

FINAL REPORT
FOR
BABY BEACH IN DANA POINT HARBOR, ORANGE COUNTY
CBI GRANT NOS. 19 AND 260
AGREEMENT NO. 01-226-550-2

PREPARED FOR:

STATE WATER RESOURCES CONTROL BOARD
DIVISION OF FINANCIAL ASSISTANCE
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Baby Beach Bacterial Monitoring Data for 2005

Quality Assurance Project Plan (QAPP) – Baby Beach Clean Beaches Initiative Dana Point California – December 2002

Ocean Institute – Stormwater BMP Performance Evaluation Monitoring and Quality Assurance Project Plan – January 14, 2003

Ocean Institute Stormwater BMP Performance Evaluation Final Report – March 28, 2006

Data Mining Task for State of the Beach Report: Evaluation of Bacteriological Data and Associated Parameters for Baby Beach, Dana Point Harbor, CA. Prepared by Science Applications International Corporation/Environmental Sciences Division/San Diego, CA. Dated January 2003.

Baby Beach Circulation Study Sampling and Analysis Plan (SAP) – September 2002

Circulation Study Report Baby Beach Region, Dana Point Harbor, California. Prepared by Science Applications International Corporation/Environmental Sciences Division/San Diego, CA. Dated March 2003.

Baby Beach Bacteriological Sampling and Analysis Plan (SAP) for Short-Term Studies and Microbial Source Tracking Evaluations – December 2002

Baby Beach Bacteriological Special Studies Report, Dana Point Harbor, California. Prepared by Science Applications International Corporation/Environmental Sciences Division/San Diego, CA. Dated June 2003.

State of the Beach Report Baby Beach Region, Dana Point Harbor, California. Prepared by County of Orange PFRD, Santa Ana, CA with the Assistance of Science Applications International Corporation/Environmental Sciences Division/San Diego, CA. Dated June 2003.

Baby Beach Avian Use: Results of a Focused Bird Survey – January 2005

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1. INTRODUCTION

1.1 PROJECT BACKGROUND

Baby Beach is a small artificial beach located in the inner most back corner of Dana Point Harbor in Orange County, California. An aerial photo of Dana Point Harbor is shown in Figure 1.1.1. The sand area measures approximately 700-ft long and between approximately 50-ft and 150-ft wide depending on the tide. This pocket beach is small but it is well known by many of the residents of Orange County as well as inland counties. The beach is popular for the following reasons: ample free parking; adjacency to the Ocean Institute; very calm waters; proximity to the I-5 Freeway; location at the base of tall picturesque bluffs, excellent pathway along thousands of boats between Baby Beach and several popular restaurants; and it is unique to any other place in Orange County.

Constructed in 1970 by the U.S. Army Corps of Engineers, Dana Point Harbor is protected from the Pacific Ocean by two breakwaters and divided into two basins, East Basin and West Basin. Baby Beach, shown in Figure 1.1.2, is surrounded by residential and commercial properties on the bluff above, the County's Dana Point Harbor Youth & Group Facility to the east and the Ocean Institute to the west. The areas immediately adjacent to the beach are parking lots and a grass picnic park. Visitors consist of beach goers, walkers and joggers, kayakers, day-camp youths from the Ocean Institute, sailing students from the Youth and Group Facility, and dog walkers.



Figure 1.1 .1 – Aerial photo of Dana Point Harbor

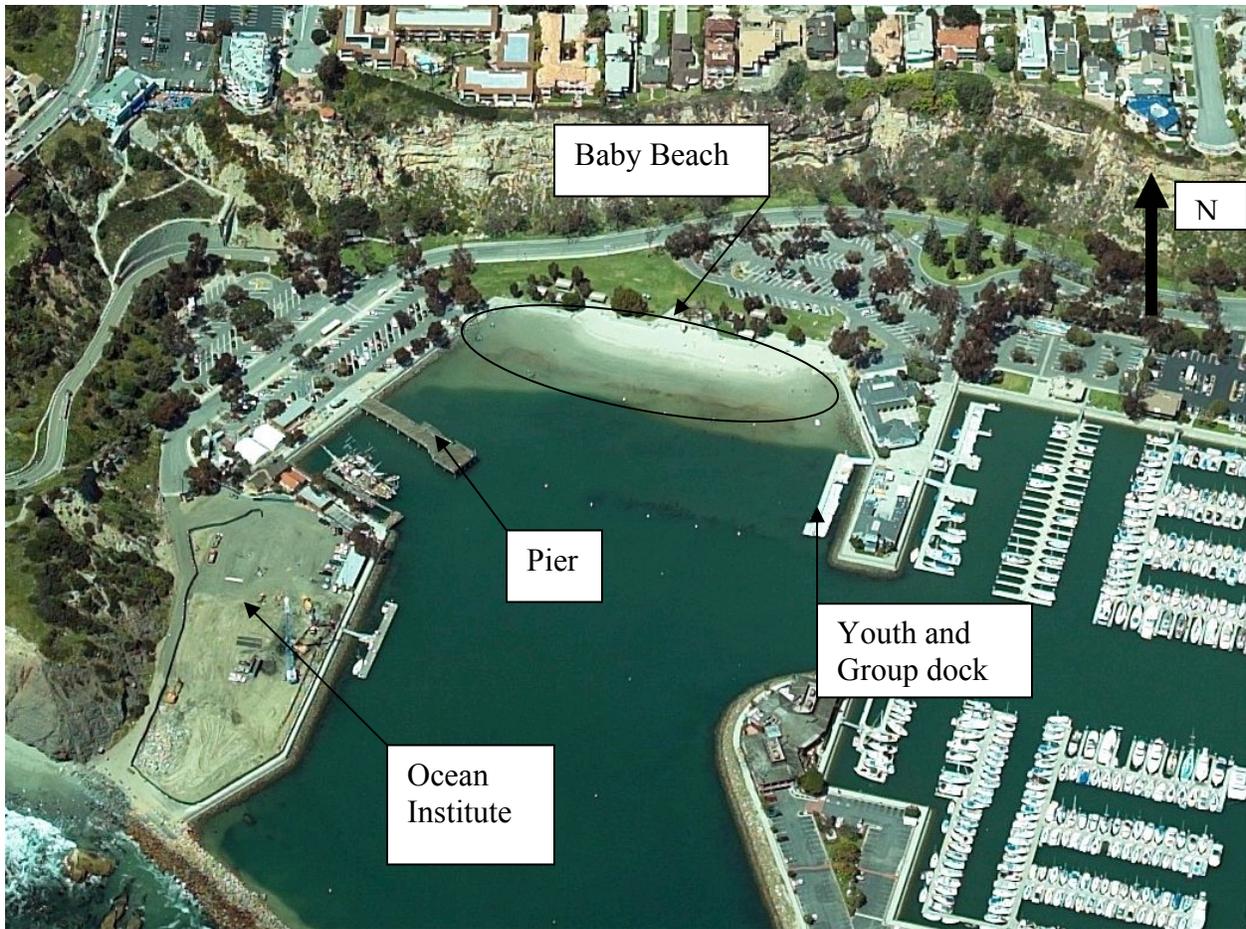


Figure 1.1.2 – Aerial Photo of Baby Beach

The Orange County Health Care Agency (OCHCA) Environmental Health Services conducts the Ocean Water Protection Program to monitor ocean and bay waters used for water contact recreational activities. The OCHCA, along with local sanitation agencies, test for bacteria indicators at approximately 150 locations throughout the coastal areas of Orange County. The California Health and Safety Code and Title 17 of the California Code of Regulations require beach closure when impacted by an unauthorized discharge of sewage, beach postings when bacteria levels exceed standards and beach-use avoidance advisories during storm events.

The bacteriological water quality standards for public beaches, informally known as the “AB411” standards, were initiated in April 1999. The AB411 standards require testing of public beaches or public water-contact sports areas for total coliform, fecal coliform, and enterococci bacteria. These bacteria serve as indicators for possible disease causing bacteria, viruses, or protozoa. Weekly testing is required between April 1 through October 31 for public water-contact sports areas and public beaches if beach attendance is greater than 50,000 people per year or the beach is located adjacent to a storm drain that flows during the summer. AB411 requires water samples be taken in ankle to knee deep water. AB411 requires the County Health Officer to post a sign on the beach in the event the sample contains bacteria in excess of the standards. A beach “posting” does not restrict people from entering the water. The salt water AB411 standards include both long-term and single sample criteria, as shown in Table 1.1.1. Long-term

criteria area based on a 30-day geometric mean of not less than five weekly samples and the single sample criteria are based on individual sample peaks.

Table 1.1.1 - California Department of Health Services AB411 Limits

| Measure | Single Sample Maximum Organisms per 100 ml | Geometric Monthly Mean Maximum Organisms per 100 ml |
|----------------|--|---|
| Total Coliform | 10,000 1,000 (if Fecal/Total Ratio ≥ 0.1) | 1,000 |
| Fecal Coliform | 400 | 200 |
| Enterococci | 104 | 35 |

Baby Beach has been ranked in the “Top 10” of the most polluted beaches (with bacteria) in the State of California by Surfrider and Heal the Bay based on data provided by the OCHCA. The ankle to knee-deep water along this beach is chronically contains bacteria which exceed AB411 standards. Bacteria have been detected in concentrations sufficient to post the beach; however, these postings are not gross exceedences of AB411 standards. Gross exceedences of AB411 standards normally occur directly at the mouth of a drainage pipe or flood control channel. This beach consistently barely exceeds AB411 standards. Unfortunately the public is not aware of this fact and they are only presented with pass or fail grades. Of course the advantage of frequently failing water quality standards by a small margin is that potentially a smaller number or scale of BMPs may be sufficient to result in significantly fewer postings. It is unknown what percentage of the public refrains from entering the water as a result of the beach postings.

Beach water quality is often measured in Beach Mile Days (BMD). A BMD is determined by multiplying the number of days of a closure or posting by the number of miles of beach closed or posted. Table 1.1.2 displays the number of days of postings at Baby Beach and the BMD. An attachment in the Appendix is the number and postings and Beach Mile Days for the entire Dana Point Harbor from 2000 to 2005.

Table 1.1.2 – Posting Data for Baby Beach

| Year | Number of Days of Posting | Beach Mile Days |
|------|---------------------------|-----------------|
| 2000 | 322 | 10.06 |
| 2001 | 162 | 3.28 |
| 2002 | 169 | 7.02 |
| 2003 | 266 | 9.86 |
| 2004 | 319 | 11.87 |
| 2005 | 237 | 6.02 |

Baby Beach water quality became an embarrassment to the County in approximately 1999 and 2000. Newspaper articles regarding water quality at Baby Beach began appearing frequently in The Los Angeles Times Orange County Edition and the Orange County Register and the public's interest in water quality at this very popular beach began to rise. The Orange County Board of Supervisors demanded that action be taken immediately. Orange County, starting in 1999 took the following actions to address the bacteria issue. These actions included:

1. Performed more frequent trash removal.
2. Placed cloth bird netting under the Baby Beach pier to eliminate direct bacteria inputs from birds roosting under the pier.
3. Installed "No bird feeding" signs.
4. Dye tested restrooms adjacent to Baby Beach to determine if any of the dye entered the beach water which would indicate the source of fecal pollution.
5. Videotaped all sewers in the vicinity of Baby Beach.
6. Plugged the 24-inch baby beach storm drain with bladders.
7. Drastically reduced irrigation of the grassy area adjacent to the sand.
8. Initiated public education campaign.
9. Dye tested boat holding tanks of moored boats near Baby Beach (performed by Sheriff Harbor Patrol).

Despite all the above efforts in 1999 and 2000, the source of the bacteria was not identified and postings due to bacteria contamination continued. The County of Orange implemented this CBI project to finally determine the source of the bacteria and construct a BMP that would reduce or eliminate the beach postings.

1.2 PURPOSE AND GOAL OF THE PROJECT

The goal of the project is to reduce the number of times the beach is posted in violation of the AB411 standards as listed above for the summer season from April 15 to October 15. Approximately one million people walk past or visit Baby Beach per year. Most of these people are walking on the concrete path for exercise or recreation. The beach users include beach goers, walkers and joggers, kayakers, day-camp youths from the Ocean Institute, sailing students from the Youth and Group Facility, and dog walkers. All these people see the beach posting signs; however, most of the visitors would not enter the water even if the water quality was pristine since the nature of many of the visits to this area are non-swimming related. Figure 1.2.1 is a photo of the "posting" sign at Baby Beach. The restroom at Baby Beach is shown on the left side of the photo. The concrete path is on the opposite side of the concrete wall and picnic table shelters are located on the grass beyond the concrete path.



Figure 1.2.1 is a photo of a posting sign at Baby Beach.

This project is funded from the Clean Beaches Initiative (CBI) grant program administered by the State Water Resources Control Board (SWRCB). The project was funded for \$750,000 in Proposition 13 grant funds in August 2001. The project consisted of two phases. The first phase consisted of performing studies at Baby Beach and installing a Stormceptor unit at the Ocean Institute at Baby Beach. The cost of the studies and the Stormceptor unit was \$500,000. The results of these studies were to recommend the most appropriate construction project to be funded with the remaining \$250,000 in Proposition 13 funds. In 2004, the SWRCB added \$130,000 in Proposition 40 Phase I funds for a storm drain to sanitary sewer diversion project, replacement of the dilapidated bird netting under the Baby Beach public pier, and purchase bird-proof trash cans for use at Baby Beach.

The second half of the project is to divert 100 percent of dry weather urban runoff from flowing into Baby Beach to the sanitary sewer. The urban runoff enters the Harbor at Baby Beach via a 24-inch diameter storm drain. A photo of the storm drain as it penetrates the sea wall is shown in Figure 1.2.2. The discharge pipe is submerged at high tide and exposed at low tide. The urban runoff from this pipe is approximately 300 gallons per day of very high bacteria laden dry-weather urban runoff. Urban runoff is believed to be a significant contributor of bacteria at this beach. The urban runoff is entering the Harbor at Baby Beach



Figure 1.2.2 – Photo of Storm Drain entering the Harbor at Baby Beach

Figure 1.2.3 is a photo of the entire 700-ft width of Baby Beach. The photo was taken from the sidewalk along the Dana Point Youth and Group Facility looking northwesterly. The buoys indicate the swim area and the remaining area on both sides of the buoys are for launching kayaks.



Figure 1.2.3 – Photo of Baby Beach

Figure 1.2.4 is a photo taken at the center of Baby Beach looking westerly. The public fishing pier is located on the left side of the photo. The photo shows some of the birds at Baby Beach.



Figure 1.2.4 – Photo of Baby Beach including the Baby Beach pier

1.3 CONTACT INFORMATION

The following personal at the County of Orange may be contacted for additional information regarding this project:

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1.4 WATERSHED DESCRIPTION

The watershed area tributary to Baby Beach in Dana Point Harbor consists of 34.1-acres. The U.S. Army Corps of Engineers constructed the harbor in 1970-1972. Figures in the Appendix include photos of the location of Baby Beach in the 1920's, prior to the construction of the Harbor. This beach is located several hundred feet north from the Old Cove Marine Preserve on the opposite side of the breakwater. The majority of the watershed is located at the top of a tall near-vertical bluff. Within the watershed reside the Chart House and Cannon's restaurants, six residential homes, Cove Road, Street of the Green Lantern, Santa Clara Avenue, Street of the Blue Lantern, grass medians, Sampson Overview Gazebo Park, Blue Lantern Inn, and a two-story strip mall (Blue Lantern Plaza) and several parking lots. The Headlands Reserve LLC is in the process of constructing a 90-room five-star hotel within the watershed at the top of the cliff. Figure 1.4.1 displays the watershed tributary to Baby Beach. As can be seen in the photo, there are homes at the top of the bluff along Baby Beach which do not flow to Baby Beach. The runoff from this area enters the Harbor via a drain further east of Baby Beach. There are three storm drains which flow down the bluff to Baby Beach. Two of the three storm drains have been replaced within the last year. The storm drains were formerly constructed of corrugated steel pipe strapped to near-vertical cliff face and these storm drains now consist of continuously welded high density black polyethylene pipe. These three storm drains flow into one 24-in diameter reinforced concrete pipe under the Baby Beach parking lot and enter the harbor through the seawall just several feet from the Baby Beach sand at low tide.

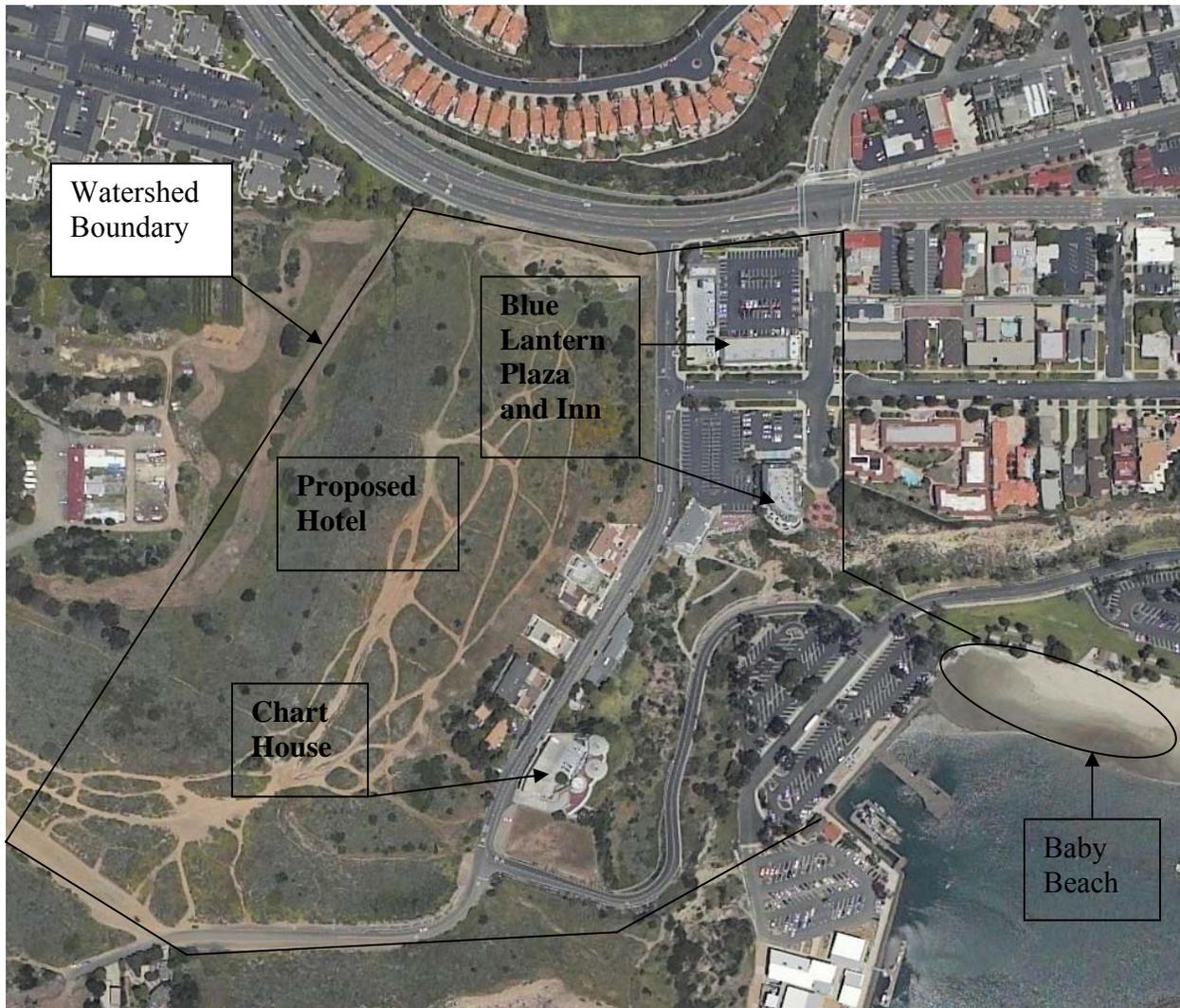


Figure 1.4.1 – Watershed tributary to the 24-inch diameter storm drain now being diverted to the sanitary sewer.

2. PROJECT DESCRIPTION

Table 2.1.1 - Schedule of Completion Dates/Deliverables

| Task | Deliverable | Completion Date |
|--|------------------------------------|-----------------|
| 1. Project Management and Administration | 1.2 Quarterly Progress Reports | Quarterly |
| | 1.5 Contract Summary Form | October 2004 |
| | 1.6 Subcontractor Documentation | October 2004 |
| | 1.7 Project Survey Form | |
| 2. California Environmental Quality Act (CEQA) | 2.1 CEQA documentation | October 2004 |
| | 2.2 Permits | November 2004 |
| 3. QAPP | 3.1 QAPP | June 2003 |
| | 3.2 Monitoring and Reporting Plan | June 2003 |
| 4. Statement of Work | 4.1 Report analyzing existing data | February 2003 |

| Task | Deliverable | Completion Date |
|--|--|------------------------|
| | 4.3 Report analyzing replicate water samples | June 2003 |
| | 4.4 Circulation Study Report | June 2003 |
| | 4.5 State of the Beach Report | June 2003 |
| | 4.7 As-built drawings of constructed facilities or modified operation/maintenance and monitoring manuals | December 2002 |
| | 4.8 Installation of BMP's, As-Built drawings of constructed facilities | December 2002 |
| 5. Urban Runoff Diversion | 5.1 Scope of work for engineering design services | November 2004 |
| | 5.2 Agreement with SOCWA/SCWD for the diversions | March 2006 |
| | 5.3 Preliminary plans and specifications for urban runoff diversion at the East and West Storm Drains | December 2004 |
| | 5.4 Final plans, specifications, construction cost estimate | July 2005 |
| | 5.5 O&M Manual | March 2006 |
| | 5.7 Construction contract | March 2006 |
| | 5.8 Photo document the construction | July 2005 |
| | 5.9 As-builts of construction | March 2006 |
| 6. Bird Study and Implement Control Measures | 6.1 Count and classification of birds at Baby Beach | July 2005 |
| | 6.2 Before and after photo-documentation of public pier netting | March 2006 |
| 7. New and Improved Trash Cans at Baby Beach | 7.2 Report of trash can products | March 2006 |
| | 7.4 Photo-documentation | March 2006 |
| 8. Reporting | 8.1 Draft Final Report | March 2006 |
| | 8.2 Final Report | March 2006 |

The State Water Resources Control Board (SWRCB) wanted CBI grant funding to be devoted to tried and true structural BMPs; however, the County recommended that additional studies be performed to try to identify the source of the bacteria and then follow up with the most appropriate structural BMP. The SWRCB then divided this project into two phases. The first phase consisted of performing studies at Baby Beach to better discern the contributory sources of fecal indicator bacteria and installed a Stormceptor unit as part of the Ocean Institute redevelopment. Study findings would be used to recommend the most appropriate structural bacteria control BMP in Phase II.

Phase I Studies

There were four (4) voluminous studies performed in Phase I. The studies are:

- Data Mining Task for State of the Beach Report: Evaluation of Bacteriological Data and Associated Parameters for Baby Beach, Dana Point Harbor, CA. Prepared by Science Applications International Corporation/Environmental Sciences Division/San Diego, CA. Dated January 2003.

- Circulation Study Report Baby Beach Region, Dana Point Harbor, California. Prepared by Science Applications International Corporation/Environmental Sciences Division/San Diego, CA. Dated March 2003.
- Baby Beach Bacteriological Special Studies Report, Dana Point Harbor, California. Prepared by Science Applications International Corporation/Environmental Sciences Division/San Diego, CA. Dated June 2003.
- State of the Beach Report Baby Beach Region, Dana Point Harbor, California. Prepared by County of Orange PFRD, Santa Ana, CA with the Assistance of Science Applications International Corporation/Environmental Sciences Division/San Diego, CA. Dated June 2003.

These four reports are posted on our website at http://www.ocwatershed.com/watersheds/sanjuan_baby_beach.asp and these reports are included in the appendix. Each study is described as follows:

Data Mining Report

The description of the data mining task is to analyze historical data (January 1997 to April 2002) on bacteria concentrations from Baby Beach and adjacent sampling stations in Dana Point Harbor and compare this information to other, potentially related data that might suggest potential sources or processes resulting in contamination. Data comparisons included oceanographic (tidal), rainfall, bird abundance, human event data, and high use periods by boats moored/anchored in the harbor adjacent to Baby Beach.

Circulation Study Report

This study provided documentation of conditions over a two-day period targeting a range of tidal and wind conditions and potentially variable conditions of wave height and direction. The overall objectives of this study were to evaluate the circulation presently occurring in the Baby Beach region and potential circulation-related impacts to Baby Beach.

Baby Beach Bacteriological Special Studies Report

The description of this report was to determine spacial and temporary variations in bacterial concentrations, assess groundwater in sediment below tide level as possible source of fecal indicator bacteria, assess groundwater in area above Baby Beach, assess effect of boating activities on fecal indicator levels, and perform microbial source tracking methods to determine the source.

State of the Beach Report

The State of the Beach Report evaluated numerous BMPs for possible installation at Baby Beach. All of the studies have limited the bacteria contamination sources to four possibilities:

1. Contaminated discharges from storm drains,
2. Bacteria resident (regrowth) in beach sediments,
3. Limited near-beach water circulation, and
4. Bacteria contamination from local birds.

The BMPs evaluated in the State of the Beach Report were: storm drain diversion; beach sand replacement; artificial aeration and mixing of sediments; artificial circulation; breakwater modification; bird netting; sonic bird repellents; and use of a falconer.

Ocean Institute Stormceptor

A structural stormwater treatment BMP was installed in the site drainage system for the 2002 redevelopment of the Ocean Institute (OI). This BMP was installed with Proposition 13 grant funds as a method to reduce bacteria input into Dana Point Harbor adjacent to Baby Beach.

Drainage from the two (2) acre site is routed differentially through the stormwater treatment system. Drainage from the parking area is routed to either of two xeriscaped infiltration swales, one in the center of the parking area and one along the NE property boundary. The swales are surfaced with 6 inches of decomposed granite, underlain by 6 inches of native fill, then 2 feet of gravel wrapped in filter fabric and drained by a perforated underdrain system. Parking area drainage was intended to infiltrate and be collected in the underdrain system; surface drainage which did not infiltrate overflows into the underground drainage system via mid-swale and/or terminal grated catch basin inlets.

Infiltrate and overflow at the end of both swales is then routed via tight line pipe where they converge just prior to entry into a Stormceptor® STC-900 stormwater separator. The Stormceptor unit was a two-chambered structure that is designed to route flows up to 0.6 cubic feet per second (cfs) under free tailwater conditions through a 900+ gallon lower chamber before upwelling at the outlet pipe, whereby some particulate sedimentation and retention was achieved in the lower chamber. Flows in excess of 0.6 cfs jump the inlet weir and discharge directly through the outlet pipe. Outflow from the Stormceptor passes through a 2x2x5 foot utility vault before discharging to the harbor via an 18 inch pipe through the seawall.

Rooftop and site walkway drainage from the six OI buildings is collected via downspouts and grate inlet structures and routed via tight line pipe directly to the Stormceptor structure.

Off-site runoff from the bluff overlooking the OI property is collected at two locations behind a detention curb along the base of the bluff behind the OI property and routed directly to the Stormceptor structure, bypassing the parking area infiltrative swales. Some of this offsite drainage undergoes particulate removal through two perforated standpipes wrapped in filter cloth. Subsequent performance evaluation suggested that the amount of offsite runoff discharging into the OI stormwater BMP system was negligible.

Phase II of Project

The second portion of the CBI grant (as a result of the above studies) resulted in the installation of the Baby Beach storm drain to the sanitary sewer diversion project, installing bird exclusion fencing under the Baby Beach pier, and installing bird proof trash cans.

The Baby Beach storm drain to sanitary sewer diversion and first flush filtration project was constructed from May through October 2005. This project is a combination pre-treatment, diversion, and final treatment facility. The diversion and first flush filtration project functions as follows:

- In the first step, a 5-ft section of existing concrete storm drain pipe was removed in the parking lot and a new manhole structure was poured around this gap in the pipe. This occurred about 50-ft from the Baby Beach seawall. A concrete weir, 1.5-ft high and 12-inches wide, was constructed inside a new manhole structure. The weir was poured

monolithically with the manhole structure to prevent any leakage around the weir which could allow bacteria laden runoff downstream. In the side of the new manhole just upstream of the diversion weir, a new 24-inch diameter storm drain was constructed which leads to a 6-ft by 12-ft concrete vault containing a series of storm screens manufactured by Stormwater 360. The purpose of the diversion weir is to divert all urban runoff and first flush storm flows out of the existing storm drain leading to the harbor. The purpose of the storm screens is to remove any debris greater than pea size from the urban runoff and first flush and capture this debris on the screens prior to the urban runoff entering the sanitary sewer.

- Downstream of the storm screen is a 4-inch diameter PVC pipe which leads to the nearby sanitary sewer. There is a 4-inch diameter valve to turn the diversion on and off. The outlet in the storm screen vault for the 4-inch PVC pipe to the sewer is located several inches lower in elevation than the storm flow outlet to ensure all urban runoff is diverted to the sanitary sewer.
- Downstream of the storm screen vault are two 12-ft by 26-ft concrete vaults containing 154 storm filters. The purpose of the storm filters is to remove total suspended solids, soluble heavy metals, oil and grease, and total nutrients. The filters contain perlite, zeolite, and activated carbon. Photos of the stormwater filter vaults and the filters are located in the appendix.
- Downstream of the two storm filter vaults is a new 24-inch diameter reinforced concrete pipe which ties back into the existing storm drain about 8 feet from the point of penetration of the storm drain through the seawall and into the harbor.
- A flapgate was installed in the storm drain at the seawall to prevent sea water at high tide from interacting with the bacteria which may be growing on the biofilm on the wall of the RCP storm drain.
- The storm drain to sanitary diversion, at the requirement of the South Coast Water District (SCWD) and South Orange County Wastewater Authority (SOCWA), is operating only during the dry weather season from April 15 to October 15.

The construction drawings for the storm drain to sanitary sewer diversion and first flush filtration system are located in the appendix. Figure 2.1.1 is a photo showing where the diversion is located with respect to the beach and may help the reader to understand the system.

Pigeon and sea gull feces are known to contain high levels of enterococcus. The purpose of the bird study was to collect data on the number and species of birds utilizing Baby Beach and the surrounding area with the goal of determining the impact that birds have on the water quality at Baby Beach. Fieldwork associated with this study consisted of a series of three focused field surveys conducted at one-week intervals; at different times of the day for each visit.

The bird control measure consisted of replacing the dilapidated bird netting under the pier. Many birds had taken up residence under the pier resulting in direct input of bacteria. The cloth netting was removed and replaced with vinyl coated chain link fence. The purpose of the new trash cans at Baby Beach was to install trash cans at the picnic area which are bird proof. It is very common for birds at Baby Beach to pull food covered plates and paper from the trash and drop them on the ground adjacent to the trash can. The wind can then blow the food covered plates or paper onto the beach and into the water.



Figure 2.1.1 – Layout of Diversion System

3. MONITORING AND SAMPLING LOCATIONS

Since AB411 was initiated, the Orange County Health Care Agency has monitored six locations at Baby Beach. These include four locations along the beach and two locations in deeper water (one at the fishing pier on the west end of Baby Beach and the other near the base of the Dana Point Youth & Group Facility dock on the east end of Baby Beach). There are many sampling sites within the harbor and six of them are at Baby Beach. Each of the Phase I studies had its own sampling and analysis plan. In order to compare bacteria levels after installation of the diversion to historical data it was determined to use the AB411 sampling locations as the project sampling locations. There was zero flow in the storm drain downstream of the diversion since 100 percent of the urban runoff was diverted. This beach is perhaps one of the most sampled beaches in the State with six sample points along a 700-ft long beach. The normal AB411 sampling frequency is once per week; however, between June 1, 2005 and September 23, 2005, the six sampling locations were sampled every day and at two times per day.

The sampling locations are described in Table 3.1.1.

Table 3.1.1 – Description of Sampling Locations

| Sample Number | Sample Location | OCHCA Identification | Location Description |
|---------------|-----------------|----------------------|--|
| 1 | Pier | BDP08 | There is a steep walkway near the end of the pier on the north side down to a dock. This sampling point is located off the side of the dock near the east end. |
| 2 | West End | BDP12 | This sampling location is directly off the stairs at the west end of the beach. At a low tide this sample location could be several feet from the storm drain pipe to the harbor and at high tide the sample point is on the stairs. |
| 3 | Buoy Line | BDP13 | This sample is at the westerly end of the buoy line |
| 4 | Swim Area | BDP14 | This sample is taken in the center of the swim area in line with the easterly edge of the baby beach restroom. |
| 5 | East End | BDP15 | At the east end of Baby Beach along the Dana Point Youth and Group seawall. |
| 6 | Youth Dock | BDP17 | Depending on tide, this sample could be only a few feet from the east end sample. This sample is located at the base of the ramp down to the youth dock. |

Additionally, in order to divert urban runoff to the sanitary sewer system, SOCWA who owns and operates the sanitary sewer treatment system, requires monthly sampling of the diverted urban runoff for an array of constituents pursuant to the Special Wastewater Discharge Permit. The sampling and discharge requirements include acceptable values for flow, pH, oil and grease, various metals and pollutants, Total Suspended Solids, Suspended Solids, and Total Volatile Suspended Solids.

The six sampling locations are graphically displayed in Figure 3.1.1. The numbers in the figure correspond to the sample numbers in Table 3.1.1.



Figure 3.1.1 – Sampling locations

4. PROJECT RESULTS

The results of the project are as follows:

Data Mining Report

The results of the study indicate a strong influence of rainfall on bacteria contamination. Tidal data generally showed no obvious relationship to patterns of bacterial contamination; however, the low incidence of sample collections (once per week) limits statistical comparisons. Long term trends in fecal and total coliforms from 1997 -02 showed a general decline in concentration and frequency of contamination, while enterococcus values showed an increase in concentration and frequency. These results likely indicate that storm drain controls have resulted in water quality improvements, while other, non-storm water sources (birds) may be contributing more to enterococcus contamination. There was no correlation between high boat use and indicator bacteria levels.

Circulation Study Report

Currents in the study area were highly variable in speed and direction. During the surveys, surface currents in the immediate vicinity of Baby Beach (Stations 1-4) were typically small and on average directed towards the shoreline. Currents within Dana Point Harbor appear to be most strongly influenced by the open ocean tides, flowing towards or ebbing away from Baby Beach with these corresponding tidal cycles. However, during periods of strong winds, without a strong tidal flow or significant waves, the surface current appears to be mainly driven by the winds.

During the conditions under which this circulation study was conducted, it appears that there was limited circulation between the waters near to Baby Beach and the waters further in the harbor channel. Wind patterns appeared to “pin” water at the beach and create eddy currents near the beach that may tend to restrict water flow. Because of this, water quality problems within Baby Beach may be exacerbated by circulation patterns in the vicinity of Baby Beach. During the surveys, surface currents were generally slow in the vicinity of Baby Beach and directed toward shore. Further, winds that are influenced by the adjacent high bluffs may cause circular or eddy circulation patterns at Baby Beach. These eddys could be trapping surface waters along Baby Beach and possibly preventing the “flushing” of surface pollutants from the beach region. Therefore, sources of bacterial contamination (e.g., storm drain discharges, birds, or sediments) could tend to be maintained in the immediate vicinity of the beach, possibly further contributing to the high incidences of postings. Increases in general circulation may improve these conditions as a result of greater dilution and mixing. Physical changes to Dana Point harbor or breakwater structures would be generally impracticable as an approach to improving water circulation in the Baby Beach area. This is because any changes might impact the intent and integrity of the breakwater and harbor design.

Baby Beach Bacteriological Special Studies Report

The results of this study indicate the following:

1. The storm drains are significant sources of bacteria and bacteria laden sediments. This was determined by taking bacteria samples in the storm drain prior to interacting with the harbor water. This data showed high bacteria levels in samples taken from inside and near the pipe, decreasing significantly within a short distance away from the pipe mouth. Elevated counts of total coliform and enterococcus were found in harbor waters and in seepage water sampled within seven feet of the pipe mouth.
2. Groundwater can potentially provide a transport mechanism for indicator bacteria from various sources into receiving waters. Bacteria levels in 15 monitoring wells dug around Baby Beach were non-detect for all indicator bacteria except for total coliforms in Well #5, which had an average count of 300 CFU/100 ml, and Enterococcus in Well #13, with an average count of 40 CFU/100 ml. These two wells are adjacent to a sewer line; however, samples from other wells and groundwater seeps suggest no significant transport of bacteria is occurring through groundwater. The locations of the monitoring wells are shown in Figure 4.1.1.

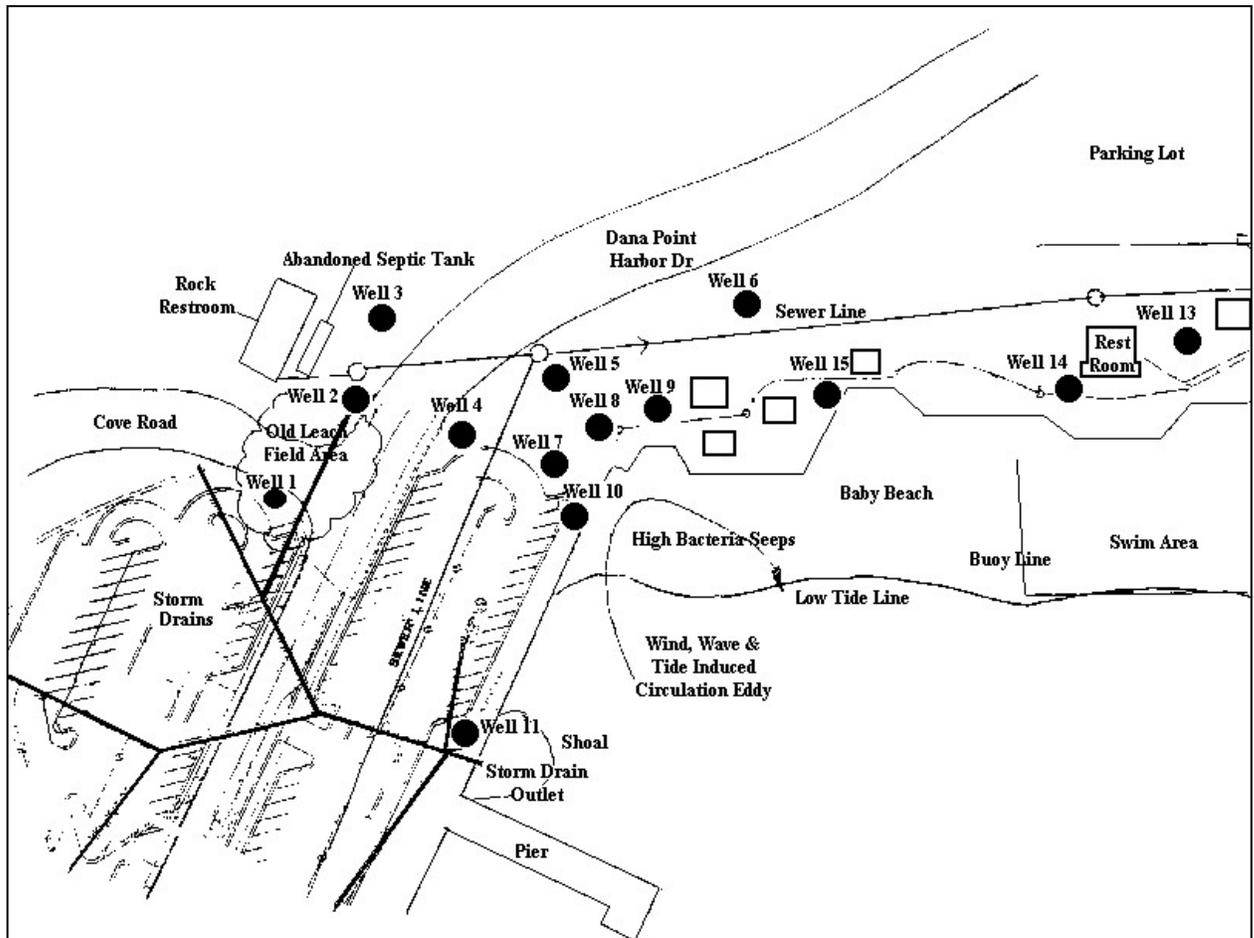


Figure 4.1.1. Sampling Stations for Study of Transport through Groundwater: Groundwater Monitoring Wells.

Prior to the sample collections, each well was pumped to ensure that water from the ground surrounding the well is sampled. A minimum of three well-water volumes was removed until either the pH or the conductivity stabilized. The data consisted of bacterial concentrations, as well as conductivity and salinity measurements from well-water samples. Please reference the Sampling and Analysis Plan in the appendix for additional information.

3. The storm drain bladders in place for the last few summers are somewhat effective as shown in the Data Mining Report (SAIC, 2003), but not 100 percent effective at mitigating summertime flows of bacteria to Baby Beach. Even with the storm drain plugs in, measurable quantities of bacteria are entering the beach waters via leaks in the plug and may be causing postings.
4. Bacteria appear to be associated with sediments and remaining viable in those sediments for some period of time after contaminating those sediments. The bacteria can be cultured from those sediments and, therefore, are still alive in the sediments. When sediments become resuspended, bacteria concentrations in the water increase.
5. Boating practices do not appear to be contributing measurable quantities of bacteria. This was determined over a five day period around a Labor Day weekend. Bacteria counts were not observed to increase with increasing boat usage.

6. Birds may be contributing some bacteria, but data collected are not sufficient to prove or disprove this.
7. The number of beach users and turbidity do not appear to correlate with bacteria concentrations in water. This was determined over a five day period around a Labor Day weekend. Bacteria counts were not observed to increase with increasing number of swimmers.
8. Bacteria concentrations in water vary widely with time of day. The current sampling time used by the Orange County Health Care Agency for AB411 (about 9:00 am at this beach) compliance monitoring may be the time during which bacteria concentrations are typically higher. The three different indicator bacteria tend to trend similarly throughout the day. The causes of the trend are unclear.
9. *Bacteroides* PCR/TRFLP microbial source tracking methods currently lack sufficient specificity or sensitivity to identify the animal or human source of fecal indicator bacteria found in the environment.

State of the Beach Report

After studying all possible sources of bacteria at Baby Beach, it has been determined that the source is one of the following four issues or a combination of the following four issues:

1. Contaminated discharges from storm drains,
2. Bacteria resident in beach sediments,
3. Limited near-beach water circulation, and
4. Bacteria contamination from local birds.

After discussing the pros and cons of many structural BMPs at this location, the State of the Beach Report lists structural implementation of the storm drain to sanitary sewer diversion at Baby Beach as the most appropriate construction project with the remaining CBI funds.

Stormceptor at Ocean Institute

The final report for the Ocean Institute Stormceptor is located in the appendix. The stormceptor intercepted 14.9 kg of sediment per inch of rainfall. As discussed in the final report, the project resulted in the removal of Cadmium, Chromium, Copper, Nickel, Silver and Zinc. Results of the water quality enhancement of the stormceptor are as follows:

- 1) The relatively low hydraulic profile of the system and the absence of a flap gate on the submerged discharge pipe allowed frequent and substantial tidal backwater up into the stormwater BMP system. These factors likely compromised the Stormceptor effectiveness in particulate contaminant removal when stormflow events are coincident with high tide events, with the level of reduced effectiveness proportionate to the level of tidal backwater. The system's performance capability was compromised approximately 45% of the days during the wet season, based on tide table elevation profiles. The backwater phenomenon also prevented effective water quality monitoring to document performance when storm events occurred during high tide events.
- 2) The decomposed granite used to overlay the parking area infiltration swales appeared to have an unsuitably high fraction of finer particles for the slope of the swale. These factors

resulted in significant erosion and overland transport to the grate inlets and entry to the drainage system. Thus, a significant amount of the solids intercepted and retained by the Stormceptor were the decomposed granite used in surfacing the BMP swale.

- 3) It was difficult to determine the extent to which infiltration occurred within the BMP swales. There was considerable surface flow to the grate inlet overflows to the drainage system for each of the storm events observed, essentially bypassing the infiltrative treatment envisioned to be provided by the swales.
- 4) The parking area infiltrative swale along the NE property boundary was inadvertently graded during construction such that drainage is routed along the margin rather than the center of the swale. This results in little or no potential for infiltrative treatment of drainage in this area. However, given the potential for erosion and transport of decompose granite fines, its present condition may have less negative impact to runoff quality.
- 5) The provisions for off-site drainage proved more than adequate to address the volume and quality of such drainage, which proved to be negligible.
- 6) Recommendations for modifications which have the potential to improve system performance would be: to consider the replacement of the outfall pipe fitted with a flap gate; and the placement of a stabilizing ground cover such as pea gravel over the decomposed granite in the infiltration swales, especially at the perimeter of the system inlet grates.
- 7) A comparison of runoff quality from the Ocean Institute treatment system with the control site showed no difference in water quality at the 1 percent significance level ($p \leq 0.01$) for any of the parameters measured. Differences approached the 5 percent significance level ($p \leq 0.05$) for three parameters: total suspended solids, turbidity and zinc. However, the concentrations of all three parameters were higher at the Ocean Institute site than at the control site.
- 8) The higher TSS and turbidity in the Ocean Institute runoff compared to the control site was primarily due to the erosion of the decomposed granite from the parking area infiltrative swales into the drainage stream.
- 9) High concentrations of zinc found in the Ocean Institute composite samples were much higher than concentrations observed in the grab samples from parking area runoff. This appeared to confirm that high zinc concentrations are attributable to leaching from the galvanized downspouts and gutters on the OI building campus.
- 10) Parking lot grab samples from both locations were similar in concentrations of total metals and nutrients.
- 11) There was no significant difference in runoff bacterial quality between the Ocean Institute and control site. The control site runoff did appear to generally have higher levels of enterococcus than the Ocean Institute runoff. However, the inherent high variability in bacteria samples and limited number of samples collected restricts the ability to draw any well-founded conclusions from the data.

- 12) The Stormceptor sump collected approximately 155 kg of particulate material through the evaluation period. Much of this material was believed to be the decomposed granite which was used to surface the infiltrative swales within the parking areas. Water quality analyses of the sediment indicated that the sump also retained measurable quantities of various trace metals and nutrients. These quantities were grossly estimated to be less than 5 percent of the total load for these contaminants which passed through into the harbor.

Phase II – Structural BMP

In 2004, the State Water Resources Control Board added \$130,000 in Proposition 40 grant funds to the original Proposition 13 grant funds for the installation of the Baby Beach storm drain to the sanitary sewer diversion project, installing bird exclusion fencing under the baby beach pier, and purchasing and installing bird proof trash cans.

The project was constructed from May through October 2005. The diversion became operational on June 30, 2005. The first flush filtration vaults & filters were installed in October, 2005. Photos of the construction are contained in the appendices.

The storm water screens and filters are acting to remove trash from the storm drain prior to it entering the Harbor. This Baby Beach CBI project is responsible for removing trash, in addition to oil and grease, from the Harbor during urban runoff and first flush storm events. Improving the overall water quality of Baby Beach is the primary goal of the Baby Beach diversion project.

The beach water quality data, consisting of the three indicator bacteria is contained in the appendix. The data is summarized and analyzed in the form of the number of posting days. However, this data may not be able to be used to determine the effectiveness of the diversion project due to the installation of the Oloid pilot project during the summer of 2005 and the fact that the 2004/2005 winter season was one of the wettest winters on record. The Oloids are an artificial circulation device which were placed at Baby Beach and turned on for two weeks and then off for two weeks all summer with funding from the City of Dana Point. The fact that two water quality projects were installed at the same time and at the same location is evidence of the desire of the County of Orange and City of Dana Point to attack the water quality problem at Baby Beach. There were two major spring tide events during the summer of 2005. Bacteria levels, for reasons yet unknown, increase during spring tide events.

Baby Beach was posted for brief periods of time when the diversion was operational in the summer of 2005. Data demonstrates that Baby Beach was much cleaner in 2005 than in 2004; however, it is too early to determine conclusively if the reason was the Baby Beach storm drain to sanitary sewer diversion project. Had the low flow diversion not been in place, Baby Beach would possibly have been posted frequently.

Table 4.1.1 displays the number of beach posting days for Baby Beach for the years of 2001 through 2005.

| Year | Number of Days of Posting | Beach Mile Days |
|------|---------------------------|-----------------|
| 2000 | 322 | 10.06 |
| 2001 | 162 | 3.28 |
| 2002 | 169 | 7.02 |
| 2003 | 266 | 9.86 |
| 2004 | 319 | 11.87 |
| 2005 | 237 | 6.02 |

Table 4.1.1 – Posting days at Baby Beach

The Baby Beach Storm Drain to Sanitary Sewer Diversion was only operational between July 1, 2005 and October 15, 2005. Table 4.1.2 displays posting days for the time period of July 1 through October 15.

| Year | Days of Posting |
|------|-----------------|
| 2000 | 62 |
| 2001 | 85 |
| 2002 | 90 |
| 2003 | 57 |
| 2004 | 91 |
| 2005 | 41 |

Table 4.1.2 – Posting days at Baby Beach for 2004 and 2005 between July 1 and October 15

The data in Table 4.1.2 indicated that 2005 had the least amount of posted days between July 1 and October 15 of the previous five years. Baby Beach was posted 41 days between July 1, 2004 and October 15, 2004. This is approximately a 55 percent reduction in the frequency of posting as opposed to 2004. It is not possible to determine what percentage of the reduction can be attributed to the diversion project and what can be attributed to other factors.

There were several problems encountered implementing the project. The most significant problem was the car-sized rock revetment under the parking lot which was removed in order to construct the project. The revetment was never removed when the harbor was constructed in 1970. Almost half of the parking lot was closed for a number of weeks; however, there were no construction related complaints. The revetment resulted in much wider trenches to install the new 24-in return line from the filters to the harbor resulting in significant construction cost overruns. Dewatering of the site during construction was a major effort. There have been no operational problems with the system.

The storm drain at the sea wall was plugged with a bladder during the summer months for several years and the storm drain flow was pumped every week to the sanitary sewer. Flow measurements from this pumping indicated storm drain volumes of about 3,000 gallons per day. The majority of the discharge must have been sea water which leaked through the bladder since

flow rate measurements recently indicated that approximately 300 gallons per day of urban runoff was entering the harbor. The data on the flow rate is contained in the appendix.

This project was simplified since the storm drain is higher in elevation than the sanitary sewer which eliminated the requirement for any pumping. The South Coast Water District and the South Orange County Wastewater Authority allowed a restrictor plate in a manhole leading to the sanitary sewer in lieu of an electrically operated valve to turn off the diversion in the event of a summer rainfall event in the event staff was not available to manually turn off the diversion. Since there are no operating systems associated with the diversion there is no possibility of equipment failure.

An added benefit of the diversion project is to protect the Harbor from an environmentally harmful sewage spill into the storm drain. The County of Orange now has a buffer since the low flow diversion will capture and direct sewage spills to the sanitary sewer before it reaches the Harbor.

Bird Study, Control Measure and Trash Cans:

The results of the bird study indicate that over 100 birds are present at Baby Beach at any given time. The dominate bird species are gulls and rock doves (pigeons); about 50 percent from each species. It is still unknown what percentage of the posting problem at Baby Beach can be attributed to bird feces.

The anti-bird fence under the Baby Beach public fishing pier was installed in September 2005 and is functioning well. The old cloth bird control fence had fallen apart and pigeons and gulls had repopulated the girders under the pier. Since the new fencing has been installed there have been no pigeons or gulls under the pier. The substantial amount of bird feathers on the fencing is evidence of the bird's attempts, to no avail, to access the underside of the pier.

The bird-proof trash cans for Baby Beach were funded through the CBI program. The bird-proof trash cans were purchased by the County of Orange in early March 2006 after significant research of the available types of bird-proof cans. The bird-proof trash cans were a grant requirement and funded 100 percent with local matching funds. The match requirement of \$15,000 for bird-proof trash cans was met.

5. CONCLUSIONS AND RECOMMENDATIONS FOR FUTURE PROJECT ENHANCEMENTS

The diversion is successfully removing urban runoff from the Harbor at Baby Beach. The monitoring data illustrates that there was a significant reduction in the number of posting days in the summer of 2005, although the data may not be able to be used to determine the effectiveness of the diversion facility due to the Oloid pilot circulation project. This project is undoubtedly a valuable addition in the effort to improve the water quality at Baby Beach. We can now say that all dry weather runoff is being diverted from the Harbor except for a minor amount of irrigation runoff from the grassy area onto the dry sand. There was approximately a 55 percent reduction in beach postings between the summer of 2004 with no diversion and the summer of 2005 with the diversion.

An important recommendation is to work with South Coast Water District (SCWD) and South Orange County Wastewater Authority (SOCWA) to allow year-round operation of the storm drain to sanitary sewer diversion. This will require storm forecasting. SCWD and SOCWA are

amenable to this; however, they will need the protocol established and approved. This should be in place by late 2006 in time for the diversion to continue year-round.

The studies performed with this grant were, without doubt, critical to the County's effort to reduce posting at this beach. The conclusions of the Phase I studies were that boaters, swimmers, leakage from storm drain joints, and groundwater seeps are not contributing significant amounts of bacteria. The conclusions of the Phase I studies were that the postings can be attributed to only four possible sources. These sources are bacteria from birds, storm drain flows, limited circulation, and bacteria resident (possibly multiplying) in the beach sediment. The Phase II structural BMP, which was constructed with this grant, eliminates the storm drain input as a possible source of continued postings. The County is in the process of working with the State Water Resources Control Board to finalize grant contract language and task items, using Proposition 40 Phase II funding, to install artificial circulation at this beach. Some people continue to feed the birds at the beach. The County needs to do a better job of enforcing the "no bird feeding ordinance" as this could continue to be a source of bacteria.

It is possible that the "smoking gun" with regard to continued beach postings after all sources of bacterial input have been accounted is possible regrowth of bacteria in beach sediment. Scientists, including scientists at the Orange County Health Care Agency, are currently starting to study this issue in more detail.

Appendix A

Photos



Figure A-1 – Photo of Baby Beach in 1920



Figure A-2 – Photo of Baby Beach in 1929



Figure A-3 – Photo of Baby Beach prior to construction of the Harbor



Figure A-4 - Photo of the storm filter vault being set in place.



Figure A-5 - Photo of the stormwater filter vault without the storm water filters



Figure A-6 - Photo of the layout of storm water filters inside the vault.



Figure A-7 - Photo of the installation of the vault cover.



Figure A-8 – Photo of the stormfilter vaults in place.