

*Prevention First 2004*

# Onshore Decommissioning Projects

---



## Introduction

---

Onshore decommissioning projects related to offshore oil and gas development present their own series of challenges as they move from the permitting through the implementation phase. In some cases, projects require significant remediation beyond what is originally envisioned during the permitting process. In other projects, applicants have to contend with sensitive biological species or cultural resources that restrict access and limit their ability to complete projects expeditiously.

In this paper, we present five different case studies of decommissioning projects that are currently active in Santa Barbara County to attempt to illustrate some of the challenges faced with decommissioning onshore projects. The projects chosen for review are:

- 1. AERA Energy Cañada de la Huerta PCB Remediation Project**
- 2. ARCO Alegria Oil and Gas Plant Decommissioning Project**
- 3. Chevron/Texaco Gaviota Equipment Removal Project**
- 4. Texaco Hollister Pipeline Removal Project**
- 5. Unocal Cojo Marine Terminal and Pt. Conception Decommissioning Project**

## Aera Energy, LLC. Cañada de la Huerta PCB Remediation

---

### Location

The AERA former gas processing site is located in Cañada de la Huerta, a canyon on the south flank of the Santa Ynez Mountains on the Gaviota Coast, approximately 20 miles north of the city of Santa Barbara. The canyon runs north-south and opens to the Pacific Ocean and Hwy 101.

### Overview

This site once housed facilities for processing natural gas produced from subsea wells in the Molino Offshore field. Today, the site is designated as a State Superfund site and is under going extensive remediation.

---

### Background

- Shell Oil was granted a County permit 1963 to construct and operate a gas plant in Cañada de la Huerta.
  - Natural gas was produced from sub-sea wells, piped to the onshore facility, treated and sold to the Southern California Gas Company.
  - Site contamination was discovered in 1986, including hydrocarbons, mercury and polychlorinated biphenyls (PCBs) and The Department of Toxic Substances Control (DTSC) designated the site a State Superfund hazardous substances release site.
  - Shell Western Exploration & Production, Inc. (SWEPI) entered into a consent order with DTSC in 1988 to clean up the onsite contamination.
  - The gas plant ceased operations in 1989.
  - A Remedial Action Plan was approved in 1994. Several addenda to this plan have been completed, the latest includes work to remove contaminants and re-grade the fill pad slope in the lower canyon area (Summer 2004).
  - The County approved a conditional use permit in 1996 for site demolition, cleanup and restoration.
- 

### Current Clean-up Activity

- Supplemental soil remediation as a result of new data showing extensive contamination beyond what was previously thought to exist onsite. The current clean-up goals for the former fill pad are:
  1. Reduce PCBs @ 68 sites  $\geq$  25ppm (former target was 50ppm)
  2. Reduce mercury @ 3 sites  $\geq$  5ppm (former target was 10ppm)
- Soil vapor extraction and air sparge pilot tests to determine an appropriate mechanism for reducing the level of volatile organic compounds (VOCs) onsite. Goal of the current pilot tests are:
  1. Determine the distribution and disposition of volatile organic compounds (VOCs) in soil.

2. Evaluate effectiveness of the pilot tests and develop a long-term program for clean-up.
- Quarterly ground water monitoring, soil sampling and bioassays are ongoing in accordance with the December 2001 Sampling Plan Addendum for the Groundwater Characterization and Remediation Monitoring Program in order to track potential movement of contaminants offsite through groundwater transport.
- 

## Lessons Learned

- Transport of contaminants not fully understood – PCBs, TPH, VOCs. Groundwater testing, surface water tests, sediment tests and bioaccumulation tests are necessary because we have little understanding of the extent of contamination. Previously excavated and remediated sites have recently been found to still contain contaminants in concentrations above action levels. Aera's goal is to achieve satisfactory conditions onsite such that the property could be designated for unrestricted use. However, this seems unlikely as soil and groundwater contaminants continue to appear in areas of previous remediation.

### *Zoning Violation, April 2004 – further site characterization necessary*

In April of 2004, Aera illegally disturbed several hundred cubic yards of material within an environmentally sensitive habitat in an effort to repair an existing drainage system, resulting in widespread disturbance and distribution of soils known to contain PCBs and other toxics. While onsite to inspect the zoning violation, agency officials noticed significant hydrocarbon discoloration of the soil and odors. Aera was directed to sample all areas of disturbance to determine the composition of surface soils. The sample results came back in August of 2004, indicating significant PCB contamination, some results indicated concentrations were 10-50 times higher than the clean up goal.

Clean-up action levels for the fill pad slope area of disturbance have not yet been finalized. They are to be based on the presence/absence of sensitive ecological receptors onsite, which have not yet been assessed. Because the target clean-up goal has not been finalized, Aera will need to complete an interim restoration project and most-likely return in the spring to further stabilize the area.

### *Issues identified as a result of the zoning violation and follow-up work:*

1. Onsite contamination is more extensive than previously thought. Site wide averaging proved to be an inadequate approach for clean-up. It does not account for unknown interaction of contaminants at depth and in contact with groundwater. Because issues such as these were not considered, additional remediation at the site is now required (almost 10 years later).
2. Agency notification, constant monitoring and interagency communication must be consistent and timely. It is extremely important that all parties be knowledgeable of all activity onsite – something very difficult as staff from agencies change through time.
3. Timing of construction efforts is off as related to plan approval. Work *cannot* commence in areas where a work plan is currently being revised or formulated (e.g. lower canyon area where an Eco-risk Assessment has not yet been performed).

## ARCO Alegria Abandonment/Decommissioning

---

### Location

The former ARCO Alegria oil and gas plant is located on the ocean side of Hwy 101 in Alcatraz Canyon, approximately 30 miles west of the City of Santa Barbara. The facility occupies approximately one acre of land within the Gaviota Marine Terminal on the western side of Alcatraz Creek.

### Overview

This site once housed oil and gas processing equipment, including two 1000-barrel crude oil processing tanks. The tanks were removed in 2003 and site cleanup and restoration is ongoing.

---

### Background

- While petroleum industry activities have taken place in the Gaviota Marine Terminal since the late 1800s, the predecessors of British Petroleum did not develop the ARCO Alegria property until 1962.
  - Production: The facility was used to process produced oil, gas, and water. The produced oil, natural gas and water were transported by pipeline into the facility and then separated. The gas was dehydrated, compressed, and piped back offshore for gas lifting of the producing oil well and any residual gas was sold via pipeline. Liquids were stored in the 1000 barrel storage tanks. The water was bled off the bottom of the tanks, disposed of and the oil was sold.
  - At the time of shut down, the facility was primarily comprised of the two bermed above ground 1000-barrel tanks, a tank battery, gas traps, compressors, controllers, and associated piping.
  - In 1991 the offshore well was shut-in and all operations ceased.
  - The offshore portion of the lines were removed during the SWARS project and the lines along the beach were inadvertently taken out during the Chevron/ AERA Flowline Removal Project in 1999.
  - On January 15, 2002, ARCO Environmental Remediation LLC requested permit approval from the Energy Division for the decommissioning of ARCO's Alegria facility and associated onshore piping.
  - Decommissioning Activity: ARCO began decommissioning in January of 2003. Above ground structures were removed in five days. Soil and groundwater sampling began in February. The last of the pipelines was removed in October of 2003.
- 

### Current Clean-up Activity

- The former tank site is currently undergoing site assessment and characterization to determine the extent of contamination. Several revisions have been made to the 2003 Remedial Action Work Plan, the latest was submitted in June of 2004. ARCO proposes to begin remediation efforts this September, to be completed prior to the onset of the 2004/2005 rainy season.

- Onsite contamination consists of petroleum hydrocarbons (TPH) from crude oil, volatile organic compounds (VOCs), semi-volatile hydrocarbons (SVOCs), polycyclic aromatic hydrocarbons (PAHs) and various heavy metals. Currently, TPH, PAHs, mercury and lead are present in concentrations that exceed clean-up levels. The site has previously been excavated to remove large amounts of free-phase mercury, but further remediation is required.
  - ARCO proposes to excavate approximately 6,650 cubic feet of soil down to 17 feet. When encountered, groundwater would be vacuumed and disposed. Groundwater remediation would be achieved by adding oxygenating compounds at depth prior to backfilling.
- 

## Challenges

- Free-phase Mercury. In December of 2002, The Source Group, consultant for ARCO discovered free-phase mercury at a depth of 6-8 inches below ground surface. A plan for removal was submitted and approved by the Fire Department. Twelve potential areas of free-phase mercury spills were dug and remediated with a mercury vacuum device. In addition, 19 former or suspected temperature wells (formerly fitted with mercury thermometers) were investigated and vacuumed. Two former wells contained elemental mercury in the area of the two gas separators. In total, 6-9 pounds of free-phase mercury were removed from the soil and temperature wells prior to beginning the actual de-construction phase of the project. The excavated areas were filled with gravel, sealed and are to be included in the final remediation effort.
- Project Delays. Restoration efforts to repair the asphalt coating on the East slope of Alcatraz creek where pipelines were excavated were delayed until the end of winter at GTC's request. Now the effort of restoring the slope is being weighed in consideration of the overall abandonment project.
- Revegetation. Failed revegetation was due in part to this year's dry season.
- Previously unknown pipelines were found during initial deconstruction. Tracking ownership of the lines has been a long process because of the long operation period of the facility and corporation turnovers.
- The route of ARCO's pipelines was found to differ from previously understood plans. An additional 80' of pipe length was discovered and excavated.

## Lessons Learned

- The extent of onsite contamination is greater than previously estimated, especially the degree of mercury and hydrocarbon contamination. Had the agencies not been vigilant and detail-oriented in reviewing plans, additional assessment may not have been required and the extent of contamination would remain underestimated. Interagency cooperation and review of all materials and plans is extremely important. Learning from efforts at the former Area gas plant, the desire for this project is to get the site sufficiently characterized and a target clean-up goal finalized prior to approving work. In this case, it meant intensive agency review and coordination.

## Chevron/Texaco Gaviota Facility Equipment Removal

---

### Location

The Gaviota Oil and Gas Processing Facility is located on the mountain side of Hwy 101 opposite the Shell Pipeline Company, LP Gaviota Oil Terminal. It receives oil and gas from the Point Arguello field west of Point Conception.

### Overview of Operations

Three offshore platforms (Hermosa, Harvest and Hidalgo) produce and process oil and gas from the Point Arguello Offshore field. Pipelines transport the produced oil and gas to onshore terminal facilities. These facilities use the sales-quality gas to generate electricity and steam for use onsite. Excess electricity can be sold to the public utility grid. The processed crude oil is pumped into the All American pipeline.

---

### Background

- Two of the four Point Arguello Unit tracts were leased in 1979 as part of lease sale 48 and the other two were leased in 1981 as part of lease sale 53.
  - Arguello, Inc. began construction of the Gaviota Facility and onshore pipelines in November of 1985. As originally designed and operated, the Gaviota Facility received wet oil and gas from Platforms Hermosa, Harvest, and Hidalgo to be processed at the onshore facility.
  - In 1998, the facility was reconfigured to streamline oil and gas processing activities and reduce costs, moving all processing functions offshore to Platform Hermosa.
  - In February of 2001, the Director of Planning and Development approved a request by Arguello Inc. to bring sweet gas to shore to fuel electrical cogeneration turbines at its onshore facility at Gaviota. The gas is now sweetened at the platforms and brought to shore in the existing pipeline system to fuel three electrical cogeneration turbines at the Gaviota facility.
  - The Director of the Planning and Development Department approved the Lease 451 E Development project on September 3, 2003 with a Letter of Authority to Continue Operations under the existing Point Arguello permit. Drilling began in the summer of 2004.
  - On June 26, 2002, the Planning Commission approved the joint application by Arguello, Inc. and ChevronTexaco to remove excess equipment at the Gaviota Processing Facility.
- 

### Current Equipment Removal Project

In June of 2002 the Planning Commission approved a joint application by Arguello, Inc. and ChevronTexaco to remove excess equipment at the Gaviota Processing Facility. The equipment is no longer necessary because the operator processes the crude oil and gas offshore. The equipment removal project is being conducted in three phases:

1. The tallest pieces of equipment and infrastructure were torn down, reducing the visual profile of the plant.

2. The applicant will sell as much of the excess equipment as possible (the project is currently in this phase).
  3. The applicant will remove the remaining excess equipment for scrap.
- 

### **Challenges/Lessons Learned:**

- Gaviota Tarplant at Siren 1 location. The Siren 1 location on Hollister Ranch was originally intended to be left in place due to Gaviota Tarplant presence. However, Tarplant was not present during this last summer so the Siren could be removed with special permission from Fish and Game. Lesson learned is that situations regarding sensitive species can fluctuate, and if they do to allow removal of equipment that normally would have been left in place then appropriate measures should be taken to remove the equipment.
- Equipment removal within an existing facility. The equipment was removed within an existing, operational facility by another company, Chevron. Issues that arose were piperack raising, regrading of northwestern corner of facility, and relocating live lines during abandonment. Lessons learned are that these issues should be planned for as much as possible, but changes often have to be made mid-stream.
- CDP Split. The follow-up CDPs for the project were issued as two permits, one for Phase 1 and one for Phase 2. During Phase 1 process the operator requested that they be allowed to sell and transport equipment, which is part of Phase 2. The problem was that State Parks had yet to issue their permit for Phase 2 work so the County could not issue the CDP. However, we had included language in Phase 1 that specifically allowed for sale and transport of equipment during that Phase, if the situation arose. The lesson learned is that all potential aspects of a particular portion of a project should be related to each other in an abandonment permit to allow for quick, logical, and reasonable removal of facility components.
- Safety audit. At a later safety audit, it was noticed that Chevron had left pipes uncapped after vessel removal. They need to "safe and seal" the loose ends of the facility. Lesson learned is that regular safety audits are important in addressing issues brought up by a partial abandonment of this nature as well as routine operational issues.



## Texaco Hollister Ranch Pipeline Abandonment

---

### Location

The Texaco's Hollister Ranch Pipeline corridor is located between the Santa Ynez Mountains and the Pacific Ocean. The approximately seven-mile-long corridor is located between San Augustine Canyon and Gaviota State Beach. This corridor crosses two major land holdings; Hollister Ranch and Gaviota State Park.

### Overview

A seven-mile-long, onshore pipeline corridor that once contained three pipelines. Sections of these pipelines have been removed or plugged and abandoned in place. The pipeline corridor is being cleaned up and restored.

---

### Background

- Pipelines were installed during 1960 and used to support development of the Conception and Cuarta offshore oil and gas fields (State lease 2725 and 2206), transporting oil and gas from two offshore platforms (Helen & Herman) to the Texaco Gaviota Oil and Gas Processing Plant.
  - The pipelines, platforms and oil and gas processing facility were used for oil and gas production from 1962 until 1973.
  - During 1973 the offshore wells were shut-in, the pipelines were flushed and the facility was idled.
  - In 1988 the platforms and offshore pipelines were removed.
  - In 1998, the Texaco Gaviota Oil and Gas Processing Plant was removed.
  - A portion of the onshore pipelines (1.6 miles) was abandoned as part of the removal of Texaco's Gaviota Oil and Gas Processing Plant. The remaining portion of the pipelines (7 miles) was left in place to be abandoned at a later date.
  - The County received an application in 1998 to abandon the seven mile section of pipelines running through the Gaviota State Park and the Hollister Ranch.
  - The project was approved by the Planning Commission in January of 2002.
  - There are a total of three pipelines in the Texaco-Hollister Ranch pipeline corridor. These include one 8-inch, one 6-inch and one 2.5-inch pipeline. The 2.5-inch pipeline runs along only a portion of the corridor, approximately two miles to a pig receiver at Alegria Creek. The 8-inch and 6-inch pipelines runs seven miles.
- 

### Current Activity

- Pipeline removal at the Hollister Ranch site is ongoing. Texaco recently acquired the appropriate permits from the California Department of Fish and Game and the Army Corps of Engineers in order to obtain a final Coastal Development Permit for the in-stream portions of their pipeline removal project.
- Project Description: The proposed project would abandon pipelines in a seven-mile corridor, which begins at the Gaviota State Park and runs west through Hollister

Ranch to San Augustine Point. The pipelines run parallel to shore (east-west) and are approximately one-quarter mile from the shoreline. There are a total of three pipelines in the corridor (8-inch, 6-inch, and 2.5-inch). The 8-inch and 6-inch pipelines run the entire seven miles, whereas the 2.5-inch pipeline runs along only a portion of the corridor (approximately two miles to a pig receiver at Alegria Creek). The pipelines are buried at least 3 feet along the entire corridor; except for the locations where they are exposed due to erosion or by design (pipelines spanning ravines on pipe supports).

- The majority of the pipelines are to be abandoned in place, only removing those lines which are exposed or otherwise located in problematic and sensitive areas. Of those identified for removal, only the in-stream portions remain.
- Work to remove the in-stream portions of the pipelines is scheduled to begin mid-September of 2004, to be completed within the first few weeks of November, 2004.

---

## Challenges

- Split Project. The County provided ChevronTexaco the flexibility to conduct the upland portion of the proposed project separately from those portions of the project located within the jurisdiction of the U.S. Army Corps (Corps) and Calif. Dept. of Fish and Game (CDFG). The "in-stream" work sites that require several agency permits were set aside from the project description in order to begin work as soon as possible. To facilitate this process, the County granted ChevronTexaco two separate Coastal Development Permits.
- Unknown lines. Property owners are aware of the pipeline removal project and one owner has come forward with claims that exposed pipelines running through his property are owned by ChevronTexaco and should be included in the project. However, both ChevronTexaco and Unocal have not formally replied to his request and the issue remains unresolved as we approach the end of the construction period for both the Unocal Cojo project and Texaco Hollister Ranch project.

## Lessons Learned

- HROA. Property owner association issues. The project was approved by the Planning Commission on January 23, 2002, and appealed by the Hollister Ranch Owners Association (HROA) on February 4, 2002. The property owners were originally resistant to a long-term monitoring program that would involve County personnel making regular visits to and surveys of the properties. On May 8, 2002, the HROA dropped its appeal and the issues were resolved.
- Tarplant issues. Some work sites became populated with Gaviota tarplants in the time between when the EIR was written and when construction actually began. In some areas, tarplants could be flagged and avoided by designating specific access corridors. In others, the work description was significantly modified to avoid a take of tarplants, requiring that those areas be added to the Pipeline Monitoring Plan. Taking note of the presence/absence of Gaviota tarplant or potential for tarplant habitat has since been carefully included in work plan approvals throughout the Gaviota coastal area.
- Pipeline Monitoring Program. To address the issues related to future erosion and potential exposure of pipelines abandoned in place, Texaco was required as a

condition of permit approval to provide the County with a bond to pay for removal of exposed pipe support footings and exposed pipelines not removed as part of this project, for permitting, and for restoration/revegetation, as well as restoration of any areas damaged due to exposure of the pipelines or footings by erosion. Every five years the amount of the bond shall be adjusted by the County to account for inflation and other unforeseen costs and expenses associated with permitting, restoration, and pipeline/footing removal. This bond shall be sufficient to cover the costs of performing all pipeline abandonment and site restoration activities including permitting costs for the County and other agencies with jurisdiction over pipeline abandonment activities and shall include a contingency amount not to exceed ten percent. The bond shall be maintained for 50 years, after 50 years the Planning Commission shall review the issue of pipeline/footing exposure to determine if bonding is still necessary.

- Texaco shall be responsible for conducting a pipeline monitoring program. Inspection of the pipelines shall be conducted according to a Pipeline Monitoring Plan approved by the County in consultation with Texaco and the Hollister Ranch Owners Association. The Pipeline Monitoring Plan shall identify the frequency of inspections, the content of the inspection reports, the areas to be inspected, and the personnel involved in the pipeline inspections. The pipeline monitoring program shall terminate when the bond is returned to the applicant.
- If any footing or pipeline section becomes exposed along the pipeline corridor, and the County determines that significant impacts could occur, Texaco shall implement measures approved by the County to restore all areas damaged due to exposure of the pipelines or footings by erosion. Within 90 days notification by the County, Texaco shall have on file with the County an application, deemed complete by the County, to remove the exposed pipelines and footings and restore the site.

## Unocal Cojo Marine Terminal and Pt. Conception Decommissioning

---

### Location

Government Point: Unocal's Cojo Bay Facility is located near Point Conception, approximately 45 miles west of the City of Santa Barbara and 13 miles south of the City of Lompoc.

Cojo Bay: Unocal's Cojo Bay Marine Terminal is located near Point Conception, approximately 45 miles west of the City of Santa Barbara and 13 miles south of the City of Lompoc.

### Description

This site houses facilities in two locations (Cojo Bay and Government Point) that were once used to accommodate oil and gas production from offshore platforms (Harry and Herman) in the Point Conception field. The platforms have been removed and the existing marine terminal and production facilities are no longer active. These facilities are currently undergoing abandonment. Once the remaining facilities have been removed, the site will be cleaned up and restored.

---

### Background

- Phillips Petroleum Company constructed the Cojo Marine Terminal onshore facility in the early 1960s to accommodate the development of the State offshore tract PRC 2207 from Platform Harry. Phillips' Platform Harry and Texaco's Platform Herman produced 13 million barrels of oil/condensate and 747 billion cubic feet of natural gas during operations.
- In the early 1970s, Phillips Petroleum abandoned and removed Platform Harry and all related onshore processing equipment connected to the marine terminal.
- Union Oil Company constructed the Government Point production facility in the early 1970s. The site produced oil and gas from the Point Conception field (State Tidelands Lease PRC 2879). Production consisted of 21 million barrels of oil/condensate and 12 billion cubic feet of natural gas.
- Unocal acquired the remaining Cojo Bay marine terminal facilities in 1973 in order to transport oil production from the Government Point facility to the marine terminal and onto oil tankers via an offshore loading line.
- The last barge loading at the Cojo Bay marine terminal occurred in 1987 and the terminal was placed under caretaker status in 1993.
- The offshore mooring system was removed in the early 1990s.
- Sections of offshore loading hoses were removed in late 1997.
- The Government Point production facility was last used in 1993 and placed under caretaker status that same year. Four onsite oil wells were idled in 1993 and abandoned in 1999.
- In February of 2000 Unocal submitted an application to the County to decommission the facility at Cojo Bay and Government Point.

- A mitigated Negative Declaration was prepared and the decommissioning project was approved in March of 2002. Work began in the June of 2004.
- 

### **Current Activity**

- Unocal began decommissioning of the Cojo Marine Terminal and Point Conception facilities June 3, 2004. Work includes removal of all above and below ground structures including tanks, piping, concrete foundations, asphalt roadways, auxiliary structures, electrical panels and miscellaneous equipment. Pipeline segments outside of the facility boundaries will be flushed to remove residual fluids and either removed offsite or abandoned in place.
  - Deconstruction should be finished by October 2004. Final recontouring and revegetation to restore disturbed areas should be completed, wrapping up the major components of the project, by September 2004.
  - Long Term Site Maintenance and Monitoring:
    - The revegetation areas shall be monitored regularly by Unocal and the County for a period of approximately 3 years until the performance criteria have been met. Maintenance shall consist of irrigation, weeding, replacement of erosion control devices and minimization of site disturbance from existing land uses. The County may recommend maintenance activities throughout the monitoring period.
    - Unocal has posted a performance bond with the County and is required to conduct a pipeline-monitoring program for a minimum of 25 years after project completion to determine if any of the remaining facilities become exposed in the future. If necessary, Unocal will then implement measures to restore all erosion damaged areas. After 25 years the Santa Barbara County Planning Commission shall review the issue of facilities and equipment exposure and determine if the Unocal performance bond is still necessary.
- 

### **Challenges**

- Sump Excavation/Trucking Issues. Significant contamination was encountered, requiring extensive excavation near the sea cliff face. Onsite remediation was not a feasible option during initial project review. Instead, the project requires several hundred truck trips to dispose of the material offsite. Approval of the Trucking Management Plan delayed the project for one year because the property and Unocal could not reach an agreement.
- Sensitive Species. Access to certain worksites was restricted due to the presence of sensitive native species (Gaviota tarplant, barn owls, cliff swallows, California red-legged frog, potential for snowy plovers). Onsite biological monitors were required to survey work sites, sometimes daily, for the onsite species. If encountered, work was to be delayed, access was to be re-routed or a buffer was to be put in place to minimize disturbance or avoid animal and plant species. Examples: Percos Beach access was re-routed along the beach instead of over the cliffs to avoid tarplant and demolition of the abandoned Butler building was delayed until the end of the nesting season for cliff swallows and barn owls.

- Offshore Loading Line. Massive corrosion was found and the pipeline was unable to withstand water pressure above 10 psi during proposed flushing procedure. An alternative flushing operation was necessary – the line was pigged.
- Percos Beach Pipe Stanchions. The exposed pipelines at Percos Beach were supported by pipe racks and stanchions thought to be cemented in concrete blocks just below ground level. During construction, it was discovered that the stanchions could not be removed by pulling with a backhoe and could not be properly excavated to determine at what depth they were anchored. The sandy dune environment and railroad easement inhibited digging efforts beyond approximately 10 feet. In addition, the metallic composition of the stanchions was unknown and cutting procedures were expected to yield unpredictable results. With County concurrence, Unocal brought a drilling rig to the site and attempted to recover the stanchions by loosening soil and other material encasing the pipe supports. The drill rig was successful and we discovered that the stanchions had been pile-driven into the bedrock and shale approximately 18-20 below ground surface.

### **Lessons learned**

- Pipeline Monitoring Program (similar to Texaco). How to deal with abandoning pipelines in place and potential for erosion and future exposure of the lines. Also discussed under "Current Activity".