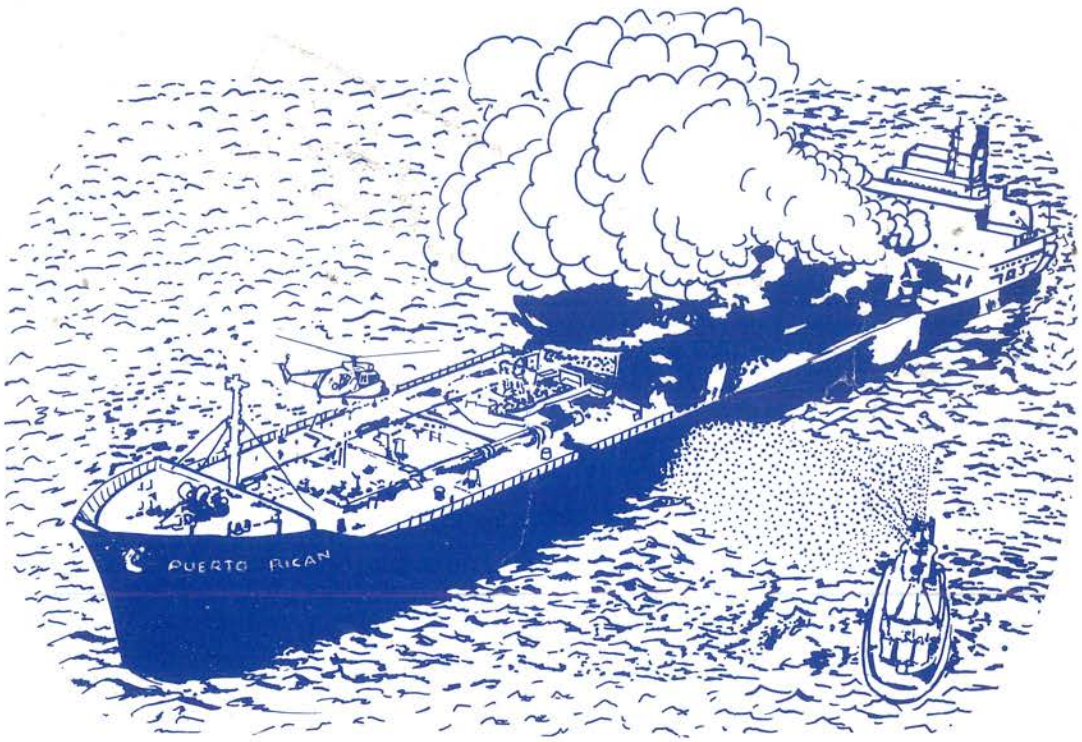
ANALYSIS OF THE *PUERTO RICAN* TANKER INCIDENT

RECOMMENDATIONS FOR FUTURE OIL SPILL RESPONSE CAPABILITY



OCTOBER 31, 1985

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Technical Report Number 5

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ACKNOWLEDGEMENTS

While the bow section of the PUERTO RICAN was still being towed through the Gulf of the Farallones and before the decision was made to return it to the San Francisco Bay, it occurred to us that there might well be important lessons to be learned from this unfortunate marine pollution incident. We approached the San Francisco Foundation regarding the possibility of funding a project which would evaluate the responses to this incident and make recommendations for improving oil spill contingency planning and cleanup in Central and Northern California. Jane Rogers of the foundation encouraged us to submit an application and has been consistently encouraging and supportive since the project was funded.

During the past year we have reviewed a four-foothigh stack of documents obtained from a long list of agencies, laboratories and individuals. A long list of people have patiently listened to our requests and, in most cases, submitted the needed information. However, several individuals deserve special acknowledgement for the many hours spent locating data and discussing interpretations. Lt. J.D. Stieb of the Coast Guard Marine Safety Office (MSO), the principal doumentarian for the MSO in this incident, and Cdr. Stewart McGee, the National Oceanic and Atmospheric Administration (NOAA) Scientific Support Co-ordinator were both of tremendous help.

In addition, Richart T. Tinney, Jr. of the Center for Environmental Education (Washington, D.C.) and Professor C.N.K. Mooers of the Naval Postgraduate School (Monterey, California) assisted us in technical evaluation of many of the documents.

Finally, Suzanne Donovan, who coordinated the production of the final report; Douglas Spicher, who helped us develop a computerized system for indexing the chronology; and Brian Baird of the California Coastal Commission, who reviewed a draft of the report from his perspective as one who has surveyed California spill response capability, also deserve our special thanks.

Despite all of this assistance, we take sole responsibility for the conclusions and recommendations contained in this report.

EXECUTIVE SUMMARY

One year ago the tanker PUERTO RICAN exploded and burst into flames just beyond the Golden Gate and then drifted to within a few miles of the coast. Moderate weather conditions permitted fire-boats usually restricted to the Bay to respond and to bring the fire under control, although two of them suffered mechanical difficulties and were forced to return to the bay.

Three days later, while under tow in the waters of the Point Reyes-Farallon Islands National Marine Sanctuary (contrary to Coast Guard orders), the PUERTO RICAN broke in two and the stern section sank, spilling 25,000-35,000 barrels (1,050,000-1,470,000 gallons) of oil into the ocean, creating a major pollution incident. Oil dispersant application was delayed because a sampling vessel was unavailable; the principal industry boat had been rendered inoperative by high seas.

Although the spilled oil moved south during the first three days after the breakup, as predicted by the NOAA spill trajectory expert, and did not touch land, suddenly, on the third night, the oil reversed direction and moved north, first encircling the Farallon Islands and then coming ashore in Bodega Bay and Bodega Harbor. Weather conditions and damaged equipment greatly reduced oil skimming effectiveness at sea, and lack of barges limited transfer of oil from skimmers. Approximately 1,500 barrels (63,000 gallons) of emulsified oil were skimmed from the ocean and from Bodega Bay during the entire incident, representing less than 5% of the total released when the ship broke up. Estimates

of the total bird mortalities resulting from the incident have been placed as high as 5,000.

Eighteen days after the explosion, the bow section of the PUERTO RICAN was towed back into San Francisco Bay without incident and the cargo safely unloaded. Although the stern section has been located in 1,246 feet of water through the use of side-scan sonar, no action has been taken to stop the leak which has continued since the sinking. It was estimated that the stern contained 8,500 barrels (367,000 gallons) of bunker fuel when it sank, but the results of our investigation strongly suggest that an additional 11,725 barrels (492,000 gallons) of oil cargo may also have gone down with the ship.

In this report we focus on specific responses to the PUERTO RICAN incident as a test of Northern California's spill response capability. We identify a number of problems encountered in dealing with the explosion, fire, spill and sinking of the vessel. We then carefully examine these difficulties to determine why they occur and make a series of recommendations designed to eliminate the problems, thus improving responses to future pollution incidents.

1. Offshore fire fighting capability does not exist in the Bay Area, and only the moderate weather conditions at the time of the explosion and fire made it possible to use fireboats that normally are restricted to the Bay. In more severe weather, the fire likely would have continued until the entire ship sank.

This problem can only be solved with a vessel with offshore capability based in the Bay Area and available for fire fighting (and perhaps towing, spill cleanup and oil storage) in waters off of Central and Northern California.

2. Emergency offshore towing in this region is provided only by vessels of opportunity. The PUERTO RICAN nearly drifted ashore before a tug that simply happened to be in the area was able to tow it offshore.

A multipurpose, dedicated vessel designed for offshore towing should be based in the Bay Area and available for emergency response.

3. There was no plan regarding a location to which the PUERTO RICAN could be towed to minimize danger to the environment.

A plan should be developed to identify offshore areas to which damaged or distressed vessels can be towed in order to reduce risks of environmental damage.

4. Predictions of the oil spill movement failed to anticipate a severe current reversal. Lack of previous oceanographic research on offshore currents and real-time information on spill location at night reduced predictive effectiveness.

A research program is needed to develop a better understanding of circulation patterns in the Gulf of the Farallones and the rest of central and northern California. Telemetry drifter buoys should be utilized to track spill movement under poor visibility conditions.

5. Offshore cleanup capability was seriously limited by weather and equipment availability. Much valuable time was lost in bringing in equipment from out of the region. Difficulties were encountered with chartered equipment refusing to respond in bad weather or being too far from the site of the spill.

The oil industry should be required to base its own offshore cleanup vessel and barges in the Bay Area for quick response and should develop plans for the staging of booms and other materials in areas of high risk (e.g., harbor and river mouths, biologically sensitive areas, etc.).

6. The decision to apply oil dispersants was made in the absence of complete information regarding potential damage to the environment from oil or toxicity of the dispersed oil.

The state should develop a program to determine the acute and chronic toxicity of dispersants and dispersed oil, create a library of information on dispersant effectiveness and toxicity, and develop guidelines regulating conditions for dispersant application and monitoring.

7. The sunken stern continues to leak bunker fuel oil into waters of the marine sanctuary and nearly half a million gallons of additional oil product may also be in the stern.

The Coast Guard and/or the ship owner should be required to perform a survey of the stern, attempt to stop the leak(s) and make recommendations regarding the remaining oil product on board.

8. Information on resources (organisms and habitats) at risk

in the area was incomplete, resulting in faulty decision making regarding protection strategies.

A detailed catalog and maps of resources, their seasonality and sensitivity to oil should be developed for Northern and Central California, and computerized for ease of periodic revision (with the assistance of local resource experts).

9. The direction of the movements of the PUERTO RICAN by the On-Scene Coordinator (OSC) required the presence of a representative of the OSC at all times during the incident. At one of the most critical periods of the incident, the OSC representative was forced by weather conditions to leave the scene and this is when the tug violated the Coast Guard boundaries and the PUERTO RICAN sank.

In order to maintain total control of a pollution incident and vessels involved in it, the On-Scene Coordinator must have a representative present at all times. It should be possible to develop a system for delegation of several representatives, or to have a designated representative appoint a replacement if he must leave the scene.

10. The tug towing the PUERTO RICAN crossed boundaries establishing prohibited areas and spent almost half a day in violation of Coast Guard orders, north and east of bounded areas. There appear to have been no written copies of the orders establishing these boundaries.

Procedures should be established to require that explicit orders relating to Coast Guard intervention authority be in writing and that copies of such orders be delivered to vessel owners or their representatives and other interested parties.

The PUERTO RICAN explosion, fire, breakup and sinking were all components of a serious pollution incident. However, the small number of birds and mammals present in the Gulf of the Farallones during this time of year minimized the environmental damage. Had this incident occurred several months earlier, the potential damage to sea birds might well have been severe, with perhaps an order of magnitude more birds on S.E. Farallon Island; and if it had been a few months later, tens of thousands of whales, elephant seals and Steller sea lions would have been in the area. This, combined with the relatively light oil pro-

duct spilled that did not persist on beaches and rocky, intertidal areas, contributed greatly to a much milder incident than might have occurred with a more typical crude oil product.

Despite the fact that the PUERTO RICAN incident was not a "worst case" accident, the resulting damage and insurance claims may well exceed $150 million.

The Coast Guard has already begun to revise its Oil Spill Contingency Plan, consistent with some of the recommendations made in this report, and legislation has recently been enacted by the state which will improve resource mapping and dispersant effectiveness research. We hope that the recommendations presented here will be used to further improve future responses to oil spills off the Central and Northern California coast.

PAN PAN, PAN PAN, PAN PAN. Hello all stations, hello all stations, hello all stations. This is the United States Coast Guard San Francisco Group, United States Coast Guard San Francisco Group. The Tanker PUERTO RICAN with 26 people onboard has exploded and is burning at the pilot station. There are Coast Guard small boats and Coast Guard aircraft and commercial vessels on scene. There are possibly still people in the water. All vessels are urged to use caution when navigating this area and report all sightings to the U.S. Coast Guard. Break. This is United States Coast Guard San Francisco Group. Out.
(From Coast Guard transcript of marine radio transmissions, 31 Oct. 84, 0424:45)

INTRODUCTION

One year ago today the Tank Vessel PUERTO RICAN exploded and caught fire just beyond the Golden Gate, killing one crewmember and injuring several others. Due to the relatively mild wind and sea conditions, fire fighting vessels which normally are restricted to San Francisco Bay, were able to bring the fire under control, although two of them suffered mechanical difficulties and were forced to return to the Bay.

Three days later, while under tow in the waters of the Point Reyes-Farallon Islands Marine Sanctuary, the PUERTO RICAN broke in two and the stern sank, releasing 25,000-35,000 barrels(1,050,000-1,470,000 gallons) of oil into the ocean and creating a major pollution incident. Oil dispersant application was delayed because a sampling vessel was unavailable; the principal industry boat had been rendered inoperative by high seas.

Although the spilled oil moved south during the first 3 days after the breakup as predicted by the NOAA spill trajectory experts and did not make landfall, suddenly, on the third night, the oil

reversed direction and moved north, first encircling the Farallon Islands and then coming ashore in Bodega Bay and Bodega Harbor. Weather conditions and damaged equipment greatly reduced oil skimming activities at sea, and lack of barges limited transfer of oil from skimmers. Approximately 1400 barrels (63,000 gallons)of emulsified oil (50% water) were skimmed from the ocean and from Bodega Bay, representing less than 5% of the total released when the ship broke up. Estimates of total bird mortalities resulting from the incident have been placed as high as 5,000.

Eighteen days after the explosion, the bow section of the PUERTO RICAN was towed back into San Francisco Bay where the remaining cargo was safely unloaded. Although the stern section has been located in 1246-feet of water through the use of side-scan sonar, no action has been taken to stop the leak which has continued since the sinking.

* * * * * *

A great number of agencies and organizations responded quickly and effectively to the incident. However, many members of the public, as well as some elected officials and agency watchdogs maintain that during this incident the people and coastline of Northern California were lucky, and that had it occurred at almost any other time of the year and had it involved crude oil, the response would have been insufficient and the impacts devastating. And they suggest that if the same incident were to occur today, one year later, the problems encountered in responding to it would once again occur.

The purpose of the present investigation is to document and evaluate the manner in which agencies and organizations re-

sponded to the incident, to track the decision-making process and, most importantly, to make recommendations regarding contingency planning for future incidents. Despite the tragedy of such an occurrence, it may ultimately benefit our society if we are able to use the lessons learned from it to prevent, or at least mitigate, future ones.

BACKGROUND

While it is fortunate that California has had no incidents on the scale of the AMOCO CADIZ tanker grounding off the coast of France (1.6 million barrels, 67.2 million gallons) or the Ixtoc test well explosion, fire and spill in the Gulf of Mexico (3.33 million barrels, 139,860,000 gallons), the environmental consequences of the 1969 Santa Barbara oil well blowout (71,430 barrels, 3 million gallons) and the 1971 tanker collision and spill at the entrance to San Francisco Bay (20,000 barrels, 840,000 gallons) were significant.

Since, and partly because of, those two California incidents, there have been major improvements in oil drilling technology, tanker design and pipeline construction, not to mention the development by the oil industry and Coast Guard of oil spill contingency plans (local, state, regional and federal) that are required by Federal law in order to minimize damage from a spill. However, the recent events surrounding the explosion, fire, breakup and sinking of the PUERTO RICAN, and the resulting spills, emphasize the continuing vulnerability of the Farallon Islands and the California coastline, as well as the practical and institutional difficulties of responding to such incidents in an effective and timely manner.

Furthermore, the Department of Interior's Minerals Management Service (MMS) intends to lease portions of central and northern California's Outer Continental Shelf for exploration and development of oil and gas in the near future. MMS environmental impact statements on proposed lease sales for this area predict a variety of major and minor oil spills associated with exploration and development.

PROCEDURE

Discussions with representatives of agencies and organizations involved in various aspects of the PUERTO RICAN incident have identified a number of problems encountered in implementation of contingency plans. The existence of separate federal, regional and state plans, as well as those developed by the oil industry, add layers of difficulty in intepretation. As we interviewed representatives of government, academic institutions, industry, environmental organizations and the public, we identified additional problem areas. Review of relevant documents such as the On-Scene Coordinator's Report, the Marine Board of Investigation Report, and additional Coast Guard, EPA, NOAA, Department of Interior, State of California, industry, academic institutions and environmental group reports and memos offered further insights.

In preparing this report we decided that although the PUERTO RICAN events are of great interest and importance in and of themselves, conclusions and recommendations resulting from an evaluation of this incident alone would be of limited value. We have therefore chosen to place this incident in a broader perspective by assuming that for a variety of reasons, this explosion, fire, sinking and spill represent a major but not a worst case marine accident situation. Consequently, in order to emphasize the potential importance of the problems encountered in responding to these events, we make reference to a variety of "worst case" conditions that might be encountered in a Northern California marine accident. In order to illustrate some of our rationale for this approach, we have contrasted the data from the PUERTO RICAN incident with a "worst case" situation in Table I.

The Tank Vessel PUERTO RICAN was a relatively small tanker, and carried only 92,000 barrels (3,864,000 gallons) representing only one quarter to one third of its capacity. By comparison, the average tanker entering and leaving S.F. Bay during 1983 carried a cargo of 500,000-800,000 barrels (21,000,000-33,000,000 gallons). In addition, the PUERTO RICAN was a "drug-store" tanker and carried a variety of light, highly refined lubricating oils (and a small amount of Bunker C oil to fuel its engines) while the majority of tankers entering S.F. Bay carry crude oils which, because of their high viscosity, pose a much greater threat to coastal and marine resources (e.g., birds, marine mammals, fisheries, coastlines, etc.) than the oil on the PUERTO RICAN (although some of the products on the PUERTO RICAN were highly toxic).

Weather conditions also played an important role in this incident, especially in the early stages when wind and sea conditions were moderate. Had the severe storms that later interfered with cleanup occurred during the period of the explosion and fire, fire fighting and towing operations might have been severely hampered. Without fireboats and tugs, it is likely that the PUERTO RICAN could not have been towed out to sea and would have run aground and broken apart on the Marin or San Francisco coast on the day of the explosion.

More important in reducing the impact of the PUERTO RICAN oil spill was the fortunate fact that populations of marine mammals and seabirds were at their low points for the year. Had the spill occurred a month or two later, ten times more birds would have been

on S.E. Farallon Island and more than 16,000 California gray whales would have been passing through the area of the spill on their southward migration. (Other endangered species also frequent this region e.g., humpback, blue, fin, right and sperm whale, sea turtles, brown pelicans and least terns.) In addition, a spill occurring during the winter months could pose a major threat to hundreds of fur seals and thousands of elephant seals. Oil moving southward could also have a major impact on the southern sea otter which is on the Federal Threatened Species list.

In addition, during the PUERTO RICAN incident, the principal commercial and sport fishing seasons (salmon, rockfish, flatfish, crab and striped bass) were either past or had not yet begun, and fisheries resources were at only minimal risk in the Gulf of the Farallons during the period of the PUERTO RICAN incident.

Table 1. PUERTO RICAN Incident vs. Worst Case Scenario. (Data compiled from OSC Report; Final EIS, OCS Lease Sale #73; Final EIS Point Reyes-Farallon Islands Marine Sanctuary)

	PUERTO RICAN	Worst Case
Deadweight Tons	35,240	123,000
Capacity	230,000 barrels	1 million barrels
Cargo	91,984 Bbs lube oil 8.500 bbs bunker oil	800,000 bbs Alaskan or Calif. crude oil
Spill Size	25-35,000 bbs lube some bunker	100,000 barrels crude oil
% recovered	Less than 5%	Less than 5%
Current & Spill Direction	S then N to Farallon Is., Bodega Bay/Harbor	S to sea otter range &/or N to Farallons &/or E to mainland coastline
Pinneped Presence	Few	1000's (elephant seals, fur seals, etc.)-winter
Oiling or Mortality	Few None	Significant Unknown
Cetacean Presence	Very few	16,000's (Gray whales) winter
Oiling or Mortality	None None	Unknown Unknown
Bird Presence	Gulf-Low density Is.-30,000	Gulf-high density-Spring Is.-300,000+ spring
Oiling or Mortality	No estimate 5000	Significant 50,000+
Fishing Activity	Little or none	High-salmon-Feb-June Crab, rockfish - high
Available Fire Fighting Equipment	Good weather permits inland vessels to respond. Damaged. No high-seas capability	Bad weather-no vessels able to fight fire
Available Oil Clean-up Equip.	Inland vessels respond. High seas 24 hrs. away, damaged	Bad weather-no vessels able to skim
Available Barge Capac.	Limited due to lack of local commercial barges	None-unable to empty skimmers

FINDINGS AND RECOMMENDATIONS

Fire Fighting

Conclusion 1: Fire Fighting Capability

Offshore fire fighting capability does not exist in the Bay Area, and only the moderate weather conditions at the time of the PUERTO RICAN explosion and fire made it possible to use fireboats that normally are restricted to San Francisco Bay. In more severe weather conditions, the fire likely would have continued until the ship sank.

Recommendation 1: Fire Fighting Capability

> Adequate oceangoing fire fighting capability should be developed in the Bay Area. The Coast Guard Bay Area Marine Safety Committee, the Association of Bay Area Governments, the major cities in the Bay area and the oil industry should work to develop guidelines, requirements, joint powers and operating agreements to meet this need. The state should consider enacting legislation to require such capability in the form of a dedicated offshore vessel based in the Bay Area (vessel should be at least 200-feet, be equipped with 50- to 60-foot tower for fire monitor, deliver 6,000-12,000 gallons per minute, 6-hour response time).

The Bay area has no ocean going fire fighting capability. The moderate sea conditions (3-foot seas, 10-knot wind) that existed on October 31, 1984, made it possible for a variety of non-oceangoing fire fighting vessels to respond to the fire. Early in the first day of the incident (0412 hours), the Coast Guard Marine Safety Office requested assistance from the San Francisco and Oakland Fire Departments and the U.S. Navy Port Services Office at Treasure Island. Although a mutual assistance agreement exists between the two cities for fighting marine fires inside San Francisco Bay, no formal arrange-

ment exists regarding responses to fires outside of the Golden Gate by these vessels.

San Francisco Bay does however have ". . . a well-coordinated marine terminal and vessel accident/fire fighting plan which continues to function among the nearly four dozen city, county, and state entities that constitute the greater Bay Area, plus some 30 military facilities and another two dozen or so commercial businesses directly involved in maritime operations along the shores of the bay." (Lamb, 1984, page 13) However, of these more than 100 entities in the Bay Area which have fire fighting capabilities, only a small number are capable of responding to incidents occurring on the waters of the bay, and none have real offshore capacity.

In fact, among the vessels initially called to respond to the fire, neither the PHOENIX (the San Francisco fireboat which was laid up at time of the PUERTO RICAN incident) nor Oakland's CITY OF OAKLAND nor the Navy's YTB fireboats are designed for offshore fire fighting. All of these vessels were able to respond only because of the moderate weather and seas. In fact, even under these conditions the CITY OF OAKLAND was forced to return to port after only 2 hours of fire fighting because of a failure of its electrical system, and one of the Navy YTBs broke a pin holding up its mast and retired from the scene after only 3 1/2 hours. Two Coast Guard 41-foot UTB vessels also attempted to fight the fire. However, their small size, limited pumping capacity and deck-mounted fire monitors (which were far below the deck level of the tanker) made it impossible to direct water onto

the base of the fire, and they were restricted to cooling the sides of the tanker with their water.

It is clear that there is a great need in the Bay Area for oceangoing fire fighting capability. Although vessel fires such as occurred on the PUERTO RICAN are not common, there is a likelihood of increases in tanker, barge and drill ship activity in Central and Northern California associated with oil and gas development, and with the rise in vessel activity comes an increase in the possibility of fires.

The Coast Guard Bay Area Marine Safety Committee was recently convened primarily to deal with the issue of fire fighting capability. The opportunity therefore exists to develop guidelines that will make it possible that responses to future offshore incidents can include facilities and equipment designed to operate under the extreme conditions frequently encountered offshore of Central and Northern California. Discussions with the designer of San Francisco's fireboat PHOENIX and with the director of operations for an international salvage and cleanup corporation indicate that a variety of multipurpose vessels that would be appropriate for the San Francisco Bay Area, have been designed and used in Alaskan and Middle Eastern oil fields.

In developing guidelines for dealing with offshore pollution incidents, it is suggested that the design and operating capabilities of such vessels be carefully reviewed. Consideration should be given to the alternative of developing a multipurpose, fire fighting, skimming, oil storage, towing boat as a "dedicated vessel" which would be operated either (1) jointly by a consortium of Bay Area ports or cities, (2) independently

by one port but with a mutual assistance agreement covering its response to incidents in other jurisdictions, or (3) privately with an annual contract with major ports and cities.

Towing

Conclusion 2: Towing Capability

Emergency offshore towing in this region is provided only by "vessels of opportunity." The PUERTO RICAN nearly drifted ashore before a tug that happened to be in the area was able to tow it away from shore.

Recommendation 2: Towing Capability

> Adequate oceangoing towing capability should be developed in the Bay Area. In preparing guidelines and requirements, the state should consider enacting legislation to require a multipurpose vessel capable of towing, fire fighting, oil skimming, dispersant application and which contains adequate tank capacity for storage of skimmed oil.

Conclusion 3: Towing and Protected Areas

There is no plan for Central and Northern California regarding locations to which damaged or distressed vessels can be towed to minimize threats to the environment.

Recommendation 3: Towing and Protected Areas

> The Coast Guard and NOAA, working cooperatively with state and local representatives should develop guidelines and recommendations which will be used to determine locations to which damaged or disabled tank vessels can be directed or towed that will minimize threats to the environment. These procedures and recommendations should be included in revisions of the Local Oil Spill Contingency Plan.

As in the case with fireboats, there appear to be no oceangoing tugboats based in the Bay Area. The Coast Guard therefore was again forced to rely upon "vessels of opportunity" for towing the PUERTO RICAN. Following the initial explosion, the civilian towing vessels, SANDY and HARRY M were in the area and volunteered to assist the Coast Guard in the rescue of crew

members from the PUERTO RICAN. When it became apparent that the vessel was drifting dangerously close to Point Bonita, the Coast Guard requested that the SANDY begin to tow it out to sea.

According to the Coast Guard, a number of factors were considered in directing the seaward tow of the PUERTO RICAN and in establishing these navigational limits for the tanker. First, there was the concern over how far from the Bay Area the ship would be towed. Since it was still burning, personnel were at risk, shore-based fire fighting and salvage support were required and any added distance from shore created additional hardship and risk. Second, both Coast Guard and NOAA were concerned about the potential damage that might result from the PUERTO RICAN breaking apart and spilling its cargo. In addition, part of the Coast Guard's responsibility is the protection of property and the possibility existed that the owners of the PUERTO RICAN might request permission to tow the vessel back to the San Francisco Bay to save it and the cargo.

After repeated contact between the Coast Guard and HAZMAT (NOAA's Hazardous Materials Branch in Seattle, WA) throughout the morning of the 31st, the ship was temporarily directed to an abandoned dumpsite 10.5 miles south of S.E. Farallon Island. Prior to this decision, the course taken by the tug and tow brought the burning PUERTO RICAN to within 10 miles of the Farallons. However, it is important to note that the Farallon Islands are part of the Point Reyes-Farallon Islands Marine Sanctuary, and that the sanctuary boundary extends 12 miles around the islands. This area was named a national marine sanctuary because of its extremely high resource value in terms

of sea birds and marine mammals, some of which are endangered species and many of which migrate and reproduce on the islands or in the surrounding waters. In addition, many regions of the sanctuary's waters are heavily used throughout much of the year by both commercial and recreational fishing boats. (The presence of large numbers of sea birds, marine mammals and fish is a result of the high productivity of these waters, especially during the summer and fall upwelling period when deep, nutrient-laden water is brought to the surface creating great quantities of food for all of these organisms.)

Ultimately it appears that the Farallon Islands and their resources were subjected to a significant risk by the Coast Guard decision (and the NOAA advice) to place the northern boundary of area the PUERTO RICAN was prohibited from entering only 5 miles south of the marine sanctuary. NOAA personnel were aware of the possibility that the southerly current was likely to reverse to a northward direction (Galt, 1985). As became apparent later in the incident, spilled oil was capable of moving at least 24 miles in less than 12 hours and producing impacts on resources of the marine sanctuary.

These events emphasize the fact that there is no standing policy regarding procedures for responding to drifting, damaged or disabled vessels. In the three hours following the explosion, the PUERTO RICAN drifted to within 3.8 miles of the Marin coast before it was towed further out to sea. In addition, brief consideration appears to have been given to towing to shallower water rather than further from shore (Coast Guard transcript of Channel 16 radio transmissions). In order to minimize damage

resulting from grounding or from spilled products from a vessel unable to proceed under its own power, guidelines should be developed regarding optimal locations to which damaged or disabled ships should be towed.

Once the "resources at risk" inventory required under the Oil Spill Contingency Plan is completed in sufficient detail, it should be possible for the Coast Guard and NOAA to work with the state, local governments and local resource experts to develop guidelines for designating "safe areas" to which disabled vessels can be towed. These guidelines should incorporate seasonal variations in regional sensitivity in order to minimize potential damage from such incidents. Such information should be a required part of the contingency plan.

Spill Trajectory Prediction and Modeling

Conclusion 4: Spill Trajectory

Predictions of oil spill movement in the PUERTO RICAN incident failed to anticipate a severe current reversal. Lack of previous oceanographic research on offshore currents reduced predictive effectiveness.

Recommendation 4: Spill Trajectory

Since relatively little is known about the transient circulation of the Gulf of the Farallones or about the annual cycles of the coastal current regime along the California coast, consideration should be given to studying these phenomena in a comprehensive, systematic way. The state should enact legislation that requires the creation and funding of a research program designed to answer these and other questions:

a. How do the major current systems, the California and Davidson currents, and their alternation affect circulation in Central and Northern California and how would they affect the trajectory of spilled oil during different seasons?

b. Has the existing NOAA trajectory model been validated for all conditions and seasons off the Central and Northern California coast?

c. What additional information is needed to develop a reliable model to permit accurate prediction of spill trajectories off the coast (both to obtain an adequate model and to establish a more reliable permanent data buoy system)?

Conclusion 5: Spill Trajectory Documentation

There is no documentation of the procedures utilized to develop spill trajectory analysis in this or previous oil spill incidents. Information from incidents receives no peer review or evaluation.

Recommendations 5: Spill Trajectory Documentation

Documentation of procedures used in predicting spill behavior should provide a new source of information for oceanographic scientists to evaluate regarding their effectiveness.

Minerals Management Service, NOAA, the Coast Guard or the state should require funding for the development of a system of documentation of spill trajectory analysis and use this information to stimulate new applied research.

The administrator of the NOAA should require that for each HAZMAT response to an oil spill, data used in the prediction of spill trajectories, including maps, modeling data, weather and current information, and biological sensitivity and recommended protection strategies be retained and made available to researchers for evaluation of the effectiveness and accuracy of the resulting predictions.

Conclusion 6: Spill Tracking

The lack of real-time information on spill location and movement during night time or under other conditions of reduced visibility, spill tracking and predictive accuracy.

Recommendation 6: Spill Tracking

The tracking of spill movement under conditions of darkness or poor visibility is critical for the protection of resources. A variety of techniques have been developed to follow spill movement including telemetry drifter buoys, satellite and airborne remote sensing devices.

a. Coast Guard spill response teams should have and utilize telemetry drifters, deployed from either planes or boats for spill tracking in poor visibility.

b. Coast Guard and NOAA should investigate the feasibility and effectiveness of satellite and airborne sensing devices.

Critical to the success of a response to any pollution incident is accurate prediction of the movement of the oil or hazardous material. Throughout the PUERTO RICAN incident the NOAA HAZMAT group provided spill trajectory analysis and modeling in support of the Coast Guard and Regional Response Team decision-making process. At 0700 on the 31st, less than 4 hours after the explosion, HAZMAT personnel began to compile and enter data into their computerized trajectory analysis routines in Seattle.

Based upon the HAZMAT model's southward trajectory for any spilled oil, at 0925 they made a recommendation (through the Scientific Support Coordinator, SSC) to the Coast Guard On-Scene Coordinator (OSC) that the ship, which at the time was being directed toward S.E. Farallon Island, be towed offshore and much further south of the Farallon Islands. Shortly after noon, HAZMAT recommended that the ship be towed to an old dump site located at the edge of the continental shelf, south of the Farallones, so that the southward movement of any spilled oil would spare the islands. The existing records do not reflect any awareness of the fact that this dump site was located several miles inside the boundary of the Point Reyes-Farallon Islands Marine Sanctuary.

Also, beginning early on October 31, HAZMAT began to contact information sources from which they could obtain the data needed to carry out its trajectory analysis and to produce predictions. The NOAA National Weather Service (NWS) office in Redwood City was contacted to obtain real-time wind data from the nearest offshore weather buoys (EB 26, 11 miles off the Golden Gate and EB 12, 12 miles from Half Moon Bay).

Conditions off the California coast are affected throughout the year by oceanographic phenomena in the Pacific, as well as by local and regional atmospheric influences. During most of the year, the surface waters along the coast are moved southward by the California Current (at about 1/4 - 1/2 knot), part of the great clockwise rotation of waters of the north Pacific. In the fall and winter (November-February), the California Current weakens and is replaced by the

Davidson Current which moves northward at about the same rate.

At the time of the PUERTO RICAN incident the system of currents off the coast was in the process of reversing from the southward moving California to the northward moving Davidson. In order to analyze this situation, HAZMAT obtained satellite data of infrared sea surface temperature for the coast and consulted with the NOAA Pacific Environmental Group. They concluded that " . . . the advance of the Davidson Current front was located somewhere between Monterey and the San Francisco Bay region itself." (Galt, 1984, page 4) Based upon this conclusion and on the north and northwest winds at the Golden Gate and Halfmoon Bay (respectively) weather buoys, HAZMAT predicted that any oil spilled at the ship's current location would move south and slightly east.

Shortly after 0000 on November 3, the PUERTO RICAN broke in half, spilling 25,000-35,000 barrels of oil (minus whatever amount was consumed in the earlier fire), and on the afternoon of the 3rd, dispersants were applied to the spill. HAZMAT trajectory analysis continued to predict movement southward and slightly toward shore through the next two days. At the end of the day on November 5, the partially dispersed oil was well south of the Farallones, but by first light on the 6th, it had reversed its movement and was 24 miles north - at the islands. The presence of a tank that had floated free of the PUERTO RICAN when the breakup occurred and was still with the oil confirmed the fact that this oil was, in fact, the same oil observed 24 miles south on the previous day.

Although HAZMAT indicated in its subsequent report that its predictions had been that "the oil could stop its southerly motion and could possibly move slightly north" (Galt, 1984,

page 12), the Coast Guard, SSC, RRT and cleanup crews were apparently taken by surprise as was the public. The HAZMAT explanation for this current reversal was that it was due to the passage of an ". . . unusually energetic frontal system" and that ". . . the reversal of the wind direction on the afternoon of the 5th and the intensity of flow not only caused the reversal of the current, but also forced a significant on-shelf movement of offshore water." (Galt, 1984, page 16) The spilled oil continued its northward movement under the influence of the wind and the Davidson Current, past Point Reyes, Bodega Bay (where some oil came ashore), the Russian River and Point Arena (after which the small quantity remaining could no longer be tracked).

The most striking aspect of the current reversal of November 5-6 is that while it was anticipated by HAZMAT, the SSC and local scientists, none of them knew when it would occur. In fact, according to Christopher N. K. Mooers, chairman of the Oceanography Department at the Naval Postgraduate School in Monterey, who has been engaged in research on California coastal currents for many years and is familiar with the current reversal phenomenon, ". . . with a modicum of understanding, the situation realized seems highly predictable." (Mooers, 1985, personal communication) He continues, " . . . with a good model for the Davidson Inshore Current front, and given the good quality of atmospheric forecasts, the reversal of the surface current could probably have been predicted 6 to 24 hours in advance, with an uncertainty of +3 hours." In addition, Mooers has also suggested that once there was a wind shift from north to south (which occurred mid-morning on November 5), it was likely that

the frontal advance of the Davidson Current, which was arrested somewhere between Monterey Bay and the Farallones, would resume its movement and cause the current to move toward the north: ". . . the PUERTO RICAN incident was a fresh reminder of how little is known of the Gulf of Farallones' transient circulation; it has probably never been studied in a comprehensive, systematic way."

There was no tracking of the oil spill during night time hours. The importance of this fact was emphasized by the overnight reversal of currents and rapid northward movement of oil to the Farallones. "Satellite tracked drifters would have been useful for testing predictions and documenting the occurrence of reversals and other major events and trends. . . . regional oceanographic institutions which operate research vessels in the area were not, to my knowledge, contacted." (Mooers, 1985, personal communication) In fact, drifters that can be tracked by aircraft are routinely used for Coast Guard Search and Rescue missions to estimate the trajectories of missing vessels and are stocked by the Coast Guard Air Station at the San Francisco Airport. In addition, there also exist several experimental telemetry buoys which have been designed specifically to be air-dropped to track the movement of oil. The Coast Guard aerial surveillance aircraft could have been very effective in tracking the movement of the spill during darkness or poor visibility.

The accuracy of oil spill trajectory analysis and prediction is highly dependent on the comprehensiveness of the available data base and the validity of the computer model into which the information is fed. The earlier reference to the lack of information on the Gulf of the Farallones underscores the need for more

complete understanding of this region. "Considering the high likelihood of further environmentally hazardous incidents and spills in the region, it would be wise to foster the requisite basic research to minimize risks. It would also be wise to press NOAA's National Ocean Service to develop operational ocean products which would be routinely available to assist in such situations as described here." (Mooers, 1985, personal communication)

Among the topics discussed at the 1985 annual meeting of the Eastern Pacific Oceanic Conference were the need for more information on California coastal currents and the lack of documentation and review of NOAA/HAZMAT trajectory analysis data from spill incidents. The oceanographers attending this conference passed several resolutions on these issues which are included in the Appendix.

Cleanup and Containment

Conclusion 7: Cleanup Capability

Offshore cleanup capability in the PUERTO RICAN incident was seriously limited by weather and equipment availability. Much valuable time was lost in bringing in equipment from out of the region. Difficulties were encountered with chartered equipment refusing to respond in bad weather or being too far from the site of the spill.

Recommendation 7: Cleanup Capability

In the absence of the more stringent regulations which establish requirements in regions undergoing offshore oil development, and after reviewing existing guidelines with the Coast Guard, industry and representatives of local government and the public, the state should enact legislation to establish requirements for:

a. Equipment - e.g., a fully equipped, fire fighting, skimming, offshore towing vessel with oil storage capacity permanently in the Bay Area; at least one barge (for skimmed oil storage) should be part of Clean Bay's permanent equipment; stationary and advancing skimming capability for offshore, etc.

b. Equipment Staging - contingency plans should require staging of equipment (booms, absorbents, etc.) in areas of high risk, e.g., harbor, river, or estuary entrances, water intakes for laboratories, aquaculture facilities.

c. Response time - requirements should be established for maximum response time for offshore cleanup vessels and barges to be on scene.

It is inevitable that oil and other hazardous materials will continue to be spilled into the marine environment. Even with the best of programs designed to reduce or eliminate marine accidents and with the most sophisticated technology and equipment, human and mechanical errors will continue to lead to major pollution accidents. When they occur, incidents such as the PUERTO RICAN

spill will cause damage, and the magnitude of the resulting losses will depend upon the effectiveness of the cleanup contingency planning and execution, availability and reliability of equipment and personnel, and, most important, the weather conditions.

Offshore oil and gas exploration and development, if they come to Central and Northern California, are predicted to bring added spill risks. For example, the Minerals Management Service (MMS), in its Environmental Impact Statement for Lease Sale 73 from Point Conception to Morro Bay, estimates three large spills (greater than 1,000 barrels or 42,000 gallons) and one very large spill (greater than 10,000 barrels or 420,000 gallons) will result from the proposed activities. Added to this, according to MMS, will be an additional three large spills resulting from existing federal oil leases and three more large spills from tanker imports of crude oil. And the area covered by these estimates represents less than 10% of the as yet undeveloped area offshore of Central and Northern California.

The Coast Guard and MMS have developed guidelines for equipment availability and oil spill response requirements for regions undergoing development. However, since there currently is no exploratory or development activity north of Morro Bay, such requirements have not been implemented for this area.

> "Recognizing the inherent beauty and sensitivity of the California coastline and the extraordinary environmental awareness of California residents, the oil industry and both the federal and state governments have joined forces to develop an integrated oil spill response system to protect waters offshore California. The system, using workable oil spill contingency plans, prestaged response vessels and oil recovery equipment, and effective training of response personnel is perhaps the most sophisticated and most effective pollution response system in the

world." (U.S. Coast Guard, "Oil Spill Response Capability in the Waters Offshore California," 1984 Oil Pollution Conference, Los Angeles.)

One of the keys to a successful response to an oil spill incident is the planning that precedes it. The "Contingency Planning" section of this report contains the details of the federal, state and local contingency plans and the levels of preparedness required by them. According to the (OCS Lease Sale No. 73 Final EIS, Volume 1), in 1983 there was over $15 million invested in cleanup equipment on the West Coast, primarily by the oil industry and the Coast Guard. While the Coast Guard is responsible for oil spill response on all waters subject to U.S. jurisdiction, the first line of defense often is frequently one of the oil industry spill cleanup cooperatives.

Under the terms of the Federal Water Pollution Control Act, unless a spiller takes responsibility for a given oil spill, the Coast Guard will perform the necessary cleanup response and then go to court to recover the costs. Since the Coast Guard cleanup costs when combined with legal expenses are perhaps much higher than what the private sector might charge, the oil industry has taken on its own cleanup responsibility.

In the San Francisco Bay area, as in most other coastal areas of the United States, the oil production and shipping companies have formed their own cleanup cooperative, Clean Bay. Clean Bay has its own carefully worked out contingency plan, maintains a small permanent staff (and on-call response teams), a variety of pieces of cleanup equipment and contracts with other resources (dispersant application aircraft, helicopters, barges, tugs, etc.). The approximately $1.5 million annual cost of maintaining this op-

erational capability is met by charging a fee which is based on the quantity of oil each member company moves into and out of the Bay each year.

This system, which was designed primarily for controlling oil spills within the Bay, has worked well. "Clean Bay, its members and local contractors, provide sufficient boom, sorbents, oil recovery devices (skimmers) and organization to provide a competent response to a large oil spill in the [San Francisco] Bay." (California Coastal Commission, 1983, page 76) According to Clean Bay figures, over the past three years there has been an average of 143.4 million barrels (6 billion gallons) of oil a year entering the Bay at a rate of about two tankers a day. Despite the volume of oil moving into the Bay, Clean Bay has responded to less than four incidents a year, with less than 750 barrels (31,500 gallons) spilled each year. However, in this incident, it was apparent that Clean Bay's capability to respond to offshore spills is limited.

In the case of the PUERTO RICAN, Clean Bay was notified of the incident only minutes after the initial explosion, and immediately began to mobilize its resources: (1) contacting Chevron Oil to arrange for empty barges for possible offloading of the PUERTO RICAN's cargo; (2) mobilizing Globe Air's dispersant application aircraft from Arizona to Oakland; (3) alerting the International Bird Rescue Center; (4) requesting Clean Seas (Southern California cooperative) MR. CLEAN II offshore oil recovery vessel; (5) activating helicopter surveillance of the incident; and (6) staging or dispatching various other tugs, cleanup boats and barges.

During the first two days of the incident, Clean Bay's SPILL

SPOILER II collected a small quantity of oil at the scene of the explosion, and MR. CLEAN II, which arrived from Port San Luis 24 hours after the explosion, stood by near the PUERTO RICAN. However, there was very little oil in the water until the breakup of the vessel early in the morning of November 3, which spilled an estimated 25,000-35,000 barrels (1,050,000-1,470,000 gallons). Clean Bay responded to the news of the breakup by dispatching the MR. CLEAN II from Half Moon Bay, but as she was departing,

" . . .a large wave broke through the pilot house window of the MR. CLEAN II, causing flying glass to injure two of the vessel's operators [and] rendered the vessel's radio and radar inoperative." (OSC Report, page 39)

With his first line of defense rendered inoperative by weather conditions, the manager of Clean Bay recommended that the OSC obtain the necessary approvals for what the manager considered his only remaining response - aerial dispersant application. As indicated in the "Dispersant Use" section of this report, approvals were obtained and dispersant was applied on the afternoon of November 3. Without MR. CLEAN II and with other vessels in the area unwilling to leave the Bay, there was no monitoring of this application as is required in the contingency plan.

The spill trajectory observations and predictions for the next two days were for continued southward movement without any landfall. No cleanup activities were attempted during these two days as the oil moved south at approximately 6 miles per day. On the morning of November 6, the biologists on S.E. Farallon Island awoke to "the smell of oil." (PRBO biologists, personal communication.) Overnight, the spill had stopped its southward progress and had

moved 24 miles north and surrounded S.E. Farallon Island. The OSC notified Clean Bay who dispatched MR. CLEAN II, which had just been repaired, to the Farallones where it began skimming. The light wind and sea conditions and the moonlight and clear sky enabled MR. CLEAN II to continue skimming until several hours after midnight the next day.

MR. CLEAN II resumed cleanup at the Farallones the next morning but suspended operations 5 hours later due to poor visibility and increasing seas. During the time it had skimmed, MR. CLEAN II recovered 800 barrels (33,600 gallons) of an oil-water emulsion estimated to contain 50% oil. Although the USCG Pacific Strike Team sent its skimming barrier to the Farallones on board the APOLLO, it was never deployed. MR. CLEAN II returned to the Bay to offload its recovered oil to the UT-5, the barge which was intended as a repository for skimmed oil, which was located at Todd Shipyard in Alameda. The manager of Clean Bay later indicated that the transfer of recovered oil from skimmers to barges took longer than the actual pickup of the oil. Clean Bay also completed its protection plan for the Marin shoreline which involved the deployment of vessels, skimmers, booms, barges, absorbent, vans and shore crews.

On the following day, November 8, severe weather conditions prevented use of either the Pacific Strike Team barrier or the MR. CLEAN II for oil recovery. Clean Bay dispatched beach cleanup crews to Bolinas Bay and Stinson Beach early in the day following reports of oil off Point Reyes and in Drakes Bay. A containment boom was deployed across Drakes Estero by 1503 and a command post established at Olema within an hour of that. Clean Bay began

implementation of its Marin County protection plan.

Weather conditions improved on November 9, and two Navy Marco Class V skimmers and the UT-5 barge were towed to Point Reyes where the Marcos collected 65 barrels (3,570 gallons) of oil. MR. CLEAN II was only able to skim in the lee of Point Reyes or Bodega Head, but working with the Marco skimmers another 300 barrels (12,600 gallons) of oil emulsion was collected. However, a large patch of oil located just off Mussel Point seemed likely to come ashore. The OSC was advised "to boom off Bodega Harbor and Estero Americano and to prepare for shoreline cleanup on 10 November." (OSC Report, page 56)

On the morning of the 10th, Clean Bay deployed booms on either side of the Bodega Bay Harbor entrance to deflect and trap incoming oil and to keep it from going inside the harbor. However, a significant amount of oil entered the harbor through openings in the jetty. Personnel on the Marco II skimmer, which operated in the main channel, reported only a light sheen entering the harbor.

Beach cleanup started at first light on the 10th with absorbents and vacuum trucks and by mid-morning one 5000-gallon truck had been filled with oil emulsion. MR. CLEAN II reported conditions too rough for skimming in Bodega Bay, and returned to the San Francisco Bay to offload oil recovered on the previous day to the UT-5 barge which was located at Pier 9. The Marco skimmers were able to collect the majority of oil from inside Bodega Harbor. Estero Americano was boomed late in the morning. Clean Bay and the Pacific Strike Team staged an absorbent boom and Zodiacs at the entrance to Tomales Bay. The boom was not actually rigged

because the current was such that the boom could not successfully have prevented oil from entering the Bay.

By November 10, as much of the oil as could be skimmed had been vacuumed up, and absorbent pads were being used to collect the remainder. Some oil did enter Estero Americano, coating the vegetation at the high tide line (Charter, personal communication). California Fish Growers, an aquaculture facility that uses water from the Estero, had been notified by Clean Bay and had shut down their water intakes. Clean Bay supplied them with a filtration system without charge for one month. Oil was also reported to be entering the filters of the Bodega Marine Laboratory (University of California) salt water system. The oil slick continued to move northward along the coast and was observed off Point Arena.

Although traces of oil continued to be sighted in the surf line along the Mendocino coast, there were few additional reports of beached oil after November 12.

Overall, the cleanup operation appears to have been typical of most offshore oil spill responses. Weather conditions were the most important factor determining success of skimming operations. On less than half of the days following the breakup and spill, wind and sea conditions were in excess of those which would permit operations (over 6-foot seas and 20-knot winds). But, according to a report done for Chevron U.S.A. (Woodward-Clyde Consultants, 1985, page 29), ". . . equipment effectiveness starts to deteriorate in seas 6 to 8 feet in height [and] also deteriorates as waves break or as white caps form [winds over 12

knots]." This report also indicates that there were only three days after the breakup when for 12-hour periods or more wind and wave conditions were such (winds less than 12 knots and seas less than 8 feet) that response equipment could have been effective (November 6, 7 and 14). The guidelines developed for Southern California indicate that equipment must be capable of operating in an 8-10 foot sea/swell state and 20-knot winds. However, a representative of the Pacific Strike Team, speaking before the September 11, 1985, Regional Response Team meeting indicated that ". . . the equipment is capable of withstanding up to 12-foot seas, but people can't function, and working with 17,000-20,000 pounds of equipment presents risks to personnel. Six foot seas are maximum for effective skimming if there are long period waves, but 4-foot waves with a short chop might result in poor efficiency of skimming."

Added to weather-produced problems in oil recovery was the difficulty encountered in availability of equipment. "Throughout the case, there was a reluctance on Crowley's [Crowley Maritime] part to take their tugs and barges offshore." (Memo from Commander, Marine Safety Office, San Francisco to Commander, Pacific Strike Team, January 21, 1985, OSC Report, Enclosure 14, page 4) This presented a serious difficulty for skimming, transfer of oil from skimmers to barges, and for the collection of water and oil samples since many of the vessels used by Clean Bay were privately owned and not under the direct control of either Clean Bay or the Coast Guard. This appeared to interfere with offshore operations unnecessarily. "On many occasions, it was calmer offshore than in the Bar Channel and Potato Patch, and

many of the necessary resources remained in the Bay." (Ibid, page 5)

In addition to difficulties encountered in transferring oil from skimmers to barges because of weather and availability of barges, there were mechanical problems. "MR. CLEAN II was full of recovered oil and needed to offload. From 1200 to approximately 1330, the MR. CLEAN II tried unsuccessfully to transfer recovered oil to the barge due to incompatible fittings." (Ibid, page 4)

The oil emulsion collected throughout the entire 19 days of the incident, approximately 1,400 barrels (58,800 gallons) represents approximately 2% - 3% of the amount spilled (since, according to Clean Bay, it is only 50% oil). From review of the OSC Report and interviews with representatives of Clean Bay and the Coast Guard, it appears that even with the existing weather conditions, it would have been possible to recover significantly more oil had barges been available offshore and had there been compatible hose fittings.

Other concerns expressed, especially with regard to the oil that reached the shore in Marin and Sonoma, as well as the part of the spill that moved northward into the waters off Mendocino, revolved around the failure of cleanup crews and equipment to be ahead of the oil. "We can't afford to adopt the philosophy of always 'chasing' along behind a spill after the impacts have taken place. Equipment and personnel moving in from the Bay Area or the last site of accessible shoreline contact will likely arrive too late for preventative action." (Local government representative, personal communication)

The conclusions and recommendations made in this report regarding cleanup capability are consistent with those reached by the staff of the California Coastal Commission in their Oil Response Survey in 1983.

> "Clean Bay has a limited amount of equipment that is capable of response in the open ocean. Most of the containment booms were not designed for open ocean use in rough weather. Only one of the oil recovery devices, the Walosep W-1, is suitable for open ocean response in severe weather and it requires a vessel of opportunity for such deployment. Two other skimmers, Marco IIIs, could operate offshore in calm seas, but would have the difficult and perhaps hazardous task of traveling to distant spills in the open ocean." (page 76)
>
> "In order for Clean Bay to respond to an open ocean oil spill from offshore production operations or a major tanker spill, the cooperative would need to acquire significantly more offshore containment booms, oil recovery devices (skimmers)and dedicated response vessels. This equipment may be staged at various locations along the coast depending upon the amount of oil activity and the proximity of environmentally sensitive habitats that may be threatened." (page 78)

According to Clean Bay, the cooperative continues to add new equipment each year and, since this report, has acquired a self-propelled barge, several small boats and additional offshore booms. The industry's view is that "We don't feel that we have the risk out there. There's no offshore development [off of Northern California]. If we have OCS development, we will re-evaluate and have a 5-year lead time until production and legal requirements for equipment." (Jack Mortenson, Clean Bay manager, personal communication).

Dispersant Use

Conclusion 8: Dispersant Toxicity Research

There is an incomplete data base on both the acute and chronic toxicity of oil dispersants and dispersed oil. Decision making regarding dispersant was done in the absence of information on potential environmental impacts of the application.

Recommendation 8: Dispersant Toxicity Research

The state should develop a research program designed to determine the acute and chronic toxicity of dispersants and dispersed oil to organisms and communities indigenous to California waters. This research program should be designed to screen a variety of species (birds, fish, shellfish, plankton) to determine which seasons and life stages are the most sensitive to these materials.

Conclusion 9: Dispersant Information System

Information regarding the effectiveness on various oil products, the toxicity to organisms and the availability of different dispersants is not readily available.

Recommendation 9: Dispersant Information System

The state should develop a computerized system for organizing and evaluating available information on the effectiveness of different dispersants on various crude and refined oils and their toxicity. This data should be updated annually. The information should become part of an oil spill data base that is available to regional offices of the Department of Fish and Game, and Water Quality Control Boards.

Conclusion 10: Dispersant Use Guidelines

The State currently has no guidelines or requirements which establish conditions which must be met prior to application of dis-

persants. In their absence, decisionmaking for dispersant use in the PUERTO RICAN incident was based on incomplete information.

Recommendation 10 (Dispersant Use Guidelines)

> The Regional Response Team, Environmental Protection Agency (EPA) and the state should develop a set of guidelines and requirements for conditions which must be met for the use of dispersants in California waters. These guidelines would establish the conditions and geographic areas in which dispersant use would be permitted and would establish procedures for dispersant application.

Conclusion 11: Sampling and Documentation

A variety of problems prevented the required sampling during and after oil spill dispersant application in the PUERTO RICAN incident. In addition, there was no photodocumentation performed to permit standardized evaluation of effectiveness.

Recommendation 11: Sampling and Documentation

> The state should permit dispersant use only if water column and surface sampling occur during and following application. In addition, photodocumentation during application should be required to permit objective rating of dispersant effectiveness.

The decision to use dispersants was based on incomplete information; the Coast Guard failed to obtain critical data on the presence of natural resources potentially subject to impact by dispersant application and on the toxicity of the dispersant and dispersed oil on those resources.

The Coast Guard Dispersant Use Form is a six-page questionnaire developed to identify the least environmentally damaging response to a particular oil. It both identifies the most effective dispersant for use on an individual spill and compares the anticipated environmental impact of an untreated spill with the

projected impact of a chemically dispersed oil slick. Prior to the decision to use dispersants on November 3, Section 8 of this form, which describes the anticipated environmental impacts, was never completed because the requested information was unknown. Because no data was available on what resources were threatened by the oil spill and how they would be affected by the use of chemical dispersants, it was determined that there would be no environmental impact. (OSC Report, Enclosure 2, Section 8).

At present, only limited information is available on the toxicity of dispersants and dispersed oil. The National Contingency Plan Product Schedule lists dispersants which have received EPA approval for use in U.S. waters. The dispersant testing required by EPA reports the results of up to 96-hour acute toxicity bioassay, using laboratory stock cultures of marine organisms (brine shrimp and a minnow native to the East and Gulf coasts). This information allows comparison of the relative toxicity of different dispersants, but cannot be directly applied to questions regarding the effects of dispersants on a particular biological community or larval organism.

Only limited research has been done on the toxicity of dispersed oils. Studies have shown some dispersed oils to have a greater acute toxicity than individual oil products or dispersants, but there is wide variability in the toxicity of different dispersant/oil combinations. (Anderson, 1985; Baxter, 1985)

The chronic, i.e., long term, toxicity of sub-lethal concen-

trations of dispersants and dispersed oil also requires further investigation. It is incorrect to assume that dilution of dispersants after application will eliminate any chronic response to the chemical. Organisms living in California waters are already stressed by chronic pollution of their habitat and additional contaminants may produce undesirable cumulative effects. Also, it is impossible to determine whether dilution will eliminate chronic effects of chemical dispersants without supporting information on the fate of that chemical in the environment. The governmental framework for organizing and funding predictive research on the effects of dispersants and dispersed oil on California organisms already exists (SB686, see Appendix.)

California requires both state (Department of Fish and Game) and federal (EPA) approval of all dispersants intended for use in its waters. (There currently are 47 chemicals that have federal approval and 6 approved for use in California. Only one, COREXIT 9527, is stockpiled here for immediate use.) The California Department of Fish and Game's procedure for dispersant approval is currently undergoing revision and could be expanded to require the type of predictive information needed for an informed decision on dispersant use.

Immediately following the PUERTO RICAN oil spill, calls were placed across the country by HAZMAT personnel to determine the dispersability of each of the oils on board the tanker. This information should be provided by industry for all oils transported in California waters and all dispersants stockpiled here. Since the American Petroleum Institute is currently developing

such a listing for the waters of the Gulf of Mexico, it is possible that it could also be done for this region.

Specific issues which should be addressed in this plan include areas of special biological sensitivity in which dispersant use is prohibited (e.g., marine sanctuaries, sea bird nesting areas and marine mammal migration pathways), and application conditions (e.g., presence of sampling vessel, adequate visibility to permit determination of effectiveness, presence of a leading edge of a spill, or imminent danger of oil coming ashore). In the case of the PUERTO RICAN spill, there was much controversy regarding how to interpret the "leading edge" of the spill which was large and unevenly shaped, had stringers and was surrounded by 100 square miles of sheen.

However, this plan should not be adopted as a "pre-approved dispersant use plan" which removes the need for state and EPA concurrence with an OSC decision to use dispersants. Although this system has been adopted in two other Coast Guard regions (Region IX-Oceania - Hawaii and the South Pacific; Region IV - Florida), the existence of specific dispersant use guidelines does not eliminate the necessity for review of dispersant need and suitability in particular circumstances.

Following damage to MR. CLEAN II on November 3, no other vessel was able to leave port to provide sampling at the spill site during dispersant application. Dispersants have the greatest likelihood of being used during sea conditions which prevent mechanical cleanup. These conditions would also reduce the possibility that sampling vessels could reach the scene. Alternative methods

of sampling, e.g., by helicopter, should be used to provide reliable documentation of dispersant use. Observers of the November 3 dispersant application widely differed in their rating of the effectiveness of the chemical dispersion of the spill. Photographic or videotaped documentation would permit more objective evaluation of the degree of effectiveness.

Contingency Planning/Resources at Risk

Conclusion 12 (Contingency Planning & Resources at Risk)

Information regarding resources at risk in the area in which the PUERTO RICAN incident occurred was incomplete. As a result, the development of detailed mitigation measures required under the Contingency Plan had not been completed.

Recommendation 12 (Contingency Planning & Resources at Risk)

> As required in the Contingency Plan,the Coast Guard, working in cooperation with the NOAA, the SSC and HAZMAT, the state and local experts, should:
>
> (a) Develop a detailed catalog and maps of resources (both organisms and areas), their seasonality and their sensitivity to oil.
>
> (b) Computerize all of this information in a form that enhances ease of communication to interested parties and facilitates revision.
>
> (c) Based upon this information, rank areas with regard to sensitivity to damage, and develop protection strategies for the most sensitive areas. (These strategies should include, but not be limited to, permanent storage of oil booms and other cleanup equipment adjacent to high sensitivity habitats.) This information (on birds, marine mammals, fish, invertebrates, plants, plankton, river mouths, estuaries, coastlines, islands and fishing areas, and their seasonal sensitivity) should become a part of the local and regional contingency plans.
>
> (d) Develop a mechanism which will ensure periodic (annual) revision and updating of this information as well as for utilizing local expert knowledge (researchers, environmental group representatives, naturalists, fishermen, etc.

The clean-up response to an offshore oil spill involves the coordinated actions of numerous federal agencies, including the Coast Guard, EPA, Department of Interior (Fish and Wildlife Service, National Park Service), NOAA, Navy, etc, under the direction of the National Oil and Hazardous Substance Contingency Plan, 40 CFR Part 300. This National Contingency Plan (NCP) not only

organizes interagency coordination in the response effort, it also outlines requirements for the structure and content of the related Federal Regional and Local Contingency Plans.

While the EPA Region IX Contingency Plan reiterates large portions of the NCP, it also outlines a specific mechanism for agency coordination with the California Department of Fish and Game and identifies specific Federal and State agencies for involvement in a spill response. The Federal Local Contingency Plan, which covers a smaller area encompassed by the boundaries of Coast Guard District 12, focuses less on the actual organizational response at the time of the spill while concentrating on organization of the actual spill response prior to the event. This includes planning for the availability and use of chemical and mechanical response equipment (in coordination with Clean Bay, the local industry oil spill cleanup cooperative), identifying potential spill sites, developing a system for using local, non-governmental expertise in spill response, and identifying areas biologically sensitive to oiling. This latter information is the basis for prioritizing the response options to an oil spill.

The Local Contingency Plan (LCP) is the key to responding to a pollution incident and much of the outcome of the response is a reflection of the level of detail developed during the planning process and accuracy and completeness of the information provided.

Much of the information on the resources at risk needed to accurately predict potential environmental impacts of spilled oil was available at the time of the PUERTO RICAN incident. However, there was no single source or location where all of the existing data could be found. And making the situation even more difficult,

the region's first SSC had only recently arrived in the Bay area and was just beginning to assemble the library, local contacts and personal expertise required to assess environmental sensitivity and develop protection strategies.

The Gulf of the Farallones, and especially the Point Reyes-Farallon Island Marine Sanctuary, is one of the most sensitive regions on the Pacific coast. In recent years, coastal seabird and marine mammal surveys have been conducted by UC Santa Cruz for the Minerals Management Service. Results indicate that for much of the year, densities for many species are higher in the Gulf of the Farallones and around the Farallon Islands than in any other region of the coast. But The Farallon's environmental sensitivity is highly seasonal and the timing of the PUERTO RICAN incident was one of the principal reasons that the oil damage resulting from the break-up of the vessel was relatively minor.

For example in April, May and June, a quarter to a third of a million birds nest and breed on S.E. Farallon Island, making it the largest breeding bird colony in the contiguous 48 states. The Farallones population ". . . probably includes over half of all California's nesting seabirds. . . . includes virtually the entire world population of the ashy storm petral . . . and one of the largest single colonies of western gulls in the world." (Final EIS on the Proposed Point Reyes-Farallon Islands Marine Sanctuary, page E-9)

Throughout the year, many hundreds of thousands of pelagic birds (which are highly sensitive oil damage) migrate through the region. Briggs et al. (1983), estimated that the total population

of seabirds in central and northern California ranged from 1.3-6.2 million between 1980 and 1982.)

In addition, during December, January and February, thousands of elephant seals, California and Steller sea lions, harbor seals and northern fur seals migrate through the area. The first four of these species also reproduce on the Farallones. Southern sea otters, a threatened species, have also been sighted in the area of the Marine Sanctuary, but their main concentration is further south, in the vicinity of Monterey Bay. Particularly during the first week of the incident, when the currents were moving spilled oil south, this population which is currently estimated to be 1500, was at risk. Otters are extremely vulnerable to oil because they must depend upon the insulation provided by the air trapped within their fur to protect them from the cold of the ocean water in which they spend most of their lives. A very small amount of oil can mat the coat, eliminating the insulating layer normally provided by the fur and exposing them to death by exposure. Since the northern extent of their range was less than 100 miles from the Farallones, there was a serious potential for damage to a significant proportion of the population.

Also, more than 16,000 California gray whales (an endangered species) pass through the Gulf of the Farallones and along the entire Pacific coast during both their southern and northern migration. Finally, other endangered species frequenting this region include the blue, humpback, fin, right, and sperm whales, sea turtle, brown pelican and least tern. (Final EIS for OCS Sale No. 73, page IV-140)

The Gulf of the Farallones and the waters of the rest of

California's central and northern coast also support significant fisheries resources (both resident and migratory). Any damage to these stocks will in time have a major impact on the commercial and recreational fishing industries which are totally dependent on them. (Commercial landings between Monterey and Drakes Bay for 1981 were over 86 million pounds valued at over $25 million. Final EIS for OCS Lease Sale No. 73, 1983, page III-100)
In terms of potential damage to these resources, the PUERTO RICAN incident also occurred at an optimal period. Had it happened several months earlier (during the peak of the commercial salmon season) or later its impact could have been greater.

In addition to various sensitive regions of the coastline (e.g.,there are 12 Areas of Special Biological Significance between Big Sur and Bodega Bay), especially rocky intertidal areas that are usually densely covered with invertebrates, there were a significant number of estuaries, river and creek mouths at risk. According to the Minerals Management Services Final EIS for Lease Sale 73, there are 18 of these between Big Sur and Point Reyes alone. These areas are most vulnerable during the winter and spring when the sandbars that block them in the summer and fall have been breached by storms and their mouths are open to oil from the ocean on incoming tides. This is when anadromous fish migrate from the sea to their freshwater spawning areas, and are particularly sensitive to the effects of pollution. Along the California coast, some of these areas contain mariculture facilities, where fish, shellfish and marine plants are farmed and where a small amount of oil can destroy many years worth of

products. This is why, after oil entered Estero Americana during the incident, Clean Bay installed a system to filter the water flowing into the California Fish Grower's aquaculture operation located in the Estero.

The preceding discussion of the biological resources in the Gulf of the Farallones presents an overview of the type of biological sensitivity information which should be incorporated into the Local Contingency Plan to permit the development of mitigation strategies which will protect critical biological areas from oil spill impacts.

Biological sensitivity information should first detail the type of biological habitat found in a particular area, what ecological communities are associated with that habitat and the diversity and abundance of organisms found within a particular community. Ideally, this baseline information is then combined with data on the toxic response of these organisms and communities following exposure to crude or refined oils. Comparison of this information then permits ranking of different biological communities' oil sensitivity, i.e., the potential severity and persistence of the biological damage to the community resulting from oil contact. This community ranking is then incorporated into the oil spill response plan. During an actual response, equipment and human resources focus first on protecting the areas with the greatest biological sensitivity to oil spills. This information, essential to an effective, timely spill response, is not available for spill responses in central and northern California.

Annex XIV (Critical Areas to be Protected) of the Coast Guard

District 12 (Federal) Local Contingency Plan presents extremely limited information on biological areas of importance to oil spill protection strategies. The description of areas biologically sensitive to oil in the Central (San Francisco Bay Area) Planning Area, which extends from Fort Bragg to Pigeon Point, contains no references to any sensitive areas west of the Golden Gate. Several reference volumes (Anderson et al., 1985; Baxter, 1985; U.S. Fish and Wildlife Service, 1980) are mentioned as containing information on marine bird populations, intertidal communities, etc., but there is no discussion of such critical areas as the Farallon Islands, Fitzgerald Marine Reserve, Tomales or Bodega Bays. There is some discussion of a few biologically sensitive areas in the Region 12 North and South Areas, e.g., Humboldt and Monterey Bays, respectively, but the vast majority have not been described.

One report (Woodward-Clyde Consultants, 1982), done under contract to Minerals Management Service (MMS), attempts to fill this information gap in the LCP. However, while it discusses the geography and biology of the coastal intertidal zone, the study does not address any offshore areas such as spawning or fishing grounds, marine mammal migration routes, seabird feeding areas or benthic communities beyond the intertidal zone.

When an oil spill is approaching a shoreline or biologically sensitive offshore area, very little time is available to devise a protection strategy for the threatened area, organize the equipment and personnel needed for the response and implement the plan of action. The entire process can be greatly facilitated if

a protection (mitigation) strategy has been developed for the threatened area. Advance mitigation planning permits efficient allocation of equipment and resources to an area while greatly increasing the chances of a successful operation. The lack of advance mitigation planning greatly influenced the cleanup response to the PUERTO RICAN spill.

On November 1st, the Coast Guard MSO received a brief description of biologically sensitive areas in the 12th District from RPI (a planning consulting firm) which identified Tomales Bay as well as other sites as areas of extreme biological sensitivity which should receive priority protection from any potential spill. On November 10th, at 0600 a Coast Guard overflight sighted oil in Bodega Bay, midway between Bodega Harbor and Tomales Bay. It was anticipated that the evening tide might carry the slick into Tomales Bay. The Pacific Strike Team (PST) responded by sending a crew to the mouth of Tomales Bay to boom off the entrance and prevent oil from entering it. However, the strong flood tide at the mouth prevented any diversionary booming, and Tomales Bay was left completely unprotected from any oil that might enter during the night. Early the next morning, the PST found that the oil that might have entered the Bay had been carried out to sea by a combination of wind, currents and outflow from streams swollen by rain the night of the 10th. Without advance planning, the PST was unable to anticipate how to protect Tomales Bay from the approaching oil slick.

This same problem was encountered in responding to other aspects of the oil spill. On the night of the 9th, oil entered Bodega Harbor through the rock jetties along the harbor channel,

while a Marco V skimmer worked to collect the light sheen which was entering the main harbor channel. Throughout the incident, problems were encountered in transferring skimmed oil from skimmers to barges for transport to shore. Better planning would have greatly increased the amount of time skimming vessels were able to skim, resulting in higher efficiency in removing oil from the water before it came ashore.

In order to improve the speed and effectiveness of responses to oil spills threatening Central and Northern California waters, a new biological sensitivity and oil spill mitigation reference system should be established which incorporates maps and text describing each coastal or marine area at risk from spills in the region. The most useful form for such a system would be a computerized data base which would allow instant access to any desired information and periodic revision with the most recent information on biological resources, habitats, toxicology and response technology. A reference library or listing of available resource documents alone will not provide the immediate information needed to respond to a spill, leading to unplanned responses.

Basic oil spill response equipment including booms, oil absorbent materials, etc should be stockpiled at strategic locations along the coast of the region. A system of volunteers should be organized and trained in the use of these materials to assist in the initial response to oil coming ashore in remote areas.

Many coastal and beach areas of the region have limited or no road access and are far from response equipment storage areas in the San Francisco Bay Area. Stockpiling of materials near

areas of high biological sensitivity to oil, such as bays, river mouths, marshes, reefs, etc. would reduce the time needed to mitigate potential oiling by eliminating the need to gather and transport initial response equipment.

Such staging of equipment at Bodega Bay on the evening of November 9th would have greatly increased the possibility that mitigation measures could have been initiated before oil reached the harbor entrance.

The system for contacting local experts and obtaining resource information for planning and responding to an oil spill must be improved and expanded within the 12th Coast Guard District LCP. The Federal National Contingency Plan requires that the LCP institute a system to gather and coordinate information from local experts in academic institutions or from the community, especially for developing mitigation and protection strategies in areas where standard response techniques will not suffice. A group of local fishermen, scientists, naturalists and citizens familiar with the topography, currents, biological resources and seasonal changes at potential spill sites could work with the Coast Guard on mitigation and protection planning for the area and later act as reliable sources of information on conditions during an actual spill response.

A network of volunteers could perform beach surveillance, notifying the Coast Guard of approaching oil patches or of continuing movement of large slicks during weather conditions which prohibit aerial tracking. During the PUERTO RICAN incident much valuable response time was lost in finding individuals with detailed

local knowledge on biological resources and currents to help guide the Coast Guard in staying ahead of the spill.

In the year that has passed since the PUERTO RICAN incident, a number of things have happened which ultimately should improve future responses to oil spills. The State Senate Select Committee on Maritime Industry, chaired by Senator Milton Marks of San Francisco and Marin, held February 1985 hearings on "The State's Oil Spill Response." The hearings were designed to examine California's oil spill response capabilities and what should be done to improve them, using the PUERTO RICAN incident as its focal point. During the spring legislative session, Senator Marks introduced legislation which has since been passed and signed into law by the governor (SB 686, see Appendix) which requires archiving of petroleum samples, resource mapping and research on the effects of dispersants on resources. Another bill (SB 959), introduced by Senator Gary Hart (Santa Barbara) was also passed and provided the necessary funding. It is hoped that some of the recommendations presented in this report will be used in implementing the provisions of these bills.

The Coast Guard is also currently in the process of revising the Local Contingency Plan as is called for annually, basing its revision on lessons learned from the PUERTO RICAN incident. Many of the recommendations and comments contained in our report have already been conveyed to the group involved in the LCP revision and it is hoped that some of them may be incorporated.

Status of Sunken Stern

Conclusion 13 Survey of Sunken Stern

The stern section of the PUERTO RICAN sank within the boundaries of the Point Reyes-Farallon Islands Marine Sanctuary and continues to discharge bunker fuel which has oiled sea birds. There is also a possibility that a significant quantity of oil product also remains in the stern.

Recommendation 13: Survey of Sunken Stern

> The continued discharge of oil from the sunken stern poses a threat to the resources of the marine sanctuary. The Coast Guard, utilizing support from the federal pollution fund, should undertake a survey of the stern to determine the location and cause of the leak, and, if feasible, plug the leak or remove the oil.

The stern section of the PUERTO RICAN sank one mile inside the boundary of the Point Reyes-Farallon Island Marine Sanctuary. According to Coast Guard estimates, the only oil to go down with the stern was a maximum of 8,500 barrels (357,000 gallons) of bunker C that was on board to fuel the ship's engines. The stern has continued to leak oil (possibly through a fuel tank vent), and subsequent samples from the oil slick and sheen from surface waters above the sinking site have been identified as weathered versions of the bunker oil that was on the PUERTO RICAN. (Coast Guard Central Oil Identification Laboratory in Washington, D.C., Enclosure 13 of OSC Report) However, available information does not appear to completely rule out the possibility that some quantity of oil products being carried as cargo also remain in the sunken stern.

According to the Coast Guard, in addition to the two wing tanks that were breached when the vessel broke in two, presumably discharging their entire contents, there were four other wing tanks aft of the break in the hull that separated the bow and stern sections. (see Appendix) Those four tanks contained 11,725 barrels (492,450 gallons) of Witco 2033 TR, 4,614 barrels (193,788 gallons) of Polybutene 24 and 4697 (197,274) barrels of Oloa 246B. The "Estimate of Oil Loss" (Enclosure 5 of the OSC Report) indicates that all of these tanks discharged when the vessel broke up, and on-scene observers indicate that the tops of the forward two of these tanks were gone so that their contents (Polybutene 24 and Oloa 246B) would have been released. However, there is no evidence to indicate that the aft two wing tanks (5P and 5S) were damaged or that their cargo (Witco 033 TR) was released when the stern sank. (In fact, a Coast Guard officer who examined and photographed the entire ship, especially the area of most severe damage, for the Coast Guard MSO Inspection Department on November 1, was unable to rule out the possibility that these tanks were not intact. Personal communication.) In addition, subsequent analyses of all oil samples collected from the ocean or from beaches at the Farallones, Bodega Bay and elsewhere identified only Oloa and bunker C. Since one of the wing tanks (45A) that was ruptured by the vessel breakup contained Oloa, it is likely that this was the source. Finally, a report prepared for Chevron, U.S.A. (Woodward-Clyde Consultants, 1985), indicates that " . . .Witco 2033 cargo appears to have floated out of the stern for several days," although sampling did not appear to confirm its presence.

Therefore, the possibility remains that the stern did contain a significant amount of oil product (11,725 barrels or 492,450 gallons) in addition to the bunker C fuel when it sank.

Beginning at the time of the breakup and sinking of the PUERTO RICAN and continuing until the present, bunker fuel has continued to appear as a visible sheen on the ocean surface near the site of the sunken stern. Since the sinking of the stern, the Coast Guard has continued to monitor the area with twice weekly helicopter flights. On 75 of the 81 flights between December 1984 and October 1985, oil was observed, and on 17 of them, sea birds and/or marine mammals were sighted in the area. Between December and March, the typical sheen ranged from 1.5 to 3.0 miles in length and was 5 to 100 yards wide. Since March the size has diminished to 1.0 to 1.5 miles by 5 to 50 yards wide.

On January 26, 1985, Dr. Jerry Galt of the NOAA HAZMAT Office, who is a highly experienced oil spill observer, flew on one of the regular surveillance overflights and estimated the rate of the leak to be 20 barrels a day. If the estimates of the total bunker fuel and the discharge rate are accurate and the leak continues at the same rate until all of the oil is gone, it might be expected to stop 14 months after it began, or in early January 1986.

The oil leaking from the stern has been confirmed as having had an impact on marine birds and mammals. Oil samples from dead birds, a live elephant seal and rocks on S.E. Farallon Island have been confirmed as matching PUERTO RICAN bunker fuel. In addition, from January through September 1985, 88 oiled birds and 7 oiled elephant seals (in addition to the 15 oiled elephant seals seen

during the incident) have been observed by Point Reyes Bird Observatory biologists on S.E. Farallon Island.

Concern has been expressed by representatives of congressional districts, local government, environmental organizations and state and federal government agencies over the continuing discharge of bunker oil from the stern. At meetings of the Coast Guard Regional Response Team and the Federal/State Damage Assessment Committee, the OSC has been urged to take action to eliminate the discharge into the waters of the Point Reyes-Farallon Island National Marine Sanctuary and the damage to its resources.

As a result of these requests, in mid-March the Commander of the Coast Guard District 12 requested NOAA to perform an evaluation of the effects of the continued discharge on the sanctuary resources. In response, NOAA recommended continuing aerial surveillance, attempting to locate the stern and recovery of released oil, if possible. At the OSC's request the U.S. Geological Survey conducted a side-sonar survey in the vicinity of the site where the sinking occurred. On April 3, 1985, the stern was located at 37-30.6N, 123-00.7W at a depth of 1,246 feet, approximately 1.3 miles east of the reported sinking location and inside the Point Reyes-Farallon Islands Marine Sanctuary. (U.S. Geological Survey, 1985) The $10,000 cost of the survey was funded by the federal pollution fund.

The OSC also agreed to further investigate the feasibility of using manned or unmanned submersible technology to survey the stern for either recovering the oil or stopping the leak. Although a number of firms were contacted, in the absence of

compelling reports of damage resulting from the leaking oil, there appears not to have been any justification for undertaking such work, especially when the OSC has concluded that, "a salvage effort with a reasonable probability of recovering oil from the stern section could cost millions of dollars with no guarantee for success." (OSC Report, page 130)

Since it appears possible that a survey and plugging of leaks could be accomplished for less than $100,000, but with no guarantee of success (Deep Ocean Technology, 1985, personal communication), the results of ongoing NOAA damage assessment surveys could influence any decision regarding such an undertaking (see Damage Assessment section of this report).

Coordination and Communication by Richard T. Tinney Jr.

Conclusion 14: Coordination

The direction of the movements of the PUERTO RICAN by the On-Scene Coordinator (OSC) required the presence of a representative of the OSC at all times during the incident. At one of the most critical periods of the incident, the OSC representative was forced by weather conditions to leave the scene and this is when the tug violated the Coast Guard boundaries and the PUERTO RICAN sank.

Recommendation 14: Coordination

In order to maintain total control of a pollution incident and vessels involved in it, the On-Scene Coordinator must have a representative present at all times. It should be possible to develop a system for delegation of several representatives, or to have a designated representative appoint a replacement if he must leave the scene.

Conclusion 15: Communication

The tug towing the PUERTO RICAN crossed boundaries establishing prohibited areas and spent almost half a day in violation of Coast Guard orders, north and east of bounded areas. There appear to have been no written copies of the orders establishing these boundaries.

Recommendation 15: Communication

Procedures should be established to require that explicit orders relating to Coast Guard intervention authority be in writing and that copies of such orders be delivered to vessel owners or their representatives and other interested parties.

Introduction

The response to the PUERTO RICAN oil spill involved a

complex array of federal, state, regional, and local government agencies, private organizations, and individuals. From an organizational and administrative standpoint, response by such a diverse array of entities to a dynamic event can pose a host of problems relating to control of the response, communications among those responding, and similar matters.

The federal response to the PUERTO RICAN incident was controlled primarily by the requirements of the various federal oil spill contingency plans as executed by the Coast Guard. The effectiveness of this response from an organizational standpoint is described below.

The National Contingency Plan

The National Oil and Hazardous Substances Pollution Contingency Plan (the "National Plan") is set out in the Code of Federal Regulations. It establishes the foundation for spill response by federal agencies, with the intent being the efficient, coordinated, and effective response to discharges of oil and other pollutants. The National Plan specifies and divides responsibilities among federal, state, and local governments, establishes the national response organization that may be brought to bear in a spill incident, and establishes requirements for Federal Regional and Federal Local Contingency Plans.

Importantly, the National Plan sets out certain responsibilities for the federal OSC. Generally speaking, the OSC is to direct the federally financed response efforts and all other federal efforts at the scene of an incident. Specifically,

the OSC is charged with assessing spills to determine their magnitude and severity and the feasibility of removing them, notifying appropriate federal and state officials, determining whether the discharger is adequately responding to the spill, and if necessary, initiating spill containment, countermeasures, cleanup, and disposal.

The National Plan also requires the preparation of Regional and Local Contingency Plans. The area in which the PUERTO RICAN incident occurred is covered by the Regional Contingency Plan for standard Federal Region IX and by the Local Contingency Plan for the Marine Safety Office (MSO) San Francisco oil and hazardous substance contingency plan.

MSO San Francisco Contingency Plan

The organizational and administrative requirements of the Local Contingency Plan are only very generally defined. Basically the Local Plan reiterates the requirements of the National and Regional Plans relating to agency responsibilities and sets out certain local concerns. With respect to local planning considerations, the Local Plan sets out items relating to all areas covered by the Plan except for the area between Fort Bragg on the north and Pigeon Point on the south and outside San Francisco Bay. It was in this area that the PUERTO RICAN incident occurred, so no local planning considerations in the Local Plan related to the PUERTO RICAN response.

The Local Plan does describe various cooperation and coordination requirements regarding OSC relationships with state, regional, and local governments as well as other organizations

and individuals. Also it describes specific duties for various federal personnel in addition to the OSC.

To the extent that the Local Plan sets out an administrative and organizational structure for oil spill response, the Plan is consistent with the Federal and Regional Plans. Moreover, the structure is generally logical and designed so that the federal response can be effective and well-coordinated.

From an administrative standpoint, the contingency plan was effectively carried out from the beginning of the PUERTO RICAN incident. Within 2 1/2 hours of the explosion, Marine Safety Office personnel had been recalled; Clean Bay, the oil spill cooperative, was notified and mobilized; the Pacific Strike Team and the NOAA Scientific Support Coordinator were taking necessary actions; the Arizona-based dispersant application aircraft was being readied; and oil spill containment and cleanup preparations were being made. There were a few problem areas, however, and these are addressed in the following pages.

Conflicting Goals

From the outset of the PUERTO RICAN incident, there was a classic instance of interorganizational conflict between the Coast Guard and the PUERTO RICAN's owner. The Coast Guard, once the crew was recovered from the vessel, had as its primary goal the prevention of a significant environmental impact from an oil spill to the San Francisco Bay area and the Farallon Islands. The OSC's report on the incident shows that the Coast Guard was willing to increase the risk of losing the vessel and its cargo to achieve this goal if it were to prove necessary.

In contrast to this goal, the goal of the vessel owner and the cargo owner was to salvage the vessel and its cargo. This difference in primary goals meant that the Coast Guard and the owners were in philosophical conflict regarding how to respond to the incident. Moreover, this conflict may have led to the ultimate oil impact on the Farallones, Point Reyes, and the Bodega Bay area.

One consequence of the organizational arrangements in effect at the time of the PUERTO RICAN sinking on the 3rd is the lack of direct control by the Coast Guard over the movement of the PUERTO RICAN. The owner of the PUERTO RICAN, Keystone Shipping, hired Alex Rynecki, Inc. as salvors. The commercial towing vessel SANDY, which had undertaken a tow of the PUERTO RICAN at the request of the Coast Guard On-Scene Commander on the day of the initial explosion, came under the control of a representative of Alex Rynecki, Inc.

Thus the movement of the PUERTO RICAN was under the direct control of the agent of Keystone Shipping. This was no problem in and of itself, so long as the salvors acted in a manner consistent with the Coast Guard's goals. In the case of the PUERTO RICAN incident however, the salvors did not act in such a manner. Instead they directed the vessel to be moved north of the limits established by the Coast Guard. The record is unclear as to whether this was a case of malfeasance on the part of the salvors, misfeasance, or a simple misunderstanding. Whatever it was, it was compounded by the failure to detect the course violation by on-scene Coast Guard District 12 personnel on

either the USCG Cutter CAPE CROSS or PT. BARROW.

Thus a compound problem, the lack of direct control over the movement of the PUERTO RICAN and the failure to actively monitor the vessel's movements by on-scene personnel, lead to the ship's breakup inside the marine sanctuary.

Under the Intervention on the High Seas Act, the Coast Guard District 12 Commander could have requested authority to direct the privately conducted movements of the PUERTO RICAN or to undertake to move the ship using Coast Guard resources. Indeed, he could have requested authority to destroy the ship and its cargo. Instead he sought only the limited authority needed to prevent the ship owner from towing it closer to shore and to direct that the vessel be towed seaward if it appeared to be in imminent danger of sinking. Thus the Coast Guard hamstrung itself by limiting its authority to take necessary actions such as directly controlling the location of the ship.

At the same time, the owners and salvors appeared to be fully cooperative. Given that the law limits the measures directed or conducted under it to what is reasonably necessary to prevent damage, the lack of authority to direct the movement of the ship may have been meaningless. The OSC may have handled the situation in the only way it could be handled given the vessel owner's apparent willingness to attempt to limit the environmental risk posed by the ship and to fully cooperate in cleaning up any spill. Nevertheless, the failure to request broader intervention authority limited the options available to the OSC and may have reduced the weight of the OSC's directive to keep the PUERTO RICAN west and south of the designated point.

With respect to the failure to have on-scene monitoring effectively operating, the problem may be more easily addressed. While this problem is discussed more fully below, suffice it to say here that the OSC should take all steps necessary to ensure that he is fully represented at key areas of oil spill response.

OSC Representation at Key Action Sites

During most of the PUERTO RICAN incident, from the time the firefighting and rescue efforts were initiated to the time the forebody reached the dry dock in San Francisco, the OSC had a representative on the towing vessel or on a near-by Coast Guard vessel. During one of the most important periods of the incident, however, there was no OSC representative with the PUERTO RICAN. While this was not entirely the fault of the Coast Guard, it in part being a consequence of a vessel casualty and bad weather, it underscores the importance of having a representative of the OSC at key action points at all times in order to ensure that interorganization coordination is adequate and that interorganizational conflicts are recognized and corrected in a manner consistent with the public welfare.

Boundary Issues

Another class of issues in the PUERTO RICAN response can be characterized as boundary issues; that is, those related to the jurisdiction of responding organizations, and efforts by individual organizations to protect their jurisdiction and their boundaries. The interorganizational nature of the National, Regional, and Local Contingency Plans is an effective effort to

negate most of these issues in advance of their occurrence by internalizing most of the organizations at the federal level with spill response and impact concerns.

By its nature as a federal planning document, however, it in a formal sense excludes non-federal agencies and organizations. While the contingency plans do speak to coordination with state and local governments and with private organizations and individuals, these groups are not ab initio involved in the federal contingency plan except through such opportunities as may be afforded for public review and comment. State and local governments are invited to participate in the planning itself, however. No formal roles for these groups are specified, although certain notification and cooperation requirements are spelled out for interactions with them on the part of federal agencies.

Given that the federal contingency plans are just that -- federal -- the exclusion of other levels of government and other organizations from them is reasonable. The coordination requirements set out in the Federal Contingency Plans are likewise reasonable attempts to bring these other groups into the federal oil spill response setup to the extent they can be without going into complex intergovernmental agreements.

The efforts of the OSC to develop coordination and cooperation with these other groups in the PUERTO RICAN incident appears to have been generally effective. Contact with the California Department of Fish and Game, the lead agency under the state's contingency plan, generally was timely and complete. Moreover, cooperation with this department, the Regional Water

Quality Control Board, and local governments was generally effective in the planning for the return of the forebody to San Francisco.

A potential interorganizational boundary issue arose in the PUERTO RICAN incident on November 7 when the Regional Water Quality Control Board issued a cleanup and abatement order requiring, among other things, that the forebody of the PUERTO RICAN be kept out of state waters (i.e., more than three miles offshore) unless authorized by the board's executive officer and the state Department of Fish and Game. This occurred four days after the vessel owner's representative had first requested OSC permission to bring the forebody into San Francisco Bay. The board's actions could have had the effect of negating any plans for returning the forebody to the Bay that might have been in effect at that time. As it turned out, the order apparently had no major effect on the decision to bring the forebody into the Bay other than to add another party to the negotiations and discussions.

Over the next several days the OSC met with representatives of the PUERTO RICAN's owners, the Regional Water Quality Control Board, the state Department of Fish and Game, and others to discuss the handling of the return of the forebody. These meetings effectively allowed the concerns of the board and Fish and Game to be considered along with those of the OSC and the ship owner. This in turn lead to all concerned parties approving the ship owner's plan for bringing the forebody into the Bay. Through coordination and cooperation a major interorganizational

turf battle was avoided.

It may be that the potential for such interorganizational problems could be lessened in advance. Based on the experience gained in the PUERTO RICAN incident, the Coast Guard may wish to develop a Memorandum of Understanding with the Regional Water Quality Control Boards and the Department of Fish and Game, addressing the techniques to be followed in such cases in order to fully address the concerns of these agencies. The Coast Guard may wish also to determine whether there are any other state, regional, or local agencies with which it should develop agreements regarding oil spill response and related activities.

Conclusion

The response to the PUERTO RICAN incident indicates that the structure established by the Federal Oil Spill Contingency Plans can be effective in preventing major impacts from oil spills. At two key points, however, the structure broke down, and these points were unfortunately associated with the breakup of the ship and the reversal of the coastal current regime.

On the positive side, the organizational arrangements effectively eliminated interorganizational conflicts relating to boundaries (turf) and goals. With some relatively minor changes in operational procedures and relationships, as described above, the organizational structure relating to federal oil spill response should fully allow effective oil spill response actions.

Damage Assessment Status

The greatest concern of all parties involved in any oil pollution incident (aside from human safety) is the prevention of damage to the environment. From the perspective of federal and state governments, damages, in the form of loss of resources, mitigation and cleanup costs, must be paid for. From the viewpoint of the responsible party (ship or cargo owner), such costs should be avoided. But when they are incurred, they must be carefully documented by the government agency attempting to recover them.

The most difficult and important part of measuring the environmental impact of an incident is quantifying the damage and assigning dollar values to killed or damaged organisms and lost habitat, or lost commercial fishing, recreation or tourism days. This task is complicated by the fact that while it is in the best interest of the public, represented by government agencies, to recover as much money as possible, the goal of the ship and cargo owners is to prevent operating costs (paying for cleanup or damage) from reducing profit. To solve this possible source of conflict, independent academic or research institutions are often used to conduct the necessary studies.

In order to measure the impacts of the PUERTO RICAN incident, a variety of damage assessment studies have been undertaken by federal and state agencies, academic and research organizations and private consulting firms (in behalf of the owners of the ship and its cargo). There are many pending suits against the ship owner (Keystone Shipping) by the state and federal government for damages, as well as by injured parties and the

family of the missing crewman. As a result, much of the specific information resulting from dam-age assessment studies will not be made public until cases are settled or tried. For the purposes of this report, we will briefly describe each study and its purpose and, if available, present a summary.

Point Reyes Bird Observatory/International Bird Rescue

Purpose: Summarize information on impacts of PUERTO RICAN oil spill on marine birds and mammals in the Gulf of the Farallones and to assess bird and mammal populations at the Farallon Islands and in the open waters of the Gulf of the Farallones.

Findings: Between November 7 and 19 there were approximately 1310 oiled birds picked up off the beaches (both dead and alive) in the Gulf of the Farallones. Of these 624 were taken alive to the Fort Cronkite Rehabilitation Station where half of them were treated and released. Since a significant proportion of the recovered dead birds (of some species, especially scoters & murres) were not oiled, it is possible that their mortality may be due to other causes.

Based on aerial surveys of seabird densities in the Gulf of the Farallones, it is estimated that 4,543 murres and auklets were killed or disabled in the Gulf of the Farallones as a result of this incident.

15 oiled elephant seals were observed on the Farallones and aerial sightings of Harbor and Dall's Porpoise, Risso's, Pacific White-sided and Northern Right Whale Dolphins, and Sperm Whales in the Gulf of the Farallones were reported for the period of the incident.

Gordon L. Chan, College of Marin, Department of Biology

Purpose: Determine the impact of the PUERTO RICAN incident on invertebrate populations along the coastline of Marin County.

Results: Surveys of oiled and non-oiled beaches indicate no differences in distribution or density of invertebrates. Those beaches for which the author had pre-spill baseline information do not appear to have been affected by the spill.

Bodega Marine Laboratory (University of California)

Purpose: Study the effects of the PUERTO RICAN oil spill on beach sediments, bivalves (mussels, clams, oysters), barnacles benthic invertebrates, Bodega Marine Lab seawater system, shorebirds (sanderlings and marbled godwits), and saltmarsh plants in

Bodega, Tomales and elsewhere studying longer term effects and recovery from the spill.

Results: Preliminary results of oiling of part of a sanderling population that has been carefully studied over the past 10 years shows an associated decrease in numbers at study sites. Other longer term data will not be available for months to years.

Woodward Clyde Consultants for Chevron, Keystone Shipping

Purpose: Study effects of oil spill on California Fish Growers salmon aquaculture program in Estero de Americano following reports of oily foam in the estero.

Results: Analysis of water samples from the estero and reservoir did not reveal substantial amounts of petroleum hydrocarbons.

Purpose: With Bodega Marine Lab - collect and archive samples of beach sediments and a variety of marine organisms from areas affected to compare with areas known not to be affected by the spill.

Results: Essentially no oil in beach sediments. Clams from Bodega Harbor contained small amounts of hydrocarbons which may have come from a variety of sources including the PUERTO RICAN. One group of mussels from Bodega Head showed "elevated concentrations, probably from the PUERTO RICAN oil spill."
Oiling of part of a sanderling population that has been carefully studies over the past 10 years with associated decrease in numbers at study sites.

University of California at Davis

Purpose: Investigate the toxic effects of oil on seabirds (loons, common murres) by analyzing blood samples and to compare breeding success of oiled with non-oiled birds.

Results: Not yet available

California Department of Fish and Game

Purpose: Documenting the effects of the spill on biological resources and habitats onshore and in state waters. Wardens, technicians and scientists surveyed the coast during the incident to record presence of oil and direct affects on organisms or habitats (beach sand, mussel and clams collected)

Results: Proprietary and will not be made available until all state claims are resolved.

San Francisco Bay Regional Water Quality Control Board
(Contracted to University of California at Berkeley)

Purpose: Measure effects of spill on organisms in the water column including plankton.

Results: Proprietary and will not be made available until all state claims are resolved.

National Oceanic and Atmospheric Administration, Sanctuary Programs Division (Contracted to Sterling Hobe Corp., Washington, D.C.)

Purpose: Assessment of damage to the Point Reyes-Farallon Island National Marine Sanctuary. Evaluating effects of original spill and the chronic leak from the sunken stern. Assessment will include an economic evaluation of the damage.

Results: Not yet completed but may be proprietary

Additional research may be in progress or have already been completed.

Conclusion

Although the PUERTO RICAN tanker explosion, spill, breakup and sinking was a serious incident, it was far from being a worst case scenario. The material spilled, while not high viscosity crude oil of the sort that produces serious damage to beaches, coasts and wildlife, did contain material toxic enough to kill thousands of birds and to oil shellfish beds in Bodega Bay. Bunker fuel oil from the sunken stern continues to leak into the waters of the Point Reyes-Farallon Islands National Marine Sanctuary, and the possibility exists that an additional nearly one half million gallons of oil product remains in the stern.

The costs associated with this incident are high. According to Keystone Shipping Company's insurance broker, the cost of cleanup, is in excess of $5 million (including the tow back to port of the bow section and Clean Bay's charges of nearly $2 million), although the cargo unloaded from the bow has been valued at $3.9 million. In addition, the ship was insured for $35 million, and additional claims filed against Keystone Shipping and Chevron, U.S.A. for environmental damage (by state and federal governments), personal injury or loss (by the San Francisco Bar Pilot and PUERTO RICAN crew or their families), and salvage claims (by tug owners) may push the total dollar cost of all elements of the incident to as much as $150 million dollars.

Had this incident involved more viscous and damaging crude oil and if it had occurred at almost any other time of the year, when the seabird, marine mammal and fisheries resources were more numerous and therefore at greater risk, the damage to the

environment and resulting legal damage claims might be much higher.

This report has focused on specific responses to the PUERTO RICAN incident. It has identified a number of problems encountered in dealing with the explosion, fire, spill and sinking of the vessel and made recommendations which are designed to improve responses to future incidents.

1. Offshore fire fighting capability does not exist in the Bay Area and the moderate weather conditions at the time of the explosion and fire made it possible to use fireboats that normally are restricted to the Bay. In more severe conditions, the fire likely would have continued until the entire ship sank.

This problem can only be solved with a vessel with offshore capability based in the Bay Area and available for fire fighting (and perhaps towing, spill cleanup and oil storage) in waters off of Central and Northern California.

2. Emergency offshore towing in this region is provided only by vessels of opportunity. The PUERTO RICAN nearly drifted ashore before a tug that happened to be in the area was able to tow it offshore. In addition, there was no plan regarding a location to which it could be towed to minimize danger to the environment.

A multipurpose, dedicated vessel that is based in the Bay Area would have prevented these risks. A plan should be developed to identify offshore areas to which damaged or distressed vessels can be towed with minimal or no risk of environmental damage.

3. Information regarding resources at risk in the area in which the incident occurred was incomplete and out of date, limiting early decision-making on potential damage to the environment.

A detailed catalog and maps of resources (organisms and habitats), their seasonality and sensitivity to oil should be developed and computerized for ease of periodic revision (with the assistance of local resource experts).

4. Predictions of the oil spill movement in this incident failed to anticipate a severe current reversal. Lack of previous oceanographic research on offshore currents and real-time information on spill location at night reduced predictive effectiveness.

A research program is needed to develop a better understanding of circulation patterns in the Gulf of the Farallones and the rest of Central and Northern California. Telemetry drifter buoys should be utilized to track spill movement under poor visibility conditions.

5. Offshore cleanup capability was seriously limited by weather and equipment availability in this incident. Much valuable time was lost in bringing in equipment from out of the region. Difficulties were encountered with chartered equipment refusing to respond in bad weather or being too far from the site of the spill.

The oil industry should base its own offshore cleanup vessel and barges in the Bay Area for quick response and should develop plans for the staging of booms and other materials in areas of high risk (e.g., harbor and river mouths).

6. The decision to apply oil dispersants was made in the absence of complete information regarding potential damage to the environment from oil or toxicity of the dispersed oil.

The state should develop a program to determine the acute and chronic toxicity of dispersants and dispersed oil, create a library of information on dispersant effectiveness and toxicity, and develop guidelines regulating conditions for dispersant application and monitoring.

7. The sunken stern continues to leak bunker fuel oil into waters of the Marine Sanctuary and nearly half a million gallons of additional oil product may also be in the stern.

The Coast Guard and/or the ship owner should be required to perform a survey of the stern, attempt to stop the leak(s) and make recommendations regarding the remaining oil product on board.

8. The direction of the movements of the PUERTO RICAN by the On-Scene Coordinator (OSC) required the presence of a representative of the OSC at all times during the incident. At one of the most critical periods of the incident, the OSC representative was forced by weather conditions to leave the scene and this is when the tug violated the Coast Guard boundaries and the PUERTO RICAN sank.

In order to maintain total control of a pollution incident and vessels involved in it, the On-Scene Coordinator must have representative present at all times. It should be possible to develop a system for delegation of several representatives, or to have a designated representative appoint a replacement if he must leave the scene.

9. The tug towing the PUERTO RICAN crossed boundaries established prohibited areas and spent almost half a day in violation of Coast Guard orders, north and east of bounded areas. There appear to have been no written copies of the orders establishing these boundaries.

Procedures should be established to require that explicit orders relating to Coast Guard intervention authority be in writing and that copies of such orders be delivered to vessel owners or their representatives and other interested parties.

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APPENDIX

CHRONOLOGY OF EVENTS

31 OCTOBER

WEATHER/SEA STATE

ON SCENE

seas: light from NW, low westerly swell

winds: NW, 10 knots

visibility: 10 miles, clear

barometric pressure: 1021.7 mb, rising

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environmental buoy 12: wind direction: NNW
wind speed: 30-40 knots

environmental buoy 26: wind direction: WNW;
wind speed: 25 diminishing to 5 knots

0324 At 0324 hrs on 31 October 1984 the oil product transport vessel PUERTO RICAN, en route to New Orleans, Louisiana, from Richmond, California, suffered 2 explosions at the Pilot Buoy #1, 8.5 miles west of the Golden Gate Bridge. At the time of the explosion the vessel was filled to 25% of its oil product storage capacity (91,984 barrels or 3.86 million gallons of refined oil products in addition to carrying 8,500 barrels or 357,000 gallons of Bunker C fuel oil). The explosion rendered the vessel dead in the water and burning from forward of the deckhouse to the bow, and shot flames several hundred feet into the air, folding back over 10,000 square feet of deck, exposing the oil storage compartments beneath. The vessel temporarily lost pumping capabilities and was unable to fight the fire.

A United States Coast Guard (USCG) C-130 fixed wing aircraft flying to the west near the Farallon Islands witnessed the explosion and immediately proceeded to the
0334 scene. Arriving 10 minutes later, aircraft personnel assumed the role of On-Scene Commander, coordinating the search and rescue operations of the responding vessels.

USCG helicopter and response vessels were immediately underway to assist in rescue of personnel. The pilot boat SAN FRANCISCO, which at the time of the explosion was picking up the bar pilot who had guided the PUERTO RICAN out of San Francisco Bay, was able to rescue two men from the water who had been blown off the boat by the explosion. A third man who had been accompanying them at the time of the
0354 explosion was never found and is presumed dead. Thirty minutes after the explosion a USCG helicopter arrived on the scene and transported the two injured men ashore for medical treatment.

0414 Fifty minutes after the explosion the tug HARRY M, which had been stationed nearby at the San Francisco sewage outfall construction site, arrived on the scene and began searching for survivors. A few minutes later two USCG vessels (41403) and (30606) arrived. The tug HARRY M, larger than the USCG vessels and equipped with fenders on her bow, was able to repeatedly approach the stern of the PUERTO RICAN close enough to allow the majority of the ship's personnel to jump on the tug. Other personnel were rescued from lifeboats.

The USCG Group San Francisco notified the Marine

Safety Office (MSO) of the explosion and fire and, in accordance with the mobilization for a potential pollution event, notified the Bay Area oil industry clean up

0355 cooperative, Clean Bay, at 0355 hrs. Within one-half hour of notification Clean Bay manager Jack Mortenson had contacted Bay Area Clean Bay personnel, requested use of the oil spill response vessel MR. CLEAN II, stationed in San Luis Obispo, from Clean Bay's Southern California counterpart Clean Seas, along with one truckload of dispersant (COREXIT 9527) and the oil dispersant application plane from its base in Arizona.

0440 At 0440 hrs the On-Scene Commander requested information on the speed and direction of the ship's drift. This information was not immediately available.

The fire continued to rage from forward of the deckhouse to the bow, but partial restoration of pumping capabilities on board the PUERTO RICAN allowed crew members to direct two fire hoses at the main fire surrounding the #6 center tank.

0442 At 0442 hours USCG vessel 41403 was directed by the On-Scene Commander to suspend its own rescue operations and begin fire fighting. The attempt was not fully effective as its fire monitor was not powerful enough to shoot water up

0500 to the base of the fire. At 0500 the ship appeared to be buckling due to weakening of the metal amidships from the heat of the fire. The ship experienced several jolts which

0515 dropped the stern lower in the water until by 0515 hrs only

four feet of freeboard remained at the stern. The USCG vessel 41403 concentrated its efforts on cooling the sides of the ship to prevent further buckling. The unusually calm seas on the 31st allowed more powerful fireboats, the fireboat CITY OF OAKLAND and a Navy YTB, intended for use in San Francisco Bay, to leave the Bay and arrive on scene at approximately 0600 hours. Both fireboats combated the blaze for several hours until electrical system problems halted
0930 the efforts of the CITY OF OAKLAND at 0800 hrs. At 0930 hrs the Navy YTB fire boat was replaced with another YTB when the first suffered damage to its fire monitor mast.
0530 At 0530 hrs the National Oceanographic and Atmospheric Administration (NOAA) Scientific Support Coordinator (SSC) stationed at the San Francisco MSO contacted the NOAA/HAZMAT national oil spill response center in Seattle, Washington, requesting a trajectory prediction for a potential oil spill from the burning vessel's present location. The NOAA/HAZMAT office was given 37-45N, 122-50W as the ship's coordinates.

Since the explosion the USCG Vessel Tracking Service (VTS) had been following the PUERTO RICAN'S movement on radar, enabling the MSO to calculate the ship's drift at
0521 046T, 1.7 knots. At 0521 unidentified personnel on scene suggested towing the vessel out of the traffic lane into shallower water. The MSO responded that the vessel should be towed out to sea as mitigation for a potential oil spill. The tug SANDY M offered to assist in this and at 0631 hrs attached a tow line to the stern of the PUERTO RICAN since access to the bow was prevented by the fire. The towing

began at position 37-47.7N, 122-36.6W.

0650 At 0650 hrs HAZMAT personnel reported their initial spill trajectory, calculated using wind information from two National Weather Service (NWS) environmental buoys, #12, off of Half Moon Bay and #26 off of the Golden Gate, and tide and current information. (Source of the tide and current information for the initial trajectory was not identified.) Any oil spill at the location given was predicted to move south and parallel to the coast.

COMMENT The original coordinates for the burning tanker which were given HAZMAT were incorrect. At 0630 hrs the PUERTO RICAN was at position 37-47.7N, 122-36.2W, roughly eleven miles east (closer to shore) than the position reported to HAZMAT. It is unknown what the spill trajectory from the ship's actual location would have been, but it must be noted that in the three hours that elapsed from the time of the explosion to the time a tow was attached to the ship, the PUERTO RICAN had drifted 2.8 miles to the northeast, to within 3.8 miles of Point Bonita on the Marin Headlands.

0700 At 0700 hrs the NOAA/HAZMAT office led by Dr. Jerry Galt began an actual computer model run to predict spill trajectory. The model incorporated wind and current data and the weather forecast with current circulation models for the Gulf of the Farallones. A NOAA contact in Louisiana, Dr. Ed Overton, predicted that any spilled cargo from the PUERTO RICAN would behave similarly to hydrocarbons and should be treated as such in the spill trajectory model.

COMMENT This prediction was later proven inaccurate for a portion of the spilled product, by the observation that emulsification of the spilled product reduced the ability of wind to move and disperse the oil. This also served to increase the oil residence time in the water and reduce the amount of wind-driven oil which came ashore at certain beaches.

Based on the results of the computer run spill trajectory model, at 0845 hrs NOAA/HAZMAT recommended to the SSC that the burning tanker be towed south of the Farallon Islands. In the event of a major oil spill the southerly flowing currents existing in the area would carry the spill away from the Farallon Islands. The southerly flowing California Current which typically has reversed to the northward moving Davidson Current at this time of year in the Gulf of the Farallones had been stalled between Monterey and the Bay Area.

After the PUERTO RICAN was attached to the SANDY, under the direction of the Coast Guard, the tug proceeded away from shore on a heading of 250 T in order to keep any spill from the vessel away from the California coast. By 0930 hrs the SANDY was heading 268 T at a speed of 3.8 knots.

COMMENT The initial course taken by the SANDY and the PUERTO RICAN would have taken the vessels within one mile of the environmentally sensitive Farallon Islands and into the Point Reyes-Farallon Island Marine Sanctuary. While the initial intention was to move the PUERTO RICAN as rapidly as possible away from the shore, the continued movement on this course suggests a lack of awareness of the environmental sensitivity of this area.

0925 At 0925 hrs NOAA/HAZMAT was notified by the SSC of the ship's heading and location at which time NOAA/HAZMAT stressed the importance of towing the PUERTO RICAN much further south of the Farallon Islands and suggested a heading of 230-240 T. Ten minutes later at 0935 the SSC notified the **1042** Operations Center of this suggested heading. At 1042 hrs when the SANDY was 10 miles east of

the Farallon Islands, she began towing southwest on the suggested heading.

COMMENT No explanation has been given for the one hour delay in responding to NOAA/HAZMAT's recommendation to tow the PUERTO RICAN south of the Farallon Islands.

By midmorning the concentrated effort to extinguish the fire was partially successful, allowing USCG personnel to
1100 board the vessel until approximately 1100 hrs when the fire
1220 again flared, forcing evacuation of the ship. At 1220 hrs the ship was again boarded and on-board fire fighting efforts continued. The entire vessel was listing to port and twisting in the midsection causing the stern to have an even greater list to port.

1211 At 1211 hrs the On-Scene Coordinator (OSC) requested information from NOAA/HAZMAT via the SSC on the required distance the PUERTO RICAN must be towed from land to prevent shoreline impact from a spill. The OSC was concerned that while the fire was not yet under control the ship was moving beyond the range of logistic support for fire fighting. HAZMAT recommended that at a minimum the ship should be towed to the abandoned dump site nine miles south of S.E. Farallon **1430** Island at position 37-32N, 122-59W. At 1430 hrs the tow was directed to this dump site on a heading of 190 T and reached it at 2030 hrs on the 31st.

COMMENT Recommending this dump site as the ship's destination indicates an apparent lack of knowledge of the 12 mile boundary around the Farallon Islands that encloses the Point Reyes-Farallon Islands National Marine Sanctuary since the abandoned dredge spoil dump site is located 2.5 miles inside the marine sanctuary boundary.

Throughout the day, mobilization of spill response equipment continued. By 1400 hours the Globe Air dispersant application plane was standing by at Oakland Airport; Clean Bay's Wolasep skimmer along with a 750-foot boom and a barge were standing by at Fort Baker (under the Golden Gate Bridge); the oil skimming vessel SPILL SPOILER I and a 440-foot boom were on standby at Martinez (inside San Francisco Bay); the Clean Seas oil response vessel, MR. CLEAN II, was underway with an estimated time of arrival of 0300 hrs NOVEMBER 1 and the cleanup vessel SPILL SPOILER II was skimming the trail of oil behind the towed PUERTO RICAN. The SPILL SPOILER II collected 10 barrels (420 gallons) of oil/water emulsion during skimming operations on the 31st.

1600 By 1600 hrs all visible fire had been extinguished on the PUERTO RICAN, but hot spots and/or fire were suspected in the tanks immediately forward of the deckhouse.

2027 The NOAA/HAZMAT updated spill trajectory at 2027 hrs predicted a southerly and shoreward oil movement but did not predict any shoreline impact for the two day forecast period.

1 NOVEMBER

WEATHER/SEA STATE

ON SCENE

seas: 3-5 ft swells

winds: south 5-10 knots, light and variable

visibility: 10 miles

barometric pressure: 1021.1 mb

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environmental buoy 12: wind direction: NNW switching to SSW
wind speed: 25 knots diminishing to 5 knots

environmental buoy 26: wind direction: WNW switching to SSE
wind speed: 10-20 knots

forecast: expect increase in winds and seas over next 24 hours

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0500 At 0500 hrs on 1 November MR. CLEAN II arrived from Southern California, 25 1/2 hours after the initial

0800 explosion. At 0800 hrs HAZMAT was notified that the PUERTO RICAN's position was 37-21.1N, 122-56.9W and recommended that the ship remain at its present location or move further west, but it should not be towed any further north. At those coordinates the ship was positioned over a large submarine canyon. HAZMAT personnel anticipated that the canyon would act to direct any spilled oil out to sea if the Davidson Current resumed its northerly advance into the area after a spill occurred.

During the morning a USCG inspection and fire team boarded the PUERTO RICAN and reported on the ship's

condition. Their survey revealed a large hole created when the explosion folded back a 120 foot long by 90 foot wide piece of center deck. Within this vast opening the empty #6 center tank floated freely in a pool of heavy lube oil, light mustard in color, which was created when the explosion ruptured the adjoining starboard wing tanks, originally containing 9,348 barrels (392,616 gallons) of OLOA 246B. The surface of this oil pool moved up and down with the seas "indicating possible free communication with the ocean." (OSC Report, page 8)

1330 At 1330 hrs a light brown trail of small oil globules was noticed leaking from below the ship's water line on the port side, 50 feet forward of the deck-house. MR. CLEAN II was positioned in the path of this oil and began skimming oil.

The use of dispersants was discussed but not acted upon as the OSC did not feel that the amount of oil being released justified such action. Dave Kennedy, of the NOAA Seattle office, came to the Bay Area to assist the SSC and for three days spent the majority of his time gaining pre-approval for the use of dispersants in the event of a spill. (Ed Simmons, personal communication)

The bow of the PUERTO RICAN was listing 15 degrees to port and the stern, aft of the explosion site, was listing 20 degrees to port.

1530 At 1530 hrs a Navy dive team performed a partial inspection of the integrity of the hull. A survey of the starboard side of the hull revealed two bends in the mid-

body near the #6 center tank. The survey was limited by rising seas and sharks and did not include the port side from the 20 foot draft to the keel, leaving unanswered questions regarding the entire hull integrity.

1950 At 1950 hrs the MSO instructed the tug SANDY with PUERTO RICAN in tow to remain south and west of 37-25N and 123W.

COMMENT No explanation was given in the OSC Report for the MSO decision to allow movement of the ship four miles north of the limit suggested by NOAA/HAZMAT at 0800 that day.

Late in the day the PUERTO RICAN salvors communicated their desire to the OSC to tow the PUERTO RICAN into San **2004** Francisco Bay for salvage. At 2004 hrs the Coast Guard District 12 Commander (Cdr. Glass) requested intervention authority from the Coast Guard Commandant in Washington, D.C., which would authorize the District 12 Commander to prevent the towing of the PUERTO RICAN ashore, or to require towing it seaward if it appeared "in imminent danger of **2100** sinking." This authority was granted at 2100 hrs.

2 NOVEMBER

WEATHER/SEA STATE

ON SCENE

seas: west, 8-9 feet

wind: south southeast 30-35 knots

visibility: 2-3 miles, cloud cover 1.0

barometric pressure: 1018.9 mb

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environmental buoy 12: wind direction: S to SSE
wind speed: 10 knots increasing to 30-40 knots

environmental buoy 26: wind direction: S to SSE
windspeed: 30-40 knots

forecast: weather front decreasing tomorrow

On the morning of November 2 a significant brown oil leak was observed originating from the #4 port forward and aft tanks which appeared to the morning's boarding party to have "free communication with the sea." (OSC Report, page 32) POLREP 9 (USCG Pollution Report 9) reported oil leaking from the #3 port tank and sloshing overboard from the #6 open compartment.

COMMENT These observations bring the integrity of the PUERTO RICAN hull seriously into doubt. When the PUERTO RICAN left the Bay Area on the 31st, the #4 port forward tank was empty. In order for oil product to leak from this tank it must have been breached at the bulkhead common with the #4 port aft tank or the bulkhead shared with the #6 center tank area, in addition to the opening in the hull. Such an extensive system of cracks and openings suggests massive structural failure from which a major break up could be predicted. The Coast Guard had intervention authority to tow the vessel further out to sea if a break up was imminent. Given the combined observations of the of November 1 and 2 (possible

communication with the sea in the #6 center tank, free communication with the sea in the #4 port aft and forward tanks, and bends and twists in the hull observed by divers), it is unclear why the OSC allowed the worsening PUERTO RICAN to remain south of the Farallones and did not use intervention authority to tow the damaged vessel further west.

Oil from the leaking tanker created a 200-yard-wide brown slick which trailed behind the vessel for one to two miles. Eight to ten foot seas prevented skimming operations by MR. CLEAN II, which returned to Half Moon Bay. Dispersant use was discussed that morning but decided against as the heavy seas appeared to dissipate the oil within two miles. The NOAA/HAZMAT trajectory predicted a southerly spill movement. It was later estimated that 600-700 barrels (25,200-29,400 gallons) of product leaked from the damaged vessel on the 2nd.

During the day EPA directed the collection of product samples for dispersant effectiveness tests to be performed by a Los Angeles testing laboratory, TetraTek. (T. Brubaker, personal communication)

1130 At 1130 hrs the OSC again directed the vessel owner's representative to keep the PUERTO RICAN south and west of 1245 37-25N, 123W. At 1245 hrs the tug SANDY crossed the eastern boundary of this designated area on an approximate heading of 120 T. The tug continued moving east for the next five hours, accompanied by the USCG Cutter CAPE CROSS, the tug SEAHORSE, and the tug TITAN which was attempting to take over the tow from the SANDY. At 1700 hrs the tug TITAN fouled her screw with a line and, unable to clear it 1745 because of the heavy seas, returned to San Francisco Bay.

At 1745 hrs the SANDY was roughly three miles east of the OSC's designated eastern boundary when it turned and began towing almost due north.

COMMENT No indication has ever been given that any of the vessels on scene, especially the Coast Guard cutter, recognized that the PUERTO RICAN had strayed beyond the OSC's designated area, and notified either the SANDY or the MSO. While it is reasonable to assume that personnel were directing their attention to the attempted transfer of the tow to the tug TITAN, there is no explanation for the continued boundary violation after the TITAN left the scene to return to San Francisco.

Throughout the evening of the 2nd, the tug SANDY, with her Coast Guard escort, continued on a north, northwest

2200 heading. At 2200 hrs the vessel was at position 37-25N and 123W, the northeast boundary of her designated area. The tug, with the PUERTO RICAN in tow, and her escort continued

2245 north. At 2245 hrs the USCG Cutter POINT BARROW relieved the

2320 CAPE CROSS. It was not until 2320 hrs that the MSO on shore realized that the vessel had left the designated area, almost 11 hours after the event. "Radio problems" (OSC oral report to the Regional Response Team (RRT), January 24, 1985) delayed communication as the MSO attempted to instruct the POINT BARROW to contact the SANDY and instruct her to return to the area south of the designated area. The orders were eventually relayed and the SANDY completed the turn south just before midnight.

3 NOVEMBER

WEATHER/SEA STATE

ON SCENE

seas: westerly, 7-10 ft swells

winds: westerly, 10 knots

visibility: 10 nm

barometric pressure: 1020.6 mb (rising)

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environmental buoy 12: wind direction: S switching to NNW
wind speed: 1-2 knots

environmental buoy 26: wind direction: S switching to WNW
wind speed: 10-20 knots

A few minutes after midnight the crew of the SANDY noticed that the PUERTO RICAN's pilot house lights appeared farther away than normal. Continued observations determined that the stern section of the ship had separated from the

0015 bow. At 0015 the SANDY reported that the vessel had split and that the tow line had separated from the bow. (This later event was reported only once, by the MSO (Capt. Bishop) at the RRT meeting on 24 January 1985.)

0300 By 0030 hrs the Coast Guard Operations Center, California Department of Fish and Game (CDFG), California Office of Emergency Services (OES), RRT and Clean Bay had been notified of the breakup. Clean Bay was asked to mobilize its spill response equipment.

A large slick was immediately noted by vessels on the scene. The maximum amount of oil possibly released during

the break up included 39,763 barrels (1,670,046 gallons) of product and 8,500 barrels (357,000 gallons) of Bunker C fuel oil. This potential discharge included 9,348 barrels (392,616 gallons) of OLOA 246B, which had been stored in tanks #4 starboard aft and forward, breached by the initial explosion; 11,730 barrels (492,660 gallons) of WITCO 233 TR from tanks #5 port and starboard; 4,614 barrels (193,788 gallons) of Polybutene 24 from tank 4 port aft; 10,425 barrels (437,850 gallons) of Alkane 60 from 5 center port tank; 3,425 barrels (143,850 gallons) of Alkane 56 from tank #5 center starboard; and 211 barrels of assorted diesel, lube and hydraulic oils. An undetermined amount of product was consumed in the initial fire, but one estimate of the amount of oil burned was "several thousand to 10,000 barrels", (84,000 to 420,000 gallons), considering the fact that during the fire a large portion of the oil surface in the #6 center tank area was exposed to the air. (J. Mortenson, Clean Bay, personal communication)

0140 At 0140 hrs the stern was assumed to have sunk when its lights could no longer be seen and it was lost from the radar at position 37-30.6N, 123-02.2W. In March 1985, the stern was located on the bottom at position 37-30.6N, 123-00.7W in 1,246 feet of water, 11.5 miles SSW of S.E. Farallon Island and 25 miles west of Pillar Point.

0210 At 0210 hrs the OSC requested approval for use of dispersants from the Coast Guard chairman of the RRT. Approval was required from the Coast Guard and EPA co-chairmen of the RRT and from the CDFG. Shoreline impact was

not predicted, but the OSC expressed concern that oil would affect grey whales seen in the vicinity and/or move south into the sea otter range.

COMMENT This justification for the use of dispersants presents conflicting reasons. The attempt to prevent an impact on two wildlife populations, one at the spill site and one a distance away, assumes that in the absence of any toxicity data dispersed oil in the water column is less toxic than oil itself. At the time of this initial request mechanical cleanup of the spill was still a possibility, although high seas may have prevented any actual skimming operations.

0320 At 0320 hrs MR. CLEAN II was en route to the scene when she strayed onto a reef outside of Half Moon Bay Harbor, and a large wave knocked out several of the vessel's ports, damaging radio and radar and injuring several crew members. (DeSantis, 1985) The ship was forced to return to Half Moon Bay for repairs, destroying any chance of immediate mechanical clean-up of the spill.

COMMENT At this point in the response, mechanical cleanup was abandoned in preference to chemical dispersion. Another option would have been to request additional high-seas response equipment from other areas.

0400 At 0400 hrs EPA (Terry Brubaker) was contacted

0600 regarding approval of dispersant use, and by 0600 hrs both EPA and CDFG had given their approval, conditional on the overflight observations at daylight.

0730 The 0730 hrs Coast Guard overflight found a large slick with two long stringers extending from it located at the approximate position where the stern sank . One oil stringer extended southwest about 11 miles to the location of the towed forebody along the course taken by the tow after the breakup and the other stringer extended 12 miles SSE along

the approximate path the PUERTO RICAN had taken the evening of 2 November.

COMMENT It is plausible that the reported discharge of oil from the PUERTO RICAN on the 2nd, which dissipated within two miles of the ship during the day, increased during the evening to such an extent that the discharge was not dissipated by wind and wave action as the ship was towed north. This may indicate that the ship began to split and release oil soon after dark.

1000 At 1000 hrs final approval for dispersant application was given at a meeting held to review and approve the dispersant use plan, which was attended by the OSC, SSC, NOAA, CDFG, EPA and Clean Bay.

COMMENT The dispersant use plan was incomplete, having been filled out prior to the spill before any specifics on the spill location, size or biological resources at risk were known. The dispersant use plan section which was supposed to contrast the environmental impacts of the dispersant-treated portion with the untreated portion of the spill indicated that there would be no environmental impact to any resources. A shoreline spill impact anywhere (which was not predicted in the decision to use dispersants) was anticipated to have a negative impact on all potential resources. The information given on the form emphasized the lower cost of dispersing oil at sea as opposed to mechanical cleanup. Only one dispersant was available, COREXIT 9527, which was anticipated to disperse all products on board with the exception of Polybutene, which comprised up to 4,614 barrels (193,788 gallons) of the spill. No attempt was made to predict the movement of the dispersed oil in the water column or on the surface.

1120 At 1120 hrs a boat chartered by Clean Bay, intended to replace the damaged MR. CLEAN II for water column sampling during the dispersant application, left Half Moon Bay but was soon forced back by heavy seas.

The NOAA/HAZMAT revised trajectory for the oil spill predicted a southeastern drift over the next two day forecast period with no anticipated landfall. Initially this

prediction was realized on the 3rd, for by 1500 hours the main body of the spill and its associated streamers had apparently drifted nine miles to the southeast to the position 37-22.8N, 122-54.2W.

1500 At approximately 1500 hrs the Globe Air dispersant application plane began applying the dispersant COREXIT 9527 over the approximately eight-mile-long southeast stringer of the spill. A total of 22 passes were made, counterclockwise over the spill, flying from south to north. The initial dispersant application rate on the southeast stringer was 5 gallons/acre. After dispersion was observed by personnel in the Clean Bay helicopter, the application rate was reduced to 4 gallons/acre for the main body of the spill. After two passes it was increased back to 5 gallons/acre when the lower application rate was determined ineffective on the northern part of the spill, which was assumed to contain a different type of oil. Roughly half of the main body of the spill was sprayed with the aircraft's entire load of dispersants, 2,500 gallons. Approaching darkness prevented reloading the dispersant plane for another application. (Kirk Miles, Globe Aircraft, personal communication)

1730 At 1730 hrs a debriefing meeting was held for those who witnessed the dispersant application. Participants from EPA, USCG, Regional Water Quality Control Board (RWQCB), NOAA, CDFG and Clean Bay were unable to reach a consensus on the amount of dispersion achieved by the chemical application, but estimates ranged from none to 20-30%.

COMMENT The highest estimate of the amount of dispersion

achieved, 70% (by Pacific Strike Team Commander B. Rome), referred not to the immediate effect observed on the 3rd but rather to the amount of oil estimated to remain the next morning after the combined action of wind, waves and dispersant.

4 NOVEMBER

WEATHER/SEA STATE

ON SCENE

seas: 1 foot

winds: NW, 8-10 knots

visibility: 10 miles

barometric pressure: 1021.7 mb and falling

environmental buoy 12: wind direction: N
wind speed: 25-30 knots

environmental buoy 26: wind direction: NW
wind speed: 25 knots diminishing to 10 knots

A USCG overflight the morning of the 4th identified three separate oil spills. A large yellow/brown slick, determined to be the original spill which had received dispersants on the 3rd, was now estimated to be 30%-35% of its original size and was located approximately 6.5 miles WSW (heading 240 T) from its location at 1500 hrs on the 3rd.

Two other oil slicks, both described as containing thick, dark oil believed to be Bunker C fuel oil (OSC report, POLREPS), were reported by the overflight. One slick containing approximately 20 barrels (840 gallons) of oil was sighted two miles south of the sunken stern and another 50-100 barrels (2,100-4,200 gallons) of heavy, dark oil was found at position 37-26.7N, 122-59.2W.

1000 At 1000 hrs the OSC met with the RRT to discuss any further use of dispersants. It was determined that without

an anticipated shoreline impact and due to the lack of evidence (no water or oil samples taken when dispersant was applied) on effectiveness, no more dispersants would be used.

COMMENT This justification for not using dispersants contradicts the reasons given on the 3rd to use dispersants (to protect grey whales and sea otters) when there was also no anticipated landfall.

The NOAA/HAZMAT trajectory for the 4th was for the oil to "continue to move east during the day and then south."

COMMENT The oil had moved WSW not east from its position at 1500 hrs on the 3rd. It is unclear why NOAA/HAZMAT did not recognize and acknowledge the actual direction of spill movement. It is also interesting to note that by 1500 hrs on the 3rd the spill had drifted to atop the head of a submarine canyon (the same submarine canyon which had influenced NOAA/HAZMAT's original recommendation on where to tow the burning tanker on the 31st). The WSW movement of the spill, which occurred between the 3rd and the 4th, mirrored the WSW orientation of the canyon.

During the morning the tug TITAN relieved the tug SANDY of the tow of the PUERTO RICAN forebody. The OSC shifted the permitted towing area 20 miles to the west, requiring the ship to remain south of 37-25N and west of 123-20W.

No mechanical cleanup of the spill was attempted on the 4th. MR. CLEAN II remained in Half Moon Bay undergoing repairs of the damage caused by the large wave encountered the morning of the 3rd.

5 NOVEMBER

WEATHER/SEA STATE

ON SCENE

seas: confused; swell 10 foot from west

winds: SSW 14 knots

visibility: 6-10 miles

barometric pressure: 1014.2 mb

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environmental buoy 12: wind direction: N shifting to SE in midmorning
wind speed: 10-25 knots

environmental buoy 26: wind direction: NW shifting to ENE in midmorning and SSE by evening
wind speed: 20 knots increasing to 30 knots

environmental buoy 13: wind direction: NNE shifting to SSE during morning
wind speed: 10 knots building to 25 knots

The USCG overflight the morning of the 5th found the major oil slick at coordinates 37-17.5N, 123-09W, approximately five miles WSW (240 T) from the spill location the previous day.

COMMENT The spill movement the night of the 4th was consistent with the trajectory since the afternoon of the 3rd, proceeding further west along the submarine canyon, but contradicted the two-day NOAA/HAZMAT spill trajectory given on the 4th. In HAZMAT's later discussion of the spill movement, this inconsistency is noted but not explained.

Clean Bay began demobilizing their spill response equipment and organization, in anticipation of the continued offshore oil movement and eventual breakup. The tug TITAN continued to tow the forebody within its designated area as a five-mile-long sheen trailed the vessel.

6 NOVEMBER

WEATHER/SEA STATE

ON SCENE

seas: 2-3 foot swells

winds: light and variable

visibility: partly cloudy

barometric pressure: 1013.4 mb

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environmental buoy 12: wind direction: SE shifting to S
wind speed: 40 knots decreasing to 10 knots

environmental buoy 26: wind direction: SE shifting to S
wind speed: 30 knots decreasing to 10 knots

environmental buoy 13: wind direction: SE shifting to SW
wind speed: 25 knots decreasing to 10 knots

Morning overflights on the 6th discovered a ring of yellow/brown oil surrounding the S.E. Farallon Island. This oil was identified as the original main concentration of the spill with the sighting of an empty tank which had been in the main slick since the breakup on the 3rd. The oil had moved 25 miles northeast from its position the previous day.

NOAA/HAZMAT attributed this unexpected, rapid movement of the slick to a "current jet" shooting the spill north, which occurred when a shift to the southerly winds on the 5th coincided with the northerly advance of the Davidson Current into the Gulf of the Farallones.

Immediate re-mobilization of the spill response equipment occurred in response to the oil around the environmentally sensitive Farallon Islands. By noon MR.

CLEAN II, with repairs completed, was en route from Half Moon Bay for the Farallones. The Coast Guard Pacific Strike Team (PST) began preparation for deployment of their oil skimming barrier, Open Water Oil Recovery System (OWORCS) on the 7th.

1410 At 1410 Clean Bay requested that International Bird Rescue establish a bird cleaning station at Fort Cronkhite on the Marin Headlands. This was accomplished using two emergency bird cleaning trailers on loan from the CDFG in addition to other equipment.

1600 MR. CLEAN II arrived on scene at the Farallones at 1600 hrs and soon began skimming oil in five feet of water on the southeast end of the Island. The 2-3 foot swells and calm seas permitted effective skimming.

1800 A Coast Guard overflight at 1800 hrs observed S.E. Farallon Island still surrounded by patches and streaks of oil, which extended from the island to position 37-44N, 122-55W, with the heaviest concentration at 37-43N, 122-55W. Also a substantial two-mile-long sheen was found extending from the vicinity of the sunken stern east (approximate heading 90 T) to within five miles of Pillar Point.

EPA discussed the use of dispersants, but rejected the idea because of the proximity of the spill to environmentally sensitive shorelines. (T. Brubaker, personal communication)

During the afternoon of the 6th several oiled birds were sighted on the Farallon Islands. (PRBO, 1985)

7 NOVEMBER

WEATHER/SEA STATE

ON SCENE

seas: 2-3 feet, increasing

winds: ESE 15 knots, increasing

visibility: .5 miles, heavy fog, light rain

barometric pressure: 1016.7 mb (falling)

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environmental buoy 12: wind direction: W shifting to SE in early morning
wind speed: 8-10 knots

environmental buoy 26: wind direction: SSW shifting to SSE in morning
wind speed: 5-10 knots

environmental buoy 13: wind direction: WSW shifting to SE in early morning
wind speed: 5 knots

Aided by moonlight MR. CLEAN II continued skimming until 0300 hrs, recovering a total of 400 barrels (16,800 gallons) of oil/water emulsion. Skimming was halted when all available storage space on board the vessel had been filled. (Clean Bay had received permission from the Coast Guard to store additional skimmed oil in containers on deck which were not originally intended for oil storage.)

The morning's USCG overflight found the oil patches two to seven miles to the northeast with the major concentration extending in a five-mile-long band from position 37-49N, 23-04W to 37-45N 122-58.9W.

NOAA/HAZMAT recognized a complex current pattern within

the Gulf of the Farallones, but predicted a general north,
1200 northwest movement for the oil. By 1200 hrs the tug APOLLO towing the PST-OWORCS aboard the Clean Bay barge UT-5, along with the USCG Cutters POINT HEYER and POINT CHICO arrived on scene. The rapidly deteriorating weather made operations difficult. At 1440 hrs the PST OWORCS was ready
1500 for deployment, but by 1500 hrs all operations were suspended due to the sea conditions. MR. CLEAN II had been unsuccessful in transferring her skimmed oil to the barge, and she accompanied other on scene vessels back into San Francisco Bay for offloading.

During the afternoon Clean Bay began preparations for boom placement across the entrances to Bolinas Lagoon and Drakes Estero, in anticipation of oil moving north to the Marin coast.

Clean Bay decided that more spill response equipment was needed and requested, through the OSC, the use of Marco V skimmers from the Navy Supervisor of Salvage.

The RWQCB (Region 2) filed a Cleanup and Abatement Order to prevent the forebody from entering state waters without concurrence of the RWQCB and CDFG.

Three hundred oiled birds were sighted at the Farallones on the 7th, and 14 oiled birds (2 dead) were found during beach surveys of the southern Marin coast. (PRBO, 1985)

8 NOVEMBER

WEATHER/SEA STATE

ON SCENE

seas: 6-8 foot

winds: 25-30 knots, west

visibility: overcast

barometric pressure: 1011.1 mb

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environmental buoy 12:	wind direction:	SE shifting to WSW in early morning
	wind speed:	20-30 knots
environmental buoy 26:	wind direction:	SE shifting to SW in morning
	wind speed:	15-20 knots
environmental buoy 13:	wind direction:	SE shifting to W in morning
	wind speed:	15-25 knots

The morning Coast Guard overflight observed a five-mile- long by 250-yard-wide slick bearing 240 T (WSW) 3 miles offshore of Point Reyes. A Point Reyes Bird Observatory (PRBO) overflight that morning also found a 20 mile long slick composed of broken, zigzag patches of oil extending from 9 miles northeast of S.E. Farallon Island to northwest of Point Reyes. A light sheen characterized the majority of the slick, although its western edge contained brown, frothy oil.

Oil skimming equipment, including MR. CLEAN II and the
0400 PST OWORCS had departed San Francisco Bay a little after 0400
0900 hrs and arrived on scene around 0900.

0920 At 0920 hrs MR. CLEAN II found it impossible to recover oil in the 15-20 knot winds and five to seven foot seas. Vessel prop washes and high pressure hoses were used to disperse the oil. No mechanical cleanup occurred on the 8th. At 1145 hours the PST abandoned their efforts to deploy
1430 the OWORCS. By 1430 hrs all response equipment left the spill site, MR. CLEAN II heading for Drakes Bay and the PST returning to San Francisco Bay. During the afternoon of the 8th, two Navy MARCO V skimmers were rigged at Yerba Buena Island for deployment on the 9th.

In anticipation of the oil moving north, Gary Page of PRBO warned Peter Chow of the Bodega Marine Laboratory (BML that oil may be moving into the Bodega Bay area. (Peter Chow, BML, personal communication)

By the 8th, 33 birds had been brought to the Fort Cronkhite oil cleaning center. Beach surveys on Point Reyes reported 57 live and 36 dead oiled birds. (PRBO, 1985)

9 NOVEMBER

WEATHER/SEA STATE

ON SCENE

seas: 2-3 foot, swells 4-6 foot

wind: southwest; light

visibility: good

barometric pressure: 1025.0 mb

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environmental buoy 12: wind direction: SSE
wind speed: 10-20 knots

environmental buoy 26: wind direction: SW shifting to S
wind speed: 10-20 knots

environmental buoy 13: wind direction: W shifting to SSE
wind speed: 10-20 knots

USCG overflights the morning of the 9th found oil slicks clustered around and north of Point Reyes, oriented on an east-west axis. A dark brown stream of heavy oil was located at 38-04N, 123-03W, extending roughly 130 T to the Great Beach on Point Reyes. Light brown oil was in the surf from the site where the oil stringer came ashore to the south of Point Reyes. PRBO photographs taken the morning of the 9th illustrate the USCG observations and identify additional patches of oil to the north near Bodega Head. One oil patch with a radius of 1/4 mile was photographed about 1 mile directly south of Bodega Head. In the same photograph a series of oil stringers appear due west from Bodega Head, approximately 2 miles offshore.

During the morning MR. CLEAN II skimmed oil on the lee

0830 side of Point Reyes. At 0830 hrs two Marco V skimmers, each accompanied by two tugs, and the tug APOLLO towing a 10,000 barrel barge left Yerba Buena Island en route to skimming operations off of Point Reyes. Arriving on scene, about 2
1230 miles south of Point Reyes, at 1230 hrs they commenced skimming after 1/2 hour of preparations. After 30 minutes of skimming one Marco had collected about 30 barrels (1,260 gallons) of oil/water emulsion (a full load) in 13-ft seas with 17 second periods.

COMMENT This sea height, reported by Paul Smith of Tracor Marine, who was on board the Marco skimmers during the operation, is at least six feet higher than the seas reported by the USCG.

During this same period of time MR. CLEAN II abandoned operations in the rough seas and proceeded to the oil slick sighted one mile south of Bodega Head to resume skimming. The Marco V's spent the next 2 1/2 hours attempting to offload their collected oil into the barge. Heavy seas prevented the skimmer's safe access to the barge and offloading at sea was eventually abandoned when the transfer hose fittings were found incompatible with connections on the barge. A 13,600-gallon flexible oil bladder had also been towed on the scene, but the Coast Guard would not allow its use, in anticipation of control problems once the bladder was loaded with oil.

COMMENT This series of events emphasizes the need for proper, functional equipment at the spill site. Had offloading of the collected oil been possible, a much larger quantity probably could have been skimmed on the 9th from the waters near Pt. Reyes, potentially reducing the amount of oil which moved north and came ashore at Bodega Bay.

Unable to offload their oil and collect any more oil at sea the Marco V skimmers proceeded to Bodega Bay. While en
1900 route, at 1900 hrs, the Marco V's received a radio message to proceed immediately to Bodega Bay to commence skimming
1900 operations at the harbor entrance. At 2300 hrs, after arriving at Bodega Bay and offloading their oil, one of the Marco's was skimming oil at the harbor entrance.

By the 9th, 150 oiled birds were under treatment at Fort Cronkhite. Beach surveys on Point Reyes beaches found 75 live and 52 dead oiled birds. (PRBO,1985)

10 NOVEMBER

WEATHER/SEA STATE

ON SCENE

seas: 4-6 foot, 8-13 foot swell

wind: south 15-20 knots

visibility: poor due to wind and rain

barometric pressure: 1018.3 mb

environmental buoy 12: wind direction: SE
wind speed: 10-20 knots increasing to 40 knots

environmental buoy 26: wind direction: S
wind speed: 5-10 knots increasing to 30-40 knots

environmental buoy 13: wind direction: S
wind speed: 20-30 knots

During the night of the 9th/10th a Marco V skimmer worked for five hours at the Bodega Harbor entrance. The
0400 Marco suspended skimming operations at 0400 hrs when the tide turned, oil was no longer entering the harbor, and a line fouled the propeller of one of the support vessels. Personnel on board the Marco reported observing only a sheen entering the harbor and failed to fill the Marco's 30-barrel sump during the night's five-hour skimming operation. Deflection booms from shore were not established at the harbor entrance the night of the 9th because no lights were available to ensure worker safety during such an operation. (J. Mortenson, personal communication)

At first light on the 10th, oil was inside Bodega Harbor

as far north as the boundary of the Bodega Marine Reserve.

COMMENT The oil found inside Bodega Harbor the morning of the 10th entered despite the efforts of V-booms and the Marco V skimmers. This occurrence emphasizes the need for anticipatory work on planning for spill events.

Oil was also reported on Doran Beach (Bodega Bay), extending from the surf line out to the end of the jetty, with particularly heavy concentrations near the jetty, and east to 100 yards past the Coast Guard station. A light oil sheen was found on every tide pool from Mussel Point south to Bodega Point, with a heavy 5-to-12-inch-thick accumulation of light brown oil in the surge channels and tossed up on the rocks. (John Geller, BML, personal communication) A 10-mile-long oil stringer, 1.5 miles offshore, extended from Bodega Head north to the Russian River.

Inside Bodega Harbor, Clean Bay established two booms on the south side of the harbor entrance, one just north of Campbell Cove and the other further inside the harbor on the boundary of the Bodega Marine Reserve. A corresponding deflection boom was placed on the north side of the channel entrance. The strength of the current entering the harbor prevented booming off the entire harbor entrance. A Marco V skimmer with two tow boats and 100 feet of V-boom, and a Clean Bay mini-skimmer patrolled the center of the channel which could not be boomed. A vacuum truck onshore collected oil diverted shoreward by the deflection booms. This arrangement on the 10th was effective in preventing more oil from entering the harbor itself.

0800 By 0800 hrs MR. CLEAN II returned to San Francisco Bay,

abandoning attempts to skim oil in the heavy seas offshore of Bodega Head. Channel depth prevented MR. CLEAN II from entering Bodega Harbor.

During the morning of the 10th, oil entered the Bodega Marine Lab sea-water system intake, located about 200 feet from shore, six feet below mean low tide, in Horseshoe Cove on the west side of Bodega Head. The sea-water pumps were on continuously, creating a large overflow from the surge tanks, which was intended to carry away any floating oil which had entered the system. This overflow procedure combined with the sand filtration system prevented oil from entering the laboratory research facilities.

During the afternoon, attempts to rake oily seaweed from the high-tide line at Estero Americano were hampered by lack of personnel and equipment failures. The estero contains a salmon farm which had shut off its sea-water intake on November 9 at the first reports of oil approaching Bodega Bay.

1600 At 1600 hrs a Coast Guard overflight reported a light brown oil slick in Bodega Bay midway between Bodega Head and Tomales Bay. In anticipation of a 2030 hrs flood tide carrying the oil into Tomales Bay, USCG Pacific Strike Team members staged a boom at the bay entrance, but were prevented from booming off Tomales Bay by the 6-knot tidal current which exceeded the boom capacity. During the afternoon and night of November 10, Tomales Bay received no protection from incoming oil because of the mechanical limitations of the spill response equipment.

COMMENT Adequate spill mitigation planning for this area would have identified in advance the problems that might be encountered in booming off Tomales Bay and developed an alternative method for dealing with oil threatening the bay. Lack of planning rendered the Pacific Strike Team powerless to prevent oiling of Tomales Bay. The bay was spared only by chance winds and currents which carried the oil offshore.

The NOAA/HAZMAT spill trajectory for the 10th predicted a northerly movement of the oil. Fewer oiled birds were found on Point Reyes beach on the 10th than on previous days, as a result of the northerly movement of the oil.

11 NOVEMBER

WEATHER/SEA STATE

ON SCENE

seas: 12-18 foot combined seas

wind: S 30-40 knots

visibility: overcast

barometric pressure: 112.7 mb

environmental buoy 12: wind direction: S
wind speed: 40 knots

environmental buoy 26: wind direction: S
wind speed: 30-40 knots

environmental buoy 13: wind direction: SE shifting to S
wind speed: 25-30 knots

An early morning inspection of the entrance to Tomales Bay by the Pacific Strike Team found that no oiling had occurred the previous night. The morning's Coast Guard flight reported a four-mile-long dark brown oil slick between positions 38-20N, 123-06W and 38-23.5N, 123-09.5W, with the heaviest oil concentrated in the northern portion of the slick.

Cleanup continued at Bodega Bay. In the early morning, vacuum trucks removed oil collected by deflection booms at the harbor entrance, and absorbent pads were used later in the day to collect the remaining oil at Bodega Harbor and to collect the oil found in the surf at Estero Americano. A
1500 Coast Guard overflight at 1500 hrs reported a five-mile-long oil slick located 7.5 miles due west of Fort Ross, containing

oil patches every 100 feet.

The tug TITAN continued to tow the forebody within the OSC-designated area, trailing a half-mile sheen behind the forebody. Representatives from the RRT, RWQCB, CDFG and Keystone Shipping (the ship owner) met to discuss Keystone's plan, submitted the previous day, to tow the forebody into San Francisco Bay for salvage.

Hundreds of oiled birds were found on beaches in the Bodega Bay area.

12 NOVEMBER

WEATHER/SEA STATE

ON SCENE

seas: 6-9 foot, swells, 12-18 foot, WSW

wind: SSE, 20-25 knots

visibility: overcast with light drizzle

barometric pressure: 1009.2 mb

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environmental buoy 12: wind direction: S
wind speed: 40 knots

environmental buoy 26: wind direction: S
wind speed: 30-40 knots

environmental buoy 13: wind direction: SSE
wind speed: 30-40 knots

On the 12th an oil residue was visible from the air in Bodega Bay, Bodega Harbor and Estero Americano and could be felt in the sandy sediment on the south portion of the Bodega Marine Reserve. Cleanup continued throughout the day at those areas. In the late morning Clean Bay crews responded to reports of oil in the surf at the mouth of Salmon Creek.

1200 A USCG overflight at noon reported an eight-mile-long S-shaped slick located roughly six miles northwest of Havens Neck (on the Sonoma coast) and about five miles offshore.

13-17 NOVEMBER

Between November 13-17 the oil slicks moved north along the coast, gradually dissipating with time and wind and wave action. A Coast Guard overflight the morning of the 12th noted a sheen off of Point Arena, with no visible brown or yellow emulsified oil and scattered patches of oily foam at points along the Sonoma and Mendocino coasts.

On the 12th the cleanup operations at Bodega Bay were determined complete by the OSC, and during the following days attention increasingly focused on plans to return the PUERTO RICAN forebody to San Francisco Bay for salvage of the product remaining in the damaged vessel.

Ongoing negotiations between interested parties including the USCG, RWQCB, EPA, CDFG and the vessel owner resulted in a plan acceptable to all parties regarding the procedure to safely tow the forebody into San Francisco Bay.

At noon on the 17th, after the forebody received a detergent cleaning to remove any surface oil, the OSC granted permission for the tug TITAN to begin towing the forebody into San Francisco Bay.

18 NOVEMBER

WEATHER/SEA STATE

ON SCENE

seas: W, light; swell WSW, light

wind: W, 10 knots

visibility: 12 miles

barometric pressure: 1019.1 mb

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environmental buoy 12: wind direction: S shifting to NW
wind speed: 25-30 knots

environmental buoy 26: wind direction: S shifting to W
wind speed: 10-25 knots

After traveling through the night the tug TITAN, with the PUERTO RICAN in tow, arrived at the OSC-designated rendezvous point at the scheduled time of 0600 hrs. The USCG Cutter POINT HEYER with the OSC and other agency officials on board
0705 did not arrive until 0705 hrs, an hour late. After an OSC representative sounded the forebody tanks and determined that no leakage was occurring, the OSC gave permission at 0720 hrs to proceed through the Golden Gate and into San Francisco Bay.

COMMENT The OSC Report attributes an underspeed tow to the delay in reaching the Main Ship Channel entrance until 0830 hrs. Alex Rynecki, of Alex Rynecki Associates, Keystone Shipping's contract salvor, attributes the delay to the Coast Guards' late arrival at the 0600 hrs rendezvous point.

Regardless of the cause, the forebody's list to port slowed the tow through the Main Ship Channel. The problem gradually worsened throughout the morning as the flood tide

slackened and the ebb tide flowing out the Golden Gate further slowed the tow. By late morning the PUERTO RICAN forebody with her escort of skimming and cleanup response vessels, was at a virtual standstill opposite Mile Rock, 1.5 miles west of the Golden Gate Bridge. At 1350 hrs assistance was given by two additional tugboats and the forebody finally entered through the Golden Gate.

The RRT-approved plan for towing the PUERTO RICAN forebody into San Francisco Bay involved an extensive system of onshore booms and escort cleanup vessels. Before the vessel entered San Francisco Bay, both Aquatic Park, along the San Francisco waterfront, and Horseshoe Cove, just inside the Golden Gate in Marin County, were completely blocked off with oil containment booms. An additional 14,000 feet of boom was staged in trailers at four locations around the Bay. As the forebody entered through the Golden Gate, a 200-foot safety zone was enforced by the USCG cutter PT. HEYER, with the OSC and Clean Bay manager onboard. Three USCG 41-foot UTB's also escorted the forebody along with several other Coast Guard vessels and a Coast Guard helicopter, which flew above the operation. Two harbor tow boats, the JODI R and the SEA EAGLE, towed 2,000 feet of containment boom behind the forebody. Also following the forebody were MR. CLEAN II, 2 Marco III oil skimmers, the barge DOUBLE BANGER, with a Walosep stationary skimmer onboard, and numerous workboats ready to assist in any operation which became necessary.

After an uneventful transit through the Bay, the PUERTO

RICAN forebody was secured at the Triple A Shipyard graving dock at 2057 hrs.

INTERVIEWEES

Lt. Todd Baxter - NOAA, SSC, Coast Guard, Region X
Brian Baird - California Coastal Commission
Walt Strach - NOAA-National Weather Service
Roger James - Regional Water Quality Control Board
Steve Ritchie- Regional Water Quality Control Board
Nancy Stone - Point Reyes-Farallon Islands Marine Sanctuary
Capt. Ed Simmons - State Department of Fish and Game
Jim Steel - State Department of Fish and Game
Jeff Zellickson - Environmental Protection Agency
Terry Brubaker - Environmental Protection Agency
Jack Mortenson - Clean Bay
Capt. Bishop - Coast Guard, Marine Safety Office, Capt. of the Port, OSC
Capt. Zawadzski - Coast Guard, Marine Safety Office, Capt. of the Port
Lt. Steib - Coast Guard, Marine Safety Office
Lt. Cdr. McCarten, Coast Guard Marine Board of Inquiry
Capt. Paul Resnick, Commander, Coast Guard Air Station
Cdr. D.D. Rome, Pacific Strike Team
Lt. Ken Keane, Pacific Strike Team
Cdr. Stewart McGee - NOAA Scientific Support Coordinator
Larry Alheim, CG Marine Safety School, Yorktown
John Robinson - NOAA/HAZMAT
Dr. Jerry Galt - NOAA/HAZMAT
Dr. Sylvia Earle - Deep Ocean Technology
Steve Etchamendi - Deep Ocean Technology
Steve Wetch - Deep Ocean Technology
Keith Kirkeide - Crowley Maritime (VP Ocean Operations)
Hugh Munroe - Plant and Munroe Naval Architects
Capt. Lawrence - Oakland Fire Department
Capt. Gray - Oakland Fire Department
Bill Walton - Boots & Coots
Dr. Ruthann Corwin
Richard Charter - OCS Coordinator, Cities & Counties of No. Calif.
Prof. Christopher N. K. Mooers - Naval Postgraduate School
Joy Hecht - Staff, Senator Milton Marks
Michael Shapiro - Senate Office of Research
Mark Kasanin - McKutchen & Doyle (Keystone attorney)
Charles Achuff - H.C. Knight (Keystone insurance broker)
Alice Berkner - International Bird Rescue Center
Dr. Stephenie Kaza - Point Reyes Bird Observatory
Gary Page - Point Reyes Bird Observatory
Aileen Zanger - California Attorney General's Office
Richard Tutor - Minerals Management Service
Paul Siri - Bodega Marine Lab
Peter Connors - Bodega Marine Lab
Victor Chow - Bodega Marine Lab
John Geller - Bodega Marine Lab
Paul Smith - Tracor Marine, Inc.
Burt Baca - Research Planning Institute
Kirk Miles - Globe Air

EASTERN PACIFIC OCEANIC CONFERENCE 1985 RESOLUTIONS

1. Whereas Incidents of oil spills continue to happen in coastal and inshore areas of U.S. waters; and

   Whereas Regional Response Teams have been established with assigned areas of responsibilities; and oil spill contingency plans have been developed defining agency responsibilities; and

   Whereas Reconstruction of events in dealing with individual spills is necessary to assess effectiveness of the system and

   Whereas NOAA has the responsibility for oil spill trajectory predictions on which most actions of the Regional Response Team are based; and

   Whereas NOAA's procedures and model for oil spill trajectory predictions are not generally available to the scientific community; therefore:

The Eastern Pacific Oceanic Conference is concerned that the latest available techniques and data are not routinely used and resolves that the Administrator of NOAA acknowledge his responsibility in the National Program to the various Regional Teams and directs the Office of Marine Pollution Assessment to initiate actions necessary to retain and make available complete records to permit reconstruction of events for proper analysis.

2. Whereas Several federal agencies use oil spill trajectory models with differing attributes and for seemingly different purposes, and

   Whereas These models do not seem to have been intercompared nor quantitatively evaluated in a variety of oceanic and atmospheric regimes in reference to reliable experimental data; therefore

The Eastern Pacific Oceanic Conference recommends that an interagency (NOAA, USGS, USCG, etc.) effort be made to develop and test an oil spill trajectory model validation procedure.

3. Whereas There are many applications for information on changing oceanographic conditions on a monthly or daily or even hourly basis; and

   Whereas Many available oceanographic observations are not being reported in real-time but in fact being delayed in assembly by years or even decades; therefore

The Eastern Pacific Oceanic Conference endorses efforts to report oceanographic observations from ships and shore stations in real-time.

AMENDED IN ASSEMBLY SEPTEMBER 10, 1985

AMENDED IN ASSEMBLY SEPTEMBER 3, 1985

AMENDED IN ASSEMBLY AUGUST 22, 1985

AMENDED IN SENATE AUGUST 19, 1985

AMENDED IN SENATE JULY 16, 1985

AMENDED IN SENATE JULY 8, 1985

AMENDED IN SENATE JUNE 5, 1985

SENATE BILL No. 686

Introduced by Senator Marks
(Coauthors: Assembly Members Filante and Hauser)

February 28, 1985

An act to amend Sections 5651 and 5655 of the Fish and Game Code, and to amend Section 152 of the Harbors and Navigation Code, relating to oil spills, making an appropriation therefor, and declaring the urgency thereof, to take effect immediately.

LEGISLATIVE COUNSEL'S DIGEST

SB 686, as amended, Marks. Oil spills: cleanup.

(1) Existing law authorizes the Department of Fish and Game to clean up or abate the effects of deposits of petroleum or petroleum products in the waters of the state and to recover any costs incurred pursuant to a specified provision of the Harbors and Navigation Code from the person who negligently or intentionally causes or permits the deposit.

This bill would authorize the department to clean up or abate the effects of any petroleum or petroleum product, as defined, deposited or discharged in any location onshore or offshore where it is likely to enter the water of this state and

where there is an imminent and substantial endangerment to human health or the environment and to order the responsible person to clean up or abate. Since a violation of such an order would be a misdemeanor, the bill would impose a state-mandated local program by creating a new crime. The bill would specify the relationship between such an order of the department and a cleanup and abatement order of a regional water quality control board. The bill would expressly authorize the department to recover any costs incurred as a result of the cleanup or abatement from the responsible party, *would require the deposit of this money in the Fish and Game Preservation Fund,* and would delete reference to the specified provision of the Harbors and Navigation Code.

(2) The California Emergency Services Act authorizes the Governor to establish a state oil spill contingency plan implemented by state agencies, as specified in the plan, to provide for an integrated and effective state procedure to combat the results of major oil spills.

Under existing law, any person that intentionally or negligently causes or permits any oil to be deposited in state waters is, among other things, liable for the costs of cleanup to any governmental agency charged with the responsibility for cleaning up the deposit. That agency is required to notify, in writing, the appropriate regional water quality control board of the nature of the deposit and of the corrective action taken or contemplated.

This bill would require, in addition to performing contingency plan functions, any state agency responding to an oil spill, or any threat thereof, to so notify the regional board of the nature of the spill, or threat thereof.

(3) The bill would require the department to make a specified report to the Legislature and the Governor by July 1, 1988.

(4) The California Constitution requires the state to reimburse local agencies and school districts for certain costs mandated by the state. Statutory provisions establish procedures for making that reimbursement.

This bill would provide that no reimbursement is required by this act for a specified reason.

(5) The bill would appropriate ~~$2,850,000~~ *$2,250,000* from

the Fish and Game Preservation Fund to the department for expenditure during the 1986–87, 1987–88, and 1988–89 fiscal years, allocated for purposes related to oil spills, as specified, to be operative when and only if SB 959 is enacted and allocates at least ~~$2,750,000~~ *$2,250,000* to the Fish and Game Preservation Fund.

(6) The bill would incorporate additional changes in Section 5655 of the Fish and Game Code made by AB 1835, to be operative only if both this bill and AB 1835 are enacted and become effective on or before January 1, 1986, and this bill is enacted last. The bill would also make additional conforming changes.

(7) The bill would take effect immediately as an urgency statute.

Vote: ⅔. Appropriation: yes. Fiscal committee: yes. State-mandated local program: yes.

The people of the State of California do enact as follows:

SECTION 1. Section 5651 of the Fish and Game Code is amended to read:

5651. Whenever it is determined by the department that a continuing and chronic condition of pollution exists, the department shall report that condition to the appropriate regional water quality control board, and shall cooperate with the board in obtaining correction or abatement in accordance with any laws administered by the board for the control of practices for sewage and industrial waste disposal.

SEC. 2. Section 5655 of the Fish and Game Code is amended to read:

5655. (a) In addition to the responsibilities imposed pursuant to Section 5651, the department may clean up or abate the effects of any petroleum or petroleum product deposited or discharged in the waters of this state or deposited or discharged in any location onshore or offshore where the petroleum or petroleum product is likely to enter the waters of this state, order any person responsible for the deposit or discharge to clean up the petroleum or petroleum product or abate the effects of

the deposit or discharge, and recover any costs incurred as a result of the cleanup or abatement from the responsible party.

(b) No order shall be issued pursuant to this section for the cleanup or abatement of petroleum or petroleum products in any sump, pond, pit, or lagoon used in conjunction with crude oil production which is in compliance with all applicable state and federal laws and regulations.

(c) The department may issue an order pursuant to this section only if there is an imminent and substantial endangerment to human health or the environment and the order shall remain in effect only until any cleanup and abatement order is issued pursuant to Section 13304 of the Water Code. A regional water quality control board shall incorporate the department's order into the cleanup and abatement order issued pursuant to Section 13304 of the Water Code, unless the department's order is inconsistent with any more stringent requirement established in the cleanup and abatement order. Any action taken in compliance with the department's order is not a violation of any subsequent regional water quality control board cleanup and abatement order issued pursuant to Section 13304 of the Water Code.

(d) *All money recovered or received pursuant to this section shall be deposited in the Fish and Game Preservation Fund.*

(e) For purposes of this section, "petroleum product" means oil in any kind or form, including, but not limited to, fuel oil, sludge, oil refuse, and oil mixed with waste other than dredged spoil. "Petroleum product" does not include any pesticide which has been applied for agricultural, commercial, or industrial purposes or has been applied in accordance with a cooperative agreement authorized by Section 2426 of the Health and Safety Code, which has not been discharged accidentally or for purposes of disposal, and whose application was in compliance with all applicable state and federal laws and regulations.

SEC. 3. Section 5655 of the Fish and Game Code is

amended to read:

5655. (a) In addition to the responsibilities imposed pursuant to Section 5651, the department may clean up or abate, or cause to be cleaned up or abated, the effects of any petroleum or petroleum product deposited or discharged in the waters of this state or deposited or discharged in any location onshore or offshore where the petroleum or petroleum product is likely to enter the waters of this state, order any person responsible for the deposit or discharge to clean up the petroleum or petroleum product or abate the effects of the deposit or discharge, and recover any costs incurred as a result of the cleanup or abatement from the responsible party.

(b) No order shall be issued pursuant to this section for the cleanup or abatement of petroleum products in any sump, pond, pit, or lagoon used in conjunction with crude oil production which is in compliance with all applicable state and federal laws and regulations.

(c) The department may issue an order pursuant to this section only if there is an imminent and substantial endangerment to human health or the environment and the order shall remain in effect only until any cleanup and abatement order is issued pursuant to Section 13304 of the Water Code. A regional water quality control board shall incorporate the department's order into the cleanup and abatement order issued pursuant to Section 13304 of the Water Code, unless the department's order is inconsistent with any more stringent requirement established in the cleanup and abatement order. Any action taken in compliance with the department's order is not a violation of any subsequent regional water quality control board cleanup and abatement order issued pursuant to Section 13304 of the Water Code.

(d) *All money recovered or received pursuant to this section shall be deposited in the Fish and Game Preservation Fund.*

(e) For purposes of this section, "petroleum product" means oil in any kind or form, including, but not limited to, fuel oil, sludge, oil refuse, and oil mixed with waste other than dredged spoil. "Petroleum product" does not

include any pesticide which has been applied for agricultural, commercial, or industrial purposes or has been applied in accordance with a cooperative agreement authorized by Section 2426 of the Health and Safety Code, which has not been discharged accidentally or for purposes of disposal, and whose application was in compliance with all applicable state and federal laws and regulations.

SEC. 4. Section 152 of the Harbors and Navigation Code is amended to read:

152. All state agencies with cleanup or other responsibilities under the state oil spill contingency plan established pursuant to Article 3.5 (commencing with Section 8574.1) of Chapter 7 of Division 1 of Title 2 of the Government Code, shall perform their responsibilities under that plan under the direction of the chairperson, or his designee, of the State Interagency Oil Spill Committee. The state agency coordinator, as designated under the state oil spill contingency plan, shall cooperate with the federal on-scene coordinator to the maximum extent feasible. All state agencies responding to an oil spill, or any threat thereof, shall notify, in writing, the appropriate regional water quality control board of the nature of the spill, or threat thereof, and of the corrective action taken or contemplated.

SEC. 5. The Department of Fish and Game shall report to the Legislature and the Governor by July 1, 1988. The report shall contain the department's findings of the needs identified as a result of the research and studies provided in Section 6 7 and its recommendations of appropriate action to be taken in responding to the needs identified. The department's report shall also describe whether it has been successful in securing petroleum samples and cargo manifests, through the voluntary cooperation of the oil and gas and maritime industries, needed to implement the laboratory research authorized in paragraph (1) of subdivision (a) of Section 6 7 of this act.

SEC. 6. No reimbursement is required by this act pursuant to Section 6 of Article XIII B of the California

Constitution because the only costs which may be incurred by a local agency or school district will be incurred because this act creates a new crime or infraction, changes the definition of a crime or infraction, changes the penalty for a crime or infraction, or eliminates a crime or infraction.

SEC. 7. (a) The sum of ~~two million eight hundred fifty thousand dollars ($2,850,000)~~ *two million two hundred fifty thousand dollars ($2,250,000)* is hereby appropriated from the Fish and Game Preservation Fund to the Department of Fish and Game for expenditure during the 1986–87, 1987–88, and 1988–89 fiscal years in the following amounts and for the following purposes:

(1) Three hundred fifty thousand dollars ($350,000) for laboratory *and consultant contract* costs incurred in obtaining, cataloging, storing, and examining petroleum samples and cargo manifests requested and received from owners and operators of vessels transporting petroleum or petroleum products in state waters.

(2) Five hundred thousand dollars ($500,000) for contracts for equipment ~~and~~*, consultant services, and other* services related to state agency oil spill response command, control, and communications; the cleaning of oiled birds and marine mammals; oil spill response personnel training and practice drills; other activities of state agencies associated with the cleanup and abatement of oil spills; the evaluation and assessment of the damage to wildlife and living marine resources from oil spills; and the biennial publication of a containment, cleanup, and damage evaluation and assessment manual for use by the State Interagency Oil Spill Committee and by any other governmental agency responding to an oil spill.

(3) One million two hundred fifty thousand dollars ($1,250,000) ~~for contracts for~~ *consultant service contracts and for costs of* surveys of existing research programs and any necessary additional research on the effects of chemical dispersants on wildlife and living marine resources; the periodic revision, in cooperation with the State Water Resources Control Board, of the list of licensed oil spill cleanup agents; and the biennial

publication of an instructional manual which sets forth a decision process for approving the use of oil spill cleanup agents, a list of state-licensed oil spill cleanup agents, criteria for selecting those agents, and directions for applying those agents.

(4) One hundred fifty thousand dollars ($150,000) for *consultant service contracts and* costs incurred in compiling existing and producing new surveys and maps, in cooperation with the National Oceanic and Atmospheric Administration, the United States Minerals Management Service, and any other appropriate agency of the federal government and the maritime and oil and gas industries, of sensitive fish and wildlife habitat in, and immediately adjacent to, state waters that are particularly vulnerable to oil spills for the purpose of siting containment and cleanup equipment at locations near those habitat areas.

~~(5) One hundred thousand dollars ($100,000) for contract services to assist the department, and any other state agency cooperating with the department, to ensure the safe and effective onshore storage and disposal of oil recovered from a spill that occurred in state waters or entered state waters.~~

~~(6) Five hundred thousand dollars ($500,000) for deposit in the Oil Spill Emergency Response Account.~~

(b) This section shall become operative when and only if Senate Bill 959 of the 1985–86 Regular Session of the Legislature is enacted and allocates at least two million ~~seven hundred fifty thousand dollars ($2,750,000) to the~~ *two hundred fifty thousand dollars ($2,250,000) to the* Fish and Game Preservation Fund.

SEC. 8. Section 3 of this bill incorporates amendments to Section 5655 of the Fish and Game Code proposed by both this bill and AB 1835. It shall only become operative if (1) both bills are enacted and become effective on or before January 1, 1986, but this bill becomes operative first, (2) each bill amends Section 5655 of the Fish and Game Code, and (3) this bill is enacted after AB 1835, in which case Section 5655 of the Fish and Game Code, as amended by Section 2 of this bill,

shall remain operative only until the operative date of AB 1835, at which time Section 3 of this bill shall become operative.

SEC. 9. This act is an urgency statute necessary for the immediate preservation of the public peace, health, or safety within the meaning of Article IV of the Constitution and shall go into immediate effect. The facts constituting the necessity are:

It is essential that, as soon as possible, the Department of Fish and Game, which chairs the state's Interagency Oil Spill Committee, be provided with authority to clean up and abate oil spills in state waters ; ~~and that an Oil Spill Emergency Response Account be created, as well as~~ *and that* a Fish and Game Department oil spill response program be established, using federal offshore oil revenues which the state is about to receive. In the absence of immediate enactment of this bill, there is no assurance that the state will have adequate authority or financial resources to respond to an oil spill such as the Puerto Rican spill which recently occurred near San Francisco Bay. It is thus necessary that this act take effect immediately.

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AMENDED IN ASSEMBLY SEPTEMBER 5, 1985

AMENDED IN ASSEMBLY AUGUST 27, 1985

AMENDED IN SENATE JULY 5, 1985

AMENDED IN SENATE JUNE 6, 1985

AMENDED IN SENATE MAY 14, 1985

SENATE BILL No. 959

Introduced by Senator Hart
(Coauthor: Assembly Member O'Connell)

March 6, 1985

An act to add Division 25 (commencing with Section 35000) to the Public Resources Code, relating to resources, and making an appropriation therefor.

LEGISLATIVE COUNSEL'S DIGEST

SB 959, as amended, Hart. Offshore energy development and coastal and ocean resources.

Under existing law, there are programs for the study, protection, and management of ocean and coastal resources.

This bill would enact the Coastal Resources and Energy Assistance Act to require the Secretary of Environmental Affairs to award block grants to coastal counties for purposes of aiding activities related to offshore energy development, as specified; ~~to direct the State Coastal Conservancy~~ *and* to award grants to coastal cities for activities related to offshore development ~~and~~. *The bill* would authorize the ~~State Coastal Conservancy~~ *secretary* to award technical and financial assistance to coastal cities for the purpose of improving the management of coastal resources, as specified; ~~to~~. *The bill would* require the Department of Fish and Game to expand existing activities or initiate new activities in its marine resources program, as specified; ~~and to authorize the~~

~~University of California to expand existing research and education programs or initiate new programs in marine science and engineering, as specified.~~

The bill would create the Offshore Energy Assistance Fund, deposit in that fund ~~$20,000,000~~ *$25,000,000* of federal escrow funds received by the state pursuant to the Outer Continental Shelf Lands Act, as amended, and continuously appropriate that amount, without regard to fiscal ~~year~~ *years*, to the secretary for purposes of exercising the secretary's responsibilities and authority under the bill. The bill would also create the Local Coastal Program Improvement Fund, deposit $10,500,000 of that federal money in that fund, and appropriate that amount without regard to fiscal ~~year~~ *years* to the ~~conservancy~~ *secretary* for purposes of exercising ~~its~~ *the secretary's* responsibilities and authority under the bill. The bill would also require that an additional ~~$7,000,000~~ *$2,500,000* of those federal escrow funds be deposited in a separate account in ~~specified funds and allocated for appropriation, as specified,~~ *the Fish and Game Preservation Fund and be available for appropriation* to the Department of Fish and Game ~~and the University of California~~ for purposes of exercising ~~their~~ *specified* responsibilities and authority under the bill.

Vote: ⅔. Appropriation: yes. Fiscal committee: yes. State-mandated local program: no.

The people of the State of California do enact as follows:

SECTION 1. Division 25 (commencing with Section 35000) is added to the Public Resources Code, to read:

DIVISION 25. COASTAL RESOURCES AND ENERGY ASSISTANCE

CHAPTER 1. GENERAL PROVISIONS

35000. This division shall be known and may be cited as the Coastal Resources and Energy Assistance Act.

35001. The Legislature finds and declares that it is essential that the state, in cooperation with local governments, invest a portion of federal revenues derived from the extraction of publicly owned, nonrenewable offshore energy resources for the sound protection and management of the state's renewable ocean and coastal resources.

35002. The Legislature further finds and declares that the federal government's accelerated and expanded federal offshore leasing program, in conjunction with the California State Lands Commission's submerged lands leasing program, have placed a greater strain on state and local government efforts to plan for and manage the ocean and coastal impacts caused by offshore oil and gas development.

35003. The Legislature further finds and declares, therefore, that a portion of federal revenues derived from the extraction of offshore energy resources should be expended by the state to further the following goals:

(a) Provision of financial assistance to coastal counties affected by federal and state offshore energy development.

(b) Assistance to local governments to exercise their responsibility for improving the management of the state's coastal resources.

~~(c) Protection of marine fisheries and wildlife, and their habitat, affected by offshore energy development.~~

~~(d) Promotion of a university research and education program in marine science and engineering to help secure ocean and coastal resource benefits for the citizens of the state.~~

CHAPTER 2. DEFINITIONS

35020. "Coastal city" means a city which lies, in whole or in part, within the coastal zone.

35021. "Coastal county" means a county or city and county which lies, in whole or in part, within the coastal zone.

35022. "Coastal zone" means the coastal zone as defined in Section 30103.

35023. "Local coastal program" means a local coastal

program as defined in Section 30108.6.

CHAPTER 3. COASTAL COUNTY OFFSHORE ENERGY ASSISTANCE

35030. The Secretary of Environmental Affairs, after consulting with the California Coastal Commission and the State Lands Commission concerning offshore energy activities, shall award block grants to coastal counties to be used for purposes of planning, assessment, mitigation, permitting, monitoring and enforcement, public services and facilities, and for other activities, related to offshore energy development, consistent with the requirements of the state's coastal management program.

35031. Prior to receiving block grants under this chapter, each coastal county shall submit a report to the Secretary of Environmental Affairs describing how the funds are to be expended. Before submitting the report, each coastal county shall provide opportunities for the public to review and comment on the report and shall hold at least one public hearing on the report.

35032. (a) The Secretary of Environmental Affairs shall determine the amount of each coastal county's block grant according to the following formula:

(1) Twenty-five percent of the funds appropriated pursuant to subdivision (a) of Section 35080 shall be allocated based on an estimate of the amount of oil and gas extracted from state or federal waters offshore of California that is expected in the next five years to be (A) landed in the county from offshore vessels and pipelines, and (B) refined or processed in the county after being transported through onshore pipelines which receive the oil or gas from marine terminals in state waters.

(2) Twenty-five percent of the funds appropriated pursuant to subdivision (a) of Section 35080 shall be allocated on the basis of the number of federal and state offshore tracts scheduled to be leased adjacent to the county within five years.

(3) Twenty percent of the funds appropriated pursuant to subdivision (a) of Section 35080 shall be

allocated on the basis of the coastal county's shoreline mileage.

(4) Fifteen percent of the funds appropriated pursuant to subdivision (a) of Section 35080 shall be allocated on the basis of the coastal county's population.

(5) Twelve percent of the funds appropriated pursuant to subdivision (a) of Section 35080 shall be allocated on the basis of indirect effects of offshore oil development, including, but not limited to, degradation of air quality, increased need for public services due to location of support facilities, and impacts on port facilities. The Secretary of Environmental Affairs shall determine the allocation of these funds based on evidence supplied by counties on the indirect effects of offshore oil development.

(b) If, after applying that formula, a coastal county would receive an amount greater than 20 percent of the amount appropriated pursuant to subdivision (a) of Section 35080, the Secretary of Environmental Affairs shall reduce the amount allocable to that county to 20 percent of the appropriated amount, with the remainder shared by other coastal counties in accordance with the formula.

(c) No coastal county shall receive less than 1 percent of the amount appropriated pursuant to subdivision (a) of Section 35080.

(d) Two percent of the amount appropriated pursuant to subdivision (a) of Section 35080 shall be allocated to the San Francisco Bay Conservation and Development Commission for allocation to counties within its jurisdiction that do not border on the Pacific Ocean.

(e) On an annual basis, the Secretary of Environmental Affairs shall review and assess county expenditures under this program. Not more than two hundred thousand dollars ($200,000) of the funds appropriated pursuant to subdivision (a) of Section 35080 may be used over a three-year period by the Secretary of Environmental Affairs to defray administrative costs.

CHAPTER 4. LOCAL GOVERNMENT COASTAL MANAGEMENT IMPROVEMENT PROGRAM

35040. (a) The ~~State Coastal Conservancy~~ *Secretary of Environmental Affairs*, after consulting with the California Coastal Commission and the State Lands Commission concerning offshore energy activities, shall award grants to coastal cities to be used for the purposes of planning, assessment, mitigation, permitting, monitoring and enforcement, public services and facilities, and for other activities related to offshore energy development, consistent with the requirements of the state's coastal management program.

(b) Prior to receiving grants under this chapter, each coastal city shall submit a report to the ~~State Coastal Conservancy~~ *Secretary of Environmental Affairs* describing how the funds are to be expended. Before submitting the report, each coastal city shall provide opportunities for the public to review and comment on the report and shall hold at least one public hearing on the report.

35040.5. Any funds appropriated in accordance with paragraph (b) of Section 35080 and not expended as described in Section 35040, may be awarded by the ~~State Coastal Conservancy~~ *Secretary of Environmental Affairs* for technical and financial assistance to coastal cities with approved local coastal programs to help them exercise effectively their responsibility for improving the management of the state's coastal resources. Technical and financial assistance shall be made available to coastal cities to do any of the following:

(a) Protect wetlands, flood plains, estuaries, beaches, dunes, and fish and wildlife and their habitat within coastal areas.

(b) Minimize the loss of life and property in coastal flood-prone, storm surge, geologic hazard, and erosion-prone areas.

(c) Provide public access to the coast for recreational purposes, to acquire coastal view sheds, and to preserve and restore historic, cultural, and esthetic coastal sites.

(d) Facilitate the process for siting major facilities along the coast related to fisheries, recreation, and ports and other coastal dependent commercial uses, giving full consideration to environmental concerns as well as the need for economic development.

(e) Promote other coastal management improvements determined by the ~~State Coastal Conservancy~~ *Secretary of Environmental Affairs* to be consistent with the state's coastal management program.

35041. The ~~State Coastal Conservancy~~ *Secretary of Environmental Affairs*, in cooperation with the California Coastal Commission, shall develop and implement an application process to award local governments financial and technical assistance pursuant to this chapter on or before July 1, 1986.

35042. Any financial assistance provided to local governments under this chapter may not exceed 80 percent of the cost of carrying out the project. Block grant funds provided to coastal counties pursuant to Section 35030 may not be used for a local government's matching share under this section.

CHAPTER 5. FISHERIES PROTECTION PROGRAM

35050. The Department of Fish and Game shall expand its existing activities or initiate new activities in its marine resources program to do all of the following:

(a) Undertake regulatory, research, and contract activities, as well as coordination, with federal agencies, other state agencies, and local governments to improve the state's equipment and capability to respond to offshore oil spills.

~~(b) Survey, map, and monitor marine fisheries, and their habitat, that may be affected by existing or proposed offshore energy development.~~

~~(c) Research the risks caused by offshore energy development to threatened or endangered species of fish and wildlife, including the sea otter, and identify mitigation measures.~~

~~(d)~~

(b) Research the effects of seismic testing on fish populations, including eggs and larvae.

~~(c) Establish, in cooperation with the commercial and sport fishing industries, a fisheries development program to mitigate damages to fisheries harmed or threatened by offshore oil development and to promote new fisheries to offset benefits lost as a result of offshore oil development.~~

35051. Not more than 3 percent of the funds appropriated pursuant to subdivision (c) of Section 35080 may be used by the Department of Fish and Game to defray administrative costs.

~~CHAPTER 6. MARINE SCIENCE AND ENGINEERING RESEARCH AND EDUCATION~~

~~35060. The University of California is authorized to expand existing research and education programs or initiate new programs in marine science and engineering, giving consideration to all of the following objectives:~~

~~(a) Expansion of human knowledge concerning the marine environment.~~

~~(b) Protection and preservation of ocean and coastal natural resources.~~

~~(c) Encouragement of private investment in technological development, marine commerce, and economic utilization of marine resources.~~

~~(d) Advancement of education and training in marine science and engineering.~~

~~(e) Facilitation of cooperation by the state with other states, the federal government, and other nations and international organizations participating in marine science and engineering programs.~~

CHAPTER ~~7~~ *6.* FISCAL PROVISIONS

35080. The sum of ~~thirty-seven million five hundred thousand dollars ($37,500,000)~~ *thirty-eight million dollars ($38,000,000)* of federal escrow funds received by the state pursuant to Section 8(g) of the Outer Continental

Shelf Lands Act, as amended (43 U.S.C. Sec. 1337 (g)), is hereby appropriated or allocated for appropriation, as the case may be, from the Federal Trust Fund, for the purposes of this division, as follows:

(a) ~~Twenty million dollars ($20,000,000)~~ *Twenty-five million dollars ($25,000,000)* shall be deposited in the Offshore Energy Assistance Fund, which is hereby created in the State Treasury, and, notwithstanding Section 13340 of the Government Code, is hereby appropriated, without regard to fiscal ~~year~~ *years*, to the Secretary of Environmental Affairs for the purposes of Chapter 3 (commencing with Section 35030).

(b) Ten million five hundred thousand dollars ($10,500,000) shall be deposited in the Local Coastal Program Improvement Fund, which is hereby created in the State Treasury, and is hereby appropriated without regard to fiscal ~~year to the State Coastal Conservancy~~ *years to the Secretary of Environmental Affairs* for the purposes of Chapter 4 (commencing with Section 35040).

~~Should~~ *If* the money available for the purposes of this division ~~be~~ *is* reduced, the appropriation in this ~~paragraph~~ *subdivision* shall be reduced or eliminated prior to the reduction of the appropriations contained in the remainder of this section.

(c) ~~Four~~ *Two* million five hundred thousand dollars ~~($1,500,000)~~ *($2,500,000)* shall be deposited in a separate account in the Fish and Game Preservation Fund and shall be available for appropriation to the Department of Fish and Game for the purposes of Chapter 5 (commencing with Section 35050) in accordance with the following allocation:

(1) Two million ~~seven~~ *two* hundred fifty thousand dollars ~~($2,750,000)~~ *($2,250,000)* for the purposes of subdivision (a) of Section 35050.

(2) Two hundred fifty thousand dollars ($250,000) for the purposes of subdivision (b) of Section 35050.

~~(3) Five hundred thousand dollars ($500,000) for the purposes of subdivision (c) of Section 35050.~~

~~(4) Two hundred fifty thousand dollars ($250,000) for the purposes of subdivision (d) of Section 35050.~~

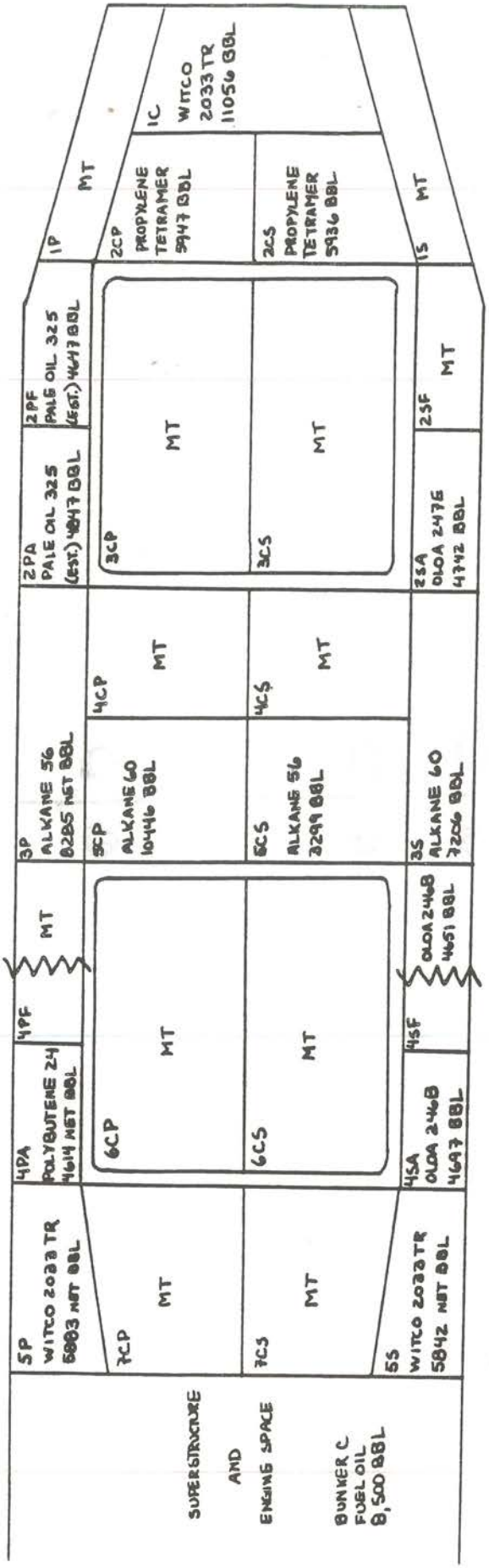
~~(5) Seven hundred fifty thousand dollars ($750,000) for the purposes of subdivision (c) of Section 35050.~~

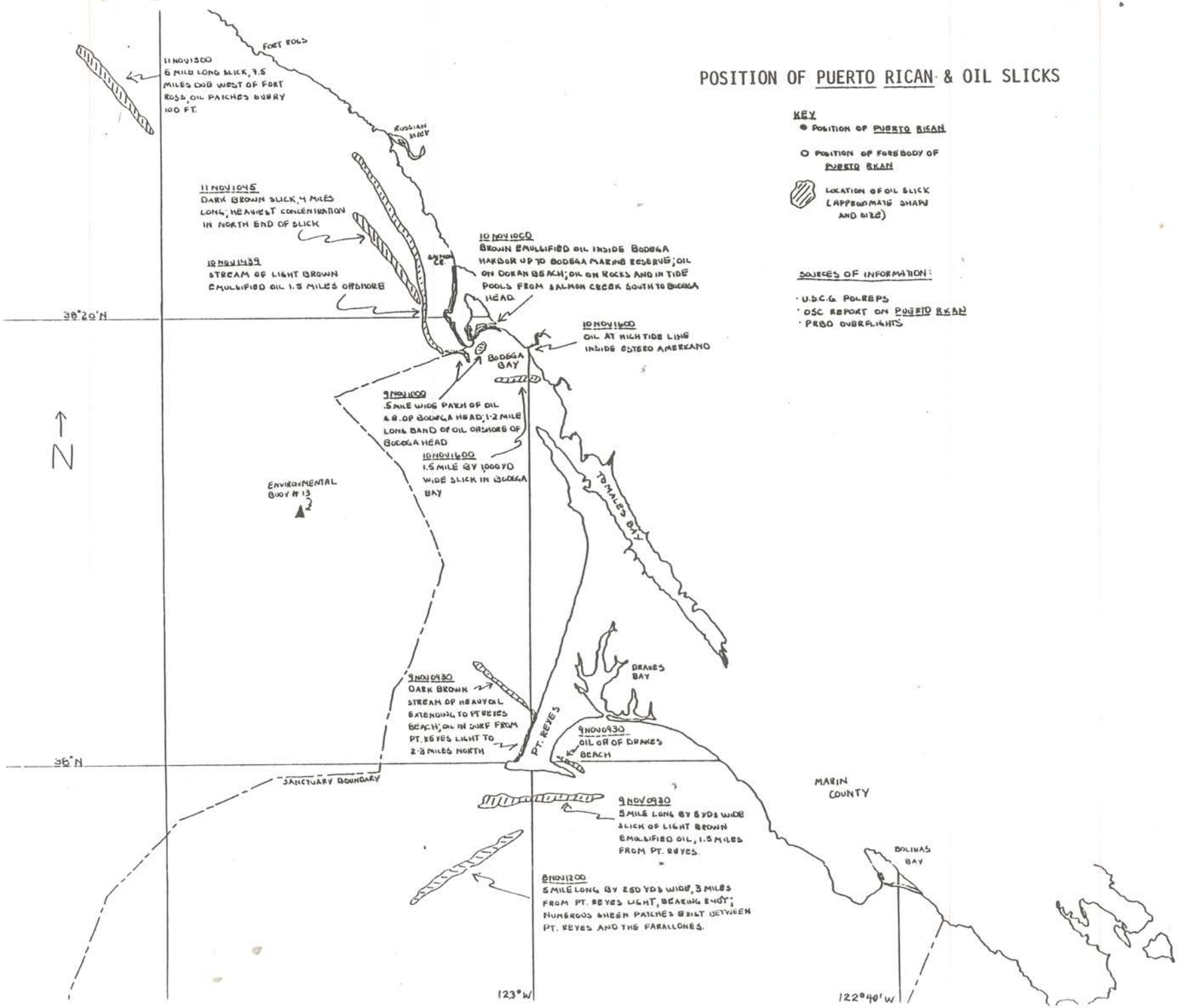
~~(d) Two million five hundred thousand dollars ($2,500,000) shall be deposited in a separate account in the General Fund and shall be available for appropriation to the University of California for the purposes of Chapter 6 (commencing with Section 35060).~~

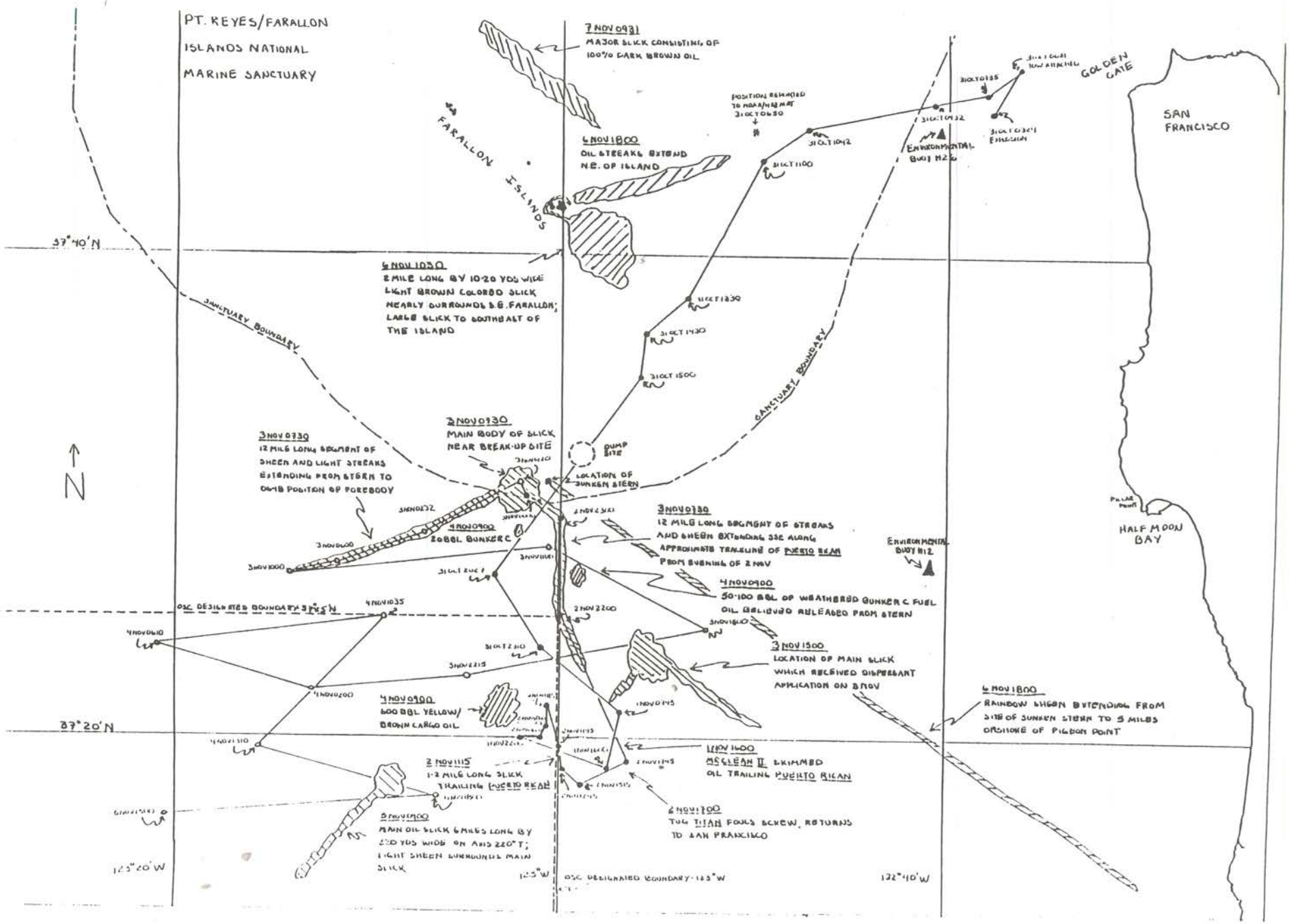
35081. It is the intent of the Legislature that the federal escrow funds appropriated or allocated pursuant to Section 35080 for the purposes of this division be used only to augment, and not be used to replace, state funds appropriated or allocated for those purposes.

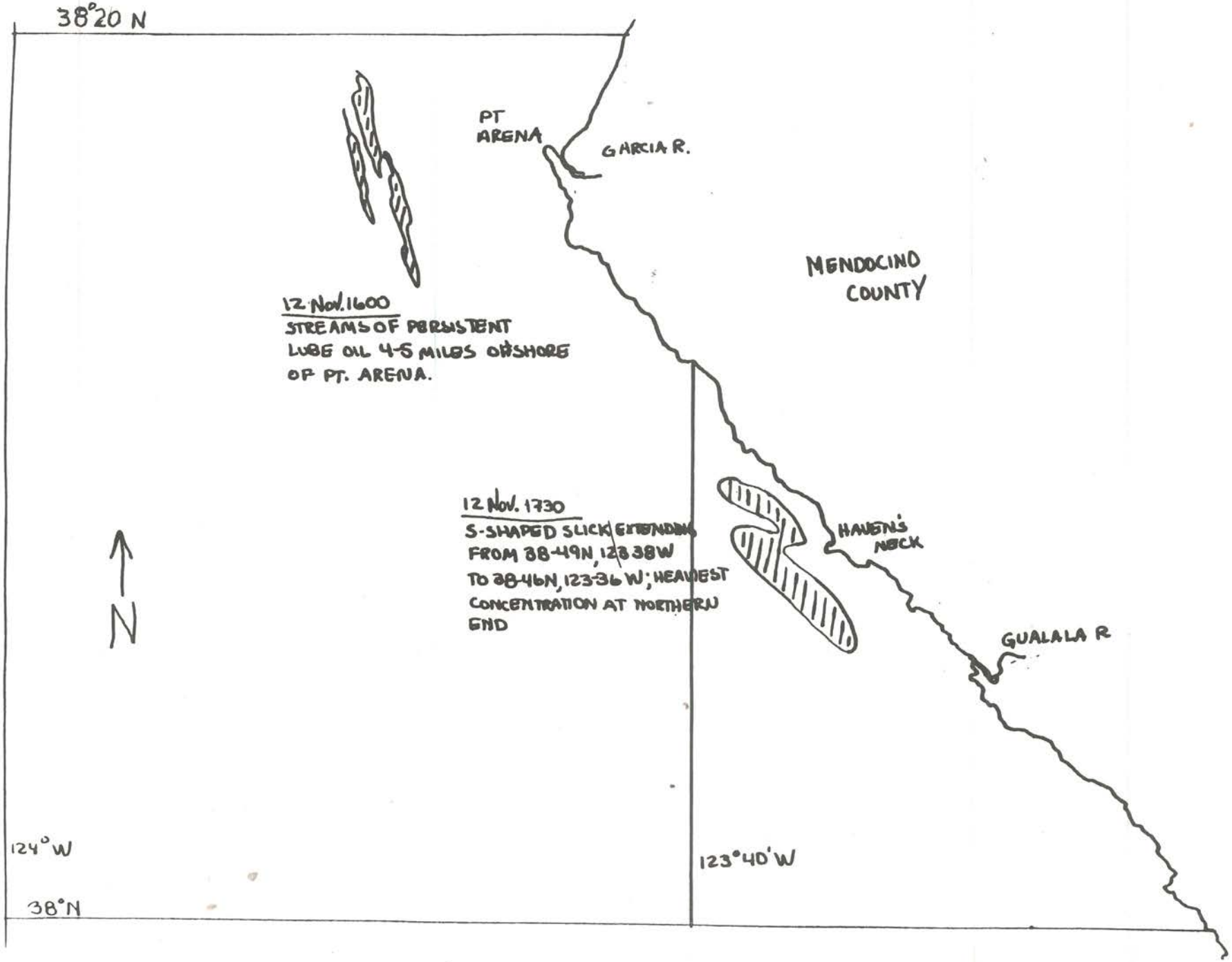
T/V PUERTO RICAN · OCTOBER 84

LOADING DIAGRAM




POSITION OF PUERTO RICAN & OIL SLICKS
KEY
● POSITION OF PUERTO RICAN
○ POSITION OF FOREBODY OF PUERTO RICAN
LOCATION OF OIL SLICK (APPROXIMATE SHAPE AND SIZE)
SOURCES OF INFORMATION:
· U.S.C.G. POLREPS
· OSC REPORT ON PUERTO RICAN
· PRBO OVERFLIGHTS
11 NOV 1300
6 MILE LONG SLICK, 7.5 MILES DUE WEST OF FORT ROSS, OIL PATCHES BUNRY 100 FT.
FORT ROSS
RUSSIAN RIVER
11 NOV 1045
DARK BROWN SLICK, 4 MILES LONG, HEAVIEST CONCENTRATION IN NORTH END OF SLICK
10 NOV 1439
STREAM OF LIGHT BROWN EMULSIFIED OIL 1.5 MILES OFFSHORE
SALMON CR.
10 NOV 1000
BROWN EMULSIFIED OIL INSIDE BODEGA HARBOR UP TO BODEGA MARINE RESERVE; OIL ON DORAN BEACH; OIL ON ROCKS AND IN TIDE POOLS FROM SALMON CREEK SOUTH TO BODEGA HEAD.
38°20'N
10 NOV 1600
OIL AT HIGH TIDE LINE INSIDE ESTERO AMERICANO
BODEGA BAY
9 NOV 1000
.5 MILE WIDE PATCH OF OIL S.W. OF BODEGA HEAD; 1-2 MILE LONG BAND OF OIL OFFSHORE OF BODEGA HEAD
10 NOV 1600
1.5 MILE BY 1000 YD WIDE SLICK IN BODEGA BAY
N
ENVIRONMENTAL BUOY # 13
TOMALES BAY
DRAKES BAY
9 NOV 0930
DARK BROWN STREAM OF HEAVY OIL EXTENDING TO PT REYES BEACH; OIL IN SURF FROM PT. REYES LIGHT TO 2-3 MILES NORTH
PT. REYES
9 NOV 0930
OIL OFF OF DRAKES BEACH
38°N
SANCTUARY BOUNDARY
MARIN COUNTY
9 NOV 0930
5 MILE LONG BY 6 YDS WIDE SLICK OF LIGHT BROWN EMULSIFIED OIL, 1.5 MILES FROM PT. REYES.
BOLINAS BAY
8 NOV 1200
5 MILE LONG BY 250 YDS WIDE, 3 MILES FROM PT. REYES LIGHT, BEARING E-NOT; NUMEROUS SHEEN PATCHES EXIST BETWEEN PT. REYES AND THE FARALLONES.
123°W
122°40'W


PT. REYES/FARALLON
ISLANDS NATIONAL
MARINE SANCTUARY
7 NOV 0931
MAJOR SLICK CONSISTING OF
100% DARK BROWN OIL
FARALLON ISLANDS
4 NOV 1800
OIL STREAKS EXTEND
N.E. OF ISLAND
POSITION REMARKED
BY NOAA/NEMAT
31 OCT 0830
31 OCT 1042
31 OCT 1100
31 OCT 1032
ENVIRONMENTAL
BUOY M2
GOLDEN
GATE
SAN
FRANCISCO
37°40'N
4 NOV 1030
2 MILE LONG BY 10-20 YDS WIDE
LIGHT BROWN COLORED SLICK
NEARLY SURROUNDS S.E. FARALLON;
LARGE SLICK TO SOUTHEAST OF
THE ISLAND
SANCTUARY BOUNDARY
31 OCT 1830
31 OCT 1500
3 NOV 0130
MAIN BODY OF SLICK
NEAR BREAK-UP SITE
DUMP
SITE
LOCATION OF
SUNKEN STERN
3 NOV 0730
12 MILE LONG SEGMENT OF
SHEEN AND LIGHT STREAKS
EXTENDING FROM STERN TO
OMB POSITION OF FOREBODY
4 NOV 0900
20 BBL BUNKER C
3 NOV 0730
12 MILE LONG SEGMENT OF STREAKS
AND SHEEN EXTENDING SSE ALONG
APPROXIMATE TRAVELLINE OF PUERTO RICAN
FROM EVENING OF 2 NOV
ENVIRONMENTAL
BUOY M12
4 NOV 0900
50-100 BBL OF WEATHERED BUNKER C FUEL
OIL GELLIDED RELEASED FROM STERN
OSC DESIGNATED BOUNDARY 37°45'N
3 NOV 1500
LOCATION OF MAIN SLICK
WHICH RECEIVED DISPERSANT
APPLICATION ON 3 NOV
4 NOV 1800
RAINBOW SHEEN EXTENDING FROM
SITE OF SUNKEN STERN TO 5 MILES
OFFSHORE OF PIGEON POINT
HALF MOON
BAY
4 NOV 0900
600 BBL YELLOW/
BROWN CARGO OIL
37°20'N
1 NOV 1100
MCCLEAN II SKIMMED
OIL TRAILING PUERTO RICAN
2 NOV 1115
1-2 MILE LONG SLICK
TRAILING PUERTO RICAN
2 NOV 1700
TUG TITAN FOULS SCREW, RETURNS
TO SAN FRANCISCO
3 NOV 0900
MAIN OIL SLICK 6 MILES LONG BY
250 YDS WIDE ON AXIS 220°T;
LIGHT SHEEN SURROUNDS MAIN
SLICK
123°20'W
123°W
OSC DESIGNATED BOUNDARY - 123°W
122°40'W


38°20 N
PT ARENA
GARCIA R.
MENDOCINO COUNTY
12 Nov. 1600
STREAMS OF PERSISTENT LUBE OIL 4-5 MILES OFFSHORE OF PT. ARENA.
12 Nov. 1730
S-SHAPED SLICK EXTENDING FROM 38-49N, 123 38W TO 38-46N, 123-36 W; HEAVIEST CONCENTRATION AT NORTHERN END
HAVEN'S NECK
GUALALA R
N
124°W
123°40'W
38°N