and fine screening analysis include the following evaluation criteria.

- Construction cost
- Operations and maintenance costs
- Land (acreage) requirements
- Nitrogen removal capabilities
- Tertiary treatment compatibility
- Sludge production quantity and quality
- Energy consumption
- Greenhouse gas emissions
- Odor control capabilities
- Potential neighborhood impacts

In addition to the rough and fine screening analysis, the County conducted detailed evaluations of alternative treatment approaches in several of the project technical memoranda.

The Partially Mixed Facultative Pond technical memorandum evaluated facultative pond treatment processes to an additional level of detail not provided in the Fine Screening Report in order to evaluate address several key issues. The evaluation included a more detailed review of dam safety issues, nitrogen removal capabilities, algae removal, energy consumption, and a comparison between different facultative pond technologies.

The Onsite Treatment technical memorandum evaluated the potential installation of onsite treatment systems on a community-wide scale. The evaluation included a review of operational issues, the ability to dispose of, or reuse, the treated effluent, sea water intrusion mitigation, on-lot impacts, and regulatory/permitting issues. A general estimate of the capital costs per residence was also developed.

The Decentralized Treatment technical memorandum evaluated the potential for developing a decentralized wastewater collection, treatment, and disposal plan consisting of several treatment facilities located throughout the community. The evaluation included a review of operational issues, community issues, the ability to dispose of, or reuse, the treated effluent, sea water intrusion mitigation, treatment facility site constraints, and regulatory/permitting issues. A detailed estimate of both capital and operations and maintenance costs was also developed for specific decentralized alternatives in Los Osos by Lombardo Associates, Inc.

The Regional Treatment technical memorandum evaluated the potential for combining the Los Osos treatment facility with neighboring facilities at Morro Bay or the California Mens Colony. The evaluation included a review of treatment facility site constraints, pipeline routes, contractual issues, the ability to dispose of, or reuse, the treated effluent, sea water intrusion mitigation, and regulatory/permitting issues. A general estimate of both capital and operations and maintenance costs was also developed.

c. Effluent Reuse and Disposal.

The approach to evaluating effluent reuse and disposal alternatives in the rough and fine screening analysis had two primary criteria. The evaluation focused on the ability of each alternative to mitigate the sea water intrusion that is occurring in the community's drinking water aquifer and achieve a balanced groundwater basin. Additionally, the evaluation considered the feasibility of each alternative to be implemented by the County, acting as the wastewater authority, or whether other partners were required that were beyond the control of the County or beyond the scope of a wastewater project. Detailed estimates of both capital and operations and maintenance costs were also developed.

In addition to the rough and fine screening analysis the County provided further detailed evaluation in the Effluent Reuse and Disposal technical memorandum. The technical memorandum provided further details for the most viable alternatives and evaluated various scenarios of combined alternatives. The overall evaluation of reuse and disposal alternatives included the following considerations.

- Mitigation of sea water intrusion.
- Feasibility within the scope of the wastewater project

- Construction cost
- Operations and maintenance costs
- Water quality objectives required for each alternative, including treatment level, suspended solids limits, BOD limits, and total nitrogen limits.
- Salt and mineral loading.
- Total capacity of each alternative relative to total wastewater flows.
- Winter and operational storage requirements.
- Flexibility for future growth within build-out projects of the General Plan.
- Land requirements.
- Regulatory/permitting requirements.
- Dam safety issues.
- Seasonal demand or capacity.
- Ability to phase development and avoid stranded costs

d. <u>Solids Handling</u>.

The Rough Screening Report recognizes the uncertainty of the direction of the biosolids disposal regulations at the state and local levels and establishes the primary criteria that the solids handling facilities be designed in a manner that allows for the greatest treatment and disposal flexibility. At the same time, this flexibility must be sensitive of environmental constraints, community values, footprint availability, energy usage, continued operations and maintenance requirements, and capital cost. It includes the following assumptions for evaluating solids handling alternatives.

- Class A biosolids production should include composting. Other options for long-term Class A production and management would pose a significant acceptance risk.
- Due to a local ordinance, non-composted Class A biosolids must either be hauled off-site or land applied at a regional location. The transportation costs and tipping fees do not favor hauling Class A over that of Class B. Therefore, there is no perceived benefit to the production of non-composted Class A biosolids.
- Alkaline stabilization will not be pursued due to the likely difficulties associated with regulatory approval and mitigation requirements while limiting the biosolids market.

The Fine Screening Report evaluated the solids handling alternatives in greater detail, taking into consideration the impacts of the collection system and treatment process alternatives. Detailed estimates of both capital and operations and maintenance costs were also developed.

In addition to the rough and fine screening analysis the County provided further detailed evaluation in the two technical memoranda. The Solids Handling technical memorandum provided further details for the most viable alternatives including end use options, co-generation potential, solar greenhouse drying, and composting. The

Septage Receiving Station technical memorandum considered the potential impacts and benefits of collection and treatment of additional solids by establishing a regional septage receiving center. The evaluation concluded that a regional septage receiving station would not be cost effective in Los Osos. The overall evaluation of solids handling alternatives included the following considerations.

- Future flexibility
- Capital costs
- Operations and maintenance costs
- Federal, state and local regulations and permitting requirements
- Land requirements
- Co-generation options
- Regional septage receiving options
- Local land disposal constraints
- Storage requirements

e. Treatment Facility Site. The evaluation criteria for potential treatment facility sites are presented in the following table, taken from the Rough Screening Report, and are a summary of the issues considered in rough and fine screening analysis.

Table 5.2 Treatment Facility Site Requirements and Issues

Siting Requirements	Issues
Acreage and Topography	• Must be of sufficient size and level topography to accommodate all of the facilities associated with a particular treatment technology. • More land intensive technologies have a higher potential to adversely affect sensitive biological, archaeological and/or agricultural resources.
Flood Hazard	• A suitable site for a wastewater treatment plant must avoid, or be protected from, the potential affects of flooding. • A treatment plant location should not contribute to downstream flooding or worsen an existing drainage problem. • Areas near Los Osos Creek and its tributaries are subject to flooding during major storm events (See Section 5.3.2).
Access to Infrastructure	• A suitable site must be accessible to supporting infrastructure – Roadways of sufficient size and capacity to accommodate the types of service vehicles and level of traffic anticipated. – A stable source of water and electricity.

Table 5.2 Treatment Facility Site Requirements and Issues

Siting Requirements	Issues
Sensitive Resources	
Agricultural Land	• Farmland suitability classifications for the properties as mapped by the California Department of Conservation (See Section 5.3.2). • The California Land Conservation Act (California Government Code Section 51290 et seq.) encourages the conservation of agricultural lands by providing a tax incentive to land owners who contract with the County to restrict land uses to agriculture and compatible uses. – Properties subject to an LCA contract must remain in agricultural use for the duration of the contract, a minimum of ten years. – A property owner may cancel the contract by filing a Notice of Non-renewal and the contract is terminated at the end of ten years. – The law provides for the cancellation of a contract but only under special circumstances and only after the Board of Supervisors makes certain specific findings. – The Gorby and Branin properties are subject to an Agricultural Preserve, making them eligible for an LCA contract.
Biological Resources	• The Los Osos area provides habitat for a number of special status species, as well as other sensitive biological resources that include riparian corridors (Los Osos Creek) and wetlands. Special-status species are plants and animals that are either listed as ‘endangered’ or ‘threatened’ under the Federal or California Endangered Species Acts, listed as ‘rare’ under the California Native Plant Protection Act, or considered to be rare (but not formally listed) by resource agencies, professional organizations, and the scientific community. • The area contains Environmentally Sensitive Habitat Areas (ESHA), which are subject to additional protections prescribed by the California Coastal Act.
Archaeological Resources	• Over 60 archaeological sites have been identified among the stabilized dunes of Los Osos and extending to the east along both sides of Los Osos Creek and beyond. • The potential to un-earth previously undiscovered archaeological resources should be considered high, especially for sites near Los Osos Creek.
Hydro-Geology, Soils and Geological Hazards	• Geologic constraints that could affect the suitability of a site for treatment facilities include: – The presence of an active fault trace. – The presence of unstable or expansive soils. – Shallow groundwater. – Slope instability. • The Paso Robles Formation comprises the plateau and gently rolling hill area east of the alluvial deposits adjacent to Los Osos Creek where the majority of potential sites are located. Sediments of the Paso Robles Formation are generally equivalent to stiff to hard cohesive soils and medium dense to very dense granular soils that are less suitable for farming but are suitable for building sites (See Section 5.3.2). • The Los Osos fault is considered ‘active’ and a portion of the fault zone near the intersection of Los Osos Valley Road and Foothill Boulevard, about 7 miles to the southeast, lies within a Seismic Special Study Zone as prescribed by the State of California Alquist-Priolo Special Studies Zones Act. The potential exists for fault rupture to affect sites in the vicinity.
Visual Resources	• The placement of treatment facilities along these corridors will need to include architectural and landscape mitigation to prevent adversely impacting scenic resources.

Table 5.2 Treatment Facility Site Requirements and Issues

Siting Requirements	Issues
Proximity of Sensitive Receptors	• The design of a treatment plant must consider the management of odors and impacts to surrounding sensitive receptors, which include residential neighborhoods, farms and ranches, businesses, and public/quasi-public facilities (schools, churches, etc.).
Regulatory Issues	• Land use within the unincorporated County is governed by the San Luis Obispo County General Plan and Land Use Ordinance. • An Agriculture and Open Space Element has been adapted by the County to guide the protection of significant agricultural resources. • The community of Los Osos and the area inland of Los Osos Creek fall within the Coastal Zone as defined by the California Coastal Act of 1976. Provisions of the Coastal Act are aimed at protecting important coastal resources and 'environmentally sensitive habitat areas'. Policies of the Coastal Act establish fairly precise criteria to govern the location and design of a 'wastewater treatment works' within the Coastal Zone. • The federal Clean Water Act establishes standards for water quality as well as governing activities that may impact 'waters of the United States', such as perennial streams and estuaries. • And lastly, the Los Osos area is known to support habitat for a number of species listed in accordance with the California and federal Endangered Species Acts. These laws address direct and indirect impacts to special status plant and animal species and set forth a process through which these species are to be protected from land development activities.
Proximity to Collection Service Area and Disposal Sites	• The more distant the treatment plant is from the collection area, the greater is the potential for construction and operational impacts associated with the collection main that conveys wastewater to the plant.
Other Site-Specific Factors	• Other factors to be considered include (but are not limited to) easements or other private restrictions on the title of a given site.

5.5. MAPS

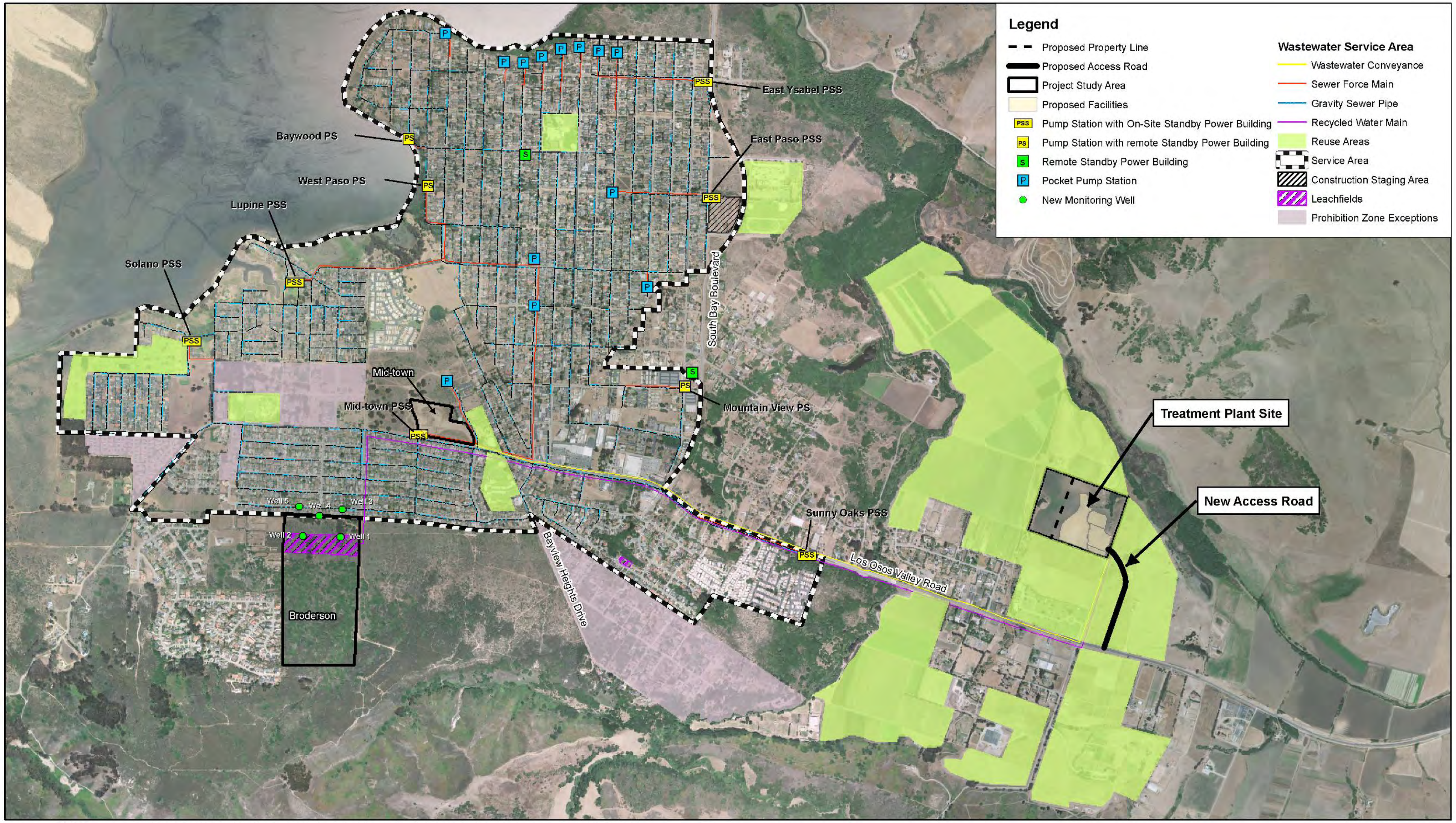
Figure 5.1 shows the location of potential collection system pipelines within the community for any alternative and the pump station locations that would be required with a gravity system.

Figure 5.2 shows the alternative treatment facility sites that were considered in the engineering and environmental analysis. [DEIR Ex. 7-1 or FSR (sites)]

Figure 5.3 shows several potential pipeline routes for conveyance of raw wastewater to a treatment facility east of the community. Further information is available in the Out of Town Conveyance Technical Memorandum included in the Appendices. [DEIR Ex. 7-2 or TM (conveyance routes)]

Figure 5.4 shows the viable effluent reuse and disposal alternatives for the project. [DEIR Ex. 7-3 or FSR/TM (reuse/disposal options)]

Figure 5.1 Project Diagram



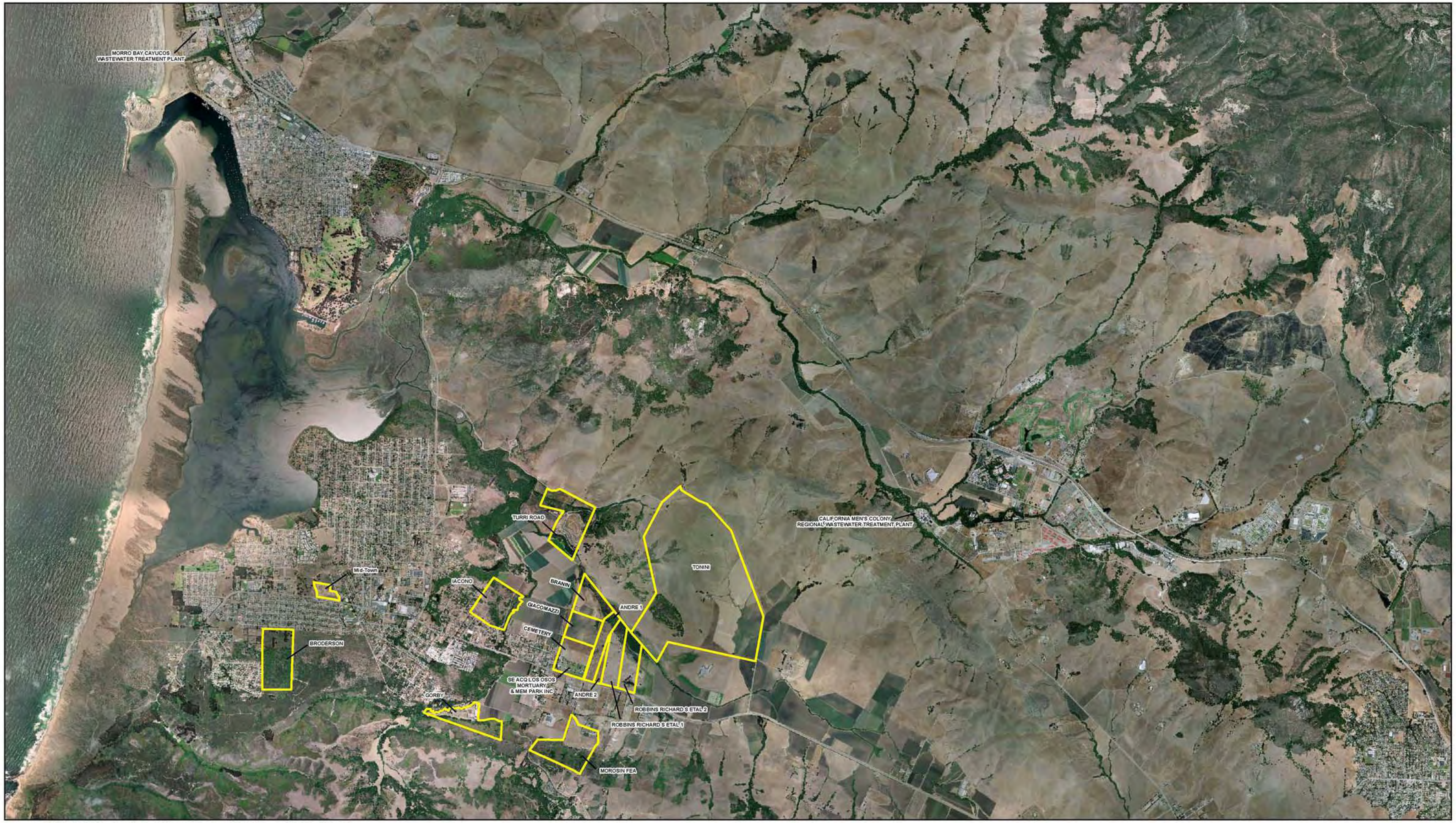
Source: 2007 Digitial Globe aerials, San Luis Obispo County GIS Data, Carollo Engineers, and MBA GIS Data.

2,000 1,000 0 2,000
Feet

Figure 1
Overall Project Site Plan
Los Osos Wastewater Project, County of San Luis Obispo, 2009

COUNTY OF SAN LUIS OBISPO • LOS OSOS WASTEWATER PROJECT

Figure 5.2 Treatment Plant Site Alternatives



Source: AirPhoto USA, San Luis Obispo County GIS Data, and MBA GIS Data.

Michael Brandman Associates

NORTH

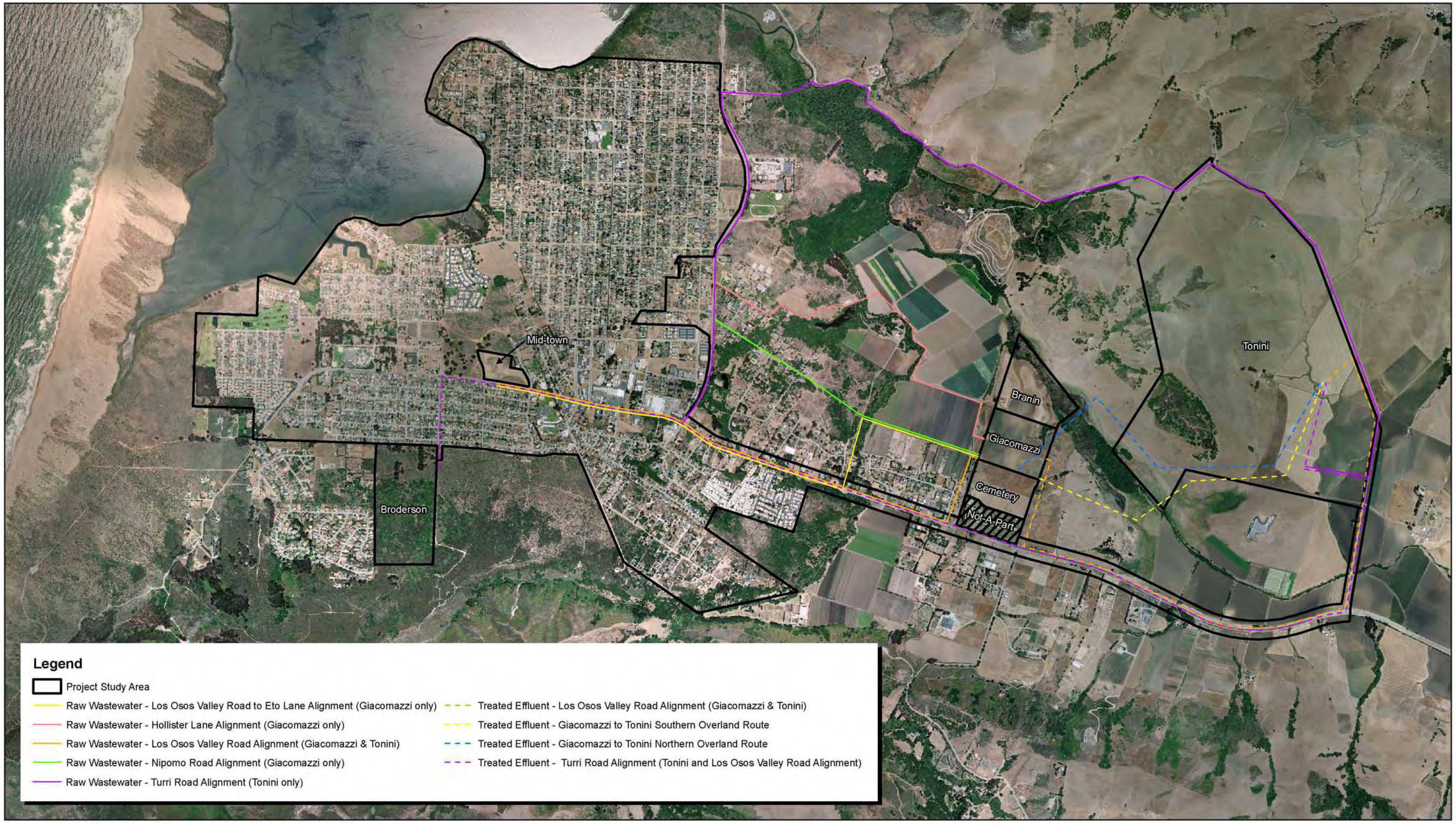
4,000 2,000 0 4,000 Feet

02240002 • 11/2008 | 7-1_treatment_plant_site_alt.mxd

Exhibit 7-1
Wastewater Treatment Plant Site Alternatives

COUNTY OF SAN LUIS OBISPO • LOS OSOS WASTEWATER PROJECT
ENVIRONMENTAL IMPACT REPORT

Figure 5.3 Out-of-Town Conveyance Route Alternatives



Source: AirPhoto USA, San Luis Obispo County GIS Data, and MBA GIS Data.

Michael Brandman Associates
NORTH
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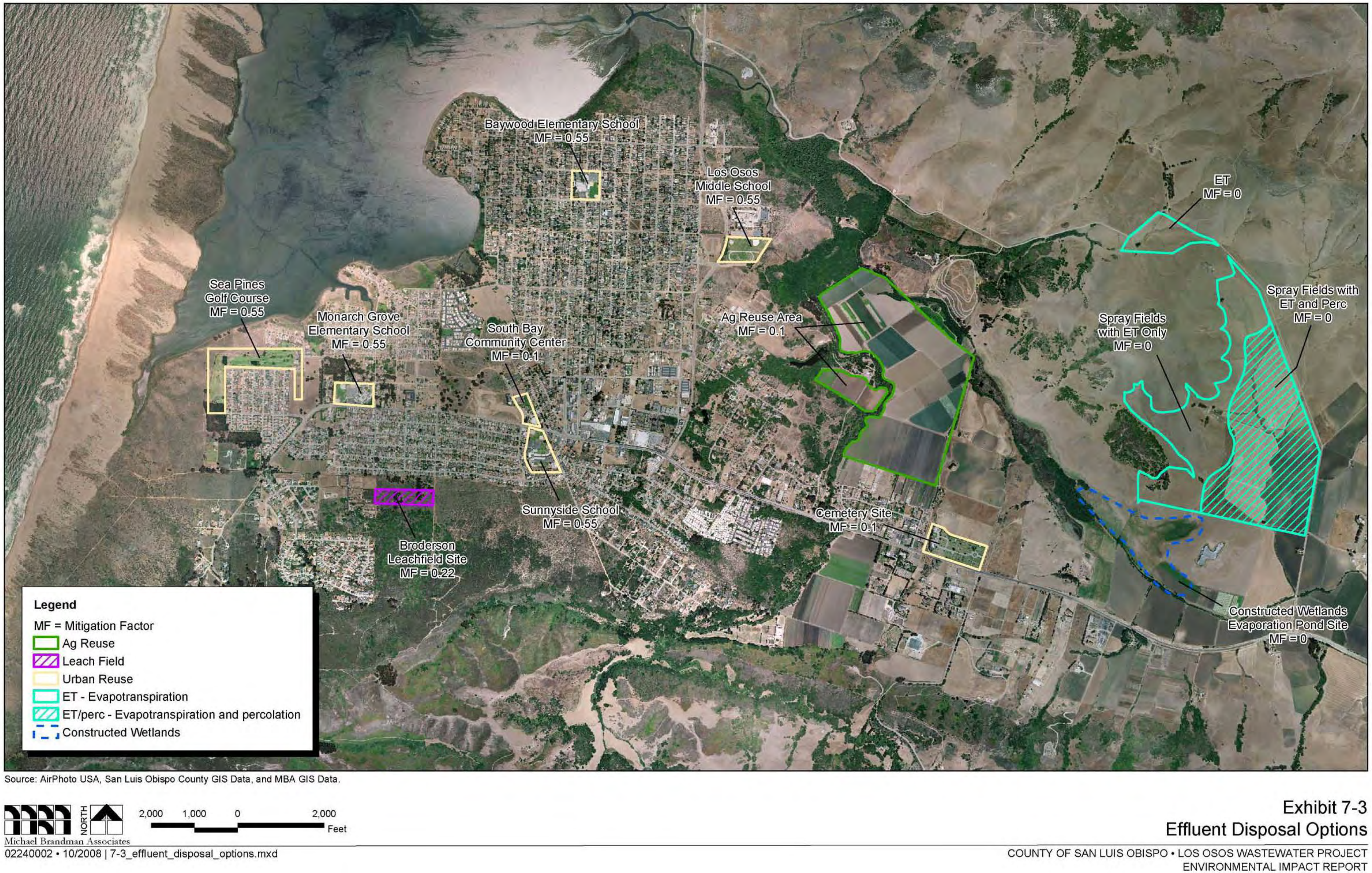
02240002 • 10/2008 | 7-2_conveyance_routes_tonini.mxd

Exhibit 7-2
Out of Town Conveyance Routes to Tonini Ranch Site

COUNTY OF SAN LUIS OBISPO • LOS OSOS WASTEWATER PROJECT
ENVIRONMENTAL IMPACT REPORT

Figure 5.4 Effluent Disposal and Recycled Water Reuse Alternatives



5.6. ENVIRONMENTAL IMPACTS

Analysis of the potential environmental impacts is included in the environmental documents. The project objective, relative to environmental impacts, is avoidance as the first priority. Any impacts to sensitive habitat or resources that cannot be avoided will be fully mitigated. There will be not direct or indirect impacts on important environmental resources.

Virtually all of the collection system and recycled water distribution components to be constructed will be located in existing roadways or other previously disturbed areas. Where it is necessary for the pipeline routes to cross Los Osos Creek, both the raw wastewater and recycled water mains will be hung from the existing bridge. The primary exception to the impacts avoidance objective is the 8 acres of leachfields on the Broderson site, which is a sensitive habitat area. The impacts at Broderson will be mitigated by the preservation of the remaining 80 acres of the site as permanent open space and species habitat. The treatment facility and associated solids handling facility will be located on previously disturbed land under all site alternatives.

5.7. CARBON FOOTPRINT/GREENHOUSE GAS EMISSIONS

The project alternative analysis included consideration of global warming impacts, in response to California Assembly Bill 32, which mandates that these issues be considered and a reduction in greenhouse gases. Greenhouse gas emission were analyzed in a Technical Memorandum and, separately, in the project EIR. The table below is a summary of the analysis, which compares collection system and treatment process alternatives, while assuming that effluent reuse is a combination of leachfields and irrigation and that solids handling is hauling unclassified sludge to a nearby landfill or composting facility. Gravity collection and extended aeration treatment processes (oxidation ditch/Biolac) were found to have the least carbon footprint of the collection and treatment alternatives.

Table 5.3 Greenhouse Gas Emissions Summary: Annual Metric Tons of CO_2 Equivalent

	Indirect						Direct	Total
Alternatives	**Operations Energy**	**Construction Production**	**Chemical Production**	**Construction Materials**	**Solids & Septage**	**Chemical Handling**	**Septic Tank Venting**	**Metric Tons CO_2 equivalent**
Existing Septic Systems	0	0	0	0	16	0	840	**856**
Gravity w/ Oxidation Ditch	769	143	48	32	47	22	0	**1,061**
STEP/STEG w/ Oxidation Ditch	549	103	389	22	14	23	624	**1,724**
Gravity w/ BIOLAC	657	136	47	38	47	22	0	**947**
STEP/STEG w/ BIOLAC	464	99	389	26	14	23	624	**1,639**
Gravity w/ Fac. Ponds	655	138	389	49	9	20	0	**1,260**
STEP/STEG w/ Fac. Ponds	560	100	389	39	10	21	624	**1,742**

5.8. PUBLIC PARTICIPATION/COMMUNITY SURVEY

The County has created several ongoing opportunities for public involvement and input on the wastewater project. These include regular (weekly or monthly) public hearings at the Board of Supervisors and TAC, town-hall and open house style community meetings, a project website with up-to-date information and documents, email and web-log forums for asking questions or posting comments, and a community-wide project survey that was mailed to all residents and property owners. The community survey was conducted in February, 2009, following the engineering alternatives analysis in the Rough and Fine Screening Reports and Technical Memoranda, and after the release of the draft EIR. The survey questions focused on costs and issues that affected individual residents, the overall community, or the environment. The results of the survey are advisory only and are used by County decision-makers in considering the project.

5.9. LAND REQUIREMENTS

A summary of land requirement is provided below. Additional information is available in the Alternative Description and Advantages/Disadvantages discussions in this section and in the attached documents.

a. <u>Collection System</u>. Land requirements are similar for the pipeline portion of each collection system alternative. However, there are some important distinctions between the alternatives for the other collection system facilities. The gravity system requires nine pumps stations and thirteen pocket pump stations. All of these will be located in the road right-of-way or other publically owned land and all of the locations have been evaluated and previously permitted by the environmental resource agencies for the LOCSD project. Each of the alternative collection systems (STEP/STEG, vacuum, or low pressure grinder pumps) require on-site tanks or vaults to be installed on each property. Due to the density of the development in Los Osos it is likely that there will be conflicts with other facilities that will result in delays or increased costs. Vacuum systems also require large, above-grade vacuum stations, in addition to underground pump stations. No locations for these vacuum stations have been identified.

b. <u>Treatment Process and Solids Handling</u>. Land requirements for the treatment process alternatives generally range from 5 to 10 acres for all of the extended aeration/activated sludge and the attached growth/fixed media technologies. Land requirements for the Advanced Wastewater Treatment Ponds are more variable and range from 20 acres for Partially Mixed Facultative Ponds to 60 to 90 acres conventional Facultative Ponds. The acreage estimates include allowances for appurtenant facilities including administration and maintenance buildings, tertiary treatment processes, and most solids handling alternatives.

c. <u>Effluent Reuse and Disposal</u>. Land requirements for effluent reuse or disposal consist of the 8 acres at the Broderson site for leachfields and approximately 10 acres at the Giacomazzi site for storage ponds to facilitate irrigation reuse options. The urban and agricultural reuse options do require any additional land, or land use conversion. The existing uses of these sites will be maintained, but irrigated with recycled, rather than potable, water. Sprayfields would require up to several hundred acres, depending on the capacity required. It would be necessary to convert the land from its previous use for dedicated irrigation of crops which have a high water intake capacity. Percolation ponds and terminal wetlands would require large amounts of land in order to have significant capacity. No suitable location for these facilities was identified in the alternatives review.

5.10. CONSTRUCTABILITY ISSUES

The treatment facility site alternatives are large, greenfield, sites with suitable soil conditions and no existing facilities to avoid. Constructability issues for the project are largely focused on the collection system, with the following key issues.

- Sandy Soil: The community of Los Osos is an ancient sand dune and virtually all of the collection system pipelines will be installed in sandy soil. The soil typical will maintain vertical excavations for a period of time. However, shoring and sheeting will likely be required for worker safety and constructability.
- High Groundwater: Selected portions of the planned collection system are in areas of high groundwater. These areas have been mapped, with depth-to-groundwater contours developed. This information will be available to potential contractors, prior to submitting bids. It is expected that extensive dewatering operations and/or alternative construction techniques such as trenchless pipe installation will be required in limited areas.
- Utility Conflicts: Utility mapping and coordination was completed for the entire collection system area as part of the LOCSD’s project in 2005. Any new development since 2005 has been tracked and coordinated to avoid potential conflicts with the planned sewer pipelines. However, portions of the potable water system are not well mapped and contains transite pipe, which is difficult to locate. A pre-construction potholing program will be required as part of the construction contract.
- Cultural Resources: There is a long history of Native American settlements in the Los Osos area. Extensive archeological surveys were conducted for the entire collection system prior to the LOCSD’s project in 2005. Pipeline routes were designed to avoid sensitive areas when possible. The construction contract will have provisions for addressing delays and construction impacts associated with encountering artifacts in the pipeline excavations.
- On-lot Construction: The gravity collection system alternative will only be constructed within the public right-of-way or easements. Sewer laterals will be constructed to the edge of the right-of-way and all on-lot lateral connections and septic tanks abandonment will be the responsibility of the individual property owner. The other collection system alternatives (STEP/STEG, vacuum, and low pressure grinder pumps) require some type of holding tank, septic tank, or pump vault to be installed on private property at each of the approximately 4,800 connections. Since these facilities must be properly maintained in order to ensure reliable system operation, the County would be responsible for the installation and maintenance. The individual property owner coordination, yard

restoration, site constraints, and contractor liability for each of the 4,800 connections would present significant constructability issues.

5.11. COST ESTIMATES

Cost estimates were developed in the Fine Screening Report, and in subsequent technical memoranda for each of the project components. The following tables summarize the cost estimates for construction, non-construction (soft costs), and operations and maintenance.

Tables 5.4 through 5.14 summarize construction and operations and maintenance costs in 2007 dollars (ENR 7879) for the collection system, treatment facility, solids handling, and effluent reuse and disposal alternatives.

Table 5.15 and 5.16 provide a summary of the total project construction costs, non-construction capital costs and long-term operations and maintenance costs.

Table 5.4 Range of Probable Costs for Gravity Collection System

Item [2]	Range of Probable Costs: Low ($M)[1]	Range of Probable Costs: High($M)[1]	Notes on Development of Range
Mobilization/Demobilization/ General Conditions	3.7	4.0	Based on 5% of Construction Cost Subtotal
COMMON FACILITIES			
Gravity Sewers and Force Mains	27.8	30.6	Low estimate based on Carollo Engineer's Unit Price Catalog with 15% contractor overhead and profit and 8% sales tax. High estimate includes 10% contingency due to final design level.
Manholes	4.3	4.7	Low estimate based on Carollo Engineer's Unit Price Catalog with 15% contractor overhead and profit and 8% sales tax. High estimate includes 10% contingency due to final design level.
Shoring and Dewatering	4.8	5.3	Low estimate based on Carollo Engineer's Unit Price Catalog with 15% contractor overhead and profit and 8% sales tax. High estimate includes 10% contingency due to final design level.
Duplex Pump Station	2.6	2.6	Based on Bid Tab values.
Triplex Pump Station	1.2	1.2	Based on Bid Tab values.
Pocket Pump Station	2.4	2.4	Based on Bid Tab values.
Standby Power Facility	2.5	2.5	Based on Bid Tab values.
Miscellaneous Facility Requirements	3.3	3.3	Based on Bid Tab values.
Laterals in Right of Way	8.8	9.7	Low estimate based on Carollo Engineer's Unit Price Catalog with 15% contractor overhead and profit and 8% sales tax. High estimate includes 10% contingency due to final design level.
Road Restoration	5.2	5.2	Based on bid assessment by the Wallace Group, March 2005
Land and Easement Acquisition	Assumed No Additional Cost [3]		

Table 5.4 Range of Probable Costs for Gravity Collection System

Item [2]	Range of Probable Costs		Notes on Development of Range
	Low ($M)[1]	High($M) [1]	
ON-LOT FACILITIES			
Project Facilities	0.0	0.0	All on-lot costs assumed to be bourne by the individual homeowners for gravity/low pressure systems
Homeowner Facilities	12.6	13.9	Based on on-lot options and cost development information presented above. High estimate includes 10% contingency.
Overhead and Profit (15%)	Included Above [4]	Included Above [4]	
Subtotal	$79.3	$85.5	
Sales Tax (8%)	Included Above [4]	Included Above [4]	
Conveyance to Out-of-Town Treatment Facility	2.9	4.1	
TOTAL CONSTRUCTION COST	**$82.2**	**$89.6**	

Notes:
(1) All costs in April 2007 dollars, based on an ENR of 7879.
(2) Prohibition zone lots only - 4,769 connections.
(3) Land and easement acquisition assumed to be sunk cost as part of previous Tri-W project.
(4) Contractor overhead and profit and sales tax assumed included in bid tab values. Where Unit Price Catalog estimates are used, contractor overhead and profit (15%) and sales tax (8%) are included in the individual line items.

Table 5.5 Range of Probable Costs for Low Pressure Collection System (LPCS)

Item [2]	Range of Probable Costs Low ($M) [1]	High ($M) [1]	Notes on Development of Range
Mobilization/Demobilization/General Conditions	3.0	3.9	Based on 5% of Construction Cost Subtotal.
COMMON FACILITIES[5]			
Force Mains and Laterals in Right-of-Way	11.7	15.2	Low estimate based on Los Osos Wastewater Management Plan Update (Ripley 2006) and installation costs from Tidwell. High estimate includes 30% contingency due to conceptual design level.
Duplex Pump Station (6)	2.6	2.6	Based on Bid Tab Values and Table 3.1, Fine Screening Report
Triplex Pump Station (2)	1.2	1.2	Based on Bid Tab Values and Table 3.1, Fine Screening Report
Standby Power Facility (7)	2.5	2.5	Based on Bid Tab Values and Table 3.1, Fine Screening Report
Miscellaneous Facility Requirements	3.3	3.3	Based on Bid Tab Values and Table 3.1, Fine Screening Report
Odor Control	0.1	0.3	Low and High estimates based on 100 and 500 air release valves respectively at $500 each.
Road Restoration	1.3	2.6	Low and High estimates based on 25% and 50% of the gravity system requirements, respectively, due to estimated reduction in pavement disturbance.
Land and Easement Acquisition	Assumed No Additional Cost[3]	Assumed No Additional Cost[3]	
ON LOT FACILITIES			
Project Facilities	21.8	24.0	All on-lot costs assumed to be borne by the individual homeowners for low pressure systems
Homeowner Facilities	6.6	7.3	Based on on-lot options and cost development information presented above. High estimate includes 10% contingency similar to gravity system.
Electrical Connection	9.1	18.1	Low and High estimates based on community average costs of $1,900 and $3,800 per connection as presented in Table 8 for 4769 Prohibition Zone lots.
Subtotal	$63.2	$81.0	
Overhead and Profit (15%)	$9.5	$12.2	
Subtotal	$72.7	$93.2	
Sales Tax (8%)[4]	$2.9	$3.7	
TOTAL CONSTRUCTION COST[6]	$75.6	$96.9	

Notes:
(1) All costs in April 2007 dollars, based on an ENR of 7879.
(2) Prohibition Zone lots only - 4769 connections.
(3) Land and easement acquisition assumed to be sunk cost as part of the previous Tri-W project.
(4) Sales Tax included on materials only. Assumed 60 percent materials cost for common and on-lot facilities.
(5) Common Facilities estimates assumed to be the same for low pressure system as for STEP system.

Table 5.6 Range of Probable Costs for STEP/STEG Collection System

Item (2)	Range of Probable Costs Low ($M) (1)	High ($M) (1)	Notes on Development of Range
Mobilization/Demobilization /General Conditions	2.6	3.2	Based on 5% of Construction Cost Subtotal.
COMMON FACILITIES			
Force Mains and Laterals in Right-of-Way	11.7	15.2	Low estimate based on Los Osos Wastewater Management Plan Update (Ripley 2006) and installation costs from Tidwell. High estimate includes 30% contingency due to conceptual design level.
Odor Control	0.1	0.3	Low and High estimates based on 100 and 500 air release valves respectively at $500 each.
Road Restoration	1.3	2.6	Low and High estimates based on 25% and 50% of the gravity system requirements, respectively, due to estimated reduction in pavement disturbance.
Land and Easement Acquisition	Assumed No Additional Cost(3)	Assumed No Additional Cost(3)	
ON LOT FACILITIES			
Project Facilities	23.5	25.8	Based on on-lot options and cost development information presented above. High estimate includes 10% contingency similar to gravity system.
Homeowner Facilities	6.1	6.7	Based on on-lot options and cost development information presented above. High estimate includes 10% contingency similar to gravity system.
Electrical Connection	9.1	14.3	Low and High estimates based on $1,900 and $3,000 per connection as presented in Table 3.15 for 4769 Prohibition Zone lots.
Subtotal	$54.4	$68.1	
Overhead and Profit (15%)	$8.1	$10.2	
Subtotal	$62.3	$78.3	
Sales Tax (8%)(4)	$2.5	$3.1	
TOTAL CONSTRUCTION COST WITH BASE ELECTRICAL CONNECTION	$65.0	$81.4	
Separate Electrical Service Premium	$14.5	$24.1	
TOTAL CONSTRUCTION WITH SEPARATE ELECTRICAL SERVICE PREMIUM	$79.5	$105.5	

Notes:
(1) All costs in April 2007 dollars, based on an ENR of 7879.
(2) Prohibition Zone lots only - 4769 connections.
(3) Land and easement acquisition assumed to be sunk cost as part of the previous Tri-W project.
(4) Sales Tax included on materials only.

Table 5.7 Estimated O&M Costs for Gravity Collection System

Item	Units	Quantity	Unit Price ($)	Annual O&M ($)
Labor	Hrs/year	4,160(1)	40(2)	170,000
Power	Kwh/year	500,000(3)	0.12(2)	60,000
Equipment Maintenance/ Replacement	%/year	2	Pump Station Power Facility and Misc Facility Requirements Construction Cost	250,000
TOTAL O&M COST(4)				$480,000

Notes:
(1) Based on 2 full-time employees and 2,080 hours per year.
(2) From Basis of Cost Evaluation Technical Memorandum.
(3) Based on energy required to convey 1.4 mgd to an out-of-town treatment facility.
(4) Septic hauling costs for homes outside of the Prohibition Zone are not included.

Table 5.8 Estimated O&M Costs for Low Pressure Collection System (LPCS)

Item	Units	Quantity	Unit Price ($)	Annual O&M ($)
Labor	Hrs/year	10,400(1)	40(2)	420,000
Power	kWh/year	860,000(3)	0.12(2)	100,000
Electrical Maintenance/ Replacement	%/year	1	Electrical Connection Construction Costs	90,000
Pump/Controls Maintenance/ Replacement	Pumps/year	700(4)	1,200-2,000(5)	840,000-1,400,000
Odor Control Maintenance/ Replacement	%/year	20	Odor Control Construction Costs	20,000
TOTAL O&M COST				~$1,500,000-$2,000,000

Notes:
(1) Based on 5 full-time employees from Horseshoe Bay, Hot Springs, and other case studies contacted. Full-time equivalent (FTE) employee based on 2,080 hours per year.
(2) From Basis of Cost Evaluation Technical Memorandum (Carollo, August 2007).
(3) Based on energy required to convey 1.2 mgd to an out-of-town treatment facility. Assumed a grinder pump efficiency of 30 percent.
(4) Assumes full pump replacement every 7 years.
(5) Range based on replacement pump costs for case studies contacted.

Table 5.9 Estimated O&M Costs for STEP/STEG Collection System

Item	Units	Quantity	Unit Price ($)	Annual O&M ($)
Labor	Hrs/year	5,200[1]	40[3]	210,000
Power	kWh/year	425,000[4]	0.12[3]	50,000
Electrical Maintenance/Replacement	%/year	1	Electrical Connection Construction Costs	90,000
Pump/Controls Maintenance/Replacement	Pumps/year	700[5]	400[6]	280,000
Odor Control Maintenance/Replacement	%/year	20	Odor Control Construction Costs	20,000
Septic Hauling[7]	Tanks/year	950[8]	150[2]	140,000
TOTAL O&M COST				~$790,000

Notes:
(1) Based on 2.5 full-time employees from Charlotte County Utility Authority, Florida, Olympia and other case studies contacted for Rough Screen Analysis. FTE based on 2,080 hours per year.
(2) Based on 1.5 full-time employees at $40/hour and $150,000 for septic hauling truck replaced every 10 years.
(3) From Basis of Cost Evaluation Technical Memorandum.
(4) Based on energy required to convey 1.2 mgd to an out-of-town treatment facility.
(5) Assumes pump replacement every 7 years.
(6) Based on pump cost provided by Orenco.
(7) Septic hauling costs for homes outside of the Prohibition Zone are not included.
(8) Based on anticipated RWQCB requirement for STEP tank pumping frequency of once every 5 years.

Table 5.10 Summary of Treatment Alternative Costs

		Treatment Alternative ($M)						
	Costs[1,2]	Extended Aeration MLE	BIOLAC®	Sequencing Batch Reactor (SBR)	Oxidation Ditch	Trickling Filters	Partially Mixed Facultative Ponds	Membrane Bio-Reactor (MBR)
Gravity Collection System	Secondary Treatment Construction Costs	$22.2	$17.2	$23.0	$19.6	$20.5	$14.7	$55.0
	Secondary Treatment O&M Costs	$700,000	$700,000	$660,000	$690,000	$670,000	$510,000	$740,000
	Nitrification Facilities Construction Costs [3,4]	-	-	-	-	$3.8	$1.0 - 3.8[6]	-
	Nitrification Facilities O&M Costs [3,4]	-	-	-	-	$90,000	$30,000 - $90,000[6]	-
	Denitrification Facilities Construction Costs [3]	-	-	-	-	$3.6	$3.6	-
	Denitrification Facilities O&M Costs [3]	-	-	-	-	$250,000	$250,000	-
STEP Collection System	Secondary Treatment Construction Costs	$19.1	$14.2	$19.4	$16.5	$17.6	$13.7	N/A
	Secondary Treatment O&M Costs	$570,000	$550,000	$590,000	$570,000	$610,000	$510,000	N/A
	Nitrification Facilities Construction Costs[3,4]	-	-	-	-	$3.3	$1.0 - 3.3[6]	-
	Nitrification Facilities O&M Costs[3,4]	-	-	-	-	$90,000	$30,000 - 90,000[6]	-
	Denitrification Facilities Construction Costs[3]	$3.6	$3.6	$3.6	$3.6	$3.6	$3.6	$3.6
	Denitrification Facilities O&M Costs[3]	$250,000	$250,000	$250,000	$250,000	$250,000	$250,000	$250,000
Gravity or STEP	Tertiary Treatment Construction Costs[8]	$1.6 - 3.5	$1.6 - 3.5	$1.6 - 3.5	$1.6 - 3.5	$1.6 - 3.5	$2.1 - 4.0[5]	-[7]
	Tertiary Treatment O&M Costs[8]	$30,000 - 100,000	$30,000 - 100,000	$30,000 - 100,000	$30,000 - 100,000	$30,000 - 100,000	$60,000 - 130,000[5]	-[7]

Notes:
(1) All costs are in April 2007 dollars, based on an ENR of 7879.
(2) Total construction costs do not include design, construction management, and legal/administrative costs. Refer to Chapter 7 for project costs.
(3) Assumed nitrification /denitrification of full plant flow to meet seasonal disposal/ reuse requirements.
(4) Trickling filters and facultative ponds require nitrification upstream of denitrification.
(5) Includes additional pre-treatment costs due to high suspended solids effluent from facultative ponds.
(6) Low costs assume fully nitrifying pond system feasible. High costs assume implementation of nitrifying trickling filters.
(7) MBR effluent quality meets Title 22 requirements without additional treatment.
(8) Tertiary cost range dependent on flowrate, upper range is for 1.2 MGD
(9) Includes 30% contingency for all capital cost estimates.

Table 5.11 Capital Cost Summary for Solids Treatment Alternatives

	Assumed Treatment Processes On Site	Estimated Capital Cost with Gravity Collection System ($M)[1]	Estimated Capital Cost with STEP/STEG Collection System ($M)[2]
Facultative Pond	Facultative Pond	0	0
Sub-Class B Biosolids[3]	Gravity Belt Thickening Solar Drying	1.9 - 2.4 (2.6 - 3.3 with BFP Dewatering)	1.0 - 1.7 (1.4 - 2.4 with BFP Dewatering)
Digested Class B Biosolids	Gravity Belt Thickening Aerobic Digestion Solar Drying	4.6 - 5.1 (5.3 - 6.0 with BFP Dewatering)	2.4 - 3.5 (2.8 - 4.2 with BFP Dewatering)
Heat Dried Class B Biosolids	Gravity Belt Thickening Belt Filter Press Dewatering Indirect Heat Drying	5.5 - 6.2	3.0 - 4.4
Composted Class B Biosolids	Gravity Belt Thickening Belt Filter Press Dewatering Windrow Composting	3.6 - 4.3	1.9 - 3.2
Composted Class A Biosolids	Gravity Belt Thickening Belt Filter Press Dewatering Windrow Composting	3.6 - 4.3	1.9 - 3.2
Digested/ Composted Class A Biosolids	Gravity Belt Thickening Aerobic Digestion Belt Filter Press Dewatering Windrow Composting	6.3 - 7.0	3.3 - 5.0

Notes:
(1) Based on an average solids volume from primary and secondary treatment process of 4,000 pounds per day (dry weight).
(2) Based on an average solids volume from primary and secondary treatment process of 1,000 pounds per day (dry weight).
(3) The Tri-W Project included treatment and disposal of Sub-class B biosolids.
(4) Includes 30% contingency for all estimates.

Table 5.12 O&M Cost Summary for Solids Treatment Alternatives

	Assumed Treatment Processes On Site	Estimated O&M Cost with Gravity Collection System ($M)[1]	Estimated O&M Cost with STEP/STEG Collection System ($M)[2]
Facultative Pond	Facultative Pond Temporary Equipment	0.04 – 0.05[3]	0.03 – 0.04[3]
Sub-Class B Biosolids[4]	Gravity Belt Thickening Solar Drying Hauling	0.43 – 0.47 (0.63 - 0.66 with BFP Dewatering)	0.18 – 0.25 (0.28 – 0.38 with BFP Dewatering)
Digested Class B Biosolids	Gravity Belt Thickening Aerobic Digestion Solar Drying Hauling	0.43 – 0.47 (0.63 – 0.66 with BFP Dewatering)	0.18 – 0.25 (0.28 – 0.38 with BFP Dewatering)
Heat Dried Class B Biosolids	Gravity Belt Thickening Belt Filter Press Dewatering Indirect Heat Drying Hauling	0.60 – 0.62	0.30 – 0.42
Composted Class B Biosolids	Gravity Belt Thickening Belt Filter Press Dewatering Windrow Composting Hauling	0.68 – 0.71	0.35 – 0.48
Composted Class A Biosolids	Gravity Belt Thickening Belt Filter Press Dewatering Windrow Composting Hauling	0.62 – 0.65	0.33 – 0.46
Digested/ Composted Class A Biosolids	Gravity Belt Thickening Aerobic Digestion Belt Filter Press Dewatering Windrow Composting Hauling	0.63 – 0.66	0.33 – 0.46

Notes:
(1) Based on an average solids volume from primary and secondary treatment process of 4,000 pounds per day (dry weight).
(2) Based on an average solids volume from primary and secondary treatment process of 1,000 pounds per day (dry weight).
(3) Based on $600,000 in 2007 dollars escalated at 5% per year until 2027 and saved for in equal annual installments.
(4) The Tri-W Project included treatment and disposal of Sub-class B biosolids.

Table 5.13 Capital Cost Summary for Effluent Reuse and Disposal Alternatives

Item	Estimated Costs	Notes
Conservation Program	$1,000,000 - $5,000,000	1
Piping to Sprayfield	$1,210,000 – $1,650,000	2
Sprayfield Development	$20,000 - $80,000	3
Sprayfield Maintenance Equipment	$700,000 - $2,800,000	4
Sprayfield Land Acquisition	$1,800,000 - $7,000,000	5
Recycled Water Storage Ponds	$400,000 - $3,900,000	6
Recycled Water Pump Station	$780,000 - $1,500,000	7
Recycled Water Return Main to Broderson	$2,200,000 - $2,900,000	8
Broderson Leachfield Development	$2,367,000	9
Urban Reuse Turnout Piping	$1,400,000 - $2,100,000	10

(1) Minimum program: 5000 toilets at $200 each.
(2) 10,500 ft from Giacomazzi to Tonini.
(3) $209/acre.
(4) $256/acre/year for 30 years.
(5) $30,000/acre for spray fields, capped at $7m (price of Tonini Ranch).
(6) Range from 30 AF to 290 AF storage.
(7) See costs in treatment plant information.
(8) 17,700 ft from plant to Broderson.
(9) Based on bid tabs for LOCSD project.
(10) Estimate 10,000 lf to 15,000 lf for turnouts to ag sites, schools, and Sea Pines at $143/lf.
(11) Includes 30% contingency for all estimates.
(12) Cost estimates summarized from Table A1 of Fine Screening Report (Carollo, August, 2007) for Alternatives 1a & 1b, 2a & 2b, and 3a & 3b.

Table 5.14 O&M Cost Summary for Effluent Reuse and Disposal Alternatives

Item	Estimated Annual O&M Cost	Notes
Sprayfields		
Energy	$67,000 - $187,000	1
Labor	$0 - $89,000	2
Leachfields		
Energy	$160,000 - $170,000	3
Labor	$90,000	4
Recycled Water Reuse		
Energy	$34,000 - $44,000	5

(1) Energy from pumping plus fuel for spray field maintenance machinery.
(2) Labor for spray field maintenance - $40/hr.
(3) Energy from pumping and leachfield maintenance.
(4) Labor for leachfield maintenance - $60/hr.
(5) Energy from pumping to ag land.
(6) Cost estimates summarized from Table A1 of Fine Screening Report (Carollo, August, 2007) for Alternatives 1a & 1b, 2a & 2b, and 3a & 3b.

Table 5.15 Total Project Capital Cost Summary ($ Millions)

Project Element		Seawater Intrusion Mitigation Level 1		Seawater Intrusion Mitigation Level 2		Seawater Intrusion Mitigation Level 3		Tri-W Project
		90 AFY	140 AFY	190 AFY	240 AFY	550 AFY	600 AFY	~285 AFY
Collection System	STEP	$65 - 81	$65 - 81	$65 - 81	$65 - 81	$65 - 81	$65 - 81	$N/A
	Gravity(7)	$82 - 90	$82 - 90	$82 - 90	$82 - 90	$82 - 90	$82 - 90	$81 - 82
Treatment (Liquid and Solids) (2)	STEP	$14 - 18	$23 - 25	$20 - 22	$23 - 25	$23 - 25	$23 - 25	N/A(8)
	Gravity	$15 - 22	$23 - 26	$20 - 22	$23 - 26	$23 - 26	$23 - 26	$55
Disposal/Reuse		$13 - 16	$13 - 14	$15 - 17	$13 - 14	$26 - 30	$26 - 27	$20 - 23
Treatment Facility Site(3)		$1 - 3	$1 - 3	$1 - 3	$1 - 3	$1 - 3	$1 - 3	$1 - 3
Permitting/Mitigation(4)		$1 - 2	$1 - 2	$1 - 2	$1 - 2	$1 - 2	$1- 2	$1 - 2
Total Construction Costs	STEP	$94-120	$103 - 126	$102-125	$103-126	$116-142	$116-139	N/A
	Gravity	$110-130	$118-133	$117-132	$119-133	$132-149	$131-146	$155 - 162
Total Construction Costs Escalated to Mid-Point of Construction(5)	STEP	$117-150	$128-157	$126-156	$129-157	$144-176	$144-173	N/A
	Gravity	$137-162	$147-166	$146-164	$148-165	$164-185	$163-182	$193 - 202
Project Costs(6)	STEP	$18-24	$18-24	$18-24	$18-24	$21-26	$21-26	N/A
	Gravity	$16-21	$16-21	$16-21	$16-21	$19-23	$19-23	$12 - 17
Total Project Costs(5)	STEP	$135-174	$146-181	$144-180	$147-181	$166-202	$165-199	N/A
	Gravity	$153-183	$163-187	$161-185	$163-186	$182-208	$182-205	$205 - 219

N/A - Not Available.
Notes:
(1) Estimated Construction Costs in April 2007 dollars including contractor overhead and profit and 30% design contingency (feasibility-level estimate).
(2) Shows combined costs of liquid treatment and solids treatment/disposal.
(3) Assumes approximately 40 acres acquired, except for Tri-W Project. Actual acreage may vary depending on the final site and plant configuration.
(4) Costs do not include land restoration costs at $20,000 to $50,000 per acre.
(5) Assumes mid-point of construction is June 2011. Escalation at 24.5% of construction cost sub-total per the Basis of Cost Evaluation (Carollo Engineers, May 2007).
(6) Project costs include design, construction management, administration and legal costs, as detailed in the Basis of Cost Memorandum in Appendix A of Fine Screening Report (Carollo, August, 2007).
(7) Cost do not include $13 to 25 million for electrical connection premium for separate electrical service that may be incurred if permitting and/or funding requirements stipulate this requirement and the funding is pursued.
(8) Tri-W costs based on gravity collection system. Treatment Costs for the Tri-W Project with STEP collection are not available from bid tab information. Based on other treatment process costs, MBR costs associated with STEP collection could be approximately 10 to 15% less than when associated with a gravity collection system.

Table 5.16 Total Project O&M Cost Summary ($ Millions)

Project Element		Seawater Intrusion Mitigation Level 1		Seawater Intrusion Mitigation Level 2		Seawater Intrusion Mitigation Level 3		Tri-W Project
		90 AFY	140 AFY	190 AFY	240 AFY	550 AFY	600 AFY	~285 AFY
Collection System	STEP Gravity	$0.8 $0.5	$0.8 $0.5	$0.8 $0.5	$0.8 $0.5	$0.8 $0.5	$0.8 $0.5	N/A $0.7
Treatment	STEP Gravity	$0.5-0.6 $0.5-0.7	$0.9-1.8 $0.8-1.8	$0.8-1.7 $0.7-1.7	$0.9-1.8 $0.8-1.8	$0.9-1.8 $0.8-1.8	$0.9-1.8 $0.8-1.8	N/A[4] $0.7
Solids (Sub Class B)[2]	STEP Gravity	$0.03-0.3 $0.04-0.5	$0.03-0.3 $0.04-0.5	$0.03-0.3 $0.04-0.5	$0.03-0.3 $0.04-0.5	$0.03-0.3 $0.04-0.5	$0.03-0.3 $0.04-0.5	N/A $0.5
Disposal/ Reuse	STEP Gravity	$0.1-0.3 $0.1-0.3	$0.1-0.2 $0.1-0.2	$0.4 $0.4	$0.4 $0.4	$0.1-1.1 $0.1-1.1	$0.3 $0.3	N/A $0.4 - 0.5
Total O&M Costs	STEP Gravity	$1.4 - 1.9 $1.1 - 1.9	$1.8 - 3.0 $1.4 - 2.9	$2.0 - 3.1 $1.6 - 3.0	$2.1 - 3.2 $1.7 - 3.2	$1.8 - 3.9 $1.4 - 3.8	$2.0 - 3.1 $1.6 - 3.0	N/A $2.3 - 2.4[3]

N/A - Not Available.
Notes:
(1) Estimated O&M Costs in April 2007 dollars.
(2) Low costs are based on an annuity to fund temporary, mobile facilities for removal of solids from facultative ponds 20 years following startup of the wastewater treatment facilities.
(3) Does not include $0.4 million for water conservation, habitat mitigation, overhead, administration and contingency to correspond to the Final Project Report (Montgomery Watson Americas, March 2001) estimate. See Table 7.2 of Fine Screening Report (Carollo, August, 2007).
(4) Tri-W costs based on gravity collection system. Treatment Costs for the Tri-W Project with STEP collection are not available from bid tab information. Based on other treatment process costs, MBR costs associated with STEP collection could be approximately 10 to 20% less than when associated with a gravity collection system.

5.12. ADVANTAGES/DISADVANTAGES

The following tables (Table 5.17 through Table 5.21) provide a summary of advantages, disadvantages, and project issues associated with each component of the project alternatives. The discussion includes collection system, treatment process, effluent reuse and disposal, solids handling, and treatment facility sites.

Table 5.17 Collection System Alternatives – Advantages, Disadvantages and Issues

Collection System	Advantages	Disadvantages	Operations & Maintenance Issues
Conventional Gravity	• Limited infrastructure and construction disturbance to individual properties • Reserve hydraulic capacity • Power required only at pump stations • Designed as part of LOCSD project • No proprietary technology	• Several lift stations required • Deep excavations for pipe installation • Requires larger pipes and manholes • Significant I/I	• Lift stations must be maintained • Reduced septage handling
STEP/STEG	• May utilizes existing septic systems if in acceptable condition (no off-site pump stations required) • Shallow excavation for pipe installation • Small pipes and no manholes • Minimal I/I • Reduced organic and suspended solids loading • Reduced biosolids production and associated hauling	• Significant infrastructure and construction disturbance to individual properties (septic tanks are typically replaced because of I&I and previous studies have estimated 85 to 100% of tanks to be replaced) • Dedicated power supply required at individual properties • Limited hydraulic capacity • Requirement to add supplemental organic material for denitrification in treatment process	• Recurring disturbance to inspect and maintain septic tanks and pumps on individual properties (Blanket easement likely required) • Increased septage handling • Privatization option may reduce costs • RWQCB may impose monitoring system and additional maintenance requirements not accounted for in previous studies/estimates

Table 5.17 Collection System Alternatives – Advantages, Disadvantages and Issues

Collection System	Advantages	Disadvantages	Operations & Maintenance Issues
Vacuum	• Limited infrastructure and construction disturbance to individual properties • Shallow excavation for pipe installation • Small pipes and no manholes • Minimal I/I • Power only required at the vacuum stations	• Only one manufacturer of vacuum systems (AIRVAC) • Collection chambers and several vacuum stations required • Limited hydraulic capacity	• Vacuum stations and interface valves must be maintained • Reduced septage handling
Low Pressure	• Minimized clogging because of grinder pumps • Shallow excavation for pipe installation • Small pipes and no manholes • Minimal I/I	• Significant infrastructure and construction disturbance to individual properties • Primary and back-up power supply required at individual properties • Limited hydraulic capacity • Lift stations may be required	• Recurring disturbance to maintain pumps and power source on individual properties (Blanket easement likely required) • Reduced septage handling • Privatization options to be investigated
Combined (Gravity/ Vacuum/ Low Pressure)	• Can optimize technology for localized conditions • Previously designed gravity system serves as design basis	• Similar to individual collection systems • Non-uniformity of design and construction	• Multiple techniques required to operate and maintain system

Table 5.18 Treatment Process Alternatives – Advantages, Disadvantages and Issues

Treatment Alternative	Relative Construction Cost	Relative O & M Cost	Estimated Acreage Required [1,2] (Acres)	Approximate Nitrogen Removal Capabilities (mg/L)[(4)]	Relative Energy Usage	"Good Neighbor" Features
Suspended Growth Activated Sludge						
Extended Aeration MLE	Moderate	Moderate	6	Probably less than10	Moderate	• Odor treatment as necessary • Low noise/enclosable equipment • Covered facility not cost-effective
Membrane Bio-Reactor (MBR)	High	Moderate	4[3]	Probably less than10	High	• Odor treatment as necessary • Low noise/enclosable equipment • Covered facility for multi-use options feasible
BIOLAC®	Low	Low	10	Probably less than10	Low	• Basin size prohibits odor control • Low noise/enclosable equipment • Covered facility not feasible
Sequencing Batch Reactor (SBR)	Moderate	Moderate	6	Probably less than10	Moderate	• Odor treatment as necessary • Low noise/enclosable equipment • Covered facility not cost-effective
Oxidation Ditch	Moderate	Moderate	8	Probably less than10	Moderate	• Odor control as necessary but costly for oxidation ditch • Low noise/enclosable equipment • Covered facility not feasible
Attached-Growth Fixed Media						
Trickling Filters	Moderate	Moderate	5	Probably greater than 10	Low	• Odor control as necessary • Low noise • Covered facility not feasible
Rotating Biological Contactors (RBCs)	Moderate	Moderate	4-6	Probably greater than 10	Low	• Odor treatment as necessary • Low noise • Covered facility not cost-effective
Packed Bed Filters	High	Moderate	4-6	Probably greater than 10	Low	• Odor control as necessary • Low noise • Covered facility not feasible

Table 5.18 Treatment Process Alternatives – Advantages, Disadvantages and Issues

Treatment Alternative	Relative Construction Cost	Relative O & M Cost	Estimated Acreage Required [1,2] (Acres)	Approximate Nitrogen Removal Capabilities (mg/L)[(4)]	Relative Energy Usage	"Good Neighbor" Features
Advanced Wastewater Treatment Ponds						
Advanced Integrated Wastewater Pond System (AIWPS®)	Low	Moderate	64	Probably greater than 10	Low	• Pond size prohibits odor control • Low noise/enclosable equipment • Covered facility not feasible
Facultative Ponds and Constructed Wetlands	Low	Low	60-90	Questionable /Limited Control (Probably greater than 10)	Low	• Limited control of water quality in wetlands • Pond size prohibits odor control • Low noise/enclosable equipment • Covered facility not feasible
Partially Mixed Facultative Ponds	Low	Low	20[(6)]	Questionable /Limited Control (Probably greater than 10)	Low	• Pond size prohibits odor control • Low noise/enclosable equipment • Covered facility not feasible

Notes:

1) Based on Los Osos Wastewater Management Plan Update (Ripley Pacific Team, 2006).
2) Based on Final Project Report (Montgomery Watson Americas, 2001).
3) TRI-W site was 8 acres. However, a significant portion of the space is necessary for community amenities. Acreage estimated is for general MBR facility to be consistent with extended aeration MLE and other alternatives.
4) Processes evaluated are not acceptable for extremely low nitrogen levels required for creek discharge and groundwater injection. A process such as Bardenpho Aeration would be required to achieve sufficient nutrient removal.
5) Costs are relative to an Extended Aeration MLE facility. Conceptual level costs will be developed as part of the detailed evaluation process.
6) Estimated acreage not presented in previous studies. Estimate is based on information from the Wallace Group.

Table 5.19 Effluent Reuse and Disposal Alternatives – Advantages, Disadvantages and Issues

Disposal/Reuse Alternative	Sufficient Local Capacity for all flow?	Winter Storage Required	Affect on Sea Water Intrusion	Treatment Level	Other Issues
Unrestricted Reuse - Urban	No, 132 ac-ft/yr identified	This alternative can only accommodate small fraction of flow year round	Helps mitigate	Disinfected Tertiary	• Can fit future development with purple pipe • Can be used for nitrogen removal
Unrestricted Reuse - Agriculture	Possibly - depends on local farmers' cooperation and using land outside basin Need 500 - 800 acres	Yes, 500 to 650 ac-ft	Helps mitigate if applied within basin, to a lesser degree than urban reuse	Disinfected Tertiary	• Farmers' response to idea has been mixed • Possibility of in-lieu exchange of reuse water for Agricultural well water • Can be used for nitrogen removal
Percolation Pond	Yes	No	Helps mitigate if located within basin	Disinfected Secondary 23 or 2.2	• Must be downwind of residential areas • Area lost to agriculture • Possible loss of biological resources
Leachfield	Not at Broderson Site (limited to 800,000 gpd with harvest wells, 400,000 without harves wells). Would require many sites (more than identified in past reports)	No, if sized for all flow	Helps mitigate if located within basin	Disinfected Secondary 23 or 2.2	• Harvest wells increase capacity, but harvest water disposal is additional issue • Additional cost to transport effluent to west of town (Broderson site) • Area lost to agriculture • Possible loss of biological/archeological resources
Sprayfield	Possibly - depends on using land outside basin Need approximately 600 acres	Yes	Does not address intrusion - most sites outside basin	Disinfected Secondary 23	• Can be used for nitrogen removal • Changes natural wet/dry seasonal cycle, affecting local species
Creek Discharge	Yes	No	Does not address intrusion	Disinfected Tertiary	• Stringent regulations • Species established due to increased flows will be afforded protections
Constructed Terminal Wetlands	Yes	No, if sized for all flow	Helps mitigate if located within basin	Disinfected Secondary 23	• Could be protected by federal and state laws once established • Provides habitat and recreation area
Direct Groundwater Injection	Yes	No	Helps mitigate if located within basin	Disinfected Tertiary with Advanced Oxidation and Reverse Osmosis	• Stringent regulations • Harvest wells increase capacity, but harvest water disposal is additional issue • Possible disruption of biological/archeological resources

Table 5.20 Solids Handling Alternatives – Advantages, Disadvantages and Issues

Solids Treatment	Considerations for Alternative Selection
Sub-Class B Biosolids	Least expensive construction cost Future flexibility for inclusion of digestion and/or composting Most expensive hauling costs Relatively low annual O&M costs Most restrictive disposal option Low acreage requirements Odor problems likely if solar drying used
Digested Class B Biosolids	Relatively high construction cost Future flexibility for inclusion of composting Relatively low annual O&M costs Moderate hauling costs Ability to implement cogeneration (if cost effective)
Heat Dried Class B Biosolids	Least expensive hauling costs (except for local recycling) Moderate to high construction cost Moderate annual O&M costs Low acreage requirements Energy intensive process - economics mostly proportional to price of natural gas
Composted Class B Biosolids	Relatively high construction cost High annual O&M costs Less land required as compared to composting Class A Composting requires large amounts of land More restrictive disposal options as compared to Class A
Composted Class A Biosolids	Relatively high construction cost High annual O&M costs Least restrictive disposal option Composting requires large amounts of land
Digested/ Composted Class A Biosolids	Most expensive alternative overall High annual O&M costs Least restrictive disposal option Composting requires large amounts of land Ability to implement cogeneration (if cost effective)

Table 5.21 Treatment Facility Site Alternatives – Advantages, Disadvantages and Issues

Property	APN	Acre-age	Description/ Topography	Flood Hazard	Access to Infrastructure	Agricultural Land	Biological Resources	Archaeological Resources	Hydro-Geology, Soils and Geologic Hazards	Visual Resources	Proximity of Sensitive Receptors	Proximity to Collection Area and Disposal Sites	Other Site-Specific factors	Advantages	Disadvantages
Cemetery Property	074-222-014	48.1	Rectangular parcel that slopes gently downward to the north; westerly boundary slopes downward to the west to a dirt road that provides access to surrounding farming operations; southerly third of the site is used for a cemetery, about 7 acres in the northwest corner is cultivated with row crops, with the remainder fallow; no trees, or other natural features; useable portion of site is about 22 acres.	None	Close to LOVR, with level, unimproved road bordering on the east that intersects LOVR opposite Clark Valley Road No public water supply Electricity at LOVR?	Class III Northwest portion appears irrigated No LCA contract	No apparent habitat value	Previously identified archaeological site (site 25)	Soils are suitable for building No landslides Potential for Los Osos fault	Site is close to LOVR and visible to passing motorists Gently sloping terrain may help reduce apparent height /prominence of buildings	Cemetery immediately adjacent to the south Residences on five-acre lots adjacent to the west Surrounding properties are ag operations	Useable portion of site is within one eighth mile of LOVR Site appears large enough to support some level of on-site disposal	No known easements or other restrictions	Effective size of the site (about 22 acres) is sufficient to accommodate a wide range of treatment technologies and on-site disposal Accessible from LOVR via intersection with Clark Valley Road No apparent habitat value No known private easement constraints Topography may allow for screening from LOVR Close to service area Less prime farm land, no LCA contract No potential for flooding.	Archaeological resources on property Close to cemetery and closer to residences to the west Expansion plans of cemetery are unknown and may affect availability Los Osos fault may be present Expansion plans for cemetery unknown
Giacomazzi	067-011-022	37.1	Rectangular parcel that slopes gently downward to the north and east toward an ephemeral drainage that extends along the easterly portion of the site to Warden Lake (offsite); collection of farm-related buildings along the western border; level areas have been cultivated with row crops (irrigation?); numerous tall trees around the buildings and in the drainage channel; useable portion of site is about 20 acres.	None; however, drainage channel conveys seasonal runoff	Close to LOVR, with level, unimproved road bordering on the east that intersects LOVR opposite Clark Valley Road No public water supply Electricity at LOVR?	Class III No LCA contract	Ephemeral drainage and surrounding sloping (uncultivated) areas support native and non-native grasses Numerous tall trees in channel and adjacent to buildings Drainage channel may support riparian species	Previously identified archaeological site (site 25) may extend onto this site	Soils are suitable for building No landslides Potential for Los Osos fault	Site is about one third mile from LOVR and partially visible to passing motorists Gently sloping terrain may help reduce apparent height /prominence of buildings	Cemetery is about one quarter mile to the south Residences on five-acre lots adjacent to the south and west Surrounding properties are ag operations	Useable portion of site is within one eighth mile of LOVR Site appears large enough to support some level of on-site disposal	No known easements or other restrictions	Effective size of the site (about 20 acres) is sufficient to accommodate a wide range of treatment technologies and on-site disposal Accessible from LOVR via intersection with Clark Valley Road No known private easement constraints Topography may allow for screening from LOVR Close to service area Less prime farm land, no LCA contract More removed from receptors and visibility from LOVR.	Ephemeral drainages may pose drainage issues with design and may support sensitive biological resources Archaeological resources may extend onto property from the south Los Osos fault may be present Requires access over intervening properties.

Table 5.21 Treatment Facility Site Alternatives – Advantages, Disadvantages and Issues

Property	APN	Acre-age	Description/ Topography	Flood Hazard	Access to Infrastructure	Agricultural Land	Biological Resources	Archaeological Resources	Hydro-Geology, Soils and Geologic Hazards	Visual Resources	Proximity of Sensitive Receptors	Proximity to Collection Area and Disposal Sites	Other Site-Specific factors	Advantages	Disadvantages
Andre 2	067-031-011	9.87	Narrow, triangular shaped parcel bordering LOVR; site slopes gently downward to the north; one small building; access provided from adjacent parcel in common ownership; one group of large trees that follows an ephemeral drainage that crosses the northerly portion of the site; useable area of site is about 9 acres, but narrow triangular shape limits development flexibility.	None; however, drainage channel conveys seasonal runoff	Borders LOVR, with level, unimproved road providing access from adjacent property to the west that intersects LOVR east of Clark Valley Road No public water supply Electricity at LOVR?	Class III No LCA contract	Site supports native and non-native grasses Ephemeral drainage contains numerous tall trees in channel	No known archaeological sites	Soils are suitable for building No landslides Potential for Los Osos fault	Site is adjacent to LOVR where the largest developable area is also located Would be highly visible to passing motorists Gently sloping terrain may help reduce apparent height /prominence of buildings, but site boundaries narrow to the north	Cemetery is about one quarter mile to the west Residences on five-acre lots are about one-half mile to the west and to the south Cluster ag-related buildings (including two residences) on properties to the east Church is located along LOVR about one-quarter mile to the west Surrounding properties are ag operations	Most useable portion of site is adjacent to LOVR Site appears too small and irregularly shaped to support on-site disposal	No known easements or other restrictions	Directly accessible from LOVR No known private easement constraints Topography may allow for screening from LOVR Slightly farther from service area but abuts LOVR Less prime farm land, no LCA contract More removed from receptors No known archaeological resources	Effective size (about 9 acres) and triangular shape may limit the types of treatment and/or disposal technologies. Useable portion of site is fairly visible from LOVR. Ephemeral drainage may support some habitat value. Vehicle speeds on LOVR are high in this area, which would likely require channelization (east-bound left turn lane, west-bound deceleration lane) for vehicle access.
Morosin /FEA	067-171-084	81.2	Irregularly shaped parcel located south of LOVR on the east side of Clark Valley Road at the base of the Irish Hills; southerly half of the site slopes upward into the foothills and is composed of native vegetation; northerly half of site is relatively flat and has been cultivated with row crops; site contains a church with parking and access road on a small knoll at the northerly border of the site; cluster of ag-related buildings located at the base of the foothills; water tank is located about 100 meters upslope from the ag buildings; useable area of site is about 35 acres.	None	Close to LOVR, with level, borders Clark Valley Road, which is a paved, two-lane county road No public water supply Electricity?	Class III on the northerly 35 acres Native soils and vegetation on the remainder No LCA contract on site Property adjacent to the west is governed by an LCA contract	Southerly (and un-buildable) portion of the site is composed of native vegetation which may support special status plant and animals species Cultivated area appears to have no habitat value No creeks or ephemeral drainages	No known archaeological sites	Soils on level portion of site are suitable for building No landslides Potential for Los Osos fault	Site borders Clark Valley Road which provides access to a small number of ranches and farms in the Clark Valley to the south Site is about one-half mile from LOVR and would be at least partially visible to passing motorists Intervening properties are mostly level and cultivated periodically with row crops	Church located on site Various farming /equestrian operations on surrounding properties of varying size Residences on five-acre site located about one mile to the west	Useable portion of site is within one half mile of LOVR Site appears large enough to support some level of on-site disposal	PG&E easement affects westerly 420 feet of site where buildings are prohibited Property immediately adjacent to the north is subject to a conservation easement	Effective size of the site (about 35 acres) is sufficient to accommodate a wide range of treatment technologies and on-site disposal Accessible from LOVR via intersection with Clark Valley Road Less visible from LOVR which may reduce need for screening Less prime farm land, no LCA contract More removed from receptors No known archaeological resources No flooding issues	Los Osos fault may be present Somewhat farther to service area than other sites Church and housing located on property Sensitive biological resources upslope to the south PG&E electrical transmission line easement affects the westerly 420 feet of site where buildings would not be allowed.

Table 5.21 Treatment Facility Site Alternatives – Advantages, Disadvantages and Issues

Property	APN	Acre-age	Description/ Topography	Flood Hazard	Access to Infrastructure	Agricultural Land	Biological Resources	Archaeological Resources	Hydro-Geology, Soils and Geologic Hazards	Visual Resources	Proximity of Sensitive Receptors	Proximity to Collection Area and Disposal Sites	Other Site-Specific factors	Advantages	Disadvantages
Branin	067-011-020	42.2	Irregularly shaped lot north of LOVR and adjacent to Warden Lake which consists of native wetland and riparian vegetation; site slopes to the north toward Warden lake and contains two ephemeral drainages; useable portion of the site appears to be periodically cultivated and consists of 15 - 25 acres.	Northerly third of site lies within the flood plain of Los Osos Creek /Warden Lake	Close to LOVR, but no apparent improved access No public water supply Electricity at LOVR?	Class III on the southerly 25 acres Native soils and wetland /riparian vegetation on the remainder No LCA contract on site	Northerly third of the site is composed of native vegetation which may support special status plant and animals species Cultivated area appears to have no habitat value Ephemeral drainages appear to have limited habitat	Previously identified archaeological site (site 13) extends onto this site	Soils on level portion of site are suitable for building May be potential for landslides on slopes leading down to Warden Lake Potential for Los Osos fault	Site is about two- thirds mile from LOVR and marginally visible to passing motorists Sloping terrain may help reduce apparent height /prominence of buildings	Cemetery is about two-thirds mile to the south Residences on five-acre lots located about two-thirds mile to the south and west Surrounding properties are ag operations	Useable portion of site is about two-thirds mile from LOVR, but appears to have no improved access Site appears large enough to support some level of on-site disposal	No known easements or other restrictions	Effective size of the site (about 15 - 25 acres) is sufficient to accommodate a wide range of treatment technologies and some on-site disposal Topography may allow for screening from LOVR Less prime farm land, no LCA contract More removed from receptors and visibility from LOVR	Ephemeral drainages may pose drainage issues with design and may support sensitive biological resources Site drains toward Warden lake, a tributary of Los Osos Creek Los Osos fault may be present Northerly portion of site (Warden Lake area) is subject to flooding Subject to agricultural preserve Requires access over intervening properties
Gorby	074-225-009	51.7	Irregularly-shaped lot located south of LOVR adjacent to the east side of Los Osos Creek; southerly half of the site slopes upward into the foothills of the Irish Hills and contains native vegetation; the north-westerly portion is level and contains a dwelling and equestrian facilities that include horse paddocks and riding areas. Several ornamental trees occupy the northwesterly portion of the site; level buildable portion of the site is triangular and consists of about 20 – 25 acres.	Site borders Los Osos Creek which is subject to periodic flooding in major storm events Buildable area appears to be outside the 100 year flood plain	Two lane dirt road provides access to LOVR opposite Lariat Drive No public water supply Electricity?	Class I on level area No LCA contract	Southerly (and un-buildable) portion of the site is composed of native vegetation which may support special status plant and animals species Los Osos Creek supports mature native riparian vegetation Equestrian area appears to have no habitat value	Numerous archaeological sites have been identified along Los Osos Creek which have been mapped to this property	Soils on level portion of site are suitable for building No landslides Oetential for Los Osos fault	Site is about two- thirds mile from LOVR and marginally visible to passing motorists Shape of lot and intervening vegetation may help reduce prominence of buildings	Dwellings on five-plus acre lots located immediately to the west of Los Osos Creek Mobile home park located within one-quarter mile to the northwest To the north are large-lot subdivisions with ag-related operations To the east is a church	Useable portion of site is about two-thirds mile from LOVR with access provided by unimproved road which also serves the intervening agricultural operations Site may be large enough to support some level of on-site disposal, including creek discharge	No known easements or other restrictions	Buildable area of the site (about 6 - 8 acres) is sufficient to accommodate some of the treatment technologies May be accessible from LOVR Less visible from LOVR	Los Osos fault may be present Los Osos creek is subject to flooding Buildable area is Class I agricultural land and subject to agricultural preserve unless currently developed area used (6 - 8 acres) Sensitive receptors to the west of creek Vehicle speeds on LOVR are high in this area, which would likely require channelization (west-bound left turn lane, east-bound deceleration lane) for vehicle access; Creek and upland area support sensitive biological resources Known unwilling seller

Table 5.21 Treatment Facility Site Alternatives – Advantages, Disadvantages and Issues

Property	APN	Acre-age	Description/ Topography	Flood Hazard	Access to Infrastructure	Agricultural Land	Biological Resources	Archaeological Resources	Hydro-Geology, Soils and Geologic Hazards	Visual Resources	Proximity of Sensitive Receptors	Proximity to Collection Area and Disposal Sites	Other Site-Specific factors	Advantages	Disadvantages
Robbins 1	067-031-037	41.1	Mostly rectangular-shaped lot abutting the north side of LOVR east of Clark Valley Road; site contains at least one dwelling and slopes to the north toward Warden Lake; large mature trees surround the farm buildings; site may be used for grazing; buildable portion of the site is about 30 acres.	Northerly portion of site lies within the flood plain of Warden Lake	Site abuts LOVR No public water supply Electricity?	Class III on the southerly 30 acres Native soils and wetland /riparian vegetation on the remainder No LCA contract on site	Northerly portion of the site is composed of native vegetation /wetlands which may support special status plant and animals species Fallow area appears to have limited habitat value	No known archaeological sites	Soils on level portion of site are suitable for building No landslides Potential for Los Osos fault	Site is adjacent to LOVR, and would be fairly visible to passing motorists Gently sloping terrain may help reduce apparent height /prominence of buildings	Cemetery and residences on five-acre lots are about one mile to the west One building (residence) on property to the east Church is located along south side of LOVR about one-half mile to the west Surrounding properties are ag operations	Site abuts LOVR and appears large enough to support some level of on-site disposal	No known easements or other restrictions	Effective size of the site (about 30 acres) is sufficient to accommodate a wide range of treatment technologies and on-site disposal Directly accessible from LOVR No known private easement constraints or archaeological resources Topography may allow for screening from LOVR Less prime farm land, no LCA contract More removed from receptors and visibility from LOVR	Site drains toward Warden lake, a tributary of Los Osos Creek Los Osos fault may be present Northerly portion of site (Warden lake area) is subject to flooding Vehicle speeds on LOVR are high in this area, which would likely require channelization (east-bound left turn lane, west-bound deceleration lane) for vehicle access Furthest property east of service area
Robbins 2	067-031-38	43.5	Mostly rectangular-shaped lot abutting the north side of LOVR east of Clark Valley Road; site slopes to the north toward Warden Lake; site may be used for grazing; buildable portion of the site is about 35 acres.	Northerly portion of site lies within the flood plain of Warden Lake	Site abuts LOVR No public water supply Electricity?	Class III on the southerly 35 acres; native soils and wetland/riparian vegetation on the remainder No LCA contract on site	Northerly portion of the site is composed of native vegetation /wetlands which may support special status plant and animals species Fallow area appears to have limited habitat value	No known archaeological sites	Soils on level portion of site are suitable for building No landslides Potential for Los Osos fault	Site is adjacent to LOVR, and would be fairly visible to passing motorists Gently sloping terrain may help reduce apparent height /prominence of buildings	Cemetery and residences on five-acre lots are about one mile to the west; at least two buildings (residences) on property to the east Church is located along south side of LOVR about one-half mile to the west Surrounding properties are ag operations	Site abuts LOVR and appears large enough to support some level of on-site disposal	No known easements or other restrictions	Effective size of the site (about 35 acres) is sufficient to accommodate a wide range of treatment technologies and on-site disposal Directly accessible from LOVR No known private easement constraints or archaeological resources Topography may allow for screening from LOVR Less prime farm land, no LCA contract More removed from receptors and visibility from LOVR	Less level than other sites; undulating topography. Site drains toward Warden lake, a tributary of Los Osos Creek Los Osos fault may be present Northerly portion of site (Warden lake area) is subject to flooding Vehicle speeds on LOVR are high in this area, which would likely require channelization (east-bound left turn lane, west-bound deceleration lane) for vehicle access Second furthest property east of service area

Table 5.21 Treatment Facility Site Alternatives – Advantages, Disadvantages and Issues

Property	APN	Acre-age	Description/ Topography	Flood Hazard	Access to Infrastructure	Agricultural Land	Biological Resources	Archaeological Resources	Hydro-Geology, Soils and Geologic Hazards	Visual Resources	Proximity of Sensitive Receptors	Proximity to Collection Area and Disposal Sites	Other Site-Specific factors	Advantages	Disadvantages
Tonini Ranch	067-031-001	645	Irregular shaped ranch land bounded by the north and east by Turri Road; located north of LOVR approximately 2 miles from the urban area; northwesterly portion of the site consists of steeply sloped hills and ravines with native vegetation. southeasterly portion of the site consists of range land and cultivated farm land; existing historic ranch house and out-building near center of parcel. buildable area is approximately 100 acres.	None; however, drainage channel conveys seasonal runoff	Site abuts Turri Road No public water supply Electricity?	Class II irrigated on approximately 100 acres. Williamson Act Contract	Northwesterly portions of the site are composed of native vegetation which may support special status plant and animals species Cultivated area appears to have no habitat value Ephemeral drainages appear to have limited habitat	Archaeological sites identified	Soils are suitable for building No landslides Potential for Los Osos fault	Site is close to Turri Road and visible to passing motorists; is distant from LOVR with limited visual impact Gently sloping terrain may help reduce apparent height /prominence of buildings	Surrounding properties are ag operations	Useable portion of site is approximately 2 miles from service area of LOVR Site is large enough to support large amount of on-site disposal	No known easements or other restrictions in potential building areas	Effective size of the site (over 100 acres) is sufficient to accommodate a wide range of treatment technologies and on-site disposal Distance from neighbors and sensitive receptors Accessible from LOVR via Turri Road No apparent habitat value or known private easement constraints in potential building areas. Topography and distance allows for screening from LOVR No potential for flooding.	Archaeological resources on property Furthest distance from service area Prime farm land, <u>and</u> LCA contract Located in scenic viewshed of Turri Road.
Mid-Town (aka Tri-W)	074-229-017	11 +	This site was rough graded for the treatment plant and drainage basin. It generally sloped gently south to north.	None; however, drainage channel conveys seasonal runoff and will require a large drainage basin.	The site is served by water, gas and electricity. The plant would require additional electrical capacity be brought to the site for operation.	Not designated agriculture.	Part of the highly sensitive Los Osos dune sands, home to the endangered Morro shoulderband snail, and several other sensitive species. Many snails were removed from the site during initial construction of the project. Habitat for the snail would easily return given the nature of the sandy soils.	Previously cleared for archaeological resources	Shallow groundwater table (although this varies because of slope); Soils and slopes suitable for construction; Proximate to presumed Strand B of Los Osos fault (disputed by Cleath & Associates)	The site is in town, and adjacent to the heavily traveled LOVR. Views of Morro Rock would be obscured by the treatment facilities. CCC report said net impact was beneficial because views to Morro Rock were opened up.	This site is proximate on three sides to developed land. Residential to the south and west, community facilities to the east. Three churches are nearby.	This site is central to the collection system. Because it lies within the area of collection, it is as efficient a location as would likely be found (i.e. no great advantage to any other site in town). It is as close to the Broderson disposal site as possible without going up the hill to the south.	The site is under the ownership of the LOCSD. Because of previous design, permitting and litigation efforts, it may have a considerably shorter time required to begin construction. Tri-W requires mitigation for ESHA loss.	Accessible from LOVR No known private easement constraints Located in center of service area Previously purchased, permitted and graded for LOCSD project	Effective size of the site (about 10 acres) limits treatment technologies to MBR process Adjacent to receptors and directly visible from LOVR. Part of the highly sensitive Los Osos dune sands, home to the endangered Morro shoulderband snail, and several other sensitive species Significant drainage area requires drainage basin

CHAPTER 6:SELECTION OF AN ALTERNATIVE

6.1. INTRODUCTION

The alternatives evaluation process described in Chapter 5, above, includes extensive review of both monetary and non-monetary factors. The evaluation includes engineering feasibility and cost evaluations of a broad range of alternatives, a co-equal environmental analysis, public outreach and input, including a community-wide survey on alternatives, and a formal, public decision making process at the County Planning Commission and Board of Supervisors.

6.2. PRESENT WORTH COST ANALYSIS

The life cycle cost evaluations completed for the engineering review are detailed in the Fine Screening Report and the project Technical Memoranda, with summaries of the cost estimates presented in Section 5.11, above. These estimates cost are the basis for the present worth cost analysis in Table 6.1 through Table 6.6. The “real” federal discount rate of 2.7% was used from Appendix C of OMB Circular A-94 to determine the present worth of operations and maintenance costs for a 30-year life. The operations and maintenance cost estimates include consideration of periodic replacement of short-lived assets.

Table 6.1 Collection System Alternatives Present Worth ($ Million)

	Capital		O&M		O&M -- PV		Total -- PV	
	Low	High	Low	High	Low	High	Low	High
Gravity	82.2	89.6	0.48	0.48	9.78	9.78	$92.0	$99.4
Low Pressure Grinder Pump	75.6	96.9	1.50	2.00	30.57	40.77	$106.2	$137.7
STEP/STEG	65.0	81.4	0.79	0.79	16.10	16.10	$81.1	$97.5

The apparent low cost collection system alternatives are gravity or STEP/STEG.

Table 6.2 Solids Handling Alternatives Present Worth ($ Million)
(with belt filter press and no outdoor solar drying)

	Capital		O&M		O&M -- PV		Total -- PV	
	Low	High	Low	High	Low	High	Low	High
with Gravity Collection								
Fac Ponds w/Gravity	0.0	0.0	0.04	0.05	0.82	1.02	$0.8	$1.0
Sub-Class B w/Gravity	2.6	3.3	0.63	0.66	12.84	13.45	$15.4	$16.8
Digested Class B w/Gravity	5.3	6.0	0.63	0.66	12.84	13.45	$18.1	$19.5
Heat Dried Class B w/Gravity	5.5	6.2	0.60	0.62	12.23	12.64	$17.7	$18.8
Compost Class B w/Gravity	3.6	4.3	0.68	0.71	13.86	14.47	$17.5	$18.8
Compost Class A w/Gravity	3.6	4.3	0.62	0.65	12.64	13.25	$16.2	$17.5
Digest/Compost Class A w/Gravity	6.3	7.0	0.63	0.66	12.84	13.45	$19.1	$20.5
with STEP/STEG Collection								
Fac Ponds w/STEP	0.0	0.0	0.03	0.04	0.61	0.82	$0.6	$0.8
Sub-Class B w/STEP	1.4	2.4	0.28	0.38	5.71	7.75	$7.1	$10.1
Digested Class B w/STEP	2.8	4.2	0.28	0.38	5.71	7.75	$8.5	$11.9
Heat Dried Class B w/STEP	3.0	4.4	0.30	0.42	6.11	8.56	$9.1	$13.0
Compost Class B w/STEP	1.9	3.2	0.35	0.48	7.13	9.78	$9.0	$13.0
Compost Class A w/STEP	1.9	3.2	0.33	0.46	6.73	9.38	$8.6	$12.6
Digest/Compost Class A w/STEP	3.3	5.0	0.33	0.46	6.73	9.38	$10.0	$14.4

The apparent low cost solids handling alternative for extended aeration processes is hauling sub-Class B biosolids for off-site disposal.

Table 6.3 Treatment Process Alternatives Present Worth ($ Million)
(with denitrification and tertiary recycled water)

	Capital	O&M	O&M -- PV	Total -- PV
with Gravity Collection				
MLE w/Gravity	25.7	0.80	16.31	$42.0
BIOLAC w/Gravity	20.7	0.80	16.31	$37.0
SBR w/Gravity	26.5	0.76	15.49	$42.0
Ox Ditch w/Gravity	23.1	0.79	16.10	$39.2
Trickling Filter w/Gravity	31.4	1.11	22.62	$54.0
Fac Ponds w/Gravity	26.1	0.98	19.98	$46.1
MBR w/Gravity	55.0	0.74	15.08	$70.1
with STEP/STEG Collection				
MLE w/STEP	26.2	0.92	18.75	$45.0
BIOLAC w/STEP	21.3	0.90	18.34	$39.6
SBR w/STEP	26.5	0.94	19.16	$45.7
Ox Ditch w/STEP	23.6	0.92	18.75	$42.4
Trickling Filter w/STEP	28.0	1.05	21.40	$49.4
Fac Ponds w/STEP	24.6	0.98	19.98	$44.6
MBR w/STEP	58.6	0.99	20.18	$78.8

The apparent low cost treatment alternative when considering solids handling is Facultative Ponds. Next low cost alternatives are BIOLAC and Oxidation Ditch.

Table 6.4 Effluent Reuse and Disposal Alternatives Present Worth ($ Millions)								
Individual reuse and disposal components								
	Capital		O&M		O&M -- PV		Total -- PV	
	Low	High	Low	High	Low	High	Low	High
Conservation Program	1.0	5.0	0.00	0.00	0.00	0.00	$1.0	$5.0
Storage Ponds (30 – 290 af)	0.400	3.900	0.00	0.00	0.00	0.00	$0.4	$3.9
Sprayfields								
Sprayfield Piping	1.210	1.650						
Sprayfield Development	0.020	0.080						
Maintenance Equipment	0.700	2.800						
Land Acquisition	1.800	7.000						
Total Sprayfields	3.730	11.530	0.07	0.28	1.37	5.63	$5.1	$17.2
Broderson Leachfields								
Recycled Water Return Main	2.200	2.900						
Recycled Water Pump Station	0.780	1.500						
Leachfield Development	2.367	2.367						
Total Leachfields	5.347	6.767	0.25	0.26	5.10	5.30	$10.4	$12.1
Urban and Ag Reuse								
Recycled Water Turn Outs	1.400	2.100						
Recycled Water Return Main	Incl w/ Broderson							
Recycled Water Pump Station	Incl w/ Broderson							
Total Urban and Ag Reuse	1.400	2.100	0.03	0.04	0.69	0.90	$2.1	$3.0
Draft EIR Environmentally Superior Alternative (\$1M conservation program, sprayfields and Broderson leachfields)								
Conservation Program	1.0	1.0	0.00	0.00	0.00	0.00	$1.0	$1.0
Sprayfields (180 acres)	9.70	10.50	0.07	0.28	1.37	5.63	$11.1	$16.1
Spray Storage Ponds (50 af)	0.67	0.87	0.00	0.00	0.00	0.00	$0.7	$0.9
Broderson Leachfields	5.35	6.77	0.25	0.26	5.10	5.30	$10.4	$12.1
VPA 2b Total	$16.7	$19.1	$0.3	$0.5	$6.5	$10.9	$23.2	$30.1
Coastal Development Permit Conditioned Alternative ($5M conservation program, Broderson leachfields, urban and ag reuse)								
Conservation Program	5.0	5.0	0.00	0.00	0.00	0.00	$5.0	$5.0
Urban and Ag Reuse	1.40	2.10	0.03	0.04	0.69	0.90	$2.1	$3.0
Recycled Water Storage (50 af)	0.67	0.87	0.00	0.00	0.00	0.00	$0.7	$0.9
Broderson Leachfields	5.35	6.77	0.25	0.26	5.10	5.30	$10.4	$12.1
CDP Alternative Total	$12.4	$14.7	$0.284	$0.304	$5.8	$6.2	$18.2	$20.9

The apparent low cost combination of effluent reuse and disposal alternatives is the Coastal Development Permit conditioned alternative.

Table 6.5 Project Soft Costs Present Worth ($ Million)

	Capital PV	
	Low	High
Treatment Site Land Acquisition	$1.0	$3.0
Env. Permitting/Mitigation	$1.0	$2.0
Project Costs		
Administration and Environmental Reports	$5.0	$7.0
Design – Gravity Collection System	$2.5	$3.0
Design – STEP/STEG Collection System	$4.5	$6.0
Design – Treatment Facility	$2.5	$3.0
Construction Engineering	$6.0	$8.0
Project Soft Costs w/Gravity	$18.0	$26.0
Project Soft Costs w/STEP/STEG	$20.0	$29.0

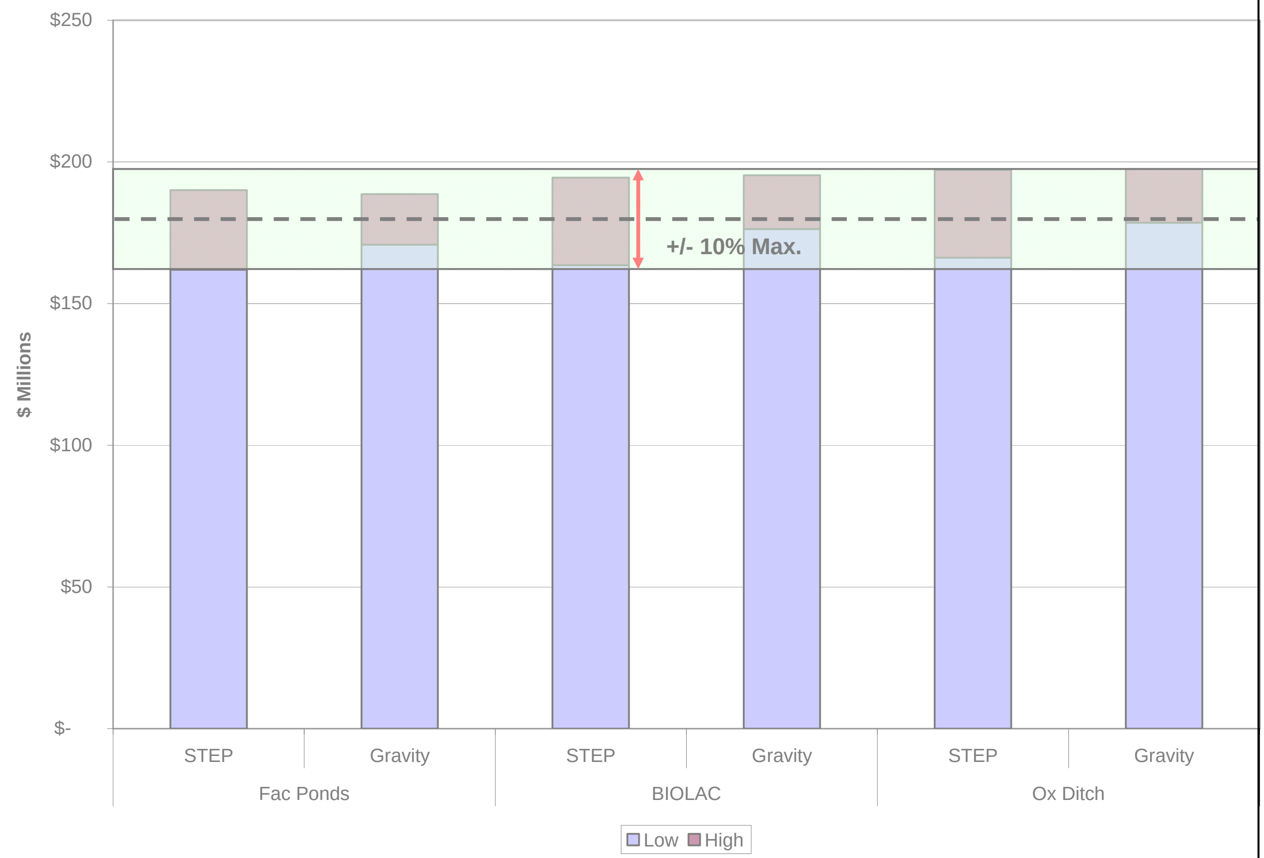
Table 6.6 Present Worth Comparison for Project Combinations of Apparent Low Cost Alternatives ($ Million)

	Collection		Treatment		Solids		Effluent		Soft Costs		Total -- PV	
	Low	High	Low	High	Low	High	Low	High	Low	High	Low	High
with Gravity Collection												
Facultative Ponds	92.0	99.4	46.1	46.1	0.8	1.0	18.2	20.9	18.0	26.0	$175.1	$193.4
BIOLAC	92.0	99.4	37.0	37.0	15.4	16.8	18.2	20.9	18.0	26.0	$180.6	$200.1
Ox Ditch	92.0	99.4	39.2	39.2	15.4	16.8	18.2	20.9	18.0	26.0	$182.8	$202.3
with STEP/STEG Collection												
Facultative Ponds	81.1	97.5	44.6	44.6	0.6	0.8	18.2	20.9	20.0	29.0	$164.5	$192.8
BIOLAC	81.1	97.5	39.6	39.6	7.1	10.1	18.2	20.9	20.0	29.0	$166.1	$197.2
Ox Ditch	81.1	97.5	42.4	42.4	7.1	10.1	18.2	20.9	20.0	29.0	$168.8	$199.9

Comparison of the present worth for several project combinations of the apparent low cost alternatives for the collection system (gravity or STEP/STEG) and treatment process (facultative ponds, BIOLAC, or oxidation ditch) demonstrates a close variance in cost estimates of +/-10% of the total estimated project cost. The variance is within the range of uncertainty for the high and low estimates of project costs and the range for each combination overlaps the ranges of the other combinations (see Figure 6.1, below).

Due to the close range of cost estimates for several viable project alternatives, non-monetary factors are also a consideration in selection of alternatives for the collection system and treatment process.

Figure 6.1 Present Worth Comparison for Apparent Low Cost Alternatives



6.3. NON-MONETARY FACTORS CONSIDERED

Multiple technology alternatives for the project are within a relative close life-cycle costs range. The ability to interchange collection system and treatment process alternatives results in a wide range of project combinations that are economically feasible. There are, however, non-monetary factors that make some options infeasible and provide direction in selecting an alternative between multiple feasible options.

a. Treatment Facility Site: The environmental review process included a broad range of potential treatment facility sites. The two most feasible site alternatives, Giacomazzi and Tonini, were co-equally analyzed in the project EIR. The formal decision making process at the County Planning Commission and Board of Supervisors further considered the potential environmental effects of each alternative. Major factors considered in the deliberations include agricultural impacts, visual impacts, and potential for water resources benefits. The decision making process resulted in the selection of the Giacomazzi site alternative and prohibited any development at the Tonini site.

b. Effluent Reuse and Disposal: No one alternative has the capacity to meet all of the project needs for effluent reuse or disposal, so several combinations of alternatives were considered in the engineering and environmental review process. The project EIR co-equally analyzed several alternatives, and the formal decision making process at the County Planning Commission and Board of Supervisors further considered the potential environmental effects of each alternative. The project was ultimately conditioned to provide tertiary treatment to produce CA Title 22 Recycled Water and to develop a recycled water reuse program that will have the greatest beneficial effect on the basin, measured by the mitigation of sea water intrusion. The reuse program includes the Broderson and Bayridge Estates leachfields and urban and agricultural irrigation reuse. The project also include 50 acre-feet of recycled water storage on approximately 10 acres of the Giacomazzi site. Disposal alternatives and irrigation outside the limits of the groundwater basin are prohibited.

c. Collection System: Life-cycle cost estimates for gravity and STEP/STEG collection system overlap, and fall within the level of uncertainty of the engineering cost estimate. Recommendation of a gravity collection system included consideration of the following non-monetary factors.

- Environmental analysis: Gravity collection system is the environmentally superior alternative with a significantly reduced greenhouse gas impact and better ability to avoid sensitive archeological areas during construction.
- Existing design level: A full design of the gravity collection system was completed, with bids received and construction underway, under the LOCSD project. The existing design level provides a high level of confidence in cost estimates and the feasibility of a gravity system. The STEP/STEG system has only been developed to a conceptual plan level. The cost estimates have a higher degree of uncertainty and certain design issues are unresolved, such as whether pump stations will be required. The feasibility of locating and installation of new septic tanks on each individual parcel, some with limited access, is unknown.
- Schedule considerations: The existing gravity design can be quickly implement by soliciting construction bids after minimal revisions to the bidding documents. Preparation of a STEP/STEG design would likely add one or more years to the project schedule. There are risks of further delay if property owners who oppose placing septic tanks on their properties raise legal challenges or if it is infeasible to locate septic tanks on a large number of properties.
- Cost escalation: Additional design costs and project delays associated with developing a STEP/STEG design can potentially escalate project costs beyond the currently estimated range, which is comparable to a gravity alternative.
- Individual property impacts: A STEP/STEG system would disproportionately impact some property owners connection costs. The estimated average cost for homeowners to complete on-lot connection work is between $2,500 and

$7,500. However, individual property owners would likely have costs well over $10,000, in addition to the project costs charged by the County.

- Overall property impacts: A STEP/STEG system is expected to have less construction impacts in the roadways, with far more impacts on private property. This alternative would disproportionately shift impacts of a public infrastructure project from the public roadway, where impacts are better able to be mitigated, to private property.
- Community survey results: The Community Advisory Survey, which was conducted in February, 2009, asked property owners and residents which collection system alternative was preferred. An overwhelming 70% preferred a gravity system, even when potential cost savings of a STEP/STEG system were considered.

d. Treatment Process: Life-cycle cost estimates for facultative ponds and for both extended aeration processes (Biolac and oxidation ditch) overlap, and fall within the level of uncertainty of the engineering cost estimate. The project EIR considered the extended aeration processes as equivalent and completed a co-equal analysis of extended aeration and facultative ponds. The formal decision making process at the County Planning Commission and Board of Supervisors further considered the potential environmental effects of each alternative and effectively eliminated the facultative pond alternative. The approved project allows either extended aeration process. For the purpose of analysis in this report, an oxidation ditch is assumed as a likely alternative to be constructed based on the following non-monetary factors.

- Site constraints: The selection of the Giacomazzi site limits the treatment facility to less than 15 acres after accounting for the recycled water storage ponds and the required setbacks from sensitive resources. Site constraints make facultative ponds infeasible at the Giacomazzi site. A Biolac is feasible on this site, however the smaller footprint of an oxidation ditch increases constructability and flexibility to meet future needs.
- Greenhouse gas impacts: Biolac and oxidation ditch process have similar greenhouse gas impacts. Facultative ponds have the greatest impact of the three alternatives at 33% greater than Biolac.
- Effluent total nitrogen limits: The project is expected to have Waste Discharge Requirements with a stringent total nitrogen limit of 7 mg/L. Both extended aeration processes have proven records of consistently meeting this level of denitrification. Facultative ponds are not expected to be able to meet the requirement without additional treatment processes added. This extra level of operational complexity with facultative ponds increases the chance of non-compliance with regulatory discharge requirements.
- Operational reliability: Facultative ponds may have other reliability compliance issues, in addition to meeting a total nitrogen limit of 7 mg/L. Seasonal variations can lead to increased suspended solids levels or algae problems and upset of thermal layers in the ponds can cause significant odor incidents. Biolac and oxidation ditch are relatively similar in reliability,

however the blower and diffuser system with Biolac is a potential maintenance issue not present with an oxidation ditch. Several municipal oxidation ditches of similar capacity are already in operation or planned in San Luis Obispo County, increasing the ability to recruit operators familiar with the process.

- Construction costs: The aeration basins with Biolac are constructed as lined earth ponds, compared to reinforced concrete with an oxidation ditch. At this time, cost estimates for the two processes are relatively close and are outweighed by non-monetary factors. Market volatility for construction materials must be monitored as the project moves toward the design phase to confirm the preliminary cost estimates.

e. Biosolids Handling: Hauling sub-Class B biosolids to a local disposal or recycling facility is the lowest life-cycle cost alternative and is recommended for the project. The current regulatory and economic climate is favorable for this alternative, and the option for further treatment is not precluded from being added at some future date, if regulations change. The facilities required for this alternative are a biosolids storage tank, a thickening process, a mechanical dewatering process, and loading station. All of these facilities would likely be used as part of a digesting or composting process to produce classified biosolids, if required in the future.

CHAPTER 7:PROPOSED PROJECT (RECOMMENDED ALTERNATIVE)

7.1. INTRODUCTION

The recommended alternative is the project description approved by the County Planning Commission and Board of Supervisors in 2009 through the formal environmental review process. The approved project is a combination of the many alternatives evaluated in the engineering and environmental review processes. The project consists of a gravity collection system for the entire service area, extended aeration secondary treatment process with tertiary filtration and disinfection at the Giacomazzi site, sanitary disposal of dewatered biosolids, and recycled water reuse program through sub-surface leachfields and unrestricted irrigation.

7.2. PROJECT DESIGN

a. Collection System Layout and Pumping Stations: A full collection system design was completed by the Los Osos CSD in 2004, prior to their cessation of the project and the passage of AB 2701. This design is largely the basis for the proposed project, with the exception of changes required to convey wastewater to a new treatment plant site at the eastern edge of the community. These changes consist of an additional pumping station at the Mid-Town site and a force main from this site to the treatment facility. Collection system and pumping station details are provided in Table 7.1, below. The layout of the collection system and pumping stations is provided in Figure 5.1 (Project Diagram).

b. Treatment Facility: The treatment facility will be located at the Giacomazzi site, on the eastern edge of the community. The site is 38 acres, with approximately 30 acres of useable area after avoidance and buffers for sensitive resources. The site will contain all treatment and related facilities including administration and maintenance buildings, solids processing, storm water and emergency overflow retention, recycled water storage ponds, and recycled water pump station.

   The treatment facility will be design for an average daily flow of 1.2 MGD and will consist of the following:

   - Headworks and bar screens covered for odor control
   - Extended aeration secondary treatment process (oxidation ditch assumed) designed to meet total nitrogen limit of 7 mg/L
   - Secondary clarifiers
   - Return/waste activated sludge pump station
   - Tertiary filtration with ultraviolet disinfection designed to meet California Title 22 standards for tertiary recycled water
   - Mechanical sludge dewatering (belt filter press or screw press) enclosed in a building for odor control
   - Recycled water storage ponds and pump station

The layout of the treatment facility and recycled water storage ponds is provided in Figure 7.1. Architectural renderings of the proposed building design are provided in Figure 7.2 and Figure 7.3.

Table 7.1	**Collection System Information**			
Pipelines				
Pipe Diameter	**Depth: 0-8 ft**	**Depth: 9-12 ft**	**Depth: 13-15 ft**	**Depth: 16-18 ft**
8-inch	159,256 ft	45,849 ft	2,240 ft	80 ft
10-inch	0	1,190 ft	1,300 ft	0
12-inch	0	2,413 ft	654 ft	654 ft
15-inch	0	3,561 ft	709 ft	0
18-inch	0	860 ft	600 ft	0
Pump Stations				
Name & Type	**Location**	**Peak Hour Wet Weather Flowrate (gpm)**	**Pump HP (each)**	**Stand-by Power**
Mid-Town Triplex	LOVR & Palisades	2,800	75	Yes, remote location
West Paso Triplex	3rd & Paso Robles Ave.	1,900	60	Yes, remote location
Lupine Triplex	Lupine & Donna	1,000	30	Yes
Baywood Duplex	2nd St.	310	5	Yes, remote location
East Ysabel Duplex	Santa Ysabel & So. Bay Blvd	170	10	Yes
East Paso Duplex	18th & Paso Robles Ave.	330	8	Yes
Mountain View Duplex	Santa Ynez & Mt. View	130	5	Yes
Solano Duplex	Solano & Butte	240	20	Yes
Sunny Oaks Duplex	LOVR @ Sunny Oaks	120	3	Yes
Pocket PS (13 each)	Various	7 – 34	1	No (2 – 7 hours storage)

Figure 7.1 Treatment Facility Layout

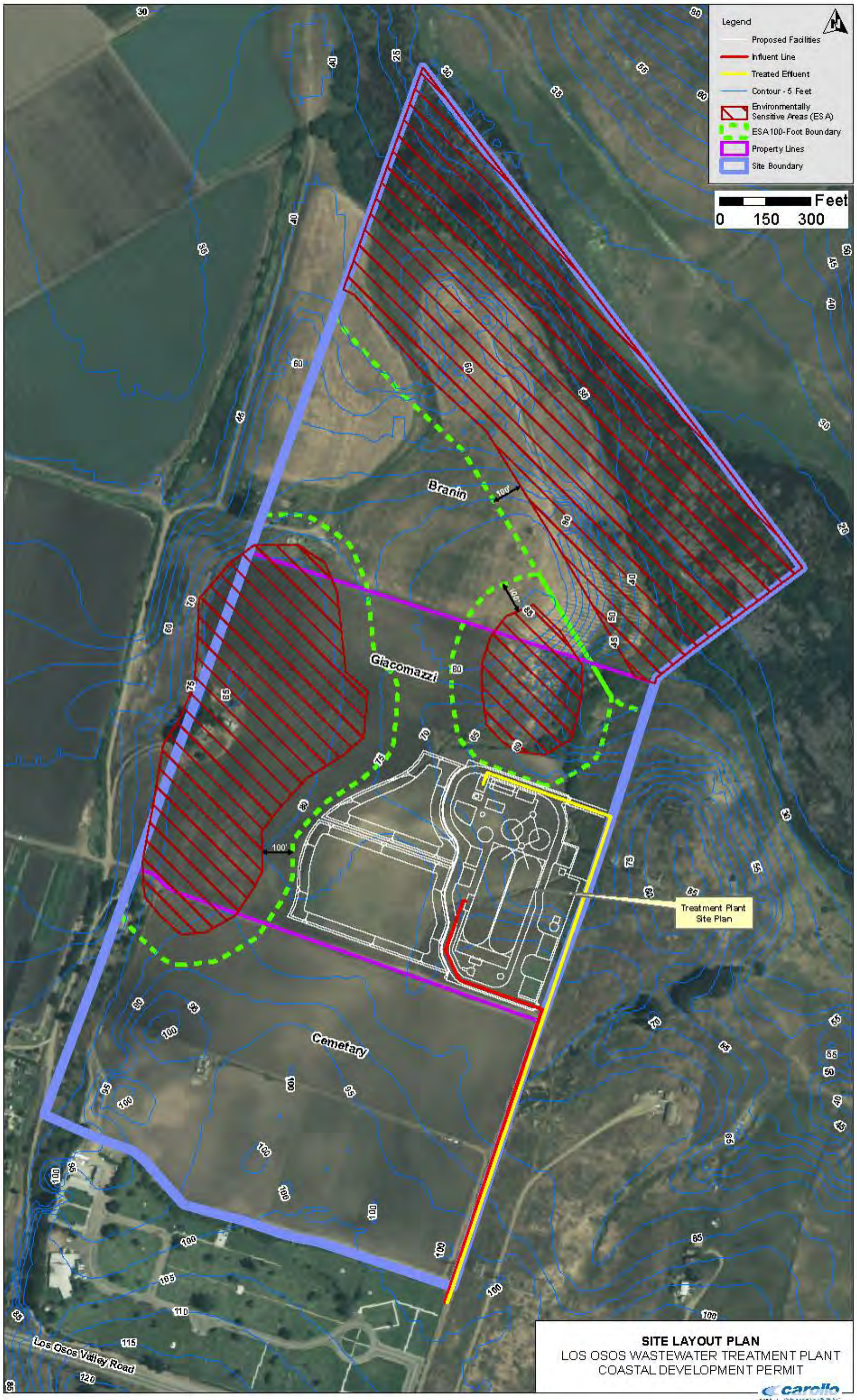
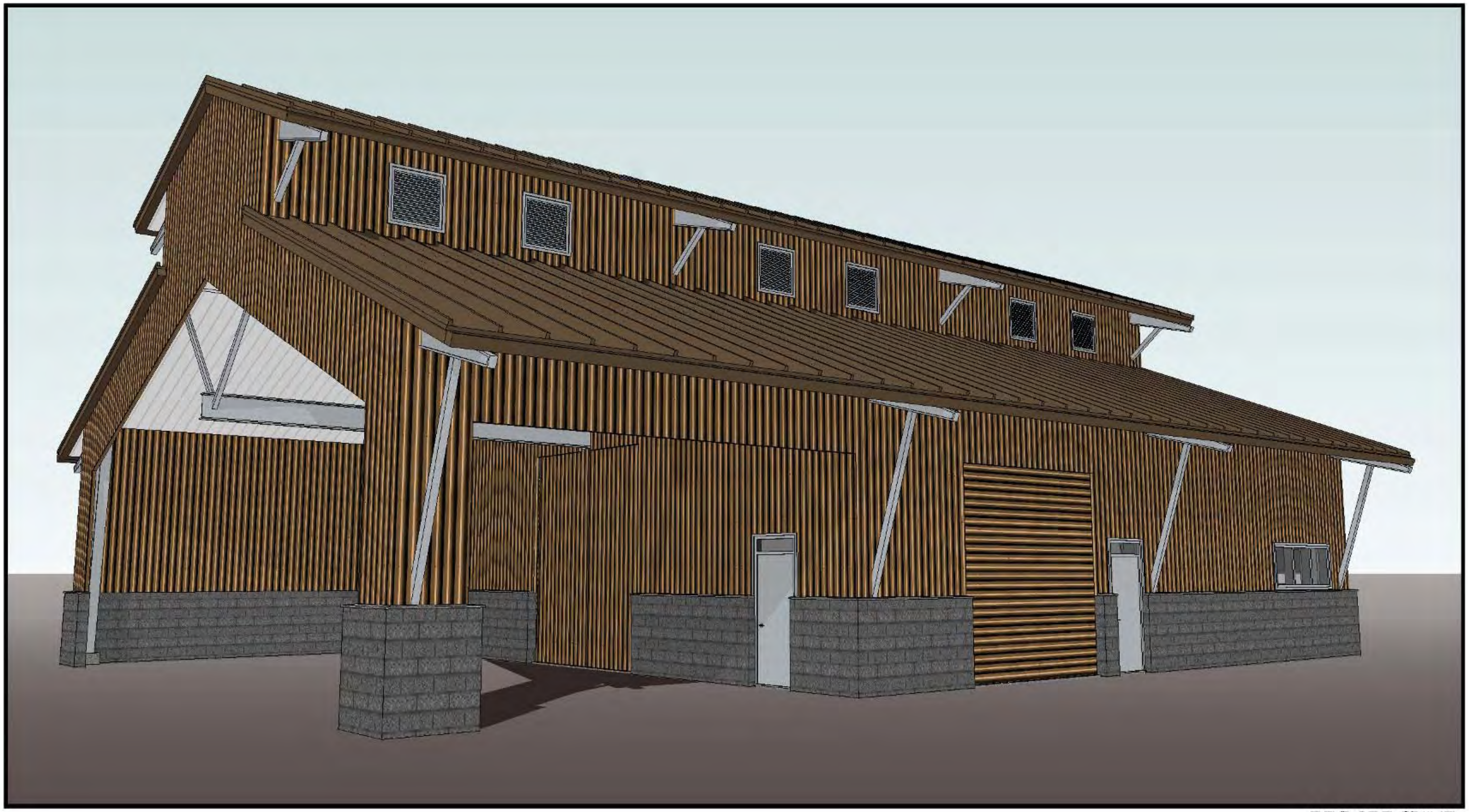


Figure 7.2 Treatment Facility Administration Building Architectural Rendering

Figure 7.3 Treatment Facility Maintenance Building Architectural Rendering



PERSPECTIVE

LOS OSOS WASTEWATER TREATMENT FACILITY

MAINTENANCE BUILDING

STEVEN D. PULTS & ASSOCIATES, LLC
SAN LUIS OBISPO, CA

COUNTY OF
SAN LUIS OBISPO, CA

c. Recycled Water Reuse: Recycled wastewater will be reused within the community or surrounding agricultural land overlying the groundwater basin according the approved conditions of the Coastal Development Permit. It will either be discharged through leachfields or directly reused for urban or agricultural irrigation. The reuse program will consist of the following:

- 50 acre-feet of storage at the treatment plant site
- A recycled water main running from the treatment plant site, through the adjacent agricultural area, to reuse sites within the community
- 8 acres of leachfields at the Broderson site, with an annual capacity of 450 acre-feet
- Utilize one acre of existing leachfieds in the Bayridge Estates sub-division with an annual capacity of 33 acre-feet
- Provide approximately 130 acre-feet of recycled water to Los Osos schools, parks, golf course, and cemetery
- Provide recycled water main turn-outs to adjacent farmlands and develop reuse agreements for approximately 100 to 200 acre-feet per year

The approved reuse program includes capacity to meet the flows from existing development that will connect to the system at project start-up. Connection of additional users, from currently undeveloped property, is specifically prohibited in the Coastal Development Permit, until certain conditions are met. These conditions include the requirement to develop a habitat conservation plan for Los Osos, develop a water management plan, and update the Local Coastal Plan to incorporate the habitat and water plans. Reuse capacity for the additional flows associated with new development is not necessary at project start-up, due to these conditions. The Coastal permit conditions effectively require a water management plan to identify the most beneficial reuse alternatives for the additional flows associated with new development, prior to any new connections to the system. The layout of the recycled water reuse sites is provided in Figure 5.1 (Project Diagram).

d. Water Conservation Program: A water conservation program will be implemented with residential and commercial fixture retrofits, appliance rebates, education, and water efficiency audits. The goal of the conservation program is to reduce indoor use by over 25% to 50 gallons per capita per day. The water conservation program will result in decreased demand on system facilities such as pump stations and treatment works, increase the operating life of the facilities, and increase operational flexibility.

7.3. TOTAL PROJECT COST ESTIMATE

Cost estimates for individual components are presented in Section 5.11. Total project cost estimate for the proposed project is summarized below. The total capital project cost expected to be financed with a combination of USDA and State Revolving Fund (SRF) financing is estimated at $173.5 M, which includes anticipated finance charges and excludes homeowner financed on-lot costs.

Table 7.2 Total Project Capital Cost Estimate

	Average Estimate ($ M)	Notes
Collection System		1
Mobilization/Demobilization	$3.9	
Gravity Sewers and Force Mains	$29.2	
Manholes	$4.5	
Shoring and Dewatering	$5.1	
Duplex Pump Stations	$2.6	
Triplex Pump Stations	$1.2	
Pocket Pump Stations	$2.4	
Standby Power Facilities	$2.5	
Misc. Facilities	$3.3	
Laterals in Right-of-Way	$9.3	
Road Restoration	$5.2	
Homeowner On-Lot Facilities	$13.3	2
Out-of-Town Conveyance	$3.4	3
Total Collection System	**$85.7**	
Treatment Process		
Secondary Process	$19.6	4
Tertiary Filtration/Disinfection	$3.5	5
Total Treatment Process	**$23.1**	
Solids Processing		
Thickening	$1.0	6
Mechanical Dewatering	$2.0	7
Total Solids Processing	**$3.0**	
Recycled Water Reuse		
Water Conservation Program	$0.0	8
Broderson Pipe and Leachfield	$6.1	
Recycled Water Turn-outs	$1.8	9
Recycled Water Storage (50 af)	$0.8	
Total Recycled Water Reuse	$8.6	
Sub-Total Construction	**$120.3**	
10% Construction Contingency	$10.7	10
Total Construction Costs	$131.0	
Cost Escalation (18.0%) to Mid-Point of Construction	$23.6	11

Table 7.2 Total Project Capital Cost Estimate		
	Average Estimate ($ M)	**Notes**
Project Soft Costs		
Water Conservation Program	$5.0	12
Admin/Environmental Reports	$6.0	
Land - Treatment Site	$2.0	
Environmental Permits/Mitigation	$1.5	
Design-Collection System	$2.7	
Design-Treatment Facility	$2.8	
Construction Management	$7.0	
Total Project Soft Costs	**$27.0**	
Total Project Costs	**$181.6**	13
Financing Costs		
Conditioned Repayment of LOSCD Default on SRF Loan	$6.5	
Interest and Issuance Charges – Interim Financing	$1.0	
Total Capital Project Costs	**$189.1**	13

(1) Collection System estimates from Fine Screening Report (FSR), Table 3.17, except as noted.
(2) Homeowner On-Lot Facilities not eligible for project financing; owner financed.
(3) Conveyance estimate from Conveyance Tech Memo, Table 7, with no micro-tunneling.
(4) Secondary treatment estimate from FSR, Tables 4.9 & 4.19.
(5) Tertiary treatment estimate from FSR, Section 4.8 for full flow.
(6) Thickening estimate from FSR, Table 5.3.
(7) Dewatering estimate from FSR, Table 5.5.
(8) Included in Project Soft Costs; no escalation on Water Conservation Program.
(9) Average of range for estimated 10,000 to 15,000 linear feet of recycled water pipeline at $143/lf.
(10) Assume 10% construction contingency, less Homeowner On-Lot Facilities.
(11) FSR, Appendix C estimated construction cost escalation at 5%, per year, from April 2007 to June 2011, the estimated mid-point of construction. The estimated construction cost escalation has been revised to reflect recent economic developments and project delays. The Engineering News Report Construction Cost Index 20-Cities Average for February, 2010 is 8671 (10.05% increase over April, 2007). Adding an assumed 3% annual escalation from February, 2010 to an assumed mid-point of construction in June, 2012, the total escalation is 18.0%.
(12) Water Conservation Program budget of $5 M required per project Coastal Development Permit conditions.
(13) Includes $15.6 M ($13.3 M + 18% escalation) for Homeowner On-Lot Facilities.

7.4. ANNUAL OPERATION BUDGET

The proposed project will provide wastewater collection and treatment services to a community that is entirely on septic systems. The development and operation of this major infrastructure project will require a variety of funding sources. In October, 2007, property assessments were established for currently developed properties that are equivalent to $24,941 per single family dwelling unit for a total of $126,722,296. Additional assessments for vacant properties are planned, subject to a second assessment vote under California Proposition 218. The assessment district for undeveloped properties will follow the same formula as for developed properties and provide an additional $27,721,704. The total property assessments of $154,444,000 will fund capital project costs that are considered "special benefits" under California assessment law. Other capital project costs which are not considered "special benefits" total approximately $12 million, plus homeowner financed on-lot facilities. The income for these non-special benefit capital costs, operations and maintenance costs, and reserve funds will be developed through user charges.

a. <u>Income – Total Revenue Requirements and Estimated Charges per EDU</u>: The total annual revenue requirements for debt service, reserves, and O&M costs are allocated between property assessments and user charges. Property assessment charges are assumed to be charged to all developed and undeveloped property in the assessment district. User charges are assumed to be charged only to currently developed property within the service area. All USDA financing is assumed to be allocated to the assessment charges. The SRF loan program will finance the remaining capital costs, which will be repaid through a combination of property assessments and user charges. All short-lived asset reserves and O&M costs are allocated to user charges.

Table 7.3 Estimated Total Revenue Requirements

Category	Total Annual Costs	Allocated to Assessments	Allocated to User Charges
Debt Service (USDA Loan)	$4,179,165	$4,179,165	$0
Debt Service Reserve (USDA Loan)	$0	$0	$0
Debt Service (SRF)	$6,284,669	$5,003,806	$1,280,863
Debt Service Reserve (SRF)	$128,086	$0	$128,086
Short-Lived Asset Reserve	$200,000	$0	$200,000
O&M	$2,370,000	$0	$2,370,000
Annual Revenue Required	$13,161,920	$9,182,971	$3,978,949

Table 7.4 Example Total Monthly Costs by User Group

Example User Group	Assessment Charge Per Unit	User Charge Per Unit	On-Lot Costs Per Unit	Total Costs Per Unit
Single Family Residence	$123.58	$60.87	$47.32	$231.77
Multi Family, 4 unit apartment or condo	$86.99	$45.66	$11.83	$144.48
Mobile Home Park, 125 unit	$33.62	$30.45	$0.38	$64.45
Single Family, Bayridge Estates/Vista De Oro Tracts	$67.06	$60.87	$0.65	$128.58
Low-Load, Non-Resid, 5 tentants, 50k ft^2	$114.47	$67.48	$9.46	$191.42
Med-Load, Non-Resid, two tentant, 15k ft^2	$89.84	$81.84	$23.66	$195.33
High-Load, Non-Resid, one tenant, 20k ft^2	$235.78	$310.78	$47.32	$593.88
Special User (septage)	$0.00	$1.95	$0.00	$1.95

b. Equivalent Dwelling Unit Calculations:

Property Assessments for Special Benefits Portion of Capital Costs: The project Assessment Engineer's Report for the project assessment district developed the calculations for "special benefit" units for various components of the project. The benefit unit calculation allocates costs to each equivalent dwelling unit (EDU) based on infrastructure needed and estimated wastewater generation. The tables below summarize the calculations in the Assessment Engineer's Report. Benefit units are apportioned to several use categories and special cases, based on wastewater generation estimates, and allocated to each project component. The actual assessment charge for each property, as detailed in the Assessment Engineer's Report, will be the basis for all assessment related charges. The total property assessments for all "special benefits" are assumed to be $154,444,000.

Table 7.5 Assessment Benefit Unit Allocation

Use Category	Benefit Units (BU)				
	Lateral	Collector	Trunk	Treatment & Disposal	Common Facility
Residential Single Family	1	1	1	1	1
Residential Multi-Family	1	0.75/unit	0.75/unit	0.75/unit	0.75/unit
Mobile Homes	1	0	0.5/unit	0.5/unit	0.5/unit
Vista del Oro & Bayridge Estates tracts	0	0	1	1	1
Commercial / Non-Residential	1	1/10,000-sf	1/10,000-sf	1/10,000-sf	1/10,000-sf
Special Cases were analyzed individually, including condominiums, mobile home parks, schools, churches, and public facilities.					

Table 7.6 Assessment Benefit Unit Weighted Average (EDU's)

Component	Special Benefit Assessment Cost	BU's for Build-Out Parcels	Cost per BU	Component % of Total Cost	Weighted Average BU's - Build-Out Parcels
Lateral	$10,956,000	4769	$2,297.34	9%	439.3
Collector	$52,341,045	5745.47	$9,109.97	37%	2098.6
Trunk	$23,105,955	6734.72	$3,430.87	14%	926.4
Treatment	$49,551,000	6734.72	$7,357.54	29%	1986.7
Common	$18,490,000	6734.72	$2,745.47	11%	741.3
Totals	$154,444,000		$24,941.19	100%	6192.3

Table 7.7 Example Assessment Charges by User Group

Example User Group	Total Assessment	Total Monthly Charge	Per Unit Monthly Charge
Single Family Residence	$24,941.19	$123.58	$123.58
Multi Family, 4 unit apartment or condo	$70,228.89	$347.97	$86.99
Mobile Home Park, 125 unit	$848,164.84	$4,202.53	$33.62
Single Family, Bayridge Estates/Vista De Oro Tracts	$13,533.88	$67.06	$67.06
Non-Resid, 5 tentants, 50k ft^2	$115,516.59	$572.37	$114.47
Non-Resid, two tentant, 15k ft^2	$36,263.12	$179.68	$89.84
Non-Resid, one tenant, 20k ft^2	$47,585.04	$235.78	$235.78

User Charges for General Benefit Portion of Capital Costs and O&M Costs: The Project Revenue Analysis, submitted for the USDA Rural Development program application, contains revenue tables in the Exhibits. EDU calculations have been developed for residential and non-residential user groups based on wastewater generation and loading estimates for the purpose of allocating project user charges. The estimates are based on current development only, which will be the start-up rate base for project user charges.

Table 7.8 User Charges EDU's

User Group	Number of Accounts	EDU's/Account	Total EDU's
Single Family	4289	1.00	4289
Multi Family	809	0.75	607
Mobile Home	542	0.50	271
Low-load Non-Resid	147	1.11	163
Med-load Non-Resid	5	1.34	7
High-load Non-Resid	17	5.08	86
Special User (septage)	749	0.03	24
Totals	**6,558**		**5447**

Table 7.9 Example User Charges by User Group

User Group	# of Accts	Variable O M & R	Fixed O M & R	Capital Replace. Fund	Debt Service	Debt Service Reserve	Total Annual Revenue	Avg. Monthly Revenue
Single Family	4289	$446,099	$1,416,592	$158,306	$1,011,132	$100,665	$3,132,794	$60.87
Multi Family	809	63,115	200,421	22,397	143,056	14,242	443,232	45.66
Mobile Home	542	28,201	89,553	10,008	63,921	6,364	198,047	30.45
Low-load Non-Resid	147	16,950	53,826	6,015	38,420	3,825	119,037	67.48
Med-load Non-Resid	5	633	2,462	204	1,444	167	4,910	81.84
High-load Non-Resid	17	8,008	32,385	2,521	18,299	2,186	63,400	310.78
Special User (septage)	749	1,994	9,759	549	4,591	637	17,530	1.95
Totals	**6558**	**$565,000**	**$1,805,000**	**$200,000**	**$1,280,863**	**$128,086**	**$3,978,949**	**$50.56**

c. Operations and Maintenance (O&M) Costs: The following tables show estimated O&M costs for labor, power, and equipment maintenance. Total project O&M costs are summarized in Table 7.13.

Table 7.10 Estimated Annual O&M Costs for Gravity Collection System

Item	Units	Quantity	Unit Price ($)	Annual O&M ($)
Labor	Hrs/year	4,160(1)	40(2)	170,000
Power	Kwh/year	500,000(3)	0.12(2)	60,000
Equipment Maintenance				200,000
TOTAL O&M COST(4)				**$430,000**

Notes:
(1) Based on 2 full-time employees and 2,080 hours per year.
(2) From Basis of Cost Evaluation Technical Memorandum.
(3) Based on energy required to convey 1.4 mgd to an out-of-town treatment facility.
(4) Septic hauling costs for homes outside of the Prohibition Zone are not included.

Annual O&M costs for each of the treatment alternatives were estimated for the following categories based on BioTran© modeling of unit process requirements.

- Labor
- Power
- Maintenance/ Equipment Replacement
- Allowances—Includes chemicals, screenings and grit disposal
- Unit cost curves for tertiary treatment per MGD
-

Table 7.11 Estimated Annual O&M Costs for Treatment Process

Item	Units	Quantity	Unit Price ($)	Annual O&M ($)
Labor	Hrs/year	5,200	60(1)	310,000
Power	Kwh/year	900,000	0.12(2)	110,000
Equipment Maintenance				75,000
Allowances				50,000
Tertiary Filter O&M				100,000
TOTAL O&M COST				**$645,000**

Notes:
(1) Labor costs are based on an average $60 hourly rate, including direct and indirect costs.
(2) Power costs based on $0.12 per kWh electrical rate.

The cost basis for biosolids processing was developed in the Fine Screening Report and is based on master planning efforts for a similar sized facility in Morro Bay, CA.

Table 7.12 Estimated Annual O&M Costs for Biosolids Processing

Item	Annual O&M ($)
Thickening(1)	170,000
Mechanical Dewatering(1)	280,000
Hauling(2) (3)	190,000
TOTAL O&M COST	**$640,000**

Notes:
(1) Includes labor, power, chemicals, and maintenance.
(2) Based on an average solids volume from primary and secondary treatment process of 4,000 pounds per day (dry weight) with dewatering to 18% solids.
(3) Based on a hauling and tipping fee at San Joaquin Composting facility of $42 per ton for Class B biosolids and $46 per ton for Sub-Class B biosolids.

The cost basis for recycled water reuse was developed in the Fine Screening Report, Appendix A, and is based on estimated energy costs for delivering recycled water to reuse locations and labor costs for routine maintenance.

Table 7.13 Estimated Annual O&M Costs for Recycled Water Reuse

Item	Units	Quantity	Unit Price ($)	Annual O&M ($)
Leachfield Labor	Hrs/year	1,500	60(1)	90,000
Leachfield Power	Kwh/year	1,375,000	0.12(2)	165,000
Reuse Irrigation Power	Kwh/year	333,000	0.12(2)	40,000
TOTAL O&M COST				**$295,000**

Notes:
(1) Labor costs are based on an average $60 hourly rate, including direct and indirect costs.
(2) Power costs based on $0.12 per kWh electrical rate.
(3) Cost estimates summarized from Table A2 of Fine Screening Report (Carollo, August, 2007)

Table 7.14 Summary of Total Project Annual O&M Cost Estimate

	Annual O&M
Collection System	
• Labor	$170,000
• Power	$60,000
• Equipment Maintenance	$200,000
Treatment Process	
• Labor	$310,000
• Power	$110,000
• Equipment Maintenance	$75,000
• Allowances	$50,000
• Tertiary Filter O&M	$100,000
Solids Handling	
• Thickening & Dewatering	$450,000
• Hauling	$190,000
Recycled Water Reuse	
• Leachfield Energy	$165,000
• Leachfield Labor	$90,000
• Reuse Irrigation Energy	$40,000
Miscellaneous Costs	
• Habitat Mitigation	$10,000
• County Overhead and Billing	$300,000
• Contingency/Operating Reserves	$50,000
Total Annual O&M Costs	**$2,370,000**

d. Debt Repayments: The County does not have any existing wastewater facilities, or existing debt, for the community of Los Osos. Total project capital costs are assumed to be financed through the USDA Rural Utility Service program and the US EPA State Revolving Fund program. Repayment of project financing will be a combination of property assessments and user charges.

Collection of both the property assessments and user charges portions of the revenue requirements will be through the County's semi-annual property tax bills. Collection of property assessments on the property tax bills is authorized by the completed Proposition 218 proceedings. User charges are also authorized to be collected on the property tax bills pursuant to CA Health and Safety Code Sections 5470-5473.11 and County Code Section 3.22.

Any delinquent project accounts for either the property assessments or user charges will be paid by the County under the *Teeter Plan*, as provided in the CA Revenue and Taxation Code Section 4701 *et seq*. Under the Teeter Plan, the County annually distributes 100% of the secured tax revenue due to the project on a cash basis. The County is then responsible for collection of delinquent charges, plus interest and penalties, through subsequent collections.

There are 4,281 existing septic systems serving individual or multiple users that must be abandoned and the users connected to the collection system laterals in the right-of-way. Individual property owners are responsible for these improvements and costs related to all work that is necessary on their private property to abandon existing septic systems. Costs are expected to vary greatly by individual property, and are estimated in the Fine Screening Report from less than $1,500 to $10,000 or more. The average cost per property, or septic system abandonment, is estimated at $3,650 and assumed to be owner financed with a home equity line of credit or other commercial loan. Financing costs would average $47.32 per month, at an assumed 9.0% interest rate for a 10 year term. Debt service for these costs are the responsibility of each property owner and their individual lender and are not included in the estimated project revenue requirements.

Table 7.15 Estimated Annual Debt Service

	Term (yrs)	Rate	Capital	Annual Debt Service
USDA Loan	40[1]	4.000%	$80,000,000	$4,041,879
SRF Loan	20	3.000%	$93,500,000	$6,284,669
Homeowner financed on-lot costs	10	9.000%	$15,600,000	$2,430,793
Total Capital Financing			$189,100,000	$12,894,627

1: USDA loan 40 year term assumes interest only payments during 3 year construction period, then principal and interest amortized over remaining 37 years.

e. Reserves:

(1) Debt Service Reserve: It is assumed that all assessment backed debt, which will be collected on the property tax bills and paid by the County under the Teeter Plan will not be subject to requirements for a debt service reserve. Debt for capital costs that are general benefits and collected through user charges will require a 10% debt service reserve on the annual payment obligation for 10 years. Capital costs allocated to user charges will be financed with an SRF loan and the debt service reserve amount is shown in the estimated total revenue requirements on Table 7.3.

(2) Short-Lived Asset Reserve: A schedule of replacement frequency and costs for short-lived assets in the collection system, treatment facility and recycled water distribution is presented below. The assumed annual reserve fund for all short-lived assets is $200,000.

Table 7.16 Short-Lived Asset Reserve Schedule

Facility/Components		Overall Life Span	Service Age 5	Service Age 10	Service Age 15	Type of Service Required	Equipment Cost	Service Age 5 Total	Service Age 10 Total	Service Age 15 Total
Pocket Pump Stations										
04A										
	Grinder Pump No. 1	15		X		Unit Replacement	$2,000	$0	$2,000	$0
	Grinder Pump No. 2	15			X	Unit Replacement	$2,000	$0	$0	$2,000
	Grinder Pump No. 3	15			X	Unit Replacement	$2,000	$0	$0	$2,000
07A										
	Grinder Pump No. 1	15		X		Unit Replacement	$2,000	$0	$2,000	$0
	Grinder Pump No. 2	15			X	Unit Replacement	$2,000	$0	$0	$2,000
08A										
	Grinder Pump No. 1	15		X		Unit Replacement	$2,000	$0	$2,000	$0
	Grinder Pump No. 2	15			X	Unit Replacement	$2,000	$0	$0	$2,000
09A										
	Grinder Pump No. 1	15		X		Unit Replacement	$2,000	$0	$2,000	$0
	Grinder Pump No. 2	15			X	Unit Replacement	$2,000	$0	$0	$2,000
	Grinder Pump No. 3	15			X	Unit Replacement	$2,000	$0	$0	$2,000
09B										
	Grinder Pump No. 1	15		X		Unit Replacement	$2,000	$0	$2,000	$0
	Grinder Pump No. 2	15			X	Unit Replacement	$2,000	$0	$0	$2,000
09C										
	Grinder Pump No. 1	15		X		Unit Replacement	$2,000	$0	$2,000	$0
	Grinder Pump No. 2	15			X	Unit Replacement	$2,000	$0	$0	$2,000
10A										
	Grinder Pump No. 1	15		X		Unit Replacement	$2,000	$0	$2,000	$0
	Grinder Pump No. 2	15			X	Unit Replacement	$2,000	$0	$0	$2,000

Table 7.16 Short-Lived Asset Reserve Schedule

Facility/Components		Overall Life Span	Service Age 5	Service Age 10	Service Age 15	Type of Service Required	Equipment Cost	Service Age 5 Total	Service Age 10 Total	Service Age 15 Total
11A										
	Grinder Pump No. 1	15		X		Unit Replacement	$2,000	$0	$2,000	$0
	Grinder Pump No. 2	15			X	Unit Replacement	$2,000	$0	$0	$2,000
12A										
	Grinder Pump No. 1	15		X		Unit Replacement	$2,000	$0	$2,000	$0
	Grinder Pump No. 2	15			X	Unit Replacement	$2,000	$0	$0	$2,000
13A										
	Grinder Pump No. 1	15		X		Unit Replacement	$2,000	$0	$2,000	$0
	Grinder Pump No. 2	15			X	Unit Replacement	$2,000	$0	$0	$2,000
13B										
	Grinder Pump No. 1	15		X		Unit Replacement	$2,000	$0	$2,000	$0
	Grinder Pump No. 2	15			X	Unit Replacement	$2,000	$0	$0	$2,000
15B										
	Grinder Pump No. 1	15		X		Unit Replacement	$2,000	$0	$2,000	$0
	Grinder Pump No. 2	15			X	Unit Replacement	$2,000	$0	$0	$2,000
Palisades										
	Grinder Pump No. 1	15		X		Unit Replacement	$2,000	$0	$2,000	$0
	Grinder Pump No. 2	15			X	Unit Replacement	$2,000	$0	$0	$2,000
Spare Pumps (All Pocket Pump Stations)										
	Grinder Pump No. 1	15				Unit Replacement	$2,000	$0	$0	$0
	Grinder Pump No. 2	15				Unit Replacement	$2,000	$0	$0	$0
	Grinder Pump No. 3	15				Unit Replacement	$2,000	$0	$0	$0
	Grinder Pump No. 4	15				Unit Replacement	$2,000	$0	$0	$0

Table 7.16 Short-Lived Asset Reserve Schedule

Facility/Components		Overall Life Span	Service Age			Type of Service Required	Equipment Cost	Service Age		
			5	10	15			5 Total	10 Total	15 Total
	Grinder Pump No. 5	15				Unit Replacement	$2,000	$0	$0	$0
West Paso Pump Station										
	Pump No. 1	15		X		Unit Replacement	$37,000	$0	$37,000	$0
	Pump No. 2	15			X	Unit Replacement	$37,000	$0	$0	$37,000
	Pump No. 3	15			X	Unit Replacement	$37,000	$0	$0	$37,000
East Paso Pump Station										
	Pump No. 1	15		X		Unit Replacement	$7,100	$0	$7,100	$0
	Pump No. 2	15			X	Unit Replacement	$7,100	$0	$0	$7,100
Baywood Pump Station										
	Pump No. 1	15		X		Unit Replacement	$4,300	$0	$4,300	$0
	Pump No. 2	15			X	Unit Replacement	$4,300	$0	$0	$4,300
Santa Ysabel Pump Station										
	Pump No. 1	15		X		Unit Replacement	$7,100	$0	$7,100	$0
	Pump No. 2	15			X	Unit Replacement	$7,100	$0	$0	$7,100
Lupine Pump Station										
	Pump No. 1	15		X		Unit Replacement	$19,000	$0	$19,000	$0
	Pump No. 2	15			X	Unit Replacement	$19,000	$0	$0	$19,000
	Pump No. 3	15			X	Unit Replacement	$19,000	$0	$0	$19,000
Solano Pump Station										
	Pump No. 1	15		X		Unit Replacement	$19,000	$0	$19,000	$0
	Pump No. 2	15			X	Unit Replacement	$19,000	$0	$0	$19,000
Mountain Viewm Pump Station										
	Pump No. 1	15		X		Unit Replacement	$4,300	$0	$4,300	$0

Table 7.16 Short-Lived Asset Reserve Schedule

		Overall Life Span	Service Age			Type of Service Required	Equipment Cost	Service Age 5	10	15
Facility/Components			**5**	**10**	**15**			**Total**	**Total**	**Total**
	Pump No. 2	15			X	Unit Replacement	$4,300	$0	$0	$4,300
Sunny Oaks Pump Station										
	Pump No. 1	15		X		Unit Replacement	$4,300	$0	$4,300	$0
	Pump No. 2	15			X	Unit Replacement	$4,300	$0	$0	$4,300
Mid Town Pump Station										
	Pump No. 1	15		X		Unit Replacement	$50,000	$0	$50,000	$0
	Pump No. 2	15		X		Unit Replacement	$50,000	$0	$50,000	$0
	Pump No. 3	15			X	Unit Replacement	$50,000	$0	$0	$50,000
	Pump No. 4	15			X	Unit Replacement	$50,000	$0	$0	$50,000
	Pump No. 5	15			X	Unit Replacement	$50,000	$0	$0	$50,000
	Mag Meter	15			X	Unit Replacement	$6,000	$0	$0	$6,000
Headworks										
Influent Pump Station										
	Influent Pump No. 1	15		X		Unit Replacement	$19,000	$0	$19,000	$0
	Influent Pump No. 2	15		X		Unit Replacement	$19,000	$0	$19,000	$0
	Influent Pump No. 3	15			X	Unit Replacement	$19,000	$0	$0	$19,000
	Influent Pump No. 4	15			X	Unit Replacement	$19,000	$0	$0	$19,000
Influent Screening										
	Mechanical Bar Screen	10		X		Unit Replacement	$138,000	$0	$138,000	$0
	Screenings Washer/Compactor	10		X		Unit Replacement	$62,000	$0	$62,000	$0
Odor Control										

Table 7.16 Short-Lived Asset Reserve Schedule

Facility/Components	Overall Life Span	Service Age			Type of Service Required	Equipment Cost	Service Age		
							5	10	15
		5	10	15			Total	Total	Total
Headworks Supply Fan	15			X	Motor Replacement/ Major Mechanical Refurbishment	$9,000	$0	$0	$3,600
Headworks Exhaust Fan	15			X	Unit Replacement	$9,000	$0	$0	$9,000
Septage Receiving									
Septage Receiving Tank	30								
Septage Transfer Pump	15			X	Unit Replacement	$16,000	$0	$0	$16,000
Oxidation Ditch No. 1									
Anoxic Mixer No. 1	20								
Anoxic Mixer No. 2	20								
Aerator No. 1	20		X		Minor Mechanical Refurbishment	$121,000	$0	$18,150	$0
Aerator No. 2	20			X	Minor Mechanical Refurbishment	$121,000	$0	$0	$18,150
Oxidation Ditch No. 2									
Anoxic Mixer No. 1	20								
Anoxic Mixer No. 2	20								
Aerator No. 1	20		X		Minor Mechanical Refurbishment	$121,000	$0	$18,150	$0
Aerator No. 2	20			X	Minor Mechanical Refurbishment	$121,000	$0	$0	$18,150
Secondary Clarifier No. 1									
Clarifier Mechanism	20								
Scum Pump	15		X		Unit Replacement	$8,000	$0	$8,000	$0
Secondary Clarifier No. 2									

Table 7.16 Short-Lived Asset Reserve Schedule

	Facility/Components	Overall Life Span	Service Age 5	Service Age 10	Service Age 15	Type of Service Required	Equipment Cost	Service Age 5 Total	Service Age 10 Total	Service Age 15 Total
	Clarifier Mechanism	20								
	Scum Pump	15			X	Unit Replacement	$8,000	$0	$0	$8,000
RAS/WAS Pump Station										
	RAS/WAS Pump No. 1	15		X		Motor Replacement/ Major Mechanical Refurbishment	$30,000	$0	$12,000	$0
	RAS/WAS Pump No. 2	15			X	Unit Replacement	$30,000	$0	$0	$30,000
	RAS/WAS Pump No. 3	15			X	Unit Replacement	$30,000	$0	$0	$30,000
	RAS Mag Meter	15			X	Unit Replacement	$6,000	$0	$0	$6,000
	WAS Mag Meter	15			X	Unit Replacement	$4,000	$0	$0	$4,000
Solid Handling Facilities										
	Sludge Holding Tank	30								
	Sludge Feed Pumps No. 1 (Progressive Cavity)	25		X		Motor Replacement/ Major Mechanical Refurbishment	$40,000	$0	$16,000	$0
	Sludge Feed Pumps No.2 (Progressive Cavity)	25			X	Motor Replacement/ Major Mechanical Refurbishment	$40,000	$0	$0	$16,000
	Belt Filter Press, Centrifuge or Screw Press	20						$0	$0	$0
	Polymer Feed Unit	15			X	Unit Replacement	$31,000	$0	$0	$31,000
	Solids Conveyor No. 1	20								
	Solids Conveyor No. 2	20								

Table 7.16 Short-Lived Asset Reserve Schedule

Facility/Components		Overall Life Span	Service Age 5	Service Age 10	Service Age 15	Type of Service Required	Equipment Cost	Service Age 5 Total	Service Age 10 Total	Service Age 15 Total
Odor Control										
	Solids Building Supply Fan	15			X	Motor Replacement/ Major Mechanical Refurbishment	$9,000	$0	$0	$3,600
	Solids Building Exhaust Fan	15			X	Unit Replacement	$9,000	$0	$0	$9,000
Tertiary Filtration										$0
	Disk Filter Unit No. 1	5	X			Unit Replacement	$8,000	$8,000	$0	$0
	Disk Filter Unit No. 2	5	X			Unit Replacement	$8,000	$8,000	$0	$0
Disinfection										
	NaOCl Storage Tank	30								
	NaOCl Feed Pump No. 1	10		X		Unit Replacement	$12,000	$0	$12,000	$0
	NaOCl Feed Pump No. 2	10		X		Unit Replacement	$12,000	$0	$12,000	$0
	UV Bank No. 1	5	X			Unit Replacement	$163,320	$163,320	$0	$0
	UV Bank No. 2	5	X			Unit Replacement	$163,320	$163,320	$0	$0
	UV Bank No. 3	5	X			Unit Replacement	$163,320	$163,320	$0	$0
Effluent Pump Station										
	Effluent Pump No. 1	25		X		Motor Replacement/ Major Mechanical Refurbishment	$80,000	$0	$32,000	$0
	Effluent Pump No. 2	25			X	Motor Replacement/ Major Mechanical Refurbishment	$80,000	$0	$0	$32,000
	Effluent Pump No. 3	25			X	Motor Replacement/ Major Mechanical Refurbishment	$80,000	$0	$0	$32,000

Table 7.16 Short-Lived Asset Reserve Schedule

	Facility/Components	Overall Life Span	Service Age 5	Service Age 10	Service Age 15	Type of Service Required	Equipment Cost	Service Age 5 Total	Service Age 10 Total	Service Age 15 Total
	Plant Water Pump No. 1	25		X		Motor Replacement/Major Mechanical Refurbishment	$21,000	$0	$8,400	$0
	Plant Water Pump No. 2	25			X	Motor Replacement/ Major Mechanical Refurbishment	$21,000	$0	$0	$8,400
Potable/Fire Water Storage										
	Water Storage Tank	30								
	Fire Pump (Engine Driven)	20								
Storm Water Pump Station										
	Storm Water Pump No. 1	20								
	Storm Water Pump No. 2	20			X	Unit Replacement	$15,000	$0	$0	$15,000
Totals										
Total Cost per Replacement Period								**$506,000**	**$603,000**	**$672,000**
Annual Cost per Replacement Period								$101,200	$60,300	$44,800
Total Annual Short-Lived Assets Reserve Fund Allocation						**$206,300**				

CHAPTER 8: CONCLUSIONS AND RECOMMENDATIONS

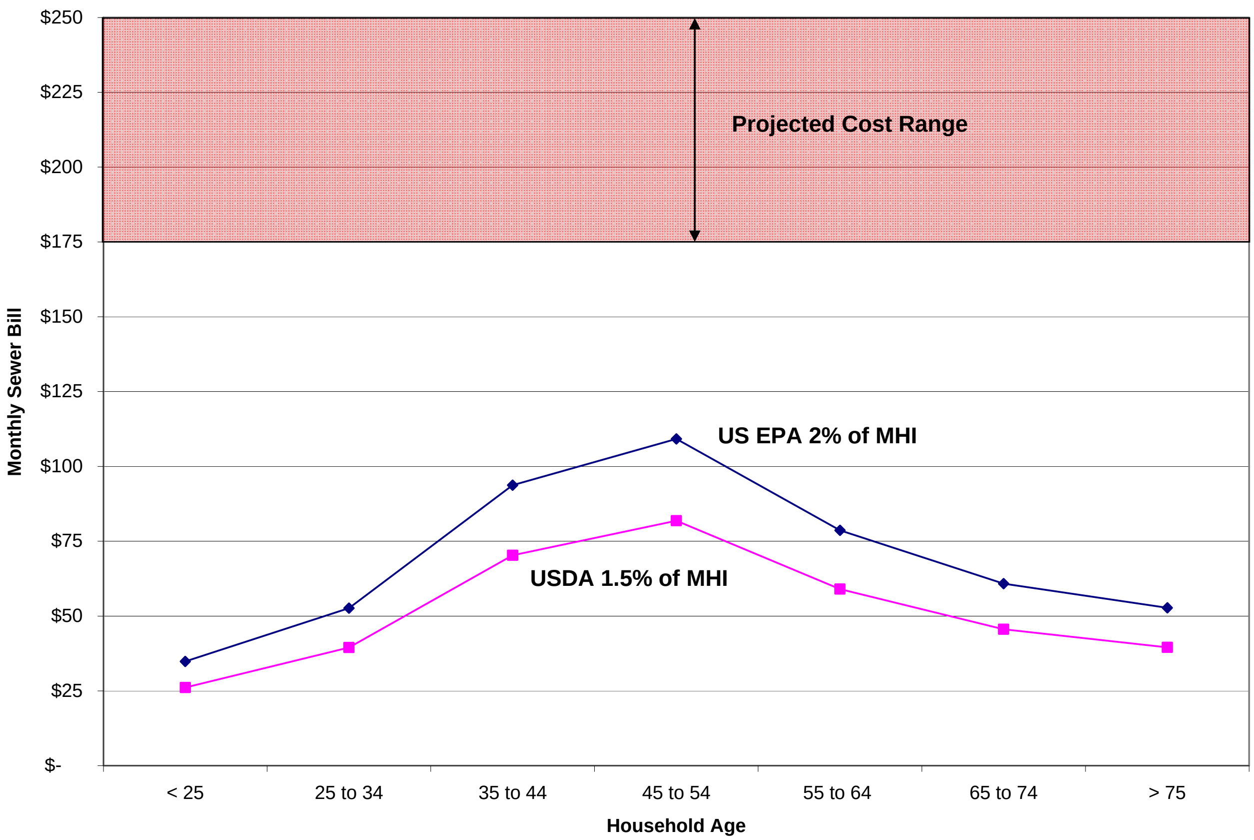
8.1. RECOMMENDATIONS FOR ADDRESSING AFFORDABILITY CHALLENGES

Project affordability has been a major challenge for the project since planning efforts began in 1983, following the Regional Water Quality Control Board's mandate to cease septic tank discharges in the Prohibition Zone. The lack of existing wastewater infrastructure requires that the community construct all of the necessary facilities for collection, treatment, and effluent reuse or disposal at one time. The large capital expenditure, plus ongoing operational costs and individual on-lot connection costs result in a total project cost that far exceeds any affordability standard in the moderate income community of Los Osos.

Financing

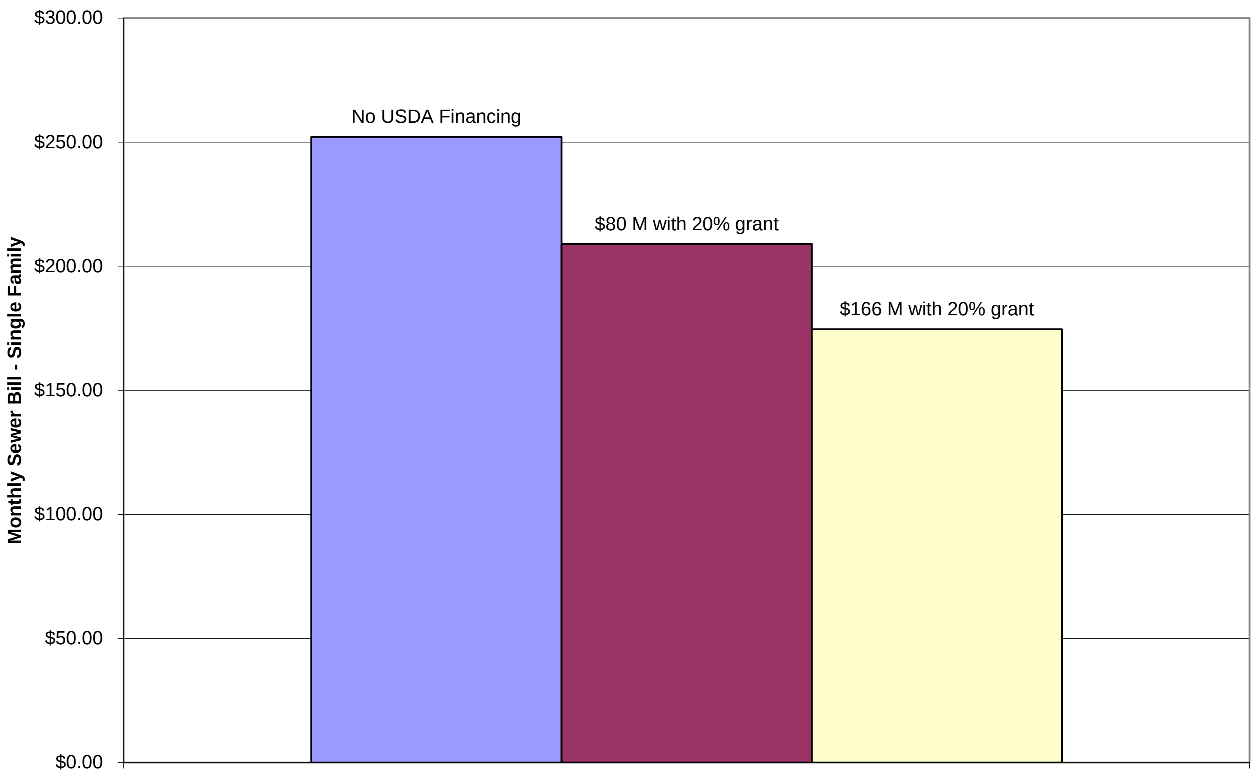
The County has evaluated project affordability as part of its overall project planning and feasibility review. Without financial assistance, the total project costs, including homeowner financed on-lot costs, are projected to exceed $250 per month for a typical, single family residence, which is more than 6% of the median household income (MHI) on an annual basis. The costs will be especially challenging for Los Osos where 33% of households receive Social Security income (50% higher than the statewide average), an indicator of fixed-income retirees.

Figure 8.1. Los Osos Affordability Thresholds by 2000 Census Household Age Category



The overall affordability impact of the project can be greatly reduced with favorable financing from the USDA Rural Development Program. USDA financing of $80 million, that includes a 20% grant component, will reduce the estimated costs for a typical single family residence by approximately $43 per month. A project that is fully funded by the USDA, including a 20% grant component, would reduce costs by an estimated $77 per month. This is more than a 30% savings over the estimated project costs without financial assistance and a substantial benefit to the community.

Figure 8.2 Benefits of Favorable USDA Financing



Mitigating project affordability impacts with USDA financing is only a first step in addressing the challenge. The County is also seeking financial assistance from several other sources, including extended term loans from the State Revolving Fund program, federal grants from the Water Resources Development Act, and state grants from the Proposition 50 and 84 Integrated Regional Water Management funds. Finally, the County is seeking to implement a financial assistance program for disadvantaged individuals in the community who are unable to afford the project costs.

<u>Collection System Contracting</u>

Construction contracting is the major capital cost of the project and it may be possible to realize significant savings over the current estimates. The current economic downturn has severely affected the California construction industry resulting in a highly competitive bidding climate.

Recent industry surveys, and the County's own experience, show that construction bids are being received at 30% - 40% below the engineer's estimates.

In order to capitalize on the favorable bidding climate, the County intends to pursue bids on the collection system as soon as possible after final regulatory permits are issued. The collection system represents 70% of the total construction costs and has the ability to realize the greatest savings. Early construction of the collection system is possible because the system is approximately 95% designed from the previous LOCSD project and can be made ready to advertise quickly by utilizing the existing design. The collection system also has a longer construction schedule than the treatment facility and should be started first in order to coordinate completion dates.

REFERENCES

(Note: Hyperlinks to documents on Project Website provided for all references.)

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22. Wallace Group. 2007. Engineer's Report for the San Luis Obispo County Wastewater Assessment District No. 1. December.

LIST OF APPENDICES

Appendix A: Los Osos Community Services District Collection System Bid Results 2/24/2005.

Appendix B: Viable Project Alternatives: Fine Screening Analysis, Carollo Engineers, in association with Crawford, Multari & Clark Associates and Cleath and Associates; August 2007. (Under Separate Cover)

Appendix C: Engineer's Report for the San Luis Obispo County Wastewater Assessment District No. 1, Wallace Group; December 2007. (Under Separate Cover)

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Appendix 1 - Bid Schedule 1 (Area B and C)

Appendix A:
Los Osos Community Service District
Collection System Bid Results: Received 2/24/2005

MWH									
Area B&C - Bid Schedule 1				Eng. Est.		Low Bid #1		Low Bid #2	
				MWH		Whitaker		Barnard	
Bid Item	Description	UOM	Quantity	Unit Price	Amount	Unit Price	Amount	Unit Price	Amount
1	Area Mobe/GCs/TCs	LS	1		$940,224		$1,200,000		$1,590,000
2	Area Sheeting, Shoring, Sloping & Bracing	LS	1		$703,034		$492,000		$4,839,000
3	48" Standard Gravity Sewer Manhole	EA	350	$4,099	$1,434,642	$3,450	$1,207,500	$6,000	$2,100,000
4	48" Drop Manhole	EA	20	$4,728	$94,553	$5,810	$116,200	$13,000	$260,000
5	48" Beaver Slide Manhole	EA	1	$5,289	$5,289	$5,163	$5,163	$5,000	$5,000
6	48" Force Main to Gravity Sewer Trans MH	EA	2	$5,886	$11,773	$7,310	$14,620	$10,000	$20,000
7	(Not Used)	EA	0		$0		$0		$0
8	8" Gravity Sewer	LF	74000	$64	$4,700,504	$132	$9,768,000	$120	$8,880,000
9	10" Gravity Sewer	LF	2000	$74	$148,711	$169	$338,000	$125	$250,000
10	12" Gravity Sewer	LF	1600	$64	$102,052	$108	$172,800	$150	$240,000
11	(Not Used)	LF	0		$0		$0		$0
12	15" Gravity Sewer	LF	3800	$69	$263,628	$108	$410,400	$130	$494,000
13	18" Gravity Sewer	LF	220	$87	$19,094	$253	$55,660	$135	$29,700
14	4" Sewer Lateral	EA	1700	$2,715	$4,615,942	$1,220	$2,074,000	$1,800	$3,060,000
15	4" Sewer Lateral from (E) Sewer MH	EA	5	$3,175	$15,875	$1,490	$7,450	$4,000	$20,000
16	6" Sewer Lateral	EA	24	$2,842	$68,214	$1,577	$37,848	$1,500	$36,000
17	(Not Used)	EA	0		$0		$0		$0
18	48" Combination Air/Vacuum Release	EA	2	$7,668	$15,335	$10,625	$21,250	$10,000	$20,000
19	(Not Used)	LF	0		$0		$0		$0
20	4" Force Main	LF	2900	$32	$92,001	$89	$258,100	$30	$87,000
21	(Not Used)	LF	0		$0		$0		$0
22	(Not Used)	LF	0		$0		$0		$0
23	10" Force Main	LF	7700	$79	$610,699	$59	$454,300	$45	$346,500
24	14" Force Main	LF	2800	$95	$266,451	$119	$333,200	$75	$210,000
25	3/4", 1/2" & 2" Polybutylene Water Svc	EA	320	$1,413	$452,067	$1,038	$332,160	$2,150	$688,000
26	(Not Used)	LF	0		$0		$0		$0
27	(Not Used)	EA	0		$0		$0		$0
28	2" Fiber Optic Cable Conduit	LF	3200	$8	$24,994	$17	$54,400	$13	$41,600
29	Fiber Optic Manhole	EA	6	$4,708	$28,247	$5,142	$30,852	$5,500	$33,000
30	Duplex Pump Station	EA	2	$137,492	$274,985	$212,925	$425,850	$400,000	$800,000
31	Triplex Pump Station	EA	1	$250,708	$250,708	$316,750	$316,750	$600,000	$600,000
32	(Not Used)	EA	0		$0		$0		$0
33	Standby Power Facility	EA	3	$228,471	$685,412	$252,350	$757,050	$350,000	$1,050,000
34	6" Harvest Main	LF	6100	$41	$252,397	$43	$262,300	$25	$152,500
35	Harvest Main Valve Vaults	EA	2	$5,885	$11,770	$15,445	$30,890	$20,000	$40,000
36	Harvest Well/Well House	EA	2	$170,008	$340,016	$289,149	$578,298	$700,000	$1,400,000
37	(Not Used)	EA	0		$0		$0		$0
38	Flow Control Vaults	EA	4	$5,080	$20,320	$40,900	$163,600	$50,000	$200,000
39	(Not Used)	EA	0		$0		$0		$0
40	Reclaimed Water Turnouts	EA	11	$2,540	$27,940	$1,803	$19,833	$4,450	$48,950
41	6" Disposal Main	LF	1800	$41	$74,478	$78	$140,400	$20	$36,000
42	8" Disposal Main	LF	5400	$55	$297,912	$60	$324,000	$24	$129,600
43	12" Disposal Main	LF	8800	$83	$728,228	$68	$598,400	$75	$660,000
44	4" Disposal Header	LF	1200	$28	$33,101	$17	$20,400	$11	$13,200
45	6" Disposal Header	LF	720	$41	$29,791	$20	$14,400	$12	$8,640
46	8" Disposal Header	LF	17000	$51	$861,873	$20	$340,000	$14	$238,000
47	Broderson 4" Percolation Piping	LF	20000	$25	$507,492	$75	$1,500,000	$60	$1,200,000
48	Monitoring Wells	EA	10	$4,675	$46,749	$4,150	$41,500	$4,800	$48,000
49	24" Bored & Jacked Casing	LF	100	$175	$17,526	$552	$55,200	$2,000	$200,000
50	Fencing	LF	3200	$19	$60,960	$18	$57,600	$25	$80,000
51	Tree Removal at Broderson	EA	40	$413	$16,510	$4,321	$172,840	$1,500	$60,000
52	Install Native Vegetation	SF	350,000	$0.13	$44,450	$1.70	$595,000	$2.25	$787,500
53	LOVR Improvements	LS	1	$254,000	$254,000	$276,500	$276,500	$500,000	$500,000
54	Cultural Resources Caused Mobe/Demobe	EA	5	$4,445	$22,225	$3,000	$15,000	$15,000	$75,000
55	Overexcavation & Repl w/ Found Rock	CY	200	$44	$8,890	$212	$42,400	$160	$32,000
56	Addl Pvmt Restoration Ordered By ENGR	SF	12000	$3.81	$45,720	$4.80	$57,600	$5.00	$60,000
57	Utility Crossing Not Shown or Identified	EA	20	$2,193	$43,866	$2,500	$50,000	$5,000	$100,000
57A	Disinfect Construction Dewatering Water	DAY	60	$3,810	$228,600	$4,455	$267,300	$3,200	$192,000
					$19,800,000		$24,507,014		$31,961,190

Appendix 2 - Bid Schedule 2 (Area A and D)

Appendix A:
Los Osos Community Service District
Collection System Bid Results: Received 2/24/2005

Los Osos Wastewater Project							
Area A&D - Bid Schedule 2				Eng. Est.		Low Bid #1	
				MWH		Barnard	
Bid Item	Description	UOM	Quantity	Unit Price	Amount	Unit Price	Amount
1	Area Mobe/GCs/TCs	LS	1		$1,272,771		$2,050,000
2	Area Sheeting, Shoring, Sloping & Bracing	LS	1		$769,608		$4,015,000
3	48" Standard Gravity Sewer Manhole	EA	340	$4,092	$1,391,110	$6,600	$2,244,000
4	48" Drop Manhole	EA	50	$4,719	$235,945	$8,500	$425,000
5	48" Beaver Slide Manhole	EA	28	$5,279	$147,820	$5,000	$140,000
6	48" Force Main to Gravity Sewer Trans MH	EA	4	$5,876	$23,502	$10,000	$40,000
7	48" Pocket PS FM Discharge MH	EA	12	$5,876	$70,506	$6,500	$78,000
8	8" Gravity Sewer	LF	93000	$67	$6,235,608	$120	$11,160,000
9	10" Gravity Sewer	LF	11000	$69	$762,644	$125	$1,375,000
10	12" Gravity Sewer	LF	3200	$80	$256,370	$150	$480,000
11	(Not Used)				$0		$0
12	15" Gravity Sewer	LF	2400	$78	$187,469	$175	$420,000
13	18" Gravity Sewer	LF	7000	$85	$595,290	$140	$980,000
14	4" Sewer Lateral	EA	3000	$2,710	$8,130,665	$1,800	$5,400,000
15	(Not Used)	EA	0		$0		$0
16	6" Sewer Lateral	EA	24	$2,837	$68,087	$1,200	$28,800
17	8" Sewer Lateral	EA	21	$2,964	$62,238	$1,300	$27,300
18	48" Combination Air/Vacuum Release	EA	31	$7,654	$237,259	$9,500	$294,500
19	2" Force Main	LF	8900	$19	$168,106	$30	$267,000
20	(Not Used)	LF	0		$0		$0
21	6" Force Main	LF	1800	$47	$85,499	$110	$198,000
22	8" Force Main	LF	2600	$63	$164,665	$40	$104,000
23	(Not Used)	LF	0		$0		$0
24	14" Force Main	LF	6000	$95	$569,952	$80	$480,000
25	3/4", 1/2" & 2" Polybutylene Water Svc	EA	480	$1,410	$676,854	$2,150	$1,032,000
26	Elec Duct Bank	LF	3100	$44	$135,258	$320	$992,000
27	Electrical or Instrumentation Pullbox	EA	7	$587	$4,109	$7,000	$49,000
28	2" Fiber Optic Cable Conduit	LF	8800	$8	$68,608	$20	$176,000
29	Fiber Optic Manhole	EA	15	$4,699	$70,491	$10,000	$150,000
30	Duplex Pump Station	EA	4	$158,979	$635,916	$400,000	$1,600,000
31	Triplex Pump Station	EA	1	$171,084	$171,084	$500,000	$500,000
32	Pocket Pump Station	EA	12	$68,685	$824,216	$180,000	$2,160,000
33	Standby Power Facility	EA	4	$226,229	$904,916	$325,000	$1,300,000
33A	Furnish Area B & Area C Equipment	LS	1	$316,891	$316,891	$350,000	$350,000
34	6" Harvest Main	LF	8500	$41	$351,026	$30	$255,000
35	Harvest Main Valve Vaults	EA	2	$5,874	$11,748	$20,000	$40,000
36	Harvest Well/Well House	EA	1	$170,008	$170,008	$500,000	$500,000
36A	East Paso Production Well	LS	1	$215,486	$215,486	$500,000	$500,000
37	(Not Used)	EA	0		$0		$0
38	Flow Control Vaults	EA	2	$5,070	$10,140	$50,000	$100,000
39	Vertical Disposal Wells	EA	48	$5,070	$243,372	$15,000	$720,000
40	Reclaimed Water Turnouts	EA	13	$2,535	$32,957	$4,600	$59,800
41	6" Disposal Main	LF	5000	$41	$206,486	$40	$200,000
42	8" Disposal Main	LF	4800	$55	$264,302	$45	$216,000
43	12" Disposal Main	LF	21700	$83	$1,792,397	$60	$1,302,000
44	4" Disposal Header	LF	200	$28	$5,506	$30	$6,000
45	(Not Used)	LF	0		$0		$0
46	(Not Used)	LF	0		$0		$0
47	(Not Used)	LF	0		$0		$0
48	Monitoring Wells	EA	10	$4,666	$46,659	$5,000	$50,000
49	30" Bored & Jacked Casing	LF	340	$254	$86,194	$1,100	$374,000
50	(Not Used)	LF	0		$0		$0
51	(Not Used)	EA	0		$0		$0
52	(Not Used)	SF	0		$0		$0
53	(Not Used)	LS	0		$0		$0
54	Cultural Resources Caused Mobe/Demobe	EA	15	$4,437	$66,551	$15,000	$225,000
55	Overexcavation & Repl w/ Found Rock	CY	300	$44	$13,310	$160	$48,000
56	Addl Pvmt Restoration Ordered By ENGR	SF	18000	$3.80	$68,454	$5	$90,000
57	Utility Crossing Not Shown or Identified	EA	20	$2,189	$43,786	$5,000	$100,000
57A	Disinfect Construction Dewatering Water	DAY	60	$3,803	$228,176	$3,200	$192,000
					$29,100,000		$43,493,400