TECHNICAL MEMORANDUM

WASTEWATER COLLECTION SYSTEM STUDY

FOR

OCEANO COMMUNITY SERVICES DISTRICT

PREPARED BY:

WALLACE GROUP

September 16, 2009

TECHNICAL MEMORANDUM

This technical memorandum (TM) addresses the Oceano CSD's (District) wastewater collection system needs, addressing existing and future build-out needs. This TM provides information to identify system needs to budget accordingly, and assist with evaluation of sewer collection system rates.

The District provides its customers with wastewater collection services; conveying wastewater to the South San Luis Obispo County Sanitation District (SSLOCSD) trunk sewer and wastewater treatment facilities. This TM focuses specifically on the Oceano CSD wastewater collection system.

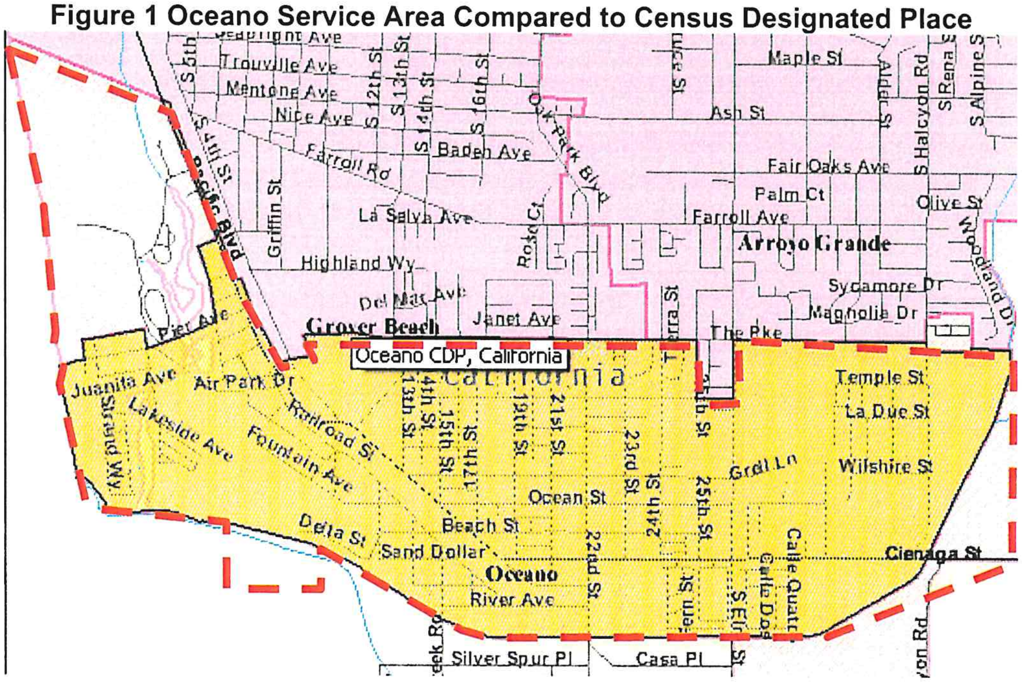
LAND USE AND SERVICE POPULATION

Population

The population of the District service area for wastewater services has a large impact on the use of and demand for those services. Determining the service population is not always a simple process and estimates are key components to forecasting system and community needs. Population can be estimated with several different approaches. Consideration must also be given to those provided sewer service living outside the official District boundary.

Figure 1 shows the Census Designated Place (CDP) in orange and the District's service area shown by the dashed red line. While they are not an exact match, most of the additional area included by the CDP is undeveloped. Also, there are other areas the District provides sewer service which are outside the District Boundary and the CDP. While the service population and the CDP are not the same, the 2000 census still provides a reasonable estimate of the typical household size (2.96) and a population of 7260 within the service area can still be used as a base point for population estimates.

Figure 1 Oceano Service Area Compared to Census Designated Place



Currently the District provides sewer collection for approximately 115 people on Paul Place and Russ Court (39 units) which is outside the District service area boundary. The current population served can be estimated several ways, detailed as follows:

1. <u>2005-2006 County General Plan:</u> Appendix A of the 2005-2006 County General Plan (General Plan) estimated the population of Oceano at 7,446 in 2005 and projected it to be 7,826 in 2010. From this, it is reasonable to interpolate a population of 7,750 in 2009 within the District. By adding the population outside the District boundary we can estimate the total sewer service population to be 7,865.
2. <u>Sewer Billing Information:</u> The previous estimate is based on data projections rather than current information. The most up-to-date information the District has concerning its customers is billing information. Billing information can be used to estimate population by multiplying the household size of 2.96 by the 2,770 residential units with sewer service to obtain a total population served of 8,199 people. The internal District population can be back calculated by subtracting out the 115 customers outside the District to arrive at a population of 8,084.

Of the two population estimating methods described above and summarized in Table 1 the sewer service based approach uses information that is both current and produces the more conservative estimate so will be used as the basis of analysis throughout the remainder of this study.

Table 1 Current District Population

Estimation Method	District	Sewer Customers
General Plan	7,750	7,865
Sewer Billing	8,084	8,199

While the preceding approach works well to estimate current population, the District's population in 20 years and at build-out will also impact planning for collection system improvements.

Future Population

Though the G&T 2004 WMP estimates future population, the update population information warrants an updated approach and estimates. It is worth noting that population projections can be developed in a number of different ways, and thus discrepancies between County and District population estimates will exist.

The 2002 Oceano specific plan estimates the build-out population under the existing County General Plan to be 9,601. Although the Oceano specific plan recognizes that the build-out population is often never reached because it represents a maximum, the population provided water service can be larger than the build-out population because land use within the District can be rezoned, the service area of the District can expand, and the District can provide service to people outside its service area. Current sewer service agreements already add 115 users not included in the Oceano Specific Plan and there are no further agreements planned.

The General Plan contains population projections to 2030. From this data we can back calculate an average population growth rate of 0.67% that can be applied to the District's current population. By this method the current population of 8,199 (including the additional 115 customers outside the service boundary) will increase to 9,416 in 2030.

Since population projections by year are difficult, a build-out population estimate provides additional perspective of potential future demands. Further, these populations correlate to the construction of new units within the District service area. Even if the year's population is no longer representative of the District projected population, the number of new units since 2009 can be used to project collection system capacity. The build-out population for the District may be affected heavily by the rezoning of agricultural land for residential housing. Build-out population of the existing service area (plus the current agreement outside the service area) was calculated to be as much as 12,299. If the zoning changes, the District expands service area, and/or outside District agreements are carried out the effective build-out population served could be as much as 15,430. These build-out population projects are based on the 2004 G&T WMP and existing information. Several key populations and their corresponding unit equivalent are summarized in Table 2 and all other populations required for this report will be calculated from this data. This collection system analysis is based on a build-out population of 12,299.

Table 2 Calculated Populations

Year	Population	Additional Units
2000	7,260	-
2009	8,199	-
2010	8,253	18
2015	8,530	112
2030	9,416	411
Build-out same zoning	12,299	1,385
Build-out rezoning	15,430	2,443

A future planned development, the Coker-Ellsworth development, is envisioned to include seven units, plus a 20-unit mini storage facility. Wastewater from this future development will be collected via the City of Arroyo Grande's sewage collection system.

WASTEWATER FLOWS

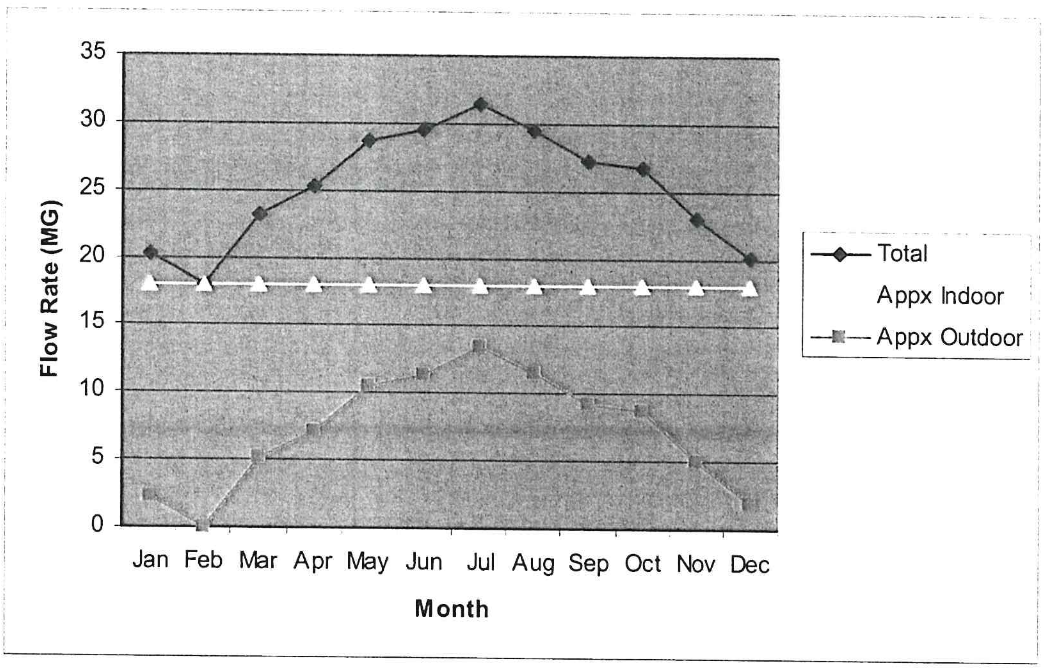
There are several wastewater production parameters used for the evaluation of a collection system under different conditions. For this analysis, average day, maximum day, and peak flows will be used to evaluate the hydraulic loading of the collection system. The time, intensity, and duration of these flows are typically described by a diurnal curve. Since wastewater flows are not metered like water demand, it is more challenging to determine the behavior of these flows. Although flow data is available at the treatment plant, the District shares the trunk collection system with two other cities making it difficult to determine the District's portion of the flow. In-line flow monitoring can also be done but is expensive for a system that has so many points of connection to the trunk collection system. For this reason wastewater parameters are estimated as follows.

1. <u>SSLOCSD Long Range Plan:</u> The 2002 Long Range Plan for SSLOCSD estimated per capita daily wastewater flows at 81 gpcd of wastewater flow. While OCSD, Grover Beach, and Arroyo Grande all contribute to SSLOCSD wastewater flows, one can reasonably assume that Oceano's per capita flow rates are comparable to its neighboring communities. The 81 gpcd represents an average daily flow for the District

and would equate to a present day flow of 0.66 MGD based on the preceding population estimates.

2. Water Use: Alternatively, per capita wastewater flows can be estimated from water use. The average 2007/2008 monthly water use is graphed in Figure 2. Assuming that the low water demand month of February is comprised predominantly of indoor water use, that indoor use is mostly discharged to the sewer, and that indoor water use does not appreciably change seasonally, the water demand in excess of the low demand rate during the rest of the year can be assumed to be for outdoor water use. Therefore, we can determine what fraction of water use is indoor and outdoor. From this analysis we can determine that approximately 72% of ADD and per capita water use is released to the collection system. Thus, average daily wastewater flows are 0.60 MGD and per capita wastewater flows are 67 gpcd. This per capita wastewater flow estimate is relatively low, even for communities with good water conservation programs.

Figure 2 Seasonal Flows



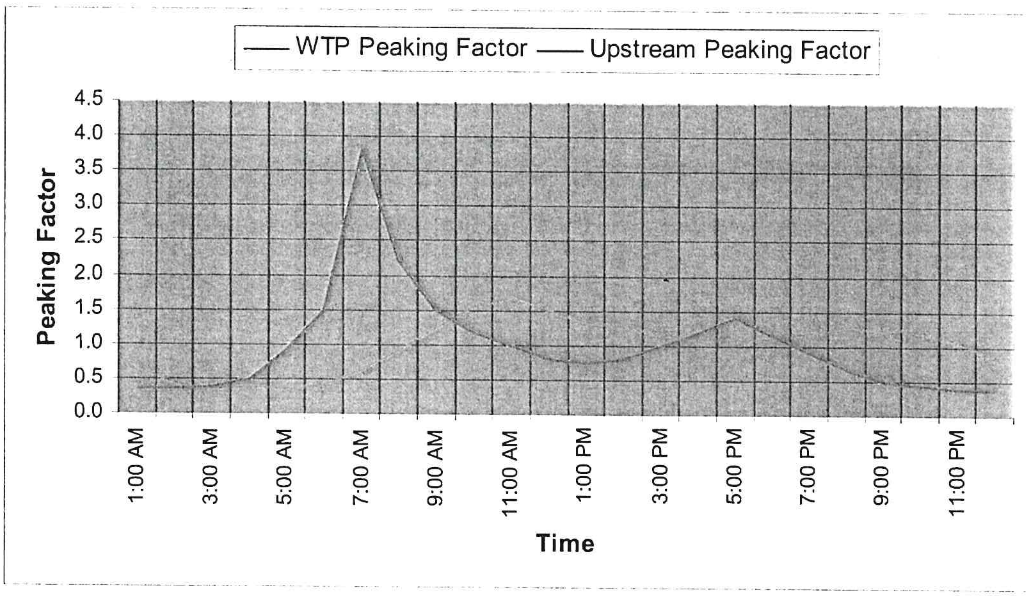
The two methods of estimating wastewater flow result in significantly different results. The 2002 long range plan is based on a study of multiple communities with different development patterns and therefore is not an ideal representation of the District's wastewater flows. The water demand approach assumes that there are no seasonal impacts on wastewater flows which may under or over estimate the actual flows. It also assumes that all of the February flow is discharged to the collection system, which will likely overestimate the flow. To determine a reasonable estimate for the purpose of analysis, the average of the two methods (74 gpcd) will be used for the collection system analysis.

Regardless of the per capita wastewater flows, a diurnal curve will explain how wastewater flows fluctuate throughout the day. Figure 3 illustrates the diurnal curve developed based on actual in-line flow readings at the SSLOCSD wastewater treatment plant (WWTP) in July 2000.

While this is not for the District directly, the shape of the diurnal curve will be similar. Figure 3 plots peaking factors over the course of a typical day at the WWTP that can be multiplied by daily flows to determine typical flows at that time of day.

However, this curve is based on flows as they enter the SSLOCSD WWTP. Typically, the further upstream a sewer is in relation to the WWTP, the earlier and more pronounced the peak will be. For this reason the peaking factors in Figure 3 are not representative of peaking factors in the upstream portions of the collection system. As an alternative, Metcalf and Eddy's Wastewater Treatment estimates a typical peaking factor for a community of the District's size to be 3.8 for peak hourly flow. This peaking factor is larger, as expected, and will be conservative enough to account for inflow and infiltration (as discussed below), so it will be used as a worst case scenario for the collection system evaluation. Using the peak hour flow peaking factor, the WWTP peaking factor data, and waste use behavior, an upstream diurnal curve was developed to be applied to daily average inflows illustrated in Figure 3.

Figure 3 Diurnal Curve of Peaking Factors



Inflow and Infiltration

Inflow and infiltration is excess water that enters into the wastewater collection system due to rainfall runoff or high groundwater seeping into manholes and collection system pipes. Inflow and infiltration can increase flows in a collection system two to three times or more in problem areas. It is important to determine the extent of inflow and infiltration in the District's collection system in order to size collection system piping and infrastructure. However, an I/I analysis was beyond the scope of this study. Thus, to account for I/I in the wastewater collection system model, a larger peaking factor discussed above will account for this.

<u>Existing Wastewater Flows</u>

Based on the existing population estimate (8,199) and per capita wastewater flows (74 gpcd) calculated above, the current average daily wastewater flow is approximately 0.6 MGD. Applying the peaking factor of 3.8 yields a peak hour flow of 2.3 MGD. The application of these wastewater flows is based on proportionate amounts of water use records by meter type for different land use types.

Future Wastewater Flows

Based on the projected population build-out under existing zoning conditions (12,299) and per capita wastewater flows calculated above remaining constant in the future, the projected build-out wastewater flow is approximately 0.91 MGD. In the future the peaking factor is likely to be lower due to the increasing population. Applying the projected peaking factor of 3.6 yields a peak hour flow of 3.3 MGD.

COLLECTION SYSTEM

The Oceano collection system conveys wastewater from the District's service area to the SSLOCSD trunk lines. To accomplish this goal the District utilizes a single lift station and force main as well as a variety of gravity sewer sizes and materials. The distribution of these facilities is illustrated in Figure 4 (next page). The length of pipe corresponding to each pipe material is unknown but the vitrified clay pipe (VCP) is the primary material with some PVC in the newer developments. The lengths by size are summarized in Table 3.

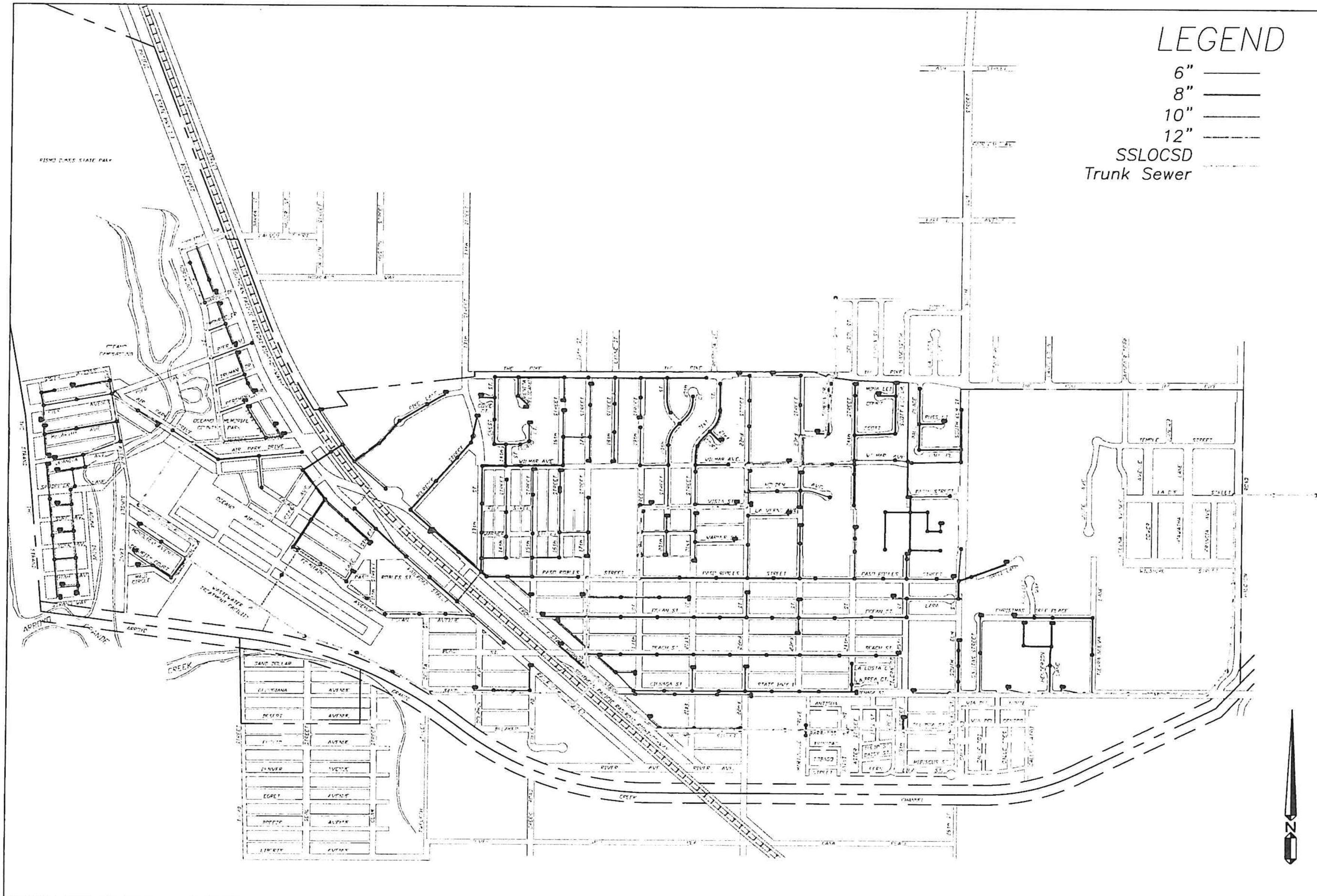
Table 3 Collection System Diameter and Length

Diameter (in)	Length (ft)
6	47,740
8	31,350
10	4,820
12	2,030

Figure 5 illustrates the approximate tributary areas that convey wastewaters to the SSLOCSD trunk system. While there are several even smaller connection to the trunk these 32 areas suffice to show the various points of connection to the SSLOCSD trunk system.

In order to determine capacity constraints of the existing collection system, a model of the District's sewer system was prepared. With a sewer model, existing and projected flows can be applied to determine remaining capacity of collection system infrastructure. Background flows from outside the District's service (Grover Beach and Arroyo Grande) area were added to the trunk system to accurately represent the effect of backwater on shallow sewer lines. For the District sewer model, two separate scenarios were prepared:

> Scenario 1 – existing wastewater flows, according to the current layout of the District's collection system.
>
> Scenario 2 – future wastewater flows, according to the current layout of the District's collection system, and distributing future flows to areas of future development within the service area.



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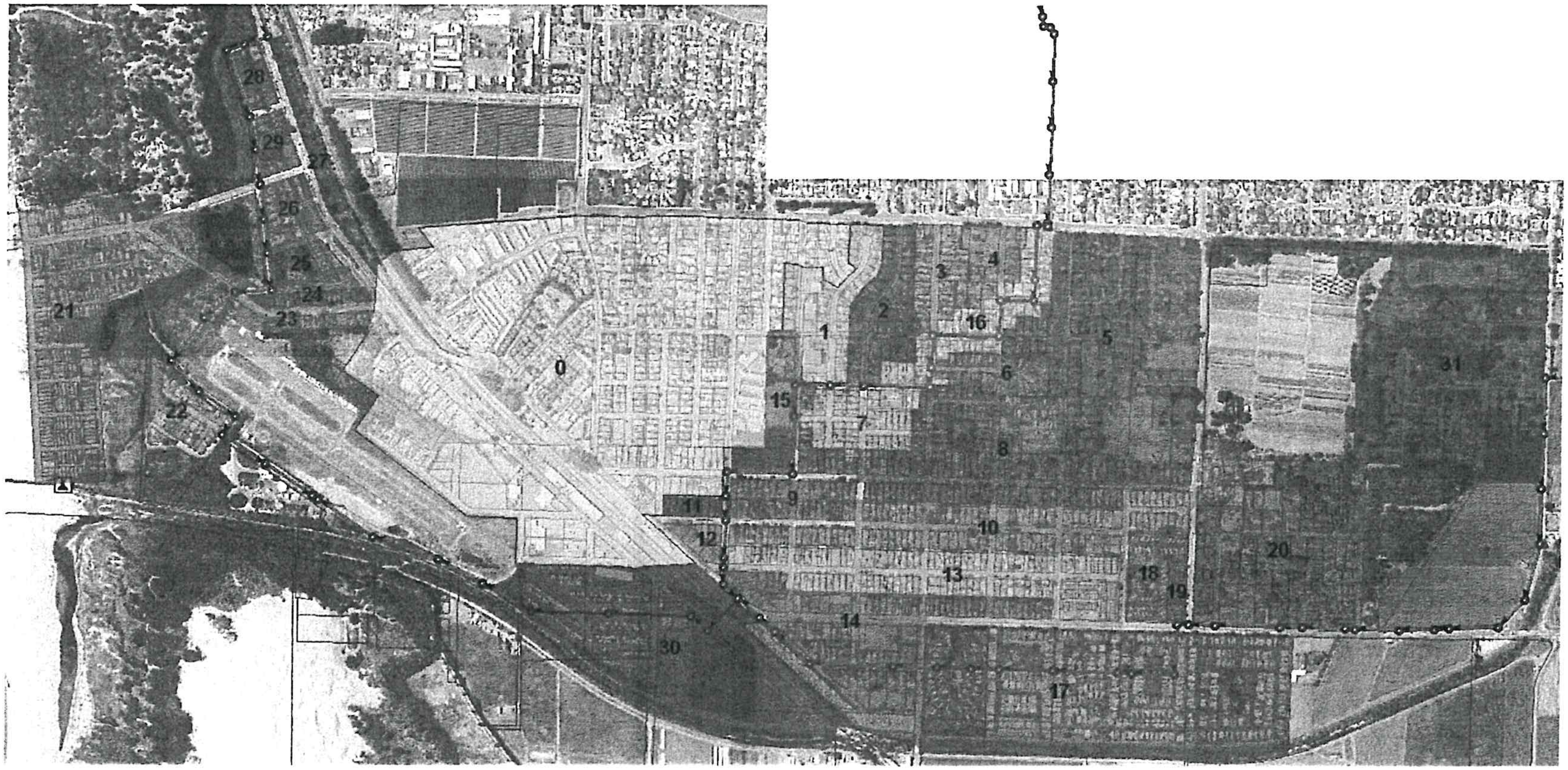
OCEANO COMMUNITY SERVICES DISTRICT (OCSD) SEWER COLLECTION SYSTEM FIGURE 4

JOB No.:	825-002-007
DRAWING:	Sewer Atlas
DRAWN BY:	MJB
DATE:	08/05/2009
SCALE:	NTS

Figure 5 District Tributary Areas to the SSLOCSD Trunk Sewer



Sufficient capacity in pipes is defined by the ratio of depth of flow under peak hour conditions to the diameter of the pipe (d/D). Acceptable d/D values are summarized in Table 4.

Table 4 Capacity Criteria

Pipe Diameter (in)	Acceptable (d/D)
6	0.5
8	0.5
10	0.75
12	0.75

Based on Table 4 criteria for existing and future conditions during peak hour wet weather flow conditions there are no improvements needed based on hydraulic capacity criteria.

LIFT STATION

Wallace Group evaluated the existing lift station located on Pier Avenue, west of the Oceano State Park. The lift station and associated force main was evaluated for service, operational and reliability parameters. The objective of this study was to identify near-term and long-term improvements to this lift station, if necessary, to serve the City through projected build-out. Hydraulic capacity and the ability of the lift station to service future needs was addressed as part of this evaluation. Recommended improvements and/or replacement, and corresponding capital costs were developed and incorporated into this evaluation. A follow up site visit was conducted with Oceano CSD staff on July 16, 2009.

Summary of Existing Lift Station

The existing conditions and design parameters for this lift station are summarized in Table 5. Hydraulic parameters are summarized in Table 6.

Table 5 Summary of Lift Station Conditions

Item	Description
Year Built	1966/67
Lift Station Type	S&L Wetwell w/Drypit and Vertical Non-Clog Pumps
Standby Power	Receptacle for Portable Generator
Alarms	Dial Up to Staff
Level Sensor	Bubbler for Pump Control, Float for High Level Alarm
Wetwell Material	Concrete
Wetwell Coating	Yes
Site Security/Fencing	None

Table 6 Summary of Hydraulic Characteristics

Item	Description
Pump Type	Vertical Non-Clog
Pump Manufacturer/Model	Smith & Loveless/07-4213
No. of Pumps	2
Pump Motor HP	5[2]
Motor Speed, rpm	875 (constant)
Impeller Size	8 1/8"
Date of Last Pump Upgrade/Overhaul	November 2005/bearing service & replacement
Design Flow/Head (gpm@TDH)	200 at 13'
Pump Design Flow Condition	Simplex
Wetwell Operating Volume, Gallons	~500
Force Main Diameter, Inches	6
Pump Invert EL	-2.80
Force Main High Point EL	~9.0
Force Main Length, ft.	600
Force Main Velocity, ft/s, Simplex (Duplex[1])	2.3/4.0

[1]Duplex operating conditions estimated from simplex pump curves. Duplex pump curves not provided by manufacturer.
[2]Pump motors upsized from 3 HP to 5 HP approximately 8 to 9 years ago, when Pacific Plaza Hotel was developed.

Existing and Future Demands

The existing and future wastewater flows/demands for this area were calculated based on the quantity of developed and undeveloped residential lots tributary to the lift station, State Park and other commercial areas. Infiltration/inflow data is not available; thus, reasonable estimates of wet weather flow were provided in Table 7.

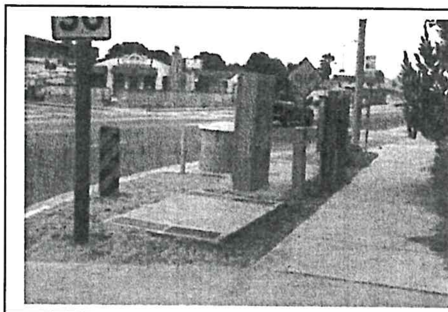
Table 7 Flow Summary[1]

Flow Parameter[1]	Value
Existing Dry Weather Peak Flow, gpm	80
Existing Wet Weather Peak Flow, gpm	105
Future Dry Weather Peak Flow, gpm	93
Future Wet Weather Peak Flow, gpm[1]	170

[1]Includes 3.5 diurnal peaking factor.

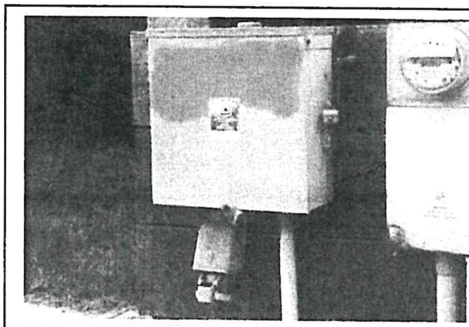
Lift Station General Evaluation (Non-hydraulic)

This evaluation included review of existing information, record drawings, and a site visit to the lift station. A summary of the pertinent non-hydraulic parameters of the lift stations is presented in Table 5.



The lift station is located on Pier Avenue, adjacent to Oceano State Park. The lift station receives flow from the park, and residential/tourist demands from this area. Sewage discharges through a 6-inch cast iron force main that flows southerly, crossing the lagoon/slough, then to Manhole T1-A, SSLOCSD trunk sewer.

- *Lift Station/Dry Pit:* The lift station and dry pit is a Smith & Loveless package lift station. The station was installed in 1966. Removing and replacing pumps can be difficult due to the depth of the dry pit, small opening, location of opening (not centered over pumps), and required confined space entry procedures. According to District staff, they generally contract out this type of service to pull the pumps from the drypit.
- *Wetwell:* The wetwell is a circular lined concrete wetwell. This wetwell was re-lined approximately one to two years ago, and is in good condition. Two gravity sewers discharge to this wetwell, and both have been equipped with stainless steel baskets to catch large debris (to avoid pump clogs). The baskets, which must be cleaned weekly, are working well to minimize the potential for large debris entering the wetwell and clogging the pumps.



- *Site Conditions:* The lift station is on the north shoulder of Pier Avenue, next to a PGE vault. The site is open (not fenced). Hatches are padlocked for security.
- *Site Power:* The lift station has a receptacle to receive a portable standby generator, which is stored at the City's water yard less than a mile away.
- *Telemetry/Alarms:* The station is equipped with an auto dialer, which telephones an alarm company when a high level or other alarm triggers at the lift station.

Lift Station Hydraulic Performance Evaluation

The hydraulic characteristics of the lift station were analyzed and deficiencies were noted. Design criteria that apply to the lift station and force main is summarized below. Table 6 summarizes the hydraulic parameters of the lift station.

- Force main velocities should be greater that 2.0 feet per second to maintain self cleaning properties but less than 6.0 feet per second to minimize head loss and water hammer.

- Lift stations should be able to convey peak flows with the largest pump out of service. Station "capacity" is therefore calculated with the largest pump out of service.

- Lift station wet wells should be sized to limit the number of pump starts per hour to acceptable limits as defined by the pump manufacturer.

- Lift stations should have a means of conveying peak flows during a power outage. Lift stations serving a small number of customers could use wetwell storage to meet this requirement.

Force Main Velocities

As indicated in Table 7, the force main velocities, in simplex or duplex mode, are acceptable and within normal ranges.

Lift Station Wet Well Capacity

The lift station operating volume was calculated/estimated (due to the conical shape of the bottom of the wetwell, exact volumes could not be computed) and pump cycle times were computed for each station, based on peak dry and wet weather flows (running in simplex mode). Operating volumes do not account for storage volume available between the lead (simplex) pump on elevation and lag (duplex) pump on elevation. Table 8 summarizes the wetwell cycle time calculations.

According to staff, in the event of a power failure, the District generally has more than one hour of response time to provide the portable standby generator, before any potential spill may occur. This provides adequate time for the District to respond.

Table 8 Summary of Lift Station Cycle Times

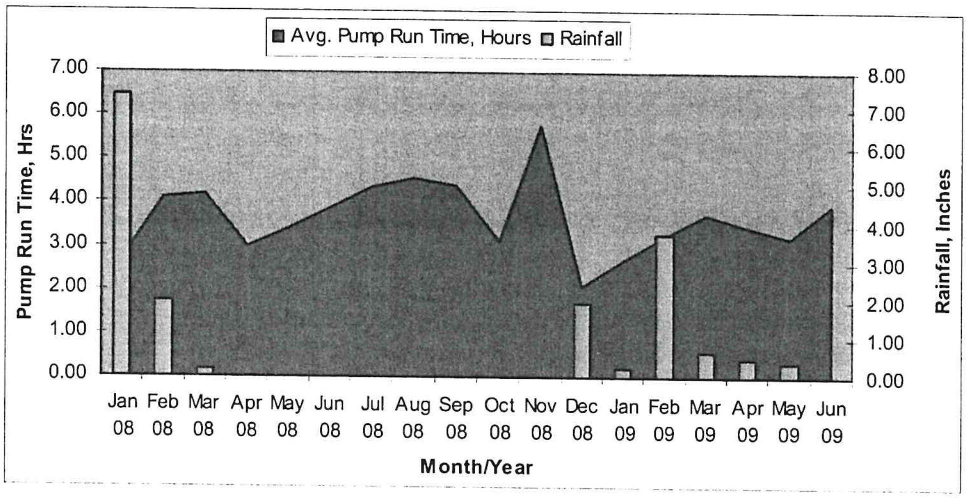
Item	Value
Wetwell Operating Volume, gallons	~500
Cycles per Hour at Existing ADWF	2.6
Cycles per Hour at Max. Day Flow	3.1
Cycles per Hour at Existing PWWF	9.8
Cycles per Hour at Future PDWF	3.1
Cycles per Hour at Max. Day Flow	3.4
Cycles per Hour at Future PWWF	10.3

Lift station pumps should typically cycle not more than 5 to 6 times per hour during average and normal flow conditions, to limit pump starts and avoid motor burnout. This recommendation, however, should be based on the actual pump manufacturer's information. The general range of cycles for this lift station are normal and satisfactory. Only on very few occasions will the lift station cycle over 10 times per hour, and that will be during wet weather flow conditions with significant inflow. It should be noted again that I/I information is not available, thus this evaluation could only be based on assumed inflow values. Regardless, the lift station appears to have more than adequate capacity for existing and future years.

Review of Lift Station Pump Run Hours

Sometimes a plot of lift station pump run times can reveal trends with inflow/infiltration, or peak summer trends. January 2008 through June 2009 pump run times were calculated, and plotted versus monthly rainfall for the same period. Figure 6 depicts this data. From a review of the chart, no clear trend can be seen between precipitation and increased response to pump run times; however, it appears that the summer tourist demands can be seen in summer months as run pump times increase.

Figure 6 Lift Station Run Times vs. Rainfall



Recommendations

Existing pump capacity for this station is greater than buildout peak wet weather flow, and thus no hydraulic upgrade recommendations are warranted. The lift station pump motors, impellers, bearings, and other components will continue to need service, maintenance, and replacements throughout the years to come. At this time, no other capital improvement recommendations are warranted for this lift station.

CAPITAL IMPROVEMENTS

At this time, there are no identified system capacity concerns and therefore no capital improvement projects are recommended. Other general recommendations are as follows:

- Sewer Videotaping - The District should consider an annual budget line item for periodic and as-needed sewer videotaping. Such review of existing collection system is part of the overall operation and maintenance program described in the Sewer System Management Plan (SSMP). At this time, focused inspections in "trouble-spots" areas is sufficient.
- Sewer Cleaning - Periodic sewer cleaning/jetting should be performed on an on-going basis.
- Manholes - Manholes should be inspected as needed consistent with current practices for signs of sulfuric acid attack and general deterioration, as well as any issues with solids build up and debris. If it is suspected that a manhole may be the source of inflow, gaskets or covers to minimize inflow through the manholes should be considered.

Lift Station

- No CIPs for the existing lift station are recommended at this time.

Gravity Collection System

- No CIPs for the existing collection system are recommended at this time.

Conclusion

The District has done an excellent job maintaining the collection system facilities. While periodic replacement of aging infrastructure will be required, a continued maintenance and inspection program will continue to further the lifetime of the system.