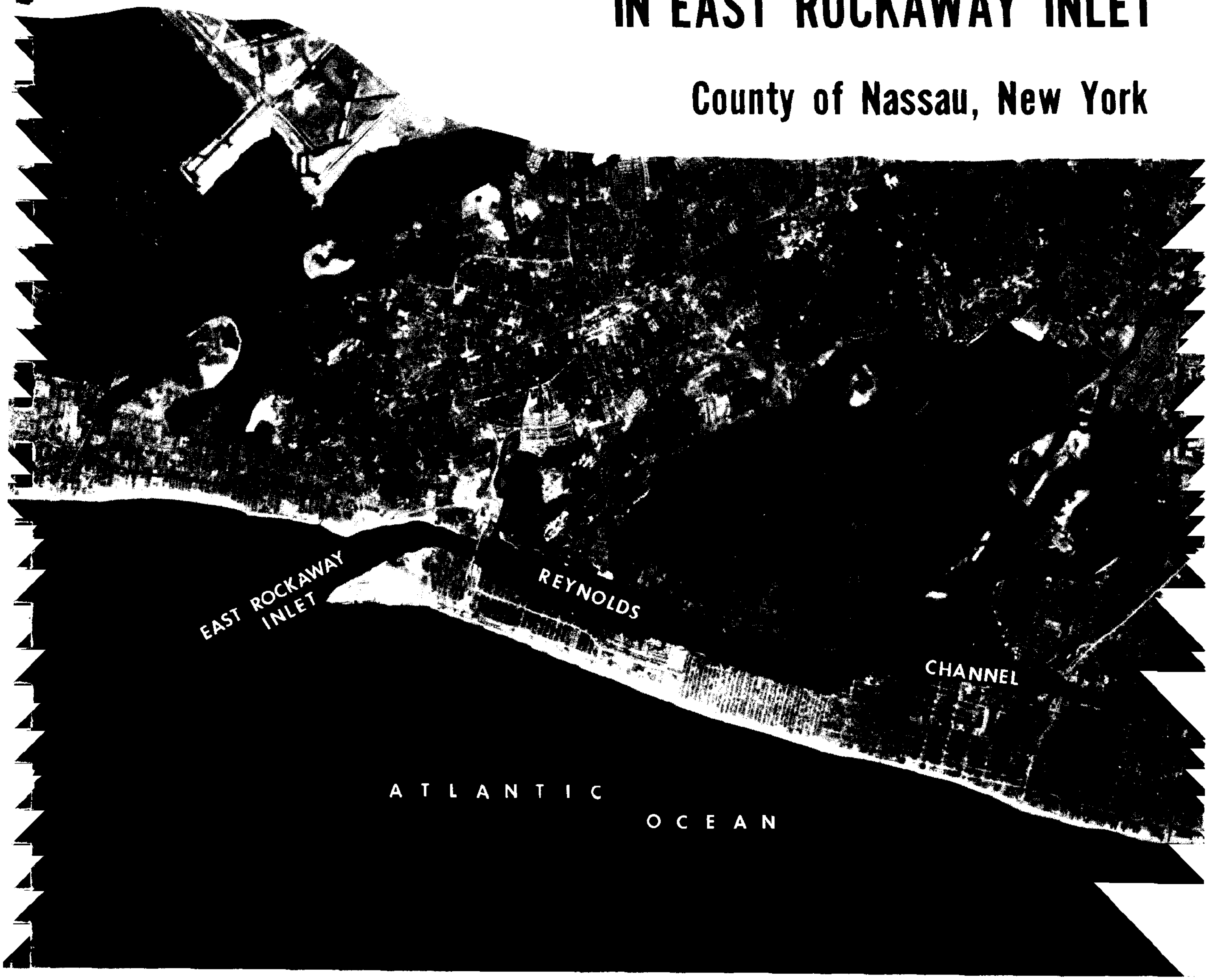
OIL SPILL RESPONSE ACTIONS IN EAST ROCKAWAY INLET

County of Nassau, New York



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SECTION 1 INTRODUCTION

1.1 STUDY OVERVIEW

The Long Island Regional Planning Board (LIRPB) with funds provided by the N.Y.S. Department of State under the Coastal Energy Impact Program, and with the assistance of the Regional Marine Resources Council and State and local government entities, initiated a three phase program in 1978 to develop options for the protection of all Long Island south shore bay environments from oil spills originating either from Atlantic Outer Continental Shelf (OCS) oil production activities or the tanker transport of petroleum products in the New York Bight. There are five shallow tidal inlets along the Island's south shore that link the bay environments with the Atlantic Ocean: Shinnecock, Moriches, Fire Island, Jones and East Rockaway Inlets. Under Phase I, the LIRPB prepared a report that contained recommended response actions for the containment and cleanup of oil spills impacting the Fire Island Inlet region (Long Island Regional Planning Board, 1979). Phase II, which was completed earlier in 1981, recommended response actions for oil spills impacting Jones and Shinnecock Inlets (LIRPB, 1981a; 1981b).

The subject report, Oil Spill Response Actions in East Rockaway Inlet, and a companion report for Moriches Inlet represent the final phase in this planning effort. All of the response plans prepared under this program provide detailed site specific information for use by the U.S. Government On-Scene Coordinator in responding to significant oil spill events.

The program addresses the need as identified in the N.Y.S. Department of Environmental Conservation report, New York State and Outer Continental Shelf Development - An Assessment of Impacts, for the development of adequate oil spill cleanup capability. Oil spills - either from OCS activities or the tanker transport of petroleum - will continue to occur in the future in or near New York's coastal zone.* Coastal areas are fortunate if oil spills occur offshore. However, spills resulting from tanker transport activities in, and around, the south shore inlets pose crises requiring a rapid response if meaningful attempts are to be made to safeguard valuable marine resources found in shallow bays.** While little can be done to prevent the spill from impacting natural areas, certain response actions, as identified in this report can, to a limited degree, contain and collect oil before it fouls widespread portions of the productive habitats found in the barrier beach lagoons.

Oil spill contingency plans usually take the form of chain-of-command lists that identify responsibility for spill cleanup, and contain the addresses of potential contractors who have spill cleanup equipment. The state-of-the-art of such plans has been improved through the development of detailed, feasible oil spill cleanup strategies for the East Rockaway region. The strategies contain information on how and where available oil spill containment-cleanup equipment can be most effectively deployed in an initial response effort.

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*The worst oil spill in Long Island waters since authorities began keeping records of such incidents in 1972 occurred on 11 January 1978 when the tank barge Bouchard 100 spilled 210,000 gallons of heating oil into Long Island Sound waters near Eatons Neck.

**On 23 February 1981, the Coast Guard informed the LIRPB that a barge containing 2.7 million gallons of #6 oil was adrift in heavy seas eight miles south of Shinnecock Inlet. The barge broke from tow and there were no people aboard the vessel. The wind direction in the afternoon was from the southeast, and it was expected to shift to the southwest during the course of a storm predicted for the evening of 23 February. Coast Guard vessels were on the scene, and an attempt was being scheduled to reconnect the tow rope apparatus. Fortunately, the barge was reconnected during the early morning hours of 24 February and there was no spillage of oil. There are probably many events of this nature occurring that do not result in actual spills. However, the events continue to pose the potential of major oil spills along the south shore of Long Island that could seriously impact not only the ocean shoreline, but bay shorelines as well.

The potential oil spill problem and its relationship to the south shore bays has been documented in N.Y.S. Department of Environmental Conservation (1977), Long Island Regional Planning Board (1979), Hardy, Baylor, Moskowitz and Robbins (1975), and Stewart and Devanney (1974). These reports contain information on the susceptibility of Long Island's south shore to oil spills, as well as the environmental and economic consequences associated with such spills. Suffice it to say that an oil spill impacting the south shore bays could have a devastating effect on estuarine habitats that support extensive commercial and recreational fisheries and waterfowl populations. These bays are also used extensively for recreational boating and water-related recreational activities.

The three oil terminals and tank farms at Island Park and Oceanside depend upon petroleum products shipped through East Rockaway Inlet and Reynolds Channel. The volume of tanker traffic in the region and obstacles to navigation together pose a potential oil spill threat to the extensive wetland system north of Reynolds Channel. Special measures recommended in this report will be required to mitigate potential environmental losses from further spills in the area.

1.2 TECHNICAL CONSULTANTS

The conduct of this study required the services of consultants having expertise in:

1. oil spill containment and cleanup technology, and;
2. hydrodynamic modeling.

Woodward-Clyde Consultants of San Francisco, CA and Tetra Tech, Inc., of Pasadena, CA were retained by the LIRPB for these services. The process employed by the LIRPB in selecting consultants is reviewed in Long Island

Regional Planning Board (1979) and other documentation prepared under Contract D142688 for the Fire Island Inlet spill response study.

1.3 REVIEW COMMENTS

Review comments on all phases of the work performed in the development of this spill control plan for East Rockaway Inlet were solicited by the staff. Meetings with local government personnel and the Regional Marine Resources Council were utilized to monitor consultant performance and discuss the technical aspects of oil spill control. Appendix A contains a digest of comments raised by interested parties regarding the oil spill contingency plan presented here. This digest is an integral part of this report, as it contains information pertaining to the implementation of recommended strategies detailed in Section 5.

1.4 BACKGROUND INFORMATION

Part of this program was devoted to the preparation of inventory information on subjects germane to the cleanup and disposal of oily waste. Appendix B contains an inventory of oil spill equipment available in the Long Island region. This appendix is in four parts:

1. equipment owned by spill contractors and spill cooperatives;
2. equipment owned by Federal, State and local agencies;
3. equipment owned by members of the Long Island Oil Terminal Association (LIOTA) under cooperative cleanup agreement; and
4. equipment owned by private companies.

Appendix C consists of an up-to-date listing of facilities that are capable of processing oily waste, as well as a listing of approved waste oil collectors located in the New York Metropolitan Region. Preparation of this appendix was necessary because of the problems associated with finding a location for the disposal of oil-contaminated materials resulting from spill cleanup.

Information on dispersants, their application techniques and environmental effects is contained in Appendix D. Appendix E deals with sorbent barrier construction for use at the entrances to mosquito ditches and other low current areas.

SECTION 2 OIL SPILL SCENARIO

The primary objective of this study is the development of recommended initial response actions to prevent or minimize oil pollution in the Nassau County south shore bay system that might result from oil spills occurring in the East Rockaway Inlet. In order to develop initial response plans it was necessary for the LIRPB staff to define an oil spill scenario that would reflect various factors influencing the selection of response actions. The scenarios described below represent "worst case" situations and are based on the characteristics of petroleum transport activities in East Rockaway Inlet.

2.1 OIL SPILL SCENARIOS

Of the five inlets on the south shore of Long Island, East Rockaway Inlet receives the most significant amount of petroleum product, on the order of 12-14 barges per week. While both small and large spills associated with tanker casualties are not uncommon events when viewed on a global scale, it is not possible to make accurate predictions of spill events, and the probabilities associated with them on local time and space scales. In general terms, smaller spills are more probable than larger spills, but again, quantification of the likelihood of such spills was not attempted in this report.

The following scenarios, developed by the staff for the preparation of a spill response plan at East Rockaway Inlet, reflect petroleum transport activities in the inlet region.

Scenario A:

A 60,000 barrel capacity barge on its way to the Hog Island Channel power plant strikes a jetty or collides with another vessel in the narrow confines of the inlet during summer weather conditions. One of the barge's main cargo tanks would be damaged, causing the immediate release of 7,800 barrels of No. 6 residual oil.

Scenario B:

A 60,000 barrel capacity barge collides with a bridge support of the Atlantic Beach Toll Bridge in Reynolds Channel during winter weather conditions. One cargo tank would be damaged, releasing 7,800 barrels of No. 6 residual oil.

The oil spill technology consultant was instructed to amplify these scenarios through the provision of sufficient detail that would be required in the formulation of spill control strategies.

2.2 LIKELIHOOD OF SPILL EVENTS AS DESCRIBED IN THE SCENARIOS

The oil spill events described above are based on characteristics of petroleum transport in East Rockaway Inlet. The scenarios were designed to include spills occurring during both summer and winter and reflect the possibility of a barge casualty occurring within the inlet. While both small and large spills associated with oil transport are not uncommon events when viewed on a global scale, it is not possible to make accurate predictions of spill events, and the probabilities associated with them on local time and space scales. For the purposes of oil spill planning, it was necessary to relate response actions to an event whose occurrence is possible in the inlet, and has the potential for causing a major environmental disruption.

SECTION 3 CONCLUSIONS AND RECOMMENDATIONS

In both scenarios presented here, only limited time would exist in which to implement the necessary spill response action. This is due to the close proximity of the spills to various sensitive areas within Hempstead Bay. Oil from either of the spills would reach Broad Channel in approximately three hours, where it would pose a serious threat to the extensive marshlands of Brosewere and Hewlett Bays. Waterfront property in Long Beach, Harbor Isle, and Island Park would also be threatened within a very short time span, while Atlantic Beach and Lawrence Marsh would be exposed almost immediately.

To protect as many of these areas as possible, an effective, very rapid spill response effort would be vital. To insure this effort, spill response equipment would have to be stored, ready for deployment, at a location such as Hempstead Town Marina West. With adequate equipment stored on hand, response actions by local groups could be implemented in approximately 3.5 hours, limiting oil contamination to the western end of Reynolds Channel. Also necessary for this effort would be the use of a supercompactible boom. The compactible boom has an advantage over the conventional boom because more of the boom can be carried in a boat for deployment at the site. This lowers the response times because the boats can travel to the response locations at 15-20 knots with the boom on board, as opposed to a speed of 2-4 knots with the boom in tow. Therefore, it is recommended that 1,000 ft. of Kepner Supercompactible Boom be purchased for storage at Hempstead Town Marina West. This boom has the performance characteristics necessary for quick deployment and effective containment of oil. The approximate cost of this boom would amount to $15,000, or $15 per foot.

If no spill response equipment is stored locally, and the response is mounted by outside contractors with their own equipment, roughly 7 hours would be required to carry out the predetermined response action. By this time, oil would have already been carried up into the marsh areas at Brosewere Bay, and along Reynolds Channel toward Island Park. Therefore, it is strongly recommended that adequate spill response equipment be stored at a strategic location such as Hempstead Town Marina West,

The use of skimmers for cleaning oil under the wintertime conditions presented in Scenario B would most likely be infeasible due to the highly viscous, solidified nature of the oil. Other alternatives for oil pickup on water include using debris or scavenger boats, "boatadozers", LCM's with opening front bays, and boats with boom or netting deployed between them to corral the oil and tow it ashore for cleanup.

The construction of permanent anchor points at all shoreline boom termination points is advisable to help minimize spill response times. This would provide stable anchoring points for booms with high tensile forces placed on them (i.e., diversion booms) and would eliminate the need for response crews to locate suitable anchoring points during an actual response when time is limited.

Spill response actions implemented after the first day are not considered in this report due to the difficulty in predicting oil movement once it has contacted shoreline. Water and shoreline cleanup typically could take up to fourteen days.

SECTION 4 HYDROGRAPHIC CONDITIONS AT EAST ROCKAWAY INLET

In order to assess those environmental factors which would constrain oil spill containment and cleanup operations it was necessary to review and analyze the existing hydrographic data for East Rockaway Inlet. It was determined that computer modeling of currents in and around East Rockaway Inlet would be used to supplement available data (Tetra Tech, Inc. 1981).

4.1 HYDROGRAPHIC SETTING

East Rockaway Inlet connects the Atlantic Ocean with the Nassau County south shore bay system, a series of interconnecting estuaries on the south shore of Long Island. Figure 1 shows the location of the study area. East Rockaway Inlet is located at the western terminus of this bay system and interacts with Jones Inlet, towards the east, in this region. Reynolds Channel, located on the shore side of the barrier beach, is the main connection between East Rockaway and Jones Inlet.

Approximately 700 million cubic feet of water passes through East Rockaway Inlet on an average tide. Water transport and exchange through East Rockaway Inlet primarily affects Hempstead Bay located to the west of Middle, East and South Oyster Bay. The major channels in Hempstead Bay, from west to east, are Woodsburgh, Broad and Hog Island which are all dredged to depths of about 10 feet. Between the channels are tidal flats, marshes and built-up islands. To the north and east are two open areas of water known as Hewlett and Broswere Bays, both of which are bounded by highly urbanized areas. Broswere Bay is very shallow while Hewlett Bay, which makes up north central Hempstead Bay, is dredged to about 35 feet in some places.

4.2 HYDROGRAPHIC CHARACTERISTICS OF EAST ROCKAWAY INLET

The tides within the study area are semi-duirnal, with a period of 12.42 hours. The mean tidal range at the mouth of East Rockaway Inlet is about 4.1

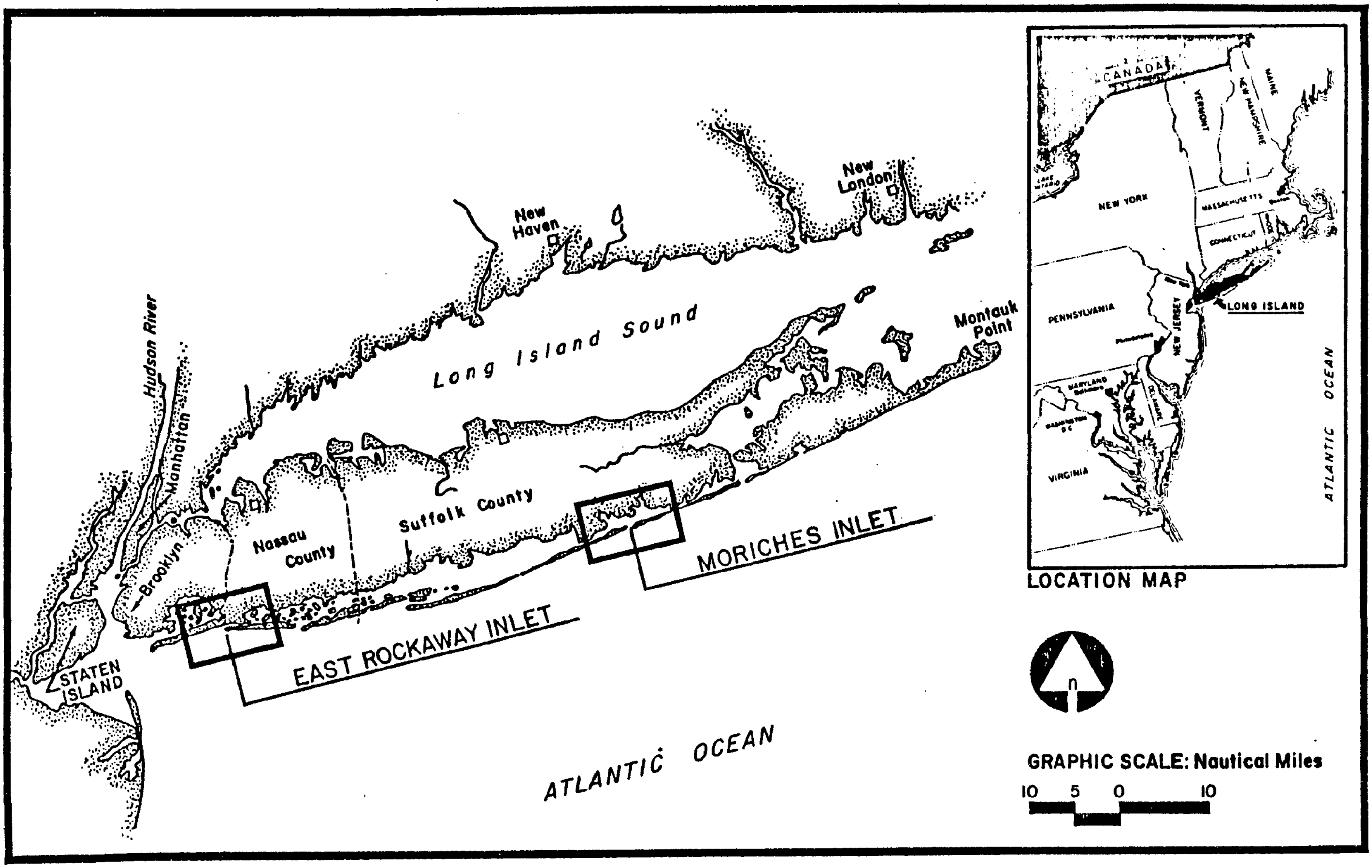

FIGURE 1: LOCATION OF EAST ROCKAWAY AND MORICHES INLET STUDY AREAS

feet, with a spring range of 5.0 feet. The maximum observed ocean storm tide south of Jones Inlet, slightly to the east, was 9.4 feet above mean sea level (MSL) and the minimum tide has been estimated at 6 feet below MSL (Tetra Tech, Inc. 1981).

Along the south shore of Long Island the prevailing winds are from the southwest. On a seasonal basis, the prevailing winds are from the southwest from April through October, from the west in November and December, and from the northwest in January, February and March. At sea, winds from the westerly quadrants prevail. The East Rockaway Inlet area is also subject to hurricanes and extratropical cyclones, known as northeasters (Tetra Tech, Inc. 1981).

The currents within East Rockaway Inlet and its interior channels are primarily controlled by tidal action. As a result, current velocities vary with tidal stage and directions reverse approximately every 6.2 hours. NOAA current tables indicate average maximum currents in the inlet of 2.2 and 2.3 knots on flood and ebb tides, respectively.

The LIRPB contracted with Tetra Tech, Inc., to conduct a detailed analysis of tidal and wind induced currents in the vicinity of East Rockaway Inlet. The purpose of this analysis was to define current magnitudes and directions under varying tide and wind conditions. This analysis included the application of a semi-one-dimensional link-node model of the south shore bay system which was used to fill data gaps.

The model was used to calculate mean tidal ranges, co-tidal lines with arrival times and current velocities under spring and neap tide conditions. Model results for spring tide current velocities are summarized in Figure 2. The full results of this analysis can be found in Tetra Tech, Inc., (1981).

FIGURE 2 - TETRA TECH LINK-NODE MODEL RESULTS
MAXIMUM SPRING TIDE FLOOD CURRENTS
(KNOTS)

SECTION 5 RECOMMENDED OIL SPILL RESPONSE ACTIONS

5.1 INTRODUCTION

East Rockaway Inlet connects the Atlantic Ocean with the series of interlinking bays and estuaries that comprise Hempstead Bay at the west end of Long Island's South Shore Bay System. The shoreline areas surrounding Hempstead Bay are heavily populated. The waterways that criss-cross the area are lined with private docks and marinas and are used extensively for boating, fishing, and other recreational activities. Lawrence Marsh, on the north side of Reynolds Channel, as well as the marsh areas in Brosewere and Hewlett Bays, are important habitats for a variety of waterfowl and fish.

Barges laden with oil must periodically pass through East Rockaway Inlet to supply the power plant facilities in Hog Island Channel on and near Anderson Island. Because of this barge traffic, the potential for an oil spill to occur does exist. An oil spill at or within the Inlet could have adverse effects on the ecological and economic resources in the area. If efficient spill containment and cleanup actions were implemented these detrimental effects could be minimized.

The degree to which these spill response actions can be effectively implemented is predicted using a wide variety of incident specific factors, such as ocean and channel currents and tides, type and quantity of oil spilled, prevailing winds, and available spill response resources. By examining hypothetical spill scenarios that approximate potential local spill incidents, the feasibility and effectiveness of response actions can be predicted with sufficient accuracy for planning purposes.

5.2 PRIORITY ANALYSIS

An oil spill at or near the entrance to East Rockaway Inlet would adversely affect the natural, residential, commercial, and industrial resources of the area. In the event of such a spill, certain of these resources should receive protection and cleanup priority because of their environmental or economic sensitivity to the effects of spilled oil.

All marshland located in Hempstead Bay should receive priority consideration, and every effort should be made to exclude oil from entering these areas. Not only are these marshlands susceptible to the toxic and smothering effects of spilled oil, but oil also tends to persist for longer periods of times in these areas. In addition, they provide necessary wildlife habitat areas, some of the more important of which include:

- Crooked Creek - nesting area for Gallinules, Least Terns, and Clapper Rails
- Lawrence Marsh - wintering waterfowl (e.g. Canada Geese, and Brant)
- Hicks Beach - heron rookery
- North Green Sedge - heron rookery
- Pearsalls Hassock - largest heron rookery on Long Island in 1979
- East Channel Islands - important shellfish area

The town beach on Hog Island Channel, across from East Meadow, should receive priority consideration because of its recreational value. Residential shoreline areas such as the Lido Canals, and commercial-recreational areas, including Harbor Isle, Island Park Channel, Shell Creek, and the Upper Hog Island Channel Terminal, while not as environmentally sensitive as the wildlife areas, should also receive priority consideration.

The entire south shore of Reynolds Channel from East Rockaway Inlet to eastern Long Beach is characterized by extensive bulkheading and mooring berths and should receive secondary consideration in spill protection and cleanup.

5.3 DETAILS OF OIL SPILL SCENARIO A

The scenario was evaluated using the following procedure:

- o Slick Modeling. The general trajectory and spread of the spill was predicted for the scenario conditions. Key data desired from this effort included net movement of the slick within the inlet and probable extent of water and shoreline contamination.
- o Priority Analysis. This analysis considered the resources of the immediate area and their biological, aesthetic, recreational, and economic values. These resources were assigned primary or secondary protection priorities according to both their sensitivity to spilled oil and their values.
- o Local/Regional Response. Local and regional oil spill response resources were inventoried and their probable response times evaluated. Response time evaluations were based on an initial reaction and mobilization period, estimated travel time to the response site, and estimated deployment time as a function of equipment type.
- o Equipment Performance. Most spill control equipment only functions effectively within a certain range of environmental conditions. This evaluation considered any limiting characteristics of the inlet and vicinity, limiting scenario criteria such as winter temperatures, and performance characteristics of locally and regionally available equipment.
- o Scenario Assessment. The preceding factors were assessed for response feasibility, effectiveness, and generalized impacts.

5.3.1 Scenario A Parameters

This scenario considers a spill at the entrance to East Rockaway Inlet. The source of the spill would be a 60,000-barrel capacity barge on its way to the Hog Island Channel power plant. Two likely causes of the accident involve the barge striking a jetty or a collision with another vessel in the narrow confines of the Inlet. One of the barge's main cargo tanks would be damaged, causing the immediate release of 7,800 barrels of No. 6 residual oil. Other pertinent spill scenario parameters include the following:

Spill Size. Loss of one main cargo tank is assumed, approximate volume 7,800 barrels (327,600 gallons), total release within minutes.

Oil Characteristic. Oil density at .970 gm/cm^3 (10 API Gravity), pour point of 18-70°F, viscosity of 800 sus at 100°F.

Season. Summer.

Tide. Accident would occur at the start of flood tide.

Winds. From the south at 10 knots.

Waves. Calm conditions, waves less than 1 foot at East Rockaway Inlet.

Temperature. 80°F.

5.3.2 Spill Movement

Predictions of oil slick movement were extrapolated from current modeling provided by Tetra-Tech (1981). Since the spill incident occurred at the start of flood tide, the slick would be carried eastward with the incoming tide. Winds from the south would tend to drive the oil toward the north bank of Reynolds Channel. One of the first areas to be contaminated by oil would be the beach on the north side of the Inlet. Oil would tend to collect there behind the numerous jetties. After approximately 3 hours the slick would contaminate Lawrence Marsh and would then move north up Broad Channel and farther east along Reynolds Channel. Aided by both currents and south winds, oil moving up Broad Channel would impact the marshlands of Brosewere and Hewlett Bays. By the end of the initial flood tide, migration of oil would extend east along Reynolds Channel to Garretts Lead and East Channel. It is here that the flood tides from East Rockaway and Jones Inlet meet. Oil reaching this area from East Rockaway Inlet during flood tide would not move farther east along Reynolds Channel due to the opposing flood tide moving west from Jones Inlet. Southerly winds would force oil in this zone up into Garrett Lead. During the ensuing ebb tide, some of this oil would then be carried farther east along Reynolds Channel and out Jones Inlet.

Figure 3 also shows the extent of shoreline contamination without the implementation of the predetermined spill response actions. Approximately 18 miles of shoreline, 14 of which are marsh, would be impacted by the oil slick. If response actions were effectively carried out, oil could be excluded from entering much of Lawrence Marsh as well as the marsh areas of Brosewere Bay and Broad Channel. The southerly winds would tend to push oil away from the south side of Reynolds Channel.

No. 6 residual oil is a heavy oil, subject to small evaporative losses under these circumstances. During the initial flood tide following the spill, approximately 10 percent (780 barrels) of the initial 7,800 barrels would be lost through evaporation.

5.4 RESPONSE ACTIONS FOR SCENARIO A

Response to an oil spill typically includes attempts to contain the spilled oil, to exclude it from environmentally sensitive areas, and to remove it. When considering overall impact, response actions that limit the area of oil contamination are most significant. For the scenario in question, feasible protection response actions to the predicted movement of the spilled oil were considered. These actions were developed by setting priorities for sensitive areas that might be impacted by spilled oil. Type

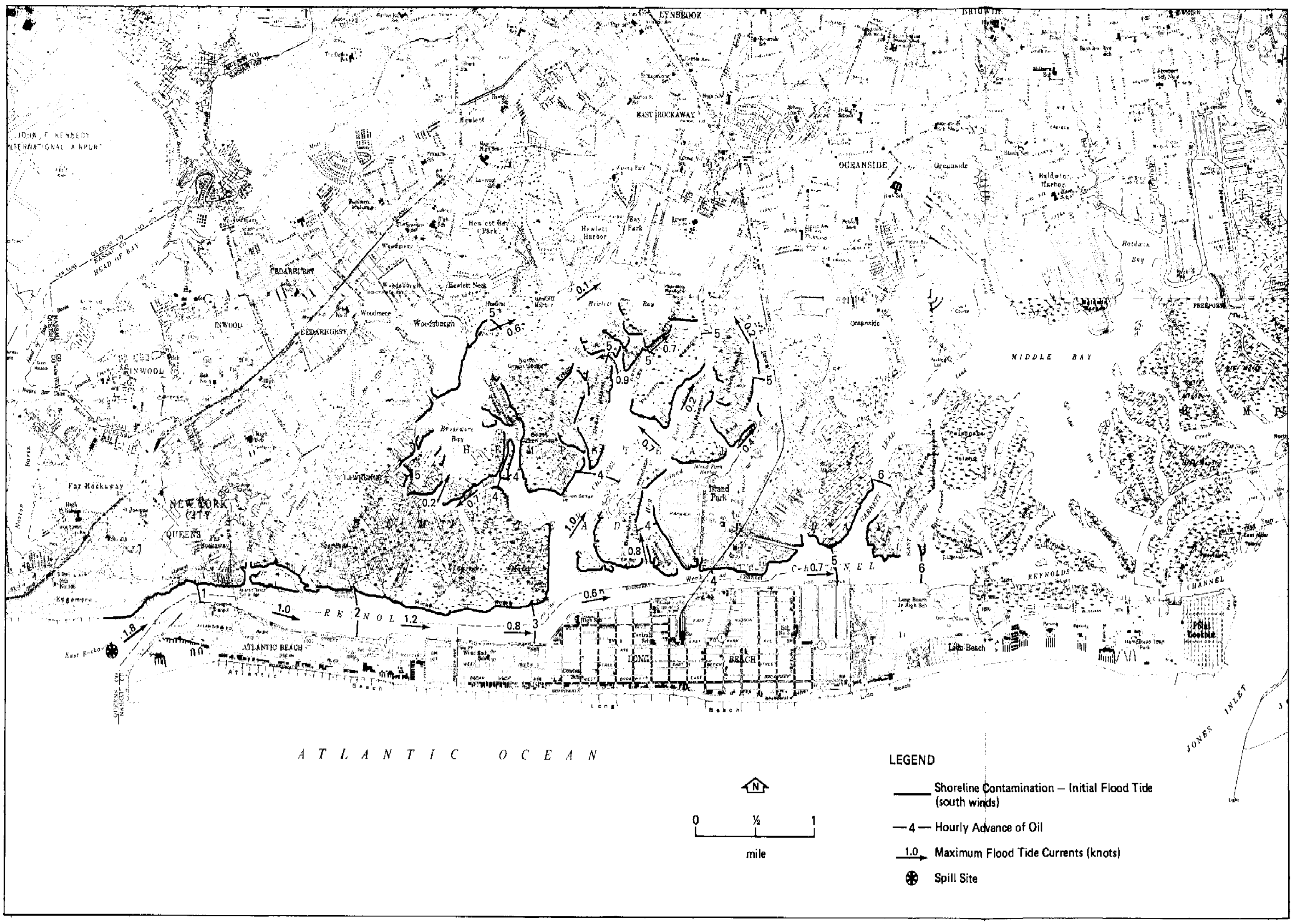

Figure 3 INITIAL SHORELINE CONTAMINATION WITHOUT RESPONSE ACTION IMPLEMENTATION – SCENARIO A

and amount of oil spill equipment available in the New York area, prevailing environmental conditions (water depth, current velocities, access, areas of natural oil accumulation, air and water temperatures), and spill response time were all considered in determining the feasibility of the responses.

Because of the spill's location, only a minimal amount of time would be available in which to mobilize a concerted spill response effort. As one can see from Figure 3, oil would reach the Hicks Beach-Lawrence Marsh area in approximately three hours. Since the incoming tide and southerly winds would tend to drive the oil toward the northern shore of Reynolds Channel, diversion and exclusion booms deployed on this shore at creek and marsh entrances, across channels, and in between islands would prevent or limit contamination in Lawrence Marsh and the marshlands adjoining Broad Channel. Booms deployed out into Reynolds Channel to divert oil ashore at strategic locations should also be utilized. Figure 4 shows the locations of booming sites and points where vacuum trucks and small skimmers would be used to recover oil. Small skimmers would be used in conjunction with the two diversion booms on Reynolds Channel, as well as with the exclusion booms at the Long Island Railroad Trestle Swing Bridge and the Long Beach Bridge. Staging area for the spill response effort would be Hempstead Town Marina West. Table 1 lists the spill response actions for the East Rockaway Inlet area.

Deployment of spill response equipment at the recommended locations should not be a problem because of the predominance of deeper water (greater than six feet deep) and lack of fast currents over 1 knot (see Figure 3).

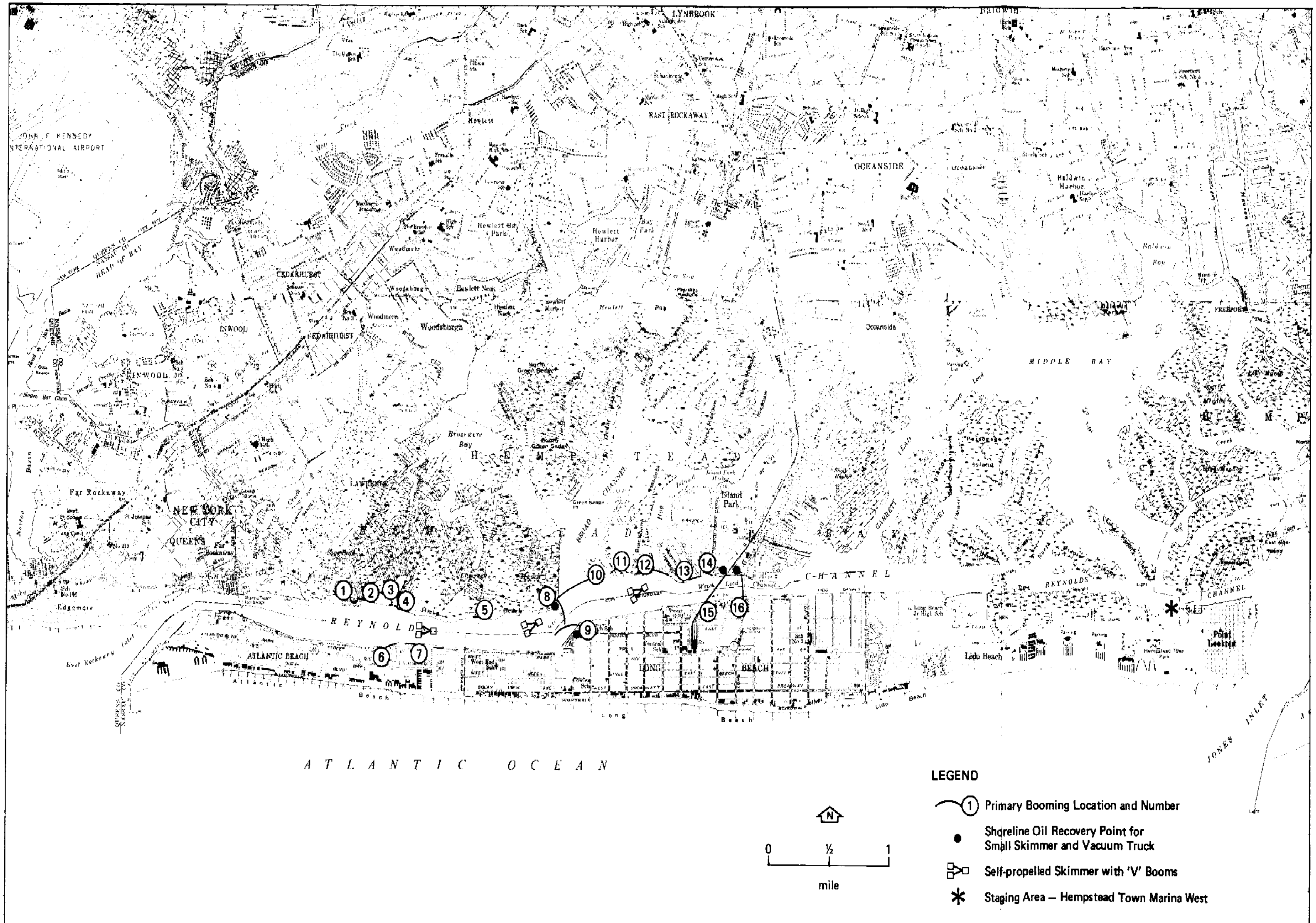

Figure 4. RESPONSE ACTION LOCATIONS

Table 1. BOOMING LOCATIONS AND EQUIPMENT/MANPOWER REQUIREMENTS

Booming Number and Location	Length and Boom Type Required	Equipment and Manpower Required to Deploy and Maintain Booms and Skim Oil[a]	Estimated Response Time From Hempstead Town Marina West	First Day Response Action Cost[b]
1. Cedarhurst Yacht Club Exclusion Booming	300 ft Kepner Supercompactible Boom[d]	1 - Boat w/2 man crew 2 - Anchors	1.0 hr.	$ 350
2. Crooked Creek Exclusion Booming	200 ft Kepner Supercompactible Boom	1 - Boat w/2 man crew 2 - Anchors	1.0 hr	$ 300
3. Lawrence Marsh-Creek Entrance Exclusion Booming	100 ft Kepner Supercompactible Boom	1 - Boat w/2 man crew 2 - Anchors	0.8 hr	$ 200
4. Lawrence Marsh-Creek Entrance Exclusion Booming	100 ft Kepner Supercompactible Boom	1 - Boat w/2-man crew 2 - Anchors	0.8 hr	$ 200
5. Lawrence Marsh-Creek Entrance Exclusion Booming	100 ft Kepner Supercompactible Boom	1 - Boat w/2-man crew 2 - Anchors	0.8 hr	$ 200
6. Bay Canal Exclusion Booming	100 ft Kepner Supercompactible Boom	1 - Boat w/2-man crew 2 - Anchors	0.8 hr	$ 200
7. Anchor Basin Exclusion Booming	100 ft Kepner Supercompactible Boom	1 - Boat w/2-man crew 2 - Anchors	0.8 hr	$ 200
8. Hicks Beach Diversion Booming	1000 ft Kepner Supercompactible Boom	1 - Boat w/3-man crew would remain to tend boom 1 - Small skimmer w/2-man crew on shore 1 - 500-gallon pillow tank[c] 4 - Anchors	1.6 hr	$ 1400
9. Long Beach Diversion Booming	1000 ft Kepner Supercompactible Boom	1 - Boat w/3 man crew would remain to tend boom 1 - Vacuum truck and 2-man crew w/small skimmer on shore 4 - Anchors	1.6 hr	$ 1500
10. Broad Channel-West Exclusion Booming	1500 ft Kepner Supercompactible Boom	1 - Boat w/3-man crew 6 - Anchors	2.3 hr	$ 1000
11. Broad Channel-East Exclusion Booming	250 ft Kepner Supercompactible Boom	1 - Boat w/2-man crew 2 - Anchors	0.8 hr	$ 300

Table 1. BOOMING LOCATIONS AND EQUIPMENT/MANPOWER REQUIREMENTS (concluded)

Booming Number and Location	Length and Boom Type Required	Equipment and Manpower Required to Deploy and Maintain Booms and Skim Oil[a]	Estimated Response Time From Hempstead Town Marina West	First Day Response Action Cost[b]
12. Hog Island Channel-West Exclusion Booming	300 ft Kepner Supercompactible Boom	1 - Boat w/2-man crew 2 - Anchors	0.8 hr	$ 350
13. Hog Island Channel-East Exclusion Booming	300 ft Kepner Supercompactible Boom	1 - Boat w/2-man crew would remain to tend boom 2 - Anchors	0.8 hr	$ 700
14. Island Park Channel Exclusion Booming	200 ft Kepner Supercompactible Boom	1 - Boat w/2-man crew 2 - Anchors	0.6 hr	$ 250
15. L.I.R.R. Trestle Swing Bridge Exclusion Booming	1000 ft Kepner Supercompactible Boom	1 - Boat w/3-man crew would remain to tend boom 1 - Vacuum truck and 2-man crew w/small skimmer on shore 4 - Anchors	1.5 hr	$ 1500
16. Long Beach Bridge Exclusion Booming	800 ft Kepner Supercompactible Boom	1 - Boat w/3-man crew would remain to tend boom 1 - Vacuum truck and 2-man crew w/small skimmer on shore 3 - Anchors	1.2 hr	$ 1400
Deeper Waters-Self-Propelled Skimmers w/"V" Booms	300 ft Optimax Curtain Boom (2-50' sections w/each skimmer)	6 - Boats w/2-man crews 3 - Self-propelled skimmers w/2-man crews		$11,000

[a]Source: C.R. Foget et al., 1979.

[b]Source: C.R. Foget 1981.

[c]Flexible, portable, rubber storage bag.

[d]Kepner Supercompactible Boom is the ideal boom for use in a spill situation in which a rapid response is required. Locally available MP Boom, although not ideal, is adequate for purposes of this plan.

Shallow water would hamper boat travel to response locations, boom deployment, and skimming operations. Currents in excess of 1 knot would cause booms to lose much of their effectiveness in containing oil or water.

One particular factor that could make response actions difficult to conduct would be the closing of the railroad trestle bridge across Reynolds Channel. Under normal operating conditions, the bridge is usually only closed for approximately ten minutes to allow passenger trains to cross the channel. However, in the past, due to mechanical failure (or other problems), the bridge has remained closed for days at a time, impeding boat traffic along Reynolds Channel. If the bridge was stuck in the closed position at the time of a spill, vessels from Hempstead Town Marina West would be prohibited from responding to a spill west of the bridge. In the event that such a situation arose, response boats could be launched west of the bridge at Nassau County Police Headquarters or Long Beach Sports Marina. Both locations have boat ramps.

Table 2 gives the estimated total response time for boom deployment at each location with equipment supplied by local spill contractors. These response times take into account a period at 4.5 hours (average taken from Table 3) for the contractors to transport their equipment to Hempstead Town Marina West and get the equipment into the water. A lag time is also added to some of the response times because it may not be possible to have separate boats respond simultaneously to each booming location. In computing these spill response times, 10 boats were used for boom deployment. As one can see from Table 2, total response times vary between 5 and 7 hours. As shown in Figure 3, after approximately 4 hours, the oil slick already would have contaminated Lawrence Marsh, as well as the marsh areas adjoining Broad Channel.

Table 2. ESTIMATED DEPLOYMENT TIMES FOR RESPONSE ACTIONS

	Average Minimum Response Time To Hempstead Town Marina East (hours)	Booming Location	Travel Time to Boom Deployment Location (hours)	Time Required to Deploy Boom at Location (hours)	Lag Time (hours)	Total Response Time (hours)
Response by contractors with their own equipment	4.5	1 - Cedarhurst Yacht Club	0.5	0.5	0.5	6.0
	4.5	2 - Crooked Creed	0.5	0.5	0	5.5
	4.5	3 - Lawrence Marsh Creek Entrance	0.4	0.4	0	5.3
	4.5	4 - Lawrence Marsh Creek Entrance	0.4	0.4	0.4	5.7
	4.5	5 - Lawrence Marsh Creek Entrance	0.4	0.4	0.8	6.1
	4.5	6 - Bay Canal	0.4	0.4	0	5.3
	4.5	7 - Anchor Basin	0.4	0.4	0.4	5.7
	4.5	8 - Hicks Beach	0.3	1.3	0	6.1
	4.5	9 - Long Beach	0.3	1.3	0	6.1
	4.5	10 - Broad Channel-West	0.3	2.0	0	6.8
	4.5	11 - Broad Channel-East	0.3	0.5	0	5.3
	4.5	12 - Hog Island Channel-West	0.3	0.5	0.4	5.7
	4.5	13 - Hog Island Channel-East	0.3	0.5	0.9	6.2
	4.5	14 - Island Park Channel	0.2	0.4	0	5.1
	4.5	15 - L.I.R.R. Trestle Swing Bridge	0.2	1.3	0	6.0
	4.5	16 - Long Beach Bridge	0.2	1.0	0	5.7

Table 3. ESTIMATED RESPONSE TIMES FOR OIL SPILL CONTRACTORS IN THE EAST ROCKAWAY INLET AREA (To Hempstead Town Marina West)

Contractor	Distance to Inlet	Mobilization Time[a]	Travel Time[b]	Boom Deployment Time[c]	Boat Deployment Time	Total Response Time
Clean Harbors (Verrazano Bridge)	24 mi	1.5 hrs	.5 hr	Compactible--1 hr Standard--2 hrs	.25 hr	3.25 to 4.25 hrs
Clean Harbors (Upper Arthur Kill)	32 mi	1.5 hrs	.75 hr	Compactible--1 hr Standard--2 hrs	.25 hr	3.5 to 4.5 hrs
Clean Harbors (Perth Amboy)	39 mi	1.5 hrs	1 hr	Compactible--1 hr Standard--2 hrs	.25 hr	3.75 to 4.75 hrs
Clean Venture (Linden)	35 mi	1.5 hrs	1 hr	Standard--2 hrs	.25 hr	4.75 hrs
Coastal Services (Elizabeth)	32 mi	1.5 hrs	.75 hr	Standard--2 hrs	.25 hr	4.5 hrs
Marine Pollution Control (Port Jefferson)	48 mi	1.5 hrs	1.25 hrs	Standard--2 hrs	.25 hr	5 hrs
Clean Water (Toms River)	85 mi	1.5 hrs	2 hrs	Standard--2 hrs	.25 hr	5.75 hrs
AAA Pollution (Long Island City)	23 mi	1.5 hrs	.5 hr	Standard--2 hrs	.25 hr	4.25 hrs
Moran-Crowley (Carteret)	38 mi	1.5 hrs	1 hr	Standard--2 hrs	.25 hr	4.75 hrs

[a]Includes .5 hrs for notification and 1 hr to get equipment on the road.

[b]Average speed of 40 mph.

[c]Time required to unpack, assemble, and launch 1,000 ft of boom.

In order to protect these sensitive areas from oil contamination, a more rapid spill response effort is required. Such an effort is feasible if selected oil spill equipment is stored at Hempstead Town Marina West, and spill response actions are implemented by the Town of Hempstead Department of Conservation and Waterways. A locally mounted spill response effort using equipment stored at the staging area would require 1.5 to 3.5 hours to execute, as shown in Table 4. This would provide adequate time to deploy booms at the majority of predesignated locations prior to arrival of the oil slick.

Spill response equipment now available in the East Rockaway Inlet area is stored at a number of locations. The list of oil companies operating locally includes B.P., Exxon, Gulf, Sunoco, and Cibro. These companies are members of Oil City Petroleum Cooperative and maintain a total of approximately 3,500 feet of boom. Excluding Cibro, all the companies are members of the Clean Harbors Cooperative. The towns of Hempstead and North Hempstead have 1,500 and 600 feet of boom, respectively. The Town of Babylon is in the process of purchasing 1,300 feet of boom. Finally, the U.S. Coast Guard maintains 1,500 feet of boom at their local stations. This gives a total of approximately 8,500 feet of boom that is or will soon be on location near East Rockaway Inlet.

Having this boom stored at various locations could increase the time in which it takes to mount a spill response effort. Also, none of this locally available boom is of a compactible type, making it more difficult to fit the necessary amounts of boom into response vessels.

To aid in assuring more rapid spill response times, 1,000 feet of Kepner Supercompactible boom should be stored at Hempstead Town Marina West. This boom would be deployed at the diversion point on Hicks Beach. Boom stored in a trailer by Hempstead Town is available for rapid deployment at Long Beach. The timely and effective deployment of booms at these two locations is vital

Table 4. ESTIMATED DEPLOYMENT TIMES FOR RESPONSE ACTIONS

	Average Minimum Response Time To Hempstead Town Marina East (hours)	Booming Location	Travel Time to Boom Deployment Location (hours)	Time Required to Deploy Boom at Location (hours)	Lag Time (hours)	Total Response Time (hours)
Response by Town of Hempstead Dept. of Conservation and Waterways, if oil spill equipment is stored at Hempstead Town Marina West (Vacuum trucks from local contractors)	1.0	1 - Cedarhurst Yacht Club	0.5	0.5	0.5	2.5
	1.0	2 - Crooked Creed	0.5	0.5	0	2.0
	1.0	3 - Lawrence Marsh Creek Entrance	0.4	0.4	0	1.8
	1.0	4 - Lawrence Marsh Creek Entrance	0.4	0.4	0.4	2.2
	1.0	5 - Lawrence Marsh Creek Entrance	0.4	0.4	0.8	2.6
	1.0	6 - Bay Canal	0.4	0.4	0	1.8
	1.0	7 - Anchor Basin	0.4	0.4	0.4	2.2
	1.0	8 - Hicks Beach	0.3	1.3	0	2.6
	1.0	9 - Long Beach	0.3	1.3	0	2.6
	1.0	10 - Broad Channel-West	0.3	2.0	0	3.3
	1.0	11 - Broad Channel-East	0.3	0.5	0	1.8
	1.0	12 - Hog Island Channel-West	0.3	0.5	0.4	2.2
	1.0	13 - Hog Island Channel-East	0.3	0.5	0.9	2.7
	1.0	14 - Island Park Channel	0.2	0.4	0	1.6
	1.0	15 - L.I.R.R. Trestle Swing Bridge	0.2	1.3	0	2.5
	1.0	16 - Long Beach Bridge	0.2	1.0	0	2.2

in limiting the spread of the oil slick. Boom from the oil companies, the towns of Hempstead and North Hempstead, and the Coast Guard Station at Short Beach could be used for exclusion deployment at the sensitive areas immediately threatened by contamination. Additional boom from less adjacent sources such as the Town of Babylon and the Coast Guard Group Rockaway Station could be used to protect sites where an extra hour or so is available in which to respond prior to the slick's arrival. Locally available boom should be adequate for use at locations requiring less than approximately 200 feet. Separate boom segments would most likely have to be coupled to meet the long lengths required at some of the sites such as the railroad trestle swing bridge and Long Beach Bridge.

The use of a compactible boom type is essential in assuring these rapid spill responses. Instead of boats towing booms to the various locations at a slow speed (approximately 2 knots), compactible booms could be carried inside the boats to be deployed at the site. Using this method the boats could travel much more rapidly (15-20 knots) to the booming locations. Compactible boom is advantageous to use because when packed it takes up less space than conventional boom, so the required amounts can be easily fit into response boats. One disadvantage to this is that boom is more difficult to deploy from a boat than from a dock or boat launch.

A boat would have to remain at each of the diversion booming locations at Hicks Beach and Long Beach to tend the boom. Boats would also have to be stationed at the L.I.R.R. swing bridge and Long Beach Bridge to reposition the boom so as to allow unimpeded vessel traffic (i.e. spill response boats from Hempstead Town Marina West) along Reynolds Channel. If barge traffic is permitted up Hog Island Channel to the power plant, a boat would have to be positioned to move the boom there also.

The total response times given are for optimum conditions. Calls for assistance during other than working hours (nights, weekends, or holidays), poor road conditions, heavy road traffic, or inclement weather, would increase these times by a factor of two or three. Also, in both contractor and local group responses, anywhere from 3 to 10 hours are required for vacuum truck arrival.

Open water skimming should be employed to help pick up oil. Seven self-propelled skimmers are now or soon to be available in the New York City area. These skimmers would be able to operate freely in the main channels because of the abundance of water with a depth greater than 6 feet (all but one of these vessels have a 6 foot draft or minimum operating depth). Attaching booms to the skimmers in a "V" configuration would increase their efficiency of oil recovery. Because of the more narrow confines of some of the channels, "V" booms might not reach the 100 foot length normally recommended for open water skimming, with 50 feet being more likely. It should be noted that it is unlikely that all seven of the skimmers would be made available at one time, especially since six belong to one organization, Clean Harbors Cooperative. Three self-propelled skimmers operating at a spill inside East Rockaway Inlet is a more realistic number. If a member company of Clean Harbors Cooperative was responsible for the spill, it would be possible to have more of their skimmers aid in the cleanup. Figure 2 shows probable locations for these self-propelled skimmers.

Oil that went ashore on the beach north of the Inlet would tend to collect behind the jetties located there. The oiled beach could be cleaned up using motor graders, elevating scrapers, front-end loaders. and vacuum trucks.

The estimated costs for implementation of spill response actions at each location during the first day (10 working hours) are given in Table 1. The total amount of equipment required and their rental costs are listed in Table 5. Total number of man-hours required and labor rates are given in Table 6. The $14,200 equipment rental cost and $7,800 labor cost give a total first day response action cost of approximately $22,000. This daily total cost would probably increase on subsequent days as additional booms, boats, and vacuum trucks were used and shoreline cleanup operations initiated.

Spill response activities conducted after the first day are beyond the scope of this report because of the difficulty in predicting spill behavior once oil has contacted a shoreline. Under the circumstances presented in this scenario, the cleaning of oil from water and shorelines could take up to 14 days.

5.5 EQUIPMENT PERFORMANCE FOR SCENARIO A

The Kepner Supercompactible Boom listed in Table 1 for each response action has the performance characteristics best suited for the booming actions required. Not only are they stable and effective in both deep and shallow draft water use, but just as importantly, they can be compacted and transported in a minimum of space. To fit the necessary amounts of boom into the response boats for deployment at the site requires the use of a compactible boom. This deployment of boom from boats at the site ensures a more rapid response time than if the boom was towed to the site in the water behind a boat.

Over 15,000 feet of this Kepner Supercompactible boom is available for use in the East Rockaway Inlet area, which is far greater than the 6,350

Table 5. EQUIPMENT RENTAL COST FOR ONE 10-HOUR DAY

Equipment	Amount/Number Required	Rental Cost	Total
Boom	6650 ft	$ .35/ft	$ 2,300
Work Boats	16	200/day	3,200
Small Skimmers	4	50/day	200
Vacuum Trucks	3	300/day	900
JBF 3003 Skimmer	1	4,000/day	4,000
Bennett MK6E Skimmer	1	2,600/day	2,600
Marco Class ID Skimmer	1	1,000/day	1,000
	TOTAL		$ 14,200

Table 6. LABOR COST FOR ONE 10-HOUR DAY

Activity	Man Hours Required in 10-Hour Day	Labor Rate	Total
Boom Deployment	70	$ 15.00/hr	$ 1,050
Boom Maintenance	140	15.00/hr	2,100
Skimmer Maintenance	80	15.00/hr	1,200
Vacuum Truck Support	30	15.00/hr	450
Self-Propelled Skimmer	60	15.00/hr	900
"V" Boom Boats	120	15.00/hr	1,800
Miscellaneous	20	15.00/hr	300
Total	520	Total	$ 7,800

feet required to carry out the necessary response actions. The 300 feet of boom to be used in conjunction with the self-propelled skimmers does not have to be of a compactible type. American Marine Optimax is well-suited for this use as well.

The four small skimmers to be used with the spill containment booms and vacuum trucks at points of natural oil accumulation would have the capacity to pick up oil at a rate of approximately 125 barrels (5,300 gallons) per day.

Most of the water in the main channels, such as Reynolds, Broad, and Hog Island, is deep enough (greater than 6 feet) to allow for the operation of the self-propelled skimmers. However, the narrow confines of some of the channel areas could limit the length of booms to be used with the skimmers in "V" configurations. Skimmers with "V" booms and two work boats can be difficult to maneuver in tight channels. The use of "V" booms with these skimmers increases their oil encounter rate by increasing their skimming width. The encounter rate is the volume of oil that a skimmer will encounter on a water surface over a given period of time. Factors influencing the encounter rate include the thickness of the oil slick on water, the skimming path width, and the skimmer's forward speed. Deploying a short length of boom from each side of the skimmer's bow increases its sweep width. In open waters, skimmer sweep width can be increased by a factor of four by using two 100-foot lengths of boom in a "V" configuration (i.e., a skimmer with a skimming width of 15 feet can skim a 60-foot swatch). Using shorter boom lengths or no boom at all decreases the sweep width, but allows the skimmer to operate in tighter quarters and at faster speeds of up to 2 knots instead of the 1 knot with booms.

Table 7 lists performance criteria for the four types of self-propelled skimmers currently or soon to be available in the New York area (4 JBF 3003, 1 JBF 3001, 1 Marco Class ID--all belonging to Clean Harbors Corporation of Perth Amboy, N.J., and 1 Bennett Mark 6E--belonging to Clean Venture of Linden, N.J.). It is unlikely that more than three of these skimmers (two from Clean Harbors and the Bennett Mark 6E) would respond to a spill in East Rockaway Inlet, unless the spill involved a Clean Harbors member company, in which case more of Clean Harbors' skimmers might respond. Clean Harbors' basic area of interest is New York City, and they would be reluctant to send all or most of their self-propelled skimming equipment out of the area, leaving themselves vulnerable in the event of a spill in their local waters.

Table 8 gives the daily oil recovery rates that could be expected from these skimmers with and without "V" booms. With three skimmers operating (1 JBF 3003, 1 Marco Class ID, 1 Bennett Mark 6E), a total of 380 barrels (16,000 gallons) could be recovered daily. Additional oil (approximately 125 barrels daily) would be recovered at shoreline recovery points in conjunction with the diversion and selected exclusion booms. The rates given are average theoretical values over the period of operation. Initially, oil recovery rates would be higher and would decrease with time as the slick breaks up and dissipates. Actual recovery rates in a real spill could vary considerably from these average values, depending on weather conditions, presence of debris, local concentrations of oil, slick thickness, etc.

Table 7. SKIMMER PERFORMANCE CRITERIA

Skimmer	Water Depth Needed for Skimmer	Skimming Speed	Max. Oil Pickup Capability	Skimming Width	Skimming Width w/"v" Boom	On-Board Storage Capacity	Off-Loading Capacity	Oil Recovery Factor[a]		Oil Content Factor[b]	
								Diesel	Crude	Diesel	Crude
JBF - 3003	6 ft	0-3 kts	450 GPM	18 ft	72 ft	4000 gal	450 GPM	65%	80%	40%	60%
JBF - 3001	4 ft	0-3 kts	100 GPM	15 ft	60 ft	1500 gal	50 GPM	65%	80%	40%	60%
Bennett Mark 6B	6 ft	1-2 kts	350 GPM	14 ft	56 ft	2500 gal	350 GPM	88%	88%	52%	60%
Marco Class ID	6 ft	1-2 kts	50 GPM	10 ft	40 ft	500 gal	50 GPM	65%	80%	40%	60%

<u>Volume of Oil Recovered</u>

[a]Oil Recovery Factor = Volume of oil presented to skimmer.

[b]Oil Content Factor = Percentage of oil in the liquid recovered by skimmer.

Source: L.B. Solsberg et al., 1977; W.F. Purres and L.B. Solsberg 1978; W.J. Logan et al., 1975.

Table 8. OIL RECOVERY EFFECTIVENESS OF SKIMMERS FOR CRUDE OIL SPILL

Skimmer	Actual Oil Recovery Rate Gallons/Hr[a]		Hours of Operation Until Storage Capacity is Reached[b]		Time Required to Offload at Point Lookout Marina Hours[c]	Total Amount of Oil That Could be Recovered In 10-Hour Day (gallons)		Average Daily Oil Recovery (gallons/day)[d]		Number of Skimmers Available in the New York Area	Total Daily Oil Recovery (gallons/day)	
	Skimmer Only	Skimmer w/"v" Booms	Skimmer Only	Skimmer w/"v" Booms		Skimmer Only	Skimmer w/"v" Booms	Skimmer Only	Skimmer w/"v" Booms		Skimmer Only	Skimmer w/"v" Booms
JBF 3003	1,310	2,620	2.2	1.1	1.0	8,650	13,000	6,500	7,800	4	26,000	31,200
JBF 3001	1,090	2,180	1.0	0.5	1.0	5,450	6,500	4,100	4,500	1	4,100	4,500
Bennett Mark 6E	1,020	2,040	1.75	0.9	1.0	6,500	10,000	4,900	6,000	1	4,900	6,000
Marco Class ID	730	1,450	.50	0.25	1.0	2,600	3,000	2,000	2,200	1	2,000	2,200

Recovery rates would increase significantly if skimmers could be offloaded by barge at the skimming site.

[a]Actual Recovery Rate = Encounter Rate x Oil Recovery Factor - Encounter Rate calculated from skimming speed of 2 kts for free skimming and 1 kt for skimming with booms, sweep width, and oil thickness - Oil Loading: Crude Oil Thickness of 0.32 mm.

[b]Adjusted for oil content factor.

[c]Includes travel time to and from skimming area.

[d]Adjusted for downtime and maneuvering.

5.6 DETAILS OF OIL SPILL SCENARIO B

The scenario was evaluated using the same procedures employed for scenario A (see section 5.3).

5.6.1 SCENARIO B PARAMETERS

This scenario considers a spill in Reynolds Channel at the Atlantic Beach Toll Bridge. A 60,000-barrel capacity barge would spill 7,800 barrels of No. 6 residual oil after colliding with a bridge support. (Experience has shown this to be a trouble spot for barge navigation.) Pertinent spill scenario parameters include the following:

Spill Size. Loss of one main cargo tank, approximate volume 7,800 barrels (327,600 gallons), total release within minutes.

Oil Characteristics. Oil density 0.970 gm/cm^3 (10 API Gravity), pour point 18°-20°F, viscosity 800 sus at 100°F.

Season. Winter.

Tide. Accident occurs at the start of flood tide.

Winds. From the northwest at 10 knots.

Waves. Rough conditions, waves 2-3 feet at East Rockaway Inlet.

Temperature. 35°F.

5.6.2 SPILL MOVEMENT

No. 6 residual oil is a highly viscous oil with a high pour point. When exposed to the extreme environmental conditions (low air and water temperatures) presented in this scenario, this oil could lose most of its liquid properties and act more as a solid. Following the spill, the oil would tend to remain in one large mass. As the mass broke up, the oil would stay clumped together in what are commonly referred to as "tar balls."

These tar balls can be several feet in diameter, and their consistency can range from thin (like that of chocolate mousse) to thick (like that of peanut butter).

Currents and winds would influence the movement of a slick consisting of solidified No. 6 oil, but internal spreading of the oil would be far less in the solid form, keeping more of the oil in a large mass. Because of its greater shearing strength, a more viscous oil tends to mix less in the water column. Wintertime slicks consisting of this type of oil have been known to reach a thickness of several feet.

Since the spill incident would occur at the beginning of flood tide, the slick would initially be carried eastward along Reynolds Channel. Winds from the northwest would tend to drive the slick away from the north shore of Reynolds Channel, protecting the Lawrence Marsh area from contamination. Oil would tend to collect on the south shore of Reynolds Channel, affecting mostly private mooring berths and bulkheads.

After approximately three hours, the slick would reach the junction of Broad and Reynolds Channel. The northwest winds would allow the currents to carry the oil slick up Broad Channel only to the southern end of South Green Hedge and into Post Lead. Currents would carry oil up Hog Island Channel to West Meadow.

The slick would continue to move east along Reynolds Channel for five hours until it reached the Garrett Lead-East Channel area, where the incoming flood tide from Jones Inlet would prohibit the slick from further eastward movement until the tide changed. During ebb tide, some of this oil would then migrate east with the tide and out Jones Inlet. Oil initially reaching the Garrett Lead-East Channel area would be averted from moving north out of Reynolds Channel by the northwest winds.

The hourly advance of oil inside East Rockaway Inlet is shown in Figure 5. This figure also shows the extent of shoreline contamination without the implementation of the predetermined spill response actions. Under those circumstances, approximately 8 miles of shoreline area would be affected by the slick. Most of this contamination would occur along the bulkheads and mooring berths that comprise the south shore of Reynolds Channel. This shoreline is not particularly sensitive to the adverse effects of spilled oil, and does not receive priority consideration in spill containment and cleanup. Marshland comprises approximately 2 of the 8 miles of shoreline that would be affected.

Under the wintertime conditions of this scenario, evaporative losses of the No. 6 residual oil would amount to less than 10 percent of the initial 7,800-barrel volume.

5.7 SPILL RESPONSE ACTIONS FOR SCENARIO B

The type of response actions implemented to combat a spill of No. 6 residual oil under winter conditions would vary according to the oil's pour point. No. 6 residual has a high pour point, and in low temperatures it would resemble a solid mass with a consistency similar to that of mousse. During winter transport of these high pour point oils, chemical agents are sometimes added to the oil to aid in its handling. These agents decrease the pour point of the oil, making it less viscous, or more fluid. Pumping and offloading times of this lower pour point, lower viscosity oil would be much more rapid than for heavier oils.

Under mild winter conditions this lower pour point No. 6 might still remain a liquid if spilled from a barge. If the oil remained a liquid once spilled, the same response actions as recommended in Scenario A should be implemented. Scenarios A and B are similar, except that the slick in Scenario B would reach the response locations approximately one hour sooner

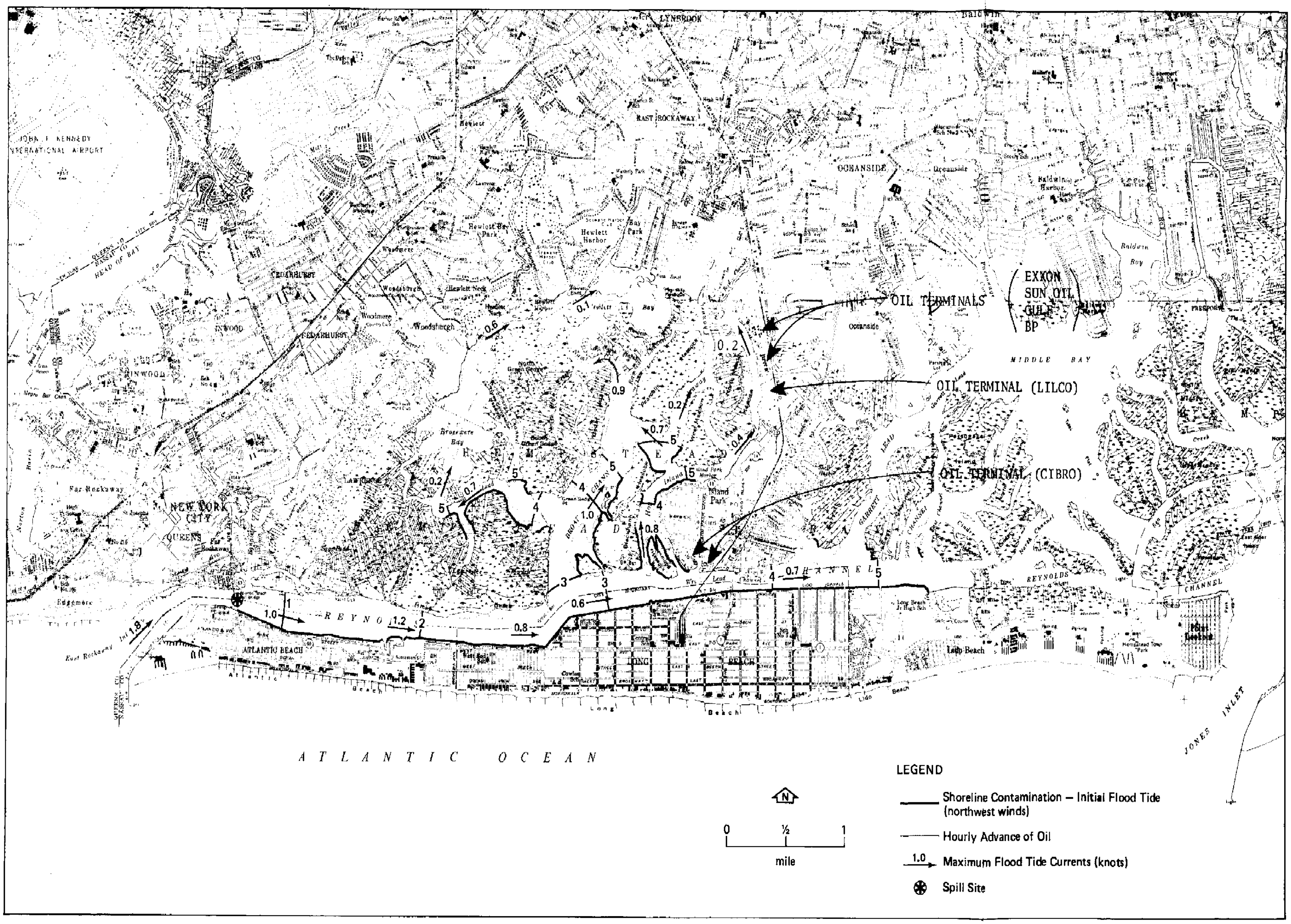

Figure 5. INITIAL SHORELINE CONTAMINATION WITHOUT RESPONSE ACTION IMPLEMENTATION – SCENARIO B

than in Scenario A because of the more easterly location of the Scenario B spill. Also, in Scenario B, northwest winds would tend to keep oil away from the north shore of Reynolds Channel and would limit the spread of the slick up Broad Channel. Although Lawrence Marsh borders the north side of Reynolds Channel, it should still be boomed due to its extreme environmental sensitivity and the close proximity of the spilled oil.

A more likely occurrence under winter conditions would be for spilled No. 6 residual oil to form tar balls or larger solid masses upon contact with cold water. Under these circumstances, implementation of the boom deployment actions described for Scenario A (Figure 4) is also recommended. The use of both small and self-propelled skimmers is not recommended because they are ineffective in picking up this heavy oil.

Several alternative methods (other than small skimmers and vacuum trucks) are available to pick up oil collected at diversion and exclusion booming locations. If the boom terminates on a beach, motor graders and front-end loaders could be used to collect and pick up oil stranded on the beach. If no vehicular access exists, workers with shovels and buckets could accomplish this. Modified pitchforks with screens could be used to collect oil out of the water. If a boom terminates at a point with a steep or vertical shoreline, scoops or buckets with holes to allow for water drainage could be lowered into the water to pick up solidified oil. Backhoes, tow trucks, or small cranes could be used to mechanically lift loads of oil out of the water. Also, a conveyor belt system with two wire mesh belts could lift oil out of the water and into storage bins or waiting trucks. Collected oil should be transported in lined dump trucks to appropriate waste disposal sites.

Since self-propelled skimmers are ineffective under these circumstances, other methods would have to be employed to pick up oil in the open water areas. If the slick remained in sizable masses, workboats with boom or reinforced netting strung between them could be used to corral the oil and tow it to land, preferably to a beach to be cleaned up with front-end loaders.

Workboats with open front bays could be used to recover both tar balls and larger masses of oil. Workers positioned in the front of the boat with shovels or modified pitchforks could pick oil out of the water. Debris or scavenger boats with large scoops or clamshells deployed in the main channels would also be effective in cleaning up large oily masses. Marine Pollution Control of Port Jefferson, New York, has one such debris boat (a "boatadozer"), as well as four LCMs with opening front bays. Clean Venture of Linden, New Jersey, also has one LCM. It should be noted that some of these larger vessels cannot be transported overland and would take approximately 12 hours to travel by water from Port Jefferson to East Rockaway Inlet. Once at the scene, they would be positioned where the greatest accumulations of oil were, just as in Scenario A.

5.8 EQUIPMENT PERFORMANCE FOR SCENARIO B

The efficiency of the self-propelled skimmers is drastically reduced when dealing with a heavy oil such as No. 6 residual. Not only is it difficult to get a very viscous oil into the collection well of a JBF skimmer, but once the oil is in the well it tends to pile up there because of its incompatability with the pumping system. All pumps have difficulty in handling this heavy oil. The buildup of oil in the well overloads the skimmer's belt system, which can cause a mechanical breakdown. The bar screen at the skimmer's bow would have to be removed when dealing with tar balls or larger oily masses.

The addition of heating coils to the skimmer's collection well and pump system could improve pump efficiency and aid in the emptying of the collection well by increasing the temperature of the collected oil and lowering its viscosity. When offloading, the coils could be hooked up to a shoreline steam supply, where steam of up to 150 psi could be used to heat the oil. Even with these modifications, skimmers would still not be effective tools for cleaning up a spill of high pour point No. 6 oil.

The Marco Class ID is also ineffective when skimming this type of oil. If the skimmer's -liophilic belt is removed, the backup belt can be installed to form a conveyor belt system. Shovels can be used to remove oil and tar balls from the belt. However, just aa with the JBF skimmers, clogging of the collection well is a problem due to the decreased pumping efficiency associated with this viscous oil.

Small skimmers and vacuum trucks would experience problems similar to those previously mentioned.

The use of U.S. Army Corps of Engineers debris barges proved to be very effective tools in cleaning up a large spill of Bunker C oil in San Francisco in January 1971. This oil is similar in characteristics to No. 6 oil. These barges employ large scoops with small holes (to permit water drainage) to remove debris from water. This system also works extremely well in removing solidified oil or tar balls from water.

When using booms to contain liquid oil, the oil collects behind the boom, forming a thin layer on the water surface. Several feet behind the boom the oil forms deeper pools, displacing water and extending farther below the water surface. Since this liquid oil has a low shear strength, currents can easily pull oil off the bottom of these pools and carry it under the skirts of booms. This is a common form of boom failure, and in currents greater than

1 knot, large amounts of this pooled oil can be entrained under the boom. When oil is very viscous and solidified, it has a high shear strength, making it difficult for currents to remove portions of the solidified masses and carry them underneath the skirts of booms. This makes booming of this type of oil very efficient.

These solidified oil masses collecting behind a boom can reach a considerable thickness, creating increased stress on the boom. If booms are not periodically checked and maintained while deployed, a large mass of collected oil could cause a boom failure. Therefore, oil must be continually removed from behind the boom to prevent this occurrence.

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APPENDIX A

Review of Comments Submitted by
Parties Interested in Oil Spill Control

1. Tom Doheny, Town of Hempstead, Dept. of Conservation and Waterways

Comments: a. The draft report implies that 7,500' of supercompactible boom would have to be purchased and stored in the East Rockaway Inlet vicinity. It should be noted that currently approximately 4,000' of boom are available in the Inlet vicinity thus reducing the purchase requirement to 3,500' of boom.

b. The easterly tidal excursion in Reynolds Channel does not end in Shell Creek after eight hours. The separation point for the meeting of the East Rockaway and Jones Inlet incoming tidal waters occurs 100 yards west of Cinder Creek. However, the incoming and outgoing phases of the tides at each inlet is such that the outgoing tide to Jones Inlet occurs prior to the easterly extent of the incoming water at East Rockaway and as such there is, depending on meteorological conditions, at least 1½ and at most 2½ hours of East Rockaway water being drawn easterly and out into Jones Inlet by the outgoing tide exiting from Jones Inlet.

Response: The final report was revised to clarify these points.

Comments: c. There should be an additional section called, "Channels and Tidal Flats - Important Shellfish Areas".

d. It would be helpful if there was an added column showing the amount of boom containment and deployment at each location per each time.

e. The report for this particular area of the Hempstead Bay Estuary should contain more oil spill preparation than what has been addressed. It should address a diurnal tide situation which represents immense logistical problems for cleanup.

f. It should provide a section which addresses separate spills associated with offloading.

g. It should provide a section whereby existing local, county and state laws already enacted and existing could be displayed for everyone's information. Along with this comment is the fact that the County of Nassau, which in addition to the Town of Hempstead has laws regulating offloading, has rescinded the booming regulation for the months of December 15 to March 15 of each year, as per a Board of Supervisors Resolution passed February, 1981. This poses a problem for two reasons,

#1 because most of the oil companies believe they were under regulation of only Nassau County during all this time, even though the Town of Hempstead, Dept. of Conservation and Waterways had responded to all the spills and have had existing oil spill prevention laws on the books since 1977 and 1978: and #2 since the booming contractor is not being paid for those three months, equipment from the terminal facility has been removed; therefore, putting the terminal facility in noncompliance with a further sub-chapter of county law which stipulates that each facility must maintain an adequate supply of containment equipment in case of emergency.

Response: The scope of this study precluded text modification to accommodate all suggestions and recommendations.

2. Matt Milhous, Regional Marine Resources Council

Comment: Does the report recognize the size limits on barges traversing East Rockaway Inlet?

Response: The scenario presented in the report describes an accident involving a barge with a capacity of 70,000 barrels. Research indicated that barges of this size commonly travel through the Inlet.

Comment: Assuming there is barge traffic at night, would it not prove extremely difficult to contain and clean-up spilled oil.

Response: The construction of permanent anchor points at key locations will greatly facilitate evening containment and clean-up activities.

3. John Black, Regional Marine Resources Council

Comment: What is done with the collected oil? What percentage of the collected liquid is oil?

Response: The oil is pumped into oil tankers and shipped to a refinery. The oily waste is landfilled. Approximately 80-90% of the collected liquid is oil.

4. Richard Miller, Executive Secretary, L.I. Fishermen's Assoc.

Comment: The use of dispersants will destroy marine life.

Response: The use of dispersants as proposed in the scenario for Moriches Inlet will prevent an oil slick from entering Moriches Bay which supports extensive marine life for both commercial and recreational purposes. The oil dispersed in the open ocean will have an increased surface area thereby facilitating its biodegradation and evaporation. The impact on marine life will be minimal. Permission from the federal government is needed prior to use of dispersants. The federal policy on dispersal use is presently being re-evaluated. The use of dispersants probably will become a more commonly used alternative in combating oil spills.

5. Robert Smolker, Regional Marine Resources Council

Comment: The control of boat traffic is not mentioned in the report.

Response: It is assumed that the U.S. Coast Guard will utilize their authority to control boat traffic.

Comment: Reynolds Channel and adjacent marshes are very important wintering areas for brant. It would be a good idea to deploy devices such as air guns to disturb the brant and deter them from using an area where oil has collected.

Response: It is so noted.

APPENDIX B

Part I - Inventory of Oil Spill Contractors and Equipment in the Long Island Region

In the event of an oil spill, an efficient and effective response is essential and can be achieved partially by familiarization with the contractors and equipment available for use in combatting oil spills. This Appendix identifies the local contractors and various operational aspects of oil spill equipment available in the Long Island area.

The type, manufacturer, quantity and location of the oil spill equipment owned by each contractor is listed in Table 1. Equipment which can be operated effectively in shallow water is denoted with an asterisk.

The rental costs for use of oil spill cleanup equipment are competitive and standardized throughout the industry. The costs are, however, subject to frequent change as are the equipment inventories of the various contractors. Table 2 gives the present rental costs for the equipment owned by two of the oil spill contractors listed in the previous table.

Equipment.

The primary types of equipment used in the containment and recovery of spilled oil are booms, skimmers and pumps. There are many varieties of each type of equipment available with some being better suited for certain purposes than others. A discussion of the characteristics of the different varieties of equipment is provided to enable the reader to determine which one is best suited for a specific purpose.

Booms. Booms are used primarily for containment or diverting spilled oil or for protecting areas from contamination. The brands of booms available from the various contractors are listed in Table 3 along with their specifications and capabilities.

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Table 1. INVENTORY OF OIL SPILL CONTRACTORS EQUIPMENT

Clean Harbors Cooperative (Verrazano Bridge)(201) 738-2438

Booms

*9,000 ft	American Marine Optimax 7" x 12"
3,000 ft	Kepner Supercompactible Sea Curtain 12" x 18"
*5,000 ft	Kepner Supercompactible Sea Curtain 8" x 12"

Skimmers

1	JDF 3003 self-propelled vessel
*1	Centrifugal Systems Oil Mop w/500' of rope
1	Marco Class JD self-propelled vessel

Boats

*4	Raider 34' work boats w/2 - 150 hp motors
*4	Orca 22' deployment boats w/2 - 85 hp motors

Oil/Water Separation Equipment

None

Clean Harbors Cooperative (Upper Arthur Kill)

Booms

*14,000 ft	American Marine Optimax 7" x 12"
* 3,500 ft	Kepner Supercompactible Sea Curtain 8" x 12"

Skimmers

2	JBF 3003 self-propelled vessel
*1	Centrifugal Systems Oil Mop w/500' of rope

Boats

*1	Bennent 27' Sealander w/2 - 150 hp motors
*6	Orca 22' deployment boats w/2 - 85 hp motors

Oil/Water Separation Equipment

None

Clean Harbors Cooperative (Perth Amboy)

Booms

*13,000 ft	American Marine Optimax 7" x 12"
* 3,500 ft	Kepner Supercompactible Sea Curtain 8" x 12"

Table 1. Continued

Skimmers

1	JBF 3003 self-propelled vessel
1	JBF 3001 self-propelled skimming vessel
1	Centrifugal Systems Oil Mop w/500' of rope

Boats

1	Bennett 27' Sealander w/2 - 150 hp motors
5	Orca 22' deployment boats w/2 - 85 hp motors

Oil/Water Separation Equipment

None

AAA Pollution Specialist, Inc. (Long Island City, NY) 212-729-2122

Booms

5,500 ft	Uniroyal Sealdboom 6" x 12"
*3,000 ft	American Marine Optimax 7" x 12"

Boats

2	30 ft work boats
1	21 ft MAKO w/115 hp
*15	small work boats w/outboard motors

Skimmers

*5	ACME Model 400 skimmers
*2	ACME FS-40 Electric skimmers

Oil/Water Separation Equipment

4	3,000-5,000 gal vacuum trucks
3	4,400 gal tank trucks
5	3,000 gal tank trucks

Spill Response Trailers

1	32' communications and repair trailer

Communication Systems

6 sets	Walkie-talkies
3 sets	Mobile units (in vehicles)
1	55 channel marine band

Advanced Environmental Technology Corp. (Morris Plains, NJ)
201-539-7111

A New York State licensed collector and transporter of hazardous wastes.

Booms

None

Boats

None

Skimmers

None

Oil/Water Separation Equipment

None

Spill Response Trailers

4	22' trucks
1	14' truck
5	44' trucks

Communication Systems

12 sets	Civilian band radios

Clean Venture (Linden, NJ) 201-862-5500

Booms

*13,000 ft	6" x 12" harbor boom
2,000 ft	12" x 24" Goodyear offshore inflatable high seas barrier boom

Boats

1	42' LCM twin screw 280 hp, 18 ton DWT
2	30' steel work boat
1	30' steel harbor tug
*6	22' work boats
*20	15'-19' work boats

Table 1. Continued

Skimmers

1	Bennett Mark 6E oil skimmer
*4	Swiss Oela skimmers
*4	Duck bill skimmers
*1	MK 209 oil mop skimmer & 300' mop

Oil/Water Separation Equipment

3	5,000 gal vacuum tractor trailer trucks
3	2,500 gal vacuum trucks (straight)
1	3,400 gal vacuum tractor trailer trucks
1	4,200 gal vacuum tractor trailer trucks

Communication Systems

10 sets	Communication trailer 8' x 35' roadable - marine and land lease communications (Motorola)
19 sets	Hand-held walkie-talkies

Spill Response Trailer

1	8' x 40' roadable - user: change area, eating area, first aid, shelter

Clean Water, Inc. (Toms River, NJ) 201-341-3600

Ship salvage and oil spill consultants - affiliated with Smit International (America), Inc.

Booms

* 4,000 bags	Filter Fence Sorbent C (Biodegradable) 4 cu ft 18 lb/bag
* 4,000 ft	5' filter boom (in one trailer)
2,250 ft	Harbor boom 8" x 24"
11,000 ft	Sea sentry boom 12" x 24"

Boats

None

Skimmers

None

Oil/Water Separation Equipment

2	12' x 4' x 5' API separators

Table 1. Continued

Spill Response Trailers

1	40' parts trailer

Communication Systems

3 sets	VHF 14 channel
8 sets	Walkie-talkies

Special Equipment

* 1	K350 36" wide track front end loader (marshland work)
*14	Mortar pans (marshland work)
1	International boom truck w/winch and boom (marshland work)

Marine Pollution Control (Port Jefferson, NY) 516-473-9132

Booms

*5,000 ft	MPC harbor boom 6" x 12"
2,000 ft	Uniroyal Sealdboom 6" x 12"

Boats

1	65' utility boat
1	60' crew boat
1	40' crew boat
3	56' LCM-6
1	50' LCM
*2	24' workboat
*2	18' outboard workboat
*2	12' aluminum workboat
1	Boston Whaler w/50 hp motor
1	Debris boat (Boatadozer)
1	80' salvage barge w/60 ton crane
1	10,000 gal vacuum barge

Skimmers

*2	Parker weir type (Oil Hawg)
*2	Slurp weir type

Oil/Water Separation Equipment

3	2,500 gal vacuum trucks
1	1,100 gal skid mounted vacuum unit
1	8,200 vacuum truck trailer & tractor

Table 1. Continued

Spill Response Trailers

None

Communication Systems

15 sets	VHF ship-to-shore units in boats and vehicles

Moran-Crowley Environmental Services Company (Carteret, NJ) 201-499-9777

Booms

*5,000 ft	Harbor boom 6" x 12"

Boats

*5	18' aluminum boats
*3	21' workboats

Skimmers

1	33' LPI skimmer
*2	Metropet skimmers

Oil/Water Separation Equipment

1	5,000 gal vacuum truck
2	3,000 gal vacuum trucks
1	3,000 gal stainless steel vacuum truck
7	5,000 gal stainless steel storage tanks

Spill Response Trailers

1	20' Command Port Travel-all

Communication Systems

6 sets	Walkie-talkies (marine band)
1 set	40 channel marine band

New England Pollution Control (Norwalk, CT) 203-853-1990

Booms

*2,000 ft.	Harbor boom 6" x 12"
2,000 ft.	Harbor boom 6" x 18"
*1,000 ft.	Inshore 6" x 6"

Table 1. Continued

Boats	
*4	15 and 18' workboats (up to 40 hp)
1	65' work barge
Skimmers	
*2	Swiss Oela
*6	Skim Pak
*2	Slick Bar Manta Ray
Oil/Water Separation Equipment	
1	6,000 gal vacuum truck
1	3,500 gal vacuum truck
1	3,000 gal vacuum truck
Spill Response Trailers	
1	24' Command trailer
Communication Systems	
4	Hand-held Motorola (USCG Freq.) & base station

Peabody Clean Industry, Inc. (Perth Amboy) 201-925-6010 and Staten Island 212-729-2121

Booms	
*2,200 ft.	Coastal boom 4" x 14"
2,300 ft.	Coastal boom 12" x 24"
Boats	
1	16' aluminum whaler 100 hp
2	18' flat bottom boats 25 hp
*1	16' work boat 15 hp
*1	14' work boat
Skimmers	
*2	Swiss Oela skimmer
*6	Slurp skimmer
1	Mash 400 skimmer
*3	Parker weir skimmers (Oil Hawg)

Table 1. Continued

Oil/Water Separation Equipment

2	3,000 gal vacuum trucks (straight)
5	6,000 gal vacuum trucks (tractor trailer)
1	4,000 gal vacuum truck
2	3,500 gal vacuum trucks
1	Vactor unit (large material mover)

Spill Response Trailers

1	Mobile Field Office & Communication Center (in Boston)

Communication Systems

10 sets	Walkie-talkies

Table 2. EQUIPMENT RENTAL COSTS

Contractor and Equipment	Rental Costs
<u>Marine Pollution Control</u>	
All Boom	$0.33/ft/day ($1.15/ft cleaning)
Slurp Skimmer	$46.00
Parker Skimmer	$46.00/day
80 ft Salvage Barge w/ 60 ton Crane	$115.00/hour
65 ft Utility Boat	$60.00/hour
60 ft Crewboat	$60.00/hour
40 ft Crewboat	$50.00/hour
56 ft LCM-6	$60.00/hour
50 ft LCM	$60.00/hour
24 ft Workboat	$35.00/hour
18 ft Outboard Workboat	$15.00/hour
12 ft Aluminum Workboat	$85.00/day
Boston Whaler (50 hp)	$15.00/hour
Boatadozer	$35.00/hour
2,500 gal Vacuum Truck	$37.00/hour
1,100 gal Vacuum Unit (skid mount)	$29.00/hour
8,200 gal Vacuum Truck Trailer & Tractor	$51.00/hour
10,000 gal Vacuum Barge	$60.00/hour
<u>Clean Venture</u>	
Boom up to 18 in.	$0.35/ft/day
Boom over 18 in.	$0.40/ft/day
Bennet Mark 6E Skimmer	$260.00/hour
MK 209 Oil Mop	$70.00/hour

Table 2. Concluded

Contractor and Equipment	Rental Costs
Slurp Skimmer	$60.00/day
Swiss Skimmer	$60.00/day
Oil Hawg Skimmer	$300.00/day
Duckbill Skimmer	$60.00/day
30 ft Harbor Tug	$37.00/hour
22 ft Workboat	$28.00/hour
15-19 ft Power Workboats	$150.00/day
Vacuum Trucks (Tractor-Trailer)	$47.50/hour
Vacuum Trucks (Straight Job)	$41.00/hour
Vacuum Unit (Skid Mount)	$27.00/hour
Tractor Trailer w/Pumps	$33.50/hour

Skimmers. Skimmers are the primary means by which oil is recovered from the water surface. They work on a variety of principles with their effectiveness being dependent on the environmental conditions and oil type. Table 4 lists the skimmers available locally and their specifications and capabilities. The majority of skimmers are small, portable units with the remainder being mounted externally or internally to a vessel.

Pumps. Because of the wide variety of pumps available from each contractor, pumps have been listed by type rather than separately. Table 5 lists the pump type with a few manufacturer's names given for each. In general, centrifugal trash pumps are the most common and most widely used in oil spill cleanup with single and double diaphragm pumps also experiencing heavy use. Both are well suited due to their ability to pump heavy oils and pass limited amounts of debris. Even though centrifugal types have a high emulsification potential, this is a secondary consideration and does not affect the capacity of the pump. Other pumps are also well suited for oil spill cleanup but are not widely available. It should be noted, however, that rating pumps by type is not absolute as a few different models or manufacturers of the same pump type may have different capabilities than those listed in Table 6.

Table 3. BOOM CAPABILITIES

Boom	Boom Type	Freeboard	Draft	Max. Wave Height	Max. Current Speed	Stability	Shallow Water Use
Metropolitan Petroleum	Curtain	6 in.	12 in.	1-3 ft	1 kt	Moderate	Good
Metropolitan Petroleum	Curtain	12 in.	24 in.	5 ft	1 kt	Moderate	Limited
Uniroyal Sealdboom	Fence	6 in.	12 in.	1-2 ft	1 kt	Poor	Poor
Coastal	Fence	6 in.	12 in.	1-3 ft	1 kt	Poor	Poor
Coastal	Fence	12 in.	24 in.	1-3 ft	1 kt	Poor	Poor
B.F. Goodrich	Fence	12 in.	24 in.	3-5 ft	1 kt	Good	Poor
Acme	Curtain	6 in.	12 in.	1-3 ft	1 kt	Moderate	Good
Slickbar MK-6	Fence	6 in.	12 in.	1-3 ft	1 kt	Moderate	Poor
American Marine Optimax	Curtain	7 in.	12 in.	1-3 ft	1.5 kt	Good	Good
Kepner Supercompactible Sea Curtain	Curtain	8 in.	12 in.	1-3 ft	1 kt	Moderate	Good
Kepner Supercompactible Sea Curtain	Curtain	12 in.	18 in.	1-3 ft	1 kt	Moderate	Limited
Sea Sentry	Curtain	12 in.	24 in.	1-3 ft	1 kt	Good	Limited

Table 4. SKIMMER CAPABILITIES

Skimmer	Portable or Vessel Mounted	Effectiveness vs. Oil Type Light	Medium	Heavy	Solid	Max. Wave Height	Skimming Speeds[2]	Required Water Depth
JBF 3003	V.M.	High	Moderate to High	Low	Low	2-3 ft	0-3 kts	6 ft
JBF 3001	V.M.	High	Moderate to High	Low	Low	2-3 ft	0-3 kts	4 ft
Bennett Mk 6E	V.M.	High	Moderate	Low	Low	2-3 ft	1-2 kts	6 ft
Oela "Swiss"	P	Moderate to High	Moderate	Low	Not Effective	6"	NA	8"
Slurp	P	Low	Moderate	Moderate	Not Effective	1 ft	NA	1 ft
Oil Hawg	P	Low	Moderate	Moderate to High	Not Effective	6"	NA	6"
Oil Mop	P	High	High	[1]Low to Moderate	Not Effective	6"	NA	6"
Manta Ray	P	Low	Moderate	Low	Not Effective	6"	NA	6"
Acme	P	Low	Moderate	Low	Not Effective	6"	NA	1 ft
Coastal Barge Skimmer	V.M.	Moderate	Moderate	Low	Not Effective	1 ft	1-2 kts	3 ft
______ I-D	V.M.	Moderate	Moderate to High	High	High	2 ft 2-3 ft	0-2 kts 1-4 kts	3 ft 3 ft
LPI	V.M.	Moderate	High	High	Not Effective			
Skim Pak	P	Moderate	Moderate	Low	Not Effective	6"	NA	6"

[1]Effectiveness improved with preheater.
[2]For vessel mounted types only.

Table 5 -- Pump Capabilities

Pump Type	High Viscosity Oils	Small Debris (< ¼")	Moderate Debris (¼-½")	Ice (Small Pieces)	Emulsification Potential	Disadvantages
Centrifugal (Monarch, Hale)	Poor	Good	Good	Good	High	Most standard types cannot handle highly viscous oils at all.
Centrifugal--Trash (Homelite, Gorman-Rupp)	Moderate to Good	Good to Excellent	Good to Excellent	Good to Excellent	High	Typically, the higher the debris handling ability of the pump the lower the high viscosity pumping and self-priming ability.
Single Diaphragm (Homelite, Gorman-Rupp)	Good to Excellent	Good*	Moderate* to Good	Good*	Low	High degree of surging from diaphragm action--not applicable for skimmers requiring even suction (Slurp).
Double Diaphragm (Wilden, Sandpiper)	Good to Excellent	Good*	Moderate* to Good	Good*	Low	Slight surging--Many diaphragm pumps are pneumatic requiring a compressor--Diaphragms are susceptible to puncture by debris.
Sliding Shoe (Megator)	Good	Good to Excellent	Good	Good	Moderate	Pump should be operated against a total head of at least 10 ft to seat shoes and maximize efficiency.
Progressive Cavity (Moyno)	Excellent	Good to Excellent**	Good to Excellent**	Good to Excellent	Low	Not designed for mobile field use, may be fixed to deck of barge.
Sliding Vane (Blackmere)	Moderate to Good	Poor	Poor	Poor	Moderate	Cannot tolerate any debris and is ill suited for cold weather.
Rotary Gear (Rotoking)	Good	Poor	Poor	Moderate	High	Can crush small pieces of ice but intolerable to most solid debris.
Hydrodynamic (Spate)	Excellent	Good	Moderate to Good	Good	Moderate	Cannot handle long pieces of debris, i.e., twigs, pencils.

*Some diaphragm pumps claim to handle debris up to 2".

**Depending on model.

Part II - Publicly Owned Oil Spill Containment and Clean-Up Equipment

Nassau County Police Department

1-42' patrol boat
3-32' patrol boats (on duty 24 hrs from April to January; one (1) boat on duty from January to April)
2-27' patrol boats (3 are generally on the North Shore; 3 are on the South Shore)

Nassau County Department of Health

1-23' Mako
2-16' Boston Whalers

Town of Oyster Bay

1-30' Columbia OBH
1-20' Boston Whaler
1-16' Boston Whaler
1-20' Garvey
1-35' Amphibious Landing Craft w/500 gal. container
1-12' Dinghy

Town of Hempstead

1 Ford Van
1 Diesel Scout 4 x 4
1 3500 lb trailer containing 1000ft of containment boom, sorbent sweeps and pads and sorbent boom, and related equipment
6 Various sized vessels for boom deployment

Material Stockpile:

500 ft M-P boom
100 boxes of sorbent pads
200' sorbent boom
400' sorbent sweeps

Town of North Hempstead

1-31' Bertram (with a 150 gpm water pump)
1-18' Boston Whaler
2-300' of Slickbar boom

Suffolk County Police Department

2-37' Egg Harbors
1-31' Chris Craft
4-30' Columbias
2-20' Shamrocks
1-22' Aquasport
1-19' Revenge
3-16' Challengers
3-16' Boston Whalers
1-15' Airgator
3-16' Grummans
1-14' Wolverine

Town of Brookhaven

1-32' Uniflite
2-20' Sealarks
1-19' Garvey
2-19' Shamrocks

Town of Babylon

1-30' Silverton (no winter service)
1-22' Airslot I/O

Town of Huntington

2-23' Patrol Boats
1-26' Work Boat
1-12' Shiff
1 4 x 4 GMC Pick-up
1 6 Wheel Drive Truck and Trailer

Material Stockpile:

300' absorbent sweeps
500 absorbent pads
50' absorbent collars

Town of Islip

In process of equipment inventory

Town of Southampton

1-36' Amphibious Lark
1-30' Dongan III
1-26' Dongan I
1-M/2 Dongan II
1-20' Pro-line (outboard)
1-17' McKee Craft (outboard)
1-16' Bayrunner
1-14' Hampton Whaler
1-14' Garvey
1-14' Grumman
1-14' Duranautic

1-24'x10' Work Barge with Hydraulic Winch

Fire Island National Seashore

Vehicles

3 4 x 4 Cherokee Jeeps
3 4 x 4 Chevy Subarbans
1 4 x 4 Dodge Rack Truck
1 4 x 4 Dodge Club Cab
1 4 x 4 Chevy Pick-Up

Boats

1-32' FINS III Inboard Diesel
1-30' FINS II Inboard Diesel
1-27' FINS IV Inboard Diesel
1-27' Boston Whaler Outrage
3-22' Boston Whalers Revenge
1-21' Stiger Outboard

U.S. Coast Guard, Marine Environmental Protection (MEP) Equipment in New York Area

*indicates equipment available for use in shallow water

Group Rockaway

	1,000 ft	Oil containment boom
*	540'	Sorbent boom (3M type)
*	6 bales	3M sorbent pads
	1 bag	Sorbent pads

Station Rockaway

*	400 ft	Sorbent boom
*	8 bales	3M sorbent pads
	1	44' boat with radar
	2	41' boats with radar
*	1	21' boat with outboard

Station Short Beach

*	400 ft	Oil containment boom (12")
*	8 bales	3M sorbent pads
	1	44' boat with radar
	1	41' boat with radar
*	1	21' boat (stored Nov.-Feb. in shed)
*	1	17' boat (stored Nov.-Feb. in shed)

Station Fire Island

*	100 ft	Sorbent boom (3M)
	6 bales	3M sorbent pads
	1	44' boat with radar (year-round)
	1	41' boat with radar (year-round)
*	1	21' boat (no winter use)
*	1	20' boat (no winter use)

Group New York

*	300 ft	Slickbar harbor boom
*	14 bales	3M sorbent pads
*	23 bales	Sorbent Sweep (100'/bale)
*	4 bags	Oil Snare sorbent
*	1	Slurp skimmer

2 41' boats with radar
5 32' boats without radar
1 30' boat
4 Response vehicles (suburban vans)
1 Command Post (16' trailer)
1 Boom trailer

U.S. Coast Guard Atlantic Strike Team (Elizabeth, NC)

Booms

5,508 ft USCG open water(high seas) boom
*1,000 ft Whittaker harbor boom
*1,000 ft Spilldam harbor boom

Skimmers

1 Lockheed 2004 disc drum skimmer (self-propelled) 1000 gpm
*1 Lockheed disc drum skimmer 50 gpm
*1 Slurp skimmer

Boats

1 22' Boston whaler (v-hull) two 85 hp
1 21' Boston whaler (Tri-hull) two 85 hp
*5 Zodiac boats 35 hp
*3 18' assault boats 25 hp

Other

5 ADAPTS type 1 Emergency Tanker Lightering Systems
1 250,000 gal Dracone barge
2 50,000 gal Dracone barge
1 10,000 gal Dracone barge

Communication Systems

USCG systems - commercial equipment may not be able to interphase easily

Long Island State Parks and Recreation Commission

2-18' Boston Whalers
1 Work Barge with Crane

New York State Department of Transportation

sorbent material stored at Hauppauge
500' Oil Containment Boom - Harbor Type
50' Light Emergency Containment Boom
160' Light Absorbent Boom
4 bales absorbent sheets
2 bales absorbent rolls

Part III - Spill Equipment Owned by Long Island Terminal Association Members

Carbo-Concord - Contact: Arnold Seltzer/James Grimaldi

(516) 293-2500

400' Optimax boom
12 Bundles 3M sorbent pads, booms and sweeps
1 Pump with 200' suction hose

Commander Oil Co. Inc. - Contact: Joseph G. Shapiro/Leonard Shapiro/ E.J. Barnett

(516) 922-7000
Emergency No. (516) 676-9393/(516) 922-7694

1 13' Boat on trailer/25HP motor
700' Containment boom
100-50 lbs. of absorbant
4 bales (400') Sorbent sweeps (T126)
2 1/2 bales (100') Sorbent booms (T270)
6 1/2 bales(1300') Sorbent sheets (T151)
10 bales 3M Sorbent pads

Glenhead Terminal Corp./Harbor Fuel Co., Inc. - Contact: Donald Death, Jr.

(516) 676-2500
Emergency No. (516) 676-0618

600' Slickbar boom
4 bundles Sorbent pads
1 bundle Sorbent boom
24 bags Oil Absorbent
25-50 401b. bags Speedi-Dri absorbent

Hawkins Cove Oil Supply Co. - Contact: Bruce Hawkins

(516) 676-7200/759-0227

150' Harbor boom
4 cases Sorbent pads
4 bags Sorbent pellets
10 bags Oil Dry

Reliance Utilities - Contact: Lawrence F. Caputo

(516) 931-6800

Unspecified quantity of Speedi-Dri, Sorbent Pads and Chemical Dispersant.

Lewis - Contact: P. Miglietta

(516) 883-1000/767-2434

800' Boom
20 bags Sorbent pellets
2 bails 3M Sorbent pads
2 boxes Metro Sorbent pads
1 16' Utility Boat 15 HP

Northville Industries Corp.

Riverhead Terminal - Contact: Capt. John Dudley/Zenon Czujko

(516) 727-5600

1 Aluminum Skiff 25 HP
1 Parker Systems Skimmer Mod. 100; Ser. 88 with accessories
1 Floating Power Skimmer with associated equipment
750'x12" Floatation, Oil containment boom
300'x12" Containment boom
1200'x6' Containment boom
100'x8" Sorbent filtering boom
1 Edson Diaphragm pump

In addition the Riverhead terminal has an assortment of Sorbent materials and oil spill response support equipment such as hoses; floats and coils of polyprophylene line.

Plainview Terminal - Contact: Pete Miloski

(516) 349-8071/727-7286

1 Scavenger Pump
30 bags Speedi-Dri

Holtsville Terminal - Contact: Jeff Burns

(516) 475-5060/727-6378

1 Portable pump
60 bags Speedi-Dri

Consolidated Petroleum Terminal (Pt. Jefferson Dock) - Contact: Mr.Vandermark

(516) 941-4040
Emergency No. John Reiff/Walter Remsky (516) 941-4040

1 12' Fiberglass Skimmer Boat 2 HP
1,600' MPL Harbor Oil spill boom
3,000' 3M Sorbent sweep
20 boxes Sorbent pads
6 boxes Sorbent pillows

6 cases Type 300 Oil snare
150' Sorbent blanket
1 Edson pump
1 Lister pump with assorted hoses and equipment

Skaggs-Walsh Inc. - Contact: Peter F. Heaney

(212) 353-7000
Emergency No. Tony Sabatino (516) 389-7247
Bill Michnowitz (516) 352-2571

1 Row boat w/oars
2000 lbs. Sorbent material
55 gals Dispersant
300' Boom
1 Skimmer
200 Sorbent pads

Windsor Fuel Oil Inc. - Contact: D. Leoguande

(516) 746-5900

150' Boom
7 boxes 3M Sorbent pads
1 10' Row Boat
10 Bales Hay

Universal Utilities Inc. - Contact: Joseph Shapiro

(516) 922-7000
Emergency No. E.J. Barnett (516) 922-7694

2 bales (200') Sorbent sweeps (T126)
2 bales (80') Sorbent booms (T270)
3 1/2 bales (750') Sorbent sheets (T151)
600' Containment boom

Part IV Spill Equipment Owned by Private Companies

A. OIL CITY PETROLEUM COOPERATIVE (includes B.P. Oil, CIBRO, EXXON, GULF, SUN OIL and LILCO)

Location - Gulf Oil Company Terminal Garage
Contact - Mr. Ray Storwick (516) 432-3900

List of Equipment:

1 Utility Trailer
1 Skimmer
1 Gasoline powered pump
50 Bags absorbent
200' Metropolitan boom

B. LILCO

Location - E. S. Barrett, Power Station
Contact - Mr. Dittmeier, Chief Engineer (516) 432-1400

1. South End of Storeroom

a. 40 bags fiber-pearl absorbent
b. 5 - 100' sections of booms with connectors
c. 48 oil absorbent pillows
d. 3 boxes of oil filtering boom
e. 4 - 100' oil absorbent sweeps
f. 1 gas-engine powered skimmer with hose
g. Boston Whaler on dolly with motor

2. At Dock

a. 600' containment boom for off-loading

3. Adjacent to Plant

a. 350 gal. tank for use with skimmer

C. B.P. OIL CORP.

Location - 3631 Hampton Road, Oceanside, New York
Contact - Mr. L. Parisi (201) 748-6724 or
Mr. P. Becker (516) 489-9261

List of Equipment

25 Bags absorbent C
Supply of absorbent pads
15 Cans No Lite
500' Boom (in water)
Foam cans

D. CIBRO TERMINAL

Location - 7 Washington Ave., Island Park, New York
Contact - Mr. Ray Storwick (516) 667-2854 or Mr. M. Marasco (516) 431-7305

List of Equipment

150 Cans powder foam
150' New Boom - packaged
25 Bags absorbent C
Supply of absorbent pads
Rack truck with lift gate
800' Boom in water

E. EXXON CO., U.S.A.

Location - Hampton Road, Oceanside, New York
Contact - Mr. J. Colligan (516) 742-3623 or
Mr. O. Runge (516) 842-1980

List of Equipment

Sorbent C 54 bags 18 CBS
Liquid foam 100 5 gal. cans XL-3 NFSI
Oil Spill Pillows 2-40 lb. boxes
80 ft. Oil Absorbent Boom - 8' x 10' sections

F. GULF OIL COMPANY

Location - Hampton Road, Oceanside, New York
Contact - Mr. S. Beanland (516) 661-6136 or
Mr. Darow Forbes (516) 764-3487

List of Equipment

1000 ft. of MP Boom in water
15' Boston Whaler with 35 HP motor in water
50 Bags of Sorbent
275 Gallons of 3% liquid foam in five gallon cans
Assorted rakes and shovels

G. SUN OIL COMPANY

Location - Hampton Road, Oceanside, New York
Contact - Mr. P. Caldwell (516) 654-3671 or
Mr. J. Vitowski (516) 587-3455

List of Equipment

1000' Metropolitan Boom in water
50 bags of sorbent
900 Gallons - 3% protein foam in tank ready for use
11-55 Gallon drums XL3
22- 5 Gallon cans of national foam

APPENDIX C

Oily Waste Disposal

The disposal of recovered oil and of oil-contaminated materials can pose immediate and long-range problems. Recovered oil is most easily dealt with by separating out any water that may be present and refining it locally or shipping it to its original destination.

Disposal of contaminated debris is more difficult. Legal requirements for its disposal are established by the New Jersey Department of Environmental Protection for New Jersey and the New York Department of Environmental Conservation or the New York City Department of Sanitation for the New York area. In most cases, contaminated wastes should not be burned. They can be buried safely on land in approved disposal sites if correct procedures are followed. It is often advisable during waste handling, transfer, or storage to cover the area of operation with plastic sheets to prevent contamination.

Disposal can pose several problems. The first is storage and transport of oil and contaminated material to the disposal sites. Remote locations and areas sensitive to vehicular traffic impose limits on access. Helicopters or boats may be necessary to remove pillow tanks and other small storage containers. In the case of a large spill or extended containment or cleanup activities, an access road should be constructed to permit the use of heavy equipment to transport material from the recovery area to the disposal site.

The second problem involves the several available disposal methods. They include oil and water separation, burial, and natural degradation. The specific disposal method selected depends on the nature of the oil-contaminated material, the location of the spill, and the prevailing weather conditions.

Disposal of Recovered Oil

In most spill situations the oil recovered will contain a large percentage of water which should be separated out prior to disposal or recycling. In the event of a major spill, a large-scale oil/water separation operation should be set up at a local refinery, processing plant, or other facility possessing separation equipment. Many authorized waste oil and chemical processing facilities exist throughout New York and New Jersey but are oriented to chemicals and may be limited as to the quantity of material they can handle. Table 1 lists these facilities. A list of the regional liquid waste oil collectors is given in Table 2.

Disposal of Oiled Material

Oil spills can generate large quantities of oil-contaminated material consisting primarily of debris, vegetation, sediments, and sorbenst. Disposal of such debris is a major problem as only a few sites are authorized to receive oily wastes. The disposal regulations for New York and New Jersey are discussed below.

New York. In the State of New York there are presently no predesignated sites approved by the Department of Environmental Conservation (DEC) for disposal of oily wastes. In the event of a spill the DEC will consider requests for disposal on a case-by-case basis. Most landfill operations on Long Island are hesitant to accept oily wastes unless directed to do so by the DEC. There are three lined landfills on Long Island at Brookhaven, Oyster Bay and North Hempstead, which may take oily wastes. The NY DEC would like local communities to accept oily sand and debris collected from their own areas. A form letter sent by the NY DEC to local landfills would request their assistance. The form letter would describe the waste, state its volume, name the waste carrier and state there is no contamination (e.g., heavy metals, PCB's, etc.) in the oil. If contamination is suspected the

Table 1. AUTHORIZED CHEMICAL WASTE PROCESSING FACILITIES*
(DISPOSAL/RECYCLING OF LIQUID WASTES)

Facility	Type of Treatment	Type of Waste Accepted
New Jersey		
Advanced Environmental Technology Corp. The Dayton Bldg. 520 Speedwell Ave. Morris Plains, NJ 07950 (210) 539-7111	Transfer, Storage	Packed laboratory chemicals, vegetable oils, motor oils, compressor oils, laboratory chemicals, solvents, pesticides, silver, platinum, gold, copper salts, acids, alkalis, dyes, pigments, solution
AntiPollution Systems, Inc. 350B W. Delilah Rd. Pleasantville, NJ 08232 (609) 641-1119	Incineration	Waste oils, emulsion, water-methanol waste, pigments, dyes
B & L Oil Corp. 472 Frelinghuysen Ave. Newark, NJ 07114 (201) 248-7925	Reprocesser	Crankcase oil, fuel oil, hydraulic oil
Browning Ferris Industries 714 Division St. Elizabeth, NJ 07207 (201) 352-2222	Transfer, Storage	Flammable solids, paint, pigment, ink sludge, oil, solvent, slurries, flammable liquids, non-flammable liquids
Clark Systems Formerly Blackwood Carbon Products Little Gloucester Rd. Blackwood, NJ (906) 589-7301	Oil Recovery	Oil and oil emulsions
Duane Marine 26 Washington St. Perth Amboy, N.J. (201) 925-6010	Oil/water separation and reprocessing. Storage facility.	Oil and oil emulsions.
Earthline Co. 100 Lister Ave. Newark, NJ 07105 (201) 465-9100	Organic reclamation, from contaminated aqueous waste, acid/base neutralization, hazardous waste detoxification (oxidation reduction), fuel reclamation	Organic, aqueous wastes, solvents, chlorinated solvents, oily wastes, acids, alkalis, cyanides, mixed heavy metal waste, waste fuel and lubricating oils

Table 1. Continued

Facility	Type of Treatment	Type of Waste Accepted
Eastcoast Pollution Control, Inc. Cenco Blvd., P.O. Box 275 Clayton, NJ 08312 (906) 881-5100	Transfer, Storage	Cleanup debris, waste oil, mixed solvents, still bottoms
Elco Solvent Corp. 30 Amor Avenue Carlstadt, NJ 07072 (601) 460-4000	Transfer, Storage	Flammable, non-flammable liquids, solvents
Inland Chemical Corp. 600 Doremus Ave. Newark, NJ (201) 589-4085	Reclamation, Recovery	Solvents, organic liquids, aqueous-organic emulsions, lacquer, paint, pigment residues
Kit Enterprises Inc. 475 Division St. Elizabeth, NJ 07201 (201) 574-8804	Reclamation, Recovery, Blending, Treatment	Oil lubricants, fats and fatty oils, heavy and light hydrocarbons
L & L Oil Service Inc. 740 Lloyd Rd. Aberdeen, NJ 07747 (201) 566-2785	Transfer, Storage, Reprocesser, Blending	Waste oil and oil sludge
Lionetti Waste Oil Service Inc. 9 Line Rd. Holmdel, NJ 07733 (201) 946-2505	Storage, Blending	Motor oils, fuel oils, hydraulic oils
Marisol Incorporated 125 Factory Lane Middlesex, NJ 08846 (201) 469-5100	Transfer, Storage, Reprocesser, Reclamation, Recovery, Blending, Treatment	Oils, emulsions, solvents, flammable organic liquids, non-flammable liquids, paint, pigment residues, flammable liquids
Modern Transportation 75 Jacobus Ave. Kearny, NJ 07032 (201) 589-0277	Transfer, Storage, Reclamation, Recovery, Treatment, Disposal	Oils, emulsions, acid, alkali solutions, wastewaters, acids alkalis

Table 1. Continued

Facility	Type of Treatment	Type of Waste Accepted
Oil Recovery Co. Inc Cenco Blvd. P.O. Box 345 Clayton, NJ 08312 (609) 881-7400	Storage, Reprocesser, Reclamation, Recovery, Blending	Waste oil, solvents, oil sludge
Rollins Environmental Services P.O. Box 221 Bridgeport, NJ 08014 (609) 467-3100	Incineration, Neutralization, Chemical Treatment, Recovery, Reclamation, Transfer, Storage	Sludges, contaminated residues, spill debris, process wastewater, slurries, tank cleanings, solvents
S & W Waste, Inc. 25 Delmar Rd. Jersey City, NJ (201) 344-4004	Transfer, Storage	Paint, dyes, pigment residues, heavy metal residues, flammable solids, oils, emulsions, flammable liquids, acids, alkalis, solvents
Safety-Kleen Corp. Almo Industrial Park Clayton, NJ 08312 (609) 881-2526	Reclamation, Recovery	Oil, oil emulsions, oil sludges, mixed solvents
Standard Tank Cleaning Co. 184 Hobart Avenue Bayonne, NJ 07002 (201) 339-5222	Recovery, Storage	Oils, emulsions, organic sludges, non-flammable liquids, flammable liquids
New York		
Chemical Waste Disposal Corp. 42-19 19th Ave. Astoria, NY (212) 274-3339	Processing/Treatment Recycling/Reclamation Distillation for oil recovery	Sludges, paint, oil, lab chemicals, plating waste, chlorinated solvents
Frontier Chemical Waste Process, Inc. 4626 Royal Avenue Niagara Falls, NY 14303 (716) 285-8200	Processing/Treatment Recycling/Reclamation	Waste oil/industrial waste, reusable chemicals, nonchlorinated oil, burnable liquid wastes, recovered methanol, recovered oil, chlorinated solvents
Haz-O-Waste Corp. Canal Road Wampsville, NY (315) 682-2160	Processing/Treatment Recycling/Reclamation Distillation	Solvents, waste oil, burnable, liquid wastes, acids, alkalis, sludges

Table 1. Concluded

Facility	Type of Treatment	Type of Waste Accepted
NEWCO Chemical Waste Systems, Inc. 4626 Royal Ave. Niagara Falls, NY 14303 (716) 278-1811	Processing/Treatment Recycling/Reclamation	Hazardous/toxic wastes and most every other waste stream except radioactive and shock-sensitive explosives
SCA Chemical Waste Services, Inc. 1550 Balmer Rd. Model City, NY 14107 (716) 754-8231	Processing/Treatment Recycling/Reclamation Secure landfill	Solvents, acid, heavy metal sludge, paint wastes, PCB solids and sludges, contaminated soil, organic liquids

Sources: New Jersey Department of Environmental Protection and New York Department of Environmental Conservation

*Check authorization status with the New York D.E.C. (212) 488-3862 or the New Jersey D.E.P. (609) 292-5560 prior to use.

Table 2. APPROVED WASTE OIL COLLECTORS (LIQUID HAULING)

Name and Address of Firm	No. of Trucks
New York	
Ace Waste Oil, 71-34 58th Avenue, Maspeth, NY 11378	
Akba Waste Oil, 3836 Hahn Ave., Bethpage, NY 11714	
A-Z Waste Service, Inc. 60 Harmon St., Falconer, NY 14733	9
Albany Waste Oil Corp., RD #2, Clifton Park, NY 12065	2
Alboro Construction Co., 90-48 Corona Ave., Elmhurst NY 13209	1
Allied Chemical Corp., P.O. Box 6, Milton Ave., Solvay, NY 13209	6
Allied Waste Corp., 88-13 204 St., Hollis, NY 11423	3
American Chemical Disposal Corp., Oser Ave., Hauppauge, NY 11778	
Buckner Waste Oil Service, 21 Stonecrest Dr., New Windsor, NY 12550	1
Certified Waste Oil, 320 Court House Rd., Franklin Square, NY 11010	
C & F Pollution Control, Inc., 3266 Taylor St., Schenectady, NY 12306	4
Chamberlain's Septic Service, 1835 Route 104, Union Hill, NY 14563	6
Chemical Management, Inc., 340 Eastern Parkway, Farmingdale, NY 11735	
Chemical Waste Disposal Corp., 42-14 19th Avenue, Astoria, NY 11105	2
C.H. Heist Corp., 505 Fillmore St., Tonawanda, NY 14150	5
Coastal Pollution Control Services, Inc., P.O. Box 140, Renesselaer, NY 12144	4
Cortlandt's Septic Tank Service, Inc., P.O. Box 351, 22 Albany Post Rd., Mentrose, NY 10548	6

Table 2. Continued

Name and Address of Firm	No. of Trucks
County Tank Lines, Inc., Rte. 58 - E. Main Street, Riverhead, NY 11901	
County Waste Oil, Inc., 57 Brown Place, Harrison, NY 10528	3
Domermuth Petroleum Equipment and Maintenance Corp., Box 62, Clarksville, NY 12041	6
Duane Marine Corp., P.O. Box 435, Staten Island, NY 10308	
East Coast Tank Lining Corp., 700 Hicks St., Brooklyn NY 11231	3
Elmwood Tank Cleaning Corp., 62 West Market St., Buffalo, NY 14204	5
Environmental Oil, Inc., P.O. Box 315, Syracuse, NY 13209	5
E.W. Wllsworth and Sons Sanitation Service, 219 Mitchell Ave., Mattydale, NY 13211	2
Fourth Coast Pollution Control, La Grasse St., Waddington, NY 13694	3
Frank Masone, Inc., 368 Ocean Ave., Lynbrook, NY 11563	4
Frank's Bay City Oil Service, 1117 Olympia Rd., No. Bellmore, NY 11710	
Frontier Chemical Waste, 4626 Royal Avenue, Niagra Falls, NY 14303	3
General Electric Co., P.O. Box 8, Room 2C13 K-1, Schenectady, NY 12301	1
General Waste Oil Co., 37 Longworth Ave., Dix Hills NY 11746	
Harrison Radiator Div. GMC, Upper Mountain Rd., Lockport, NY 14094	3
Industrial Oil Tank and Line Cleaning Service Co., 307 East Garden St., Rome, NY 13440	4
Inland Pollution Control Inc., P.O. Box 357, 63 Columbia St., Rensselaer, NY 12144	2

Table 2. Continued

Name and Address of Firm	No. of Trucks
J.B. Waste Oil Co., 18-18 41st St., Long Island City, NY 11105	
James Parks, 2734 Chestnut St., York, NY 14592	1
Janic Waste Oil Corp., Bay Street, Freeport, NY 11520	
J.K. Waste Oil Service, 280 Grank Blvd., Deer Park, NY 11729	2
J.W. Lenza Oil Company, 3 Court St., Staten Island, NY 10304	1
Kroll Associates, 19 Woodgate Rd., Tonawanda, NY 14150	RENTAL
Loeffel's Oil Service, RD #2, Narrowburg, NY 12764	3
Lomasney Combustion, Inc., 366 Mill St., Poughkeepsie, NY 12602	2
Long's Landscaping, 2106 Love Rd., Grand Island, NY 14072	1
Luzon Oil Company, P.O. Box 19, Hurleyville, NY 12747	2
Manhattan Oil Service, 21-11A 46th St., Astoria, NY 11105	1
Marine Pollution Control, Inc., 460 Terryville Rd., Port Jefferson Station, NY 11776	4
New Era Oil Service, Inc., 402 Parsons Drive, Syracuse, NY 13219	5
Niagra Mohawk Power Corp., 300 Erie Blvd., West Syracuse, NY 13202	2
Niagra Tank and Pump Co., 262 Carlton St., Buffalo, NY 14204	1
Oceanside Equipment Rental Corp., 70 New St., Oceanside, NY 11572	3
Oldover Corp., P.O. Box 2, Saugertiers, NY 12477	1
Patterson Chemical Co. Inc., 102 Third St., Brooklyn, NY 11231	
RGM Liquid Waste Removal, 972 Nicols Rd., Deer Park, NY 11729	

Table 2. Continued

Name and Address of Firm	No. of Trucks
Rice Tank Cleaning Corp., 434 Suffolk Ave., Box 296, Central Islip, NY 11722	7
Wm. F. Sheridan, Jr. Industrial Oil Corp., 114 Peconic Ave., Medford, NY 11763	
Southgate Oil Services, Inc., P.O. Box A, 2699 Transit Rd., Elma, NY 14059	9
Stage Construction Co., Inc., 105 Commercial Ave., Vestal, NY 13850	2
Strebel's Laundry, 644 Montauk Highway, Westhampton, NY	
Superior Pipecleaning, Inc., 168 Woodlawn Ave., Woodlawn, NY 14219	5
Swanson Chemical Laboratories, Inc., 4 West First St., Lakewood, NY 14750	1
Timber Lake Campground, Plato Maples Rd., RFD #1, Box 72, E St., Otto, NY 14729	1
United Pump and Tank of Rochester, Inc., 779 Arnett Blvd., Rochester, NY 14619	1
Verdi Construction, Route 31, Savannah, NY 13146	6
Wizard Method, Inc., 1100 Connecting Rd., Niagra Falls, NY 14304	14
W.L. Oil Co., Inc., 178 North Elting Corners Rd., Highland, NY 12528	2
W.M. Spiegel Sons, Inc., 461 E. Clinton St., Elmira, NY 14902	7
World Wide Pollution Control, Inc., P.O. Box 702 New Station, New Paltz, NY 12561	3
<u>New Jersey</u>	
A.M. Environmental Services, Inc., 1031 Market St., Paterson, NJ 07513	7
Angus Tank Cleaning Corp., One Ingham Ave., Bayonne, NJ 07002	6

Table 2. Continued

Name and Address of Firm	No. of Trucks
Clean Venture, Inc., P.O. Box 418, Foot of South Wood Ave., Linden, NJ 07036	1
Depalma Oil Co., 21 Myrtle Ave., Jersey City, NJ 07305	4
Eastcoast Pollution Control, Inc., Cenco Blvd., Clayton, NY 08312	12
Energall, Inc., 411 Wilson Ave., Newark, NJ 07105	18
Essential Trucking Corp., Fanny Rd., Boonton, NJ 07005	3
Kisko Transportation Co., Inc., 504 Raritan St., Sayerville, NJ 08872	1
Loeffel's Waste Oil Service, Inc., P.O. Box 651, Old Bridge, NJ 08857	3
Marisol, Inc., 125 Factory Lane, Middlesex, NJ 08846	4
Nalco Chemical Co., 1927 Nolte Drive, Paulsboro, NJ 08066	1
Ned's Waste Oil Service, P.O. Box 375, Newton, NJ 07860	4
Phil's Waste Oil, 13 Ronald Drive, E. Hanover, NJ 07936	1
Robert More Waste Oil, 124 Baltimore St., North Arlington, NJ 07032	1
SCA Chemical Services, Earthline Division, 100 Lister Ave., Newark, NJ 07105	47
Solvents Recovery Service of New Jersey, Inc., 1200 Sylvan St., Linden, NJ 07036	2
T/A Samson Tank Cleaning, 101 E. 21st St., Bayonne, NJ 07002	3
<u>Other</u>	
Acme Services, Inc., 985 Plainfield St., Johnston, RI 02919	7
Berks Associates, Inc., P.O. Box 305, Douglassville, PA 19518	4

Table 2. Concluded

Name and Address of Firm	No. of Trucks
Colvin's Waste Oil Service, 24 Marrer St., Warren, PA 16365	1
G & H Oil Co., 455 Hemlock Rd., Warren, PA 16365	1
Hitchcock Industrial Liquid Waste, 40 California St., Bridgeport, CT 06608	5
Jet Line Services, Inc., 441R Canton St., Stoughton, MA 02072	18
New England Marine Contractors, Inc., 189 Lakeside Ave., Burlington, VT 05401	6
New England Pollution Control Co., Inc., 7 Edgewater Pl, E. Norfolk, CT 06855	6
Schofield Oil Ltd., P.O. Box 40, Breslau, Ontario, Canada NOB 1MO	3
Solvents Recovery Service of New England, Inc., Lazy Lane, Southington, CT 06489	6
The Crago Co., Inc., Route 26, P.O. Box 409, Gray, ME 04039	3
Tansenvironmental Corp., 500 Ford Blvd., Hamilton, OH 45011	1
Tricil Limited, 602 Rte. 132, Ste. Catherine, Quebec, Canada	1

NY DEC would analyze the contents. This plan is still in the fromative stages.

New York City. All requests for information relative to disposal of oil-contaminated solid wastes shall be channeled through the NYC Department of Sanitation, Operations Control Office, Bureau of Waste Disposal at the following numbers:

(212) 566-5326/5327

The following locations have been designated for receipt of oil-contaminated solid waste generated during and as a result of oil spill cleanup operations. Use of the following disposal facilities will be limited to those carriers possessing a "NYS DEC Industrial Waste Collector Certificat of Registration" (SW-3) and either a Department of Consumer Affairs Waste Conveyance License or a Department of Sanitation Construction Waste Permit. Disposal of materials will be from 0800 to 1600, Sundays and holidays excluded.

NYC Disposal Sites - Fountain Avenue Landfill
Fountain Ave. & Belt Parkway
Brooklyn, N.Y.

Edgemere Landfill
Beach 49th St. & Beach Channel Dr.
Rockaway, Queens, N.Y.

Brookfield Avenue Landfill
Arthur Kill Rd. & Brookfield Ave.
Staten Island, N.Y.

A list of qualified and approved regional oily solid waste carriers is given in Table 3.

If further information be required, Mr. Gus Fischetti, Engineer in Charge of Landfills, should be contacted, (212) 272-9811.

New Jersey. For disposal of oil-contaminated solid wastes within the State of New Jersey, contact the New Jersey Department of Environmental Protection for an approved dump site at (609) 292-5560. There are currently no

Table 3. APPROVED OILY WASTE CARRIERS (SOLID WASTE BUILDING)

Active Oil Service, Inc.
374 Main Street
Belleville, NJ 07109
(201) 482-4600

Atlantic B.C., Inc.
145 Van Dyke Street
Brooklyn, NY 11231
(212) 522-3260

Chemical Control Corp.
23 South Front Street
Elizabeth, NJ 07202
(201) 351-5460

Earth Line, Inc.
End of Wood Avenue
Linden, NJ 07036
(201) 862-4747

East Coast Tank Lining Co.
700 Hicks Street
Brooklyn, NY 11231
(212) 855-7272

Guardino & Sons, Inc.
80 Broad Street
New York, NY 10004
(212) 943-6966

Mobil Oil Corp.
4165 Arthur Kill Road
Staten Island, NY 10307
(212) 948-5400

Modern Transportation Co.
75 Jacobus Avenue
S. Kearney, NJ 07032
(201) 589-0277

National Oil Recovery Corp.
Hook Road & Commerce Street
Bayonne, NJ 07002
(201) 437-7300

Newtown Refinery Corp.
37-80 Review Avenue
Long Island City, NY 11101
(212) 729-7660

Oceanside Equipment Rental Corp.
70 New Street
Oceanside, NY 11572
(516) 678-4466

Oil Tank Cleaning Corp.
107-127 27th Street
Brooklyn, NY 11232
(212) 499-9608

Petroleum Tank Cleaners, Inc.
145 Huntington Street
Brooklyn, NY 11231
(212) 624-4842

Royal Tank Cleaning Corp.
687 S. Columbia Avenue
Mount Vernon, NY 10550
(914) 664-7070

Samson Tank Cleaning Corp.
101 East 21st Street
Bayonne, NJ 07002
(201) 437-1044

Standard Tank Cleaning Corp.
One Ingham Avenue
Bayonne, NY 07002
(201) 339-5222

approved dump sites in New Jersey. Approval for dumping oil-contaminated solid wastes is granted on a case-by-case basis.

All vehicles used in the collection or haulage of solid waste shall properly and conspicuously display the New Jersey Solid Waste Administration (NJSWA) registration number in letters and numbers at least 3 inches in height, and shall carry the current Solid Waste Administration registration certificate in the vehicle. In addition, in letters and numbers at least 3 inches in height, the capacity of the vehicle in cubic yards or in gallons, with the appropriate unit designated, shall be marked on both sides of the vehicle so as to be visible to the operator of the solid waste facility.

Further, all vehicles containing oil-contaminated waste shall be conspicuously placarded by the special waste hauler. Such placarding shall meet the requirements of the United States Department of Transportation for the transport of hazardous materials (49 CFR 170 et seq.).

No special waste facility shall accept oil-contaminated waste unless the vehicle is properly placarded in accordance with this section.

Temporary Waste Storage. If there are large quantities of materials for disposal, a temporary storage site should be established. A temporary storage site provides a location to store oily sediment and debris removed during shoreline cleanup operations until a final disposal site has been located, approved, and made operable. The temporary storage sites should be located in areas with good access to the shoreline cleanup operation and to nearby streets and highways. Good storage site locations are flat areas such as parking lots (paved or unpaved) or undeveloped lots adjacent to the shoreline.

Temporary storage sites should be selected and prepared to minimize contamination of surrounding areas from leaching oil. Therefore, storage sites should not be located on or adjacent to ravines, gullies, streams, or the sides of hills, but on flat areas with a minimum of slope. Once a location is selected, certain site preparations are usually necessary to contain any leaching oil. An earth berm should be constructed around the perimeter of the storage site. If a paved parking lot is used, earth would have to be imported from nearby areas; if an unpaved surface is used, material can be excavated from the site itself and pushed to the perimeter thereby forming a small basin. Entrance and exit ramps should be constructed over the berm to allow cleanup equipment access to the site. If the substrate or berm material is permeable, plastic liners should be spread over the berms and across the floor of the storage site in order to contain any possible oil leachate.

A front-end loader should be stationed at each storage site to evenly distribute the dumped oily material and to load trucks removing the material to final disposal.

APPENDIX D

Dispersants

Introduction

Spills of crude oil and petroleum products in the marine environment can result in varying types and degrees of environmental damage. In some cases spills may even involve threat of fire and explosion. To reduce these threats, various specialized techniques and equipment have been developed and used with different degrees of success. In almost all cases, limitation of spread and physical recovery of the spilled material represent the most environmentally acceptable actions and should always be given first consideration. However, as a result of spill size, weather, and other factors, control and recovery are not always adequate or even possible. Other options to minimize impacts should be explored in these situations.

An alternative to conventional methods of containment and recovery is the use of chemical dispersants. Dependant on the oil characteristics dispersants can assist the breakup and mixing of oil slicks into the water column, accelerating dilution and degradation rates. In addition, they may be used in sea states where conventional techniques are no longer effective.

Federal Regulation

The use of chemical dispersants is closely regulated by the federal government and can only be initiated in situations where it is deemed the most effective and least environmentally hazardous alternative. While advocating physical control and removal of spilled oil, the National Oil and

Hazardous Substances Pollution Contingency Plan provides the basis for case-by-case utilization of chemical dispersants and other treating agents. Known as Annex X, this schedule permits consideration of chemical dispersion in the following circumstances (40 CFR 1510, Annex X, Sections 2003.1-1 to 2003.1-1.3):

- In any case when, in the judgement of the federal On-Scene Coordinator (OSC), their use will prevent or substantially reduce hazard to human life or limb or substantially reduce explosion or fire hazard to property.
- For major or medium discharges when, in the judgement of the on-scene Environmental Protection Agency representative, their use will prevent or reduce substantial hazard to a major segment of the population(s) of vulnerable species of waterfowl.
- For major and medium discharges when, in the judgement of the Environmental Protection Agency response team member in consultation with appropriate state and federal agencies, their use will result in the least overall environmental damage, or interference with designated water uses.

Principals of Dispersion

Dispersion may be defined as the act or state of being broken apart and scattered. Oil floating on water will ultimately disperse naturally in response to currents and waves. As the degree of surface energy increases, the rate of natural dispersion increases. Typically, however, the natural process is slow and agitation of some oils often results in the formation of extremely persistent and difficult to treat water-in-oil emulsions (tar balls, mousse). For some oil types dispersants can greatly increase the rate of dispersion and prevent the formation of water-in-oil emulsions reducing the potential damage associated with floating slicks.

Dispersant formulations contain varying amounts of surface active agents (or surfactants). Technically, surfactants act to modify (reduce) the oil surface tension. Each surfactant molecule may be thought of as polar in nature, one end having an affinity for oil, and the other an affinity for water. When applied to floating oil, the surfactant diffuses through the oil and individual surfactant molecules orientate themselves along the surface with their water attracting ends out. (It is critical that the dispersant contact the oil and not be applied to the surrounding water.) As the slick is broken apart by natural or manmade energy, treated particles are separated and repelled, preventing slick reformation. Eventually, treated oil particles are broken into small enough drops that they remain suspended and dispersed in the water. Because the oil particles are surrounded by surfactant molecules, they tend not to adhere to solid objects such as boats, shorelines, etc. In dispersed form, the spilled oil has a much larger surface area which serves to accelerate solution, evaporation, photo-oxidation, and biodegradation rates.

Environmental Effects

The acceptance of chemical dispersants as a means of combatting oil spills has been deterred by real and inferred environmental damages associated with a few misapplications of early high toxicity products and a limited knowledge of the potential effects of the modern, low toxicity dispersant formulations.

However, there has been little evidence from actual field use of dispersants to prove or disprove significant effects resulting from the proper application of chemical agents. In contrast, the ecologic realities associated with spilled oil - particularly in coastal and shoreline areas - are dramatic and far better understood. When predictable damage or threats associated with untreated oil are compared with the known and unknown aspects of chemically treated oil, it may be possible to identify cases in which one action has significantly less total risk than another.

Toxicity data on government accepted dispersants are available from the EPA in the form of LC_{50}'s. Using the effective dosage rates, the potential concentrations of dispersants in the water column can be estimated and compared to their LC_{50} values. The comparison can then be used to predict possible ecologic consequences.

Some laboratory and field evidence suggests that chemically produced oil dispersions may be more toxic than naturally produced dispersions. It has been hypothesized that this phenomenon is a synergism between oil and dispersant which produces more toxic end products. Certain toxic components in the oil are activated, and therefore, preferential release of other toxic components occurs. A dispersant can increase the rate at which volatile fractions of oil are available to enter the water column. It is generally believed, however, that the "increased toxicity" of a dispersion is more related to the increased availability of the oil to various marine organisms. By breaking the oil up into minute droplets, the dispersant enhances the uptake and incorporation of certain oil components by many marine organisms through their breathing and feeding mechanisms. For this reason, dispersed oil at a given concentration may have a more adverse impact on a biological amenity than untreated oil at the same concentration.

Undispersed oil in nearshore areas and on shorelines can smother organisms and plants and cause extensive physical and aesthetic impacts. Undispersed oil is difficult and expensive to clean up because it typically adheres to shoreline surfaces.

<u>Use</u>

There are three basic types of modern dispersants: water-base, solvent-base, and concentrate. They differ mainly in the nature of their carrier

Table B-1. DISPERSANT APPLICATION EQUIPMENT AND TECHNIQUES

Type of Equipment	Application Technique	Dispersant Type
Hand-operated garden sprayer	Manual application from vessel or dock	Premixed solvent base, water base or concentrate
Portable pump and hand-carried spray nozzle	Manual application from vessel or dock	Premixed solvent base or concentrate
Spray boom and low pressure pump	Direct application from vessel at sea; agitation with breaker boards	Premixed solvent base
Spray boom, high pressure pump and eductor or metering pump	Direct application from vessel at sea: agitation with breaker boards, water streams or propwash optional	Concentrate or water base diluted onboard with sea water
Fire monitor/hose, high pressure pump, and eductor or metering pump	Direct application from vessel at sea or from dock: agitation optional	Concentrate or water base dilluted onboard or dockside with sea water
Helicopter with spray booms	Aerial application: agitation from wind and waves	Undiluted concentrates
Light aircraft with crop dusting apparatus	Aerial application: agitation from wind and waves	Undiluted concentrates
Heavy aircraft with spray booms	Aerial application: agitation from wind and waves	Undiluted concentrates

medium and the ease with which dispersions are formed. Dispersion using water-base formulations typically requires more time and energy. Because they use water as a solvent, these products can be diluted on-site with seawater, thus lending themselves to vessel application. Solvent-base formulations tend to disperse more easily, but are generally more toxic and require higher dosage rates. They are ineffectual when diluted with water. Concentrates contain high percentages of surface active agents. Depending on the product, they may be used neat, diluted with seawater, and/or diluted with hydrocarbon solvents. The "self-mixing" type of concentrate requires extremely low levels of mixing energy. By virtue of their versatility, dispersant concentrates lend themselves to most methods of application.

Dispersant use is greatly affected by the type of oil. Rapidly spreading oils are more easily dispersed than heavy or slowly spreading oils. Solvent base dispersants were formulated primarily for use on heavy or paraffinic oils as they are harder to break down. Chemical dispersion of highly weathered oils or water-in-oil emulsions is typically very difficult, if not impossible.

Application Techniques and Equipment

There are three basic techniques used to apply dispersants to floating oil; each has its own variety of application equipment. The three application techniques are: manual, vessel and aerial. The actual equipment and technique used depends on the type of dispersant to be applied, and the size and location of the spill. Table B-1 lists the type of equipment needed for the various dispersing agents and application techniques.

Manual Application. Manual application is typically limited to use in very small spills or confined areas. The equipment consists of three-to-five-gallon garden sprayers, usually the backpack type, or portable pumps with hand-carried nozzle sprayers. Equipment should be fitted with nozzles producing a coarse spray for applying dispersants. Manual application is usually done from the shoreline, a dock or pier, and can also be done from small boats.

Vessel Application. Basically, there are three types of vessel mounted application systems: bow spray, Warren Spring Laboratory (WSL) - type, and high-pressure jet spray. The bow spray and WSL systems both use booms fitted with spray nozzles to apply the dispersants. The nozzles produce coarse flat sprays which overlap slightly at the water surface. The bow spray system has the booms mounted near the vessel bow. With the WSL system, booms are positioned slightly aft of midship. The WSL system also incorporates breaker boards towed behind the spray booms to provide external mixing energy. Bow wakes and propellor wash from several small boats and high-pressure water streams from fire fighting equipment can also be used to supply energy.

The third system uses fire fighting monitors or hand-held nozzles to apply dispersants. The high-pressure streams are directed in an arc up over the slick or played back and forth across the oil. In most cases the vessel's own salt-water fire fighting system is used.

These systems are used primarily to apply water-base or concentrated dispersants in heavily diluted solutions. The systems operate by drawing water from the sea and supplying it to the booms or monitors at high pressures and volumes (100 psi and 100-250 gpm respectively). The dispersant is introduced into the mainstream of water using an eductor or metering pump at a rate which produces the desired concentration.

Also available is a WSL low pressure volume system for applying hydrocarbon-base dispersants. In this case the agent is supplied directly to the booms with no dilution.

Aerial Application. Three types of aircraft have been used in aerial application of dispersants: helicopters, light, and heavy fixed-wing aircraft. Suitable aircraft typically come fitted with agricultural or fire fighting spray systems which require only minor modification for dispersant use. The spray systems are usually supplied with misting or atomizing nozzles which must be replaced with ones producing a coarse spray.

Two types of spray systems are available for use with helicopters. One is the on-board type which has the spray booms, tanks, and motor fitted directly to the helicopter. The other system has a single unit consisting of the booms, tank and pump, which is slung underneath the helicopter. The advantage of this system is that it can be hooked up in a matter of minutes to almost any available helicopter.

Dosage

Dosage required for effective dispersion will vary with each spill situation. Most manufacturers supply or can provide dosage recommendations with their products. Subject to regulatory approval, these recommendations can be used as a starting point for dosage determination. The optimum dosage (number of gallons of dispersant applied per acre of slick), is primarily governed by the slick thickness. Generally, the amount of dispersant required is directly proportional to the thickness, and therefore the volume of oil per acre. Under normal conditions the recommended dosage for most dispersants is 5 to 10 gallons per acre for an average slick thickness of 0.5 to 2.0 mm. By trial application, dosage should be adjusted to achieve the desired result at the minimum application rate.

APPENDIX E

Filter Fence/Sorbent Barrier

Permeable barriers constructed onsite and made of wire screen or mesh and sorbents can be used to contain or exclude oil from interior areas such as marsh, channels and mosquito ditches. Permeable barriers offer the advantages of noninterference with flow, conformance with bottom configuration, and response to tidal variation. Because of flow reverses in tidal areas, double barriers are required. A diagram of a typical permeable barrier is shown in Figure A-1. While a variety of screen and mesh fencing is available, heavier materials are recommended. When subjected to high currents and debris, lighter material such as chicken wire will probably fail.

Single-sided permeable barriers may be constructed in small streams or channels having continual water flow in one direction. In this case a single line of posts is driven into the stream bottom with the screen fastened to the upstream side. Sorbent is also placed on the upstream side of the barrier only, relying on the current to hold it in place.

The screen height in both cases must be sufficient to prevent sorbent from going over the top at high tide and under the bottom at low tide. The screen mesh size must be compatible with the type and size of the sorbent used.

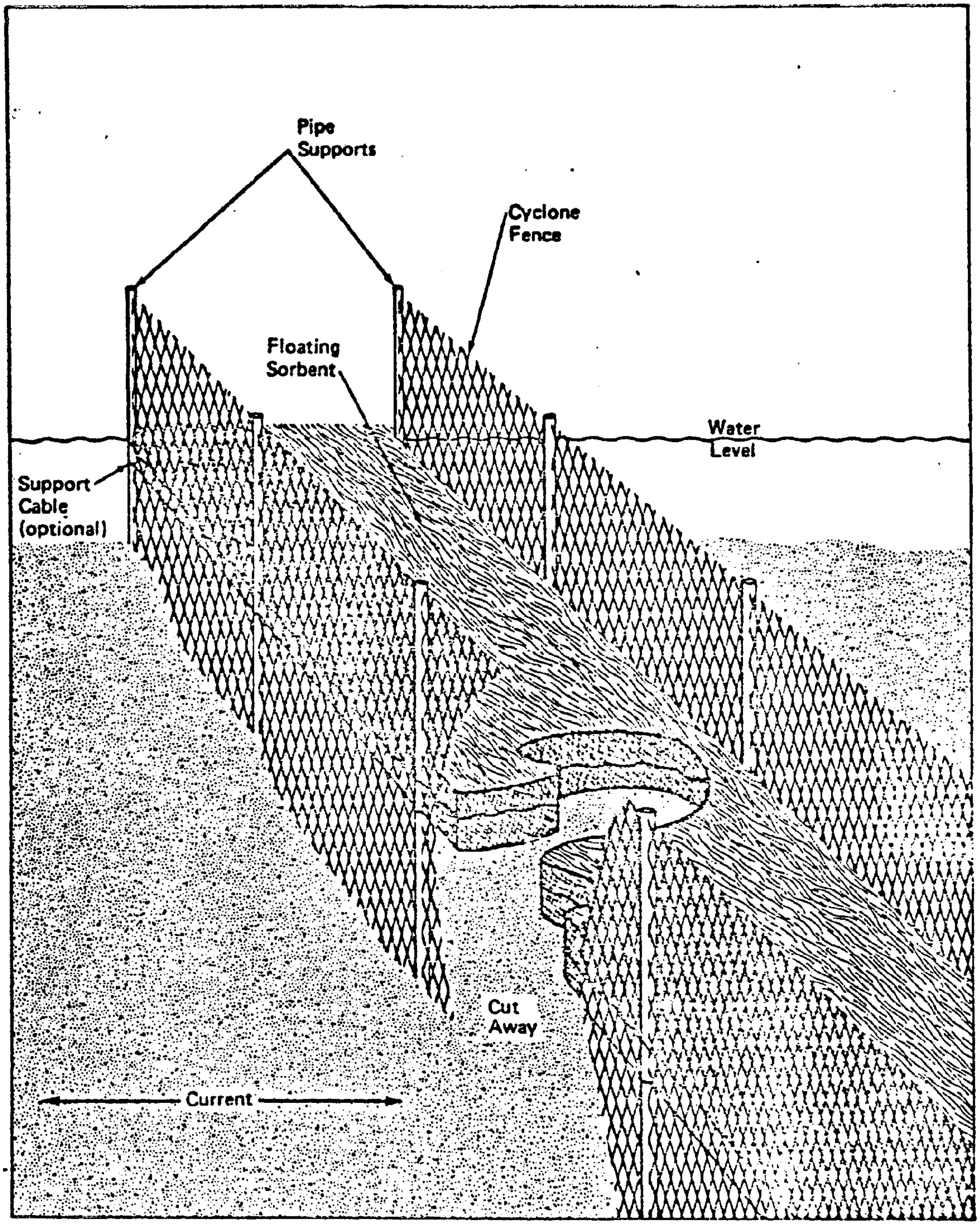

Figure 1. TYPICAL PERMEABLE BARRIER