n these surveys. The USFWS vessel M/V *Tiglax* was used as a working platform. Landing on beaches was accomplished using skiffs. The selection of shoreline segments surveyed was determined by the USFWS sampling plan used to survey the segments for bird carcasses. This was a stratified-random design, with the strata being wave-exposed, wave-protected, and accumulation beaches. Segments were randomly selected within these strata. Segment identification codes were the same as was designated for SCAT surveys and is shown in Figure 2.

*Observations and Discussion:* In these winter surveys, days were short and daytime tides were high, so observations were limited to the highest portions of the intertidal zone. However, SCAT surveys documented that most of the oil on the shoreline e had been deposited at higher tide elevations by storm waves in the supratidal zone and in the seaward edge of the terrestrial vegetation. Most of the vegetation is Aleutian rye grass. In the winter, the above-ground portions of this grass were dead, straw-like, and appeared to have an affinity for the oil. In these high locations the oil was beyond the reach of the normal tides. Some of the oil was buried beneath gravel and cobble in storm berms. Evidence of mobile oil in the form of patties (congealed oil mixed with straw from Aleutian rye grass) was also observed. Many of the patties were about the size, shape, and thickness of shoe soles, sporadically stranded on the beaches. In these winter temperatures, any remobilized oil would not be liquid and would not form spreading slicks.

With temperatures around freezing (~32ºF, ~0ºC), most of the oil stranded on the shore was the consistency of thick, cold, sticky peanut butter. To illustrate the consistency of the *Selendang Ayu* oil in winter, the oil could be picked up as a lump with a wooden tongue depressor without losing its shape. When placed in seawater, it did not give off sheen and barely floated (it floated with more than 95% of the lump below the surface of the water). Nick Iadanza observed that the oil appeared less viscous on days with temperatures in the forties (ºF) (~8ºC) and produced sheen when placed in seawater.

Most of the oil we observed was partially emulsified (i.e., had incorporated water and become an oil-water mix). It was a medium brown color instead of black. When pressed with a tongue depressor, the masses of brown oil exuded droplets of water.

Numerous samples of potentially and visibly oiled sediments, the oil itself, and various kinds of biota (mostly mussels) were taken. These samples are being held in frozen storage and could be analyzed if the Trustees determine the information is needed.

In examining the invertebrate fauna of high beaches at Spray Cape (SPR11 and SPR13) on 7 January 2005, Dan Hahn reported amphipods and isopods coated with oil. These oil-coated crustaceans were both live and dead. Some of these appeared to have crawled upwards through the overlying oil. Ty Wyatt (USFWS) made similar observations, including photo-documentation (Wyatt, pers. comm.).

Additional observations of oil movement and deposition were made during the June 2005 surveys described below. Numerous photos illustrating the oiled shorelines and history of the *Selendang Ayu* oil spill are shown on the Incident Command website: http://www.dec.state.ak.us/spar/perp/response/sum\_fy05/041207201/041207201\_ph\_index.htm

**June Surveys: Observations of oil and biota from NOAA field surveys conducted in June 2005**

*Objectives:* The objectives for the June 2005 surveys were the following:

Identify resources at risk; that is, identify fresh, brackish, and marine water biota and habitat in the spill area that could have been injured as a result of the oil spill, including clean-up activities.

Document degree of exposure of natural resources to *Selendang Ayu* oil. (This objective incorporated SCAT data already collected and documented presence of oil in the environment and in/on biota.)

Document indications of possible resource injury caused by the *Selendang Ayu* oil spill and clean-up actions.

Collect ephemeral data (data that would be lost if not recorded by these surveys at this time) regarding potential injury to trust resources.

Collect any additional information necessary for designing or implementing future NRDA and restoration studies.

**Surveys of Intertidal Habitats in June 2005**

*Methods:*The NOAA and responsible party preassessment teamconducted two sets of surveys of intertidal habitats in June 2005, coinciding with the minus low tide series of 2-9 June and 19-23 June. The extreme low tides during these two periods facilitated our access to the lowest intertidal levels of the shores in the spill area.

The primary scientific personnel conducting the intertidal surveys for NOAA are all marine biologists with years of experience surveying intertidal biota in Alaska and/or the Pacific Northwest.

John Cubit (Lead scientist), marine ecologist, NOAA Damage Assessment Center: all June 2005 surveys (2-9 June and 19-23 June)

Allan Fukuyama, marine ecologist, University of Washington















|  |  |  |  |
| --- | --- | --- | --- |
| **Date** | **Segment** | **Date** | **Segment** |
| 6/2/2005 | ALM 8 | 6/9/052 | UDE3 |
|  | ALM 7 |  | UDE1 |
|  | ALM 6 |  | VLC9 |
|  | ALM10 |  | VLC10 |
|  | CFS 19 |  |  |
|  | CFS 20 | 6/19/2005 | SKN 3 |
| 6/3/2005 | KMK 30 |  | SKN 4 |
|  | PMS 7 |  | SKN 7 |
|  | PMS 10 |  | SKN 6 |
| 6/4/2005 | SPR 11 |  | PMS 16 |
|  | SPR12 | 6/20/2005 | HMP 12 |
|  | SKS 4 |  | HMP 9 |
|  | SKS 6 |  | PTN 3 |
| 6/5/2005 | CNB9 |  | PTS 11 |
|  | CNB10 | 6/21/2005 | MKS 4 |
|  | PTN2 |  | MKS 5 |
|  | PTN3 |  | MKS 6 |
| 6/6/2005 | HMP7 |  | SPR 2 |
|  | HMP6 |  | SPR 3 |
|  | HMP10 |  | UDW 1 |
|  | HMP11 | 6/22/2005 | SKN 14 |
|  | HMP5 |  | SKN 10 |
| 6/7/2005 | SKN8 |  | SKN 11 |
|  | SKN9 |  | SKN 7 |
|  | SKN11 |  | PMS 20 |
|  | SKN12 | 6/23/2005 | HMP 11 |
|  | SKN14 |  | HMP 13 |
|  | SKN15 |  |  |
| 6/8/2005 | SKS 18 |  |  |
|  | SKS 14 |  |  |
|  | SKS 15 |  |  |
|  | SKS 16 |  |  |
|  | SKS 17 |  |  |

|  |  |
| --- | --- |
| **Invertebrates** | **Common name category** |
| *Henricia* | starfish |
| *Katharina* | chiton |
| *Littorina* *sitkana* | snail |
| *Lottia digitalis* | limpet |
| *Lottia pelta* | limpet |
| *Nucella emarginata* | snail |
| *Calliostoma ligatum.* | snail |
| *Balanus glandula* | barnacle |
| *Semibalanus cariosus* | barnacle |
| *Mytilus trossulus* | mussel |
|  |  |
| **Marine algae** |  |
| *Laminaria* | kelp |
| *Alaria* | kelp |
| *Cymathere* | kelp |
| *Fucus* | rockweed |
| *Hedophyllum* | kelp |
| *Neorhodomela larix* | red alga |
| *Petrocelis* | tar-spot alga |
| *Agarum (or* possibly *Thalassiophyllum)* | kelp |
| The individuals of these species were large enough that they were probably present in the spill area before 8 December 2004, when the *Selendang Ayu* wrecked at Spray Cape. | |

| **SEGMENT NAME** | **WINTER OILING CAT.** | **SPRING OILING CAT.** | **SPRING**  **CLEAN-UP?** | **MANUAL CLEAN-UP** | **MECH. REMOVAL** | **MECH. TILL** | **BERM RELOC-ATION** | **OPEN BURN** |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| ALM03 | NOO | MODERATE | YES | X |  |  |  |  |
| ALM09 | NOO | MODERATE |  |  |  |  |  |  |
| AND01 | LIGHT | LIGHT | NFT |  |  |  |  |  |
| AND06 | LIGHT | LIGHT | YES | X |  |  |  |  |
| AND07 | NOO | HEAVY | NFT |  |  |  |  |  |
| AND08 | NOO | HEAVY | YES | X |  |  |  |  |
| ASP07 | NOO | LIGHT | YES | X |  |  |  |  |
| ASP14 | NOO | MODERATE | YES | X |  |  |  |  |
| ASP15 | NOO | LIGHT | YES | X |  |  |  |  |
| ASP16 | NOO | LIGHT | YES | X |  |  |  |  |
| BCK07 | NOO | HEAVY | YES | X |  |  |  |  |
| BCK09 | HEAVY | MODERATE | YES | X |  |  |  |  |
| BCK11 |  | HEAVY | YES | X |  |  |  |  |
| CBE21 | HEAVY | NOO | NFT |  |  |  |  |  |
| CNB01 | NOO | MODERATE | YES | X |  |  |  |  |
| CNB10 | NOO | LIGHT | YES | X |  |  |  |  |
| CNB11 | NOO | LIGHT | YES | X |  |  |  |  |
| CNB14 | NOO | LIGHT | YES | X |  |  |  |  |
| CNB15 | NOO | LIGHT | YES | X |  |  |  |  |
| CNB17 | NOO | MODERATE | YES | X |  |  |  |  |
| CNB19 | MODERATE | LIGHT | NFT |  |  |  |  |  |
| CNB20 | MODERATE | HEAVY | YES | X |  |  |  |  |
| CNB21 | HEAVY | HEAVY | YES | X |  |  |  |  |
| HMP02 | NOO | HEAVY | YES |  |  |  |  |  |
| HMP03 | NOO | HEAVY | YES |  |  |  |  |  |
| HMP05 | HEAVY | HEAVY | YES | X |  |  |  |  |
| HMP06 | HEAVY | HEAVY | YES | X |  |  |  |  |
| HMP07 | HEAVY | HEAVY | YES | X | X | X |  |  |
| HMP08 | HEAVY | LIGHT | YES | X |  |  |  |  |
| HMP10 | HEAVY | HEAVY | YES | X |  |  |  |  |
| HMP11 | HEAVY | HEAVY | YES | X | X | X |  | X |
| HMP12 | HEAVY | HEAVY | YES | X | X | X | X |  |
| HMP13 | HEAVY | HEAVY | YES | X |  |  |  |  |
| KFP01 | NOO | HEAVY | YES | X |  |  |  |  |
| KFP02 | NOO | HEAVY | YES | X |  |  |  |  |
| KFP03 | NOO | HEAVY | YES | X |  |  |  |  |
| KFP04 | NOO | VERY LIGHT | X | X |  |  |  |  |
| KFP05 | LIGHT | VERY LIGHT | NFT |  |  |  |  |  |
| KFP07 | LIGHT | VERY LIGHT | NFT |  |  |  |  |  |
| KFP08 | NOO | HEAVY | YES | X |  |  |  | X |
| KFP09 | MODERATE | HEAVY | YES | X |  |  |  |  |
| KFP10 | NOO | HEAVY | YES | X |  |  |  |  |
| KMK02 | NOO | HEAVY | YES | X |  |  |  |  |
| KMK06 | MODERATE | MODERATE |  |  |  |  |  |  |
| KMK07 | MODERATE | HEAVY | YES | X |  | X |  |  |
| KMK08 | HEAVY | NOO | NO |  |  |  |  |  |
| KMK09 | HEAVY | HEAVY | YES | X |  |  |  |  |
| KMK11 | HEAVY | LIGHT | YES | X |  |  |  |  |
| KMK15 | NOO | LIGHT | YES | X |  |  |  |  |
| KMK26 | NOO | HEAVY | YES | X |  |  |  |  |
| KMK27 | MODERATE | HEAVY | YES | X |  |  |  |  |
| KMK28 | HEAVY | HEAVY | YES | X |  |  |  |  |
| KMK29 | HEAVY | LIGHT | NFT |  |  |  |  |  |
| KMK30 | HEAVY | HEAVY | YES | X |  |  |  |  |
| KMK32 | NOO | MODERATE | YES | X |  |  |  |  |
| KSB01 | NOO | MODERATE | YES | X |  |  |  |  |
| KSB02 | MODERATE | HEAVY | YES | X |  |  |  |  |
| KSB03 | NOO | HEAVY | YES | X |  |  |  |  |
| KSB08 | MODERATE | MODERATE | YES | X |  |  |  |  |
| KSB10 | HEAVY | MODERATE | YES | X |  |  |  |  |
| KSB15 | NOO | LIGHT | YES | X |  |  |  |  |
| KTS19 |  | LIGHT | YES | X |  |  |  |  |
| MKS01 | HEAVY | HEAVY | YES | X | X | X |  | X |
| MKS02 | HEAVY | HEAVY | YES | X | X | X |  |  |
| MKS03 | HEAVY | LIGHT | YES | X |  |  |  |  |
| MKS04 | HEAVY | NOO | NFT |  |  |  |  |  |
| MKS05 | HEAVY | HEAVY | YES | X |  |  |  |  |
| MKS06 | HEAVY | HEAVY | YES | X |  |  |  |  |
| MKS07 | LIGHT | HEAVY | YES | X |  |  |  |  |
| MKS08 | LIGHT | NOO | NFT |  |  |  |  |  |
| MKS09 | HEAVY | HEAVY | YES | X |  |  |  |  |
| MKS10 | HEAVY | NOO | NFT |  |  |  |  |  |
| MKS11 | HEAVY | HEAVY | YES | X |  |  |  |  |
| MKS12 | NOO | HEAVY | YES | X |  |  |  |  |
| **MKS13** | NOO | HEAVY | NFT |  |  |  |  |  |
| **MKS14** | NOO | HEAVY | NFT |  |  |  |  |  |
| **MKS15** | NOO | HEAVY | NFT |  |  |  |  |  |
| **MKS16** | NOO | HEAVY | NFT |  |  |  |  |  |
| **MKS17** | NOO | HEAVY | NFT |  |  |  |  |  |
| **MKS18** | NOO | HEAVY | NFT |  |  |  |  |  |
| NGE07 | LIGHT | LIGHT | YES | X |  |  |  |  |
| NGW01 | LIGHT | LIGHT | NFT |  |  |  |  |  |
| NGW02 | MODERATE | LIGHT | YES | X |  |  |  |  |
| NGW03 | MODERATE | LIGHT | YES | X |  |  |  |  |
| NGW04 | LIGHT | LIGHT | NFT |  |  |  |  |  |
| NGW05 | LIGHT | LIGHT | NFT |  |  |  |  |  |
| NGW06 | LIGHT | LIGHT | NFT |  |  |  |  |  |
| NGW07 | LIGHT | LIGHT |  |  |  |  |  |  |
| PMN02 | HEAVY | NOO | NFT |  |  |  |  |  |
| PMN10 | LIGHT | NOO | NFT |  |  |  |  |  |
| PMN12 | LIGHT | LIGHT | NFT |  |  |  |  |  |
| PMN13 | NOO | VERY LIGHT | NFT |  |  |  |  |  |
| PMN15 | NOO | MODERATE | YES | X |  |  |  |  |
| PMN16 | NOO | MODERATE | YES | X |  |  |  |  |
| PMN24 | LIGHT | NOO | NFT |  |  |  |  |  |
| PMN25 | LIGHT | NOO | NFT |  |  |  |  |  |
| PMN28 | NOO | HEAVY | YES | X |  |  |  |  |
| PMS05 | LIGHT | LIGHT |  |  |  |  |  |  |
| PMS06 | LIGHT | MODERATE | YES | X |  |  |  |  |
| PMS10 | MODERATE | MODERATE | YES | X |  |  |  |  |
| PMS11 | LIGHT | LIGHT |  |  |  |  |  |  |
| PTN01 | MODERATE | LIGHT | NFT |  |  |  |  |  |
| PTN02 | NOO | HEAVY | YES | X |  |  |  |  |
| PTN03 | HEAVY | HEAVY | YES | X |  |  |  |  |
| PTN04 | HEAVY | HEAVY | YES | X |  |  |  |  |
| PTN10 | LIGHT | HEAVY | YES | X |  |  |  |  |
| PTS01 | LIGHT | HEAVY | YES | X |  |  |  |  |
| PTS03 | LIGHT | NOO | NFT |  |  |  |  |  |
| PTS04 | LIGHT | NOO | NFT |  |  |  |  |  |
| PTS05 | MODERATE | MODERATE | NFT |  |  |  |  |  |
| PTS06 | NOO | NOO | NO |  |  |  |  |  |
| PTS07 | MODERATE | LIGHT | NFT |  |  |  |  |  |
| PTS08 | MODERATE | NOO | NFT |  |  |  |  |  |
| PTS10 |  | MODERATE | NFT |  |  |  |  |  |
| SKN04 | NOO | LIGHT | YES | X |  |  |  |  |
| SKN05 | HEAVY | HEAVY | YES | X |  | X | X | X |
| SKN06 | NOO | MODERATE | YES | X |  |  | X |  |
| SKN08 | HEAVY | MODERATE | YES | X |  |  |  | X |
| SKN11 | HEAVY | HEAVY | YES | X | X | X |  | X |
| SKN12 | LIGHT | HEAVY | YES | X |  |  |  |  |
| SKN13 | HEAVY | MODERATE | YES | X |  |  |  |  |
| SKN14 | HEAVY | HEAVY | YES | X |  |  |  |  |
| SKN15 | HEAVY | HEAVY | YES | X |  |  |  | X |
| SKS01 | NOO | HEAVY | YES | X |  |  |  |  |
| SKS02 | NOO | HEAVY | YES | X |  |  |  |  |
| SKS03 | NOO | HEAVY | YES | X |  |  |  |  |
| SKS04 | MODERATE | HEAVY | YES | X | X | X | X |  |
| SKS06 | HEAVY | HEAVY | YES | X |  |  |  |  |
| SKS10 | NOO | HEAVY | YES | X |  |  |  |  |
| SKS11 | NOO | HEAVY | YES | X |  |  |  |  |
| SKS12 | NOO | LIGHT | YES | X |  |  |  |  |
| SKS13 | NOO | MODERATE | YES | X |  |  |  |  |
| SKS14 | NOO | MODERATE | YES | X |  |  |  |  |
| SKS15 | NOO | HEAVY | YES | X |  |  |  |  |
| SKS16 | NOO | HEAVY | YES | X |  |  |  |  |
| SKS17 | NOO | MODERATE | YES | X |  |  |  |  |
| SKS18 | HEAVY | HEAVY | YES | X | X | X |  |  |
| SMB06 |  | HEAVY | YES | X |  |  |  |  |
| SPR01 | NOO | MODERATE | YES | X |  |  |  |  |
| SPR02 | HEAVY | MODERATE | YES | X |  |  |  |  |
| SPR03 | NOO | LIGHT | YES | X |  |  |  |  |
| SPR04 | HEAVY | MODERATE | YES | X |  |  |  |  |
| SPR05 | HEAVY | NOO | NFT |  |  |  |  |  |
| SPR07 |  | MODERATE | YES | X |  |  |  |  |
| SPR09 |  | MODERATE | YES | X |  |  |  |  |
| SPR10 |  | LIGHT | YES | X |  |  |  |  |
| SPR11 | LIGHT | HEAVY | YES | X |  |  |  |  |
| SPR12 |  | HEAVY | YES | X |  |  |  |  |
| UDE16 | LIGHT | LIGHT | YES | X |  |  |  |  |
| WDE03 | MODERATE |  |  |  |  |  |  |  |
| UDW01 | NOO | HEAVY | YES | X |  |  |  |  |
| UDW04 | NOO | LIGHT | YES | X |  |  |  |  |
| UNK03 |  | LIGHT | YES | X |  |  |  |  |
| VLC01 |  | HEAVY | YES | X |  |  |  |  |
| VLC10a |  | LIGHT | YES | X |  |  |  |  |

|  |  |
| --- | --- |
| **DATES** | **OBSERVATIONS** |
| 20-23 June 2005: | NOAA survey teams documented remobilized oil from beach cleaning operations in Skan Bay (SKN10-11) and probably from beach cleaning operations in Hump Back Bay (~HMP10-12). |
| August-September 2005 | Scott Arnold, Alaska Department of Health and Social Services, reported elevated levels of total PAHs in blue mussels from various locations in Skan Bay, but not in other nearby bays |
| ~September 2005: | Mark Carls reported increase of oil in PEMD samplers at Skan Bay (SKN-14). |
| 21 October 2005 | Unnamed observer in civilian aircraft reported what appeared to be a sheen around thevessel. Coast Guard reported oil from Selendang in water and onshore around wreck (Spray Cape) and Skan Bay. |
| 24 October 2005 | Coast Guard reported seeing sheen and emulsified oil coming from the stern of the *Selendang Ayu*. |
| 25 October 2005 | Coast Guard observed a rainbow sheen burping up from around 350 yards from the vessel. |
| 1 December 2005: | Coast Guard/ADEC reported sheening from the vessel (POLREP 104). |
| 1 December 2005 | Dan Magone reported oil on about 200 feet of shoreline near the Selendang; “grass has distinctive droopy look….” |
| 3 December 2005 | Dan Magone reported “ribbon of oil sheen” in inner bay of “Lower Skan Bay”. |
| Feb or March 2006(?) | Seaduck crews reported sticky oil blobs on beach and oiled scaup. |

| **SEGMENT** | **SEGMENT LENGTH (km)** | **OILED LENGTH (km)** | **FINAL STATUS** | **DATE of STATUS DETERMINATION** |
| --- | --- | --- | --- | --- |
| BCK11 | 0.951 | 0.08 | End Point Reached | 6/8/06 |
| HMP06 | 0.463 | 0.08 | Natural Recovery | 6/6/06 |
| HMP11b | 0.300 | 0.12 | End Point Reached | 6/6/06 |
| KFP01 | 1.494 | 0.635 | Natural Recovery | 6/13/06 |
| KFP02 | 0.536 | 0.38 | End Point Reached | 6/12/06 |
| KFP03 | 0.239 | 0.03 | End Point Reached | 6/12/06 |
| KFP10a | 1.102 | 0.36 | End Point Reached | 6/12/06 |
| KMK26 | 0.265 | 0.02 | End Point Reached | 6/4/06 |
| KMK30 | 1.839 | 0.04 | End Point Reached | 6/4/06 |
| MKS13 | 1.507 | 0.02 | End Point Reached | 6/4/06 |
| MKS14 | 0.688 | 0.14 | Natural Recovery | 6/4/06 |
| MKS16 | 0.681 | 0.265 | Natural Recovery | 6/4/06 |
| MKS17 | 1.294 | 0.08 | End Point Reached | 6/4/06 |
| SKN05 | 0.676 | 0.6 | End Point Reached | 6/5/06 |
| SKN06 | 1.854 | 0.02 | End Point Reached | 6/5/06 |
| SKN08 | 0.128 | 0.082 | End Point Reached | 6/5/06 |
| SKN11 | 0.210 | 0.24 | End Point Reached | 6/5/06q |
| SKN12 | 1.172 | 0.025 | End Point Reached | 6/5/06 |
| SKN15 | 2.610 | 2.073 | Natural Recovery | 6/12/06 |
| SKS03 | 0.865 | 0.122 | Natural Recovery | 6/8/06 |
| SKS04 | 0.235 | 0.235 | End Point Reached | 6/8/06 |
| SKS06 | 0.439 | 0.04 | End Point Reached | 6/8/06 |
| SKS11c | 0.045 | 0.08 | End Point Reached | 6/12/06 |
| SKS18d,e,g | 3.610 | 0.354 | End Point Reached | 6/12/06 |
| SPR11a | 1.210 | 0.1 | Natural Recovery | 6/8/06 |
| SPR12 | 0.593 | 0.2 | End Point Reached | 6/8/06 |

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Incident Command Segment Code** | **General Location Name** | **Site of Auke Bay Hydrocarbon Monitoring Stations** |
| 1. | MKS 5 | Makushin Bay South (Glacier Valley Creek) | X |
| 2. | HMP 9 | Humpback Bay |  |
| 3. | HMP12 | Humpback Bay |  |
| 4. | PTN 3 | Portage Bay North |  |
| 5. | PTS 10 | Portage Bay South |  |
| 6. | SKN 4 | Skan North | X |
| 7. | SKN 14 | Skan North | X |
| 8. | SPR 3 | Spray Cape |  |
| 9. | PMN 20/21 | Pumicestone North | X |
| 10. | PMS 16 | Pumicestone South | X |

