Neah Bay Rescue Tug
Report to the Washington State Legislature

WASHINGTON STATE
DEPARTMENT OF
ECOLOGY

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Abstract: *Neah Bay Rescue Tug: Report to the Washington State Legislature* describes the need for additional marine safety infrastructure for the outer coast of Washington and the Strait of Juan de Fuca. The report provides a history of the issue, and describes and analyzes the operations and lessons learned from stationing a rescue tug at Neah Bay, Washington for three seasons.

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Prepared by:

Washington State Department of Ecology
Spill Prevention, Preparedness, and Response Program

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I. Executive Summary

The outer coast of Washington and the western Strait of Juan de Fuca contain highly valuable marine resources. These areas are also vulnerable to oil spills from the large volume of marine traffic. This report focuses on an effective spill prevention measure that can significantly reduce the probability of an oil spill in this area – a dedicated rescue tug.[1]

Recognizing the value of the resources and their vulnerability, the 1991 Washington Legislature called for an emergency response system for the Strait of Juan de Fuca (see sidebar). In 2000, the Legislature appropriated $1.65 million to establish a rescue tug at Neah Bay that could assist disabled commercial vessels and prevent major oil spills.

In a competitive procurement process the Department of Ecology (Ecology) selected Foss Maritime Co. to provide the tug. The tug *Barbara Foss* arrived in Neah Bay on September 18, 2000 and is expected to remain on station during the winter storm season, through at least May 18, 2001. The Coast Guard routinely dispatches the tug through an operating protocol developed by the two agencies.

The primary mission of the rescue tug is to provide timely emergency towing services for disabled vessels to prevent pollution events on Washington's northern outer coast and in the western Strait. The rescue tug is also capable of rapidly assisting vessels with propulsion and steering failures, structural casualties, fires and other problems. It can also escort high risk vessels, provide a lifesaving and spill response deployment platform during major casualties, and assist during salvage operations.

Rescue tugs have been stationed at Neah Bay a total of 11 months during the current and last two winter seasons. The tugs have been called out to assist vessels eight times, towing or escorting five of the vessels to safety. The tugs have also conducted more than 143 drills and exercises. These drills proved the effectiveness of the tugs under moderate to adverse weather conditions.

Makah Tribal facilities and navigational access to Neah Bay have proven to be both operationally and logistically suitable for a tug the size of Foss Maritime's *Barbara Foss*.

Funding is the principal issue of contention regarding stationing a dedicated rescue tug at Neah Bay. Opponents argue that the probability of a spill is low enough that a relatively expensive spill prevention measure like a dedicated tug is not a wise investment. They also are concerned that Washington trade would be diverted to other ports if the marine transportation industry were forced to pay for a tug. Proponents argue that the potential consequences of a spill on the coast are so enormous that a rescue tug is relatively cheap "insurance" in the long run. They also point to the number of vessel propulsion, steering and other problems that continue to occur near the entrance to the Strait of Juan de Fuca. (See Chapter III.)

Legislative Mandates

The 1991 Legislature stated:
"An emergency response system for the Strait of Juan de Fuca shall be established by July 1, 1992." (See Chapter III.)

The 2000 supplemental budget proviso for the tug stated:
"$1,650,000 of the general fund—state appropriation for fiscal year 2001 is provided solely to the oil spill administration account to be used for a rescue tug. By December 1, 2000, the department shall report to the appropriate fiscal committees of the legislature on the activities of the dedicated rescue tug. The report shall include information on rescues, assists, or responses performed by the tug. The report shall also indicate the class of vessels involved and the nature of the rescue, assist, or response."[2]

Findings

1. The U.S. Coast Guard has characterized vessel salvage capability in the Pacific Northwest as "weak and slow." A recent Coast Guard study projected that the risk of major spills will increase over the next 25 years. However, Coast Guard headquarters continues to postpone national rulemaking on vessel salvage that would, in part, address the need for a rescue tug.
2. **A rescue tug should be permanently stationed at Neah Bay.** This finding is based upon previous studies, analysis of 10 years of vessel spills and incidents, hundreds of hours of tug operations and analysis of eight rescue tug vessel assists. It also reflects the experience of other countries in deploying permanent rescue tugs.
3. In its deliberations, the North Puget Sound Oil Spill Risk Management Panel suggested that government funding would be desirable to ensure a "level playing field" for Washington's ports in competition with other West Coast ports.
4. The federal government should provide the bulk of funding for the tug based upon the following premises:
   - The federal government is a *trustee of natural resources* in the area, including the Olympic National Marine Sanctuary, Olympic National Park, and the coastal national wildlife refuges;
   - The federal government *has designated certain species found in the area as threatened and endangered.* These species and their habitats would be affected by major oil spills;
   - The federal government has a responsibility to *protect the treaty rights of Puget Sound tribes* in their usual and accustomed fishing areas;
   - Washington is meeting a regional energy supply need. The North Puget Sound marine transportation corridor contains a regional crude oil refining center and is a *conduit of refined petroleum products to other western states*;
   - The Strait of Juan de Fuca *conveys more tonnage of cargo to and from Pacific Rim ports* than any other West Coast waterway;
   - Puget Sound is *homeport* for a large portion of the nation's strategic naval fleet, which also poses a risk of major spills; and
   - There is *potential for international tension with Canada* should a major transboundary oil spill occur in this waterway.

Recommendation

Ecology recommends that state funding be provided to station a rescue tug at Neah Bay while federal funding is pursued. Specifically, Ecology recommends that the legislature provide $3 million in stopgap funding for the 01-03 Biennium to provide the rescue tug for approximately 12 months.

If long-term federal funding does not become available, the state would have the option to proceed with rulemaking. The rulemaking process would determine whether vessels transiting the northern coast and western Strait of Juan de Fuca should have a user-fee-supported rescue tug available during their passage.

II. Risk of Major Oil Spills

The **risk** of accidents is commonly viewed as the combination of two primary components, the **probability** that an accident will occur and the **consequences** of that accident. Major oil spills are typically low-probability, high-impact events with the potential to cause serious long-term damage to natural resources, quality of life and economy. As the public places a higher and higher value on the marine environment, the consequences of a spill in terms of depleted natural resources and diminished quality of life will become more significant – increasing the risk.

In the Strait of Juan de Fuca and its ocean approaches there is a significant risk of a major oil spill due to the high vessel traffic and oil volumes. In 1999, there were a total of **12,308 commercial vessel transits** through the area – 10,560 cargo and passenger vessel transits and 1,748 oil tanker or tank barge transits. (A transit is the passage of a vessel entering or leaving Washington state waters.) In 2000, approximately **15.1 billion gallons** of oil will move through Puget Sound. The risk of spills will grow over the next 25 years as the number of vessel transits and the size of vessels increase, unless additional spill prevention measures are put in place.

Marine Safety Considerations

Vessels transiting the western Strait of Juan de Fuca do not benefit from several key spill prevention measures that are in place eastward of Port Angeles. These include state-licensed marine pilots and tug escorts for laden oil tankers. Because of this disparity, it is prudent to target additional prevention measures for the highly vulnerable coast and western Strait.

In 1991, the Washington Legislature directed that: "An emergency response system for the Strait of Juan de Fuca shall be established by July 1, 1992" (RCW 88.46.130). After ten years and numerous evaluations and community discussions, general agreement has emerged supporting the value of a rescue tug, although some have argued the cost effectiveness of the vessel.

A funding mechanism to permanently establish a rescue tug has yet to be set up. Ecology, however, has demonstrated through this year's bid process that this additional safety net, with a tug such as the *Barbara Foss*, can be contracted for about $2.5 million per year. An even larger, more powerful tug with enhanced capability for salvage and fire-fighting could be placed on station for approximately $3 million per year, considerably less than the $3.4 to $6 million annual cost estimated by previous studies.

Need for Additional Spill Prevention

The U.S. Coast Guard's Environmental Impact Work Group of the Volpe Study[3] found that "we must prevent oil spills on Washington's outer coast because we cannot effectively respond to an oil spill there."

Significant Spills and Incidents

These margin notes describe significant vessel spills and incidents that occurred in the general operating area of the rescue tug. They illustrate the variety of problems experienced by deep draft commercial vessels transiting the area. They all occurred while a rescue tug was not on station and in an area where vessels are not required to have a state-licensed pilot aboard. We believe that, had a rescue tug been available during these incidents, it would probably have been dispatched to assist.

*March 1964 – the **towline** between a United Transportation barge and its tug **snapped**. The barge grounded on the beach near Moclips. The incident **spilled 1.2 million gallons of refined oil** on coastal beaches, killing a large number of razor clams and causing serious damage.*

April 1988 – the inbound tanker Matsukaze ***ran*** *straight down through the entrance to the shipping lanes* ***on automatic pilot*** *and* ***up onto the rocky coastline*** *at Crescent Bay west of Port Angeles, causing extensive damage to the vessel. Fortunately, the ship's double-bottomed hull prevented any environmental damage and no oil was released.*

December 1988 – the tug Ocean Service*'s* ***towline snapped*** *resulting in the barge* Nestucca *drifting off of the northern entrance to Grays Harbor. The tug collided with the barge while trying to regain the tow. The barge eventually* ***spilled 231,000 gallons of heavy fuel oil*** *causing extensive environmental damage as far north as Vancouver Island's Pacific Rim National Park.*

Congress established the Olympic Coast National Marine Sanctuary in 1994, in large part because the overall natural resource values on Washington's pristine Northwest coast and the sensitivity of those resources to environmental damage are among the highest in the state. A major oil spill could be catastrophic due to the impacts such a spill would have on threatened and endangered species, natural resources, cultural resources, recreation, trade, commercial fishing, aquaculture, tourism, and the overall quality of life for citizens of Washington. The coast is also subject to frequent severe weather, which would make containing and cleaning up an oil spill difficult and often ineffective.

Vessel Incident Data Highlights Risk

Since 1995, Ecology has maintained an incident, casualty and oil spill database for commercial vessels 300 gross tons or more. The information is self-reported by vessel operators and supplemented by data received from the U.S. Coast Guard. Because some incidents are not reported, these data establishe the lower boundary of the actual incident rate in the North Puget Sound Area.

This information demonstrates that large commercial vessels traveling along Washington's coast and approaching the Strait of Juan de Fuca continue to experience propulsion, steering and other problems that could lead to a vessel casualty and oil spill. During 1999, 96 vessels transiting through Puget Sound experienced an "incident" that increased the risk of a spill.

Table 1: Number of Incidents, shows that 69 percent of the total vessel incidents occurred without prior warning of degraded propulsion or steering and when the vessel was within 12 miles of the coast. This means there is only limited time for the marine safety system to take action to mitigate the added risk presented by the vessel.

Table 1: Number of Incidents

Type of Incident	Number
Total incident since 1995	163
Incidents occurring without prior warning (Immediate incidents)	113 (69 percent of Total Incidents)
Incidents of higher severity occurring within Straits	73 (65 percent of Immediate Incidents)
• Incident means collision, grounding, loss of propulsion or steering • Higher severity means higher risk of an oil spill, i.e. actual collision, allision (impact with a fixed structure, such as a pier), grounding, or complete loss of steering	

Furthermore, Table 2: Severity of Incidents, shows that 65 percent of these "immediate" incidents were in the "higher severity" category. That is, they were more likely to involve a complete loss of propulsion or steering rather than a less-risky reduction in propulsion or steering reliability. This

observation is particularly true in the coastal approaches to and the western portion of the Strait, where the availability of tugs or other spill prevention and response mechanisms is low.

Table 2: Severity of Incidents

	Incidents of Higher Severity	Incidents of Lower Severity
Washington seacoast (approaches to Strait)	9	0
Western portion of Strait	12	2

Federal Obligation to Minimize Risk

On our Northwest coast, the U.S. government by treaty has obligations to protect the Makah Tribe and other Indian tribes. Their culture and economy depend upon protecting the marine and coastal environment and their usual and accustomed fishing grounds from the potential devastation of major oil spills.

April 1989 – the tanker Exxon Philadelphia ***lost power*** *and was* ***adrift*** *off the mouth of the Strait of Juan de Fuca with a load of 23 million gallons of Alaska North Slope crude oil. A tug reached the tanker approximately five hours later and towed it to Port Angeles.*

The federal obligation extends to important coastal resources of national value that would be damaged by oil spills, including the Olympic National Marine Sanctuary, Olympic National Park, and the coastal national wildlife refuges. The federal government has also designated several species found in the area as threatened or endangered. An independent study for the North Puget Sound Oil Spill Risk Management Panel found that the consequences of a major spill in Puget Sound would be at least $500 to $1,000/gallon. (See Appendix F.)

From a national economic perspective, Washington is a regional crude oil refining center that provides refined products to other West Coast states. Pacific Rim trade centered in Washington provides important national economic benefits while presenting risks to local resources.

September 1989 – the tanker Exxon San Francisco ***lost power*** *while outbound in the Strait of Juan de Fuca. The vessel later returned to Port Angeles without further incident.*

The federal government prevailed at the U.S. Supreme Court in a suit that limited Washington state's authority to protect its waters from oil spills. Furthermore, should a transboundary spill occur, it could precipiate international tension with Canada. **Therefore, the federal government has significant responsibility to fund the Neah Bay rescue tug.**

III. Chronology

The following is a chronology of studies, legislation, spills and vessel incidents related to the history of the Neah Bay rescue tug.

Early Marine Safety Legislation

Washington's marine safety system in Puget Sound was established by the Legislature in 1975 in anticipation of large tank ships with Alaskan North Slope crude oil on board transiting through Puget Sound to Washington's refineries. "Laden" tankers transiting Puget Sound waters east of Dungeness Light (just east of Port Angeles) were required to have tug escorts.

They were also required to "take a Washington State licensed pilot while navigating Puget Sound and adjacent waters." In 1977, pilotage requirements were extended to other large commercial vessels operating east of Port Angeles. A 125,000 dead weight ton limit was placed on single hulled tankers proceeding east of Port Angeles.

July 1991 – the Chinese bulk carrier Tuo Hai *did not respond to Canadian Coast Guard radio communication efforts. The ship* ***on automatic pilot ran straight over the*** *Japanese fish processor* **Tenyo Maru** *northwest of Neah Bay. The* Tenyo Maru *was cut in half and immediately sank. The entire crew went into the frigid water; one crewmember was never found. Over* ***400,000 gallons of oil*** *was on-board the vessel and caused extensive environmental damage to coastal resources.*

1988-1989

Backdrop for 1991 Legislative Action

The following incidents set the stage for legislators and the public to consider establishing a rescue tug at Neah Bay:

- December 1988, *Nestucca* oil spill.
- March 1989, the *Exxon Valdez* oil spill.
- 1989, *Exxon San Francisco* and *Exxon Philadelphia* disabled off the Washington coast.

July 1994 – the bulk carrier Verbier *was outbound from Vancouver, BC when it* ***lost power*** *2.5 miles from shore in the Strait of Juan de Fuca. After an unsuccessful attempt to tow it to port by a small tug, a second larger tug was dispatched. The* ***towline parted*** *after several hours of towing. The tug "made-up" again and successfully completed the tow to Port Angeles, with the assistance of other tugs.*

1991

Authorizing Legislation

In 1991 the State's precedent-setting spill-prevention legislation (House Bill 1027) passed with very strong bi-partisan support. The legislation called for the establishment of an "emergency response system" for the Strait of Juan de Fuca. Specifically, the legislation stated:

"An emergency response system for the Strait of Juan de Fuca shall be established by July 1, 1992. In establishing the emergency response system, the administrator (of the Office of Marine Safety) shall consider the recommendations of the regional marine safety committees. The administrator shall also consult with the province of British Columbia regarding its participation in the emergency response system." (See the conclusions of the British Columbia government's report below.)

December 1995 – the bulk-carrier ship Ledra ***drifted*** *in the western Strait for seven and one-half hours before* ***emergency anchoring*** *2.25 miles off Vancouver Island* ***to prevent grounding****. The ship had repeatedly notified authorities that repairs would take longer than estimated.*

May 1996 – the bulk-carrier ship Mount Parnitha ***drifted*** *in the western Strait for seven hours before* ***emergency anchoring*** *off Freshwater Bay, Washington (about 10 miles west of Port Angeles). The ship's* ***main engine*** *was* ***undergoing repairs****.*

July 1996 – the ***cruise ship*** Golden Princess ***drifted*** *off Neah Bay for about four hours. The ship had suffered a serious* ***engine room fire*** *losing electrical power and propulsion with* ***1,200 persons aboard****. Fortunately, the weather was good and the ship was eventually taken under tow to Victoria, British Columbia. The vessel was also carrying over 600,000 gallons of fuel. A tug eventually arrived on scene and towed the vessel to Vancouver for repairs.*

"The regional safety committees shall recommend to the office (Office of Marine Safety) the need for, and the structure and design of, an emergency response system for the Strait of Juan de Fuca and the Pacific coast." (See 1994: Regional Marine Safety Committee Report)

1993

Regional Marine Safety Committees

In 1993 the Regional Marine Safety Committees for the Strait of Juan de Fuca/Northern Puget Sound and the Grays Harbor/Pacific Coast, made up of industry, tribal, and other stakeholders, issued preliminary recommendations supporting the concept of a rescue tug as part of an emergency response system. In response, the Washington State Office of Marine Safety (OMS)[4] formed the Emergency Towing System Task Force in August 1993.

1994

Regional Marine Safety Committee Report

In June 1994, the Strait of Juan de Fuca/Northern Puget Sound Regional Marine Safety Committee issued its report[5] in conjunction with the OMS. In reviewing the requirements for tug escorts for tankers, petroleum barges, commercial ships and barges, the Committee stated:

"This subcommittee does not recommend tug escorts west of Port Angeles, ***provided*** *an adequate emergency response towing tug is stationed initially in Port Angeles, and then transferred to Neah Bay when conditions have been met to accommodate the vessel."* (Emphasis added)

Study of Emergency Towing Services Worldwide

In June 1994, marine expert Robert Allan prepared a *Study of Emergency Towing Services Worldwide* for OMS. The report documented the availability of rescue tugs in Alaska, several nations in northern Europe, and Japan.

Emergency Towing System Task Force

OMS established the broad-based Emergency Towing System Task Force in 1993 to further explore the need for an emergency towing vessel for the western Strait of Juan de Fuca. The Task Force included the U.S. Coast Guard, Canadian shippers, the British Columbia government and others. The report[6] was issued in August 1994 with the preferred alternative of:

"…a dedicated rescue vessel at the entrance to the Strait to provide immediate emergency assistance to disabled vessels…A dedicated rescue tug is a reasonable alternative to tug escorts in the Strait and a viable

means of reducing the risk of spill events in the area."

The study recommended a dedicated rescue tug with a pulling capacity of between 100 and 150 tons depending on whether "severe" or "extreme" duty criteria is selected.

Olympic Coast National Marine Sanctuary Established

In July 1994, Congress recognized the unique and relatively pristine environment of Washington's outer coast by establishing the Olympic Coast National Marine Sanctuary. In recognition of the threat to the Sanctuary of oil spills, a voluntary vessel Area To Be Avoided was established to provide a buffer by moving vessels further off shore.

1995

Canadian Tug Initiative

In April 1995, the Canadian Council of Ministers of the Environment[7] undertook a comprehensive review of regional risks, conditions, options, and costs for using escort, rescue and salvage tugs. The final report included discussions of the Strait of Juan de Fuca and its western approaches. One of the recommendations of the report was for a 70-ton pulling capacity tug to be stationed at either Bamfield or Victoria, British Columbia, for use as an escort/salvage tug to fill

"...towing capability deficiencies, considered to be the most severe..."

That recommendation has not been acted upon.

British Columbia Tug Study

A September 1995 report to the Ministry of the Environment found that pre-positioned rescue tugs were already in place in Europe and other locations. It also supported the need for a rescue tug.

1997

International Tug of Opportunity System

In 1997 a marine industry coalition established the International Tug of Opportunity System (ITOS), paid for by the industry through fees collected by the Puget Sound Marine Exchange. Participating tugs were equipped with electronic transponders, which made them readily identifiable on computer tracking screens at the Marine Exchange and the U.S. Coast Guard's Puget Sound Vessel Traffic Service. While the system does not place any more tugs in service, it is designed to allow for rapid identification and contact with tugs that may be able to assist disabled vessels.

November 1996 – the container ship Gao He ***drifted*** *for nearly two hours north of Cape Flattery, Washington after suffering an* ***engine*** *problem that required a* ***shut-down for repair****. Tug assistance was estimated to be four hours away.*

November 1998 – the general cargo ship Aristotelis ***drifted*** *for about three hours after* ***breaking down*** *about three miles off Cape Flattery. The ship drifted at about four knots towards Vancouver, Island,* ***refusing a Canadian Coast Guard offer for an emergency tow-assist****. The ship finally* ***anchored*** *about two miles from shore.*

February 1999 – the Hanjin Elizabeth ***lost power*** *off Cape Hook on Vancouver Island when a spare piston pin broke loose from its stowage in a storm and was tossed about the engine room****.*** *The ship* ***drifted for 36 hours****, passing 20 miles east of Scott Island, British Columbia. A tug dispatched to assist finally reached the ship and held the vessel's head into the sea until the crew could make a repair. The crew restarted the engine and arrived in Washington waters under her own power with two tug escorts.*

February 1999 – (at the same time the Hanjin Elizabeth *was drifting), the general cargo ship* Caria*'s* ***engines failed*** *and the ship began* ***drifting*** *17 nautical miles from Brooks Peninsula towards the northern end of Vancouver Island. Severe storm to hurricane-force winds and seas prevailed in the area. Ocean-going tugs from the United States and Canada were dispatched by the Canadian Coast Guard's Rescue Coordination Center in Victoria. The* Caria ***drifted 41 miles over a 19-hour period****. It came within 10 nautical miles of both Vancouver Island and Scott Islands before a towline was secured by a Canadian tug. It took the tug seven hours to arrive from Tahsis, British Columbia, approximately 80 nautical miles away. The severe sea conditions made it difficult to secure a towline; the task took over five hours. Based on drift rate, there were about two hours to spare before the ship could have grounded.*

Scoping Risk Assessment (Volpe Study)

The Coast Guard-sponsored Scoping Risk Assessment (Volpe Study) found that as a vessel moves westward from Port Angeles to the outer coast, the following progressive changes affect the probability and consequences (i.e. risk) of major oil spills:

- Certain spill prevention measures – tug escorts for tankers and state-licensed pilots – are not required.
- The likelihood of a casualty is increased as sea-state and weather conditions become more severe.
- Spill response resources are less available.
- Because of weather and sea-state conditions, spill response measures are less effective.
- Natural resources are more economically valuable.

Dr. Sharon Christophersen of the National Oceanic and Atmospheric Administration (NOAA) chaired the Environmental Impact Work Group of the Volpe Study. Dr. Christophersen communicated one of the work group's findings that "we must prevent oil spills on Washington's outer coast because we cannot effectively respond to an oil spill there."

1999

New Carrissa **Oil Spill & Interim Tug Funding**

In February 1999, the bulk freighter *New Carrissa* grounded on the Oregon Coast, causing a 40,000-gallon oil spill. This incident renewed the call for a rescue tug at Neah Bay. In February 1999, Congressman Norm Dicks secured funding for the tug from the U.S. Department of Defense through the U.S. Navy. A tug was contracted and in place from March through April 1999. (See Chapter IV.)

ITOS Evaluation

An August 1999, review of the ITOS by the U.S. Coast Guard[8] confirmed Ecology's earlier conclusion, that the ITOS provided a relatively small "incremental improvement to the existing safety system." Using assumptions regarding the ability and willingness of participating tugs to assist a drifting vessel, the report concluded that the "risk eliminated by ITOS" in "western waters" (western Strait of Juan de Fuca and Juan de Fuca entrance) to be nine percent. This number was questioned by some observers who pointed out that the ITOS system partially duplicated the vessel tracking function of Tofino (Canada) and Puget Sound Vessel Traffic Services and did not physically add any new rescue capability to the waters around Cape Flattery.

Coast Guard Regulatory Assessment

In November 1999, a report titled *Regulatory Assessment: Use of Tugs to Protect Against Oil Spills in the Puget Sound Area* was prepared for the U.S. Coast Guard. While the report did not include oil spill clean up costs and environmental damage assessments in the cost-benefit analysis portion of the report, it found that:

- Vessel traffic in the Strait of Juan de Fuca will increase by 50 percent by the year 2025.
- The quantity of oil transiting the Strait in ships of all types will increase from 360 million barrels to 457 million barrels by the year 2025.
- The probability of a spill over 10,000 gallons from collisions and groundings of commercial vessels would increase from one every five years currently to one every 3.6 years by 2025 if additional risk mitigation measures are not put in place.
- The spill probability from tankers would decrease by threefold over this time period, but this reduction in risk is expected to be offset by increased spills from dry cargo vessels.

In addition, the report concluded that while ITOS was the least expensive alternative reviewed for reducing oil spills, it was also the least effective option. In comparison, a dedicated rescue tug was found to be moderately expensive and would avert a moderate quantity of spilled oil.

2000

Follow-up to the U.S. Coast Guard's Regulatory Assessment

In February 2000, Ecology commissioned a supplemental report titled *Allocation of Tug Costs on a "Per Transit Basis."*[9] (See Appendix E). The per transit cost, based on $4 million and $6 million dollar per year estimates for a rescue tug, ranged from $369 to $553 per transit in 2000 and **decreased** to $240 to $360 per transit by 2025 (not accounting for inflation). The bid process for the current tug contract, however, demonstrated that a tug can be put in place for as low as $2.5-$3 million per year, depending on performance standards.

Rescue Tug Interim Funding

During the winter of 1999-2000, Washington state, through the Governor's emergency fund, and the federal government provided funding to station a dedicated rescue tug at Neah Bay, Washington. The *Tenyo Maru* Oil Spill Natural Resources Trustees provided additional funding to extend rescue tug coverage at Neah Bay through the spring of 2000.

In the spring of 2000, the Washington State Legislature provided $1.65 million to position a rescue tug at Neah Bay for the September 2000 - May 2001 winter season.

August 2000 – the bulk carrier ship Marine Express *departed Vancouver, British Columbia bound for Bangladesh, loaded with grain. A **fire** was discovered **in the engine room** and the main engine was shut down when the ship was in the western Strait. The **fire was not reported to authorities**. Three men found refuge in the lower engine room. Fortunately, the engine room ventilation fans remained on and provided fresh air. The ship's crew re-entered the engine room with protective gear to search for the other men, fearing them dead. The fire was finally extinguished when a hose was brought to bear on it from above. No serious injuries were reported. The ship **drifted** for about two and one-half hours.*

September 2000 – the bulk carrier ship Selendang Kasa *and the 57-foot purse seiner* Anthony G ***collided in fog*** *near the western entrance to the Strait of Juan de Fuca. The collision resulted in no significant injuries, but the* Anthony G *incurred substantial damage to its wheelhouse. Fortunately, the* Anthony G*, with three persons on board, did not sustain any damage below the waterline and no oil spilled. The vessel was later escorted back to Bellingham, Washington.*

North Puget Sound Risk Management Panel

In July 2000, the North Puget Sound Long-Term Oil Spill Risk Management Panel (NPS Panel) issued its *Final Report and Recommendations*. The NPS Panel, made up of 22 stakeholders, met from September 1999 to July 2000. The Panel was formed through a Memorandum of Understanding between the U.S. Secretary of Transportation and the Governor of Washington and co-chaired by the U.S. Coast Guard and Ecology (as non-voting members).

The NPS Panel adopted 24 recommendations to improve marine safety in the waters of the Washington Coast, Strait and northern Puget Sound. Six additional measures were considered, but not adopted. One of those considered was the recommendation for a "year-round, federally-funded, dedicated rescue tug at the entrance to the Strait of Juan de Fuca." (See Appendix B.) Three-fourths of the Panel members supported this proposed recommendation. However, the Panel's ground rules required a consensus of the members, with no more than two dissenting votes, to pass a recommendation. The rescue tug proposal received four "nay" votes and did not pass.

IV. Operations 1999-2001

March – April 1999

One of two Crowley Marine Services tugs, *Sea Valiant* or *Sea Breeze* was stationed at Neah Bay during this short season with federal funds.

DESCRIPTION	SEA BREEZE	SEA VALIANT
Dimensions		
Length	126’	128.5’
Breadth	34’	38’
Depth	16.5’	19.9’
Tonnage	198 GT	199 GT
Main Engines	2 Cat Incline 6 Cyl 3606	2 EMD 20-645-E5
Horse Power	4962 max HP	5750 max HP
Bollard Pull Ahead	102,580 lbs	175,000 lbs
Bollard Pull Astern	70,000 lbs	103,000 lbs
Expected Speed*	11.5 Kts	12.0 Kts
Dates on Station	1 Mar - 7 Mar	8 Mar - 30 Apr
* Speed based on performance in light to moderate weather		

Figure 1: Characteristics of the tugs Sea Breeze *and* Sea Valiant *presented for comparison to the Barbara Foss. (From the U.S. Coast Guard’s 1999 report on the interim rescue tug [See Appendix I]).*

The rescue tug responded to two vessel emergencies between March 1, 1999, and April 30, 1999:

Bouchard Barge No. 230 Incident

On the evening of March 28, 1999 the tank barge *Bouchard No. 230* was separated from the tug *Ralph E. Bouchard* when the towline parted in a storm. The barge was not carrying an oil cargo, but had diesel aboard to fuel its generators. The position was about 17.5 miles off the coast, west of La Push, Washington. Two men were aboard the drifting barge, which was taking water over its deck. During the evening of March 28 and early morning of March 29, despite attempts by the tug to reconnect, the *Bouchard No. 230* drifted northeast about 19 miles at 2.3 knots. By 4:15 a.m., the drifting barge was about 13.5 miles west of Cape Alava, Washington. The rescue tug *Sea Valiant* was dispatched at 9:15 p.m. on March 28 and arrived on-scene at 1:15 a.m. on March 29, standing by to assist. The *Ralph E. Bouchard* was finally able to retrieve the *Bouchard No. 230* at 8:15 a.m. on March 29 and made its way to Port Angeles, Washington under escort by the *Sea Valiant*. The *Sea Valiant* later assisted the *Ralph E. Bouchard* in retrieving the broken end of the tow wire still attached to the barge. Following the incident the Captain of the *Ralph E. Bouchard* spoke very supportively of the rescue tug. He told an Ecology investigator that it provided a comfort factor during the hazardous conditions his people worked in. See Appendix C for details of this incident.

Aleutian Challenger Incident

On April 5, 1999, the 78-foot fishing vessel *Aleutian Challenger* lost propulsion 3.6 miles northwest of Tatoosh Island as a result of running out of fuel. The rescue tug, *Sea Valiant*, responded, but the Captain of the *Aleutian Challenger* refused the tug's assistance because a commercial agreement for towing services could not be reached. The distant, potential destination for the fishing vessel, and the associated high cost of contracting with the tug for a long tow was a factor. A U.S. Coast Guard boat stationed at Neah Bay later towed the fishing vessel into Neah Bay when it drifted near the shipping lanes. During the time that the *Aleutian Challenger* was adrift, the *Sea Valiant* stood by ready to assist, and eventually escorted the U.S. Coast Guard boat, with the *Aleutian Challenge*r in tow, to the entrance to Neah Bay.

December 1999 – June 2000

The tug stationed at Neah Bay as a dedicated rescue tug was the *Barbara Foss*, a 4,300 horsepower twin-screw tugboat rated for ocean service. The tug is 126 feet long, 35 feet wide, and has a maximum draft of 16 feet when fully loaded with fuel. It has two diesel main engines that drive two conventional propellers to create 142,600 pounds of pull. A recent refit enhanced the maneuverability of the tug with the addition of nozzles on its twin screws (propellers). The tug's free-running speed is approximately 12.5 knots. It has fuel capacity of over 100,000 gallons of diesel, allowing for extended tows. Foss has previously used the tug for a wide range of tasks, including rescue work and towing heavy barges and ships on trans-ocean voyages.

Figure 2: The Foss tug Barbara Foss*, at the pier in Neah Bay.*

The rescue tug *Barbara Foss* responded to three vessel emergencies between December 16, 1999, and June 20, 2000:

Clipper Arita Incident

On February 22, 2000, a large dry-cargo ship, the *Clipper Arita*, lost propulsion approximately 10 miles west of Cape Flattery and started to drift northeast toward shore (see Rescue Tug Response Report Map #0222-1, Appendix H). The rescue tug *Barbara Foss* was underway in 11 minutes and was able to make over 10 knots in 12 to17 foot seas proceeding toward the disabled vessel. The vessel crew was able to repair their propulsion system just as the *Barbara Foss* arrived on scene, 80 minutes after getting underway. The *Clipper Arita* had a fuel oil capacity of about 235,000 gallons.

Sharlene K Incident

On May 8, 2000, the *Barbara Foss* towed the Canadian fishing vessel, *Sharlene K*, to safety in Neah Bay after the vessel ran out of fuel near the entrance to the Strait (see Rescue Tug Response Report Map #0508-1, Appendix H). Wind, wave and swell were from the west, which would have pushed the *Sharlene K* towards the coast of Vancouver Island. The *Barbara Foss* reached the vessel 50 minutes after getting underway. While out of fuel, the *Sharlene K* had lube and hydraulic oils aboard that would have been a risk to the environment had the vessel grounded.

Virtue Incident

On June 6, 2000, a large bulk-cargo ship, the *Virtue,* bound for Vancouver, British Columbia, lost propulsion approximately 30 miles west of Cape Flattery and started to drift to the north (see Rescue Tug Response Report Map #0607-1, Appendix H). The U.S. Coast Guard directed the master of the *Virtue* to arrange for tug assistance due to repeated propulsion failures on the ship. The *Virtue*'s master contracted with the rescue tug *Barbara Foss*. The *Barbara Foss* escorted the ship into the Strait of Juan de Fuca and finally, after repeated propulsion failures, towed the ship to Esquimalt, British Columbia for inspection by Transport Canada Marine Safety officials. The response took over 29 hours to complete. The *Virtue* had a fuel oil capacity of about 468,000 gallons. (See Appendix D for details of this incident.)

September 2000 – May 2001

The 2000-2001 operations plan for the rescue tug has been altered from that of 1999-2000. Instead of emphasizing drills, the *Barbara Foss* will be sent out to meet and escort vessels when the vessel's history suggests the need.

The rescue tug, *Barbara Foss*, responded to two vessel emergencies between September 18, 2000, and October 31, 2000:

Ever Given Incident

The *Barbara Foss* made its first deployment of the season to assist a drifting vessel on October 16, 2000. The 885-foot container ship *Ever Given* shut down main engines about six miles off the Washington Coast, 26 miles south of the western entrance to the Strait of Juan de Fuca. The ship, with a fuel oil capacity of about 1.4 million gallons, was drifting to accomplish repairs to its fuel heating system. The U.S. Coast Guard Captain of the Port issued an order to the Captain of the *Ever Given* requiring a tug escort to Port Angeles, Washington. The *Barbara Foss* was dispatched and escorted the ship safely to anchor at Port Angeles.

Daewoo Spirit Incident

The *Barbara Foss* again deployed on October 26, 2000 to assist the 941-foot bulk carrier *Daewoo Spirit*. The *Daewoo Spirit*, with a fuel oil capacity of about 1.2 million gallons, was having intermittent steering losses near the western entrance to the Strait of Juan de Fuca. The U.S. Coast Guard could not determine the cause due to the crew's limited English-language ability. The Coast Guard therefore required the ship's Master to undertake a tug escort to anchorage at Constance Bank, British Columbia. The *Barbara Foss* undertook the escort.

Mediteran Frigo Safety Issue

On October 27, 2000, the refrigerated cargo ship, *Mediteran Frigo*, reported on their arrival notice that they were approaching the Strait of Juan de Fuca, bound for Seattle, without nautical charts of the area. In response, the U.S. Coast Guard issued an order requiring the ship to: (a) obtain the necessary charts before passing Buoy "J" (at the entrance to the Strait) or, (b) get a tug escort from Buoy "J" to the pilot station at Port Angeles and then take on nautical charts. Early on the morning of October 28, the *Barbara Foss* was called into service to deliver nautical charts to the ship before it arrived at Buoy "J" so that the ship could transit the Strait and Puget Sound safely and in compliance with international regulations. The *Barbara Foss* then escorted the ship to a point five miles east of Buoy "J" to further ensure safety. (Lack of charts is not an isolated occurrance. In 1999 alone, Ecology cited two tankers for coming to Puget Sound ports without adequate charts.)

V. Funding 1999-2001

For portions of three seasons the rescue tug has been funded from state and federal sources while on standby and during drills. However, once a decision has been made to initiate an actual towing operation, four possible funding sources become available:

- A routine contract negotiated between the vessel owner and the private sector rescue tug operator;
- The vessel's insurance company (such as one of the Lloyds of London "P&I" Clubs) will reimburse the tug's owner if assistance is required for salvage operations;
- The Coast Guard can open the federal Oil Spill Liability Trust Fund (OSLTF) if there is a threat of an oil spill; or
- The State's Oil Spill Response Account can be used during oil spill emergencies. The vessel operator is then billed to recover the costs.

March – April 1999

The U.S. Navy, through its SupSalv organization, stationed an interim rescue tug at Neah Bay in March and April of 1999. This was done in response to public pressure and the February wreck of the *New Carrissa* on the Oregon Coast. Federal funding was secured in February 1999 through the efforts of Congressman Norm Dicks.

December 1999 – June 2000

From December 1999 to June 2000, the federal government (led by the U.S. Navy and the Coast Guard) and the state of Washington contracted with Foss Maritime Services. The contract covered commercial tug services at the western end of the Strait of Juan de Fuca, including rescue, standby and operational drills. The *Tenyo Maru* Oil Spill Natural Resources Trustees provided additional funding to extend rescue tug coverage at Neah Bay through the spring of 2000.

Federal funding	=	$1,000,000
State funding	=	100,000
Tenyo Maru funding	=	400,000
Total Costs	**=**	**$1,500,000**
Length of Coverage	**=**	**178 days**

September 2000 – May 2001

The Washington Legislature provided $1,650,000 for the winter of 2000-2001 to again station a dedicated rescue tug at Neah Bay, Washington. The Foss tug *Barbara Foss* was selected. The tug will be deployed from September 18, 2000 until May 18, 2001. Ecology was able to achieve eight months of rescue tug coverage through the competitive bid process.

VI. Capability Evaluation

An important factor in selecting a tug is its bollard pull. Bollard pull is a measure of the towing power of a tug boat. Crowley Marine Services' *Sea Valiant* has 87.5 tons of bollard pull and 5,750 horsepower. Foss Maritime's *Barbara Foss* has 70 tons of bollard pull and 4,300 horsepower.

For comparison, the April 1995 report to the Canadian Ministers of the Environment completed by Robert Allan recommended a minimum of 70 tons of bollard pull for a Strait of Juan de Fuca and Vancouver Island rescue tug. Washington's August 1994 Emergency Towing System Task Force recommended a tug with a 100 to 150 ton bollard pull, depending on the weather and sea state conditions in which the tug was expected to operate.

Prince William Sound, Alaska, which has lower volume and less diverse vessel traffic than Puget Sound, has systematic rescue tug coverage. In addition, three Alert-class Crowley tugs (built in Anacortes) with 10,200 horsepower and a 150-ton bollard pull, were delivered to Prince William Sound in 2000. These tugs are especially designed to operate in that area and carry out multiple missions including the ability to arrest the drift of a fully laden oil tanker under storm conditions.

March – April 1999

During this two-month season, the rescue tug conducted 100 drills and responded to two vessel emergencies. The U.S. Navy collected data on the drills and the Thirteenth U.S. Coast Guard District prepared a report on the interim rescue tug (see Appendix I).

Table 3: 1999 Rescue Tug Statistics

Value Measured (units)	Minimum	Maximum	Average
Time to get underway (minutes)	0	45	10
Time to arrival at ship (minutes)	13	210	80
Distance traveled to ship (nautical miles)	Not Available	Not Available	Not Available
Underway Speed (knots)	Not Available	Not Available	11.3
Effective Speed (from tug notification) (knots)	Not Available	Not Available	9.6
Wind Speed (knots)	0	40	13.3
Wave Height (feet)	0	22	3.3

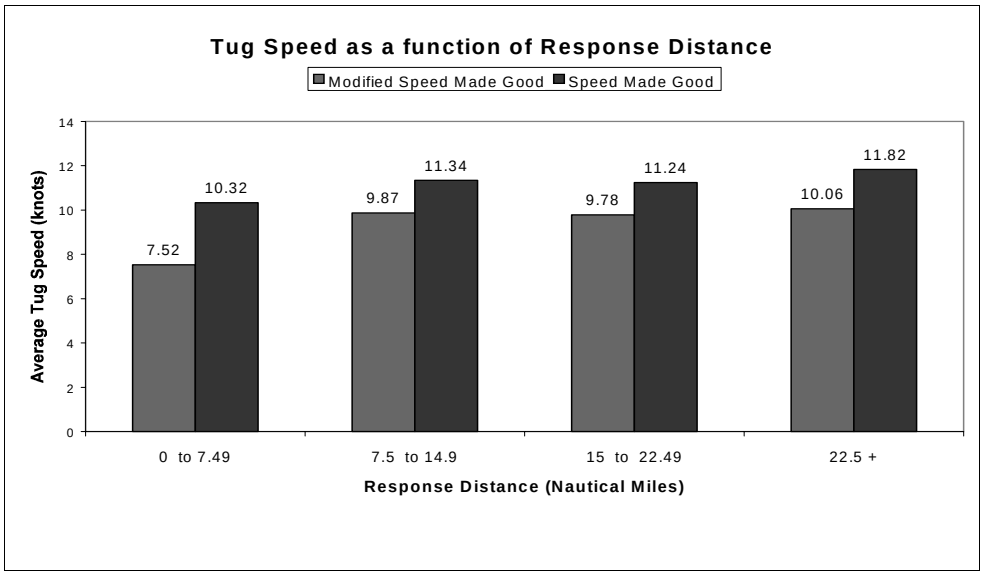


Figure 3: Adapted from the U.S. Coast Guard's 1999 interim rescue tug report.

December 1999 – June 2000

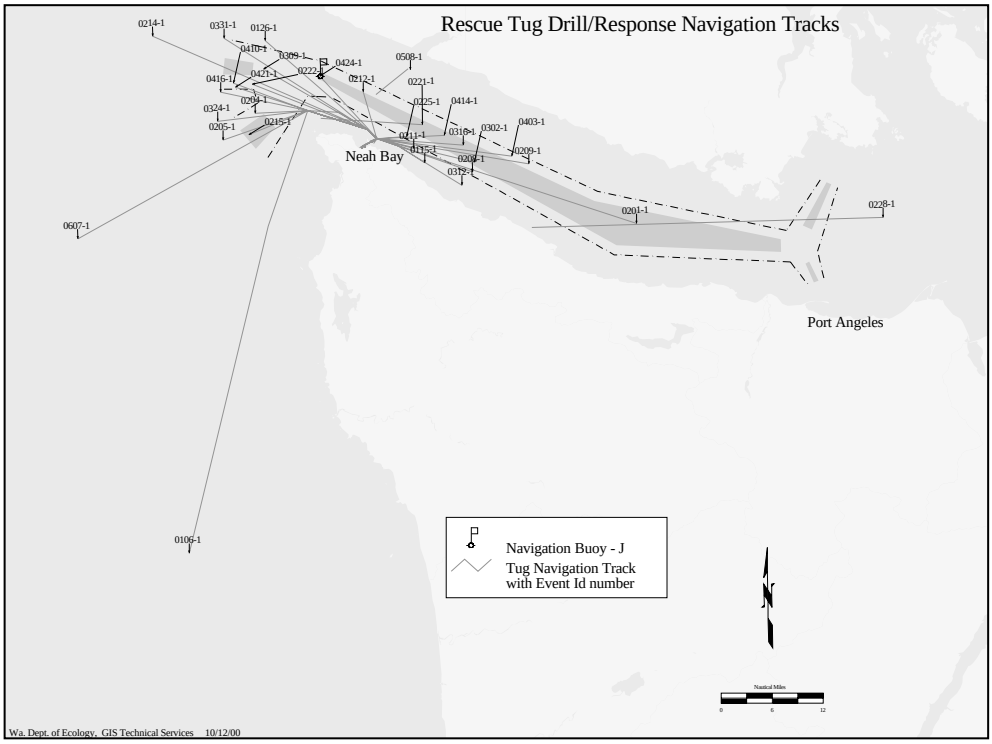


Figure 4: Chart showing rescue tug track lines for drills and responses from December 15, 1999 to June 9, 2000. (See also Appendix H.)

The rescue tug performed 43 drills between December 16, 1999, and June 20, 2000:

- Twenty-seven (27) drills tested the tug's ability to respond to a fictitious drifting vessel in various locations and weather conditions (see Rescue Tug Drill Report Maps, Appendix H). Four drills involved Navy vessels

that simulated a drifting vessel by shutting off their propulsion plants.

- Two drills consisted of escorting a "high-risk" vessel from three miles west of the Strait entrance past Duntze and Duncan Rocks, the navigational obstructions off Cape Flattery (see Appendix G).

- Seven drills consisted of deploying an "Orville Hook" device from the tug, simulating recovery of a drifting barge or ship by snagging the bridle or anchor chain (see Appendix G).

- Two drills simply tested the speed of the tug in existing sea conditions (see Appendix G).

- One drill tested the fire pumps and hoses of the tug for use in assisting a fictitious fishing vessel in Neah Bay (see Appendix G).

- Four drills self-initiated by the tug Captain involved traveling to a given location at best speed (see Appendix G).

Additional drills, using commercial vessels and U.S. Coast Guard vessels to pass a tow line to, were discussed at the beginning of the 1999-2000 tug deployment season, but no commercial vessel was willing to participate and Coast Guard resources were not available. One drill with a Navy ship involved passing a heaving line to the vessel and picking up passengers (see Rescue Tug Response Report Map #0221-1, Appendix H).

Analysis

The statistics in the following table were derived from the 27 deployment drills and three responses (a total of 30 deployments) that the Barbara Foss accomplished.

Table 4: 1999-2000 Rescue Tug Statistics

Value Measured (units)	Minimum	Maximum	Average
Time to get underway (minutes)	0	15	7
Time to arrival at ship (minutes)	33	419	95
Distance traveled to ship (nautical miles)	6.4	62	17.6
Underway Speed (knots)	8.0	13.7	11.3
Effective Speed (from tug notification) (knots)	6.9	13.7	10.2
Wind Speed (knots)	0	25	13.2
Wave Height (feet)	0	5	1.5
Swell Height (feet)	0	14	5.4

Reported wind speed, wave height and swell height were examined to determine if any of those factors significantly impacted the tug's underway speed during the 30 drills and responses accomplished. It was found that wind speed, wave and swell height had only a weak statistical relation to tug speed.[10] Wind speed, wave and swell height were also analyzed for impact on tug speed based on the direction of each environmental variable relative to the tug's direction of travel (impacting the tug from ahead, abeam or astern). The statistical relationships to tug speed, while stronger in some cases, were also found to be weak.[11] The following graphs show the tug speed versus each of the environmental factors observed by the Captains of the *Barbara Foss*.

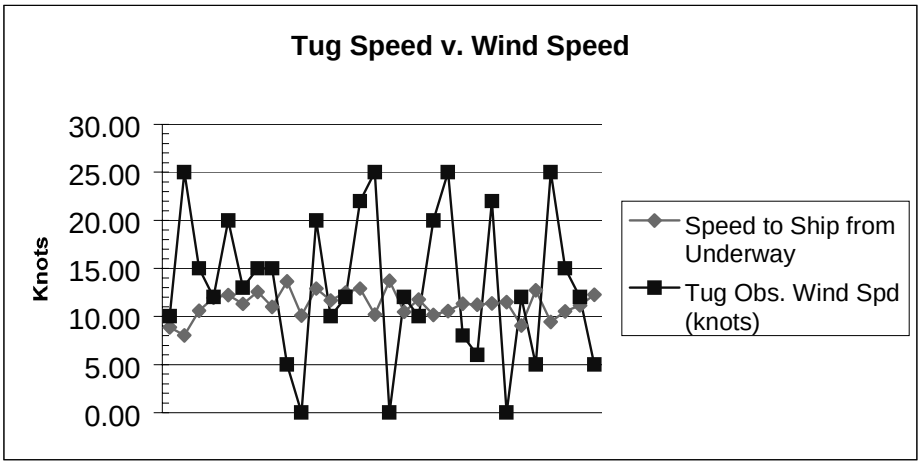


Figure 5

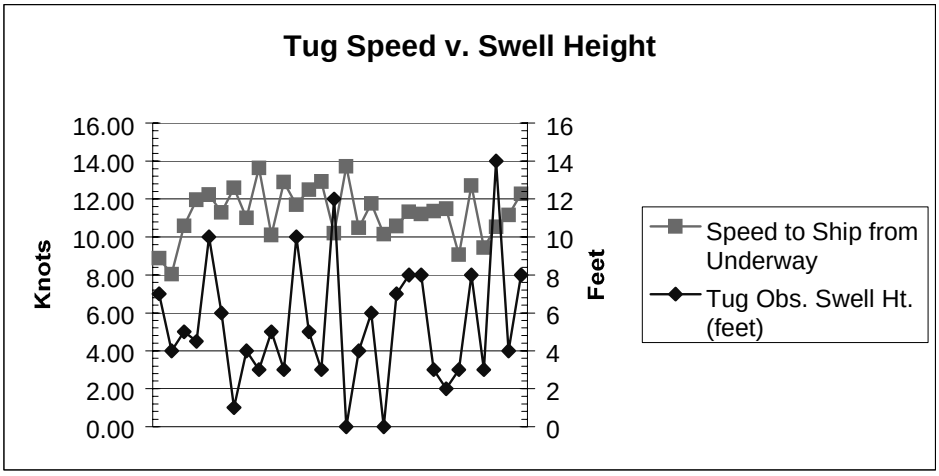


Figure 6

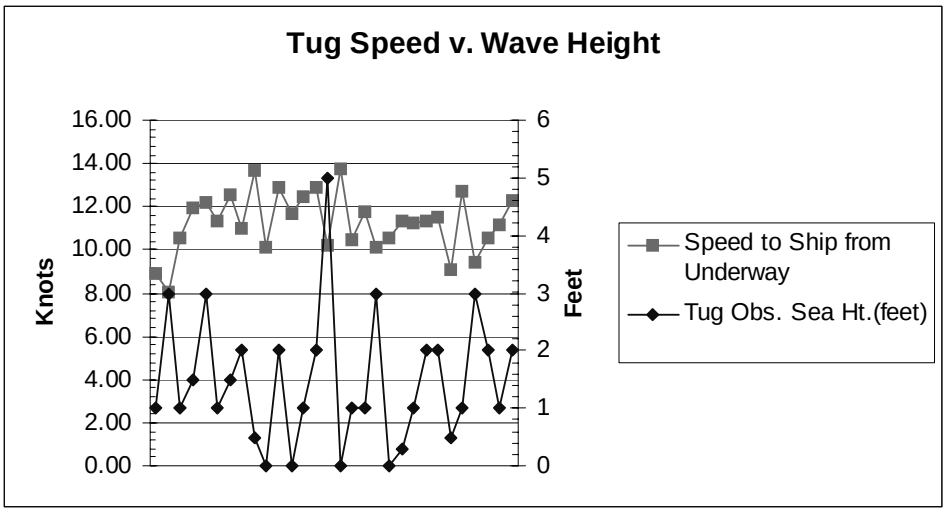


Figure 7

There were four drills in which the tug's average underway speed was reduced to below 10 knots (drill numbers 0106-1, 0115-1, 0414-1, and 0421-1, see Appendix H).

- In the first case (0106-1) the *Barbara Foss* made the longest exercise transit of the season (62 miles) into approximately 7-foot seas from the west and southwest, reducing its speed to about 8.9 knots.
- In the second case (0115-1), tug speed was reduced to 8.0 knots because the tide in Neah Bay was low, requiring the tug to move slowly past the rock pinnacles near the entrance to Neah Bay losing about 15 to 20 minutes.
- In the third case (0414-1), tug speed was 9.1 knots, but no cause for the slower speed was discerned.
- In the last case (0421-1), tug speed was 9.4 knots, into southerly winds of 25 knots. During the initial part of the response the tug was traveling into a predicted current of about 0.7 knots.

The data collected by the *Barbara Foss* regarding environmental conditions had its limitations. Notably, the record for each deployment includes only a single entry for wind, wave, swell and current and it was therefore assumed that conditions recorded were representative for the entire outbound tug transit. In addition, tidal current observations were not recorded as consistently as other environmental conditions. Therefore, the maps contained in Appendix H display tidal current based on predicted values for locations in the Strait of Juan de Fuca.

An analysis of the rescue tug's underway and effective speeds was also done by distance categories corresponding to the same categories contained in the U.S. Coast Guard's 1999 Interim Rescue Tug Report (see Appendix I). Analysis indicated that, as would be expected, both underway and effective speeds increased with longer travel distances as the tug's best speed running in open waters pushed-up the averages (see Figure 7).

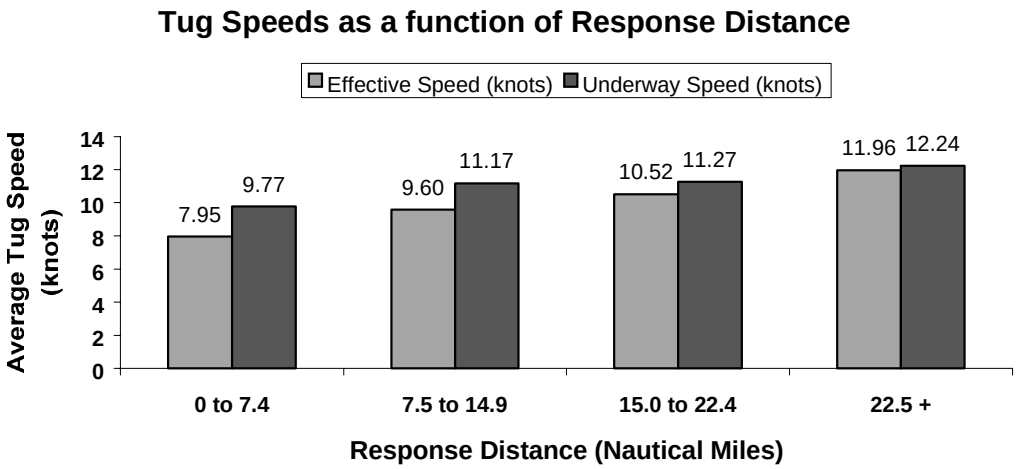


Figure 8

Neah Bay as a Rescue Tug Base

Foss Maritime Company provided the following summary comment regarding the feasibility of Neah Bay as a mooring and staging site for a rescue tug.

"During the test period, Foss Maritime Company, unequivocally demonstrated that Neah Bay is an excellent location for mooring and staging a tug like the Barbara Foss*. Additionally, logistical support for all but fuel and lube re-supply and major marine repairs was satisfactory. The Makah Tribal council members, residents, local vendors and Port managers deserve credit for their assistance and cooperative attitude during our stay."*

Additional information can be found in Foss' report, located in Appendix J.

VII. Findings & Recommendation

Findings

Oil Spill Risk May Increase

The risk of oil spills is expected to increase. A recent Coast Guard study estimated that the current probability of an oil spill over 10,000 gallons in Puget Sound is one in five years. This risk will increase to one in 3.6 years by 2025, driven by larger volumes of oil and more vessel traffic.

Rescue Tugs Protect Other Sensitive Coastlines

In many areas of the world, communities with sensitive coastlines have stationed large, highly capable rescue tugs as an effective protection measure. Alaska, several countries in northern Europe, South Africa and Japan all provide this extra margin of safety for their environment.

Community Supports Government-funded Tug

A majority of stakeholders participating in the North Puget Sound Long-Term Oil Spill Risk Management Panel voted in favor of a year-round, government-funded, dedicated rescue tug as a risk management measure. But due to the Panel's voting procedure, the measure did not pass as a recommendation. The Strait of Juan de Fuca/Northern Puget Sound Regional Marine Safety Committee, also representing diverse interests, also supported the rescue tug concept, as did the Emergency Towing System Task Force.

Federal Responsibility to Fund Tug

The federal government should provide the bulk of funding for the tug based upon the following premises:

- The federal government is a *trustee of natural resources* in the area, including the Olympic National Marine Sanctuary, Olympic National Park, and the coastal national wildlife refuges;
- The federal government *has designated certain species found in the area as threatened and endangered.* These species and their habitats would be affected by major oil spills;
- The federal government has a responsibility to *protect the treaty rights of Puget Sound tribes* in their usual and accustomed fishing areas;
- Washington is meeting a regional energy supply need. The North Puget Sound marine transportation corridor contains a regional crude oil refining center and is a *conduit of refined petroleum products to other western states*;
- The Strait of Juan de Fuca *conveys more tonnage of cargo to and from Pacific Rim ports* than any other West Coast waterway;

- Puget Sound is *homeport* for a large portion of the nation's strategic naval fleet, which also poses a risk of major spills; and
- There is *potential for international tension with Canada* should a major transboundary oil spill occur in this waterway.

Actual Cost Lower than Estimated Cost

The $1.65 million provided by the Washington Legislature was enough funding to station a rescue tug at Neah Bay for eight months of the 2000-2001 winter season. By extrapolation, contract tug coverage on an annual basis might be obtained for as little as $2.5 million. If it was determined that a more powerful tug would be best, Ecology believes one could be secured for approximately $3 million per year, based on recent procurement experience.

The *Allocation of Tug Costs on a "Per Transit Basis"* and Regulatory Assessment studies estimated the costs at $3.4 million to $6 million for a 5,500 or 10,000 horsepower tug. While the *Barbara Foss* is less powerful than called for by the Emergency Towing System Task Force (100 to 150 tons pulling power), it does meet the minimum power criteria proposed in the report for the Canadian Ministry of the Environment (70 tons pulling power).

Rescue Tug Shown to be Effective

Actual experience during the last three seasons demonstrated:

- A dedicated rescue tug is capable of rapid response. The tugs were able to get underway within 15 minues and maintained an average speed of 11.3 knots. Factoring in the time to get underway, the effective speed was 10.2 knots.
- Neah Bay is an effective base of operations. Foss Maritime was complimentary of the facilities and the support of the Makah Tribe.
- Sea state only minimally affected the rescue tug speed. Environmental conditions affected tug speed in only three cases out of 30 during the 1999-2000 season.

Recommendation

Ecology recommends that state funding be provided to station a rescue tug at Neah Bay while federal funding is pursued. Specifically, Ecology recommends that the legislature provide $3 million in stopgap funding for the 01-03 Biennium to provide the rescue tug for approximately 12 months.

If long-term federal funding does not become available, the state would have the option to proceed with rulemaking. The rulemaking process would determine whether vessels transiting the northern coast and western Strait of Juan de Fuca should have a user-fee-supported rescue tug available during their passage.

VIII. Endnotes

[1] The term “rescue tug” refers to an Emergency Towing Vessel with additional capability to respond to other types of emergencies.

[2] Engrossed House Bill 2497, page 119.

[3] 1997 Puget Sound Risk Assessment Expert Panel for the Scoping Risk Assessment

[4] The Office of Marine Safety was merged into the Department of Ecology in July 1997. It became part of the Spill Prevention, Preparedness, and Response Program.

[5] *Regional Marine Safety Committee Safety Plan & OMS Response: Strait of Juan de Fuca, Northern Puget Sound.* June 1994.

[6] *An Oil Spill Prevention Proposal for A Dedicated Rescue Tug to Protect the Strait of Juan de Fuca and Adjacent Pacific Coast: Final Report of the Emergency Towing System Task Force for the Washington State Office of Marine Safety.* August 1994.

[7] *A Review of Escort, Rescue and Salvage Towing Capability in Canadian Waters.* Robert Allen Ltd. And D. F. Dickens Associated Ltd. April 1995.

[8] *Analysis of the Geographic Coverage Provided by the International Tug of Opportunity System from November 1998 to May 1999.* August 30, 1999.

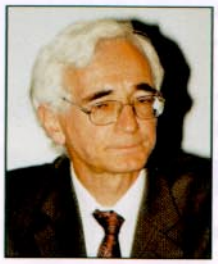
[9] Herbert Engineering Corporation. Report No. 9939-001. February 16, 2000.

[10] Based on linear regression analysis with highest R-squared value found to be 0.13. The 30 deployments represented a small sample size.

[11] R-squared values ranged from 0.0025 to 0.49, with even smaller sample sizes.

Appendix A
"The Case for Extra Protection"
from *International Tug & Salvage*

The case for extra protection



by Jean Labescat, vice-president, International Salvage Union

There can be few concepts as commercial as 'no cure–no pay', the traditional basis of the marine salvage contract. Success brings reward. Failure produces nothing. Over the past 20 years, however, concern about damage to the marine environment has led to new salvage concepts, such as Special Compensation and the newly introduced SCOPIC Clause. These departures from the 'no cure–no pay' principle recognise that, in the final analysis, a response to a pollution threat should not depend entirely on the salvor's willingness to accept such an extreme form of commercial risk.

Concern for the environment and recognition of the salvor's lead role in pollution defence has also resulted in partnerships between governments and salvors, with the aim of providing an extra tier of protection for vulnerable coastlines.

Until the 1970s, governments displayed little interest in marine salvage, but a series of major spills demonstrated that new thinking was required. Today, many governments have contracts with salvors that provide an extra measure of security, by retaining salvage tugs and other resources. As a result, a small number of powerful salvage tugs are now stationed at strategic locations, held in readiness to respond to marine casualties which have the potential to cause environmental damage.

The concept of retained salvage services originated in South Africa. Since the mid-1970s arrangements have been in place which ensure that salvage resources are available when needed in South African waters. The retainer solution was also adopted by the French Government a few years later, following the ***Amoco Cadiz*** spill. For the past 22 years, three large salvage tugs have been held at permanent readiness, tasked to intervene and deal with any pollution threat to the coastline of northern France and the Mediterranean Riviera.

In Britain, the grounding in 1993 of the tanker ***Braer*** served as the catalyst for another partnership agreement of this type. This disastrous spill resulted in an inquiry headed by Lord Donaldson. The report, *Safer Ships, Cleaner Seas*, favoured Government-sponsored strategic salvage cover at specific locations around the UK coast. The Government acted. A winter season contract was awarded to a salvor, for station tugs covering the Dover Strait and the Minches.

Similar schemes have been established in a number of other EU Member States, including the Netherlands, Germany and Spain. The Netherlands, for example, has a large salvage tug based at Den Helder, which is required to put to sea, at 15 minutes' notice, whenever weather conditions deteriorate.

In Spain, state agencies and salvors co-operate under a national plan for salvage and pollution prevention. The central objective is to avoid a spill disaster, which could have severe consequences for tourism - one of the country's most important industries.

A review of British and French arrangements for retained salvage services is instructive, not least because they have a common focal point - the English Channel. The French have the most experience of standby arrangements, as contracts for this purpose have been in place for over two decades. Under a time charter, the French government contributes to the upkeep of designated station tugs, in return for an operational commitment from the salvor. The contract requires the tugs to be available at 40 minutes' notice. They put to sea in bad weather and patrol offshore, ready to respond to any emergency.

When a station tug is actively engaged in a salvage, the salvor is responsible for obtaining remuneration under a Lloyd's Form or other contractual option. The partnership with the French Government provides for the sharing of remuneration. A proportion of any reward for salvage services is returned to the State, after costs are taken into consideration. It is interesting to note that salvage arbitrators accept the performance of salvage by the salvor, despite State involvement, as a commercial operation and they make awards on that basis. This recognises the underlying purpose of such partnerships.

As mentioned above, the French scheme was devised after the grounding of ***Amoco Cadiz*** off Portsall, Brittany, in March 1978. This released 220,000 tonnes of Iranian crude oil onto the shores of north western and northern Brittany. The French Government responded in a number of ways. The International Maritime Organisation agreed changes to traffic separation lanes off Ushant to increase the 'drift time' and, therefore, the response time available to assist vessels with engine failure.

There was also a move to obtain optimum benefit from French salvage assets. A contract was developed to guarantee the availability of large salvage tugs. Under the current contract, which protects the coastline of northern France, two 12,800hp tugs (160 tonnes bollard pull) are on station. ***Abeille Languedoc*** is based at Cherbourg whilst ***Abeille Flandre*** is stationed at Brest. When one of the large tugs is in scheduled downtime, its place is taken by a third tug. Schedules are arranged to ensure that one of the big tugs is always available at Brest - to cover the most vulnerable part of the coast. In addition, one 8,000hp tug (100 tonnes bollard pull), ***Merou***, is on station at Toulon to cover the Mediterranean coast and Corsica.

The tugs are under the operational control of the Prefet Maritime at Brest, Cherbourg and Toulon, who also have responsibility for organising regular exercises, to test response capabilities. Given the instant availability required of a station tug, the very highest standards of condition and maintenance are essential. The crews of the tugs serve 45-day duty periods and are always on standby, unless on leave. Their vessels have an endurance of 35 days and each carries a substantial range of salvage equipment, including pumps, compressors, generators and diving gear.

The standby tugs have carried out some 1,800 tasks over the past 20 years, including around 400 salvage operations. Channel ferry, ***Stena Challenger,*** went aground during a stormy night in September 1995, while

Abeille Languedoc.

making for Calais, but fortunately, only lightly. Port tugs were mobilised from Calais and Dunkerque, while ***Abeille Languedoc*** and ***Abeille Picardie*** proceeded to the scene from the south. Within a short period, the ferry was refloated and towed to Calais.

A collision in November 1995, involving the 6,000m³ LPG carrier ***Happy Fellow*** and a general cargo vessel, occurred off Le Havre, in the entrance to the Seine. The gas tanker was proceeding down river, with the other ship heading towards Rouen. As they approached each other, the general cargo vessel suffered a rudder failure. ***Happy Fellow*** was damaged, but, fortunately, did not catch fire. As a precautionary measure, the salvors deliberately grounded the LPG tanker, to win sufficient time to pump and patch the casualty, which was then gas-freed and inerted prior to entry into Le Havre and drydocking. One special feature of this case was the extensive precautions taken to avoid pollution from the flooded engine room.

The container vessel, ***MSC Rosa M***, developed a severe list off Cherbourg in December 1997. Whilst ***Abeille Languedoc*** immediately made for the scene, the casualty's crew was airlifted to safety. This case had similarities to the ***Happy Fellow*** incident, as ***MSC Rosa M*** had to be beached in order to perform a successful salvage. Hostile weather added to the salvage team's difficulties, but the vessel was dewatered and stability restored prior to entry into Le Havre. The engine room was then pumped out – with strict procedures to prevent pollution. This was followed by discharge of the cargo at the berth.

With the ability to look back over a period exceeding 20 years, the French Government regards the standby salvage scheme as an effective means of pollution defence.

For the UK, the loss of 85,000 tonnes of crude oil from ***Braer***, which grounded and broke up in the Shetlands in 1993, had many consequences. The first of a series of standby salvage contracts was signed the following year. This pilot contract, for the winter months, commenced 1st December 1994. Under the agreement, an ISU salvor provided two ETVs (Emergency Towing Vessels), one positioned in the Dover Strait and the other in the far north, at Stornoway in the Outer Hebrides. Services have been provided ever since, on a winter season basis.

The **Sea Empress** *incident off Milford Haven.*

Another major spill took place in 1996, when ***Sea Empress*** grounded at Milford Haven. During the following year, a third ETV was added to the scheme - based at Falmouth.

Incidents in the English Channel last year included the collision involving ***Ever Decent*** and ***Norwegian Dream***. This incident occurred in August. Recently, the French Government decided to go into partnership with the British Government, with a view to extending coverage in the Dover Strait to the summer months.

Salvage resources for pollution defence in the English Channel zone now consist of the two British tugs, at Dover and Falmouth, and two French tugs, at Brest and Cherbourg. The governments have arrangements in place for co-operation should a major casualty or pollution threat arise in the Channel. Equally, British and French ISU salvors have a co-operation agreement, allowing them to call on each other's resources, as required.

British arrangements in the south currently consist of a winter only contract extending to 2003, with summer coverage at Dover now provided on a seasonal basis. The Dover tug is the 10,560hp ***Far Turbot*** (100 tonnes bollard pull). The Falmouth tug, tasked with protecting the Western Approaches, is the 12,240hp ***Far Minara*** (127 tonnes bollard pull).

Under a separate, winter only contract, two large salvage tugs now protect the UK's northern waters – one at Stornoway and the second in the Fair Isle area, between Orkney and Shetland. The Fair Isle tug was introduced last year. A number of incidents and near misses in this region underlined the need for ETV coverage. In this connection, the loss of the small cargo vessel, ***Green Lily***, in the Shetlands, was a traumatic event. This ship went aground in appalling weather and a helicopter winch man lost his life during the rescue of the crew. In its report on the ***Green Lily***, the Marine Accident Investigation Branch called for an ETV to be stationed in this area.

Under the existing arrangements, the ETVs patrol at sea or, if at anchor, are maintained at 30 minutes' readiness. On average, the Dover standby tug is tasked on 40-50 occasions in a six-month period. Most operations consist of responses to vessels with engine breakdowns. The Falmouth tug has completed its second winter season on standby. It was mobilised over 20 times during each six-month period.

The ETVs are under the operational control of the MCA. When an ETV becomes involved in a salvage, the contract with the MCA is

Far Minara

suspended and the response takes on a commercial character. A common element with the French arrangements is the sharing of remuneration. A proportion of remuneration is received by the MCA, as a contribution towards the cost of maintaining standby cover.

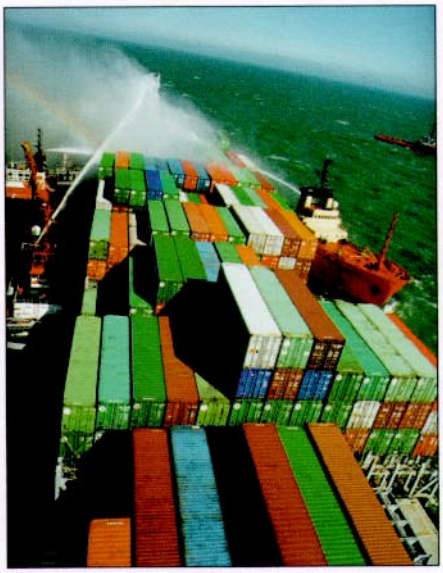
British ETVs have intervened in many potentially serious incidents and successfully prevented a number of groundings. One case in the Channel involved the large fish factory vessel ***Ionava***. During 1995, this vessel suffered an engine breakdown in a Force 10 south westerly and began to drift towards the Kent coast at Dungeness, with 300 tonnes of heavy fuel oil in her bunker tanks. The crew attempted to anchor the vessel, but the violent storm continued to push the vessel towards the shore. Fortunately, the ETV reached the casualty in time and the vessel was towed to safety. Incidents the following year included a very similar case, this time involving the container vessel ***Cam Azobe Express***, which reported an engine failure off the Kent coast. Once again, this situation ended in a successful tow to safety.

In late 1997, a British ETV and a French ETV responded to the plight of the ro-ro ***Kukawa***, which reported fire when off the Channel Islands. The tugs participated in the fire-fighting effort. When the blaze was brought under control, the casualty was towed to Falmouth – where the fires were finally extinguished at the quayside. This case demonstrates the vital role that port authorities often play in salvage operations. In some instances, it is difficult to arrange a port of refuge, so increasing the human and environmental hazards involved in salvage. Ultimately, success in some cases will depend on the active co-operation of port authorities.

The crew of the Falmouth ETV ***Far Minara*** got off to a brisk start in 1998, when tasked on 1st January to make for the 20,000dwt tanker ***Santa Anna*** which had run aground off Torquay during bad weather. Fortunately, the tanker was in ballast, but its 500 tonnes of bunkers and 2,000 tonnes of slops still represented a significant pollution threat. The ETV assisted in the salvage, which resulted in the refloating of the vessel.

Operations in 1998 also included the response to the 70,000dwt OBO ***Bona Fulmar***, which was involved in a collision with a chemical tanker in foggy conditions off the Kent coast. The OBO's cargo consisted of 65,000 tonnes of gasoline; some 6,000 tonnes was lost as a result of the collision. There was no fire, but still air increased the hazards at the scene. The Dover ETV's crew worked to gas-free damaged tanks and carry out temporary repairs. The casualty was then escorted to Rotterdam.

Recent winters have been relatively quiet in UK waters. Nevertheless, the ETVs have performed a series of rescue tows in hostile weather conditions. Some of these cases had the potential to turn into major incidents.



Ever Decent *ablaze in the English Channel.*

They include ***Candourity***, ***Ross Alcedo***, ***Viking Princess*** and ***Boisterence***.

The British ETVs participate in frequent exercises to test the co-ordination and effectiveness of all response resources, at sea and ashore. Two or three MCA-supervised exercises are held each year. These are full-scale response drills, lasting up to 48 hours and often involving a vessel (simulating a casualty), one or more ETVs, helicopters, spill response and clean-up agencies and shore-based organisations. The UK has a new National Contingency Plan for response to shipping casualties and one objective of current exercises is to test elements of this plan. The next major UK exercise is scheduled for October when a two-day drill will be co-ordinated from Falmouth and will involve ***Far Minara*** and a tanker.

Joint exercises involving British and French response teams are also organised. 'MANCHEX 99', for example, took place last November, which involved ***Far Turbot*** and ***Abeille Languedoc***, responding to a VLCC incident in mid-Channel. Such exercises take place under the auspices of the 'Mancheplan' – a bilateral agreement, between France and the UK, which provides for co-operation when responding to marine pollution threats and undertaking search and rescue operations.

Partnering arrangements between Governments and salvors are here to stay. These schemes provide additional security and also offer a focal point for training and drills - which improve the efficiency of response when real emergencies occur. The investment involved is not insignificant. Equally, costs are low when measured against the scale of the risk. The prevention of just one ***Sea Empress*** or ***Braer*** would cover the costs of standby salvage services for decades. It is always difficult to measure the return on such an investment, when the return – pollution prevention – is invisible. Yet, every few years or so, an incident occurs which results in very severe environmental damage. Such events underscore the value of an extra tier of security.

Partnering between Governments and salvors can take many forms. In some countries, there is no structured scheme, but Government agencies have powers to mobilise tugs and other salvage resources when needed to confront an emergency. This approach has obvious cost advantages but, on the other hand, it has some crucial disadvantages. Firstly, the Government has no influence over the character of the resources (for example, tug size and location). Secondly, opportunities to train and exercise together are absent. From the governmental standpoint, a more structured approach has the advantage of direct input, with opportunities to test the operational capabilities and performance of all concerned – including the all-important command and control infrastructure.

The South African and French schemes have stood the test of time. They have provided models for other governments seeking to put in place national schemes for pollution defence, in partnership with salvors. Given the dominant trend of environmental concern, it is likely that the existing schemes will evolve in the years ahead, with an emphasis on new thinking in areas such as command and control. The central aim, as always, is to make the optimum use of available assets. There can be little doubt that more governments will adopt the standby salvage approach.

One point of growing concern, however, is that many of the tugs, which are in the frontline pollution defence role and retained for standby duties, are now rather elderly. Sooner or later, they must be replaced. Are governments sufficiently committed to accept higher rates applicable to dedicated, purpose-built new tonnage? A second concern is the issue of ports of refuge. Central government has a role to play in this area. Ports of refuge need to be identified and arrangements put in place to ensure that vessels in difficulty – and salvors assisting a casualty – receive the attention and support they require, without delay.

The ISU believes that salvage is an activity best performed by commercial companies. The growth in standby salvage arrangements has not eroded the commercial status of the industry. Only a very small proportion of the salvage industry's total assets are committed to standby schemes. The government schemes, in effect, merely focus a small proportion of these resources into areas where they are most needed.

This paper was first presented at Seawork 2000, Southampton, UK, on 20th June.
The author gratefully acknowledges the generouus assistance of Mark Hoddinott, salvage master at Howard Smith, UK, in its preparation.

Review expected to extend UK's ETV coverage...

As this issue of *IT&S* goes to press, the UK's Maritime & Coastguard Agency (MCA) is shortly expected to announce the findings of a far-reaching review of ETV requirements and policy.

Currently, the AHTS vessels ***Far Turbot*** and ***Far Minara***, operated by Howard Smith, are contracted until 31st March 2003, to cover the Dover Straits and Western Approaches, respectively, during the winter months only. In addition, ***Far Turbot*** has been given a one season only contract to provide coverage this summer.

Klyne vessels ***Anglian Prince*** and ***Anglian Monarch*** will be stationed in Scottish waters (Stornaway and Fair Isle) this coming winter under a contract that expires on 31st March 2001.

Although no details of the MCA review are officially known, it is widely thought that, following intense industry pressure, led by *IT&S*, future coverage at all four stations will be all-year-round. One close observer of the situation says: "This is a very high probability".

The UK government's much vaunted PPP (public/private partnership) policy is also fuelling speculation that the MCA wants to at least part-own ETV vessels in a consortium with a major operator. Such a prospect has been hinted at by leading MCA officials on several occasions and it is further rumoured that a specification has been drawn up. We await the outcome with interest.

Anglian Monarch *is one of two Klyne vessels protecting Scottish coasts.*

...but US votes against

The stationing of a designated rescue tug at Neah Bay continues to be a controversial subject, writes Jim Cole of the Seattle-based Elliott Bay Design Group. The risks of oil spills have been debated around Puget Sound since the *Exxon Valdez* incident in Alaska in 1989. Shortly after this incident, a loaded tanker lost power at the entrance to the Strait and other merchant ships have had temporary losses of power or steering since then.

Until a permanent decision has been made, the State of Washington, with monetary assistance from three federal entities, the US Navy, the Department of Transportation and the Environmental Protection Agency, has contracted rescue tugs for the last two winters. A tug from Crowley Marine Services was on station during the winter of 1998/99, followed last winter by the 4,000hp coastal and harbour tug, ***Barbara Foss***.

The North Puget Sound Oil Spill Risk Management Panel has spent nine months studying the risks of oil spills from shipping accidents in North Puget Sound and the Strait of Juan de Fuca and this was one of the issues raised at a meeting held in Seattle on 10th July. The result of a vote by the 20 members for a designated rescue tug was 14 to 6 in favour. This is a clear majority with all of the elected officials being in support of a tug as well as the environmentalists, the Makah Tribal Council (the traditional home of the Makah Tribe is at the entrance to the Strait of Juan de Fuca), and the two oil industry representatives.

Barbara Foss

All democratic processes can occasionally create a strange agreement as they evolve. The one created by The Oil Spill Risk Management Panel was that if more than two members voted against an issue, it would not pass. Therefore, a vote of 14 to 6 was not good enough.

Reasons given by the Oil Spill Risk Management Panel for voting against the designated rescue tug were that it would cost millions of dollars each year with little real benefit. The local industry has decided to rely on their 'tug of opportunity' system, which has up to 100 tugs working at all times. A 'tug of opportunity' would be called upon to respond to an emergency by switching its tow to another tug or to anchor it. Significant improvements in technology and regulations have raised the performance levels of the local tugs and tug companies, but the question remains. Does the 'tug of opportunity' system guarantee that a tug will be available with the size, power, and speed to prevent an accident in heavy weather?

Appendix B
NPS Panel Report Excerpt:
“Other Measure Considered No. 5 – Dedicated Rescue Tug”

Other Measure Considered No. 5 – Dedicated Rescue Tug

Issue: Should the United States and Canadian governments enhance the International Tug of Opportunity System (ITOS) by funding the deployment of a dedicated rescue tug for the international waterway at the entrance of the Strait of Juan de Fuca and adjacent ocean waters?

Position in Support of Issue: A dedicated rescue tug should be available year-round at Neah Bay[23] to ensure that an adequate tug is available at all times to respond to a drifting vessel (and other types of incidents) in the Western Strait of Juan de Fuca and coastal waters of Washington and British Columbia, and to decrease response time.

Funding arrangements for this recommended rescue tug must be economically neutral for commerce to and from ports in the United States and Canada. Commercial transits through the shared waters of the Strait of Juan de Fuca are approximately equal to ports in the United States and Canada. Therefore, the U.S. and Canada should share equally in funding this rescue tug. This proposal should be a matter of priority in discussions between the U.S. State Department and Canada. Deployment of a dedicated rescue tug is urgent; therefore, until Canada funds its share the U.S. Government should fund it fully.

Many funding arrangements have been discussed. However, via the recent U.S. Supreme Court decision[24] the U.S. federal government has asserted its constitutional primacy over safety regulation in these waters, thus successfully preempting certain Washington State maritime safety laws. The U.S. government also has solemn Treaty obligations to the Makah Tribe and other Indian tribes in this region whose culture and economy is dependent upon the utmost protection of the marine and coastal environment and their usual and accustomed fishing grounds from the devastation of oil spills. Important federal assets of great national value would be damaged by any oil spill, including the Olympic National Marine Sanctuary, the coastal strip of Olympic National Park, and numerous national wildlife refuges. These federal responsibilities and the urgency of achieving a practical permanent deployment of a rescue tug, justify that the greatest portion of the U.S. share of the cost of this rescue tug should be borne by the federal government.

Trade through Puget Sound ports benefits not only this state but also the entire nation. Approximately 80% of the relative volume of cargo originates or terminates beyond the boundaries of the State of Washington to the direct benefit of the people of the other 49 states. This fact should be recognized in the funding formula for a dedicated rescue tug.

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[23] There are currently physical limitations on the size of vessel that can operate from Neah Bay during certain low tides. This recommendation is based on the size of rescue tug deemed necessary to meet the mission. Priority should be given to dealing with any physical limitations of the harbor.

[24] *United States* vs. *Locke*, No. 98-1701, decided March 6, 2000.

The continuity of rescue tug coverage is paramount. The U.S. federal government and the State of Washington should employ all possible means to assure the sustained availability of appropriations as recommended here.

The primary mission of this dedicated rescue tug is to arrest the drift of a disabled vessel to prevent a pollution event. As long as its primary mission is not jeopardized, the tug should be equipped and available to provide other emergency rescue services and early assistance in oil spill response. These services include:

- Providing intervention support for the Coordinated Vessel Traffic Service
- Assist in search and rescue efforts
- Marine firefighting
- Early oil spill response

The specifications for a suitable tug should be addressed by a group of experts convened by the U.S. Coast Guard and Washington Department of Ecology. These experts should include those recommended by local government, industry and environmental groups.
The annual operational cost for a suitable rescue tug meeting these requirements ranges from $3,500,000 to $7,000,000 including amortization.[25] The higher figure is the most probable. Cost includes charter of a stand-in replacement tug during periods when the dedicated rescue tug is out of service for general maintenance, repair and annual dry-docking, or on a specific rescue assignment.

The role and performance of this rescue tug should be routinely evaluated as part of overall assessments of the maritime safety systems of the U.S. and Canada in this region. The permanence of this rescue tug is a critical element in the marine safety system; any decision to remove or reduce this important oil spill prevention asset must be made by affirmative decision, and not by any form of automatic "sunset clause."

This recommendation reflects the unique circumstances and challenges to maritime safety, and oil spill prevention in the Western Strait of Juan de Fuca as well as the Washington and British Columbia coasts.

A dedicated rescue tug stationed at the entrance of the Strait of Juan de Fuca will significantly improve oil spill prevention for both the United States and Canada. It will round out the present coverage by commercial tugs, and place a vessel equipped for arresting drifting vessels (and for other collateral duties) as well as a trained crew at a point readily accessible for incidents developing in the western Strait, the ocean approaches and along the coasts of British Columbia and Washington. It will significantly reduce response times, enabling a tug to reach a drifting vessel far sooner than can be assured in any other way.

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[25] These estimates are based upon the recommendations of the 1994 Emergency Towing System Task Force and on data developed as part of the U.S. Coast Guard's "Regulatory Assessment" [see especially p. 58-59]. Costs in this same range were derived in the 1995 cost-benefit analysis prepared for the Province of British Columbia.

In a cooperative effort between the industry associations of British Columbia and Washington State, the International Tug of Opportunity System (ITOS) has been implemented on a voluntary basis by the shipping industry at its own expense. The system provides transponders on approximately 100 Canadian and U.S. tugs operating in the shared waters. The Marine Exchange and the Cooperative Vessel Traffic System monitor tug activity. Location and physical attributes of tugs operating are displayed for rapid identification of assets in the event of an emergency.

The U.S. Coast Guard evaluated ITOS in a report published in August 1999, and concluded "…(ITOS) provide(s) an incremental improvement to the existing marine safety system."[26] The study emphasized, however, "What is important is the determination of how big a gap there is in tug coverage."[27] Analyzing real-world data, Coast Guard studies show a lower incidence of tugs present in the outer strait when commercial vessels were present than for other portions of the study area, thus revealing an oil spill prevention gap in the waters at the entrance of the Strait and adjacent ocean waters.

The Coast Guard review found that "there is approximately a 15% chance that there is an ITOS tug in the vicinity of the intended operating area of the [proposed] dedicated rescue tug."[28] Assuming that any ITOS tug is available, willing and technically equipped to hook up to and slow the drift rate of a vessel in distress, the study concluded that ITOS eliminates approximately 11% of the risk of a significant oil spill throughout the region and 9% for the offshore approaches.[29]

Using different methodology the Coast Guard's Regulatory Assessment found that "ITOS is expected to reduce the number of drift groundings by approximately 3% in 2000 and 6% in 2025."[30]

There are two gaps in oil spill prevention coverage associated with the outer Strait of Juan de Fuca and ocean approaches:

- The review of ITOS confirms a lower probability of an adequate and available commercial tug of opportunity in the outer Strait and ocean approaches than in any other portion of the study area.
- There are fewer response assets for the containment and recovery of spilled oil in the outer Strait and ocean approaches than in the marine waters further east.

The 1997 Volpe Report concludes: "Environmental sensitivity generally drops as one moves west to east while response efficacy increases."[31]

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[26] "Analysis of the Geographic Coverage Provided by the International Tug of Opportunity System From November 1998–May 1999," U.S. Coast Guard, 30 August 1999.
[27] *Ibid.*, p. 36.
[28] *Ibid.*, p. 16. It is noteworthy that the Executive summary states: "Not addressed in this analysis are issues such as the adequacy of the power of ITOS tugs or their ability to hook up to a vessel in distress".
[29] *Ibid.*, p. 51. These assumptions are not warranted and the risk reduction is thus even less than implied here.
[30] "Regulatory Assessment: Use of Tugs to Protect Against Oil Spills in the Puget Sound Area," prepared for the U.S. Coast Guard, Report No. 9522-002, November 15, 1999, p.47.
[31] "Scoping Risk Assessment: Protection Against Oil Spills in the Marine Waters of Northwest Washington State," published by the John Volpe National Transportation Systems Center, July 18, 1997, p.86. [Cited here as "Volpe Report"]

In the final analysis, each person, each organization and each segment of the shipping industry assesses the maritime oil spill risk at the entrance of the Strait of Juan de Fuca in their own way, reflecting their own interests. It is evident however, that the people of the State of Washington have concluded that current maritime safety measures in this particularly vulnerable and valuable area are not adequate to protect the public interest.[32]

The oil spill risk from commercial vessel traffic in these waters is not static. Both vessel traffic and public concern for the consequences of a large oil spill are increasing. The growth in international trade to and from both the United States and Canada will fuel ever-greater traffic by ever-larger vessels with ever-larger tanks of bunker fuel. While double hull tankers will be phased in for the U.S. oil trade in these waters by 2015, well before that time the greater share of the risk will have shifted to dry cargo vessels simply because of the rapid growth projected in their trade through the Strait.[33] Risk is further elevated by the rapidly growing use of these waters by recreational boats of all kinds.

The people of Washington State and the United States place enormous value on the integrity of this natural environment, as witnessed by the dedication of the outer coastline as part of Olympic National Park and the adjacent offshore area as the Olympic National Marine Sanctuary. Moreover, the serious deterioration of the marine environment, particularly within the Strait and Puget Sound, has called forth a tremendous commitment of public effort and funding. Examples include the listings (completed and pending) of more and more species under the Endangered Species Act – and the significant public sacrifices that will be required to restore these species – as well as the urgency Congress felt in approving and funding the Northwest Straits Initiative.

An overriding factor necessitating placing a response tug in the outer Strait is the treaty obligation of the Federal Government to protect the Usual and Accustomed lands of the tribes in Washington State. There is embodied within the treaty an absolute obligation to the protection of the marine environment.

The deployment of additional towing assets in the greater Puget Sound basin adds to the emergency response capability in the event of a disabled vessel. The greatest potential for an asset reducing a hazard would be in response to a drift grounding.

It is important to note that industry stakeholders are currently contributing to the protection of the marine resources in several ways:

- The tanker industry through taxation and required tug escorts for laden tankers transiting east of Port Angeles, as well as in the additional costs to build and operate double-hulled tankers.

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[32] This is demonstrated by the 1991 state law mandating an emergency towing system at the entrance of the Strait of Juan de Fuca by 1992, by the growing support of state and federal legislators and the elected commissioners of the most affected counties, and by the significant funding devoted to interim tug protection by both the Clinton Administration and the State Legislature.

[33] "Regulatory Assessment: Use of Tugs to Protect Against Oil Spills in the Puget Sound Area," prepared for the U.S. Coast Guard, Report No. 9522-002, November 15, 1999.

- The dry cargo and tanker industries through its voluntary funding of the International Tug of Opportunity System (ITOS).
- Both the dry cargo and oil tanker industries support oil spill response organizations.

Prevention of an oil spill is altogether preferred over spill cleanup efforts that are inherently of limited success and very costly. In addition to the economic, environmental and social benefits to society in general, the shipping industry itself stands to gain from the improved oil spill prevention capability represented by a dedicated rescue tug at the entrance of the Strait in two primary ways:

1. The ship owner involved in an incident which, as a result of the services of a dedicated rescue tug, does not unravel into a major oil spill gains by avoiding huge costs, including liability and punitive damage claims.
2. The shipping industry as a whole gains by avoiding the far more intense regime of operating regulations which would inevitably be imposed upon it in the political aftermath of a major oil spill in these essentially urban waters.

Position Opposed to Issue: The proposal for a tug is fiscally irresponsible where there is not a cost-benefit ratio that supports the expense, regardless of the source of funds.

Using data directly cited in the regulatory assessment performed by Herbert Engineering and basic probability analysis, one reaches a much different position than presented by the authors of that report. It requires making only one assumption: "The value of a dedicated tug is only in the arrest of a drifting vessel."

For collisions and powered groundings a dedicated tug is essentially of little value.

To arrest a drifting vessel the probability of success is determined by the product of the probabilities of the dependent events.

The arguments against the issue rest with the assumption above and the use of three facts from the report:

- 5.5 year return of an oil spill is a 0.18 probability of an incident in any one year.
- 8% of the incidents resulting in an oil spill are from drift grounding.
- Only half of the attempted drift arrests were projected to be successful.

The probability of preventing an oil spill from a successful recovery of a drifting vessel is 0.0072 in any given year, or a return of a successful arrest every 139 years. Accordingly, the probability alone makes the event so remote that the cost-benefit approaches nil.

If the actual incident data for the past 10 years is used the return period of this analysis is even longer.

Comments related to points made in the Tug Recommendation:

- Comments about INTERTANKO are not germane to the discussion of a dedicated tug. The Court's decision had nothing to do with the right of the State or anyone else in placing a dedicated tug.
- In the New Carissa case the first available tug was unable to assist because it could not leave port due to weather. Even if there had been a tug at sea it could neither have prevented the grounding nor been more successful than subsequent efforts to pull the vessel off the beach. To have extracted a single sentence from the Coast Guard Report is a misrepresentation of the facts of the case.
- Without assurance that funding would be from the federal general fund or a partnership with the state there could be no support for the initiative because the industry can not assume this additional cost.
- Once one tug is in place there will be a push for at least two other ports within Washington State. Two or more in Oregon and four or five in California.
- $4.5 m in additional funding for the Canadian Coast Guard would undergo scrutiny as to the best place to be spent.
- The U.S. Coast Guard is also critically short of funds.
- To fill the voids in tug coverage in the outer strait on a continuing basis through the spot chartering of tugs would for practical purposes cost the same as a dedicated tug. ITOS has never professed to be able to cover the outer coast.
- Regarding the issue of trade for the past 10 years, trade to the U.S. West Coast including British Columbia has been growing on a year on year average of about 7 %. California has been growing at greater than 8 %, while the Pacific Northwest (PNW) (Seattle, Tacoma and Vancouver) has grown at approximately 6 %.
- During that same period the number of carriers competing in the Pacific Trade to the PNW has declined by about 30%. Further consolidation of the container industry has taken place as the result of mergers and sailing agreements, which reduce the number of calls. In addition, the ships are newer, larger, and equipped with more modern aids to navigation, computerized radar tracking of traffic and redundant systems. In the general cargo area, forest products have been steady to declining for the past ten years and the projections are for reduced volumes.
- There is no question, within plus or minus about 10 percent year on year, that vessel calls for the past 10 years have not increased. They have remained steady or declined for the combined reasons cited above.

Vote:

Members Present:	19*
Yes:	11
No:	4
Stand Aside:	2

*Includes the Panel's two non-voting co-chairs.

Appendix C
Incident Summary Report on the
Tank Barge Bouchard No. 230

The Bouchard Barge No. 230 broken tow wire of March 28, 1999

March 19, 1999
0905: Barge B. NO. 230, paired with the tug RALPH E. BOUCHARD, completed discharge of 138,739 bbls of black oil product at Equilon Martinez, California. No cargo was left on board. Closing drafts were 3 feet forward and 6 feet aft.

March 25, 1999
0615: The barge hove anchor in San Francisco anchorage 5, bound for Anacortes, Washington. The tug RALPH E. BOUCHARD and barge B. NO. 230 had been weather bound at anchorage for 6 days. Barge service oil was onboard including: lubrication oil for the engines, hydraulic oil for the pumps, mooring winches and anchor winches and diesel oil in an integral tank and diesel fuel in the service tanks. Barge B. NO. 230 was on the RALPH E. BOUCHARD's port tow wire. There were six persons aboard the RALPH E. BOUCHARD (Captain, Mate, 2 Deckhands, a Chief Engineer, and an Assistant Engineer). There were two tankermen aboard B. NO. 230.

0815: The vessels cleared the main bar channel buoys number 1 and 2. The tug's log indicated the weather was westerly with an 8 to 11 foot swell

1250: The tug was abeam Point Reyes, California.

1500: The tug's log indicated northwest winds 15 to 20 knots with a combined sea and swell of 17 to 20 feet, also from the northwest. Tug & tow speed was logged as 4.5 knots.

1715: The tug and tow were clear of the Northwest radius of the vessel traffic service (VTS) for San Francisco.

1800 to 2400: The tug and tow proceeded North. The tug's log indicates the weather was northwest with a 14 to 20 foot swell and wind 20 to 30 knots, also from the northwest. Tug & tow speed was logged as between 4.6 and 6.3 knots.

March 26, 1999
0230: The tug and tow made way point 24 as per the voyage plan, abeam Point Arena, California.

0300 to 2400: The tug and tow proceeded North at speeds between 7.7 and 9.2 knots. The tug's log indicated the weather was from the Northwest with a 11 to 15 foot swell and wind 10 to 20 knots, also from the Northwest.

March 27, 1999
0710: The tug and tow made way point 26 as per the voyage plan, abeam Point Blanco, Oregon.

0900: The tug and tow proceeded northbound at a speed of 9.2 knots. The tug's log indicated the wind from the northwest at 10-15 knots with combined seas of 15 feet.

1200: The vessels' speed had dropped to 7.8 knots. The wind had shifted and was now from the southwest at 10 knots. The sea was from the west at 14 to 20 feet.

2100: The tug and tow were making 8.2 knots. The tug's log indicated the wind was now southwest at 25 knots with combined seas of 15 to 17 feet.

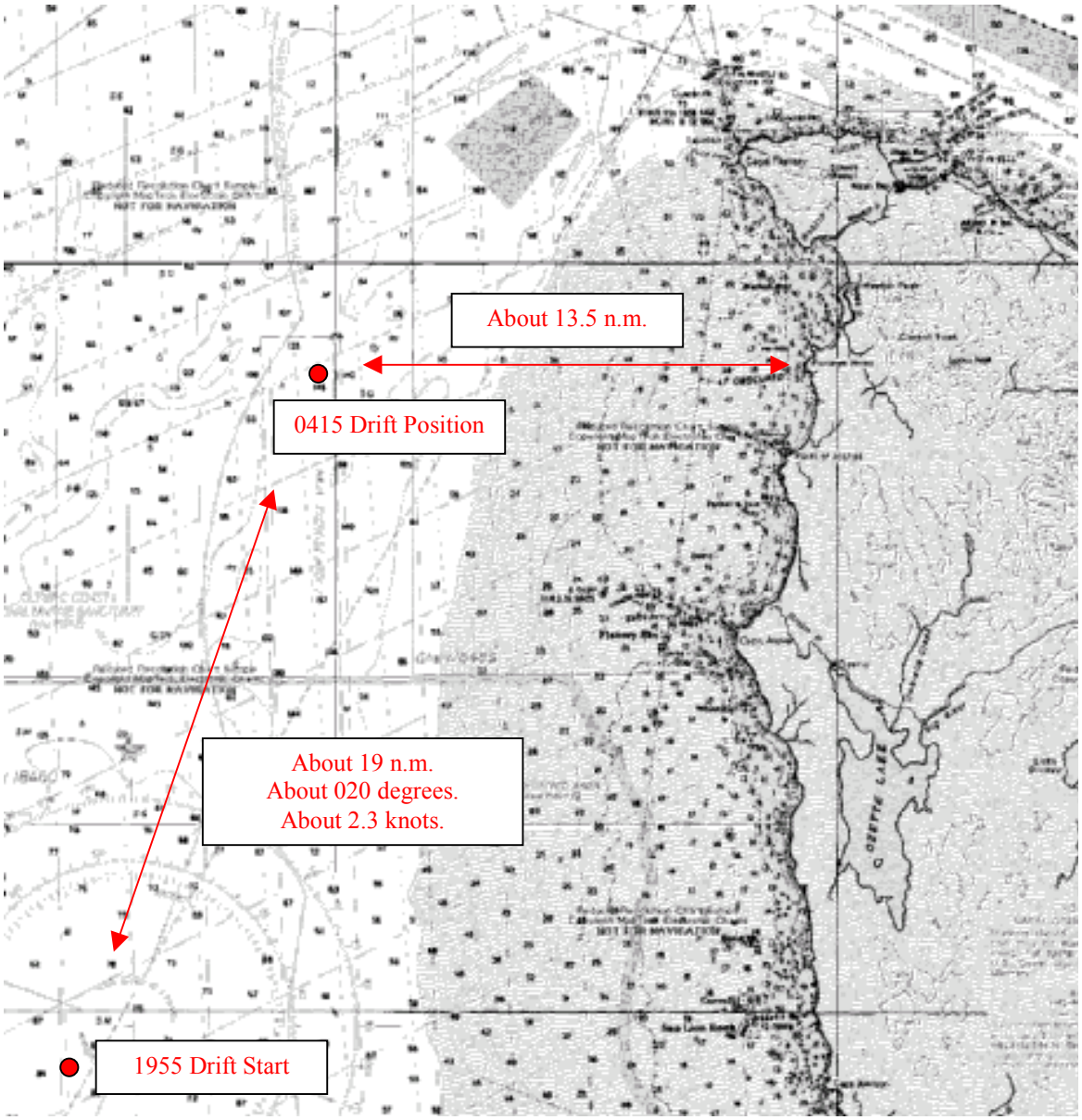
March 28, 1999

0300: The tug's log indicated wind was from the west at 20 to 25 knots with combined seas of 20 feet. The vessels' speed is logged as 8.5 knots.

1500: Southerly winds had increased to 35 to 45 knots. Seas were 5 to 8 feet with a 20-foot southwesterly swell. Vessels' speed 8.8 knots.

1630 to 1800: Southerly winds had increased to 40 to 45 knots with 55-knot gusts. Southerly combined seas were logged as 28 feet.

1955: At position Lat. 47-58.7N, Long. 125-10.2W the port towing cable parted at the connection to the "D" (socket on the tug's end of the towing cable). The wind was from the south at 35 to 45 knots with southerly combined seas of 14 to 30 feet. When the tow wire broke, 180 feet of ocean towing bridle chain and an additional 50 feet of 2 ½ inch wire pennant hung down into the ocean from the bow of the barge. When interviewed, the master characterized the conditions as hazardous. The tug was subjected to increase pitching, and the barge laid in the trough of the 30 foot Southerly swell. He reported that the seas were on the deck of the barge and tug. The tug maneuvered to recover barge. Notifications were made to Tofino Traffic and the USCG.



Chartlet showing position at start of incident (1955, 03/28/1999) and the position where the 8-inch hawser parted (0415, 03/29/1999).

2015: The Master of the RALPH E. BOUCHARD notified the New York office of Bouchard Coastwise Management.

2050: New York office reviewed reconnect procedure with Master of the RALPH E. BOUCHARD and the barge crew.

2120: The USCG was notified of the incident.

At the New York office of Bouchard Coastwise Management, they contacted Foss Maritime, their nearest resource was reported to be 60 miles away, so Crowley was contacted about their nearest rescource.

2115: Crowley Maritime Service dispatched the SEA VALIANT after consultation with Bouchard management. The tug was about 20 miles and 2 to 3 hours away. The SEA VALIANT started her engines and got authorization from Crowley dispatch to proceed to aid the RALPH E. BOUCHARD and B. NO. 230.

2155: Master of RALPH E. BOUCHARD notified Bouchard office in New York that tug and barge would be ready to attempt emergency tow wire retrieval in 30 minutes.

2240: Crowley contract for the services of the SEA VALIANT reached Bouchard offices (New York).

2315: Bouchard office was notified by RALPH E. BOUCHARD that the retrieval buoy was trailing under the bottom of barge and the tug will have to try the line throwing gun. Arrangements were made for the two tankermen to go on deck. They attached an 8-inch barge mooring line to the "D" on the end of the emergency towing wire. The mooring line was lead overboard and floated astern of the drifting barge. The tug maneuvered to retrieve the floating 8-inch mooring line in heavy seas while attempting to avoid striking the barge or fouling the line in the tug's propeller. The tug was taking water over the bulwarks causing the crew members on deck to hang on or move to avoid going overboard when the decks were awash.

March 29, 1999

0030: The tug had picked up the 8-inch mooring line and pulled the emergency towing cable from the retaining clips securing the wire along the port side. About 450 feet of the cable came free before a problem arose. The emergency tow wire fouled when it got wrapped around the inside of a closed steel chock located on the port side about 30 feet from the bow. The tug and barge hove to until daylight. The barge could not be turned into the sea because the towline lead was not from the centerline of the barge.

0115: The tug SEA VALIANT arrived on scene to assist as necessary. Master of RALPH E. BOUCHARD notified New York office that the 8-inch hawser and half of the emergency tow wire was off the barge deck. Says he had too much hawser on the barge deck and has to straighten it out before proceeding.

0200: Master of RALPH E. BOUCHARD notified Bouchard that the tug was connected to tow wire, but only by the 8-inch messenger hawser and he was waiting for first light.

0245: The mooring line connecting the emergency towing cable to the tug broke under excessive tension. The barge began drifting north-northeast. Southerly winds were 30 to 35 knots with combined southerly seas of 25 to 30 feet.

The tug's Master made the decision to let the barge drift until daylight to allow the crew time to rest and warm-up. He said at one point during the first pick-up attempt he saw the mate, up to his neck in waves washing over the deck, hanging on to the winch.

The SEA VALIANT offered to attempt to retrieve the barge using an Orville hook, Bouchard declined, planning on another attempt.

0415: Bouchard was notified that hawser broke and that barge was drifting north (Lat. 48-17N, Long. 125-00.9W).

0600: The operation to recover the barge continued. A safety meeting was held where the operation to recover the barge was described. All crew wore rain gear, rubber boots, flotation work vests and hard hats. One deck hand wore a safety line to prevent him from washing overboard.

0645: Master of RALPH E. BOUCHARD called Bouchard. He told them that he was leery of attempting to connect to the emergency tow wire since it had an 8-inch hawser attached that could foul his propellers. He said he would try to pull up the emergency line using a shackle and a mooring winch—if it could be pulled up, another attempt would be made to reconnect.

Time Unknown: A 45-caliber line gun with brass projectile was used to connect a messenger to the barge. The gun was fired in a looping arch over the top of the barge while the two crew members aboard took cover. It was reported that the wind carried away the light line causing it to fall clear of the barge. After adjustments for windage and trajectory the third shot succeeded in getting a small line to the barge. Initially the barge personnel thought the line had missed; however, from the tug crew's vantage, they could see the messenger and called the barge on the radio to say the line had hung in the rigging.

With water coming on deck, the barge crew climbed the mast and retrieved the messenger. A two-inch line was tied to the messenger and pulled to the barge. Attached to the 2-inch line was 200 feet of 8-inch Spectra fiber line. The barge crew pulled the spectra line to the bow and dropped the spliced eye with chaffing protection over the bow centerline bit of B. NO. 230. The Spectra line was shackled into the starboard tow wire.

0815: Barge B. NO. 230 was recovered by the tug RALPH E. BOUCHARD while the tug SEA VALIANT stood-by to assist as requested.

0910: Bouchard was notified that tug and barge were underway using secondary towing gear, and dragging about 450 feet of emergency tow wire below from the barge.

0945: Tug and barge were about 7 miles from Buoy "J".

1000: Bouchard was looking at information on submerged cable and other items that can be damaged by the trailing emergency tow wire.

1115: The tug SEA VALIANT was released by Bouchard; however, the tug log book indicated that the USCG required the SEA VALIANT to remain in escort of the recovered tow.

1200: The RALPH E. BOUCHARD was abeam buoy J.

1450: The RALPH E. BOUCHARD and barge B. No. 230 stopped in the sheltered waters offered by the Straight of Juan de Fuca. With the tug alongside, the barge's mooring winches were used to hoist about 450 feet of 2 ½ inch emergency towing cable and placed it on the deck of the barge along the port side gunwale. After the emergency tow cable was picked up, the RALPH E. BOUCHARD made up in push mode at the stern notch of the barge.

1650: The barge was underway towards Port Angeles with the tug SEA VALIANT standing by.

2115: The RALPH E. BOUCHARD was abeam Port Angeles.

2145: The SEA VALIANT assisted barge B. No. 230 to retrieve about 450 feet of towing gear by hauling the bridle, pig tail, surge gear and 50 foot wire pennant aboard the stern deck with her deck crane and capstans. A mooring wire from the barge was shackled into the end of the pendant to haul the gear up to the barge. The tug RALPH E. BOUCHARD held the barge made up in push gear.

March 30, 1999

0005: Port Angeles pilot boarded the RALPH E. BOUCHARD. The SEA VALIANT was reported to have headed west in the Strait of Juan de Fuca at this time.

0020: Barge B. NO. 230 was underway for Equilon, Anacortes.

0130: The RALPH E. BOUCHARD shifted from a pushing to a towing configuration.

0440 to 0630: Barge B. NO. 230 was assisted to the Equilon dock 2 by the tug BARBARA FOSS.

0610: Pilot off the RALPH E. BOUCHARD

0630: Barge was secure at the dock with the RALPH E. BOUCHARD in pushing configuration.

When interviewed, the Master was asked what happened. He said they waited in San Francisco for a week waiting for the weather to break. When they got outside the weather changed from the northwest to out of the south. The weather from the south was 15 foot swells with bigger swells from time to time up to 30 feet. He said he saw a set of the big swells coming on radar and then visually. He pulled the engines back to 125 r.p.m. then, when the swells got to the tug, one made the tug go one direction while the barge was trying to go up the back side of another one. The Master spoke very supportively of the rescue tug. He said it provided a comfort factor to the hazardous conditions his people worked in.

Between 1955, when the port tow wire broke, and 0415, when the 8-inch hawser broke, barge B. NO. 230 drifted about 19 n.m. at 020 degrees (True) (speed of drift about 2.3 knots).

Appendix D
Incident Summary Report on the Marine Vessel *Virtue*

The M/V VIRTUE loss of propulsion incident of June 7, 2000

The dedicated rescue tug, BARBARA FOSS, stationed at Neah Bay under contract with Washington State, was called upon to assist the VIRTUE which was adrift about 25 miles off the northern Washington coast. The VIRTUE was a grain ship bound for Vancouver, British Columbia.

The incident began on Monday, June 5th, when the VIRTUE lost propulsion due to exhaust valve problems and began a slow drift north. Propulsion problems were first noted at 1600 with the onset of engine knocking and turbocharger surging. This necessitated an engine shutdown and an opening of the cylinders at 1700. The No. 3 cylinder was found to have fuel oil accumulation on the piston crown. The piston was overhauled and the rings renewed.

The engine was restarted at 1400 on June 6th, but had to be stopped again due to severe knocking and turbocharger surging. Knocking was noted in cylinders Nos. 1,2, 3 and 6. The ship continued its journey at reduced speed (60 r.p.m. – full sea speed is 83 r.p.m.).

The U.S. Coast Guard was notified at 0200 on June 7th of the problem and required that the VIRTUE to obtain "…a tug of a size suitable to achieve and maintain control…" after determining that the ship posed "…a substantial threat of discharge…"

At 0600 on June 7th the main engine stopped on its own. The scavenging spaces on the main engine were opened again and fuel oil accumulation was found on piston crowns of cylinder Nos. 1, 2, 3, and 6. The No. 2 piston also had a broken ring. The ring on No. 2 and the fuel injectors for 1, 2, 3, and 6 were replaced. The BARBARA FOSS got under way from Neah bay to assist the VIRTUE at 0647, Wednesday, June 7th, and arrived on scene at 0948.

At 1400 the engine was restarted and the turbocharger made a lot of noise and smoked. Engine r.p.m.'s fluctuated badly.

The BARBARA FOSS stood by while the VIRTUE's crew continued to work on repairs near Latitude 48-11.15N, Longitude 125-19.38W. Weather conditions on scene were relatively good.

Intermittent failures of the main engine continued as the VIRTUE, escorted by the BARBARA FOSS, made its way to the Strait of Juan de Fuca at reduced speed. The escort began at Lat. 48-15.7N, Lo. 125-18.4W.

At 2135, just inside the entrance to the Strait of Juan de Fuca, the U.S. Coast Guard (in consultation with the Canadian Coast Guard and the ship's operator) ordered the master of the VIRTUE to accept towing assistance. The Captain of the Port Order (00-019) stated "While you report that your engines are now operating properly, we have received reports that your vessel continues to intermittently loose (sic) and regain propulsion capabilities. Repairs have not been made to my satisfaction…" The VIRTUE was under

tow by the BARBARA FOSS at 2210. The VIRTUE dropped anchor at Royal Roads, Victoria, British Columbia at 0705 on Thursday, June 8th with the assistance of an additional tug, the SEASPAN CAVALIER.

The ship underwent repairs at Victoria attended by the ship's superintendent and a Sulzer Engineer (actually a Wartsilla N.A., Inc. engineer on behalf of Sulzer), conducted sea trials. The turbocharger was still malfunctioning, but was required to be repaired at Vancouver.

The VIRTUE got underway for Vancouver at 1924 on June 11th. Within 30 minutes of getting underway the turbocharger began surging again. Engine r.p.m.'s were reduced, but problems persisted. The engine was again shut down while adjustments were made. The ship was able to continue to anchorage at Vancouver at reduced speed.

Repairs were made to the turbocharger on June 13th at a repair berth. All the turbocharger blades were found to be badly damaged. Repairs were completed at 2330 on June 15th. The main engine was tested satisfactorily on June 16th and the VIRTUE departed the berth at 1300 bound for Portland, Oregon. The only residual issue noted by ship's personnel was the No. 5 cylinder, which was running with a low exhaust temperature.

The VIRTUE, a 593-foot bulk cargo ship registered in Singapore, was reportedly carrying about 138,000 gallons of diesel oil as fuel.

Appendix E
NPS Panel Report Excerpt: "Allocation of Tug Costs on a 'Per Transit Basis'"

Appendix 12 – Herbert Engineering (Keith Michel) – Allocation of Tug Costs on a "Per Transit Basis"; report to NPS Panel 2/16/2000

Allocation of Tug Costs on a "Per Transit Basis"

Prepared for:

State of Washington Department of Ecology
P.O. Box 47600
Olympia, Washington 98504-7600

Prepared by:

Herbert Engineering Corp.
98 Battery Street, Suite 501
San Francisco, CA 94111

Report No. 9939-001
February 16, 2000

1 INTRODUCTION

This report presents rescue tug costs proportioned on a "per transit basis", for vessels transiting the Strait of Juan de Fuca. Three alternatives for allocating the costs are presented: (1) proportional to the number of transits, (2) proportional to the quantity of oil onboard each vessel, and, (3) proportional to the projected oil spillage. Data for the number of transits, oil movements, projected outflows, and costs are taken from the USCG report, "Regulatory Assessment -- Use of Tugs to Protect Against Spills in the Puget Sound Area".

2 OVERVIEW

Allocated tug costs per transit for various vessel types are presented in Table 1 for year 2005. Table 3 and Table 4 contain summaries for years 2000-2025. Background data used to develop the allocated costs are presented in Table 2 for year 2005, and in Table 5 and Table 6 for years 2000-2025.

Assumed annualized cost of rescue tug =		$ 6,000,000			$ 4,000,000	
(All costs given on a per transit basis)	Proportioned on basis of number of transits	Proportioned on basis of barrels of oil carried	Proportioned on basis of projected oil outflow	Proportioned on basis of number of transits	Proportioned on basis of barrels of oil carried	Proportioned on basis of projected oil outflow
Year 2005						
Single Hull Tankers - Laden w/ Crude	$514	$9,896	$10,437	$343	$6,597	$6,958
Double Hull Tankers - Laden w/ Crude	$514	$9,896	$2,389	$343	$6,597	$1,593
Single Hull Tankers - Laden w/ Product	$514	$3,960	$4,177	$343	$2,640	$2,785
Double Hull Tankers - Laden w/ Product	$514	$3,960	$956	$343	$2,640	$637
Single Hull Tank Barges - Laden w/ Product	$514	$1,408	$9,774	$343	$939	$6,516
Double Hull Tank Barges - Laden w/ Product	$514	$1,408	$2,070	$343	$939	$1,380
Tankers in Ballast	$514	$231	$140	$343	$154	$93
Containerships	$514	$275	$360	$343	$183	$240
Bulk Carriers	$514	$93	$121	$343	$62	$81
Others vessels >3000 GT in size	$514	$130	$171	$343	$87	$114
Others vessels 300 to 3000 GT in size	$514	$18	$94	$343	$12	$63

Table 1 Allocated Costs per Vessel Transit (Years 2005)

	No. of Transits	Oil Moved per Transit (bbls)	Oil Carried (bbls x 1000)	Projected Outflow (bbls)	Outflow per Transit (bbls/transit)	Outflow per barrel moved (bbls)
Single Hull Tankers - Laden w/ Crude	133	618,440	82,242	185.8	1.397	0.0023
Double Hull Tankers - Laden w/ Crude	178	618,440	110,093	56.9	0.320	0.0005
Single Hull Tankers - Laden w/ Product	115	247,501	28,363	64.1	0.559	0.0023
Double Hull Tankers - Laden w/ Product	153	247,501	37,968	19.6	0.128	0.0005
Single Hull Tank Barges - Laden w/ Product	146	87,983	12,815	190.6	1.309	0.0149
Double Hull Tank Barges - Laden w/ Product	55	87,983	4,870	15.3	0.277	0.0031
Tankers in Ballast	497	14,446	7,180	9.3	0.019	0.0013
Containerships	2,620	17,174	44,995	126.2	0.048	0.0028
Bulk Carriers	5,546	5,793	32,127	90.1	0.016	0.0028
Others vessels >3000 GT in size	1,680	8,150	13,692	38.4	0.023	0.0028
Others vessels 300 to 3000 GT in size	544	1,146	624	6.9	0.013	0.0110
Total Yr 2005	11,667		374,966	803.4		

Table 2 Transit, Oil Movement and Spill Projections (Years 2005)

The tug costs are proportioned as follows:

Proportioned on the number of transits: This cost is developed by dividing the annual tug cost by the total number of transits per year. All vessels greater than 300GT in size are accounted for. Inbound and outbound voyages are considered independent transits.

Example: For year 2005: Cost = $6,000,000 / 11,667 = $514 per transit

Proportioned on barrels of oil carried: This cost is developed by multiplying the annual tug cost by the ratio of oil moved on a given transit to the total oil movement for the year.

Example: For year 2005 for crude oil carriers:
Cost = ($6,000,000)(618,440 / 374,966,000) = $9,896 per transit

Proportioned on projected oil outflow: This cost is developed by multiplying the annual tug cost by the ratio of projected oil outflow for a single transit to the projected oil outflow for all vessels over the year.

Example: For year 2005 for single hull crude oil carriers:
Cost = ($6,000,000)(1.397 / 803.4) = $10,437 per transit

To obtain total costs for a roundtrip voyage, the costs for the inbound and outbound legs should be combined. For example, the cost for a containership in year 2005 assuming proportioning on the basis of the number of transits will be ($514)(2)=$1,028. The cost for a single hull tanker inbound with crude and outbound in ballast, assuming proportioning on the basis of oil outflow, will be $10,437 + $140 = $10,577.

The rescue tug costs include both annualized capital cost and operating costs. A new 10,000 BHP tug and a new 5,500 BHP tug are projected to cost about $6 million and 4$ million per year respectively. Allocated costs for both alternatives are presented in this report.

3 ASSUMPTIONS AND COMMENTS

The following assumptions apply to the transit and cost data:

1. The number of transits per year for each vessel type is based on the historical traffic data and the forecast of cargo flows presented in the *Regulatory Assessment*. No adjustments were made for the potential impact that a transit fee may have on the number of transits, or on the mix of single hull vs. double hull tankers.

2. Oil movements include crude oils, refined products, and bunkers. Separate cost figures are presented for crude oil and refined product carriers, although no attempt was made to account for the relative environmental impact of different oil types (e.g. crudes vs. refined products) when proportioning costs on the basis of oil outflow.

3. Tug operating costs for the out years have not been adjusted for inflation.

4. Oil outflow values applied in this report correspond to the "Reference Case" assessed in the *Regulatory Assessment*. Spill rates are based on historical data for the 1992-1997 period.

   Possible reduced tank barge accident rates due to safer operations in the Puget Sound region (refer to sensitivity analysis case "K" of the *Regulatory Assessment*) were not accounted for. Based on historical spill statistics, the number barrels of oil spilled per barrel moved is more than six times higher for tank barges as compared to tankers. The Panel of Experts convened for the *Regulatory Assessment* indicated that the accident rate for tank barges in the Puget Sound region might be significantly lower than for the nation as a whole, perhaps only 43% of the national

average. To account for this expected reduction in spill rates, multiply the tank barge transit cost developed on the basis of oil outflow by 0.43.

4 SUMMARY OF ALLOCATED TUG COSTS

Assumed annualized cost of rescue tug =	$ 6,000,000			$ 4,000,000		
(All costs given on a per transit basis)	Proportioned on basis of number of transits	Proportioned on basis of barrels of oil carried	Proportioned on basis of projected oil outflow	Proportioned on basis of number of transits	Proportioned on basis of barrels of oil carried	Proportioned on basis of projected oil outflow
Year 2000						
Single Hull Tankers - Laden w/ Crude	$553	$10,067	$8,845	$369	$6,711	$5,896
Double Hull Tankers - Laden w/ Crude	$553	$10,067	$2,025	$369	$6,711	$1,350
Single Hull Tankers - Laden w/ Product	$553	$4,145	$3,642	$369	$2,763	$2,428
Double Hull Tankers - Laden w/ Product	$553	$4,145	$834	$369	$2,763	$556
Single Hull Tank Barges - Laden w/ Product	$553	$1,469	$8,320	$369	$980	$5,547
Double Hull Tank Barges - Laden w/ Product	---	---	---	---	---	---
Tankers in Ballast	$553	$235	$117	$369	$157	$78
Containerships	$553	$262	$281	$369	$175	$187
Bulk Carriers	$553	$97	$103	$369	$64	$69
Others vessels >3000 GT in size	$553	$136	$145	$369	$91	$97
Others vessels 300 to 3000 GT in size	$553	$19	$81	$369	$13	$54
Year 2005						
Single Hull Tankers - Laden w/ Crude	$514	$9,896	$10,437	$343	$6,597	$6,958
Double Hull Tankers - Laden w/ Crude	$514	$9,896	$2,389	$343	$6,597	$1,593
Single Hull Tankers - Laden w/ Product	$514	$3,960	$4,177	$343	$2,640	$2,785
Double Hull Tankers - Laden w/ Product	$514	$3,960	$956	$343	$2,640	$637
Single Hull Tank Barges - Laden w/ Product	$514	$1,408	$9,774	$343	$939	$6,516
Double Hull Tank Barges - Laden w/ Product	$514	$1,408	$2,070	$343	$939	$1,380
Tankers in Ballast	$514	$231	$140	$343	$154	$93
Containerships	$514	$275	$360	$343	$183	$240
Bulk Carriers	$514	$93	$121	$343	$62	$81
Others vessels >3000 GT in size	$514	$130	$171	$343	$87	$114
Others vessels 300 to 3000 GT in size	$514	$18	$94	$343	$12	$63
Year 2010						
Single Hull Tankers - Laden w/ Crude	$481	$9,698	$10,791	$320	$6,466	$7,194
Double Hull Tankers - Laden w/ Crude	$481	$9,698	$2,470	$320	$6,466	$1,647
Single Hull Tankers - Laden w/ Product	$481	$3,774	$4,931	$320	$2,516	$3,287
Double Hull Tankers - Laden w/ Product	$481	$3,774	$1,129	$320	$2,516	$752
Single Hull Tank Barges - Laden w/ Product	$481	$1,345	$11,832	$320	$897	$7,888
Double Hull Tank Barges - Laden w/ Product	$481	$1,345	$2,506	$320	$897	$1,670
Tankers in Ballast	$481	$227	$174	$320	$151	$116
Containerships	$481	$290	$479	$320	$193	$319
Bulk Carriers	$481	$89	$147	$320	$59	$98
Others vessels >3000 GT in size	$481	$125	$206	$320	$83	$137
Others vessels 300 to 3000 GT in size	$481	$18	$114	$320	$12	$76
Year 2015 (before final phase-out of single hull vessels)						
Single Hull Tankers - Laden w/ Crude	$437	$9,463	$11,972	$292	$6,309	$7,982
Double Hull Tankers - Laden w/ Crude	$437	$9,463	$2,741	$292	$6,309	$1,827
Single Hull Tankers - Laden w/ Product	$437	$3,582	$4,532	$292	$2,388	$3,021
Double Hull Tankers - Laden w/ Product	$437	$3,582	$1,037	$292	$2,388	$692
Single Hull Tank Barges - Laden w/ Product	$437	$1,281	$11,519	$292	$854	$7,680
Double Hull Tank Barges - Laden w/ Product	$437	$1,281	$2,439	$292	$854	$1,626
Tankers in Ballast	$437	$221	$167	$292	$148	$111
Containerships	$437	$275	$449	$292	$183	$299
Bulk Carriers	$437	$85	$138	$292	$56	$92
Others vessels >3000 GT in size	$437	$119	$195	$292	$79	$130
Others vessels 300 to 3000 GT in size	$437	$17	$108	$292	$11	$72

Table 3 Allocated Costs per Vessel Transit (Years 2000-2015)

Assumed annualized cost of rescue tug =		$ 6,000,000			$ 4,000,000	
(All costs given on a per transit basis)	Proportioned on basis of number of transits	Proportioned on basis of barrels of oil carried	Proportioned on basis of projected oil outflow	Proportioned on basis of number of transits	Proportioned on basis of barrels of oil carried	Proportioned on basis of projected oil outflow
Year 2015 (after final phase-out)						
Single Hull Tankers - Laden w/ Crude	---	---	---	---	---	---
Double Hull Tankers - Laden w/ Crude	$437	$9,463	$3,572	$292	$6,309	$2,381
Single Hull Tankers - Laden w/ Product	---	---	---	---	---	---
Double Hull Tankers - Laden w/ Product	$437	$3,582	$1,352	$292	$2,388	$901
Single Hull Tank Barges - Laden w/ Product	---	---	---	---	---	---
Double Hull Tank Barges - Laden w/ Product	$437	$1,281	$2,914	$292	$854	$1,942
Tankers in Ballast	$437	$221	$224	$292	$148	$150
Containerships	$437	$275	$604	$292	$183	$403
Bulk Carriers	$437	$85	$186	$292	$56	$124
Others vessels >3000 GT in size	$437	$119	$242	$292	$79	$162
Others vessels 300 to 3000 GT in size	$437	$17	$145	$292	$11	$97
Year 2020						
Single Hull Tankers - Laden w/ Crude	---	---	---	---	---	---
Double Hull Tankers - Laden w/ Crude	$397	$9,180	$3,300	$265	$6,120	$2,200
Single Hull Tankers - Laden w/ Product	---	---	---	---	---	---
Double Hull Tankers - Laden w/ Product	$397	$3,375	$1,213	$265	$2,250	$809
Single Hull Tank Barges - Laden w/ Product	---	---	---	---	---	---
Double Hull Tank Barges - Laden w/ Product	$397	$1,213	$2,724	$265	$808	$1,816
Tankers in Ballast	$397	$216	$208	$265	$144	$139
Containerships	$397	$259	$544	$265	$173	$363
Bulk Carriers	$397	$80	$169	$265	$54	$113
Others vessels >3000 GT in size	$397	$113	$238	$265	$75	$158
Others vessels 300 to 3000 GT in size	$397	$16	$130	$265	$11	$86
Year 2025						
Single Hull Tankers - Laden w/ Crude	---	---	---	---	---	---
Double Hull Tankers - Laden w/ Crude	$360	$8,903	$3,039	$240	$5,935	$2,026
Single Hull Tankers - Laden w/ Product	---	---	---	---	---	---
Double Hull Tankers - Laden w/ Product	$360	$3,169	$1,082	$240	$2,113	$721
Single Hull Tank Barges - Laden w/ Product	---	---	---	---	---	---
Double Hull Tank Barges - Laden w/ Product	$360	$1,144	$2,574	$240	$763	$1,716
Tankers in Ballast	$360	$209	$192	$240	$139	$128
Containerships	$360	$244	$493	$240	$163	$328
Bulk Carriers	$360	$76	$154	$240	$51	$103
Others vessels >3000 GT in size	$360	$107	$216	$240	$71	$144
Others vessels 300 to 3000 GT in size	$360	$15	$116	$240	$10	$77

Table 4 Allocated Costs per Vessel Transit (Years 2015-2025)

	No. of Transits	Oil Moved per Transit (bbls)	Oil Carried (bbls x 1000)	Projected Outflow (bbls)	Outflow per Transit (bbls/transit)	Outflow per barrel moved (bbls)
Single Hull Tankers - Laden w/ Crude	226	604,179	136,673	323.8	1.432	0.0024
Double Hull Tankers - Laden w/ Crude	93	604,179	56,060	30.4	0.328	0.0005
Single Hull Tankers - Laden w/ Product	178	248,769	44,279	104.9	0.589	0.0024
Double Hull Tankers - Laden w/ Product	73	248,769	18,162	9.9	0.135	0.0005
Single Hull Tank Barges - Laden w/ Product	188	88,185	16,579	253.2	1.347	0.0153
Double Hull Tank Barges - Laden w/ Product	0	---	---	---	--	--
Tankers in Ballast	506	14,119	7,144	9.6	0.019	0.0013
Containerships	2,440	15,736	38,396	110.9	0.045	0.0029
Bulk Carriers	5,072	5,793	29,381	84.8	0.017	0.0029
Others vessels >3000 GT in size	1,578	8,151	12,862	37.1	0.024	0.0029
Others vessels 300 to 3000 GT in size	498	1,143	569	6.5	0.013	0.0114
Total Yr 2000	10,852		360,106	971.2		
Single Hull Tankers - Laden w/ Crude	133	618,440	82,242	185.8	1.397	0.0023
Double Hull Tankers - Laden w/ Crude	178	618,440	110,093	56.9	0.320	0.0005
Single Hull Tankers - Laden w/ Product	115	247,501	28,363	64.1	0.559	0.0023
Double Hull Tankers - Laden w/ Product	153	247,501	37,968	19.6	0.128	0.0005
Single Hull Tank Barges - Laden w/ Product	146	87,983	12,815	190.6	1.309	0.0149
Double Hull Tank Barges - Laden w/ Product	55	87,983	4,870	15.3	0.277	0.0031
Tankers in Ballast	497	14,446	7,180	9.3	0.019	0.0013
Containerships	2,620	17,174	44,995	126.2	0.048	0.0028
Bulk Carriers	5,546	5,793	32,127	90.1	0.016	0.0028
Others vessels >3000 GT in size	1,680	8,150	13,692	38.4	0.023	0.0028
Others vessels 300 to 3000 GT in size	544	1,146	624	6.9	0.013	0.0110
Total Yr 2005	11,667		374,966	803.4		
Single Hull Tankers - Laden w/ Crude	60	633,308	38,067	72.8	1.212	0.0019
Double Hull Tankers - Laden w/ Crude	244	633,308	154,459	67.7	0.277	0.0004
Single Hull Tankers - Laden w/ Product	57	246,448	13,936	31.3	0.554	0.0022
Double Hull Tankers - Laden w/ Product	229	246,448	56,548	29.1	0.127	0.0005
Single Hull Tank Barges - Laden w/ Product	101	87,825	8,860	134.1	1.329	0.0151
Double Hull Tank Barges - Laden w/ Product	114	87,825	10,023	32.1	0.281	0.0032
Tankers in Ballast	492	14,831	7,297	9.6	0.020	0.0013
Containerships	2,762	18,934	52,297	148.6	0.054	0.0028
Bulk Carriers	6,064	5,793	35,127	99.8	0.016	0.0028
Others vessels >3000 GT in size	1,782	8,150	14,523	41.3	0.023	0.0028
Others vessels 300 to 3000 GT in size	580	1,144	664	7.5	0.013	0.0112
Total Yr 2010	12,485		391,799	673.9		
Single Hull Tankers - Laden w/ Crude	34	647,805	22,221	50.4	1.471	0.0023
Double Hull Tankers - Laden w/ Crude	263	647,805	170,177	88.4	0.337	0.0005
Single Hull Tankers - Laden w/ Product	35	245,210	8,694	19.7	0.557	0.0023
Double Hull Tankers - Laden w/ Product	272	245,210	66,585	34.6	0.127	0.0005
Single Hull Tank Barges - Laden w/ Product	107	87,687	9,422	152.0	1.415	0.0161
Double Hull Tank Barges - Laden w/ Product	122	87,687	10,659	36.4	0.300	0.0034
Tankers in Ballast	486	15,159	7,367	9.9	0.020	0.0014
Containerships	3,246	18,798	61,018	179.0	0.055	0.0029
Bulk Carriers	6,632	5,793	38,418	112.7	0.017	0.0029
Others vessels >3000 GT in size	1,894	8,153	15,442	45.3	0.024	0.0029
Others vessels 300 to 3000 GT in size	628	1,147	720	8.3	0.013	0.0116
Total Yr 2015 (before final phase-out))	13,719		410,722	737.0		

Table 5 Transit, Oil Movement and Spill Projections (Years 2000-2015)

	No. of Transits	Oil Moved per Transit (bbls)	Oil Carried (bbls x 1000)	Projected Outflow (bbls)	Outflow per Transit (bbls/transit)	Outflow per barrel moved (bbls)
Single Hull Tankers - Laden w/ Crude	0	---	---	---	--	--
Double Hull Tankers - Laden w/ Crude	297	647,805	192,398	96.8	0.326	0.0005
Single Hull Tankers - Laden w/ Product	0	---	---	---	--	--
Double Hull Tankers - Laden w/ Product	307	245,210	75,279	37.9	0.123	0.0005
Single Hull Tank Barges - Laden w/ Product	0	---	---	---	--	--
Double Hull Tank Barges - Laden w/ Product	229	87,687	20,080	60.9	0.266	0.0030
Tankers in Ballast	486	15,159	7,367	9.9	0.020	0.0014
Containerships	3,246	18,798	61,018	179.0	0.055	0.0029
Bulk Carriers	6,632	5,793	38,418	112.7	0.017	0.0029
Others vessels >3000 GT in size	1,894	8,153	15,442	41.9	0.022	0.0027
Others vessels 300 to 3000 GT in size	628	1,147	720	8.3	0.013	0.0116
Total Yr 2015 (after single hull phase-out)	13,719		410,722	547.4		
Single Hull Tankers - Laden w/ Crude	0	---	---	---	--	--
Double Hull Tankers - Laden w/ Crude	291	661,926	192,621	100.7	0.346	0.0005
Single Hull Tankers - Laden w/ Product	0	---	---	---	--	--
Double Hull Tankers - Laden w/ Product	331	243,395	80,564	42.1	0.127	0.0005
Single Hull Tank Barges - Laden w/ Product	0	---	---	---	--	--
Double Hull Tank Barges - Laden w/ Product	246	87,434	21,509	70.3	0.286	0.0033
Tankers in Ballast	480	15,543	7,461	10.5	0.022	0.0014
Containerships	3,816	18,678	71,274	217.9	0.057	0.0031
Bulk Carriers	7,256	5,793	42,032	128.5	0.018	0.0031
Others vessels >3000 GT in size	2,014	8,150	16,413	50.2	0.025	0.0031
Others vessels 300 to 3000 GT in size	672	1,144	769	9.1	0.014	0.0119
Total Yr 2020	15,106		432,642	629.2		
Single Hull Tankers - Laden w/ Crude	0	---	---	---	--	--
Double Hull Tankers - Laden w/ Crude	284	677,333	192,363	104.3	0.367	0.0005
Single Hull Tankers - Laden w/ Product	0	---	---	---	--	--
Double Hull Tankers - Laden w/ Product	357	241,098	86,072	46.7	0.131	0.0005
Single Hull Tank Barges - Laden w/ Product	0	---	---	---	--	--
Double Hull Tank Barges - Laden w/ Product	264	87,060	22,984	82.2	0.311	0.0036
Tankers in Ballast	475	15,905	7,555	11.0	0.023	0.0015
Containerships	4,486	18,553	83,230	267.2	0.060	0.0032
Bulk Carriers	7,940	5,793	45,994	147.7	0.019	0.0032
Others vessels >3000 GT in size	2,142	8,149	17,456	56.0	0.026	0.0032
Others vessels 300 to 3000 GT in size	730	1,146	836	10.2	0.014	0.0122
Total Yr 2025	16,678		456,490	725.3		

Table 6 Transit, Oil Movement and Spill Projections (Years 2015-2025)

Appendix F
NPS Panel Report Excerpt:
“Oil Spill consequences:
Costs of Selected Incidents”

Appendix 13 – DF Dickens Associates Ltd. – Oil Spill Consequences: Costs of Selected Spills; Report to NPS Panel 2/18/2000 (See page 33)

Oil Spill Consequences:

Costs of Selected Incidents

SUMMARY

prepared for

North Puget Sound Oil Spill Risk Management Panel

submitted

February 18, 2000

prepared by

DF Dickins Associates Ltd.
1660 Cloverdale Road
Escondido, CA 92027

Tel 760-746-8688 email dfdickins@access1 net

Oil Spill Consequences: Costs of Selected Incidents

Acknowledgments: The author wishes to acknowledge the assistance of Dagmar Etkin, Environmental Research Consulting in providing cost information on recent US spills Previous reports by Etkin (1998) formed the basis for much of the cost data reported here.

Summary

The objective of this study was to compile information on selected US and worldwide spill incidents to serve as a guide to the expected range in costs which could result from future spills Incidents were selected by first examining the full set of case studies presented in Etkin's two 1998 reports on the financial costs of spills in the US and Worldwide Criteria for compiling the subset presented here included: persistent oils (crude, bunker, fuel oil), coastal or estuarine location, and shoreline impacts

Although a few spills were included from the 1980's, the focus was on incidents from 1989 to current No effort was made to select case studies with any particular spill size or to concentrate on any particular vessel type The final selection covered 19 US incidents (2 pipeline, 7 tanker, 4 barge, 5 non tanker), and 16 worldwide incidents (10 tanker, 4 freighter, 2 barge)

Results from 30 incidents are summarized in the following two page spreadsheet. The range of costs expressed as dollars per gallon spilled from these incidents is compared with other sources in the attached table

Information on all of the spills considered in this study is contained in a detailed spreadsheet printed as a separate document Details on four incidents are also printed as a separate subset for further discussion: Nestucca (Dec 88), Exxon Valdez (Mar 89), American Trader (Feb 90), and Tenyo Maru (Jul 91) The headings used for the detailed data compilation are included here as an indication of the level of detail attempted in the study

Wherever possible, cost figures are presented in 1997 US dollar equivalents to match the bulk of the original data compiled in 1998.

It should be noted that for many incidents the available cost information (and in some cases even the volume spilled) is either estimated or incomplete While the total costs summarized here represent the most accurate data publicly available, the final figure shown will not necessarily represent the full cost to society or to a region For the more recent spills, litigation may be ongoing with the final settlement costs to be decided

Table

Spill Cost Comparison

Source	$ per Gallon Spilled	Reference
Dickins Selected US Incidents 1985-99 (all spill sizes)	$119 - $1,136 Avg. $499	D. S. Etkin (1998 & pers. comm Jan 2000)
Puget Sound /Juan de Fuca Spill Scenarios moderate * (420,000 gal)	$720	Dickins et al. (1990) States/BC Task Force
Puget Sound /Juan de Fuca Spill Scenarios large to very large * (assume 8 million gal)	$296	Dickins et al. (1990) States/BC Task Force
Nestucca Contingent Value Analysis + (moderate spills)	$1,164	Haglar Bailly for BC Gov't (1995)
Valdez Contingent Value Analysis + (large spills)	$414	Haglar Bailly for BC Gov't (1995)
Costs Avoided (considers only fatalities, injuries, ship damage, lost ship time, cargo damage)	up to $160 depending on alternative considered	US Coast Guard (Nov 1999) Table 40, p. 63

+ Calculated by using Table 5-2. Estimated Willingness to pay (WTP) over five years to avoid one moderate spill: $110 per household in WA X 1.6 million + $80 per household in BC X 1 million = 256 Million. Moderate spill considered equivalent to Nestucca in size and impacts (42,000 to 420,000 gal). Used actual Nestucca volume of 231,000 gal in calculating equivalent $1,164/gallon here. Large spill costs calculated by taking the quoted WTP figures and multiplying by 10 to cover the stated 50 year lifetime remaining for the average householder / Valdez spill volume to arrive at an equivalent large spill cost of $414 (converted from 95 to Dec 97 dollars)

* Calculated from Table 2-30 converting Cdn to US dollars at 1.3/1 and using characteristic sizes of 420,000 gallons for moderate spills, 8,000,000 gallons for large to very large spills (representing the largest spill represented by the study scenarios). Dollar figures derived from most costly scenarios (eastern part of study area). States/BC Task Force scenarios considered clean-up, fisheries losses, property damage and tourism (NRDA, punitive damages, fines and criminal penalties not included).

Note: all dollars converted to the end of 1997 using the CPI except USCG left as published. No allowance for inflation in converting 50 year CVM methodology to current value.

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Spill Cost Summary: Selected US and Worldwide Incidents, 1984-2000 (all costs in 97 US$ equivalent)

Vessel or Facility Name	Vessel Type	Date	Location	Oil Type	Total Spill Vol.	Response Cost	Natural Resource Damages	Economic Claims	TOTAL SPILL COST	TOTAL COST/GAL
					(gal)	($ per gal. spilled)	($ per gal. spilled)	($ per gal. spilled)	(millions)	($ per gal. spilled)
US SPILLS										
Arco Anchorage	Tanker	31-Dec-85	WA	Crude	189,000	143	3		**27.2**	**143**
Apex Houston	Barge	28-Jan-86	CA	Crude	25,000	2	481		**12.11**	**484**
Glacier Bay	Tanker	2-Jul-87	AK	Crude	60,000	68		1,416	**89.18**	**1,486**
Nestucca	Barge	23-Dec-88	WA	Fuel Oil	231,000	56	57	4	**27.68**	**119**
Exxon Valdez	Tanker	24-Mar-89	AK	Crude	11,000,000	306	140	665	**12,262.95**	**1,114**
American Trader	Tanker	7-Feb-90	CA	Crude	417,000	36	29	54	**59.52**	**142**
Sammi Superstars/Maui	Freighter	8-Jan-91	CA	Fuel Oil	32,064	620			**20**	**623**
Texaco Anacortes	Refinery	22-Feb-91	WA	Crude	27,300				**11**	**402**
Tenyo Maru	Fishing Vessel	22-Jul-91	WA/BC	Fuel oil, diesel	173,000	88	65	in NRDA	**28.33**	**163**
Union Oil	Pipeline	3-Aug-92	CA	Crude	14,700	1,006	108		**16.7**	**1,136**
Morris J. Berman	Barge	7-Jan-94	Puerto Rico	Fuel Oil	789,000	111	9	7	**182.14**	**230**
Barge 101	Barge	31-Dec-94	WA	Diesel	26,900					
Kure	Freighter	5-Nov-97	CA	Fuel oil	4,500	2,222				
Kuroshima	Freighter (Fish)	26-Nov-97	AK	Fuel oil	47,000	159			**11.5**	**244**
Command	Tanker	28-Sep-98	CA	Fuel Oil	51,450	23			**9.4**	**182**
New Carissa	Freighter	4-Feb-99	OR	Fuel oil	70,000	328			**36.5**	**521**
US Averages					**822370**	**369**	**112**	**429**	**914**	**499**
US Avg. excl Valdez					**145328**	**374**	**107**	**370**	**41**	**451**

DF Dickins Associates Ltd. from D.S. Etkin (98 and current), Harper et al. (95) and OSIR (29/7/99, 30/12/99, 20/01/00)

Spill Cost Summary: Selected US and Worldwide Incidents, 1984-2000 (all costs in 97 US$ equivalent)

Vessel or Facility Name	Vessel Type	Date	Location	Oil Type	Total Spill Vol.	Response Cost	Natural Resource Damages	Economic Claims	TOTAL SPILL COST	TOTAL COST/GAL
WORLDWIDE SPILLS										
Maritime Gardenia	Bulker	24-Jan-90	Japan	Fuel oil	242,000	31			**7.72**	**31**
Vista Bella	Barge	6-Mar-91	Caribbean	Bunker	588,000	10			**5.97**	**10**
Agip Abruzzo	Tanker	11-Apr-91	Italy	Crude + bunker	588,000	41			**29.4**	**50**
Haven	Tanker	4-Apr-91	Italy	Crude	6,000,000	38	113	1.89	**927.07**	**154**
Arisan	Ore Carrier	12-Jan-92	Norway	Fuel Oil	44,000	129			**5.68**	**129**
Aegean Sea	Tanker	3-Dec-92	Spain	Crude	21,900,000	1.44		12	**313.83**	**14**
Taiko Maru	Tanker	########	Japan	Fuel oil	153,000	67		78	**22.34**	**146**
Keumdong No.5	Barge	27-Sep-93	S. Korea	Fuel Oil	391,000	18		687	**301.44**	**770**
Sea Prince	Tanker	23-Jul-95	S.Korea	Fuel Oil	412,000	61		680	**305.17**	**740**
Yeo Myung	Tanker	3-Aug-95	S. Korea	Fuel Oil	12,000	117		775	**10.73**	**894**
Honan Sapphire	Tanker	17-Nov-95	S. Korea	Crude	370,400	32		167	**74.08**	**200**
Sea Empress	Tanker	15-Feb-96	UK	Crude + fuel oil	21,274,000	1.45	12.34	10	**479**	**22**
Nakhodka	Tanker	2-Jan-97	Japan	Fuel oil	2,288,000	94		36	**286.9**	**125**
Erika	Freighter	12-Dec-99	France	Fuel oil	2,800,000	Ongoing	Ongoing	16	**Ongoing**	**Ongoing**
AVERAGES					**4174031**	**49**	**63**	**246**	**213**	**253**

DF Dickins Associates Ltd. from D.S. Etkin (98 and current), Harper et al. (95) and OSIR (29/7/99, 30/12/99, 20/01/00)

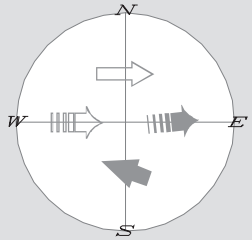
Appendix G
Summary of Additional Tug Drills

Summary of Additional Tug Drills

Date	Event I.D.	Vessel Name	Vessel Type	Tug Name	Tug Comments
02/19/00	0219-1			BARBARA FOSS	1200 U/W FOR ORVILLE HOOK DRILL. DROP PICK UP BUOY 1 MILE OUT FROM NEAH BAY. DEPLOY ORVILLE HOOK, PICK UP BUOY. ALL WENT WELL. FIRE & BOAT DRILL, SAFETY MEETING, LINE GUN DRILL, ETC.
02/19/00	*0219-2*	*VICTORY III*	*TANK SHIP*	*BARBARA FOSS*	*SHIP SPEED 10.5 KTS. RAN ON PORT SIDE OF SHIP 300 FT OFF. NO OTHER TRAFFIC. 2305 FIN. ESCORT 3.7 MILES EAST OF BUOY "J" RUN LITE FOR NEAH BAY - A/F NEAH BAY @ 2350*
02/27/00	0227-1			BARBARA FOSS	SVEN P. EKLOF ONBOARD DEPART NEAH BAY FOR ORVILLE HOOK DRILL 1 MILE NE NEAH BAY. ALL WENT WELL. HOOKED BUOY THIRD PASS.
02/27/00	0227-2			BARBARA FOSS	RUN LITE TO DRILL AREA. PASSED CABLE VESSEL. SEA SPREAD 1/2 MILE CPA.
03/11/00	0311-1			BARBARA FOSS	DEPART MAKAH MARINA, NEAH BAY TO 1 MI. E[AST] OF SAIL RK. 48-21.5N, 124-30.8W FOR ORVILLE HOOK DRILLS. DROP TARGET & PICK UP WITH ORVILLE HOOK 3 TIMES, CREW ALSO VIEW ORVILLE HOOK VIDEO.
03/25/00	0325-1	BUOY "J"	BUOY	BARBARA FOSS	RUN FULL FROM ENT OF NEAH BAY @ BUOY #1 TO BUOY J, TIME DIST RUN AND SPD MADE GOOD. AVG SPD M/G FM BUOY #1 TO BUOY "J" 11.5 KTS.
03/26/00	0326-1			BARBARA FOSS	DEPLOY BUOY W/ 25' OF LASH CHAIN & RETRIEVE W/ ORVILLE HOOK. WENT WELL -- MATE & CAPT BOTH TOOK TURNS & CREW DID FINE.
03/28/00	0328-01		FISHING	BARBARA FOSS	DRILL: FISHING VESSEL ON FIRE IN NEAH BAY. RUN LITE TO FISHING VESSEL LAUNCH SKIFF WITH PORTABLE FIRE PUMP AND FIRE HOSE. ALL WENT WELL. SLOW PUMP IN SKIFF WITH SUCTION AND SHORT FIRE HOSE.
4/19/00	0419-1			BARBARA FOSS	RUN OUT & DEPLOY ORVILLE HOOK & HOLD FIRE & BOAT DRILLS. CREW DEPLOY & P/U ORVILLE HOOK & BUOY W/ CHAIN. MATE & CAPT HOOK UP WITH BUOY & CHAIN, SECURE AND HOLD FIRE AND BOAT DRILLS, ALL WENT FINE.
5/1/00	0501-1	ALBATROSS	BULK CARRIER	BARBARA FOSS	SELF-DRILL. RUN LITE TO 48-19'N 124-23'W. TO BULK CARRIER 'ALBATROSS' WITH POWER FAILURE, DIW. DEPART DIW SITE RUN TO 48-21.9N 124-32W. DROP ANCHOR AND EXERCISE ANCHOR. 1505 ANCHOR. 1630 ANCHOR UP. & LITE TO HBR.
05/06/00	0506-1			BARBARA FOSS	SELF-DRILL. RUN LITE TO 48-24.4N 124-36.74W. BACK TO ANCHOR WAADAH IS. AWAIT INCOMING TIDE.
5/7/00	0507-1			BARBARA FOSS	AT ANCHOR WAADAH IS. DEPART FOR ORVILLE HOOK DRILL. ORVILLE HOOK DRILL. FIRE & BOAT DRILL. SAFETY MEETING.
5/13/00	*0513-1*	*LAURA D'AMATO*	*TANK SHIP*	*BARBARA FOSS*	*STANDBY @ APPROX. 3 NM DUE WEST OF BUOY J & SHADOW 'LAURA D'AMATO' TO APPROX. 3 NM SE OF BUOY J. FLANK 'LAURA D'AMATO' ON HER STBD SIDE @ 0.02 NM FOR 5.5 NM @ 12.7 KTS. FRM TIME @1335.*
05/28/00	0528-1			BARBARA FOSS	SELF-DRILL. RUN LITE TO 124.40 FOR SELF NOTIFIED DRILL. BROKEN DOWN SHIP. ALL WENT WELL. GOOD WEATHER.
6/1/00	0601-1			BARBARA FOSS	WAADAH IS., 1.48 MILE NORTH OF. ORVILLE HOOK DRILL. DROP BUOY PICK UP. FIRE & BOAT DRILL. SAFETY MEETING. ALL WENT WELL. BRUCE REED, MIKE SUTTON ONBOARD FOR DRILL FROM FOSS.
6/4/00	0604-1			BARBARA FOSS	R/L TO 124-39.07 W FOR BROKEN DOWN SHIP. ALL WENT WELL RAN AT 800 RPM'S.

Appendix H
Rescue Tug Drill & Response Maps

Rescue Tug Drill Report #0106-1
Ship - ICHI MARU
Tug - BARBARA FOSS
1/6/00



Neah Bay

Port Angeles

		Ship distress call location
		Tug/Ship Intercept location
10		Wind speed(knots) and direction
0.5		Current speed(knots) and direction
1		Sea height(feet) and direction
7		Swell height(feet) and direction
		Navigation Buoy - J

11:16	Time notified
11:23	Depart time
18:22	Intercept time
18:35	Release time
23:40	Return time
62	Distance to intercept
885	Tug RPM

Nautical Miles
0 6 12

Tug Notes:
bucked sly after duntz rock buoy for trip av. 8.9k

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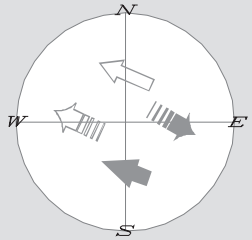
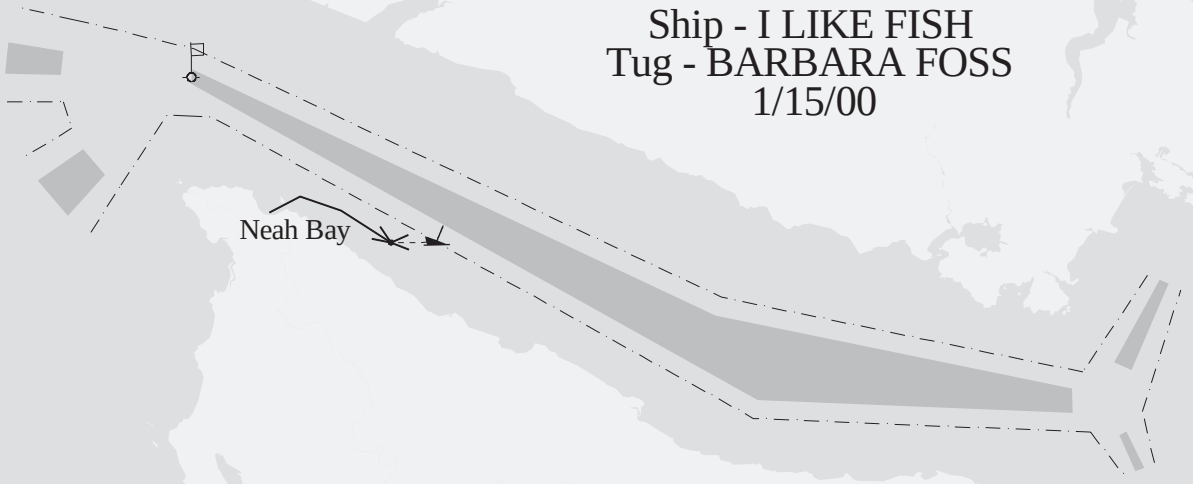
Rescue Tug Drill Report #0115-1
Ship - I LIKE FISH
Tug - BARBARA FOSS
1/15/00





	Ship distress call location
	Tug/Ship Intercept location
25	Wind speed(knots) and direction
1.4	Current speed(knots) and direction
3	Sea height(feet) and direction
4	Swell height(feet) and direction
	Navigation Buoy - J

16:21	Time notified
16:30	Depart time
17:23	Intercept time
17:23	Release time
18:20	Return time
7.1	Distance to intercept
902	Tug RPM

Tug Notes:

went well. time to dept. neah bay takes approx 15-20 min. due to having to idle out of marina thru pinnacles.

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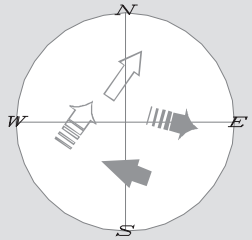
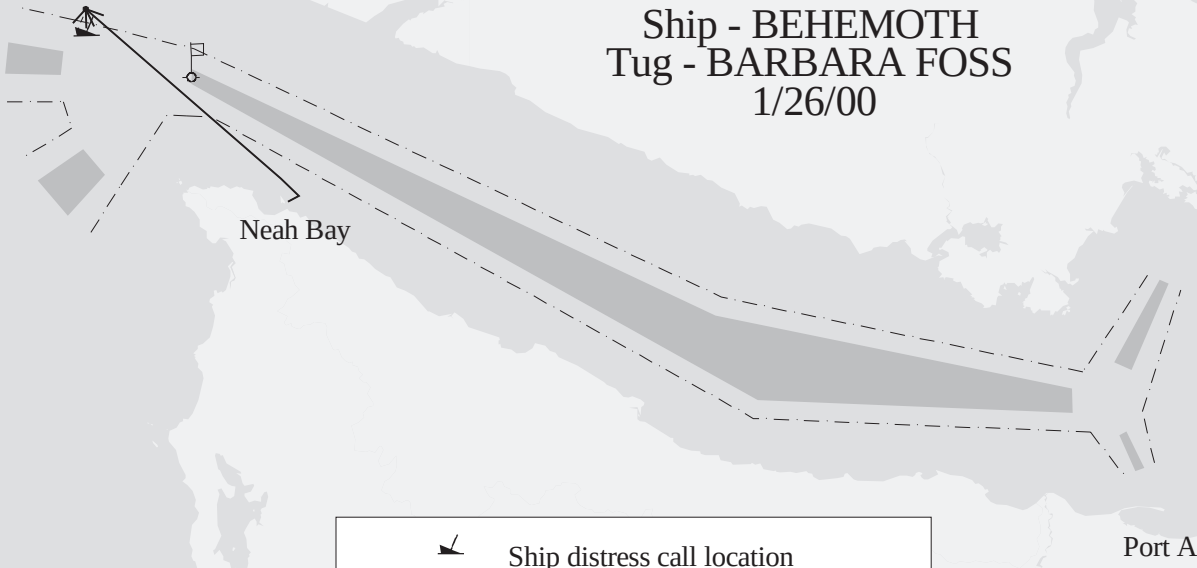
Rescue Tug Drill Report #0126-1
Ship - BEHEMOTH
Tug - BARBARA FOSS
1/26/00



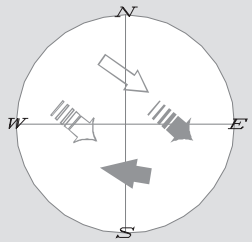


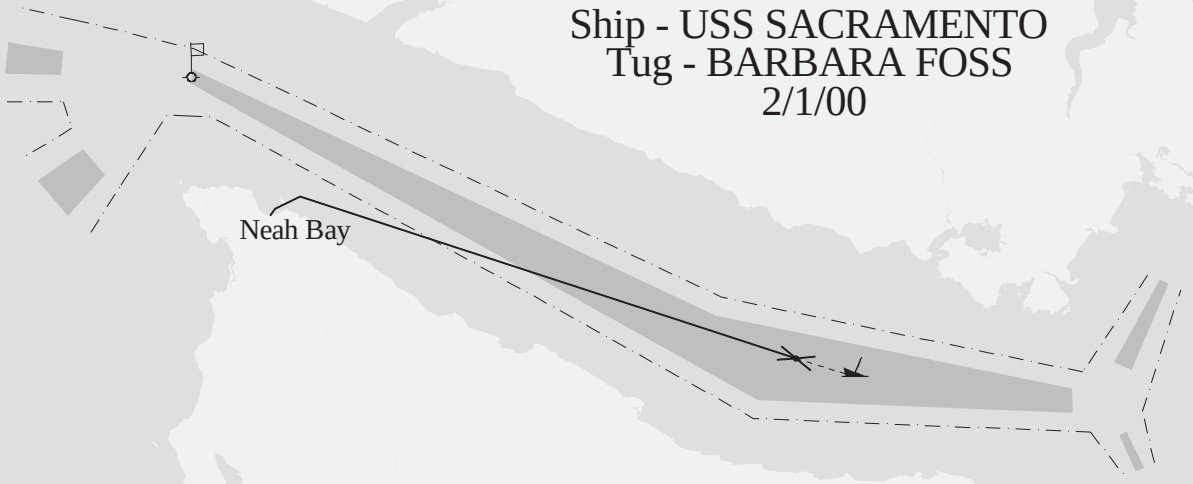
		Ship distress call location
		Tug/Ship Intercept location
15		Wind speed(knots) and direction
1.3		Current speed(knots) and direction
1		Sea height(feet) and direction
5		Swell height(feet) and direction
		Navigation Buoy - J

8:50	Time notified
8:55	Depart time
10:20	Intercept time
10:23	Release time
11:45	Return time
15	Distance to intercept
900	Tug RPM

Tug Notes:
exercise went well. no problems. all systems running well.

Rescue Tug Drill Report #0201-1
Ship - USS SACRAMENTO
Tug - BARBARA FOSS
2/1/00





		Ship distress call location
		Tug/Ship Intercept location
12		Wind speed(knots) and direction
1.9		Current speed(knots) and direction
1.5		Sea height(feet) and direction
5		Swell height(feet) and direction
		Navigation Buoy - J

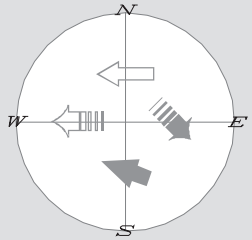
14:40	Time notified
14:50	Depart time
17:23	Intercept time
17:45	Release time
20:30	Return time
30.5	Distance to intercept
900	Tug RPM

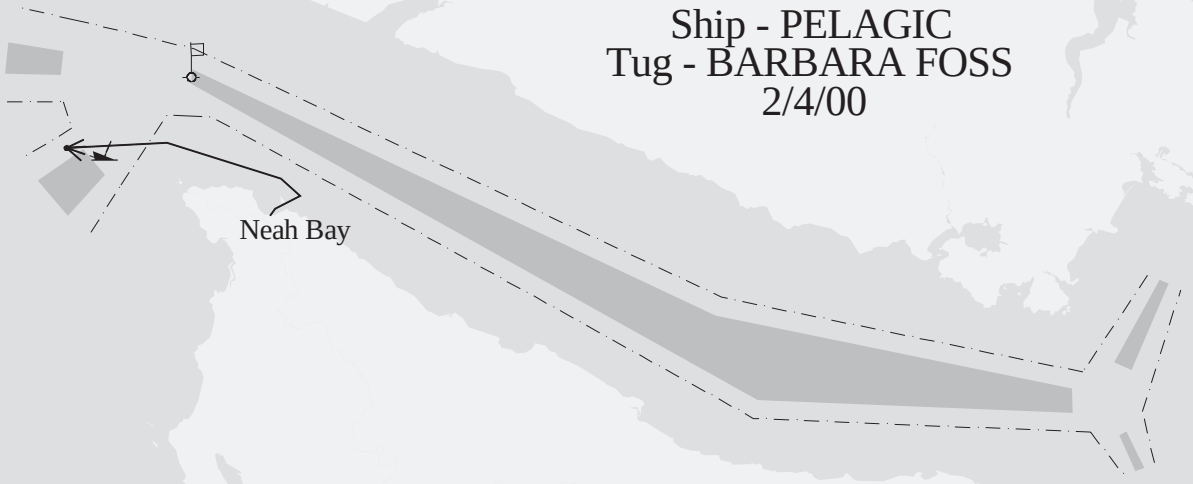
Tug Notes:

run 30.5 n.m. in 2.7 hours. 11.1 knots. slowed once for deep draft traffic approx. 4 minutes. heaving line from ship. pick up three passengers from stern. turned with swell crew wet on back deck.

Wa. Dept. of Ecology, GIS Technical Services 10/12/00

Rescue Tug Drill Report #0204-1
Ship - PELAGIC
Tug - BARBARA FOSS
2/4/00





		Ship distress call location
		Tug/Ship Intercept location
20		Wind speed(knots) and direction
0.8		Current speed(knots) and direction
3		Sea height(feet) and direction
10		Swell height(feet) and direction
		Navigation Buoy - J

9:50	Time notified
9:55	Depart time
11:13	Intercept time
11:15	Release time
12:40	Return time
15.9	Distance to intercept
900	Tug RPM

Tug Notes:
tanker pelagic lost steering and power

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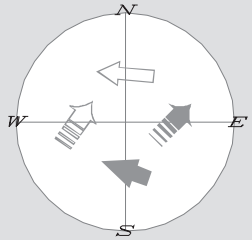
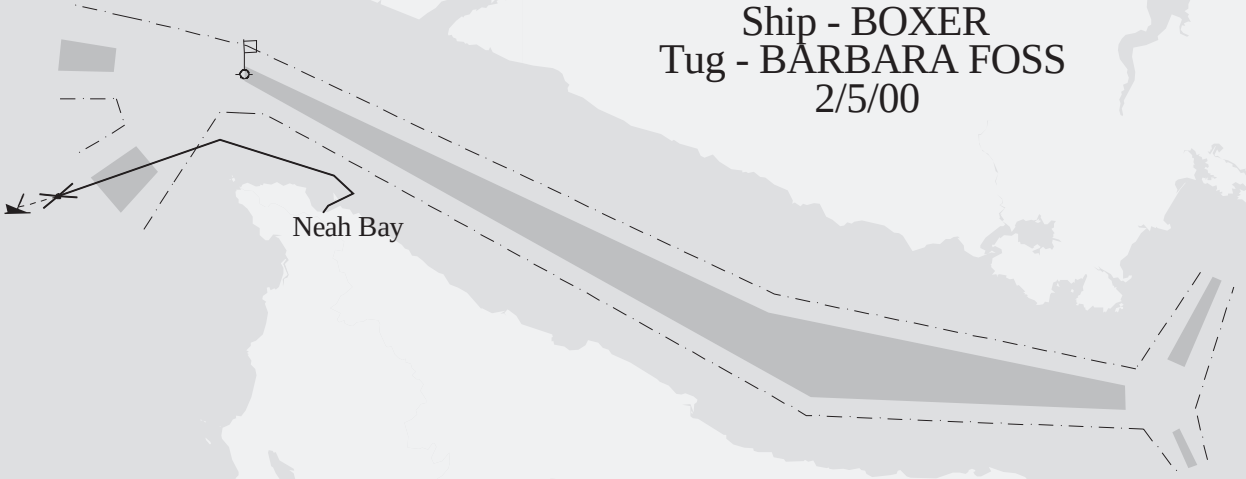
Rescue Tug Drill Report #0205-1
Ship - BOXER
Tug - BARBARA FOSS
2/5/00





		Ship distress call location
		Tug/Ship Intercept location
13		Wind speed(knots) and direction
1.5		Current speed(knots) and direction
1		Sea height(feet) and direction
6		Swell height(feet) and direction
		Navigation Buoy - J

21:21	Time notified
21:27	Depart time
23:00	Intercept time
23:00	Release time
0:30	Return time
17.5	Distance to intercept
900	Tug RPM

Tug Notes:

dist travel approx 17.2 n.m. - avg. 10.5 kts from dock to p.a.
all went well

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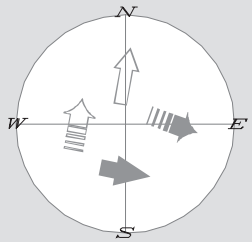
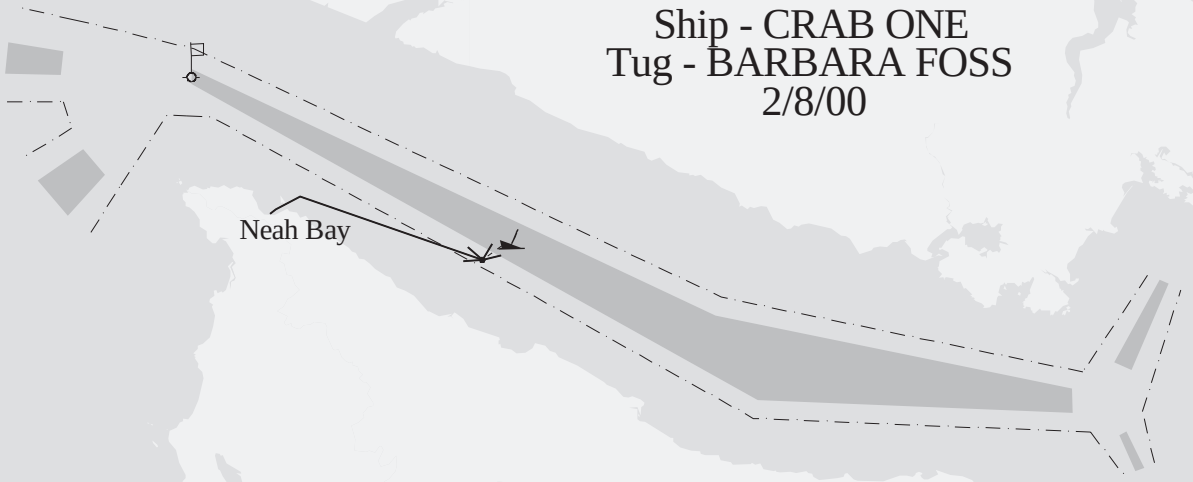
Rescue Tug Drill Report #0208-1

Ship - CRAB ONE

Tug - BARBARA FOSS

2/8/00





		Ship distress call location
		Tug/Ship Intercept location
15		Wind speed(knots) and direction
0.3		Current speed(knots) and direction
1.5		Sea height(feet) and direction
1		Swell height(feet) and direction
		Navigation Buoy - J

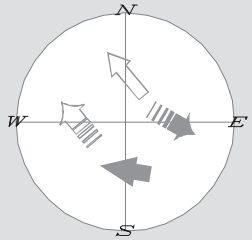
15:45	Time notified
16:00	Depart time
17:02	Intercept time
17:34	Release time
19:25	Return time
13	Distance to intercept
900	Tug RPM

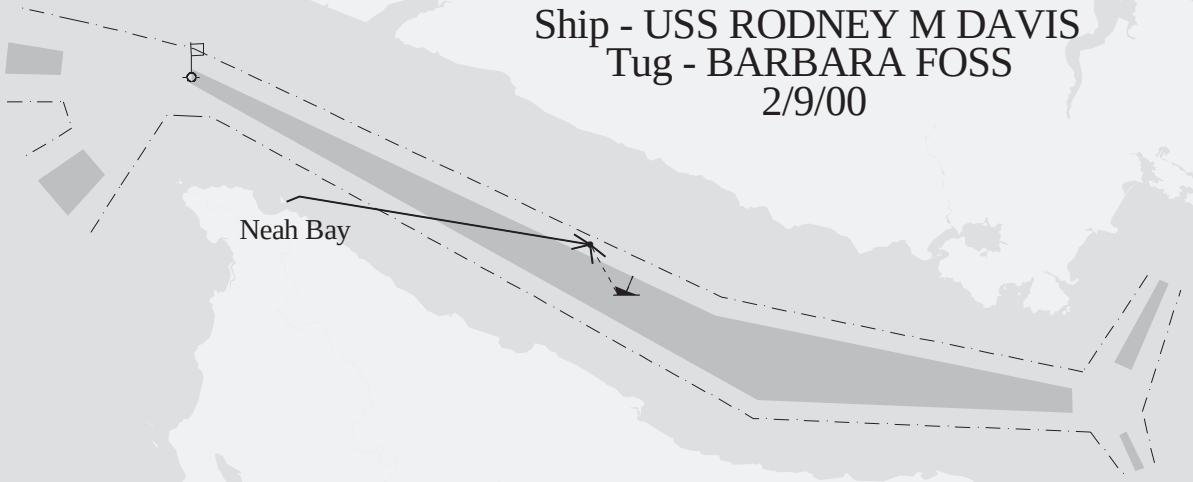
Tug Notes:

run 13 miles in 1 hr 2 min = 12.6 kts. set & drift 113 t 2.4k

Wa. Dept. of Ecology, GIS Technical Services 10/12/00

Rescue Tug Drill Report #0209-1
Ship - USS RODNEY M DAVIS
Tug - BARBARA FOSS
2/9/00





		Ship distress call location
		Tug/Ship Intercept location
15		Wind speed(knots) and direction
1.3		Current speed(knots) and direction
2		Sea height(feet) and direction
4		Swell height(feet) and direction
		Navigation Buoy - J

8:25	Time notified
8:35	Depart time
10:10	Intercept time
10:22	Release time
11:45	Return time
17.4	Distance to intercept
900	Tug RPM

Tug Notes:

uss rodney m davis adrift in p.a. 48-18.8n, 124-08.6w. has engine room casualties as per seattle vts. no problem. dist trvl frm dept 17.4 nm time run frm dept 1 hr 35 m - avg spd 11.2 kts

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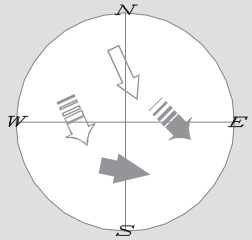
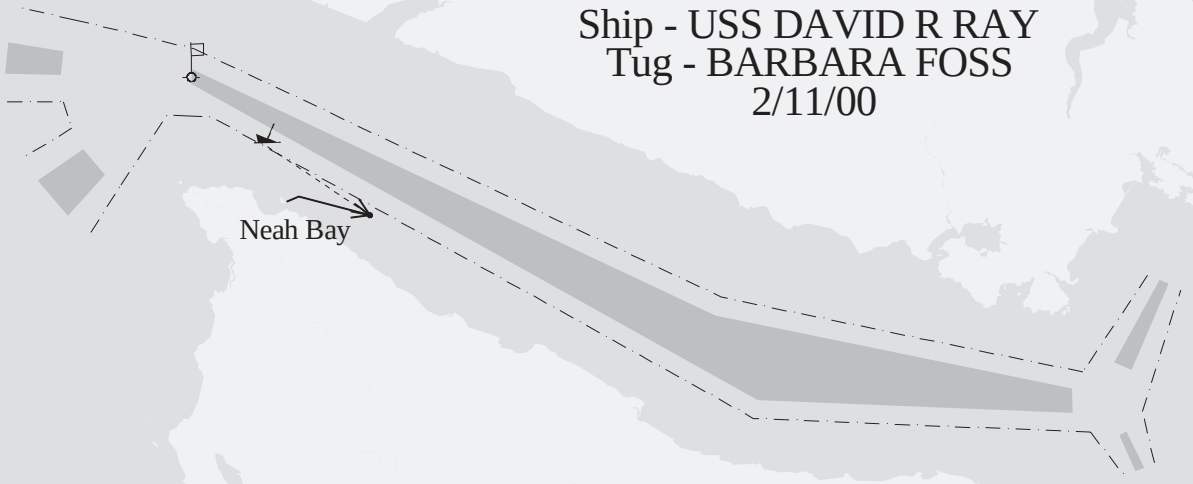
Rescue Tug Drill Report #0211-1
Ship - USS DAVID R RAY
Tug - BARBARA FOSS
2/11/00





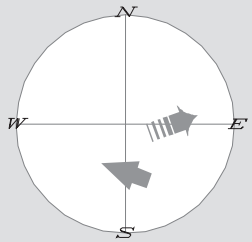
		Ship distress call location
		Tug/Ship Intercept location
5		Wind speed(knots) and direction
0.5		Current speed(knots) and direction
0.5		Sea height(feet) and direction
3		Swell height(feet) and direction
		Navigation Buoy - J

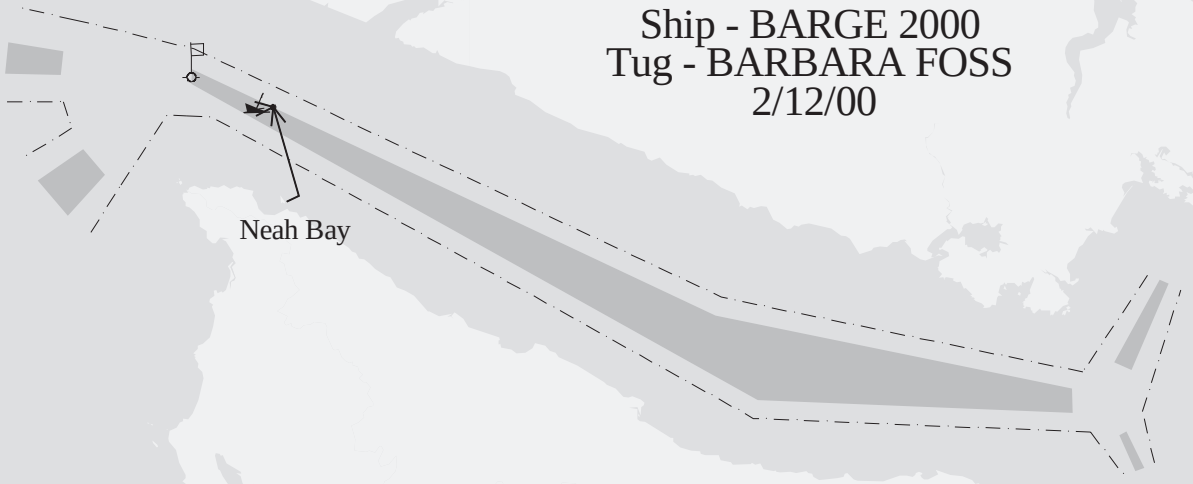
4:40	Time notified
4:49	Depart time
5:22	Intercept time
5:22	Release time
6:15	Return time
7.5	Distance to intercept
900	Tug RPM

Tug Notes:

tug comments: rendezvous with uss david r. rey. 7.5 nm dist run @ 32 min from dk dept. avg spd 14.1 kts. all went well.

Rescue Tug Drill Report #0212-1
Ship - BARGE 2000
Tug - BARBARA FOSS
2/12/00





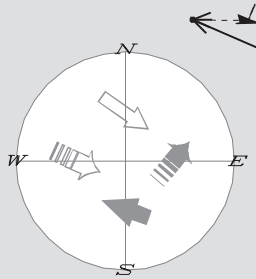
		Ship distress call location
		Tug/Ship Intercept location
0		Wind speed(knots) and direction
1		Current speed(knots) and direction
0		Sea height(feet) and direction
5		Swell height(feet) and direction
		Navigation Buoy - J

15:24	Time notified
15:36	Depart time
16:14	Intercept time
16:15	Release time
17:15	Return time
6.4	Distance to intercept
900	Tug RPM

Tug Notes:
all went well. dist run 6.4 nm 1 hr 39 min. avg spd 10.2 kts.

Wa. Dept. of Ecology, GIS Technical Services 10/12/00

Rescue Tug Drill Report #0214-1
Ship - CANOPUS
Tug - BARBARA FOSS
2/14/00



Neah Bay

Port Angeles

	Ship distress call location
	Tug/Ship Intercept location
20	Wind speed(knots) and direction
1.4	Current speed(knots) and direction
2	Sea height(feet) and direction
3	Swell height(feet) and direction
	Navigation Buoy - J

13:41	Time notified
13:46	Depart time
15:47	Intercept time
15:47	Release time
18:20	Return time
26	Distance to intercept
Unk	Tug RPM

Tug Notes:

variable engine rpm. running time 121 min and run of 26 nm for a avg trip spd of 13 kts. fin going. no problems.

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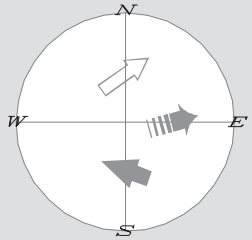
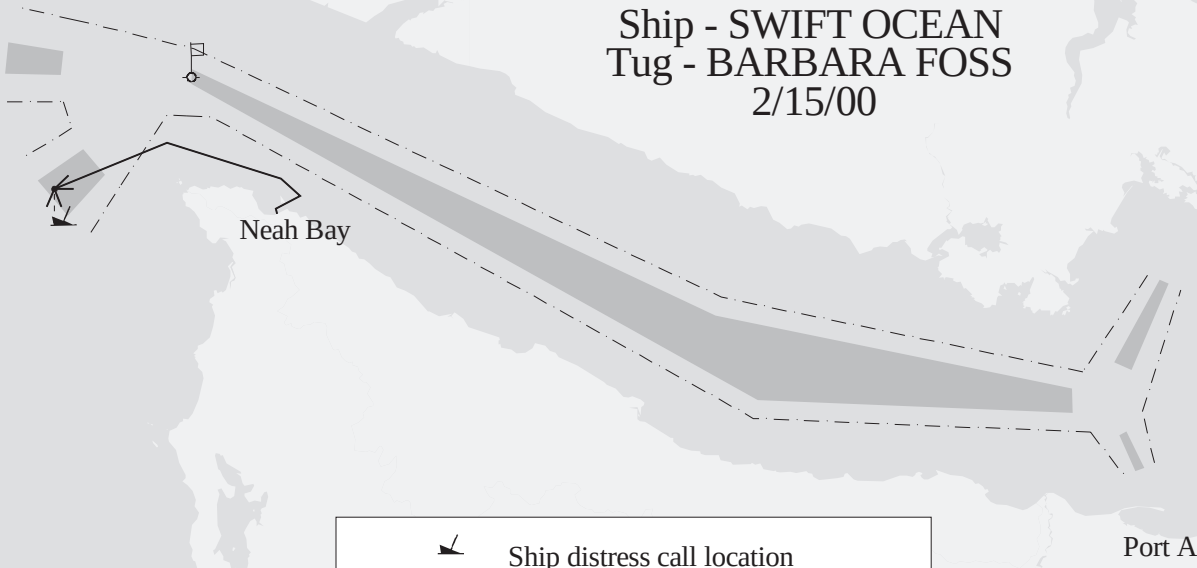
Rescue Tug Drill Report #0215-1

Ship - SWIFT OCEAN

Tug - BARBARA FOSS

2/15/00





		Ship distress call location
		Tug/Ship Intercept location
10		Wind speed(knots) and direction
2		Current speed(knots) and direction
0		Sea height(feet) and direction
10		Swell height(feet) and direction
		Navigation Buoy - J

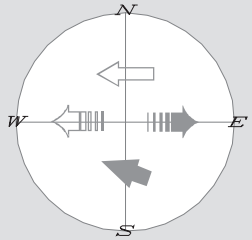
15:37	Time notified
15:47	Depart time
17:04	Intercept time
17:04	Release time
18:40	Return time
15	Distance to intercept
900	Tug RPM

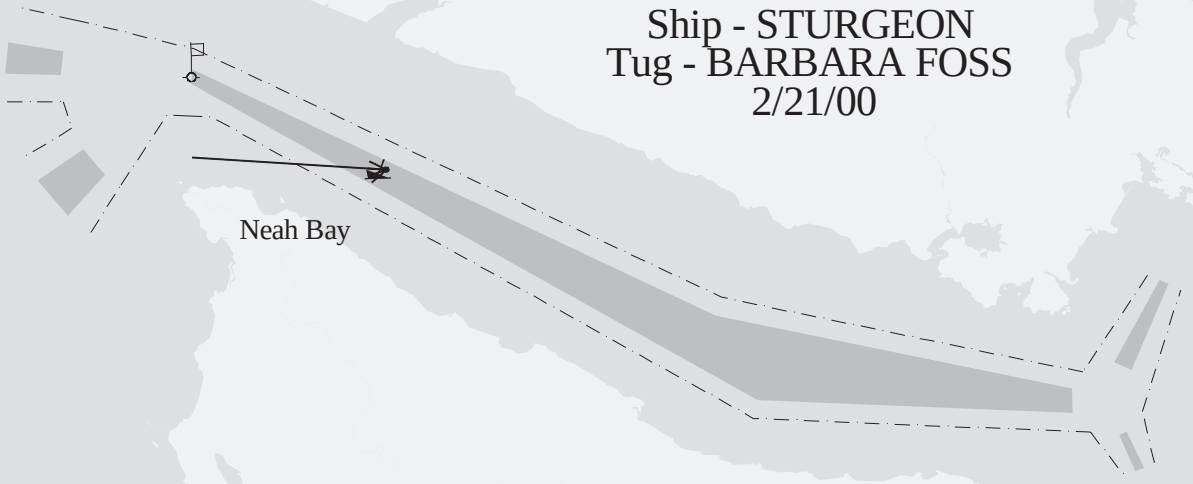
Tug Notes:

all went fine. 15 nm run from neah bay - running time @ dept 1 hr 17 m - avg spd - 11.7 kts

Wa. Dept. of Ecology, GIS Technical Services 10/12/00

Rescue Tug Drill Report #0221-1
Ship - STURGEON
Tug - BARBARA FOSS
2/21/00





		Ship distress call location
		Tug/Ship Intercept location
12		Wind speed(knots) and direction
0.2		Current speed(knots) and direction
1		Sea height(feet) and direction
5		Swell height(feet) and direction
		Navigation Buoy - J

12:36	Time notified
12:36	Depart time
13:25	Intercept time
13:25	Release time
14:05	Return time
10.2	Distance to intercept
800	Tug RPM

Tug Notes:
when called we were at tatoosh i. on warm up cruise.

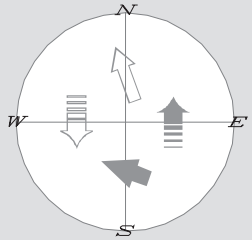
Wa. Dept. of Ecology, GIS Technical Services 11/01/00

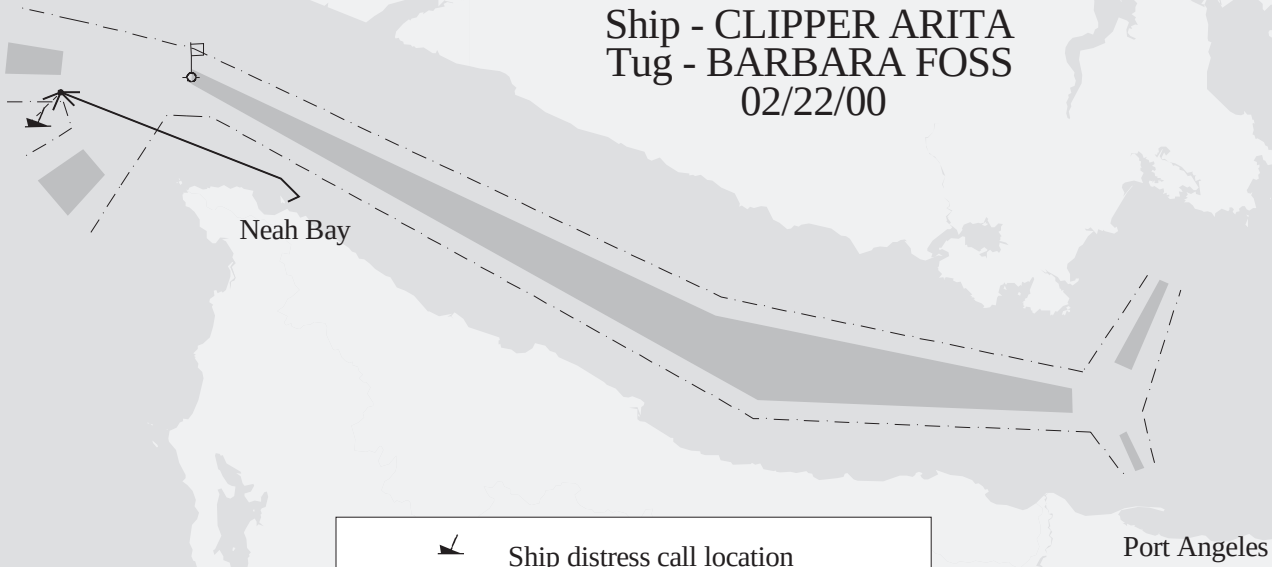
Rescue Tug Response Report #0222-1

Ship - CLIPPER ARITA

Tug - BARBARA FOSS

02/22/00





		Ship distress call location
		Tug/Ship Intercept location
25		Wind speed(knots) and direction
0.4		Current speed(knots) and direction
5		Sea height(feet) and direction
12		Swell height(feet) and direction
		Navigation Buoy - J

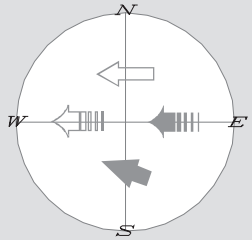
13:06	Time notified
13:17	Depart time
14:37	Intercept time
14:37	Release time
16:02	Return time
13.6	Distance to intercept
905	Tug RPM

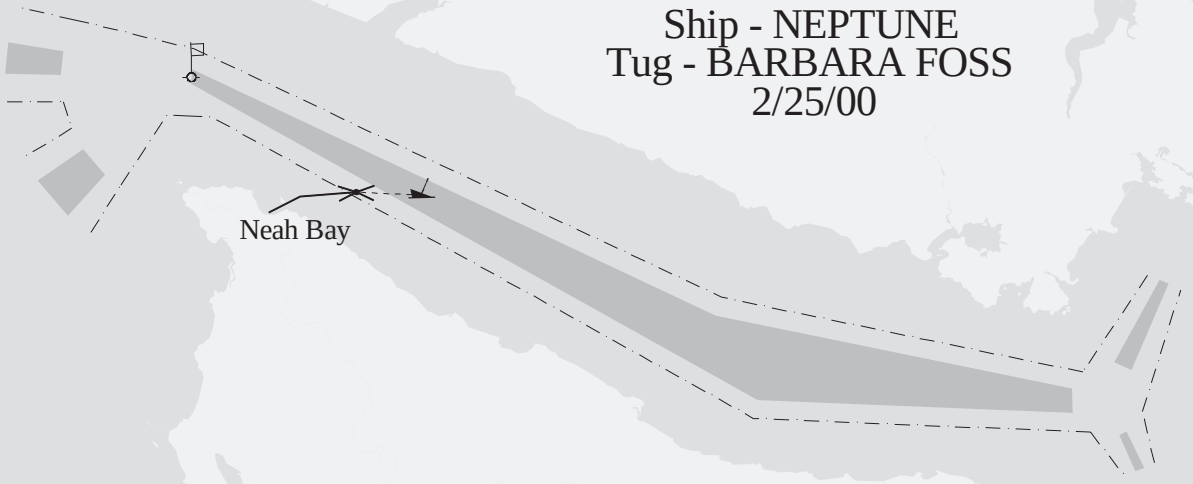
Tug Notes:

vessel adrift making repairs 8 nm west of buoy j. drifting westerly @ 0.5 kn. tofino traffic released tug 1.3 nm east of ship.

Wa. Dept. of Ecology, GIS Technical Services 10/13/00

Rescue Tug Drill Report #0225-1
Ship - NEPTUNE
Tug - BARBARA FOSS
2/25/00





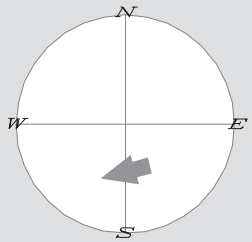
		Ship distress call location
		Tug/Ship Intercept location
22		Wind speed(knots) and direction
1.5		Current speed(knots) and direction
2		Sea height(feet) and direction
3		Swell height(feet) and direction
		Navigation Buoy - J

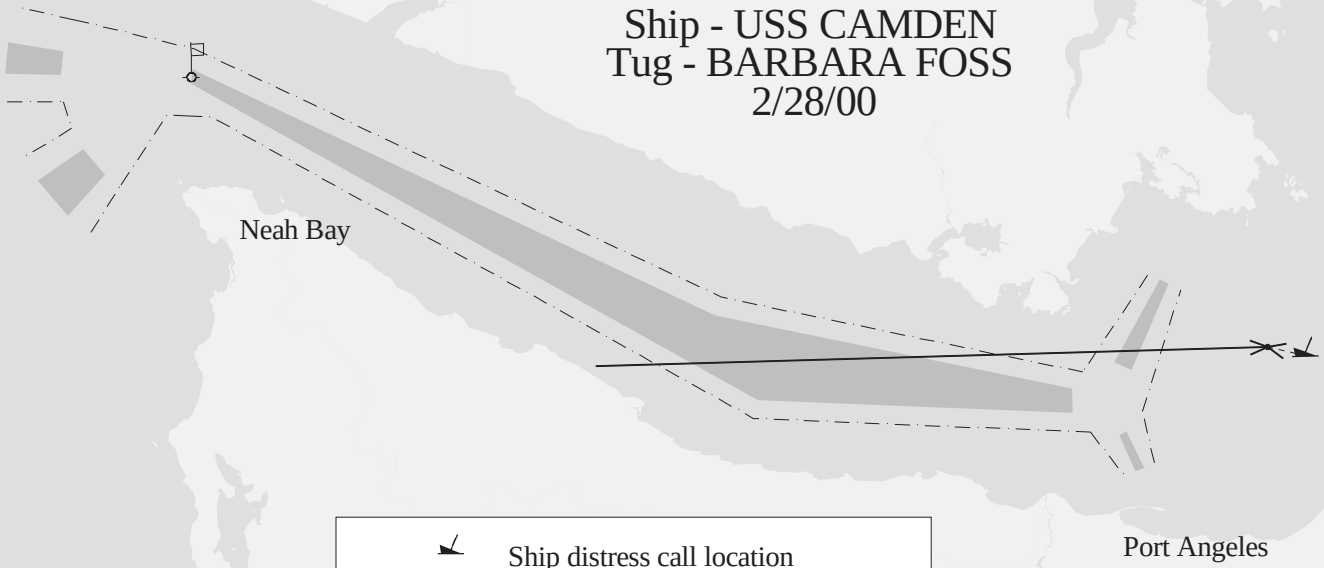
10:29	Time notified
10:37	Depart time
11:10	Intercept time
11:11	Release time
11:39	Return time
7.1	Distance to intercept
900	Tug RPM

Tug Notes:

mv neptune lost steerin in inbound traffic lane. mild weather. all went well.

Rescue Tug Drill Report #0228-1
Ship - USS CAMDEN
Tug - BARBARA FOSS
2/28/00





		Ship distress call location
		Tug/Ship Intercept location
0		Wind speed(knots) and direction
0.6		Current speed(knots) and direction
0		Sea height(feet) and direction
0		Swell height(feet) and direction
		Navigation Buoy - J

1:05	Time notified
1:05	Depart time
4:00	Intercept time
4:00	Release time
8:50	Return time
40	Distance to intercept
900	Tug RPM

Tug Notes:

uss camden loss of power & drifting nw towards constance bank.
uss camden finished drills when we were about 1.5 miles from him.

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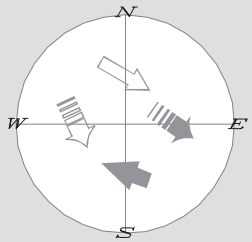
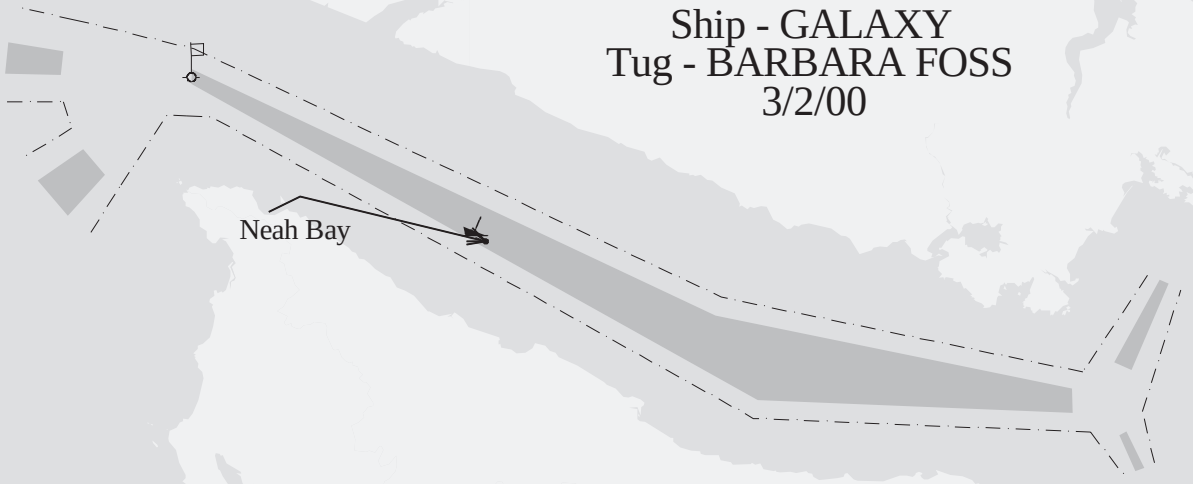
Rescue Tug Drill Report #0302-1
Ship - GALAXY
Tug - BARBARA FOSS
3/2/00





		Ship distress call location
		Tug/Ship Intercept location
12		Wind speed(knots) and direction
1		Current speed(knots) and direction
1		Sea height(feet) and direction
4		Swell height(feet) and direction
		Navigation Buoy - J

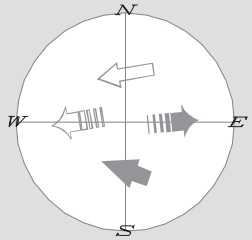
14:09	Time notified
14:24	Depart time
15:27	Intercept time
15:27	Release time
16:36	Return time
11	Distance to intercept
900	Tug RPM

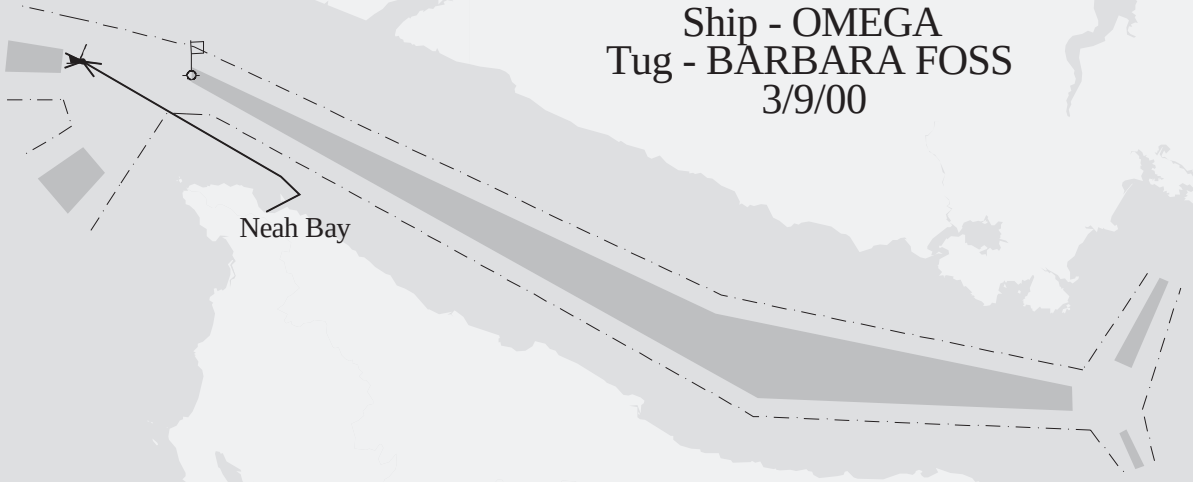
Tug Notes:

galaxy lost steering and drift 115 t at 1 k. we were loading grub at the time. joe was at the store, still u/w in 15 minutes.
called on channel 16 by tofino traffic.

Wa. Dept. of Ecology, GIS Technical Services 10/12/00

Rescue Tug Drill Report #0309-1
Ship - OMEGA
Tug - BARBARA FOSS
3/9/00



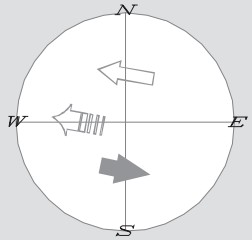


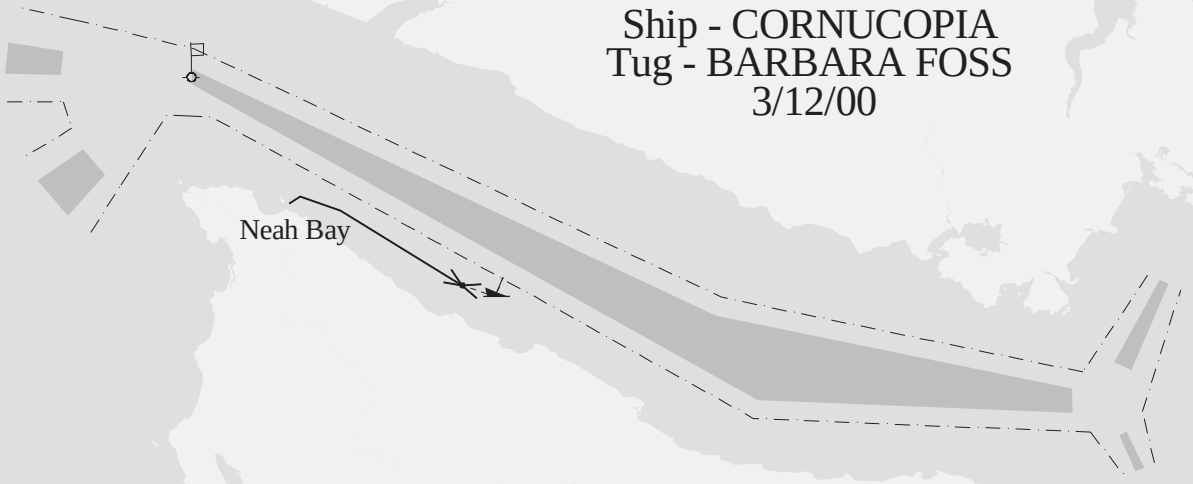
		Ship distress call location
		Tug/Ship Intercept location
10		Wind speed(knots) and direction
0.2		Current speed(knots) and direction
1		Sea height(feet) and direction
6		Swell height(feet) and direction
		Navigation Buoy - J

18:25	Time notified
18:36	Depart time
19:55	Intercept time
20:47	Release time
22:30	Return time
15.5	Distance to intercept
900	Tug RPM

Tug Notes:
set 270 t, drift 0.3 k drifted for 41 min. for 0.25 miles.

Rescue Tug Drill Report #0312-1
Ship - CORNUCOPIA
Tug - BARBARA FOSS
3/12/00



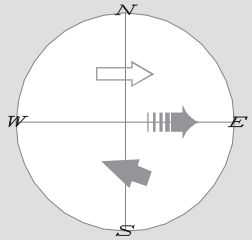


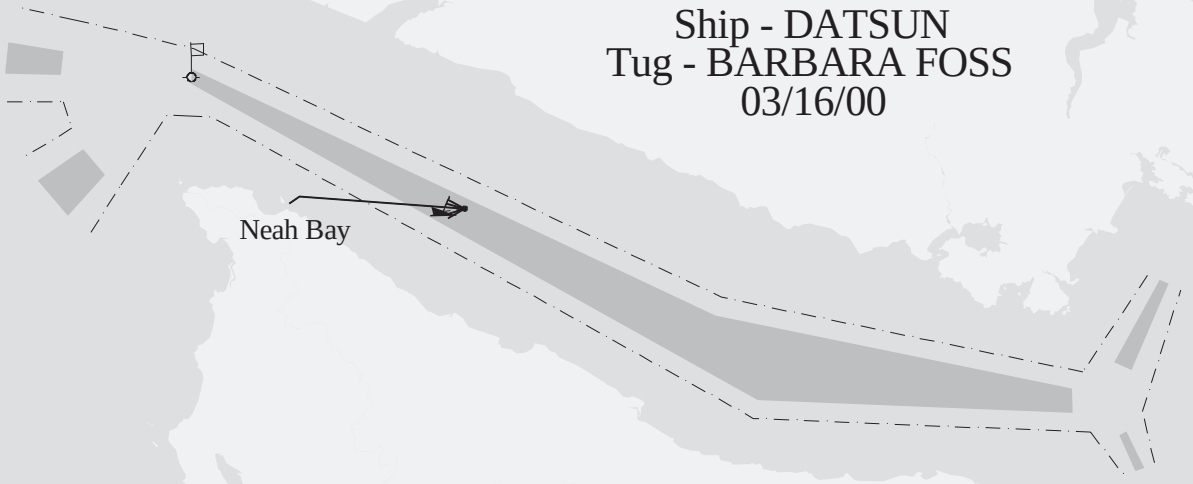
		Ship distress call location
		Tug/Ship Intercept location
20		Wind speed(knots) and direction
0.8		Current speed(knots) and direction
3		Sea height(feet) and direction
0		Swell height(feet) and direction
		Navigation Buoy - J

20:20	Time notified
20:30	Depart time
21:35	Intercept time
21:36	Release time
Unk	Return time
11	Distance to intercept
900	Tug RPM

Tug Notes:
1 hr and 05 min run for a dist of 11 m for avg spd of 10.3 kts. all went well.

Rescue Tug Drill Report #0316-1
Ship - DATSUN
Tug - BARBARA FOSS
03/16/00





		Ship distress call location
		Tug/Ship Intercept location
25		Wind speed(knots) and direction
0.4		Current speed(knots) and direction
0		Sea height(feet) and direction
7		Swell height(feet) and direction
		Navigation Buoy - J

12:18	Time notified
12:26	Depart time
13:25	Intercept time
13:25	Release time
14:55	Return time
10.4	Distance to intercept
903	Tug RPM

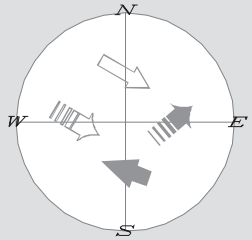
Tug Notes:
mv datsun adrift w/o steering and power. drifting 085 @1.5 kts

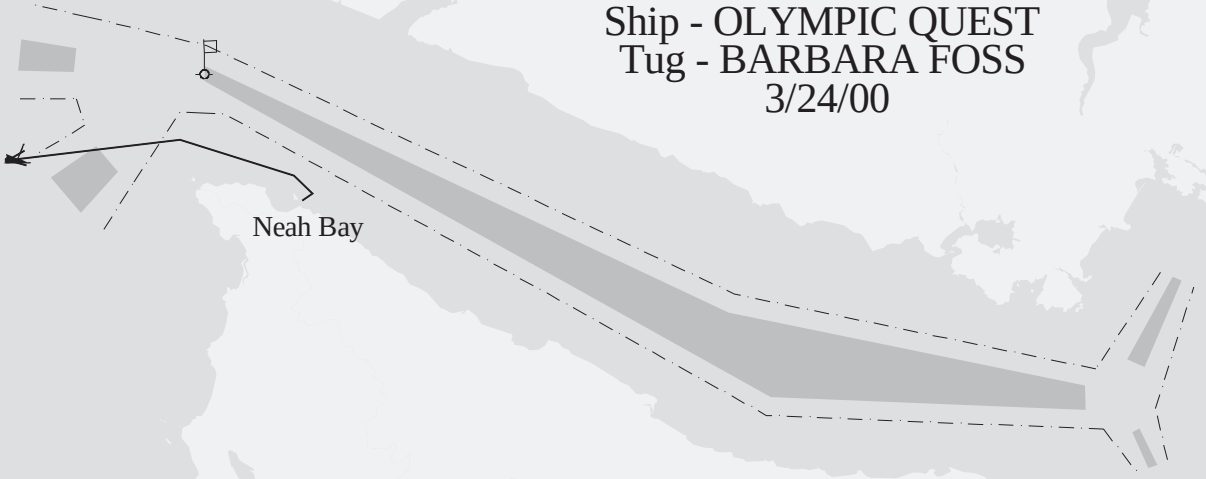
Rescue Tug Drill Report #0324-1

Ship - OLYMPIC QUEST

Tug - BARBARA FOSS

3/24/00





		Ship distress call location
		Tug/Ship Intercept location
8		Wind speed(knots) and direction
0.2		Current speed(knots) and direction
0.3		Sea height(feet) and direction
8		Swell height(feet) and direction
		Navigation Buoy - J

14:20	Time notified
14:25	Depart time
15:55	Intercept time
16:00	Release time
17:45	Return time
17	Distance to intercept
900	Tug RPM

Tug Notes:
container ship olympic quest lost propulsion

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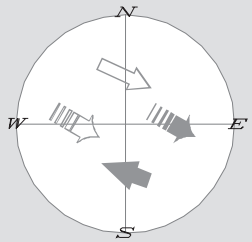
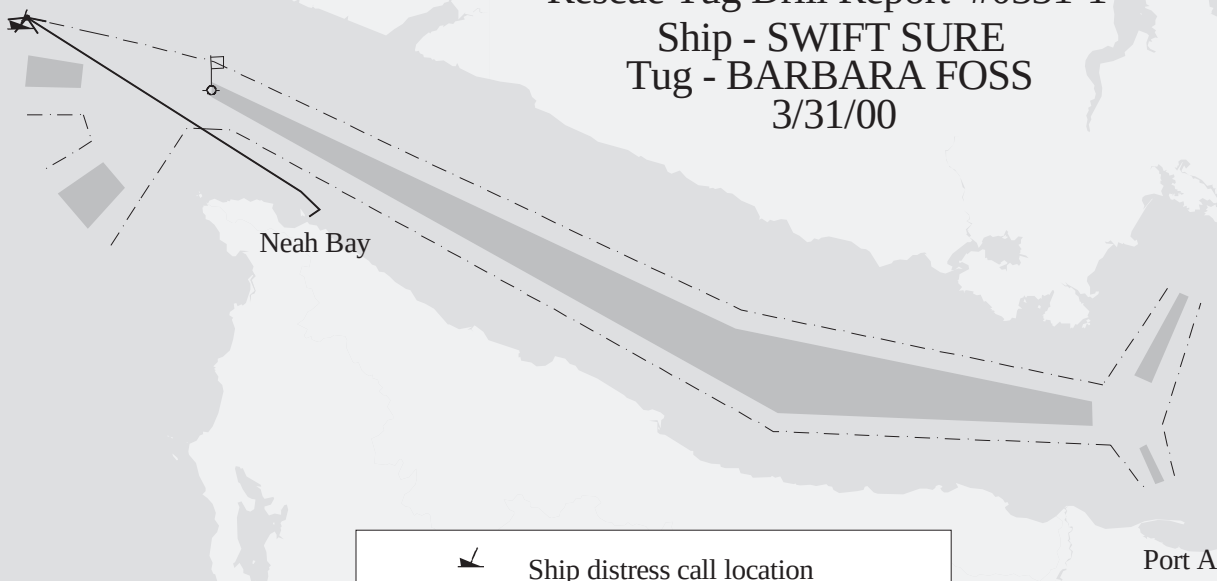
Rescue Tug Drill Report #0331-1

Ship - SWIFT SURE

Tug - BARBARA FOSS

3/31/00





		Ship distress call location
		Tug/Ship Intercept location
6		Wind speed(knots) and direction
0.6		Current speed(knots) and direction
1		Sea height(feet) and direction
8		Swell height(feet) and direction
		Navigation Buoy - J

8:30	Time notified
8:34	Depart time
10:20	Intercept time
10:20	Release time
12:15	Return time
19.8	Distance to intercept
900	Tug RPM

Tug Notes:

vessel swift sure lost power & adrift. had approx. 15 delay until pos. confirmation made. given wrong position by dispatch.

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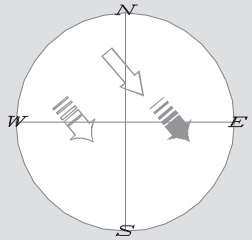
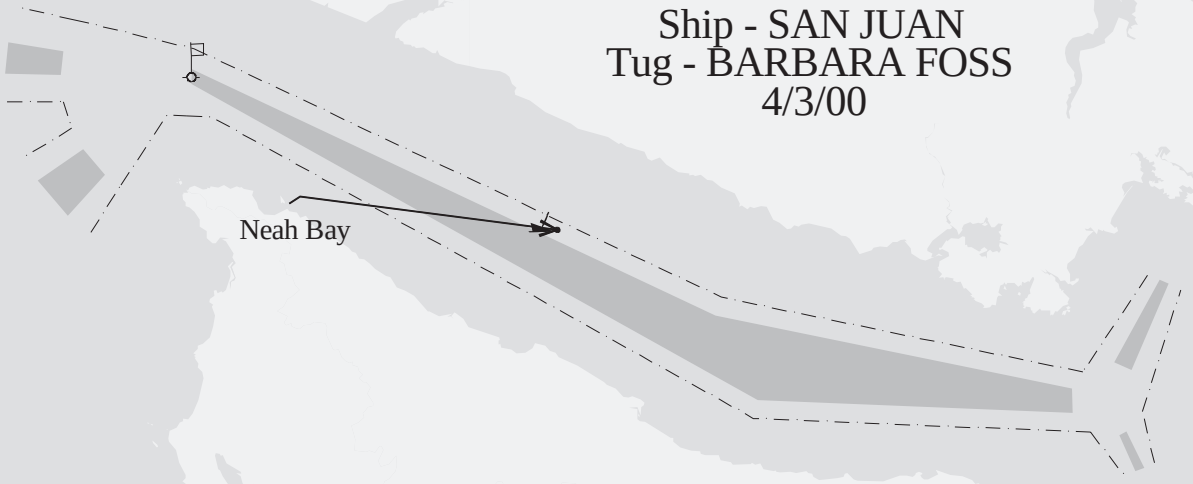
Rescue Tug Drill Report #0403-1

Ship - SAN JUAN

Tug - BARBARA FOSS

4/3/00





		Ship distress call location
		Tug/Ship Intercept location
22		Wind speed(knots) and direction
0		Current speed(knots) and direction
2		Sea height(feet) and direction
3		Swell height(feet) and direction
		Navigation Buoy - J

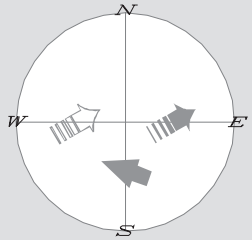
15:50	Time notified
15:56	Depart time
17:10	Intercept time
17:15	Release time
18:30	Return time
14	Distance to intercept
900	Tug RPM

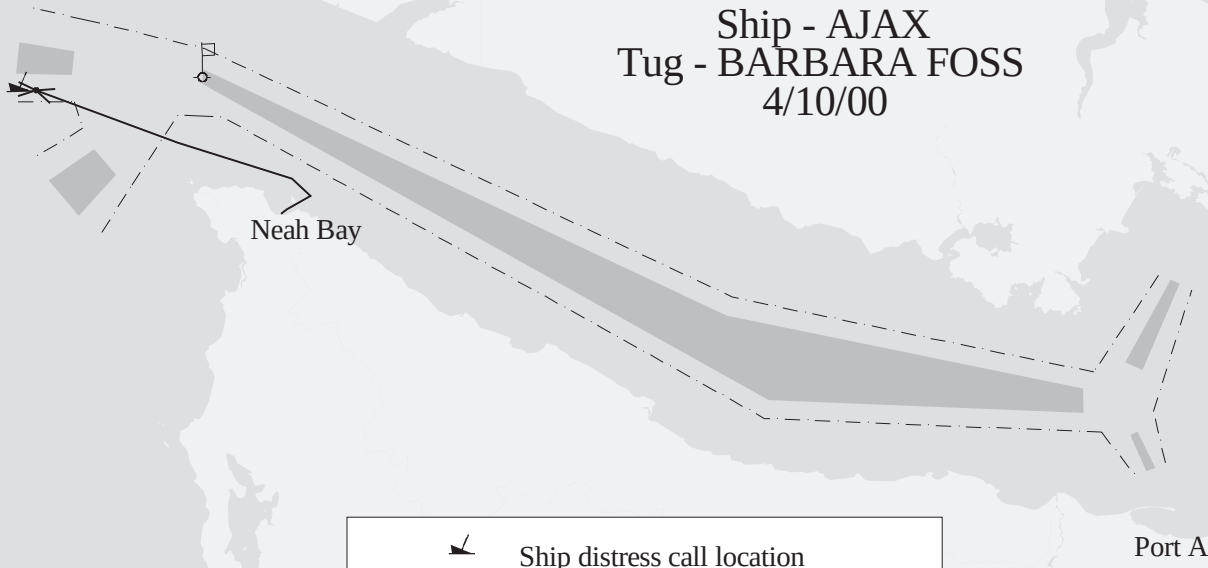
Tug Notes:

d.i.w at 48-22', 124-15.6 w. run lit to d.i.w.; all went well

Wa. Dept. of Ecology, GIS Technical Services 10/12/00

Rescue Tug Drill Report #0410-1
Ship - AJAX
Tug - BARBARA FOSS
4/10/00





		Ship distress call location
		Tug/Ship Intercept location
0		Wind speed(knots) and direction
0.3		Current speed(knots) and direction
2		Sea height(feet) and direction
2		Swell height(feet) and direction
		Navigation Buoy - J

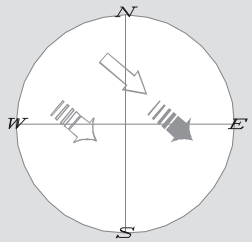
7:08	Time notified
7:15	Depart time
8:48	Intercept time
8:48	Release time
10:24	Return time
17.8	Distance to intercept
900	Tug RPM

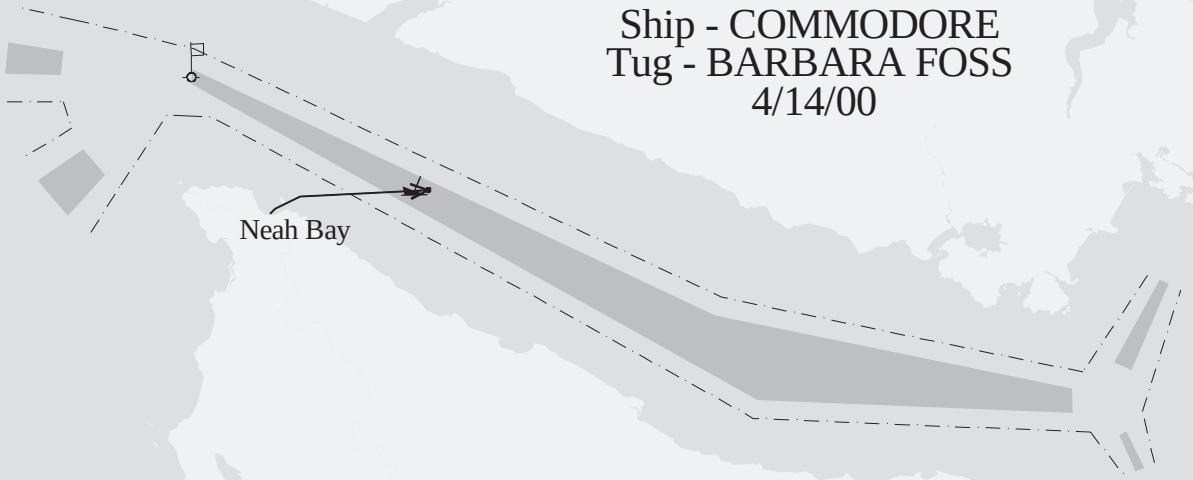
Tug Notes:

ajax lost propulsion drifting 090 t, 1.2 kts. all went well. good weather.

Wa. Dept. of Ecology, GIS Technical Services 10/12/00

Rescue Tug Drill Report #0414-1
Ship - COMMODORE
Tug - BARBARA FOSS
4/14/00





		Ship distress call location
		Tug/Ship Intercept location
12		Wind speed(knots) and direction
0		Current speed(knots) and direction
0.5		Sea height(feet) and direction
3		Swell height(feet) and direction
		Navigation Buoy - J

12:33	Time notified
12:40	Depart time
13:33	Intercept time
13:35	Release time
15:45	Return time
8	Distance to intercept
900	Tug RPM

Tug Notes:

container ship commodore lost propulsion & adrift.
drill went fine - tl spd make good frm dept 1200 frm emt @ 1335 start set & drift w/ barbara for 4 hr. 1435 fin w/ drift 169 @0.3 kt spd.

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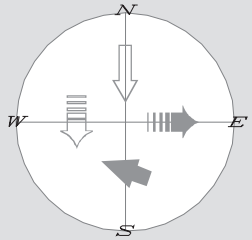
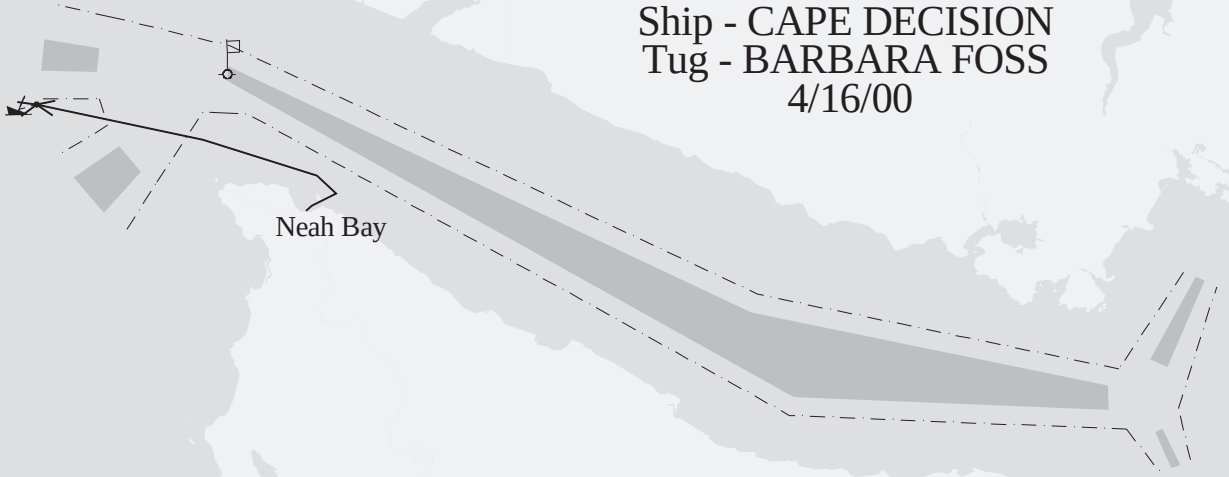
Rescue Tug Drill Report #0416-1

Ship - CAPE DECISION

Tug - BARBARA FOSS

4/16/00





		Ship distress call location
		Tug/Ship Intercept location
5		Wind speed(knots) and direction
0.3		Current speed(knots) and direction
1		Sea height(feet) and direction
8		Swell height(feet) and direction
		Navigation Buoy - J

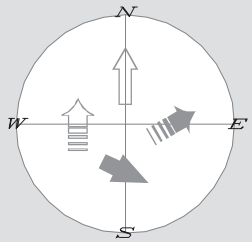
10:41	Time notified
10:41	Depart time
12:06	Intercept time
12:08	Release time
14:00	Return time
18	Distance to intercept
900	Tug RPM

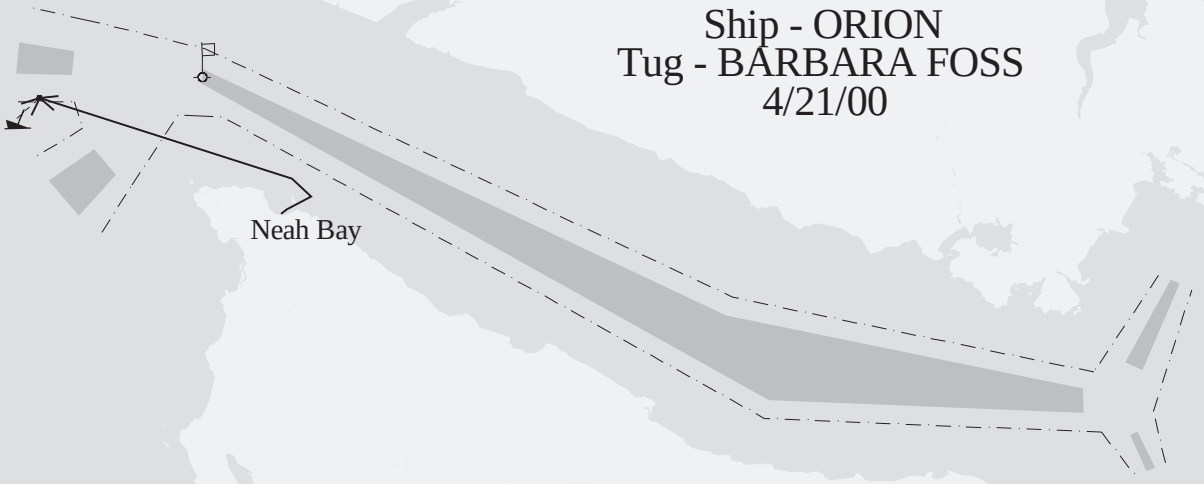
Tug Notes:

cape decision adrift w/ steering problem. drifting @ 1 kt - 070 t.
we were already u/w so had a good response time to scene -
avg 12 kts then out transit - no problems.

Wa. Dept. of Ecology, GIS Technical Services 10/12/00

Rescue Tug Drill Report #0421-1
Ship - ORION
Tug - BARBARA FOSS
4/21/00





		Ship distress call location
		Tug/Ship Intercept location
25		Wind speed(knots) and direction
0.7		Current speed(knots) and direction
3		Sea height(feet) and direction
3		Swell height(feet) and direction
		Navigation Buoy - J

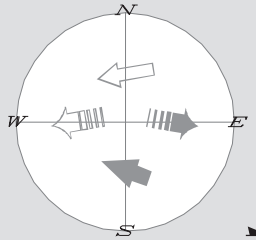
15:10	Time notified
15:17	Depart time
17:00	Intercept time
17:00	Release time
18:35	Return time
16.2	Distance to intercept
900	Tug RPM

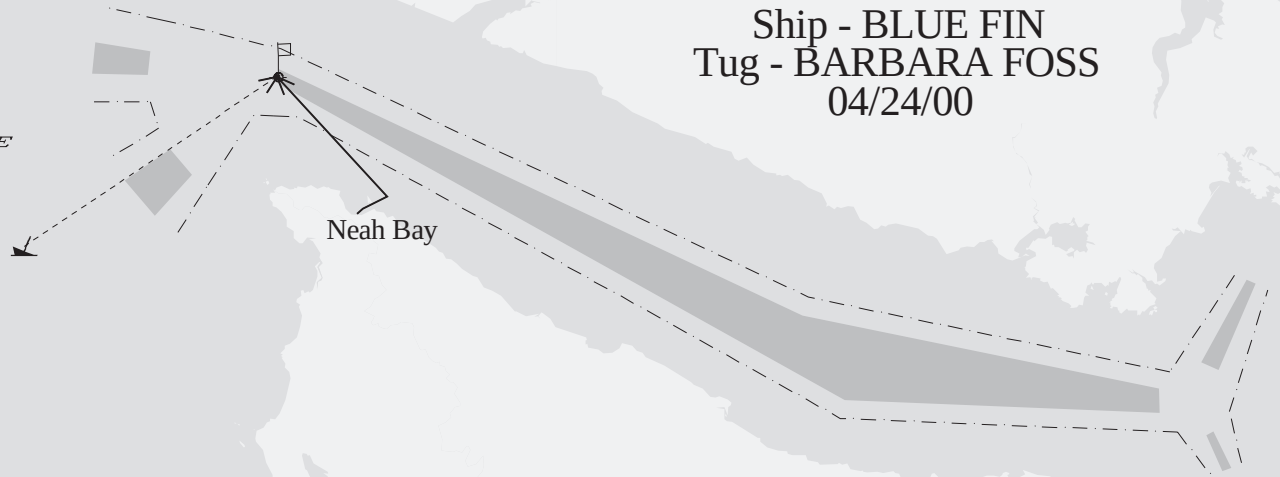
Tug Notes:

containership "orion' lost propulsion. position 48-26n, 124-59w. drifting 045 t @ 1.1 kt. all went fine contacted sven ecklof and secured frm drill. 1700 u/w back for neah bay. avg 9.2 kts frm dept.

Wa. Dept. of Ecology, GIS Technical Services 10/12/00

Rescue Tug Drill Report #0424-1
Ship - BLUE FIN
Tug - BARBARA FOSS
04/24/00





		Ship distress call location
		Tug/Ship Intercept location
15		Wind speed(knots) and direction
0.4		Current speed(knots) and direction
2		Sea height(feet) and direction
14		Swell height(feet) and direction
		Navigation Buoy - J

07:25	Time notified
07:30	Depart time
09:16	Intercept time
09:16	Release time
11:15	Return time
18.6	Distance to intercept
900	Tug RPM

Tug Notes:

f/v blue fin adrift. @ 060 t @ 1.2 kts. received call frm s. eklof @ 0725. m/e already up running u/w @0730. ran 18.6 nm for a spd of 10.2 avg - all went fine

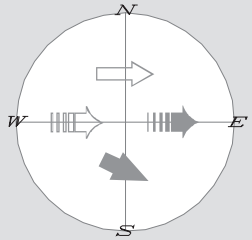
Wa. Dept. of Ecology, GIS Technical Services 10/12/00

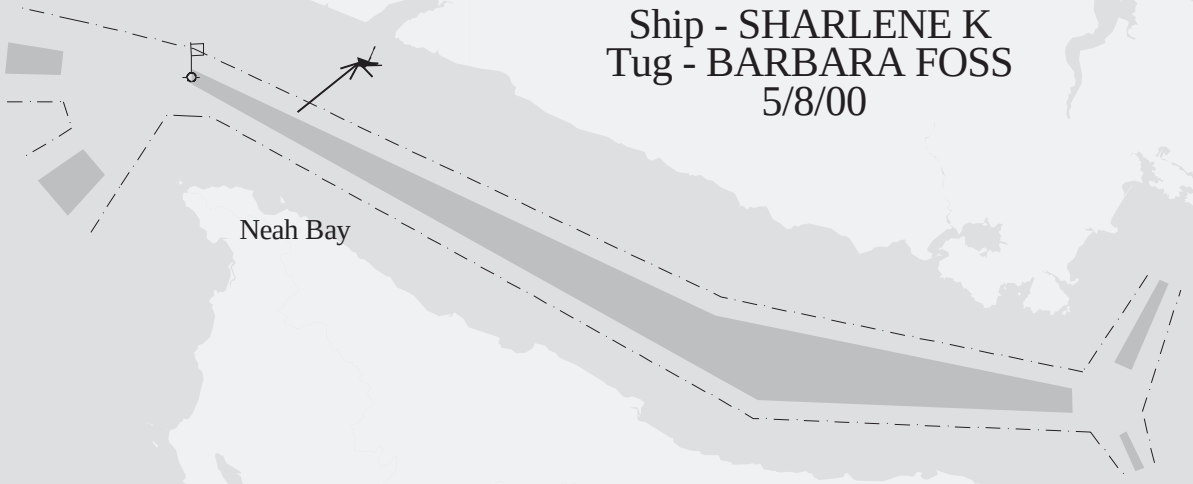
Rescue Tug Response Report #0508-1

Ship - SHARLENE K

Tug - BARBARA FOSS

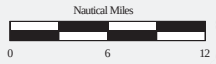
5/8/00





		Ship distress call location
		Tug/Ship Intercept location
12		Wind speed(knots) and direction
1.2		Current speed(knots) and direction
1		Sea height(feet) and direction
4		Swell height(feet) and direction
		Navigation Buoy - J

18:15	Time notified
18:30	Depart time
19:20	Intercept time
21:45	Release time
21:45	Return time
9.3	Distance to intercept
900	Tug RPM



Tug Notes:

sharlene k. 96', 10' draft lost fuel on m/e & request assistance.
sharlene k. set & drift 097 t - 1.7 k. 1800-1920 - original pos. to dock arrival time. a/s at salmon fuel pier 21:45.
vessel towed back to fuel pier at neah bay by barbara foss

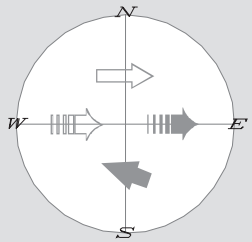
Wa. Dept. of Ecology, GIS Technical Services 10/12/00

Rescue Tug Response Report #0607-1

Ship - VIRTUE

Tug - BARBARA FOSS

6/7/00



		Ship distress call location
		Tug/Ship Intercept location
5		Wind speed(knots) and direction
0.6		Current speed(knots) and direction
2		Sea height(feet) and direction
8		Swell height(feet) and direction
		Navigation Buoy - J

6:43	Time notified
6:47	Depart time
9:48	Intercept time
22:10	Release time
12:10	Return time
37	Distance to intercept
Unk	Tug RPM

Tug Notes:

bulk carrier "virtue" adrift making repairs. escort began 1425.
taken under tow at 2210 just inside buoy j.

Wa. Dept. of Ecology, GIS Technical Services 10/12/00

Appendix I
U.S. Coast Guard Report:
“An Overview of the U.S. Navy Chartered Interim Rescue Tug in the Western Strait of Juan de Fuca”

An Overview of the U.S. Navy Chartered Interim Rescue Tug In the Western Strait of Juan de Fuca (March 1, 1999 to April 30, 1999)

Prepared by:

Thirteenth U.S. Coast Guard District

U.S. Navy-Chartered Interim Rescue Tug
In the Western Strait of Juan de Fuca

I. Overview

The primary purpose of the U.S. Navy chartered rescue tug was to provide an interim safety measure against the risk of an oil spill in the western most section of the Strait of Juan de Fuca. This purpose was met through the placement of a Crowley tug in the Strait, near Neah Bay, during the two-month period commencing March 1, 1999. Secondarily, a concerted effort was made to seize the opportunity presented by a publicly funded tug being placed in the western Strait by collecting supporting information for the planned, Coast Guard-funded, cost benefit analysis. Furthermore, this information could be considered by the anticipated North Puget Sound risk management panel to be co-chaired by the U.S. Coast Guard and Washington State Department of Ecology. The purpose of this report is to summarize this data collection effort. The report is not intended to be all-inclusive and data shortfalls are highlighted as appropriate.

II. Background

In early February 1999, U.S. Representative Norm Dicks announced that the U. S. Navy would be conducting an "operational evaluation" of oil spill response capability by stationing a standby response tugboat near the entrance of the Strait of Juan de Fuca. Between March 1 and April 30, 1999, a commercial tug operated by Crowley Marine Services, Inc. (Crowley) was placed on station near the Western entrance of the Strait of Juan de Fuca. This 60-day placement of a dedicated tug was an interim measure designed primarily to reduce the risk of a drift grounding by public or commercial vessels transiting the Western Strait. Subsequent to assignment on station, the tug also provided some level of protection to military vessels conducting drift analysis studies (discussed in more detail later) in the same area.[1]

[1] The area of operation encompassed the waters contained within a somewhat arbitrarily drawn arc centered roughly at the "J" buoy. This test area necessarily included the adjacent Canadian waters within the Strait, since the outbound traffic lanes are exclusively on the Canadian side of the international boundary line.

The U.S. Navy provided a ceiling amount of $800,000 in funding to hire the Crowley tug under an existing contract with the U.S. Navy Supervisor of Salvage and Diving (SUPSALV).[2] Crowley utilized two separate tugs during the 60-day operational evaluation: the SEA VALIANT and the SEA BREEZE. Each of these tugs met the capability standards imposed by the Navy under their contract. Originally, the tug SEA VICTORY was planned for this duty, but ultimately two other tugs proved to be necessary because of the emergent need for a commercial tug of unique capabilities to respond during the M/V NEW CARISSA oil spill on the Oregon Coast. A summary of the tugs utilized, and the capability of each tug is provided in Table 1.

DESCRIPTION	SEA BREEZE	SEA VALIANT
Dimensions		
Length	126'	128.5'
Breadth	34'	38'
Depth	16.5'	19.9'
Tonnage	198 GT	199 GT
Main Engines	2 Cat Incline 6 Cyl 3606	2 EMD 20-645-E5
Horse Power	4962 max HP	5750 max HP
Bollard Pull Ahead	102,580 lbs	175,000 lbs
Bollard Pull Astern	70,000 lbs	103,000 lbs
Expected Speed*	11.5 Kts	12.0 Kts
Dates on Station	1 Mar - 7 Mar	8 Mar - 30 Apr

* Speed based on performance in light to moderate weather

Table (1): Utilization and Characteristics of Crowley Tugs

To take advantage of the opportunity provided by the Navy's placement of a tug on station in the Western Strait, Crowley, the U.S. Coast Guard, and the U.S. Navy designed a series of data collection efforts or operational drills. The goal of these drills was to gather information in support of an ongoing evaluation of the feasibility, cost and benefit of a permanently placed rescue tug in the Western Strait as an oil spill risk reduction measure. This effort was undertaken without any additional personnel or funding support.

III. Operational Capability Drills

The operational capability drills conducted by the Crowley tug are summarized below:

[2] The total billing to the U.S. Navy was $502,628.76. This total includes fuel and port charges and is reflective of the varying rates associated with the two tugs used.

1. Response Time Drill (Type I): The rescue tug proceeds to a given geographic point in the area of operations to measure response time given existing wind, tide, and current conditions. The primary measures for this drill are tug speed made good and modified speed made good.[3]

2. Response Time to a Drifting Vessel Drill (Type II): The rescue tug proceeds to a location in the area of operation where a U.S. Navy or U.S. Coast Guard vessel is simulating distress by drifting. The goal of this drill is to measure tug response time, and the distressed vessel's drift rate given existing wind, tide, and current conditions. The primary measures for this drill are tug speed made good and modified speed made good, plus the drifting vessel measures its own drift rate.

3. Response Time to, and Emergency Tow Hook Up to a Drifting Vessel Drill (Type III): This drill is identical to the Type II drill, except that the rescue tug passes a towline to the "drifting" vessel and tows the vessel a short distance. The primary measures for this drill are to capture the same information as Type I and II drills plus measure how quickly a tow can be established once the tug arrives on scene.

IV. Drill Results

During the 60-day evaluation period, there were 100 total drills conducted, plus two instances where the tug responded to vessels potentially needing assistance. Of these, a total of only 80 drills possessed sufficient documentation to be considered. A breakdown of drill types is represented in Table (2).

	Type I Drills	Type II Drills	Type III Drills	Responses
Total Exercises	78	21	1	2
Exercises w/ Data	63	16	1	1

Table (2): Crowley Rescue Tug Drill Composition

For each of these 80 total drill-types, various data was collected and relatively straightforward analyses were performed. For the two instances where the Crowley tug responded to unusual vessel situations, which were outside the scope of their standby

[3] Speed made good (SMG) is defined as the tug speed considering elapsed time between when the tug actually gets underway for the drill and when it arrives on scene. Modified speed made good is calculated tug speed based on the total elapsed time from when the tug was notified of the drill until the tug gets on scene. Accordingly, modified speed made good is always less than or equal to speed made good.

contract with the U.S. Navy, only one was documented sufficiently to determine response times. These two situations involved commercial vessels that may have necessitated the rendering of assistance.[4] A summary of these non-drill responses is provided at the end of this section.

Response Time Drills: Response time drills were widely conducted within the area of operations and represent the vast majority (77%) of the total drills conducted. Attachment (1) is a digitized NOAA chart that illustrates the geographic distribution of these drills.[5] Several of the drills were conducted using the same physical location as the response point.

- Data Collected: Crew from the response tug recorded data for all drills conducted. An example data collection form is provided as Attachment (2). Information collected includes latitudes and longitudes for the tug location at the initiation and completion of each drill, time notified, time underway, and time on scene. Also recorded was the on scene wind speed / direction, tidal current, and sea state conditions at the time the drill commenced. Attachment (3) summarizes, in spreadsheet format, all of the physical data collected.

- Analysis Conducted: Data from the Type I drill was used to measure rescue tug response times, distance traveled, speed made good, modified speed made good, and impacts of weather and sea conditions on response time. A straight analysis of tug speeds showed a relatively consistent average speed made good of approximately 11.3 knots over the range of response distances conducted. The modified speed made good over the entire range was 9.6 knots. A small variation of increased speed with increased response distance is observed as would be expected, given necessary ramp up time. A summary of this analysis is provided in Figure (1) on the following page.

[4] Contingencies for assisting an actual vessel in distress and in danger of drifting aground had been planned for during the development of the response tug operation. Essentially, this involved a release from Navy contractual obligation upon U.S. Coast Guard direction authority being exercised because of a substantial threat of oil pollution.

[5] Each icon represents one or more drills to a given geographic location. Multiple "rescues" were often made to one geographic location.

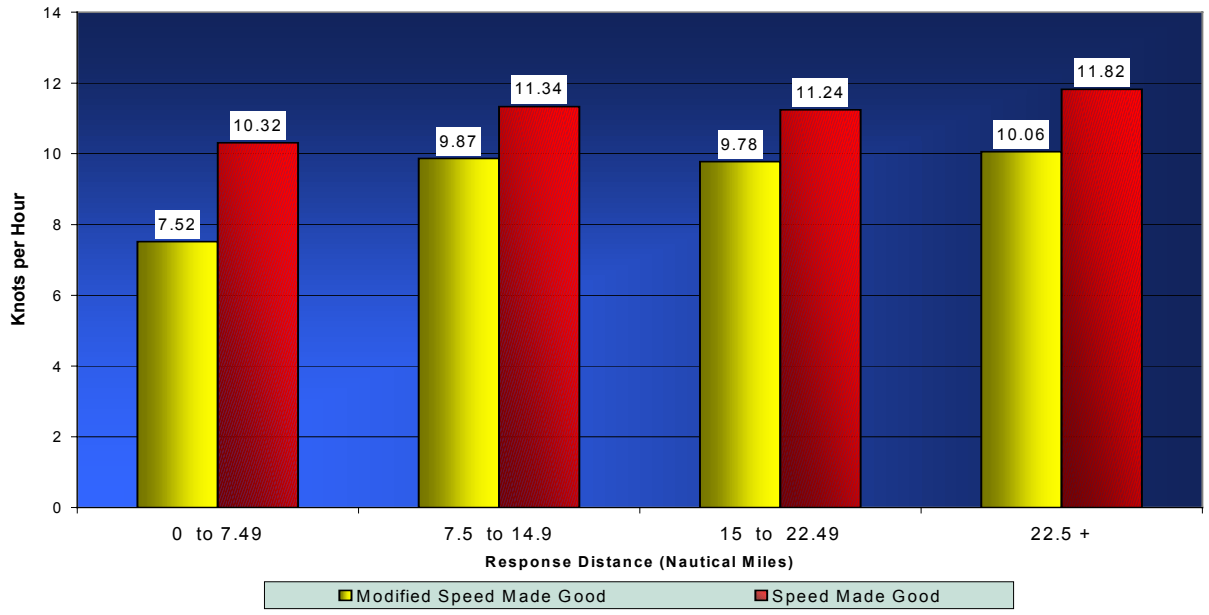


Figure (1): Rescue Tug Response Time Speed

The tug's course and distance traveled to each casualty were derived from recorded originating and culminating LAT/LONG positions. Using recorded true wind and tidal conditions plus the tug's course, the effects of wind and current were analyzed. The three cases specifically considered were head, following and cross wind and current conditions. The wind and current effects were considered for each individual case by plotting the tug's speed made good as a function of the speed of the wind and current. A linear regression was then done on each set of data points. This analysis showed a poor relationship between wind and/or current and the speed of the tug. This would indicate, at least for these test cases, that neither wind nor current had a significant impact on the tug when treated independently. The diagrams, Figures (2) through (7), shown on the following two pages summarize graphically the results of this analysis.

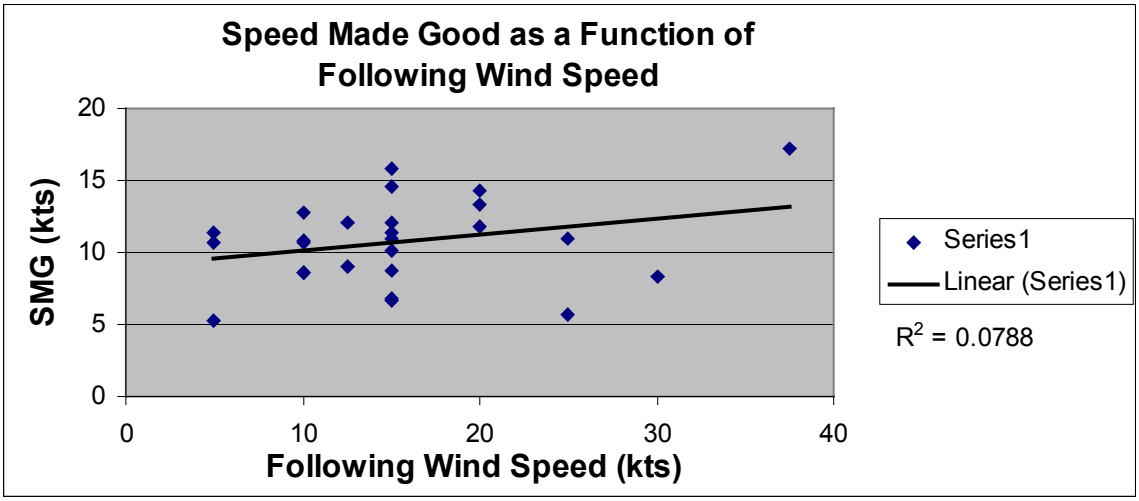


Figure (2):

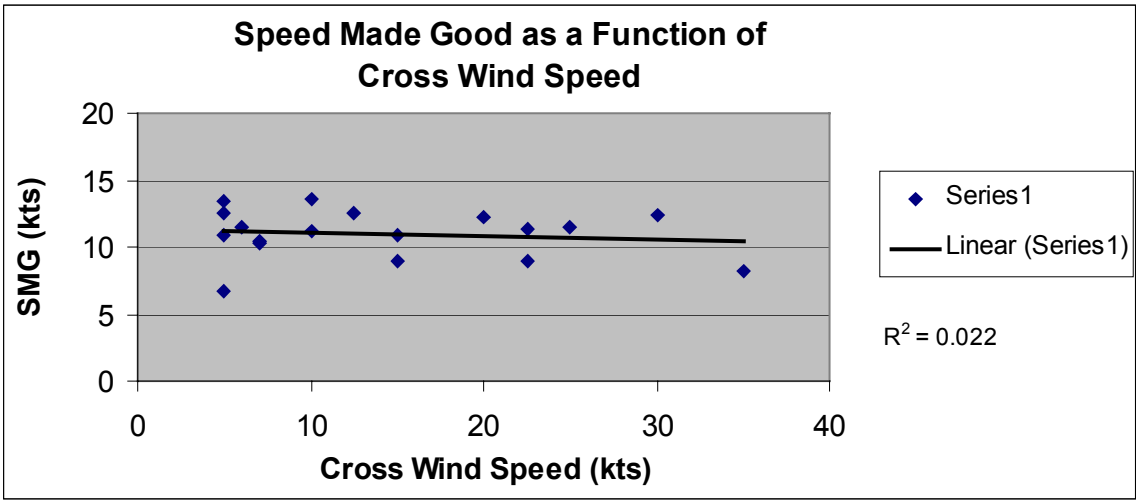


Figure (3):

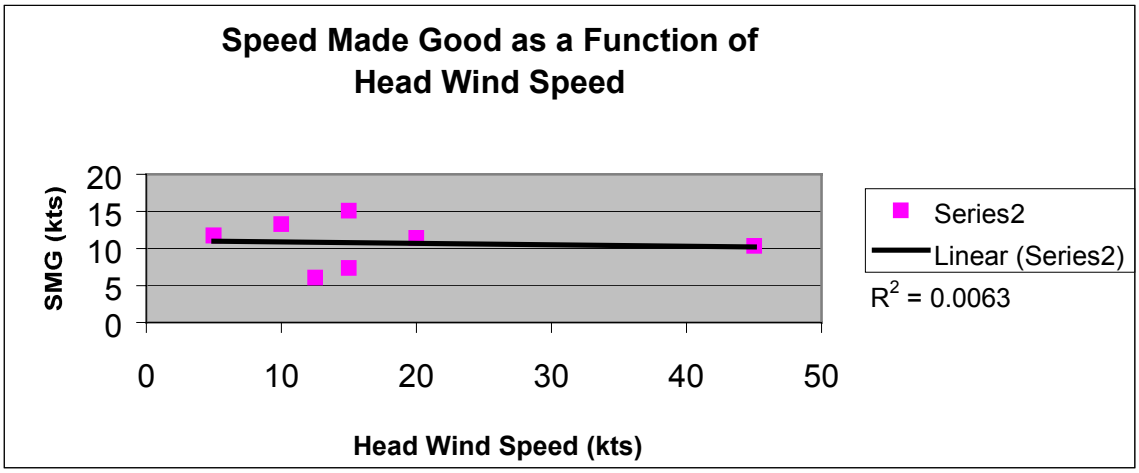


Figure (4):

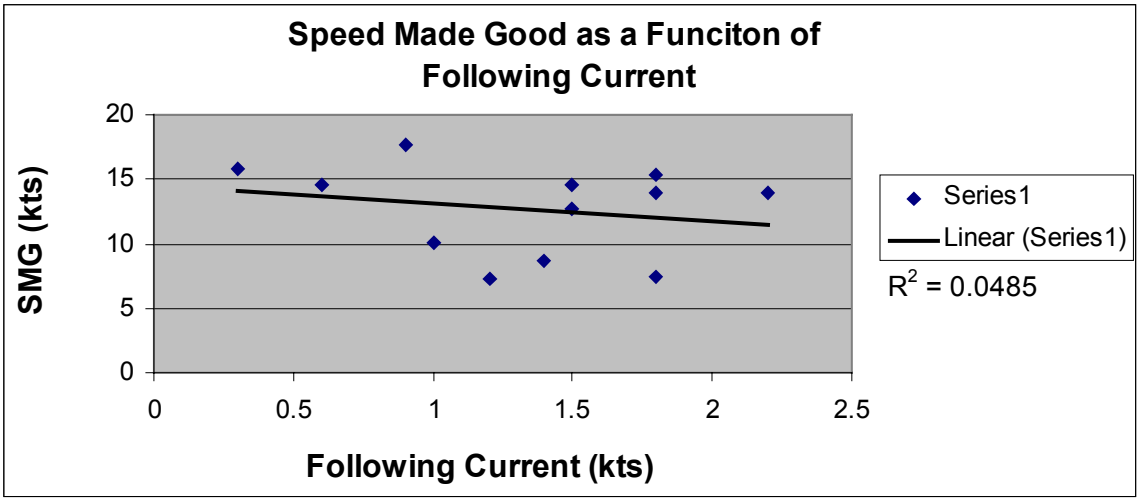


Figure (5):

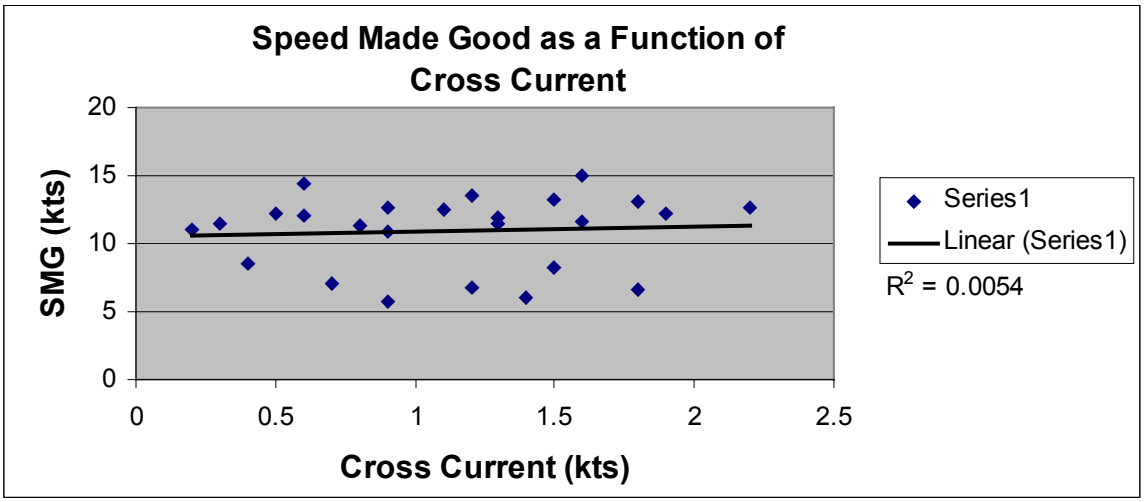


Figure (6):

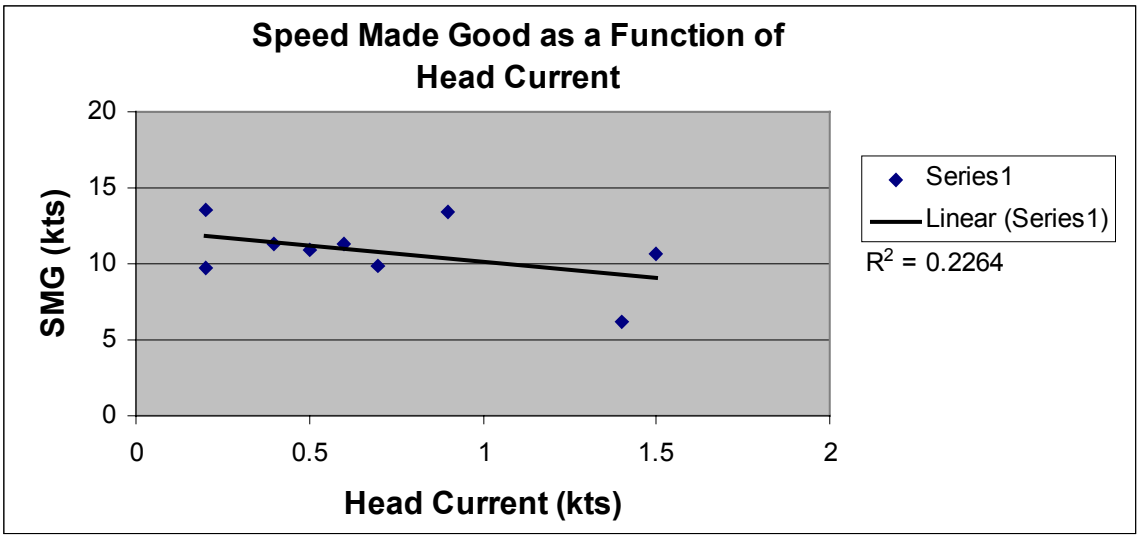


Figure (7):

- Limitations of Data and Analysis: The weather and tidal current data collected was not always consistently recorded.[6] Several drills were conducted where a complete set of weather data was not captured. While this was particularly true of early drills, the shortfalls occurred on an occasional basis throughout the 60-day period.[7] Another limitation of the data is that the data captured did not include a measure of the tidal current velocity. Accordingly, there was not enough information available to analyze the combined effects of wind and current, and no definitive conclusions could be drawn in this regard. Sea state was also envisioned to have a large impact on the tug's speed of advance; however comparisons of speed made good and wave height are not conclusive. This may be due, at least in part, to the highly subjective evaluation of wave and swell height. One additional aspect of the exercises that relates to the weather's impact on the tug was the relatively short transit times. The average time to respond was approximately 2.5 hours and encompassed the range of 0.5 to 3.0 hours. The relatively short distances covered by the tug may have lessened the overall effect of the weather on the tugs transit time.

Response Time to a Drifting Vessel Drills: In addition to the same information captured in Type I drills, Type II drills also captured data from U.S. Navy and U.S. Coast Guard ships conducting drift tests. During the drill period, three Coast Guard vessels, seven Navy vessels, and one Canadian Naval vessel participated in 20 drift analyses.

- Data Collected: U.S. Navy, U.S. Coast Guard, and Canadian Naval vessels submitted drift data via message traffic. Data captured included the drifting ship's dimensions (length over all [LOA], beam, draft, and displacement tonnage), on-scene weather (wind speed/direction, wave height), a time line with drill start and stop locations, and

[6] For example, the wind speeds may have been described as "073 degrees at 18 knots" and in another drill the same wind conditions would be described as "ENE 15-20 knots." These inconsistencies are not the fault of the rescue tug crew, rather the result of a lack of standardized data recording format and protocol.
[7] Where weather data was not recorded, weather data available online (website location) from NOAA weather buoy 46206 was utilized. The buoy location is 48.5 N, 126.0W and is approximately 55 miles away from the primary drill location.

calculations of drift rate. Attachment (4) summarizes the vessel drift data collected.

- Analysis Conducted: The drift tests conducted were intended, to the extent possible, to provide some real measure of vessel drift characteristics in the Western Strait of Juan de Fuca. The results could then be used to supplement the work done previously on this subject by NOAA and the Coast Guard. Although a concerted effort to quantify various aspects of vessel drift rates was made, as delineated in more detail below, ultimately the results of these tests were inconclusive.

  A cursory review of the data indicates a lack of adequate current (direction/speed) information, which in turn thwarts any attempt to perform an analysis that would isolate the effect of wind or current on vessel drift. Further review of the recorded drift rates, however, indicates a poor relationship between wind speed and vessel drift. Indeed, scrutiny of this data appears to indicate that the current (not the wind) was the dominant factor in the drift rate of the studied vessels. Accordingly, a simplistic evaluation of the time available prior to vessel grounding was performed.

  Specifically, there was sufficient data captured for sixteen of the twenty trials conducted to perform an analysis. Each recorded drift position was plotted and the respective drift directions were drawn. From these plots, assuming steady state conditions, the course could be extrapolated to determine the distance to where the vessel would be expected to go aground and how long it would take. For each of these cases, the estimated grounding times were compared to the response time goals[8] determined for that geographic region (either 2.5 or 6 hours depending on location). Results of this comparison indicate that the calculated grounding times when compared to the corresponding response times gave factors ranging from 0.95 to 8.6 times. Actually 15 of the 16 tests had grounding times more than twice the response times, with the 16th being nearly equal. Of the 16 tests considered, 5 were initiated with the vessel on the side of the Traffic Separation Scheme (TSS) to which the

[8] Response time goals in this context refer to those times established in the Addendum Report to Congress on International, Private-Sector Tug-of-Opportunity System (ITOS) for the Waters of the Olympic Coast National Marine Sanctuary and the Strait of Juan de Fuca, dated December 1997.

vessel eventually drifted, 5 were started on the opposite side, and the remaining 6 were located within the TSS when the test commenced. Therefore, some of the vessels were positioned in closer proximity to shore than would normally be the case for a vessel participating in the vessel traffic system (conservative comparison) and some were located further away than would normally be expected (not conservative). These results are displayed below in Figure (8).

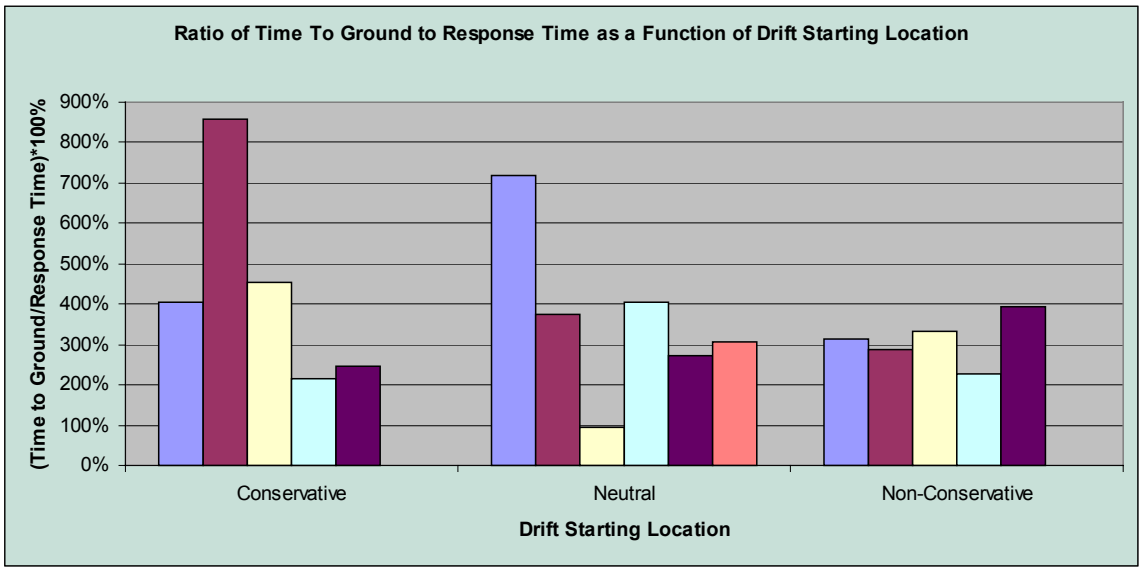


Figure (8):

In addition, the possibility of using the vessel drift data to evaluate the assumption of a maximum vessel drift rate of 6% of the wind speed used to generate the response time goals was investigated. However, the lack of sufficiently detailed data would not allow the effects of the current to be screened out to isolate the effect of the wind only on vessel drift rates.

- Limitations of Data and Analysis: As mentioned previously, the lack of detailed tidal current speeds and directions limited the analysis. Furthermore, despite having a published format, vessels participating did not consistently submit drift reports, plus when submitted, key data was occasionally absent. This, in turn, limited the ability to comprehensively compare drift rates with actual on-scene weather. The relatively

large variance in extrapolated grounding times can primarily be attributed to the combination of relatively slow drift rates with drift directions that were nearly parallel to the Strait's banks (consistent with the ebb and flood tidal currents). This combination was noted in all trials, despite varying wind directions and speeds.

Additionally, there are several related considerations worth mentioning. The vessels in these trials started drifting with little or no headway, which may not be the case in an actual scenario. The vessel's momentum could potentially increase the drift rate, or it could also enable the initial use of the rudder to steer a greater distance from shore. As such, it is unclear whether actual time to grounding would be longer or shorter than the results of these trials. Furthermore, the lack of information related to the vessel's sail area and underwater profile makes the drift analysis of limited utility knowing that these factors will directly influence drift rates. Specifically, the drift rates associated with military vessels have potentially limited correlation with commercial vessels of dramatically different design. Finally, the extrapolated grounding times were calculated using a steady state drift rate, which evidence would clearly indicate is at least influenced, if not dominated, by the currents. This steady state assumption introduces some unknown, non-quantifiable (but likely considerable) errors into the analysis. Tidal conditions will change, ultimately resulting in a complete swing in currents which may hasten a vessel grounding or potentially prevent it altogether.

Response Time to, and Emergency Tow Hook Up to, a Drifting Vessel Drills: The purpose of these drills was to simulate a fully disabled vessel response scenario. Specifically, the goal was to determine how long it would take for a rescue tug to successfully respond to, then connect with, a vessel simulating distress. Because of the difficulty in conducting this kind of drill due to variables of weather, availability of ships, and the overriding safety concerns for drill participants, only one such drill was conducted. On April 30th, the Crowley Tug Sea Valiant passed a tow wire to the USS DECATUR after the USS DECATUR reported a simulated main engine casualty.

The specific data collected from this drill are as follows:

Response Time	Sea State	Wind Speed	Hook Up Time
40 minutes	3-4 feet	15-20 Knots	8 Minutes[9]

Table (3): Type III Drill Data

Non-drill Responses: On two separate occasions, the Crowley rescue tug responded to vessels in distress. The first response was on March 26, 1999. The Crowley rescue tug responded to the drifting barge B. NO. 230, which had separated its tow wire from the tug RALPH BOUCHARD in 30' seas about 21 nautical miles west of Cape Johnson on the northwest Washington Coast. The B. NO. 230 was a manned double-hulled 467' X 80' tank barge that was not laden with oil at the time it broke away. The barge was equipped with an emergency towline. Although the Crowley tug responded and remained on scene, the Crowley rescue tug did not actively engage in the rescue of the barge. The Crowley tug's response was limited to standing by while the RALPH BOUCHARD reestablished its own tow.

The second response was to the commercial fishing vessel (F/V) ALEUTIAN CHALLENGER on April 5, 1999, when it lost its main propulsion near Tatoosh Island. The (F/V) ALEUTIAN CHALLENGER is a 78 foot, 137 gross ton trawl vessel. While the Crowley rescue tug responded on scene, the F/V ALEUTIAN CHALLENGER Master refused assistance because the rescue tug could not tow the stricken vessel into Neah Bay. This was due to draft to water depth limitations of the rescue tug and because of the high costs associated with towing the fishing vessel to Port Angeles or Seattle. A Coast Guard motor lifeboat stationed at Neah Bay had also responded to the scene and eventually towed the fishing vessel into Neah Bay when it drifted into the traffic lanes.

[9] The USS DECATUR is considerably smaller and designed differently than most commercial vessels that conduct trade in the Puget Sound region. Any comparison between this vessel's hook up time and that of other commercial vessels should be limited.

V. Other Drill Evaluations

In addition to the data captured with the previous three rescue tug drill-types, another element considered for evaluation was a review of the availability of potential response tugs participating in the International Tug of Opportunity System (ITOS) coincident with the random Crowley tug drills. While this evaluation was originally planned for inclusion in the rescue tug review, the lack of valid, substantive documentation of ITOS participating tugs associated with the timing of Crowley tug drills, made accurate meaningful comparison difficult, if not impossible. Furthermore, the existence of an ongoing, in depth study of ITOS being conducted at Coast Guard Headquarters is considered a much more appropriate and comprehensive review of ITOS tug availability throughout the Straits of Juan de Fuca. Consequently, an additional evaluation of the ITOS system was not completed in conjunction with the rescue tug evaluation.

VI. Conclusion

The U.S. Navy-contracted tug, which remained on station in the Western Strait of Juan de Fuca during the months of March and April, provided a temporary incremental improvement to the marine transportation system safety regime. The tug was used to collect information and responded to two incidents, neither of which resulted in an action that prevented a vessel from drifting aground, during this period. This "operational evaluation" provided an indication of the potential cost (approximately $250,000 per month) of stationing an asset of this type at, or near, the entrance to the Strait. The data collected, analyzed and summarized in this report will be made available as input to the Coast Guard sponsored cost benefit analysis, which will consider among other things, the feasibility of a dedicated rescue tug for the Strait of Juan de Fuca.

Appendix J
Foss Maritime Company Report:
“The Neah Bay Report”

The Neah Bay Report

Observations and Evaluations on the Use of Neah Bay, Washington

As a Mooring and Staging Site For a Multi-mission Vessel

Prepared by:

Foss Maritime Company

June 30, 2000

Overview

The primary purpose of the U. S. Navy chartered rescue tug was to provide an interim safety measure against the risk of an oil spill in the western most section of the Strait of Juan de Fuca. The purpose was served by placing the tug Barbara Foss in Neah Bay for a six-month period commencing on December 16, 1999. A secondary purpose was to demonstrate the feasibility of using Neah Bay as a mooring and staging site for a multi-purpose salvage, response and emergency towing vessel and evaluate the use of Neah Bay "with regard to adequacy and logistics". The subject of this report is to summarize information and provide recommendations on the use of Neah Bay as a "homeport" for a multi-purpose emergency response vessel. The information and comments made in this report are limited to the Foss Maritime Company towing vessel "Barbara Foss" experience while stationed in Neah Bay between December 16, 1999 and June 20, 2000.

Background

Foss Maritime Company vessels have routinely called at Neah Bay for the past sixty years towing log rafts and barges in and out of Neah Bay. Many of the tows have required tugs of the size and class of the Barbara Foss. Our corporate and crew familiarity with Neah Bay and adjacent waters allowed Foss Maritime Company a high comfort level in the task of demonstrating the feasibility of using Neah Bay as our homeport for this operation.

Location

Marina - The mooring area in Neah Bay is well protected from all points except the Northeast. Prolonged weather from the East creates a 3'-5' swell in the harbor area, that on occasion required the tug to depart the berth. The marina in Neah Bay is very modern (built in 1997) and of first class construction. The marina was designed and constructed for pleasure craft and small to medium size fishing vessels.

While on station in Neah Bay the Barbara Foss berthed at the outer end of dock B, starboard side to the dock. Two steel pipe piles at the end of last boat slip acted as the primary mooring fixture. Secondary mooring lines were run to smaller cleats installed on the float (see Ideas below). The distance from the berth to parking lot was approximately 500'. The use of marina-provided wheelbarrows allowed easy transport of routine stores and supplies to the tug. Water depth at our berthing area was satisfactory on all occasions. At 0.0 tide the tug's fathometer registered 12' of water under the keel.

A full range of utilities can be provided by the marina on request. Fresh water was provided via ¾ ' hose. Foss decided not to install either telephone lines or shore power connections to the Barbara during our stay, although both were available at incremental cost.

Staging

All major marine operations require upland staging areas. The area surrounding the marina offers a wide variety of open grassy and gravel lots. The largest in the immediate vicinity is 300' x 300'. The USCG station, at the entrance to Neah Bay offers

additional staging areas. During the summer months most of the staging areas fill up with recreational boats, empty boat trailers, recreational vehicles and travel trailers making quick use impossible.

Access

Port Access The buoyed entrance to the bay is between Waadah Island and Baada Point. Immediately inside the entrance to the harbor there are six rocky outcroppings commonly know as the "pinnacles" (see Ideas below). They range from a depth of 14 to 16 feet below the surface at zero tide. The initial operating plan required the Barbara to depart the marina dock prior to minus tides, anchor outside the harbor and return at above zero tide. The operating plan was later altered allowing the Barbara Foss to transit the approach both inbound and outbound at a –1.5 tide with fair sea conditions.

Road Access Considering its remote location, Neah Bay is served by fair to good ground access. Various routes connect Neah Bay with the major state and federal highway system with the most common route being I-5 to highway 101 to either State route 112 or 113. The last 32 miles into Neah Bay has no alternative route. Winter access to Neah Bay can be difficult depending on ice and snow conditions. On two occasions we elected to change crews in Port Angeles instead of Neah Bay (coupled with fuel re-supply) for safety concerns.

Support

Supplies

Commissary The majority of the commissary supplies while on station in Neah Bay were purchased locally from Washburn's grocery. Food quality was good to excellent. Owners were very easy to work with and their staff provided excellent service to the crew.

Deck Supplies The bulk of our deck supplies (paint, paint supplies, rigging and tools) were either resident on the tug at the time of deployment or re-supplied from our inventory in Seattle. However, supplemental deck supplies were purchased from the local hardware store (adjacent to and part of Washburn's grocery) as needed.

Engine Supplies Most mechanical systems and components resident on the Barbara Foss require specialized tools, equipment and parts. While the local marine stores in the Neah Bay area inventory common items for the fishing and recreational vessel fleets few parts were available for our equipment. While on station spare parts were either placed on the tug at the time of deployment or shipped from Seattle.

Services

Fuel Fueling facilities located in Neah Bay did not have sufficient water depth for the safe fueling of a vessel with the draft of the Barbara. All fueling was conducted at the TESORO dock located in Port Angeles, Washington, fifty miles East of Neah Bay.

Maintenance and Repair The Barbara Foss is self sufficient for most small to medium sized M and R tasks. The combination of physical (welder, burning torch, hand tools) and employee (U.S. Coast Guard licensed Chief Engineer) assets coupled with onboard inventory of commonly used parts allows most repairs to be completed on the tug. Major repairs require repositioning to either Port Angeles or our Shipyard in Seattle.

Potential problem

Loading heavy items to the vessel on short notice Loading or unloading to a vessel, with the size and draft of the Barbara, any load of significant weight on short notice may be problematic. Two docks in Neah Bay are available. The Tribal dock, located at the eastern end of the bay is fairly exposed to weather from the Northwest. Water depths along side the dock restrict use to high water. The dock is of typical piling and cross beam construction and in fair condition. We were not able to ascertain load limits on the dock. The Cannery dock is the other facility in Neah bay. This dock is just to the West-Southwest of the Marina. As with the Tribal dock, use of the facility is limited to high water and load limits are unknown.

Ideas:

Many mariners without local knowledge consider the entrance to Neah Bay treacherous. Because of our historical and current experience transiting the entrance we know the safest route. One idea is to install "range boards" for the entrance. Range boards are used as a navigational aid on river systems where either boards or lights (or in combination) are placed at appropriate horizontal and vertical distances apart to indicate a line of direction for guidance in a narrow waterway. A range system could be established for Neah Bay giving the uninitiated mariner an additional navigational tool for safe passage.

The Barbara Foss moored over 100 times during the six months on station without damage to the two steel mooring piles. However, the vessel crew was extremely cautious of exerting strain on the two piles. A cost benefit analysis should be conducted on filling the outermost steel piles with concrete for a stronger tie up for a large vessel.

Conclusion

The Barbara Foss, which remained on station from December 16, 1999 to June 20, 2000, was tasked with demonstrating the "feasibility of using Neah Bay as a mooring and staging site" and "evaluate the use of Neah Bay with regard to adequacy and logistics support".

The ideas offered above should be considered enhancements and are not required for safe navigation or moorage.

During the test period, Foss Maritime Company, unequivocally demonstrated that Neah Bay is an excellent location for mooring and staging a tug like the Barbara Foss. Additionally, logistical support for all but fuel and lube re-supply and major marine repairs

was satisfactory. The Makah Tribal council members, residents, local vendors and Port managers deserve credit for their assistance and cooperative attitude during our stay.

Neah Bay Rescue Tug:
Report to the Washington State Legislature

Publication No. 00-08-023

Joe Stohr, Manager
Spill Prevention, Preparedness, and Response Program
P. O. Box 47600
Olympia, WA 98504-7600
(360) 407-7455

Authors
Mike Lynch
Jon Neel

Major Contributors
Stan Norman
Jack Barfield

Editing and Production
Mariann Cook Andrews