Tug *Western Mariner* Oil Spill, Sitka, Alaska Natural Resource Damage Assessment

Summary of Preassessment

July 2024

Prepared by the Natural Resources Trustees for the Tug Western Mariner Oil Spill:
National Oceanic and Atmospheric Administration
U.S. Fish and Wildlife Service
U.S. Forest Service
Bureau of Indian Affairs
Alaska Department of Environmental Conservation
Alaska Department of Natural Resources
Alaska Department of Fish and Game
Alaska Department of Law

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Acronyms

ADEC – Alaska Department of Environmental Conservation

ADFG – Alaska Department of Fish and Game

ADNR – Alaska Department of Natural Resources

ADOL – Alaska Department of Law

BIA – Bureau of Indian Affairs

EFH – Essential Fish Habitat

FLAT – Federal Lead Administrative Trustee

FWS – U.S. Fish and Wildlife Service

NEPA – National Environmental Policy Act

NOAA – National Oceanic and Atmospheric Administration

NPFC – National Pollution Funds Center

NRDA – Natural Resource Damage Assessment

OPA – Oil Pollution Act

OSLTF – Oil Spill Liability Trust Fund

PAH – polycyclic aromatic hydrocarbons

RP – Responsible Party

SCAT – Shoreline Cleanup Assessment Technique

SEAPRO – Southeast Petroleum Response Organization

SITREP – Situation Report (from ADEC Division of Spill Prevention and Response Prevention Preparedness and Response Program)

USCG – United States Coast Guard

USFS – U.S. Forest Service

Executive Summary

On March 21, 2022, the tug *Western Mariner* collided with its freight barge while traveling through Neva Strait, approximately 18 miles northwest of Sitka, Alaska. The collision pushed the tug onto the beach, resulting in the release of diesel. Responders observed oil slicks and sheens on marine waters throughout Neva Strait and in areas to the north and south of the Strait. Response and assessment teams also documented shoreline oiling throughout Neva Strait. In some areas, diesel penetrated shoreline sediments and persisted through at least June 2024. Despite active shoreline oil removal actions undertaken by the response, including cold-water deluge and sediment agitation, some shorelines did not meet clean-up endpoints. Under the Oil Pollution Act of 1990 (33 U.S.C. § 2701, et seq.), the Natural Resource Trustees are responsible for restoring natural resources injured by the oil spill.

The Trustees, acting on the public's behalf, conducted preassessment activities to document injuries to trust resources resulting from the *Western Mariner* oil spill. Preassessment activities included, wildlife surveys, collecting sediment and biota samples for chemical analyses, intertidal community surveys, compiling available aerial photography and SCAT (shoreline cleanup assessment technique) data, and determining if feasible restoration actions exist to address the scale of potential injuries. The results of the preassessment efforts documented injuries to shoreline habitats and resources exposed to oil and found that the initial response actions did not adequately address the injuries. They also documented likely injuries to human uses of natural resources that the spill impacted and possible injuries to marine mammals, which were observed swimming in oil slicks and sheens. The preassessment identified a feasible restoration option, shoreline marine debris removal, to compensate for potential injuries to natural resources and services.

1. Introduction and Purpose

On March 21, 2022, the 83.7 ft tug *Western Mariner* was towing the freight barge *Chichagof Provider* south through Neva Straight outside of Sitka, Alaska. Reportedly, a steering failure aboard the *Western Mariner* caused the barge to collide with the tug. The collision pushed the tug onto the beach in Neva Strait, approximately 18 miles northwest of Sitka, resulting in a release of diesel. The *Western Mariner* is owned and operated by Western Towboat Co. (hereinafter the Responsible Party or RP). The total volume of spilled oil is unknown; however, the vessel had a maximum capacity of 50,000 gallons, was carrying an estimated 43,500 gallons at the time of the grounding, and 33,040 gallons of clean diesel was directly offloaded from the vessel into secured storage tanks during the response. Source control was achieved three days after the grounding, and eight days after the incident the *Western Mariner* was refloated and towed to Sitka.

During the incident, responders observed oil slicks and sheens on marine waters throughout Neva Strait and in areas to the north and south of the Strait. Response and assessment teams also documented shoreline oiling throughout Neva Strait. In some areas, diesel penetrated shoreline sediments and persisted through at least March 2023. Despite active shoreline oil removal actions undertaken by the response, including cold-water deluge and sediment agitation, some shorelines did not meet clean-up endpoints. Under the Federal Oil Pollution Act of 1990 (33 U.S.C. § 2701, et seq.; OPA), the Natural Resource Trustees are responsible for restoring natural resources injured by the oil spill.

The released oil negatively impacted marine shoreline habitats and resources, including water, sediment, porewater, and intertidal benthic invertebrate infauna (e.g., clams, cockles), epifauna (e.g., limpets, mussels), and macroalgae (e.g., rockweed). Other natural resources and services, including marine mammals and human uses of injured natural resources, were potentially impacted. The Trustees may assess these or other injuries as the assessment proceeds, or if additional information becomes available.

1.1. Purpose of the Report

Consistent with 15 C.F.R. § 990 Subpart D (the Preassessment Phase), the purpose of this report is to (1) provide an overview of the incident, response actions to-date, and natural resources at risk, (2) provide an explanation of the Trustees' determination of jurisdiction, (3) determine if injuries have resulted, or are likely to result, from the incident, (4) gather and analyze information for the purposes of conducting injury assessment activities, and (5) evaluate if feasible restoration actions exist to address the scale of potential injuries.

1.2. Overview of the Incident

On the morning of March 21, 2022, following the grounding that occurred at approximately 2:55am AKST, personnel on scene reported that a diesel spill had occurred, and silver and rainbow sheens were observed to cover approximately 4 nautical miles. Subsequent laboratory analyses of the source oil confirmed the release as red dye diesel. Emergency responders undertook efforts to control the source of the spill, including lightering fuel from compromised tanks and sealing leaks. According to the Alaska Department of Environmental Conservation (ADEC), Division of Spill Prevention and Response, Prevention Preparedness and Response Program Situation Reports (SITREPs),[1] source control was achieved on March 24 and all remaining fuel was emptied from the tug's tanks by March 26. On March 29, the *Western Mariner* was refloated and towed to Sitka. An estimated 43,500 gallons of diesel were onboard at the time of the grounding and 33,040 gallons were directly offloaded from the *Western Mariner* during response operations. Between March 23–30, oil sheens on water were observed throughout Neva Strait, including the mouth of St. John Baptist Bay, in southern Salisbury Sound to the north of the grounding, and in the northern part of Olga Strait, Krestof Sound, and the Magoun Islands to the south (Figure 2).

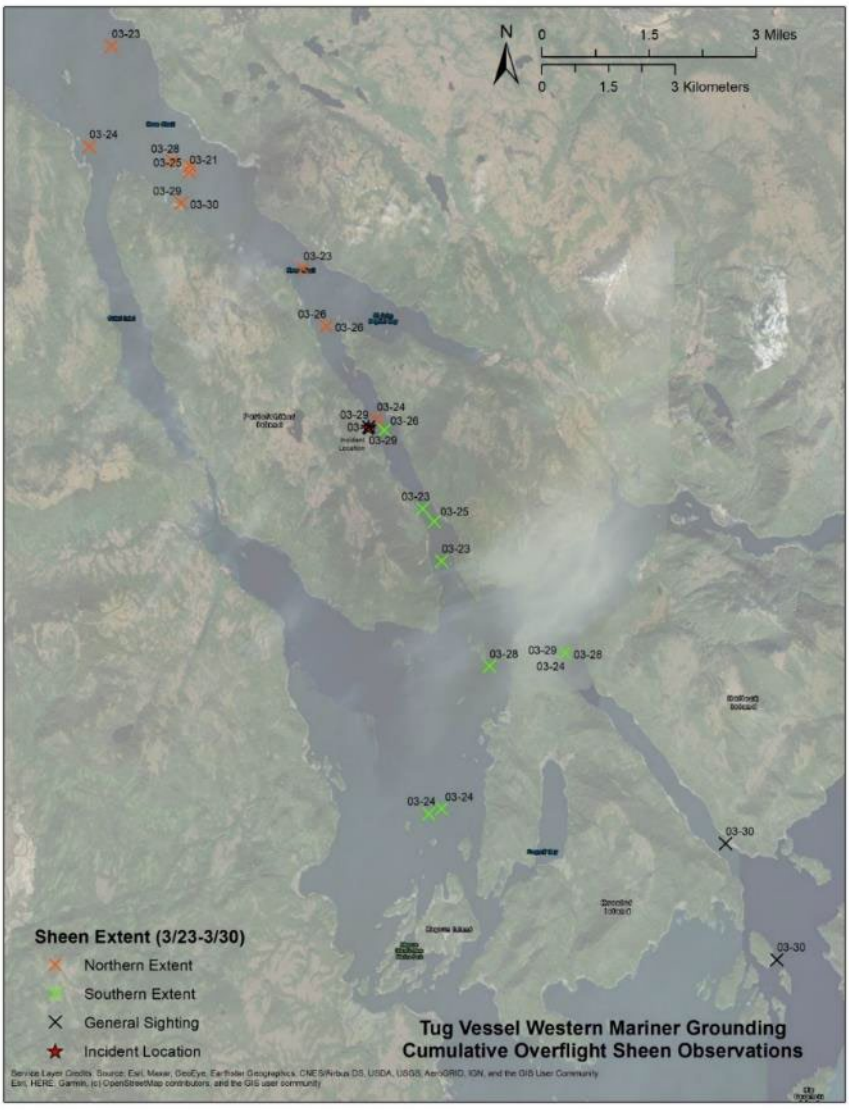

***Figure 2**: Cumulative overflight reports of oil sheen observations from March 23-30, 2022. Figure Credit: Polaris Applied Sciences, Inc.*

[1] SITREPs are available on the ADEC website for the incident: https://dec.alaska.gov/spar/ppr/spill-information/response/2022/01-tug-western-mariner-grounding/

1.3. Summary of Emergency Response Actions

This section provides information about emergency response actions carried out to control the release, clean up spilled oil, and protect human health and the environment. Details of the response effort are primarily derived from the ADEC SITREPs. Additional information was provided by on-scene responders and others involved in the response. A complete list of agencies and stakeholders involved in the emergency response is available in SITREP #3.[2] A Natural Resource Damage Assessment (NRDA) liaison to the Unified Command for the incident was a conduit for information sharing and operations coordination between the two groups during the emergency response phase of the incident. The summary below highlights actions that are most relevant to the NRDA preassessment but does not include a complete recounting of the emergency response.

Initial response efforts included deployment of containment booms around the vessel and lightering of fuel from damaged tanks and other areas on the vessel. Skimming and sorbent booms were used to recover diesel from the water surface in the vicinity of the vessel, though these recovery actions were put on hold on March 22 due to poor weather conditions (Figure 3). Source control was reportedly achieved on March 24, and all remaining oil was removed from the vessel by March 26. Skimming operations were discontinued following source control, but containment booms and sorbent material were maintained at the grounding site to recover fuel that had already been released. After the vessel was refloated and removed from the site, on March 29 (Figure 3), containment booms were maintained to capture residual sheen until April 3. Shoreline treatments along specific beach segments continued until May 21, 2022, as detailed below. The Southeast Alaska Petroleum Response Organization (SEAPRO) and the Alaska Department of Fish and Game (ADFG) conducted overflights on multiple days between March 23–31, generally twice a day, to primarily conduct aerial surveys of herring spawning. Other wildlife observations were also collected during the overflights, particularly of marine mammals,[3] which congregate in large numbers during the herring spawn.

On March 26 the Alaska Department of Health and Social Services and ADEC issued a seafood safety advisory (originally posted on the ADEC website, available in the Administrative Record[4]). The advisory recommended not harvesting shellfish, herring roe, or kelp/algae from Neva Strait and St. John Baptist Bay, and contained other recommendations to minimize potential human health risks from harvesting herring eggs and other subsistence foods related to the oil spill. On March 9, 2023, The Alaska Department of Health (formerly part of the Alaska Department of Health and Social Services) and ADEC issued a notice that the public could resume harvesting resources from the spill area, but it maintained the standard advice against harvesting or eating food that had evidence of oil.[5]

[2] https://dec.alaska.gov/media/25302/western-mariner-grounding-sitrep3.pdf
[3] ADFG Southeast Alaska Herring Survey track lines and wildlife observations are available in their online mapper.
[4] Administrative Record for the Western Mariner Oil Spill NRDA: https://www.diver.orr.noaa.gov/web/guest/diver-admin-record/15922
[5] https://dec.alaska.gov/media/coobuuwt/seafood-safety-advisory.pdf

***Figure 3**: Oil around grounded vessel on the morning of March 23 (top left, photo credit: ADFG); skimmer recovering product inside the containment boom on March 23 (top right, photo credit: Global Diving and Salvage, Inc.); oil sheen in Neva Strait on March 23 (bottom left, photo credit: ADFG); tug Western Mariner afloat in Neva Strait before being towed to Sitka on March 29 (bottom right, photo credit: SEAPRO)*

A Shoreline Cleanup Assessment Technique (SCAT) team conducted an informal survey of the Magoun Islands on March 25 and began formal beach surveys in Neva Strait on March 26. On March 28, the SCAT team recommended high-volume, low-pressure seawater deluge for three oiled beaches in Neva Strait. Flushing operations were carried out on March 29 through April 3 (Figure 4). Initially, containment boom and adsorbent material were used to capture oil mobilized by the shoreline flushing operations, but the sorbent pads were not effective at capturing the product, so vessels were used to mechanically disperse the sheens in the containment boom. On April 5, response personnel performed manual agitations of the intertidal beach sediment along shorelines in the vicinity of the grounding site to remove entrained oil. On April 19, the SCAT team performed manual agitation of shoreline sediments in the middle intertidal zone on Highwater Island. Additional shoreline treatment by manual agitation was conducted at Highwater Island on May 19–21 (Figure 4). Following a SCAT survey on May 22, the team determined that the site did not meet clean-up endpoints[6] but recommended no further treatment and an

[6] Spill cleanup endpoints standards are defined on an incident -specific basis by the Unified Command. For this incident, cleanup endpoints were documented in the SCAT Work Plan developed by the Environmental Unit and approved by the Unified Command. An endpoint for fine sediment/sand/gravel beaches was subsurface oil lens removed or cleaned to <20% partially filled pore spaces.

additional survey, for monitoring purposes only, in a year. An informal survey of the shoreline at the grounding site in May noted sheen and diesel odor (Figure 4). A map of maximum oiling observed by SCAT through May 22, 2022 is shown in Figure 5. The SCAT team returned to the area approximately one year later on March 19, 2023, and noted that they could see and smell diesel at the grounding site, particularly in the strip of beach between the rocky shore where the tug grounded and where a freshwater stream flows down the beach. They also documented lingering pockets of sheen at the Highwater Island site, meaning the site still had not met clean-up endpoints, but noted that oiling conditions at both sites had improved substantially since the previous year. On June 23, 2023, the Unified Command issued a "No Further Action Decision" memorandum.[7]

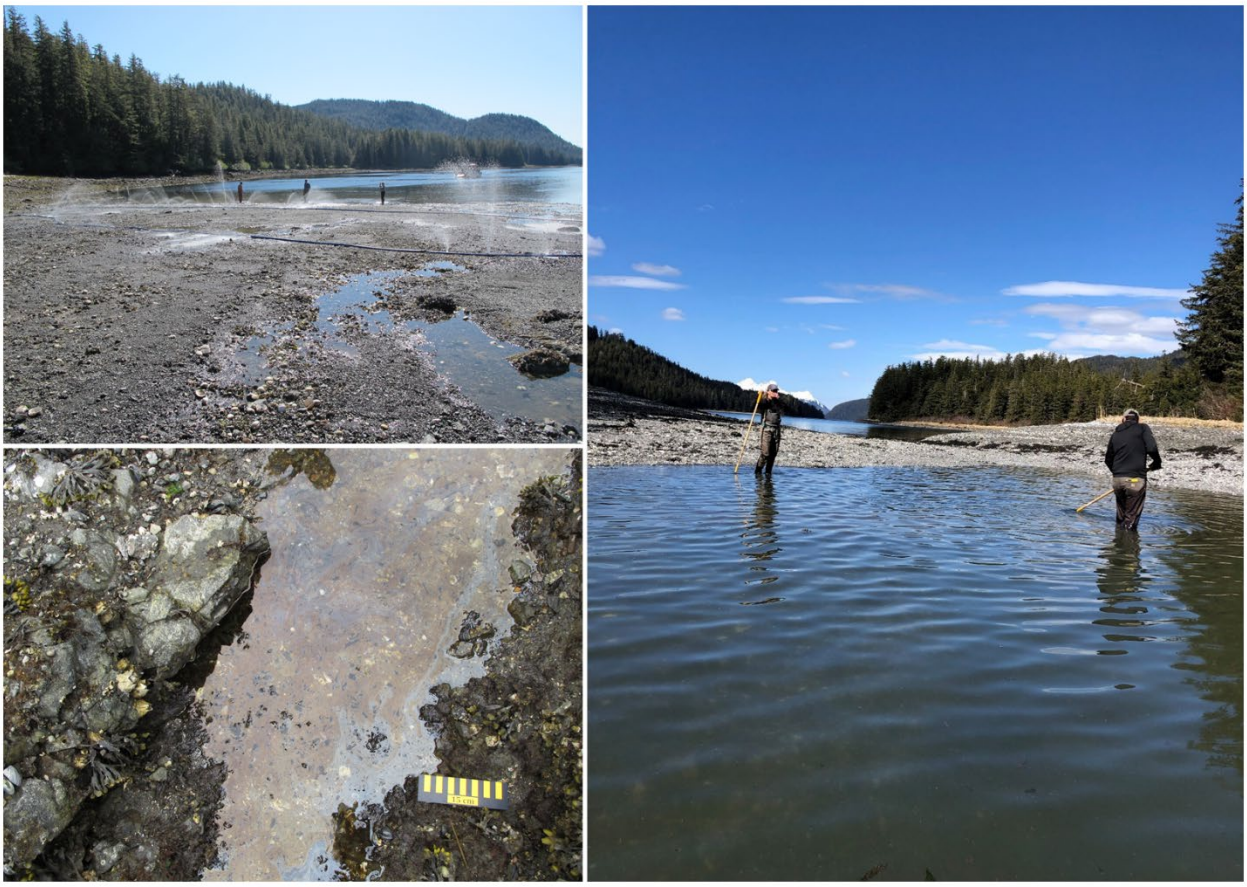

***Figure 4**: Examples of shoreline observations and treatment provided by the SCAT team: High-volume, low-pressure seawater deluge (top left), oil on beach near grounding sit in May 2022 (bottom left), shoreline manual agitation (right).*

Concurrent with the emergency response to the spill, the NRDA Trustees (described in section 1.4) began collecting preassessment data to determine whether NRDA actions under the Oil Pollution Act of 1990 (OPA; 33 U.S.C. § 2706(b)) were justified. NRDA emergency response efforts focused on the collection of ephemeral data, as detailed in chapter 3.

[7] https://dec.alaska.gov/media/qcmho0s0/uc-nfa-decision-memo.pdf

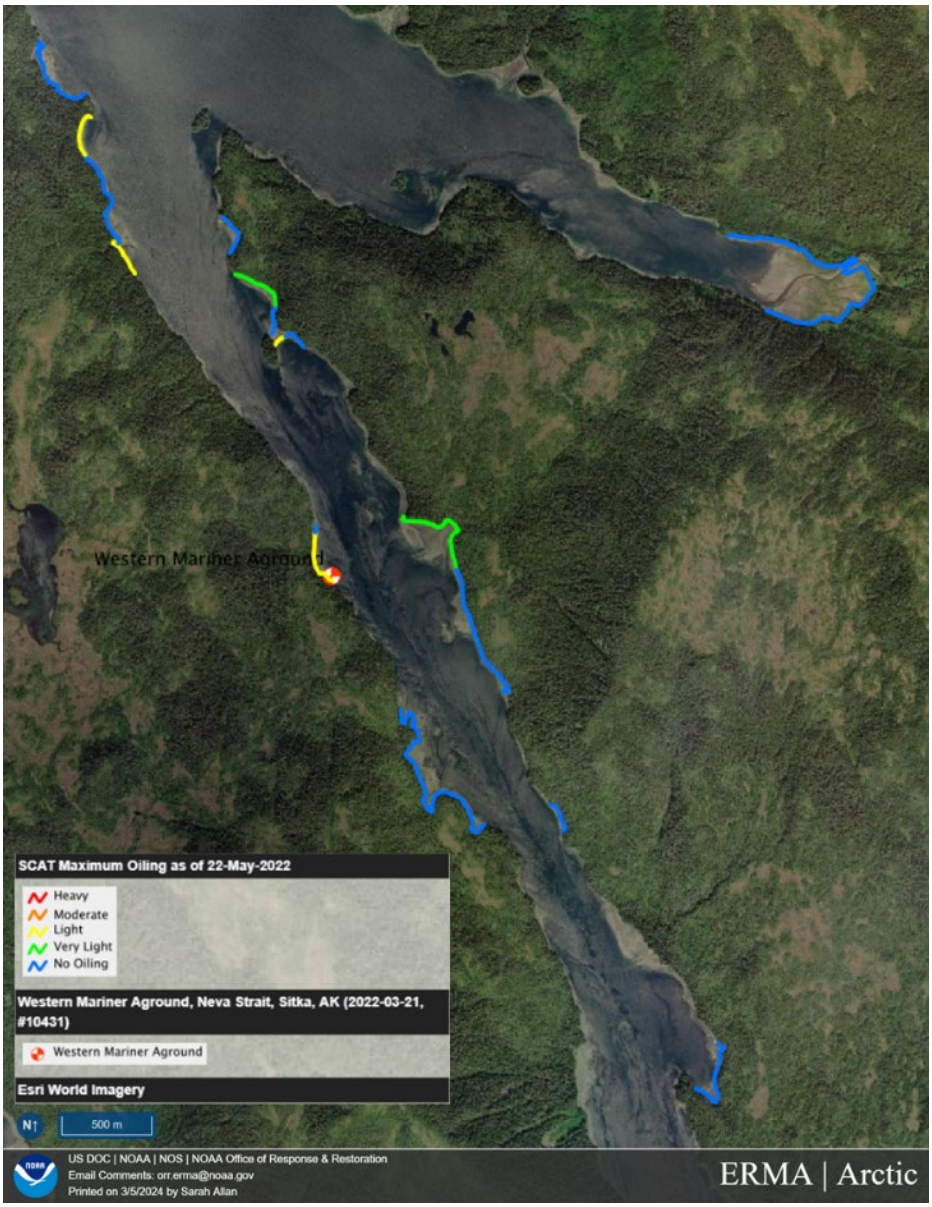

***Figure 5**: Maximum shoreline oiling observed by SCAT teams from March 26 to May 22, 2022.*

1.4. Coordination and Compliance

During initial response actions, the Trustees worked together to meet their responsibilities under OPA and other applicable Federal and State laws. The Trustees are the U.S. Department of Commerce through the National Oceanic and Atmospheric Administration (NOAA), the U.S. Department of the Interior through the U.S. Fish and Wildlife Service (FWS) and Bureau of Indian Affairs (BIA), U.S. Forest Service (USFS), Alaska Department of Environmental Conservation (ADEC), Alaska Department of Natural Resources (ADNR), Alaska Department of Fish and Game (ADFG), and Alaska Department of Law (ADOL). The Federal Lead Administrative Trustee (FLAT) for this incident is NOAA.

The OPA regulations require the Trustees to invite the RP to participate in the damage assessment process (15 C.F.R. § 990.14). Accordingly, immediately following the spill, the Trustees began

coordinating with the RP on cooperative assessment activities. On March 22, 2022, representatives from Polaris Applied Sciences, Inc. (Polaris), operating as technical advisors for the RP, reached out to NRDA Trustee representatives inquiring about possible NRDA engagement and offering to collect samples opportunistically as they supported the on-scene response. Polaris shared information gathered on-scene with the Trustees over the course of the response. On March 25, the Trustees provided an update to Polaris on initial NRDA sampling plans and continued to provide updates and invite the RP to participate in cooperative data collection efforts throughout the preassessment. Cooperative efforts focused on sharing information for situational awareness, providing response data, such as SCAT observations, coordinating sample collections, and coordinating on forensic hydrocarbon analyses. The Trustees also shared with the RP all data generated from the NRDA samples and updates on initial preassessment data interpretation and restoration scoping, and coordinated with the RP on public outreach, through September 2023.

On March 24, 2022, the Trustees received verbal authorization from the U.S. Coast Guard National Pollution Funds Center (NPFC) for initiate funds to conduct NRDA preassessment activities associated with the incident. An interagency agreement for initiate funding was finalized in September 2022 (NPFC Interagency Agreement number NOAA21NRD02-0005-000), amended to extend the period of performance in June 2023, and amended a second time to revise the scope of work in March 2024.

On April 28, 2022, the Trustees and RP signed a funding letter, which established that the RP would fund the Trustees' recoverable costs and described basic grounds for cooperative work on NRDA preassessment and assessment. The RP reimbursed the Trustees for costs incurred on the NRDA work between March 21, 2022, and approximately the end of December 2022 (exact dates differ between agencies). Additionally, the RP directly paid a commercial lab for analysis of NRDA samples collected in April 2022 and March 2023. On October 30, 2023, the legal counsel for the RP sent a letter to the Trustees stating that they would no longer be funding the cooperative NRDA. They indicated that the RP had entered into a settlement agreement with the U.S. Coast Guard that established that the RP was entitled to a limitation of liability ($997,100) and that the expenditures related to response and remediation efforts had already exceeded that amount.

1.5. Legal Authority

Under OPA, state and federal agencies are designated as natural resource Trustees, responsible for assessing natural resource losses and restoring those losses to baseline conditions (i.e., the conditions that would have existed had the incident not occurred). Regulations promulgated under OPA provide a framework for conducting a NRDA, including preassessment, restoration planning, and restoration implementation (15 C.F.R. Part 990). Funds to assess losses and to plan and implement appropriate restoration may be provided upfront or reimbursed by either the RP or, if an RP does not exist or exceeds its limit of liability,[8] the Oil Spill Liability Trust Fund (OSLTF)[9] established under OPA.

[8] Under OPA, the limits of liability are based on the vessel's gross tonnage (GT). See the NPFC's web site (www.uscg.mil/npfc) for current applicable limits.

[9] The OSLTF is administered by the U.S. Coast Guard (USCG). It was established and is maintained by the collection of a tax on the petroleum industry. See the NPFC's Web site (www.uscg.mil/npfc).

1.6. Public Participation and Administrative Record

The Trustees kept the public and stakeholders informed about NRDA activities during the emergency response and early preassessment through regular updates to the Unified Command and NRDA preassessment updates, posted on the ADEC website for the incident, that shared the results of field assessment work.[10] Further, the Trustees have made all validated chemistry data publicly available through NOAA's DIVER data warehouse.[11] The Trustees are also coordinating with the Sitka Tribe of Alaska, including sharing validated chemistry data as soon as possible after receipt, sharing timely updates, and maintaining reciprocal communication opportunities for the Tribe to provide input on the NRDA and receive information from the NRDA effort that can be used to respond to their priorities related to the incident.

An Administrative Record[12] and NRDA case page[13] have been established and will continue to be updated with relevant documents as the NRDA progresses. Should the Trustees enter the restoration planning phase, the Trustees will continue to maintain an Administrative Record, and provide public participation opportunities consistent with 15 C.F.R. § 990.14(d).

[10] Tug Western Mariner Diesel Spill Preassessment Update: Results of March 2022 Mussel Sampling (PDF) Tug Western Mariner Diesel Spill Preassessment Update: May 2022 Bivalve Sampling (PDF)
Tug Western Mariner Diesel Spill Preassessment Update: March 2023 (PDF)

[11] https://www.diver.orr.noaa.gov/web/guest/diver-explorer?sqid=737

[12] https://www.diver.orr.noaa.gov/web/guest/diver-admin-record/15922

[13] https://darrp.noaa.gov/oil-spills/tug-western-mariner-grounding-neva-strait

2. Natural Resources and Services in the Spill Area

This chapter briefly describes the natural resources, habitats, and the associated human uses that are in the vicinity of the spill. It provides an overview of natural resources and services, under the trusteeship of the Trustees, that were considered when evaluating injuries or likely injuries resulting from the incident. The potentially affected environment for injury preassessment activities includes marine and shoreline areas in the greater Sitka Sound area, north of Sitka, Alaska, specifically in Neva Strait, Southern Salisbury Sound, St. John Baptists Bay, Krestof Sound, Nakwasina Passage, Olga Strait and the Magoun Islands. The biological environment where oil came to be located includes a diversity of fish, birds, mammals, and other biota found within the water column, shoreline, and intertidal habitats. The human uses of natural resources within this area primarily include recreation, commercial fishing, and subsistence and non-commercial harvest of natural resources.

Specifically, the geographic scope of the preassessment includes open water and nearshore sub-tidal and intertidal aquatic environments where oil was observed or where response or preassessment activities were carried out. Oil sheens in open water were observed via aerial imagery when conditions allowed (Figure 2). SCAT surveys and NRDA surveys and samples documented shoreline oiling. The limited spatial and temporal coverage of these observations means that none of them continuously accounted for the full extent of the oiling. However, they can be used as a surrogate to estimate a minimum affected area. Some response and preassessment activities were carried out in locations that were apparently not oiled, either as a precautionary measure (e.g., looking for oil in herring spawning areas) or to be used as reference sites.

2.1 Physical Environment

Neva Strait and adjacent waters are located on the western edge of Southeast Alaska. This area consists of a narrow strip of land and offshore islands adjacent to the Province of British Columbia, Canada. Covering approximately 23 million acres, Southeast Alaska consists of over 5,000 islands making up the Alexander Archipelago. Collectively, the entire length of the coastline exceeds 18,000 miles and makes up approximately 20% of the coastline of the entire United States (Audubon 2016).

Of the 23 million acres, 17 million are located within the federally managed Tongass National Forrest. The topography of the region is dominated by high mountains that rise to over 15,000 feet, which are bisected by glacial fjords and major river systems. These river systems discharge approximately 90 cubic meters of freshwater annually, creating a unique coastal environment. Many of the coastal river systems are short due to the surrounding elevation and contain large wetland and riparian areas. The terrestrial ecosystems are intertwined with the aquatic biota (e.g., anadromous fish transport marine nutrients to freshwater and adjacent habitats) and are composed primarily of coastal temperate rainforests, a unique habitat that constitutes only 3% of the world's temperate forests (Audubon 2016).

The marine waters of the greater Sitka Sound area are found between Baranof and Kruzof Islands, with those and many other islands creating protected and semi-protected bays, sounds, and passages. The marine shorelines in the affected environment in Neva Strait and adjacent waters are primarily sand and

gravel beaches and sheltered scarps, with areas of exposed rocky shore, and numerous salt-water marshes. Many of the beaches have large areas of exposed tidal flats. Though Neva Strait is relatively protected from wind and waves, the primarily tidally driven currents are very strong.

2.2 Biological Resources

Abundant marine, estuarine, and shoreline biological resources are found within the geographic scope of the preassessment, including aquatic vegetation, fish, invertebrates, birds, and marine mammals.

2.2.1 Aquatic Vegetation

Neva Strait and surrounding waters support numerous types of aquatic vegetation, which provide important ecological services, including as habitat for invertebrates, fish, and wildlife. Large, continuous eelgrass (*Zostera marina*) beds, and smaller patches of eelgrass are present throughout Neva Strait and adjacent waters, including a large eelgrass bed directly across the strait from where the *Western Mariner* grounded and another at the head of St. John Baptist Bay (ShoreZone Alaska[14] and personal communication from on scene responders). Canopy kelps, including bull kelp (*Necrocystis luetkeana*) and giant kelp (*Macrocystic pyrifera*) are found throughout the area. Many different species of red, green, and brown macroalgae are found in intertidal and subtidal shoreline habitats throughout the area. Some examples are sea lettuce (*Ulva* sp.), sugar kelp (*Saccharina latissima*), and rockweed (*Fucus* sp.), which is abundant in the mid-intertidal zone on most shorelines in the preassessment area. Beach asparagus (*Salicornia virginica*) is also found in the upper intertidal and supratidal areas in specific locations.

2.2.2 Marine Invertebrates

Neva Strait and adjacent waters and shorelines provide habitat for benthic and pelagic invertebrates, including sponges, hydroids, jellyfish, sea anemones, marine worms (multiple phyla), chitons, gastropods, bivalves, tuskshells, cephalopods, bryozoas, barnacles, copepods, amphipods, isopods, hermit crabs, true crabs, shrimp, brittle stars, sea stars, sea cucumbers, sea urchins, and tunicates. A few notable invertebrates observed in the spill impact area include the red sea cucumber (*Apostichopus californicus*), pinto abalone (*Haliotis kamtschatkana*), sunflower star (*Pycnopodia helianthoides*), sea stars (*Pisaster ochraceous, Dermasterial imbricata,* and other species), and green and purple urchins (*Strongylocentrotus* sp.). Large mussel (primarily *Mytilus trossulus*) beds in the mid-intertidal and large clam (multiple species) beds in the low intertidal are found throughout the area.

2.2.3 Fish

The productive marine habitats in and around Neva Strait support a diverse array of fish species including, but not limited to, Pacific herring (*Clupea pallasii*), Pacific halibut (*Hippoglossus stenolepis*), and nine anadromous fish species (e.g., salmon). St. John Baptist Bay is a nursery area for juvenile sablefish (*Anoplopoma fimbria*). According to the Alaska Department of Fish and Game's Catalog of Waters Important for the Spawning, Rearing or Migration of Anadromous Fishes (known as the Anadromous Waters Catalog, (ADFG 2023)) three streams flowing into Neva Strait and three streams flowing into St. John Baptist Bay are anadromous waters that support multiple species and life stages

[14] https://alaskafisheries.noaa.gov/mapping/sz/

of salmon.[15] During the time of the release, Pacific herring were aggregating in the greater Sitka Sound area and staging for spawning. This seasonal concentration of fish biomass attracts an abundance of other fish and wildlife that congregate to feed on the herring and their eggs.

2.2.4 Birds

As reported in Audubon (2016), over 200 species of marine and terrestrial birds can be found in Southeast Alaska. Many of these species utilize the waters of greater Sitka Sound and prey on biota found within the geographic scope of the preassessment. Examples of birds in the region include bald eagles (*Haliaeetus leucocephalus*), marbled murrelet (*Brachyramphus marmoratus*), black oystercatcher (*Haematopus bachmani*), and the pelagic cormorant (*Phalacrocorax pelagicus*). Gulls (*Larus glaucescens*, *L. hyperboreus*, and *L. argentatus*) and surf scoters (*Melanitta perspicillata*) are herring predators that target spawning aggregations.

2.2.5 Marine Mammals

Examples of marine mammals that utilize the waters of Sitka sound include sea otters (*Enhydra lutris kenyoni*), Steller sea lions (*Eumetopias jubatus*), harbor seals (*Phoca vitulina*), humpback whales (*Megaptera novaeangliae*), orcas (*Orcinus orca*), and gray whales (*Eschrichtius robustus*). The herring spawn attracts large numbers of marine mammals to the greater Sitka Sound area, where they feed on herring, roe, and other animals that have congregated to feed in the area.

2.3 Human Uses

The plentiful and diverse natural resources in Southeast Alaska support numerous human use activities, including recreation, commercial fishing, and subsistence and non-commercial harvest. The OPA statute and associated federal NRDA regulations authorize the Trustees to pursue claims for losses of recreational uses of natural resources under the trusteeship of the Trustees.

2.3.1 Recreation

The natural resources of Southeast Alaska, including Sitka Sound, provide abundant hunting, fishing and sightseeing opportunities. Wildlife viewing is popular among visitors, many of whom travel via cruise ships to Sitka. In 2022, the City of Sitka was anticipating 480,000 cruise ship visitors[16]. In addition to cruise ships, numerous smaller tour boats provide wildlife viewing tours. Further, recreational fishers travel to Southeast Alaska from around the globe to fish for salmon and other anadromous and marine fish such as steelhead, Dolly Varden, halibut, and rockfish.[17] Local residents engage in a variety of recreational activities, including fishing, boating, hunting, and hiking.

2.3.2 Commercial Fishing

In Southeast Alaska, including Sitka Sound, commercial fishing is a major economic driver. In 2022, over 161 million pounds of salmon were harvested in Southeast Alaska/Yakutat area (landed weight),

[15] https://www.adfg.alaska.gov/sf/SARR/AWC/index.cfm?ADFG=main.interactive and https://www.adfg.alaska.gov/sf/SARR/AWC/index.cfm?ADFG=maps.AWCData
[16] Sitka's Short-Term Tourism Plan, February 8, 2022
[17] https://www.adfg.alaska.gov/index.cfm?adfg=ByAreaSoutheastSitka.morefishingInfo

most of which was chum (46%) and pink (42%) salmon (by weight).[18] The salmon fishery in Alaska is managed as a limited entry fishery, which determines the total number of vessels allowed to use different gear types and results in specific harvest limits by gear type and species. Throughout Southeast Alaska, including in Sitka Sound, state-run hatcheries aim to increase salmon abundance to supplement wild runs (Audubon 2016).

In addition to salmon fisheries, there is a commercial herring sac roe fishery in Sitka Sound. In 2022, the sac roe harvest in Sitka Sound was 25,090 pounds, valued at $7.53 million.[19] Food, bait, and spawn on kelp herring fisheries occur elsewhere in the Southeast region. Southeast Alaska also supports smaller fisheries for ground fish and shellfish (Audubon 2016). There is a commercial sea cucumber fishery in Sitka Sound, including in Neva Strait and adjacent waters. In the 2022/23 season, 289,132 pounds of sea cucumbers were harvested in the commercial dive fishery in Sitka.[20] The Sitka area also has a two-year rotational dive fishery for geoduck clams (*Panopea generosa*).

2.3.3 Subsistence and Non-Commercial Harvest

Alaska Natives and other Alaskan residents harvest the region's natural resources as part of long-standing subsistence practices and for a variety of personal uses. As reported in Audubon (2016), with greater than 80% of households partaking in some form of subsistence or non-commercial harvesting, Southeast Alaska residents average 200 pounds per year of take. ADFG's most recent report on the harvest and use of wild resources in Sitka, Alaska, 2013, reports that approximately 54% of households harvest salmon and non-salmon fish and approximately 90% of households use those resources (Sill et al. 2017). More than 80% of households harvest and use vegetation resources, primarily berries, but also marine vegetations including different species of kelp and beach asparagus (Sill et al. 2017). Over 64% of households use marine invertebrates, especially shrimp, crab, and various bivalves (Sill et al. 2017). Other resources used by households in Sitka include large land mammals, small land mammals, marine mammals, birds, and bird eggs (Sill et al. 2017).

Herring roe (eggs) is a traditional food with great cultural importance for indigenous coastal communities in Southeast Alaska (Moss 2016). The primary method of harvest is to submerge hemlock branches in waters just outside of the intertidal zone before spawning takes place and then remove the branches from the water with the eggs adhered after the spawn. Herring eggs are also collected on other natural substrates. Estimated average annual harvest from 2012-2021 was 75,197 pounds of roe (Sill et al. 2023). A large proportion of the herring roe harvest is shared within the local community or with other communities in the state and beyond (Sill et al. 2023).

2.4 Threatened and Endangered Species and Essential Fish Habitat

While Southeast Alaska does support numerous endangered species, none were identified within the vicinity of the oil spill during response or preassessment actions. As such, the Trustees have chosen not

[18] https://www.adfg.alaska.gov/index.cfm?adfg=commercialbyfisherysalmon.salmon_landings
[19] https://www.adfg.alaska.gov/index.cfm?adfg=commercialbyareasoutheast.herring#harvest
[20] https://www.adfg.alaska.gov/static/fishing/PDFs/commercial/southeast/2022-2023_seacucumber_summary.pdf

to focus on identifying and quantifying potential injuries to endangered species. If additional information becomes available, the Trustees may assess such injuries.

The marine waters in the preassessment area are Essential Fish Habitat (EFH) for all five species of Pacific salmon (Chinook (*Oncorhynchus tshawytscha*), chum (*Oncorhynchus keta*), coho (*Oncorhynchus kisutch*), sockeye (*Oncorhynchus nerka*), and pink (*Oncorhynchus gorbuscha*)). The preassessment did not focus on injuries to salmon or salmon habitat specifically, but injuries to marine and shoreline habitats and services discussed further below may be relevant to EFH and impacts to EFH may be evaluated further as part of restoration planning.

2.5 Focus of Preassessment

The release potentially impacted numerous natural resources that are under the trusteeship of one or more Trustee agencies. As part of the NRDA and restoration planning processes, the Trustees must determine which trust resources can be effectively studied under the given circumstances, and with reasonable costs. As such, based on the extent and duration of oiling on marine shorelines in Neva Strait and adjacent waters, the Trustees have focused the preassessment on impacts to shoreline (intertidal) habitats and the natural resources that utilize those habitats. The Trustees also evaluated potential injuries to marine mammals, which were observed in and near the spilled oil, and lost human uses related to the seafood harvest and consumption advisory for Neva Strait. If additional information becomes available, the Trustees may expand the scope of the assessment.

2.5.1 Shoreline Habitats and Resources

In southeast Alaska, high volumes of freshwater from rain and glacial sources transports nutrients and sediments from the forest to the ocean, creating a rich, productive marine environment. The shoreline provides an impressive diversity of habitats that support an abundance of biota. Physical factors, primarily wave energy, substrate type, tidal exposure, temperature, and salinity control the distribution and abundance of biota in the intertidal zone. Shorelines in the greater Sitka Sound area where this spill occurred include exposed rocky shores, exposed platforms, sand and gravel beaches, sheltered scarps and rocky shores, tidal marshes, and exposed tidal flats (NOAA Environmental Sensitivity Index Maps[21]). These shorelines provide habitat for a diversity of plants, invertebrates, fish, birds, and mammals (Figure 6).

[21] https://response.restoration.noaa.gov/oil-and-chemical-spills/oil-spills/download-esi-maps-and-gis-data#Alaska

***Figure 6**: Example of a shoreline in Neva Strait, showing intertidal protected rocky shore, sand and gravel beach, and tidal flats.*

Shorelines provide habitat for plants (e.g., seagrasses, seaweeds, marine lichens) and organisms that live in the sediments (benthic infauna), on the substrates (benthic epifauna), and in the shallow, nearshore waters. These plants and animals themselves provide services for other organisms. Seagrasses, kelp, and mussel beds are a few examples of organisms that both use and create shoreline habitat. Shoreline organisms are prey for a wide range of both marine and terrestrial animals, such as shorebirds, fish, and sea otters (Carstensen 2007, Audubon 2016).

Some parts of shoreline biological communities may show predictable seasonal changes, such as annual changes in primary productivity and seasonal spawning events (Coletti et al. 2016). In Sitka Sound, Pacific herring spawn on intertidal and shallow subtidal aquatic vegetation. The annual event attracts many other fish and wildlife species to the area to feed on the spawning herring and their eggs (Sill et al. 2023). Shorelines may experience changes in their community composition on longer time scales associated with environmental shifts, natural succession, and other factors (Coletti et al. 2016, Weitzman et al. 2021).

Shoreline habitats and resources are vulnerable to impacts from oil spills, and impacts can be especially severe when oiling is heavy or persistent (Fukuyama et al. 2014). Shoreline habitats can also be impacted by shoreline cleaning methods. Cold water flushing is less damaging than more aggressive shoreline cleaning options deployed extensively in the past (e.g., hot water pressure washing) (Hoff et al. 1999, Peterson 2001), but it can still disrupt benthic habitats and organisms (Michel et al. 2017). Though shoreline organisms are adapted to the stressful conditions of intertidal living, they are vulnerable to physical and chemical impacts from shoreline oiling (Peterson 2001). Oil can cause lethal and sublethal impacts to plants and animals from both acute and chronic exposures. Further oil can concentrate in organisms, especially invertebrates that metabolize oil chemicals less efficiently, contaminating food sources for fish and wildlife (Bodkin et al. 2012, Fukuyama et al. 2014).

2.5.2. Marine Mammals

Marine mammals, including sea otters, seals, sea lions, dolphins, and whales, are present in the waters of greater Sitka Sound year-round. They congregate in high numbers during the spring herring spawn. ADFG herring spawn observers record marine mammal observations during their regular aerial surveys.[22] During the 2022 herring spawn season, between March 8 and April 29, ADFG recorded 3,600 Steller sea lion, 533 humpback whale, and 158 gray whale sightings (counts may not represent unique individuals as the same animal may be observed multiple times over the survey period). ADFG observed sea lions and humpback whales in Neva Strait during that time; response and NRDA personnel in the field also observed sea lions swimming in and near oil during the spill and its immediate aftermath.

Marine mammals are vulnerable to injury from oil exposure (Geraci 2012, Helm et al. 2014). Despite limitations on studying oil exposure and impacts on highly mobile, long-lived, offshore species, impacts at individual (Schwacke et al. 2013, Helm et al. 2014) and population (Matkin et al. 2008) levels have been recorded in past oil spills. Exposure to oil through inhalation, ingestion, or dermal pathways can lead to acute mortality or physiological responses that compromise health, long-term survival, and reproduction (Geraci 2012, Helm et al. 2014, Ziccardi et al. 2018). For animals that rely on fur for insulation, such as sea otters, the most serious threat from oil is extreme hypothermia (Geraci 2012). All marine mammals are vulnerable to injury from respiratory system damage, especially when they encounter fresher oil (Lipscomb et al. 1993, Smith et al. 2021), and these effects can be chronic and associated with long-term reduced health and survival (Smith et al. 2022). Gastrointestinal, eye, skin, and mucus membrane damage are also likely with exposure to oil (Lipscomb et al. 1993, Helm et al. 2014).

2.5.3. Human Uses

Nearly all residents of Sitka and surrounding communities harvest or utilize wild resources, including marine resources. Recreational and subsistence harvest activities carried out in the spill area include fishing, shellfishing, hunting, and gathering plants (Sill et al. 2017). Shortly following the spill, the Alaska Department of Health and Social Services and ADEC issued a seafood safety advisory that recommended not harvesting shellfish, herring roe, or kelp/algae from the spill area. In addition to the advisory, general community awareness of the oil spill and response activities likely impacted recreational and subsistence activities in the spill area. Neva Strait is a search and harvest area for shellfish, chum and pink salmon, lingcod, rockfishes, and marine mammals (Sill et al. 2017).

The Tlingit people have lived in the Sitka (Sheet'ka or Shee At'ika) area for thousands of years and rely on the rich coastal resources for sustenance and culture (Sill et al. 2017). The Sitka Tribe of Alaska is a federally recognized government for enrolled Tribal Citizens. The Tribe has several Resource Protection Programs that focus on protecting subsistence resources and ensuring access to them.[23] Tribal members may harvest several types of potentially impacted resources in the spill area, including

[22] ADF&G Southeast Alaska Herring Surveys interactive mapper: https://experience.arcgis.com/experience/52ffb83c47844ef5ba14e7a0f063fcc7

[23] https://sitkatribe.org/our-services/resource-protection-programs/

shellfish, fish, and marine mammals (Sill et al. 2017). Tribal members and representatives repeatedly expressed concerns about food safety during spill response coordination meetings in March and April 2022 (personal communication from Jody Barthlow, ADEC, NRDA Liaison to the Unified Command during the response), particularly related to gathering herring roe from traditional harvest areas.

3. Overview of Preassessment Activities

This chapter describes the Trustees' initiation of preassessment activities and efforts to collect ephemeral data during and following the oil release. Ephemeral data collection efforts included wildlife surveys, sediment and tissue sample collection, intertidal community surveys, review of information from the emergency response, and review of existing information. The Trustees carried out field assessment activities in March 2022, May 2022, March 2023, and June 2024. In addition, the Trustees analyzed environmental samples that were collected by a third party in April 2023.

Over the course of the preassessment, the Trustees provided regular public updates on preassessment work, posted on the ADEC spill incident page,[24] and public access to validated data through NOAA's DIVER data warehouse.[25]

3.1 Initiation of preassessment activities

The Trustees initiated the NRDA preassessment on March 21, 2022, after receiving notification of the *Western Mariner* grounding and an ongoing oil release. In accordance with the NRDA preassessment requirements at 15 C.F.R. § 990.41(a), the Trustees determined that:

1. An incident has occurred, as defined in § 990.30 of this part;
2. The incident is not:
    i. Permitted under a permit issued under Federal, State, or local law; or
    ii. From a public vessel; or
    iii. From an onshore facility subject to the Trans-Alaska Pipeline Authority Act, 43 U.S.C. 1651, et seq.; and
3. Natural resources under the trusteeship of the trustee may have been, or may be, injured as a result of the incident.

Response and preassessment activities, as defined by OPA (15 C.F.R. §§ 990.42 and 990.43), focused on collecting ephemeral data essential to determine whether:

- Natural resource injuries have resulted, or are likely to result from, the incident,
- Response actions have adequately addressed, or are expected to address, the injuries resulting from the incident, and
- Feasible restoration actions exist to address the potential injuries.

[24] https://dec.alaska.gov/spar/ppr/spill-information/response/2022/01-tug-western-mariner-grounding/
[25] https://www.diver.orr.noaa.gov/web/guest/diver-explorer?sqid=737

The Trustees received verbal authorization for initiate funding from the National Pollution Funds Center on March 24, 2022, and later established an interagency agreement (IAA) obligating funding for the Trustees' NRDA preassessment activities (see the Administrative Record for IAA and amendments).

On April 28, 2022, the Trustees and RP signed a funding letter, establishing initial terms for a cooperative assessment. The Trustees conducted some preassessment efforts in coordination with the RP. Specifically, the Trustees coordinated with the RP to compile response information, including SCAT data, notes, and photos. The Trustees also met with representatives of the RP to discuss preassessment study plans, sample analyses, chemistry data, and initial injury evaluations and restoration scoping. On October 30, 2023, the RP notified the Trustees that it would no longer provide funding for the NRDA work. Other preassessment activities described here were conducted independently of the RP.

3.2 Wildlife Surveys

On March 26-27, 2022, FWS NRDA scientists, with boat support from the USFS, conducted wildlife surveys in Olga Strait, Neva Strait, Krestof Sound, and Hayward Strait. The objectives of the surveys were to 1) evaluate and document potential hydrocarbon exposure and injury to trust resources, 2) perform shoreline searches for and remove dead wildlife from the environment, 3) perform surveys of live wildlife to assess potential for exposure to hydrocarbons, and 4) collect mussels for lab analysis of tissue contamination (reported below).

On March 26, the team traveled into Neva Strait, the southern part of Salisbury Sound, and St. John Baptist Bay. They observed hundreds of birds (both waterbirds and carcass scavengers), bald eagles, eight Steller sea lions (including one group of six), two harbor seals, and at least one humpback whale (two observations traveling north, and then later one observation heading south). Sea lions and the humpback whale were observed foraging. No sea otters were observed. None of the wildlife was observed in distress or obviously fouled. However, a total of five seals and sea lions were observed in sheen near the boom at the *Western Mariner* grounding site where response operations were ongoing. Their behavior appeared normal. The team also walked four shoreline segments: north of the grounding site, west of Zeal Point to Salisbury Sound, northeast side of Neva Strait, and in St. John Baptist Bay. This team did not observe any bird or marine mammal carcasses during the shoreline segment surveys or while in transit.

On March 27, the same team of NRDA scientists traveled through Olga Strait, into Neva Strait, through Krestof Sound, and through Hayward Strait. They observed hundreds of birds (both waterbirds and carcass scavengers), bald eagles, 35 sea otters (most in Krestof Sound, 2 in Neva Strait just south of the grounding), 5 Steller sea lions, 4 harbor seals (in Krestof Sound), and one humpback whale (traveling south in Krestof Sound). All of the Steller sea lions were observed in the grounding area, swimming in sheen, including one that swam under a boom at the grounding site and into sheen. However, no wildlife were observed in obvious distress and behavior appeared normal. The team also walked 3 shoreline segments in search of wildlife carcasses: directly across from the grounding in Neva Strait, on Krestof Island at Olga Point, and on Partofshikof Island on the Sukoi Inlet side. This team did not observe any bird or marine mammal carcasses during the March 27 shore surveys.

The NRDA team shared marine mammal sightings with the Incident Command for the emergency response. The team also collected mussel samples for chemical analyses (see below for more information).

3.3 Samples for chemical analyses

Environmental samples were collected to evaluate oil pathways, and exposure and injury in natural resources. Field sampling efforts also provide information about the extent, duration, and magnitude of oil exposure, which is important for evaluating the need for damage assessment and restoration. The Trustees prioritized collection of intertidal invertebrates and selection of shoreline sampling sites based on information available at the time about oil transport and resources at risk, as well as on the ground observations of the NRDA field teams and logistical consideration (e.g., safe shoreline access, avoiding emergency response operations).

Mussels, which were collected in every NRDA sampling effort for this incident, are a commonly used biomonitoring organism to evaluate the presence and bioavailability of contaminants, including oil, as well as oil exposure concentration, duration, and resulting injuries in intertidal and subtidal habitats and organisms (Peterson 2001, Skarphéðinsdóttir et al. 2007, Thomas et al. 2007, Sundt et al. 2011, Mearns et al. 2014, Counihan 2018). Other bivalves and sediment samples were also collected to document oil exposure and injury in shoreline habitats.

Samples for chemical analyses were collected in March, April, and May 2022 and March 2023, as detailed in chronological order below. Shellfish and sediment sampling protocols were modified from NOAA guidelines for ephemeral data collection for NRDA.[26] Samples were analyzed by a commercial laboratory, Alpha Analytical (Mansfield, MA). Some samples that were collected have not been analyzed; they are being held at the lab, pending a decision about the need for any additional analyses to support injury determination or quantification. All analytic chemistry data and the associated analytical reports from the lab are available in NOAA's DIVER data warehouse.[27]

3.3.1 Mussels for Chemical Analysis - March 2022

On March 26-27, 2022, concurrent with the wildlife surveys, the team of FWS scientists collected mussel samples for chemical analyses. A total of eight mussel samples were collected from sites in southern Salisbury Sound, Neva Strait, St. John Baptist Bay, Olga Point and the Magoun Islands (Figure 7), which includes shorelines where oil had been observed as well as shorelines outside of the southern extent of reported oil sheens in priority areas for herring spawn and roe harvest. Between 10-50 mussels were collected from each location. For each location, the tissues of the collected mussels were combined together into a single sample and processed as a composite sample. Samples were analyzed for aromatic hydrocarbons, aliphatic hydrocarbons, and biomarkers, as well as percent moisture and percent lipids.

Analysis of these samples showed elevated concentrations of petroleum hydrocarbons in mussels collected from sites in Salisbury Sound, St. John Baptist Bay, and Neva Strait, consistent with oil

[26] https://www.diver.orr.noaa.gov/field-forms-and-templates
[27] https://www.diver.orr.noaa.gov/web/guest/diver-explorer?sqid=737

exposure, including concentrations of polyaromatic hydrocarbons (PAH) exceeding known thresholds for toxic effects in mussels (Thomas et al. 2007, Sundt et al. 2011, Counihan 2018) at some sites. The results of this sampling effort are summarized in the first NRDA preassessment update[28] and available on DIVER (see footnote 27).

***Figure 7**: Map of mussel sample collection locations in March 2022. (Note: sample numbers on the map differ from sample IDs in the data; for example, Sample 1 is NRDAR-001 in the lab data)*

3.3.2 Mussels, Herring eggs, and Clams for Chemical Analysis – April 2022

On April 1, 2022, a local resident who works for the Southeast Alaska Conservation Council reached out to the Trustees about testing herring eggs for diesel contamination from the oil spill. The Trustees shared information about ongoing and planned NRDA work. The individual then received guidance from a scientist at the Sitka Sound Science Center and worked with another local resident to collect water, mussel, clam (species unknown), and Pacific herring egg samples from locations in Neva Strait, St. John Baptist Bay, Krestof Sound, and other locations to the south of the spill area (Figure 8) on April

[28] https://dec.alaska.gov/media/26414/wm-nrda-preassessment-results.pdf

4, 2022. Sample collection was done without the knowledge or oversight of the NRDA Trustees. However, after the samples were collected, individuals involved with the sampling effort reached out about having them analyzed. The Trustees determined that the samples had been collected using appropriate methods and documentation and had been held in a secure freezer under chain of custody and decided that the samples would provide important information for the preassessment, especially in terms of evaluating the spatio-temporal extent of oil exposure and potential exposure to sensitive early life stages of herring. The Trustees worked with the samplers and the consultants for the RP to have mussel, clam, and herring egg samples analyzed by Alpha Analytical (water samples were not analyzed). Samples were analyzed for aromatic and aliphatic hydrocarbons, percent lipids, and percent moisture.

***Figure 8**: Map of sample locations in April 2022. Circles are Pacific herring eggs, diamonds are bivalves. All bivalves are mussels except SS#6, which is a clam sample.*

Analysis of these samples showed elevated concentrations of PAHs in bivalve samples from St. John Baptist Bay and Neva Strait. The PAH concentrations in these samples were an order of magnitude lower than the ones collected from the Neva Strait area by NRDA scientists in March, but the samples had PAH profiles consistent with exposure to the spilled oil. Samples from northern Olga Strait and Sound Island had slightly elevated PAH concentrations, compared to samples collected outside of the spill area. The sample from Mud Bay (southwest Krestof Sound) also had slightly elevated PAH concentrations, but the source is believed to be unrelated to the *Western Mariner* spill. Very low concentrations of PAHs were detected in herring egg samples, with quantifiable levels found only in two samples that were collected outside of the spill area (SS#12 and SS#13), likely reflecting background exposure levels. Chemistry data from field samples are available on DIVER (see footnote 27).

3.3.3 Mussels, Clams, and Cockles for Chemical Analysis – May 2022

On May 15-17, 2022, Trustee scientists from NOAA and FWS, with boat support from USFS, visited sites in Neva Strait where the SCAT team had reported persistent lingering oil in intertidal sediments (Figure 9). The Highwater Island area (southern side of the intertidal isthmus) had previously not met response clean-up endpoints and when the SCAT team returned in May, two days before the NRDA work, they documented sheens in pits dug in intertidal areas. The SCAT team also reported evidence of lingering oil on the shoreline at the grounding site and beach just to the north, though that area had been previously been signed off on as meeting clean-up endpoints. A third site where oil had accumulated in shoreline sediments, called '1.7 mile beach' by the response team (because it was approximately 1.7 miles north of the grounding site on the western side of Neva Strait), had also been signed off on as meeting clean-up endpoints previously, and was not visited by the SCAT team or Trustees in May 2022. The Trustees also collected samples at a reference site in northern Krestof Sound that had shoreline morphology and exposure similar to the sites in Neva Strait, but was not impacted by the oil spill (Figure 9).

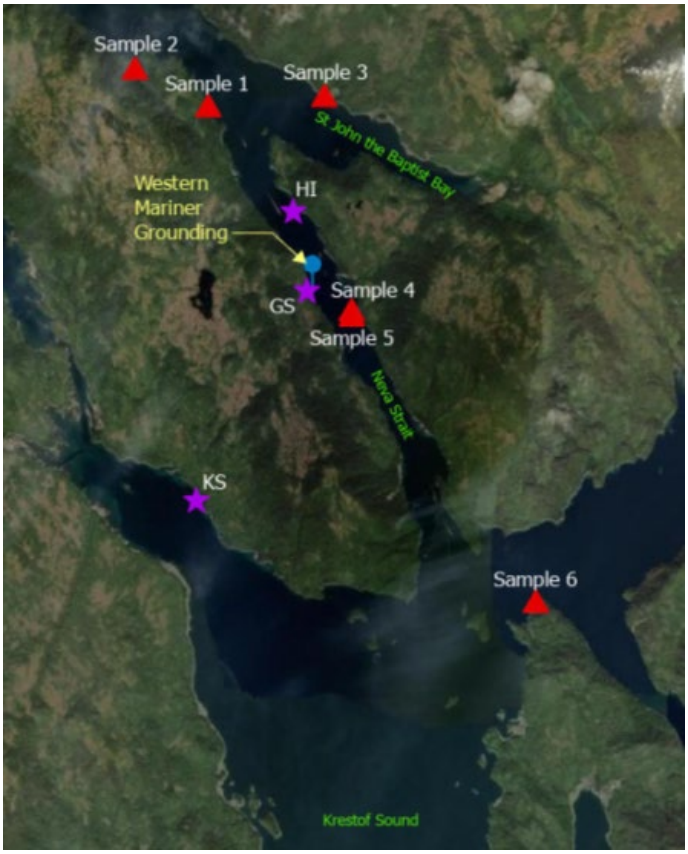

***Figure 9**: Map of sample locations in March (red triangles) and May (purple stars) 2022. March sampling sites on the Magoun Islands not shown.*

At both the Highwater Island and grounding site sampling locations, the Trustee scientists documented visible oil on shorelines and in pits, oil sheens released by the incoming tide, and diesel odors (Figure 10). At both sites with persistent oil, clams and cockles were observed alive on the surface of the beach with their shells open to the air during low tide (Figure 11). Clams and cockles may display this abnormal behavior in response to oil exposure. (Taylor et al. 1977, Stekoll et al. 1980, Nagarajah et al. 1985).

***Figure 10**: Oil sheen on cobble and a tidepool at the grounding site (left and center), and sheen on water mobilized by the rising tide at Highwater Island (right), on May 16-17, 2022.*

***Figure 11**: Unburied cockle (top left) and clam (top right), multiple bivalves on beach surface with shells open (bottom left), and oil sheens on water surface over open bivalves and small fish (bottom right). All photos taken on Highwater Island, May 15, 2022.*

The Trustees collected mussel samples at all three sampling locations. The Trustees also collected butter clam (*Saxidomus gigantea*) and cockle (*Clinocardium nuttallii*) samples from the three sites to evaluate exposure in these benthic infaunal species. Clams and cockles are filter-feeders that usually

live buried in sand and mud in the mid to lower intertidal and subtidal zones; they may be exposed to oil in sediments through different routes and at different concentrations than the intertidal epifaunal mussels. They are an important part of the intertidal community and a potential food source for birds, marine and terrestrial mammals, and people. Some of the clam and cockle samples collected from the grounding site and Highwater Island were organisms that were found "gaping", open on the surface of the beach, while others were dug up from within the sediment. All bivalve samples collected were alive. Bivalve samples were analyzed for aromatic and aliphatic hydrocarbons, percent lipids, and percent moisture. Concurrent with the sample collection, the Trustees carried out intertidal community surveys at the two lingering oil sites and the reference site (described below).

Analysis of these samples showed ongoing elevated concentrations of petroleum hydrocarbons in bivalves collected from shorelines where persistent oil was present two months after the spill. The bivalves from the unoiled site in Krestof Sound did not contain detectable levels of PAHs. The concentrations of PAHs in mussels from Highwater Island and the grounding site in May were only slightly reduced from the highest concentrations recorded in mussels collected in Neva Strait in March 2022. PAH concentrations and analyte profiles were consistent with ongoing exposure to lightly weathered diesel, and they were consistent with field observations of oil presence and toxic effects in intertidal organisms at the time of sampling. The results of this sampling effort are summarized in the second NRDA preassessment update[29] and available on DIVER (see footnote 27).

3.3.4 Mussels, Clams, Cockles, and Sediment for Chemical Analysis – March 2023

On March 23-24, 2023, Trustee scientists from NOAA and FWS, with boat support for the USFS, visited 13 shoreline sites in Neva Strait, St. John Baptist Bay, Krestof Sound, Olga Strait, and the Magoun Islands (Figure 12). This field assessment work was carried out approximately one year after the spill, to collect data to evaluate shoreline recovery and potential ongoing oil exposure. The objective of the work was to reoccupy all of the sites where oil contamination was documented in intertidal organisms in 2022, as well as a new reference site in Olga Strait, to collect samples to inform shoreline habitat and resources injury and recovery timelines for the natural resource damage assessment.

Three mussel samples were collected at every location, from sites distributed approximately evenly across the sampling location shoreline segment. Each mussel sample contained 12-15 individual mussels, depending on the size of the organisms. Clam and cockle samples were collected from oiled locations where they were previously sampled (grounding site, Highwater Island), a potential lingering oil site that had not been previously sampled (1.7 mile beach), and reference areas in north Krestof Sound (previously used as a reference in March 2022) and Olga Strait. The addition of the Olga Strait reference site was requested by the RP because the area would have vessel traffic and other activities similar to Neva Strait but did not receive oil from the spill. Each clam or cockle sample contained 3-5 individual organisms. For all samples (i.e., mussels, clams, and cockles), only live, intact bivalves were collected, all bivalve shells were closed at the time of collection, and the shells were not opened in the field. Tissues from all individuals in a sample were composited. Some mussel samples from different sites on the same beach segment were composited. Bivalve samples were analyzed for aromatic and

[29] https://dec.alaska.gov/media/3ceoeppy/wm-nrda-preassessment-results-may2022.pdf

aliphatic hydrocarbons, percent lipids, and percent moisture. Sediment samples were collected at five shoreline locations to provide additional information about potential oil pathway and exposure in shoreline habitats (Figure 12). Sediment samples were analyzed for aromatic and aliphatic hydrocarbons and organic carbon.

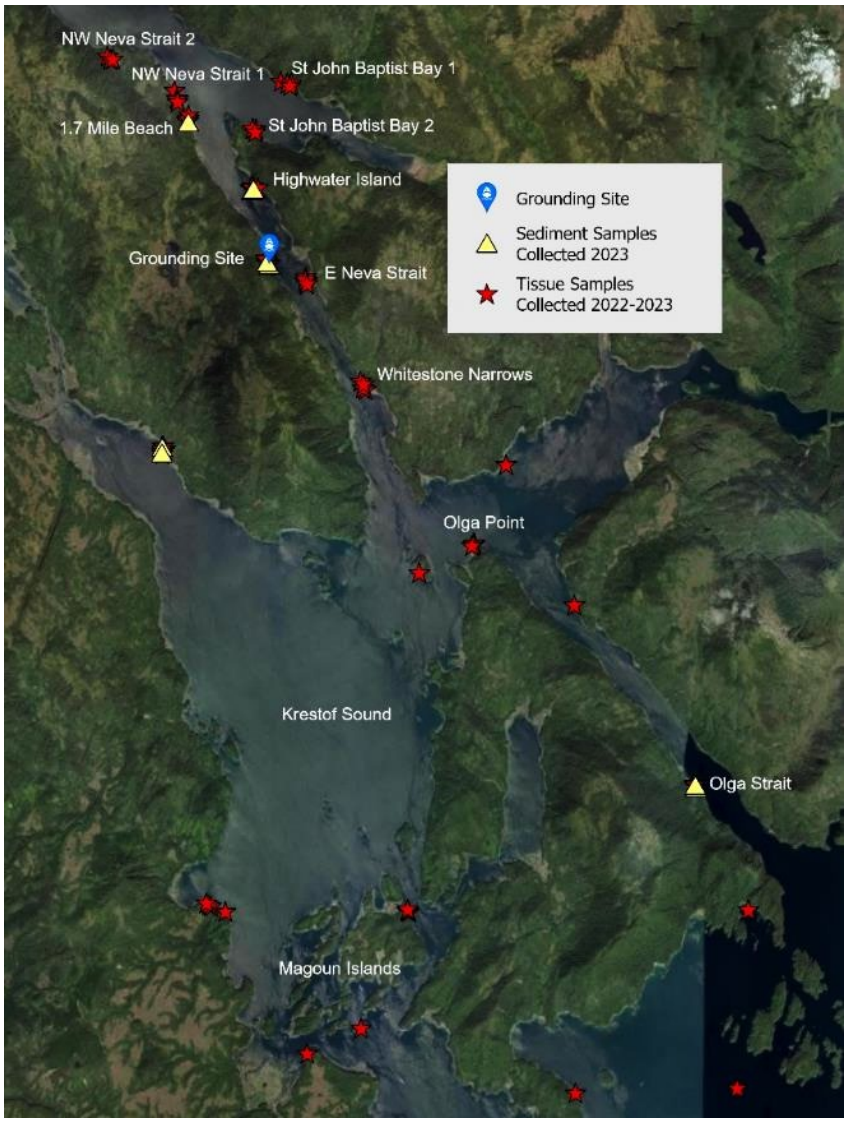

***Figure 12**: Map showing all locations where bivalve tissue and sediment samples for NRDA were collected (including samples collected by a third party in April 2022 and analyzed by the NRDA)*

The chemical results show that most areas where elevated oil concentrations were documented in bivalves in spring 2022 have recovered to pre-spill, baseline conditions that are comparable to the unoiled reference sites. However, areas at the grounding site, Highwater Island, and '1.7 Mile Beach', all places where persistent oil was documented in 2022, continue to show elevated PAH concentrations in bivalve tissues. Visible oil sheening was also observed at the grounding site and Highwater Island. Sediment samples confirmed ongoing elevated concentrations of PAHs in sediments from those beaches (Figure 4), with notably high variability among samples from the same location,

likely reflecting the 'patchiness' of oil in intertidal sediments observed in the SCAT pit data (not shown here). However, the oil chemical concentrations recorded in 2023 were at least 100-times lower than those recorded in 2022, indicating substantially reduced oil exposure one year after the spill (Table 1). The results of this sampling effort are summarized in the third NRDA preassessment update[30] and available on DIVER (see footnote 27).

PAH Concentrations in Mussel Tissue (ppb dry wt.)

	Mar-22	Apr-22	May-22	Mar-23
NW Neva Strait 2	4700	n/s	n/s	11
NW Neva Strait 1	29000	n/s	n/s	4.0
St John Baptist Bay 1	4500	n/s	n/s	2.5
St John Baptist Bay 2	n/s	710	n/s	3.7
1.7 Mile Beach	n/s	n/s	n/s	55
Highwater Island	n/s	n/s	21000	70
Grounding Site	n/s	n/s	16000	780
E Neva Strait	27000	n/s	n/s	7.7
Whitestone Narrows	n/s	340	n/s	5.0
Olga Point	290	n/s	n/s	1.5

***Table 1**: PAH concentrations in mussel tissue samples (ppb dry wt.) collected in 2022-2023 (n/s – not sampled). Concentrations are the sum of 72 PAH compounds in parts per billion in the dry weight of the tissue. PAH compounds not detected in samples (i.e., below method detection limits) were not included in the sums.*

3.3.5 Mussels for Chemical Analysis – June 2024

On June 10, 2024, Trustee scientists from NOAA and FWS, with boat support from the USFS, returned to four sites that had been sampled in previous years to collect mussel samples for chemical analysis. The team collected samples from three sites in Neva Strait where lingering oil was documented in March 2023 (i.e., the grounding site, Highwater Island, and 1.7 mile beach), as well as a reference site in Olga Strait (Figure 12). These samples were collected approximately two years after the spill, to provide data on shoreline recovery and potential ongoing oil exposures. These data will inform shoreline habitat and resource injury and recovery timelines for the damage assessment.

The Trustee scientists followed the same bivalve tissue sampling protocols reported here for previous sampling efforts. The composite mussel tissue samples will be analyzed for aromatic and aliphatic hydrocarbons, percent lipids, and percent moisture. As of July 2024, sample analysis is in progress and results are not yet available. The Trustees will consider the data from this sampling effort, once it is received, in future injury assessment and restoration planning work.

Though chemical analyses are pending, the field team noted that oil sheens were readily mobilized from sediments at the grounding site by simply walking in the intertidal area, and diesel odor was detectable in the area of the tug's grounding. The residual oil sheens appeared to be primarily associated with fine sediments and organic material in a relatively small area near a freshwater stream just to the north of where the tug grounded. Oil was not visually noted at other sites. The persistence

[30] https://dec.alaska.gov/media/3ceoeppy/wm-nrda-preassessment-results-may2022.pdf

of spilled diesel on certain shorelines for over two years is notable, given the low environmental persistence typically described for diesel in marine environments.

3.4 Intertidal Community Surveys

On May 15-17, 2022, Trustee scientists from NOAA and FWS conducted intertidal community surveys at two sites with persistent oil in Neva Strait (the grounding site and Highwater Island) and a reference site in northeastern Krestof Sound (Figure 9). The objective of the intertidal surveys was to characterize intertidal biological communities (vegetation and benthic macrofauna) at sites where persistent oil was observed and unoiled shorelines to document potential community-level impacts from chronic oil exposure.

The Trustees used shoreline survey methods modified from intertidal monitoring protocols developed for Sitka National Historical Park by the U.S. Geological Survey (Irvine et al. 2008) and NOAA ephemeral data collection guidelines for intertidal habitats (see footnote 23). Each survey location consisted of a beach segment from previous SCAT or NRDA work, except for the reference site. Three transects were established in each segment, spaced approximately evenly across the segment starting from a randomly selected point. Transects were perpendicular to the shoreline and extended from the supratidal zone to the low intertidal (water edge). Each transect was divided into three intertidal zones based on approximate height as determined by representative biobands.[31] Quadrats measuring 1/9 m^2 were deployed along the transects at randomly determined points within each tidal zone. Three observations were collected in each tidal zone on each transect. Observations included macroalgae identification and percent cover (live and dead), and faunal species identification and counts. Algae and smaller rocks were moved to count organisms living under those structures. Sediment cores were collected from tidal flat areas to identify and count benthic infauna. Some species IDs and counts were recorded in the field, while other quadrats were photographed for later analysis. Surveys were carried out during low tides (-1.78 to -2.86 feet).

***Figure 13**: Example of a transect (left) and quadrat (right) used for intertidal community surveys.*

[31] Biobands are band-forming assemblages of coastal biota and grow in a typical across-shore elevation, and at characteristic wave energies and substrate conditions.

Analysis of the information collected from the intertidal community surveys is incomplete. Some initial analyses of community parameters showed preliminary evidence of reduced species richness in intertidal communities at sites with persistent oil compared to unoiled locations. However, input from scientists who specialize in Alaskan shoreline algae and invertebrates would be required to derive full species identification and count data from the survey forms and photos. Additional work with the survey data may be pursued by the Trustees as needed for injury determination or quantification.

3.5 Other preassessment activities

In addition to the ephemeral data collection activities detailed above, the Trustees carried out other preassessment work to support their evaluation of potential injuries to natural resources from the *Western Mariner* oil spill. Other preassessment activities included compiling and reviewing information from the emergency response, especially related to oil observations, resources at risk, wildlife observations, observed injuries to natural resources, and potential impacts to human uses of natural resources. Information from the SCAT team, including SCAT data (Figure 14) and field notes, particularly documentation of likely injuries to shoreline habitats and resources (e.g., observations of dead limpets, echinoderms, and macroalgae), informed the Trustees' ephemeral data collection study plans and evaluation of natural resource injuries.

In addition, the Trustees began reviewing existing information to support an injury preassessment, such as scientific publications about the toxicity of oil to shoreline resources and habitat services and information about oil impacts to marine mammals. Agency reports documenting natural resource use by local communities were compiled and evaluated in relation to the harvest and consumption advisories and other information about wild resource harvests. These evaluations are ongoing.

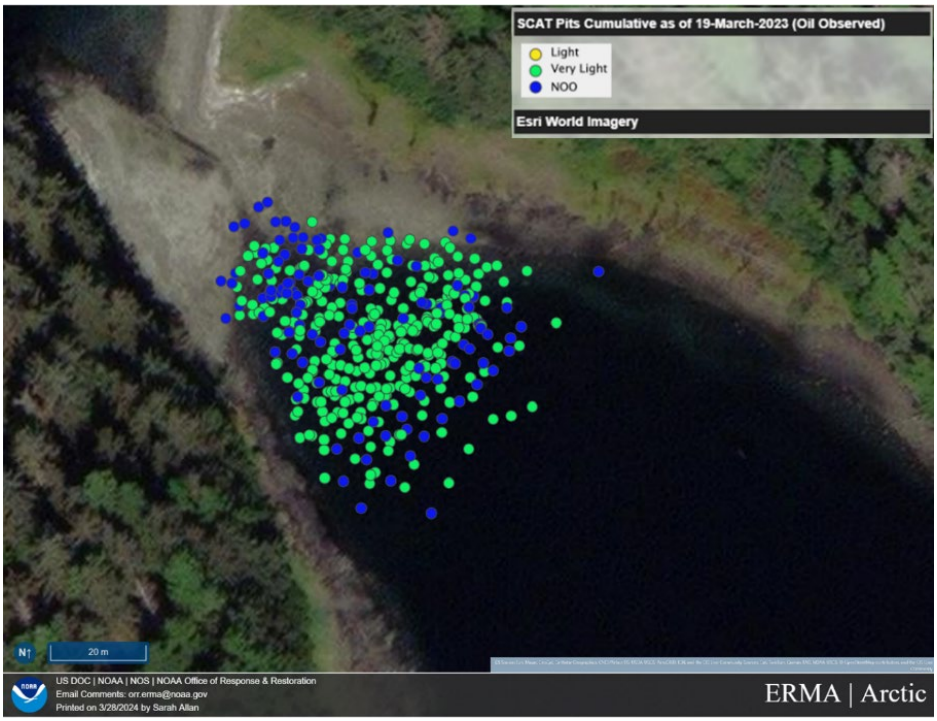

***Figure 14**: Example of SCAT data reviewed by the NRDA Trustees for field study planning and injury preassessment.*

3.6 Restoration Project Identification

The goals of restoration planning under the OPA are to quantify the natural resource injuries and identify actions appropriate to restore natural resources or services to the condition that would have existed if the incident had not occurred and compensate for interim service losses. The latter goal is achieved through the restoration, rehabilitation, replacement, or acquisition of equivalent natural resources and/or services (15 CFR 990.10). Further, the development and consideration of restoration alternatives may be required to comply with the National Environmental Policy Act (NEPA).

As part of the preassessment, in accordance with OPA NRDA regulations, the NRDA Trustees determined that restoration options were available. Potential restoration projects were identified by engaging Federal, State, Tribal, and local natural resource planners and managers. Trustees focused on resource-to-resource approaches capable of restoring potentially lost shoreline habitat services. Restoration for other types of natural resource injuries, such as potential injuries to marine mammals or lost human uses, may be considered in the future. Additional public engagement and targeted outreach to identify appropriate restoration projects would be part of the restoration planning process in the next phase of the NRDA work. As part of the preassessment, marine debris removal was identified as a feasible restoration option to compensate for potential injuries to shoreline habitat and resources, with benefits potentially extending to other impacted marine habitats and resources.

3.6.1. Marine Debris Removal

Marine debris is found along shorelines throughout the greater Sitka Sound area.[32] Past marine debris removal efforts have identified depositional beaches, where shoreline and marine characteristics contribute to greater accumulations of marine debris. Much of the marine debris on shorelines in Alaska and around Sitka Sound consists of plastic materials, such as fish nets, rope, packing materials, and containers (Polasek et al. 2017). Marine debris causes physical impacts to shoreline habitat and resources and may also change the physical and chemical composition of beaches in ways that impact ecological services. Marine debris on shorelines can also be remobilized into marine and terrestrial environments (Johnson et al. 1988). Further, macroplastics debris, which is recoverable through removal efforts, degrades into smaller particles (e.g., microplastics – pieces smaller than 5 mm, and nanoplastics – pieces smaller than 0.001 mm) (Andrady 2022), which have a range of impacts on organisms and their marine habitats. As such, removal of beach-cast marine debris would provide benefits to shoreline habitat and associated marine ecosystems.

Marine debris removal decreases degradation of physical habitat (e.g., smothering, occupation of void space in log jams), removes sources of persistent toxic chemicals, reduces entanglement and ingestion risks, and reduces microplastic production and associated impacts, among other potential benefits. Marine debris on shorelines or in the marine environment can smother plants and animals, creating more anoxic environments and preventing feeding, and changing temperature regimes, among other effects (Kühn et al. 2015, Lavers et al. 2021). Marine debris on shorelines and in the water presents an entanglement risk, primarily for marine mammals (Fowler 1987, Stewart et al. 1987, Laist 1997, Raum-Suryan et al. 2009, Donnelly-Greenan et al. 2019) and birds (Laist 1997, Rodríguez et al. 2013, Ryan

[32] https://sitkascience.org/research-projects/marine-debris/marine-debris-map/

2018, Donnelly-Greenan et al. 2019). Marine mammals, birds, and other marine organisms also ingest macro- and micro-debris, and may be impacted by the debris itself and the chemicals in the materials (engineered or acquired from the environment) (Teuten et al. 2009, Lavers et al. 2014, Pittura et al. 2018, Thaysen et al. 2018, Ryan 2019, Kühn et al. 2020, Savoca et al. 2021, Zolotova et al. 2022). Consequently, removal of marine debris from shorelines has the potential to reduce these negative impacts and enhance the services provided by marine shoreline habitats and associated marine environments.

Numerous marine debris removal efforts have been carried out in Sitka Sound in the past. Further, standard methods for beach surveys and documenting debris removal exist and have been applied to previous cleanup efforts in the area (see footnote 29). The Trustees determined that marine debris removal is a feasible, scalable potential restoration project that could compensate for injuries to shoreline habitats from the *Western Mariner* oil spill.

3.7 Preassessment Conclusions

Overall, the preassessment work conducted by the NRDA Trustees for the *Western Mariner* oil spill establishes that injuries to trust natural resources have resulted from the spill, response actions did not adequately address the injuries, and feasible compensatory restoration exists to address the injuries. This meets the criteria under OPA for pursuing a damage assessment and restoration planning (15 C.F.R. § 990.42(a)). Based on information collected during the preassessment, the Trustees conclude that spilled oil caused injuries to marine shoreline habitat and resources, and likely injuries to marine mammals and human uses of natural resources. Thus, the Trustees intend to pursue restoration and will prepare and make publicly available a Notice of Intent to Conduct Restoration Planning (15 C.F.R. § 990.44(a)).

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