SAN DIEGO RIVER - OCEAN BEACH WATER QUALITY IMPROVEMENT PROJECT

San Diego River Sampling and Source Identification Investigations

Phase I - Final Report

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EXECUTIVE SUMMARY

Introduction

San Diego River is a prominent feature of San Diego County. From its source in the Laguna Mountains to its terminus at the Pacific Ocean near Ocean Beach, it provides an environment for many recreational uses and habitat for wildlife. The San Diego River meanders through the river-side communities such as Lakeside, Santee, Mission Valley and San Diego. Mission Trails Park, a large open space in East County and the Riverwalk Golf Course in Fashion Valley are built around the river. Just west of Interstate 5, the river becomes tidally influenced and the large flood plain comprises the Southern Wildlife Refuge. The mouth of San Diego River is located just north of Ocean Beach at Dog Beach. Dog Beach is an icon of the Community of Ocean Beach and was one of the first leash-free areas in the United States. Dog Beach is a popular tourist destination providing opportunities for surfing, swimming, sunbathing, and for pet-owners to exercise their dogs.

Despite the positive influence the San Diego River has on recreational uses and sustaining wildlife, water quality degradation has the potential to negatively impact the public and wildlife community. The City of San Diego (City) recognized the need to sustain a high level of water quality in order to maintain the river's beneficial uses. By the mid-1990's, the Mission Bay Sewage Interceptor System (MBSIS), which includes the tidally influenced portions of San Diego River, was in place and working to prevent sewage overflows and dry weather flow from impacting the region's water resources.

Although the MBSIS has proven its capabilities to prevent sewage overflows and divert urban run-off from Mission Bay and San Diego River, bacterial contamination still occurs. Bacterial contamination has been documented in the San Diego River and at Dog Beach. Based on recommendations of the Regional Water Quality Control Board (RWQCB), the Lower San Diego River is 303(d) listed as impaired for bacterial contamination. In addition, samples collected since 1999 as required under the State's AB411 criteria have exceeded standards on numerous occasions at Dog Beach.

In 2002, the City, in response to a request under the California Water Code, Section 13267 by the RWQCB, investigated bacterial contamination at Dog Beach. In spite of Best Management Practices (BMPs) established in the Summer and Fall 2001, such as the addition of signage, disposable bags and trash cans for dog owners to pick up after their pets and the relocation of the County of San Diego Department of Environmental Health's (DEH) AB411 monitoring site, the City's investigation found that bacterial contamination along Dog Beach often exceeded AB411 standards and was spatially and temporally variable. Their findings also suggested that dog and bird feces were not the primary contributors to elevated bacterial levels recorded at that beach.

Based on the numerous exceedances of the AB411 criteria and the City's investigation, the City obtained a grant from the Clean Beaches Initiative for investigation of bacterial sources potentially impacting Dog Beach. This project, San Diego River – Ocean Beach Water Quality Improvement Project, Phase 1, was designed to investigate potential sources of bacterial

contamination to the San Diego River including storm drain and near beach diversion structures, as well as any natural local sources. Its aim was to also recommend BMPs to abate any potential contamination from identified sources. This study was prepared for the California State Water Resources Control Board by the City and MEC Analytical Systems, Inc. (MEC).

Major Tasks of the Study

The goal of Phase I of the study was to identify the source of bacterial contamination to Ocean Beach, specifically at Dog Beach, establish a baseline of water quality for the San Diego River (River) and recommend BMPs to abate bacterial contamination. There were four major tasks to accomplish this goal:

- Task 1 – Determination of segments of San Diego River for Source Identification;
- Task 2 – Human Sewage Investigations;
- Task 3 – Near Beach Storm Drain and Diversion System Investigations; and
- Task 4 – Visual Observations of other potential sources of bacterial contamination.

Task 1 was completed by performing an extensive program of sampling throughout the River. Sites were located from the mouth of the River to approximately 11 miles upstream in the Mission Trails Park. Results showed that the river (Mission Trails to the San Diego River mouth) could not be considered as a whole. Bacterial concentrations varied from site to site, and this variation was consistent from day to day for the duration of the study. There appeared to be areas with a chronic source input, however, the resulting elevated bacterial levels would be undetectable at stations downstream. Samples collected at Sunset Cliffs Blvd. Bridge showed the disconnect between stations upstream and stations around Dog Beach. This station had significantly lower levels of all three bacterial indicators than the next closest upstream station, suggesting that bacterial contamination was not being transported downstream. The lower levels between these stations may be due to increased dilution, deactivation by sunlight or the natural transition to more saline water. Levels of *Enterococcus* significantly increased at stations on Dog Beach suggesting the presence of a local source.

In Task 2, potential inputs of human sewage to the river system were investigated. A review of City provided maps of the sewage infrastructure to determine likely locales of human sewage inputs along with interviews of City staff were conducted. These investigations resulted in no probable inputs from human sewage. Samples for Polymerase Chain Reaction analyses to determine the presence of human fecal contamination around Dog Beach were conducted to confirm the initial findings. These samples showed that only 1 of 18 samples may have had a weak human fecal contamination signature. The presence of non-human fecal contamination in all other samples collected suggested that there were no chronic inputs of human fecal contamination to Dog Beach. In addition, a closed-circuit TV inspection of a comfort station on Ocean Beach was conducted. The inspection found the sewage system serving this comfort station to be in good condition and not a source of bacterial contamination.

Task 3 was completed with inspections of the 7 pump stations serving the Lower San Diego River and multiple storm drain outfalls. All but one of the 7 pump stations were found to be undiverted. Pump Station H was the only station diverting flow to the sewage system during dry weather conditions. Pump Stations D, E, I , J and K all discharge to the river system, however, only Pump Station D discharges directly to the River; other pump stations discharge to wetland type habitat on the flood banks of the River. Only Pump Station D discharges significant volumes of urban runoff and this discharge impacts water quality in the River locally downstream. During the course of this study, discharge from Pump Station D did not evidently impact Dog Beach.

Of the numerous outfalls inspected, two outfalls were discovered to be inputting elevated bacterial levels that could degrade the water quality at Dog Beach. These were Outfalls 13 and 14 located at the southeastern end of Dog Beach. Samples collected at their terminus were significantly higher for all three bacterial indicators than samples collected 0.5 miles upstream. The remaining outfalls inspected were either dry or samples either had low levels of the three bacterial indicators or the discharge was not observed to impact Dog Beach.

The results of Tasks 1 – 3 suggested that the River was not the primary source of bacterial contamination to Dog Beach. Elevated bacterial levels on the beach appeared to be from local sources. Therefore, several site and time specific studies located around Dog Beach comprised the efforts to satisfy Task 4. Surveys were conducted to establish sources and transport mechanisms of bacteria around Dog Beach. These included sediment sampling, 24-hour tidal influence, focused high tide influence, kelp sampling and sand berm sampling surveys.

Sediment samples collected on the mudflats east of Dog Beach and along the eastern portion of Dog Beach had low levels of all three bacterial indicators. This single survey suggested that although some samples did have detectable levels of the bacterial indicators, the washing of bird feces did not appear to be the primary cause of extreme bacterial contamination observed along Dog Beach. This confirms earlier studies performed by the City.

Based on findings from similar studies in other regions of Southern California, a survey was developed to determine if elevated bacterial levels were related to tide height or stage (flooding vs. ebbing). Four surveys were conducted, two on neap and two on spring tides, with samples collected every two hours along Dog Beach. An upstream station was included in the survey to rule out any potential influence of the River at the same time. Although statistical analyses could not confidently (alpha = 0.05) confirm a direct relationship between tide height or stage with bacterial levels, graphical representations suggested that high tides caused an increase in bacterial levels and the presence of sunlight (UV) decreased levels.

The appearance that bacterial levels increased following high tides resulted in a study that focused sampling around the high tide. High tides tend to wash the wrack line collecting on the beach (the wrack line is composed of marine vegetation, typically kelp and eelgrass, and other debris found deposited at the extent of the last high tide). Observations on the beach showed that dog feces tend to be higher within the wrack line as well. Therefore, it seemed that the source of elevated bacteria levels may be the washing of dog feces in the wrack line. Four

surveys were conducted that collected samples approximately 3-hours prior to high tide, during high tide, and approximately 3-hours following high tide. Samples were also collected in three specific regions of the beach, west (surf influenced), north (strong tidal current flow, steep beach, narrow river channel) and east (variable tidal current flow, flat beach, mudflats). The west and north regions were further segmented into areas with observed higher and lower concentrations of dog feces in the wrack line. The results showed a significant difference between pre- and during high tide samples. Samples collected at high tide were significantly higher than those collected 3 hours prior, with concentrations of all three bacterial indicators typically an order of magnitude or more greater. The western region had the lowest concentrations of bacterial indicators and samples collected in areas with high concentrations of dog feces versus areas with low concentrations of dog feces were not significantly different. This suggested washing of the wrack line itself was a contributing factor to elevated bacterial levels.

Samples of freshly deposited and decomposing kelp and eelgrass from the wrack line were then collected and analyzed. These samples were collected with and without the apparent presence of dog fecal matter. Results showed that decomposing marine vegetation, with or without the apparent presence of dog feces, had levels of bacterial contamination that were among the highest levels observed during the study at Dog Beach and the washing of this material could be the primary mechanism for transporting bacteria in high concentrations into the water column. Freshly deposited marine vegetation did not have similarly elevated levels of bacterial contamination. The source of the bacterial contamination to the marine vegetation is assumed to be dog and bird feces, however, the mechanism for bacterial transport from one pile to the next and the ability of bacteria to regrow in this environment was not studied directly.

Sand Berms are constructed along Ocean Beach, adjacent and directly south of Dog Beach, during winter months to protect back shore property. Sand berms are not constructed on Dog Beach. These sand berms are constructed with kelp as a binding agent. Ocean water samples collected prior to the sand berm spreading event in Spring 2003 were significantly lower in bacterial contamination as compared to samples collected directly after the spreading event.

Conclusions

The tidal estuary appeared to disconnect the influence of the River from impacting Dog Beach. The decrease in bacterial levels may be a result of several factors, including increased dilution and deactivation by sunlight and more saline water. This was shown in the river segment source identification surveys as part of Task 1. Exceedances of the AB411 criteria still occurred at samples collected on Dog Beach suggesting the presence of a local source. Inspections of the storm drains and near beach diversion systems found that samples collected at the base of Outfalls 13 and 14 had significantly higher bacterial concentrations than the nearest upstream station. The exchange of water during a tidal cycle in the estuary provides the mechanism for these elevated bacterial levels to impact the shores of Dog Beach. In addition, focused studies of tidal washing effects showed that bacterial levels increase with high tides. During periods of high tides, the wrack line, consisting of decomposing marine vegetation, dog feces and likely bird feces was washed, providing a mechanism for transporting bacteria into the water column.

Samples of this wrack line were analyzed and extremely high levels of all three bacterial indicators were documented.

Based on the results presented, two major recommendations are made. The first is to redesign the infrastructure at Outfalls 13 and 14. Increasing the diversion capacity and eliminating effects tidal intrusion in the storm drain outfalls appears to be a priority in reducing beach closures at Dog Beach. Second, wrack line, or "kelp" management practices need reviewing. Best Management Practices to consider would be the removal from the site of deposited marine vegetation and the reduction of kelp used as a binding agent in sand berms, where at all feasible, taking into consideration the risk of flooding and the protection of public safety and property.

Remaining contents of Final Report are in Master File for reference