Needs Assessment
for a
Major Fuel Oil Spill

Glacier Bay National Park and Preserve

May 2000

Scope of study

To identify the maximum most probable fuel spill in the Park, judge the impact of this discharge on resources at risk, and determine what response equipment and personnel needs, along with performance standards, should exist to provide an effective level of response.

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1.0 **Executive Summary.** This study reviewed maritime accidents in Southeast Alaska within the past decade and applied the conclusions of that review to higher-risk transit areas in Glacier Bay National Park and Preserve. Using this information, oil spill scenarios were developed for Lityua Bay, North Inian Pass, Point Gustavus, and Sitakaday Narrows. Available planning criteria were used to generate resource tables for an effective response to each scenario. This study recommends that the National Park Service maintain equipment and trained personnel at Bartlett Cove capable of expediently:

- double booming a large vessel (4800 feet of 24-inch harbor boom),
- skimming oil within the boom and at least one location down current (two skimmers, 1500 feet 24-inch harbor boom, up to four work boats),
- holding temporarily up to 100,000 gallons of oily water mixture,
- deploying deflection/exclusion boom for the most vulnerable resource at risk (5000 feet 18-inch calm water boom, 2 workboats).

A number of other recommendations are suggested to enhance prevention, planning and training.

2.0 Introduction

2.1 Objectives

The objectives and goals of this study are to identify the maximum most probable fuel spill in the Park, judge the impact of this discharge on resources at risk, and determine what response equipment and personnel needs, along with performance standards, should exist to provide an effective level of response.

2.2 Guiding Principles and Procedures

2.2.1 Guiding principles and assumptions:

- Past accidents can help determine what might happen. The likelihood of an accident, however, cannot be determined due to the sparse data available.
- Experts that have a comprehensive and sophisticated understanding of marine transportation in Southeast Alaska can provide a more accurate risk analysis than probability models or other quantitative measures. In Southeast Alaska, the experts with the most comprehensive knowledge are the state pilots, particularly with regard to the likely location of accidents.
- International, national, and local planning standards for tank vessels, while not strictly applicable to this needs assessment, are nonetheless useful benchmarks for evaluating the adequacy of oil spill response resources.
- A worst-case discharge (loss of all oil on board a deep draft non-tank vessel) is unlikely. A case is made for using the maximum most probable discharge (10% of the oil on board) as the planning standard.

- The primary focus of this study will be spills from vessels that do not carry oil as cargo (non-tank vessels). The rationale for this is developed in Section 4.2.1.
- This study attempts to project what resources will be needed on scene within the first 24 hours of a spill. It is assumed that after 24 hours response equipment and personnel from other areas in Alaska and NorthAmerica will begin to arrive in response to the unique requirements of a specific spill.

2.2.2 Procedures. The equipment and personnel needed to effectively respond to a maximum most probable spill in Glacier Bay National Park and Preserve were determined through the following steps:

Step1 Development of an inventory of the fuels moving through Glacier Bay and the Icy Strait/Cross Sound by identifying the amount and type of fuel oil carried on each large vessel and the typical trackline of these vessels.
Step 2 Construction of a list of possible casualties based on a review of past casualties throughout Southeast Alaska.
Step3 Identification of higher-risk transit areas through interviews with marine pilots and others knowledgeable of the maritime transportation in Southeast Alaska.
Step 4 Development of accident scenarios by applying the casualty list developed in Step Two with the higher-risk transit areas identified in Step Three.
Step 5 Descriptions of the fate and effects of oil discharged in each accident scenario.
Step 6 Development of response resource tables for each scenario.

2.3 **Limitations:**

- Accident scenarios were developed through anecdotal material and the best judgement of experts. Statistical probability models were not developed.
- When this study was conducted shoreline classification codes were not complete. Shoreline classifications are extremely useful in identifying resources at risk and selecting specific clean-up techniques.
- Charts and maps that identify resources at risk were not up to date. This should be developed along with the shoreline classification codes.
- Water flow in the Bay is complex and dynamic. Without a circulation model it is hard to project slick movement. Development of a circulation model is highly recommended.
- This study is not a geographic specific response plan. Such a plan would more precisely identify the type and amount of emergency response resources needed. Development of geographic specific response plans should be the next step in contingency planning.

2.4 Definitions

Accident: An occurrence that has an adverse consequence (grounding results in an oil spill).

Barrel: 42 gallons

Bulk carrier: A ship that carries unpackaged cargo (logs, ore).

Bunker fuel: Heavy fuel oil

CFR: US Code of Federal Regulations

Cruise ship: Large passenger ship (over 300 gross tons)

Diesel: Non-persistent fuel oil

Group I Oil: Non-persistent oil (see 33 CFR 155.1020)

Group II Oil: Persistent oil with a specific gravity less than 0.85

Fathom: Measurement of water depth equal to 6 feet.

Higher-risk transit area: A watercourse or marine transportation route where, relative to other nearby routes, there is a lower margin for error in the operation of a ship.

Incident: An undesirable event related to control failure or system failures (loss of propulsion, error in navigation). Incidents are usually corrected in time before they result in an accident (grounding, spills).

IFO 180 and IFO 380: Intermediate fuel oil with a viscosity of 180 or 380 centistokes, respectively, at 50^0 C. IFO is persistent oil.

Maximum most probable discharge: A regulatory term for tank vessels appearing in 33 CFR 154.1020. It refers to an oil spill equal to 10% of a vessels cargo capacity. For this study it will refer to 10% of a vessels fuel oil capacity.

Mechanical Removal: The use of machinery (skimmers, pumps) to remove oil.

Non-persistent oil: See 33 CFR 155.1020. An oil that will generally disperse rapidly once spilled. Diesel is a non-persistent oil.

Persistent oil: See 33 CFR 155.1020. An oil that will not disperse rapidly. IFO is a persistent oil.

Powered Grounding: Grounding of a vessel while it is underway or under power. Generally, a powered grounding is more damaging than a drift grounding.

Resources at risk: Sensitive natural resources vulnerable to an oil spill (marine mammals, important intertidal organisms, etc.)

Small Passenger Vessel: As used in this study, a commercial vessel that does not require a marine pilot onboard. May also be referred to as a tour boat, excursion boat, day boat, pocket cruiser.

Tonnes: Metric ton, 1000 kilograms, 2200 pounds. Standard unit of mass (and by inference, volume) used virtually everywhere but in the U.S. Foreign flag cruise ships typically report liquid production and consumption in tonnes. One tonne of intermediate fuel oil is approximately 267 U.S. gallons. A one cubic meter tank or double bottom will hold about one tonne of fuel oil.

Worst-case discharge: Loss of all fuel on board.

2.4 Reference sources:

33 CFR 155: Title 33, Part 155 of the U.S. Code of Federal Regulations, *Oil or Hazardous Material Pollution Prevention Regulations for Vessels*, requires certain types of equipment, procedures, training, records, and plans for both the transfer of products and the accidental spill of products carried by tank vessels.

Canadian Coast Guard Oil Spill Response Field Guide is an internationally used handbook for response. It contains a number of equipment selection matrixes that have been used in developing the resource tables for the scenarios in this study.

Shoreline Countermeasures Guide: Developed by NOAA in 1998, this manual lists and recommends clean-up methods for specific types of shorelines.

ADIOS: Automated Data Inquiry for Oil Spills (ADIOS) integrates a library of approximately one thousand oils with a short-term oil fate that estimates the amount of time that spilled oil will remain in the marine environment. It was developed through the NOAA Hazardous Materials Response and Assessment Division.

3.0 Overview of marine transportation within Glacier Bay National Park and Preserve

In 1999, four hundred and eighty-nine thousand tourists visited the Park between May and September. Virtually every tourist obtained access to the Park by vessel, utilizing a large cruise ship or tour boat. Commercial vessels are allowed in the Park through a permitting system. Two large cruise ships are allowed to enter the Park each day.

Other deep draft vessels will sail within the Park boundaries in the course of transiting Cross Sound between the Gulf of Alaska and Icy Strait. The vast majority of these vessels are log carriers travelling to and from Hoonah, ore carriers loading at Greens Creek Mine in Hawk Inlet or ferries enroute to Pelican, Yakatat or Seward.

Table 3.0 Marine traffic statistics for 1999

Vessel type	Size range	Draft	Annual visits	Total passengers/crew transported	Max fuel onboard
Cruise ship (19 ships operated by 10 companies)	3,700-84,000 GT, 285-915 ft	20-28 ft	217	469,713	405,000 gals (1500 tonnes) of IFO
Small Passenger Vessel (13 vessels operated by 5 companies)	18-120 GT 25-219 ft	6-15 ft	297	23,540	12,000 gals of diesel
Log or Ore Carrier*	400-620 ft	30-35 ft (loaded)	approx 12	15-25	190,000 gals (700 tonnes) IFO
Ferry* (2 operated by Alaska Marine Highway)	1,200-9,978 GT 210-344 ft	20-25 ft	22	up to 700 per trip	150,000 gals (650 tonnes) of diesel
Fuel Barge	about 250 ft	13 ft (loaded)	12 visits Bartlett Cove	3 crewmembers on attending tug	1.5 millon gals non-persistent oil
Commercial Fishing Vessel	20-50 ft	4-8 ft	by permit	1 to 5	<4000 gals diesel

*Transits Cross Sound and Icy Strait. Does not enter Glacier Bay.

3.1 Large Cruise Ships

In 1999, nineteen large cruise ships[1] made 217 visits to the Park. Although most cruise ships arrived at the mouth of the Bay from the east, vessels occasionally came from Seward, Sitka or directly from Vancouver, requiring a transit through Cross Sound. Typically a ship arrived off Bartlett Cove at 6:00 a.m. where an interpreter-ranger embarked. From there it made its 55-mile journey to Tarr Inlet at the head of the west arm of the Bay, arriving around the lunch hour. After spending an hour or so a quarter of a mile off Margerie and Grand Pacific Glaciers, most ships entered Johns Hopkins Inlet and proceeded up the Inlet to a point no further than due west of Jaw Point. Using bow and stern thrusters, which enable these vessels to twist about to reverse their heading from a dead stop, they then slowly proceeded out the west arm and down the Bay. Most vessels left the Park between 4:00 p.m. and 8:00 p.m. If the next destination was Seward, Yakatat or Sitka the vessel turned west to transit Cross Sound; if the destination was Skagway, Juneau or Ketchikan it turned east once clear of the mouth of the Bay.

Table 3.1 Summary of normal transit speeds for large cruise ships

Trackline	Distance	Speed over ground
Cross Sound: Cape Spencer to abeam Point Carolus	21 nm	20 knots
Icy Strait: Pleasant Island to abeam Point Gustavus	6.5 nm	20 knots
Point Gustavus to Strawberry Island (whale waters, reduced speed required by 36 CFR 13.65)	9 nm	10 knots
Strawberry Island to Composite Island	26 nm	20 knots
Composite Island to Russell Island	10 nm	20 knots 8 knots (under ice conditions)
Russell Island to Tarr Inlet and/or Johns Hopkins Inlet	10 nm	Maneuvering speed (8 knots) or less

[1] For purpose of this study, large cruise ships refer to foreign commercial passenger vessels subject to state pilotage requirements (i.e. greater than 300 gross tons).

3.2 Small passengers ships and tour boats

Due to their size, these vessels are capable to entering more remote inlets and harbors within the Park and Preserve. Many anchor to provide kayaking directly from the vessel. Several are capable of "soft grounding" at the shoreline for deploying an especially constructed gangway out of the bow, thus allowing passengers to disembark directly to shore. Unlike cruise ships, tour boats can operate in Glacier Bay without the assistance of a state pilot. Tour boats that offer overnight excursions will normally carry a captain and two to three mates. "Day boats" departing from Bartlett Cove will normally carry only one licensed officer. Tour boats, small passenger vessels and day boats are designed to allow a single person to steer, navigate and control the engines from the bridge. Two of these vessels have grounded in the Park (Yorktown Clipper in 1995 and Wilderness Adventurer in 1999) resulting in extensive damage and fuel oil spills. These and other casualties will be reviewed in section 4.2.

3.3 Bulk carriers

Both log and ore carriers are similar in appearance and function. They may be up to 620 feet in length, with 2 to 5 large, covered cargo holds. When loaded, their draft is significantly more than that of the larger cruise ships. Like cruise ships, they must employ a state pilot while operating within U.S. waters. The normal bridge watch will consist of a mate, helmsman, lookout and pilot. Unlike cruise ships, they are normally single screw and without the advantage of stern and bow thrusters. Although log and ore carriers do not enter the Bay, they do enter the boundaries of the Park and Preserve when transiting Cross Sound in the course of operations out of Hoonah and Hawk Inlet. Normally, bulk carriers will only enter Cross Sound between May and September, when the Cape Spencer pilot station is manned. At other times they will travel to and from Hoonah and Hawk Inlet via Chatham Strait. In 1999, 22 ore carriers called at Hawk Inlet, 14 log carriers called at Hoonah. Of those, about 10 used the Cross Sound route.

3.4 Ferries

Ferries operated by the Alaska Marine Highway System occasionally enter the boundaries of the Park while enroute to and from Pelican or the Gulf of Alaska. Unlike cruise ships and bulk carriers that operate under foreign registry, state ferries are U.S. Coast Guard certificated vessels manned by US licensed officers. A state pilot is not required but licensed officers with a federal pilotage endorsement for the vessel's route must navigate these vessels. The typical bridge watch includes the pilot/mate, the helmsman and a lookout.

3.5 Fuel Barges

On average, two fuel barges, carrying up to 1.5 million gallons of diesel, gasoline and aviation fuel deliver 50,000 to 100,000 gallons of gasoline or diesel to Bartlett Cove once a month during the May-September tourist season. The Bartlett Cove marine transfer facility can and does provide fuel for vessels up to 150 feet in length.

4.0 Development of Oil Spill Scenarios

4.1 Categories of Marine Accidents

The following types of vessel accidents were considered in this study:

- Powered grounding. The contact with the shore or bottom by a vessel underway and under power due to an error in navigational or a steering failure.
- Drift grounding. The contact with the shore or bottom by a drifting vessel that has been disabled due loss of propulsion or steering failure.
- Allision. The striking of a fixed object while a vessel is docking or undocking. The only allision envisioned for Glacier Bay is that of a fuel barge striking a structure at Bartlett Cove. Because of its low probability to occurrence and even lower probability of an allision being the cause of an oil spill, this casualty type will not be considered in this study.
- Vessel collision. The colliding or striking of two vessels due to human error or mechanical failure.
- Collision with ice. The collision of an underway vessel with floating ice. Incidental, controlled contact with ice while maneuvering in Tarr Inlet or Johns Hopkins Inlet is not considered an ice collision.
- Fire/explosion. Occurrences of a fire of explosion serious enough in itself to cause a fuel or cargo spill. If the fire or explosion is the root cause of a grounding or collision, the accident will be treated as a grounding for the purpose of spill scenario development.
- Structural failure. A structural failure due to hull fracture or corrosion that is serious enough to cause an oil spill.
- Foundering. The sinking of a vessel due to water ingress or loss of stability.

4.2 Historical review of marine accidents in Southeast Alaska

Table 4.2 provides a brief review of vessel accidents and incidents (for a definition of an incident, see section 2.3) in Southeast Alaska from 1993 through 1999. Since this is not a risk assessment or a study to develop prevention initiatives, the root causes of the accidents and incidents have not been analysed or described. This table is merely intended to provide some indication of the types of accidents that may lead to an oil spill. Serious accidents that presented no risk of an oil spill (ex. the cruise ship Universe Explorer fire in 1996) have not been listed.

Table 4.2 Summary of Large Vessel Casualties & Incidents 1994-1999

Vessel/Type/Year	Accident/Incident	Location	Consequence	Comments
Nieuw Amsterdam, cruise ship (1994)	powered grounding	Revillagigedo Channel	Extensive bottom damage, 200 gal hydraulic oil spill	daytime, charted rock near trackline
Yorktown Clipper, small passenger vessel (1994)	powered grounding	Geikie Rock, Glacier Bay	Extensive bottom damage, minor oil spill	daytime, charted rock near trackline
Star Princess, cruise ship (1995)	powered grounding	Lynn Canal	Extensive bottom damage, minor oil spill	nightime, marked rock near trackline
Rotterdam, cruise ship (1996)	loss of propulsion	Lynn Canal	none	anchored to avoid drift grounding
Seamore, excursion day boat, 1996	collision with ice	Tracey Arm	minor hull damage, serious to minor injuries to all on board	high speed allision, captain did not have a license
Executive Explorer, small passenger vessel, 1996	collision with ice	Tarr Inlet	bottom damage, required temporary repairs to continue voyage	catamaran, tried to “take the ice down the middle”
Statendam, cruise ship (1999)	loss of propulsion	Lynn Canal	none	restored power after 13 minutes
Spirit of Alaska, small passenger vessel (1997)	powered grounding	Sea Otter Sound	negligible bottom damage	refloated with rising tide
Taku, ferry, (1998)	powered grounding	Anan Bay, confluence of Blake and Bradfield Canal	negligible bottom damage	soft grounding in sand at creek mouth, refloated with rising tide
Spirit of Endeavour, small passenger vessel (1999)	powered grounding	Idaho Inlet	negligible bottom damage	soft grounding while maneuvering around another vessel
Aurora, ferry, (1999)	powered grounding, struck rock but continued to next port	Port Chester, Nichols Pass	minor hull damage	late turn leaving Metlakatla
Regal Princess, cruise ship (1993)	allision	City Dock, Ketchikan	minor damage to vsl, ext damage to dock and building	docking during high winds
Wilderness Adventurer, small passenger vessel (1999)	powered grounding	Dundas Bay	extensive damage to hull, several hundred gallon diesel spill, vessel nearly lost in downflooding	spill response successful in limiting environmental damage
Spirit of 98, tour boat (1999)	powered grounding	Tracey Arm, approaching North Sawyer Glacier	extensive damage to hull, nearly foundered, no fuel spill	intentional grounding to avoid sinking

4.2.1 Observations

As discussed, statistically valid conclusions cannot be drawn due to the sparse data available and the limitations imposed on this study. However, when Table 4.2 is viewed as a whole, there are some obvious trends that will be helpful in determining spill response resource needs.

- **Powered groundings are the most likely accident.** Most groundings were on charted rocks and pinnacles. In only two of the accidents (Spirit of 98, Taku) were the accuracy of the charts called into question.

- **Powered groundings are most likely to occur when vessels intentionally deviate from established tracklines.** Although the most serious groundings (Star Princess, Nieuw Amsterdam) occurred because of an error in navigation while following established tracklines, ships have successfully sailed these tracklines thousands of times over the past ten years. By contrast the master of the Taku (powered grounding in Anan Bay, 1998) reported that it had been several years since he had sailed Blake Canal. The Spirit of Alaska grounded when the vessel entered waters in Sea Otter Sound that the master or mate on watch had never sailed. The mate on watch for the Wilderness Adventurer made a non-standard manoeuvre to allow passengers a closer look at bears along the shoreline of Dundas Bay. In other words, these three vessels had a one-to-one accident-to-transit ratio for these waters.

- **If a ship remains relatively stable after a powered grounding, extensive bottom damage, even if fuel tanks are involved, will not usually result in a serious oil spill.** If the bottom of a vessel is holed at a fuel tank, water will enter and the fuel oil will be pressed up to the tank top[2]. This "water bottom" prevented a significant fuel spill in the Star Princess grounding (Poundstone Rock, Lynn Canal, 1995). The oil spilled from the Wilderness Adventurer occurred primarily through the fuel vents as the stranded vessel heeled over and downflooded during each rising tide. Significant spills from a non-tank vessel occurs when the stranded vessel is progressively damaged due to wave, wind and tide actions. Notable examples include the Kiroshima in Dutch Harbor (1997) and the New Carissa in Coos Bay (1999).

- **An accident involving an excursion boat or small passenger vessel can occur anywhere in the Park.** Given the nature of this niche market in

[2] The U.S. Navy has ships in commission that use this principle as a matter of design. The fuel tanks have open grate inserts in the bottom hull plate that allows seawater in as fuel is consumed. Since the fuel is pressed against the tank top, there is no vapor space and the risk of an explosion is reduced.

cruising, these vessels will go to out of the way inlets and bays, particularly those with exceptional natural beauty or abundance of wildlife.

- **The absence of serious tank barge accidents is remarkable,** particularly given the conditions under which these vessels operate and the off-loading points to which they travel. Tank barges transporting fuel from Washington can be found year-round throughout Southeast Alaska servicing log camps, mines, and remote communities. Spills during loading and offloading operations are rare and minor. This study did not uncover a single incident of a spill due to a tank barge grounding, collision, allision or other hull failure. Although the largest spills are potentially from tank barges, the probability of a spill is low and the existing response capability is high.

  Tank barges in Southeast Alaska carry only non-persistent oil. All the tank barges that ply the waters of Southeast Alaska carry spill response equipment on deck that is capable of immediate deployment. Tank barge operations in Southeast Alaska are members of SEAPRO Co-op, an oil spill recovery organization certified by the Coast Guard to respond to tank vessel spills.

  Laden tankships from Valdez must stay 200 miles off the Southeast Alaska coastline. Because of the distance these vessels are from shore and the prevailing counter-clockwise surface currents of the Gulf of Alaska, a major spill from a tankship will not impact the Park and Preserve.

  For these reasons the primary focus of this study will be spills from vessels that do not carry oil as cargo (non-tank vessels).

- **The probability of a fuel oil spill as a result of a collision with ice is low.** Ice damage has caused oil spills in Cook Inlet, but these incidents have been primarily due to ice movement at fuel terminals under severe winter conditions. In the early 1990’s the tankship Overseas Ohio, travelling in excess of 20 knots in the Gulf of Alaska, apparently hit an iceberg. Although the vessel sustained extensive damage to the its bulbous bow there was no tank damage or oil spill. Marine pilots report that during the cruise ship season the southern-most boundary for ice in Glacier Bay is Composite Island. North of Composite Island cruise ships travel at maneuvering speeds in daylight at less than 8 knots. Ice that is not pushed away from the hull by Lattimer flow makes only incidental contact.

- **The average most probable oil spills are from fishing vessels.** Diesel oil spills from fishing vessels, ranging from 50 to 4000 gallons, are common throughout Southeast Alaska. They exceed, both in number and in gallons spilled per accident, all other vessel mishaps during the past decade. Recovery and clean-up is seldom feasible. The larger spills occur when the vessels flounder or break up after grounding. On some occasions, responders have been successful in pumping fuel off the vessel before it sinks or breaks up. A rapid response team, capable of pumping out fuel tanks and bilges of a stricken fishing vessel, is one of the most useful and effective weapons in the response arsenal.

4.3 Higher Risk Transit Areas for Deep Draft Vessels:

Two pilots and one pilot apprentice, each with extensive experience navigating in and around the waters of GBNP, were interviewed. Each were asked to identify areas with the smallest margin for error in navigation or where a loss of power or steering would have the most serious consequence. For the purpose of this study, these locations will be defined as higher risk transit areas. A summary of their collective judgements are presented in the following subparagraphs:

4.3.1 **Lituya Bay.** The entrance to this bay is the only “west coast-like bar” in Southeast Alaska. The current runs at an angle to the mouth; swells and breakers are often present at the bar entrance. Strong ebbs present a particular challenge. Fog can develop quickly; even after a vessel has entered the bay. This bay has been subjected to much seismic activity in recent years and charts may not be accurate.

4.3.2 **North Inian Passage**. The tidewater that floods and ebbs from Southeast Alaska to the Gulf of Alaska passes through only three points: Clarence Strait, Chatham Strait, and Cross Sound. Of the three, Cross Sound is the most restricted and the result is exceptionally strong, bifurcating tidal currents with a standing wave at North Inian Pass during certain times of the tide cycle. Between February 4 and April 4, 2000 the current at North Inian Passage exceeded 6.0 knots 42 times. This is significant, especially in light the 40^0 course change required to transit the Pass.

4.3.3 **The five-fathom pinnacle at the mouth of the Bay** (58^0 21’N, 136^0 00.0’W). This pinnacle is the highest protrusion of a ledge that crosses North Passage between Point Carolus and Lemesurier Island. Because of the bottom contour here, water rushing out of the Bay and Icy Strait during ebb tides can create whirlpools and standing waves. Under these situations, a loaded bulk carrier or cruise ship could “bottom out” on this rock.

4.3.4 **Uncharted rocks immediately south of Ancon Rock, Point Gustavus.** There are several rocks and shoals that lie close to the surface near the Ancon Rock navigational aid. The pilots interviewed believed that not all were accurately charted. A ship or barge cutting in close to Point Gustavus runs the risk of grounding, even if they steer south of the aid.

4.3.5 **Sitakaday Narrows.** Exceptionally strong currents are created at this choke point for up-bay waters during ebb tides. Tide table calculations indicate that currents exceed 8.0 knots sixteen different times in 2000. The rock at Rush Point, although seasonally marked, protrudes a half-mile into the Narrows. The navigational buoy is often reported off station due to the strong tidal currents. Vessel speeds are limited to 10 knots over ground to protect the whales feeding in the area from June through August. When the ships pass through the narrows with the current, these speed limitations reduce steerageway significantly.

4.3.6 **The Bay north of Sitakaday Narrows presents a lower potential for a powered grounding and a slightly higher risk of a collision.** From Jaw Point to Grand Pacific Glacier the currents are moderate and predictable, rocks and pinnacles are well away from established tracklines, courses changes are minor, and the vessels are operating at lower speeds for much of the route. Given that the tidewater glaciers at the head of Tarr Inlet are the ultimate destination of every vessel that enters the upper Bay, there is a higher risk of collision due to congestion. A collision between two deep draft vessels is not considered likely since only two vessels are allowed in the Bay at once, and they generally follow each other, thus avoiding reciprocal courses. A low speed collision between two excursion vessels or between an excursion vessel and a cruise ship is felt to be the most likely of a list of low probability incidents at this end of the Bay. These accidents would be unlikely to result in a significant oil spill.

4.4 **Accident scenarios for higher risk transit areas.** An incident (loss of propulsion or steerage, error in navigation) in one of the higher risk transit areas identified above could result in the accidents listed below. These accident scenarios and the fate/effects of an oil spills from these accidents will be developed in section 5.

- Powered grounding of a small cruise ship or small passenger vessel at the entrance to Lityua Bay.
- Loss of propulsion of a cruise ship, ferry or ore carrier during a transit through North Inian Pass results in a drift grounding.
- Powered grounding at the five-fathom pinnacle, or nearby shoal water at the mouth of Glacier Bay.
- Loss of propulsion of a cruise ship during a transit through Sitakaday Narrows results in a drift grounding.

5.0 Fate and effects of oil discharged

5.1 Properties of marine diesel and intermediate fuel oil (IFO)

There are two refined oils used for fuel by vessels that enter the Park. Cruise ships and bulk carriers use intermediate fuel oil (IFO 180, IFO 380). All other vessels burn diesel. Fact sheets prepared by NOAA on both fuels are included in this study as Appendix A. The properties of these fuels that are of particular interest in response are compared and summarized in Table 5.0. In preparing this table, the author used data from the NOAA fact sheets, calculations produced using ADIOS[3] software, and his personal experience dealing with spills of both products.

5.2 Difficulties in predicting slick movement

The author of this study was naive in believing at the outset that slick trajectories for Glacier Bay could be predicted using available software. Recent studies have shown that the Bay is even more dynamic than previously believed. This fjord-estuarine system with its numerous fills and tidewater glaciers concentrate currents, drive surface water down, create numerous convergent zones, develop extensive fresh water lens over salt water with dramatic differences in temperature and density. The net effect is complete daily mixing of waters at all depths, and complex currents and eddies which make it impossible at the present time to construct a general surface water circulation model useful to the responder.

Given the difficulties in developing trajectories, this study will “dead reckon” slick paths for each accident scenario and attempt to identify convergent zones and eddies where on-water recovery might be feasible.

[3] ADIOS (Automated Data Inquiry for Oil Spills) integrates a library of approximately one thousand oils with a short-term oil fate that estimates the amount of time that spilled oil will remain in the marine environment. It was developed through the NOAA Hazardous Materials Response and Assessment Division.

Table 5.0
Comparison of Marine Diesel and Intermediate Fuel Oil
(assumes 2500 barrel spill (100,000 gallons) in 9^0 C seawater under calm conditions with winds at 10 mph)

Properties	MARINE DIESEL	IFO 380
Synonyms	No 2 Fuel Oil	No 6 Fuel Oil
General description	light, refined product	blend of heavy residual oil with diesel (3:1 usually)
Density:	0.86 g/cc at 9.0 C (33.5 API)	0.99 g/cc at 9.0 C (11.5 API)
Kinematic Viscosity	20.4 cSt at 9.0 C	3,627 cSt at 9.0 C
Pour Point	-15.0 C	between 4.4 C and 15.6 C
Classification under 33 CFR 155	Group I, non-persistent oil	Group III, persistent oil
Probability of mousse formation	low (viscosity too low)	low (viscosity too high)
Percent evaporated and dispersed after 12 hours	24%	1%
Percent evaporated and dispersed after 24 hours	42%	4%
Percent evaporated and dispersed after 48 hours	67%	10%
Percent evaporated and dispersed after 5 days	87%	20%
Behavior on shoreline	penetrates porous sediments, dispersed/degraded by tide, wave and microbial action	remains on surface, bath tub ring at high tide, degradation takes months to years
Environmental Toxicity	acutely toxic to water column organisms, shellfish tainting, fish kills in confined shallow water, minor impacts on seabirds due to quick dissipation	primarily from physical coating of marine mammals, seabirds, intertidal organisms
Effectiveness of mechanical recovery and shoreline countermeasures	usually of limited effectiveness due to rapid dissipation, exclusion/deflection booming can be effective	open water recovery should be attempted, shoreline countermeasures can be very effective

5.3 Fate and effects of oil spilled from accidents in higher risk transit areas

5.3.1 Powered grounding of a small cruise ship or small passenger vessel at the entrance to Lityua Bay. This is the most catastrophic of the accidents envisioned. The vessel, exposed to the full force of the Pacific Ocean, would be worked against the rocks flanking the narrow entrance to the Bay. Passenger rescue would be difficult, salvage tugs would be a long time coming, and only under prolonged, exceptionally calm conditions would the vessel not break up and lose all the fuel on board. However, since the vessels visiting Lituya Bay burn diesel the environmental impact of this spill would be mitigated by wave action and exposed shorelines that would rapidly disperse the light fuel oil. Response would be limited by the remote hazardous locale and likely would ineffective in any event. Salvage and monitoring should be the only spill response attempted.

5.3.2 **A cruise ship, ferry or ore carrier loses propulsion during a transit through North Inian Pass.** Strong ebb currents could sweep the drifting vessel unto the shore of Taylor Bay or Inian Island. Inian Island would be the least forgiving due to its exposed shoreline of rocky cliffs. The same currents would quickly beach oil leaking from the stranded vessel, primarily along the northern shoreline of Cross Sound and Inian Island. A significant IFO spill could produce a "bath tub" ring at the high tide line throughout Cross Sound. Both diesel and IFO would have the greatest impact at the tidal flats at the head of Taylor Bay, and the more sheltered waters in Fern Harbor and the mouth of Dundas Bay. The effect of a diesel spill would not be long lasting due to the dynamic conditions of Cross Sound. Open water recovery would be ineffective even if responders found floating oil by the time they arrived. For a spill that was not instantaneous, exclusion and deflection booming could be effective in keeping leaking oil from entering the more highly sensitive areas of Fern Harbor and Dundas Bay.

5.3.3 **Powered grounding at the five-fathom pinnacle, or nearby shoal water at the mouth of Glacier Bay.** This type of grounding would cause extensive bottom damage but the vessel would likely not strand. The master or pilot would likely attempt to anchor the vessel in sheltered waters near or in Bartlett Cove. This would place the ship in the best position for emergency evacuation of passengers and damage control. Oil leaking from the anchored vessel would travel with the currents down the Bay and out into Icy Strait and Cross Sound. It would impact the peninsula shoreline north of Point Gustavus up to Bartlett Cove. A large slick might impact the biologically rich areas at Point Carolus. For an IFO spill on water containment and recovery should be attempted. Exclusion and deflection boom should be deployed throughout Bartlett Cove, the entrance to Secret Bay and, possibly, the most sensitive areas of Point Carolus.

5.3.4 **Loss of propulsion of a cruise ship during a transit through Sitakaday Narrows.** Strong tide currents would quickly push the vessel into shoal water either north or south of Rush Point or perhaps to Strawberry Island, depending on the current direction. The vessel may be able to emergency anchor on the rocky shelves around Rush Point and Young Island, but the strong currents will make this difficult. A drift grounding under these circumstances could extensively damage the hull, but if weather conditions were not severe, the vessel would remain stable. Spilt oil would spread both north and south of Jaw Point, complicating the response. With currents between 5 to 8 knots, a large IFO spill would quickly impact the Beardlee Islands and the western shoreline. Shoreline countermeasures should be mounted quickly and the personnel needs will be significant. There are opportunities for on-water recovery within eddies and convergence zones north of Young Island. Skimmers should be deployed to these areas first since recovery south of Rush Point will be more difficult. Deflection and exclusion boom should be deployed at the tidal areas north of Rush Point, at the mouth of Berg Bay and at the entrances to Secret Bay.

6.0 Resources Needed for Effective Spill Response

6.1 **General Considerations.** In this study, the list of resources needed for effective response in Glacier Bay National Park has been compiled under the following assumptions and guidelines:

- On-water recovery operations will be conducted in sheltered waters where wave heights are less than 2 feet.
- Floating debris (kelp, popweed, logs and ice) will be present.
- Because of its persistence in the marine environment, response planning will focus on recovery and countermeasures for IFO 180 or IFO 380. If resources are adequate for IFO, they will also be adequate for diesel spills.
- Even under optimal conditions for on-water recovery at least 50% of the discharge will impact the shoreline.
- Chemical dispersants, *in-situ* burning and other chemical treatment methods are not an option.
- Under calm, "still pond" conditions, double booming, even triple booming the stricken vessel is extremely important. Secondary and tertiary containment has been shown to hold spilt oil where a single boom surrounding the vessel has not. The best opportunity for on-water recovery is always nearest the source. In addition, boom will contain debris and other contaminates that will inevitably fall off the vessel. Secondary and tertiary booming of the vessel should be a primary focus during the first hours of the response to both diesel and IFO spills.
- Under less than calm conditions, booming is effective but will require more skill in deployment. Boom/skimmer deployment in "J" and "U" configurations at some distance and down current from the vessel will be required.
- Oil-contaminated debris collection and removal will comprise a significant portion of shoreline cleanup. It will likely be the only shoreline response activity for a diesel spill. The amount of debris that can be contaminated per mile of shoreline should be estimated in advance through shoreline assessments.
- For booming and skimming, equipment and personnel should be on-scene during the first 24 hours. It is expected that equipment and personnel for shoreline countermeasures will not be fully assembled and deployed during the first 24 hours.

6.2 Review of Planning Standards

6.2.1 33 CFR 155.

6.2.1.1 Basic components. Title 33, Part 155 of the U.S. Code of Federal Regulations, *Oil or Hazardous Material Pollution Prevention Regulations for Vessels*, requires certain types of equipment, procedures, training, records, and plans for both the transfer of products and the accidental spill of products carried by tank vessels. Subpart D-Response Plans establishes planning criteria for plan development and identification of resources necessary to respond to oil spill scenarios identified in the planning process. Although not applicable to non-tank vessels, these regulations have planning criteria developed through much research and consultation, which are worth considering in this study. They include:

- Planning volumes for determining resource needs in advance.
- Effective daily recovery capacity.
- Temporary storage capacity.
- Response resource operating criteria for oil recovery devices.
- Shoreline protection requirements.

These criteria are used in developing the resource tables in each scenario in section 6.3.

6.2.1.2 Use of 'Maximum Most Probable Discharge' as a Planning Volume

'Maximum most probable discharge' is a regulatory term used in Title 33 U.S. Code of Federal Regulations Part 155 to evaluate required response resources for vessels and marine facilities that handle oil as cargo. Essentially, a maximum most probable discharge is an accidental spill of 10% of a vessel's cargo. Used in the context of this study, it refers to a loss of 10% of the fuel oil on board at the time of a vessel accident. The largest vessels entering the Park carry approximately 405,000 gallons (1500 tonnes) of fuel oil. Thus, using the maximum most probable criteria the planning volume would be 40,500 gallons. Obviously, maximum most probable discharge has no legal bearing here since, with the exception of tank barges, the vessels examined in this study do not carry oil as cargo. However, there is sound rationale for its use as a planning figure for the Park, as opposed to that of a worst case discharge (loss of all the fuel on board):

- Passenger vessels and bulk carriers carry fuel in multiple tanks. Even under catastrophic conditions it is unlikely that all fuel oil would be discharged for the reasons set forth in section 4.3.1. The M/V Kiroshima, aground in Dutch Harbor in a winter storm with winds exceeding 100 miles per hour, loss only 36,000 gallons of fuel oil.

- If all fuel is lost under worst-case conditions (floundering, vessel break-up) it would be under conditions that would limit the effectiveness of responders. For example, there is little that spill responders could do at the scene of a vessel stranded at the mouth of Lituya Bay. Conditions would be hazardous, swells and breakers would prevent booming and oil recovery.

- Standards for maximum most probable discharges plan for long-term response. For example, under the requirements for tank vessels set forth in 33 CFR 155 Appendix B the effective daily recovery capacity on scene must equal 50% of the planning volume. Temporary storage must be equal to twice the daily recovery capacity. In other words, if 50,000 gallons is the planning volume, responders must be able to recover 25,000 gallons per day and 175,000 gallons within the first week with the capacity to store twice that amount. These criteria will be developed further in section 6.3.

6.2.2 **U.S. Coast Guard planning proposal for Southeast Alaska.** The only regionally specific criterion for non-tank vessels is a planning proposal developed by the Coast Guard in 1997. This proposal, which has been informally adopted by the Alaska Department of Environmental Conservation has been distributed to the industry as guidelines or expectations for an effective response. (Type in here or include as appendix B)

6.2.3 **Canadian Coast Guard Oil Spill Response Field Guide** is an internationally used handbook for response. It contains a number of equipment selection matrixes that have been used in developing the resource tables for the scenarios in this study.

6.3 Recommendations for Each Scenario. For booming and skimming, equipment and personnel should be on-scene during the first 24 hours. It is expected that equipment and personnel for shoreline countermeasures will not be fully assembled and deployed during the first 24 hours.

6.3.1 Powered grounding of a small cruise ship or small passenger vessel at the entrance to Lityua Bay. For the reasons stated in Section 5.3.1 response will be limited to shoreline assessment and salvage.

6.3.2 A cruise ship, ferry or ore carrier loses propulsion during a transit through North Inian Pass, drift grounds in the vicinity of Taylor Bay, and leaks 40,000 gallons of IFO in a 72-hour period.

Equipment/Application	Type	Quantity
Boom/surround stricken ship: likely to be ineffective or hazardous given the exposed conditions	NA	NA
Boom/protect tide flats and marsh lands in Taylor Bay, Dundas Bay	24-inch or more harbor boom	(1.5+current) x width of marsh [est 10,000 ft]; five workboats with crew
Diversion/deflection boom for streams from Taylor Bay to Pt Carolus	18-inch calm water boom	3-4 times width of water body [est 4500-6000 ft for five areas]; three workboats with crew
Anchor/chain sets for boom	line at 5 times water depth, chain, 20 lb anchor	anchor boom every 50-75 yards [50-80 sets]
Skimmers: Likely to be ineffective or hazardous to operate	NA	NA
Shoreline countermeasures:		
1. Contaminated debris removal, manual oil removal	manual collection, incineration in place	up to 50 HAZWOPER certified cleanup personnel
2. Cold water wash (<50 psi) and vacuum for gravel beach and sheltered rocky shoreline (cannot quantify due to lack of assigned shoreline codes)	flushing unit, landing craft with vacuum pumps and storage capacity	3 flushing units per landing craft; if landing craft is impractical shallow water skimmers must be used; temp storage for oily liquid

References: 33 CFR 155, Appendix B
Canadian Coast Guard Field Operations Guide

6.3.3 Powered grounding at the five-fathom pinnacle, or nearby shoal water at the mouth of Glacier Bay. The damaged vessel anchors on the east side of the Bay 3 miles south of Bartlett cove. Soundings and bottom surveys indicate the vessel has the potential to lose 40,000 gallons of fuel oil.

Equipment/Application	Type	Quantity
Boom/surround stricken ship	24-inch or greater harbor boom, internal-foam flotation	double boom vessel (twice ship's length plus twice beam plus 20% times two) [4800 feet for 900-ft vessel]; 2-3 workboats with crew
Boom/protect SW entrance to Secret Bay	18-inch calm water boom	3-4 times width of water body [4500-6000 ft]; two workboats with crew
Boom/protect marsh at Lagoon Island	18-inch calm water boom	(1.5+current) x width of marsh [est 5000 ft]; two workboats with crew
Anchor/chain sets for boom	line at 5 times water depth, chain, 20 lb anchor	anchor boom every 50-75 yards [50-80 sets]
Skimmers with a combined daily recovery capacity of one-half the spill potential	Oleophilic brush, sorbent belt; effective recovery rate calc using 33 CFR 155, App B, sec 6.	at least two: one inside boom surrounding vessel, second working down current
Boom for down-current skimmer*	24-inch harbor boom	1500 feet*; 2 workboats with crew
Temporary storage for twice the daily recovery capacity	tank barge, bladder; shoreside facility sized for 5 days of operation	capable of collecting and transporting 40,000 gallons per day to a shoreside facility, shoreside facility for 100k gallons of oil/water mixture
Shoreline countermeasures:		
1. Contaminated debris removal, manual oil removal	manual collection, incineration in place	up to 50 HAZWOPER certified cleanup personnel
2. Cold water wash (<50 psi) and vacuum for gravel beach and sheltered rocky shoreline	flushing unit, landing craft with vaccuum pumps and storage capacity	3 flushing units per landing craft; if landing craft is impractical shallow water skimmers must be used

* Some advancing skimming systems may require less boom.

References: 33 CFR 155, Appendix B
Canadian Coast Guard Field Operations Guide

6.3.3 A cruise ship loses propulsion during a transit through Sitakaday Narrows and drift grounds south of Rush Point or Strawberry Island, and leaks 40,000 gallons of IFO in a 72-hour period.

Equipment/Application	Type	Quantity
Boom/surround stricken ship: if the vessel is stranded on shore surrounding vessel will be difficult	24-inch or greater harbor boom, internal-foam flotation	attempt to boom seaward portion of vessel [2000 ft], 2 workboats with crew
Boom/protect SW entrance to Secret Bay	18-inch calm water boom	3-4 times width of water body [4500-6000 ft]; two workboats with crew
Deflection/exclusion boom for resources at risk around Pt Carolus and/or Berg Bay	18-inch calm water boom	(1.5+current) x width of marsh [est 10,000 ft]; four workboats with crew
Anchor/chain sets for boom	line at 5 times water depth, chain, 20 lb anchor	anchor boom every 50-75 yards [50-80 sets]
Skimmers with a combined daily recovery capacity of one-half the spill potential	Oleophilic brush, sorbent belt; effective recovery rate calc using 33 CFR 155, App B, sec 6.	at least three: one inside boom surrounding vessel, second working down current, third working slack water/convergences among Beardlee Islands
Boom for skimmers working down-current & around Beardslee Islands*	24-inch harbor boom	3000 feet*; 6 workboats with crew
Temporary storage for twice the daily recovery capacity	tank barge, bladder; shoreside facility sized for 5 days of operation	capable of collecting and transporting 40,000 gallons per day to a shoreside facility
Shoreline countermeasures:		
1. Contaminated debris removal, manual oil removal	manual collection, incineration in place	up to 50 HAZWOPER certified cleanup personnel
2. Cold water wash (<50 psi) and vacuum for gravel beach and sheltered rocky shoreline	flushing unit, landing craft with vacuum pumps and storage capacity	3 flushing units per landing craft; if landing craft is impractical shallow water skimmers must be used, 9 personnel to operate out of one landing craft

* Some advancing skimming systems may require less boom.

6.4 Summary of minimum needs on-scene for first 24 hours of each scenario:

	North Inian Pass	Mouth of Glacier Bay	Sitakaday Narrows
24-inch harbor boom	10,000 feet	4800 feet	5000 feet
18-inch calm water boom	6000 feet	11,000 feet	16,000 feet
Skimmers	0	2	3
On-water temp storage	About 30,000 gals	40,000 gals	40,000 gals
Shoreside temp storage	About 150,000 gals	200,000 gals	200,000 gals
Workboats with crew	8	7	6
HAZWOPER personnel	50	50	50
Flushing units and support equipment	TBD	TBD	TBD

By applying the Coast Guard planning proposal (appendix B) to these tables it can be inferred that there should be equipment and personnel at **Bartlett Cove** capable of:

- double booming a vessel (4800 feet of 24-inch harbor boom),
- skimming oil within the boom and at least one location down current (two skimmers, 1500 feet 24-inch harbor boom, up to four work boats),
- holding temporarily up to 100,000 gallons of oily water mixture,
- deploying deflection/exclusion boom for the most vulnerable resource at risk (5000 feet 18-inch calm water boom, 2 workboats).

7.0 Recommendations for Future Activity

7.1 Prevention

1) Limit or exclude passenger vessels from Lituya Bay. Given the consequences of a mishap, it is difficult to justify the need to offer this excursion.
2) Equip and train a rapid response team for fishing vessel casualties that are capable of removing up to 4000 gallons of on-board oil and hazardous materials.

7.2 Additional Studies and planning

1) Develop a surface water circulation model as an aid in projecting slick movement throughout the park. Use drift buoys or other field

observations to identify zones of convergence and slack water where on-water recovery is optimum.

2) Identify an anchorage near Bartlett Cove that provides quick access to shore-based resources and allows the best opportunity for on-water oil recovery (low current, minimum water depths for anchoring boom).
3) Classify all shorelines by type code.
4) Develop geographic specific response plans and Incident Action Plans for the most sensitive areas, particularly the mouth of the Bay and the Beardslee Islands.
5) Develop a hazing strategy for birds.
6) Develop a protection plan for marine mammal haul outs.
7) Purchase chart software that will allow current/tide prediction and development of tactical plan graphics. (around $600.00)

7.3 Training

1) Ensure a pool of 50-100 HAZWOPER trained personnel are available to respond within 24 hours. Prepare in advance a logistics plan that supports these responders. Consider SEAPRO as a resource provider.
2) Develop an in-house incident management team with expertise in spill management.

Appendix A: FACT SHEET for IFO Spills
Prepared by NOAA, 2000

IFO 180 and IFO 380 are designations used by the International Standards Organization (ISO) for two intermediate fuel oils that are commonly used as marine fuels. IFOs are typically made by blending the heavy residuum from the refining process with a lighter fuel oil, such as diesel, to meet the viscosity requirements specified by the ISO. IFO 180 has a specified viscosity of 180 centistokes at 50°C; IFO 380 has a specified viscosity of 380 centistokes at 50°C. (Note: Fuel Oil No.6 is an ASTM designation for similar oils but it encompasses a wider viscosity range than the ISO specifications. Both IFO 180 and 380 could be classified as Fuel Oil No.6 based on their viscosities.)

At low temperatures, an IFO will flow slowly due to its high viscosity, or not at all depending upon its pour point. Very little of this viscous oil is likely to mix into the water column. It can form thick streamers or, under strong wind conditions, break into patches and tarballs.

It is a persistent oil; only a small fraction is expected to evaporate within the first hours of a spill. Thus, spilled oil can be carried long distances by winds and currents. Previous IFO spills have contaminated shorelines over 200 miles from the spill site.

IFOs are relatively dense fuels. Their specific gravity nominally ranges from 0.98 to 1.01. Thus, spilled oil can float, suspend in the water column, or sink depending upon the salinity of the water. Floating slicks may become non-floating when they spread into areas of freshwater influence. Adhesion to sediments can also cause IFOs to sink in fresh and salt water.

Because IFOs can be very viscous and sticky, stranded oil tends to remain on the surface rather than penetrate sediments. Light accumulations usually form a "bath-tub ring" at the high-tide line; heavy accumulations can pool on the surface.

Shoreline cleanup can be very effective, particularly soon after the spill before the oil weathers, becoming stickier and even more viscous. Removal is needed because degradation rates for heavy oils are very slow, taking months to years.

Adverse effects of floating IFO are related primarily to coating of wildlife dwelling on the water surface, smothering of intertidal organisms, and long-term sediment contamination. IFO is not expected to be as acutely toxic to water column organisms as lighter oils, such as diesel.

Direct mortality rates can be high for seabirds, waterfowl, and fur-bearing marine mammals, especially where populations are concentrated in small areas, such as during bird migrations or marine mammal haulouts.

Direct mortality rates are generally less for shorebirds because they rarely enter the water. Shorebirds, which feed in intertidal habitats where oil strands and persists, are at higher risk of sublethal effects from either contaminated or reduced population of prey.

The most important factors determining the impacts of IFO contamination on marshes are the extent of oiling on the vegetation and the degree of sediment contamination from the spill or disturbance from the cleanup. Many plants can survive partial oiling; fewer survive when all or most of the above-ground vegetation is coated with heavy oil. However, unless the substrate is heavily oiled, the roots often survive and the plants can re-grow.

Appendix B

Draft PLANNING PROPOSAL[4]
Oil Spill Response Capability in Southeast Alaska
for
Vessels Greater than 500 gross tons
that do not carry oil in bulk as cargo

(assuming maximum most probable spill of 50,000 gallons No. 4-5 fuel oil)

Overall Objectives:

1. Control the source of discharge,
2. Halt the spread of discharge,
3. Recover discharged oil from the water and adjoining shorelines by mechanical or manual methods or both,
4. Dispose of recovered oil and oil contaminated materials in accordance with applicable state and local government procedures,
5. Provide appropriate safeguards, training and safe work practices that ensure site safety and health.

In addition to the requirements of the Shipboard Oil Pollution Emergency Plan as specified by MARPOL, vessels operating in Southeast Alaska should be able to provide:

I. Within 2 hours:

- A company representative who has the authority and capability to participate in unified command and to act in the capacity equal to that of a "qualified individual" as described in 33 CFR 155.1026 contacts the Federal and State On-Scene Coordinator.

II. On-scene within 6 hours:

- Boom in place in the amount of 2 times the ship length, sufficient to contain a discharge on one side of the vessel and allow skimming operations.
- Recovery capability of 25-50 bbls/hr (recovery of a 25,000-50,000 gallon discharge within 24 hours).
- Recovery devises are matched for the type of product spilled.
- Temporary storage capacity of 6000-12,000 gallons (150-300 bbls).
- Means and capacity to lighter ¼ of ship's fuel oil tanks.

III. At the incident command post within 6 hours:

- A spill management team comprising of, as a minimum, 6 individuals trains in command and control, safety, spill response operations, planning, logistics support, and finance.

IV. Within 12 hours:

- 5000 feet of shoreline protection boom on-scene with trained personnel and equipment capable of deploying and tending the boom in accordance with the Incident Action Plan.
- Vessel double boomed.
- Total temporary storage capacity of 18,000 gallons.

V. Within 24 hours:

- All equipment and personnel specified by the Incident Specific Action Plan.

[4] Developed by USCG Captain of the Port, Southeast Alaska (1997)