Changes in Prince William Sound Crude Oil Transportation Since the Exxon Valdez Oil Spill

Prince William Sound Regional Citizens’ Advisory Council
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*These icebergs were calved from Prince William Sound’s Columbia Glacier, just visible in the background. Photo by Bill Rome.*

**Cover photos:** Exxon Valdez Oil Spill Trustee Council, Tom Copeland, Bud Ehler, Tom Kuckertz, Joe Banta, Dan Gilson, and Lisa Ka’aihue.
INTRODUCTION

Twenty years have passed since the Exxon Valdez struck Bligh Reef, resulting in the worst tanker oil spill in U.S. history. On March 23, 1989, the super tanker departed Valdez, left the tanker lanes to avoid icebergs from Columbia Glacier, and failed to return to the lanes. Shortly after midnight on March 24, it struck Bligh Reef, less than 30 miles from port. Some 11 million gallons of North Slope crude oil poured into the pristine waters of Prince William Sound, fouling beaches and marine life as far away as the Alaska Peninsula, devastating communities, and sending local economies into a tailspin.

While the immediate cause of the spill lies with the tanker’s captain and crew, it’s also true that complacency on the part of the oil industry, regulatory agencies, and the public played a part in the disaster. Regulatory agencies failed to establish proper oversight measures and the oil industry failed to ensure a prompt and effective cleanup. While some citizen activists were calling for safety improvements in Prince William Sound long before the grounding of the Exxon Valdez, the public largely ignored their voices. On March 24, 1989, the few prevention measures in place were inadequate to forestall the spill, and the cleanup resources immediately available were inadequate to deal with it.

Much has changed in the past two decades. Regulatory agencies, industry and citizens have worked together to use the painful memories and hard lessons of the Exxon Valdez oil spill to reduce the chances of another such spill and to prepare for a better cleanup if one should occur. The tanker fleet is switching to double hulls, which do much to reduce or eliminate spills that result from groundings or collisions. Loaded tankers are escorted from Valdez to the Gulf of Alaska by powerful tugs designed to keep a disabled tanker off the rocks or begin cleanup if there is a spill. Detailed contingency plans for preventing and cleaning up spills are now mandatory. Citizens are guaranteed a voice in safety planning and in oversight of the Prince William Sound oil transportation industry.

Despite these improvements, much remains to be done. Constant vigilance is needed to prevent a return of the complacency that allowed the Exxon Valdez spill to happen. That is the reason that the Prince William Sound Regional Citizens’ Advisory Council was created and it’s the reason we produced this report.

Our council is a non-profit corporation that derives its authority from the Oil Pollution Act of 1990 and from a contract with Alyeska Pipeline Service Co. The council works to observe, verify, advise and inform government, citizens, and industry about the safety of crude oil transportation through Prince William Sound. Our 18 member organizations represent oiled communities as well as Alaska Native, aquaculture, commercial fishing, environmental, scientific, recreation and tourism interests.

As we move past the twentieth anniversary of the spill, we hope this report will serve to identify the many areas where progress has been made as well as those where work is still needed so that history won’t repeat itself in Prince William Sound.

— Prince William Sound Regional Citizens’ Advisory Council

March 24, 2009
PREVENTION

The oil spill that never happens is the easiest to clean up. Safety improvements put in place since 1989 have drastically reduced the risk of another spill like the Exxon Valdez. In the past twenty years, the Prince William Sound crude oil transportation industry has phased in double-hulled tankers, developed a first-class escort tug system, and initiated numerous other prevention improvements.

DOUBLE-HULLED TANKERS

The Exxon Valdez, a single-hulled tanker, was carrying a full load of North Slope crude when it ran aground on Bligh Reef and caused the worst tanker spill in U.S. history. A Coast Guard study found that a double hull could have cut the size of the 11 million-gallon spill by 60 to 80 percent. Double hulls had already been identified as an effective design feature for reducing the size and frequency of oil spills and citizens were calling for their use in the Prince William Sound tanker fleet long before 1989.

Double-hulled tankers have two steel skins separated by several feet of space, reducing the chances of a spill even if the outer hull is penetrated in a collision or grounding. Double-hulled tankers cannot prevent all oil spills, but they are widely regarded as one of the most effective tanker design features for reducing the number and size of spills.

The Oil Pollution Act of 1990 requires the phase out of single-hulled tankers by 2015, a transition that is almost complete for the Prince William Sound carriers.

In 2001, the first double-hulled tanker designed and built specifically for the Prince William Sound oil transportation industry, since the Exxon spill, entered service. That tanker is the Polar Endeavour, operated by Conoco Phillips’s Polar Tankers. The Endeavour, built in Louisiana at a cost of over $200 million, is 895 feet long and carries just over 40 million gallons of oil. It is equipped with two independent engine rooms, twin propellers, and twin rudders.

ESCORT SYSTEM

Before the Exxon spill, each loaded tanker leaving Valdez was escorted by a single conventional tug that turned back several miles short of Bligh Reef. Thus, the Exxon Valdez was unescorted when it ran aground.

Now, loaded tankers are escorted by two tugs until they leave Prince William Sound through Hinchinbrook Entrance and pass into the Gulf of Alaska. The present escort system resulted from a research effort initiated in the mid-1990s by a partnership of citizens, industry and government.
The Exxon Valdez spilled 11 million gallons of North Slope crude oil into Prince William Sound. The oil spread south and west, affecting more than 1,300 miles of Alaska shoreline. The extent of oiling varied from heavy to light, sheen to tar balls.

A risk assessment was commissioned to review the escort system in existence at the time, as well as practices in waterways management and vessel management. The risk assessment concluded that better escort tugs were needed, leading to the world-class system operating in Prince William Sound today.

The escort tugs are operated by Alyeska’s Ship Escort Response Vessel System, usually called SERVS. SERVS’ mission is to prevent oil spills by helping tankers navigate safely through Prince William Sound and to start the response if there is a spill. SERVS maintains a fleet of 11 tugs and keeps response crews on duty around the clock.
Under today’s practices, both escort tugs are required to stay within a quarter-mile of the tanker at the north end of the Sound, and one of them is tethered to the tanker’s stern in Valdez Narrows, where ships have less room to maneuver if they lose power. In the less confined central part of the Sound, one tug must stay with the tanker, while the other can be a “sentinel” tug, meaning it can be stationed a few miles away from the tanker.

A rescue tug stays on station near Hinchinbrook Entrance until the loaded tanker passes into the Gulf of Alaska and is at least 17 miles out to sea.

The escort system started seeing equipment failures in 2003, with towlines breaking during training exercises. Crowley Marine Services, which operates the tugs for Alyeska, worked with the towline manufacturer to fix the problem, which has not recurred. These failures underscored the importance of drills and showed the need for continued close monitoring of the system.

SERVS safely escorted its 11,000th loaded tanker through Prince William Sound in January 2009, a milestone for the safety measures put in place since 1989. While the Oil Pollution Act of 1990 requires tug escorts only for single-hulled tankers, our council in 2006 adopted a position that calls for preserving the two-tug escort requirement for all loaded tankers, whether single- or double-hulled, and for a limit of two loaded tankers in the system at any one time.

The council position also calls for the tug stationed at Hinchinbrook Entrance to be a high-performance Prevention/Response Tug rather than a conventional tug, due to the severe weather commonly encountered at the Entrance.
A navigational mistake, not a hardware malfunction, was the chief cause of the Exxon spill. The captain was intoxicated, according to the National Transportation Safety Board, and failed to ensure that the tanker was returned to the shipping lanes (after diverting to avoid icebergs) in time to avert the grounding on Bligh Reef.

While double hulls and other technological improvements can reduce the frequency and severity of spills, they may not affect the chain of human errors at fault in many accidents. Some of these safety improvements may give a false sense of security, which could lead to complacency.

Tanker captains weren’t subject to alcohol tests prior to 1989. Now, all captains are given breath tests an hour before sailing and any crew member suspected of consuming alcohol is tested. Each tanker leaves port with a state-certified pilot, who stays aboard until the tanker passes Bligh Reef. In 1989, the pilots got off at Rocky Point, 10 miles shy of Bligh Reef, where the Exxon Valdez ran aground. Today, crews receive more training and work hours are limited in an effort to reduce fatigue-related accidents.

The Coast Guard and the Alaska Department of Environmental Conservation are the agencies primarily responsible for oversight and monitoring of the Valdez Marine Terminal and tanker operations.

After the Exxon spill, both agencies were criticized for failing to implement and enforce proper prevention and response measures and many improvements have been made since then. At the federal level, the Coast Guard has been given a more direct role in spill prevention and response, with greater regulatory oversight. The Alaska Department of Environmental Conservation now has the authority to regulate terminal and tanker operations, and the agency formed the Division of Spill Prevention and Response to oversee oil related functions.

Its responsibilities include overseeing industry spill drills, conducting facility inspections, and reviewing contingency plans from Alyeska and individual tanker companies.

The state of Alaska had a spill-response fund prior to 1989. It was expanded after the Exxon spill to ensure that sufficient money would be available to oversee cleanup operations in the event of another spill.
and to support routine operations of state prevention and response programs. The response fund is financed by a tax of 1 cent per barrel on crude oil produced in Alaska. (A barrel of oil is 42 gallons.)

The tax is suspended when the spill response fund reaches a balance of $50 million, then restarted if the fund is drawn down by the state’s expenses in responding to a spill. The day-to-day operations of prevention and response programs, meantime, are supported by a tax of 4 cents per barrel on crude oil.

**MONITORING**

Before the Exxon spill, there was only limited radar coverage of tanker operations in Prince William Sound. The Coast Guard’s radar did not detect the grounding at Bligh Reef, less than 30 miles from the agency’s vessel traffic center in Valdez. Now, the Coast Guard tracks tankers and other vessels in Port Valdez and much of Prince William Sound with better radars and with an Automatic Identification System. This system helps reduce collisions by monitoring the navigational status of each ship, including speed and heading.

We have installed Automatic Information Systems in our Anchorage and Valdez offices to monitor tanker movements and are archiving the data to verify vessel tracks and travel times through the Sound. Alyeska also upgraded its reporting and communications by installing repeater towers to improve communications between tankers and the Valdez Marine Terminal.

While weather was not an immediate cause of the Exxon spill, it is an important factor in preventing, containing, and cleaning up oil spills. We have advocated for and helped fund projects to study wind, ocean currents, and other environmental factors near the Valdez terminal, in Prince William Sound, and in the Gulf of Alaska.

Weather equipment has been installed in Valdez Narrows, at Bligh Reef and another point nearby, in central Prince William Sound, and at Hinchinbrook Entrance to monitor wind speed, direction, barometric pressure, temperature, and wave action. Through a partnership with the Oil Spill Recovery Institute at the Prince
William Sound Science Center, our council started monitoring ocean currents in Prince William Sound in the fall of 2003. The goal of the project was to use data collected from remote weather stations and ocean sensors to develop models that could predict the path of spilled oil.

Weather stations equipped with web cameras have been installed at 15 sites across the Sound. The group also deployed gauges to collect data on currents, wave height and frequency in Valdez Arm and in central Prince William Sound in October 2007.

ICE DETECTION

The Exxon Valdez left the tanker lanes in 1989 because of reports of icebergs drifting into the tanker lanes from nearby Columbia Glacier. The crew failed to return the vessel to the lanes on schedule, resulting in the grounding on Bligh Reef.

Ice caused another accident in 1994 when the tanker Overseas Ohio struck an iceberg and suffered about $1 million in hull damage. Fortunately, the Ohio was inbound at the time and not carrying crude oil. It is likely that the iceberg was mostly submerged and therefore invisible to the crew. SERVS established the current ice scouting system in response to this incident.

Our council led and helped fund a risk assessment for Prince William Sound tankers in the mid-1990s. It identified icebergs in tanker lanes as among the most significant risks to crude oil tankers.

A later study estimated that the volume of icebergs calving from Columbia glacier had increased five-fold over the preceding two decades and the trend was likely to continue or intensify.

This led to a collaborative effort to install an ice-detecting radar system on Reef Island, near Bligh Reef. It began providing ice information to SERVS in 2002. SERVS receives ice radar signals at its office in Valdez and uses the information to warn tanker captains when icebergs pose a threat to navigation.

The ice detection system is an example of a good working partnership between industry, government and citizens. We received a Legacy Award from the Pacific States/British Columbia Oil Spill Task Force for the project in 2003.
Prevention must always come first in promoting the safe transportation of crude oil through Prince William Sound, but even the best prevention measures are not completely fail-safe. Thus, a top-notch response system is also vital.

Industry and regulatory agencies must be prepared to respond by having equipment ready, people trained, and plans in place to mount an immediate, large-scale response in the event of a spill.

**SPILL DRILLS AND RESPONSE EQUIPMENT**

The response to the Exxon spill was widely criticized as poorly coordinated and largely ineffective. The weather was ideal for spill response for three days after the grounding, but the equipment wasn’t ready.

Alyeska’s lone response barge was onshore for repairs and much of the equipment it normally carried was buried under more than ten feet of snow, or under other equipment in a warehouse.

Seventeen hours after the spill, neither the tanker nor the leading edge of the oil slick had been boomed and skimmers weren’t working effectively. The little skimming that did occur was soon halted because there wasn’t room to store recovered oil. Today, systems are in place to coordinate industry and government roles and responsibilities in a spill response.

Before 1989, few drills were held to test prevention and response plans for tanker companies and the Alyeska terminal. Today, the oil industry must conduct two major drills each year and several smaller drills take place in communities throughout the area affected by the Exxon spill. These drills allow response personnel to learn about equipment and procedures for cleaning up a spill. They also coordinate the efforts of Alyeska, regulatory agencies, fishing vessels, tanker owners and operators, and our council.

Alyeska SERVS is now considered one of the best-equipped oil-spill response forces in the world and is responsible for ensuring that adequate response equipment is ready for use against a spill. In 1989, there were only 13 oil-skimming systems in Alyeska’s response inventory; today contingency plans require 76...
systems to be on hand, with a total recovery capacity of over 12 million gallons in 72 hours. Only 5 miles of containment boom were available in 1989; today, 71 miles are required. Alyeska had only about 220,000 gallons of storage capacity for recovered oil and the water that comes with it; today, total storage capacity exceeds 37 million gallons.

Alyeska maintains depots of spill-response equipment and materials at communities throughout the Sound, including Cordova, Whittier, Tatitlek and Chenega Bay, as well as at five salmon hatcheries.

In addition, response barges are anchored at remote locations in the Sound and manned 24 hours a day for rapid action. A response will be successful only if equipment is ready, personnel are trained, and all parts of the system are effectively coordinated.

Responders in Prince William Sound use the National Incident Management System, which is based on a system first developed by fire fighters in California to coordinate management, resources and roles during fire response. It engages Alyeska, the Coast Guard, the state of Alaska, and the party responsible for the spill in a unified command structure that expands according to need and is tested extensively in drills.

**CONTINGENCY PLANS**

Anyone who transports or handles crude oil as cargo, including the Valdez Marine Terminal and individual tanker companies, must have a government-approved contingency plan in place for preventing and responding to spills. State and federal laws and regulations determine what must be in the plan and what must be provided in the way of drills, training, and equipment.

Requirements vary based on location, the type of vessel or facility, and the amount and type of cargo involved. Since 1989, state and federal agencies have expanded plan requirements and changed some of the assumptions. The Oil Pollution Act of 1990 stipulated the first contingency plan requirements for tankers.

Those who are required to have contingency plans to operate must provide assurances that personnel are being trained, that equipment and resources are available to be mobilized quickly, and that all participants have practiced their roles in preparation for an actual spill.
RESPONSE

Alyeska Pipeline was required to have a contingency plan before the Exxon spill, but it was not effectively implemented. Spill response duties were assigned to personnel with other day-to-day operational tasks, and equipment was not adequately maintained and available. As a result, the initial response in 1989 was slow, ineffective, and poorly coordinated.

The potential size of a spill determines the amount of resources and equipment that must be available for response. Alyeska’s 1987 state-approved contingency plan said a spill of 8.4 million gallons (three quarters the size of the Exxon spill) was highly unlikely. It stated that, “catastrophic events of this nature are further reduced because the majority of tankers calling on Port Valdez are of American registry and all of these are crewed by licensed masters and state pilots.”

Now, both federal and state laws require planning for larger spills, and require more spill response equipment to be immediately available. Contingency plan holders must have enough equipment to deal with a spill of 12 million gallons within 72 hours. They must also plan for a much larger spill based on a complicated formula that includes credit for prevention measures.

In Prince William Sound, tanker owners and operators must have their own approved contingency plans, although they contract with Alyeska to provide the initial response described in the plans.

Under these contracts, Alyeska manages the spill response for up to the first 72 hours after a spill. After that, management is transferred to the spiller, as long as the Coast Guard and the Alaska Department of Environmental Conservation agree that the spiller or its representative is ready to take over.

Alyeska Pipeline Service Co. maintains its own contingency plans for the Valdez Marine Terminal and for the trans-Alaska pipeline. Our council reviews and comments on Alyeska’s terminal plan and on individual tanker plans.

In 2003, Alyeska began work on its five-year contingency plan renewal for the terminal. A working group was created with regulators,
industry and the council, providing an example of parties working together toward a common goal. This collaborative process addressed and resolved some issues, and produced a plan that the working group was confident would do a good job of preventing and responding to spills.

In recognition of this effort, we nominated Alyeska for a Legacy Award from the Pacific States/British Columbia Oil Spill Task Force. Alyeska didn’t get the award, but we continue to regard this process as a model of the kind of collaboration and cooperation needed to maximize the safety of crude oil operations in Prince William Sound.

The smooth working relationship with Alyeska was in sharp contrast to what happened when the shipping companies began work on the five-year renewal of the tanker contingency plans. Our council was excluded from the process, and the Alaska Department of Environmental Conservation deemed the companies’ first draft “insufficient for review.”

The plan was not specific enough to show how or even whether it would work in a real-life scenario. The companies created a working group for the second draft, this time including our council, and the plan was eventually approved.

However, the time lost put the process under pressure that made it more difficult to create a truly first-rate plan. Since the plan was approved, a steering committee and various work groups have been set up—with council participation—to address issues in the tanker plan that still need improvement.

Contingency plans have helped ensure that measures are in place to prevent and respond to a spill, but there is room for more work. For example, the industry contingency plans assume that, even in a catastrophic spill larger than the Exxon spill, no oil would escape Prince William Sound and therefore no cleanup planning would be required outside of the Sound.

In fact, oil from the Exxon spill reached communities as far away as the western beaches of Kodiak Island and the eastern shores of the Alaska Peninsula. Communities in these downstream areas do not have the same response equipment as is stationed in Prince William Sound. If another spill sent oil in their direction, the necessary equipment for protecting hatcheries, salmon streams, clamming beaches, wildlife, and other local resources might not be readily available.

Our council has focused on developing plans for downstream communities, including a timeline for when oil might reach them and estimates of the personnel and equipment that would be needed to respond.
RESPONSE

NEARSHORE RESPONSE

Some of the changes since 1989 put more emphasis on shoreline protection, wildlife protection, and the identification of sensitive areas such as hatcheries. A new term was coined — nearshore response — to describe the effort to protect shorelines threatened by spilled oil that escapes initial containment.

Nearshore response is a major component of spill response, in which local personnel, knowledge and resources can be used to protect critical resources and shorelines. Industry groups, the council and regulatory agencies have worked cooperatively to develop nearshore response plans.

Local fishing vessels are part of Alyeska's planned nearshore response. They are used to transport response equipment, deploy and tend boom, and mobilize pre-staged equipment to protect fish hatcheries, among other things. Alyeska provides response training to over 350 fishing boats and their crews. The fishing vessels, based in communities in Prince William Sound, the Kenai Peninsula and Kodiak Island, are under contract with Alyeska to respond to spills if willing and available at the time of an incident.

Storage capacity for recovered oil was a problem in the 1989 recovery effort, when only 220,000 gallons of storage capacity was available. Boats would pick up the emulsified oil (oil that has mixed with seawater into a goo that sometimes resembles chocolate mousse), only to find there was nowhere to put it. Alyeska is now required to maintain storage capacity, much of it on barges, for over 37 million gallons of recovered oil and water mixture. The oil industry is much better prepared today for nearshore response than it was 20 years ago, but there is still room for improvement.

GEOGRAPHIC RESPONSE STRATEGIES

Prince William Sound has thousands of miles of shoreline that support clamming beaches, salmon streams, hatcheries, and other valuable resources that could be threatened by spilled oil. Changes since the Exxon spill have addressed the need to protect these critical resources.

Our council has worked cooperatively with industry and regulatory agencies to develop detailed Geographic Response Strategies to protect sensitive areas and resources from spilled oil. These are map-based strategies that can save time during the critical first few hours of an oil spill response. Strategies have been developed for Prince William Sound, Cook Inlet, and Kodiak Island. Work continues today on developing and testing these strategies, though no more are being created for Prince William Sound at present.

Fishing boats tow boom during a 2006 vessel training exercise near Homer. Photo by Roy Robertson.
PLACES OF REFUGE

In November 2002, the tanker Prestige suffered structural damage off northwest Spain and leaked a little over 4 million gallons of its cargo of heavy fuel oil into surrounding waters. Winds pushed the oil onto the Spanish and French coasts, after which the vessel was towed offshore while the Spanish government decided what to do.

This spill was an example of the dangers of being unprepared and unable to respond. We began studying the issue of tankers in distress, which resulted in a places-of-refuge matrix that has been incorporated in the contingency planning process. A place of refuge is an area where a disabled tanker could take shelter while repairs are made.

SHOREZONE MAPPING

In an effort to improve response planning, our council began video mapping the shoreline of Prince William Sound in the summer of 2004. This effort sent researchers into the air to take aerial video of shorelines during low tides to monitor habitat, plants, and animals.

The video is used in conjunction with detailed maps to form a database of the nearshore environment. Besides being a tool for planning and conducting oil-spill response, this database is available for education and research. Researchers had mapped 1,680 miles of shoreline by 2007 with an end goal of mapping the entire shoreline from Southeast Alaska to Kodiak Island.

RESPONSE GAP

We continue to have major concerns about regulations governing the rescue and response tugs that escort loaded oil tankers out of Prince William Sound. Loaded tankers are permitted to sail if the sustained wind at Hinchinbrook Entrance is less than 52 mph (45 knots) and waves are less than 15 feet high. The Alyeska contingency plan says the SERVS response system can work in winds up to 40 mph (35 knots) and waves up to 10 feet.
RESPONSE

However, based on observation of numerous drills and exercises, we have concluded that the safe operating limits for oil-spill responders are closer to 35 mph (30 knots) of wind and seas of 3 to 4 feet. When loaded tankers can sail but cleanup is not feasible, conditions are said to be in the “response gap.”

We have conducted studies of winds, waves, temperature, and visibility to determine how often conditions are in the response gap. For both mechanical cleanup (primarily with booms and skimmers) and non-mechanical cleanup (dispersants and in-situ burning), the response gap exists about 30 percent of the year in central Prince William Sound and at Hinchinbrook Entrance, or about 110 days per year. The gap is smaller in the summer, occurring about 10 percent of the time, and larger in the winter, when immediate response is impossible 56 percent of the time.

DISPERANTS

The use and effectiveness of chemical dispersants in oil-spill response has long been a matter of debate. Industry and government regulators maintain that dispersants could be a powerful tool for dealing with oil spills in Prince William Sound and the Gulf of Alaska, despite the fact that they failed when tried on spilled oil from the Exxon Valdez.

The purpose of dispersants is to mix spilled oil into the water column, reducing a surface slick that could contaminate the shoreline, birds, or marine mammals. There are so many unknowns about the effects of dispersants—including long-term impacts—that we have consistently advocated for a conservative approach to their use.

Our council has sponsored extensive research in an effort to better understand how chemically dispersed oil behaves in the water column, from the surface of the sea to the bottom, and how it affects species that live there. The results have been inconclusive as to whether dispersants would work in cold waters such as those found in Prince William Sound. Due to these many unknowns, we concluded that mechanical recovery with booms and skimmers should always take first priority in oil-spill response.

Mechanical recovery requires barges or another means of storing recovered oil and the water that comes with it. However, mechanical recovery is the only method proven to remove the oil from the environment, without creating additional environmental hazards.

Dispersants are known to be toxic and, while they may shift oil from one part of the environment to another, they do not remove it, as does mechanical response. Consequently, the use of dispersants represents an environmental trade off.
Reports after the Exxon spill concluded that chemical dispersants were largely useless in the cleanup effort. In the days following the spill, dispersants were applied several times, with observers noting that the efforts were ineffective.

After these failures, state officials became skeptical of dispersants as a response option, yet application efforts continued for up to a week or more after March 24. Most of the oil had emulsified by that point, making it resistant to breakdown. On April 8, the Environmental Protection Agency declared that further dispersant applications would not be effective and therefore would be inappropriate.

It is estimated that it would have taken 500,000 gallons of Corexit 9527, the dispersant used on the Exxon spill, to treat the 11 million gallons of oil released, but only 22,150 gallons of the dispersant were available in Alaska at time of spill. Additionally, the low temperature and frequently low salt content of Prince William Sound waters make dispersants less effective.

We have worked both on our own, and in coordination with the Alaska Regional Response Team (a group of state and federal agencies in charge of oil spill response in Alaska), to look for a way to address questions about dispersant toxicity, effectiveness, and planning.

A committee of the National Research Council, that included representation from the council, recently issued a report titled Understanding Oil Spill Dispersants: Efficacy and Effects. The report concluded that the decision to use dispersants after an oil spill should be based on prioritizing which part of the marine ecosystem should be protected. A choice may have to be made between surface waters and shorelines or water column and seafloor. The committee recommended further study on the effectiveness of dispersants on different types of oil in various environmental conditions. It also suggested study of the acute and long-term toxicity of dispersed oil.

Studies that have been conducted raised concerns for our council. For instance, studies on the effects of sunlight on oil found that ultraviolet radiation (a component of sunlight) significantly increases the toxic effects of oil on marine organisms.

Other studies of herring larvae exposed to oil showed that oil became two to 450 times more toxic.
when exposed to sunlight and chemically dispersed oil demonstrated similar or greater toxicity, killing or injuring 90 percent of herring exposed. These findings are critical to evaluating the risk and injuries from spilled oil and chemically dispersed oil in Prince William Sound.

Dispersants require a considerable level of wave activity in order to work and resurfacing can also be a problem. Resurfacing occurs when oil that has been broken apart coalesces and returns to the surface. This is cause for concern because resurfaced oil may form a slick elsewhere and unexpectedly harm environmentally sensitive areas, the very thing dispersants are intended to protect.

These findings, along with inconclusive laboratory and open sea tank tests prompted our council to call for a ban on dispersant use until research shows the chemicals to be a safe and effective way to treat spilled oil. As a result, after years of in-depth review, in 2006 our board of directors adopted a position opposing any use of dispersants in Prince William Sound until they are shown to be effective at cleaning up oil without harming the environment.

IN-SITU BURNING

In-situ burning, or burning oil while it is still on the water, is another much-debated method of treating oil spills. Two attempts at in-situ burning took place on the second day of the Exxon Valdez cleanup.

The first attempt ignited 15,000 gallons of crude oil, which burned with high efficiency. Efforts to ignite a second slick were unsuccessful because the oil had emulsified, making it resistant to burning, and the strategy was abandoned as a cleanup tool.

Burning converts oil from water pollution to air pollution, but still leaves it in the environment. In December 2004, we adopted a position opposing in-situ burning in most cases.

In-situ burning could be useful in pack ice spills, spills at extremely low temperatures, and on spills in extremely remote locations. Citing the concern for the effect of burn residue on sea life and recognizing that sometimes burning may be best, our board of directors determined that continued research into the issue is necessary.
The Exxon spill brought devastation to Prince William Sound 20 years ago, but tanker spills are not the only pollution threat the crude oil trade poses to the region’s environment or residents.

Day-to-day operations of oil tankers and the Valdez Marine Terminal create pollution, including small leaks and spills of crude oil and other petroleum products, as well as permitted discharges from the terminal into the air and into the waters of Port Valdez. The council is also concerned about the risk of invasive species reaching Prince William Sound via tankers.

LONG TERM ENVIRONMENTAL MONITORING PROGRAM

When the Exxon spill hit Prince William Sound, there was very little in the way of baseline scientific data on pre-spill environmental conditions that could be used to gauge the impacts of the spill. One of our council’s first priorities was to launch a project to compile this valuable information.

Begun in 1993, the goal of the Long Term Environmental Monitoring Program is to monitor for oil pollution from operations of oil tankers and Alyeska’s Valdez Marine Terminal by analyzing the tissue of mussels collected from the shorelines of the Sound, the lower Kenai Peninsula, and Kodiak Island. Mussels are filter feeders and accumulate toxins from the water.

The data collected from the program form a benchmark for assessing the ongoing impacts of routine tanker and terminal operations. And, if there is ever another spill, the data will allow for before-and-after comparisons to help determine its impacts.

This program is the longest continuous record of regular mussel sampling in the region. Mussels are collected at least annually at 10 sites around Prince William Sound. Two sites in Port Valdez are monitored more closely, with mussel tissue and bottom sediments collected and analyzed for hydrocarbons three times a year.

Results are summarized in a year-end report. The latest data show that oil pollution at the sites does not exceed levels permitted by current water quality regulations; this is true even at the Port Valdez sites, where levels tend to be higher. However, some NOAA studies conducted after the Exxon Valdez spill indicate that marine species may be harmed even at lower levels than those permitted by
current regulations. Laboratory tests “fingerprint” the mussel tissues to identify the source of any crude oil in the tissues. Exxon Valdez hydrocarbons have been detectable at several of the sites, but they are declining to very low levels.

Beginning in 2010, the program will change to sampling once per year in the summer season at the two Port Valdez sites and at the Knowles Head site in Prince William Sound proper. The other seven sites will be sampled once every five years in the summer season.

NON-INDIGENOUS SPECIES

In addition to the oil pollution concerns posed by the tankers and the terminal, tankers are also the cause of another potential environmental and economic problem—non-indigenous species.

Non-indigenous species can be transported in ballast water, on vessel hulls, in sediment taken in with ballast water in shallow ports, and in sea chests (compartments on the sides of vessels that house seawater intake lines used for ballast, engine cooling, and fire suppression).

Oil tankers traveling empty from west coast ports to Valdez take on seawater ballast for navigational stability. Some ballast water is carried in the same tanks used for oil. There, it mixes with oily residue and has to be cleaned upon arrival before it can be discharged into Port Valdez. Other ballast is carried in segregated tanks reserved for that purpose. These tanks never hold oil, so this water does not have to be cleaned like oily ballast water discharged from cargo tanks.

Millions of gallons of segregated—or “clean”—ballast water are discharged near Valdez each year, posing a risk that Prince William Sound could be invaded by non-indigenous species. (Dirty ballast does not pose this risk, because oily residues kill any organisms taken in with the ballast water.)

Alaska—primarily Port Valdez—receives more clean ballast water than almost any other state. Much of it comes from ports already invaded by non-indigenous species such as the European green crab and Chinese mitten crab. Our council made the issue of non-indigenous species a priority in 1996 by pursuing two

Dan Gilson of the citizens’ council staff uses these traps to monitor for European green crabs, an invasive species that has yet to reach Prince William Sound. Photo by Linda Robinson.

The European green crab is one non-indigenous species with the potential to invade the waters of Prince William Sound. Photo by Stan Jones.
tracks—research and legislation. In partnership with the U.S. Fish and Wildlife Service, NOAA’s Sea Grant program, Alyeska Pipeline Service Co., and the University of Alaska Fairbanks, we have cosponsored a series of scientific studies by the Smithsonian Environmental Research Center.

These studies identified 15 non-indigenous species in Prince William Sound. However, our council and invasive species experts are generally more concerned with species that have yet to be found in our waters, but are known ballast water invaders such as the European green crab. Green crabs were first detected on the west coast in San Francisco in 1989; by 1999 they had worked their way as far north as British Columbia.

We sponsored research that found the green crab could easily establish itself in the waters of Prince William Sound and the Gulf of Alaska. We have established a citizen monitoring effort to educate the public on this growing concern, and also to look for green crabs along the shores in our communities.

So far, green crabs have not been found in Alaska, although most experts agree that they will make it to the state eventually. Thus, our council is in support of a new effort by regulators to develop an early detection and rapid response plan to combat the species.

A more recent area of research concerns hitchhikers that catch rides on the hulls of ships, called hull-fouling or biofouling. Barnacles, mussels and non-attached organisms such as crabs and lobsters also find their way into sea chests.

We are sponsoring research with the University of Washington to identify the potential for hull-fouling invasions as a result of shipping traffic into the Sound. This research is being sponsored in partnership with the U.S. Fish and Wildlife Service.

In addition to focusing on research, we have monitored and advised regulatory bodies and legislators on invasive species laws and regulations. Current regulations have a substantial hole in regard to ballast water exchange, a known and effective treatment for the problem of non-indigenous species.

Ballast water exchange removes coastal organisms from ballast tanks by replacing seawater taken on in port with open-ocean seawater. Oceanic water is much less likely to contain organisms able to survive in the coastal waters of the destination port where the ballast will be discharged. Similarly, discharging coastal ballast water in the open ocean poses little danger of contaminating those waters with non-indigenous species because inland
coastal organisms typically cannot survive there. At present, the tankers in the North Slope crude oil trade are exempt from federal ballast water exchange requirements. We have voiced concern about this situation year after year, but Congress has yet to act on the issue as of this writing.

The United States also has not set standards for treating ballast water, whether by ballast exchange or by other means. Such standards would establish limits on how many organisms ballast water could legally contain when discharged back into the sea at the vessel’s destination port. This is another area our council has urged policy makers to address, and the sooner the better. Every day that passes without action increases the risk that Alaska will suffer a harmful invasion by a marine non-indigenous species.

One only has to look at the rest of the United States to see the consequences of harmful invasions. The prime example of this is the zebra mussel’s invasion of the Great Lakes. Damage to water pipes, boat hulls, and other hard surfaces by this species in the Great Lakes is estimated at $5 billion. So far, no harmful non-indigenous species from tanker ballast water is known to have invaded Prince William Sound, and our goal is to make sure our waters don’t become the next Great Lakes.

IMPACTS ON THE HUMAN ENVIRONMENT

The plight of communities affected by the Exxon spill was all but overlooked in the immediate aftermath of the disaster, despite the severe social and economic disruptions these communities endured. Our council took the lead in addressing the need to repair the human environment. We produced Coping with Technological Disasters, a guidebook for communities. It won the council a Legacy Award in 2000 from the Pacific States/British Columbia Oil Spill Task Force.

The guidebook was published in 1999 following studies on the effects of the Exxon spill on the commercial fishing town of Cordova. The studies found that man-made, or technological, disasters affect people very differently than do natural disasters. These disasters tend to produce a corrosive community characterized by high levels of tension, conflict, litigation and chronic psychological stress. The guidebook offers ways to cope with the economic, social,
and personal hardships caused by a disaster like the Exxon spill. We sent copies of the guidebook to several communities outside Alaska that experienced technological disasters, including a diesel spill from the tanker *Jessica* off the coast of Ecuador on January 16, 2001. The 243,000-gallon spill threatened the ecologically fragile Galapagos Islands. Copies of the guide were also sent to Coos Bay Oregon, the site of the *New Carissa* oil spill; to Bellingham Washington, site of a pipeline explosion; and to Brittany, France, after the *Erika* spill.

We developed a peer-listener training program, available on DVD, to complement the guidebook. Training sessions have been presented to many communities, where residents learn to be peer counselors, advisors, friends, and referral agents for those who may not seek professional services or may not know that help is available.

The guidebook and peer-listener training are currently being updated to address the socio-economic effects of the long-running *Exxon Valdez* litigation.

**VALDEZ MARINE TERMINAL**

The trans-Alaska pipeline ends at the Valdez Marine Terminal. There, approximately 90 to 95 percent of the oil produced on Alaska’s North Slope is loaded onto tankers for shipment to Hawaii, the west coast of the United States, or to Alaska’s Cook Inlet (which has one small refinery). The rest of the oil is taken out of the pipeline by refineries in Fairbanks and Valdez. At peak North Slope production in the mid-1990’s, about 2 million barrels of oil poured into tankers each day at the Valdez terminal. Production has declined since then; it averaged slightly less than 650,000 barrels a day in 2008.

Building the 800-mile trans-Alaska pipeline from Prudhoe Bay to Prince William Sound cost $8 billion, took three years, and employed some 70,000 people. The pipeline and Alyska Pipeline Service Co. turned 30 years old on June 20, 2007. In that time, the system had moved more than 15 billion barrels of oil, enough to make up 19,000 tanker loads.

While this was a major milestone, it also serves as a reminder that the system is getting old. Constant vigilance is needed to ensure that the necessary maintenance is performed to guarantee safe operations.
Routine operations of the tanker industry create a level of ongoing pollution, mostly from oil residues released into the water and hydrocarbon vapors into the air by the Valdez Marine Terminal. Many of these emissions are permitted by regulation, but are a continuing concern for our council, which strives to reduce permitted pollution to the minimum feasible levels.

For the first twenty years of terminal operations, the most serious pollution came from tanker loading, in the form of toxic crude oil vapors forced out of holds as tankers took on cargo. These vapors were vented into the atmosphere, threatening the health of terminal workers and Valdez residents. We opposed this practice and, after a series of scientific studies, called for a system to capture these vapors.

While this practice was in effect, the Valdez terminal with its tanker operations was the biggest source of vapor emissions in the United States, annually releasing 43,000 tons of volatile organic compounds, which are known to cause cancer.

In 1995, the Environmental Protection Agency agreed that a system to capture these harmful vapors should be required. By 1998, Alyeska had installed vapor controls at two loading berths, eliminating nearly all air pollution from tanker loading operations.

Under the original design of the ballast water facility, this “dirty” ballast water was treated in a three-part process that utilized the natural tendency of oil and water to separate. The ballast water was first transferred to settling tanks where most of the oil floated to the top to be skimmed off and loaded onto outgoing tankers as cargo. The water left behind then went to a dissolved air flotation system, where tiny bubbles were floated through it to carry most of the remaining oil to the surface. The
final step was at biological treatment tanks where microbes ate the remaining water-soluble hydrocarbons. The treated water was then discharged into Port Valdez. All stages of the process released hydrocarbon vapors into the air.

The ballast water facility was designed to process up to 30 million gallons of ballast (as well as storm water run-off from the terminal grounds), but now handles only about 2 million gallons a day.

Throughput has declined because the double-hulled tankers that now make up most of the Prince William Sound fleet rarely use oil tanks to carry ballast water, and because less oil is being produced on Alaska’s North Slope, meaning fewer tankers load at the Valdez terminal.

Ballast-water throughput is likely to decline even more as the conversion to double-hulled tankers proceeds and North Slope oil production continues to fall. Our council had long urged for the capture of vapors from the ballast water facility. In 2007, Alyeska committed to a plan that will make it virtually free of air pollution.

The plan will eliminate one large settling tank and incinerate the vapors from two others rather than releasing them into the air. The dissolved air flotation system, which is open to the atmosphere, is being replaced with a closed system completely sealed off from the atmosphere. Finally, Alyeska’s plan will replace the open-air biological treatment tanks with a closed system that captures vapors for incineration rather than releasing them into the atmosphere.

ENVIRONMENT

A tanker docks to load oil at the Valdez Marine Terminal.

EARTHQUAKE RESISTANCE

In an effort to ensure the stability and strength of the Valdez Marine Terminal, our council has studied the engineering standards used to design and build it in the 1970s. The terminal was designed to withstand an earthquake equaling the Good Friday earthquake of 1964, which devastated Valdez and many other coastal communities in Alaska.

But we now know the Good Friday quake was more severe than originally thought. Analysis has also shown that another earthquake of equal magnitude could occur sooner than estimated, perhaps in the next 1,000 years as opposed to the 2,500 originally estimated.

These findings raise the question of earthquake resistance at the terminal. We continue to analyze the stability of containment dikes around storage tanks, slope stability, earth and rock under storage tanks, and structural integrity of oil handling components to recommend re-engineering in weak spots.
Of all the changes in Prince William Sound since 1989, perhaps the most innovative was the establishment of permanent, industry-funded citizen oversight. Citizens were calling for changes long before the spill, including the establishment of independent, adequately funded citizens’ advisory councils to oversee industry operations and monitor the actions of regulatory agencies like the Coast Guard and the Alaska Department of Environmental Conservation. These calls went unanswered until the Exxon Valdez oil spill.

Our council was formed as a non-profit corporation in December 1989, nine months after the spill. Two months later, Alyeska signed a contract guaranteeing funding for the council, establishing its responsibilities, and guaranteeing its independence.

In August 1990, the first President Bush signed the Oil Pollution Act of 1990 into law. It included citizen-oversight provisions that bolstered the council’s authority and responsibilities. Citizen oversight of the oil industry is vital because citizens have so much to lose from a catastrophic spill.

Many of the safety improvements now in place in Prince William Sound are a direct result of partnerships between citizens affected by the spill, industry and regulators. In many parts of the world, oil development still takes place without citizen involvement, but there is a growing international interest in the Alaska model of citizen oversight.

In our two decades of existence, we have concluded that several elements are critical to making citizen oversight work. Every citizen oversight group needs clear authority to monitor and oversee oil industry operations. In our case, that authority comes from the federal Oil Pollution Act of 1990 as well as from our contract with Alyeska.

Our mission is to minimize the environmental impacts from oil tankers traveling through the Sound, and from the Valdez terminal where they load. Conducting the technical research, monitoring tanker and terminal operations, and evaluating industry and government proposals are costly undertakings. Thus, adequate funding, provided by the industry that has the potential to spill or otherwise cause

Even today, feelings run high about the spill, and oil from the Exxon Valdez can still be found under some of the beaches in Prince William Sound.

This photo was taken on Smith Island in July 2008, after the U.S. Supreme Court dramatically cut the jury award to over 30,000 oil-spill victims in the long-running punitive damages case resulting from the grounding at Bligh Reef.

The ruling triggered an outcry from fishermen and other plaintiffs in the case, and even from Alaska Gov. Sarah Palin, who complained the high court had “gutted the jury’s decision.”

Photo by Dave Janka.
environmental damage, is another key element to successful citizen oversight.

The internal structure of governance must be left up to the oversight group. The board members of our council are appointed by our 18 member entities. Not one seat is appointed by the oil industry, or by any agency or elected official of the state or federal government.

Other key elements include the ability for the group to control its budget and hire experts to cover subjects as it sees fit, also called budgetary independence. The group must also have access to industry facilities, personnel, and, ideally, records on the same basis as regulators.

As memories of the Exxon Valdez grounding fade with time, the risk will increase that the complacency that allowed it to happen could return. Thus, despite all of the valuable safety improvements in Prince William Sound since 1989, continued vigilance over terminal and tanker operations is as imperative as ever. This makes it even more important that the system of collaborative citizen oversight developed since the Exxon spill continues to function as long as oil flows through the trans-Alaska pipeline.
PRINCE WILLIAM SOUND REGIONAL CITIZENS’ ADVISORY COUNCIL

MEMBER COMMUNITIES & ENTITIES

Alaska State Chamber of Commerce
AK Wilderness Recreation & Tourism Assoc.
Community of Chenega Bay
Chugach Alaska Corporation
City of Cordova
City of Homer
City of Kodiak
City of Seldovia
City of Seward

City of Valdez
City of Whittier
Cordova District Fishermen United
Kenai Peninsula Borough
Kodiak Island Borough
Kodiak Village Mayors Association
Oil Spill Region Environmental Coalition
PWS Aquaculture Corporation
Community of Tatitlek
BOARD OF DIRECTORS & STAFF

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Sheri Buretta, Chugach Alaska Corporation
Patrick Duffy, AK State Chamber of Commerce
Jane Eisemann, City of Kodiak
Cathy Hart, AK Wilderness Recreation & Tourism Association
Blake Johnson, Kenai Peninsula Borough
Charles Totemoff, Community of Chenega Bay
George Levasseur, City of Valdez
Iver Malutin, Kodiak Village Mayors Assoc.
Thane Miller, Prince William Sound Aquaculture Corporation
Dorothy M. Moore, City of Valdez
Walter Parker, Oil Spill Region Environmental Coalition
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