FINAL PROJECT REPORT
FOR THE
ROSE AVENUE PHASE II
LOW-FLOW DIVERSION (LFD) PROJECT

Clean Beaches Initiative 113
Agreement Number: 02-237-550-0
Project No. 46

February 2008

Prepared for

State Water Resources Control Board

Prepared By

LOS ANGELES COUNTY FLOOD CONTROL DISTRICT

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2) Introduction

Problem Statement:

This project was undertaken in order to address the dry weather bacterial contamination in Santa Monica Bay. The project will be considered a complete success if all dry weather bacterial contamination in the bay is eliminated. A low flow diversion (LFD) system was constructed at the Rose Avenue Storm Drain to divert dry weather runoff away from the beach and into the sanitary sewer. Flow from the dry weather runoff may contribute to elevated bacterial levels in Santa Monica Bay, and this project was undertaken in an effort to reduce levels of bacteria in the bay in order to be in compliance with the Santa Monica Bay Beaches Bacteria TMDL. An aerial photo and a map showing the location of the Rose Avenue storm drain are found below.

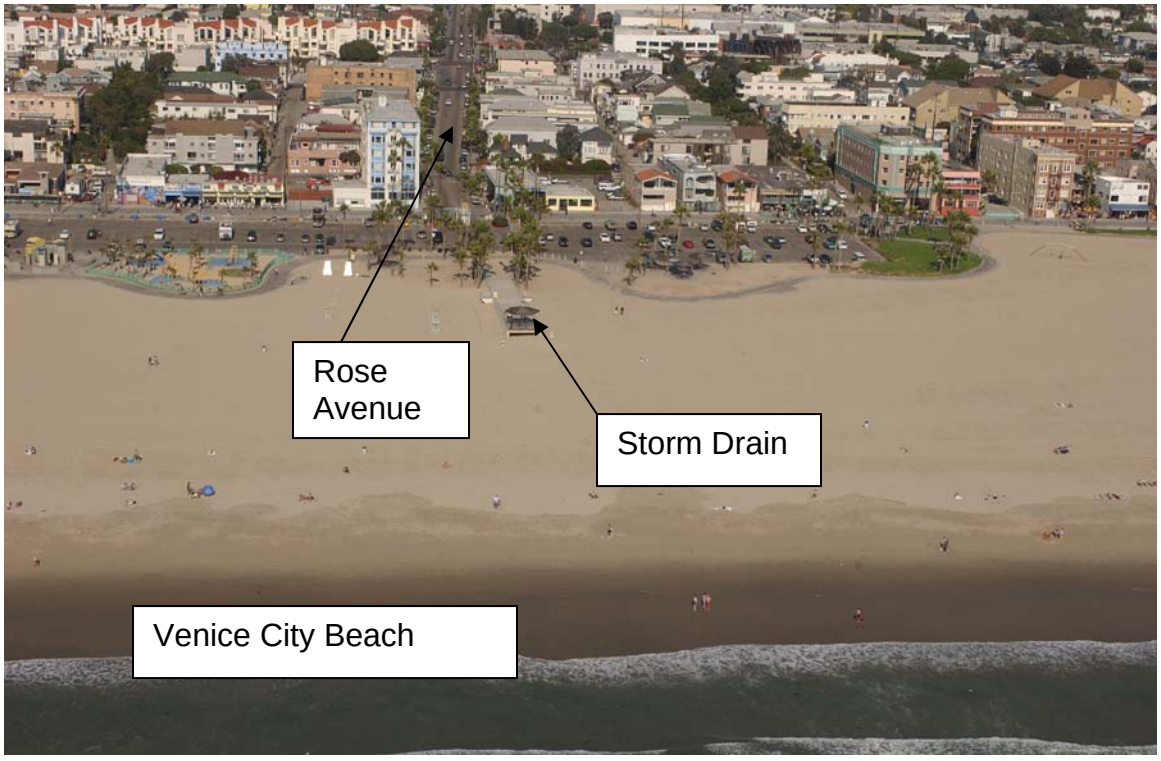

Figure 1) Project Site

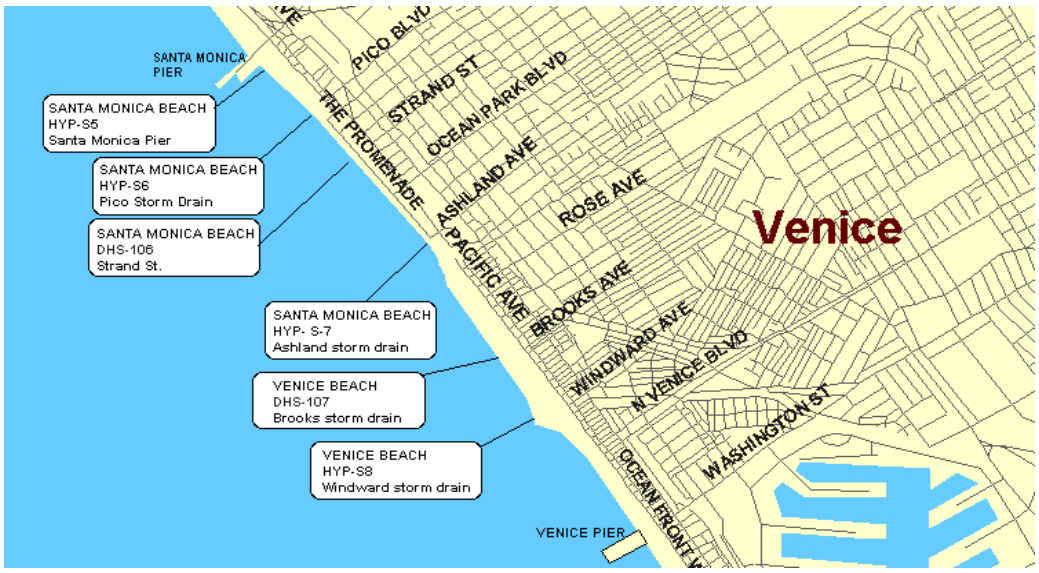

Figure 2) Shoreline Monitoring Sites Near Rose Avenue

This low flow diversion project was funded by the Clean Beaches Initiative (Proposition 40). Post construction bacterial monitoring has been conducted and the results are presented in this report. An assessment of the effectiveness of this project in diverting bacteria to the sanitary sewer, the changes in the quality of the receiving waters near the beach and of lessons learned from the genesis, construction and maintenance of the project are also presented. Additional project background including a project location map and aerial imagery can be found in the Monitoring Plan, Quality Assurance Project Plan, Project Questionnaire, and/or Grant Agreement, which are found in Appendix D. A table of items for review which shows a schedule of agreed upon tasks with completion dates is found below in Table 1.

Item	DESCRIPTION	DUE DATE	COMPLETED DATE
EXHIBIT A - SCOPE OF WORK			
1.0	QUALITY ASSURANCE PROJECT PLAN and MONITORING PLAN		
1.1	Quality Assurance Project Plan	March 2005	April 2005
1.2	Monitoring Plan	March 2005	April 2007
2.0	WORK TO BE PERFORMED BY GRANTEE		
2.1.3	Final Plans and Specifications	April 2004	November 2005
2.1.4	Cost Estimate	April 2004	November 2005
2.2	Board of Supervisors Approval of Plans and Specifications	June 2004	November 2005
2.3.5	Geotechnical and Geologic Investigations Report	September 2004	November 2005
2.4.1	Notice to Proceed	July 2004	November 2005
2.4.3	Photo Documentation of Project Construction	Continuous	November 2005
2.4.4	Board of Supervisors Acceptance of Project	April 2005	January 2006
2.6	REPORTING		
2.6.1	Annual Progress Summary	September 2005; September 2006; September 2007	October 2007
2.6.2	Draft Project Report	December 2007	December 2007
2.6.3	Final Project Report	February 2008	February 2008
EXHIBIT B - INVOICING, BUDGET DETAIL AND REPORTING PROVISIONS			
5.0	STANDARD REQUIREMENTS CERTIFICATION FORM	(as needed)	November 2005
6.0	REPORTS		
6.1	Progress Reports by the twentieth (20th) of the month following the end of the calendar quarter (March, June, September, and December)	Quarterly	October 2007
6.2	Expenditure/Invoice Projections	Quarterly	October 2007
6.3	Grant Summary Form	Day 90	November 2005
6.4	Natural Resource Projects Inventory Project Survey Form	Before Final Invoice	
EXHIBIT C - SWRCB GENERAL CONDITIONS			
#6	Copy of Final CEQA/NEPA Documentation	February 2004	January 2004
#22	Signed Cover Sheets for All Permits	February 2004	November 2005
EXHIBIT D - GRANT PROGRAM TERMS & CONDITIONS			
#5	Monitoring and Reporting Plan	March 2005	April 2007

Table 1) Table of Items for Review

3) Data

Samples were collected and analyzed in compliance with the approved Monitoring Report. Data is presented below in graphical form. Tabulated monitoring data, Chains of Custody and the Field Data Sheet can be found in Appendices A and B.

Flow data was collected during monitoring. An estimate of the total volume of water diverted to the sanitary sewer and an approximate bacterial load is presented below.

Beach Mile Days data was downloaded from the Beachwatch Website (http://beachwatch.waterboards.ca.gov) and analyzed to determine trends in shoreline water quality.

Summer Beach Report Cards were downloaded from Heal the Bay (www.healthebay.org) and the grades for Rose Avenue LFD shoreline and the two adjacent monitoring sites are tabulated below.

Shoreline monitoring data for the Rose Avenue storm drain during the 2007 Assembly Bill 411 year was obtained from the Los Angeles County Department of Health Services and is shown below.

3.1) Low Flow Diversion Monitoring Data

Water samples were collected from the storm drain upstream of the diversion structure. Samples were collected in a pre-rinsed bucket and then transferred to sterile bottles containing sodium thiosulfate. Sodium thiosulfate dechlorinates the sample so that unwanted bacteria die-off does not occur. Sample bottles were then transported on ice and under chain of custody to the laboratory within the required 6 hour holding time.

Figures 3 through 5 show the results of bacterial sampling at Rose Avenue upstream of the low-flow diversion.

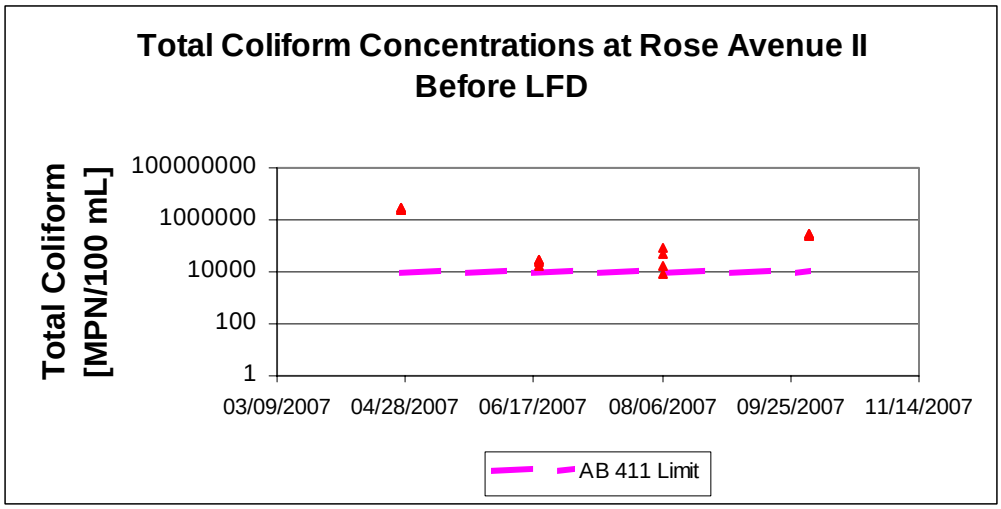

Figure 3) Total Coliform Concentrations Diverted to Sewer at Rose Avenue

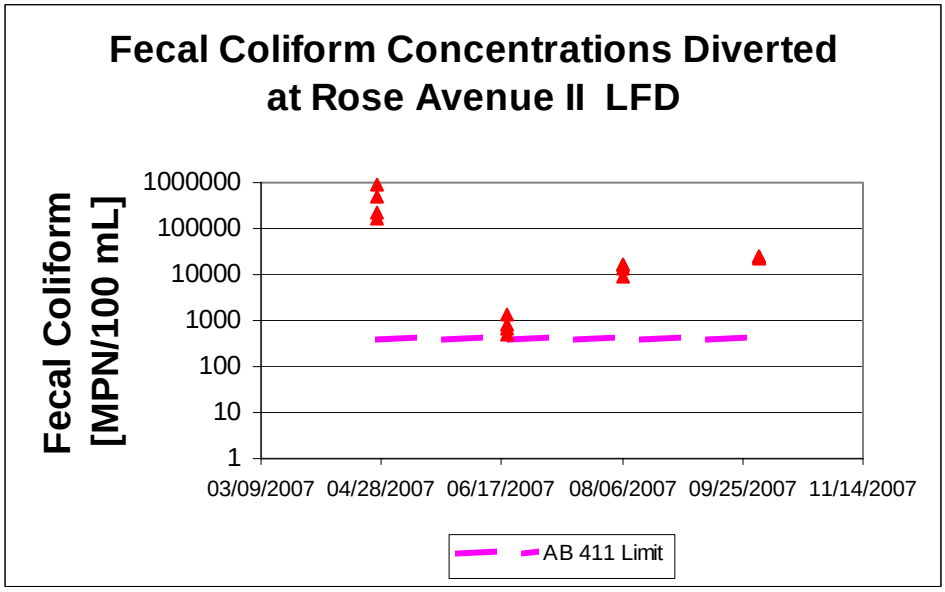

Figure 4) Fecal Coliform Concentrations Diverted to Sewer at Rose Avenue

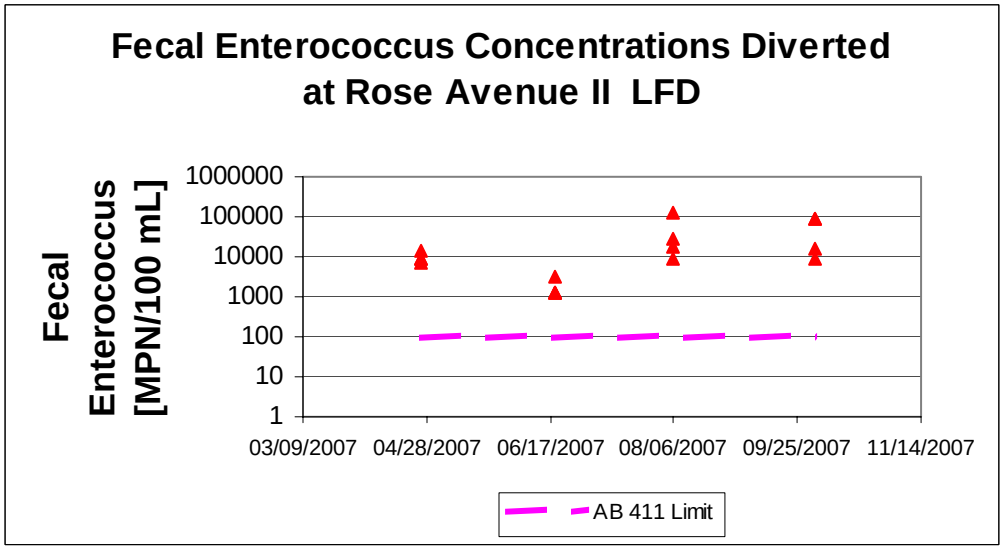

Figure 5) Fecal Enterococcus Concentrations Diverted to Sewer at Rose Avenue

Figures 3 through 5 show the results of bacterial monitoring conducted at diversion to LFD, during the summer of 2007. Exceedences of AB 411 standards are seen for all three bacteria. Bacteria levels tend to be highest during summer when temperatures

and beach use are expected to peak. Exceedences can also be seen throughout the summer in the year suggesting that bacteria may exceed Assembly Bill 411 (AB 411) standards at various times throughout the dry weather at this storm drain. However, the majority of samples collected had bacteria concentrations more than the AB 411 limits, suggesting that the storm drain system would have made continuous contributions to shoreline exceedences. Geometric averages of bacteria diverted to the sewer can be found below in Table 2.

Monitoring results taken at the same time are generally within an order of magnitude of each other, but do exhibit some variation. It may be helpful for future monitoring efforts to collect multiple samples in order to minimize exceedences and/or the risk of missing an exceedence due to natural variation in the concentrations. In this manner the health of the beach going public and other portions of the environment can be protected most economically and efficiently.

Tabulated data can be found in Appendix A.

3.2) Flow Data and Estimated Loading

Approximately 14 million gallons of flow was diverted to the sanitary sewer at the Rose Avenue low-flow diversion during the 2007 AB 411 year. Table 2 shows the geometric average concentrations of the diverted bacteria and an estimated diverted load. For bacteria, geometric averages were calculated by multiplying all sixteen individual sample values and then taking the sixteenth root of the product. This was done for each reported category of bacteria (Total Coliform, Fecal Coliform and Enterococcus). Flow volume was calculated by determining the flow that occurred between June 19, 2007 and October 2, 2007 based upon the cumulative flow gage, then prorating this value over the 2007 AB 411 year. Estimated Bacteria Loads were calculated by multiplying the flow volume by the geometric averages. Bacteria can exhibit rapid changes in population size, so these estimated loads should not be relied upon when determining bacterial concentrations in receiving waters.

Geometric Bacteria Concentrations (MPN/100 mL)		Flow (Gallons)	Flow (mL)	Estimated Bacteria Loads (MPN)
Total Coliform	147,824		5.3E+10	7.8E+13
Fecal Coliform	17,211		5.3E+10	9.1E+12
Enterococcus	10,795	1.4E+07	5.3E+10	5.7E+12

Table 2) Flow Volume and Estimated Bacterial Loads to Sanitary Sewer

3.3) Beach Mile Days

Beach Mile Day data was downloaded from the BeachWatch website (http://beachwater.waterboards.ca.gov). A Beach Mile Day is a measure of shoreline water quality that takes into account both the geographical and temporal extent of water quality issues. Tabulated results for the shoreline monitoring stations located near outfall of Rose Avenue storm drain and the nearest stations north and south are presented below in Table 3.

Year	BMD (all year)	BMD (AB 411 year April - October)	BMD (all year)	BMD (AB 411 year April - October)
	Pico Kenter storm drain		Brooks Ave.	
2002	0	0	0	0
2003	0	0	17.6	6.52
2004	1.9	0.99	1.87	1.54
2005	5.49	2.11	0.11	0.11
2006	1.71	0.91	0.88	0.22
2007	0.65	0.3	0.32	0.1
	Ashland (near Rose Ave) storm drain			
2003	0	0		
2004	3.08	1.43		
2005	3.25	0.31		
2006	1.48	1.15		
2007	0.33	0		

Table 3) Beach Mile Days (BMD)

Table 3 shows the BMD data for the entire year and for the AB 411 year (April to October) for the last five years. An analysis of the Beach Mile Days for these stations indicates that water quality in the bay generally improved over the past five years. However, with only five years of data it is difficult to establish a definite trend, and other variations such as rainfall totals make it difficult to definitively assert that any single Low Flow Diversion project significantly affected water quality in Santa Monica Bay.

3.4) Summer Beach Report Card Grades

Another widely used and publicly available measure of shoreline water quality is Heal the Bay's Report Card. This Low-Flow Diversion is designed to operate only during dry weather between April 1 and October 31, so only the Summer Dry scores are presented below in Table 4 for the Rose Avenue Storm Drain and the stations immediately to the north and south. Appendix C contains the weekly Beach Report Cards for these drains.

Year	Ocean Park Beach at Ashland Ave. Drain	Venice Beach at Rose Ave. Drain	Venice Beach at Brooks Ave. Drain
2007	A	A	B
2006	A	A+	A+
2005	A	ns	A
2004	A+	A	A
2003	A	A	A+

Table 4) Heal The Bay Summer Dry Beach Report Card Grades

An analysis of the grades indicates that water quality at the Rose Avenue Storm Drain outlet has been improved since the installation of the LFD. Water quality at the adjacent Ashland Avenue drain outlet and at Brooks Avenue Drain has remained consistently high except for Brooks Avenue drain in 2007, which showed a decline in quality. The water quality at these adjacent drains appears to influence each other, but this is most likely indicative of an outside factor common to them. In 2005, at Rose Avenue Drain, no samples were taken by Heal The Bay, thus 'ns' is shown in the table above for that location.

3.5) Shoreline Bacteria Monitoring

In accordance with Assembly Bill 411 and the Santa Monica Bay Beaches Bacterial TMDL, bacteria monitoring is conducted along the shore of Santa Monica Bay. These monitoring results are used to determine if beaches should be posted or closed to protect the health of the public depending on the concentrations of fecal indicator bacteria. This project diverts low flows away from the bay, but if it did not, the water would enter the bay at the Rose Avenue Storm Drain, SMB-3-6. Results for this year's AB 411 season are presented graphically below in Figures 4 to 6. Tabulated Data can be found in Appendix E.

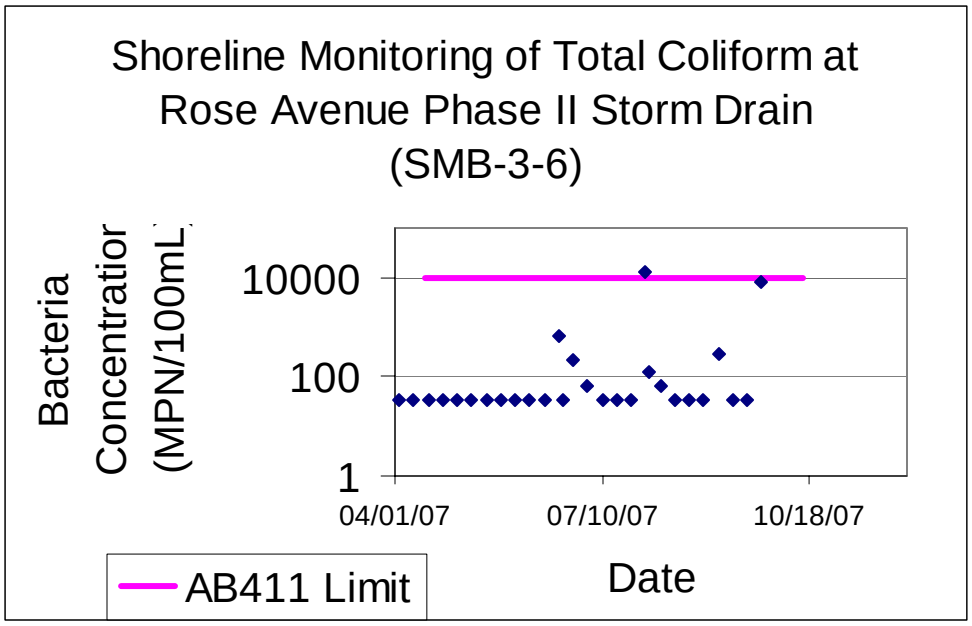

Figure 6) Shoreline Monitoring of Total Coliform at Rose Avenue

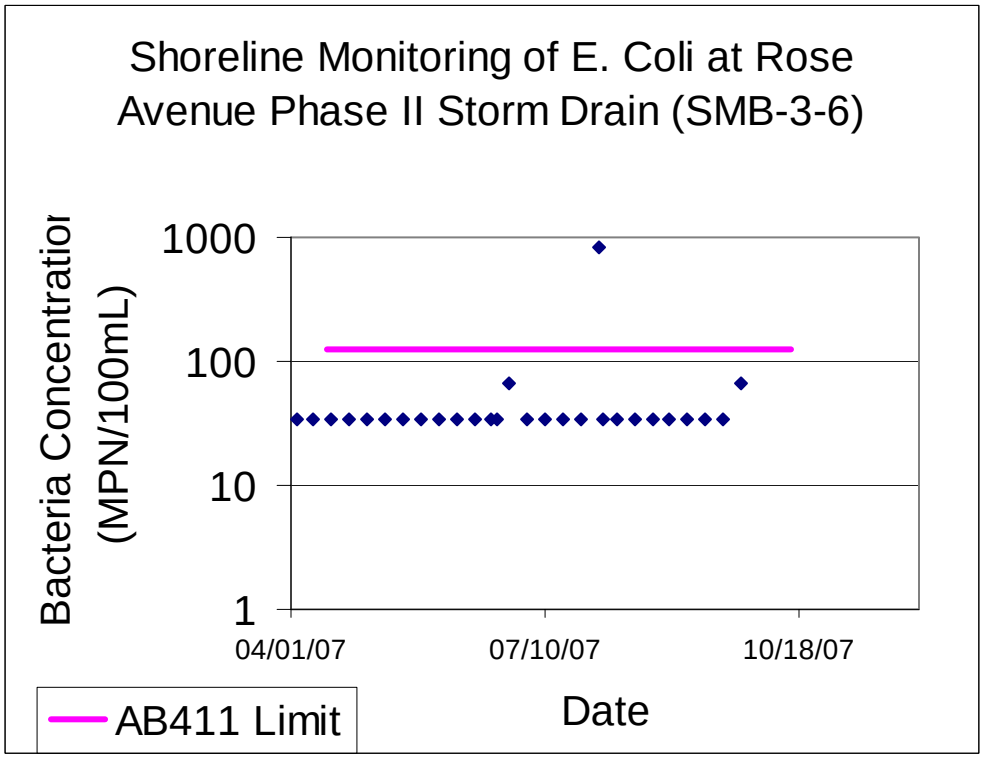

Figure 7) Shoreline Monitoring of E. Coli at Rose Avenue

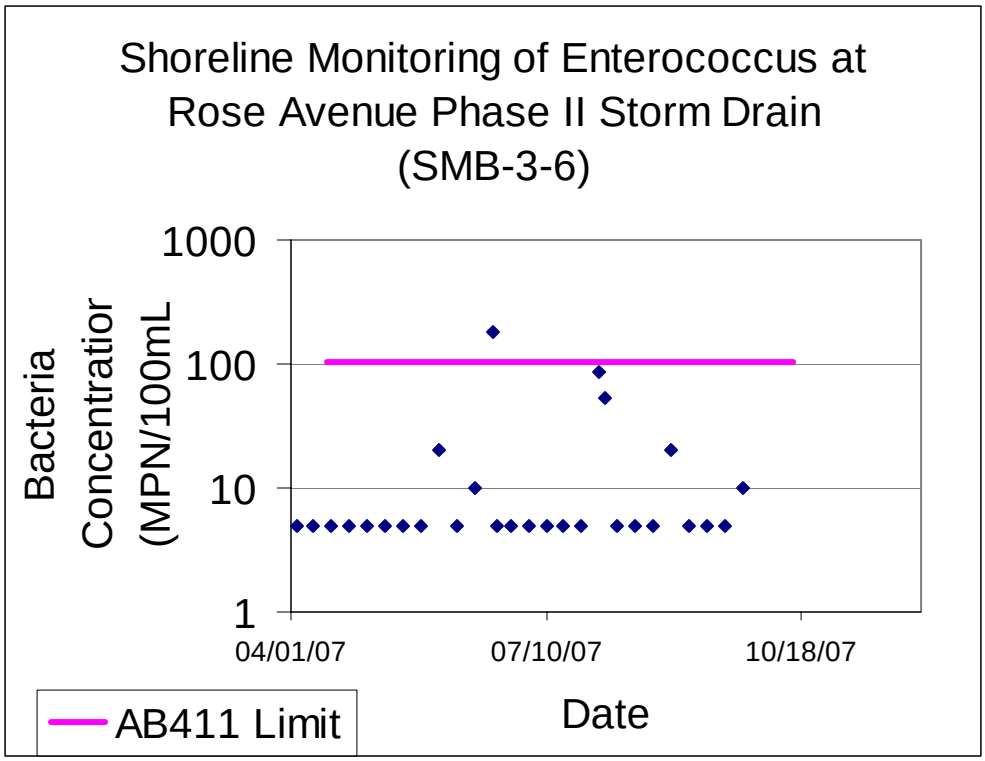

Figure 8) Shoreline Monitoring of Enterococcus at Rose Avenue

Figures 6 to 8 illustrate that bacteria samples taken at the outfall of the Rose Avenue storm drain were generally below AB 411 single sample limits. A single exceedence is observed for each of Total Coliform, E. Coli, and Enterococcus, during the sampling period. Flow from the Low Flow Diversion was diverted to the sanitary sewer during this time period, which suggests that runoff upstream of the diversion did not contribute to shoreline water quality, and that bacterial exceedences can occur even when a Low Flow Diversion system is in place. There are natural and anthropogenic sources of bacteria, which do not use the storm drain system to reach Santa Monica Bay, and flows downstream of the diversion continue to contribute to shoreline water quality.

4) Conclusions and Recommendations

Although this report is primarily focused on fecal indicator bacterial monitoring, some important conclusions and recommendations regarding other aspects of this Low-Flow Diversion project should be acknowledged. For the convenience of the reader these are presented in three sections: Bacteria and Flow Monitoring, Siting, and Design and Maintenance.

4.1) Bacteria and Flow Monitoring

This project successfully diverted 14 million gallons of water to the sanitary sewer for treatment. The geometric seasonal average concentrations of Total Coliform, Fecal Coliform, and Enterococcus in this water were all over the AB 411 single sample limit for contact recreation. These bacteria concentrations in the diverted water also exceeded AB 411 standards for contact recreation by and large, especially later in the dry season.

Water quality in Santa Monica Bay seems to have generally improved during the summer dry weather in the last five years. Water quality at Rose Avenue appears to have improved since the installation of the LFD, but was not consistently poor before the installation.

This Low-Flow Diversion Project successfully diverts water that sometimes contains bacteria in excess of public health standards into the sanitary sewer for treatment. However, it is difficult to determine if this has a significant effect on the water quality in Santa Monica Bay since the shoreline water quality near this project is variable. In the season since the LFD was installed, summer dry weather water quality near the Rose Avenue Storm Drain has been good.

However, steps should still be taken to prevent the degradation of current conditions including conducting source identification studies similar to the North Santa Monica Bay Source Identification Study conducted by the Los Angeles County Department Of Public Works and partnership with the Los Angeles County Department of Public Health, Heal The Bay and the Southern California Coastal Waters Research Program in the event that an exceedence is detected. Rapid identification of bacteria sources will allow for quick assessment of the threat and for the proper remedial measures to be taken.

4.2) Siting

This project is located on a street in a vault within Rose Avenue, a moderately sized right-of-way, and 5th Street in the City of Los Angeles. This is a fairly heavily traveled intersection; however the sampling is performed with some traffic control measures in place, to help avoid unnecessary risk. Working in traffic poses risks and hardships to maintenance staff and the traveling public that were not mainly avoidable in this project. Interagency red-tape, which may delay access, was not always avoidable, either.

The Rose Avenue LFD project is largely located in a mixed use urban area. The nature of the watershed results in bacterial and sediment loads that are similarly characteristic of typical urban runoff. The outlet to the drain was sanded in again this year. These all tie into the conclusions about the bacterial monitoring and design and maintenance of this LFD. Although the water quality needs for this project are hard to determine, locating this project more away from heavy traffic yielded some important lessons.

4.3) Design and Maintenance

Construction of the LFD was completed in June 2005 and was operational June 14, 2005. Modifications have not been made since that time. The Rose Avenue LFD is unique in its superior maintenance record. It operates from April 1 until October 31, yearly, only during dry weather.

Presently, inspection is performed weekly. Routine cleaning is done on an as needed basis to maintain the LFD. Flow meters are also recalibrated annually. Storm drain and well water sampling is conducted quarterly during the dry season. If the system does not operate properly and at peak performance if it will not comply with NPDES standards, due to failed of telemetry, pumps, or electric control mechanisms; any faulty equipment must be replaced or repaired. Overall, under normal conditions, the low flow diversion system operates properly.

It has been observed that the electrical control panels are different on most LFDs installed by the County of Los Angeles. This makes it difficult to operate and maintain these systems since each LFD requires the development of specific training. This is a time intensive process, which saps Flood Control District's resources. It is recommended that Design Division coordinate with Flood Maintenance and Operational Services Divisions at the field supervisor level to develop a single control panel system for use in all LFDs. This will streamline the design, construction and maintenance processes, saving time and taxpayer dollars.

5) Contact Information

For questions regarding Project 46, the Rose Avenue Low-Flow Diversion Project, please contact Ms. Maria Sim, Associate Civil Engineer of Los Angeles County Department of Public Works, at 626 458 5956 or msim@dpw.lacounty.gov.

Questions specifically regarding the content of this project report may be directed to Mr. John Merrifield, Associate Civil Engineer of Los Angeles County Department of Public Works at 626 458 4361 or jmerrifi@dpw.lacounty.gov.

6) References

BeachWatch Beach Mile Days Reports, http://beachwatch.waterboards.ca.gov, Unavailable on Web due to technical issues

Heal the Bay Summer Report Cards, http://healthebay.org/brc/summer/default.asp, accessed 12/26/07

Appendix A Bacterial Monitoring Data

Appendix B Chains of Custody and Field Data Sheets

Appendix C Beach Report Cards

Appendix D Grant Documents and Project Photos

Appendix E Shoreline Monitoring Results