Technical Memorandum

Date: 7/11/2013

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Project: Cayucos Sanitary District

Subject: **CONCEPTUAL WASTEWATER TREATMENT ALTERNATIVES TECHNICAL MEMORANDUM**

This TM is organized into the following sections:

Section 1. Purpose and Background

To comply with the Regional Water Quality Control Board's (RWQCB) requirement for full secondary treatment at the Morro Bay-Cayucos Sanitary District Wastewater Treatment Plant (MBCSD), the Cayucos Sanitary District (District) and the City of Morro Bay (Morro Bay) have been collectively working on an upgrade to their existing facility since 2005. However, at the request of Morro Bay, the California Coastal Commission (CCC) denied the Coastal Development Permit to build an upgraded WWTP at the location of the current MBCSD. Therefore, the District finds itself needing to evaluate alternatives for the sustainable treatment and disposal and/or reuse of its wastewater.

The District hired Water Systems Consulting (WSC) to develop a Conceptual Wastewater Treatment Alternatives Technical Memorandum (TM) to identify representative conceptual wastewater treatment alternatives for further consideration. This TM is intended to be used as a guide for the District's Board of Directors as they work with Morro Bay and the various resource agencies that will be involved in future efforts to develop or modify wastewater treatment facilities to serve the needs of the District's customers. The TM is not intended to be a comprehensive alternatives analysis, but should rather be viewed as information gathering and conceptual alternatives development to help guide the District's decision making. Morro Bay and the District have made significant financial and time investments in their effort to upgrade the existing MBCSD. To the extent possible, WSC has made use of those documents in the preparation of this TM. These reference documents are listed in Section 3 of this report.

Section 2. Approach

The goal of the TM is to provide the District with information on conceptual wastewater collection and treatment alternatives to help guide their pursuit of a preferred wastewater treatment alternative to replace/modify the existing MBCSD. The specific objectives of the TM include:

1) Selection of conceptual wastewater treatment alternatives for evaluation;
2) Development of descriptions for each of the identified conceptual alternatives; and
3) Preparation of preliminary capital and O&M cost estimates.

The TM identifies and describes several wastewater treatment alternatives developed during a workshop with the District and WSC (Project Team). During the workshop, the Project Team reviewed the project background, evaluated the needs of the community of Cayucos, developed the project goals and objectives and identified representative conceptual wastewater treatment alternatives. Each conceptual wastewater treatment alternative description included: 1) representative site location; 2) disposal and/or reuse strategy; 3) level of treatment required; 4) representative treatment technologies; and 5) planning-level capital and O&M cost estimates. Using this conceptual wastewater treatment alternative definition, the Project Team identified several initial conceptual wastewater treatment alternatives for further evaluation. These alternatives were refined by the Project Team as the project progressed to incorporate the needs of the community and to reflect the practical application of current technology. The alternative descriptions contained in this TM do not include an analysis of feasibility of implementation (i.e. regulatory requirements, political considerations, etc.) which are beyond the scope of this TM.

Cost Estimates

To develop the cost estimates for the TM, WSC reviewed available cost estimating references and previously completed cost estimates for wastewater treatment facilities in the region. Wastewater treatment facility cost estimates were developed from previously completed cost estimates for similar projects and from the Environmental Protection Agency's (EPA) Construction Costs for Wastewater Treatment Plant reference (1). Pump station cost estimates were established using index adjusted cost curves that incorporate flow rate and total dynamic head (2). Membrane treatment cost estimates were obtained using index adjusted cost curves from a treatment cost estimating reference (3). Pipeline cost estimates were developed from previously completed wastewater studies in the region. All capital cost estimates include non-construction costs (e.g. permitting, planning, design, administration, engineering and contingency). The cost estimates do not include land or right-of-way acquisition costs, which are potentially significant for several of these alternatives. The capital cost estimates in this report do not include upgrades to the existing MBCSD outfall nor any annualized reserve to cover the cost of replacing that facility when it reaches the end of its useful life.

The O&M cost estimates only include the costs to deliver the wastewater to the proposed treatment location, the cost of treatment and the cost of disposal. These estimates do not include the District's current cost to operate its collection system or reflect the potential savings from not operating the existing MBCSD.

The cost estimates included in this TM should be considered order of magnitude or planning level costs only. For reference purposes, these cost estimates are in 2013 dollars (ENR CCI 9515.86).

Section 3. Summary of Available Data

Numerous feasibility studies and alternatives analyses have been completed to evaluate potential alternatives for upgrading, replacing, and/or relocating the existing MBCSD. WSC's initial step in developing this TM included review of previously completed studies, and extraction of relevant data for use in identifying and developing cost estimates for the conceptual wastewater treatment alternatives. The reference sources reviewed by WSC are shown in the list below:

- City of Morro Bay Wastewater Treatment Plant Study (5/2007)
- Morro Bay-Cayucos WWTP Facility Master Plan (9/2007)
- Morro Bay-Cayucos WWTP Facility Master Plan – Amendment 1 (8/2009)
- Morro Bay- Cayucos WWTP Facility Master Plan – Amendment 2 (7/2010)
- Morro Bay-Cayucos WWTP Draft Rough and Fine Screening Alternative Sites Evaluation (11/2011)
- Draft Recycled Water Feasibility Study (4/2012)
- Current plant flow totals (2006 to present)
- Lift Station #5 pumping records (2006 to present)
- Status Report of a Major Maintenance & Repair Plan (MMRP) for the WWTP (6/2013)

Section 4. Flow Analysis

To develop the conceptual wastewater alternatives, WSC performed an analysis of the available flow data and developed estimates of future flow data for the District, shown in Table 1. The plant design values in Table 1 were taken from the MBCSD WWTP Upgrade Revised Flows and Loadings TM prepared by MWH as part of their WWTP upgrade project (4). As part of the process of preparing that TM, MWH reviewed flow data from 1995-2009 and developed estimates of current Annual Average Daily Flow (AADF) and Average Daily Maximum Month Flow (ADMMF). This flow was then increased to reflect build-out conditions for the District and Morro Bay.

Rather than reproduce that effort to develop estimates for future Cayucos flows, a single factor was generated to convert between total plant flows and Cayucos flows. For the purpose of this analysis, WSC reviewed flow data from 2006-2012 to develop a simplified understanding of the flow relationship between Morro Bay and Cayucos and developed a Cayucos flow factor based on the average flow relationship. This factor was used to convert from total plant flows to Cayucos flows (5).

Table 1. District future flow estimates

Parameter	Plant Design Value (MGD)	Flow Factor	Estimated District Flows (MGD)
AADF	1.5	0.25	0.38
ADMMF	2.9		0.73

Section 5. Conceptual Alternative Descriptions

To help provide the District with information on the potential wastewater treatment and disposal alternatives, the Project Team developed the conceptual treatment and disposal alternatives outlined in Table 2. To select these conceptual alternatives, the Project Team reviewed previously completed siting studies and reference materials, and discussed a range of other potential solutions. These conceptual alternatives are intended to provide the District with a range of representative alternatives, including options for treating wastewater at a Cayucos Wastewater Treatment Facility (WWTF), at the existing MBCSD and at a regionally operated facility at the California Men's Colony Wastewater Treatment Plant (CMC WWTP). While this is not a comprehensive list of the potential alternatives considered, these alternates were selected to provide the District with a broad enough range of representative options to inform future evaluation and project development efforts.

Table 2. Conceptual wastewater treatment and disposal alternatives

Conceptual Alternative	Location	Disposal and/or Reuse Method(s)	Treatment Level	Representative Treatment Technology
1a	Cayucos	Outfall	Secondary	Aerated Lagoon
1b	Cayucos	Ag Reuse Outfall (Brine)	Tertiary (plus salt reduction)	Oxidation Ditch Microfiltration Reverse Osmosis
2	MBCSD	Outfall	Secondary	Trickling Filters
3[1]	CMC WWTP	Creek Discharge Ag Reuse Outfall (Brine)	Tertiary (plus salt reduction) Nitrogen Reduction	Oxidation Ditch Media Filtration Reverse Osmosis

Alternative 1. Cayucos WWTF

Alternative 1 includes the development of a new WWTF to exclusively serve the District service area. The specific location, disposal method and treatment level parameters for the WWTF (Alternative 1) are general enough to allow the District flexibility to evaluate a variety of different site locations, disposal options and treatment level combinations. To develop the cost estimates for Alternative 1, two sub-alternatives were developed (Alternative 1a and 1b), with 1a designed to represent low cost alternative and 1b designed to represent the high cost alternative for a Cayucos WWTF alternative.

Proposed Facility Location

The specific locations for Alternatives 1a and 1b have not been identified. Given the limited number of potential locations for a Cayucos WWTF, the Project Team elected to evaluate two representative site locations to present a range of costs that are intended to provide "book-end" cost estimates for the potential site locations. One of the primary factors impacting the costs associated with each potential site location is the infrastructure requirements to deliver wastewater to the WWTF and to convey treated wastewater to the disposal location. A site located somewhere at the southern end of the District's service area would require the least amount of new conveyance infrastructure, as this is the direction that wastewater is currently routed; this site alternative was used to develop the low-end cost estimate (Alternative 1a). A site location somewhere at the northern end of the District's service area would require the construction of a force main from the southern end of the District's service area, or a re-configuration of the existing collection system; this site alternative was used to develop the high-end cost estimate (Alternative 1b). Figure 1 shows the extent of the District's service area.

[1] The parameters for Conceptual Alternative 3 represent the proposed treatment and disposal process for a regional CMC WWTP, not the current treatment process.

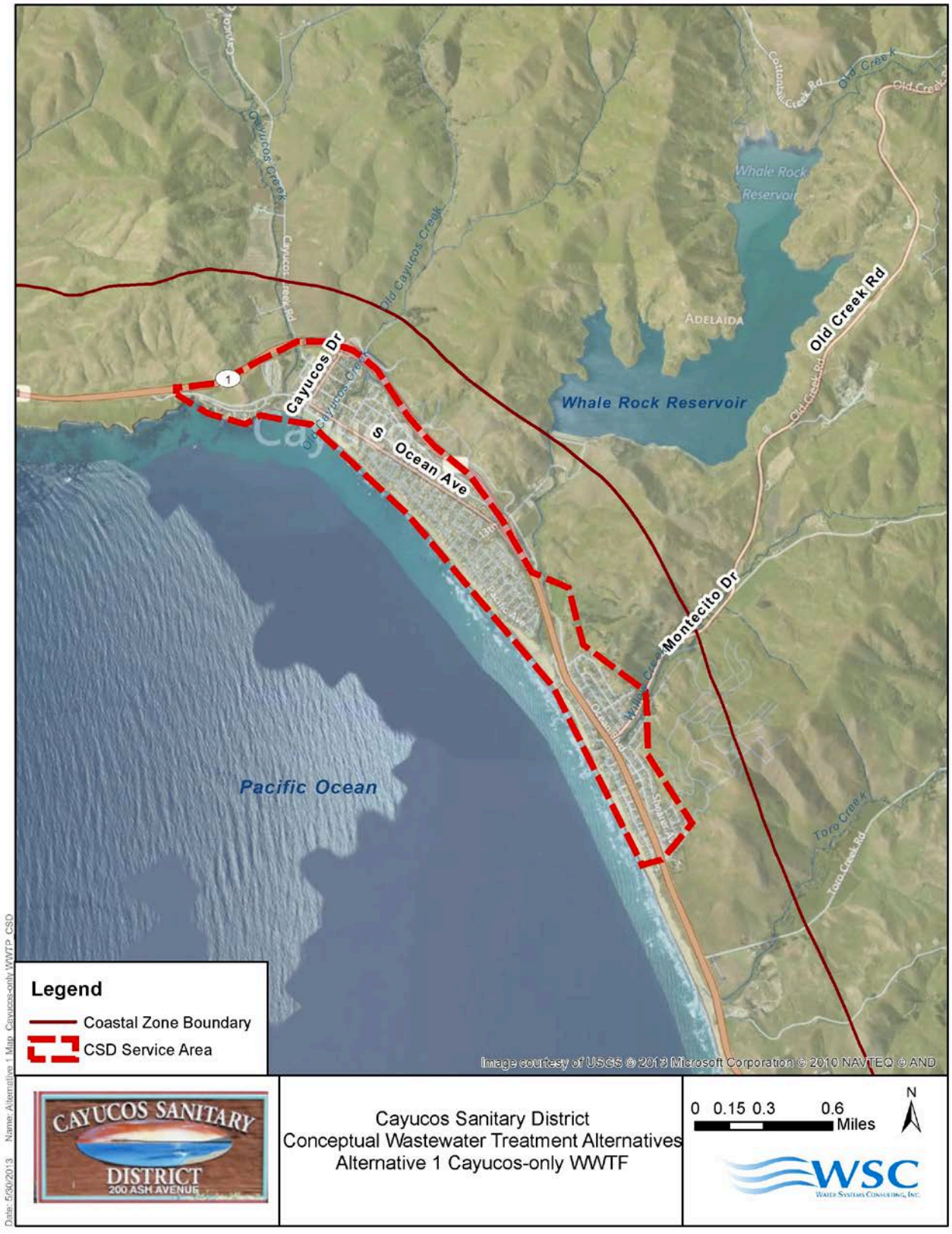

Figure 1. District service area

Disposal Method Options

The Project Team identified two effluent disposal methods to represent the range of possible methods for Alternative 1. For the lower cost disposal option (Alternative 1a), the Project Team selected use of the existing MBCSD outfall. This option would require minimal conveyance infrastructure realignment and, per the Clean Water Act as well as the terms of the settlement agreement with the RWQCB, secondary wastewater treatment.

For the higher cost option (Alternative 1b), the Project Team selected agriculture irrigation and groundwater percolation (wetlands). This disposal option would require recycled water conveyance infrastructure, realignment of collection and conveyance infrastructure, a high level of treatment, salt removal and wetland facilities for wet weather storage. This alternative does not include costs for effluent disposal through groundwater injection, which could require additional treatment.

Level of Treatment Options

The range of treatment options evaluated for Alternative 1 were selected to represent a broad range of cost estimates, as well as to be compatible with the disposal methods described above. For the outfall disposal option (Alternative 1a), the Project Team assumed that secondary treatment would be sufficient and that the use of an aerated lagoon would be a cost effective treatment option. Figure 2 shows the process flow diagram for the outfall disposal option.

For the agriculture reuse and wetland disposal option (Alternative 1b), the Project Team selected a treatment process that included an oxidation ditch, filtration and reverse osmosis. This treatment process would provide tertiary treated wastewater, along with salt reduction. Additionally, this treatment option would require use of the existing WWTP outfall for disposal of the brine generated from the reverse osmosis process. Figure 3 shows the process flow diagram for the Ag reuse disposal option.

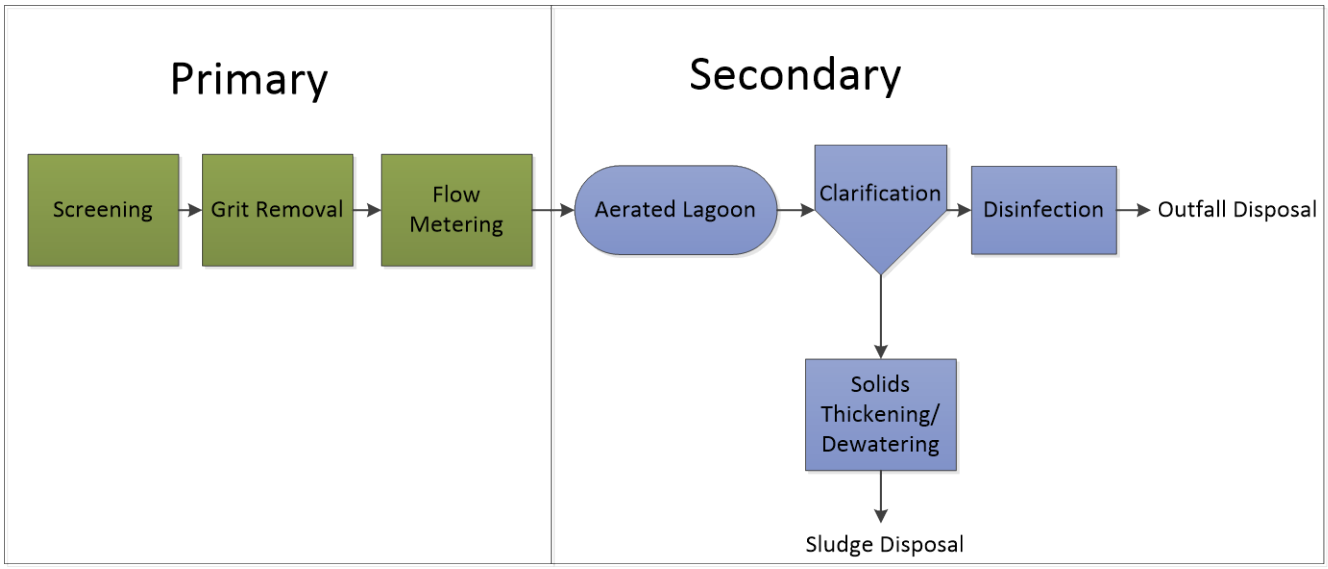

Figure 2. Outfall disposal process flow diagram (Alternative 1a)

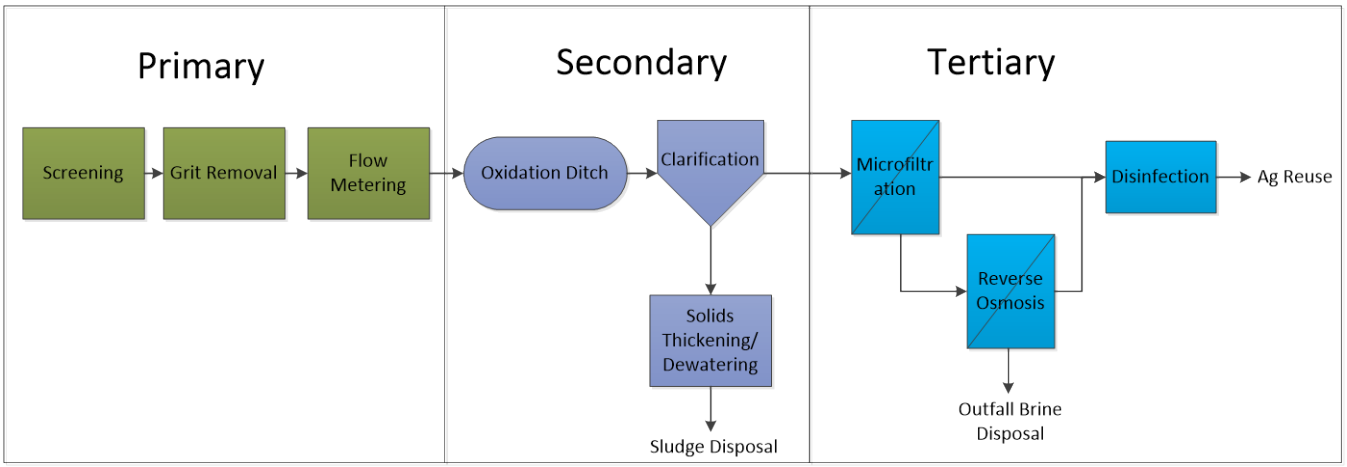

Figure 3. Alternative 1b - Ag reuse disposal process flow diagram (Alternative 1b)

Cost Estimates

Capital Cost

The capital cost estimates for Alternatives 1a and 1b were developed using index adjusted EPA wastewater treatment cost curves, cost estimates for similar wastewater facility projects in the region, and reference text cost estimates.

Given the limited size of the District's collection system and increased peaking factors typically associated with smaller systems, the cost estimates for the Cayucos alternatives were estimated using the ADMMF rate as the design flow rate (see Table 1). The cost estimates for Alternative 1b do not include costs for recycled water distribution infrastructure. The estimated range of construction costs for Alternative 1 is shown in Table 3.

Table 3. Alternative 1 Cayucos capital cost estimate summary

Alternative	Treatment Capital Cost ($M)	Conveyance Infrastructure Capital Cost ($M)	Total Capital Cost ($M)
1a - Outfall	15.9	1.5	17.4
1b - Ag Re-use	30.0	5.0	35.0

O&M Cost

O&M cost estimates for the Cayucos alternatives (1a and 1b) include the estimated cost of treating the wastewater to the required level of treatment for each alternative and the estimated energy costs for sewage and brine pumping. Table 4 outlines the estimated O&M costs for Alternative 1a and 1b.

Table 4. Alternative 1 Cayucos O&M cost estimate summary

Alternative	Annual Treatment O&M Cost ($k)	Annual Conveyance Infrastructure O&M Cost ($k)	Total Annual O&M Cost ($K)
1a - Outfall	808	9	817
1b - Ag Re-use	1438	18	1456

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Alternative 2. MBCSD

Alternative 2 includes utilization of the existing MBCSD to continue to provide treatment for the District's wastewater. Due to the existing MBCSD's deteriorating condition, the cost estimates for Alternative 2 include several upgrades required for the MBCSD to reliably treat wastewater from the District. In this alternative, it is assumed that Morro Bay would select an alternate location for the treatment of its wastewater.

Proposed Facility Location

The current MBCSD is located near the intersection of Highway 41 and Highway 1 in Morro Bay. Figure 4 shows the location of the MBCSD relative to the District service area and Figure 5 shows an aerial photo of the current MBCSD. Wastewater collected by the District is pumped from Lift Station #5, located at the southern end of the District's service area, to the northern end of the City of Morro Bay, where it flows by gravity to the MBCSD.

Figure 4. Alternative 2 - MBCSD site location map

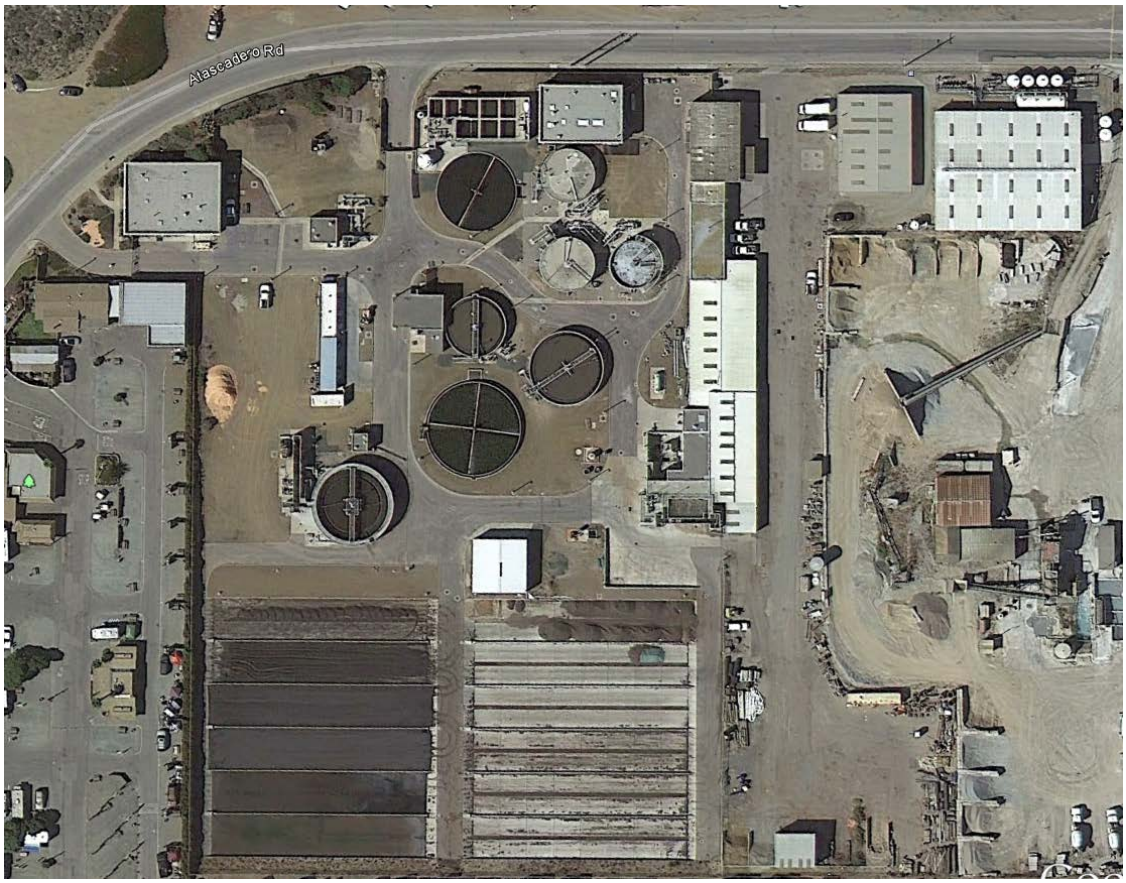

Figure 5. MBCSD aerial photo

Disposal Method

For this alternative, it is assumed that the existing ocean outfall would continue to be used for disposal of treated secondary effluent.

Level of Treatment

Given that the assumed disposal method for Alternative 2 is via the existing ocean outfall, Alternative 2 is based on providing secondary treatment consistent with existing regulatory requirements. To enable the MBCSD to treat the District's wastewater to secondary standards during peak flow events, it was assumed that additional onsite storage would be required. Figure 6 shows the anticipated treatment process for the MBCSD.

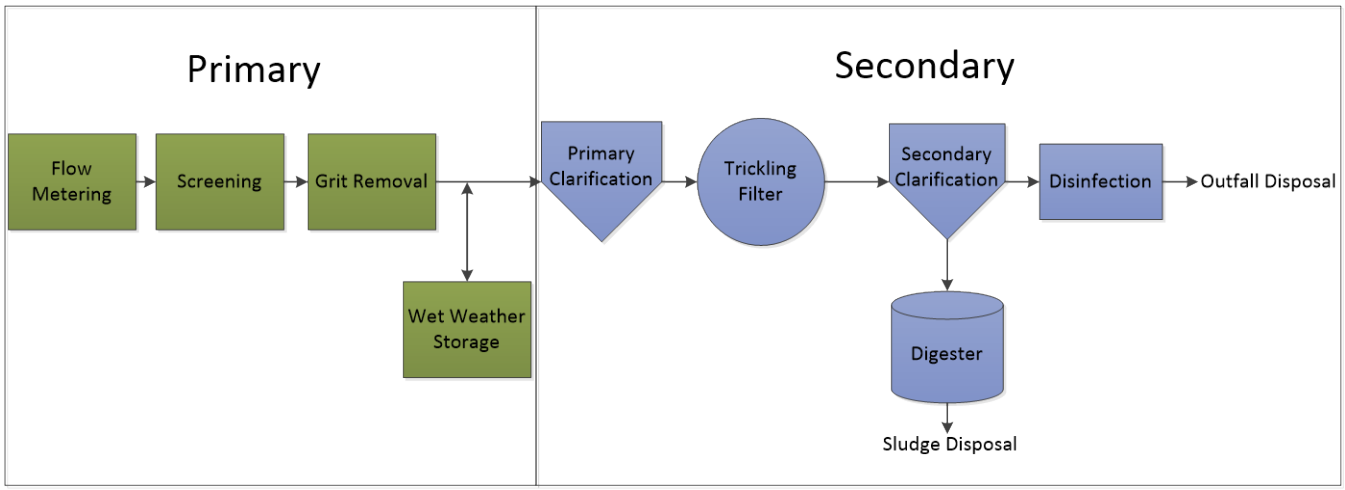

Figure 6. MBCSD process flow diagram

Cost Estimates

Capital Cost

To develop cost estimates for Alternative 2, the 2007 Facility Master Plan Report prepared by Carollo for the WWTP Upgrade project, which included a review of the major treatment processes and deficiencies found in them, was used to obtain costs to repair deteriorating equipment (6). The MBCSD Major Maintenance & Repair Plan (MMRP) was then reviewed to identify upgrades that the District and Morro Bay are intending to complete prior to the construction of a new WWTP for Morro Bay (7). The proposed MMRP upgrades and costs associated with them were then subtracted from the repair costs identified in the 2007 Facility Master Plan Report to estimate the capital costs for Alternative 2.

Additionally, the MBCSD as it sits today has the potential to experience flooding during storm events that are less than the 100 year flood. In order to advance this alternative, a detailed analysis of the processes, facilities and the impact of flooding would need to be developed. WSC has used the same $2,500,000 place holder, adjusted to 2013 dollars, to review, design, and flood proof this site as was included in the 2007 Facility Master Plan Report (6).

For Alternative 2, it was assumed that no conveyance infrastructure improvements would be required. Table 5 shows the capital cost estimates for Alternative 2.

Table 5. Alternative 2 – MBCSD capital cost estimates

Alternative	Treatment Capital Cost ($M)	Conveyance Infrastructure Capital Cost ($M)	Total Capital Cost ($M)
2 – MBCSD	11.1	0	11.1

O&M Cost

O&M costs for Alternative 2 were estimated by scaling the existing O&M costs for the MBCSD to match the anticipated annual average daily flow rate for the District's collection system. Table 6 outlines the estimated O&M costs for Alternative 2.

Table 6. MBCSD O&M cost estimates

Alternative	Annual Treatment O&M Cost ($k)	Annual Conveyance Infrastructure O&M Cost ($k)	Total Annual O&M Cost ($k)
2 – MBCSD	724	0	724

Alternative 3. Upgraded CMC WWTP

Alternative 3 includes transmission infrastructure from the MBCSD to California Men's Colony (CMC) and the expansion of the CMC WWTP to provide treatment for wastewater from the District and Morro Bay (Upgraded CMC WWTP). The existing CMC WWTP treats wastewater from the CMC, Cuesta College, Camp San Luis Obispo, and County of San Luis Obispo Operations Center. Table 7 provides the anticipated breakdown of flows at the Upgraded CMC WWTP. Currently the wastewater is treated to tertiary standards for disposal to Chorro Creek and for landscape irrigation reuse at Dairy Creek Golf Course and at Cal Poly. The CMC WWTP does not currently possess excess capacity and would require capacity upgrades to accommodate flows from the District and Morro Bay (8).

Table 7. Upgraded CMC WWTP flow ratio

Agency	Anticipated Flow (MGD)	Flow Ratio
District	0.38	0.13
Morro Bay	1.12	0.40
Existing CMC Agencies	1.30	0.46
Total Flow	**2.80**	**1.0**

For this alternative it was assumed that both Morro Bay and the District would participate. While it would be possible for the District to transfer flow to CMC without the participation of Morro Bay, Morro Bay would derive the greatest benefits from a regional CMC facility, due to augmented flows in Chorro Creek and the stream flow conditions that limit Morro Bay's ability to pump water from Chorro Creek. If Morro Bay chooses not to participate in this alternative, the costs for the District would increase as some of the economies of scale would be lost. This cost increase without Morro Bay participation has not been quantified.

Expansion of the CMC WWTP and increased wastewater treatment discharges would provide a high potential for recycled water reuse in the Chorro Valley. Releases from the CMC WWTP could be extracted by down gradient water users for use as irrigation.

Proposed Facility Location

The current CMC WWTP is located along Chorro creek, west of Cuesta College and just south of Highway 1. Figure 7 shows the location of the CMC WWTP relative the District service area and Figure 8 shows an aerial photo of the current CMC WWTP. For the purposes of developing costs estimates for Alternative 3, it was assumed that wastewater from the District's service area would flow to a location near the current MBCSD, where it would be blended with the wastewater from Morro Bay and pumped to the Upgraded CMC WWTP.

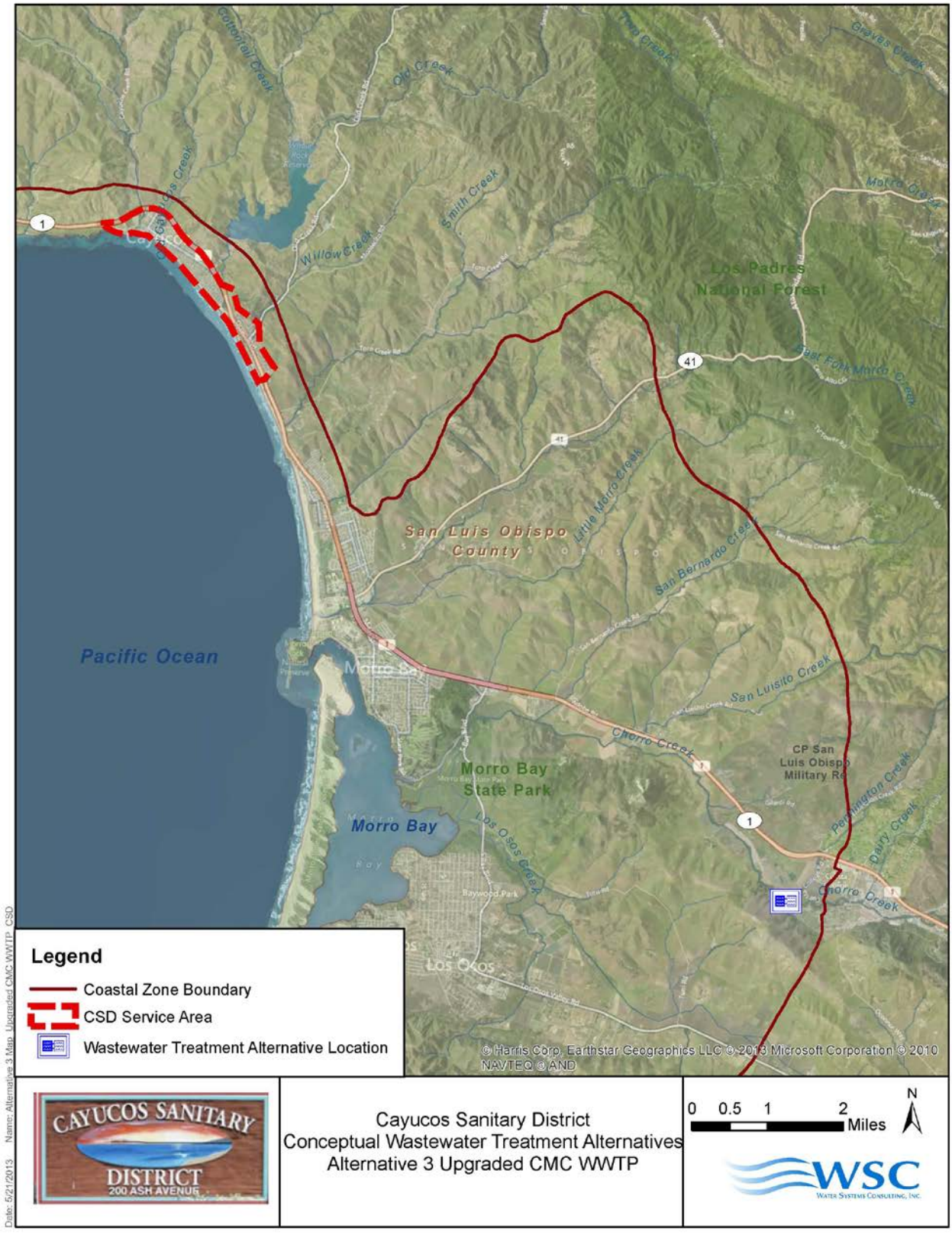

Figure 7. Alternative 3 Upgraded CMC WWTP site location map

Figure 8. CMC WWTP aerial photo

Disposal Method

For the purposes of developing costs estimates for Alternative 3, it was assumed that disposal from the Upgraded CMC WWTP would be achieved through discharge to Chorro Creek and continued reuse at Dairy Creek Golf Course, Cal Poly and other potential users in the future (e.g. ag reuse in Chorro Valley).

Level of Treatment

The discharge permit for the existing CMC WWTP includes limitations on the concentrations of certain water quality characteristics that can be discharged to Chorro creek. Currently, the CMC Permit requires that the monthly average TDS concentration be less than 500 mg/L. The concentration of TDS measured at the headworks of the MBCSD in 2006-2007 ranged from 710 to 1,700 mg/L and averaged approximately 1,100 mg/L and thus the treatment process for the Upgraded CMC WWTP will most likely require salt reduction (9). As Salt and Nutrient management plans are developed, it is possible that the discharge limits for salt will decrease as well, leading to more stringent salt removal requirements for the CMC WWTP.

Given the current and future anticipated discharge requirements, the level of treatment for Alternative 3 includes secondary and tertiary treatment, along with filtration and reverse osmosis for salt reduction. Figure 9 shows the anticipated treatment process for the Upgraded CMC WWTP. Adding salt reduction and additional redundancy to the existing CMC WWTP would be a valuable modernization for the CMC WWTP, increasing its reliability and improving its effluent quality.

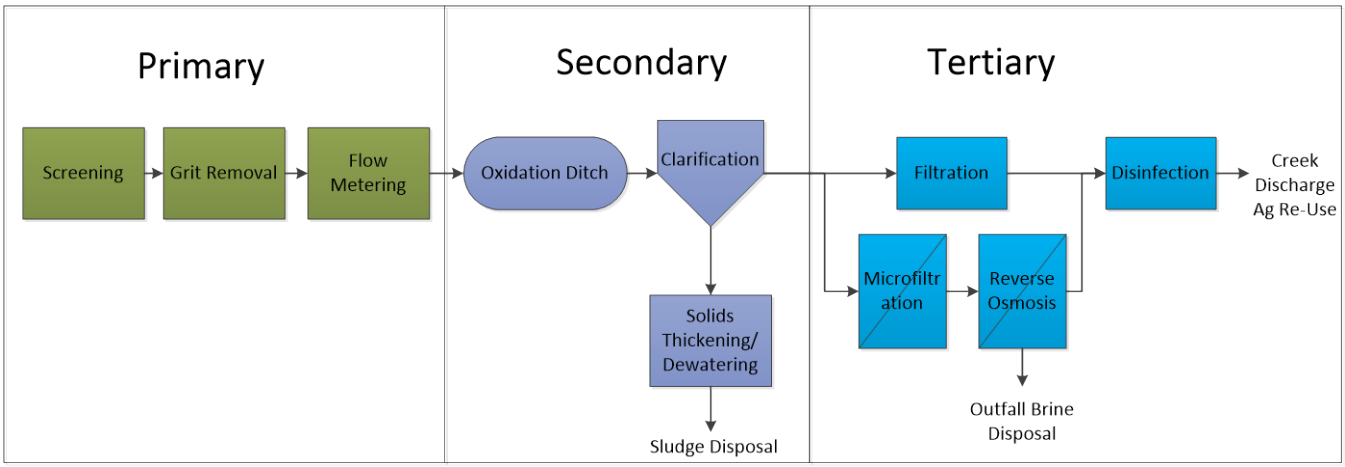

Figure 9. Upgraded CMC WWTP process flow diagram

Cost Estimates

Capital Cost

The capital cost estimates for the Upgraded CMC WWTP were based on cost estimates prepared in previous wastewater studies related to the MBCSD and CMC WWTP. To develop the Upgraded CMC WWTP cost estimate, it was assumed that the current treatment process would be expanded to provide capacity for wastewater from Morro Bay and Cayucos. Additionally, it was assumed that reverse osmosis treatment would be added for fifty percent of plant flows providing all agencies treating wastewater at CMC WWTP with salt reduction.

Additionally, cost estimates were developed for the pump stations and force mains that would be required to deliver the wastewater to the Upgraded CMC WWTP and return the brine to the existing outfall at the MBCSD. It was assumed that costs for the WWTP upgrade, lift station and force main would be shared, based on flow, between the District and Morro Bay. Costs for the reverse osmosis treatment process and the brine return line were assumed to be shared between all of the agencies participating in the regional treatment facility that the CMC WWTP would become. Table 8 outlines the total estimated cost to upgrade the CMC WWTP and construct the necessary conveyance infrastructure. Table 9 outlines the District's portion of the capital cost for Alternative 3.

Table 8. Total Upgraded CMC WWTP capital cost estimate

Alternative	Treatment Capital Cost ($M)	Conveyance Infrastructure Capital Cost ($M)	Total Capital Cost ($M)
3 - Upgraded CMC WWTP	58.7	18.3	77.0

Table 9. District's portion of the Upgraded CMC WWTP capital cost estimate

Alternative	District's Portion Treatment Capital Cost ($M)	District's Portion Conveyance Infrastructure Capital Cost ($M)	District's Portion Total Capital Cost ($M)
3 - Upgraded CMC WWTP	12.7	4.1	16.8

O&M Cost

O&M cost estimates were developed by correlating previously completed O&M costs estimates for similar facilities to the Upgraded CMC WWTP and by calculating the required energy to pump sewage and brine to and from the Upgraded CMC WWTP. Table 10 outlines the total estimated cost and the District's portion to operate and maintain the Upgraded CMC WWTP. Table 11 outlines the District's portion of the O&M cost for Alternative 3.

Table 10. Total Upgraded CMC WWTP O&M cost estimate

Alternative	Annual Treatment O&M Cost ($k)	Annual Conveyance Infrastructure O&M Cost ($k)	Total Annual O&M Cost ($K)
3 - Upgraded CMC WWTP	6,814	114	6,928

Table 11. District's portion of the Upgraded CMC WWTP O&M cost estimate

Alternative	District's Portion Annual Treatment O&M Cost ($k)	District's Portion Annual Conveyance Infrastructure O&M Cost ($k)	District's Portion Total Annual O&M Cost ($K)
3 - Upgraded CMC WWTP	914	29	943

Section 6. Summary and Recommendations

The Project Team identified and investigated a number of conceptual wastewater alternatives to provide the District with additional information to guide their continued evaluation of wastewater treatment options. Table 12 provides a summary of the District's capital cost estimates, Table 13 provides a summary of the District's O&M cost estimates and Table 14 provides a summary of the combined Net Present Value project cost estimates for the District for the selected conceptual alternatives.

Table 12. Capital cost summary

Alternative	Treatment Capital Cost ($M)	Conveyance Infrastructure Capital Cost ($M)	Total Capital Cost ($M)
1a – Outfall	15.9	1.5	17.4
1b – Ag Re-use	30.0	5.0	35.0
2 – MBCSD	11.1	0.0	11.1
3 – Upgraded CMC WWTP	12.7	4.1	16.8

Table 13. O&M cost summary

Alternative	Annual Treatment O&M Cost ($k)	Annual Conveyance Infrastructure O&M Cost ($k)	Total Annual O&M Cost ($K)
1a – Outfall	808	9	817
1b – Ag Re-use	1,438	18	1,456
2 – MBCSD	724	0	724
3 – Upgraded CMC WWTP	914	29	943

Table 14. NPV Project Cost Summary

Alternative	District's 20 Year Net Present Value Project Cost ($M)[1]
1a – Outfall	23.3
1b – Ag Re-use	44.6
2 – MBCSD	17.2
3 – Upgraded CMC WWTP	24.2

Recommendations

The Project Team has defined conceptual alternatives for the conveyance and treatment of the District's wastewater. The costs and the ability of the District to successfully implement these alternatives range significantly. These conceptual alternatives were chosen to approximate a range of potential projects that might be implemented by the District. WSC recommends that the District coordinate with the other stakeholder agencies to consider these conceptual alternatives broadly, establish an evaluation and screening methodology, and select a set of preferred alternatives and sub-alternatives for more detailed evaluation and feasibility assessment.

[1] Assumes all capital costs are financed at 3.5% over 20 years, a 6% discount rate and do not include costs for land acquisition or reclaimed water infrastructure.

Section 7. Works Cited

1. **EPA.** *Construction Costs for Municipal Wastewater Treatment Plans: 1973-1982.* 1983.

2. **Jones, Garr M, et al., et al.** *Pumping Station Design.* Burlington : Butterworth-Heinemann, 2008. Revised Thrid Edition.

3. **McGivney, William T and Kawamura, Susumu.** *Cost Estimating Manual for Water Treatment Facilities.* Hoboken : John Wiley & Sons, Inc., 2008.

4. **MWH.** *Flows and Loadings Technical Memorandum.* 2010.

5. **Morro Bay/Cayucos JPGA.** *Morro Bay Cayucos WWTP Flow Data.* 2013.

6. **Carollo Engineers.** *City of Morro Bay Cayucos Sanitary District Wastewater Treatment Plant Facility Master Plan Report.* 2007.

7. **Keogh, Bruce.** *Status Report of a Major Maintenance & Repair Plan (MMRP) for the WWTP.* 2013.

8. **Carollo Engineers.** *Los Osos Wastewater Project Development Regional Treatment Technical Memorandum.* 2008.

9. **Cannon Associates.** *City of Morro Bay Wastewater Treatment Plant Study.* 2007.