

Montara Water and Sanitary District 2004 Sewer Improvement Project

Clean Beaches Grant Report CBI-62

Introduction

The Montara Water and Sanitary District's Water and Sewer Pipeline Replacement Project was part of the on going capital improvement plan the District has to repair and rebuild their sewer and water pipe infrastructure. During the design of this phase of the project the District identified deficiencies in the trunk sewer feeding the California Street Pump Station, situated near at the entrance to the Fitzgerald Marine Reserve, at intersection of California Street and North Lake Street, Moss Beach, CA. These deficiencies posed several potential sewage spill and ground water/creek contamination risks. This line had suffered dry weather stoppages and overflows and required immediate attention.

The Montara Water and Sanitary District applied for and received grant CBI-62 in the amount of \$15,500.00, managed by the California EPA State Water Resources Control Board, under the Clean Beaches Initiative Grant Program, which was funded by the Watershed, Clean Beaches and Water Quality Act, signed into law September 20, 2002, to help pay for this project (See history of this Initiative in Section #10.)

Understanding the sensitivity of the Marine Reserve to E. coli and other sewage contamination and the risk to public health, the District took immediate action to include this section of sewer in this repair project to reduce the risk of future leaks or spills. To evaluate the effectiveness of the repair, the District was able to rely on an existing water-sampling program by the County of San Mateo. Since 1998 the County has a coastal beach and creek weekly water-sampling program, which includes sampling the surf zone at the public beach of the Marine Reserve as well as all along the San Vicente creek, which flows by the pump station and feeds the Marine Reserve.

Condition of the Old Sewer

The old sewer pipe in this critical area was 288 feet long, was made of vitrified clay pipe (V.C.P.) and had sags and offset joints with root intrusion that had partially closed off the sewage flow, and had the potential for infiltration of ground water into the sewer, or sewage to leak out of the sewer. Also, in order to improve the grade of the sewer, the project had to be extended 132 feet up Nevada Street for a total sewer repair of 420 linear feet. Overall, there were four risk factors identified during design, each of which could lead to sewage spills.

- *First*, the offset pipe joints had caused sewer blockages and dry weather overflows into the entrance of the reserve at the intersection of Nevada and North Lake Streets.
- *Second*, the sewer had poor grade with sags and the manhole at the reserve entrance was poorly designed. These both restricted the hydraulic flow so during wet weather events, the sewage was at risk of spilling rather than draining into the pump station.
- *Third*, the old band seals on the clay pipes potentially allowed rain water to infiltrate and inflow (I/I) into the pipe which would further restrict the hydraulics of the system increasing the risk of wet weather over-flow.
- *Fourth*, the old band seals also had the potential under certain hydraulic conditions during summer and high flow fall months to allow sewage to leak out into the soil. This could have potentially impacted the San Vicente Creek feeding the Fitzgerald Marine Reserve. While the District did not have any direct evidence that the sewage was leaking and directly impacting the creek, a substantial risk existed.

The Repair Goals

It was decided that 420 linear feet of V.C.P sewer along North Lake must be replaced with a water tight pipe and a new manhole must be built to address each of leak, I & I and stoppage concerns. The pipe material chosen was PVC C900 water pipe with a pressure rating of 150 PSIg and which had an extra heavy SDR-17 gage wall thickness compared to conventional SDR-35 sewer pipes, to ensure this pipe would remain trouble free for years to come.

A description of the work performed can be found in the Project Specifications, Section S-01010, previously submitted, and is excerpted here where it can be found in Section #3 of this report.

In order to balance the hydraulic flow between Nevada Street and North Lake Street, and further reduce overflow risks, an up-sized 10” PVC pipe was recommended by the District engineer, but the County of San Mateo’s Coastal Development Review Board rejected the District’s initial CDX application request (the CDX is described below, and the application is included in Section #4 of this report) because of this request for a 10” pipe. The pipe diameter was reduced to 8 inches (to match the existing pipe), and the hydraulic gradients were matched as closely as possible) by increasing the pipe grade as much as was feasible with in the existing collection system elevation restraints.

Water Quality Monitoring Plans and Quality Assurance Project Plan

The District did not develop its own water-sampling plan because the County has an up to date Quality Assurance Project Plan (QAPP) and an active sampling program in the

area adjacent to this work. The details of the sampling and QAPP and water quality data are included in Section #6 of this report.

This sewer replacement project is located adjacent to the Fitzgerald Marine Reserve, where ocean and creek waters are routinely monitored for bacteria levels (e.g., E. coli and/or Enterococcus) by the San Mateo County Department of Environmental Health. The County implements a Quality Assurance Project Plan (Section #6) to ensure that high quality data is used to characterize water quality and if necessary to issue beach advisories to the public within 24 hours of measured exceedances of water quality standards. The QAPP in Section #5 is for the Pilarcitos creek, but as discussed on page 4, the QAPP and sampling approach are developed in San Vicente Creek and Fitzgerald Marine Reserve.

The parameters measured by the County's ambient monitoring program are the appropriate bacterial indicators, total coliform, E. coli and fecal streptococcus, that would otherwise be used by the District to measure whether the collection system is having an impact on water quality. The County's monitoring locations on San Vicente Creek and Fitzgerald Marine Reserve are located where the District would otherwise collect samples to characterize water quality upstream and downstream of the Nevada-North Lake sewer rehabilitation project. Therefore the District monitoring plan uses the County's existing water quality monitoring program in the project area as representative water quality data for evaluating the success of the project in protecting water quality.

Water quality data collected in this monitoring program may not be able to measure the water quality benefit of the project, but over time, projects such as this are expected to reduce the number of beach advisories and closures at the Marine Reserve. Ambient monitoring data is an indirect or secondary indicator of project success under typical sewer operation, because the effects of the sewer leaking or not leaking may or may not be reflected in the ambient data. It is possible that, during pre-project overflow events, the County samples may have directly measured increases of indicators caused by with sewage entering the water just prior to the time of sampling.

The purpose of the project is to eliminate sanitary sewer overflows, which are episodic events not always captured by water quality monitoring programs. Overflows have historically occurred at the project site during dry weather and wet weather conditions. The County monitoring program collects data year-round. Bacterial samples are grab samples taken every week at specific locations by the County. As such, it may be impossible to show a net water quality improvement with bacterial data. Moreover, the San Vicente Creek and beach bacteria levels are also influenced by horse facilities and septic systems upstream of the project area, so water quality exceedances may occur after the project is completed, unrelated to the District's collection system.

In light of the uncertainties associated with ambient water quality monitoring, a more direct, "primary" indicator of project success is reduction or elimination of overflow events in the project area.

The water quality monitoring occurs as follows:

1. Trained staff collects water samples in sterile bottles according to specific guidelines.
2. Sampling staff wade into the surf zone and collect water using a long pole with a sample bottle attached to the end
3. The sample bottles are immediately capped and placed into an ice chest for preservation.
4. The time, date, weather conditions, and location of collection are recorded on a log sheet.
5. The samples are analyzed in a state-certified laboratory within 6 hours of the collection time.

The District will review pre-project and post-project monitoring data from the County and note any reduction in advisories or beach closures or exceedances of water quality standards. Pre-project data are included as Section #6, and exceedance frequencies of applicable water quality standards are described below.

The exceedance frequencies of water quality standards in San Vicente Creek, Fitzgerald Marine Reserve and a nearby culvert, from 1998-2004, are shown in the table below. The EPA water contact criteria of 235 cfu/100ml for E. coli at designated beaches was exceeded the most often at both the creek and the beach, at 86% and 25%, respectively. The exceedance frequency in the spring and summer of 2006 will be reviewed when it becomes available as a potential secondary indicator of project success.

The District will also review the records of overflows and track this primary indicator at the project location in the future. The District expects overflow events to be eliminated in the project area as a result of this infrastructure rehabilitation project.

PRE-PROJECT WATER QUALITY MONITORING 1998-2004

| | Fitzgerald Marine Reserve | | | San Vicente Creek | | Eastside Hiway 1 culvert @ Young Ave | |
|-------------------------------|------------------------------------|---------------------------------|---------------------------------|------------------------------------|---------------------------------|--------------------------------------|---------------------------------|
| | Total Coliform | E. coli | Fecal Streptococcus | Total Coliform | E. coli | Total Coliform | E. coli |
| No. of Detects | 227 | 212 | 99 | 245 | 247 | 15 | 10 |
| No. of Samples | 259 | 259 | 170 | 248 | 248 | 17 | 17 |
| Water Quality Standard | No single sample >10,000 cfu/100ml | No single sample >235 cfu/100ml | No single sample >104 cfu/100ml | No single sample >10,000 cfu/100ml | No single sample >235 cfu/100ml | No single sample >10,000 cfu/100ml | No single sample >235 cfu/100ml |
| No. of Exceedances | 1 | 66 | 11 | 22 | 213 | 1 | 1 |
| Exceedance Frequency | 0.39% | 25.48% | 6.47% | 8.87% | 85.89% | 5.88% | 5.88% |

Raw Data

Section #6 has the complete pre-job raw data set from the San Mateo sampling program for reference. The Fitzgerald Marine Reserve and the San Vicente Creek are both circled in red. Post construction/real time data is available directly from San Mateo at: <http://www.co.sanmateo.ca.us/>, or at <http://www.earth911.org/waterquality/default.asp?cluster=6081>

Permits Required

The District is required to request either the standard Costal Development Permit (CDP) or the Coastal Development Exemption (CDX) for any sewer infrastructure improvement performed in San Mateo County. The contractor is also required to get a standard encroachment permit to cover the actual digging and street repair. The San Mateo County was contacted by the District on October 4th, 2004, after the bids were excepted for an Emergency Costal Development Exemption (CDX) Permit, see section #4. This application was approved Spring 2005.

Pre Job Photos

Section #7 of this report shows pictures of the creek and streets in the vicinity of the work area. The problem manhole which had suffered repeated overflows is located at the intersection of Nevada and North Lake streets about 20 yards away from the steel gate at the Reserve's entrance and can be seen in picture #7O. Pictures #7G, #7J, #7Q and #7V are all taken at the location of this manhole. The sewer drains into the California Street pump station shown in picture #7R and runs to the west side of North Lake in the dirt parking area shown in #7S. As can be seen in the vicinity pictures, any sewage leaks or spills in this area can have a direct and immediate detrimental effect on the creek and Marine Reserve.

Description of Construction and Photos

Excavation started at the lowest elevation of the pipe, which was at the entry into the California Street pump station. This location can be seen in the photos in Section #7R and #8A.

The first discovery was that the sewer trench went under the pump station's 6" cast iron force main. The force main had a 45-degree and a 22-degree bend directly next to each other with out any restraints or kickers. The lack of restraints on these joints posed a leak risk should an earthquake shift the ground and separate the joints. A picture of the

stainless steel restraints added to retrofit the force main are shown in a picture in Section #8D.

Pictures #8A and #8B also show the geology of the local soil. Picture #8B clearly shows striated semi-consolidated sand (not yet formed into sand stone.) This soil is firm, but may be porous allowing water to flow into and out of the sewer trench. The trench did not have standing water during construction, but was damp.

The sewer pipe connections at the pump station wet well and about 20 feet away from the set well had poor quality rubber band seals which were badly offset and had been adversely impacted by tree roots from the nearby willow trees. These two offset joints undoubtedly had been the sources of sewage stoppages. The sand soil surrounding the sewer pipe was not blackened by septic sewage bacteria, and carried no odor, so it appears that there was not a large sewage leak as was speculated during the design phase. While this was a relief, it will still be a much more robust system to replace this fragile old clay pipe susceptible to root damage with sound modern pipe.

The lateral near the intersection of North Lake and Nevada Streets had a back flow check valve added to ensure if the sewer system surcharged, it would not overflow because

Another problem in the existing pipe was filled with sags. Apparently this sandy native soil was difficult to build a stable pipe bedding on once it became unconsolidated during excavation. The two sags were noted in the post construction video of the new pipeline which were greater than the District specification allowance. Andreini Brothers was called back in July 2006 to adjust the grade and correct the problems so the pipe was within grade specification.

We also encountered a water main pipe repair which was made out of several small sections of Transite (asbestos cement) pipe and an unsupported reducer. This section of pipe was unstable and on the verge of rupture. Had the pipe failed, it would have flooded the creek to the Marine Reserve with silt and mud which would have had a detrimental affect on marine life. We performed a 20-foot repair to remove the unstable water pipe joints and install a new section of cast iron. Pictures of this repair can be seen in Section #8G and #8H.

Sewer Testing and Post Construction Photos

The MWSD requires that all new sewer pipes be air tested under pressure to ensure that the sewer was installed correctly and there are not any leaks. The testing procedure is to fill the pipeline with 4 PSI of air with zero leakage for 15 minutes. The new PVC sewer passed this requirement. Pictures of the testing can be seen in Section #9 of this report.

Project Schedule Summary

The following is a summary of the schedule of the project milestones:

- 1 September 21, 2004: Notice to proceed (N.T.P) issued (Section #3.)
- 2 October 4, 2004: Application for CDX, San Mateo (described in “Permits Required” section of this report, Section #4.)
- 3 Spring 2005, CDX issued by County of San Mateo.
- 4 April 1, 2005: Work begins.
- 5 Dec 27, 2005: Sewer substantial completion, final TV showed errors in grade, and outstanding punch list items.
- 6 July 15, 2006: Final repairs to grade made, punch list complete, District accepted pipeline from contractor.

Project Cost Summary

Based on bid item costs including site specific bid items for this section of sewer and proportional parts of lump sum items like mobilization and demobilization this repair was expected to cost: \$52,658.00. The actual cost was increased by the extra work associated with the sewer force main retrofit and the water pipe repair described elsewhere in this report. The construction cost for this section of the sewer repair project was \$59,848.00, or about \$140 per linear foot. This price is consistent with other sewer projects of similar complexity and scale. The Project bid prices for the three lowest bidders and the final invoice from Andreini Brothers are found in Section #3 of this report. This was called Line A, and the costs pipe laying are listed in lines 01 and 02 on the invoice, but fractions of the other bid items also are included in the above total, like demo and installation of two manholes, one lateral with a backflow valve, and paving, etc. The final cost including design, engineering, construction and field observation was about \$72,000.

Project Summary

The goal of replacing the fragile clay sewer in front of the entrance to the Fitzgerald Marine Reserve with a modern sewer to reduce overflows, stoppages, and potential leaks has been met. The sewer has been in operation for 9 months and has not had once service call. The re-televising of the sewer after the contractor made the final repairs/adjustments to the sewer grade in July 2006, showed after 7 months of operation, the system was performing very well with out any debris collections or other problems.

It is the expectation of the District that this sewer repair has substantially reduced the overflow risks associated with this sewer for years to come. This effort to make the sewer collection system more robust directly implements the Montara Water and Sanitary District’s goals to provide sewer and water service to the residents in the area while minimizing risks to public health and the water environment.