

MBARI Sanitary Sewer Analysis Report

Executive Summary:

This Sanitary Sewer Analysis Report has been prepared for the Monterey Bay Aquarium Research Institute (MBARI) located on Moss Landing Island. MBARI is proposing to expand its facilities and must submit an engineering report to Monterey County, serving as the Moss Landing County Sanitation District (District), for approval of an increase in wastewater allocation.

In this report, we have estimated the District's allocation will be need to be 6405 gallons per day (GPD), average daily dry weather flow, for the build-out of the MBARI site, based on the original formula shown in the District's Wastewater Flows dated February 5, 1985, attached in the Appendix, and based on MBARI's current Master Plan, also included in the Appendix. This compares to an estimated water use for the same build-out of 12,209 GPD, based on the current water meter readings of the Pajaro/Sunny Mesa Community Services District for MBARI's existing office buildings. We have estimated the wastewater requirements for similar land uses using industry standard rates from other public agencies to be over 27,000 GPD dry weather flow. This demonstrates the low water use of the existing MBARI facilities at Moss Landing.

Typically the sewage outflow from most developments is 10% to 25% less than the water usage, making water usage a conservative approach to estimating wastewater generation. The water company's meter readings of current water usage for MBARI's existing buildings (including the restaurant which is proposed to be demolished) was 11,243 GPD average between November 21, 2007 and February 4, 2008, but was only 4479 GPD average for just the MBARI buildings without the restaurant. See the Appendix for details.

Based on these meter readings, we have calculated an estimated current water use of 45 GPD/1000 square feet of building space for the existing MBARI buildings. This rate results in a projected maximum wastewater generation of 12,209 GPD average daily dry weather flow for the MBARI build-out. This is an 8% increase over MBARI's current total flows, based on water use.

Finally, the total metered water use for the entire island was 1.496 million gallons for the same period as the wastewater flow of 1.987 million gallons measured by SFE in the force main at the bridge for the entire island. This indicates a likelihood of significant groundwater infiltration, and we therefore recommend having the sewer system video taped to determine where repairs and/or replacement might be required to reduce flows from the island. We also recommend consideration of having separate landscape

irrigation meters in order to isolate water being used for irrigation that should not impact sewer allocations.

An additional suggestion for analysis of the existing public system within Sandholdt is to have a “run-time” meter placed on the pump at the force main to determine why the pump seems to run so frequently.

Introduction:

The Monterey Bay Aquarium Research Institute (MBARI), located on the Moss Landing Island, desires to expand its existing facility. Monterey County, which provides sanitary sewer services to the island, is requiring an engineering report be prepared justifying an increase in capacity to serve MBARI and the other users on the island. This request was stated in an email from Ed Muniz to Keith Raybould on March 13, 2008.

This report is an analysis of the existing sewer flows from the MBARI facilities and the future needs based on MBARI’s Master Plan and Site Building Information dated March 18, 2008, prepared by EHDD Architecture.

Background:

Sanitary sewer services are provided to MBARI by Monterey County with a special district called the “Moss Landing County Sanitation District”. The district was formed by the County in 1984 and allocated a total flow capacity of 105,000 gallons per day (GPD) average daily dry weather flow for five (5) service areas which are served by pump and lift stations.

The MBARI development is located in Service Area No. 3 (Moss Landing Island), which has a total flow capacity allocation of 14,000 GPD average daily dry weather flow.

In November 2007 MBARI engaged SFE Global of Sacramento, CA to obtain sanitary sewer flow measurements from the island. Measurements were taken between November 21, 2007 and February 4, 2008. This data is provided in a report dated February 2008, also included in the Appendix.

References:

The following data was used by Harris & Associates in preparation of this report:

1. Monterey County, CA, MBARI Temporary Sanitary Sewer Flow Monitoring, SFE File #C91-01, Final Report.
2. “As Built” drawings for the construction of “Sewerage Project for Moss Landing County Sanitation District” prepared by Engineering Science of Monterey, CA, dated February 26, 1985.

3. Water Usage information for Moss Landing Island as provided by the Pajaro/Sunny Mesa Community Services District for November 21, 2007 through February 4, 2008.
4. MBARI Master Plan, site and building information dated March 18, 2008.
5. Street address information is a combination of Monterey County information and field review.
6. Assessor's map information from Parcel Quest.
7. Water meter locations (shown on attached map) from field review.

Analysis:

Attached is a spreadsheet showing a listing of the MBARI parcels located on Sandholdt Road. Each parcel has been identified with an assessor's parcel number, street address, water meter number (with location address provided by the water district), MBARI master plan building identification letter, and estimated projected Sanitary Sewer Flow based on two different water usage rates. 45 gal/day/1000 SF is the current rate of water use for the existing MBARI buildings based on the referenced water meter readings. It should be noted that during a field review, a newly occupied development with 8 water meters exists at 7532 Sandholdt Road. Meter readings for this development were not included in the data provided by the water company, and the meters may not have been active during our study period.

For most development similar to the MBARI buildings, the average gallons per day of water usage is greater than the amount of wastewater generated due to losses from landscape irrigation (the MBARI site does not have separate irrigation water meters), outdoor uses such as washing equipment, human and operational consumption. Differences between inflow and outflow will vary with user, but may be in the range of 10% to 25%. The analysis shown herein makes no allowance for these losses, and is therefore considered to be conservative.

The Flow Measurements obtained by SFE show an average daily wet weather flow for the entire island of 25,600 GPD during the winter, which is 11,600 GPD greater than the service areas average dry weather daily allocation of 14,000 GPD. Wet weather flow measurements are typically greater than dry weather measurements because of greater ground water infiltration.

Currently the northern and southern halves of the island each sewer to different main lines. Both main lines are 8 inches in diameter and drain by gravity to the same pump station, which pumps the entire flow from the island through a 4-inch force main. Each 8-inch line slopes at 0.6% and has a hydraulic capacity (flowing full) of 0.95 cubic feet per second (CFS) or approximately 605,000 GPD.

As Built Drawings for the existing pump station show a 5-horse power pump. The pump's performance information was not available on the plans; however, other pumps under similar situations can push approximately 400 GPM or 480,000 GPD thru a 4-inch line.

The design capacity of the existing mainline, force main and pump station all appear to greatly exceed the potential wastewater generation from the site.

Design Flow Criteria:

The original service area allocation used in the Monterey County Sewer District assumptions is 250 GPD for vacant industrial parcels. This will serve approximately 2500 SF of new industrial/office space per parcel at industry standard rates, or 5000 SF per parcel at the current MBARI water use rate.

Comparing the existing water use of the MBARI buildings (excluding the restaurant), to the existing building area, shows an average use of 42.1 GPD/1000 SF, or approximately 20 GPD per employee. Using a rounded number of 45 GPD/1000 SF, the total projected water use and hence wastewater flows for the MBARI build-out would be an average of 12,209 GPD average daily flow.

If the Sanitation District's "Chart of Annual Waste Water Flows per Category for Moss Landing County Sanitation District dated February 5, 1985", were used to determine the total sewer allocation available to MBARI at full development, the development would be allocated 15 GPD per student/employee for State Marine Lab category. The total projected allocation for MBARI at build-out for 427 employees would total 6405 GPD average daily dry weather flow. However, measured water use is approximately 20 GPD per employee; hence the build-out requirement would be 8,540 GPD, on an employee basis.

Infiltration:

Infiltration of ground water appears to also be a factor in the measured average daily flows from the island. The following items might be contributing to this situation:

- a. The As-Built Drawings show that vitrified clay pipe (VCP) was used for the sewer mains. Pipe joints are susceptible to breakage and leaking, and pipe lengths are often 6 feet, creating more joints per linear foot of pipe than other types of pipe that come in longer lengths.
- b. The As-Built Drawings also show that a portion of the sewer system was built at an elevation of 4 feet below sea level, making the system very susceptible to ground water infiltration, particularly with the properties located adjacent to the bay.
- c. The report by SFE shows a measured flow of 15,000 GPD on December 25, 2007. Most businesses are traditionally closed on Christmas, and Phil's Market/Restaurant confirmed it was closed on that day. Therefore,

groundwater infiltration might be as much as 15,000 GPD for the entire island during the winter.

- d. The Report by SFE also shows a total measured flow of 1.987 million gallons (MG) for the reported period from November 21, 2007 through February 4, 2008, and the Water District shows a total metered water usage of 1.495 MG for the same reporting period. This calculates to a total potential groundwater infiltration of at least 492,000 gallons over 77 days, or an average infiltration of approximately 6,390 GPD.
- e. Additionally, the pump station should be inspected for leaks in the wet well or other conditions that might be impacting the efficiency of the pump's operation.

Sewer System Rehabilitation:

We recommended that the entire sewer system, including laterals, and force main be video taped and repairs be made as needed.

Rehabilitation of a deteriorated sewer lines with infiltration problems can be accomplished with the a number of methods of repair depending upon the existing pipe condition including point repairs, slip lining, removing the existing pipe by bursting it in place and replacing the pipe with trenchless methods, removing and replacing the existing pipe with open trenching, or abandoning the existing pipe in place and installing a new parallel line. The last method is probably the least desirable method from a sewer provider's point of view.

Potential costs for each method of rehabilitation will vary, but may be on the order of the following for the 8-inch main:

- a. Point Repairs with open trenching \$120/LF.
- b. Slip lining the existing pipe \$210/LF to \$260/LF.
- c. Bursting the existing pipe in place and installing the same size pipe using trenchless methods \$200/LF.
- d. Removing and replacing the existing pipe with the same size pipe using open trench methods \$260/LF.
- e. Installing a new system and abandoning the existing system in place \$260/LF.

The appropriate repair method may be impacted by the number of laterals, existing slope and grade of the pipe, soil conditions, etc.

