Oil Spill Response Capabilities in South Florida

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The oil spill response capabilities of a unique area in the United States, the South Florida region, are examined and assessed. A literature search was conducted and a questionnaire on oil spill cleanup response capability was sent to relevant agencies and contractors. From the data gathered through literature and the questionnaire, a computerized data base was developed with a manual that would enable users to quickly retrieve needed information to plan and assemble manpower and equipment necessary to contain and clean up a major oil spill. A major oil spill would be more disastrous to an unprepared Florida than the *Exxon Valdez* accident was to Alaska. Growing tanker traffic in Florida waters, shortage of cleanup equipment, types of currents, shallow reefs, and vulnerable coastline all contribute to greater potential damage from an oil spill. The few oil cleanup contractors and specialized companies in the state are confined to large cities. It would be almost impossible for these operators to reach a remote oil spill disaster area quickly. Oil spill cleanup contractors are equipped to handle only minor spills and financially they are unable to purchase expensive equipment geared for major spills. The computerized data base should assist the oil spill task force agencies and industry to assemble quickly in response to a major oil spill.

The oil spill cleanup response capabilities in a unique area of the United States, coastal South Florida, are examined and assessed. A literature search was conducted and a questionnaire on oil spill cleanup response capabilities was mailed to relevant agencies and industries. Florida's diverse coastal environment is composed of ecosystems such as mangrove swamps, seagrass beds, coral reefs, sand beaches, and associated wildlife. These ecosystems are important to Florida's environment and are indeed vulnerable to oil spills. For instance, mangroves alone (*a*) are a habitat for fish and other wildlife; (*b*) provide protection against storms and erosion; (*c*) contribute to the environment's biochemistry system; and (*d*) are significant to tourism, wildlife, and personal intangible values (*1*). Mangroves occupy nearly 470,000 acres of southern Florida, and almost 90 percent of the area lies in the four South Florida counties of Lee, Collier, Monroe, and Dade.

An oil spill reaching South Florida beaches would have a great impact on the tourism industry. Furthermore, Florida's coastal lands are used for second homes or vacation homes. The impact of an oil spill on these resources could be severe (*1*). Southern Biscayne Bay and Card Sound are expected to be the most vulnerable to oil spills. Figure 1 presents the sensitive shorelines (e.g., sandy beaches, mangroves, etc.) of South Florida (*2*). Continental Shelf Associates, Inc., estimated that a major oil spill near a coastal recreation area in Florida would reduce tourism by 5 to 15 percent over one season (*2*). A contingency oil spill cleanup program is necessary to deal with a major oil spill in the Florida coastal region. A computerized data base contingency plan has been developed that would enable users to quickly plan and assemble the necessary manpower and equipment in case of a large oil spill and cleanup operation.

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EXISTING VESSEL TRAFFIC AND OIL SPILL RISK ANALYSIS

Accidental oil spills from oil transportation and operation activities probably account for the largest source of oil spills

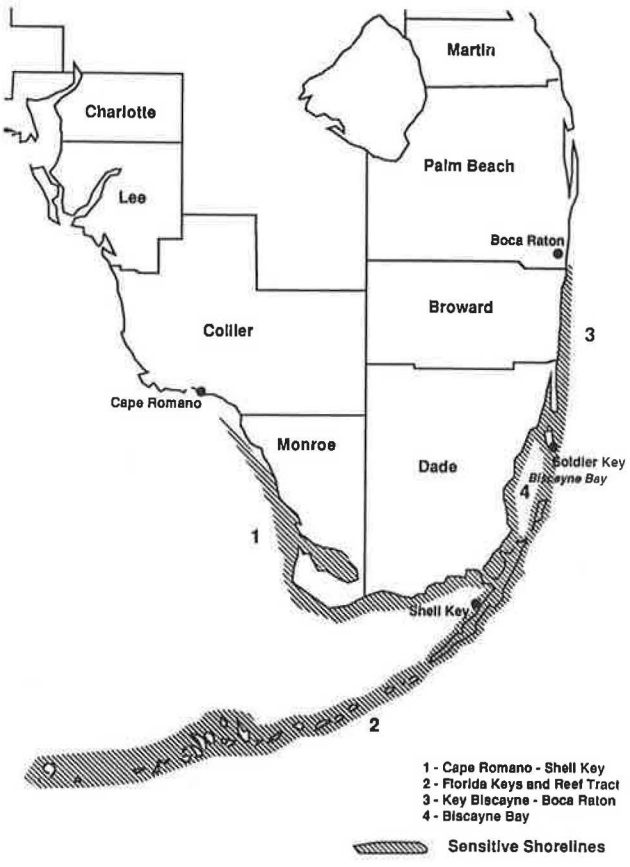

FIGURE 1 Sensitive shorelines of South Florida.

in the United States (*3*). In order to meet the increasing demand for petroleum and petroleum products, more and more oil-carrying vessels are cruising Florida's coastal waters each year. Florida's geographic location and its natural resources make the state more vulnerable to the consequences of a major oil spill than most other coastal areas in the United States. Oil spills could also affect the state economy by polluting the shoreline or contaminating the fishstock.

On the basis of observations of the United States Coast Guard (USCG), the South Florida Regional Planning Council (SFRPC) estimated that 1.2 billion barrels of oil were transported through the Straits of Florida in 1979 (*1*). In 1989, 93.5 million barrels (13.3 million tons) of petroleum and petroleum products were transported through Port Everglades. This volume is expected to reach 103.2 million barrels by 2000. According to the Department of Natural Resources (DNR), total petroleum transfers of oil products through the ports in the entire state totaled 286.5 million barrels carried in a total of 5,860 transits in 1989 (*4*).

The heavy traffic of large tankers imposes the possibility of a major oil spill in South Florida waters. The four locations identified by SFRPC as hazard areas have a greater potential for an oil spill because of converging or crossing routes of tanker traffic. These areas include 11 nautical miles (nmi) south-southeast of West Palm Beach, which is the crossing point of north-south traffic with westbound traffic; 10 nmi east-southeast of Fort Lauderdale where the north and south routes are intersected by the Port Everglades entrance route; 11 nmi south-southeast of Miami where Miami Harbor trips and through-traffic merge; and the area 12 nmi south of the Dry Tortugas, where the traffic from the Gulf of Mexico converges to enter the Loop Current to travel northeast. Figure 2 shows the oil transportation routes in South Florida.

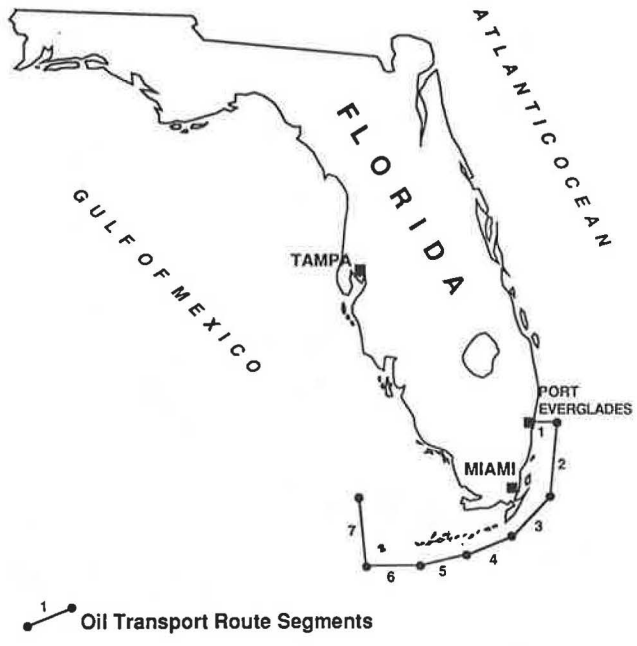

FIGURE 2 Oil transportation routes in South Florida.

OIL SPILL RESPONSE CAPABILITIES

Figure 3 shows the South Florida oil spill response information system. On the basis of the system represented in this figure, a computerized data base was developed. It is explained in detail at the end of this section. Figure 3 shows that the response teams include federal, state, county, and city contacts. To ensure a quick response to oil spills, the federal response organization established a National Response Center (NRC), the National Response Team (NRT), the Regional Response Center, Regional Response Teams (RRTs), and an On-Scene Coordinator (OSC) (*5*). In the event of a major oil spill beyond the control of the RRT, the NRT can be actuated. The NRT may (*a*) monitor the spill, evaluating the reports of the OSC; (*b*) request oil spill response resources from federal, state, local, or private organizations; and (*c*) coordinate other activities as may be required to ensure that the effective oil spill response plan is in operation (*5*). OSCs are predesignated federal officials from USCG or the Environmental Protection Agency (EPA). The OSC collects facts about the spill, identifies the spill's potential impact, and estimates cleanup costs. The spiller is responsible for the spill. The OSC will hire commercial contractors and monitor the cleanup activity. If commercial resources are not available, the OSC will deploy federal resources. Federal personnel and equipment can be obtained from the National Strike Force and the U.S. Navy (*5*). The OSC will also implement the following actions: (*a*) immediately notify the RRT and NRC, (*b*) classify the size of the discharge and determine the proper course of action, and (*c*) determine the state or local government cleanup capabilities to carry out response actions (*5*).

The South Florida region's oil spill response capability analysis is based on a methodology to gather information from oil cleanup contractors, cooperatives, equipment manufacturers, the Marine Spill Response Corporation (MSRC), Florida port authorities, DNR, EPA, and USCG.

The two main factors in analyzing the existing oil spill response capabilities in the South Florida region are the quantities and types of oil cleanup equipment available in the area and the contractors' locations and their expected response times to an oil spill.

To assess the existing capabilities and update the equipment inventories, cleanup contractors and cooperatives were asked to send their equipment lists. Despite the reluctance of some contractors, most responded (see Table 1).

During the course of this study, DNR, USCG, MSRC, EPA, and others were contacted to identify Florida state oil spill cleanup contractors. After identifying these contractors, a simple questionnaire was prepared and sent out asking contractors about their existing equipment inventories, types of equipment, average oil spill response time (e.g., mobilization, travel, and installment), and mode of transportation. These details are explained in the following sections.

CONTINGENCY PLAN

"The Florida Coastal Pollutant Spill Contingency Plan has been developed in compliance with Section 376.07(2)(e), Florida Statutes. It is in support of the Region IV Contingency Plan as it relates to spills occurring in coastal waters" (*6*).

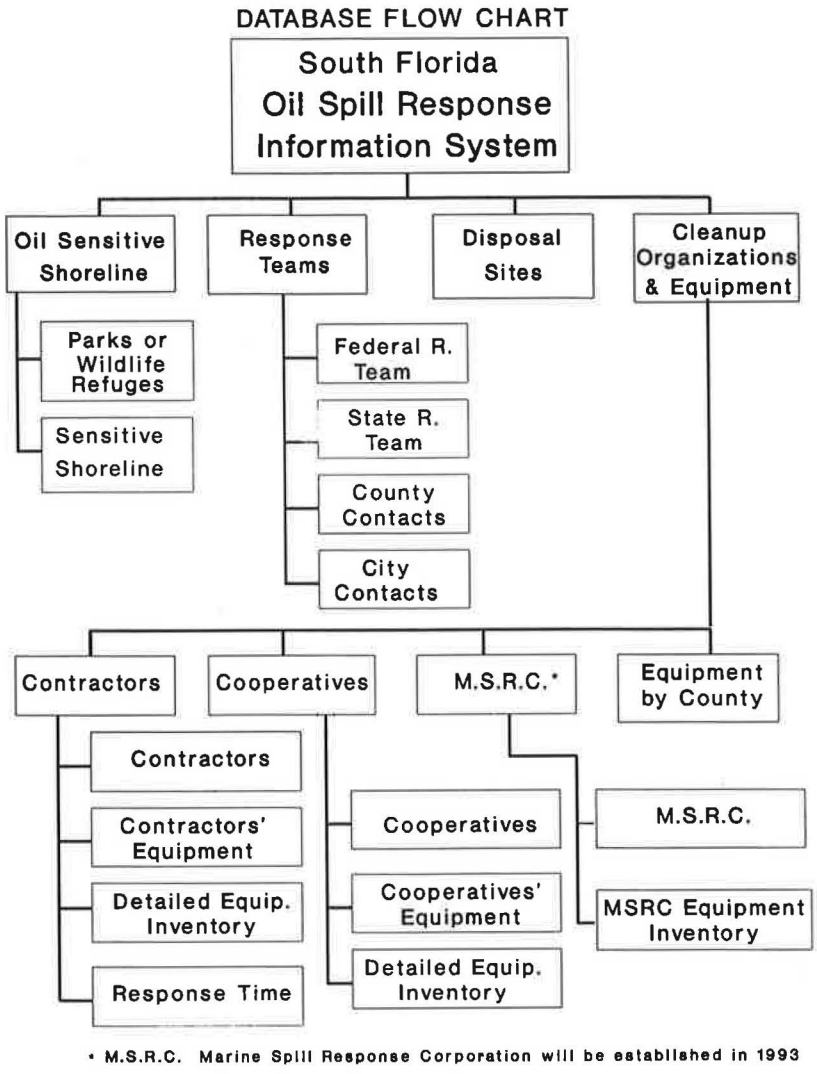

FIGURE 3 South Florida Oil Spill Response Information System.

The objective of the contingency plan is to coordinate federal, state, and local government activities in responding to an oil spill. Under this plan, the state has an oil spill task force composed of trained individuals. The state OSC is responsible for state cleanup and monitoring.

The State Response Team (SRT) is composed of DNR, the Department of Environmental Regulation (DER), the Department of Community Affairs, the Department of Commerce, the Department of Highway Safety and Motor Vehicles, the Department of Law Enforcement, the Department of Legal Affairs, the Department of Military Affairs, the Department of Transportation, the Game and Fresh Water Fish Commission, Governor's Office, and the Department of Health and Rehabilitation Services. The chairperson of SRT is the executive director of DNR or the secretary of DER. During a pollution incident, the chairperson is responsible for the overall management of SRT (*6*).

To identify Florida state oil spill cleanup response capabilities, a questionnaire was prepared and mailed to various agencies and contractors responsible for oil spill cleanup. Additional relevant information was obtained through telephone and personal contacts.

CLEANUP EQUIPMENT ANALYSIS AND EXISTING CAPABILITIES

The existing capabilities depend on the resources that can be supplied by the cleanup contractors and cooperatives. The most important resources are equipment and personnel. Most of the cleanup equipment is owned by contractors and cooperatives, whereas the personnel supply mainly depends on contractors. Major types of equipment that are used in a cleanup operation consist of containment and recovery devices. Booms, skimmers, suction hoses, boats, and storage tankers are the most needed equipment supplied by the contractors or cooperatives in an oil spill response (see Table 2).

Performances of these equipment items, particularly booms and skimmers, are as important as their quantity and capacities in determining the effectiveness of a response operation.

Booms are used to

- Contain a spill,
- Thicken the oil layer to ease oil recovery,
- Deflect the spill from sensitive areas, and
- Remove the spilled oil.

TABLE 1 TYPE OF INFORMATION RECEIVED FROM CLEANUP CONTRACTORS

Company Name	Location	Equipment List	Response Time
O.H.M. Corp.	Clermont	yes	yes
Cliff Berry	Ft. Lauderdale	yes	no
Danmark	Miami	yes	no
Need a Diver	Tampa	Does not respond to spills anymore	
Haztech	Tampa	yes	no
Clean Harbors	Apopka	no	no
Diversified Environmental Services	Tampa	yes	yes
Florida Spill Corp.	Cocoa	yes	yes
Cape Canaveral	Cape Canaveral	yes	no
Riedel-Peterson	Mobile	yes	yes
Environmental Recovery Group	Atlantic Beach	yes	no

To meet these requirements, a broad variety of equipment has been designed along with different methods of deployment. Among different types of booms, harbor, river, and offshore booms are the main categories. Compared with river and harbor booms, offshore booms are larger and heavier, which enables them to be used in open sea conditions. However, the effectiveness of these boom systems depends on environmental conditions (see Table 3). In South Florida, adverse weather conditions, such as high winds and waves that would restrict the use of offshore booms and other cleanup equipment, are the main concern of response personnel.

Skimmers are used to recover the oil contained by the booms. Their performance is affected by oil viscosity and often by the physical properties of oil. Different skimmer systems have varying oil recovery capacities, but usually the capacity of a certain skimmer decreases once the oil becomes emulsified. In South Florida, the winter months are the most critical time, since water temperatures become relatively cold, which speeds emulsification. According to oil spill cleanup contractors, during winter months a quick containment and recovery response (6 to 8 hr after the spill), before emulsification of the oil can take place, is essential.

The existing oil spill cleanup equipment owned by contractors and cooperatives is limited in the handling of a major oil spill. The type of equipment owned is another problem, since only a small part of it could be used for major offshore

TABLE 2 MAJOR OIL CLEANUP EQUIPMENT QUANTITIES IN FLORIDA

Contractor/Cooperative	Skimmers	Booms (ft)	Hoses (ft)*	Boats	Tankers (gal)
Cape Canaveral Marine Services	1	5000	900	7	N/A
Cliff Berry	N/A	4000	yes	3	14300
Danmark	4	2400	yes	24	N/A
Diversified Environmental Services	1	2350	N/A	4	10000
Environmental Recovery Group	3	2000	9700	2	40000
Florida Spill Response Corp.	4	3500	yes	8	28800
Haztech	3	6700	N/A	3	6700
O.H. Materials	1	2000	4100	3	3000
Riedel-Peterson Environmental Services	3	3000	250	2	N/A
Tampa Port Committee Spillage Control	N/A	2800	yes	1	2500
Port Everglades Spillage Committee	N/A	1500	yes	1	N/A
Port of Palm Beach	1	4000	N/A	N/A	N/A
Port of Miami	1	8380	yes	N/A	N/A
Jacksonville Pollution Control	8	6750	yes	3	5500

* a yes response indicates that an exact amount or quantity was not specified

TABLE 3 CONDITIONS THAT AFFECT THE DEPLOYMENT OF BOOMS

Ideal	> Increasing Difficulty >	Adverse
Water Conditions		
Calm		Waves
Still		Currents
Shallow		Deep
Fresh		Salt
Location		
Ponds		Oceans
Inland		Offshore
Weather Conditions		
Calm		Windy
Warm		Cold
Dry		Rain
Clear		Foggy
Light Conditions		
Daylight		Darkness

Source: Oil Spill Barriers and Their Use, Environment Canada, 1981

oil spills. Most of the equipment owned is suitable for responding to minor and inland spills, which occur more frequently. Past experience shows that with existing capabilities, minor or moderate spills could be cleaned successfully. However, according to DNR statistics, the largest oil spill that occurred in Florida between 1975 and 1990 was 108,000 gal. The frequency of minor spills and the low possibility of a major oil spill put other limitations on the existing capabilities. The private sector, namely third-party contractors, usually has the equipment needed for events occurring more frequently. This enables response to as many spills as possible within a certain time frame and continued competitiveness in the sector.

SIGNIFICANCE OF RESPONSE TIME

One of the major factors affecting the success of a cleanup operation is the time lapse between the occurrence of the spill and the start of the cleanup. An effective response should include the presence of all of the available equipment and personnel at the spill site in the shortest time possible. Since most of these resources are supplied by the cleanup contractors and cooperatives, it is important to assess their capability of reaching the spill location within a certain time frame. Figure 4 shows assumed oil spill locations, cleanup contractors, and major cities in the South Florida region.

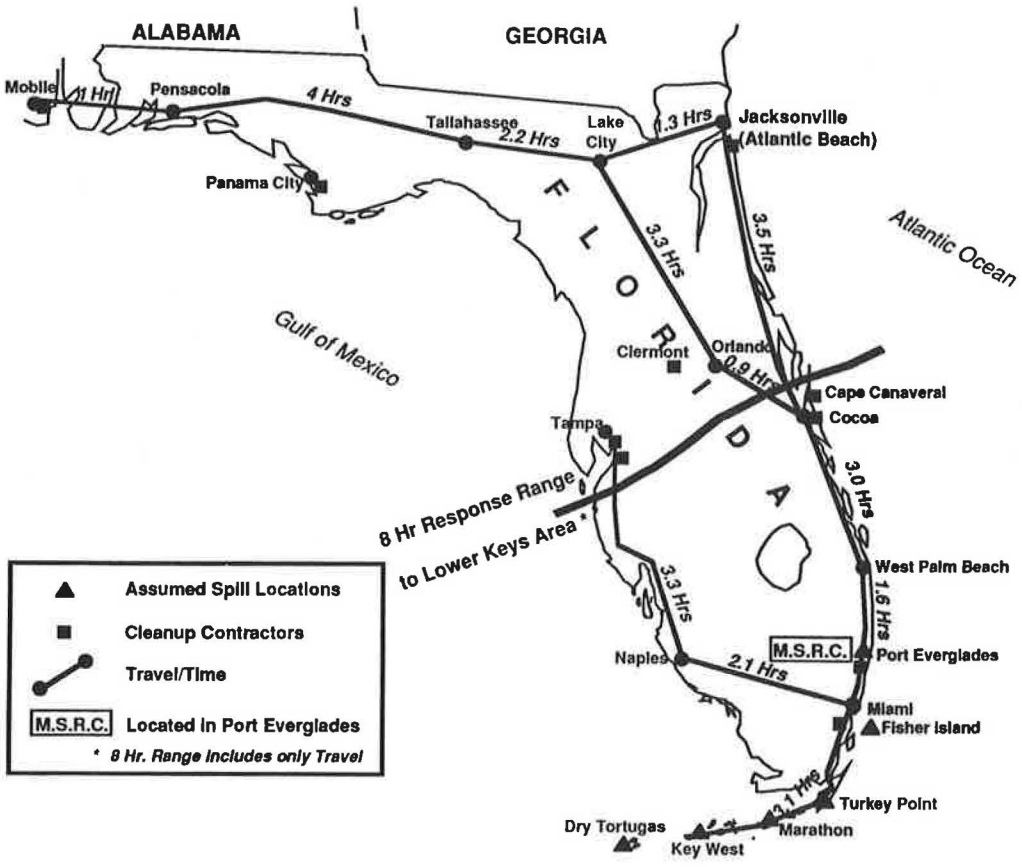

FIGURE 4 Assumed oil spill locations, cleanup contractors, expected travel time for cleanup contractors, and cities in the South Florida region.

TABLE 4 ESTIMATED RESPONSE TIME, FLORIDA SPILL RESPONSE CORPORATION, COCOA, FLORIDA

Oil Spill Location	Components of Response Time (hours)		
	Mobilization	Travel	Installment
Port Everglades	3/4	3	3/4
Miami Beach	3/4	4	3/4
Turkey Point	3/4	4	3/4
Marathon	3/4	5	3/4
Key West	3/4	6	3/4
Dry Tortugas	3/4	7	3/4

To assess the response time to an oil spill, contractors were requested to provide their expected response times to spills occurring at different locations in South Florida. Table 4 gives the replies of the contractors who responded.

Response times for all of the contractors were projected (see Tables 5 through 8). The following assumptions were made in calculating the figures for the response timetable:

1. Mobilization time of the contractor, 1 hr;
2. Installment time of equipment, 1 hr; and
3. Travel time, distance/50 mph average speed.

Figures were rounded to the next hour.

On the basis of the response time of the contractors to a distant spill location, the two time brackets of 6 to 8 hr and 14 to 16 hr were chosen to assess the available equipment within these time periods after the spill. According to contractors, 6 to 8 hr is the limit when oil starts to emulsify during cold weather and cool water temperatures. This is significant to Florida especially during winter months when the oil would emulsify faster and make recovery difficult after 8 hr. Another consideration in this time period is the spreading of oil under adverse weather conditions and currents. The second response time period, 14 to 16 hr after the spill, was set as an arbitrary limit for milder weather conditions and warmer water temperatures.

In evaluating the response capabilities within these time periods, the number of feet of boom that could be transported to the site was chosen as the basic criterion. It was assumed that once the oil is contained by the booms, it would be possible to remove it with the available recovery devices or with the additional equipment that could be pooled from other farther locations. For the spill location, the Lower Florida Keys area, where logistics would play a major role in implementing the cleanup action, was chosen. The small amount of equipment stockpiled and the long distances between the existing contractors and the region were also significant.

TABLE 5 ESTIMATED RESPONSE TIME, DIVERSIFIED ENVIRONMENTAL SERVICES, TAMPA, FLORIDA

Oil Spill Location	Components of Response Time (hours)		
	Mobilization	Travel	Installment
Port Everglades	1	5	2
Miami Beach	1	6	2
Turkey Point	1	*	2
Marathon	1	9	2
Key West	1	11	2
Dry Tortugas	1	*	2

* Data not provided

TABLE 6 ESTIMATED RESPONSE TIME, RIEDEL-PETERSON ENVIRONMENTAL SERVICES, MOBILE, ALABAMA

Oil Spill Location	Components of Response Time (hours)		
	Mobilization	Travel	Installment
Port Everglades	1/2	13	1/2
Miami Beach	1/2	13	1/2
Turkey Point	1/2	*	1/2
Marathon	1/2	15	1/2
Key West	1/2	16	1/2
Dry Tortugas	1/2	19	1/2

* Data not provided

FUTURE OIL SPILL RESPONSE CAPABILITIES

After the 1989 *Exxon Valdez* oil spill, the Petroleum Industry Response Organization, in early September 1990, announced the formation of MSRC. MSRC will be the world's largest and perhaps most effective oil spill response network when it becomes operational in 1993 (*7*). MSRC is an independent,

TABLE 7 ESTIMATED RESPONSE TIME, OHM CORPORATION, CLERMONT, FLORIDA (KEEPS EQUIPMENT IN BOCA RATON)

Oil Spill Location	Components of Response Time (hours)			Total Time (hours)
	Mobilization	Travel	Installment	
Port Everglades	1/2	1/2	1	2
Miami Beach	1/2	1/2	1	2
Turkey Point	1/2	2 1/2	1	4
Marathon	1/5	3	1	4.2
Key West	1/5	4 1/2	1	5.7
Dry Tortugas	*	*	*	*

* Data not provided

TABLE 8 EXPECTED RESPONSE TIMES FOR CONTRACTORS

Company Name	Location	Response Times for Locations* (hr)				
		a	b	c	d	e
O.H. Materials	Clermont	3	4	5	6	8
Cliff Berry	Ft. Lauderdale	2	3	4	5	7
Denmark	Miami	3	2	3	4	6
Environmental Recovery Group	Atlantic Beach	10	11	12	13	15
Diversified Environmental Services	Tampa	7	8	9	10	12
Haztech	Tampa	7	8	9	10	12
Florida Spill Response Corp.	Cocoa	6	7	8	9	11
Riedel-Peterson	Mobile	15	16	17	18	20

* Spill Locations:

a. Port Everglades

b. Miami Beach

c. Turkey Point

d. Marathon

e. Key West

nonprofit corporation with headquarters in Washington, D.C. and five regional response centers, including Port Everglades in Southeast Florida. The centers will be capable of responding to a spill of 30,000 tons (216,000 barrels). The Port Everglades site, which is the headquarters of the Southeast region, will be manned around the clock by 64 people. Jacksonville and Tampa sites will be two of the five equipment prestaging facilities for the Southeast (*8*). In full operation, MSRC will have 400 staff and more than $300 million worth of oil spill cleanup equipment distributed among the regional centers. MSRC plans to establish a 5-year, $35 million relevant research program (*8*).

SOUTH FLORIDA OIL SPILL RESPONSE INFORMATION SYSTEM: COMPUTERIZED DATA BASE

Purpose

The purpose of the South Florida Oil Spill Response Information System is to enhance existing response capabilities and to assist officials in handling oil spills by providing the necessary data. The data base contains information on oil-sensitive areas, addresses and phone numbers of contact personnel, and a list of oil spill cleanup contractors and equipment.

Features

DBASE3 PLUS is a popular data base management language that can run on an IBM PC/AT or compatible in a DOS environment. This system was selected to write the oil spill response information system. The system is run by loading the data base diskette into a drive, retrieving the main menu screen, and selecting the desired option. For each record the system includes on-screen options such as add, delete, edit, search, view, list print, and so forth. The system has the following features:

1. The ability to access data from a file and from several files at any time,
2. Data updating and editing capability on the screen,
3. Automatic calculation of the total number of pieces of cleanup equipment by updating the detailed equipment inventory of the contractors and cooperatives,
4. Printing options for data file records, and
5. A menu-driven program with on-screen information providing easy access to higher and lower levels of the system.

Description

The information system consists of four subsystems: oil-sensitive areas in South Florida, oil spill response teams, available disposal sites, and cleanup organizations and equipment.

Oil-Sensitive Areas in South Florida

This subsystem includes two parts: (*a*) sensitive shorelines and (*b*) parks and refuges.

Sensitive shorelines consists of information on the sensitive shorelines in South Florida. The area is divided into four regions on the basis of each area's characteristics and related oil spill impacts as follows: Cape Romano to Shell Key, Florida Keys and Reef Tract, Key Biscayne to Boca Raton, and Biscayne Bay.

Parks and refuges includes the list of parks and refuges in South Florida and the associated oil spill impacts.

Oil Spill Response Teams

The subsystem contains the addresses and phone numbers of the following oil spill response agencies: RRT, SRT, city, and county.

Available Disposal Sites

This part includes information about available county oil disposal sites in South Florida.

Cleanup Organizations and Equipment

This subsystem provides information on oil spill response organizations and available equipment in South Florida. The

cleanup organizations are divided into three parts: cleanup contractors, cleanup cooperatives, and MSRC (in 1993). Also included are their equipment inventories and expected response times for potential oil spills in different locations of South Florida. Information on cleanup equipment in this section is limited to basic types of equipment. Another subsection provides more detailed information about the types, models, and capacities of available equipment.

The developed computerized data base can be used by different industries and government agencies. The relevant industry could use this program to update its equipment inventory and response time. Government agencies could use the program to update relevant oil spill cleanup activities.

The Florida oil spill SRT can be responsible for keeping the file up-to-date. The updated information can be disseminated by the SRT to relevant agencies, cities, counties, and industries.

CONCLUSIONS AND RECOMMENDATIONS

On the basis of the literature search, responses to the oil spill questionnaires, and personal visits and interviews, it is concluded that South Florida is one of the regions most vulnerable to the consequences of oil spills. The increasing oil tanker traffic, fragile coastline, associated wildlife, geographical complexity of the region, and the Loop Current factor all add to the risks associated with an oil spill. On the basis of this study, the conclusions and recommendations are as follows:

1. There is a requirement for more offshore containment and recovery equipment in Florida. Cleanup contractors, cooperatives, and other county agencies should be encouraged to increase their equipment inventories to be able to respond to major offshore spills. Efforts should be made and plans prepared to stockpile some of this equipment and the necessary trained manpower at strategic points and vulnerable areas of the South Florida region such as the Lower Keys.

2. South Florida has not yet faced a catastrophic oil spill. Such an event would require an effective and combined response from all the responsible units in the region. Coordination of these units is a key issue for the success of the operation and is addressed in the federal and state contingency plans. Answers to questionnaires indicate that contingency plans should be dynamic plans that would also be adequate for major oil spills. State plans should be updated regularly because of turnover in the organizational section and should include the use of expert consultants. USCG officials suggest that all existing oil spill contingency plans should be revised. Their experience indicates that no clear lines of authority or good coordination among contingency plans, either public or private, exist. To determine the applicability of contingency plans and enhance oil spill response capabilities, systematic drills should be conducted involving all units in the region. Emphasis should be given to unannounced drills.

Florida must examine the plans of other states. For instance, the recent legislative changes in California (Chapter 1248), the Oil Spill Prevention and Response Act (*9*), has application in South Florida. "The bill would create the Oil Spill Response Trust Fund. The bill would require every operator of a refinery to pay an oil spill response fee of 25 cents per barrel of crude oil received" (*9*). The establishment of such a fund in Florida might create future funding for purchasing suitable cleanup equipment.

3. Equipment inventories supplied by contractors and cooperatives should be updated regularly, and drills must be conducted to verify the availability of existing equipment to locations in South Florida.

4. Better data on transportation patterns, weight limits, and other details on spilled oil in South Florida are needed. According to these data, certain areas could be identified where spilled oil would be carried away by currents without contacting the shoreline. In the event of an accident, damaged tankers could be towed away to one of these preidentified areas, where it would be safer to proceed with the lightering and cleanup operations.

5. Most of the responses to the questionnaire indicate that the buffer zone around the Florida Keys would help to a great degree to protect the reefs from oil spills due to groundings and give response officials time to plan and assemble forces. However, some officials state that this would increase the possibility of collisions due to narrowed shipping lanes. In this regard, tanker traffic through the Straits of Florida should be monitored more closely and additional measures should be taken if necessary.

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