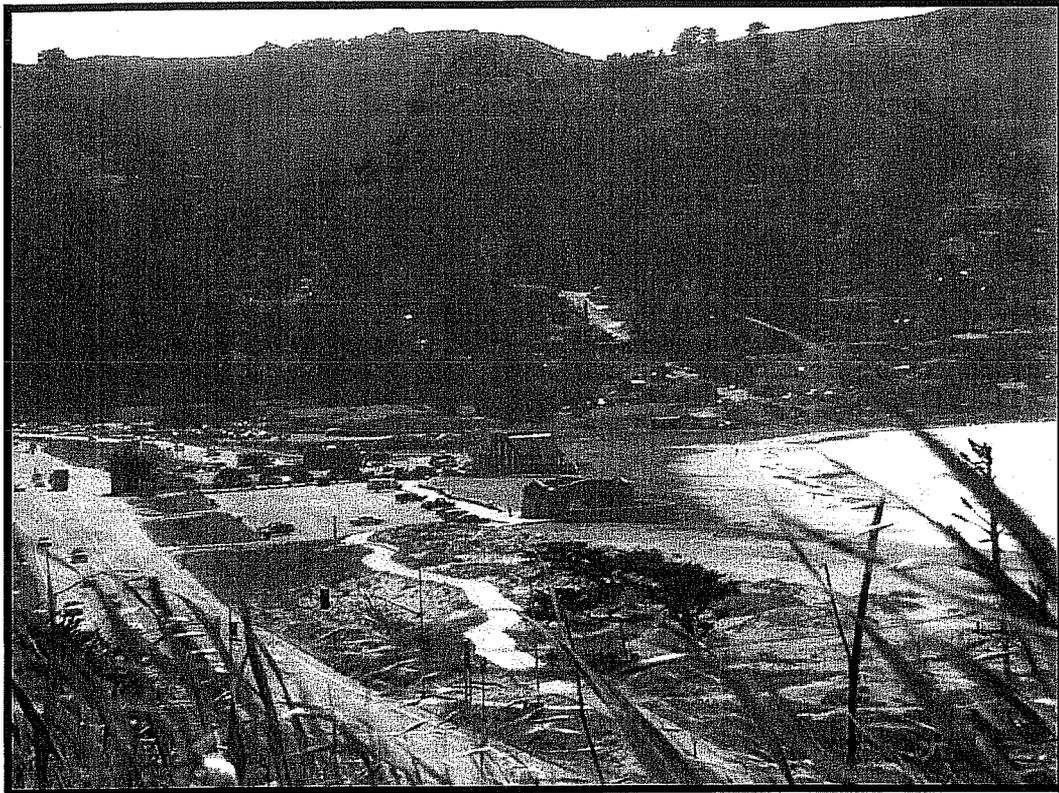


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FINAL REPORT



COMPLETED REPORT PREPARED BY:

Elizabeth Claycomb, Department of Public Works

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**CONSTRUCTION OF NON- POINT SOURCE POLLUTION DUNE AND  
WETLAND TREATMENT SWALES AND DUNE REPLACEMENT**

*Project Scope and Background~*

In July of 2001, the City of Pacifica received Proposition 13 Clean Beaches Initiative Grant funding through the State Water Resources Control Board. This funding, in the amount of \$500,000, was needed in order to facilitate the reduction of health risks associated with storm water and ground water runoff contaminated by non-point source pollution in and around Linda Mar State Beach. This is known as the Pacifica State Beach Treatment Swale Project. The specific locations targeted were the Linda Mar Pump Station and the Anza Pump Station. The San Pedro Creek Mouth is the focus of the CBIG (Clean Beaches Initiative Grant) proposition 40 grant. The primary objective for the City was to lessen the amount of bacteria contamination, specifically Coliform and E-coli released into the Pacific Ocean via the Anza Pump Station which exists at the lower 1/3 of Linda Mar State Beach and the Linda Mar Pump Station. The Project location is detailed in Exhibit A which includes images of the Linda Mar State Beach, Treatment Wetlands, Pump Stations and Outfalls.

This project's goals were to address the non-point source pollution in the southern third of the beach. This project has successfully achieved a significant reduction of potential contamination sources as well as the improvement of salt water quality through the diversion of the dry water runoff into the treatment wetlands and dune treatments swales.

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The Anza and Linda Mar Pump Stations were initially discharging storm drainage water from highway one, approximately ten acres of residential development in lower Linda Mar and approximately 20 acres of open space. This project diverted these flows along with the newly constructed beach parking lots run off to the new treatment wetlands.

Linda Mar State Beach is one of the most highly accessed beaches on the west coast, serving more than one million visitors annually. In and around the bay area, it is one of the only “naturally protected beaches” due to its half moon shape buffered by Rockaway and Pedro Points to the north and south respectively. These points shelter the Linda Mar State Beach, allowing for a more calm beach break which allows surfers of all levels to enjoy surf spots located up and down the entire beach.

The City of Pacifica has an annual summer surf camp program facilitated by two city residents/lifeguards. This program takes advantage of the “more protected area” of the beach located at the south end between the creek mouth and Linda Mar Pump Station outfall. Concerns have been presented to the city in the past by surf camp parents/staff who do not want their children/campers exposed to high levels of bacteria associated with the creek mouth and parking lot, open space and Linda Mar neighborhood runoff processed at the Anza and Linda Mar Pump Stations. Other concerns have been presented to the city on a somewhat regular basis due to the county “Beach Contamination/Closure Signs” posted at the creek mouth after county water testing has shown higher than acceptable levels of E-Coli and Coliform.

In addition to regulated beach programs, the beach has a multitude of non-residents and residents who enjoy its beautiful beaches and waters year round.

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Fishermen, kayakers, swimmers and boogie boarders all take advantage of the natural resources available at Linda Mar State Beach. With the influx of non-residents attending the beach in the spring and summer months comes the increase in parking lot runoff, trash and other man made contaminants including waste that negatively affect the bacteriological levels in and around the beach/creek/ocean at Linda Mar.

The city, with the help of CBIG Prop13 funds has successfully implemented the Pacifica State Beach Treatment Swale Project which consists of diverting runoff in to the wetlands from the San Pedro Creek Mouth, Linda Mar Pump Station and Anza Pump Station via two major changes to the storm water drainage system. The first change implemented is the connection between the Linda Mar Pump Station and the Anza Pump Station via Gravity Flow underground pipe. The runoff captured at the Linda Mar Pump Station travels north to the Anza Pump Station and then is discharged into the constructed treatment wetlands. The second change is the construction of treatment wetlands that exist between the north parking lot and highway one and run from the sand dunes below Crespi to the end of the intersection at San Pedro Terrace Road and Highway One. Additionally, treatment wetlands were constructed around the total perimeter of the Linda Mar Pump Station. These waters flow into these wetlands starts at the Linda Mar Pump Station. It then runs north to the Anza pump station and be discharged into the constructed wetland. The contaminated water then flows south through the wetland back to the Linda Mar Pump Station and is re-circulated at the treatment wetlands surrounding the Linda Mar Pump Station until it is absorbed, evaporated or taken up by vegetation.

The Proposition 13 project focuses solely on the non-point source discharges associated with the Linda Mar Pump Station and Anza Pump Station. The second phase

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of the City's goal of non-point source pollution prevention at Linda Mar State Beach: the Convalescent Homes Sewer Replacement/Sewer Diversion Project is currently under construction and is being funded by SWRCB proposition 40 funds which were secured in 2003 for the Beach Master Plan/Flood Control Projects. With Prop 40 funds, the city will divert storm drainage from the residential neighborhood starting at Peralta to the west. This will ensure that the current situation: the upper part of Linda Mar residential area being drained to San Pedro Creek and released about ¼ mile from the creek mouth will no longer occur. This final leg of the City's massive redesign/protection of its watershed and coastal resources will complete this particular grants goal; which is to reduce the non-point source pollution that reaches the creek mouth and ultimately the ocean as well as the protection of our "protected and endangered species" both plant and animal that happen to reside in these wetland/watershed areas. Proposition 40 focuses on the non-point source discharge of San Pedro Creek and 6 acres of wetlands restoration west of the Capistrano Bridge and at the creek mouth.

***Project Goals~***

The Pacifica State Beach Treatment Swale Project funded by Prop 13 via the State Water Resources Control Board has achieved its project goal: diversion of non-point source pollution via diversion of storm runoff from First Flush release into the ocean (Linda Mar and Anza Pump Stations) to two areas of fully functioning treatment wetlands.

The first of the two treatment areas are the treatment swales associated with the Anza Storm Drain Pump Station located along the highway north of Taco Bell extending

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to Crespi. Water that would normally be discharged on the beach is pumped into a treatment swale from this pump station wet well and thus diverted from a beach discharge during low flow and first flush situations.

The Second location is at the Linda Mar Storm Drainage Pump Station, where water is pumped from the Linda Mar Wet Well into a storm water treatment swale that surrounds the pump station. Another feature linked both the Linda Mar and Anza Pump Station Wet Wells together, so diversion flows from both drainage sheds can go to either and/or both of the treatment wetlands.

The Specific goal of this project was to demonstrate a reduction in Coliform load discharged at these two pump station locations. The reduction in pollutants occurs primarily at First Flush and during summertime low flows. It is extremely difficult if not impossible to correlate the levels of pollutants associated with these discharges to beach closure. Beach closures are primarily related to the larger flows associated with San Pedro Creek and reductions in closures will be associated with the success of the proposition 40 project.

Summer low flow pump station discharges, even though very high in Coliform levels, occur only a few times per summer months and have never resulted in a beach closure. Winter time pump station discharges are dwarfed in proportion to the San Pedro Creek discharge.

The grant scope identifies the best way to measure pollutant reductions which was to measure concentration of total Coliform and Fecal Bacteria multiplied by the flow diverted, and then calculate the total load of bacteria then being diverted from the beach discharge. As identified in the QAPP and Monitoring and Reporting Plan for this grant,

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there is no direct correlation between monitoring this reduction in pollutants at these specific discharges with the counties monitoring program data for the beach and San Pedro Creek. The counties data has a direct correlation with the success of the improvements associated with the proposition 40 project.

The Bacteriological Monitoring for the Pacifica State Beach Treatment Swale Project is detailed in Exhibit B, C and D. Exhibit B details project location and water monitoring site. The data shows significant reduction in total Coliform Discharge in late spring 2005 when the groundwater flow was still significant. This tapered off during the dryer summer months and became more significant during the First Flush of the fall. The data also indicates total and fecal Coliform levels in the 16,000 level are typical for the storm drainage collected in this sub-drainage system.

The graph illustrates the reduction in Coliform loading throughout the sampling period.

We have followed and met Project goals outlined in our *Dune Swale Waters/Wetlands Maintenance and Monitoring guide for the Pacifica State Beach Master plan for Public Improvements*. Specifically the goals of:

- Complete diversion in the dry periods and partial diversion in the wet months
- Improvement of Water Quality at Linda Mar State Beach to ensure that these waters meet bacteriological standards set forth by the state of California

The reduction of bacterial concentrations is exemplified in our data, and has indicated project success. Exhibit E is the task/deliverables list detailed in Prop 13 CBIG

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Contract agreement # 01-225-550-02. The City has successfully met the task/deliverables requirements.

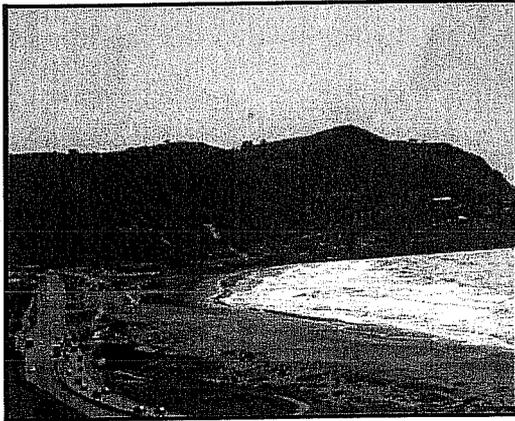
*Conclusion~*

The Project Goals have been achieved along with creating attractive and biologically diverse coastal wetlands. The plant growth and planting diversity goals have been achieved. The wetlands have accommodated high levels of ground water recharge. All storm water during dry weather periods and during First Flush is completely dissipated through Ground Water Percolation and Evapotranspiration. During these periods bacterial contamination is completely eliminated from the beach discharges. The monitoring program successfully indicates the level of pollutant reduction.

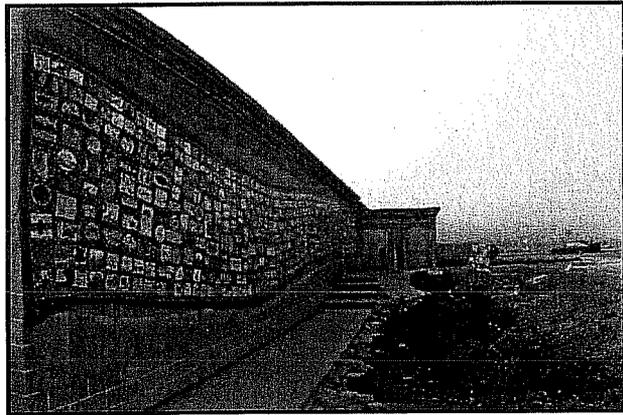
This project as mentioned previously will not necessarily reduce beach closure postings but successfully eliminates a rather obnoxious intermittent discharge. The second phase and additional projects to be funded through the Clean Beached Initiative Grant Program focusing on San Pedro Creek (Prop 40), will have significant impacts on reduction of beach closures. One of the main objectives for this project was to successfully construct functioning treatment wetlands that diversions of storm water from future Clean Beaches Initiative Grant Projects can treat successfully. This project has accomplished this goal. The data accumulated has demonstrated that this project can successfully treat really large volumes of storm water. As a result, we are diverting storm water from Crespi and De Solo into these wetlands as part of the proposition 40 project.

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Exhibit A



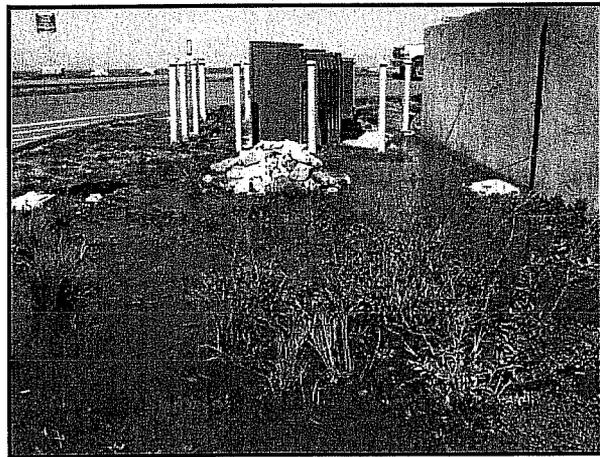
Overview: Linda Mar State Beach



Linda Mar Pump Station Wetlands

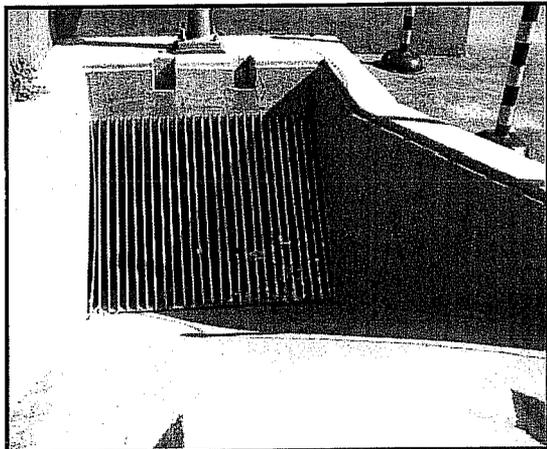


Linda Mar Pump Station Wetlands

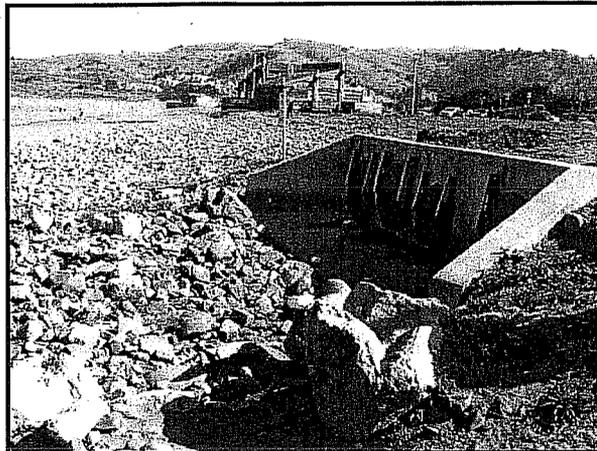


Linda Mar Pump Station Wetlands

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Linda Mar Pump Station Bar screen



Linda Mar Pump Station Outfall

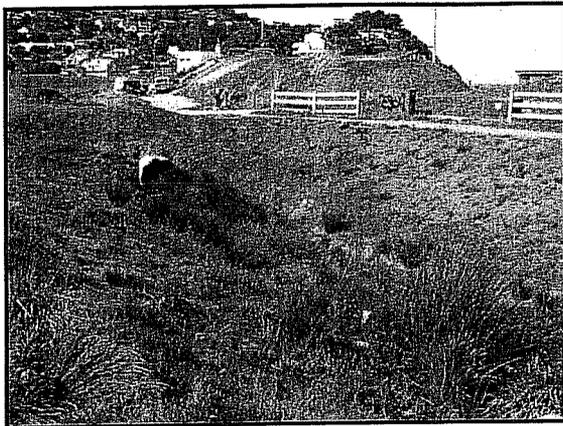


Anza Pump Station



Restored Sand dunes

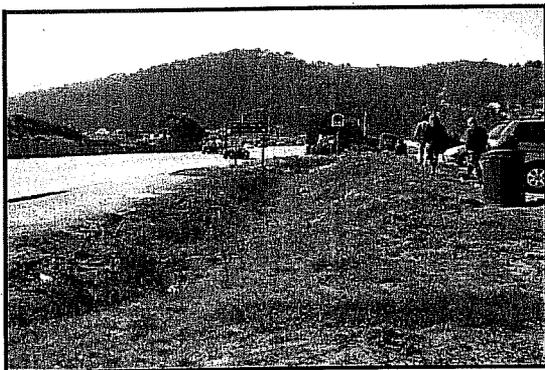
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Wetlands South of Creek Mouth



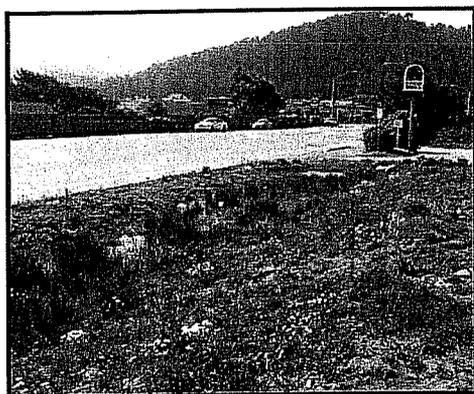
Wetlands South of Creek Mouth



Wetlands along highway 1 north parking lot



Linda Mar Pump Station Wetlands



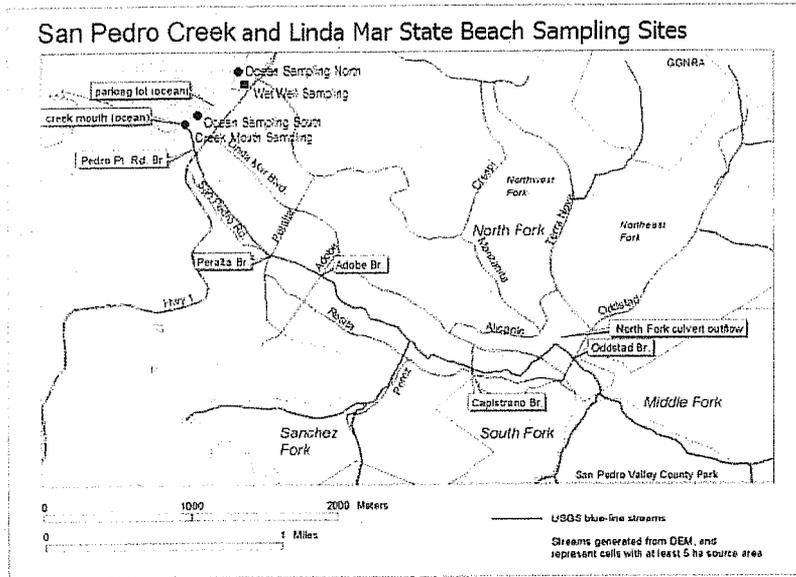
Wetlands along highway 1 north parking lot



Wetlands along bike trail south of Crespi north of north parking lot

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Exhibit B



Project Location/Wet Well Sampling Site



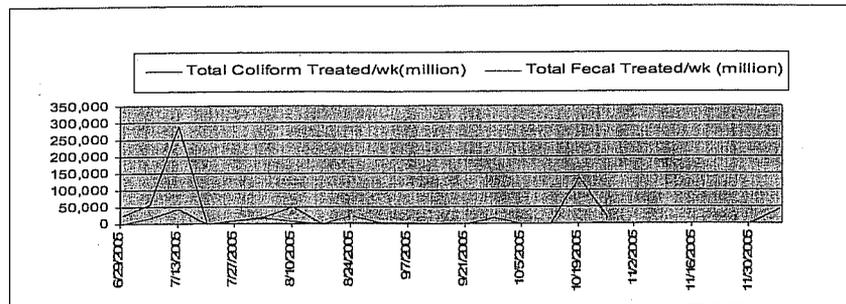
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Exhibit C

DATE	PUMP #1 (min.)	PUMP #2 (min.)	Total mins. of P #1 & P #2	Total gals pumped into Wet Land (350gal/min.)	Total Coliform (MPN/100ML)	Total Fecal (MPN/100ML)	DATE	Total Coliform Treated/wk(million)	Total Fecal Treated/wk (million)
6/29/05	57	59	116	40,600	16090	330	6/29/05	24,824	509
7/6/05	688	227	799	279,650	5420	1720	7/6/05	57,597	18,278
7/13/05	2047	227	1359	475,650	16090	2400	7/13/05	290,822	43,379
7/20/05	2238	229	193	67,550	110	20	7/20/05	282	51
8/3/05	6645	1250	5428	1,899,800	300	240	8/3/05	21,658	17,326
8/10/05	6985	1679	769	269,150	5000	500	8/10/05	51,139	5,114
8/17/05	7318	1740	394	137,900	300	110	8/17/05	1,572	576
8/24/05	7907	1740	589	206,150	2800	500	8/24/05	21,934	3,917
8/31/05	8552	1740	645	225,750	500	230	8/31/05	4,289	1,973
9/7/05	9228	1740	676	236,600	210	20	9/7/05	1,888	180
9/14/05	9228	1740	0	0	9000	800	9/14/05	0	0
9/21/05	9228	1740	0	0	16000	16000	9/21/05	0	0
9/28/05	9305	1741	78	27,300	16000	300	9/28/05	16,598	311
10/5/05	10137	1741	832	291,200	20	20	10/5/05	221	221
10/12/05	10700	1741	563	197,050	20	20	10/12/05	150	150
10/19/05	11338	1741	638	223,300	16000	16000	10/19/05	135,766	135,766
10/26/05	11341	1821	83	29,050	16000	16000	10/26/05	17,662	17,662
11/2/05	11343	1824	5	1,750	N/A	N/A	11/2/05		
11/30/05	11353	1833	19	6,650	16000	1300	11/30/05	4,043	329
12/7/05	11562	1833	209	73,150	16000	16000	12/7/05	44,475	44,475

Bacteriological Monitoring Data

Exhibit D



Bacteriological Monitoring Graph

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Exhibit E

Task	Deliverable	Completion Date
<b>1</b>	<b>Project management and administration</b>	
		Ongoing through February 2005
1.2	Quarterly Progress Reports	
1.5	Contract Summary Form	9/2/2003
1.6	Subcontractor Documentation	12/2/2003
1.7	Project Survey Form	1/2/2005
<b>2</b>	<b>California Environmental Quality Act (CEQA) documents and permits</b>	
2.1	Notice of Determination	2/2/2003
2.2	Required Permits	2/2/2003
<b>3</b>	<b>Quality Assurance Project Plan</b>	
3.1	QAPP	4/2/2004
<b>4</b>	<b>Statement of Work</b>	
4.2	Contract with Design Consultant	6/2/2003
4.3	100 % Plans and Specifications	6/2/2003
4.4	Proof of approved P&S, contract add., Evidence of Award	6/2/2003
<b>5</b>	<b>Project Implementation</b>	
5.1	Contract with Construction Contractor	12/2/2003
5.3	Pre and post photos	3/2/2004
5.5	Notice of Completion and formal acceptance by City	3/2/2004
<b>6</b>	<b>Reporting</b>	
6.1	Monitoring and Reporting Plan	4/2/2004
6.2	Draft Final Report	2/2/2006
6.3	Final Report	3/2/2006