Catalog

Table D-1: NAVBASE Kitsap INRMP Projects and Implementation Table

Installation	Project Number	Project Title	Project Description	INRMP Goals	INRMP Objective	Law, Policy, or Guidance	DOD Class and DON ERL Level	Progress Code	Fiscal Year	Ecosystem	Status
Bangor	6843612001	Threatened, Endangered, and Forage Fish Surveys	Conduct surveys of fish use and presence at NAVBASE Kitsap at Bangor to include ESA listed species.	1 5	1.7 5.2	ESA, SAIA, OPNAV M-5090.1	DOD Class 2.b ERL 4	Non-Recurring	2012-2017	Nearshore	**Cancelled** – Crosslinked to EPR 68436NR003
Bangor	68436NR001	1 CP NW NBK – Chico Creek Trestle Habitat Improvement	Remove remnants of a former railroad trestle crossing at Chico Creek and add large woody debris or other enhancements to improve habitat for salmonids	1 3	1.2 3.1	ESA, CWA, SAIA, OPNAV M-5090.1	DOD Class 2.c ERL 4	Recurring	2016-2018	Riparian	**Not Approved** – Separate project covering Chico Creek Trestle.
Bangor	68436NR002	1 CP NW – NBK Bangor Fish Access Restoration	Fish access restoration at Devil's Hole Creek at NAVBASE Kitsap at Bangor. Project includes removal of six culverts that block fish access and habitat enhancement in other areas.	1 3	1.2 3.1	ESA, CWA, SAIA, OPNAV M-5090.1	DOD Class 2.c ERL 4	Non-Recurring	2016-2016	Shoreline	In Process
Bangor	68436NR003	1 S NW – NBK Bangor T&E Fish Surveys	Conduct surveys of threatened or endangered fish species (to include newly listed Rockfish species) along all NAVBASE Kitsap shorelines. Cross-linked to 68742CN002	1 5	1.7 5.2	ESA, SAIA, OPNAV M-5090.1	DOD Class 2.b ERL 3	Recurring	2015-2016	Shoreline	**Cancelled** – Crosslinked to EPR 68742CN002
Bangor	68436NR004	SIKES NW NBK – Bangor Shellfish Abundance Surveys	Partner with State and tribal representatives that have harvesting agreements to conduct a shellfish and habitat survey. Survey will help develop a complete baseline data set that will aid natural resources personnel in conservation and management decisions on Navy lands.	1 4	1.2 3.1	SAIA, OPNAV M-5090.1	DOD Class 2 ERL 3	Recurring		Shoreline	**Cancelled** – Funds not needed as Tribes manage their shellfish and conduct their own surveys.
Bangor	68436NR005	NW – NBK Rail-Line Wetlands Survey	Conduct survey of wetlands and floodplains along the Navy owned railway from Shelton to Bangor and Bremerton.	1 5	1.7 1.8 1.10 5.2	CWA, OPNAV M-5090.1	DOD Class 2.c ERL 3	Non-Recurring	2018	Wetlands	Approved

Installation	Project Number	Project Title	Project Description	INRMP Goals	INRMP Objective	Law, Policy, or Guidance	DOD Class and DON ERL Level	Progress Code	Fiscal Year	Ecosystem	Status
Bangor	68436NR007	NW – NBK Rail-line Alder and Maple Removal	Remove alders and maples along the Navy owned railway from Shelton to Bremerton/Bangor and replace with conifers that are more stable and present less risk to the rail line.	1 5	1.7 1.8 1.10 5.2	SAIA, OPNAV M-5090.1	DOD Class 2.c ERL 4	Recurring	2014-2018	Forest	**Cancelled** – Removal of aldner and maple is not for the benefit of the habitat.
Bangor	68436NR008	SIKES NW – NBK BANGOR Christmas Bird Count	Participate in the annual Audubon Christmas Bird Count at NAVBASE Kitsap at Bangor/Keyport with sites to expand in out years. Data will be used to develop migratory bird datasets and management prescriptions.	1 3	1.7 3.1	MBTA, SAIA, OPNAV M-5090.1	DOD Class 2.c ERL 3	Recurring	2012, and yearly	Riparian	**Cancelled** – Surveys are not planned to take place.
Bangor	68436NR009	NW – NBK Earth Day Projects	Participation in the annual Earth Day event at all NAVBASE Kitsap properties. Provide tools/supplies to volunteers for invasive weed removal, beach cleanups, tree plantings, and other activities.	1 5	1.7 1.8 1.10 5.2	CWA, OPNAV M-5090.1	DOD Class 2.c ERL 2	Recurring	2014-2018	Riparian	**Cancelled** – Incorporated with other Ongoing Projects
Bangor	68436NR010	EO13148 NW NBK – Native Plant Landscaping management Guide/Plan	Develop a comprehensive Grounds Maintenance Management Plan for all NAVBASE Kitsap properties. Plan will reduce amount of landscaped areas and replace with native habitat conditions.	1	1.1 - 1.6 1.8	SAIA, ESA, MBTA, CWA, OPNAV M-5090.1	DOD Class 1.b ERL 3	Non-Annual Recurring	2016-2018	Riparian	2016 Funding
Bangor	68436NR011	ARCHIVED NW NBK – Interpretive Signs	Design and install interpretive signs about natural resources conservation and fish and wildlife habitat protection along hiking and jogging trails	2 4	4.1	SAIA, OPNAVINST 5090.1C	DOD Class ERL 1	Non-Recurring	2014 & 2015	Forest	**Cancelled** – Volunteers were used to Implement.
Bangor	68436NR012	NW NBK – Bangor Loop Trail Construction	NAVBASE Kitsap at Bangor loop trail construction between existing trails.	2 4	2.3 4.1	SAIA, OPNAVINST 5090.1C	DOD Class 2.c ERL 2	Non-Recurring	2015	Forest	**Cancelled** – Duplicated in EPR 68436NR015

Installation	Project Number	Project Title	Project Description	INRMP Goals	INRMP Objective	Law, Policy, or Guidance	DOD Class and DON ERL Level	Progress Code	Fiscal Year	Ecosystem	Status
Bangor	68436NR013	SIKES NW NBK – Hazard Tree Management Plan	Plan for all of NAVBASE Kitsap to assess hazard trees for both safety and habitat values. Plan will incorporate hazard tree abatement with need for achieving habitat objectives.	1	1.1 1.4 1.9 1.11	SAIA, OPNAV M-5090.1	DOD Class 2.b ERL 3	Non-Recurring	2015-2016	Forest	**Cancelled** – This would be evaluated on a project by project basis and overall planning is not feasible.
Bangor	68436NR014	CWA NW NBK – Wetland Invasive Species Control	Invasive species control (Japanese knotweed and reed canary grass) at all NAVBASE Kitsap properties.	1	1.4 1.5	OPNAV M-5090.1	DOD Class 2.b ERL 4	Recurring	2016	Forest	Funding for 2016
Bangor	68436NR015	SIKES NW NBK Nature Trail Construction	Construction of a ¼-mile trail through a forested stand at NAVBASE Kitsap at Bangor.	2 4	2.3 4.1	SAIA, OPNAV M-5090.1	DOD Class 2.c ERL 1	Non-Recurring	2015-2016	Forest	**Cancelled** – Primary trail is closed due to extensive root rot hazard and not in use.
Bangor	68436NR016	CHS EO13112 NW NBK – Reduce Invasive Species and Establish Native Species	Reforestation on disturbed areas to rehabilitate natural habitat. Project will address approximately 5 acres a year at NAVBASE Kitsap at Bangor.	1 5.2	1.1 1.7 1.10 5.2	SAIA, ESA, SAIA, OPNAV M-5090.1	DOD Class 2.c ERL 4	Recurring	2.15-2020	Forest	**Cancelled and Cross-linked** to Region EPRs 6874212345 & 68742NWTJ1
Bangor	68436NR017	SIKES NW NBK – Forest Management /Stand Improvement	Forest stand improvements on all NAVBASE Kitsap properties. Treatments will increase vigor, diameter, resistance to insects/disease, reduce fire hazard, soil nutrition or crown expansion. 5acres planned for each FY.	1 5.2	1.1 1.7 1.10 5.2	SAIA, ESA, SAIA, OPNAV M-5090.1	DOD Class 2.c ERL 4	Recurring	2015-2018	Forest	**Cancelled and Cross-linked** to Region EPR 68742NWTJ1

Installation	Project Number	Project Title	Project Description	INRMP Goals	INRMP Objective	Law, Policy, or Guidance	DOD Class and DON ERL Level	Progress Code	Fiscal Year	Ecosystem	Status
Bangor	68436NR018	SIKES NW NBK – Tribal Cedar Bark Collection Plan	Tribal Cedar bark collection plan. Plan at NAVBASE Kitsap at Bangor that will include a map identifying areas containing cedars with limited branches and incorporate management techniques to improve the health and quality of bark.	1 3	1.7 3.1	OPNAV M-5090.1	DOD Class 2.c ERL 2	Non-Recurring	2015 & 2017	Forest	**Cancelled**
Bangor	68436NR019	MBTA NW NBK – Non T&E Bird Surveys & Mapping	Bird and habitat surveys at NAVBASE Kitsap properties to develop a baseline data set to assist in conservation.	1 5	1.7 5.2	ESA, MBTA, DODPIF, SAIA	DOD Class 2.b ERL 4	Non-Annual Recurring	2016-2018	Forest	**Approved**, but Low Priority
Bangor	68436NR020	CWA NW NBK Cattail Lake Mitigation	Monitoring and vegetation management incl sediment, oysters, beach elevations, streams, salinity, eel grass, woody debris, hydrology, photopoint, vegetation, invasive species. Treat invasive species and establish palustrine habitat. Required per the Waterfront Security Enclave project (P-977). Permit NWS # 2006-1439	1 5	1.2 1.7 3.1	CWA, Sikes, Invasives, 5090,T&E	DOD Class 2.a ERL 4	Non-Recurring	2016-2023	Nearshore	**Approved**
Bangor	68436NR023	NW – NBK Jackson park Erosion Control	Conduct engineering analysis/feasibility study for shoreline erosion and install solution along Elwood Point Project to focus on soft armoring techniques.	1 3	1.2 1.5 3.1	CWA, NHPA, SAIA, OPNAV M-5090.1, ESA	DOD Class 2.c ERL 3	Recurring	2016-2018	Shoreline	**Not Approved**
Bangor	68436NR024	SIKES NW NBK – Terrestrial Mammal Survey	Conduct comprehensive mammal surveys including important habitat locations at all NAVBASE Kitsap properties.	1 5	1.7 5.2	SAIA, OPNAV M-5090.1 MMPA	DOD Class 2.b ERL -7	Recurring	2015-2018	Forest	**Funding Request for FY 2020**
Bangor	68436NR025	Sikes NW NBK – Amphibian & Reptile Surveys	Reptile/Amphibian survey at NAVBASE Kitsap at Bangor, Keyport, Jackson Park/Navy Hospital; develop GIS maps for inclusion in the INRMP.	1 5	1.7 5.2	SAIA, OPNAV M-5090.1	DOD Class 2.c ERL 3	Recurring	2016-2018	Riparian	**Not Approved**

Installation	Project Number	Project Title	Project Description	INRMP Goals	INRMP Objective	Law, Policy, or Guidance	DOD Class and DON ERL Level	Progress Code	Fiscal Year	Ecosystem	Status
Bangor	68436NR026	CWA NW NBK Bangor – Shoreline Management	Shoreline surveys for erosion, habitat conditions, species, pollution, and potential enhancement opportunities at NAVBASE Kitsap at Bremerton, Bangor, Keyport, and Jackson Park/Naval Hospital.	1 5	1.2 1.4 1.5 1.8 5.2	SAIA, ESA, CWA, OPNAV M-5090.1	DOD Class 2.b ERL 3	Recurring	2016-2018	Shoreline	**Approved for 2016**
Bangor	68436NR027	NW – NBK Tree Planting	Plant native trees around buildings or structures where trees have been lost to storms or disease. Provides for reforestation to support healthy forests. Will support application to Arbor Day Foundation for NBK to become a "Tree City USA" and to receive saplings for Arbor Day plantings. Plantings will provide energy reduction savings through sustainable, natural shading of facilities.	1 5	1.3 1.4 4.1	SAIA, OPNAV M-5090.1	DOD Class 2 ERL 3	Recurring	2014-2018	Forest	**Cancelled** – Covered within other EPRs
Bangor	68436NR029	CWA NW NBK – Wetland Survey and Delineation	Wetland Survey & Delineations in support of proposed INRMP projects at NAVBASE Kitsap at Bangor.	1 5	1.2 1.7 5.2	CWA, SAIA, OPNAV M-5090.1	DOD Class 2.b ERL 3	Non-Recurring	2016-2018	Wetlands	**SCA Funds**, Project Order for FY15.
Bangor	68436NR033	2 BO NW – NBK Steelhead and Salmonid Entrainment Study	Study of NAVBASE Kitsap at Bangor dry dock effects on steelhead and salmonid entrainment. Required and consistent with NMFS BO # 2009/06414	1	1.10	ESA	DOD Class 2.a.1 ERL 4	Non-Recurring	2016-2018	Nearshore	**In Process**
Bangor	68436NR034	CHS NW – NBK Invasive Species Control - Uplands	Manual/Mechanical Invasive Species control at NAVBASE Kitsap properties.	1	1.4 1.5	OPNAV M-5090.1	DOD Class 2.b ERL 4	Non-Recurring	2014-2018	Forest	**Cancelled and Crosslinked** to Region EPR 68742NWTJ1

Installation	Project Number	Project Title	Project Description	INRMP Goals	INRMP Objective	Law, Policy, or Guidance	DOD Class and DON ERL Level	Progress Code	Fiscal Year	Ecosystem	Status
Bangor	68436NR035	CHE NW NBK INRMP	INRMP five year update.	1 5	1.7 5.2	OPNAV M-5090.1	DOD Class 2.c ERL 3	Recurring	2016-2020	Shoreline, Nearshore, Forest, Riparian, Wetlands	**Approved**
Bangor	68436NR182	1 CP NW Naval Base Kitsap - Bangor Remove Culvert 14 and Restore Stream	Completely remove the existing culvert and restoration of the stream channel to more natural conditions.	1 3	1.1 1.2 1.5 3.1 3.2	ESA, CWA, Sikes Act, OPNAV M-5090.1	DOD Class ERL 4	Non-Recurring	2018	Riparian	Awaiting Approval by Region
Bangor	68436NR183	1 CP NW Naval Base Kitsap - Bangor Remove Culvert 15 and Restore Stream	Completely remove the existing culvert and restoration of the stream channel to more natural conditions.	1 3	1.1 1.2 1.5 3.1 3.2	ESA, CWA, Sikes Act, OPNAV M-5090.1	DOD Class ERL 4	Non-Recurring	2018	Riparian	Awaiting Approval by Region
Bangor	68436NR184	1 CP NW Naval Base Kitsap - Bangor Remove Culvert 13 and Restore Stream	Completely remove the existing culvert and restoration of the stream channel to more natural conditions.	1 3	1.1 1.2 1.5 3.1 3.2	ESA, CWA, Sikes Act, OPNAV M-5090.1	DOD Class ERL 4	Non-Recurring	2018	Riparian	Awaiting Approval by Region
Bangor	68436NR185	1 CP NW Naval Base Kitsap - Bangor Remove Culvert 12 and Restore Stream	Completely remove the existing culvert and restoration of the stream channel to more natural conditions.	1 3	1.1 1.2 1.5 3.1 3.2	ESA, CWA, Sikes Act, OPNAV M-5090.1	DOD Class ERL 4	Non-Recurring	2018	Riparian	Awaiting Approval by Region

Installation	Project Number	Project Title	Project Description	INRMP Goals	INRMP Objective	Law, Policy, or Guidance	DOD Class and DON ERL Level	Progress Code	Fiscal Year	Ecosystem	Status
Bangor	68436NR036	1 S NW – NBK Marbled Murrelet Density Surveys	Marbled Murrelet Density Surveys at NAVBASE Kitsap at Bangor. Cross-linked to 68742CN001	1 5	1.7 5.2	SAIA, OPNAV M-5090.1	DOD Class 2.c ERL 4	Non-Recurring	2016 & 2018	Nearshore	**Cancelled – Crosslinked** to Region EPR 68742CN001
Bremerton	3241612001	1 S NW – NBK Bremerton-Listed Fish Surveys	Conduct surveys of fish use and presence at NAVBASE Kitsap at Bremerton to include ESA listed species.	1 5	1.7 5.2	ESA, SAIA, OPNAV M-5090.1	DOD Class 2.b ERL 4	Non-Recurring	2016-2019	Nearshore	**Approved**
Bremerton	32416CHA16	2 BO NW NBK Bremerton Charleston Beach Restoration Monitoring	NAVBASE Kitsap at Bremerton Charleston Beach Restoration Monitoring	1 5	1.1 1.2 1.5 1.7	ESA, OPNAV M-5090.1	DOD Class 2.a, 5.a ERL 4	Non-Annual Recurring	2016-2020	Shoreline	**Funded 2016**
Bremerton	32416FF016	1 CP NW NBK Bremerton Forage Fish Surveys	NAVBASE Kitsap at Bremerton will conduct surveys at beaches for forage fish and associated ESA species of fish.	1 5	1.1 1.7 2.2	ESA, OPNAV M-5090.1	DOD Class 2.a ERL 4	Non-Annual Recurring	2016 & 2019-2020	Shoreline	Crosslinked to EPR# 68742CN002
Bremerton	32416NOX16	CHS EO13112 NW NBK Bremerton – Invasive Species/Noxious Weed Control	Control invasive and noxious weeds at NAVBASE Kitsap at Bremerton with herbicide application	1 5	1.2 1.4 2.2	EO 13112, ESA, OPNAV M-5090.1	DOD Class 2.a, 3 ERL 4	Recurring	2016-2020	Riparian	**Cross Linked** to EPR# 6874212345

Installation	Project Number	Project Title	Project Description	INRMP Goals	INRMP Objective	Law, Policy, or Guidance	DOD Class and DON ERL Level	Progress Code	Fiscal Year	Ecosystem	Status
Bremerton	32416OSP16	MBTA NW NBK Bremerton Osprey Nesting Platforms	Construct multiple Osprey platforms to encourage Osprey to move nests off of inactive Navy vessels at NAVBASE Kitsap at Bremerton	1 5	1.1 1.7 1.9 1.10	MBTA, SIKES, OPNAV M-5090.1	DOD Class 2.a ERL 4	Non-Recurring	2016	Riparian	On Hold
Bremerton	68436JAR16	1 RP NW NBK – Salmon Culvert Replacement at Jarstad Creek	Replacement of Jarstad Creek culvert to provide fish passage based on culvert survey guidelines	1 5	1.1 1.2 1.5	SIKES, OPNAV M-5090.1	DOD Class 2.a ERL 4	Non-Recurring	2017	Riparian	Replaced with EPR# 32416JAR10, which was not approved
Bremerton	68436NR021	1 CP NW – NBK Charleston Beach Habitat Replenishment	NAVBASE Kitsap at Bremerton Charleston Beach Habitat Replenishment. Install fish mix where erosion is occurring.	1 3	1.2 1.5 3.1 3.2	CWA, ESA, SAIA, OPNAV M-5090.1, NEPA, CERCLA	DOD Class 2.b ERL 4	Non-Annual Recurring	2017-2020	Shoreline	**Cancelled** – Discussions with IR groups found that duplicate efforts were being conducted.
Bremerton	32416JAR10	SIKES NW NBK – Salmon Culvert Replacement at Jarstad Creek (MP BS 1.04)	Replacement of Jarstad Creek culvert to provide fish passage based on culvert survey guidelines	1 5	1.1 1.2 1.5	SIKES, OPNAV M-5090.1	DOD Class 2.a ERL 4	Non-Recurring	2019	Riparian	POM Request

Installation	Project Number	Project Title	Project Description	INRMP Goals	INRMP Objective	Law, Policy, or Guidance	DOD Class and DON ERL Level	Progress Code	Fiscal Year	Ecosystem	Status
Bremerton	32416JARDS	SIKES NBK - Salmon Culvert Replacement Design at Jarstad Creek	Culverts preventing fish migration were identified in the NBK INRMP, and the final Navy Railroad Culvert Assessment for Fish Passage Report dated June 14, 2015. This assessment was conducted to locate, assess and document stream crossing along the approximate 50 miles of Navy owned railroad (RR) track between NBK Bangor, NBK Bremerton and Shelton WA and rate for fish barrier status. Select culverts classified as fish barriers were carried forward for preliminary design and costing for replacement.	1 5	1.1 1.2 1.5	Sikes act, OPNAV M-5090.1, DOD 4715.03	DOD Class ERL 4	Non-Recurring	2018	Riparian	POM Request
Bremerton	32416DCRDS	CHS NW NBK - Salmon Culvert Replacement Design at Dickerson Creek (MP 36.09)	Culverts preventing fish migration were identified in the NBK INRMP, and the final Navy Railroad Culvert Assessment for Fish Passage Report dated June 14, 2015. This assessment was conducted to locate, assess and document stream crossing along the approximate 50 miles of Navy owned railroad (RR) track between NBK Bangor, NBK Bremerton and Shelton WA and rate for fish barrier status. Select culverts classified as fish barriers were carried forward for preliminary design and costing for replacement.	1 5	1.1 1.2 1.5	ESA, Sikes Act, OPNAV M-5090.1	DOD Class 1 ERL 4	Non-Recurring	2018	Riparian	POM Request
Bremerton	32416DCR15	CHS NW NBK - Salmon Culvert Replacement at Dickerson Creek (MP 36.09)	This project will replace a fish blocking culvert beneath the Navy owned railroad on a Tributary to Dickerson Creek in Kitsap County Washington.	1 5	1.1 1.2 1.5	ESA, Sikes Act, OPNAV M-5090.1	DOD Class 1 ERL 4	Non-Recurring	2019	Riparian	POM Request

Installation	Project Number	Project Title	Project Description	INRMP Goals	INRMP Objective	Law, Policy, or Guidance	DOD Class and DON ERL Level	Progress Code	Fiscal Year	Ecosystem	Status
Bremerton	32416MNT10	SIKES NW NBK - Salmon Culvert Maintenance at Tributary to Deer Creek (MP 10.5)	This project will provide maintenance to a fish blocking culvert beneath the Navy owned railroad on a tributary to Deer Creek in Mason County Washington.	1 3	1.1 1.2 1.5 3.1 3.2	Sikes act, OPNAV M-5090.1, DOD 4715.03	ERL 4	Non-Recurring	2018	Riparian	POM Request
Bremerton	32416MNT12	SIKES NW NBK - Salmon Culvert Maintenance at the Tributary to Deer Creek Culvert (MP 12.01)	This project will provide maintenance to a fish blocking culvert beneath the Navy owned railroad on a tributary of Deer Creek in Mason County Washington.	1 3	1.1 1.2 1.5 3.1 3.2	Sikes act, OPNAV M-5090.1, DOD 4715.03	ERL 4	Non-Recurring	2018	Riparian	POM Request
Bremerton	32416MNT14	SIKES NW NBK - Salmon Culvert Maintenance at Deer Creek Headwaters (MP 14.89)	This project will replace a fish blocking culvert beneath the Navy owned railroad on the Deer Creek Headwaters in Mason County Washington.	1 3	1.1 1.2 1.5 3.1 3.2	Sikes act, OPNAV M-5090.1, DOD 4715.03	ERL 4	Non-Recurring	2018	Riparian	POM Request
Bremerton	32416MNT15	SIKES NW NBK - Salmon Culvert Maintenance at the Tributary to Gorst Creek (MP BS 1.58)	This project will provide maintenance to a fish blocking culvert beneath the Navy owned railroad on a tributary to Gorst Creek Kitsap County Washington.	1 3	1.1 1.2 1.5 3.1 3.2	Sikes act, OPNAV M-5090.1, DOD 4715.03	ERL 4	Non-Recurring	2019	Riparian	POM Request

Installation	Project Number	Project Title	Project Description	INRMP Goals	INRMP Objective	Law, Policy, or Guidance	DOD Class and DON ERL Level	Progress Code	Fiscal Year	Ecosystem	Status
Bremerton	32416MNT16	1 RP NW NBK - Salmon Culvert Maintenance at Tributary to Sherwood Creek (MP 16.88)	This project will provide maintenance to a fish blocking culvert beneath the Navy owned railroad on a tributary to Sherwood Creek in Mason County Washington.	1 3	1.1 1.2 1.5 3.1 3.2	ESA, MSFCM SIKES, OPNAV M-5090.1, DOD 4715.03	ERL 4	Non-Recurring	2022	Riparian	POM Request
Bremerton	32416MNT21	SIKES NW NBK - Salmon Culvert Maintenance at Tributary to Oakland Bay (MP 2.19)	This project will provide maintenance to a fish blocking culvert beneath the Navy owned railroad on a tributary to Oakland Bay in Mason County Washington.	1 3	1.1 1.2 1.5 3.1 3.2	Sikes act, OPNAV M-5090.1, DOD 4715.03	ERL 4	Non-Recurring	2022	Riparian	POM Request
Bremerton	32416MNT3X	SIKES NW NBK - Salmon Culvert Maintenance at Tributary to Dyes Inlet (MP 38.36)	This project will provide maintenance to a fish blocking culvert beneath the Navy owned railroad on a tributary to Dyes Inlet in Kitsap County Washington.	1 3	1.1 1.2 1.5 3.1 3.2	Sikes act, OPNAV M-5090.1, DOD 4715.03	ERL 4	Non-Recurring	2020	Riparian	POM Request
Bremerton	32416MNT31	SIKES NW NBK - Salmon Culvert Maintenance at Tributary to Gorst Creek (MP 31.55)	This project will provide maintenance to a fish blocking culvert beneath the Navy owned railroad on a tributary to Gorst Creek in Kitsap County Washington.	1 3	1.1 1.2 1.5 3.1 3.2	Sikes act, OPNAV M-5090.1, DOD 4715.03	ERL 4	Non-Recurring	2019	Riparian	POM Request

Installation	Project Number	Project Title	Project Description	INRMP Goals	INRMP Objective	Law, Policy, or Guidance	DOD Class and DON ERL Level	Progress Code	Fiscal Year	Ecosystem	Status
Bremerton	32416MNT38	SIKES NW NBK - Salmon Culvert Maintenance at Tributary to Dyes Inlet (MP 38.11)	This project will provide maintenance to a fish blocking culvert beneath the Navy owned railroad on a tributary to Dyes Inlet in Kitsap County Washington.	1 3	1.1 1.2 1.5 3.1 3.2	Sikes act, OPNAV M-5090.1, DOD 4715.03	ERL 4	Non-Recurring	2020	Riparian	POM Request
Bremerton	32416MNT41	SIKES NW NBK - Salmon Culvert Maintenance at Tributary to Strawberry Creek (MP 41.35)	This project will provide maintenance to a fish blocking culvert beneath the Navy owned railroad on a tributary to Strawberry Creek in Kitsap County Washington.	1 3	1.1 1.2 1.5 3.1 3.2	Sikes act, OPNAV M-5090.1, DOD 4715.03	ERL 4	Non-Recurring	2020	Riparian	POM Request
Bremerton	32416MNT5X	SIKES NW NBK - Salmon Culvert Maintenance at E Mason Lake Road (MP 5.2 & 5.36)	This project will provide maintenance to fish blocking culverts beneath the Navy owned railroad on E Mason Lake Road in Mason County Washington.	1 3	1.1 1.2 1.5 3.1 3.2	Sikes act, OPNAV M-5090.1, DOD 4715.03	ERL 4	Non-Recurring	2022	Riparian	POM Request
Bremerton	32416MNT69	SIKES NW NBK - Salmon Culvert Maintenance at Tributary to Cranberry Creek (MP 6.91)	This project will provide maintenance to the fish blocking culvert beneath the Navy owned railroad on a tributary to Cranberry Creek in Mason County Washington.	1 3	1.1 1.2 1.5 3.1 3.2	Sikes act, OPNAV M-5090.1, DOD 4715.03	ERL 4	Non-Recurring	2021	Riparian	POM Request

Installation	Project Number	Project Title	Project Description	INRMP Goals	INRMP Objective	Law, Policy, or Guidance	DOD Class and DON ERL Level	Progress Code	Fiscal Year	Ecosystem	Status
Bremerton	32416MNT71	CHS NW NBK - Salmon Culvert Maintenance at Heins Creek (MP 0.71)	This project will provide maintenance to a fish blocking culvert beneath the Navy owned railroad on Heins Creek in Kitsap County Washington.	1 3	1.1 1.2 1.5 3.1 3.2	ESA, MSFCM, Sikes Act	ERL 4	Non-Annual Recurring	2018, 2022	Riparian	POM Request
Bremerton	32416MNT82	SIKES NW NBK - Salmon Culvert Maintenance at Tributary to Cranberry Creek (MP 8.2)	This project will provide maintenance to a fish blocking culvert beneath the Navy owned railroad on a tributary to Cranberry Creek in Mason County Washington.	1 3	1.1 1.2 1.5 3.1 3.2	Sikes act, OPNAV M-5090.1, DOD 4715.03	ERL 4	Non-Annual Recurring	2021	Riparian	POM Request
Bremerton	32416MNT89	SIKES NW NBK - Salmon Culvert Maintenance at Tributary to Deer Creek (MP 8.9)	This project will provide maintenance to a fish blocking culvert beneath the Navy owned railroad on a tributary of Deer Creek in Mason County Washington.	1 3	1.1 1.2 1.5 3.1 3.2	Sikes act, OPNAV M-5090.1, DOD 4715.03	ERL 4	Non-Recurring	2018	Riparian	POM Request
Bremerton	32416MNT92	SIKES NW NBK - Salmon Culvert Maintenance at the Tributary to Deer Creek Culvert (MP 9.28)	This project will provide maintenance to a fish blocking culvert beneath the Navy owned railroad on a tributary of Deer Creek in Mason County Washington.	1 3	1.1 1.2 1.5 3.1 3.2	Sikes act, OPNAV M-5090.1, DOD 4715.03	ERL 4	Non-Recurring	2018	Riparian	POM Request

Installation	Project Number	Project Title	Project Description	INRMP Goals	INRMP Objective	Law, Policy, or Guidance	DOD Class and DON ERL Level	Progress Code	Fiscal Year	Ecosystem	Status
Bremerton	68436NR028	CHS NW – NBK Vegetated Buffer	Assess and vegetate buffer strips along Sinclair Inlet at NAVBASE Kitsap at Bremerton with native vegetation. Project includes yearly maintenance for invasive removal.	1	1.2 1.3 1.4 1.5 1.8	SAIA, OPNAV M-5090.1	DOD Class 2.b ERL 3	Non-Recurring	2016-2018	Riparian	**Cancelled** – Project with Bangor UIC caused confusion, and funds were used at Bangor.
Region	6874212345	EO13112 NRNW NBK invasive Species Control	Project is to control invasive and noxious weeds at all Naval Base Kitsap Properties and associated rights of way. Control is accomplished through an integrated pest management process with herbicide application being the primary action and mechanical removal as necessary for scotch broom (Class B). Weed control will be conducted based on a rotational priority basis which is based on habitat benefits and habitat and species support.	2 3 5	1.2 1.4 3.2	EO13112, ESA, Sikes Act	DOD Class 2.c ERL 4	Recurring	2018-2022	All	Funded FY16
Region	68742CN001	1 CR NRNW Marbled Murrelet Density Surveys	The objectives of the annual marbled murrelet winter density survey are to estimate (1) population trends and (2) population size during the winter season. The surveys will occur in the marine environment adjacent to Navy installations within Puget Sound and the Washington coast.	2 3	1.10 3.2	ESA, Migratory Bird Treaty Act, Sikes Act	DOD Class ERL 4	Non-Annual Recurring	2016-2021	Nearshore	Funded FY2016
Region	68742CN002	1 S NRNW Threatened and Endangered Fish and Forage Fish Surveys	During the Puget Sound Chinook salmon ESA Critical Habitat review, the Navy committed to conducting annual monitoring for salmon and their prey species along Navy owned intertidal areas to support Critical Habitat exemption.	2 3	1.10 3.2	ESA, Migratory Bird Treaty Act, Sikes Act	DOD Class 2.c ERL 4	Recurring	2016-2022	Nearshore	Funded FY2016

Installation	Project Number	Project Title	Project Description	INRMP Goals	INRMP Objective	Law, Policy, or Guidance	DOD Class and DON ERL Level	Progress Code	Fiscal Year	Ecosystem	Status
Region	68742NWTJ1	SIKES NRNW Establishing, Sustaining & Improving Vegetated Habitats	These projects contribute toward establishing, sustaining and improving habitats that support a variety of species. · Density and competition management (maintains habitat vigor, develops larger tree crowns for nests and cover, increases vertical diversity (e.g. can reduce nest predation), increases landscape habitat diversity, increases species diversity and provides for introduction of some late successional habitat characteristics earlier than would naturally occur, etc.) Establish native species (restores habitat, reduces fragmentation, increases habitat diversity, maintains wildlife travel corridors etc.) · Decrease or mitigate habitat damaging agents to reduce habitat degradation (e.g. reduce the spread of disease, mitigate susceptibility to wind-throw, etc.) These projects would be implemented in areas where the investment is predicted to benefit habitat over the long-term. As a part of the project, some treatments may require a vegetation based habitat inventory, evaluation of existing conditions and a prioritized plan to enable focused implementation in areas that would effectively facilitate habitat recovery and contribute toward long-term habitat quality.	3 4	1.10 1.11 4.1	Sikes Act, DOD Inst 4715.03, OPNAV M-5090.1	DOD Class ERL 4	Recurring	2018-2022	Forest	Awaiting CNO Approval

Installation	Project Number	Project Title	Project Description	INRMP Goals	INRMP Objective	Law, Policy, or Guidance	DOD Class and DON ERL Level	Progress Code	Fiscal Year	Ecosystem	Status
Region	68742MMS01	5 S NRNW Marine mammal Monitoring and Orca Network	Marine mammal monitoring will occur weekly at Navy Region Northwest (NRNW) installations to support Marine Mammal Protection Act (MMPA) permits (IHA applications) for mission activities and construction.	2	1.10	ESA, EFH, MMPA, Sikes Act	DOD Class 2.c ERL 4	Recurring	2018-2022	Nearshore	POM 18

Appendix E. Species That May Occur at NAVBASE Kitsap

Species	Installation									
	Camp McKean	Camp Wesley Harris	Jackson Park Housing Complex	Naval Hospital Bremerton	NAVBASE Kitsap, Bangor	NAVBASE Kitsap, Bremerton	NAVBASE Kitsap, Keyport	Navy Railroad	Toandos Buffer Zone	Zelatched Point
Reptiles and Amphibians										
American bullfrog	X	X	X	X	X	X	X	X	X	X
Common gartersnake	X	X	X	X	X	X	X	X	X	X
Terrestrial gartersnake	X	X	X	X	X	X	X	X	X	X
Northwestern gartersnake	X	X	X	X	X	X	X	X	X	X
Long-toed salamander	X	X	X	X	X	X	X	X	X	X
Northwestern salamander	X	X	X	X	X	X	X	X	X	X
Northern Pacific chorus frog	X	X	X	X	X	X	X	X	X	X
Pacific treefrog	X	X	X	X	X	X	X	X	X	X
Western Toad	X	X	X	X	X	X	X	X	X	X
Rubber Boa		X		X	X		X	X	X	X
Northern Alligator Lizard	X	X	X	X	X	X	X	X	X	X
Ensatina	X	X	X	X	X	X	X	X	X	X
Western Redback Salamander	X	X	X	X	X	X	X	X	X	X
Northern Red- legged Frog		X	X	X	X		X	X	X	X
Western pond turtle	X	X			X					
Rough-Skinned Newt		X	X	X	X		X	X	X	X
Mammals										
Beaver		X			X		X		X	X
Black bear		X	X	X	X		X	X	X	X
Black-tailed deer	X	X	X	X	X		X	X	X	X
Bobcat		X			X		X	X	X	X
Brush rabbit	X	X	X	X	X	X	X	X	X	X
Bushytail woodrat	X	X	X	X	X	X	X	X	X	X
Coyote	X	X	X	X	X	X	X	X	X	X

Species	Installation									
	Camp McKean	Camp Wesley Harris	Jackson Park Housing Complex	Naval Hospital Bremerton	NAVBASE Kitsap, Bangor	NAVBASE Kitsap, Bremerton	NAVBASE Kitsap, Keyport	Navy Railroad	Toandos Buffer Zone	Zelatched Point
Cougar	X	X			X			X	X	X
Deer mouse	X	X	X	X	X	X	X	X	X	X
Douglas squirrel	X	X	X	X	X	X	X	X	X	X
Long-tailed vole	X	X	X	X	X	X	X	X	X	X
Muskrat	X	X	X		X		X	X	X	X
Opossum	X	X	X	X	X	X	X	X	X	X
Raccoon	X	X	X	X	X	X	X	X	X	X
Red fox	X	X	X	X	X		X	X	X	X
River otter	X	X	X	X	X	X	X	X	X	X
Short-tailed weasel	X	X	X	X	X		X	X	X	X
Shrew	X	X	X	X	X	X	X	X	X	X
Townsend's chipmunk	X	X	X	X	X		X	X	X	X
Spotted skunk		X			X	X	X	X	X	X
Douglas squirrel	X	X	X	X	X	X	X	X	X	X
Mountain beaver		X	X	X	X		X	X	X	X
Long-tailed weasel		X			X		X	X	X	X
Mink		X			X		X	X	X	X
Townsend's Big-eared Bat	X	X	X	X	X	X	X	X	X	X
Pacific mole	X	X	X	X	X	X	X	X	X	X
Townsend mole	X	X	X	X	X	X	X	X	X	X
Striped skunk		X			X	X	X	X	X	X
Oregon vole	X	X	X	X	X	X	X	X	X	X
Marine Mammals										
Minke whale			X	X	X	X	X		X	X
Killer whale (transient)			X	X	X	X	X		X	X
Harbor porpoise			X	X	X	X	X		X	X
Gray whale			X	X		X	X			
Steller sea lion			X	X	X	X	X		X	X
North pacific Humpback whale			X	X	X	X	X		X	X
Northern elephant seal						X	X			
Harbor seal			X	X	X	X	X		X	X

Species	Installation									
	Camp McKean	Camp Wesley Harris	Jackson Park Housing	Naval Hospital Bremerton	NAVBASE Kitsap, Bangor	NAVBASE Kitsap, Bremerton	NAVBASE Kitsap, Keyport	Navy Railroad	Toandos Buffer Zone	Zelatched Point
California sea lion			X	X	X	X	X		X	X
Birds										
American coot			X	X	X	X	X	X	X	X
American robin	X	X	X	X	X	X	X	X	X	X
Bald eagle	X	X	X	X	X	X	X	X	X	X
Barrow's goldeneye			X	X	X	X	X		X	X
Bufflehead			X	X	X	X	X		X	X
Bushtit	X	X	X	X	X		X	X	X	X
Caspian tern					X	X	X		X	X
Common crow	X	X	X	X	X	X	X	X	X	X
Common goldeneye			X	X	X	X	X		X	X
Common loon			X	X	X	X	X		X	X
Common raven	X	X	X	X	X		X	X	X	X
Downy woodpecker	X	X	X	X	X		X	X	X	X
Dunlin			X	X	X		X		X	X
Great blue heron		X	X	X	X		X	X	X	X
Hairy woodpecker	X	X	X	X	X		X	X	X	X
Harlequin duck					X		X		X	X
Hutton's vireo	X	X	X	X	X	X	X	X	X	X
Mallard	X	X	X	X	X	X	X		X	X
Merlin (pigeon hawk)	X	X	X	X	X		X	X	X	X
Mew gull	X	X	X	X	X	X	X	X	X	X
Northern pintail		X			X		X			
Northern pygmy owl	X	X	X	X	X		X	X	X	X
Northwestern crow	X	X	X	X	X	X	X	X	X	X
Osprey	X	X	X	X	X	X	X	X	X	X
Peregrine falcon					X					
Pigeon guillemot			X	X	X	X	X		X	X
Pileated woodpecker	X	X	X	X	X		X	X	X	X
Rhinoceros auklet					X		X		X	X
Sharp-shinned hawk	X	X	X	X	X		X	X	X	X
Sparrow hawk	X	X	X	X	X		X	X	X	X
Steller's Jay	X	X	X	X	X	X	X	X	X	X
Surf scoter			X	X	X	X	X		X	X

Species	Installation									
	Camp McKean	Camp Wesley Harris	Jackson Park Housing Complex	Naval Hospital Bremerton	NAVBASE Kitsap, Bangor	NAVBASE Kitsap, Bremerton	NAVBASE Kitsap, Keyport	Navy Railroad	Toandos Buffer Zone	Zelatched Point
Townsend's Warbler	X	X	X	X	X		X	X	X	X
Swallow	X	X	X	X	X	X	X	X	X	X
Varied thrush	X	X	X	X	X	X	X	X	X	X
Western grebe			X	X	X	X	X		X	X
Western sandpiper			X	X	X	X	X		X	X
Wood duck		X			X		X		X	X
Yellow-billed loon			X	X	X	X	X		X	X
Pine siskin	X	X	X	X	X	X	X	X	X	X
American goldfinch	X	X	X	X	X	X	X	X	X	X
European starling	X	X	X	X	X	X	X	X	X	X
Bewick's wren	X	X	X	X	X	X	X	X	X	X
Greater yellowlegs			X	X	X	X	X		X	X
Winter wren	X	X	X	X	X	X	X	X	X	X
Robin	X	X	X	X	X	X	X	X	X	X
Barn owl	X	X			X	X	X	X	X	X
Barred owl	X	X			X	X	X	X	X	X
Mourning dove	X	X	X	X	X	X	X	X	X	X
White-crowned sparrow	X	X	X	X	X	X	X	X	X	X
Coopers' hawk		X	X	X	X		X	X	X	X
Spotted sandpiper			X	X	X	X	X		X	X
Red-winged blackbird		X			X		X	X	X	X
American widgeon		X	X	X	X	X	X		X	X
Green-winged teal		X	X	X	X	X	X		X	X
Northern shoveler		X	X	X	X	X	X		X	X
Greater scaup			X	X	X	X	X	X	X	X
Canvasback		X			X		X			
Lesser scaup			X	X	X	X	X	X	X	X
Ring-necked duck		X			X		X			
Ruffed grouse		X			X				X	X
Canada goose	X	X	X	X	X	X	X	X	X	X

Species	Installation									
	Camp McKean	Camp Wesley Harris	Jackson Park Housing Complex	Naval Hospital Bremerton	NAVBASE Kitsap, Bangor	NAVBASE Kitsap, Bremerton	NAVBASE Kitsap, Keyport	Navy Railroad	Toandos Buffer Zone	Zelatched Point
Great horned owl		X			X		X	X	X	X
Red-tailed hawk		X	X	X	X		X	X	X	X
House finch	X	X	X	X	X	X	X	X	X	X
Purple finch	X	X	X	X	X	X	X	X	X	X
Brown creeper		X	X	X	X		X	X	X	X
Killdeer	X	X	X	X	X	X	X	X	X	X
Night hawk	X	X	X	X	X		X	X	X	X
Dipper		X			X		X		X	
Northern harrier		X	X	X	X		X		X	X
Evening grosbeak	X	X	X	X	X	X	X	X	X	X
Common flicker	X	X	X	X	X	X	X	X	X	X
Band-tailed pigeon	X	X	X	X	X	X	X	X	X	X
Rock dove	X	X	X	X	X	X	X	X	X	X
Common loon		X	X	X	X	X	X		X	X
Barn swallow	X	X	X	X	X	X	X	X	X	X
Dark-eyed (Oregon) junco	X	X	X	X	X	X	X	X	X	X
Herring gull			X	X	X	X	X	X	X	X
Ring-billed gull			X	X	X	X	X	X	X	X
Glaucous-winged gull			X	X	X	X	X	X	X	X
Bonaparte's gull			X	X	X	X	X	X	X	X
Long-billed dowitcher			X	X	X	X	X		X	X
Hooded merganser			X	X	X	X	X		X	X
California quail		X	X	X	X		X	X	X	X
Red crossbill	X	X	X	X	X	X	X	X	X	X
American widgeon		X	X	X	X	X	X		X	X
European widgeon		X	X	X	X	X	X		X	X
Belted kingfisher		X	X	X	X	X	X	X	X	X
White-winged scoter		X	X	X	X	X	X		X	X
Song sparrow	X	X	X	X	X	X	X	X	X	X
Common merganser		X	X	X	X	X	X		X	X

Species	Installation									
	Camp McKean	Camp Wesley Harris	Jackson Park Housing Complex	Naval Hospital Bremerton	NAVBASE Kitsap, Bangor	NAVBASE Kitsap, Bremerton	NAVBASE Kitsap, Keyport	Navy Railroad	Toandos Buffer Zone	Zelatched Point
Red-breasted merganser		X	X	X	X	X	X		X	X
Black (Common) scoter			X	X	X	X	X		X	X
Screech owl		X	X	X	X		X	X	X	X
Black-capped chickadee	X	X	X	X	X	X	X	X	X	X
House sparrow	X	X	X	X	X	X	X	X	X	X
Fox sparrow	X	X	X	X	X	X	X	X	X	X
Rufous-sided towhee	X	X	X	X	X	X	X	X	X	X
Double-crested cormorant			X	X	X	X	X		X	X
Pelagic cormorant			X	X	X	X	X		X	X
Horned grebe			X	X	X	X	X		X	X
Red-necked grebe			X	X	X	X	X		X	X
Eared grebe			X	X	X	X	X		X	X
Pied-billed grebe			X	X	X	X	X		X	X
Purple martin	X	X	X	X	X	X	X	X	X	X
Ruby-crowned kinglet	X	X	X	X	X	X	X	X	X	X
Golden-crowned kinglet	X	X	X	X	X	X	X	X	X	X
Red-breasted nuthatch	X	X	X	X	X	X	X	X	X	X
Red-breasted sapsucker		X	X	X	X		X	X	X	X
Fish										
Arrowtooth flounder			X	X	X	X	X		X	X
Blackeye goby					X	X	X		X	X
Bluegill sunfish	X	X	X	X						
Buffalo sculpin			X	X	X	X	X	X	X	X
Chum salmon			X	X	X	X	X	X	X	X
Cutthroat trout			X	X	X	X	X		X	X
Dwarf wrymouth					X	X	X		X	X
High cockscomb			X	X	X	X	X	X	X	X
Kelp greenling			X	X	X	X	X	X	X	X
Pacific cod					X	X	X		X	X

Species	Installation									
	Camp McKean	Camp Wesley Harris	Jackson Park Housing Complex	Naval Hospital Bremerton	NAVBASE Kitsap, Bangor	NAVBASE Kitsap, Bremerton	NAVBASE Kitsap, Keyport	Navy Railroad	Toandos Buffer Zone	Zelatched Point
Pacific herring			X	X	X	X	X	X	X	X
Pacific lamprey			X	X	X	X	X	X	X	X
Pacific sand lance			X	X	X	X	X	X	X	X
Pacific sanddab					X	X	X		X	X
Padded sculpin			X	X	X	X	X	X	X	X
Penpoint gunnel					X	X	X		X	X
Pink salmon			X	X	X	X	X		X	X
rex sole			X	X	X	X	X		X	X
Rock sole			X	X	X	X	X		X	X
Roughback sculpin			X	X	X	X	X	X	X	
Sablefish			X	X	X	X	X		X	X
Scalyhead sculpin			X	X	X	X	X	X	X	X
Sharpnose sculpin			X	X	X	X	X	X	X	X
Shiner perch			X	X	X	X	X		X	X
Smoothhead sculpin			X	X	X	X	X	X	X	X

Species	Installation									
	Camp McKean	Camp Wesley Harris	Jackson Park Housing Complex	Naval Hospital Bremerton	NAVBASE Kitsap, Bangor	NAVBASE Kitsap, Bremerton	NAVBASE Kitsap, Keyport	Navy Railroad	Toandos Buffer Zone	Zelatched Point
Soft sculpin			X	X	X	X	X	X	X	X
Speckled sanddab			X	X	X	X	X		X	X
Spinycheek starsnout					X	X	X		X	X
Spinyhead sculpin			X	X	X	X	X	X	X	X
Sturgeon poacher					X	X	X		X	X
Surf smelt			X	X	X	X	X	X	X	X
Threespine stickleback	x	x	X	X	X	X	X	X	X	X
Tube-snout			X	X	X	X	X		X	X
Walleye pollock			X	X	X	X	X		X	X
Roughspine sculpin			X	X	X	X	X		X	X
Blacktip poacher					X	X	X			X
Greenstriped rockfish			X	X	X	X	X			X
Yellowtail rockfish			X	X	X	X	X			X
Quillback rockfish			X	X	X	X	X			X
Black rockfish			X	X	X	X	X			X
Redstriped rockfish			X	X	X	X	X			X
Spiny dogfish			X	X	X	X	X			X
Bay pipefish			X	X	X	X	X		X	X
Manacled sculpin			X	X	X	X	X		X	X
Sand sole			X	X	X	X	X		X	X
Tadpole sculpin			X	X	X	X	X		X	X
Slim sculpin			X	X	X	X	X		X	X
Big skate			X	X	X	X	X		X	X
Longnose skate			X	X	X	X	X		X	X
Pile perch			X	X	X	X	X		X	X
Northern ronquil			X	X	X	X	X		X	X
Rainbow trout	X		X	X	X	X	X		X	X

Species	Installation									
	Camp McKean	Camp Wesley Harris	Jackson Park Housing Complex	Naval Hospital Bremerton	NAVBASE Kitsap, Bangor	NAVBASE Kitsap, Bremerton	NAVBASE Kitsap, Keyport	Navy Railroad	Toandos Buffer Zone	Zelatched Point
Cabezon, giant marbled sculpin			X	X	X	X	X		X	X
Brown rockfish			X	X	X	X	X		X	X
Copper rockfish			X	X	X	X	X		X	X
Brown bullhead	X		X	X	X	X	X		X	X
Arrow goby			X	X	X	X	X		X	X
Striped seaperch			X	X	X	X	X		X	X
Northern anchovy			X	X	X	X	X		X	X
Red irish lord			X	X	X	X	X		X	X
Flathead sole			X	X	X	X	X		X	X
Whitespotted greenling			X	X	X	X	X		X	X
Ratfish			X	X	X	X	X		X	X
Pacific staghorn sculpin			X	X	X	X	X		X	X
Ribbon snailfish			X	X	X	X	X		X	X
Showy snailfish			X	X	X	X	X		X	X
Pacific snake prickleback			X	X	X	X	X		X	X
Wattled eelpout			X	X	X	X	X		X	X
Blackbelly eelpout			X	X	X	X	X		X	X
Slender sole			X	X	X	X	X		X	X
Blackfin sculpin			X	X	X	X	X		X	X
Pacific hake			X	X	X	X	X		X	X
Pacific tomcod			X	X	X	X	X		X	X
Largemouth bass	X	X			X					
Dover sole			X	X	X	X	X		X	X
Sailfish sculpin			X	X	X	X	X		X	X
Pygmy poacher			X	X	X	X	X		X	X
Tidepool sculpin			X	X	X	X	X		X	X

Species	Installation									
	Camp McKean	Camp Wesley Harris	Jackson Park Housing Complex	Naval Hospital Bremerton	NAVBASE Kitsap, Bangor	NAVBASE Kitsap, Bremerton	NAVBASE Kitsap, Keyport	Navy Railroad	Toandos Buffer Zone	Zelatched Point
Coho salmon	X		X	X	X	X	X	X	X	X
Sockeye salmon			X	X	X	X	X	X	X	X
Painted greenling			X	X	X	X	X		X	X
English sole			X	X	X	X	X		X	X
Lingcod			X	X	X	X	X		X	X
Crescent gunnel			X	X	X	X	X		X	X
Saddleback gunnel			X	X	X	X	X		X	X
Starry flounder			X	X	X	X	X		X	X
Bluebarred prickleback			X	X	X	X	X		X	X
Silverspotted sculpin			X	X	X	X	X		X	X
C-O Sole			X	X	X	X	X		X	X
Plainfin midshipman			X	X	X	X	X		X	X
Benthic & Shellfish Species										
Blue mussels			X	X	X	X	X		X	X
Butter clam			X	X	X	X	X		X	X
Dungeness crab			X	X	X	X	X		X	X
Littleneck clams					X	X	X		X	X
Olympia oyster			X	X	X	X	X		X	X
Pacific oyster			X	X	X	X	X		X	X
Pandalid shrimp			X	X	X	X	X		X	X
Red urchin			X	X	X	X	X		X	X
Brittle Stars			X	X	X	X	X		X	X
Tubeworm			X	X	X	X	X		X	X
Sea anemones			X	X	X	X	X		X	X
Barnacles			X	X	X	X	X		X	X
Graceful crab			X	X	X	X	X		X	X
Red rock crab			X	X	X	X	X		X	X
Decorator crab			X	X	X	X	X		X	X
Sea cucumbers			X	X	X	X	X		X	X
Starfish			X	X	X	X	X		X	X
Burrowing anemone			X	X	X	X	X		X	X

Species	Installation									
	Camp McKean	Camp Wesley Harris	Jackson Park Housing Complex	Naval Hospital Bremerton	NAVBASE Kitsap, Bangor	NAVBASE Kitsap, Bremerton	NAVBASE Kitsap, Keyport	Navy Railroad	Toandos Buffer Zone	Zelatched Point
Rock scallop			X	X	X	X	X		X	X
Limpet			X	X	X	X	X		X	X
Bent-nosed clam			X	X	X	X	X		X	X
Decorator crab			X	X	X	X	X		X	X
Horse mussel			X	X	X	X	X		X	X
Eastern soft shell clam			X	X	X	X	X		X	X
Bay mussel, Pacific blue mussel			X	X	X	X	X		X	X
Mediterranean mussels			X	X	X	X	X		X	X
Nudibranchs			X	X	X	X	X		X	X
Sea cucumber			X	X	X	X	X		X	X
Native littleneck clam			X	X	X	X	X		X	X
Kelp crab			X	X	X	X	X		X	X
Tubeworm			X	X	X	X	X		X	X
Jackknife clam			X	X	X	X	X		X	X
Manila clam; Japanese littleneck clam			X	X	X	X	X		X	X
Helmet crab			X	X	X	X	X		X	X
Horse clam, Gaper clam			X	X	X	X	X		X	X
Pacific geoduck			X	X	X	X	X		X	X

Potentially Occurring Threatened, Endangered, and Sensitive Species at NAVBASE Kitsap

Species	Status		Installation									
	Federal (critical habitat)	Washington	Camp McKean	Camp Wesley Harris	Jackson Park Housing	Naval Hospital Bremerton	NAVBASE Kitsap, Bangor	NAVBASE Kitsap, Bremert on	NAVBASE Kitsap, Keyport	Navy Railroad	Toandos Buffer Zone	Zelatched Point
Fauna												
Marbled murrelet	T	T			X	X	X	X	X		X	X
Bald eagle	SoC	S	X	X	X	X	X	X	X	X	X	X
Puget Sound chinook salmon	T	C			X	X	X	X	X	X	X	X
Hood Canal summer-run chum salmon	T	C					X				X	X
Puget Sound steelhead	T	T			X	X	X	X	X	X	X	X
Bull trout	T	C			X	X	X	X	X		X	X
Bocaccio	E	C			X	X	X	X	X		X	X
Canary rockfish	T	C			X	X	X	X	X		X	X
Yelloweye rockfish	T	C			X	X	X	X	X		X	X
Steller sea lion		T			X	X	X	X	X		X	X
Humpback whale	E	E			X	X	X	X	X		X	X
Southern resident killer whale	E	E			X	X		X	X			
Fisher		E									X	X
Yellow-billed cuckoo (riparian)	T	C		X	X	X	X		X	X	X	X
Burrington jumping-slug	C						X					
Evening fieldslug	C				X	X	X	X	X			
Cascades Frog	C	SM									X	X
Flora												
Marsh sandwort	E	PE		X		X	X		X	X	X	X
Howellia	T	T		X		X	X		X	X	X	X
Tall bugbane	SoC	T					X					
Torrey's peavine	SoC	T		X								
Yellow cedar	C			X	X	X	X		X	X	X	X
Pink sand-verbena	SoC	PE									X	

C=Candidate, E=Endangered, S=Sensitive, SoC=Species of Concern, T=Threatened, PE=Possibly Extirpated, P=Proposed, SM=State Monitored

NAVBASE Kitsap at Bangor
Installation Restoration Sites

Naval Base Kitsap Bangor

Naval Base Description

Naval Base Kitsap (NBK) Bangor consists of approximately 7,000 acres of semirural land located on Hood Canal, 10 miles north of the city of Bremerton, Kitsap County, Washington. NBK Bangor was used as an ammunition transfer point from 1944 to the early 1970s. Ordnance arrived by train and ship to support U.S. military efforts in the Pacific theater. It was established as a Trident submarine base in 1973 and is currently used for that purpose. In February 1977, Naval Base Kitsap Bangor was commissioned as Naval Submarine Base (SUBASE), Bangor, the west coast homeport for the Trident Submarine Launched Ballistic Missile System. There are eight operable units (OUs) at NBK Bangor consisting of 23 individual sites. NBK Bangor is administered under a Federal Facilities Agreement between the Navy, Washington State Department of Ecology, and U.S. Environmental Protection Agency (EPA).

The following is a list of historical events at NBK Bangor from 1944 to the present:

- In 1944, naval activities began at the facility on 4 June.
- In 1944, the Pacific shipment point for ammunition and explosives was established.
- In 1945, Bangor Naval Magazine began operations on 25 January.
- In 1973, Trident System was approved by Congress; Bangor Naval Complex was selected as the location.
- Prior to 1977, ordnance and other wastes were burned, detonated, or disposed of at SUBASE, Bangor.
- In 1977, SUBASE, Bangor was commissioned.
- In 1982, the first submarine arrived.
- In 1987, Site A, located at the northern end of the base, was listed on the National Priorities List (NPL).
- In 1990, the remainder of SUBASE, Bangor was listed on the NPL.
- In 1991, the OU 1 Site A Record of Decision (ROD) was executed and the interim ROD for OU 2 was executed.
- In 1993, the OU 5 ROD was executed.
- In 1994, the OU 2 Site F ROD was executed.
- In 1994, RODs for OUs 3, 4, 5, and 6 were executed.
- In 1994, the Explanation of Significant Differences (ESD) No. 1 was prepared for OU 1, Site A.
- In 1994, an ESD was prepared for OU 2, Site F.
- In 1996, the OU 7 ROD was executed.
- In 1998, the ESD No. 2 was prepared for OU 1, Site A.
- In 2000, the ESD No. 3 was prepared for OU 1, Site A.
- In 2000, the OU 8 ROD was executed and the first 5-year review for NBK Bangor was completed.
- In 2001, the Institutional Controls Management Plan (ICMP) for NBK Bangor was completed and implemented.
- In 2005, the second 5-year review for NBK Bangor was completed.
- From 2005 to present, operation, maintenance, and monitoring are being conducted as specified in the RODs for OUs 1, 2, 3, 7, and 8.

Naval Base Kitsap Bangor

OPERABLE UNIT 1 (OU 1)
Site A Bangor Ordnance Disposal Site

OPERABLE UNIT 2 (OU 2)
Site F Former Wastewater Location

OPERABLE UNIT 3 (OU 3)
Site 16 Drum Storage Area
Site 24 Former Incinerator Site
Site 25 Former Treatment Plant Outfall

OPERABLE UNIT 4 (OU 4)
Site C-West Bldg 7700 Fill Area
Site C-East Ordnance Wastewater Disposal Area

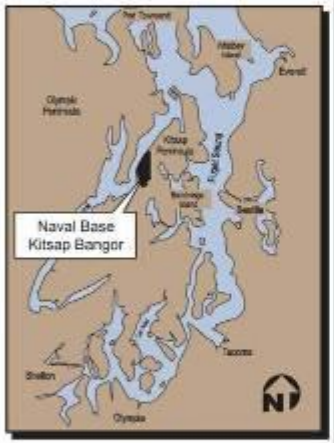
OPERABLE UNIT 5 (OU 5)
Site 5 Former Metallurgy Lab Rubble

OPERABLE UNIT 6 (OU 6)
Site D Munitions Burn Area

OPERABLE UNIT 7 (OU 7)
Site B Floral Point
Site E Old Acid Pit
Site 2 Classification Yard/ Fleet Deployment Parking
Site 4 Carlson Spit
Site 7 Old Paint Can Site
Site 10 Pesticide Storage Quonset Huts
Site 11 Pesticide Drum Disposal Area
Site 18 PCB Spill Site
Site 26 Hood Canal Sediments
Site 30 Railroad Tracks

OPERABLE UNIT 8 (OU 8)
Site 27 Bldg 1014 Steam Cleaning Pit
Site 28 Paint Shop Bldg 1032 Drainage Ditch
Site 29 Public Works Maintenance Garage
SS Public Works Industrial Area Service Station

EO 300 Small Arms Ranges



Area Data Sheet

Area
Naval Base Kitsap (NBK) Bangor

Location
Kitsap Peninsula
Silverdale, Washington

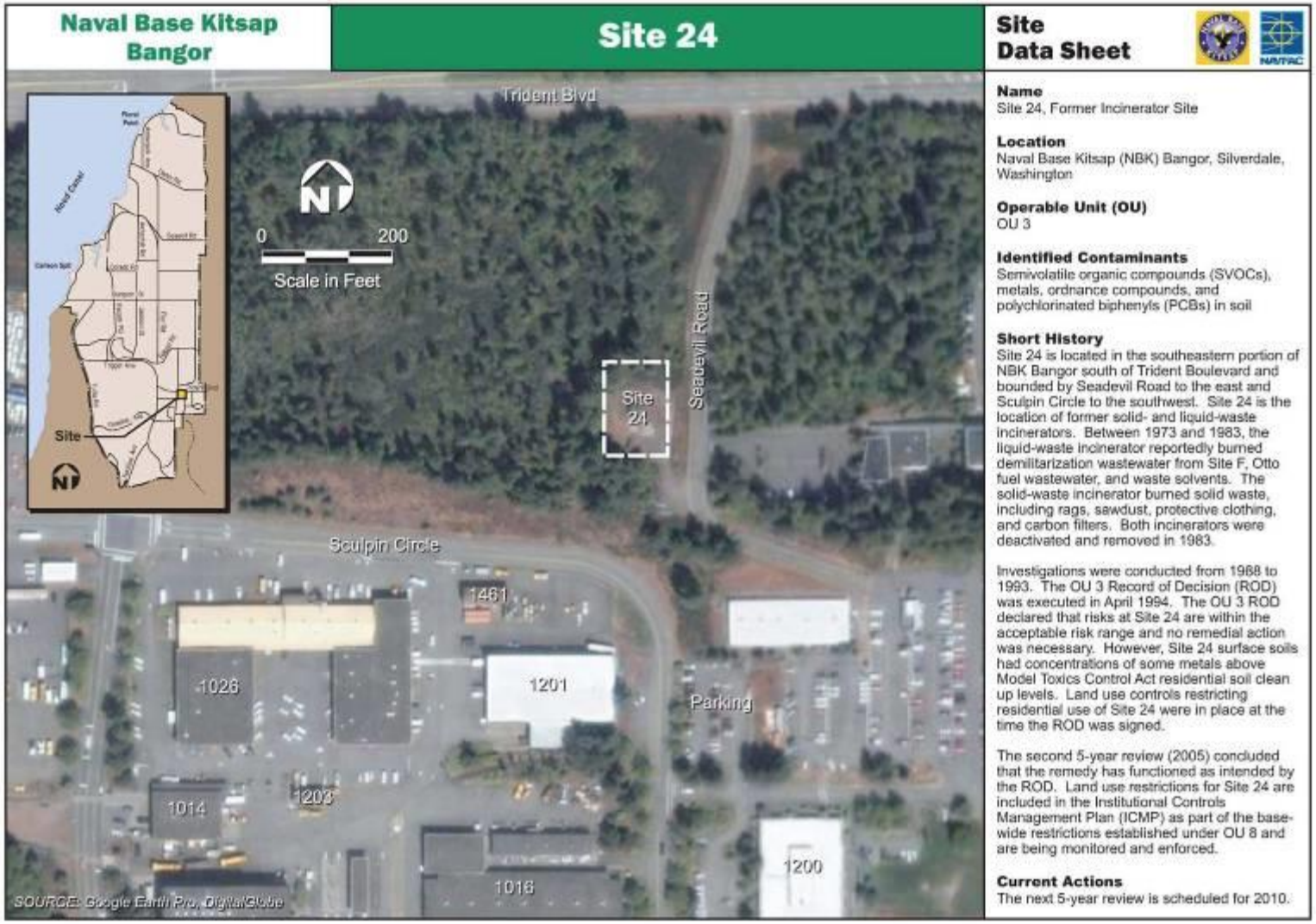
Operable Units (OUs)
22 Sites grouped into 8 OUs and an explosive ordnance site

Short History
NBK Bangor was used as an ammunition transfer point during World War II and the Vietnam conflict. It was established as a Trident submarine base in 1973 and is currently used for that purpose. NBK Bangor is under a Federal Facilities Agreement with the Washington State Department of Ecology and U.S. Environmental Protection Agency. Records of Decision have been executed for all eight OUs and the specified remedial actions have been implemented. Remedy operation, maintenance, and monitoring are ongoing. The second 5-year review was conducted in 2005. The next 5-year review is scheduled for 2010.


Naval Base Kitsap
Bangor
Site A
Site
Data Sheet
Site
Vinland
Cattail
Lake
Pintado Road
Site A
Tinosa Road
0
800
Scale in Feet
SOURCE: Google Earth Pro, DigitalGlobe
Name
Site A, Bangor Ordnance Disposal Site
Location
Naval Base Kitsap (NBK) Bangor, Silverdale, Washington
Operable Unit (OU)
OU 1
Identified Contaminants
Dinitrotoluene (DNT), picric acid, picramic acid, tetryl, trinitrotoluene (TNT), royal demolition explosive (RDX), and Otto fuel in soil, surface water, and groundwater
Short History
Site A was used to detonate and incinerate various ordnance materials from 1962 to 1975 and is composed of a burn area, two debris areas, and a storm water discharge area. Soil, surface water, and shallow groundwater were impacted because of its historical use. Municipal water supplies for nearby Vinland to the north are obtained from the deeper sea level aquifer, which has not been impacted by activities at Site A.
Investigations for this site were conducted from 1984 to 1991. The OU 1 Record of Decision (ROD) was executed in December 1991. The remedy for OU 1 consisted of excavating and treating 7,000 cubic yards of surface soil from the Burn Area and 100 cubic yards of soil from Debris Area 2, treating impacted groundwater using an ultraviolet oxidation process and reinfiltrating treated water in the shallow aquifer, and monitoring groundwater throughout the restoration action.
In 1993, soil contaminated with residue from burning explosives was excavated and cleaned using a wash-leach process and placed within a lined soil washing basin within the Burn Area. Debris Area 2 soils with elevated lead concentrations were isolated in a special cell within the wash basin. Groundwater restoration at OU 1 began in May 1997. Regular operation, maintenance, and monitoring of the system and groundwater have been conducted since 2000.
The second 5-year review (2005) concluded that the groundwater extraction and treatment system is not functioning as intended. The second 5-year review recommended that the Navy finalize optimization recommendations for the groundwater treatment system at Site A. The other components of the remedy for Site A are functioning as intended. The base-wide land use controls inspection process is functioning as intended.
Current Actions
The Navy conducts regular operation, maintenance, and monitoring of the groundwater treatment system. The next 5-year review is scheduled to be conducted in 2010.


Naval Base Kitsap
Bangor
Site F
Site
Data Sheet
Trigger Ave
Rabaul Rd
Railroad Sidings
Site F
Trident Blvd
Trigger Ave
Railroad
Railroad Sidings
Thresher Ave
Site
N
0
1,000
Scale in Feet
SOURCE: Google Earth Pro, DigitalGlobe
Name
Site F, Former Wastewater Lagoon
Location
Naval Base Kitsap (NBK) Bangor, Silverdale, Washington
Operable Unit
OU 2
Identified Contaminants
Trinitrotoluene (TNT) and royal demolition explosive (RDX) in soil and groundwater
Short History
Site F is a former wastewater lagoon and ditch that received rinse water from a steam-cleaning operation between 1957 and 1972. The wastewater was produced during the demilitarization (demil) of ordnance items in the adjacent building. Much of the wastewater infiltrated through the lagoon bottom. Periodically, the wastewater lagoon was allowed to drain and waste materials at the surface of the lagoon were "burned off" in place. The lagoon was taken out of service in 1972-1973.
Investigations for this site were conducted from 1988 to 1993. An interim Record of Decision (ROD) for OU 2 was executed in September 1991, specifying the interim remedial action of limiting further migration of ordnance-related chemicals in groundwater. The final OU 2 ROD was executed in September 1994. The remedy for OU 2 consisted of soil excavation and treatment, installation an infiltration barrier, periodic inspections of infiltration barrier to ensure long-term integrity, groundwater extraction and treatment, treated ground reinfiltration, and groundwater monitoring.
Impacted soil was excavated and treated in 1972. The former lagoon was backfilled and paved in 1980. On-site buildings were decontaminated and converted to storage. A groundwater extraction and treatment system specified by the interim ROD was constructed in 1994 and upgraded in 1996. This system is currently operational. Additional soil was excavated and treated in 1996. The site was capped in December 1997.
The second 5-year review (2005) concluded that the groundwater extraction and treatment portion of the remedy for Site F is not functioning as intended. An optimization review performed in 2004 concluded that the system is still effective at removing contaminant mass but will not fully clean up groundwater. Five specific recommendations for system optimization and future monitoring were made. The second 5-year review recommended that the Navy implement these optimization recommendations. The other components of the remedy for Site F are functioning as intended.
Current Actions
The Navy conducts regular operation, maintenance, and monitoring of the groundwater treatment system. The next 5-year review is scheduled to be conducted in 2010.


Naval Base Kitsap
Bangor
Site 16
Site
Data Sheet
NAVFAC
Trident Blvd
Seadevil Road
Site 16
Sculpin Circle
1461
1026
1201
Parking
1014
1203
1016
1200
Site
0
200
Scale in Feet
SOURCE: Google Earth Pro, DigitalGlobe
Name
Site 16, Drum Storage Area
Location
Naval Base Kitsap (NBK) Bangor, Silverdale, Washington
Operable Unit (OU)
OU 3
Identified Contaminants
Semivolatile organic compounds (SVOCs), metals, ordnance compounds, and polychlorinated biphenyls (PCBs) in soil
Short History
Site 16 is located in the southeastern portion of NBK Bangor south of Trident Boulevard, and bounded by Seadevil Road to the east and Sculpin Circle to the Southwest. Site 16 is the location of a former drum storage area associated with former solid- and liquid-waste incinerators (Site 24). From 1970 to 1983, drums containing Otto fuel, trinitrotoluene (TNT), royal demolition explosive (RDX), and waste solvents were stored at Site 16. The area was used to store materials to be burned in the incinerators. Small spills reportedly occurred at the site, especially during heavy rainfall.
Investigations for this site were conducted from 1988 to 1993. The OU 3 Record of Decision (ROD) was executed in April 1994. The OU 3 ROD declared that risks at Site 16 are within the acceptable risk range and no remedial action was necessary. However, Site 16 surface soils had concentrations of some metals above Model Toxics Control Act residential soil clean up levels. Institutional controls restricting residential use of Site 16 were in place at the time the ROD was signed.
The second 5-year review (2005) concluded that the remedy has functioned as intended by the ROD. Land use restrictions for Site 16 are included in the Institutional Controls Management Plan (ICMP) as part of the base-wide restrictions established under OU 6 and are being monitored and enforced.
Current Actions
The next 5-year review is scheduled to be conducted in 2010.


Naval Base Kitsap
Bangor
Site 24
Site
Data Sheet
Trident Blvd
Seadevil Road
Sculpin Circle
Site
24
Site
0
200
Scale in Feet
1461
1026
1201
Parking
1203
1014
1016
1200
SOURCE: Google Earth Pro, DigitalGlobe
Name
Site 24, Former Incinerator Site
Location
Naval Base Kitsap (NBK) Bangor, Silverdale, Washington
Operable Unit (OU)
OU 3
Identified Contaminants
Semivolatile organic compounds (SVOCs), metals, ordnance compounds, and polychlorinated biphenyls (PCBs) in soil
Short History
Site 24 is located in the southeastern portion of NBK Bangor south of Trident Boulevard and bounded by Seadevil Road to the east and Sculpin Circle to the southwest. Site 24 is the location of former solid- and liquid-waste incinerators. Between 1973 and 1983, the liquid-waste incinerator reportedly burned demilitarization wastewater from Site F, Otto fuel wastewater, and waste solvents. The solid-waste incinerator burned solid waste, including rags, sawdust, protective clothing, and carbon filters. Both incinerators were deactivated and removed in 1983.
Investigations were conducted from 1988 to 1993. The OU 3 Record of Decision (ROD) was executed in April 1994. The OU 3 ROD declared that risks at Site 24 are within the acceptable risk range and no remedial action was necessary. However, Site 24 surface soils had concentrations of some metals above Model Toxics Control Act residential soil clean up levels. Land use controls restricting residential use of Site 24 were in place at the time the ROD was signed.
The second 5-year review (2005) concluded that the remedy has functioned as intended by the ROD. Land use restrictions for Site 24 are included in the Institutional Controls Management Plan (ICMP) as part of the base-wide restrictions established under OU 8 and are being monitored and enforced.
Current Actions
The next 5-year review is scheduled for 2010.


Naval Base Kitsap
Bangor
Site 25
Site
Data Sheet
Name
Site 25, Former Treatment Plant Outfall
Location
Naval Base Kitsap (NBK) Bangor, Silverdale, Washington
Operable Unit (OU)
OU 3
Identified Contaminants
Trinitrotoluene (TNT), royal demolition explosive (RDX), and metals in groundwater
Short History
Site 25 is located at the southeastern boundary of NBK Bangor between Sculpin Circle and Southern Boundary Road. Site 25 is the location of a former outfall from a sewage treatment plant that served the base's industrial area. The outfall discharged into two small ponds that directly discharged into Clear Creek. Records from 1971 indicate that RDX- and TNT-contaminated wastewater was treated at the plant. Site 25 has since been regraded and currently consists of two stormwater detention ponds that discharge into an oil-water separator prior to discharge into Clear Creek. Site 25, located downgradient of Sites 16/24, was included in OU 3 because of its proximity to Site 16/24 and because of the potential for contaminant migration from Sites 16/24 to Site 25 either by surface water or groundwater.
Investigations were conducted from 1988 to 1993. The OU 3 Record of Decision (ROD) was executed in April 1994. The OU 3 ROD declared that risks at Site 25 are within the acceptable risk range and no remedial action was necessary. However, Site 25 groundwater had concentrations of some chemicals of concern above groundwater cleanup levels. The ROD required 5 years of groundwater monitoring at Site 25. Following eight rounds of groundwater monitoring, the Navy and Washington State Department of Ecology agreed that the groundwater monitoring completed for Site 25 met the requirements of the OU 3 ROD and that no additional monitoring was required.
The second 5-year review (2005) concluded that the remedy for Site 25 has functioned as intended by the OU 3 ROD.
Current Actions
The next 5-year review is scheduled to be conducted in 2010.
Site
1016
1038
1021
1202
Parking
Parking
Parking
Public Works
1025
2011
Scorpion Ave
Sculpin Circle
Oil/Water
Separator
Site 25
Southern Boundary Road
0
200
Scale in Feet
SOURCE: Google Earth Pro, DigitalGlobe


Naval Base Kitsap
Bangor
Site C-East
Site
Data Sheet
NAVFAC
Site
Site C-West
Pogy Rd
Flier Rd
East
Carbon
Filter
West
Carbon
Filter
7701
Darter Road
Fill Material
Return Area
Probable
Leachate Pits
Site C-East
Flier Rd
N
0
400
Scale in Feet
SOURCE: Google Earth Pro, DigitalGlobe
Name
Site C-East, Ordnance Wastewater Disposal Area
Location
Naval Base Kitsap (NBK) Bangor, Silverdale, Washington
Operable Unit (OU)
OU 4
Identified Contaminants
Ammonium picrate, trinitrotoluene (TNT), royal demolition explosive (RDX), and Otto fuel in soil
Short History
Site C-East is a former wastewater and sludge disposal area located at the intersection of Flier Road, Darter Road, and Pogy Road. Site C-East was a gravel pit used for periodic ordnance wastewater and sludge disposal resulting from demilitarization operations. Documented disposal activities occurred from 1957 to 1973. Between 1957 and 1964, an estimated 1 million gallons of picric acid from Jackson Park demilitarization operations were disposed of in the unlined leachate pits at Site C-East. From 1964 to 1971, Site C-East was inactive. In 1971, an oil/water separator was installed on Site C-East to treat wastewater. In 1977, a portion of one of the disposal pits was excavated during construction of Flier Road and used as fill material in what is now Site C-West. It was later discovered that the material was contaminated, and it was returned to Site C-East. In 1978, a curtain drain, a road underdrain, and two carbon filter units were installed to treat surface water that had been contaminated. The carbon filter system was deactivated in 1982 due to low influent concentrations, but the road underdrain is still present.
Investigations for this site were conducted from 1988 to 1993. The OU 4 Record of Decision (ROD) was executed in July 1994. The evaluation indicated that no action was required to be protective of human health and the environment. Washington State Department of Ecology and U.S. Environmental Protection Agency concurred with these findings. Therefore, remedial action, land use controls, and monitoring were not required for this site.
Current Actions
None


Naval Base Kitsap
Bangor
Site C-West
Site
Data Sheet
Site
7062
Suspected
Fill Area
7700
Site C-West
Pogy Rd
Flier Rd
Darter Road
Site C-East
Flier Rd
0
400
Scale in Feet
SOURCE: Google Earth Pro, DigitalGlobe
Name
Site C-West, Building 7700 Fill Area
Location
Naval Base Kitsap (NBK) Bangor, Silverdale, Washington
Operable Unit (OU)
OU 4
Identified Contaminants
Ammonium picrate, trinitrotoluene (TNT), royal demolition explosive (RDX), and Otto fuel in soil
Short History
Site C-West is west of Site C-East, along Flier Road. Most of Site C-West is paved. Site C-West is an area where fill from Site C-East was taken to level a site for construction of Building of 7700. Prior to construction, this fill was determined to be contaminated and returned to Site C-East.
Investigations for this site were conducted from 1988 to 1993. The OU 4 Record of Decision (ROD) was executed in July 1994. The evaluation indicated that no action was required to be protective of human health and the environment. Washington State Department of Ecology and U.S. Environmental Protection Agency concurred with these findings. Therefore, remedial action, land use controls, and monitoring were not required for this site.
Current Actions
None


Naval Base Kitsap
Bangor
Site 5
Site
Data Sheet
NAVFAC
Trigger Ave
Site 5
Railroad Sidings
Railroad Sidings
Railroad Sidings
Trigger Ave
Thresher Ave
Site
N
0
1,000
Scale in Feet
SOURCE: Google Earth Pro, DigitalGlobe
Name
Site 5, Former Metallurgy Lab Rubble
Location
Naval Base Kitsap (NBK) Bangor, Silverdale, Washington
Operable Unit (OU)
OU 5
Identified Contaminants
Mercury in soil
Short History
Site 5 consists of the construction rubble disposal area containing demolition rubble from the former metallurgy laboratory (FML). The disposal area is believed to be in the northern portion of the western barricaded railroad siding area, located in the south-central portion of NBK Bangor. This area consists of 20 barricaded railroad sidings located between Thresher Avenue and Trigger Avenue. From approximately 1958 to 1973, the FML was used for testing brass projectile shell casings. Approximately 100 pounds of mercurous nitrate was used to coat the casings. The volatilized mercury condensed on the walls of the FML building and was believed to be present in the rubble of the FML building. According to Navy personnel, the FML was demolished in the early 1970s.
Investigations for this site were conducted from 1988 to 1993. These evaluations resulted in a Record of Decision for OU 5 that was executed in September 1993. The evaluation indicated that no action was required to be protective of human health and the environment. The Washington State Department of Ecology and the U.S. Environmental Protection Agency concurred with these findings. Therefore, remedial action, land use controls, and monitoring were not required.
Current Actions
None


Naval Base Kitsap
Bangor
Site D
Site
Data Sheet
Site
Site D
Escolar Rd
Abandoned Railroad Grade
Burn Mounds or
Residual Soil
Seasonally
Wet Area
Stained
Area
Small Arms
Incinerator
Disturbed Area
Burn Trench
0
300
Scale in Feet
SOURCE: Google Earth Pro, DigitalGlobe
Name
Site D, Munitions Burn Area
Location
Naval Base Kitsap (NBK) Bangor, Silverdale, Washington
Operable Unit (OU)
OU 6
Identified Contaminants
Ammonium picrate, trinitrotoluene (TNT), royal demolition explosive (RDX), metals, picric acid, and picramic acid in soil, surface water and groundwater
Short History
Site D is a former munitions burn area located south of Dorado Road between Escolar Road and an abandoned railroad spur. It served as the principal ordnance burning and detonation area at NBK Bangor from 1944 to 1963 when these activities were transferred to Site A. Between 1944 and 1957, explosive D (ammonium picrate) sludge from the steam cleaning of projectiles at other areas was transferred to Site D for disposal. Site D was used sporadically for ordnance disposal until approximately 1965. Waste disposal areas at Site D included a small arms incinerator, a burn trench, and smaller burn areas or mounds.
Investigations for this site were conducted from 1988 to 1993. The OU 6 Record of Decision (ROD) was executed in September 1994. The remedy consisted of soil excavation and soil treatment, confirmation sampling of on-site surface water, and groundwater monitoring.
Impacted soil was excavated and treated in 1996 and 1997. The treated soil was then returned to the excavation area and planted with native vegetation.
The first 5-year review (2000) concluded that the remedy components for soil removal and treatment, surface water monitoring, and groundwater monitoring at OU 6 functioned as intended by the ROD. No additional monitoring was required following the first 5-year review. The second 5-year review concluded that there was no apparent change in the functionality of the remedy. Land use controls are not required for OU 6.
Current Actions
The next 5-year review is scheduled to be conducted in 2010.

OU 7

OPERABLE UNIT 7 (OU 7)

Site B	Floral Point
Site E	Old Acid Pit
Site 2	Classification Yard/ Fleet Deployment Parking
Site 4	Carlson Spit
Site 7	Old Paint Can Site
Site 10	Pesticide Storage Quonset Huts
Site 11	Pesticide Drum Disposal Area
Site 18	PCB Spill Site
Site 26	Hood Canal Sediments
Site 30	Railroad Tracks

Area Data Sheet

Area
Operable Unit (OU) 7

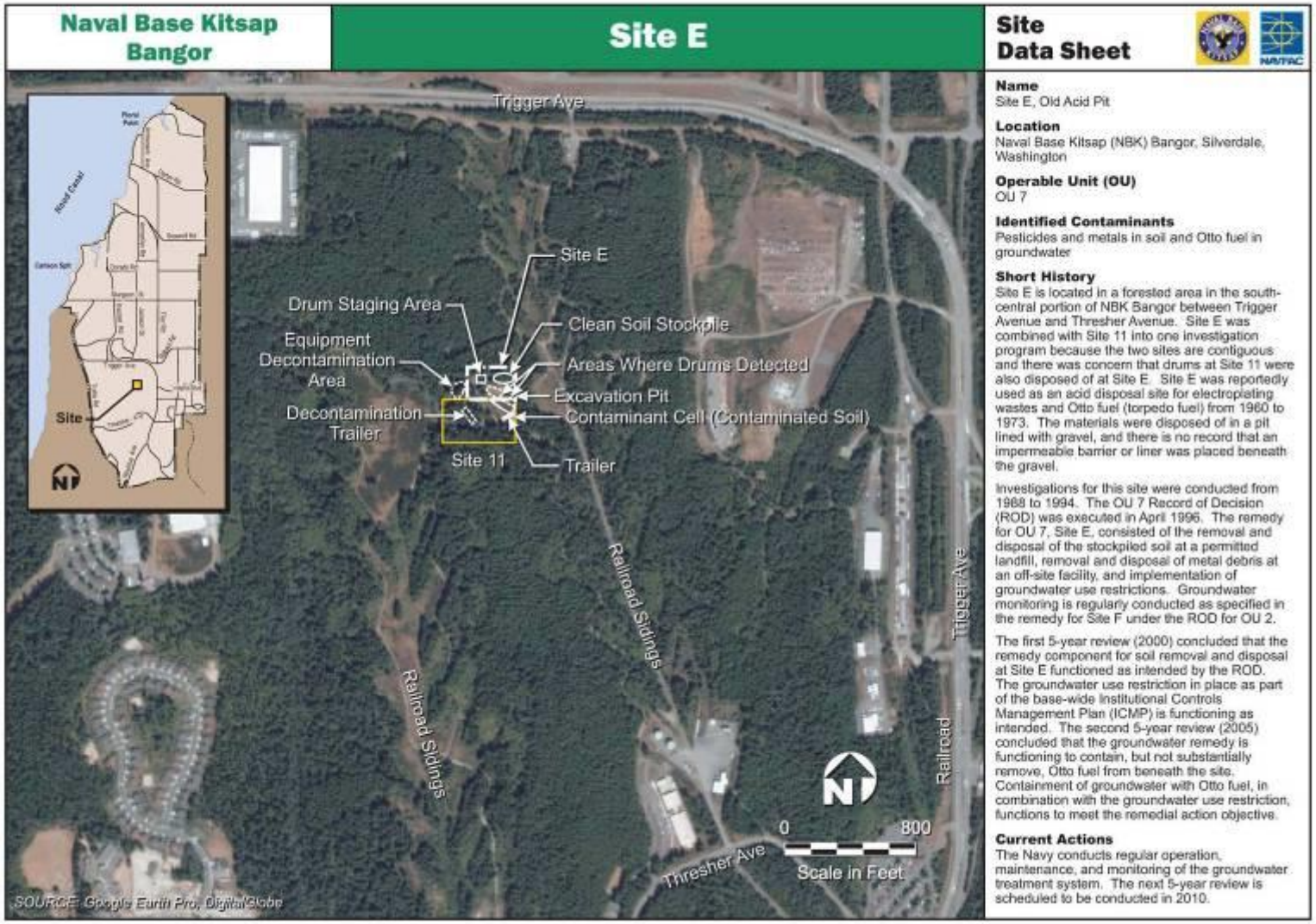
Location
Naval Base Kitsap (NBK) Bangor, Silverdale, Washington

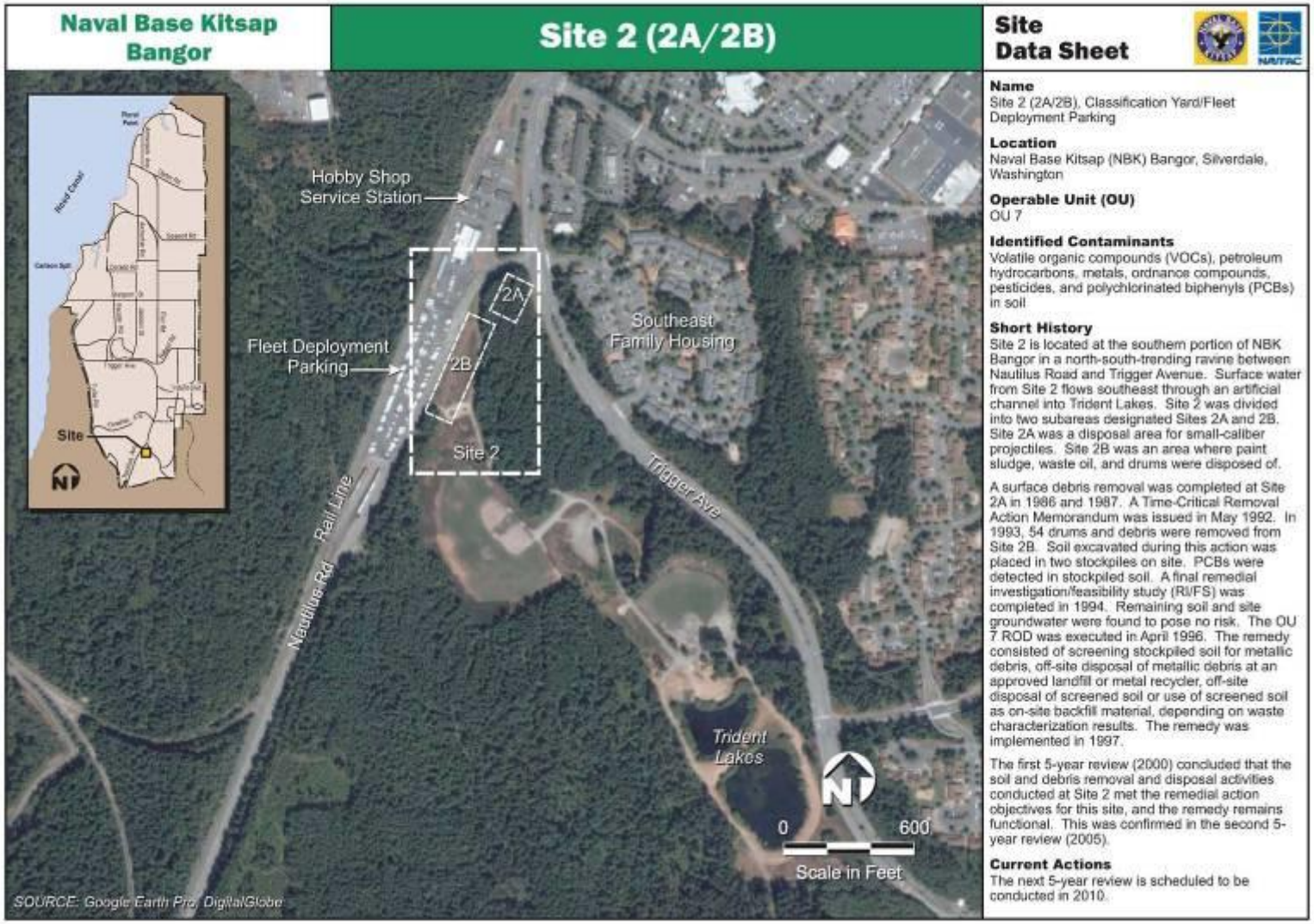
Operable Units
10 sites grouped into OU 7

Short History
OU 7 comprises 10 known or suspected waste sites (Sites B, E, 2, 4, 7, 10, 11, 18, 26, and 30) at locations across NBK Bangor. Sites 27, 28, and 29 were originally part of OU 7, but were included within OU 8 in 1994 following investigation of surrounding areas. Although not part of OU 7 as defined in the Federal Facilities Agreement (FFA), three lake or wetland areas (Cattail Lake, Hunter's Marsh, and Devil's Hole, collectively termed the Ecological Areas) were included for study with the 10 sites.

The remedial investigation/feasibility study for OU 7 was completed in 1994, and the Record of Decision was completed in 1996. More details on each of the 10 OU 7 sites are provided in the following site data sheets.

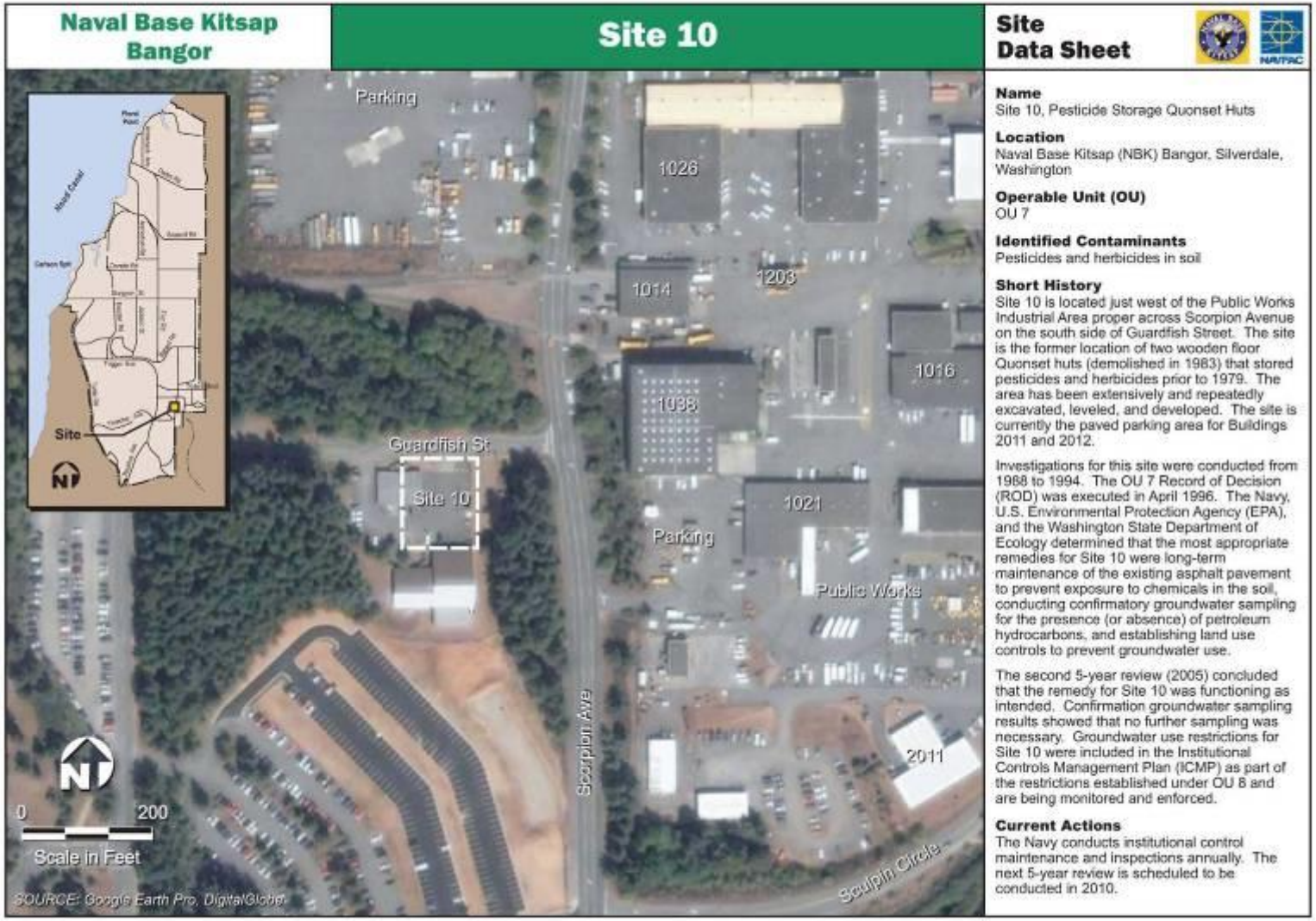

Naval Base Kitsap
Bangor
Site B
Site
Data Sheet
NAVFAC
Site
Hood Canal
Site B
Concrete
Pad
Amberjack Rd
0
150
Scale in Feet
SOURCE: Google Earth Pro, DigitalGlobe
Name
Site B, Floral Point
Location
Naval Base Kitsap (NBK) Bangor, Silverdale, Washington
Operable Unit (OU)
OU 7
Identified Contaminants
Volatile organic compounds (VOCs), petroleum hydrocarbons, polycyclic aromatic hydrocarbons (PAHs), metals, ordnance compounds, pesticides, and polychlorinated biphenyls (PCBs) in soil
Short History
Site B is located in the northwest portion of NBK Bangor at Floral Point. It consists of approximately 5 acres of natural shoreline between Amberjack Road and Hood Canal. The only structures on the site are a small observation hut facing Hood Canal and an L-shaped concrete foundation located in the approximate center of the point. The interior of the point is vegetative with some trees and underbrush. Pyrotechnic testing and black powder burning were conducted at Floral Point in the 1950s and 1960s. Floral Point was also used for station dumping, including pit disposal, landfilling and trash burning, from approximately 1950 to 1968. From 1966 to 1967, the site was reportedly used for open burning of explosive residuals from Site F. Floral Point contains no surface water drainages, and groundwater beneath the shoreline site is not suitable for consumption due to mixing with salt water.
Investigations for this site were completed from 1988 to 1994. The OU 7 Record of Decision (ROD) was executed in April 1996. The remedy for Site B at OU 7 consisted of removing metal debris from the wetland area, decommissioning nine monitoring wells, covering contaminated soil areas with 1 foot of clean soil overlain by a mulch layer and revegetation, construction of a shoreline protection system, installation of a stormwater drainage system, and construction of a concrete turnaround at the top of the boat ramp to prevent erosion from vehicles using the ramp.
Remedial actions at Site B were completed in November 1997. Remedy components have been inspected and maintained since then. Land use controls are in place, are enforced, and are inspected annually. Sediment and clam tissue monitoring was conducted in the area of Floral Point for 14 years (1991 through 2004). Trends in this analytical data show that groundwater discharge from Floral Point into Hood Canal is not adversely affecting sediments or clam tissue. The second 5-year review (2005) concluded that the monitoring component of the Site B remedy has functioned as intended by the ROD and is complete.
Current Actions
The Navy conducts remedy inspections and sediment and clam tissue monitoring annually. The next 5-year review is scheduled to be conducted in 2010.

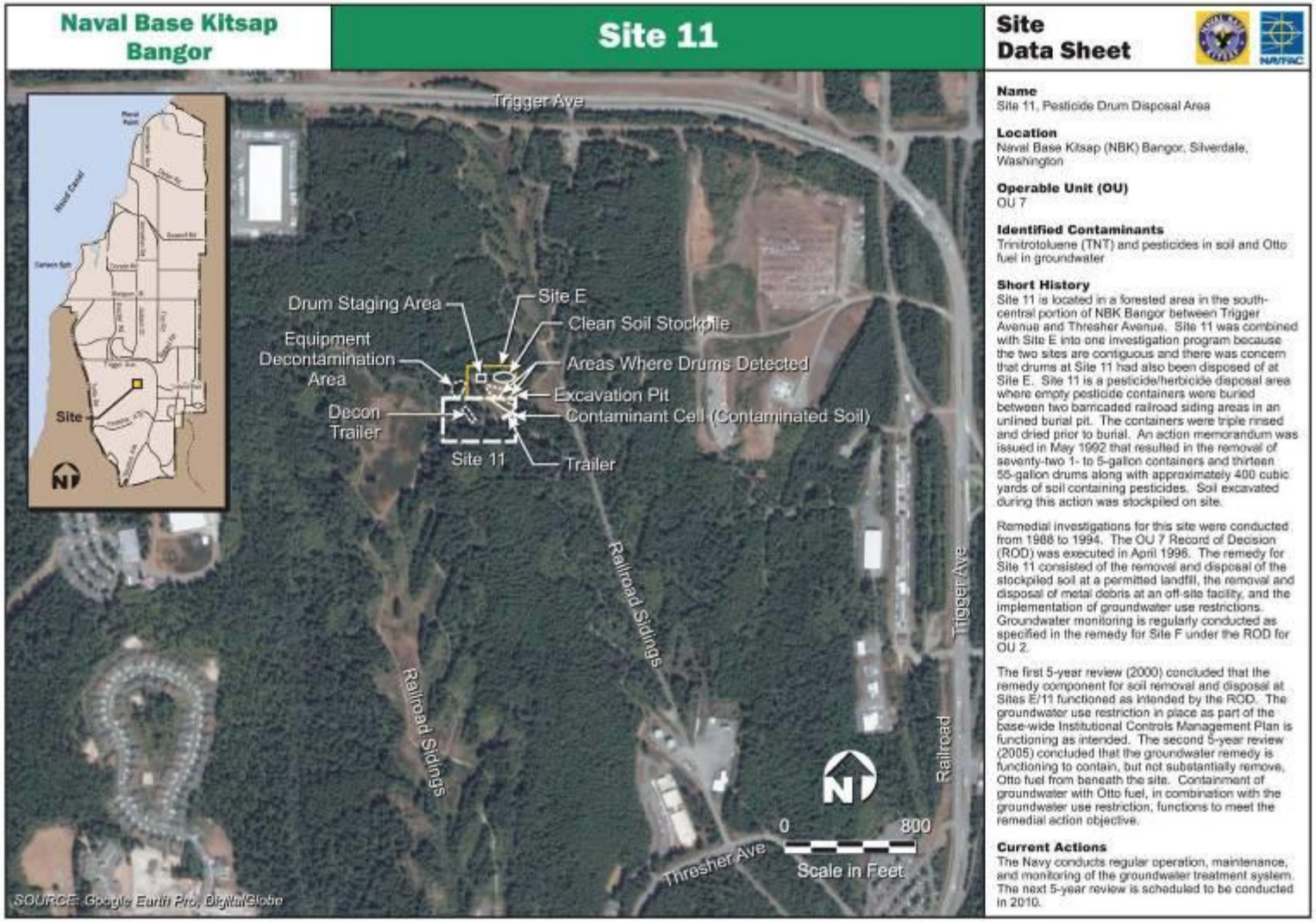

Naval Base Kitsap
Bangor
Site E
Site
Data Sheet
Trigger Ave
Site E
Drum Staging Area
Equipment
Decontamination
Area
Decontamination
Trailer
Clean Soil Stockpile
Areas Where Drums Detected
Excavation Pit
Contaminant Cell (Contaminated Soil)
Trailer
Site 11
Railroad Sidings
Railroad Sidings
Trigger Ave
Railroad
Thresher Ave
0
800
Scale in Feet
Site
SOURCE: Google Earth Pro, DigitalGlobe
Name
Site E, Old Acid Pit
Location
Naval Base Kitsap (NBK) Bangor, Silverdale, Washington
Operable Unit (OU)
OU 7
Identified Contaminants
Pesticides and metals in soil and Otto fuel in groundwater
Short History
Site E is located in a forested area in the south-central portion of NBK Bangor between Trigger Avenue and Thresher Avenue. Site E was combined with Site 11 into one investigation program because the two sites are contiguous and there was concern that drums at Site 11 were also disposed of at Site E. Site E was reportedly used as an acid disposal site for electroplating wastes and Otto fuel (torpedo fuel) from 1960 to 1973. The materials were disposed of in a pit lined with gravel, and there is no record that an impermeable barrier or liner was placed beneath the gravel.
Investigations for this site were conducted from 1988 to 1994. The OU 7 Record of Decision (ROD) was executed in April 1996. The remedy for OU 7, Site E, consisted of the removal and disposal of the stockpiled soil at a permitted landfill, removal and disposal of metal debris at an off-site facility, and implementation of groundwater use restrictions. Groundwater monitoring is regularly conducted as specified in the remedy for Site F under the ROD for OU 2.
The first 5-year review (2000) concluded that the remedy component for soil removal and disposal at Site E functioned as intended by the ROD. The groundwater use restriction in place as part of the base-wide Institutional Controls Management Plan (ICMP) is functioning as intended. The second 5-year review (2005) concluded that the groundwater remedy is functioning to contain, but not substantially remove, Otto fuel from beneath the site. Containment of groundwater with Otto fuel, in combination with the groundwater use restriction, functions to meet the remedial action objective.
Current Actions
The Navy conducts regular operation, maintenance, and monitoring of the groundwater treatment system. The next 5-year review is scheduled to be conducted in 2010.

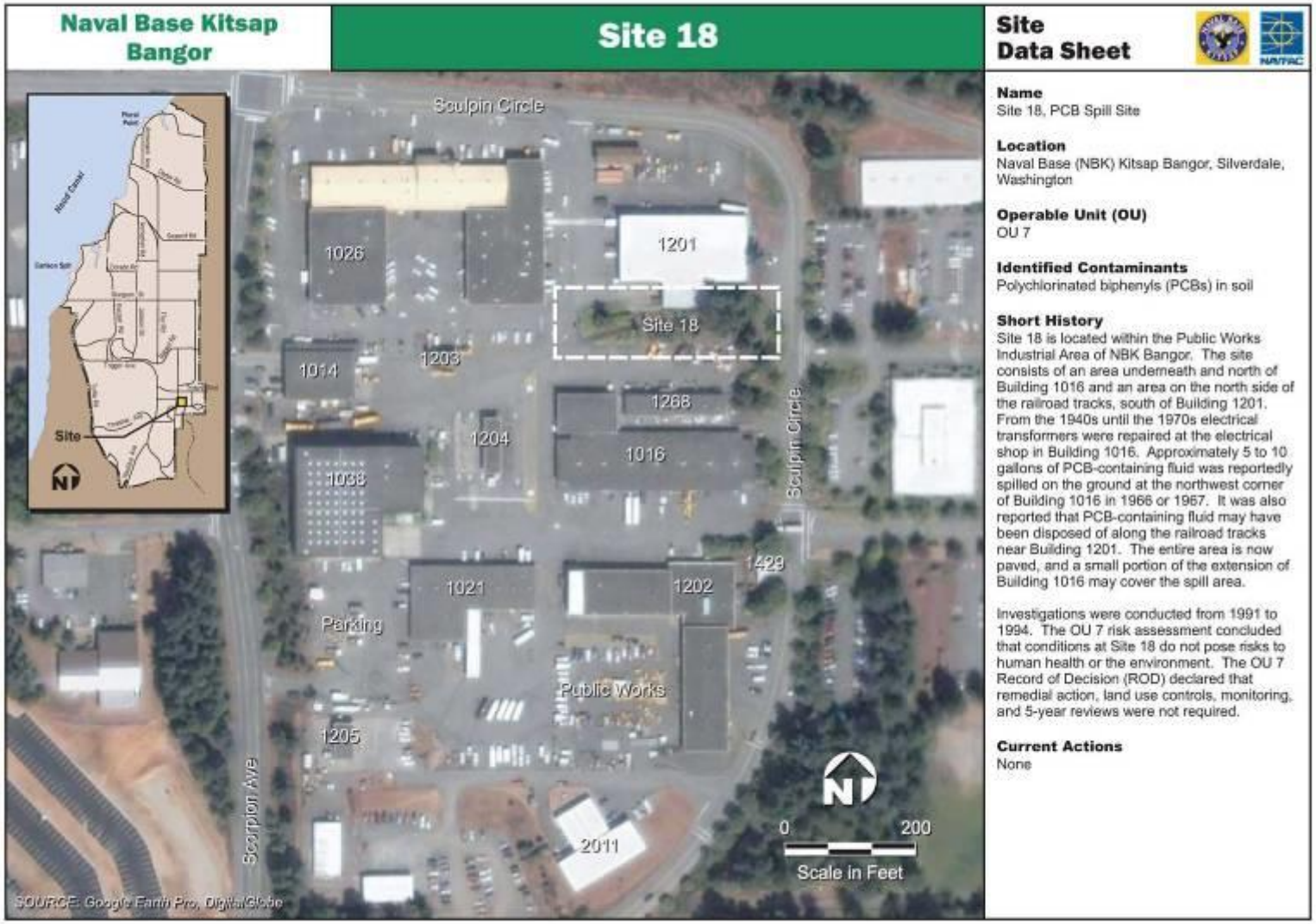

Naval Base Kitsap
Bangor
Site 2 (2A/2B)
Site
Data Sheet
NAVFAC
Hobby Shop
Service Station
Fleet Deployment
Parking
2A
2B
Site 2
Southeast
Family Housing
Trigger Ave
Rail Line
Nautilus Rd
Trident
Lakes
Site
0
600
Scale in Feet
SOURCE: Google Earth Pro, DigitalGlobe
Name
Site 2 (2A/2B), Classification Yard/Fleet Deployment Parking
Location
Naval Base Kitsap (NBK) Bangor, Silverdale, Washington
Operable Unit (OU)
OU 7
Identified Contaminants
Volatile organic compounds (VOCs), petroleum hydrocarbons, metals, ordnance compounds, pesticides, and polychlorinated biphenyls (PCBs) in soil
Short History
Site 2 is located at the southern portion of NBK Bangor in a north-south-trending ravine between Nautilus Road and Trigger Avenue. Surface water from Site 2 flows southeast through an artificial channel into Trident Lakes. Site 2 was divided into two subareas designated Sites 2A and 2B. Site 2A was a disposal area for small-caliber projectiles. Site 2B was an area where paint sludge, waste oil, and drums were disposed of.
A surface debris removal was completed at Site 2A in 1986 and 1987. A Time-Critical Removal Action Memorandum was issued in May 1992. In 1993, 54 drums and debris were removed from Site 2B. Soil excavated during this action was placed in two stockpiles on site. PCBs were detected in stockpiled soil. A final remedial investigation/feasibility study (RI/FS) was completed in 1994. Remaining soil and site groundwater were found to pose no risk. The OU 7 ROD was executed in April 1996. The remedy consisted of screening stockpiled soil for metallic debris, off-site disposal of metallic debris at an approved landfill or metal recycler, off-site disposal of screened soil or use of screened soil as on-site backfill material, depending on waste characterization results. The remedy was implemented in 1997.
The first 5-year review (2000) concluded that the soil and debris removal and disposal activities conducted at Site 2 met the remedial action objectives for this site, and the remedy remains functional. This was confirmed in the second 5-year review (2005).
Current Actions
The next 5-year review is scheduled to be conducted in 2010.

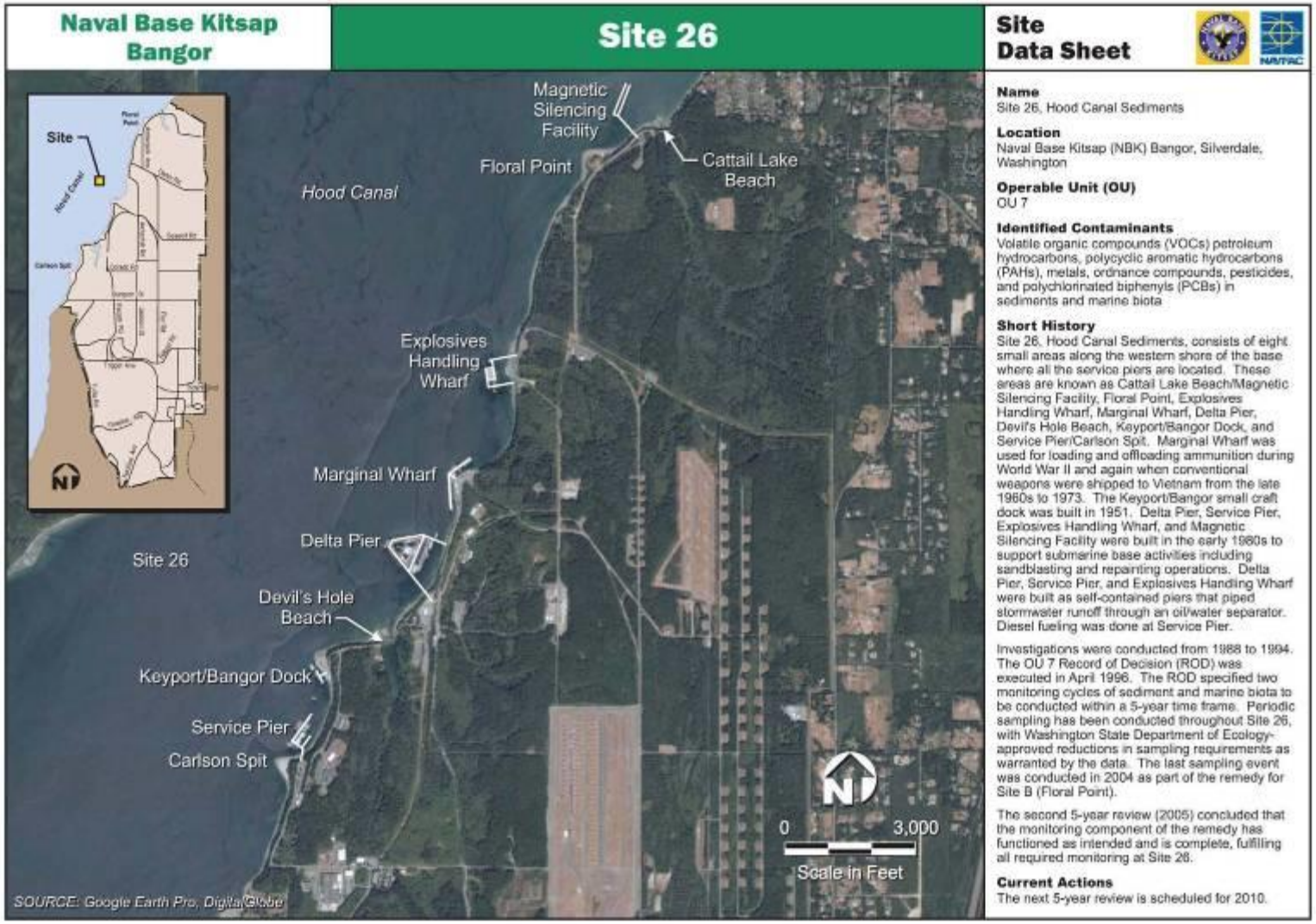

Naval Base Kitsap
Bangor
Site 4
Site
Data Sheet
Hood Canal
Service Pier
Site
7041
7101
Site 4
Wahoo Rd
Parking
0
200
Scale in Feet
SOURCE: Google Earth Pro, DigitalGlobe
Name
Site 4, Carlson Spit
Location
Naval Base Kitsap (NBK) Bangor, Silverdale, Washington
Operable Unit (OU)
OU 7
Identified Contaminants
None identified
Short History
Site 4 is a gravelly beach and upland area located at Carlson Spit between Wahoo Road and Hood Canal just south of Service Pier. The site reportedly contained ordnance detonation test pits. No contamination was identified during Phase I sampling activities.
The OU 7 risk assessment concluded that conditions at Site 4 do not pose risks to human health or the environment. The OU 7 Record of Decision (ROD) declared that remedial action, land use controls, monitoring, and 5-year reviews were not required.
Current Actions
None


Naval Base Kitsap
Bangor
Site 7
Site
Data Sheet
Hood
Canal
Site
Tinosa Rd
Cattail
Lake
Marsh
Site
7
0
300
Scale in Feet
SOURCE: Google Earth Pro, DigitalGlobe
Name
Site 7, Old Paint Can Site
Location
Naval Base Kitsap (NBK) Bangor, Silverdale, Washington
Operable Unit (OU)
OU 7
Identified Contaminants
Metals and solvents in soil and groundwater
Short History
Site 7 is located in a wooded area on the hillside above the south end of Cattail Lake in the northern portion of NBK Bangor. It was used for disposal of containers from an old paint shop during the mid-1970s. Some of the containers were partially filled with paint, thinner, and solvents. The containers were removed in 1981. The OU 7 risk assessment concluded that conditions at Site 7 do not pose risks to human health or the environment. The OU 7 Record of Decision (ROD) declared that remedial action, land use controls, monitoring, and 5-year reviews were not required.
Current Actions
None


Naval Base Kitsap
Bangor
Site 10
Site
Data Sheet
Parking
1026
1014
1203
1016
1038
1021
Guardfish St
Site 10
Parking
Public Works
Scorpion Ave
2011
Sculpin Circle
Site
0
200
Scale in Feet
SOURCE: Google Earth Pro, DigitalGlobe
Name
Site 10, Pesticide Storage Quonset Huts
Location
Naval Base Kitsap (NBK) Bangor, Silverdale, Washington
Operable Unit (OU)
OU 7
Identified Contaminants
Pesticides and herbicides in soil
Short History
Site 10 is located just west of the Public Works Industrial Area proper across Scorpion Avenue on the south side of Guardfish Street. The site is the former location of two wooden floor Quonset huts (demolished in 1983) that stored pesticides and herbicides prior to 1979. The area has been extensively and repeatedly excavated, leveled, and developed. The site is currently the paved parking area for Buildings 2011 and 2012.
Investigations for this site were conducted from 1988 to 1994. The OU 7 Record of Decision (ROD) was executed in April 1996. The Navy, U.S. Environmental Protection Agency (EPA), and the Washington State Department of Ecology determined that the most appropriate remedies for Site 10 were long-term maintenance of the existing asphalt pavement to prevent exposure to chemicals in the soil, conducting confirmatory groundwater sampling for the presence (or absence) of petroleum hydrocarbons, and establishing land use controls to prevent groundwater use.
The second 5-year review (2005) concluded that the remedy for Site 10 was functioning as intended. Confirmation groundwater sampling results showed that no further sampling was necessary. Groundwater use restrictions for Site 10 were included in the Institutional Controls Management Plan (ICMP) as part of the restrictions established under OU 8 and are being monitored and enforced.
Current Actions
The Navy conducts institutional control maintenance and inspections annually. The next 5-year review is scheduled to be conducted in 2010.


Naval Base Kitsap
Bangor
Site 11
Site
Data Sheet
Trigger Ave
Drum Staging Area
Site E
Clean Soil Stockpile
Equipment
Decontamination
Area
Areas Where Drums Detected
Excavation Pit
Decon
Trailer
Contaminant Cell (Contaminated Soil)
Site 11
Trailer
Railroad Sidings
Railroad Sidings
Trigger Ave
Railroad
Thresher Ave
0
800
Scale in Feet
SOURCE: Google Earth Pro, DigitalGlobe
Name
Site 11, Pesticide Drum Disposal Area
Location
Naval Base Kitsap (NBK) Bangor, Silverdale, Washington
Operable Unit (OU)
OU 7
Identified Contaminants
Trinitrotoluene (TNT) and pesticides in soil and Otto fuel in groundwater
Short History
Site 11 is located in a forested area in the south-central portion of NBK Bangor between Trigger Avenue and Thresher Avenue. Site 11 was combined with Site E into one investigation program because the two sites are contiguous and there was concern that drums at Site 11 had also been disposed of at Site E. Site 11 is a pesticide/herbicide disposal area where empty pesticide containers were buried between two barricaded railroad siding areas in an unlined burial pit. The containers were triple rinsed and dried prior to burial. An action memorandum was issued in May 1992 that resulted in the removal of seventy-two 1- to 5-gallon containers and thirteen 55-gallon drums along with approximately 400 cubic yards of soil containing pesticides. Soil excavated during this action was stockpiled on site.
Remedial investigations for this site were conducted from 1988 to 1994. The OU 7 Record of Decision (ROD) was executed in April 1996. The remedy for Site 11 consisted of the removal and disposal of the stockpiled soil at a permitted landfill, the removal and disposal of metal debris at an off-site facility, and the implementation of groundwater use restrictions. Groundwater monitoring is regularly conducted as specified in the remedy for Site F under the ROD for OU 2.
The first 5-year review (2000) concluded that the remedy component for soil removal and disposal at Sites E/11 functioned as intended by the ROD. The groundwater use restriction in place as part of the base-wide Institutional Controls Management Plan is functioning as intended. The second 5-year review (2005) concluded that the groundwater remedy is functioning to contain, but not substantially remove, Otto fuel from beneath the site. Containment of groundwater with Otto fuel, in combination with the groundwater use restriction, functions to meet the remedial action objective.
Current Actions
The Navy conducts regular operation, maintenance, and monitoring of the groundwater treatment system. The next 5-year review is scheduled to be conducted in 2010.


Naval Base Kitsap
Bangor
Site 18
Site
Data Sheet
Sculpin Circle
1026
1201
Site 18
1203
1014
1268
1204
1016
1038
Sculpin Circle
1429
1021
1202
Parking
Public Works
1205
Scorpion Ave
2011
Site
0
200
Scale in Feet
SOURCE: Google Earth Pro, DigitalGlobe
Name
Site 18, PCB Spill Site
Location
Naval Base (NBK) Kitsap Bangor, Silverdale, Washington
Operable Unit (OU)
OU 7
Identified Contaminants
Polychlorinated biphenyls (PCBs) in soil
Short History
Site 18 is located within the Public Works Industrial Area of NBK Bangor. The site consists of an area underneath and north of Building 1016 and an area on the north side of the railroad tracks, south of Building 1201. From the 1940s until the 1970s electrical transformers were repaired at the electrical shop in Building 1016. Approximately 5 to 10 gallons of PCB-containing fluid was reportedly spilled on the ground at the northwest corner of Building 1016 in 1966 or 1967. It was also reported that PCB-containing fluid may have been disposed of along the railroad tracks near Building 1201. The entire area is now paved, and a small portion of the extension of Building 1016 may cover the spill area.
Investigations were conducted from 1991 to 1994. The OU 7 risk assessment concluded that conditions at Site 18 do not pose risks to human health or the environment. The OU 7 Record of Decision (ROD) declared that remedial action, land use controls, monitoring, and 5-year reviews were not required.
Current Actions
None


Naval Base Kitsap
Bangor
Site 26
Site
Data Sheet
Site
Hood Canal
Magnetic
Silencing
Facility
Floral Point
Cattail Lake
Beach
Hood Canal
Explosives
Handling
Wharf
Marginal Wharf
Delta Pier
Site 26
Devil's Hole
Beach
Keyport/Bangor Dock
Service Pier
Carlson Spit
0
3,000
Scale in Feet
SOURCE: Google Earth Pro, DigitalGlobe
Name
Site 26, Hood Canal Sediments
Location
Naval Base Kitsap (NBK) Bangor, Silverdale, Washington
Operable Unit (OU)
OU 7
Identified Contaminants
Volatile organic compounds (VOCs) petroleum hydrocarbons, polycyclic aromatic hydrocarbons (PAHs), metals, ordnance compounds, pesticides, and polychlorinated biphenyls (PCBs) in sediments and marine biota
Short History
Site 26, Hood Canal Sediments, consists of eight small areas along the western shore of the base where all the service piers are located. These areas are known as Cattail Lake Beach/Magnetic Silencing Facility, Floral Point, Explosives Handling Wharf, Marginal Wharf, Delta Pier, Devil's Hole Beach, Keyport/Bangor Dock, and Service Pier/Carlson Spit. Marginal Wharf was used for loading and offloading ammunition during World War II and again when conventional weapons were shipped to Vietnam from the late 1960s to 1973. The Keyport/Bangor small craft dock was built in 1951. Delta Pier, Service Pier, Explosives Handling Wharf, and Magnetic Silencing Facility were built in the early 1960s to support submarine base activities including sandblasting and repainting operations. Delta Pier, Service Pier, and Explosives Handling Wharf were built as self-contained piers that piped stormwater runoff through an oil/water separator. Diesel fueling was done at Service Pier.
Investigations were conducted from 1988 to 1994. The OU 7 Record of Decision (ROD) was executed in April 1996. The ROD specified two monitoring cycles of sediment and marine biota to be conducted within a 5-year time frame. Periodic sampling has been conducted throughout Site 26, with Washington State Department of Ecology-approved reductions in sampling requirements as warranted by the data. The last sampling event was conducted in 2004 as part of the remedy for Site B (Floral Point).
The second 5-year review (2005) concluded that the monitoring component of the remedy has functioned as intended and is complete, fulfilling all required monitoring at Site 26.
Current Actions
The next 5-year review is scheduled for 2010.


Naval Base Kitsap
Bangor
Site 30
Site
Data Sheet
NAVFAC
Name
Site 30, Railroad Tracks
Location
Naval Base Kitsap (NBK) Bangor, Silverdale, Washington
Operable Unit (OU)
OU 7
Identified Contaminants
Herbicides and pesticides in soil
Short History
Site 30 is a portion of the railroad tracks north of Trigger Avenue Gate and on the west side of Nautilus Avenue. The site includes the railroad tracks and a steep drainage ditch adjacent to the tracks. Site 30 was reportedly used from 1977 to 1985 for the disposal of rinsewater from a triple-rinsing process that used Nutra-sol to clean large tank sprayers and holding tanks of pesticides and herbicides. The quantity of materials disposed of at this site is unknown. The OU 7 risk assessment concluded that conditions at Site 30 do not pose risks to human health or the environment. The OU 7 Record of Decision (ROD) declared that remedial action, land use controls, monitoring, and 5-year reviews were not required.
Current Actions
None
Base Boundary
Site 30
Rail Line
Nautilus Ave
Southern Boundary Rd
Gate 4
Site
N
0
600
Scale in Feet
SOURCE: Google Earth Pro, DigitalGlobe

OU 8

OPERABLE UNIT 8 (OU 8)

Site 27	Bldg 1014 Steam Cleaning Pit
Site 28	Paint Shop Bldg 1032 Drainage Ditch
Site 29	Public Works Maintenance Garage
SS	Public Works Industrial Area Service Station

Area Data Sheet

Area
Operable Unit (OU) 8

Location
Naval Base Kitsap (NBK) Bangor, Silverdale, Washington

Operable Units
OU 8 includes Sites 27, 28, 29, the Public Works Industrial Area (PWIA) Service Station, and areas affected by groundwater contamination originating from these sites

Short History
OU 8 at NBK Bangor was established by authority of the SUBASE Federal Facility Agreement at the Remedial Project Manager's meeting on September 15, 1994. OU 8 includes Site 27 (Building 1014 Steam Cleaning Pit), Site 28 (Building 1032 Drainage Ditch), Site 29 (Public Works Maintenance Garage), the PWIA Service Station, and an associated plume of groundwater contamination that emanates from the PWIA and extends in a southeast direction toward the Mountain View residential neighborhood.

OU 8 encompasses the groundwater impacted with volatile organic compounds (VOCs) and petroleum, which has migrated off base, and petroleum-contaminated soil (PCS) from the depth of 15 feet below ground to groundwater. The petroleum impacts are limited to the vicinity of the service station within the PWIA, where a gasoline release from an underground storage tank (UST) was discovered in 1986. Free-phase gasoline was reported on the groundwater surface beneath the PWIA Service Station. PCS to a depth of 15 feet has been cleaned up using soil vapor extraction (SVE) under NBK Bangor's UST Program. Washington State Department of Ecology issued a No Further Action determination for these soils in March 2000.

An action memorandum was issued in December 1994 for a Voluntary Time-Critical Action at OU 8. Based on this memorandum, the Navy connected 23 residences in the Mountain View neighborhood, southeast of the

OU 8 (continued)

OPERABLE UNIT 8 (OU 8)

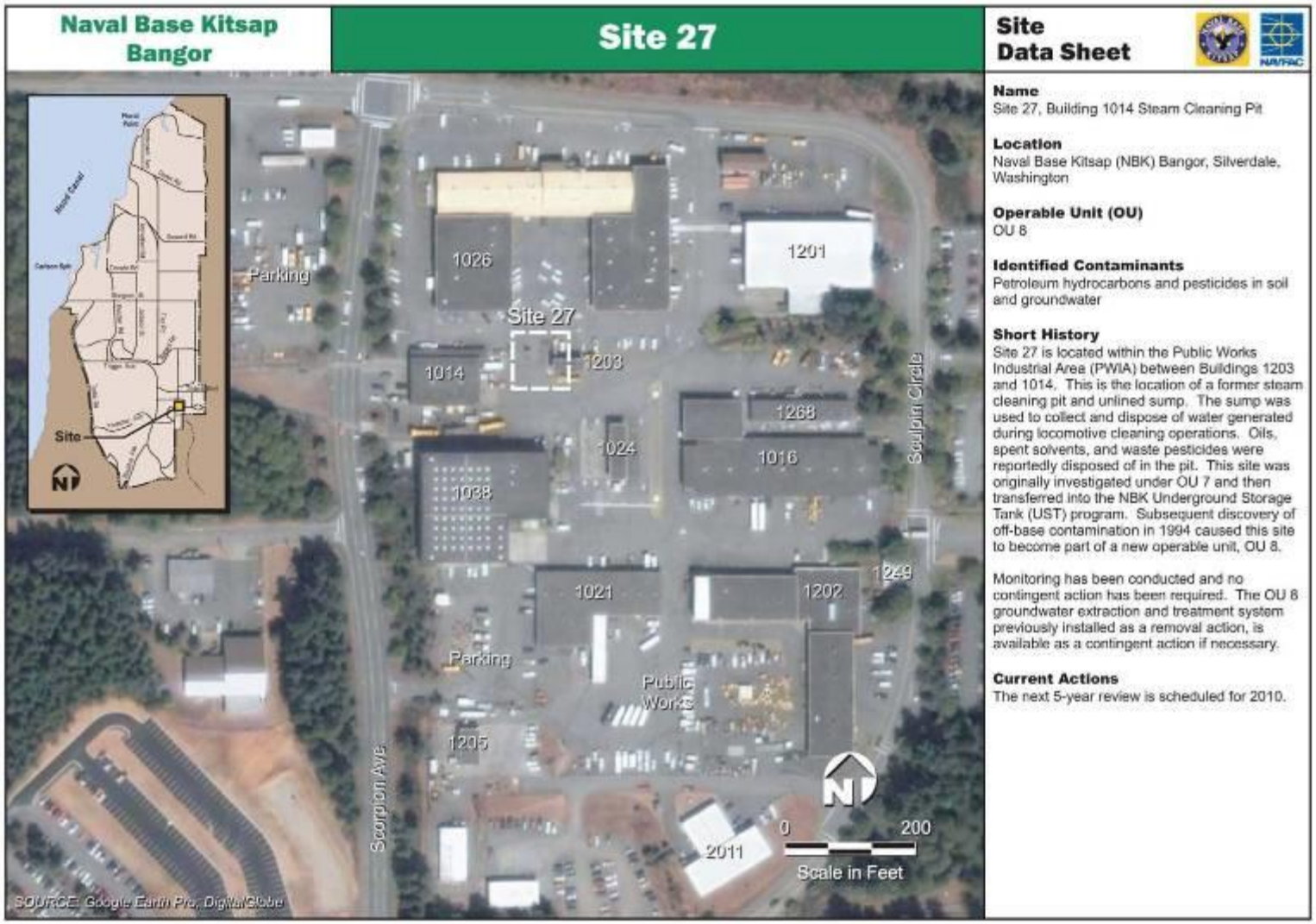
Site 27	Bldg 1014 Steam Cleaning Pit
Site 28	Paint Shop Bldg 1032 Drainage Ditch
Site 29	Public Works Maintenance Garage
SS	Public Works Industrial Area Service Station

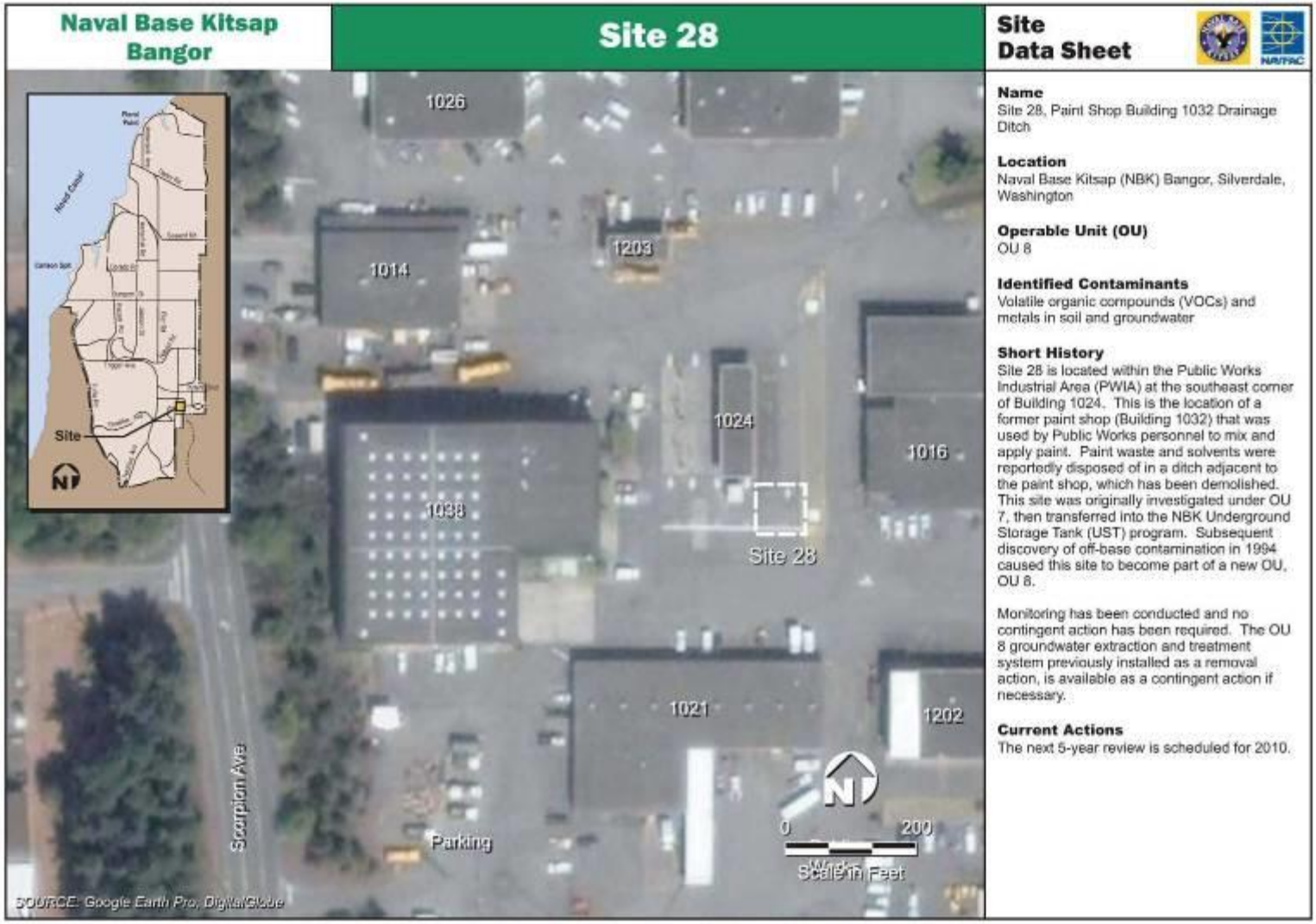
Area Data Sheet

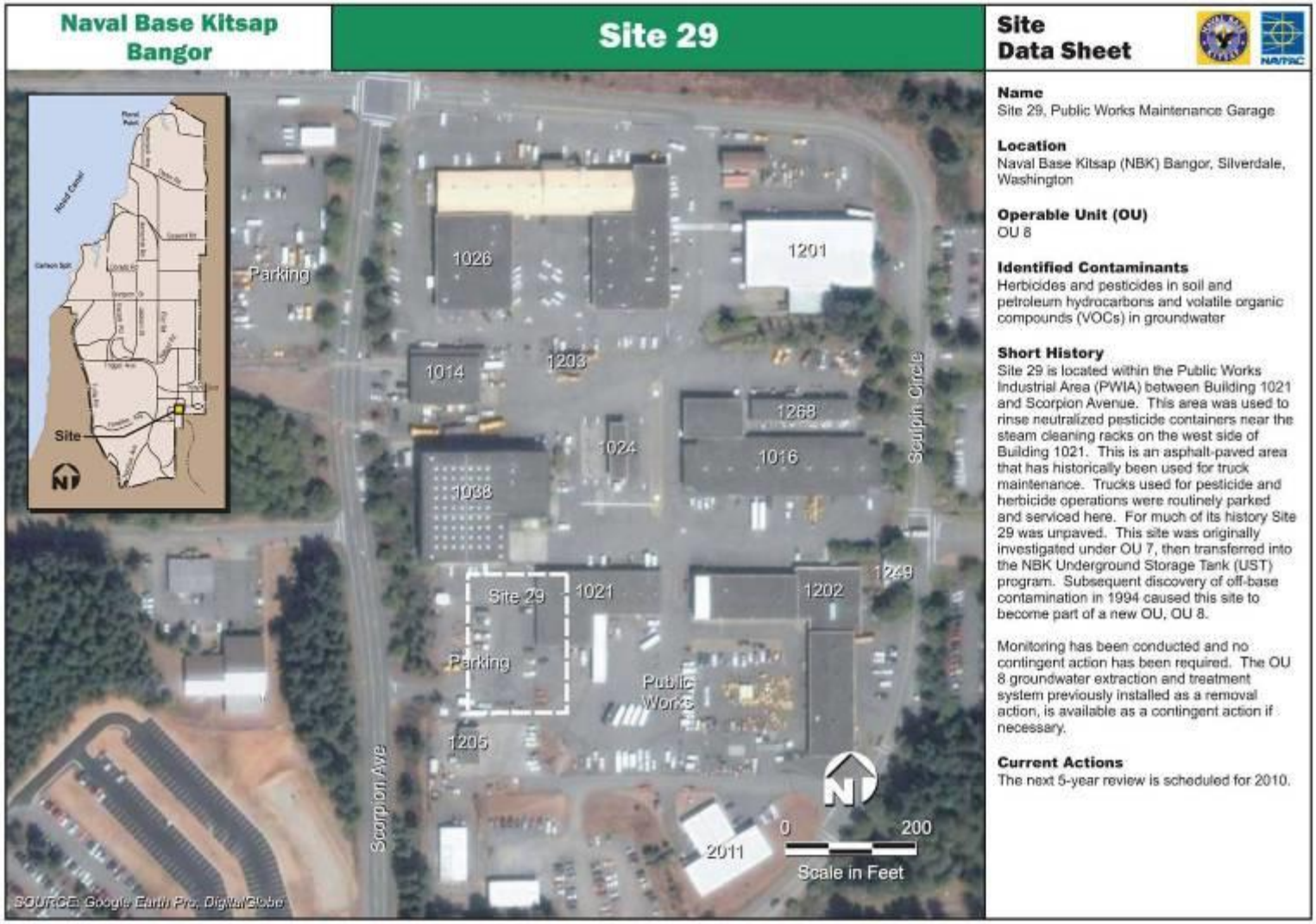
Short History (continued)

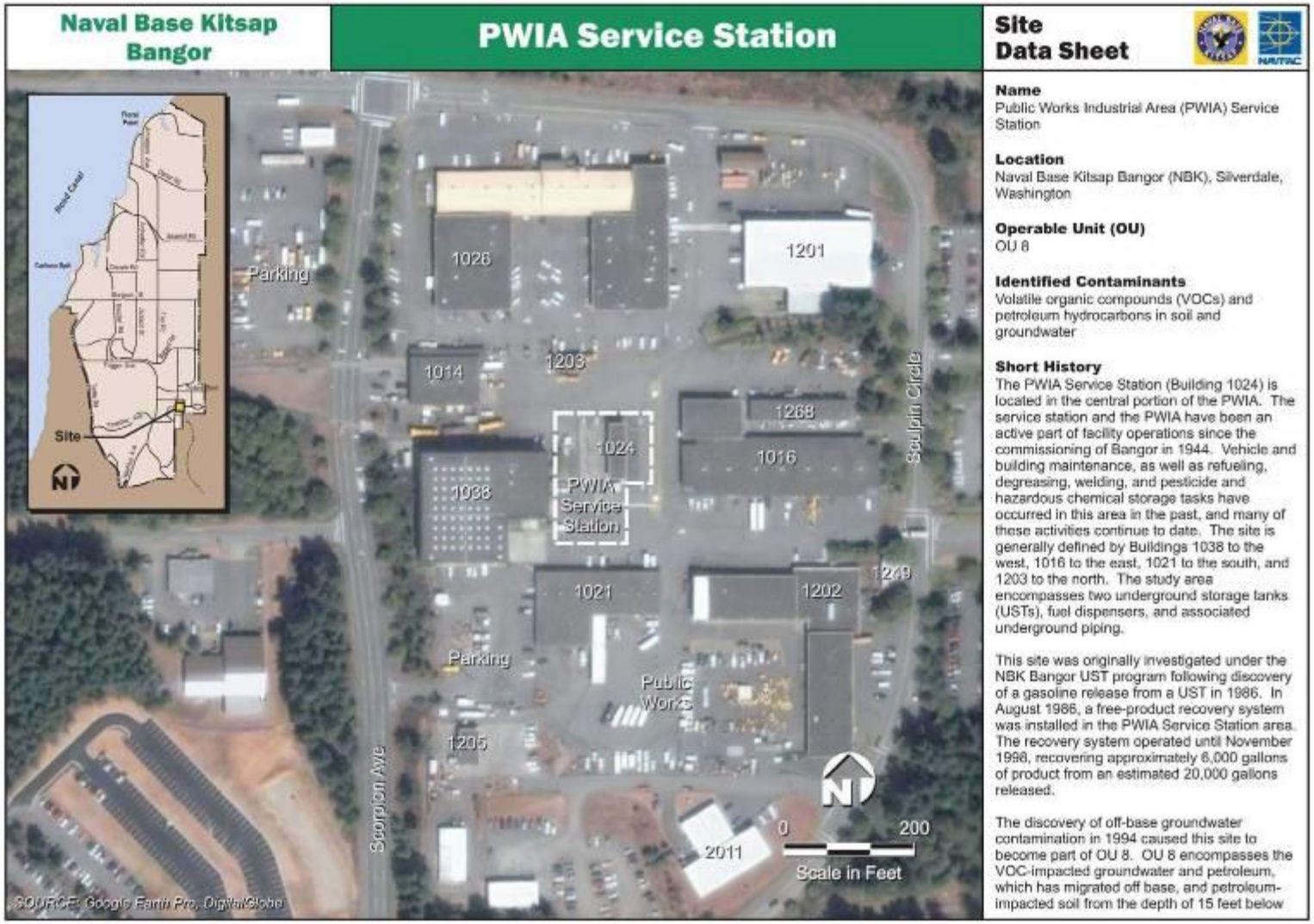
base boundary, to the Silverdale Water District in 1995, a municipal water supply. A second Time-Critical Action Memorandum was issued in February 1996. Based on this memorandum, the Navy installed a groundwater containment system to minimize off-base plume migration in 1996. The Record of Decision (ROD) for OU 8 was executed in September 2000. The preferred cleanup alternative includes a combination of three technologies: monitored natural attenuation (MNA) of contaminants in groundwater, free-product recovery, and land use controls.

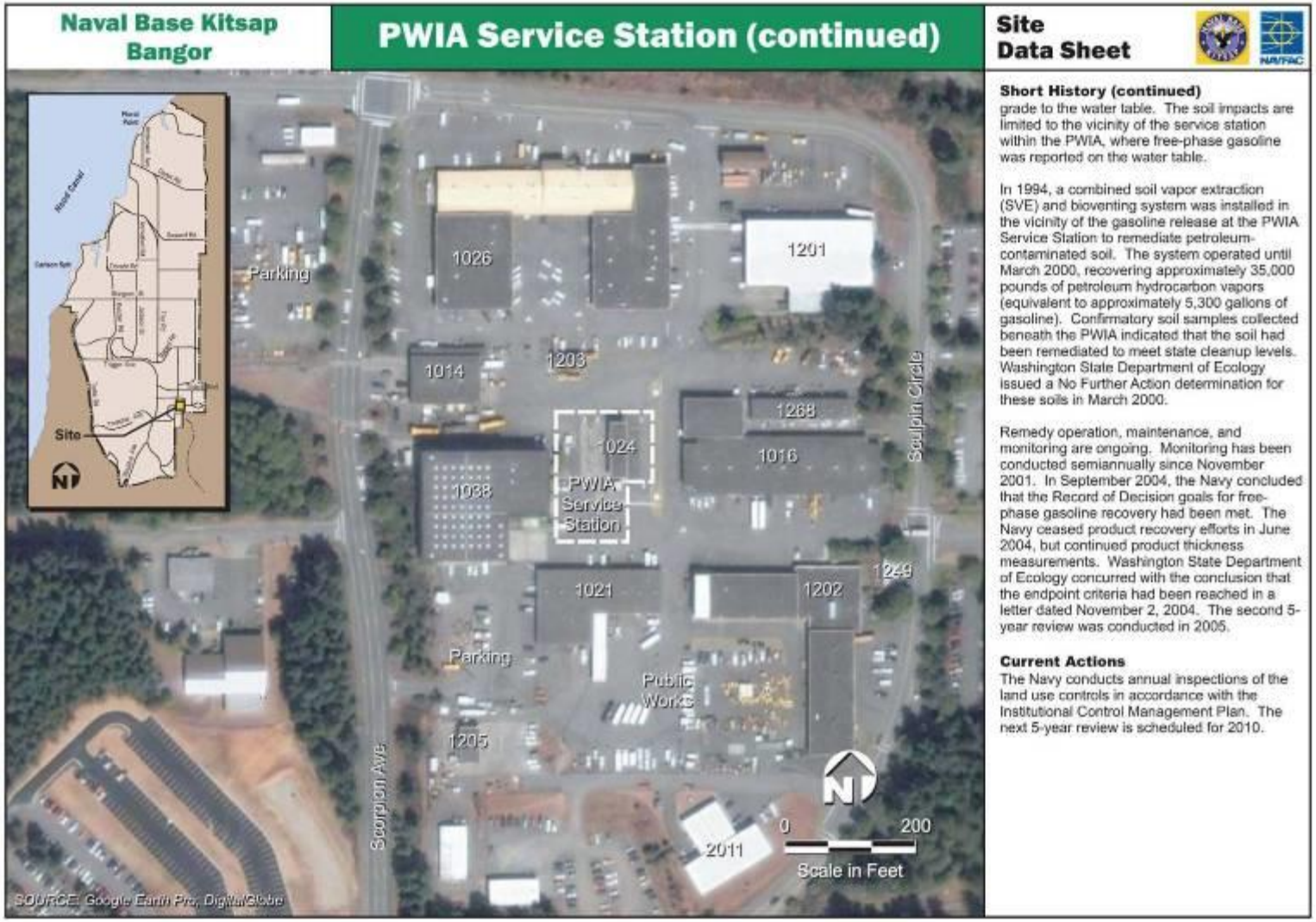
Remedy operation, maintenance, and monitoring are ongoing. MNA monitoring has been conducted semiannually since November 2001. In September 2004, the Navy concluded that the ROD goals for product recovery had been met. The Navy ceased product recovery efforts in June 2004, but continued product thickness measurements. Washington State Department of Ecology concurred with the conclusion that the endpoint criteria had been reached in a letter dated November 2, 2004. The Navy has conducted annual inspections of the land use controls. The second 5-year review was conducted in 2005. The next 5-year review is scheduled for 2010.


Naval Base Kitsap
Bangor
Site 27
Site
Data Sheet
Name
Site 27, Building 1014 Steam Cleaning Pit
Location
Naval Base Kitsap (NBK) Bangor, Silverdale, Washington
Operable Unit (OU)
OU 8
Identified Contaminants
Petroleum hydrocarbons and pesticides in soil and groundwater
Short History
Site 27 is located within the Public Works Industrial Area (PWIA) between Buildings 1203 and 1014. This is the location of a former steam cleaning pit and unlined sump. The sump was used to collect and dispose of water generated during locomotive cleaning operations. Oils, spent solvents, and waste pesticides were reportedly disposed of in the pit. This site was originally investigated under OU 7 and then transferred into the NBK Underground Storage Tank (UST) program. Subsequent discovery of off-base contamination in 1994 caused this site to become part of a new operable unit, OU 8.
Monitoring has been conducted and no contingent action has been required. The OU 8 groundwater extraction and treatment system previously installed as a removal action, is available as a contingent action if necessary.
Current Actions
The next 5-year review is scheduled for 2010.
Site
Parking
1026
1201
Site 27
1014
1203
1268
1024
1016
Sculpin Circle
1038
1021
1202
1249
Parking
Public Works
1205
Scorpion Ave
2011
0
200
Scale in Feet
SOURCE: Google Earth Pro, DigitalGlobe


Naval Base Kitsap
Bangor
Site 28
Site
Data Sheet
NAVFAC
Name
Site 28, Paint Shop Building 1032 Drainage Ditch
Location
Naval Base Kitsap (NBK) Bangor, Silverdale, Washington
Operable Unit (OU)
OU 8
Identified Contaminants
Volatile organic compounds (VOCs) and metals in soil and groundwater
Short History
Site 28 is located within the Public Works Industrial Area (PWIA) at the southeast corner of Building 1024. This is the location of a former paint shop (Building 1032) that was used by Public Works personnel to mix and apply paint. Paint waste and solvents were reportedly disposed of in a ditch adjacent to the paint shop, which has been demolished. This site was originally investigated under OU 7, then transferred into the NBK Underground Storage Tank (UST) program. Subsequent discovery of off-base contamination in 1994 caused this site to become part of a new OU, OU 8.
Monitoring has been conducted and no contingent action has been required. The OU 8 groundwater extraction and treatment system previously installed as a removal action, is available as a contingent action if necessary.
Current Actions
The next 5-year review is scheduled for 2010.
1026
1014
1203
1024
1016
1038
Site 28
1021
1202
Scorpion Ave
Parking
Site
0
200
Scale in Feet
SOURCE: Google Earth Pro, DigitalGlobe


Naval Base Kitsap
Bangor
Site 29
Site
Data Sheet
NAVFAC
Name
Site 29, Public Works Maintenance Garage
Location
Naval Base Kitsap (NBK) Bangor, Silverdale, Washington
Operable Unit (OU)
OU 8
Identified Contaminants
Herbicides and pesticides in soil and petroleum hydrocarbons and volatile organic compounds (VOCs) in groundwater
Short History
Site 29 is located within the Public Works Industrial Area (PWIA) between Building 1021 and Scorpion Avenue. This area was used to rinse neutralized pesticide containers near the steam cleaning racks on the west side of Building 1021. This is an asphalt-paved area that has historically been used for truck maintenance. Trucks used for pesticide and herbicide operations were routinely parked and serviced here. For much of its history Site 29 was unpaved. This site was originally investigated under OU 7, then transferred into the NBK Underground Storage Tank (UST) program. Subsequent discovery of off-base contamination in 1994 caused this site to become part of a new OU, OU 8.
Monitoring has been conducted and no contingent action has been required. The OU 8 groundwater extraction and treatment system previously installed as a removal action, is available as a contingent action if necessary.
Current Actions
The next 5-year review is scheduled for 2010.
Site
Parking
1026
1201
1014
1203
1268
1024
1016
1038
Site 29
1021
1202
1249
Parking
Public Works
1205
2011
Scorpion Ave
Sculpin Circle
0
200
Scale in Feet
SOURCE: Google Earth Pro, DigitalGlobe


Naval Base Kitsap
Bangor
PWIA Service Station
Site
Data Sheet
Name
Public Works Industrial Area (PWIA) Service Station
Location
Naval Base Kitsap Bangor (NBK), Silverdale, Washington
Operable Unit (OU)
OU 8
Identified Contaminants
Volatile organic compounds (VOCs) and petroleum hydrocarbons in soil and groundwater
Short History
The PWIA Service Station (Building 1024) is located in the central portion of the PWIA. The service station and the PWIA have been an active part of facility operations since the commissioning of Bangor in 1944. Vehicle and building maintenance, as well as refueling, degreasing, welding, and pesticide and hazardous chemical storage tasks have occurred in this area in the past, and many of these activities continue to date. The site is generally defined by Buildings 1038 to the west, 1016 to the east, 1021 to the south, and 1203 to the north. The study area encompasses two underground storage tanks (USTs), fuel dispensers, and associated underground piping.
This site was originally investigated under the NBK Bangor UST program following discovery of a gasoline release from a UST in 1986. In August 1986, a free-product recovery system was installed in the PWIA Service Station area. The recovery system operated until November 1998, recovering approximately 6,000 gallons of product from an estimated 20,000 gallons released.
The discovery of off-base groundwater contamination in 1994 caused this site to become part of OU 8. OU 8 encompasses the VOC-impacted groundwater and petroleum, which has migrated off base, and petroleum-impacted soil from the depth of 15 feet below
Site
Parking
1026
1201
1014
1203
1268
1024
1016
1038
PWIA Service Station
Sculpin Circle
1021
1202
1249
Parking
Public Works
1205
Scorpion Ave
2011
0
200
Scale in Feet
SOURCE: Google Earth Pro, DigitalGlobe


Naval Base Kitsap
Bangor
PWIA Service Station (continued)
Site
Data Sheet
NAVFAC
Short History (continued)
grade to the water table. The soil impacts are limited to the vicinity of the service station within the PWIA, where free-phase gasoline was reported on the water table.
In 1994, a combined soil vapor extraction (SVE) and bioventing system was installed in the vicinity of the gasoline release at the PWIA Service Station to remediate petroleum-contaminated soil. The system operated until March 2000, recovering approximately 35,000 pounds of petroleum hydrocarbon vapors (equivalent to approximately 5,300 gallons of gasoline). Confirmatory soil samples collected beneath the PWIA indicated that the soil had been remediated to meet state cleanup levels. Washington State Department of Ecology issued a No Further Action determination for these soils in March 2000.
Remedy operation, maintenance, and monitoring are ongoing. Monitoring has been conducted semiannually since November 2001. In September 2004, the Navy concluded that the Record of Decision goals for free-phase gasoline recovery had been met. The Navy ceased product recovery efforts in June 2004, but continued product thickness measurements. Washington State Department of Ecology concurred with the conclusion that the endpoint criteria had been reached in a letter dated November 2, 2004. The second 5-year review was conducted in 2005.
Current Actions
The Navy conducts annual inspections of the land use controls in accordance with the Institutional Control Management Plan. The next 5-year review is scheduled for 2010.
Site
Parking
1026
1201
1014
1203
1268
1024
1016
1038
PWIA Service Station
Sculpin Circle
1249
1021
1202
Parking
Public Works
1205
Scorpion Ave
2011
0
200
Scale in Feet
SOURCE: Google Earth Pro, DigitalGlobe


Naval Base Kitsap
Bangor
EO 300
Site
Data Sheet
Nautilus Avenue
Site
Small Arms
Ranges
EO 300
Pistol Range 1
Pistol Range 2
Trap Range
South Boundary Road
0
400
Scale in Feet
SOURCE: Google Earth Pro, DigitalGlobe
Name
EO 300, Small Arms Ranges
Location
Naval Base Kitsap (NBK) Bangor, Silverdale, Washington
Operable Unit
Not Applicable
Identified Contaminants
Lead in soil
Short History
The Small Arms Ranges consist of two pistol ranges and one trap range that were constructed in the late 1940s. Only small caliber ammunition was used at the ranges. Following the closure of the ranges in the late 1970s, the area was used for an archery range. The ranges are currently unused.
In 1995, lead concentrations in soil were detected in excess of state cleanup levels. In 2006, the Navy completed a preliminary assessment of the Small Arms Ranges. This assessment reported no evidence of munitions and explosives of concern (MEC) during a site visit and concluded that this site is not suspected to contain MEC. The assessment also concluded that complete exposure pathways exist for human and ecological receptors for munitions constituents (MC) in surface soil and potentially complete pathways exist for subsurface soil and groundwater.
Project plans for field sampling were completed in September 2007. Field sampling was conducted in December 2007.
Current Actions
Project plans are being developed for a removal action that is scheduled for 2009.

NAVBASE Kitsap at Keyport
Installation Restoration Sites

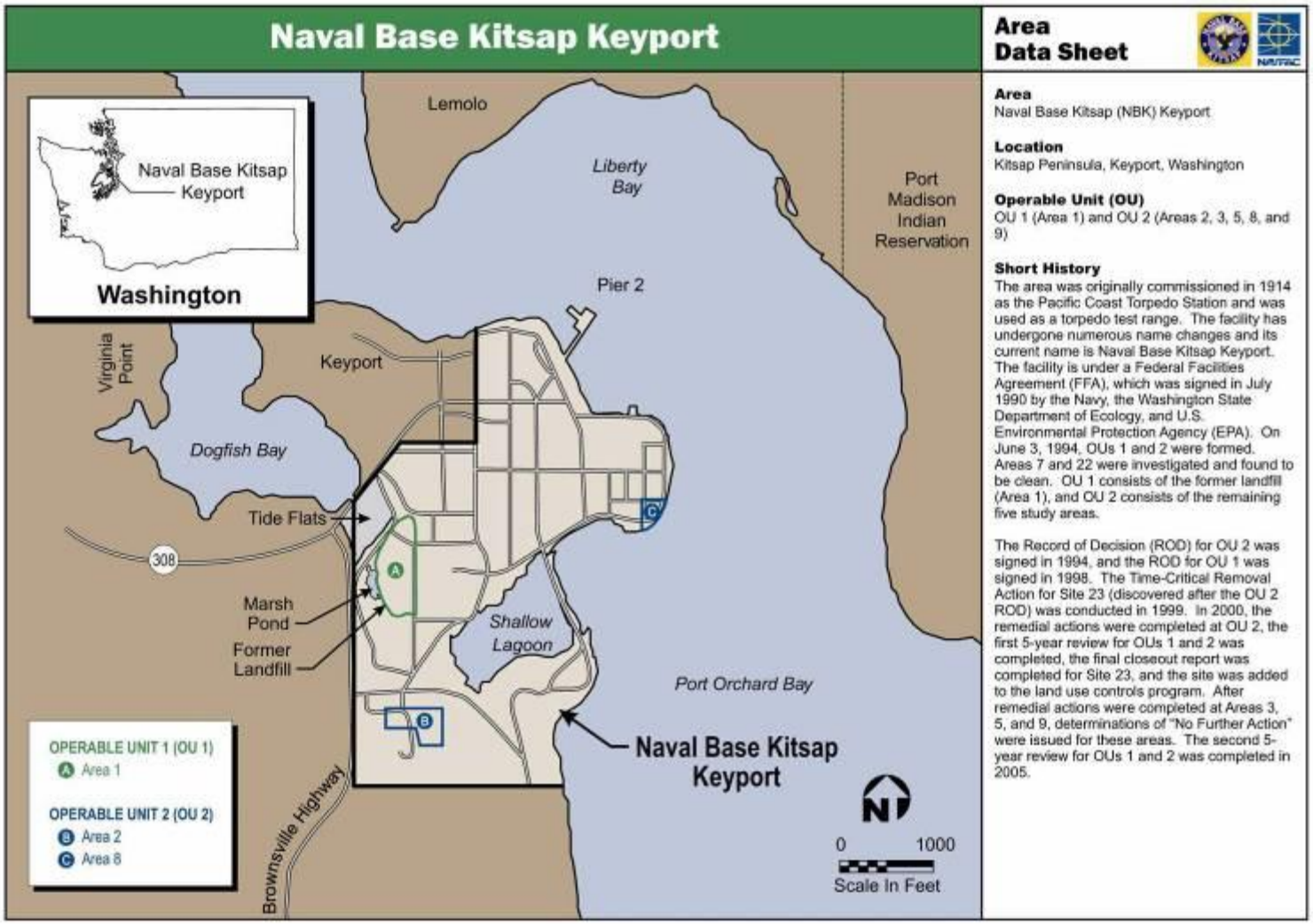
Naval Base Kitsap Keyport

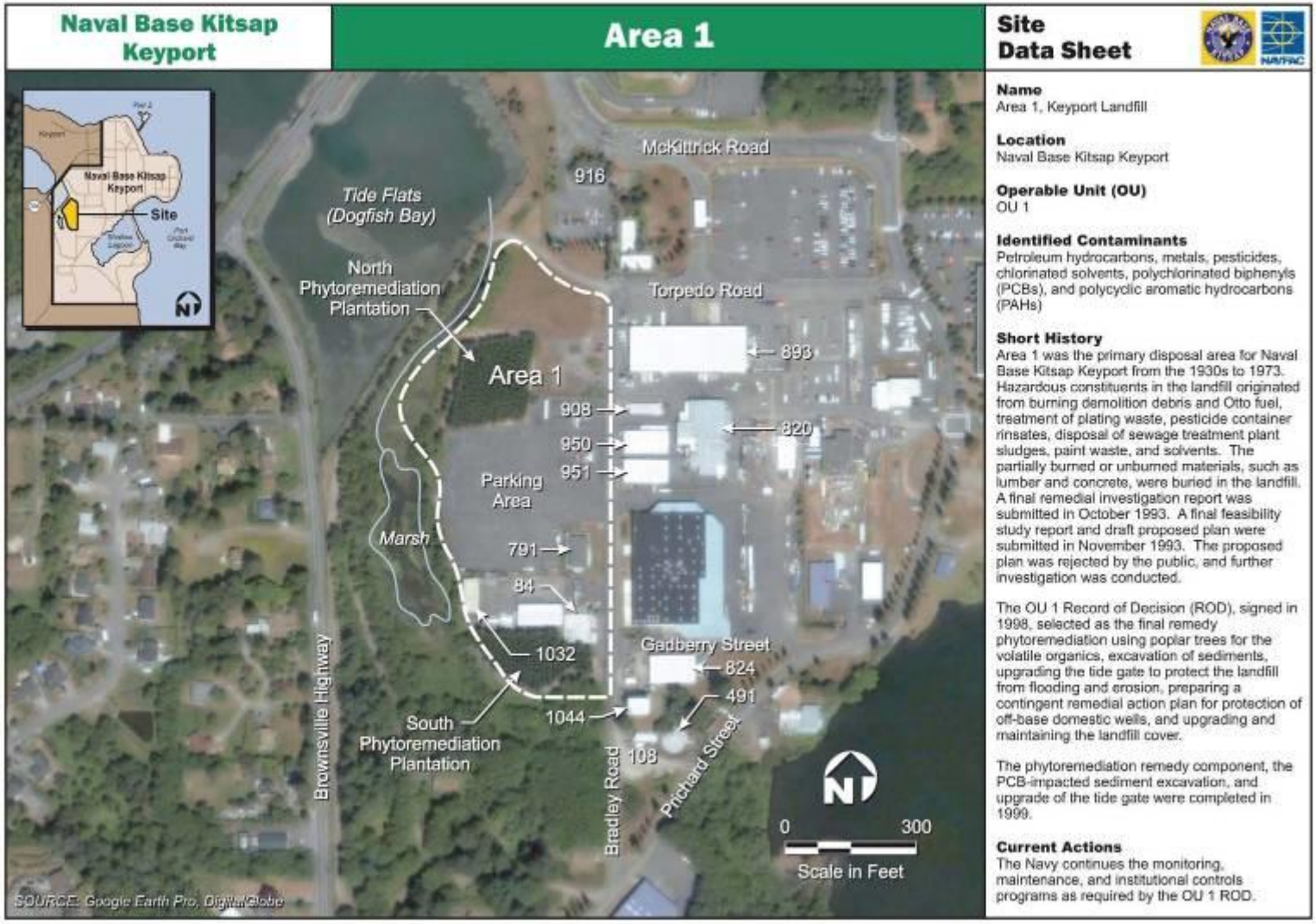
Naval Base Description

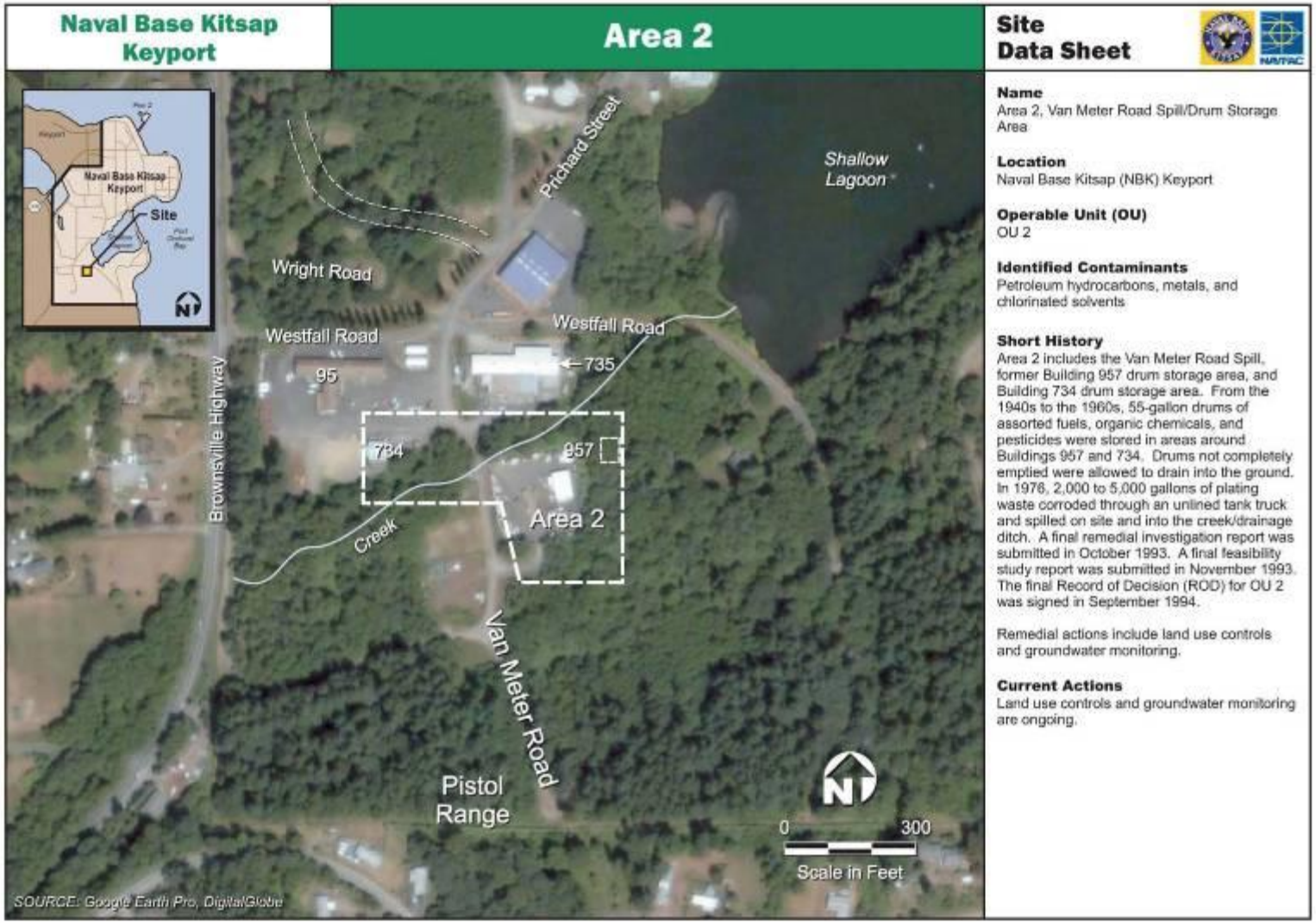
Naval Base Kitsap (NBK) Keyport consists of approximately 340 acres on the Kitsap Peninsula in the north-central portion of Puget Sound, approximately 5.5 miles northeast of Silverdale, Washington. The mission of Naval Base Kitsap Keyport is to provide testing and evaluation; in-service engineering, maintenance, and repair; fleet readiness; and industrial-base support for undersea warfare systems, countermeasures, and sonar systems.

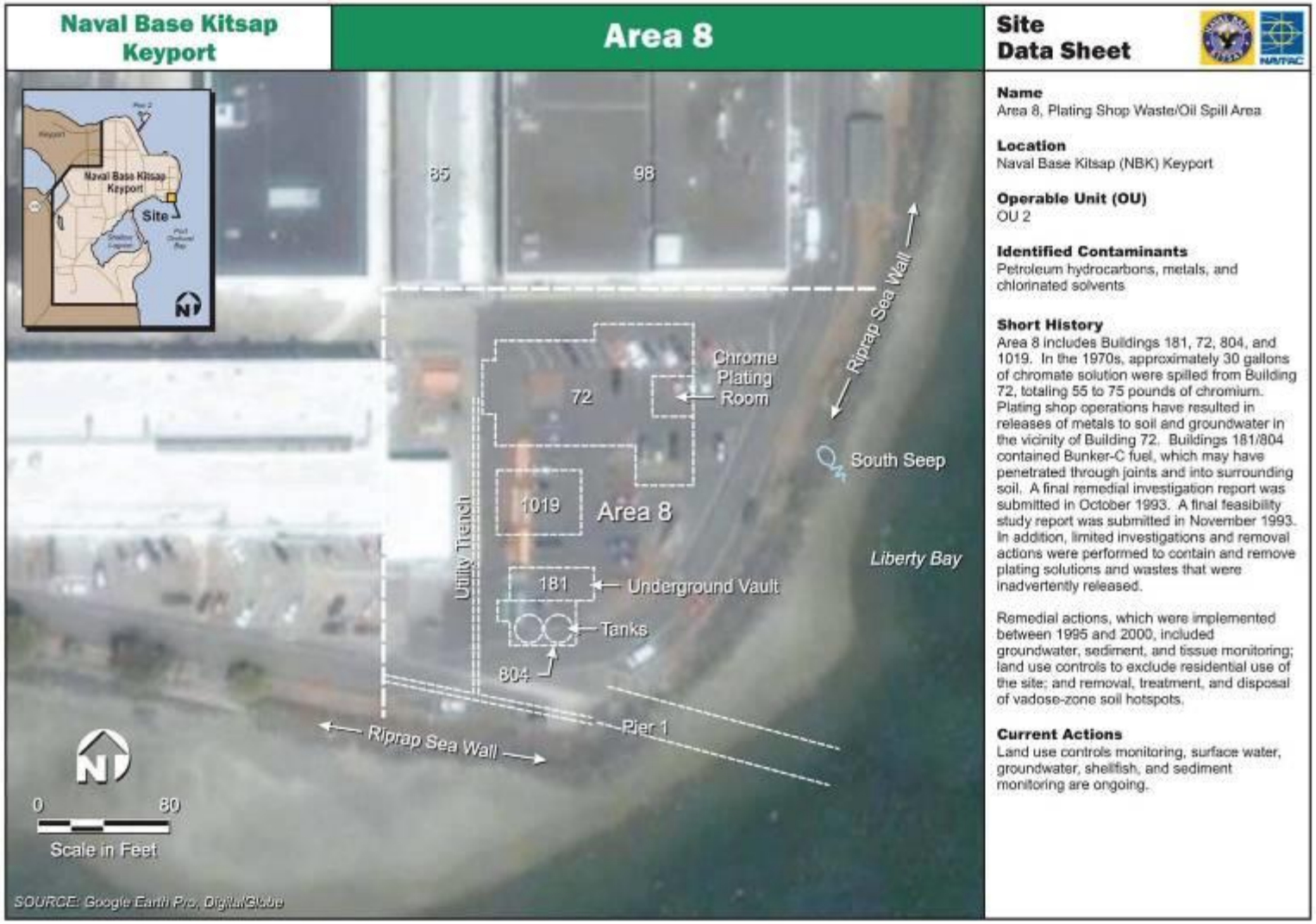
The following is a list of historical events at Naval Base Kitsap Keyport from 1913 to the present:

- The Navy acquired Naval Base Kitsap Keyport property in 1913. The property was commissioned in 1914 as the Pacific Coast Torpedo Station and the first building was constructed in 1915.
- The largest facility expansion occurred during World War II. Activities included torpedo production, proofing, and overhaul.
- In 1963, a new torpedo shop was constructed and the facility name was changed to Naval Torpedo Station Keyport.
- In 1978, the name of the facility was changed from Naval Torpedo Station Keyport to Naval Undersea Warfare Engineering Station (NUWES) Keyport. The name was subsequently changed to Naval Undersea Warfare Center (NUWC) in January 1992.
- In 1984, the initial assessment study (IAS) conducted by SCS Engineers identified past waste disposal and spill sites at NUWC Division, Keyport.
- In 1987, the current situation report completed by SCS Engineers verified contamination at the waste disposal and spill sites.
- In May 1988, the entire Keyport Station was proposed by the U.S. Environmental Protection Agency (EPA) for inclusion on the National Priorities List (NPL), and in October 1989, Keyport was placed on the NPL.
- Initial remedial investigations (RIs) started in 1988. The RI and feasibility study (FS) was started in 1990 and completed in November 1993.
- In July 1990, a Federal Facilities Agreement (FFA) was signed by the Navy, EPA, and Washington State Department of Ecology.
- On June 3, 1994, Operable Units (OUs) 1 and 2 were formed. The final Record of Decision (ROD) for OU 2 was signed in September 1994. OU 1 consists of Area 1 (the former base landfill), and OU 2 consists of the remaining areas of concern (Areas 2, 3, 5, 8, and 9). Areas 7 and 22 were investigated and found to be clean.
- In March 1996, the ROD for OU 2 was modified by an Explanation of Significant Differences (ESD).
- The ROD for OU 1 was signed in September 1998.
- In 1999, the Time-Critical Removal Action was conducted for Site 23, which was discovered post-OU 2 ROD.
- In 2000, the remedial actions were completed at OU 2, and the first 5-year review for OU 1 and OU 2 was completed. The final closeout report was completed for Site 23, and the site was added to the institutional controls (ICs) program.
- After remedial actions were completed at Areas 3, 5, and 9, determinations of "No Further Action" were issued for these areas.
- Phytoremediation and monitoring is ongoing at Area 1. Monitoring is ongoing at Areas 1, 2, and 8.
- In 2005, the second 5-year review for OUs 1 and 2 was completed.


Naval Base Kitsap Keyport
Area
Data Sheet
Area
Naval Base Kitsap (NBK) Keyport
Location
Kitsap Peninsula, Keyport, Washington
Operable Unit (OU)
OU 1 (Area 1) and OU 2 (Areas 2, 3, 5, 8, and 9)
Short History
The area was originally commissioned in 1914 as the Pacific Coast Torpedo Station and was used as a torpedo test range. The facility has undergone numerous name changes and its current name is Naval Base Kitsap Keyport. The facility is under a Federal Facilities Agreement (FFA), which was signed in July 1990 by the Navy, the Washington State Department of Ecology, and U.S. Environmental Protection Agency (EPA). On June 3, 1994, OUs 1 and 2 were formed. Areas 7 and 22 were investigated and found to be clean. OU 1 consists of the former landfill (Area 1), and OU 2 consists of the remaining five study areas.
The Record of Decision (ROD) for OU 2 was signed in 1994, and the ROD for OU 1 was signed in 1998. The Time-Critical Removal Action for Site 23 (discovered after the OU 2 ROD) was conducted in 1999. In 2000, the remedial actions were completed at OU 2, the first 5-year review for OUs 1 and 2 was completed, the final closeout report was completed for Site 23, and the site was added to the land use controls program. After remedial actions were completed at Areas 3, 5, and 9, determinations of "No Further Action" were issued for these areas. The second 5-year review for OUs 1 and 2 was completed in 2005.
Naval Base Kitsap Keyport
Washington
Lemolo
Liberty Bay
Port Madison Indian Reservation
Pier 2
Keyport
Virginia Point
Dogfish Bay
Tide Flats
308
Marsh Pond
Former Landfill
Shallow Lagoon
Port Orchard Bay
Naval Base Kitsap Keyport
Brownsville Highway
OPERABLE UNIT 1 (OU 1)
A Area 1
OPERABLE UNIT 2 (OU 2)
B Area 2
C Area 8
0
1000
Scale In Feet


Naval Base Kitsap Keyport
Area 1
Site Data Sheet
Name
Area 1, Keyport Landfill
Location
Naval Base Kitsap Keyport
Operable Unit (OU)
OU 1
Identified Contaminants
Petroleum hydrocarbons, metals, pesticides, chlorinated solvents, polychlorinated biphenyls (PCBs), and polycyclic aromatic hydrocarbons (PAHs)
Short History
Area 1 was the primary disposal area for Naval Base Kitsap Keyport from the 1930s to 1973. Hazardous constituents in the landfill originated from burning demolition debris and Otto fuel, treatment of plating waste, pesticide container rinsates, disposal of sewage treatment plant sludges, paint waste, and solvents. The partially burned or unburned materials, such as lumber and concrete, were buried in the landfill. A final remedial investigation report was submitted in October 1993. A final feasibility study report and draft proposed plan were submitted in November 1993. The proposed plan was rejected by the public, and further investigation was conducted.
The OU 1 Record of Decision (ROD), signed in 1998, selected as the final remedy phytoremediation using poplar trees for the volatile organics, excavation of sediments, upgrading the tide gate to protect the landfill from flooding and erosion, preparing a contingent remedial action plan for protection of off-base domestic wells, and upgrading and maintaining the landfill cover.
The phytoremediation remedy component, the PCB-impacted sediment excavation, and upgrade of the tide gate were completed in 1999.
Current Actions
The Navy continues the monitoring, maintenance, and institutional controls programs as required by the OU 1 ROD.
Naval Base Kitsap Keyport
Site
McKittrick Road
916
Tide Flats (Dogfish Bay)
North Phytoremediation Plantation
Torpedo Road
893
Area 1
908
820
950
951
Parking Area
Marsh
791
84
1032
Gaudberry Street
824
491
1044
South Phytoremediation Plantation
108
Brownsville Highway
Bradley Road
Pritchard Street
0
300
Scale in Feet
SOURCE: Google Earth Pro, DigitalGlobe


Naval Base Kitsap
Keyport
Area 2
Site
Data Sheet
Name
Area 2, Van Meter Road Spill/Drum Storage Area
Location
Naval Base Kitsap (NBK) Keyport
Operable Unit (OU)
OU 2
Identified Contaminants
Petroleum hydrocarbons, metals, and chlorinated solvents
Short History
Area 2 includes the Van Meter Road Spill, former Building 957 drum storage area, and Building 734 drum storage area. From the 1940s to the 1960s, 55-gallon drums of assorted fuels, organic chemicals, and pesticides were stored in areas around Buildings 957 and 734. Drums not completely emptied were allowed to drain into the ground. In 1976, 2,000 to 5,000 gallons of plating waste corroded through an unlined tank truck and spilled on site and into the creek/drainage ditch. A final remedial investigation report was submitted in October 1993. A final feasibility study report was submitted in November 1993. The final Record of Decision (ROD) for OU 2 was signed in September 1994.
Remedial actions include land use controls and groundwater monitoring.
Current Actions
Land use controls and groundwater monitoring are ongoing.
Naval Base Kitsap Keyport
Site
Prichard Street
Shallow Lagoon
Wright Road
Westfall Road
Westfall Road
95
735
734
957
Area 2
Brownsville Highway
Creek
Van Meter Road
Pistol Range
0
300
Scale in Feet
SOURCE: Google Earth Pro, DigitalGlobe


Naval Base Kitsap
Keyport
Area 8
Site
Data Sheet
Name
Area 8, Plating Shop Waste/Oil Spill Area
Location
Naval Base Kitsap (NBK) Keyport
Operable Unit (OU)
OU 2
Identified Contaminants
Petroleum hydrocarbons, metals, and chlorinated solvents
Short History
Area 8 includes Buildings 181, 72, 804, and 1019. In the 1970s, approximately 30 gallons of chromate solution were spilled from Building 72, totaling 55 to 75 pounds of chromium. Plating shop operations have resulted in releases of metals to soil and groundwater in the vicinity of Building 72. Buildings 181/804 contained Bunker-C fuel, which may have penetrated through joints and into surrounding soil. A final remedial investigation report was submitted in October 1993. A final feasibility study report was submitted in November 1993. In addition, limited investigations and removal actions were performed to contain and remove plating solutions and wastes that were inadvertently released.
Remedial actions, which were implemented between 1995 and 2000, included groundwater, sediment, and tissue monitoring; land use controls to exclude residential use of the site; and removal, treatment, and disposal of vadose-zone soil hotspots.
Current Actions
Land use controls monitoring, surface water, groundwater, shellfish, and sediment monitoring are ongoing.
Naval Base Kitsap Keyport
Site
85
98
72
Chrome Plating Room
Riprap Sea Wall
South Seep
1019
Area 8
Utility Trench
Liberty Bay
181
Underground Vault
Tanks
804
Pier 1
Riprap Sea Wall
0
80
Scale in Feet
SOURCE: Google Earth Pro, DigitalGlobe

This Page Intentionally Left Blank

NAVBASE Kitsap Jackson Park
Installation Restoration Sites

Jackson Park Housing Complex/Naval Hospital Bremerton

Naval Base Description

Jackson Park Housing Complex (JPHC)/Naval Hospital Bremerton (NHB) consists of 300 acres and is located in the central portion of the Kitsap Peninsula, approximately 2 miles northwest of Bremerton, Washington. A chronological history of the site is as follows:

- In 1904, JPHC/NHB site is established as the former Naval Magazine Puget Sound.
- From 1908 to 1914, the magazine operated as a naval ammunition storage facility.
- During World War I, operations expanded to include ordnance manufacturing and processing, projectile loading and cleaning, and ordnance demilitarization.
- In 1916, Naval Magazine Puget Sound was commissioned as the U.S. Naval Ammunition Depot (NAD) Puget Sound.
- During World War II, ordnance production was increased for military support.
- In 1948, the command of NAD Puget Sound changed during the development of NAD Bangor and Naval Torpedo Station Keyport. During this time, NAD Puget Sound was reauthorized as Bremerton Annex.
- In 1959, NAD Bangor assumed command of the Bremerton Annex. The annex was decommissioned and placed on caretaker status.
- From 1965 to 1975, a portion of the property was converted to military housing and renamed the Jackson Park Housing Complex.
- In 1981, a gas station was added to the Navy Exchange (NEX) convenience store located within the JPHC.
- In 1983, a preliminary assessment (PA) was conducted.
- In 1992, the Washington State Department of Ecology issued an Enforcement Order.
- In 1993, a site inspection (SI) was conducted.
- In 1994, JPHC/NHB was placed on National Priorities List (NPL).
- In 1995, the site was divided into OU 1 (terrestrial environment) and OU 2 (marine environment).
- In 1996, the OU 1 remedial investigation (RI) was completed.
- In 1998, the OU 1 feasibility study (FS) was completed.
- From 1997 to 1999, OU 1 post-FS investigations were conducted.
- In 2000, the OU 1 Record of Decision (ROD) was issued.
- In 2000, remedial action construction was initiated at OU 1. OU 3 was added to address abandoned ordnance in the terrestrial (OU 3-T) and marine environments (OU 3-M).
- In 2002, remedial action construction was completed and a draft closeout report for OU 1 was issued.
- In 2003, a PA/SI was completed for OU 3 and the Phase I RI for OU 3-T JPHC begins.
- From 2004 to 2005, the Phase I RI for OU 3-T was continued.
- In 2006, Phase II OU 3-T and OU 3-M work was initiated.
- In 2007, Phase II RI field work is completed at OU 3-T at JPHC and the RI work for OU 3-T at NHB was initiated. Work at OU 3-M continued.
- In 2008, RI work at OU 3-T NHB continues and work at OU 3-M continues.


Jackson Park Housing Complex
Area Data Sheet
Jackson Park Housing Complex
Washington
OPERABLE UNIT 1 (OU 1)
A Site 101 – Industrial Area
B Site 101A – Underground Storage Tank Site
C Site 103 – Elwood Point
D Site 110 – Upland Area
E Benzene Release Area
OPERABLE UNIT 2 (OU 2)
F Marine Environment
OPERABLE UNIT 3 (OU 3)
G OU 3-Terrestrial (T)
H OU 3-Marine (M)
Erlands Point
Navy Hospital
Fishing Pier
Elwood Point
Elwood Pt Rd
Dowell Rd
Pier 2
Ostrich Bay
Former Oil Pier
Madrona Point
Jackson Park Housing Complex
0
1,500
Scale in Feet
SOURCE: Google Earth Pro, DigitalGlobe
Area
Jackson Park Housing Complex (JPHC)
Location
Bremerton, Washington
Operable Units (OUs)
OUs 1, 2, and 3
Short History
JPHC was established in 1904 as Naval Magazine Puget Sound. The magazine operated as a naval ammunition storage facility from 1908 to 1914. It was commissioned as Naval Ammunition Depot (NAD) Puget Sound in 1916. Operations were increased to provide military support during World War II. During this time, the primary role was shifted to ordnance demilitarization. During 1948, the command of NAD changed during development of NAD Bangor (now Naval Base Kitsap Bangor) and Naval Torpedo Station Keyport (now Naval Base Kitsap Keyport). During 1959, the NAD was decommissioned. The site was converted to a military residential complex over time beginning in the 1960s. JPHC includes Naval Hospital Bremerton (NHB). JPHC was placed on the national Priorities List (NPL) in 1994. The site was divided into OU 1 (Terrestrial) and OU 2 (Marine). A benzene release area was identified in 1996. The Record of Decision (ROD) for OU 1 was signed during 2000. Remedial action construction was initiated at OU 1 during 2000. The ordnance work was segregated from the chemical work by designating ordnance work as OU 3 during 2000. Work associated with OUs 1 and 2 was complete in 2002. Work associated with OU 3 (ordnance) and the benzene release area is ongoing.

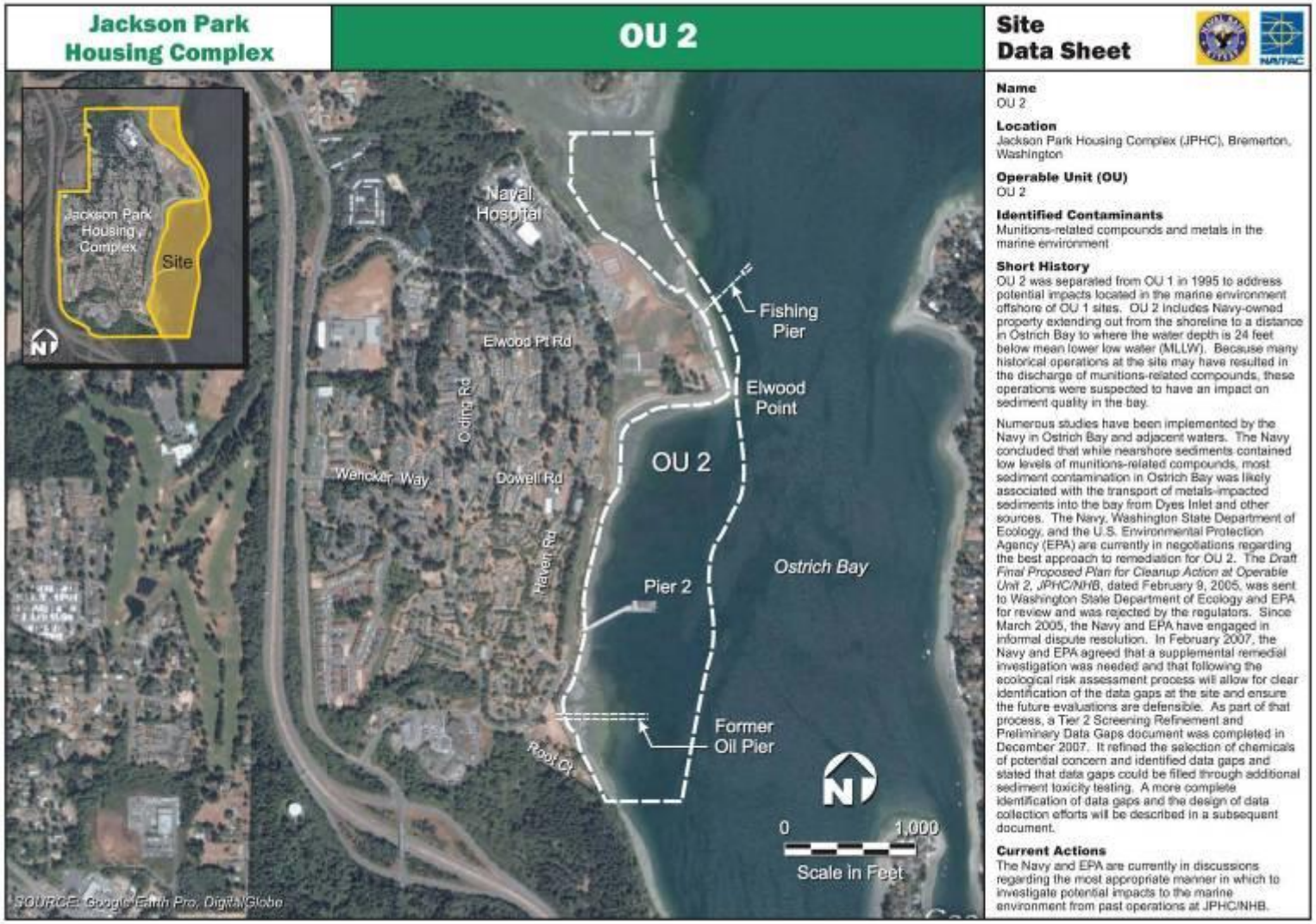

Jackson Park Housing Complex
Site 101
Site Data Sheet
Jackson Park Housing Complex
Site
Dowell Road
126
38
160
Haven Road
36
95
7
94
9
90
67
55
Ostrich Bay
Pier 2
0
400
Scale in Feet
Former Oil Pier
SOURCE: Google Earth Pro, DigitalGlobe
Name
Site 101, Industrial Area
Location
Jackson Park Housing Complex (JPHC), Bremerton, Washington
Operable Unit (OU)
OU 1
Identified Contaminants
Volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), pesticides, ordnance compounds, and metals in groundwater and shellfish
Short History
Site 101 includes a strip of shoreline located primarily east of Haven Road along Ostrich Bay up to Elwood Point. Past operations at Site 101 included ordnance production and destruction, storage of ordnance, and recycling and disposal of ordnance wastes. Around 1965, a portion of the property was converted to military housing and renamed the Jackson Park Housing Complex. As housing construction continued in the early 1970s, the Navy demolished most of the remaining depot structures at the site.
Site investigations were conducted from 1992 to 1999. Soil removal was conducted from September 1993 through February 1994. The Record of Decision (ROD) was signed in 2000. The selected remedial action was a vegetated cover, shoreline stabilization, regular inspection of the cover and shoreline structure, land use controls, and groundwater and shellfish sampling programs. Remedy implementation for Site 101 occurred primarily from June 2000 through June 2001.
Current Actions
The Navy conducts remedy and land use controls inspections, groundwater and shellfish monitoring, and erosion controls maintenance.

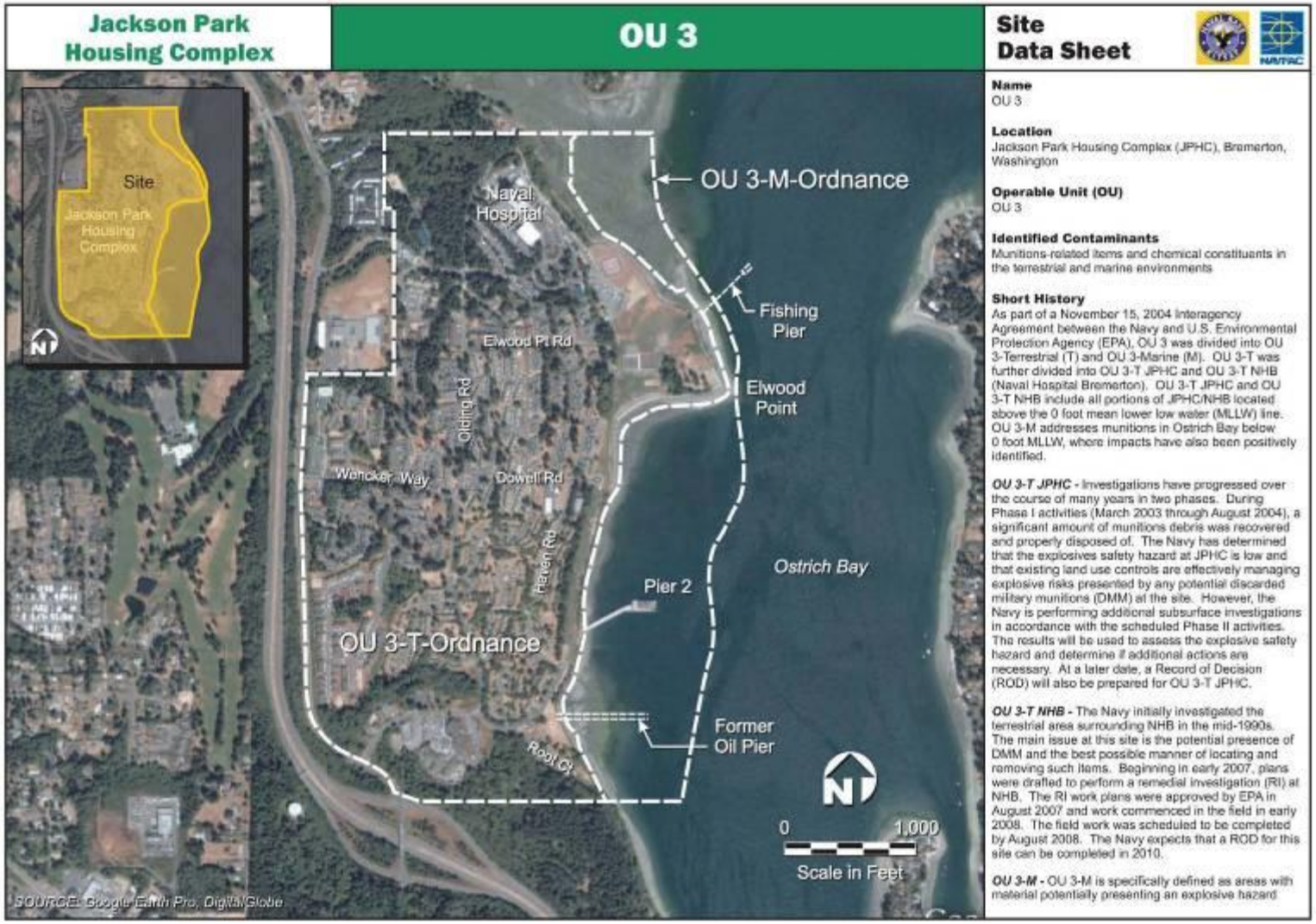

Jackson Park Housing Complex
Site 101A
Site Data Sheet
Jackson Park Housing Complex
Site
N
0
250
Scale in Feet
Former Oil Pier
Ostrich Bay
UST-1
UST-2
UST-3
UST-4
100
102
104
Site 101A
Lower Area
Upper Area
Abandoned Gravel Access Road
SOURCE: Google Earth Pro, DigitalGlobe
Name
Site 101A, Underground Storage Tank Site
Location
Jackson Park Housing Complex (JPHC), Bremerton, Washington
Operable Unit (OU)
OU 1
Identified Contaminants
Volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), and ordnance compounds in shellfish
Short History
Site 101A lies to the west and includes a strip of shoreline along Ostrich Bay and approximately 7 acres of adjacent uplands located south of Site 101. Past operations at Site 101A included ordnance production and destruction and ordnance sifting and loading. Demilitarization used high temperature water and steam. An incinerator and a boiler house were also present at the site. Around 1965, a portion of the property was converted to military housing and renamed the Jackson Park Housing Complex. As housing construction continued in the early 1970s, the Navy demolished most of the remaining depot structures at the site. The site currently includes a former construction debris landfill and a housing area.
Six underground storage tanks (USTs), associated pipes and fuel distribution lines, and all petroleum-impacted soils were removed from Site 101A in 1993. The landfill containing structural debris from ordnance storage bunkers at Site 110 was identified as an additional source of environmental concern at Site 101A.
Site investigations were conducted from 1992 to 1999. The Record of Decision (ROD) was signed in 2000. The selected remedial action was a vegetated cover, shoreline stabilization, regular inspection of the cover and shoreline structure, land use controls, and a shellfish sampling program. Remedy implementation for Site 101A occurred from June 2000 through June 2002.
Current Actions
The Navy conducts remedy and land use controls inspections, groundwater and shellfish monitoring, and erosion controls maintenance.


Jackson Park Housing Complex
Site 103
Site Data Sheet
Site
Jackson Park Housing Complex
Site 103
Former Trash Burning Area
Ostrich Bay
Former Ordnance Burning Area
Fishing Pier
Railroad Transfer Station
Suspected Fill Area
Baseball Fields
Elwood Point Road
Personnel Barracks
Elwood Point
0
400
Scale in Feet
SOURCE: Google Earth Pro, DigitalGlobe
Name
Site 103, Elwood Point
Location
Jackson Park Housing Complex (JPHC), Bremerton, Washington
Operable Unit (OU)
OU 1
Identified Contaminants
Volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), pesticides, ordnance compounds, and metals in groundwater and shellfish
Short History
Site 103 consists of a low, flat promontory referred to as Elwood Point and approximately 500 feet of Ostrich Bay shoreline to the east of the hospital. Past operations at Site 103 include maintenance of locomotives, sand blasting, military and civilian housing, barracks, a cafeteria, latrines, paint and oil storage, and a railroad transfer station. Ordnance wastes were burned on a concrete slab on the north side of Elwood Point, and trash was burned in an area farther north along the shoreline. An incinerator was also present at Site 103. Landfilling took place from 1910 to 1959 and included sands, gravels, and man-made materials such as concrete and metal debris. The site currently includes a helicopter pad, recreation fields, playing courts, a picnic area, and remnants of a former pier.
In 1998, significant shoreline erosion was occurring near the helipad that had the potential to release fill material into the marine environment. A removal action was conducted to prevent further erosion along the shoreline.
Site investigations were conducted from 1992 to 1999. The Record of Decision (ROD) was signed in 2000. The selected remedial action was a vegetated cover, shoreline stabilization, regular inspection of the cover and shoreline structure, land use controls, and groundwater and shellfish sampling programs. Remedy implementation for Site 103 occurred from June 2000 through June 2002.
Current Actions
The Navy conducts remedy and land use controls inspections, groundwater and shellfish monitoring, and erosion controls maintenance.


Jackson Park Housing Complex
Site 110
Site Data Sheet
Site
Jackson Park Housing Complex
Naval Hospital
Elwood Pt Rd
Upland Bunker Area
Olding Rd
Site 110
Wencker Way
Dowell Rd
Haven Rd
Pool Ct
Fishing Pier
Elwood Point
Ostrich Bay
Pier 2
Former Oil Pier
0
1,000
Scale in Feet
SOURCE: Google Earth Pro, DigitalGlobe
Name
Site 110, Upland Areas
Location
Jackson Park Housing Complex, Bremerton (JPHC), Washington
Operable Unit (OU)
OU 1
Identified Contaminants
Volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), pesticides, ordnance compounds, and metals in groundwater
Short History
Site 110 includes the majority of JPHC and Naval Hospital Bremerton (NHB). Past operations at Site 110 include ordnance production and storage of ordnance and other materials. Around 1965, the property was converted to military housing and renamed to JPHC. As housing construction continued in the early 1970s, the Navy demolished most of the remaining depot structures at the site. Three of the original bunkers are currently used as warehouses, a fourth is being used as storage for household goods, and the remaining two have been demolished. Currently, the site is predominantly occupied by housing units or housing support activities.
Surface soil containing metals and organic compounds were excavated and properly disposed of between August 1994 and June 1995. Pavement serves as a barrier for a limited amount of soil containing arsenic in front of two of the bunkers. A disposal site was discovered at the northeast corner of Olding Road and Elwood Point Road. Samples confirmed the presence of asbestos in pipe insulation, petroleum products and lime waste in drums, petroleum impacts in soil, and creosote compounds in timber. In March 1995, all waste and impacted soil were removed and disposed of. Four underground storage tanks (USTs) were removed from Site 110 in 1996. The tanks and all associated petroleum-impacted soil were removed and disposed of as required by law.
Soil impacted with organic compounds and arsenic east of two residential buildings along Haven Road were further investigated in June 2001 and March 2002. Excavation and disposal of impacted soil occurred in June 2002. Pipe debris assumed to contain asbestos, lead-wrapped wire, and railroad ties assumed to be creosote treated were discovered, removed, and properly disposed of. After excavation work was completed, the selected remedial action included import of clean material as backfill and planting sod. Land use controls and a groundwater monitoring program were included as components of the remedy.
Current Actions
The Navy conducts remedy and land use controls inspections, groundwater monitoring, and erosion controls maintenance.


Jackson Park Housing Complex
Benzene Release Area
Site Data Sheet
Jackson Park Housing Complex
Site
Benzene Release Area
NEX Gas Station
Dowell Rd
Haven Rd
Ostrich Bay
Pier 2
0
400
Scale in Feet
SOURCE: Google Earth Pro, DigitalGlobe
Name
Benzene Release Area
Location
Jackson Park Housing Complex (JPHC), Bremerton, Washington
Operable Unit (OU)
OU 1
Identified Contaminants
Volatile organic compounds (VOCs) and petroleum hydrocarbons in groundwater
Short History
The Benzene Release Area is located within Sites 101 and 110. The area is defined by two seeps that discharge through pipes along the shore of Ostrich Bay and an area of known soil or groundwater impact that extends approximately 450 feet uphill from the seeps. The site is currently occupied by housing units or housing support activities.
Seep sampling at Site 101 identified one shoreline outfall that was discharging water containing benzene and petroleum hydrocarbons above state cleanup levels. In 1997 and 1998, a second investigation was conducted by the Navy in an attempt to determine the source and extent of benzene and petroleum impact in soil and groundwater. In November 1999, additional field work identified a source of the benzene and petroleum impacts near the fuel dispenser island at the NEX gas station located at Dowell Road and Sullivan Place in Site 110.
At the time the Record of Decision (ROD) was signed (2000), it was thought that the perched groundwater in the Benzene Release Area was impacted, but the deeper groundwater was not. Therefore, the remedial action specified in the ROD was protection of the marine environment (located in Site 101). Subsequent investigation activities have identified past releases from the NEX gas station that have also impacted the deeper groundwater unit.
Current Actions
A removal action to skim the gasoline is being implemented. A feasibility study is ongoing to determine what further site remediation is required.


Jackson Park Housing Complex
OU 2
Site Data Sheet
Jackson Park Housing Complex
Site
Naval Hospital
Elwood Pt Rd
Oding Rd
Wencker Way
Dowell Rd
Haven Rd
Root Ct
Fishing Pier
Elwood Point
OU 2
Ostrich Bay
Pier 2
Former Oil Pier
0
1,000
Scale in Feet
SOURCE: Google Earth Pro, DigitalGlobe
Name
OU 2
Location
Jackson Park Housing Complex (JPHC), Bremerton, Washington
Operable Unit (OU)
OU 2
Identified Contaminants
Munitions-related compounds and metals in the marine environment
Short History
OU 2 was separated from OU 1 in 1995 to address potential impacts located in the marine environment offshore of OU 1 sites. OU 2 includes Navy-owned property extending out from the shoreline to a distance in Ostrich Bay to where the water depth is 24 feet below mean lower low water (MLLW). Because many historical operations at the site may have resulted in the discharge of munitions-related compounds, these operations were suspected to have an impact on sediment quality in the bay.
Numerous studies have been implemented by the Navy in Ostrich Bay and adjacent waters. The Navy concluded that while nearshore sediments contained low levels of munitions-related compounds, most sediment contamination in Ostrich Bay was likely associated with the transport of metals-impacted sediments into the bay from Dyes Inlet and other sources. The Navy, Washington State Department of Ecology, and the U.S. Environmental Protection Agency (EPA) are currently in negotiations regarding the best approach to remediation for OU 2. The Draft Final Proposed Plan for Cleanup Action at Operable Unit 2, JPHC/NHB, dated February 9, 2005, was sent to Washington State Department of Ecology and EPA for review and was rejected by the regulators. Since March 2005, the Navy and EPA have engaged in informal dispute resolution. In February 2007, the Navy and EPA agreed that a supplemental remedial investigation was needed and that following the ecological risk assessment process will allow for clear identification of the data gaps at the site and ensure the future evaluations are defensible. As part of that process, a Tier 2 Screening Refinement and Preliminary Data Gaps document was completed in December 2007. It refined the selection of chemicals of potential concern and identified data gaps and stated that data gaps could be filled through additional sediment toxicity testing. A more complete identification of data gaps and the design of data collection efforts will be described in a subsequent document.
Current Actions
The Navy and EPA are currently in discussions regarding the most appropriate manner in which to investigate potential impacts to the marine environment from past operations at JPHC/NHB.


Jackson Park Housing Complex
OU 3
Site
Data Sheet
Site
Jackson Park Housing Complex
OU 3-M-Ordnance
Naval Hospital
Fishing Pier
Elwood Pt Rd
Elwood Point
Olding Rd
Wenicker Way
Dowell Rd
Haven Rd
Ostrich Bay
Pier 2
OU 3-T-Ordnance
Former Oil Pier
Roof Ct
0
1,000
Scale in Feet
SOURCE: Google Earth Pro, DigitalGlobe
Name
OU 3
Location
Jackson Park Housing Complex (JPHC), Bremerton, Washington
Operable Unit (OU)
OU 3
Identified Contaminants
Munitions-related items and chemical constituents in the terrestrial and marine environments
Short History
As part of a November 15, 2004 Interagency Agreement between the Navy and U.S. Environmental Protection Agency (EPA), OU 3 was divided into OU 3-Terrestrial (T) and OU 3-Marine (M). OU 3-T was further divided into OU 3-T JPHC and OU 3-T NHB (Naval Hospital Bremerton). OU 3-T JPHC and OU 3-T NHB include all portions of JPHC/NHB located above the 0 foot mean lower low water (MLLW) line. OU 3-M addresses munitions in Ostrich Bay below 0 foot MLLW, where impacts have also been positively identified.
OU 3-T JPHC - Investigations have progressed over the course of many years in two phases. During Phase I activities (March 2003 through August 2004), a significant amount of munitions debris was recovered and properly disposed of. The Navy has determined that the explosives safety hazard at JPHC is low and that existing land use controls are effectively managing explosive risks presented by any potential discarded military munitions (DMM) at the site. However, the Navy is performing additional subsurface investigations in accordance with the scheduled Phase II activities. The results will be used to assess the explosive safety hazard and determine if additional actions are necessary. At a later date, a Record of Decision (ROD) will also be prepared for OU 3-T JPHC.
OU 3-T NHB - The Navy initially investigated the terrestrial area surrounding NHB in the mid-1990s. The main issue at this site is the potential presence of DMM and the best possible manner of locating and removing such items. Beginning in early 2007, plans were drafted to perform a remedial investigation (RI) at NHB. The RI work plans were approved by EPA in August 2007 and work commenced in the field in early 2008. The field work was scheduled to be completed by August 2008. The Navy expects that a ROD for this site can be completed in 2010.
OU 3-M - OU 3-M is specifically defined as areas with material potentially presenting an explosive hazard

This Page Intentionally Left Blank

NAVBASE Kitsap at Bremerton
Installation Restoration Sites

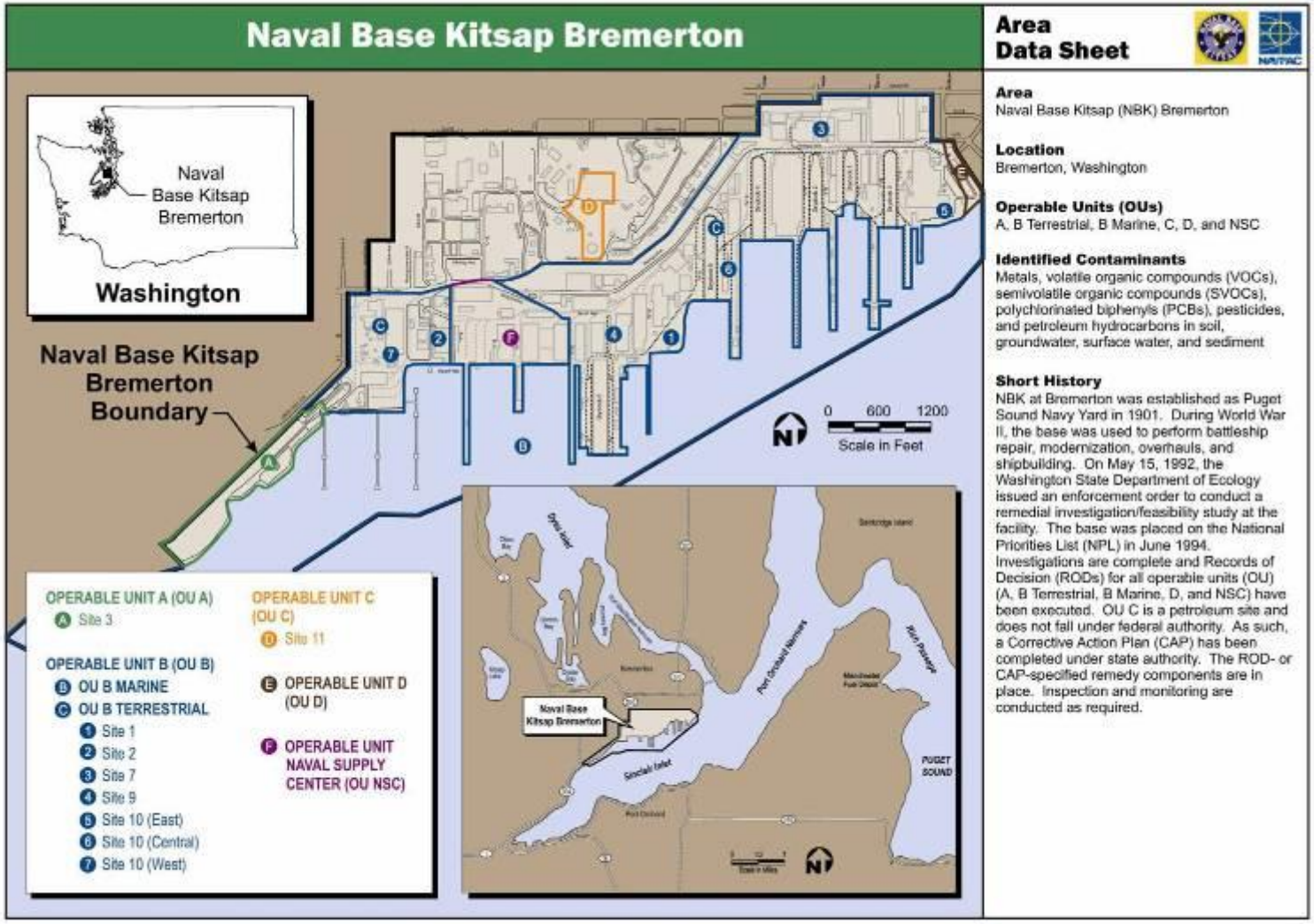
Naval Base Kitsap Bremerton

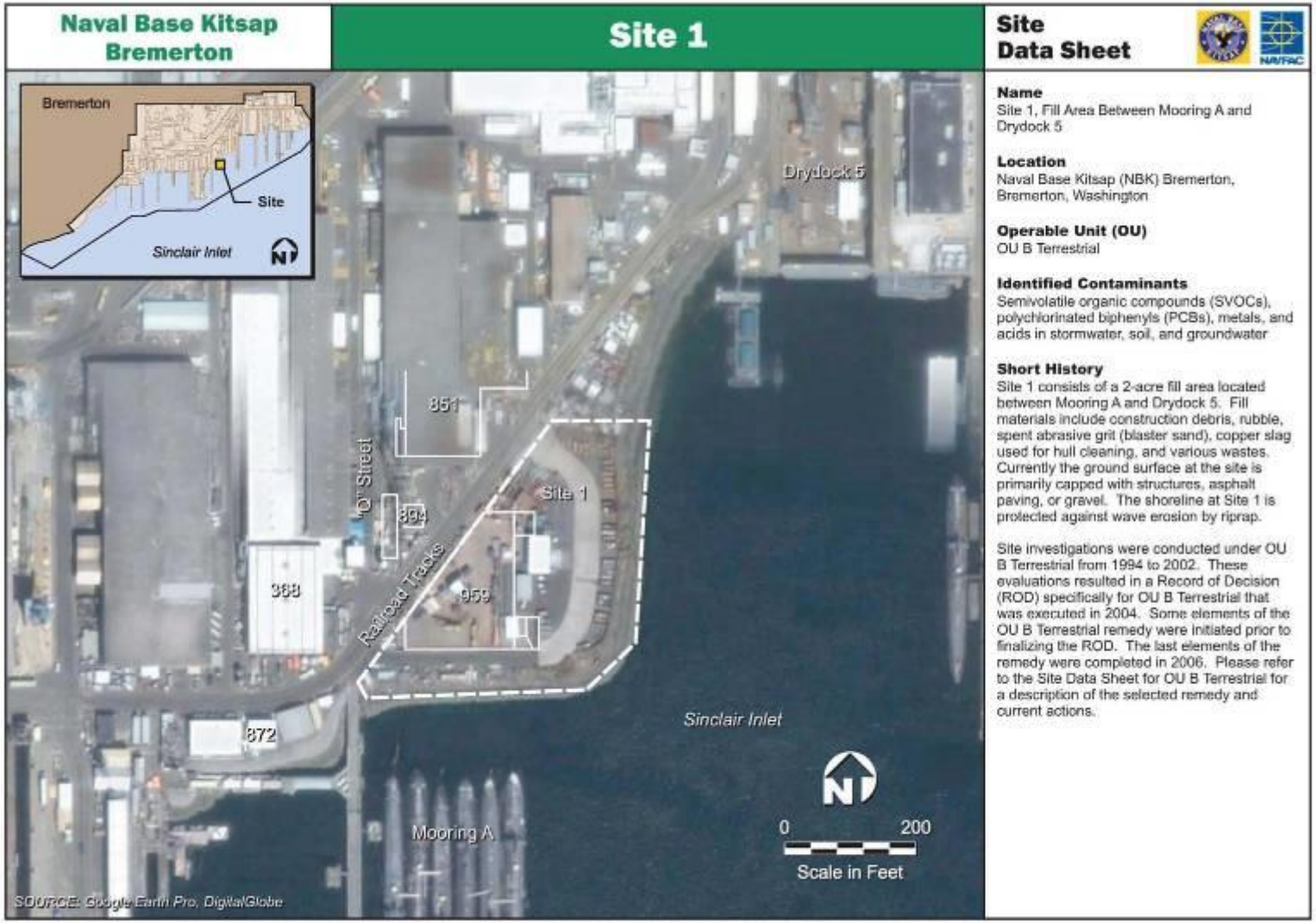
Naval Base Description

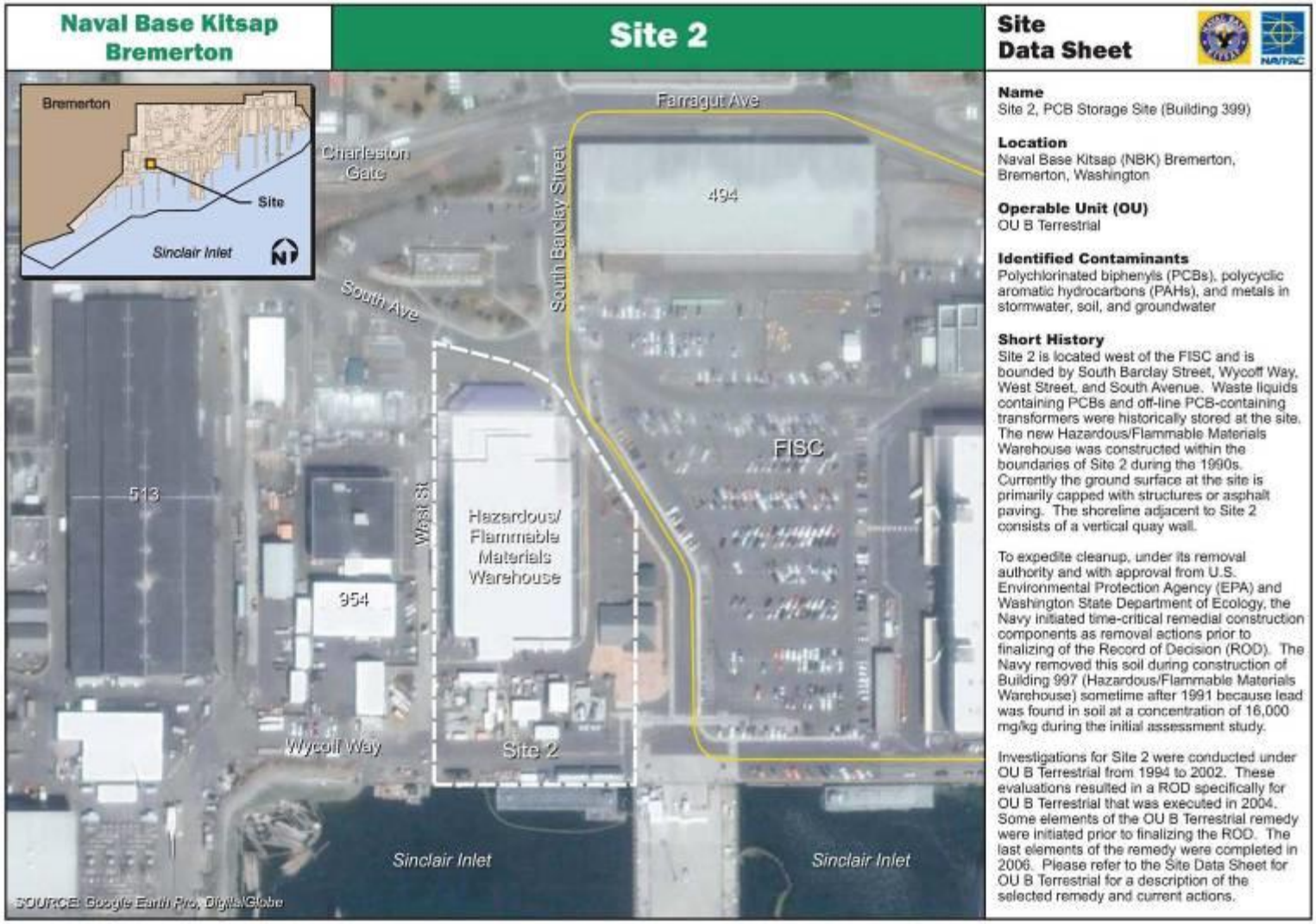
The Bremerton naval complex (Bnc) comprises Naval Base Kitsap (NBK) Bremerton, Puget Sound Naval Shipyard and Intermediate Maintenance Facility (PSNS & IMF), and supported commands. NBK Bremerton/Fleet and Industrial Supply Center (FISC), Puget Sound consists of approximately 1,650 acres (terrestrial and marine) located on the Sinclair Inlet in the southeastern portion of the Kitsap Peninsula, approximately 15 miles west of Seattle, Washington. It is surrounded to the west and north by the city of Bremerton's commercial and residential areas, to the northeast by a Washington State Ferry terminal, and to the south and southeast by Sinclair Inlet. The industrial portion of the site contains approximately 380 acres of terrestrial area, 270 acres of submerged land, and 1,000 acres of railroad area that is contiguous. It was established in 1901 as the Puget Sound Navy Yard. The facility is used to perform shipbuilding, repair, modernization, overhauls, and decommissioning.

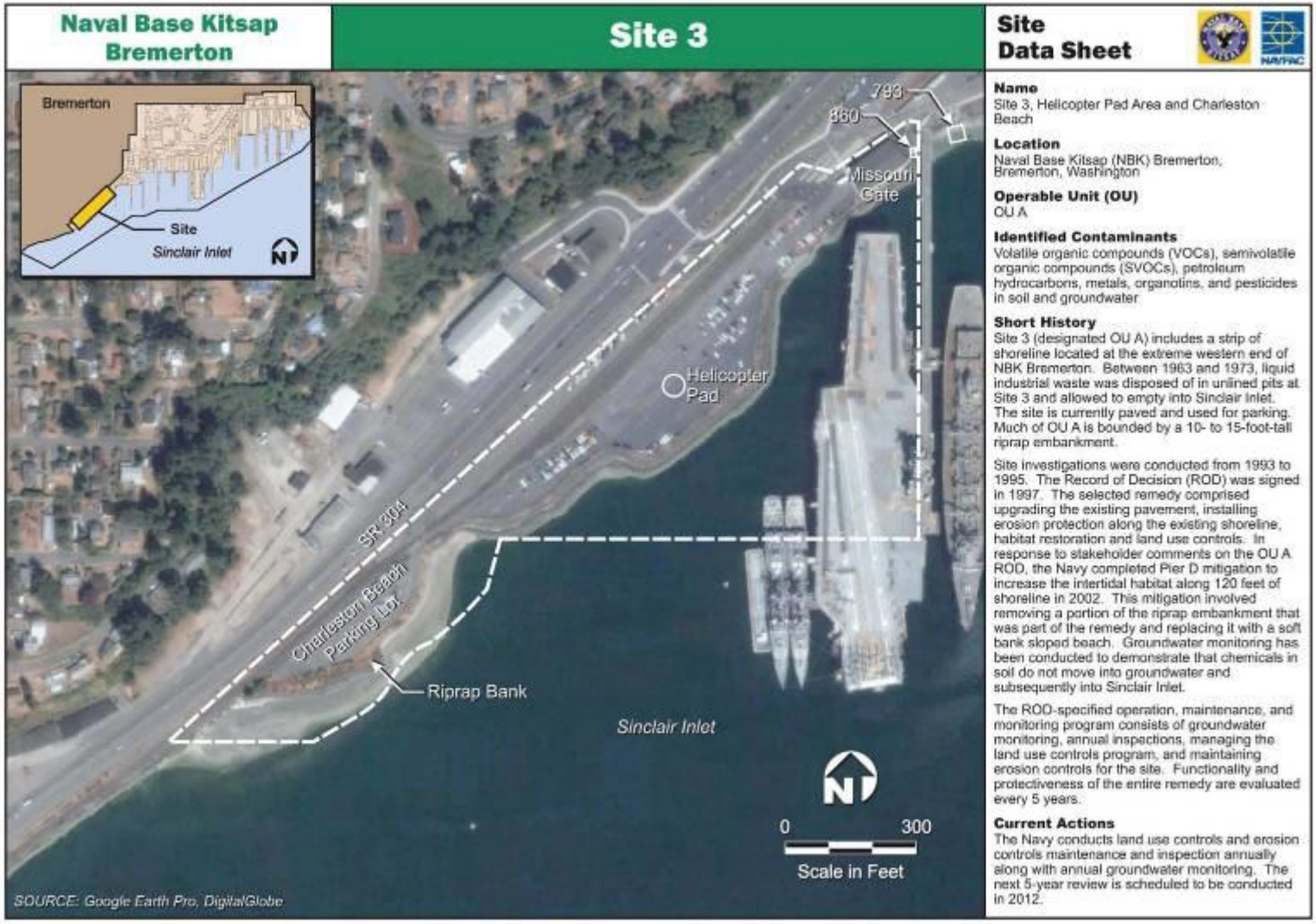
The following is a list of historical events at the Bnc from 1891 to the present:

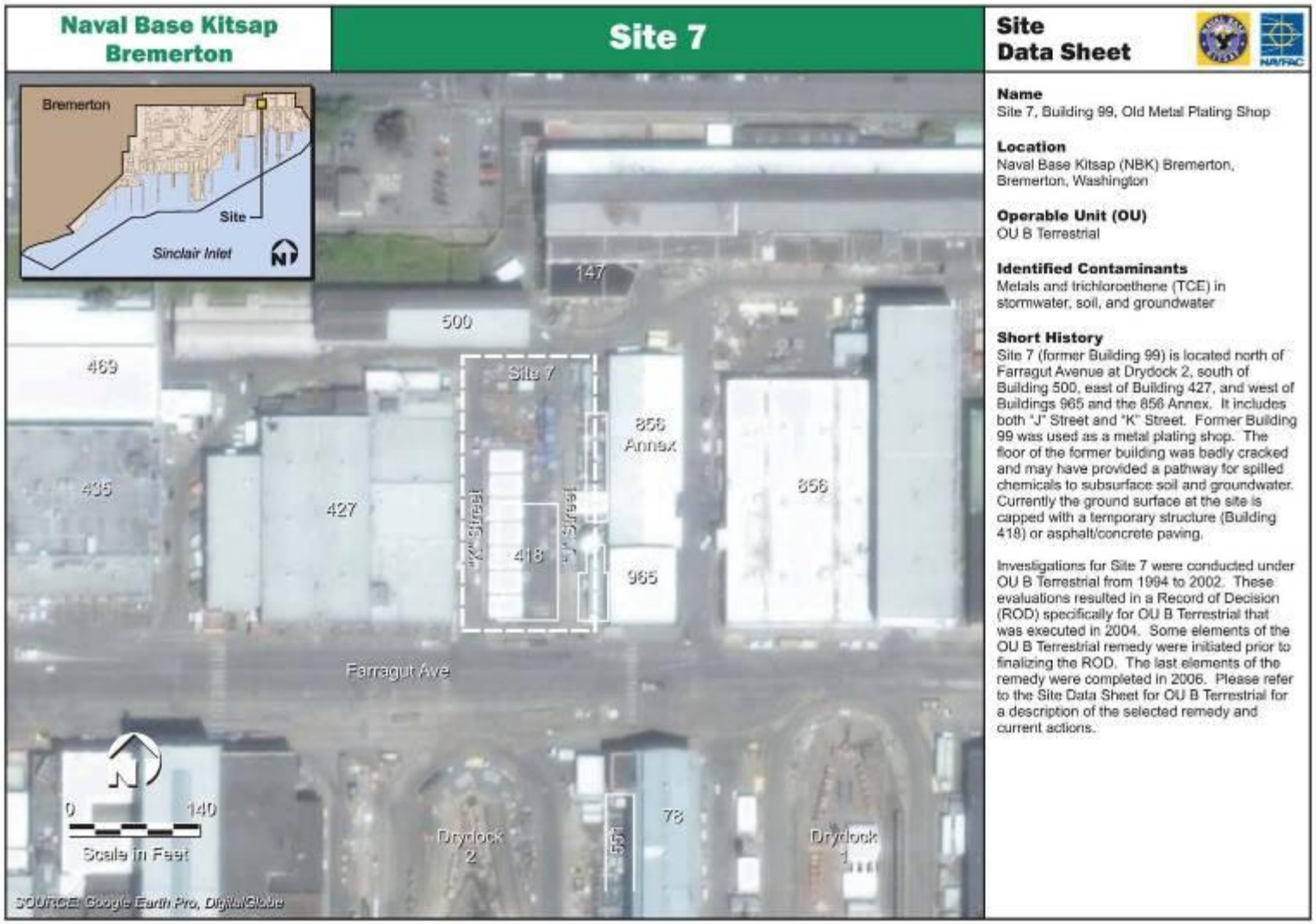
- In 1891,congressional funding led to the purchase of 190 acres on the Sinclair Inlet for the construction of a ship drydock, repair, and overhaul base for the Navy.
- In 1901, Puget Sound Navy Yard was established and in the early 1900s was substantially expanded.
- In 1945, Puget Sound Navy Yard was renamed to Puget Sound Naval Shipyard (PSNS).
- In 1967, Naval Supply Center (NSC) was commissioned.
- In 1979, site discovery was conducted.
- In 1980, the Navy established the Environmental Restoration (ER) Program.
- In 1983, Naval Energy and Environmental Support Activity and the Army Corps of Engineers conduct initial assessment study (IAS) of PSNS.
- In 1990, the Navy reauthorized the ER Program and conducted a supplementary preliminary assessment.
- From 1990 to 1992, the Navy conducted a site inspection (SI) at PSNS.
- From 1990 to 2001, the Navy conducted removal actions at Operable Unit B Terrestrial (OU B T)
- In 1992, the Washington State Department of Ecology issued two enforcement orders resulting in PSNS being divided into OUs A and B. A Resource Conservation and Recovery Act (RCRA) facility inspection was conducted by the U.S. Environmental Protection Agency (EPA).
- In 1993, NSC was renamed FISC.
- In 1994, EPA placed Bnc on the National Priorities List (NPL) and the Navy conducted interim soil removal action at OU NSC.
- In 1995, the remedial investigation/feasibility study (RI/FS) for OU A and OU NSC was completed.
- In 1996, the Record of Decision (ROD) for OU NSC was signed.
- In 1997, the ROD for OU A was signed.
- From 1997 to 1999, the Navy conducted the remedial action for OU NSC.
- In 1998, the Navy entered into an interagency agreement with Washington State Department of Ecology and EPA.
- From 1998 to 2000, the Navy conducted remedial actions for OU A.
- In 1999, the final closeout report for OU NSC and final remedial action report for OU A were completed.
- In 2000, an early action ROD for OU B Marine was signed and an addendum to the final remedial action report for OU A was completed.
- From 2000 to 2004, the Navy conducted a remedial action for OU B Marine.
- In 2002, an RI/FS for OU B Marine and OU B Terrestrial were completed, the RI/FS for OU C was completed, OU D was established, and the first 5-year review for Bnc was completed.
- From 2003 to 2005, the Navy conducted a remedial action for OU B Terrestrial.
- From 2004, an Explanation of Significant Differences (ESD) was issued for OU B Marine, the RI/FS for OU D was completed, and the ROD for OU B Terrestrial was signed.
- In 2005, the ROD for OU D was signed and the final closure report for OU B Marine was completed.
- From 2005 to 2006, the Navy conducted a remedial action for OU D.
- In 2006, the final closure report for OU B Terrestrial was completed and the Cleanup Review Tiger Team (CURTT) was established to evaluate the draft decision framework for OU B Marine.
- In 2007, the final remedial action report for OU A and OU B Terrestrial, OU D, and OU NSC were completed, the OU C Cleanup Action Plan was implemented, and the second 5-year review for Bnc was completed.
- In 2008, the Navy is conducting monitoring to demonstrate that cleanup actions at Bnc are working as intended.

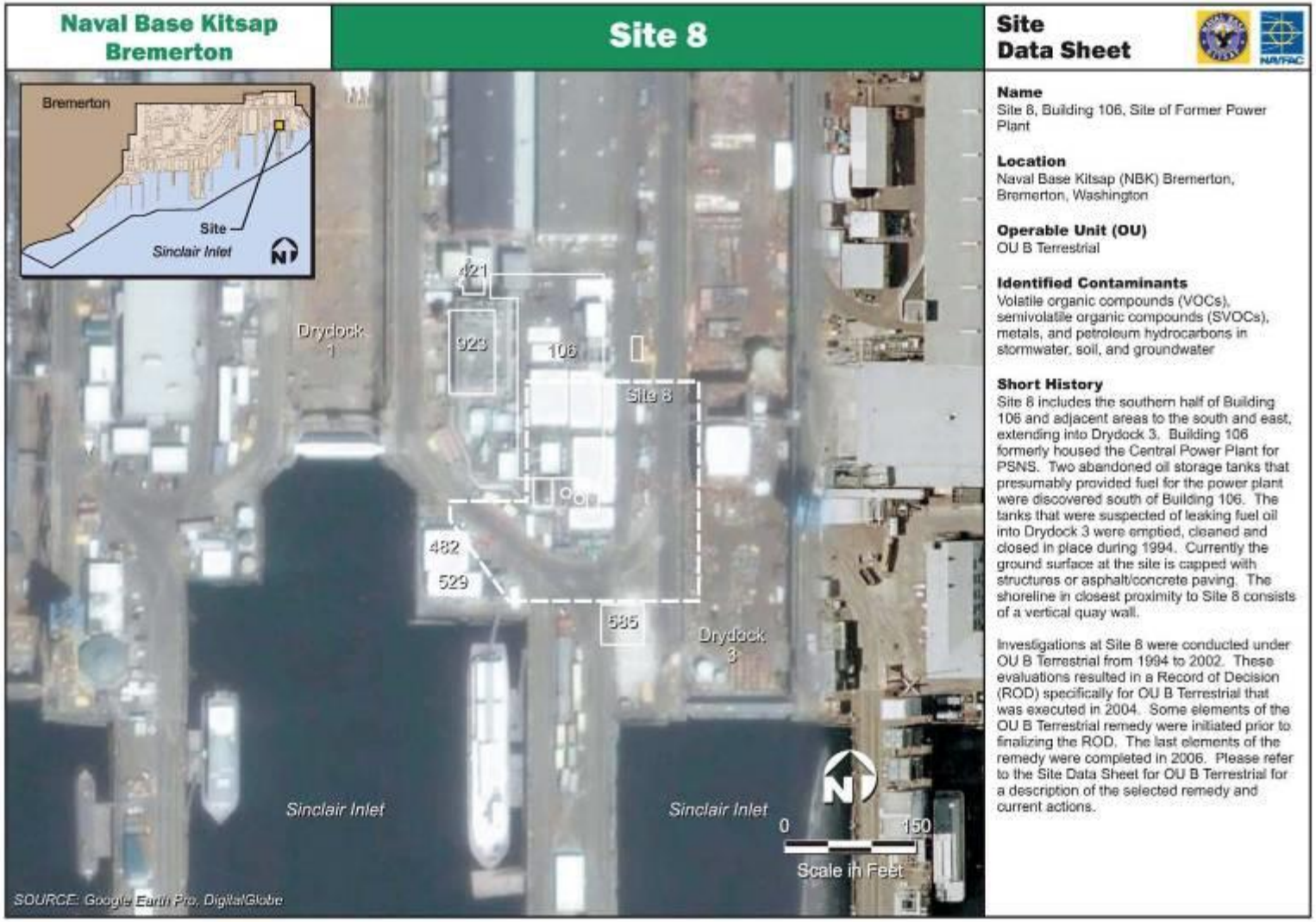

Naval Base Kitsap Bremerton
Area
Data Sheet
Naval
Base Kitsap
Bremerton
Washington
Naval Base Kitsap
Bremerton
Boundary
0 600 1200
Scale in Feet
OPERABLE UNIT A (OU A)
A Site 3
OPERABLE UNIT B (OU B)
B OU B MARINE
C OU B TERRESTRIAL
1 Site 1
2 Site 2
3 Site 7
4 Site 9
5 Site 10 (East)
6 Site 10 (Central)
7 Site 10 (West)
OPERABLE UNIT C
(OU C)
D Site 11
E OPERABLE UNIT D
(OU D)
F OPERABLE UNIT
NAVAL SUPPLY
CENTER (OU NSC)
Naval Base
Kitsap Bremerton
PUGET
SOUND
Area
Naval Base Kitsap (NBK) Bremerton
Location
Bremerton, Washington
Operable Units (OUs)
A, B Terrestrial, B Marine, C, D, and NSC
Identified Contaminants
Metals, volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), polychlorinated biphenyls (PCBs), pesticides, and petroleum hydrocarbons in soil, groundwater, surface water, and sediment
Short History
NBK at Bremerton was established as Puget Sound Navy Yard in 1901. During World War II, the base was used to perform battleship repair, modernization, overhauls, and shipbuilding. On May 15, 1992, the Washington State Department of Ecology issued an enforcement order to conduct a remedial investigation/feasibility study at the facility. The base was placed on the National Priorities List (NPL) in June 1994. Investigations are complete and Records of Decision (RODs) for all operable units (OU) (A, B Terrestrial, B Marine, D, and NSC) have been executed. OU C is a petroleum site and does not fall under federal authority. As such, a Corrective Action Plan (CAP) has been completed under state authority. The ROD- or CAP-specified remedy components are in place. Inspection and monitoring are conducted as required.

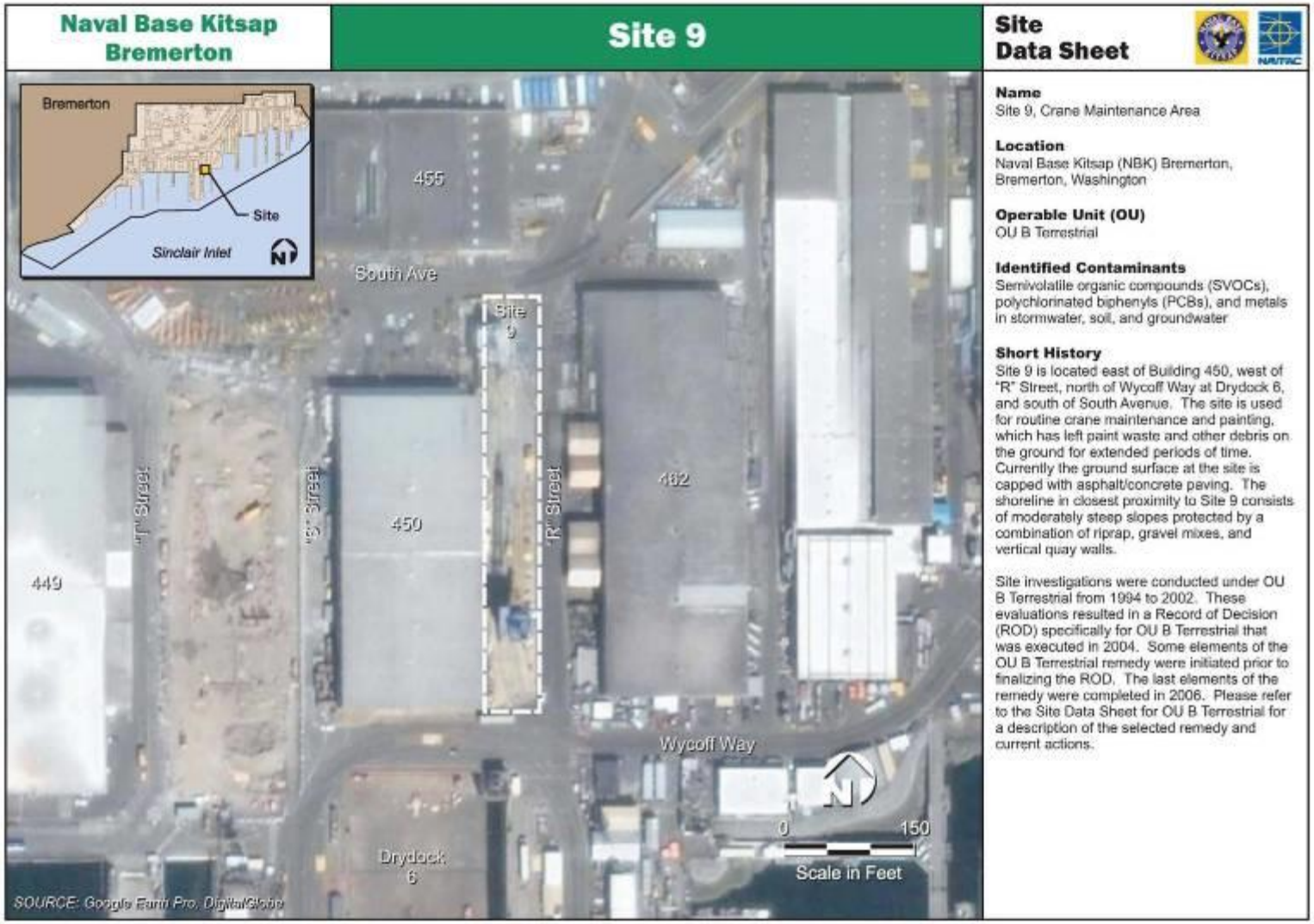

Naval Base Kitsap
Bremerton
Site 1
Site
Data Sheet
NAVFAC
Bremerton
Site
Sinclair Inlet
Drydock 5
851
"Q" Street
Site 1
894
Railroad Tracks
388
959
872
Sinclair Inlet
Mooring A
0
200
Scale in Feet
SOURCE: Google Earth Pro, DigitalGlobe
Name
Site 1, Fill Area Between Mooring A and Drydock 5
Location
Naval Base Kitsap (NBK) Bremerton, Bremerton, Washington
Operable Unit (OU)
OU B Terrestrial
Identified Contaminants
Semivolatile organic compounds (SVOCs), polychlorinated biphenyls (PCBs), metals, and acids in stormwater, soil, and groundwater
Short History
Site 1 consists of a 2-acre fill area located between Mooring A and Drydock 5. Fill materials include construction debris, rubble, spent abrasive grit (blaster sand), copper slag used for hull cleaning, and various wastes. Currently the ground surface at the site is primarily capped with structures, asphalt paving, or gravel. The shoreline at Site 1 is protected against wave erosion by riprap.
Site investigations were conducted under OU B Terrestrial from 1994 to 2002. These evaluations resulted in a Record of Decision (ROD) specifically for OU B Terrestrial that was executed in 2004. Some elements of the OU B Terrestrial remedy were initiated prior to finalizing the ROD. The last elements of the remedy were completed in 2006. Please refer to the Site Data Sheet for OU B Terrestrial for a description of the selected remedy and current actions.


Naval Base Kitsap
Bremerton
Site 2
Site
Data Sheet
Bremerton
Site
Sinclair Inlet
Charleston
Gate
Farragut Ave
South Barclay Street
494
South Ave
FISC
513
West St
Hazardous/
Flammable
Materials
Warehouse
954
Wycoff Way
Site 2
Sinclair Inlet
Sinclair Inlet
SOURCE: Google Earth Pro, DigitalGlobe
Name
Site 2, PCB Storage Site (Building 399)
Location
Naval Base Kitsap (NBK) Bremerton, Bremerton, Washington
Operable Unit (OU)
OU B Terrestrial
Identified Contaminants
Polychlorinated biphenyls (PCBs), polycyclic aromatic hydrocarbons (PAHs), and metals in stormwater, soil, and groundwater
Short History
Site 2 is located west of the FISC and is bounded by South Barclay Street, Wycoff Way, West Street, and South Avenue. Waste liquids containing PCBs and off-line PCB-containing transformers were historically stored at the site. The new Hazardous/Flammable Materials Warehouse was constructed within the boundaries of Site 2 during the 1990s. Currently the ground surface at the site is primarily capped with structures or asphalt paving. The shoreline adjacent to Site 2 consists of a vertical quay wall.
To expedite cleanup, under its removal authority and with approval from U.S. Environmental Protection Agency (EPA) and Washington State Department of Ecology, the Navy initiated time-critical remedial construction components as removal actions prior to finalizing of the Record of Decision (ROD). The Navy removed this soil during construction of Building 997 (Hazardous/Flammable Materials Warehouse) sometime after 1991 because lead was found in soil at a concentration of 16,000 mg/kg during the initial assessment study.
Investigations for Site 2 were conducted under OU B Terrestrial from 1994 to 2002. These evaluations resulted in a ROD specifically for OU B Terrestrial that was executed in 2004. Some elements of the OU B Terrestrial remedy were initiated prior to finalizing the ROD. The last elements of the remedy were completed in 2006. Please refer to the Site Data Sheet for OU B Terrestrial for a description of the selected remedy and current actions.

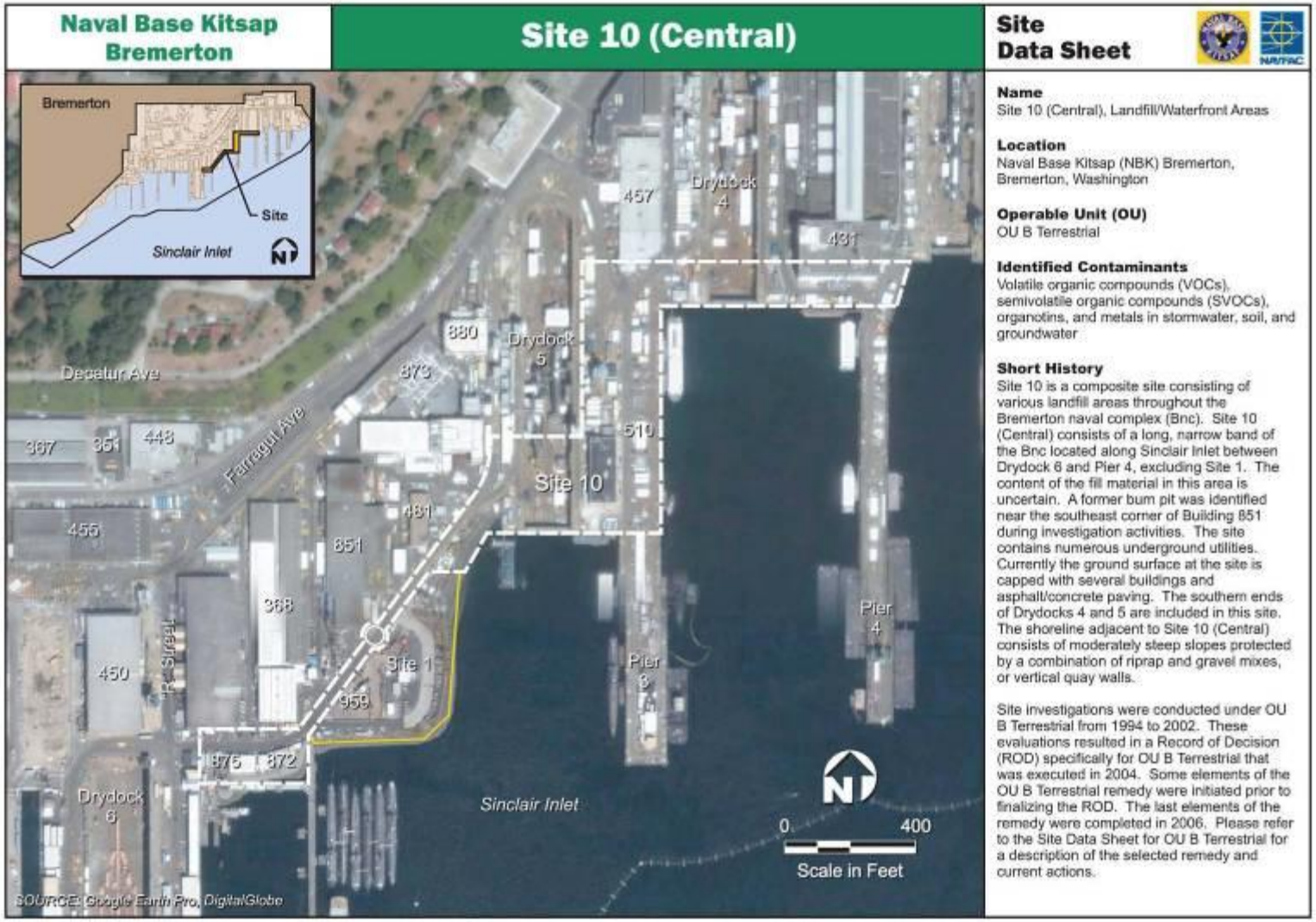

Naval Base Kitsap
Bremerton
Site 3
Bremerton
Site
Sinclair Inlet
793
860
Missouri Gate
Helicopter Pad
SR 304
Charleston Beach Parking Lot
Riprap Bank
Sinclair Inlet
0
300
Scale in Feet
SOURCE: Google Earth Pro, DigitalGlobe
Site
Data Sheet
NAVFAC
Name
Site 3, Helicopter Pad Area and Charleston Beach
Location
Naval Base Kitsap (NBK) Bremerton, Bremerton, Washington
Operable Unit (OU)
OU A
Identified Contaminants
Volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), petroleum hydrocarbons, metals, organotins, and pesticides in soil and groundwater
Short History
Site 3 (designated OU A) includes a strip of shoreline located at the extreme western end of NBK Bremerton. Between 1963 and 1973, liquid industrial waste was disposed of in unlined pits at Site 3 and allowed to empty into Sinclair Inlet. The site is currently paved and used for parking. Much of OU A is bounded by a 10- to 15-foot-tall riprap embankment.
Site investigations were conducted from 1993 to 1995. The Record of Decision (ROD) was signed in 1997. The selected remedy comprised upgrading the existing pavement, installing erosion protection along the existing shoreline, habitat restoration and land use controls. In response to stakeholder comments on the OU A ROD, the Navy completed Pier D mitigation to increase the intertidal habitat along 120 feet of shoreline in 2002. This mitigation involved removing a portion of the riprap embankment that was part of the remedy and replacing it with a soft bank sloped beach. Groundwater monitoring has been conducted to demonstrate that chemicals in soil do not move into groundwater and subsequently into Sinclair Inlet.
The ROD-specified operation, maintenance, and monitoring program consists of groundwater monitoring, annual inspections, managing the land use controls program, and maintaining erosion controls for the site. Functionality and protectiveness of the entire remedy are evaluated every 5 years.
Current Actions
The Navy conducts land use controls and erosion controls maintenance and inspection annually along with annual groundwater monitoring. The next 5-year review is scheduled to be conducted in 2012.

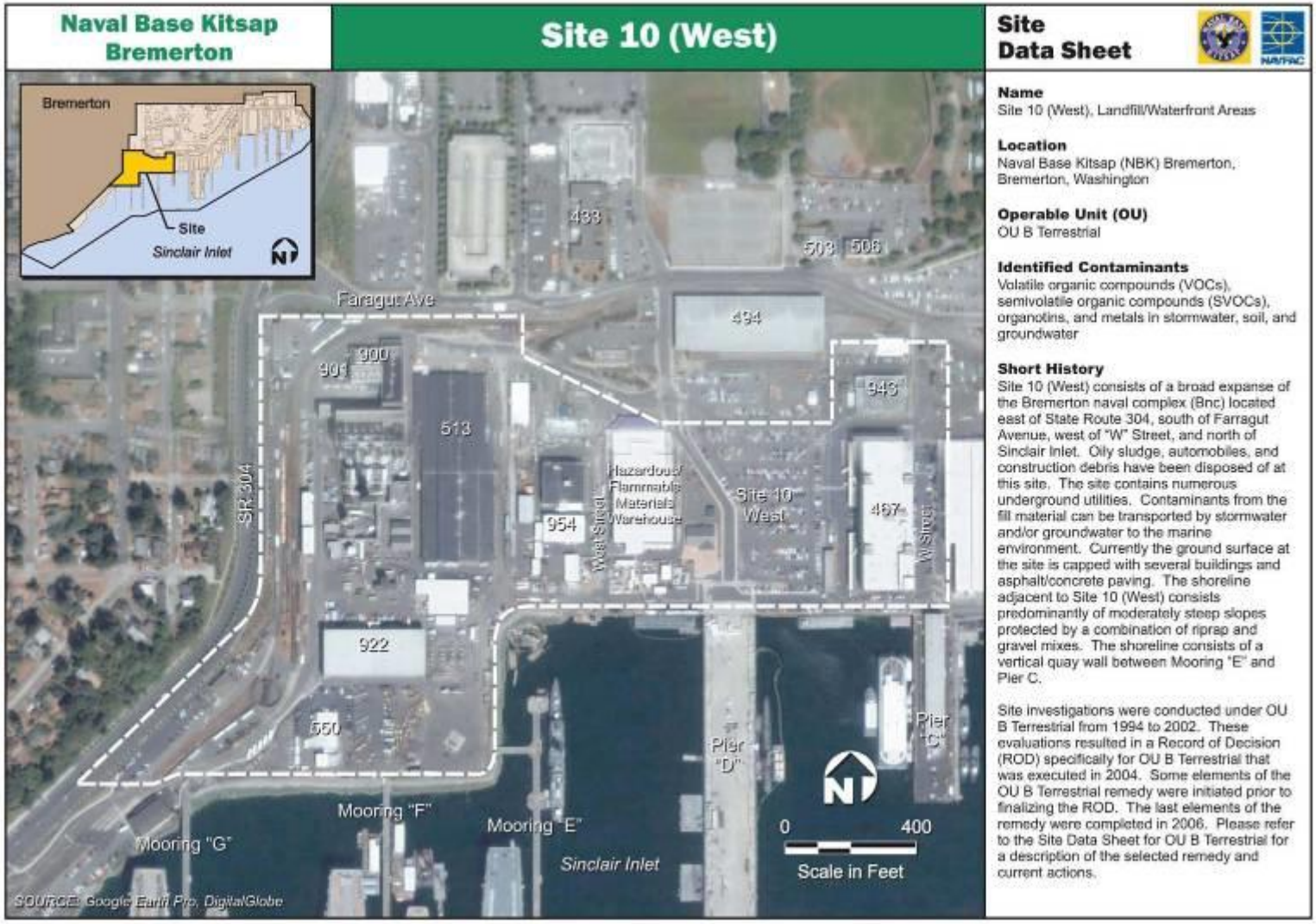

Naval Base Kitsap
Bremerton
Site 7
Site
Data Sheet
Bremerton
Site
Sinclair Inlet
147
500
469
Site 7
856
Annex
435
427
856
"J" Street
418
"K" Street
965
Farragut Ave
0
140
Scale in Feet
Drydock
2
78
551
Drydock
1
SOURCE: Google Earth Pro, DigitalGlobe
Name
Site 7, Building 99, Old Metal Plating Shop
Location
Naval Base Kitsap (NBK) Bremerton, Bremerton, Washington
Operable Unit (OU)
OU B Terrestrial
Identified Contaminants
Metals and trichloroethene (TCE) in stormwater, soil, and groundwater
Short History
Site 7 (former Building 99) is located north of Farragut Avenue at Drydock 2, south of Building 500, east of Building 427, and west of Buildings 965 and the 856 Annex. It includes both "J" Street and "K" Street. Former Building 99 was used as a metal plating shop. The floor of the former building was badly cracked and may have provided a pathway for spilled chemicals to subsurface soil and groundwater. Currently the ground surface at the site is capped with a temporary structure (Building 418) or asphalt/concrete paving.
Investigations for Site 7 were conducted under OU B Terrestrial from 1994 to 2002. These evaluations resulted in a Record of Decision (ROD) specifically for OU B Terrestrial that was executed in 2004. Some elements of the OU B Terrestrial remedy were initiated prior to finalizing the ROD. The last elements of the remedy were completed in 2006. Please refer to the Site Data Sheet for OU B Terrestrial for a description of the selected remedy and current actions.

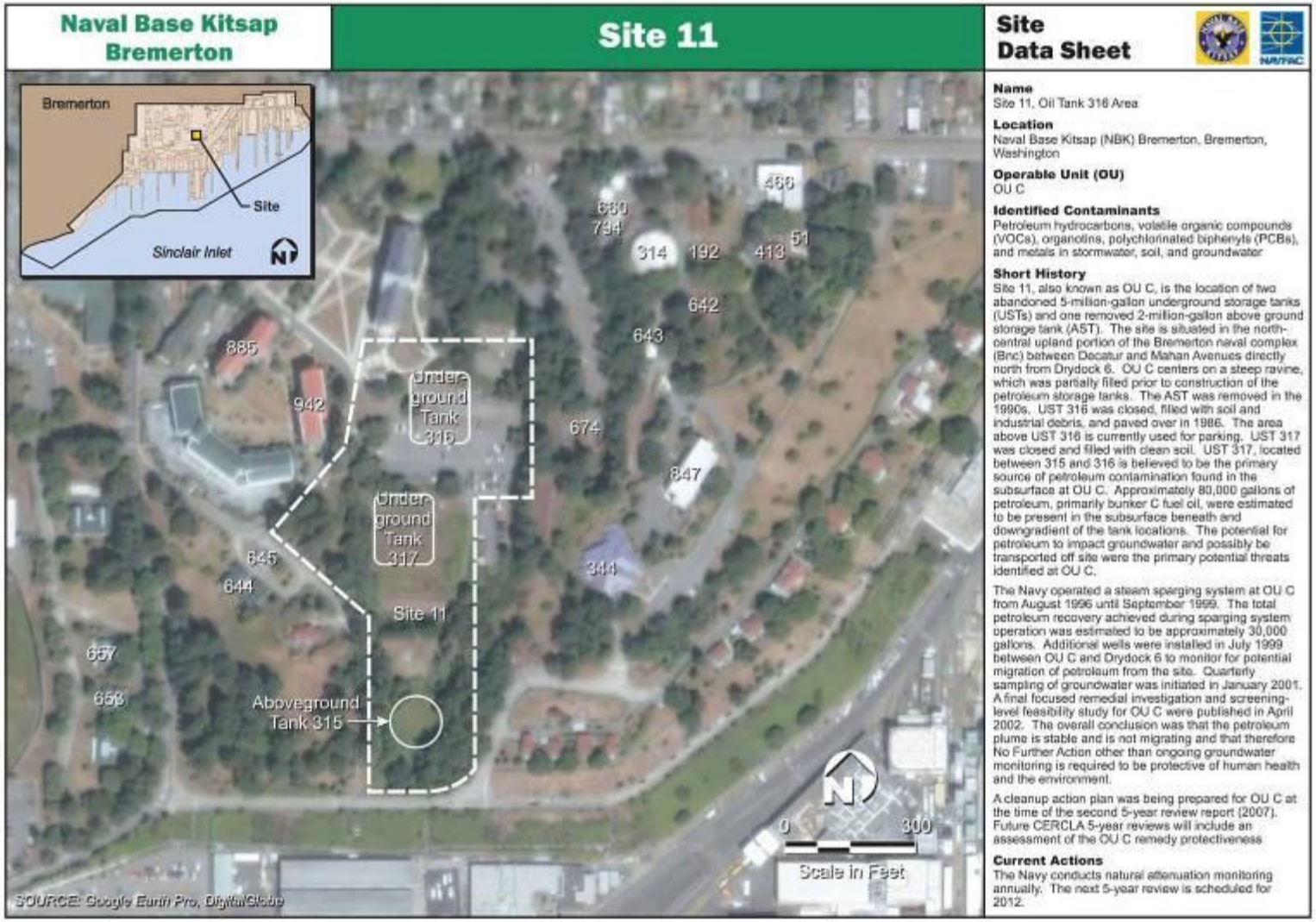

Naval Base Kitsap
Bremerton
Site 8
Bremerton
Site
Sinclair Inlet
421
923
106
Site 8
482
529
535
Drydock
1
Drydock
3
Sinclair Inlet
Sinclair Inlet
0
150
Scale in Feet
SOURCE: Google Earth Pro, DigitalGlobe
Site
Data Sheet
NAVFAC
Name
Site 8, Building 106, Site of Former Power Plant
Location
Naval Base Kitsap (NBK) Bremerton, Bremerton, Washington
Operable Unit (OU)
OU B Terrestrial
Identified Contaminants
Volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), metals, and petroleum hydrocarbons in stormwater, soil, and groundwater
Short History
Site 8 includes the southern half of Building 106 and adjacent areas to the south and east, extending into Drydock 3. Building 106 formerly housed the Central Power Plant for PSNS. Two abandoned oil storage tanks that presumably provided fuel for the power plant were discovered south of Building 106. The tanks that were suspected of leaking fuel oil into Drydock 3 were emptied, cleaned and closed in place during 1994. Currently the ground surface at the site is capped with structures or asphalt/concrete paving. The shoreline in closest proximity to Site 8 consists of a vertical quay wall.
Investigations at Site 8 were conducted under OU B Terrestrial from 1994 to 2002. These evaluations resulted in a Record of Decision (ROD) specifically for OU B Terrestrial that was executed in 2004. Some elements of the OU B Terrestrial remedy were initiated prior to finalizing the ROD. The last elements of the remedy were completed in 2006. Please refer to the Site Data Sheet for OU B Terrestrial for a description of the selected remedy and current actions.


Naval Base Kitsap
Bremerton
Site 9
Site
Data Sheet
Bremerton
Site
Sinclair Inlet
455
South Ave
Site
9
"R" Street
"S" Street
"R" Street
450
482
449
Wycoff Way
Drydock
6
0
150
Scale in Feet
SOURCE: Google Earth Pro, DigitalGlobe
Name
Site 9, Crane Maintenance Area
Location
Naval Base Kitsap (NBK) Bremerton, Bremerton, Washington
Operable Unit (OU)
OU B Terrestrial
Identified Contaminants
Semivolatile organic compounds (SVOCs), polychlorinated biphenyls (PCBs), and metals in stormwater, soil, and groundwater
Short History
Site 9 is located east of Building 450, west of "R" Street, north of Wycoff Way at Drydock 6, and south of South Avenue. The site is used for routine crane maintenance and painting, which has left paint waste and other debris on the ground for extended periods of time. Currently the ground surface at the site is capped with asphalt/concrete paving. The shoreline in closest proximity to Site 9 consists of moderately steep slopes protected by a combination of riprap, gravel mixes, and vertical quay walls.
Site investigations were conducted under OU B Terrestrial from 1994 to 2002. These evaluations resulted in a Record of Decision (ROD) specifically for OU B Terrestrial that was executed in 2004. Some elements of the OU B Terrestrial remedy were initiated prior to finalizing the ROD. The last elements of the remedy were completed in 2006. Please refer to the Site Data Sheet for OU B Terrestrial for a description of the selected remedy and current actions.

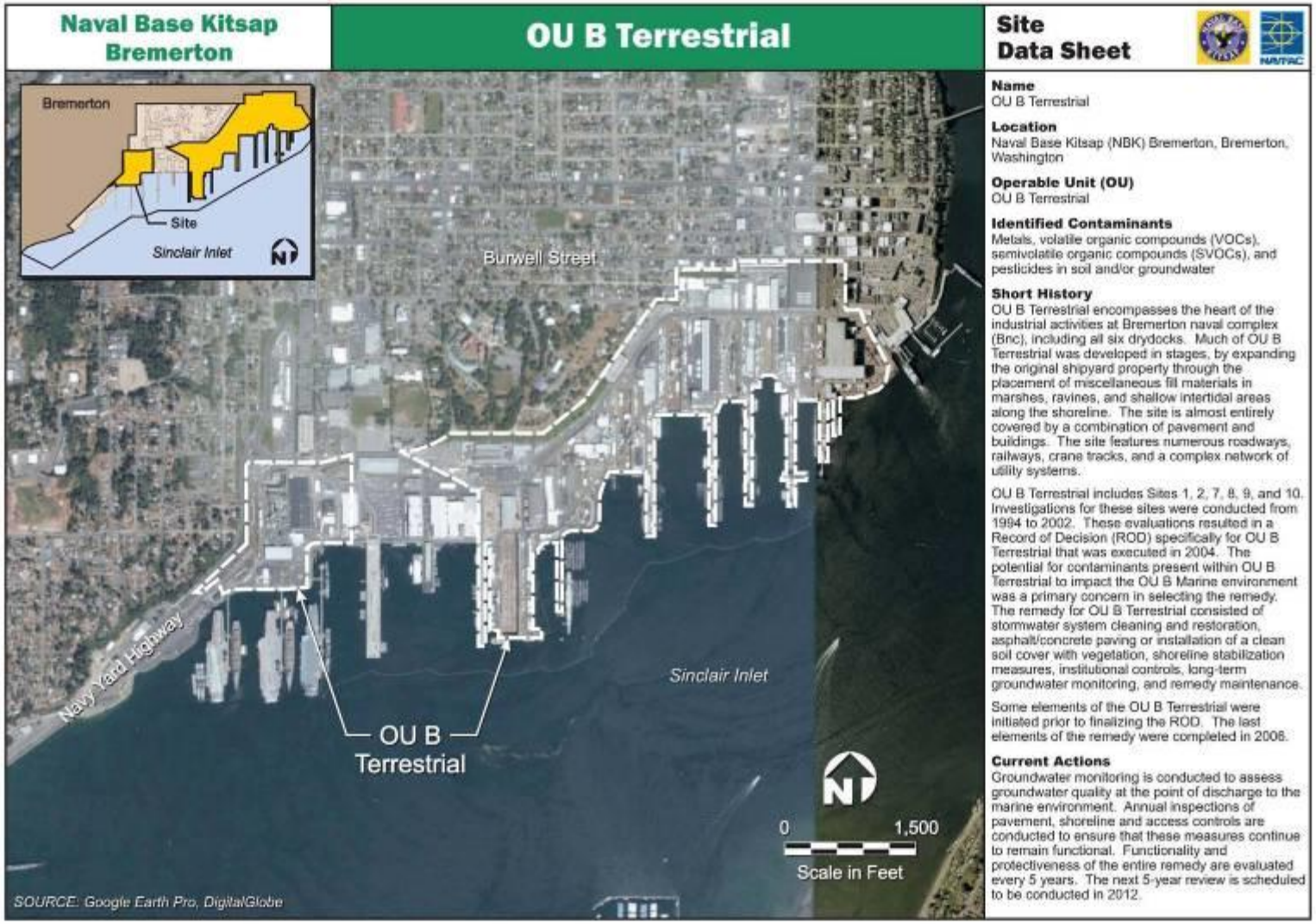

Naval Base Kitsap
Bremerton
Site 10 (East)
Site
Data Sheet
Bremerton
Site
Sinclair Inlet
Ferry
Terminal
480
F Street
Site 10 East
862
Drydock
3
495
Pier 6
Pier 7
Pier 8
Sinclair Inlet
0
200
Scale in Feet
SOURCE: Google Earth Pro, DigitalGlobe
Name
Site 10 (East), Landfill/Waterfront Areas
Location
Naval Base Kitsap (NBK) Bremerton, Bremerton, Washington
Operable Unit (OU)
OU B Terrestrial
Identified Contaminants
Volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), organotins, and metals in stormwater, soil, and groundwater
Short History
Site 10 is a composite site consisting of various landfill areas throughout the Bremerton naval complex (Bnc). Site 10 (East), located along Sinclair Inlet between Drydock 3 and the Washington State Ferry terminal, is suspected to contain sandblast grit that was used as fill material. Currently the ground surface at the site is capped with several buildings and asphalt/concrete paving. The shoreline adjacent to Site 10 (East) consists predominantly of moderately steep slopes protected by a combination of riprap and gravel mixes. The shoreline consists of a vertical quay wall between Drydock 3 and Pier 8.
Site investigations were conducted under OU B Terrestrial from 1994 to 2002. These evaluations resulted in a Record of Decision (ROD) specifically for OU B Terrestrial that was executed in 2004. Some elements of the OU B Terrestrial remedy were initiated prior to finalizing the ROD. The last elements of the remedy were completed in 2006. Please refer to the Site Data Sheet for OU B Terrestrial for a description of the selected remedy and current actions.


Naval Base Kitsap
Bremerton
Site 10 (Central)
Site
Data Sheet
Bremerton
Site
Sinclair Inlet
Name
Site 10 (Central), Landfill/Waterfront Areas
Location
Naval Base Kitsap (NBK) Bremerton, Bremerton, Washington
Operable Unit (OU)
OU B Terrestrial
Identified Contaminants
Volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), organotins, and metals in stormwater, soil, and groundwater
Short History
Site 10 is a composite site consisting of various landfill areas throughout the Bremerton naval complex (Bnc). Site 10 (Central) consists of a long, narrow band of the Bnc located along Sinclair Inlet between Drydock 6 and Pier 4, excluding Site 1. The content of the fill material in this area is uncertain. A former burn pit was identified near the southeast corner of Building 851 during investigation activities. The site contains numerous underground utilities. Currently the ground surface at the site is capped with several buildings and asphalt/concrete paving. The southern ends of Drydocks 4 and 5 are included in this site. The shoreline adjacent to Site 10 (Central) consists of moderately steep slopes protected by a combination of riprap and gravel mixes, or vertical quay walls.
Site investigations were conducted under OU B Terrestrial from 1994 to 2002. These evaluations resulted in a Record of Decision (ROD) specifically for OU B Terrestrial that was executed in 2004. Some elements of the OU B Terrestrial remedy were initiated prior to finalizing the ROD. The last elements of the remedy were completed in 2006. Please refer to the Site Data Sheet for OU B Terrestrial for a description of the selected remedy and current actions.
Drydock 4
457
431
880
Drydock 5
873
Decatur Ave
Farragut Ave
337
361
443
510
Site 10
481
455
851
388
Site 1
450
959
876
872
Drydock 6
Pier 4
Pier 3
Sinclair Inlet
0
400
Scale in Feet
SOURCE: Google Earth Pro, DigitalGlobe


Naval Base Kitsap
Bremerton
Site 10 (West)
Site
Data Sheet
Bremerton
Site
Sinclair Inlet
Farragut Ave
438
503
506
494
900
901
513
943
954
Hazardous/
Flammable
Materials
Warehouse
Site 10
West
467
SR 304
West Street
W Street
922
550
Pier
"D"
Pier
"C"
Mooring "F"
Mooring "E"
Mooring "G"
Sinclair Inlet
0
400
Scale in Feet
SOURCE: Google Earth Pro, DigitalGlobe
Name
Site 10 (West), Landfill/Waterfront Areas
Location
Naval Base Kitsap (NBK) Bremerton, Bremerton, Washington
Operable Unit (OU)
OU B Terrestrial
Identified Contaminants
Volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), organotins, and metals in stormwater, soil, and groundwater
Short History
Site 10 (West) consists of a broad expanse of the Bremerton naval complex (Bnc) located east of State Route 304, south of Farragut Avenue, west of "W" Street, and north of Sinclair Inlet. Oily sludge, automobiles, and construction debris have been disposed of at this site. The site contains numerous underground utilities. Contaminants from the fill material can be transported by stormwater and/or groundwater to the marine environment. Currently the ground surface at the site is capped with several buildings and asphalt/concrete paving. The shoreline adjacent to Site 10 (West) consists predominantly of moderately steep slopes protected by a combination of riprap and gravel mixes. The shoreline consists of a vertical quay wall between Mooring "E" and Pier C.
Site investigations were conducted under OU B Terrestrial from 1994 to 2002. These evaluations resulted in a Record of Decision (ROD) specifically for OU B Terrestrial that was executed in 2004. Some elements of the OU B Terrestrial remedy were initiated prior to finalizing the ROD. The last elements of the remedy were completed in 2006. Please refer to the Site Data Sheet for OU B Terrestrial for a description of the selected remedy and current actions.


Naval Base Kitsap
Bremerton
Site 11
Site
Data Sheet
NAVFAC
Bremerton
Site
Sinclair Inlet
466
680
794
314
192
413
51
642
643
885
942
Underground Tank 316
674
847
Underground Tank 317
845
644
344
Site 11
657
658
Aboveground Tank 315
0
300
Scale in Feet
SOURCE: Google Earth Pro, DigitalGlobe
Name
Site 11, Oil Tank 316 Area
Location
Naval Base Kitsap (NBK) Bremerton, Bremerton, Washington
Operable Unit (OU)
OU C
Identified Contaminants
Petroleum hydrocarbons, volatile organic compounds (VOCs), organotins, polychlorinated biphenyls (PCBs), and metals in stormwater, soil, and groundwater
Short History
Site 11, also known as OU C, is the location of two abandoned 5-million-gallon underground storage tanks (USTs) and one removed 2-million-gallon above ground storage tank (AST). The site is situated in the north-central upland portion of the Bremerton naval complex (Bnc) between Decatur and Mahan Avenues directly north from Drydock 6. OU C centers on a steep ravine, which was partially filled prior to construction of the petroleum storage tanks. The AST was removed in the 1990s. UST 316 was closed, filled with soil and industrial debris, and paved over in 1986. The area above UST 316 is currently used for parking. UST 317 was closed and filled with clean soil. UST 317, located between 315 and 316 is believed to be the primary source of petroleum contamination found in the subsurface at OU C. Approximately 80,000 gallons of petroleum, primarily bunker C fuel oil, were estimated to be present in the subsurface beneath and downgradient of the tank locations. The potential for petroleum to impact groundwater and possibly be transported off site were the primary potential threats identified at OU C.
The Navy operated a steam sparging system at OU C from August 1996 until September 1999. The total petroleum recovery achieved during sparging system operation was estimated to be approximately 30,000 gallons. Additional wells were installed in July 1999 between OU C and Drydock 6 to monitor for potential migration of petroleum from the site. Quarterly sampling of groundwater was initiated in January 2001. A final focused remedial investigation and screening-level feasibility study for OU C were published in April 2002. The overall conclusion was that the petroleum plume is stable and is not migrating and that therefore No Further Action other than ongoing groundwater monitoring is required to be protective of human health and the environment.
A cleanup action plan was being prepared for OU C at the time of the second 5-year review report (2007). Future CERCLA 5-year reviews will include an assessment of the OU C remedy protectiveness
Current Actions
The Navy conducts natural attenuation monitoring annually. The next 5-year review is scheduled for 2012.


Naval Base Kitsap
Bremerton
OU B Marine
Site
Data Sheet
NAVFAC
Bremerton
Site
Sinclair Inlet
Burwell Street
Navy Yard Highway
OU B Marine
Sinclair Inlet
Approximate CAD Pit
Location
0
1,500
Scale in Feet
SOURCE: Google Earth Pro, DigitalGlobe
Name
OU B Marine
Location
Naval Base Kitsap (NBK) Bremerton, Bremerton, Washington
Operable Unit (OU)
OU B Marine
Identified Contaminants
Polychlorinated biphenyls (PCBs), polycyclic aromatic hydrocarbons (PAHs), metals, and pesticides in the marine environment
Short History
OU B Marine (formerly known as Site 6) is composed of all of the nearshore marine environment associated with the Bremerton naval complex (Bnc) extending an average of approximately 1,500 feet outward into Sinclair Inlet. Most of the shoreline is composed of moderately steep slopes protected by a combination of riprap, gravel mixes, and quay walls.
Investigations were conducted from 1994 to 2002. The primary potential source of contamination in OU B Marine is contaminant discharges via the Bnc storm drains. Investigations concluded that the primary threat posed by conditions within OU B Marine was human health risk associated with the presence of PCBs in fish. These evaluations resulted in a Record of Decision (ROD) specifically for OU B Marine that was executed in 2000.
The remedy for OU B Marine consisted of dredging PCB-impacted sediments, disposal in a confined aquatic disposal (CAD) area (an offshore pit) and placement of a thick-layer cap offshore of OU A, habitat restoration in the area offshore of OU A and shoreline stabilization at Site 1, development and implementation of a long-term monitoring (LTM) plan, remedy maintenance, and implementation of land use controls.
Construction was completed between 2000 and 2001. A monitoring plan was developed in 2003 and updated in 2005 and 2007. Functionality and protectiveness of the entire remedy are evaluated every 5 years. In addition, a Cleanup Review Tiger Team (CURTT) was established in 2006 to evaluate the draft decision framework for OU B Marine, ensure that the framework is technically defensible, and provide credible evidence that additional action is or is not warranted.
Current Actions
The Navy conducts sediment and tissue monitoring every other year.


Naval Base Kitsap
Bremerton
OU B Terrestrial
Site
Data Sheet
Bremerton
Site
Sinclair Inlet
Burwell Street
Navy Yard Highway
Sinclair Inlet
OU B
Terrestrial
0
1,500
Scale in Feet
SOURCE: Google Earth Pro, DigitalGlobe
Name
OU B Terrestrial
Location
Naval Base Kitsap (NBK) Bremerton, Bremerton, Washington
Operable Unit (OU)
OU B Terrestrial
Identified Contaminants
Metals, volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), and pesticides in soil and/or groundwater
Short History
OU B Terrestrial encompasses the heart of the industrial activities at Bremerton naval complex (Bnc), including all six drydocks. Much of OU B Terrestrial was developed in stages, by expanding the original shipyard property through the placement of miscellaneous fill materials in marshes, ravines, and shallow intertidal areas along the shoreline. The site is almost entirely covered by a combination of pavement and buildings. The site features numerous roadways, railways, crane tracks, and a complex network of utility systems.
OU B Terrestrial includes Sites 1, 2, 7, 8, 9, and 10. Investigations for these sites were conducted from 1994 to 2002. These evaluations resulted in a Record of Decision (ROD) specifically for OU B Terrestrial that was executed in 2004. The potential for contaminants present within OU B Terrestrial to impact the OU B Marine environment was a primary concern in selecting the remedy. The remedy for OU B Terrestrial consisted of stormwater system cleaning and restoration, asphalt/concrete paving or installation of a clean soil cover with vegetation, shoreline stabilization measures, institutional controls, long-term groundwater monitoring, and remedy maintenance.
Some elements of the OU B Terrestrial were initiated prior to finalizing the ROD. The last elements of the remedy were completed in 2006.
Current Actions
Groundwater monitoring is conducted to assess groundwater quality at the point of discharge to the marine environment. Annual inspections of pavement, shoreline and access controls are conducted to ensure that these measures continue to remain functional. Functionality and protectiveness of the entire remedy are evaluated every 5 years. The next 5-year review is scheduled to be conducted in 2012.


Naval Base Kitsap
Bremerton
OU D
Site
Data Sheet
NAVFAC
Bremerton
Site
Sinclair Inlet
Pacific Avenue
1st Street
OU D
Sinclair Inlet
0
300
Scale in Feet
SOURCE: Google Earth Pro, DigitalGlobe
Name
OU D
Location
Naval Base Kitsap (NBK) Bremerton, Bremerton, Washington
Operable Unit (OU)
OU D
Identified Contaminants
Volatile organic compounds (VOCs), polycyclic aromatic hydrocarbons (PAHs), pesticides, inorganics, and heavy oil in soil and groundwater
Short History
In August 2002, a new OU, OU D, was designated, made up of a limited portion of the far eastern end of OU B Terrestrial. This new OU was established to support the planned conveyance to the City of Bremerton of land for creation of a new city park in conjunction with ongoing development in the vicinity of the Washington State Ferry terminal.
Soil sampling was carried out in 2003 to supplement sampling previously carried out in the area during the investigation for OU B Terrestrial. A final remedial investigation report and feasibility study for OU D was published in March 2004. The primary sources of contamination at OU D are believed to be the materials used as fill in expanding the shipyard area and possible historical releases from industrial operations. The baseline human health risk assessment concluded that risks to site workers and recreational users are acceptable under current and projected future land use conditions. However, remedial action was undertaken at OU D based on the threat to the marine environment from potential off-site transport of contaminants by groundwater and stormwater.
The remedial action components specified in the OU D Record of Decision (ROD) consists of site-wide capping (either with asphaltic concrete, pavement or a vegetative cap), stormwater system sediment removal, cleaning, inspecting, repairing or replacing damaged portions of the stormwater system, disposal of removed debris and sediment, implementing institutional controls, and long-term groundwater monitoring.
The ROD for OU D was executed in May 2005. Remedy implementation for OU D began in June 2005. Site-wide capping and stormwater sediment removal activities were completed in December 2006.
Current Actions
Long-term groundwater monitoring is conducted in conjunction with monitoring conducted for OU B Terrestrial. Future 5-year reviews will include an assessment of the OU D remedy protectiveness. The next 5-year review is scheduled to be conducted in 2012.

This Page Intentionally Left Blank

Appendix G: Forestry Prescriptions

This Appendix contains detailed information and management prescriptions for the forest stands on Naval Base Kitsap Components.

Naval Base Kitsap forest stand data is found in the following tables in this section:

Table 1: Stand Data
Table 2: Stand Data by Decade of Origin
Table 3: Habitat Data by Cruised Stand
Table 4: Type Group Summary

A summary of the type symbols used follows.

Species

D	Douglas-fir
H	Western hemlock
RC	Western redcedar
WP	Western white pine
LP	Lodgepole pine (shore pine)
TF	True fir (Grand fir, Silver fir)
SS	Sitka Spruce
RA	Red alder (includes aspen, cherry)
Md	Madrona
Q	Aspen
Hd	Mixed hardwoods
BLM	Bigleaf maple
BC	Black cottonwood

Lower case letter species designations indicate a secondary species which comprises 20% or more of the stand volume as estimated from the aerial photographs or cruisers judgment. The secondary call is useful to indicate that an individual stand is somewhat different from the type group in which it is included.

Non-Forest Types

A	Agriculture
Br	Brush
G	Grass
O	Open (developed)

Size Class

4	21” dbh and larger
3	11-21” dbh
2	5-11” dbh
1	0-5” dbh

Occasionally a size class is difficult to determine because of the broad range of diameters present. In this case, the diameter class may be shown as 4/3 indicating a mixture of size class 4 and 3 trees. Stocking is represented by percent crown closure, based on aerial photo examination.

Stocking
,3 = 70-100 percent
,2 = 40-69 percent
,1 = 10-39 percent

Decade of origin is shown as a two-digit number following the type call. For instance, 92 indicates that the stand began between 1921 and 1930, and so forth.

Origin

90	1900
91	1910
92	1920
93	1930
94	1940
95	1950
96	1960
97	1970
98	1980
99	1990
00	2000

For volume compilation purposes, cruise data from individual stands is combined with other similar stands into type groups. The groups contain stands with minor species variances that are unique to that stand; however, the volume sample is too small to report individual stand volumes. Occasionally, an individual stand may not receive plots or may be too small to be reported separately. In that case, a judgment is made as to the most appropriate type group. When type groups are indicated with an "a", this means that the cruiser chose a different basal area factor for that stand, although the group is the same as other stands.

Type Groups

0	non-timber stands
1	D1,3
2	D2,1
3	D2,2
4	D2,3
5	D3,1
6	D3,2
6a	Lp3,3
7	D3,3ra
8	D3,3
10	D4/3,3
11	D4,1

12 D4,2
13 D4,3
14 Ra1,3
15 Ra3,3
16 Cw3,3
17 M3,2
18 Rc3,2
19 H3,2
20 H3,3
21 H3,3,d
22 H4,3
23 H4,3,d

Volume is calculated from variable radius plots. The plot grid is designed to attain a 5-percent sampling error. Plot grids ranged from one plot per acre to one plot per 6.5 acres depending on compartment size and tree variability. Plot sizes are chosen to achieve a tree tally of 4 to 8 trees per plot. Merchantable timber is cruised in 32-foot logs, to a 6-inch top or 40-percent of dbh. Volumes are calculated using INFO's PACNW timber cruise program. This program is formula based and allows the use of variable log lengths. Gross volumes are adjusted in the field for visible defect, and again in the office for hidden defect and breakage, ranging from 5 to 15 percent. Data by species gathered at each measured sample point (generally every other point) are merchantable tree diameter in 1-inch classes and merchantable height. At each point, subsamples of tree form were also gathered. This information is used to calculate volumes.

Growth increment is determined from standard yield tables[1]. Basal area was calculated for each stand as well as site index on 4 to 20 sample trees per stand. The appropriate cubic and Scribner volume is read from the tables and reported.

Table 1 reports volume data by stand.
Table 2 reports volume data by 10-year age class.
Table 3 reports snag, downed woody debris and vegetation information as well as per acre volume data by stand.
Table 4 reports volume data by type group.

A variable sub plot was taken at each measure point to measure snags. A fixed length transect was taken at each measure point to measure down woody material to a 4-inch diamter[2].

---

[1] Chambers, Charles J. Empirical Growth and Yield Tables for Douglas-fir Zone., Dept. of Natural Resources Report No. 41, 1980.
Chambers, Charles J. Empirical Yield Tables for Predominantly Alder Stands in Western Washington., Department of Natural Resources Report No. 31, 1974

[2] Howard, James O. and Franklin Ward. Measurement of Logging Residue., USDA Forest Service, PNW-13.

A 1/20th acre fixed plot was taken at each point to estimate the coverage of brush and ground covers in Table 3, the percentage of ground cover by primary species is provided. In some instances, either by reason of sample size or variability of conditions, the ground cover is reported in combinations such as S/F, meaning salal and ferns. The combination codes are found at the end of Table 3.

Maps are provided on disks in ArcView format. Property ownership information was provided by the Navy. This was adjusted to State Plane Coordinates using electronic information provided by the State of Washington. Roads and other planimetric information as found on the aerial photos are shown with numbers and type call information corresponding with the tables. Acres were calculated electronically.

Site Index. Site quality, is a term used to describe the relative productivity of a land area for a particular tree species. Site quality is usually defined in terms of capacity to produce wood, or the overall health of the dominant species in a stand. The most common expression of site quality is site index. Site index is based on tree growth patterns and refers to the height of dominant or dominant and co-dominant trees in even-aged stands at some index age, usually 100 years. The height growth of such trees is considered to be independent of stand density over a wide range of stand density and strongly related to site quality. Due to prior land management constraints in land acquisition, many stands on Naval Base Kitsap components have not been actively managed to maximize tree growth. Thus, the use of site indices may not always reflect actual site productivity potential. One goal of this plan is to achieve well stocked, regulated stands in order to take advantage of site productivity and to restore the coniferous forest cover previously found on these lands. Thus, site indices based on existing stand characteristics may increase with management and time. Site indices are given in Table 1 for the dominant species in each stand.

FOREST STAND MANAGEMENT

The following prescriptions provide guidance in the preservation, management and treatment of forest stands. The prescriptions are descriptive and prescriptive; meaning that they address, in unrestrictive terms, the management and silvicultural goals and treatments to be applied over the lifespan of this plan and subsequent editions. Management will be adjusted in light of any unforeseen circumstances that pose new situations for forest and land management. Changing or evolving mission requirements and natural disasters may require some adjustment of the location, sequence and timing of silvicultural treatments. Regardless of stand prescriptions, any and all trees determined to be a hazard or safety risk will be removed to eliminate the unsafe condition. The silvicultural policies described elsewhere in this plan are considered ecologically sound and will be adhered to in the absence of urgent and compelling alternative land use requirements documented and adopted through established programmatic and project planning processes.

Due to the sensitive nature of such areas and resources, no information will be included here concerning historical, cultural or archeological items and sites discovered over the years while conducting forestry work. Such information is available from the Forester, EFA NW, through confidential discussions as appropriate and pertinent to land management issues and uses.

Relict Old Growth Forest Trees: While there are no currently delineated stands of old growth timber on Naval Base Kitsap, there are scattered relict old growth trees. To the maximum extent practicable, these will be preserved for the unique characteristics they contribute to forest stands.

Second Growth Stands: Most second growth stands need thinning to focus site potential growth on fewer, larger trees per acre and to foster development of understory vegetation and tree reproduction. The following prescriptions are provided for silvicultural treatments possible under the INRMP for Naval Base Kitsap.

Common Forestry Definitions:

O.C.: On Center, referring to a square spacing used in forestry activities.

T.S.I.: Timber Stand Improvement, referring to any activity which improves stand quality that is not a form of commercial harvesting.

Requirements pertinent to all prescriptions.
Prior to treatment all stands will be evaluated for, nests and associated restricted zones, streams, stream channels and wetlands and the prescription/contract will incorporate the appropriate protection measures whether stated in the following site specific stand prescriptions or not. When prescriptions change the dominant species from broadleaf to conifer 5% or more of the best quality broadleaf species will be retained to contribute to habitat diversity and retain songbird habitat. Exceptions may occur when the objective of site conversion is hazard reduction to adjacent roads and facilities. This requirement overrides any statements to the contrary in the prescriptions below. Additionally, measures to retain and promote merchantable and vigorous western white pine and western redcedar when present will be incorporated into all finalized prescriptions prior to implementation.

NAVAL BASE KITSAP, BANGOR, NORTH, COMPARTMENT 1

Stand prescriptions are developed with the information available and present at the time of their generation. Pending changes in stand data via surveys or field verification, prescriptions are subject to change to meet the needs of the most current stand information available. Silvicultural prescriptions are also subject to change in support of mission related projects.

Stand 1:
This large, 296 acre open area represents the clearing and subsequent paved areas resulting from the road system and utility corridors present in the northern compartment of the installation. Trees and other vegetation may be removed from this stand if it is found to be hazardous to human activity or road structural stability. Also, hazard tree removal or thinning with pruning may occur along this stand's road corridors if security mandates the removal or thinning of trees or vegetation in order to maintain the security of mission related activities. Deciduous trees (primarily alder) within 30 feet of any road corridor that represent a hazard may be subject to removal in a manner that protects streams and wetlands; whereby, the deciduous trees will be removed and the subsequent clear area will be planted with seedlings of various native conifers. Within this stands utility corridors, ground cover and shrub species that encourage the health and vitality of wildlife will be planted to increase wildlife habitat within the area. Any open areas resulting from past disturbance shall have the existing ground cover removed and disposed of off the installation. This will be followed by ripping with a 12" ripping shank in preparation of planting with seedlings of various site representative native conifers.

Stand 2:
This stand represents Cattail Lake; which, in the past was used for fishing and recreation by sailors and their families. However, as a part of NEPA required mitigation, this lake will be drained and the site will be restored to the salt water marsh that existed prior to the man-made formation of the lake. After the lake has been drained and the work is completed to develop the area into a saltwater marsh, the site will be assessed from a forestry perspective to ensure the continuity of the surrounding forest cover type. The area around the future marsh may require thinning and planting to restore the vegetative regimes that would thrive in a salt water marsh environment. Thus, post-conversion, a site survey shall be conducted to determine the future silvicultural prescriptions for this stand.

Stand 3:
This stand is dominated by second growth Douglas-fir with varying amounts of western hemlock and western redcedar. This stand has had two windthrow salvage harvests since the establishment of the base, one in 1979 and the other in 1991. Also, the southern tip of this stand overlaps with an active environmental restoration site (Site A), which will limit the amount of forestry activity that can occur in the area. However, the northern portion of the stand has sufficient size and density to be commercially thinned to a 20' on center (O.C.) spacing; where the residual stand has approximately 100 trees per acre. To encourage vertical and horizontal stratification, seedlings of various native conifers will be planted in the openings created by the thinning. On a side note, the northwest corner of this stand has a listed historical structure that must be evaluated and appropriately buffered before forestry operations can occur in that section of the tract.

Stands 4, 5, and 6:
Stands 4, 5, and 6 are relatively dense and homogenous stands of red alder. The high density and homogeneous nature of the stands shows the need for thinning and subsequent planting. These stands will be thinned using the leave tree release hardwood thinning method whereby a leave tree is selected on a variable residual spacing between 14'-20' O.C. to achieve a residual stand density of 134 trees per acre; whereby, all trees whose crowns are either touching or above the leave tree shall be removed. To encourage both horizontal and vertical stratification within these stands, seedlings of various native conifers will be planted in the newly opened areas. Wetland issues must be addressed prior to forestry operations in this area. Alder thinning will be done in a manner that protects the integrity of streams and wetlands.

Stand 7:
Stand 7 is a Douglas-fir dominated tract with low proportions of mixed native conifers. This stand is not overly dense but could use a light crown thinning to open up growing space and increase the availability of light for photosynthesis to occur in trees of the second and third cohorts. The light crown thinning will consist of the removal of first cohort trees on a spacing of roughly 20' O.C.; whereby, selected stems will be removed on the set spacing and shall not be left. This will open up the canopy and result in greater stand health and vitality without causing the stand to become under-stocked from a heavier thinning. These operations can either be conducted as a commercial timber sale or a TSI project depending on the trees selected for removal. If the TSI option is selected, then the removed stems will be cut and left lie in the stand.

Stand 8:
This stand is primarily within environmental restoration site A, which limits the forestry activities that can be accomplished within the stand. However, the site was a part of a red alder thinning in 2004. Thus, the forested sections of the stand are not overly dense and do not require additional thinning in order to ensure the continuity of the stands health and vigor. However, this site has space for planting of seedlings of various native conifers in both the previously thinned stand and along the edges of the environmental restoration cleared area. In the environmental restoration site, the ground shall be ripped using a 12" ripping shank, top soil added in preparation of planting with seedlings of representative native conifers on 8' O.C. spacing. Prior to planting coordinate with environmental restoration personnel to ensure compliance.

Stand 9:
Stand 9 is a small alder tract with relatively low density and low levels of biodiversity. Thus, hardwood conversion will occur whereby the hardwood over story will be removed and the site shall be planted with seedlings consisting of various native conifer species to increase both the horizontal and vertical stratification of the stand. This will be accomplished through a shelter wood thinning; whereby, the stand will be thinned to a residual spacing of 25' O.C. to achieve 70 trees per acre of residual density. The thinning shall be following with inter-planting with seedlings of various native conifers. Wetland and streams must be delineated and addressed prior to any forestry operations. Alder thinning will be done in a compliant manner that protects the integrity of streams and wetlands.

Stands 10 and 11:
Stand 10 is a very small Douglas-fir dominated stand that shall be thinned to a spacing of 20' O.C. to achieve a residual stocking density of 100 trees per acre. Stand 11 will require planting to bring the productivity of the site back to the original condition of the area. Stand 11 will require removal of the brush and vegetation with disposal off site followed by ripping of the whole area with a 12" ripping shank in preparation for planting. The two stands shall be either planted or inter-planted with seedlings of representative native conifers.

Stand 12:
Stand 12 is a Douglas-fir dominated tract that is adjacent to an active environmental restoration site (Site A); but, the stand is considerably over stocked, which is decreasing the stands productivity, crown ratio and health and vigor. This stand shall be thinned to a spacing of 18' O.C. with a residual stand density of 135 trees per acre. The thinning shall be conducted whereby alder, bigleaf maple and any other broadleaved species cannot be marked as "leave" trees but up to 5% of them will be retained on site to contribute to diversity. This treatment will encourage stump sprouting by the broadleaved species leading to the enhancement of residual native conifer health and vigor, while increasing vertical and horizontal stratification, improving forage and maintaining songbird habitat.

Stand 13:
Stand 13 is in the heart of an environmental restoration site (Site A); thus, it is open and denuded of forest vegetation. Scotch broom now dominates the site and should be removed and disposed of offsite followed by ripping with a 12" ripping shank (if approved) and adding top soil to the site. This treatment will release bare mineral soil allowing for easier root penetration and planting success. The invasive species removal and ripping will be followed by planting with seedlings of various native conifers. These operations will be limited in their scope and size by the operations at the environmental restoration facility (Site A). Thus, prior to forestry operations, environmental restoration personnel must be consulted and issues with the ground water barrier addressed.

Stand 14:
Stand 14 is a slightly over stocked Douglas-fir dominated stand that was thinned previously in 1998. This stand shall be thinned again at a spacing of 20' O.C. to enhance residual stand growth and vigor. There shall be approximately 100 trees per acre in the residual stand. This will allow light to reach the forest floor which will develop a healthy understory for the enhancement of wildlife habitat.

Stand 15, 16 and 21:
These three stands run adjacent to Amberjack road. The stands are Douglas-fir dominated with high proportions of alder, bigleaf maple and mixed native conifers. This site shall be crown thinned to a residual spacing of 16' O.C. to achieve a residual stand density of 170 trees per acre; whereby, no red alder or stand dominants shall be marked as leave trees, but approximately 5% of the broadleaf species shall be retained. Conifer selection for retention shall be of healthy co-dominant intermediate and suppressed stems. After the thinning the site shall be planted with seedlings of various native conifers. This will not only open the site for higher levels of growth and forest health but will also help to decrease the number and amount of hazard trees that may present a hazard to Amberjack road.

Stand 17:
Stand 17 is a relatively small tract that is dominated by red alder with a large proponent of Douglas-fir. This stand is under stocked and has a stream with an adjacent wetland running down the middle of the tract. The stand shall be planted with seedlings of various native conifers with an emphasis on western redcedar in order to improve wetland function and vitality. Any identified hazard trees shall be carefully removed and disposed of offsite.

Stand 18
Stand 18 is a red alder dominated tract that is adjacent to an active environmental restoration site; but, the stand is considerably over stocked, which is decreasing the stands productivity, health and vigor. This stand shall be thinned using the leave tree release thinning method whereby the tract will be cut with a variable residual spacing between 14'-20' O.C. with a set residual stand density of 140 trees per acre. Leave trees selection will be of stems with the largest diameter having good health, good form and a well formed crown. Any nearby stem whose crown is either touching or above the leave tree shall be subject to removal.

Stand 19 and 20:
Stands 19 and 20 are located between Amberjack Ave. and Tang Rd. The tract has a high density consisting of Douglas-fir and red alder. This area shall be thinned to a residual spacing of 18' O.C. with a residual stand density of 134 trees per acre to encourage growth but also to ensure the continuity of the shoreline vegetative visual buffer which supports mission objectives.

Stand 22:
Stand 22 is a larger tract that will require two separate prescriptions. The western half of this stand is densely stocked with larger diameter Douglas-fir, with proportions of western redcedar. The western half of this stand shall be thinned to a 20' O.C. residual spacing to achieve a residual stand density of 100 trees per acre which will encourage stand health and vigor, while also increasing understory wildlife habitat. The eastern half of the stand is in close proximity to a unique interior species habitat management area containing aspects of old growth characteristics; thus, the eastern half of the stand will not be thinned but will be managed to enhance the old growth characteristics of the adjacent stand, as outlined in the Forest Service document PNW-RN447.

Stand 23:
Stand 23 is a smaller size tract that is dominated by both red alder and Douglas-fir that is moderate in size and density. This stand will be subject to a general thinning to a 20' O.C. residual spacing with an end objective of 100 trees per acre to encourage vertical and horizontal stratification along with increased understory wildlife habitat.

Stand 24, 25, 26, 27 and 36:
These four stands represent multiple unique habitat types for NBK forests. There is a well defined perennial headwater stream catchment that flows throughout an interior species habitat zone with multiple old growth characteristics, including many relict old growth trees. Thus, typical silvicultural prescriptions and management strategies do not apply to these stands. This stand shall be managed to enhance interior species habitat while increasing the old growth characteristics of the site as outlined in the forest service old growth definition found in the forest service document PNW-RN447. Also, any and all management activities used on these stands must not work to

impede the headwater catchment's structural integrity and water quality. The southern edge of stand 24 runs along Darter road and has been significantly disturbed in the past. Thus, the portion of the stand which lies within 300 feet of Darter road will not be managed for interior species habitat but will simply be treated for hazard tree abatement and mission security. Stand 27 does not fully lie within the interior species habitat management area, thus portions of the northern and southern extents of the stand may be thinned along with adjacent stands to a minimum residual spacing of 20' O.C. and a minimum residual density of 100 trees per acre, to the extent deemed necessary by Navy Foresters prior to treatment.

Stand 28:
Stand 28 is a small stand that lies adjacent to the eastern installation boundary line. This stand is moderately stocked with moderately sized Douglas-fir and western hemlock; thus, this stand shall be thinned to a 20' O.C. residual spacing with a residual stand density of 100 trees per acre; whereby, leave trees shall be native conifers with good form, health and crown. This will allow improved stand structure, health and vigor while also aiding in the development of understory habitat for wildlife and biodiversity.

Stand 29:
Stand 29 is a narrow strip of primarily larger sized red alder that runs along the eastern installation boundary. In order to ensure the efficacy and structural stability of the installation fence-line, this area will be thinned of all poor form and structure hardwood stems and will be replanted with seedlings of various native conifers. The stand shall be thinned to a residual spacing of 20' O.C. to achieve a residual stand density of 100 trees per acre; whereby, leave trees shall be stems of good form, health and crown vigor.

Stand 30:
Stand 30 is a red alder dominated stand that has multiple stream channels crossing the stand primarily in the northern portion of the tract. In order to reduce the risk of erosion and sedimentation, this stand shall be thinned using the leave tree release method; whereby, stems of good form health and crown vigor shall be selected at no set spacing in order to achieve a residual density of 140 trees per acre. To release a selected leave tree, any and all stems whose crowns are either touching or above the crown of the leave tree shall be subject to removal. Due to waterway and wetland concerns, careful planning of ground based yarding and development of effective best management practices shall be used for all operations on this stand.

Stand 31:
Stand 31 is a lower density stand with fairly large timber throughout the stand. A light low thinning, whereby intermediate and suppressed stems will be removed, will be needed to bring the overall stand density down to 100 trees per acre. In open areas, seedlings of various native conifers will be planted to allow for the vertical and horizontal stratification of the stand. This can be achieved as a TSI project, whereby non-merchantable stems will be cut and left in the stand while leaving all merchantable stems as standing timber.

Stand 32:
Stand 32 is a moderately large tract with a high stand density that is dominated by larger diameter Douglas-fir. Thinning to a residual spacing of 20' O.C. to achieve a residual stand density of 100 trees per acre will be conducted. Red alder stems may not be counted as leave trees except in contiguous blocks of red alder, which will be thinned at the spacing of the rest of the stand. Subsequent open areas will be inter-planted with seedlings of various native conifers. This thinning must be conducted with careful planning of yarding strategies and best management practices to protect nearby headwater catchments. The thinning will allow for a vigorous and productive understory especially with inter-planting which will increase biodiversity both horizontally and vertically.

Stand 33:
Stand 33 is a small tract that runs along the eastern installation boundary. The small size and relative low density of stems does not allow for a thinning or any other type of harvest unless the stand is combined with another stand to form a more contiguous tract of merchantable timber. Thus, this stand will be managed for hazard tree abatement for installation fence-line structural stability and efficacy.

Stand 34 and 35:
Stands 34 and 35 have present stocking levels of approximately 140 trees per acre, thus any thinning that would occur to bring the stocking down to the desired 100 trees per acre would be relatively light. Thus, this stand shall be thinned in concurrence with adjacent stands to a residual spacing of 20' O.C. to achieve a residual stand density of 100 trees per acre; whereby, selected leave trees shall be stems with good form, health and crown vigor.

Stand 37:
Stand 37 is a small stand which lies to the east of the Flier road clearing and thinning project. The stand has a moderate, 170 trees per acre, current stocking density, with large diameter Douglas-fir dominating the stand. Thus, this stand is to be thinned to a residual spacing of 18' O.C. to achieve the desired residual stocking density of 134 trees per acre; whereby, leave trees shall be native conifers with a straight bole, good form, good health and a vigorous crown. This spacing will allow for the development of pole quality timber while still providing light to the forest floor to develop a vigorous understory for wildlife habitat development.

Stand 38:
The entire stand is composed of wetland features making forest operations very limited. Hazard tree abatement along with support for mission related projects will be permitted but otherwise no management in this stand is planned at this time. The stand shall be surveyed at a future time to determine the applicability of various management strategies.

Stand 39:
Stand 39 was cleared and thinned in support of the Flier road clearing and thinning project. The security stipulations of that project prevent the planting or further habitat enhancement of the stand. Thus, this stand will be managed for hazard tree abatement and for the support of future mission security objectives. However, pending a change in security requirements, this stand shall be planted and inter-planted with seedlings of various native conifers.

Stand 40:
Stand 40 was completely denuded of standing timber in support of the Flier road clearing and thinning project. Since the project prohibits the planting of seedlings, this area will not be treated at this time for timber but will be managed for wetland stability and efficacy. However, pending a change in security requirements, this stand shall be planted and inter-planted with seedlings of various native conifers.

Stand 41:
The eastern portion of stand 41 has been either cleared or thinned in support of the Flier road clearing and thinning project. The western portion of the stand has a large contiguous wetland with perennial flowing waterways. Thus, this stand will be managed to enhance wetland functionality and stability. A light low thinning using the leave tree release method to a residual stocking of 100 trees per acre will occur; whereby, leave trees shall be stems of good form, health and crown vigor. This can be accomplished as TSI; whereby, removed trees are cut and left in the stand. This approach will prevent major impact to either the water ways or the wetlands from yarding activities. Open areas to the west of the Flier road project area will be planted with seedlings of various native conifers. Pending security requirement changes, the eastern portion of the stand shall be planted or inter-planted with seedlings of various native conifers.

Stand 42:
The eastern portion of stand 42 was thinned in support of the Flier road clearing and thinning project. The western side of the stand could be thinned to a 20' O.C. residual spacing to achieve a residual stand density of 100 trees per acre in order to improve heath and vigor of the residual stand. However, management of this stand will be greatly hindered by the security requirements of the area, which prevents the planting of seedlings. Pending security requirement changes, the eastern portion of the stand shall be planted or inter-planted with seedlings of various native conifers.

Stand 43, 44, 45, 46 and 47:
A majority of stands 43, 44, 45, 46 and 47 will be removed in support of a mission related project. Thus management of the small, if not insignificant, portions of the stand left un-cleared will be combined with adjacent stand management prescriptions. However, the minimum residual spacing shall be 20' O.C. to achieve a minimum residual density of 100 trees per acre; whereby, leave trees shall be stems with good health, form and crown vigor.

Stand 48:
A small portion along the northern boundary of stand 48 will be removed in support of a mission related project. Although the rest of the stand will not be cleared the topography of the stand hinders the ability of active management activities from occurring on this stand. Thus, this stand will be managed for shoreline habitat and hazard tree abatement.

Stand 49:
Stand 49 is a red alder dominated stand with a relative high density of small pioneering stems. This stand shall be pre-commercially thinned to a residual density of 170 stems per acre with a residual spacing of 16' O.C.; whereby, leave trees shall be stems with the best health, form and crown vigor. The topography of this stand will hinder the types of equipment that can be used for forestry operations; thus, a stand survey shall be conducted prior to implementation as a TSI project.

Stand 50:
Stand 50 is located near the shore line with drastically steep topography with a relatively low density of merchantable timber. Thus, this area will be managed for shoreline habitat enhancement and for hazard tree abatement.

Stand 51:
The eastern portion of the stand 51 will be cleared in support of a mission related project. The remaining timber is dominated by larger diameter Douglas-fir with a moderate stocking density. The stand shall be thinned to a residual spacing of 20' O.C. to achieve a desired stocking density of 100 trees per acre; whereby, leave trees shall be native conifers with the best form, health and crown vigor. However, special care must be taken in the vicinity of a building located along the boundary of this tract. With a close proximity to an existing facility, a distance of one tree length into the stand shall be managed for hazard tree abatement.

Stand 52 and 53:
The eastern half of both stand 52 and stand 53 will be cleared in support of a mission related project. The western halves will not have sufficient timber both in terms of number and quality to warrant a commercial thinning. Also, the topography of stand 52 will hinder any forestry activities from occurring on the site. Thus, no management will be prescribed at this time for these two stands, reevaluation of these stands will occur at a later date to define future management objectives for these stands.

Stand 54:
The western portion of stand 54 will be cleared in support of a mission related project. However, the eastern portion of the stand is dominated by larger diameter Douglas-fir stems that have a moderately high stocking density. This stand will be thinned to a residual spacing of 18' O.C. with a residual density of 134 trees per acre; whereby, selected leave trees shall be native conifers with a straight bole, good form, good health, a relatively low number of lower stem branches and a full vigorous crown. This thinning will encourage the growth of pole quality timber, while still achieving a vigorous understory for structural stratification and wildlife habitat.

Stand 56 and 57:
Stand 56 and 57 have either been cleared or thinned in support of the mission related Flier road clearing and thinning project. There are no prescriptions for these stands at this time, reevaluation at a future time will occur to reassess the applicability of these stands for active forest management. Pending changes in security requirements, these stands shall be either planted or inter-planted with seedlings of various native conifers to encourage stand health through structural stratification.

Stand 58:
The timber along the western boundary of stand 58 has either been removed or thinned in support of the mission related Flier road clearing and thinning project. The remaining timber is larger diameter second growth dominated by Douglas-fir. The stand is fairly dense and shall be thinned to a 20' O.C. residual spacing to achieve a residual density of 100 trees per acre; whereby, leave trees shall be selected that are of large diameter, good form, good health and vigorous crowned stems. This thinning will work to encourage stand vigor and health, while meeting the security objectives of the area.

Stand 59:
Stand 59 is a larger tract of sawlog sized Douglas-fir, hemlock, and redcedar that has a high stocking density. The stand shall be thinned to a residual spacing of 18' O.C. in order to achieve 134 trees per acre of residual density for the production of pole quality timber. Leave trees shall be large native conifers with a straight bole, good health, good form and a well formed vigorous crown. No hardwoods are to be marked or tallied as leave trees and must be removed. Any subsequent open areas shall be inter-planted with seedlings of various native conifers.

Stand 60 and 61:
The western half of both stands 60 and 61 was cleared or thinned in support of the mission related Flier road clearing and thinning project. The remaining timber of stand 61 has a perennial stream flowing through it with wetlands adjacent to the channel. Stand 60 is a small patch of timber that is of lower value and is between roads and a building. Thus, management of these two stands will be for the abatement of hazard trees and the enhancement of water quality and wetland vitality.

Stand 62:
Stand 62 is a small strip of timber that lies between Seawolf road, Archerfish road and a turnout for a service well. There is insufficient volume of timber to warrant the thinning or active management of this stand. Thus, this stand will only be managed for the abatement of hazard trees or for mission related projects.

Stand 63:
Stand 63 is an isolated tract of primarily sawlog size red alder that has a fairly high stocking density. This stand shall be thinned to a residual spacing of 18' O.C. to develop a residual stocking density of 134 trees per acre to encourage the diameter growth of the alder to form veneer quality sawlogs. The thinning shall be a leave tree release, whereby any and all stems whose crowns are either touching or above the crown of the leave shall be subject to removal. Logistically, this tract should be thinned in conjunction with stand 12 and only to the extent allowable by the operations at the environmental restoration site A.

Stand: 64, 65 and 66:
These three stands are primarily open with some standing timber in the form of small non-contiguous strips. Any and all invasive species in the open areas shall be removed and disposed of off the installation followed by an herbicide treatment with approved chemicals at the appropriate time of use. The open areas shall be ripped using a 12" ripping shank in preparation of planting with seedlings of various native conifers. The standing strips of timber shall be managed for the abatement of hazard trees.

Stand 67:
The south eastern corner of stand 67 has been both cleared and thinned in support of the mission related Flier Road clearing and thinning project. The residual timber both the previously thinned stems and the previously un-thinned stems surround an ephemeral stream channel. However, this stand is overstocked with pole quality Douglas-fir. Thus, this stand shall be thinned to a residual spacing of 20' O.C. to achieve a residual density of 100 trees per acre in order to encourage vigorous growth and healthy crown production. Logistically, this stand should be thinning in correlation with stand 59.

Stand 215 and 315:
Stand 215 and 315 were previously thinned to a wide (25' O.C.) residual spacing in 2001. A stand survey must be conducted to determine the extent of regeneration that has occurred since the previous thinning. From brief field visits, it has been determined that there is a prevalence of western white pine regeneration within this stand. This stand will require both a pre-commercial thinning to a 16' O.C. residual spacing and pruning of the residual stems. Pruning would be required because of the widespread infestation of pine rust in lower bole branches of western white pine. Thus, the bole of the western white pine regeneration would need to be pruned to a height of one third of the total height of the tree with the branches being trimmed from a distance of 6 inches from the bole up the branch in order to prevent the entrance of pine rust into the main bole of the regeneration.

Stand 222, 322 and 323:
These three stands are highly dense stands that are dominated by large diameter Douglas-fir. These stands shall be thinned to a residual spacing of 20' O.C. to achieve a residual stand density of 100 trees per acre. This timber is of pole quality and can be marked and sold as such. Also, this area has a forest road mapped through it that has not been constructed yet; thus, when planning the thinning, the previously designed road should be considered when laying out the harvesting haul roads.

Stand 254:
The south western corner of stand 254 shall be cleared in support of a mission related project. In the northwestern portion of the tract there is an extensive wetland that is being cleared for the maintenance of the power line right-of-way adjacent to the stand. The rest of the stand is intermixed with large coniferous saw-timber and pockets of pure red alder regeneration. The larger saw-timber shall be commercially thinned to a 20' O.C. residual spacing to achieve a residual stand density of 100 trees per acre which will encourage tree growth and ecosystem function. Leave trees shall be native conifers with good form, health and crown vigor. The pockets of regeneration shall be pre-commercially thinned to a residual spacing of 16' O.C. to achieve a residual density of 170 trees per acre.

Stand 303:
Stand 303 lies partially along the northern installation boundary line and to the north of environmental restoration site A. The stand is a moderately dense, saw-timber sized Douglas-fir dominated stand with proportions of western hemlock and western redcedar. This stand shall be thinned in combination with stand 3, whereby the residual spacing shall be 16' O.C. in order to achieve a residual stand density of 170 trees per acre. The close spacing will be used to encourage the growth of pole quality timber. A distance that is one tree length into the stand from the installation fence line shall also be managed for the hazard tree abatement in order to maintain the structural stability and efficacy of NBK security.

Stand 308:
Stand 308 is completely within a marked wetland; thus, stand 308 will be managed for vertical and horizontal stratification by inter-planting seedlings of various native conifers. Also, the management of this stand shall include actions to encourage and foster wetland function and vitality. TSI shall be conducted whereby poor health, form and crowned stems shall be cut and left in the stand to a residual stocking density of 134 trees per acre. The TSI will improve the ecosystem function of the stand which will invariably improve the functionality and vitality of the wetlands in the stand.

Stand 309:
Stand 309 has no merchantable timber but does have significant brush that is primarily dominated by invasive species. The brush on this stand shall be cleared and disposed of offsite and the cleared ground shall be ripped with a 12" ripping shank in preparation of planting. Once ripped, the site shall be planted with seedlings of various native conifers in conjunction with stands 10 and 11. This will work to increase the vertical and horizontal diversity of the stand while also eliminating invasive species in favor of native species.

Stand 319:
Stand 319 is a small but moderately dense stand along the shoreline to the north of Flier road. This stand shall be thinned to a residual spacing of 15' O.C. to achieve a residual density of 194 trees per acre. The shallow spacing will allow for some growth and increased crown health but will also protect the visual buffer this stand provides from the shore to the installation. Thinning to be conducted in concert with stands 19 and 20.

Stand 320:
Stand 320 was completely cleared and thinned in support of the mission related Flier road clearing and thinning project. The large residual spacing and the security requirements of the stand prevent harvesting or planting at this time. However, pending future removal of vegetation restrictions this stand shall be planted or inter-planted with seedlings of various native conifers, to the extent allowable by security restrictions.

Stand 337:
Stand 337 lies to the north of compartment 04 (Keyport Annex) and to the south of Darter road. The southeast corner of the stand is primarily brush which shall be removed and disposed of offsite. The cleared area from the brush removal shall be ripped with a 12" ripping shank to foster tree planting with seedlings of various native conifers. The rest of the stand is very small and dense Douglas-fir and red alder, which shall be pre-commercially thinned to a residual spacing of 16' O.C. to achieve a residual density of 170 trees per acre.

Stand 338:
The western stand boundary of stand 338 is an extensive wetland that will hinder forestry activities in that portion of the stand. The rest of the stand is small diameter red alder that shall be removed to support the hardwood conversion of the site from hardwoods to conifers. This will prevent the leaching of nitrogen from the nitrogen fixing alder into the down slope wetland along the western boundary of the stand. Upon hardwood removal, the site shall be planted and inter-planted with seedlings of various native conifers. Any and all conifers already present within the stand shall be

retained as leave trees along with any and all stems, hardwood and conifer, that lie within the western boundary and buffer of the wetland.

Stand 342:
Stand 342 lies at the outlet of the hunter's marsh wetland. This stand also has multiple eagle nesting points within the stand boundaries. Thus, no active management shall occur within this stand, in order to ensure the efficacy and retention of threatened or endangered species habitat.

Stand 344:
The northern majority of stand 344 was either thinned or cleared in support of the mission related Flier road clearing and thinning project. The remaining standing timber shall be managed for the abatement of hazard trees. Pending changes in security requirements, this stand shall be planted with seedlings of various native conifers.

Stand 346 and 347:
These two stands shall be either partially or fully cleared in support of a mission related project. Any remaining timber shall be managed the abatement of hazard trees and to foster adjacent wetland functionality and vitality.

Stand 354:
Stand 354 was completely cleared or thinned by the mission related Flier road clearing and thinning project. Pending future changes in security vegetation requirements, this stand shall be planted with seedlings of various native conifers.

Stand 356:
The southern boundary of stand 356 was thinned in support of the mission related Flier road clearing and thinning project. The rest of the stand consists of Douglas-fir dominated, pole quality saw-timber that has a moderately high density. The northern half of the stand shall be thinned to a 20' O.C. residual spacing to achieve a residual density of 100 trees per acre, which will encourage healthier crowns and increased growth. Pending future changes in security vegetation requirements, the southern half of the stand shall be planted with seedlings of various native conifers.

Stand 363:
Stand 363 lies completely within a wetland. Thus, the management of this stand shall be for the enhancement and vitality of wetland ecosystem processes and function.

Any other stands not specifically addressed above will be considered eligible for pre-commercial thinning, timber stand improvement treatments, clearing and planting or any other silvicultural treatment that will enhance stocking and long term forest and tree productivity. In all forest areas, diseased trees may be cut down. Prescriptions will follow the silvicultural criteria and goals discussed for all other stands.

NAVAL BASE KITSAP, BANGOR, CENTRAL, COMPARTMENT 2

Stand 1:
Stand 1 represents both the MLA and production area of SWFPAC along with all contiguous open areas and roadways. There is no timber within the MLA and some scattered clumps of young planted Douglas-fir in the production area. The scattered clumps of Douglas-fir shall be pre-commercial thinned o a residual spacing of 16' O.C. to achieve a residual stocking density of 170 trees per acre; whereby, residual stems shall be pruned to a height equal to one third of the total height of the tree. Furthermore, in the production area, seedlings shall be planted of various native conifers in remaining open areas to provide visual security for that part of the installation. In the contiguous open areas of this stand that are outside of SWFPAC; any and all invasive vegetation shall be removed and disposed of offsite followed by ripping with a 12" ripping shank in preparation of planting with seedlings of various native conifers. Along all roadways, a distance equal to one full tree length from the road edge into the stand shall be managed for hazard tree abatement.

Stand 2:
Stand 2 represents Devil's Hole Lake which lies along the waterfront area of the installation. This lake was once a prominent recreation area for sailors and their families; however, with increased security requirements the recreation areas became derelict and overgrown. This stand shall be managed to encourage the vitality and water quality of the lake and its inhabitants.

Stand 3:
Much of stand 3 has been previously cleared in support of an expansion to the refit parking lot. However, there is still a small strip of timber located within the stand. The small strip has the potential to be removed in support of a mission related project. But, pending further delineation of project boundaries, these trees are to be managed for hazard tree abatement and for structural diversity by removing invasive species and planting seedlings of various native conifers. Any and all invasive species removed from the site shall be disposed of off the installation.

Stand 4:
A portion of stand 4 was previously used as a parking lot for recreation activities at Devil's Hole Lake. At the present this site is a conglomeration of a couple of relict second growth madrone trees and various invasive species. Thus, for the open areas of this stand, the invasive species and all other shrub species shall be removed from and disposed of offsite. The ground is to be ripped with a 12" ripping shank which is to be preceded by planting with seedlings of various native conifers. Care must be taken to ensure the continuity and efficacy of the three relict pacific madrone trees in the open areas. The timbered portion of this stand shall be thinned to a 20' O.C. spacing to achieve a residual stocking density of 100 trees per acre. No hardwoods shall be selected as leave trees to allow for planting with seedlings of various native conifers in the subsequent open areas.

Stand 5:
Stand 5 was thinned in 2003, which brought the stand to a relatively productive spacing, in terms of health and crown vigor. The previous thinning coupled with the presence of a known and documented bald eagle nesting site, leads to the management objective for inter-planting with seedlings of native shade tolerant conifers. This will allow for vertical and horizontal stratification

without infringement upon the bald eagle nesting site. However, if harvesting of any nature is required in this area, it shall occur during the inactive nesting season. Also, this will ensure the visual security of the waterfront area by providing an intact buffer strip of standing timber.

Stand 6:
Stand 6 represents a long narrow strip of timber that lies along the southern portion of the waterfront area for the installation. This strip of trees works to stabilize the very steep and geologically unstable hill slopes and provides visual security from the water to the facilities located behind this strip of timber. Thus, this stand will be managed solely for hazard tree abatement.

Stand 7:
Stand 7 is an alder dominated stand that was thinned in 2003 along with stand 5; thus, stand 7 has a relatively productive spacing. There is a wetland which runs down the center of the stand. This stand shall be the subject of timber stand improvement (TSI) whereby, individual tree selection will occur where the selected individual will be released on all sides from competition. Leave trees shall be those of higher importance for wildlife habitat and wetland function. A leave tree shall be selected every 25' O.C. with only those trees in direct competition with the leave tree being removed, all others shall be left standing and shall not be damaged. This will enhance the wildlife habitat along with increasing the vertical and horizontal stratification of the stand.

Stand 8:
Stand 8 is a moderately dense, Douglas-fir dominated tract that lies along the southwestern shore of Devil's Hole Lake. The entire northern half of this stand lies directly against the water of the lake and would require at least a 100 foot vegetative buffer to ensure the prevention of sedimentation and erosion directly into the water body. However, the stand shall be thinned to a 20' O.C. residual spacing with a residual density of 100 trees per acre; whereby, only native conifers shall be selected as leave trees. Any large openings resulting from the removal of hardwoods shall be planted with seedlings of various native conifers. The removal of primarily the alder in this stand will work to reduce the nitrogen runoff from this stand into Devil's Hole Lake.

Stand 9:
Stand 9 is a small tract which lies along the southeastern side of Devil's Hole Lake and to the south of the recently expanded pier parking lot. This stand is a moderately dense tract which is dominated by larger diameter Douglas-fir and red alder. This stand shall be thinned to a 20' O.C. residual spacing to achieve a residual stand density of 100 trees per acre. The use of a carefully planned yarding strategy will be required on this stand due to the slope and proximity of this stand to a water body and an adjacent stream.

Stand 10 and 18:
Stands 10 and 18 are moderately dense stands that are dominated by larger diameter Douglas-fir and red alder. These stands shall be thinned to a 20' O.C. residual spacing to achieve a residual stand density of 100 trees per acre; whereby, no red alder stems may be selected as leave trees. Logistically, this stand shall be harvested along with a strip thinning that will be discussed herein with the prescriptions for stands 54 and 62 of this compartment.

Stand 11:
Stand 11 is a long, narrow, meandering corridor which runs along and with a flowing stream and the streams associated wetlands which lie in the eastern half of the stand. This stand is dominated by moderate to larger diameter red alder which has a severely high density. The western half of the stand shall be thinned using the crop tree selection system whereby a leave tree shall be selected at a residual spacing in the range of 14' to 20' O.C. to achieve a residual stocking density of 140 trees per acre. Leave trees shall be selected based on their ability to enhance wetland and stream ecology and aquatic habitat. Once a tree is selected as a leave tree, any and all crowns either touch or above the crown of the leave tree shall be removed.

Stand 12:
The southwestern two thirds of this stand have previously been cleared in support of a mission related project. Thus, only the northern third of the stand has viable timber remaining. The remaining timber shall be managed for hazard tree abatement and for bald eagle management. This stand also includes a documented historical structure; thus, any and all forestry actions on the remaining timber shall include a consultation with cultural resource personnel.

Stand 13:
Stand 13 is a smaller sized tract which lies to the west of the power line right-of-way and to the north of Sturgeon Street. The tract is smaller in size (6.3 acres) and is dominated by highly dense smaller sized red alder. This stand shall be, pending a survey, either pre-commercially thinned or commercially thinned depending on the average stand diameter found during the survey. If the average stand diameter is less than 8 to 10 inches then the stand shall be pre-commercially thinned to a residual spacing of 16' O.C. to achieve a residual stand density of 170 trees per acre. If the average stand diameter is greater than 8-10 inches, then the stand will be commercially thinned to an 18' O.C. residual spacing to achieve a residual stand density of 134 trees per acre. This stand is drastically overstocked which is resulting in a loss of crown vigor and health; thus, thinning will open up growing space to allow for the development of healthier more vibrant and vigorous crowns which in turn will improve the overall ecosystem function of the area.

Stand 14:
Stand 14 represents a long narrow strip of timber that lies along the southern portion of the waterfront area for the installation, further to the south of stand 6. This strip of trees works to stabilize the very steep and geologically unstable hill slopes and provides visual security from the water to the facilities located behind this strip of timber. Thus, this stand will be managed solely for hazard tree abatement.

Stand 15:
Stand 15 lies directly beside an existing facilities building on the installation. The southern half of the stand is moderately dense, whereas the northern half of the stand was thinned in 2003 and has spacing conducive for tree health and vitality. The entire stand has larger diameter Douglas-fir in dominance. However, the proximity to an existing building will inhibit the amount of forestry actions that can be conducted on the site. The southeastern half of this stand shall be thinned to a residual spacing of 20' O.C. to achieve a residual stocking density of 100 trees per acre. The western half of this stand shall be managed for the abatement of hazard trees to a distance of one full tree length from the building opening into the stand.

Stand 16:
The northwest section of this stand was thinned in 2003 to a residual spacing that is conducive to productive tree growth, health, and crown vigor. This stand also has a wetland that runs down the middle of the northern two thirds. The non-thinned portions of the stand are dominated by primarily red alder with considerable amounts of Douglas-fir intermixed. The non-thinned areas of this stand shall be thinned to a residual spacing of 20' O.C. to achieve the desired residual stand density of 100 trees per acre; whereby, no red alder shall be marked as leave trees. All open spaces generated by the removal of red alder shall be planted with seedlings of various native conifers. In order to diminish the impact of harvesting operations on the wetland within this stand, all yarding shall be done utilizing a sound strategy as the primary moving force, with all decking or landings being placed outside of the stand boundary itself.

Stand 17, 23 and 317:
Stand 17 is a fairly large (27.1 acres) tract and stand 23 is a moderately sized (11.0 acres) tract which both support larger diameter redcedar and Douglas-fir stems at a moderately high density. Stand 317 is a small (4.3 acres) stand that borders a navy facility and is highly dense larger diameter Douglas-fir. There is an employee walking trail through these stands that must be taken into account prior to forestry actions commencing. This tract shall be crown thinned to a 16' O.C. spacing to achieve 170 trees per acre residual density; whereby, the largest stems with the best form and the straight boles that are native conifers shall be selected as leave trees in order to support the development of pole quality timber and a thriving ecosystem. Along with the crown thinning, a low thinning will occur, which will remove any and all poor quality (poor form, noticeable rot, immense epicormic branching, etc.) suppressed stems.

Stand 19:
Stand 19 lies to the north of Sturgeon Street and to the east of installation building 7001**.** This stand supports a perennial stream with an associated wetland feature. This stand is moderately overstocked primarily with moderate diameter red alder. This stand shall be thinned using the leave tree release system; whereby, a leave tree will be selected along the range of residual spacing 12'-20' O.C. to achieve a residual stocking density of 140 trees per acre. The range of spacing will allow the forester to adaptively manage the stand for ecological needs unique to the site. Leave trees shall be those with the greatest diameter, good form, good health and a vigorous crown. Any and all stems whose crowns are either above or touching the crown of the leave tree shall be subject to removal.

Stand 22:
Stand 22 is a unique site in NBK forests. In the southwestern corner of the stand lies a clump of Douglas-fir trees and within the clump there is a derelict homestead from before the base was constructed. The open brush area in this stand is the result of a fruit tree orchard that is still partially standing from the homestead. The area around the orchard and the multiple historic structure points within the stand will prevent active silvicultural management in this stand. However, this stand shall be managed for the abatement of hazard trees and in support of mission related projects. Also, since the orchard trees on this site are fairly old and have most likely not hybridized with other species, the USDA shall be permitted to enter into the area and harvest seeds from the orchard trees in order to enhance the biodiversity of seed banks in the region for those represented species.

Stand 24 and 25:
Stands 24 and 25 are moderate sized tracts which support moderately dense small diameter Douglas-fir with patches of sparsely stocked red alder. The center area within the two stands is considerably wet. This stand shall be surveyed for wetlands and if any are found they must be delineated, flagged and mapped using GPS. This stand shall also be thinned to a 25' O.C. residual spacing in order to open up areas to be inter-planted. The open brush areas of this tract shall have all brush and invasive species removed and disposed of offsite followed by ripping with a 12" ripping shank in preparation of planting. After brush removal, the entire site shall be planted and inter-planted with seedlings of various native conifers.

Stand 26, 27 and 28:
Stand 26 is an overstocked Douglas-fir dominated tract; whereas, stands 27 and 28 are moderate density red alder dominated stands. This area shall be thinned to a 20' O.C. spacing to achieve a residual stand density of 100 trees per acre; whereby, alder cannot be selected as a leave tree and must be removed. The subsequent open areas from the hardwood conversion shall be planted with seedlings of various native conifers, along with inter-planting with seedlings of various native conifers in the thinned areas. The hardwood conversion will support the enhancement of water quality by decreasing the exportation of nitrogen from these stands to the watershed.

Stand 31:
Stand 31 is a large (59.4 acres) stand that is dominated by highly dense moderately sized red alder with major components of large Douglas-fir intermixed. There are four separate free flowing drainages within this stand with moderately expansive wetlands associated with each individual drainage. The northern end of this stand will be cleared in support of a mission related construction project. The remaining timber is rather unique in that it has large diameter native conifers intermixed with smaller diameter red alder. There is also an old skid road that runs throughout the stand that is currently populated by smaller sized red alder. The site must be completely surveyed for wetlands prior to any forestry operations occurring. In the red alder dominated portions this stand shall be thinned to a residual spacing of 25' O.C. to achieve a residual stocking density of 70 trees per acre. After thinning, the red alder areas shall be inter-planted with seedlings of various native conifers along with planting in any open areas of the stand. In the coniferous portions of the stand, the site shall be thinned to a residual spacing of 20' O.C. to achieve a residual stocking density of 100 trees per acre; whereby, leave trees shall be selected that are native conifers with a larger diameter, good form, good health and a vigorous crown. No skidding, yarding, dragging, rolling, or driving shall occur within 50' of drainages or wetlands. Stems may be cut and carried or picked up and carried from these areas as long as the action does not drag, roll or pull stems through a wetland and providing the removal will clearly benefit the wetland.

Stand 32:
Stand 32 is a small (3.5 acres) stand with a relatively high density of Douglas-fir and red alder. This stand shall be thinned to an 18' O.C. residual spacing to achieve a residual stocking density of 134 trees per acre; whereby, no red alder, larger than 8" in diameter, shall be marked or tallied as a leave tree. Any open areas larger than the uniform residual spacing openings shall be inter-planted with seedlings of various native conifers.

Stand 33 and 34:
Stand 33 and 34 are alder dominated stands that have moderate stem densities. However, most of stand 33 and all of stand 34 will be removed in support of a mission related project. The remaining vegetation in either stand 33 or 34 will be used as a vegetative filter for the minimization of erosion and sedimentation from construction sites. Also, any standing timber shall be managed for the abatement of hazard trees

Stand 35 and 38:
The tract created by stand 35 and 38 is one of the largest contiguous stands on the installation with stand acreages of 73.1 acres and 41.1 acres respectively. The south and east boundaries of the tract have already been thinned in support of the mission related Flier road clearing and thinning project; along with the Archerfish thinning and Jefferson Street timber sale thinning. Despite the previous thinning, the stand is moderately dense with larger diameter Douglas-fir that is of pole quality. Thus, these stands are to be thinned to a residual spacing of 18' O.C. to achieve a residual stand density of 170 trees per acre. The tight spacing will allow the stands to continue to produce straight bole stems while still allowing for light to penetrate through the crown and hit the forest floor to develop a vigorous understory for biodiversity and wildlife habitat. This stand will also have a 7 acre block of timber along the northwestern boundary removed in support of a mission related project.

Stand 36 and 37:
Stands 36 and 37 are small odd shaped stands that serve as a vegetative break between a security road and Seawolf Road. Much of stand 37 has already been either cleared or thinned in support of the mission related Flier road clearing and thinning project. Thus, any remaining timber shall be thinned to a 20' O.C. residual spacing to achieve a residual stand density of 100 trees per acre.

Stand 39:
Stand 39 is a small tract of mixed conifer and hardwood species. This stand is partially within the clearing limits of a mission related project and could be slated for removal in support of future mission related security needs. Thus, this stand shall be managed for hazard tree abatement and for the support of mission related projects.

Stand 40:
Stand 40 is a small tract of primarily larger Douglas-fir and smaller red alder that borders a soil deposition site for multiple mission related projects. This stand is moderately dense and shall be thinned to a residual spacing of 16' O.C. to achieve a residual stand density of 170 trees per acre, whereby no red alder shall be selected as leave trees. This narrow spacing will maintain visual security for the open soil deposition site from the roadway. The removal of the red alder will prevent future hazards from developing from the standing timber in this area.

Stand 41:
Stand 41 is a tiny (1 acre) stand which is dominated by red alder regeneration. However, much of the site is open grass; thus, this stand shall be inter-planted with seedlings of various native conifers that emphasize western redcedar (*Thuja plicata)*. This will allow for the vertical and horizontal stratification while also capitalizing on the wetter soil conditions of the site to enhance the growth of western redcedar.

Stand 42:
The western one quarter of stand 42 shall be cleared in support of a mission related project. In addition, the southern panhandles of this stand have already been cleared in support of a mission related project. However, a handful of trees have been left in the southern extent of the stand for the support of visual security and unique species; these residual trees shall be managed for the abatement of hazard trees. The remaining three quarters represents one of the best examples of vertical and horizontal stratification found on the installation. Thus, the management of this stand shall be to emphasize biodiversity through the use of selective cutting whereby certain habitat trees are selected to be released and any tree that is either touch or above that tree will be removed. Also, inter-planting shall occur in this stand to establish a new cohort of various native conifers and if available various native hardwoods. Also two large drainages flow through this stand that shall be protected with at least fifty foot buffers or from the top of the hill slope.

Stand 43:
Stand 43 is a large (44.7 acre) stand that is dominated by saw log sized red alder. The eastern spur of this stand follows a drainage, which includes the stream and the wetlands associated with the channel. Thus, this portion of the stand shall be managed for wetland function and water quality. The eastern spur shall be selectively crown thinned whereby larger over-mature red alder trees shall be selected at a variable 14'-25' spacing in order to open the area up for planting with seedlings of various native conifers with an emphasis on western redcedar (*Thuja plicata).* However, the minimum residual density that this stand may be thinned to is 70 trees per acre. The western and southern extents of the stand are almost pure stands of red alder and have some wet areas but no pronounced drainages. Thus, this area shall be crown thinned using the leave tree release method; whereby, an intermediate or suppressed stem shall be selected as a leave tree and all dominate and co-dominate stems that are above or touching the leave tree shall be removed. This portion of the stand has a minimum residual density after any thinning operation of 100 trees per acre. Due to the proximity of this stand to a roadway and the wet nature of the site, this stand will only be thinned if yarding can be done in a manner that maintains the integrity of the wet area; this includes prevention of soil erosion and sedimentation. After thinning the stand shall be inter-planted with seedlings of various native conifers with an emphasis on western redcedar because of the wetter characteristics of the stand.

Stand 44:
Stand 44 is a small (4.4 acre) stand that is dominated by moderate diameter Douglas-fir. This stand is not overly dense but could be opened up a little more to enhance the growth of the pole quality Douglas-firs in the stand. Thus this stand shall be thinned to a residual spacing of 20' O.C. to achieve a residual stocking density of 100 trees per acre. This will open the area up to ensure productive growth and crown health of the residual stand, while also allowing for the development of a vigorous understory to enhance biodiversity and wildlife habitat.

Stand 45 and 47
Stands 45 and 47 are small moderately dense stands dominated by moderate size Douglas-fir. This stand shall be thinned to a residual spacing of 25' O.C. to achieve a residual stocking density of 70 trees per acre. This wide residual spacing will open these stands up for inter-planting with seedlings of various native conifers with an emphasis on western white pine to provide increased biodiversity and age diversification while attempting to develop a regime of an uncommon species.

Stand 46:
Stand 46 is a small (2.1 acre) strip of timber, of which the northern half will be cleared in support of a mission related project. Thus, the southern half will not provide sufficient area or timber volume for a timber sale. This stand shall be managed for the abatement of hazard trees and for the support of mission related projects along with invasive species removal.

Stand 48, 49, 50 and 51:
This tract covers a large (106.6 acres collectively) area that has had some previous thinning and active management. In previously thinned portions of the tract, inter-planting shall occur with seedlings of various native conifers to the extent allowable by security regulations along the eastern boundary of the tract. In the un-thinned areas of this tract, thinning shall occur to a residual spacing of 18' O.C. to achieve a residual stocking density of 134 trees per acre; which will allow for increased crown production and health while still achieving the development of pole quality timber.

Stand 54:
Stand 54 is a critical stand of moderately dense Douglas-fir. This stand is adjacent to a large contiguous block of red alder that will be significantly managed in the coming years. Thus, this stand shall be thinned to a 20' O.C. residual spacing with a residual stocking density of 100 trees per acre; whereby, the largest most vigorous stems shall be selected as leave trees in order to ensure good progeny for seeding of the adjacent stand. Having this stand healthy and vigorous will ensure that a healthy, vibrant crown is developed to enhance the ability of the stand to seed and protect the adjacent stands.

Stand 55:
Stand 55 is a red alder dominated heavily dense stand that needs active management to decrease the crown volume of the stand. This stand shall be thinned to a 20' O.C. residual spacing to achieve a residual stocking density of 100 trees per acre. When selecting leave trees, all healthy and good formed coniferous trees shall be selected over hardwood trees. However, considering the density of red alder in this stand some alder shall be selected as leave trees as long as it is of good form and size (>= 10" DBH). Due to the presence of some wet areas and drainages, the use of a sound strategy to achieve yarding and compliance objectives is required in order to protect wetland function and water quality by decreasing the amount of exposed bare mineral soil which in turn will decrease erosion and sedimentation.

Stand 56 and 59:
Both stands 56 and 59 were previously thinned to a rather wide residual spacing during the Escolar Timber Sale. The site is at a spacing which is advantageous to crown production and growth. However, with ever changing regimes this site will require additional management to ensure biodiversity. Thus, this site shall be thinned using the single tree selection method whereby a tree is selected for removal based on habitat requirements, disease prevention, stand health, or crown function. There is no set spacing or residual density requirements for this stand. However, under no circumstance other than natural succession shall this stand fall below 70 trees per acre of stocking density. This stand shall also be inter-planted with seedlings of various native conifers.

Stand 57:
Stand 57 was thinned to a wide residual spacing in support of the mission related Flier road clearing and thinning project. This stand shall be successively inter-planted with seedlings of various native conifers; whereby, the stand shall be planted every five years for fifteen years. The species used will have an emphasis on western white pine on the drier portions of the stand and western redcedar on the wetter portions of the stand for the first planting. The second planting will emphasize the selection of shade tolerant species, while the third planting will focus on the development of hardwood (primarily big-leaf maple) regimes. The wide spacing of the first cohort and the complete removal of all understory vegetation has left this stand with a single age class that has a moderately narrow species regime. Thus, the successive inter-planting of the stand will allow for the development of multiple age classes and broader species distribution, to encourage vertical and horizontal stratification.

Stand 58 and 60:
Stands 58 and 60 should be the site of a pole thinning in order to release the co-dominant and intermediate stems. The thinning shall be a single tree selection thinning whereby the trees selected for removal shall be of pole quality and size. The residual stocking density shall be 170 trees per acre and care should be taken to ensure a residual spacing of 16' O.C. The tight spacing and moderate density is required in order to keep the stands crown in pole production. This stand shall also be thinned in five to ten years with an 18' O.C. residual spacing whereby the removed trees are also of pole quality and size.

Stand 61 and 360:
Stand 61 is a small stand with a lower density of stems dominated by Douglas-fir and red alder. Most of the stand is populated in an expansive wetland and a drainage channel. This stand shall be thinned to a 20' O.C. residual spacing to achieve a residual stand density of 100 trees per acre; whereby, all activities shall address wetland issues prior to operations and shall use a carefully planned yarding strategy to reduce erosion and sedimentation. The leave trees shall be based on a set of priorities whereby large, good from, and healthy coniferous trees shall be selected first, with good form and health hardwoods next, followed by poorer form but good health coniferous trees and under no circumstance shall a poor form hardwood tree be selected as a leave tree. Any large open areas resulting from the removal of poor form hardwood stems shall be inter-planted with seedlings of various native conifers with an emphasis on western redcedar due to the wet nature of the stand.

Stand 62, 63, 64 and 362:
These stands are primarily dominated by large contiguous blocks of red alder that is of sawlog size and quality. These stands also include minor components of larger diameter Douglas-fir. The density of these stands is moderately high and will require thinning to increase the productivity of the crowns. Most of the tract is considered a wet area with intermixed wetlands; thus, a unique thinning method will be used to diminish the impacts that thinning would have on the stand and on wetland function. This tract shall be strip thinned during the dry season; whereby, a one crown wide strip of timber is removed running generally from east to west at one tree length from the southern boundary and is yarded out of the tract along that same strip. From the strip the faller will go into the stand both to the north and to the south of the strip and cut stems on an 18' O.C. residual spacing up to one tree length away from the strip. The removed trees to the north and south will be

directionally felled away from any wetlands and toward the strip so that all yarding activities occur solely in the strip previously removed. Once the thinning has occurred from one tree length to the north and south of the strip is complete, another strip is cut that is two tree lengths to the north of the previous strip and the process repeats itself until the entire stand is thinned. Care should be taken to locate the strips in areas with significantly less water and decreased soil moisture conditions than the rest of the stand; this will prevent yarding through and compaction of true wetlands. All yarding within the strips shall be conducted with a sound strategy to reduce the amount of bare mineral soil exposed so that erosion and sedimentation from the strips is diminished in comparison to mechanized yarding. This thinning method will enhance the production and vigor of the residual crowns while minimizing soil compaction and wetland disturbance which would detract from the area's wetland habitats. The increased vertical and horizontal stratification will also improve this sites biodiversity and habitat structure for wetlands. After the thinning has been completed the site shall be inter-planted using seedlings of western redcedar in order to enhance the wetland ecosystem by changing from a very unstable and short lived dominant tree species to a stable long lived dominant species; thus, providing a stable ecosystem for the enhancement of wetland functionality and vigor. Western redcedar will also provide shade throughout the year which will help alleviate the reed canary grass problem that is found throughout this area. Reed canary grass shall also be combated on the dry portions of this site via the application of approved herbicides. This stand shall also be managed for hazard tree abatement along Escolar Road. On a side note there is an old foundation identified by cultural resources to be non-significant in this tract that could pose issues to forestry operations.

Stand 65 and 66:
Both stands 65 and 66 are red alder dominated with multiple stream channels flowing through the tract along with some expansive wetland areas. The alder in this area is smaller in size and has a density that reduces crown production. Thus, this area is to be thinned using the leave tree management method to a residual density of 100 trees per acre; whereby, leave trees will be selected based on their function in the overall habitat of the site and any tree that is either touching or above the leave tree shall be removed. This thinning will release the crowns of the residual trees to improve crown production, health, and vigor which will in turn increase the size and ecosystem function of the residual stems, making an overall more productive ecosystem in terms of water quality and wetland function.

Stand 67:
Stand 67 is a moderate sized stand that is dominated by larger diameter Douglas-fir stems. The stand density is just above the desired 100 trees per acre residual stocking density for the installation. Thus, in order to provide a spacing that will maximize crown light exposure and maximize crown production and health, this stand shall be single tree selection thinned. The single tree selection will bring the stand down to the desired 100 trees per acre residual stocking density. The thinning will include the selection of single non-desirable trees to be removed from the stand at no set spacing or design to the extent needed to hit the desired stocking density. This could be achieved using simple TSI; whereby, the non-desirable trees are cut and left in the stand to provide wildlife habitat along with improved crown health.

Stand 68 and 71:
Stand 68 is a moderately large (23.5 acres) stand that is dominated by larger diameter Douglas-fir and western white pine. Stand 71 has similar characteristics as stand 68 however it is dominated solely by Douglas-fir and is not as large in terms of acreage. The densities of both stands are moderately high which is preventing the crowns from maximizing their health and production. Thus, this stand is to be thinned to a residual spacing of 20' O.C. to achieve a residual stand density of 100 trees per acre; whereby, leave trees are to be among the largest, most healthy, and straightest native conifer stems in the stand. Big-leaf maple may be selected as some leave trees because of the increased wildlife habitat and biodiversity that species provides.

Stand 69 and 79:
This stand was previously cleared of all forest cover in support of a mission related project in the production area of SWFPAC. Pending completion of the project and consideration of security requirements, the stand could potentially be ripped with a 12" ripping shank and planted with seedlings of various native conifers with an emphasis on western white pine.

Stand 70 and 379:
Stand 70 is a larger stand that consists of moderately dense large diameter Douglas-fir. Stand 379 is similar in that it is also moderately stocked and has a major component of the stand as larger diameter Douglas-fir but it also has a major component of moderately sized and densely stocked red alder. Both stands have considerable wetland areas and prevalent drainages; thus, forestry activities shall be restricted to enhance the function and vitality of the drainages and their subsequent wetlands. This tract shall be thinned to a 20' O.C. residual spacing to achieve a residual stocking density of 100 trees per acre; whereby, leave trees shall be native conifers and bigleaf maple that has a larger diameter, good form, good health and a vigorous crown. Red alder and other hardwood species shall not be marked as leave trees, but uncommon hardwoods such as, wild cherry, willow, etc. shall be retained for wildlife habitat. Upon removal of the red alder component of the stand, this tract shall be inter-planted with western redcedar to provide a more stable ecosystem for wetland vitality and function.

Stand 72 and 78:
These stands are moderately stocked tracts that are dominated by large diameter Douglas-fir and western redcedar. Along Escolar Road and the power line trail to a distance of one tree length into the stand, management for the abatement of hazard trees and the protection of edge habitat for wildlife shall occur. The interior of this tract will be thinned to a residual spacing of 20' O.C. to achieve a residual stocking density of 100 trees per acre; whereby leave trees shall be the largest diameter and best form native conifers or bigleaf maple. No red alder shall be selected as a leave tree. This thinning will enhance the crown productivity and health of the stand by releasing leave trees to increased sunlight; subsequently, releasing the stand will allow light to penetrate the canopy and strike the forest floor which will develop a vigorous understory for improved wildlife habitat. Higher production crowns will produce more mast and browse for wildlife and will increase the vitality and function of the ecosystem as a whole. There are three stream channels that run in the northeast of this stand; care should be taken to minimize or prevent any and all disturbances to the stream channel.

Stand 73 and 373:
Stand 73 is a moderate diameter red alder dominated stand that is densely stocked and has an expansive wetland which almost covers the entire southern half of the stand. Stand 373 is a smaller stand that is dominated by Douglas-fir and red alder at moderate diameters with a relatively moderate stocking density. This stand shall undergo a light crown thinning to remove portions of the red alder overstory to open area up for inter-planting of more stable species. The thinning shall have a remove tree spacing of 20' O.C. in order to remove 100 trees per acre; whereby, removal trees will be the stems which opens up the largest space for planting. In the open areas, inter-planted shall occur with seedlings of primarily western redcedar along with other various native conifers. This will interject a regime that is dominated by a species that is a lot more stable for wetland function and vitality.

Stand 74:
Stand 74 is a small stand which has very little forest cover. There are a few small red alder stems on the stand that will be removed in the site preparation for planting. This site shall have all invasive and large woody vegetation removed and disposed of offsite and shall be ripped with a 12" ripping shank to loosen up the soil for seedling vitality after planting. The site is to then be planted with seedlings of various native conifers. This will return the site to its native vegetative cover and increase the ecosystem function of the installation.

Stand 75, 76 and 77:
These stands are all smaller stands (< 6 acres) that are dominated by larger diameter Douglas-fir that is moderately stocked. These stands shall be thinned to a residual spacing of 20' O.C. to achieve a residual stand density of 100 trees per acre; whereby, the leave trees will be the largest most healthy stems on the set spacing. The portions of this tract which are along Golet road and Plunger Street shall be managed for the first one tree length from the roadway into the stand for the abatement of hazard trees along with the development of wildlife habitat for edge species.

Stand 80:
Stand 80 is a large (44.9 acres) contiguous stand of larger diameter well stocked Douglas-fir. This stand is located to the west of Escolar road and to the north of Trigger road. This stand shall be thinned with a TSI single tree selection; whereby, the stems selected will be cut and left lay in the stand in order to ensure a uniform residual stocking density of 100 trees per acre. This operation will develop stand characteristics which support interior species wildlife habitat and ensure vegetative biodiversity. There is no set spacing for removal but trees will be selected based on form, health, ecosystem function, and uniqueness for the habitat.

Stand 81 and 82:
Stands 81 and 82 are Douglas-fir dominated densely stocked smaller stands. The portions of the tract which lie along the power line trail or the adjacent installation facility shall be managed to the first one tree length for the abatement of hazard trees as well as for edge species habitat. The rest of the stand shall be thinned to a residual spacing of 20' O.C. to achieve a residual stocking density of 100 trees per acre; whereby, the selected leave trees shall be of good form, health and diameter. This will allow the stand to increase its crown production and health and increase the overall ecosystem function of the tract.

Stand 83, 84, 85 and 86:
These stands are primarily red alder dominated with intermixed coniferous species throughout. They run along and to the north of Trigger Avenue and have either moderate or low stocking densities, with some open brush areas. In the moderately dense portions of the stand, thinning shall occur to a residual spacing of 25' O.C. to achieve 70 trees per acre of residual stocking density which is conducive for planting. Leave trees shall be of native conifers with good form and health that will not be susceptible to sun shock. In the brush areas, the invasive species and any other woody groundcover shall be removed and disposed of offsite. After the brush has been removed, the site shall be ripped with a 12" ripping shank with herbicide treatment directly following the shank. The entire tract: thinned areas, low density areas, and ripped areas shall be planted and inter-planted with seedlings of various native conifers. This will revive the ecosystem of the stand toward native coniferous regimes and will remove invasive species and bring areas back into forest production. This will in turn increase wildlife habitat and encourage ecosystem health and growth.

Stand 87 and 88:
Stand 87 is a well stocked stand dominated by larger diameter Douglas-fir and western redcedar. Within stand 87 is stand 88, which is a highly stocked red alder and western redcedar stand. These stands shall be thinned concurrently with separate thinning methods. Stand 87 shall be thinned with single tree selection; whereby, trees shall be selected at no set spacing in order to allow for the uniform density of 100 trees per acre to be achieved. Stand 88 shall be thinned to 20' O.C. to achieve a residual spacing of 100 trees per acre. In stand 87 the selected trees will be stems of poor form and poor health that will be cut and removed or left lying in the stand. In stand 88, the selected leave trees will be stems of good form and health with a vigorous crown. No western redcedar shall be removed from either stand.

Stand 89:
Stand 89 is a larger (37 acres) stand that is dominated by large diameter well stocked Douglas-fir. This stand shall be managed for interior species wildlife habitat, whereby any and all management that occurs will be to enhance the old growth characteristics of this stand. Meaning TSI single tree selection will occur; whereby, trees will be selected for removal due to poor form and poor health and will be cut and left lie in the stand to increase wildlife habitat. Large standing dead stems will remain standing unless within one tree length of Trigger Avenue and/or Grampus Road, which would require dead stem removal, as they would be a hazard to the roadway. Along the eastern boundary of the stand, some timber may be included into a thinning on an adjacent stand. But under no circumstance shall the thinned areas residual stocking fall below 70 trees per acre unless made so by natural causes. Also, inter-planting shall occur to increase the vertical and horizontal stratification of the stand as aligned with management toward old growth characteristics.

Stand 90:
Stand 90 is a very small (1.3 acres) stand that is predominately larger diameter Douglas-fir. The close proximity of this stand to both Trigger Avenue and a naval facility prevents active management of the stand. Thus, this stand shall be managed for hazard tree abatement.

Stand 91 and 92:
These stands are moderately dense stands of larger diameter Douglas-fir and western hemlock. The tract shall be thinned to a residual spacing of 20' O.C. to achieve a residual spacing of 100 trees per

acre in order to enhance ecosystem function by increasing crown vigor and health. Along the western boundary of this tract lies Skipjack Circle, Grampus Road and SWFPAC parking lots which require management for hazard tree abatement within the first one tree length from the edge of the roadway or parking lot into the stand.

Stand 93, 94, 95, 96, 97, 98 and 296:
Portions of this tract have been recently thinned or cleared either for Silvicultural purposes or in support of mission related projects. However, the uniform management of this contiguous block of timber is desired to enhance the ecosystem vitality and function in the area. This tract is primarily Douglas-fir dominated with patches of red alder and western white pine. The density of this tract is variable because of past forestry activities but in all stands it is above the desired 100 trees per acre stocking density for optimal crown vigor and health. Thus, this stand shall be thinned to a residual spacing of 20' O.C. to achieve a residual stocking density of 100 trees per acre; whereby, leave trees will be native conifers or bigleaf maple which have good form, good health and a vigorous crown. Red alder shall not be selected as leave trees; all other hardwoods, other than bigleaf maple, may not be selected as leave trees but shall be retained to preserve biodiversity and wildlife habitat. In some parts of this stand, only single tree selection will be needed to obtain the 100 trees per acre of stocking density. But having a uniform stocking density will allow for adaptive management to occur whereby inter-planting and TSI can occur to increase and improve ecosystem function.

Stand 99, 100, 101, 103, 109 and 304:
These stands are composed of smaller diameter Douglas-fir that has variable densities due to previous harvesting and thinning. These stands shall be thinned to a residual spacing of 18' O.C. to achieve a residual stand density of 134 trees per acre. The slightly tighter spacing will prevent the smaller sized timber of this tract from developing poor form features or have sun shock from thinning, while still provide extra light in order to enhance crown production, growth and health. These stands are bordered by Flier Road, Lafayette Street and a patrol road; thus, any and all management of this tract must include the abatement of hazard trees for the first one tree length into the stand.

Stand 102, 104 and 107:
These stands consist of small and moderately sized Douglas-fir and western white pine with high to very high stocking densities. This stand shall be pre-commercially thinned to a residual spacing of 16' O.C. to achieve a residual stocking density of 170 trees per acre. This tighter spacing will allow for the younger timber to thrive and grow while preventing the same timber from developing poor features which would detract from the health and vitality of the stand and decrease the ecosystem function of the areas by inviting disease and insects into the stand. Continuing to rely on density dependent mortality is both a fire hazard and a pathogen hazard because in dense stands, both fire and pathogens spread quickly and can soon become out of control. Thus, pre-commercial thinning of this stand will be exponentially beneficial to the installation.

Stand 105, 106, and 503:
These stands are primarily dominated by moderately dense moderate diameter Douglas-fir with some smaller blocks of red alder and white pine. These stands shall be thinned to a 20' O.C. spacing to achieve a residual stand density of 100 trees per acre; whereby, leave trees shall be native conifers with good form, good health and a vigorous crown. However, bigleaf maple and other

hardwood species besides red alder shall be left standing but will not count toward the leave tree tally. This will allow the stand to become more productive and increase crown vigor and health. Also, reducing the density of these stands will decrease the risk of fire and pathogen spread and will lead to increased wildlife habitat. The eastern boundary of this tract runs along the security gate and boundary for the Keyport annex; thus, the first one tree length into the tract from the eastern boundary shall also be managed for the abatement of hazard trees.

Stand 110:
This stand has very little if any forest cover and is primarily covered by brush and other ground cover species. This stand shall have all non-native vegetation removed and disposed of offsite. The site shall also be ripped with a 12" ripping shank to break loose the soils for planting. The stand shall be planted using seedlings of various native conifers with an emphasis on western white pine and Douglas-fir.

Stand 112:
This stand is densely stocked with Douglas-fir and red alder that is of small non-merchantable size that is currently in a stage of density dependent mortality. This stand shall be pre-commercially thinned to a residual spacing of 16' O.C. to achieve a residual stocking density of 170 trees per acre. This tighter spacing will allow for the younger timber to thrive and grow while preventing the same timber from developing poor features which would detract from the health and vitality of the stand and decrease the ecosystem function of the areas by inviting disease and insects into the stand.

Stand 113 and 114:
These two stands are both moderately stocked with moderate diameter Douglas-fir in dominance. These stands shall be thinned to a residual spacing of 18' O.C. to achieve a residual stocking density of 134 trees per acre. This spacing will allow the moderate sized stems to add diameter from increased crown production and health but will prevent sun shock and poor form from occurring as a result of too wide of a spacing. Leave trees shall be native conifers with good form, good health and a vigorous crown. No red alder shall be selected and tallied as leave trees in order to prevent the development of hazard trees along the Lake Ruth soil deposition site.

Stand 116, 117, 119 and 517:
The western boundary of this tract has been drastically thinned in support of the mission related Flier road clearing and thinning project. The western half of the tract is primarily Douglas-fir with small patches of red alder whereas the eastern half of the tract is primarily red alder with patches of Douglas-fir. The timber on this tract is relatively small to moderate in diameter; thus a mixture of pre-commercial thinning and commercial thinning will be used. The northern half of the stand will be thinned to a residual spacing of 18' O.C. to achieve a residual stocking density of 134 trees per acre. This will increase the crown productivity, vigor, and health without causing poor form feature from developing with too wide of a spacing. The southern half of the tract will be pre-commercially thinned to a residual spacing of 16' O.C. to achieve a residual stocking density of 170 trees per acre. This will take the stand out of density dependent mortality and allow the stand to develop a more vigorous and healthy canopy while preventing the spread of disease and other pathogens throughout the tract. Leave trees in both thinning types shall be stems with good form, good health and a large vigorous crown. Western white pine, western redcedar and bigleaf maple shall not removed unless

they posses extremely poor form and health. Thus, maintaining the horizontal biodiversity of the site.

Stand 123:
The western one quarter of this large (62.8 acres) stand has been thinned to a drastic spacing in support of the mission related Flier road clearing and thinning project. The remaining three quarters of the stand is moderately sized and moderately dense Douglas-fir. This stand shall be thinned to a residual spacing of 20' O.C. to achieve a residual stocking density of 100 trees per acre; whereby, leave trees shall be native coniferous stems with good form, good health and a vigorous crown. This thinning will allow the residual stems to increase their crown production which will lead to larger diameters, increased tree health and greater crown vigor; which will improve the ecosystem function of the entire installation.

Stand 124, 125, 126 and 127:
These stands are dominated by moderate diameter moderate stocked Douglas-fir. This stand shall be thinned to a residual spacing of 20' O.C. to achieve a residual stocking density of 100 trees per acre; whereby, leave trees shall be native coniferous stems with good form, good health and a vigorous crown. However, one tree length from the north and east boundary of the track management should be focused on hazard tree abatement due to the close proximity of the stand to Scorpion Avenue and Seawolf Road.

Stand 129:
Most of stand 129 has been harvested and replanted in support of a mission related construction project. Thus, the stand shall be pre-commercially thinned to a residual spacing of 16' O.C. to achieve a residual stand density of 170 trees per acre. Any areas where the seedlings did not become established, planting shall occur with seedlings of various native conifers. These actions will help develop a health and vigorous stand that will be stratified both horizontally and vertically, because of the presence of an older regime of red alder at a lower density within the stand.

Stand 301 and 302:
These stands represent a small vegetated strip of timber that separates Sealion Road and Escolar Road from the waterfront. These stands are so steep and provide such important structural stability to the slope that they cannot be removed unless as part of a hazard tree abatement or a mission related project. Thus, if not deemed as a hazard tree but visibility is needed then the stems can be pruned to a height no greater than 2/3 of the live crown height; but, the stems must be kept alive and cannot be removed as it may impact the structural integrity of the waterfront bank.

Stand 305:
This stand is a small (4.1 acres) stand that is moderately dense and is dominated by moderate sized Douglas-fir and red alder. The western boundary of this stand lies along the eastern shore of Devil's Hole Lake; while the northern boundary wraps around the refit parking lot. The rest of the stand boundaries either run along the power line right-of-way or an adjacent forested stand. Also, there is a historical structure which needs to be taken into advisement whenever planning forestry operations in the area. This stand has a lot of restrictions to forestry activities; however, a distance from the boundary of one tree length within the stand shall be managed for hazard tree abatement. There shall be at least a 50' buffer for all forestry activities from the eastern boundary along Devil's

Hole Lake. The rest of the stand shall be thinned to a residual spacing of 25' O.C. to achieve a residual stand density of 70 trees per acre; whereby leave trees shall be selected if they are native conifers with good form, good health, and a vigorous crown. Red alder cannot be selected as a leave tree. The subsequent open areas from the wide spacing thinning shall be inter-planted with seedlings of western redcedar and other native conifers in order to develop a more stable ecosystem for drainage into Devil's Hole Lake.

Stand 329 and 330:
Both stands can be characterized by having areas of extreme graded slopes and areas with relatively flat terrain. Both stands are dominated with small to large diameter red alder with intermixed conifers. The extreme grades on these stands mixed with previous disturbances have caused serious geological and slope instability which is evident by the slides and break offs the slope has already experienced. Thus, removal of the timber on these stands would be increasingly detrimental to the structural integrity of the slope. This stand shall be managed for hazard tree abatement and for mission related projects. However, timber stand improvement shall be conducted on this stand to remove brush, invasive species and small poor formed red alder. The brush and invasive species shall be removed and disposed of offsite while the poor form stems shall be cut and left in the stands, which will be followed by planting in the open areas with seedlings of various native conifers with an emphasis on western redcedar. This will provide a longer lasting and more stable ecosystem within this stand which will support wetland health and function while providing some amount of slope stability as well.

Stand 352:
Stand 352 is a small (3.3 acre) red alder dominated stand that is almost completely within a wetland. This stand shall undergo selection thinning whereby trees within the wetland will be cut only if they are within one tree length from the edge of the wetland so as to prevent driving, dragging, or rolling downed timber in the wetland. Remaining stems within the wetland will be cut and left lie as a form of timber stand improvement. The selection thinning of the stand will have no set spacing but will target the residual stand density of 150 trees per acre; whereby, leave trees shall be those stems with good form, good health and a vigorous crown. These forestry actions will help improve the function and vitality of the wetland while also providing wildlife habitat through the downed woody debris.

Stand 353:
This stand is a small (0.7 acre) tract that has a relatively low density of primarily red alder. The western boundary of this stand runs along Escolar road, while the rest of the stand runs along a service road for a pumping station. The close proximity to roadways coupled with the small size of the stand will inhibit timber harvesting due to logistics. However, this stand shall be managed for the abatement of hazard trees and for the support of mission related projects. Pruning may also occur when applicable to a height no greater than one third of the height of the live crown.

Stand 395 and 511:
These stands are long and narrow (9.0 and 5.0 acres) tracts that are completely within other stands on all sides. The stands are dominated by highly dense larger diameter red alder with some pockets of mixed conifers. There is a small wetland at the northern boundary of stand 395 and the south of stand 511. Since red alder is a species which derives from disturbance and the surrounding vegetation is mostly native conifers, a heavy crown thinning would help to bring this stand back into

the native cover type for the area. This stand shall be thinned to a 25' O.C. residual spacing to achieve a residual stand density of 70 trees per acre; whereby leave trees shall be native conifers, bigleaf maple and the best form and health red alder, all other stems shall be cut and removed from the site. The stand shall then be inter-planted with seedlings of various native conifers

Stand 510:
Stand 510 is solely Lake Ruth, which is a standing water body that is 5.7 acres in size. This stand incorporates no vegetation thus no forest management can occur on the site.

Stand 513:
Stand 513 is a vegetated buffer that surrounds Lake Ruth. The primary composition of the vegetation is scotch broom which is an invasive species. To the north of the stand there is some standing timber which works as shelter for wildlife and a visual barrier for Lake Ruth. This stand will have a site conversion from invasive species to native species whereby any native standing timber shall not be removed but all non-native timber, brush and shrubs shall be removed and disposed of offsite. After vegetation removal, the site shall be ripped using a 12" ripping shank to churn the soils in preparation for planting. The site then shall be planted with seedlings of various native conifers. The next 2 to 10 years will require annual herbicide or mechanical treatment to keep the invasive regeneration at bay until the planted native species will be large enough to shade out the invasive species; at that time herbicide and mechanical treatments will no longer be needed.

Stand 518:
This stand is a small stand (5.4 acre) in which the majority of the stand is Bullhead Lake with the remainder being a small vegetated buffer strip around the lake. The vegetated buffer strip shall be thinned along with adjacent stands whereby the residual spacing shall be no less than 20' O.C. and the residual stand density shall be no less than 100 trees per acre. There will be no skidding or yarding on the site due to the close proximity to the lake but a harvester or loader can cut and carry or pick up and carry the downed stems from the site. Preventing skidding or yarding in this stand will diminish the amount of bare mineral soil exposed, thus decreasing the amount of erosion and sedimentation that could occur from forestry activities to Bullhead Lake. A well stocked stand is required on this site to ensure proper ecosystem function for the water body and its shoreline.

Stand 520:
Stand 520 is primarily an open brush filled area with forest vegetative cover in the north of the stand. This stand shall be surveyed for wetlands prior to any operations occurring; if wetlands are found they are to be delineated, marked on the ground and mapped using GPS.
In non-forested, non-wetland portions of this stand the brush shall be removed and disposed of offsite which will be followed by ripping with a 12" ripping shank in preparation of planting. The area will be planted with seedlings of various native conifers. The forested areas and wetland areas shall undergo timber stand improvement whereby poor form and poor health trees will be singly selected for removal and the stem will be cut and left lie in the stand.

Stand 521 and 522:
These stands are smaller sized (6.7 and 2.4 acres, respectively) with moderately dense moderate diameter Douglas-fir and western white pine forest cover. This stand shall be surveyed for wetlands prior to any operations occurring; if wetlands are found they are to be delineated, marked on the ground and mapped using GPS. Thinning shall occur in the non-wetland portions of the stand at a residual spacing of 20' O.C. to achieve a residual spacing of 100 trees per acre; whereby leave trees shall be large diameter, good form, good health and vigorous crowned native conifers and bigleaf maple. In wetland portions of the stand timber stand improvement shall occur whereby trees will be selected for cutting only if they are of poor form, poor health, or have a small non-vigorous crown. Cut trees shall be left lie in the stand and shall be cut to a residual density no less than 100 trees per acre and no greater than 170 trees per acre. This will maximize the health and function of the stand while also increasing the vitality and function of the potential wetlands in the area.

Any other stands not specifically addressed above will be considered eligible for pre-commercial thinning, timber stand improvement treatments, clearing and planting or any other silvicultural treatment that will enhance stocking and long term forest and tree productivity. In all forest areas, diseased trees shall be evaluated in context of area objectives and pathogen(s) present. Prescriptions will follow the silvicultural criteria and goals discussed for all other stands.

NAVAL BASE KITSAP, BANGOR, SOUTH, COMPARTMENT 3

Stand 1:
Stand 1 represents all roadways, parking lots, open areas, residential areas, and some small scale forested areas. All forested areas within one tree length from a naval facility, roadway, residential area, parking lot, or walkway shall be managed first and foremost for the abatement of hazard trees in order to protect the safety of installation patrons. Whereby, any tree that is either dead, leaning, or found to be unsound by a Navy Forester shall be removed. Stems can be pruned to a height of one third of the live crown height for security mandates but in order to remove trees for purposes other than as a hazard NEPA documentation is required. Open areas, non-native landscaping areas or areas with invasive species can have the ground vegetation cleared and disposed of off base followed by ripping of the soil surface using a 12" ripping shank in preparation of planting with seedlings of various native conifers. Any and all open areas can be planted with seedlings of various native conifers, the spacing of which will be determined by a Navy Forester prior to the commencement of planting activities. In the few areas with small tracts of standing timber, the timber will be managed concurrently with the adjacent stand or stands, unless unique circumstances arise for the site.

Stand 2 and 3:
Stand 2 is a moderate (21.5 acre) sized stand that is dominated by moderate diameter densely stocked Douglas-fir and western hemlock. Stand 3 is a smaller (4.8 acres) stand that is dominated by moderately sized and moderately stocked Douglas-fir, western hemlock, and western white pine. These stands lie to the northeast of the SWFPAC support area; thus, a distance of one full tree length from the boundary into the stand must be managed for the abatement of hazard trees. However, the rest of the stand shall be thinned to a residual spacing of 20' O.C. to achieve a residual stocking density of 100 trees per acre; whereby, leave trees shall be native conifers with larger diameters, good form, good health and a robust vigorous crown. Bigleaf maple shall not be tallied as a leave tree but must not be removed. This thinning will allow the canopy of these stands to become more productive and vibrant with increased health and vigor which in turn will increase the wildlife habitat and ecosystem function of the stand.

Stand 4, 5 and 6:
Stand 4 is a moderately stocked stand that is dominated by moderate diameter Douglas-fir and western hemlock. Stand 5 is a partially stocked mainly open brushy stand that needs to be replanted and thinned. Stand 6 is a Douglas-fir dominated moderately stocked tract. These stands shall be thinned to a residual spacing of 18' O.C. to achieve a residual stocking density of 134 trees per acre; whereby, leave trees shall be native conifers that have larger diameters, good form, good health and a vibrant crown. Open areas shall have the brush cleared and disposed of offsite followed by ripping with a 12" ripping shank in preparation of planting. Planting and inter-planting shall occur with seedlings of various native conifers to increase the vertical and horizontal stratification of the stand. Increased biodiversity and stand health will improve the wildlife habitat and ecosystem function of the area. Management for the abatement of hazard trees shall occur in any portion of this tract which is within one tree length of a facility, roadway or parking lot.

Stand 7 and 8:
Stands 7 and 8 are small (3.1 and 2.3 acre) stands that are moderately stocked with smaller diameter Douglas-fir. These stands lie along Trigger Avenue, Flying Fish Road and a security road; thus, one tree length into the tract from the boundary of either stand must be managed for hazard tree abatement. These stands shall be thinned to a residual spacing of 18' O.C. to achieve a residual stocking density of 134 trees per acre; whereby leave trees shall be those stems with good form, good health, a vigorous crown and a high propensity for increased crown volume.

Stand 9 and 10:
These stands cover almost thirty acres and consist of heavily dense moderate sized Douglas-fir and western white pine. These stands shall be thinned to a residual spacing of 20' O.C. to achieve a residual stocking density of 100 trees per acre; whereby, leave trees shall be native conifers with good form, good health, a vigorous crown and a high propensity for increased crown volume.

Stands 11, 12, and 13;
These stands cover a large (65.8 acre) area that is largely homogeneous moderately stocked moderately sized Douglas-fir and western white pine. However, there are patches of lower density and larger sized Douglas-fir and higher density and smaller sized red alder. In the portions of the stand that are homogenous moderate sized and moderate density Douglas-fir and western white pine thinning shall occur to a residual spacing of 18' O.C. to achieve a residual stocking density of 134 trees per acre; whereby leave trees shall be native conifers with good form, good health, a vigorous crown and a high propensity for increased crown volume in order to encourage the growth of pole quality timber. The portions of the stand with larger sized lower density Douglas-fir shall be thinned using single tree selection; whereby, trees are selected for removal based on their form, health and crown in order to obtain a more uniform residual density of 100 trees per acre and to increase the health and crown vigor of the residual timber. The last portion of the stand which is dominated by red alder shall be thinned to a residual spacing of 25' O.C. to achieve a residual stocking density of 70 trees per acre; whereby, space is generated for inter-planting with seedlings of various native conifers. Leave trees in the alder portion of the stand shall be moderate sized stems with good form, good health and a vigorous crown. Any and all areas bordering a naval facility, roadway, fence line or power line shall be managed within one tree length from the edge of the stand for the abatement of hazard trees.

Stand 14:
Stand 14 is a moderate (14.3 acre) sized stand that consists of moderate diameter Douglas-fir and western hemlock at a relatively moderate stocking density. Along the western boundary is a stream channel and a subsequent wetland that must be surveyed and flagged prior to forestry operations occurring in the area. This stand shall be thinned to a residual spacing of 20' O.C. to achieve a residual stocking density of 100 trees per acre; whereby, leave trees shall be native conifers and big leaf maple with good form, good health and a vigorous crown.

Stand 15:
Stand 15 is a moderate (12.2 acre) stand that follows a stream channel; thus, the stand is a long and narrow corridor of timber with extensive wetlands and waterways. The stand is dominated by larger diameter red alder that is fairly dense in terms of stocking. Single tree selection thinning shall occur on this stand; whereby, leave trees shall be selected at no set spacing to achieve a uniform residual

stocking density of approximately 140 trees per acre. Commercial thinning shall only occur to a maximum distance of one tree length into any wetland to prevent driving or other impacts from occurring within wetlands. All thinning that occurs deeper than one tree length into a wetland shall be TSI thinning; whereby, removed stems shall be cut and left in the stand so as to not drag, roll or drive within any wetland. Leave trees shall be those stems with good health, good form and a vigorous crown that cannot be easily removed without impacting wetlands. Removal trees shall be directionally felled away from any wetland toward a yarding corridor. All yarding shall be done using a sound strategy in order to diminish the amount of exposed bare mineral soil which in turn will decrease the amount of erosion and sedimentation that could impact the wetlands or streams. This thinning will open the canopy to allow light to penetrate to the forest floor; which in turn, will aide in the development of a diverse understory that will work to improve wetland function and increase wildlife habitat.

Stand 16 and 17:
Stands 16 and 17 are small stands which act as vegetative strips that run through or border installation housing facilities. Thus, first and foremost these stands shall be managed for the abatement of hazard trees. These stands consist of moderately dense larger diameter Douglas-fir, red alder and western hemlock. The close proximity to residential areas will prevent any non-critical harvesting to occur on these stands. However, TSI work to remove snags, small poor formed trees and other non-merchantable timber can occur to improve the aesthetics of the stands and to prevent over-densification of the stand from occurring. Over-densification will cause density dependent mortality to occur which in turn will generate hazard trees creating the potential of human harm or the destruction of government property; thus, the stand shall not be allowed to enter into the density dependent mortality stage of development.

Stand 18:
Stand 18 is a large (52 acre) tract that on all sides borders either an installation facility or roadway. The stand is dominated by moderate diameter moderately dense Douglas-fir and western redcedar. The first one tree length into the stand along all boundaries shall be managed for hazard tree abatement. The rest of the stand shall be commercially thinned to a residual spacing of 20’ O.C. to achieve a residual spacing of 100 trees per acre; whereby, leave trees shall be native conifers with good health, good form and a vigorous crown. Due to the close proximity of this stand to an installation residential area, all yarding operations shall be done using a sound strategy in order to decrease the auditory effects of harvesting in the area. Thinning the stand will increase the productivity of the residual stems by increasing crown volume and leaf area while also allowing light to penetrate the canopy and strike the forest floor; thus, fostering the development of a vigorous and diverse understory for improved wildlife habitat.

Stand 19:
Stand 19 is a smaller tract which borders a wetland to the east and an installation residential area to the west. Thus, the first one tree length into the stand form the western boundary shall be managed for hazard tree abatement in order to ensure the safety and structural integrity of installation patrons and property. The stand is dominated by larger diameter moderately dense Douglas-fir that is of pole quality. This stand shall be thinned to a residual spacing of 18’ O.C. to achieve a residual stocking density of 134 trees per acre; whereby, leave trees shall be native conifers with a straight bole, good health, good form, a low number of lower stem branches and a vigorous crown. The

tighter spacing will allow for the development of pole quality timber while still allowing light to penetrate the crown to help foster the development of a diverse and vigorous understory for wildlife habitat.

Stand 20:
Stand 20 is a lower density stand of larger diameter Douglas-fir and western redcedar that to the south borders an installation residential area. The first one tree length into the stand from the southern boundary shall be managed for hazard tree abatement to ensure the safety and structural integrity of installation patrons and property. The rest of the stand shall be single tree selection thinned; whereby, trees will be selected that detract from overall stand health and vigor or are of poor form or have a poor crown. The trees selected can either be commercially thinned out or cut and left in the stand by way of a TSI project. Any large open areas along with the entire stand shall be inter-planted with seedlings of various native conifers and if available various native hardwoods to encourage vertical and horizontal biodiversity.

Stand 21:
Stand 21 is a small stand that is dominated by moderate diameter highly dense Douglas-fir. This stand shall be thinned to a residual spacing of 20' O.C. to achieve a residual spacing of 100 trees per acre; whereby, leave trees shall be stems with good form, good health and a vigorous crown. Red alder shall not be selected as a leave tree; however, any red alder stems that have a diameter less than 8" shall be retained but not tallied as leave trees. This thinning will improve stand health by increasing crown volume and leaf area of the residual stems which in turn will increase the rate of carbon sequestration and diameter growth.

Stand 23:
Stand 23 is a smaller sized swathe of timber that sits in the middle of multiple installation residential areas and installation roadways. Thus, the first one tree length into the stand along all boundaries shall be managed for hazard tree abatement to ensure the safety and structural integrity of installation patrons and property. The stand consists of highly dense moderate diameter Douglas-fir, western white pine and western hemlock. The interior of the stand shall be thinned to a residual spacing of 20' O.C. to achieve a residual stocking density of 100 trees per acre; whereby, leave trees shall be native conifers with good health, good form and a vigorous crown. No timber shall be removed within one tree length of any boundary to ensure the aesthetics and visual sensitivity of the residential area. Also, all yarding operations shall be conducted using a sound strategy to diminish the auditory effects of harvesting timber near a residential area.

Stand 24:
Stand 24 is a small (1.9 acre) tract that lies adjacent to both Thresher Avenue and a naval facility. Thus this stand shall be managed for hazard tree abatement and for the support of mission related projects.

Stand 25:
Stand 25 is a smaller tract that consists of highly dense smaller diameter Douglas-fir and western white pine. This stand shall be pre-commercially or pulp thinned to a residual spacing of 16' O.C. to achieve a residual stocking density of 170 trees per acre. This thinning will allow the stand to

develop beyond the density dependent mortality stage of stand development thus increasing stand health, crown volume and leaf area.

Stand 26 and 27:
Both stands 26 and 27 are overly dense and have eastern borders that lie along naval facilities or roadways. Stand 26 is dominated by moderate diameter red alder whereas stand 27 is dominated by moderate diameter Douglas-fir with large contingents of western hemlock and western redcedar. The first one tree length into the stand from any boundary which lies along a roadway or facility shall be managed for hazard tree abatement. The rest of the stand shall be thinned to a residual spacing of 18' O.C. to achieve a residual stocking density of 134 trees per acre; whereby, leave trees shall be those stems with good health, good form and a vigorous crown. The tighter spacing will allow the residual stems to develop greater leaf area and crown vigor while preventing over exposure of the stems to sunlight which could cause sun shock or epicormic branching.

Stand 28:
Stand 28 is a very small tract that acts as an island of timber that is surrounded by either naval facilities, roadways or parking lots. Thus management of this stand shall be for hazard tree abatement and for the support of mission related projects.

Stand 29:
Stand 29 is a smaller tract of timber that borders the railroad to the south, Thresher Avenue to the north and naval facilities to the east. This stand shall be managed for the abatement of hazard trees and for the support of mission related projects. However, this stand has had some significant mortality due to application of herbicides along the railroad; thus, this stand shall be TSI thinned to remove all dead or dying stems within the stand whether they are hazards or not. Any opening that results from the removal of dead or dying stems shall be inter-planted with seedlings of various native conifers to encourage vertical and horizontal stratification.

Stand 30:
Stand 30 is a smaller tract of timber that borders the railroad to the southwest, Trigger Avenue to the east and naval facilities to the northwest. This stand shall be managed for the abatement of hazard trees and for the support of mission related projects. However, this stand has had some significant mortality due to application of herbicides along the railroad; thus, this stand shall be TSI thinned to remove all dead or dying stems within the stand whether they are hazards or not. Any opening that results from the removal of dead or dying stems shall be inter-planted with seedlings of various native conifers to encourage vertical and horizontal stratification.

Stand 31, 32, 33 and 36:
These stands are dominated by small to moderate diameter Douglas-fir that is either very dense or moderately dense throughout the tract. The entire northeastern and eastern boundary of the tract lies along the Navy railroad, while the entire northwestern boundary lies along Thresher Avenue with the remaining boundaries lying either along a roadway or a naval facility. Thus, the first one tree length into the stand shall be managed for hazard tree abatement. However, this stand has had some significant mortality in that first one tree length area due to application of herbicides along the railroad; thus, this stand shall be TSI thinned to remove all dead or dying stems within the stand whether they are hazards or not. Any opening that results from the removal of dead or dying stems

shall be inter-planted with seedlings of various native conifers to encourage vertical and horizontal stratification. The rest of the stand shall be thinned to a residual spacing of 18' O.C. to achieve a residual uniform stocking density of 134 trees per acre; whereby, leave trees shall be native conifers with good form, good health and a vigorous crown. The thinning will develop a more vigorous crown with greater leaf area and rates of carbon sequestration while still allowing light to penetrate the crown and aide in the development of a vigorous and diverse understory for wildlife habitat.

Stand 34:
Stand 34 represents primarily a naval facility with an adjacent service road to another naval facility. Thus, all standing timber shall be managed for hazard tree abatement and in support of mission related projects. The timber present on parts of the stand is very small diameter Douglas-fir that could be thinned in conjunction with an adjacent thinning but cannot on its own provide sufficient volume or area to warrant a TSI thinning. There are some significant open areas from over sizing of construction clearing limits. The open areas shall have all non-native vegetation remove and disposed of offsite followed by ripping with a 12" ripping shank to churn the soils in preparation of planting with seedlings of various native conifers.

Stand 35 and 344:
Stands 35 and 344 form a moderately dense tract that is dominated by moderate diameter Douglas-fir that borders a naval facility to the northwest. Any boundary that lies along a naval facility shall be managed to the first one tree length into the stand for the abatement of hazard trees. The rest of the stand shall be thinned to a residual spacing of 18' O.C. to achieve a residual stocking density of 134 trees per acre; whereby, leave trees shall be native conifers with good form, good health and a vigorous crown.

Stand 37, 38, 39, 40 and 240:
These stands are small stands that lie in close proximity to installation residential areas, roadways and fence lines. Thus, the first one tree length into the stand along any boundary that faces a residence, roadway or fence line shall be managed for hazard tree abatement. All stands shall be managed for the support of mission related projects. However, the only stand that shall be thinned is stand 37 which is an overly dense stand of moderate diameter Douglas-fir. Stand 37 shall be thinned to a residual spacing of 18' O.C. to achieve a residual stand density of 134 trees per acre; whereby, leave trees shall be native conifers with good health, good form and a vigorous crown. Due to the proximity of this stand to a residential area, yarding shall be accomplished using a sound strategy in order to prevent noise complaints from developing from mechanized yarding. Stand 38, 39, 40 and 240 shall be pre-commercially thinned to a residual spacing of 16' O.C. to achieve a residual spacing of 170 trees per acre.

Stand 41:
Stand 41 is a moderate (7.5 acre) sized stand located between Turtle Road and the navy railroad. The stand is moderately stocked with smaller diameter Douglas-fir. The first one tree length into the stand from the railroad or Turtle Road shall be managed for hazard tree abatement. The rest of the stand shall be thinned to a residual spacing of 20' O.C. to achieve a uniform residual stocking density of 100 trees per acre. The thinning will allow for the penetration of light through the canopy in order to develop a vigorous and diverse understory in order to improve wildlife habitat.

Stand 42:
Stand 42 is a larger (38 acre) sized stand that is dominated by moderately dense smaller diameter Douglas-fir, white pine and red alder. The stands western boundary lies along an installation residential complex. The first one tree length into the stand from the western boundary shall be managed for hazard tree abatement to ensure the safety and structural integrity of installation patrons and property. The rest of the stand shall be thinned to a residual spacing of 18' O.C. to achieve a residual spacing of 134 trees per acre; whereby, leave trees shall be native conifers and bigleaf maple with good health, good form and a vigorous crown. No red alder greater than 12" in diameter shall be marked or tallied as leave trees and shall be removed. Any subsequent open areas resulting from the removal of larger stemmed red alder shall be inter-planted with seedlings of various native conifers with an emphasis on western redcedar.

Stand 43:
Stand 43 is a small (1.5 acre) stand that is primarily dominated by brush and red alder regeneration. In order to bring this stand back into productivity and into a native cover regime this stand shall have all vegetation that is non-native or greater than 3 inches in height removed and disposed of offsite. The site shall then be ripped using a 12" ripping shank to churn the soils in preparation of planting at 8' O.C. with seedlings of various native conifers in order to establish a true first cohort.

Stand 44:
Stand 44 is a smaller (3.5 acre) stand that is dominated by smaller diameter red alder and western white pine. The northeastern boundary of this stand lies along a naval facility; thus, the first one tree length into the stand from that boundary shall be managed for hazard tree abatement. The rest of the stand shall be TSI group thinned whereby patches of 5-10 stems shall be selected for removal in order to open space up for planting. The selected removal trees shall be those stems which are of poor form, poor health or are completely suppressed. The selected trees shall be cut and left in the stand to preserve nutrients and decrease cost. After removal, the group areas shall be planted with both seedlings of various native shade tolerant conifers and, if available, seedlings of various native hardwoods. The group thinning will allow for the release of residual stems while opening the stand up for the introduction of a new age class.

Stand 45:
Stand 45 is a moderately dense stand consisting of moderate diameter Douglas-fir and western hemlock. The entire eastern boundary of the stand runs along the Navy railroad and the pacific edge outfitters' storage lot. Thus, the first one tree length into the stand from the eastern boundary shall be managed for hazard tree abatement. The rest of the stand shall be thinned to a residual spacing of 20' O.C. to achieve a residual spacing of 100 trees per acre; whereby leave trees shall be native conifers with good from, good health and a vigorous crown. Along the railroad, there are a significant number of dead stems that are the result of application of herbicides. The dead and dying stems shall be cut and removed of offsite to prevent the buildup of fuel material along the railroad. Any contiguous open areas resulting from this removal shall be inter-planted with seedlings of various native conifers to prevent the succession of the area into invasive species and to ensure the stability of the railroad embankment.

Stand 46 and 47:
Stand 46 is a large (54.3 acre) tract that is dominated by highly dense moderate diameter Douglas-fir; similarly, stand 47 is moderately stocked with smaller diameter Douglas-fir. The eastern and southern boundaries of stand 46 run along the Navy railroad; thus the first one tree length into the stand from the railroad shall be managed for hazard tree abatement. Along the railroad, the use of herbicides has lead to mortality of standing timber near or around the rail line; thus, any and all dead or dying stems standing in the area near the railroad shall be removed and disposed of offsite. The subsequent open areas from the removal of the herbicide trees shall be planted with seedlings of various native conifers. The rest of the tract shall be thinned to a residual spacing of 20' O.C. to achieve a residual stocking density of 100 trees per acre; whereby, leave trees shall be native conifers with good health, good form and a vigorous crown. No red alder shall be selected, marked or tallied as leave trees it shall be harvested. This thinning will work to increase the crown volume of the stand by increasing leaf area. The improved health of the stand will help prevent breakouts of insects and disease and in turn will encourage a diverse and vigorous understory which adds vertical and horizontal stratification.

Stand 48:
Stand 48 is a smaller (13.4 acre) tract that is dominated by moderately dense larger diameter Douglas-fir. The stands eastern and western boundaries run along either railroad or security roads; thus, the first one tree length into the stand on those two sides shall be managed for the abatement of hazard trees. The rest of the stand shall be single tree selection thinned to a residual spacing of 125 trees per acre; whereby, trees will be selected for retention at no set spacing. Any and all trees that are in direct competition to leave trees shall be removed. Leave trees shall be native conifers with good form, good health and a vigorous crown.

Stand 49:
Stand 49 is a smaller (6.9 acre) tract consisting of highly dense moderate diameter Douglas-fir and western hemlock. The southern and northern boundaries of this stand are either fully or partially set adjacent to naval housing or the railroad; thus, the first one tree length into the stand from those areas shall be managed for hazard tree abatement. The rest of the stand shall be thinned to a residual spacing of 18' O.C. to achieve a residual spacing of 134 trees per acre; whereby, leave trees shall be those individuals with good form, good health, a vigorous crown and habitat value. Due to the close proximity of this stand to an installation residential area, all yarding operations must be accomplished using a sound strategy in order to prevent noise complaints from developing in the residential areas.

Stand 53:
Stand 53 is a small (6.6 acre) tract that is bordered on all sides by the navy railroad. This stand shall be managed for the abatement of hazard trees. Also, there are numerous dead or dying stems from the application of an herbicide along the railroad. These dead or dying stems shall be removed and disposed of offsite; the openings created by their removal shall be replanted with seedlings of various native conifers.

Stand 54 and 55:
Stands 54 and 55 are small (1.2 and 1 acre) stands that are dominated by moderately dense moderate diameter Douglas-fir. Both stands lie along the southern perimeter fence line, while stand 54 lies

partially along the western installation perimeter fence as well. Thus both stands shall be managed first and foremost for the abatement of hazard trees. The rest of the two stands shall be individual tree selection thinned to achieve a residual stand density of 100 trees per acre; whereby, selected trees shall be remove trees that are of poor form, poor health and poor structure that would have the potential to have a future detriment to the installation fence line. No hardwoods shall be left standing due to the short lifespan of native species in the area. Thus, any and all open areas resulting from thinning shall be inter-planted with seedlings of various native conifers.

Stand 57:
The southern quarter of this stand has been previously cleared and developed for the construction of a mission related facility. The western boundary of this tract lies along the Navy railroad and shall be managed for the first on tree length into the stand from that boundary for the abatement of hazard trees. Use of herbicides along the railroad has generated many dead and dying stems along the boundary; thus, all dead or dying stems shall be removed and disposed of offsite with any open areas resulting from the removal of dead stems replanted with seedlings of various native conifers. The remaining standing timber is a narrow strip of timber that consists of smaller diameter Douglas-fir. The remaining timber shall be pre-commercially thinned to a residual spacing of 16’ O.C. to achieve a residual stocking density of 170 trees per acre; whereby, leave trees shall be native conifers with good form, good health, a vigorous crown and a high propensity for increased crown volume and production.

Stand 58:
Stand 58 is a larger (45.5 acre) stand that partially borders the Navy railroad to the west and an active environmental restoration site to the east. Along the railroad the stand shall be managed for the abatement of hazard trees to a distance of one tree length into the stand. There are many dead and dying stems along the railroad that shall be removed and disposed of offsite with the subsequent open areas being replanted with seedlings of various native conifers. The rest of the stand is highly dense moderate diameter Douglas-firs and mixed conifers. The stand shall be thinned to a residual spacing of 25’ O.C. to achieve a residual stocking density of 70 trees per acre; whereby, leave trees shall be larger diameter native conifers with good form, good health and a vigorous crown. The larger spacing will be used as a means to regenerate the stand with western white pine. This spacing will act as a very tight irregular shelter wood cut whereby after the establishment cut the residual stems are left standing indefinitely. This thinning method will allow the regeneration to obtain immense amounts of light but will also protect and harbor their development as well.

Stand 59:
Stand 59 is an open area that is the remnant of an old shooting range. The site is currently undergoing environmental restoration operations to remove undesirable elements from the soils. Upon completion of environmental restoration operations the site shall be denuded of the invasive species presently on the site and ripped using a 12” ripping shank to churn the soils in preparation of planting at an 8’ O.C. spacing with seedlings of various native conifers with an emphasis on western white pine.

Stand 60:
Stand 60 is a larger (31.5 acre) tract that is moderately stocked with larger diameter Douglas-fir. This stand represents a significant recreation area on the installation with multiple trails and interpretive signs throughout the area. The entire eastern boundary of the stand lies along the trident lakes recreation area. Thus, the first one tree length into the stand along the entire eastern boundary and along any and all trails shall be managed for the abatement of hazard trees in order to ensure the safety and security of installation patrons. The rest of the stand shall be thinned using either single tree selection whereby single undesirable trees are selected for removal or a group thinning whereby a group of 5- 10 non-desirable trees are selected for removal. Either thinning method shall not result in a residual stocking density that is less than 100 trees per acre and will require the inter-planting with seedlings of shade tolerant native conifers. All yarding operations shall be accomplished using a sound strategy in order to: decrease the auditory symptoms of the yarding operations for the recreation area patrons and decrease the amount of exposed bare mineral soil to diminish erosion and sedimentation.

Stand 61:
Stand 61 is a small (2.9 acre) tract that is dominated by moderately dense moderate diameter red alder. The stand runs along Trigger Avenue to the north and the installation fence line to the south; thus, the entire stand shall be managed for the abatement of hazard trees. The stand shall also be thinned using the leave tree release method whereby stems of good form and good health are selected as leave trees with any and all stems whose crowns are either touching or above the crown of the leave tree shall be subject to removal. This shall be done at no set spacing and shall only be to the extent as to achieve a residual stocking density of 130 trees per acre.

Stand 62 and 66:
These stands are moderately stocked with smaller diameter Douglas-fir that borders Trigger Avenue to the east and the Trident Lakes recreation are to the west. Thus the first one tree length into the stands shall be managed for the abatement of hazard trees. The rest of the tract shall be either pre-commercially or commercially thinned (depending on the diameter of the stems) to a residual spacing of 18’ O.C. to achieve a residual stocking density of 134 trees per acre; whereby, leave trees shall be native conifers with good form, good health, a vigorous crown and a high propensity for increased crown volume and production.

Stand 63, 64 and 262:
These stands are primarily dominated by smaller diameter highly dense Douglas-fir that borders either a recreation area or a naval facility. The first on tree length into the stand from a boundary that lies either along the recreation area or the naval facility shall be managed for the abatement of hazard trees. The rest of the tract shall be pre-commercially or pulp thinned to a residual spacing of 16’ O.C. to achieve a residual stocking density of 170 trees per acre; whereby leave trees shall be native conifers with good form, good health, a vigorous crown and a high propensity for increased crown volume. All yarding operations shall be accomplished using a sound strategy in order to: decrease the noise complaints of the yarding operations for the recreation area patrons.

Stand 69:
The northern half of stand 69 has been either cleared or thinned and pruned in support of the mission related railroad sighting project. The rest of the stand is highly dense larger diameter

Douglas-fir that sits on very steep inclines. The stand shall be either commercially or TSI thinned to a residual spacing of 18' O.C. to achieve a residual stocking density of 134 trees per acre; whereby, leave trees shall be native conifers with good health, good form and a vigorous crown. The decrease in density will help to decrease the forest fire risk and spread rate along the railroad corridor. This will also retain sufficient stems to provide slope stability along the railroad while still developing a healthier and more vigorous stand.

Stand 70 and 71:
Stands 70 and 71 are visually sensitive stands that lie along Trident Boulevard directly after entering the installation from the main gate. Thus, the first one tree length into either stand shall be managed for the abatement of hazard trees. These two stands cover over twenty acres and consist of primarily moderately overstocked larger diameter Douglas-fir. The site shall be selectively thinned at no set spacing to a residual stocking density of 100 trees per acre; whereby, leave trees shall be those stems with the largest diameter, good health, good form and a vigorous crown. All yarding shall be accomplished using a sound strategy in order to provide an opportunity for education about forestry principles and to minimize site disturbances. There are a few areas along the Trident Boulevard boundary that have become fully stocked with invasive species, in these areas site conversion shall occur whereby all non-native vegetation shall be removed and replaced with seedlings of various native conifers. To ensure the survival of the native vegetation and the eradication of the non-native vegetation, installation approved herbicides shall be applied at the appropriate interval and season to keep the non-native vegetation from overtopping the native vegetation before it can shade the other out.

Stand 72:
Stand 72 is a small (3.1 acre) stand that surrounds an existing installation facility that rests outside of the main installation fence line. The small size and odd shape of the stand along with the close proximity of the stand to an existing facility will inhibit the forestry operations that can occur in the stand. Thus, this stand shall be managed for hazard tree abatement and for the support of mission related projects.

Stand 74 and 75:
These two stands are small (2.8 and 8.1 acre) tracts that surround an existing naval facility and lie along the installation fence line on the eastern boundary of the tract. The stands consist of moderately dense larger diameter Douglas-fir and red alder. The first one tree length into the stand along the entire boundary shall be managed for hazard tree abatement. The rest of the stand shall be thinned using single tree selection to a residual stocking density of 100 trees per acre; whereby, leave trees shall be those stems that enhance biodiversity and have good form, good health and a vigorous crown. All yarding shall be accomplished with a sound strategy to prevent noise complaints from developing. Any and all open areas or lower density portions of the stand shall be planted with seedlings of various native conifers.

Stand 76:
Stand 76 is a small (3 acre) stand that consists of highly dense moderate diameter Douglas-fir. The stand borders an installation facility and a roadway; thus, the first one tree length into the stand shall be managed for hazard tree abatement. The rest of the stand shall be thinned to a residual spacing of 20' O.C. to achieve a residual stocking density of 100 trees per acre; whereby, leave trees shall be

those stems that enhance biodiversity and have good form, good health and a vigorous crown. All yarding operations shall be accomplished using a sound strategy to prevent noise complaints from developing and to diminish harvesting impacts. Any and all open areas or lower density portions of the stand shall be planted using seedlings of various native conifers.

Stand 77 and 78:
These stands consist of highly dense moderate diameter Douglas-fir that borders Trident Boulevard to the north and Sculpin Road to the south. Thus, this stand shall be managed for the first one tree length into the stand for hazard tree abatement. This stand is moderately to very steep making commercial thinning difficult especially for the small size of the tract. Thus, this tract shall be TSI thinned using single tree selection to a minimum residual stocking density of 100 trees per acre; whereby, trees will be selected with poor form, poor health and an unproductive crown. Selected trees shall be cut and left lie in the stand. This thinning will open the stand up to allow for increased crown volume and health, while supporting the development of a vigorous native understory. The areas directly adjacent to roadways have become populated with invasive species; thus, any and all areas containing invasive species shall have all non-native vegetation removed and have native vegetation planted in the location, preferably with seedlings of various native conifers.

Stand 79:
Stand 79 is a small clump of trees at the corner of Trident Boulevard and Scorpion Avenue that does not contain sufficient volume for a commercial thinning. The stand shall be managed for the abatement of hazard trees and for the support of mission related projects.

Stand 80:
Stand 80 is a smaller (9.5 acre) stand that consists of highly dense moderate diameter Douglas-fir. The northwestern and southwestern corners of the stand have been partially cleared and thinned in support of a mission related project. The stand borders Trident Boulevard to the north, Silversides Road to the south, the Navy railroad to the West and a naval facility to the east. Thus, the first one tree length into the stand on all sides shall be managed for hazard tree abatement. The rest of the stand shall be thinned to a residual spacing of 18’ O.C. to achieve a residual stocking density of 134 trees per acre; whereby, leave trees shall be those stems that enhance biodiversity and have good form, good health and a vigorous crown. All yarding shall be accomplished using a sound strategy to prevent noise complaints from developing and to diminish the impacts of downstream habitat from sedimentation.

Stand 81:
Stand 81 is a small (1.8 acre) strip of timber that lies between Trigger Avenue and the Navy railroad. Most of the stand has already been either cleared or thinned in support of safety requirements for the railroad; thus, the stand will primarily be managed for hazard tree abatement. This stand shall be inter-planted with seedlings of various native conifers. This stand shall also be pruned at a consistent interval to ensure sight lines for Navy railroad safety.

Stand 82 and 83:
The northwestern corner of stand 82 has been both cleared and thinned in support of the mission related railroad sighting safety project. The rest of the tract covers a relatively small (6.9 acre) area that consists of highly dense moderate diameter Douglas-fir. The tract borders Silversides Road to

the north, a Navy rail line to the south and west with a naval facility to the east. Thus, the first one tree length into the stand shall be managed for hazard tree abatement. The rest of the stand shall be TSI thinned to a residual spacing of 18' O.C. to achieve a residual stocking density of 134 trees per acre; whereby, leave trees shall be those stems that enhance biodiversity and have good form, good health and a vigorous crown. All other stems shall be cut and left lie in the stand. TSI is recommended because of the relatively high number of smaller sized stems and the topography of the site that would inhibit the commercial viability of harvesting the timber.

Stand 84:
Stand 84 is a small (1.8 acre) red alder dominated stand that has stems of moderate diameter at a high stocking density. This site is predominately wet and shall be surveyed for the presence of wetlands prior to any and all forestry operations occurring on the stand. Any and all wetlands found in the survey shall be flagged, marked and mapped using G.P.S. The stand shall be either commercially or TSI, depending on wetland extent, thinned using the leave tree release method; whereby, leave trees shall be those stems that enhance biodiversity and have good form, good health and a vigorous crown. Any stem whose crown is either touching or above the crown of the leave tree shall be removed and decked or left lie in the stand depending on the thinning type chosen. If commercial thinning, all yarding shall be completed using a sound strategy to prevent noise complaints from developing. After either thinning, the stand shall be inter-planted with seedlings of various native conifers to aide in the production and functionality of any and all wetlands present in the stand.

Stand 86:
Stand 86 is a smaller (9.2 acre) oddly shaped stand that is bordered along most of the northern and western boundary by the Navy railroad and naval facilities to the south and east. Thus, the first one tree length into the stand shall be managed for hazard tree abatement. The rest of the stand is dominated by moderate density moderate diameter Douglas-fir that lies on variable steep to moderate topography. The stand shall be thinned using single tree selection to a residual stocking density of 100 trees per acre; whereby, leave trees shall be those stems that enhance biodiversity and have good form, good health and a vigorous crown. All yarding shall be completed using a sound strategy to prevent noise complaints from developing.

Stand 89:
Stand 89 is a larger (14.9 acre) stand that forms a triangle with the western installation fence line, Grampus road and Scamp Road. The first one tree length into the stand from all boundaries shall be managed for hazard tree abatement to ensure installation security. The rest of the stand consists of moderately dense Douglas-fir and red alder that is of moderate diameters. This stand shall be thinned to a residual spacing of 20' O.C. to achieve a residual stocking density of 100 trees per acre; whereby, leave trees shall be those stems that enhance biodiversity and have good form, good health and a vigorous crown. No red alder greater than 10 inches in diameter shall be marked or selected as leave trees and must be removed from the stand. Any and all open areas resulting from the thinning and removal of larger diameter alder shall be inter-planted with seedlings of various native conifers and if available seedlings of various native hardwoods as well. However, no hardwoods shall be planted within one tree length of the stand boundary to prevent future hazards from developing.

Stand 91:
Stand 91 is a very small (1 acre) stand that separates a parking lot from Guardian Street and Barb Street. The close proximity of this stand to naval facilities, roadways and parking lots coupled with the small size of the stand will inhibit commercial thinning of the stand from occurring. Thus, the stand shall be managed for the abatement of hazard trees and for the support of mission related projects.

Stand 92:
Most (75%), of stand 92 has been cleared, graded and paved as a parking lot in support of a mission related project. The remaining standing timber shall primarily be managed for hazard tree abatement and for future mission related projects. However, the stand has multiple residual open areas that have become populated with invasive species. These open areas shall have all non-native vegetation removed from and disposed of offsite followed by ripping with a 12" ripping shank to churn the soil in preparation of planting with seedlings of various native conifers.

Stand 93:
Stand 93 is a small (1.5 acre) stand that consists of moderate diameter higher density Douglas-fir and red alder. The stand lies along Skate and Sculpin Streets and borders a large recreation and training area and the southern boundary lies along the southeastern installation fence line. The factors mentioned previously coupled with the small size of the stand leads to the primary management objective for the first on tree length into the stand of hazard tree abatement. However, the standing timber should be thinned to a residual stocking density of 100 trees per acre using single tree selection; whereby, leave trees shall be those stems that enhance biodiversity and have good form, good health and a vigorous crown. No red alder shall be marked, tallied or retained as leave trees and shall be removed from the site. Any and all open areas resulting from the removal of the red alder shall be planted with seedlings of various native conifers and if possible native hardwoods excluding red alder in order to retain biodiversity.

Stand 94 and 95:
These two stands lie along the southeastern and eastern installation fence line to the south and east and borders Tautog circle and a naval facility to the north and west. The first one tree length into the stand from the boundary shall be managed for hazard tree abatement. The rest of the tract consists of moderately dense moderate diameter Douglas-fir and red alder. The stand shall be thinned to a residual spacing of 20' O.C. to achieve a residual stocking density of 100 trees per acre; whereby, leave trees shall be those stems that enhance biodiversity and have good form, good health and a vigorous crown. All yarding shall be completed using a sound strategy to prevent noise complaints from developing. This tract does not have an even distribution of stems, thus any large areas devoid of larger (greater than 8" DBH) timber shall have the ground cover, including red alder regeneration, cut and mulched in the stand and shall be planted with seedlings of various native conifers.

Stand 96:
Stand 96 is a smaller (4.5 acre) stand of smaller diameter highly dense Douglas-fir. The area to the south of the stand has previously been cleared in support of a mission related project, leaving the smaller stems susceptible to windthrow in the future. The stand borders the installation fence line to the east and Scorpion Avenue to the west; thus, the first one tree length into the stand shall be

managed for hazard tree abatement. The rest of the stand shall be pre-commercially thinned to a residual spacing of 16' O.C. to achieve a residual stocking density of 170 trees per acre; whereby, leave trees shall be those stems that enhance biodiversity and have good form, good health, a vigorous crown and will not be susceptible to sun shock or windthrow. All yarding shall be completed using a sound strategy to prevent noise complaints from developing.

Stand 97:
Much of stand 97 has been cleared and developed in support of a mission related project. However, long narrow strips of timber in the stand have been left standing. These strips consist of moderate diameter high density Douglas-fir. The remaining timber shall be pre-commercially thinned to a residual spacing of 16' O.C. to achieve a residual stocking density of 170 trees per acre; whereby, leave trees shall be those stems that enhance biodiversity and have good form, good health, a vigorous crown and will not be susceptible to sun shock or windthrow. All yarding shall be completed using a sound strategy to prevent noise complaints from developing. Areas of this stand have unused open areas that are developing invasive species; thus, these areas shall be denuded of non-native vegetation and shall be ripped using a 12" ripping shank to churn the soil in preparation of planting with seedlings of various native conifers with higher drought resistance. Drip irrigation may be needed when planting seedlings on hill slopes greater than 15 % in grade to ensure seedling survival.

Stand 98:
All of stand 98 has been either cleared or thinned in support of the construction of a training course for mission related activities. Thus, any remaining standing timber in the area shall be managed for hazard tree abatement and for the support of mission related projects. If the facility falls derelict or is no longer in use, then the site shall be cleared of standing debris and ripped using a 12" ripping shank to churn the soils in preparation of planting with seedlings of various native conifers.

Stand 99:
Almost all of stand 99 has been previously cleared and developed for the expansion of the NEX on the installation. Any and all remaining timber shall be managed for hazard tree abatement and for the support of mission related projects.

Stand 100:
Stand 100 is an oddly shaped smaller size (7.2 acre) tract that borders Trigger Avenue to the west, Thresher Avenue to the north, a parking lot and the MWR recreation facility to the east and a naval facility to the south. Thus, the first one tree length into the stand shall be managed for hazard tree abatement. The stand consists of moderately dense moderate diameter Douglas-fir and western hemlock. The stand shall be thinned using single tree selection at no set spacing to achieve a residual stocking density of 134 trees per acre; whereby, leave trees will be selected that increase biodiversity and wildlife habitat while still presenting good form, health and crown vigor. No red alder stems whose diameter is larger than 10" shall be marked, tallied or retained as leave trees. All yarding shall be completed using a sound strategy to prevent noise complaints from developing. Any and all open areas that are the result of the thinning operations shall be inter-plated or replanted with seedlings of various native conifers.

Stand 101, 102, 103, 104, 105, 106, 107, 108 and 109:
These stands represent primarily vegetated strips that border or are within residential areas within the installation and the subsequent roadways and parking lots. The main focus for the management of these stands shall be the safety, security and structural stability of installation residents, patrons and property; thus, management shall primarily be for hazard tree abatement and for the support of mission related projects. However, these stands do represent a cumulatively large volume of standing timber in this portion of the installation and shall also be managed for wildlife habitat and stand health after safety concerns have been addressed. These stands are primarily moderate to highly stocked tracts of moderate diameter Douglas-fir and mixed conifers. These stands shall be thinned using single tree selection at no set spacing to achieve a minimum residual stocking density of 100 trees per acre; whereby, leave trees will be selected that increase biodiversity and wildlife habitat while still presenting good form, health and crown vigor. All yarding shall be completed using a sound strategy to prevent noise complaints from developing and to diminish impacts to soils including erosion and sedimentation. In stands that have smaller sized timber that should not be opened up to a residual stocking density of 100 trees per acre, shall be thinned to a higher density as determined by Navy foresters prior to operations occurring in the area. This will work to diminish the number of sun shocked or wind-thrown stems after thinning has been completed. No red alder shall be marked, tallied or retained in these stands in order to diminish the number of hazard trees that pose a significant safety hazard to installation residents, patrons and property. Any and all open areas or areas with invasive species shall have all non-native vegetative ground cover removed and disposed of offsite followed by ripping with a 12" ripping shank to churn the soils in preparation of planting with seedlings of various native conifers. Planting projects in these stands can be used as educational outreach events for installation residents and patrons to increase the knowledge of forestry and forest management on NBK lands.

Stand 110:
Stand 110 is a smaller (4.9 acre) long and narrow stand that runs on the eastern boundary along the Navy railroad adjacent to the installation patron gas station. The first one tree length into the eastern boundary of the stand shall be managed for hazard tree abatement. There are a considerable number of dead stems along the Navy railroad from use of herbicides; thus, any dead or dying stems shall be removed and disposed of offsite with any open areas replanted with seedlings of various native conifers to bring the area back into vegetative production and preventing the infestation of invasive species. The rest of the stand consists of moderately dense moderate diameter Douglas-fir and western hemlock. The stand shall be thinned to a residual spacing of 20' O.C. to achieve a residual stocking density of 100 trees per acre; whereby, leave trees shall be native conifers with good form, good health and a vigorous crown. Logistically, this stand shall be thinned in conjunction with either stand 35 or 36 and possibly both.

Stand 111:
Stand 111 is a small (1.8 acre) highly visible stand that rest to the north and west of the Trigger Avenue gate and the subsequent southern and eastern installation fence lines. This stand consists of primarily moderate diameter moderately dense red alder and Douglas-fir. The whole stand shall be managed for the abatement of hazard trees and in support of mission related projects, as well as for security and visibility requirements. This stand shall be thinned to a residual spacing of 25' O.C. to achieve a residual stocking density of 70 trees per acre; whereby, leave trees shall be those stems that enhance biodiversity and have good form, good health, a vigorous crown and will not be

susceptible to sun shock or windthrow. This wide spacing will facilitate the inter-planting of this stand with seedlings of various native conifers to develop greater biodiversity both vertically and horizontally. All yarding operations shall be accomplished using a sound strategy in order to diminish soil impacts (including rates of erosion and sedimentation) and to provide an educational opportunity to the general public, installation residents and installation patrons. The entire stand shall be inter-planted with seedlings of various native conifers.

Stand 242:
Stand 242 is a smaller (7 acre) stand that borders an installation residential area along the extent of the eastern boundary of the stand. Thus, the first one tree length into the stand from the residential area shall be managed for hazard tree abatement to ensure the safety, security and structural stability of installation residents, patrons and property. The rest of the stand consists of variable density smaller diameter Douglas-fir that surrounds a mapped stream channel that runs through the western arm of the stand. This stand shall be thinned to a residual spacing of 20' O.C. to achieve a uniform residual stocking density of 100 trees per acre; whereby, leave trees shall be those stems that enhance biodiversity and have good form, good health, a vigorous crown and will not be susceptible to sun shock or windthrow. Thinning in this fashion will eliminate the variability of densities within this stand and allow for uniform future management of the stand. Any and all areas that are either open or below 100 trees per acre shall be inter-planted with seedlings of various native conifers.

Stand 276:
Stand 276 is a small (1.2 acre) narrow strip of timber that rests between Hunley Road and an installation parking lot. This stand shall solely be managed for hazard tree abatement and for the support of mission related projects.

Stand 348:
Stand 348 is a smaller (5.8 acre) stand that has been previously harvested and replanted along Turtle Road and the southern installation fence line. The first one tree length from the fence line into the stand shall be managed for hazard tree abatement. The stand consists of smaller diameter highly dense Douglas-fir and western white pine that is in the density dependent mortality stage of stand development. This stand shall be pre-commercially thinned to a residual spacing of 16' O.C. to achieve a residual stocking density of 170 trees per acre; whereby, leave trees shall be native conifers with good form, good health and a vigorous crown. Decreasing the density of this over stocked stand will increase the individual crown volume of the stems thus increasing the overall ecosystem function and carbon sequestration of the stand.

Any other stands not specifically addressed above will be considered eligible for pre-commercial thinning, timber stand improvement treatments, clearing and planting or any other silvicultural treatment that will enhance stocking, habitat qualities and long term forest and tree productivity. In all forest areas, diseased trees may be appropriately addressed in accordance with the site objectives and the pathogen(s) present. Prescriptions will follow the silvicultural criteria and goals discussed for all other stands.

NAVAL BASE KITSAP, KEYPORT, BANGOR ANNEX, COMPARTMENT 4

Stand 1:
Stand 1 is a smaller (5.4 acre) tract that lies partially adjacent to both a naval facility and the Bangor annex fence line. Thus, any and all areas in the stand that lie within one tree length from a naval facility, roadway or fence line shall be managed for the abatement of hazard trees. The rest of the stand consists of non-uniform higher density moderate diameter Douglas-fir and mixed conifers. This stand shall be single tree selection thinned at no set residual spacing in order to achieve a minimum residual stocking density of 100 trees per acre; whereby leave trees shall be stems with a larger diameter, good health, good form and a vigorous crown. The thinning will allow for a uniform stocking density in order to facilitate the future management of the stand. Any and all portions of the stand that have a residual stocking density that is below the minimum of 100 trees per acre shall be inter-planted with seedlings of various native conifers.

Stand 2:
Stand 2 is a smaller (4.6 acre) tract with boundaries that follow along the top of a well defined stream channel. The northern boundary lies along Darter Road and the Bangor annex fence line; thus, the first one tree length into the stand from the north shall be managed for the abatement of hazard trees. The stand consists of moderately dense moderate diameter red alder. The stand shall be surveyed for the presence of wetlands prior to any and all forestry operations occurring. Any areas that are found to be wetlands are to be marked, flagged and mapped using GPS. Following the survey the stand shall be thinned to a residual spacing of 18’ O.C. to achieve a uniform residual stocking density of 134 trees per acre; whereby, leave trees shall be stems with a larger diameter, good health, good form and a vigorous crown.

Stand 3:
Stand 3 is a moderate sized (10.9 acre) tract that consists of moderately dense moderate diameter red alder. The northern boundary of the stand lies completely along Darter Road and is adjacent to the Bangor annex fence line; thus, the first one tree length into the stand from the northern boundary shall be managed for hazard tree abatement. The stand follows two pronounced drainages that need to be surveyed for the presence of wetlands. Any and all wetlands found during the survey shall be marked, flagged and mapped using GPS prior to any forestry operations occurring. Following surveying, the stand shall be single tree selection thinned at no set residual spacing to achieve a minimum stocking density of 100 trees per acre; whereby leave trees shall be stems with good health, good form and a vigorous crown. No red alder that is greater than 12” in diameter shall be marked, tallied or retained as leave trees. This thinning will allow for a uniform stocking density that will facilitate future management of the stand, while also opening the canopy to foster the development of a vigorous and thriving understory for wildlife habitat. Any and all portions of the stand that fall below the minimum stocking density of 100 trees per acre shall be inter-planted with seedlings of various native conifers.

Stand 4 and 5:
Stands 4 and 5 represent a large cumulative area (64.7 acre) that is primarily open and developed. The open areas are required for the eastern boundary road north of gate 12 and other openings directly linked to the eastern boundary road. Where possible, the open areas shall have non-native vegetation removed and disposed of offsite followed by ripping with a 12” ripping shank to churn

the soils in preparation of planting with seedlings of various native conifers. Within these stands there is some high density small diameter mixed conifer and red alder stems that shall be pre-commercially thinned to a residual spacing of 16' O.C. to achieve a residual stocking density of 170 trees per acre; whereby, leave trees shall be stems with good form, good health and a vigorous crown.

Stand 6, 12, 17 and 18:
This very large (150+ acre) tract consists of higher density moderate diameter Douglas-fir, mixed conifers and hardwoods. Portions along all boundaries of these stands lie near or adjacent to naval facilities, roadways or fence lines; thus, in those areas the primary objective shall be the abatement of hazard trees. The rest of the stand shall be thinned to a residual spacing of 18' O.C. to achieve a residual stocking density of 134 trees per acre; whereby, leave trees shall be native conifers with good form, good health and a vigorous crown. Any and all contiguous open areas shall be planted with seedlings of various native conifers and any portions of the stand which have a stocking density lower than 100 trees per acre shall be inter-planted with seedlings of various native conifers. This thinning will work to increase the individual crown volume of the residual stems which subsequently increases the rate of carbon sequestration and the overall health of the stand. The increased light hitting the forest floor will foster the development of a vigorous understory to improve wildlife habitat.

Stand 7:
Stand 7 is a smaller (5.7 acre) tract that consists of moderately dense moderate diameter red alder. The western boundary of the stand runs along Gurnard Road with the southern boundary being adjacent to a naval facility; thus one tree length into the stand from either of those boundaries shall be managed for the abatement of hazard trees. The whole stand shall be surveyed for the presence of wetlands that, if found, shall be marked, flagged and mapped using GPS prior to any forestry operations occurring. The stand shall be thinned using the leave tree release method; whereby, a stem with good form, good health and a vigorous crown is selected as a leave tree with all stems whose crowns are either touching or above the crown of the leave tree being subject to removal. There is no set spacing but there shall be a uniform minimum stocking density of 100 trees per acre. Any and all contiguous open areas shall be planted with seedlings of various native conifers and any portions of the stand which have a stocking density lower than 100 trees per acre shall be inter-planted with seedlings of various native conifers.

Stand 8 and 9:
Stands 8 and 9 are small (2.3 and 2.9 acre) narrow strips of small diameter lower quality red alder. Along the western and southern boundaries of the tract are naval facilities and given the small size of the stands, the primary management objective shall be the abatement of hazard trees and the support of mission related projects.

Stand 10:
Stand 10 is a smaller (7.5 acre) stand that consists of higher density moderate diameter Douglas-fir and mixed conifers. The eastern boundary of this stand runs along Gurnard Road and the western boundary is within a single tree length from naval facilities; thus, those areas shall be managed for the abatement of hazard trees. The stand shall be thinned to a residual spacing of 18' O.C. to achieve a residual stocking density of 134 trees per acre; whereby, leave trees shall be native

conifers with good from, good health and a vigorous crown. No red alder greater than 12" in diameter shall be marked, tallied or retained as a leave trees. Any and all contiguous open areas shall be planted with seedlings of various native conifers and any portions of the stand which have a stocking density lower than 100 trees per acre shall be inter-planted with seedlings of various native conifers.

Stand 11:
Stand 11 is a very large (288.1 acre) open tract that has little to no standing timber. This stand represents all roads, facilities, parking lots and grass areas within the compartment that were not included in stand 4. The primary objective for this stand is the abatement of hazard trees that are within one tree length from any type of government property and for the support of mission related projects. Where possible, open areas shall have all non-native vegetation removed and disposed of offsite followed by ripping with a 12" ripping shank to churn the soil in preparation of planting with seedlings of various native conifers.

Stand 13 and 16:
These stands are smaller (3.8 and 1.6 acre) narrow strips of timber that surround storage magazines. The timber on these stands is primarily small diameter very low density red alder that is of poor form and generally poor health. The management of these stands shall be for the abatement of hazard trees and for the support of mission related projects and security requirements.

Stand 14:
Stand 14 is a smaller tract that consists of lower density moderate diameter Douglas-fir and western hemlock. The eastern boundary lies along Gurnard Road; thus, the first one tree length into the stand from that boundary shall be managed for hazard tree abatement. The rest of the stand shall be single tree selection thinned at no set spacing to a residual stocking density of 100 trees per acre; whereby, removal trees will be selected that are poor in form health and crown vigor. Removing poor formed and poor health trees will allow the residual stand to capture mortality by transferring growth from poor form suppressed stems to good from dominant and co-dominant stems.

Stand 15:
Stand 15 is a small (4.9 acre) odd shaped stand that surrounds storage magazines. Most of the boundary lines lie within one tree length of a storage bunker or roadway; thus, the entire stand shall be managed for the first one tree length for the abatement of hazard trees. The stand consists of smaller diameter higher density red alder. The stand shall be thinned to a residual spacing of 18' O.C. to achieve a residual stocking density of 134 trees per acre; whereby, leave trees shall be stems with high ecological value, good form, good health and a vigorous crown.

Stand 19:
Stand 19 is a smaller (2.7 acre) tract that borders a storage magazine to the west, Gurnard Road to the east and Seawolf Road to the south; thus, the first one tree length into the stand shall be managed for the abatement of hazard trees and for the support of mission related projects and security requirements. The stand consists of moderately dense moderate diameter Douglas-fir that shall be thinned to a residual spacing of 20' O.C. to achieve a residual stocking density of 100 trees per acre; whereby, leave trees shall be native conifers with good form, good health and a vigorous crown.

Stand 20:
Stand 20 is a moderate (17 acre) tract that consists of moderately dense moderate diameter Douglas-fir and mixed conifers. The northern boundary lies along Seawolf Road, the eastern boundary lies along the Eastern Boundary Road and the rest of the boundaries have portions that lie along roadways or facilities; thus, the first one tree length into the stand shall be managed for hazard tree abatement. The stand shall be thinned to a residual spacing of 20' O.C. to achieve a residual stocking density of 100 trees per acre; whereby, leave trees shall be stems with good health, good form, a vigorous crown and a high propensity for increased crown volume and production.

Stand 21:
Stand 21 is a smaller (2.9 acre) tract that consists of small diameter moderately dense red alder. The stand lies along Seawolf Road to the north and storage bunkers to the west; thus, the first one tree length into the stand shall be managed first and foremost for the abatement of hazard trees. This stand shall be selectively thinned at no set residual spacing to attain a residual stocking density of 70 trees per acre; whereby, leave trees shall be those individuals with the highest propensity to increase crown volume and health from a thinning. Any and all stems whose crowns are either touching or above the crown of the leave tree shall be removed. After thinning, this stand shall be inter-planted with seedlings of various native conifers to provide additional horizontal and vertical stratification.

Stand 22:
Stand 22 is a smaller (6.7 acre) tract that consists of small diameter lower density Douglas-fir, this structure has been driven by having the entire stand thinned in the last decade. The stand shall be managed for hazard tree abatement to a distance of one tree length into the stand. This stand shall be inter-planted with seedling of various native conifers in order to increase the site productivity and develop a strong vertically and horizontally stratified stand.

Stand 23:
Stand 23 is a smaller stand (5.1 acre) that consists of moderate density smaller diameter Douglas-fir and western redcedar. The stand is a narrow strip of timber which wraps around six storage magazines; thus, the stand shall be managed for the abatement of hazard trees and for the support of mission related projects and security requirements.

Stand 24:
Stand 24 is a moderate (10.3 acre) stand that lies along Gurnard Road to the south and surrounding storage magazines on Scorpion Avenue to the north. The first one tree length into the stand shall be managed first and foremost for the abatement of hazard trees and for the support of mission related projects and security requirements. The stand consists of moderately dense moderate diameter Douglas-fir that shall be thinned to a residual spacing of 20' O.C. to achieve a residual stocking density of 100 trees per acre; whereby, leave trees shall be native conifers with a larger diameter, good form, good health and a vigorous crown. The wider spacing will increase the individual crown volume of the standing timber and will allow light to hit the forest floor in order to develop a thriving understory to improve wildlife habitat.

Stand 25:
Stand 25 is a smaller (3.9 acre) tract that surrounds storage magazines to the east of Scorpion Road. The first one tree length into the stand shall be managed first and foremost for the abatement of hazard trees and for the support of mission related projects and security requirements. The stand

consists of smaller diameter moderate density red alder that shall be pre-commercially thinned to a residual spacing of 16' O.C. to achieve a residual stocking density of 170 trees per acre; whereby, leave trees shall be stems with good form, good health and a vigorous crown.

Stand 26:
Stand 26 is a small (2.6 acre) tract that lies to the west of Trepang Road surrounding storage magazines. The first one tree length into the stand shall be managed first and foremost for the abatement of hazard trees and for the support of mission related projects and security requirements. The stand consists of moderately dense smaller diameter Douglas-fir that shall be pre-commercially thinned to a residual spacing of 16' O.C. to achieve a residual stocking density of 170 trees per acre; whereby, leave trees shall be native conifers with good form, good health and a vigorous crown.

Stand 27 and 28:
These two stands are open areas that lie completely within other stands and contain no standing timber. The tract shall have all non-native ground cover vegetation removed and disposed of offsite, followed by ripping with a 12" ripping shank to churn the soils in preparation of planting with seedlings of various native conifers.

Stand 29, 30 and 31:
These stands represent a section of standing timber that is moderate in size and that borders the Eastern Boundary Road to the east, Trepang Road to the west, Bullhead Road to the south and partially an open storage area to the north. The first one tree length into the stand shall be managed first and foremost for the abatement of hazard trees and for the support of mission related projects and security requirements. The stand consists of predominately Douglas-fir at varying densities with a non-uniform distribution of timber. The tract shall be selection (1-2 trees) or group (3-8 trees) thinned at no set residual spacing to achieve a minimum residual density of 100 trees per acre; whereby, removal trees shall be selected that have poor form, poor health and if removed will have a large release capability. After thinning the tract shall be inter-planted with seedlings of various native conifers in any areas with residual stocking densities below 100 trees per acre.

Stand 32, 33, 34, 35, 36, 37 and 38:
These stands represent smaller long and narrow stands that surround storage magazines and lie along Scorpion Road, Gurnard Road or Trepang Road. The first one tree length into the tract shall be managed first and foremost for the abatement of hazard trees and for the support of mission related projects and security requirements. These stands all consist of smaller to moderate diameter Douglas-fir at moderate to high stocking densities. The tract shall be single tree selection thinned at no set spacing to achieve a uniform residual stocking density of 100 trees per acre; whereby, leave trees shall be stems with a high propensity for increased crown volume and production, good from, good health and a vigorous crown. Any and all stems whose crowns are either touching or above the crown of a leave tree shall be removed. Inter-planting shall occur in any areas that have a residual stocking density below 100 trees per acre.

Stand 39:
Stand 39 is a smaller (6.1 acre) tract that was partially thinned in 2005 as a part of the east boundary thinning. The stand lies along the eastern side of Trepang Road and follows a considerable draw and stream channel. The first one tree length into the stand shall be managed first and foremost for the

abatement of hazard trees and for the support of mission related projects and security requirements. The rest of the stand has either been thinned or has topographical constraints which would prevent economical thinning from occurring; thus it shall be managed by inter-planting with seedlings of various native conifers in order to increase the vertical and horizontal stratification.

Stand 40, 41 and 42:
These stands form a larger (46.1 acre) tract that consists of moderate diameter relatively well stocked Douglas-fir. These stands were thinned in 2005 as a part of the east boundary thinning which resulted in a well formed canopy with a relatively good stocking density. The tract lies along Trepang road to the west, Bullhead Road to the north, East Boundary Road to the east and Palau Road to the south. The first one tree length into the stand shall be managed first and foremost for the abatement of hazard trees and for the support of mission related projects and security requirements. The rest of the stand shall be single tree selection thinned at no set spacing to achieve a stocking density that is greater than 70 trees per acre; whereby removal trees will be those that detract from the wildlife habitat and stand health of the tract and that are of poor form, poor health and have surpassed maturity.

Stand 43:
Stand 43 is a narrow strip of timber that is moderate (13.4 acre) in size. The stand lies along the Eastern boundary road to the east and Kete Road to the west. The first one tree length into the stand shall be managed first and foremost for the abatement of hazard trees and for the support of mission related projects and security requirements. The stand consists of moderate to smaller diameter Douglas-fir that is very dense. The stand shall thinned to a residual spacing of 18’ O.C. to achieve a residual stocking density of 134 trees per acre; whereby, leave trees shall be native conifers with good health, good form, a vigorous crown and a high propensity for increased crown volume and production.

Stand 44, 45, 46, 47 and 48:
This conglomeration of stands represents a larger (64.4 acre) area that has many boundaries along roadways and storage magazines. The first one tree length into the stand shall be managed first and foremost for the abatement of hazard trees and for the support of mission related projects and security requirements. The tract consists of moderate diameter moderate density Douglas-fir and red alder that shall be thinned using the leave tree release method. The thinning shall be at no set spacing to a minimum uniform residual stocking density of 130 trees per acre; whereby, leave trees shall be stems with a high propensity for increased crown volume and production, good health, good form and a vigorous crown. Any and all stems whose crowns are either touching or above the crown of a leave tree shall be removed. Any and all open areas or area with residual densities below the minimum 100 trees per acre shall be inter-planted with seedlings of various native conifers.

Stand 49:
Stand 49 is a moderate (20 acre) tract that surrounds storage magazines to the east of Scorpion Road and to the west of Aspro Road with boundaries that also lie along Pargo Road to the south and Puffer Road to the north. The first one tree length into the stand shall be managed first and foremost for the abatement of hazard trees and for the support of mission related projects and security requirements. The stand consists of moderate diameter highly dense Douglas-fir and mixed conifers. The stand shall be thinned to a residual spacing of 20’ O.C. to achieve a residual spacing of 100

trees per acre; whereby, leave trees shall be native conifers with good form, good health and a vigorous crown.

Stand 50:
Stand 50 is a smaller (3.6 acre) area that borders the Eastern Boundary Road to the east, Pargo Road to the south and Kete Road to the west. The first one tree length into the stand shall be managed first and foremost for the abatement of hazard trees and for the support of mission related projects and security requirements. The stand consists of lower density smaller diameter red alder. The stand shall be pre-commercially thinned to a residual spacing of 16' O.C. to achieve a residual stocking density of 170 trees per acre; whereby, leave trees shall be stems with good form, good health, a vigorous crown and a high propensity for increased crown volume and production.

Stand 51 and 52:
Stand 51 and 52 create a rectangle of timber that lies between the annex security fence to the west and Scorpion Road to the east. The first one tree length into the stand shall be managed first and foremost for the abatement of hazard trees and for the support of mission related projects and security requirements. The tract consists of small to moderate diameter highly dense Douglas-fir and western redcedar. The tract shall be thinned to a residual stocking density of 18' O.C. to achieve a residual stocking density of 134 trees per acre; whereby, leave trees shall be native conifers with good form, good health, a vigorous crown and a high propensity for increased crown volume and production. Any and all open areas or areas with densities below 134 trees per acre shall be inter-planted with seedlings of various native conifers.

Stand 53 and 54:
Stand 53 and 54 are smaller (7.5 and 2.3 acre) stands that lies between the annex security fence to the west and Scorpion Avenue to the east. The first one tree length into the stand shall be managed first and foremost for the abatement of hazard trees and for the support of mission related projects and security requirements. The stand consists of smaller to moderate diameter moderately dense Douglas-fir and red alder. The stand shall be single tree selection thinned at no set residual spacing to achieve a residual stocking density of 130 trees per acre; whereby, leave trees shall be stems with good form, good health, a vigorous crown and a high propensity for increased crown volume and production. Any and all open areas or areas where the residual stocking density is below 130 trees per acre shall be inter-planted with seedlings of various native conifers.

Stand 55:
Stand 55 is a small (3.4 acre) narrow strip of timber that lies along the Eastern Boundary Road and consists of small diameter moderately dense red alder. The first one tree length into the stand shall be managed first and foremost for the abatement of hazard trees and for the support of mission related projects and security requirements. The stand shall be pre-commercially thinned to a residual spacing of 16' O.C. to achieve a residual stocking density of 170 trees per acre; whereby, leave trees shall be stems with good form, good health, a vigorous crown and a high propensity for increased crown volume and production.

Stand 56:
Stand 56 is a smaller (5.4 acre) narrow strip of timber that runs along Kete Road that consists of highly dense moderate diameter Douglas-fir and western redcedar. The first one tree length into the stand shall be managed first and foremost for the abatement of hazard trees and for the support of mission related projects and security requirements. The stand shall be thinned to a residual spacing of 18' O.C. to achieve a residual stocking density of 134 trees per acre; whereby, leave trees shall be native conifers with good form, good health, a vigorous crown and a high propensity for increased crown volume and production.

Stand 57:
Stand 57 is a small (2.9 acre) tract that borders Pargo Road to the north, Haddo Road to the west and naval facilities to the east. The first one tree length into the stand shall be managed first and foremost for the abatement of hazard trees and for the support of mission related projects and security requirements. The stand consists of smaller diameter moderately dense red alder. The stand shall be TSI thinned to a residual spacing of 25' O.C. to achieve a residual stocking density of 70 trees per acre; whereby leave trees shall be stems with good form, good health, a vigorous crown and a high propensity for increased crown volume and production. After thinning the stand shall be inter-planted with seedlings of various native conifers with a focus on western white pine in order to provide horizontal and vertical stratification.

Stand 58 and 61:
Stand 58 and 61 form a moderately (30.2 acre) large strip of timber that consists of moderate diameter moderately dense Douglas-fir and western redcedar. The tract borders Haddo Road to the west, Kete Road to the south and naval facilities to the east. The first one tree length into the stand shall be managed first and foremost for the abatement of hazard trees and for the support of mission related projects and security requirements. The stand shall be thinned to a residual spacing of 20' O.C. to achieve a residual stocking density of 100 trees per acre; whereby leave trees shall be native conifers with good form, good health, a vigorous crown and a high propensity for increased crown volume and production.

Stand 59 and 70:
These stands represent a block of timber that lies along the Eastern Boundary Road to the east, the annex fence line to the south and Kete Road to the west. The first one tree length into the stand shall be managed first and foremost for the abatement of hazard trees and for the support of mission related projects and security requirements. The stand consists of moderate diameter moderately dense Douglas-fir and red alder. The stand shall be thinned to a residual spacing of 18' O.C. to achieve a residual spacing of 134 trees per acre; whereby, leave trees shall be stems with good form, good health, a vigorous crown and a high propensity for increased crown volume and production. Any and all open areas shall be planted with seedlings of various native conifers.

Stand 60:
Stand 60 is a smaller (3.7 acre) tract that has only one boundary that lies along a roadway, Haddo Road. The first one tree length into the stand from Haddo Road shall be managed first and foremost for the abatement of hazard trees and for the support of mission related projects and security requirements. The stand consists of moderately dense moderate diameter red alder and Douglas-fir. The stand shall be single tree selection thinned at no set spacing to achieve a residual stocking

density of 85 trees per acre; whereby, leave trees shall be stems with good form, good health, a vigorous crown and a high propensity for increased crown volume and production. After thinning, the stand shall be inter-planted with seedlings of various native conifers to provide increased horizontal and vertical stratification.

Stand 62, 63 and 64:
These stands combine to create a smaller (7.2 acre) strip of timber that borders Dace Road to the west, Pargo Road to the north, and storage magazines along Haddo Road to the east. The first one tree length into the stand shall be managed first and foremost for the abatement of hazard trees and for the support of mission related projects and security requirements. This tract consists of moderate diameter highly dense Douglas-fir, red alder and western redcedar. The tract shall be single tree selection thinned at no set residual spacing to achieve a residual stocking density of 100 trees per acre; whereby, leave trees shall be native conifers with good form, good health, a vigorous crown and a high propensity for increased crown volume and production. Any and all areas where the residual stocking density is below 100 trees per acre shall be inter-planted with seedlings of various native conifers and if possible, big-leaf maple.

Stand 65 and 66:
Stands 65 and 66 surround storage magazines that lie along Dace Road to the east and Scorpion Avenue to the west. The first one tree length into the stand shall be managed first and foremost for the abatement of hazard trees and for the support of mission related projects and security requirements. The tract consists of moderately dense moderate diameter Douglas-fir and red alder. This stand shall be thinned to a residual spacing of 18’ O.C. to achieve a residual stocking density of 134 trees per acre; whereby, leave trees shall be stems with good form, good health, a vigorous crown and a high propensity for increased crown volume and production.

Stand 67:
Stand 67 is a moderate (11.9 acre) sized strip of timber that runs along the annex fence line to the west and Scorpion Avenue to the east. The first one tree length into the stand shall be managed first and foremost for the abatement of hazard trees and for the support of mission related projects and security requirements. The stand consists of moderate diameter moderate density Douglas-fir that shall be thinned to a residual spacing of 20’ O.C. to achieve a residual stocking density of 100 trees per acre; whereby, leave trees shall be native conifers with good form, good health, a vigorous crown and a high propensity for increased crown volume and production. Any and all areas that have residual stocking densities that are less than 100 trees per acre shall be inter-planted with seedlings of various native conifers.

Stand 68:
Stand 68 is a small (1.6 acre) tract that lies adjacent to naval facilities to the east, west and north of the stand. The first one tree length into the stand shall be managed first and foremost for the abatement of hazard trees and for the support of mission related projects and security requirements. The stand consists of smaller diameter higher density Douglas-fir and red alder. The stand shall be pre-commercially thinned at no set residual spacing to obtain a minimum residual stocking density of 150 trees per acre using the leave tree release method. Leave trees shall be stems with good form, good health, a vigorous crown and a high propensity for increased crown volume and production. Any stem whose crown is either touching or above the crown of a leave tree shall be removed.

Stand 69:
Stand 69 is a small (1.3 acre) tract that lies along Kete Road to the south, Dace Road to the west and naval facilities to the east and north. The first one tree length into the stand shall be managed first and foremost for the abatement of hazard trees and for the support of mission related projects and security requirements. This stand consists of smaller diameter higher density Douglas-fir and red alder. The stand shall be pre-commercially thinned to a residual spacing of 16' O.C. to achieve a residual stocking density of 170 trees per acre; whereby, leave trees shall be stems with good form, good health, a vigorous crown and a high propensity for increased crown volume and production.

Any other stands not specifically addressed above will be considered eligible for pre-commercial thinning, timber stand improvement treatments, clearing and planting or any other silvicultural treatment that will enhance stocking and long term forest and tree productivity. In all forest areas, diseased trees may be cut down. Prescriptions will follow the silvicultural criteria and goals discussed for all other stands.

NAVAL BASE KITSAP, KEYPORT, COMPARTMENT 5

Stand 1:
Stand 1 represents all roadways, parking lots, open areas, residential areas, and some small scale forested areas for the installation. All forested areas within one tree length from a naval facility, roadway, residential area, parking lot, or walkway shall be managed first and foremost for the abatement of hazard trees in order to protect the safety and structural stability of installation patrons and property; whereby, any tree that is either dead, leaning, or found to be unsound by a Navy Forester shall be removed. Stems can be pruned to a height which leaves one third of the total height of the tree in live crown for security mandates but in order to remove trees for purposes other than as a hazard NEPA documentation is required. Open areas, non-native landscaping areas or areas with invasive species can have the ground vegetation cleared and disposed of off base followed by ripping of the soil surface using a 12" ripping shank to churn the soil in preparation of planting with seedlings of various native conifers and/or if possible, various native hardwoods. Any and all open areas can be planted with seedlings of various native conifers, the spacing of which will be determined by a Navy Forester prior to the commencement of planting activities. In the few areas with small tracts of standing timber, the timber will be managed concurrently with the adjacent stand or stands, unless unique circumstances arise for the site.

Stand 3:
Stand 3 is a smaller (1.8 acre) tract that borders roadways and parking lots on all sides of the tract. Due to the close proximity to government property, the stand shall be first and foremost managed for hazard tree abatement and for the support of mission related projects and security requirements. The stand consists of lower density larger diameter Douglas-fir. This stand shall be timber stand improvement (TSI) thinned; whereby, a low thinning shall occur to cut all suppressed and intermediate stems that are taking nutrients and resources away from the dominant and co-dominant stems and leave them lie within the stand. No red alder regeneration or understory stems shall be retained in the TSI operation. The TSI will help to facilitate inter-planting with seedlings of various native conifers.

Stand 4:
Stand 4 is a small (1.4 acre) tract that borders the turn off for NBK, Keyport to the south and the naval undersea warfare museum to the east. Due to the close proximity to government property, the stand shall be first and foremost managed for hazard tree abatement and for the support of mission related projects and security requirements. The stand consists of lower density larger diameter Douglas-fir. The stand shall be single tree selection thinned at no set spacing to achieve a residual stocking density of 80 trees per acre; whereby, leave trees shall be native conifers with good from, good health, a vigorous crown and a high propensity for increased crown volume and production. All yarding activities shall be conducted using a sound strategy in order to diminish the adverse soil impacts generated by mechanized yarding and to provide an educational opportunity for installation patrons and the general public. After thinning, the stand shall be inter-planted with seedlings of various native conifers.

Stand 6:
Stand 6 represents a moderately (21.8 acre) large water body in the middle of the Keyport installation. The water body is known as the Keyport Lagoon and is a fresh water impoundment drains into Puget Sound. This stand shall be managed for shoreline habitat both in terms of native vegetation regimes and in terms of fish and wildlife. The stand shall also be managed for the abatement of hazard trees and for the support of mission related projects and security requirements.

Stand 7:
Stand 7 is a small (1.1 acre) sparsely stocked stand that consists of small diameter red alder that borders a security road and a lay-down area to the south and east. The first one tree length into the stand shall be first and foremost managed for the abatement of hazard trees. This stand shall undergo timber stand improvement (TSI) to remove most understory vegetation and thin the scattered clumps of red alder that have formed in the area. The removal and mulching of the understory vegetation will open the forest floor up for inter-planting with seedlings of various native conifers. Since red alder grows in tightly spaced clumps, which can be seen on this site, pre-commercial thinning shall occur within each clump where the stem with goof form, good health, a vigorous crown and a high propensity for increased crown volume and production is selected at a spacing of 16’ O.C. to achieve a residual stocking density of 170 trees per acre. The thinning will open the overstory to facilitate inter-planting with seedlings of various shade tolerant native conifers.

Stand 8:
Stand 8 is a smaller (4.9 acre) tract that borders the installation fence line to the west, naval facilities to the north and east, a security road to the south and is within one tree length from the Brownsville Hwy. on the other side of the installation fence line. Thus, the first one tree length into the stand shall be managed first and foremost for hazard tree abatement. The stand consists of moderately dense moderate diameter red alder that shall be thinned using the leave tree release system at no set residual spacing in order to achieve a residual stocking density of 100 trees per acre; whereby leave trees shall be stems with good form, good health, a vigorous crown and a high propensity for increased crown volume and production. Any stem whose crown is either touching or above the crown of a leave tree shall be removed. All yarding shall be done using a sound strategy in order to diminish the adverse soil impacts that occur during mechanized yarding and to provide an educational opportunity for installation residents and patrons.

Stand 9:
Stand 9 is a small (2.8 acre) sparsely stocked stand that consists of small diameter red alder that borders a roadway to the west. The first one tree length into the stand from the roadway shall be managed for the abatement of hazard trees and for the support of mission related projects. This stand shall be pre-commercially thinned to a residual spacing of 16’ O.C. to achieve a residual stocking density of 170 trees per acre; whereby, leave trees shall be stems with good form, good health, a vigorous crown and a high propensity for increased crown volume and production. All yarding operations shall be conducted using a sound strategy in order to alleviate the adverse soil impacts caused my mechanized yarding. Any and all parts of the stand with stocking levels below 170 trees per acre shall be inter-planted with seedlings of various native conifers.

Stand 10:
Stand 10 is a smaller (9.2 acre) stand that borders roadways, parking lots and naval facilities along the entire boundary; thus, the first one tree length into the stand shall be managed first and foremost for the abatement of hazard trees and for the support of mission related projects. The stand consists of lower density moderate diameter red alder and big-leaf maple with immense amounts of invasive species (primarily Japanese Knotweed) throughout the stand. The stand shall undergo timber stand improvement whereby all standing native vegetation that is less than 4 inches in diameter is to be cut and mulched on site with non-native vegetation removed and disposed of offsite. Any standing timber that is immersed with ivy or grapevine shall be removed and disposed of offsite. After the vegetation removal has occurred a TSI low thinning shall occur; whereby, all suppressed and intermediate hardwood stems are to be cut and left lie in the stand. Following the low thinning the entire stand is to be inter-planted with seedlings of various shade tolerant conifers; whereby, scalping will occur in planting sites so as to expose bare mineral soil to help ensure seedling survival. In areas where invasive species were removed and native conifers seedlings were planted, treatment shall occur annually either by mechanical means or with approved and appropriately applied herbicides for a length of time equal to five years or after complete shade establishment.

Stand 11:
Stand 11 is a smaller (5.0 acre) tract that lies along the southern installation boundary to the south, the western installation boundary to the west, a security road to the north and a roadway to the east. The first one tree length into the stand shall be first and foremost managed for hazard tree abatement. The stand consists of previously thinned well stocked larger diameter Douglas-fir and big-leaf maple. The stand shall be single tree selection thinned to achieve a uniform residual stocking density of 100 trees per acre; whereby, leave trees shall be stems with good form, good health, a vigorous crown and a high propensity for increased crown volume and production. All yarding shall be conducted using a sound strategy in order to diminish the adverse soil impacts associated with mechanized yarding. No red alder greater than 10" in diameter shall be marked, tallied or retained as leave trees. Any and all portions of the stand that have a residual stocking density below 100 trees per acre shall be inter-planted with seedlings of various native conifers.

Stand 12:
Stand 12 is a moderate (12.4 acre) sized tract that borders the southern installation fence line to the south and a roadway to the east and west. The first one tree length into the stand shall be managed for hazard tree abatement and for the support of mission related projects. The stand consists of larger diameter moderately dense Douglas-fir and Big-leaf maple that shall be thinned to a residual spacing of 21' O.C. to achieve a residual stocking density of 98 trees per acre; whereby, leave trees shall be stems with good form, good health, a vigorous crown and a high propensity for increased crown volume and production. All yarding shall be conducted a carefully crafted strategy to diminish the adverse soil impacts of mechanized yarding.

Stand 13 and 14:
These stands are smaller (6.0 and 0.9 acre) in size that lie to the south of the Keyport Lagoon and partially lie along the waterfront shoreline to the west with some areas of the tract bordering naval residencies or roadways. The first one tree length into the stand from a roadway or naval structure shall be managed for the abatement of hazard trees. The first one tree length into the stand from the Lagoon or shoreline shall be managed for shoreline habitat both in terms of native vegetation

regimes and in terms of fish and wildlife habitat. The tract consists of larger diameter well stocked Douglas-fir that shall be single tree selection thinned at no set residual spacing to achieve a uniform residual stocking density of 85 trees per acre; whereby, leave trees shall be native conifers and big-leaf maple with good from, good health, a vigorous crown and a high propensity for increased crown volume and production. All yarding shall be conducted using a sound strategy in order to diminish the adverse soil and runoff conditions that can result from mechanized yarding. Any and all areas with stocking densities below 85 trees per acre shall be inter-planted with seedlings of various shade tolerant native conifers.

Stand 16:
Stand 16 is a smaller (3.8 acre) tract that borders naval residencies and roadways to the west, north and partially to the east. Some of the eastern boundary lies along the shoreline as well. The first one tree length into the stand from any roadway or naval residence shall be managed first and foremost for the abatement of hazard trees. Along the eastern boundary where the stand borders the shoreline the stand shall be managed for the first one tree length into the stand for shoreline habitat both in terms of vegetative regimes and in terms of fish and wildlife regimes. The stand consists of larger diameter moderate to lower density Douglas-fir and big-leaf maple. The stand shall be thinned to a residual spacing of 20’ O.C. to achieve a uniform residual stocking density of 100 trees per acre; whereby, leave trees shall be stems with good from, good health, a vigorous crown and a high propensity for increased crown volume and production. All yarding shall be conducted using a sound strategy in order to diminish the adverse soil and runoff conditions that can result from mechanized yarding.

Stand 18:
Stand 18 is a smaller (3.3 acre) stand that borders the shoreline to the east, the installation fence-line to the south and naval residences to the west. The first one tree length into the stand from any roadway or naval residence shall be managed first and foremost for the abatement of hazard trees. Along the eastern boundary where the stand borders the shoreline the stand shall be managed for the first one tree length into the stand for shoreline habitat both in terms of vegetative regimes and in terms of fish and wildlife regimes. The stand consists of larger diameter lower density big-leaf maple and red alder. The stand shall undergo a single tree selection leave tree release thinning at no set residual spacing to achieve a residual stocking density of 85 trees per acre; whereby, leave trees shall be stems with good form, good health, a vigorous crown and a high propensity for increased crown volume and production. Any stem whose crown is either touching or above the crown of a leave tree shall be removed. All yarding shall be conducted using a sound strategy in order to diminish the adverse soil and runoff conditions that can result from mechanized yarding.

Any other stands not specifically addressed above will be considered eligible for pre-commercial thinning, timber stand improvement treatments, clearing and planting or any other silvicultural treatment that will enhance stocking and long term forest and tree productivity. In all forest areas, diseased trees may be cut down. Prescriptions will follow the silvicultural criteria and goals discussed for all other stands.

NAVAL BASE KITSAP, TOANDOS BUFFER ZONE, COMPARTMENT 8 AND ZELATCHED POINT

Stand 1:
Stand 1 is a moderate (13.3 acre) sized tract that consists of large diameter lower density Douglas-fir. This stand shall be single tree selection thinned at no set residual spacing to achieve a uniform residual stocking density of 75 trees per acre; whereby, leave trees shall be native conifers with larger diameters, good form, good health, a vigorous crown and a high propensity for increased crown volume and production. After thinning, the stand shall be inter-planted with seedlings of various native conifers in order to increase the vertical and horizontal stratification.

Stand 2:
Stand 1 is a moderate (14.2 acre) sized tract that consists of moderate diameter well stocked Douglas-fir. This stand shall be single tree selection thinned at no set residual spacing to achieve a uniform residual stocking density of 85 trees per acre; whereby, leave trees shall be native conifers with larger diameters, good form, good health, a vigorous crown and a high propensity for increased crown volume and production. No red alder shall be marked, tallied or retained as leave tree and shall be removed from or cut and left lie in the stand. After thinning, the stand shall be inter-planted with seedlings of various native conifers in order to increase the horizontal and vertical stratification.

Stand 3:
Stand 3 is a moderate (15.0 acre) area that consists primarily of brush and open areas with some scattered standing timber along the northern shoreline of the buffer zone. The standing timber shall be managed concurrently with the prescriptions provided for adjacent stands including thinning and inter-planting. The rest of the stand shall have all non-native vegetation removed and disposed of offsite followed by ripped with a 12” ripping shank to churn and expose the soils in preparation of planting with seedlings of various native conifers with an emphasis on western redcedar.

Stand 4:
Stand 4 is a smaller (5.4 acre) tract that consists of moderate diameter moderate density Douglas-fir. The stand shall be thinned to a residual spacing of 20’ O.C. to achieve a residual stocking density of 100 trees per acre; whereby, leave trees shall be native conifers with larger diameters, good health, good form, a vigorous crown and a high propensity for increased crown volume and production. No red alder greater than 8” in diameter shall not be marked, tallied or retained as leave trees and shall be removed from or cut and left lie in the stand. Any and all open areas or areas within the stand that are below the residual stocking density of 100 trees per acre shall be inter-planted with seedlings of various native conifers.

Stand 5:
Stand 5 is a small (2.8 acre) tract that consists of very small diameter highly dense red alder and Pacific madrone. This stand shall be pre-commercially thinned to a residual spacing of 16’ O.C. to achieve a residual stocking density of 170 trees per acre; whereby, leave trees shall be stems with good form, good health, a vigorous crown and a high propensity for increased crown volume and production.

Stand 6, 7 & 8:
Stands 6, 7 and 8 are smaller (1.8, 5.9 and7.0 acre) stands that have similar stand characteristics; in that, the stands consist of moderate to larger diameter moderate to lower density Douglas-fir and red alder. This tract shall be single tree selection thinned at no set residual spacing in order to achieve a uniform residual stocking density of 100 trees per acre; whereby, leave trees shall be stems with larger diameters, good form, good health, vigorous crowns and high propensities for increased crown volume and production. Any and all areas that have residual stocking densities that are less than 100 trees per acre shall be inter-planted with seedlings of various native conifers.

Stand 9 & 10:
Stands 9 and 10 are smaller (3.1 and 4.1 acre) stands that consist of moderately dense moderate to large diameter Douglas-fir. This stand shall be thinned at a residual spacing of 20' O.C. to achieve a residual stocking density of 100 trees per acre; whereby, leave trees shall be native conifers with good from, good health, a vigorous crown and a high propensity for increased crown volume and production. No red alder greater than 8" in diameter shall be marked, tallied or retained as a leave trees.

Stand 11:
Stand 11 is a smaller (7.8 acre) stand that consists of highly dense small diameter Douglas-fir. This stand shall be pre-commercially thinned to a residual spacing of 16' O.C. to achieve a residual stocking density of 170 trees per acre; whereby, leave trees shall be stems with good form, good health, a vigorous crown and a high propensity for increased crown volume and production.

Stand 12, 13, 14, 17 and 18:
Stands 12, 13, 14, 17 and 18 vary in size from small (4.4 acre) to moderate (13.9, 23.1, 40.1 and 15.8 acre) with all five stands consisting of moderate to large diameter moderate density Douglas-fir and red alder. This tract shall be single tree selection, leave tree release thinned at no set residual spacing to achieve a minimum residual stocking density of 100 trees per acre; whereby, leave trees shall be stems with good form, good health, a vigorous crown and a high propensity for increased crown volume and production. Any stem whose crown is either touching or above the crown of a leave tree shall be removed. No red alder greater than 10" in diameter shall be marked, tallied or retained as leave trees. Any and all open areas or portions of the tract that have residual stocking densities lower than 100 trees per acre shall be inter-planted with seedlings of various native conifers.

Stand 15 and 16:
Stands 15 and 16 are moderate (13.4 and 31.7 acre) sized stands that consist of small diameter highly dense Douglas-fir and red alder. These stands shall be pre-commercially thinned using the leave tree release system at no set residual spacing to achieve a residual stocking density of 150 trees per acre; whereby, leave trees shall be stems with good from, good health, a vigorous crown and a high propensity for increased crown volume and production. Any stem whose crown is touching or above the crown of a leave tree shall be cut and left lie in the stand.

Stand 19:
Stand 19 is a larger (45.6 acre) stand that consists of small diameter highly dense Douglas-fir regeneration. The stand shall be pre-commercially thinned to a residual spacing of 16' O.C. to achieve a residual stocking density of 170 trees per acre; whereby, leave trees shall be native conifers with good from, good health, a vigorous crown and a high propensity for increased crown volume and production. No red alder shall be marked, tallied or retained as leave trees and shall be cut and left lie in the stand.

Stand 20:
Stand 20 is a smaller (4.1 acre) tract that lies along the shoreline for the buffer zone. The stand consists of moderate diameter moderate density Douglas-fir. This stand shall be single tree selection thinned at no set residual spacing in order to achieve a residual stocking density of 130 trees per acre; whereby, leave trees shall be native conifers with good form, good health, a vigorous crown and a high propensity for increased crown volume and production. No red alder shall be marked, tallied or retained as leave trees and shall be either removed from the stand or cut and left lie.

Stand 21, 22, 23, 24, 26, 28 and 29:
These multiple stands are of varying sizes and locations which together form one large (119.6 acre) tract. The stands have similar characteristics in that they all consist of moderate to large diameter lower to moderately dense Douglas-fir. This tract shall be single tree selection thinned at no set residual spacing in order to achieve a uniform residual stocking density of 85 trees per acre; whereby, leave trees shall be native conifers and with large diameters, good from, good health and a vigorous crown. No red alder shall be tallied, marked or retained as leave trees and shall be either removed or cut and left lie in the stand; however, any and all other hardwoods found in the tract may be retained within the stand but shall not be tallied as leave trees. After thinning, the stand shall be inter-planted with seedlings of various native conifers in order to improve the vertical and horizontal stratification.

Stand 25:
Stand 25 is a smaller (6.2 acre) tract that lies directly in the center of the previously prescribed tract. Thus, for logistical reasons, this stand shall be thinned in conjunction with stands 21, 22, 23, etc. The stand consists of moderate diameter moderately dense red alder that shall be thinned using the leave tree release method. The thinning will occur at no set residual spacing in order to achieve a residual stocking density of 85 trees per acre; whereby, leave trees shall be stems with good from, good health, a vigorous crown and a high propensity for increased crown volume and production. Any stem whose crown is either touching or above the crown of a leave tree shall be subject to removal. After thinning, this stand shall be inter-planted, along with the previous tract, with seedlings of various native conifers.

Stand 27:
Stand 27 is a smaller (9.3 acre) tract that consists of smaller diameter moderately dense red alder. This stand lies to the north of a prominent drainage that could complicate any forestry operations in the area. However, the stand shall be either pre-commercially or commercially thinned (depending on the overall merchantability of the stems) using the leave tree release system. The thinning will be at no set residual spacing in order to achieve a residual stocking density of 100 trees per acre; whereby, leave trees shall be stems with good health, good form, a vigorous crown and a high

propensity for increased crown volume and production. Any stem whose crown is either touching or above the crown of a leave tree shall be removed. If the stand is pre-commercially thinned, the cut stems may be left lie in the stand.

Stand 30, 31 and 32:
Stands 30, 31 and 32 are smaller (2.2, 7.4 and 4.2 acre) tracts that consist of small to moderate diameter moderately dense red alder. This tract shall be thinned to a residual spacing of 25' O.C. to achieve a residual stocking density of 75 trees per acre; whereby, leave trees shall be stems with good form, good health and a vigorous crown. After thinning, the stand shall be inter-planted with seedlings of various shade tolerant native conifers.

Stand 33 and 34:
Stands 33 and 34 are smaller (4.7 and 11.4 acre) tracts that consist of moderate to larger diameter moderately dense Douglas-fir. The stand shall be thinned to a residual spacing of 20' O.C. to achieve a residual stocking density of 100 trees per acre; whereby, leave trees shall be native conifers with good form, good health, a vigorous crown and a high propensity for increased crown volume and production. Any and all portions of the tract that are either open or have stocking densities below 100 trees per acre shall be inter-planted with seedlings of various native conifers.

Stand 35:
Stand 35 is a moderate (15.1 acre) sized stand that has the shoreline of the buffer zone as the entire western stand boundary. The stand consists of moderately dense moderate diameter red alder and Douglas-fir. The stand shall be single tree selection, leave tree release thinned at no set spacing in order to achieve a residual stocking density of 100 trees per acre. Leave trees shall be stems with good from, good health, a vigorous crown and a high propensity for increased crown volume and production. Any stem whose crown is either touching or above the crown of a leave tree shall be subject to removal. No red alder with a diameter greater than 12" shall be marked, tallied or retained as leave trees.

Stand 36, 37, 38 and 39:
These stands are all smaller (< 7.0 acre) sized tracts that consist of moderately dense moderate diameter Douglas-fir. This tract shall be thinned to a residual spacing of 18' O.C. to achieve a residual stocking density of 134 trees per acre; whereby, leave trees shall be native conifers with good from, good health, a vigorous crown and a high propensity for increased crown volume and production. No red alder shall be marked, tallied or retained as leave trees. After thinning, any and all open areas or portions of the stand with residual densities below 134 trees per acre shall be inter-planted with seedlings of various native conifers.

Stand 40:
Stand 40 is a moderate (41.2 acre) sized tract that follows a distinct and large drainage from the top of the ridgeline (western installation boundary) to the shoreline (eastern installation boundary). This stand consists of moderately dense moderate diameter red alder and Douglas-fir. This stand shall be surveyed for wetlands prior to any and all forestry operations occurring in the stand. If any wetlands are found during surveying, they are to be marked, flagged and mapped using GPS. The topography of the stand will limit the amount of forestry activities that can occur within the stand but should not completely prevent operations from achieving the following prescriptive goals. The stand shall be

single tree selection, leave tree release thinned at no set residual spacing to achieve a residual stocking density of 85 trees per acre; whereby, leave trees shall be stems with good form, good health, a vigorous crown and a high propensity for increased crown volume and production. An emphasis should be placed on the selection of Douglas-fir as leave trees; however, there are no restrictions on the selection of red alder as leave trees. Any and all portions of the stand that are either open or have a residual stocking density that is less than 85 trees per acre shall be inter-planted with seedlings of various native conifers with an emphasis on western redcedar.

Stand 41:
Stand 41 is a smaller (2.9 acre) stand that lies at the outflow (eastern extent) of the large drainage basin that runs through the center of the installation. The stand has very little standing timber and is dominated primarily by brush and other ground cover types. The stand shall be surveyed for wetlands prior to forestry operation occurring. If any wetlands are found they must be marked, flagged and mapped using GPS. Following the wetland survey, the stand shall be cleared of all non-native vegetation and scarred on a 10' O.C. spacing in order to expose bare mineral soil for planting with seedlings of various native conifers with an emphasis on western redcedar.

Stand 42 and 43:
Stands 42 and 43 combine to form a moderately (42.8 acre) large tract that consists of small to moderate diameter moderately dense red alder with some Douglas-fir. This tract runs primarily along the southern boundary of the main drainage for the installation having some topographical issues that could potentially hinder forestry operations. The tract shall be surveyed for the presence of wetlands and if found they must be marked, flagged and mapped using GPS. The stand shall be thinned using the leave tree release method at no set residual spacing to achieve a residual stocking density of 100 trees per acre; whereby, leave trees shall be native conifers with good form, good health, a vigorous crown and a high propensity for increased crown volume and production. Any and all stems whose crowns are either touching or above the crown of a leave tree shall be subject to removal.

Stand 44, 45, 51 and 52:
This large conglomeration of stands forms a large (98.1 acre) tract that consists of moderate diameter moderate to low density Douglas-fir, part of which was thinned within the last ten years. The tract shall be thinned to a residual spacing of 20' O.C. to achieve a uniform residual stocking density of 100 trees per acre; whereby, leave trees shall be native conifers with good form, good health, a vigorous crown and a high propensity for increased crown volume and production. Any and all open areas within the stand or areas with residual stocking densities below 100 trees per acre shall be inter-planted with seedlings of various shade tolerant native conifers.

Stand 46:
Stand 46 is a smaller (6.1 acre) stand that consists of larger diameter moderately dense Douglas-fir. The stand lies along the prominent main drainage that runs through the center of the installation which will make forestry operations more complicated for the stand. However, this stand shall be thinned to a residual spacing of 18' O.C. to achieve a residual stocking density of 134 trees per acre; whereby, leave trees shall be native conifers with a low number of lower stem branches, a straight well formed bole, good health, a vigorous crown and a high propensity for increased crown volume and production.

Stand 47, 48 and 50:
These stands are smaller (<13.1 acre) sized tracts that consist of moderate to larger diameter moderately dense Douglas-fir. This stand shall be thinned to a residual spacing of 20' O.C. to achieve a residual stocking density of 100 trees per acre; whereby, leave trees shall be native conifers with good form, good health, a vigorous crown and a high propensity for increased crown volume and production. After thinning, any and all open areas or areas with stocking densities below 100 trees per acre shall be inter-planted with seedlings of various native conifers.

Stand 49:
Stand 49 is a smaller (8.1 acre) stand that lies along the southern extent of the installation shoreline and consists of moderate diameter moderately dense red alder with some Douglas-fir. The stand shall be single tree selection, leave tree released thinned at no set residual spacing to achieve a residual stocking density of 85 trees per acre; whereby, leave trees shall be stems with good form, good health, a vigorous crown and a high propensity for increased crown volume and productivity. Any stem whose crown is either touching or above the crown of a leave tree shall be subject to removal. This stand shall be inter-planted with various shade tolerant native conifers with an emphasis on western redcedar.

Stand 53:
Stand 53 is a smaller (4.4 acre) tract that consists of large diameter lower density Douglas-fir and red alder. This stand shall be single tree selection thinned at no set residual spacing in order to achieve a uniform residual stocking density of 85 trees per acre; whereby, leave trees shall be stems with larger diameter, good form, good health, a vigorous crown and a high propensity for increased crown volume and production. No red alder greater than 12" in diameter shall be marked, tallied or retained as leave trees. The stand shall be inter-planted with various native conifers with an emphasis on western redcedar and Douglas-fir.

Stand 54:
Stand 54 is a smaller (4.6 acre) stand that consists of moderate diameter moderately dense red alder with some contingents of Douglas-fir. The stand shall be leave tree release thinned at no set residual spacing to achieve a residual stocking density of 130 trees per acre; whereby, leave trees shall be stems with good form, good health, a vigorous crown and a high propensity for increased crown volume and production. Any and all stems whose crowns are either touching or above the crown of a leave tree shall be subject to removal. No red alder greater than 10" in diameter shall be marked, tallied or retained as leave trees and shall be removed or cut and left lie in the stand. Any and all open areas or areas within the stand with stocking densities less than 130 trees per acre shall be inter-planted with seedlings of various native conifers.

Stand 55:
Stand 55 is a smaller (7.8 acre) stand that consists of moderate diameter moderately dense Douglas-fir. This stand shall be thinned to a residual spacing of 20' O.C. to achieve a residual stocking density of 100 trees per acre; whereby, leave trees shall be native conifers with good form, good health, a vigorous crown and a high propensity for increased crown volume and production. No red alder shall be marked, tallied or retain as leave trees and shall be removed from or cut and left lie in the stand. Any and all open areas or areas within the stand with stocking densities less than 100 trees per acre shall be inter-planted with seedlings of various native conifers.

Stand 56:
Stand 56 is a small (3.8 acre) stand that runs along the ridgeline (western installation boundary) above a smaller stream channel near the southern tip of the installation. This stand has previously been a part of a timber sale that removed almost all larger sized timber from the stand leaving the stand with small diameter high density Douglas-fir. The stand shall be pre-commercially thinned to a residual spacing of 16' O.C. to achieve a residual stocking density of 170 trees per acre; whereby, leave trees shall be native conifers with good form, good health, a vigorous crown and a high propensity for increased crown volume and production.

Stand 57:
Stand 57 is a moderate (17.6 acre) sized stand that incorporates the entire drainage of a stream that runs near the southern corner of the installation from the ridge top (western installation boundary) to the shoreline (eastern installation boundary). The topography and potential wet nature of this stand may prevent any significant forestry operation from occurring in this stand at all. The stand shall be surveyed for the presence of wetlands prior to any and all forestry operations occurring in the stand. If any wetlands are found, they are to be marked, flagged and mapped using GPS. The stand shall be leave tree release thinned at no set residual spacing to achieve a residual stocking density of 100 trees per acre; whereby, leave trees shall be stems with good from, good health, a vigorous crown and a high propensity for increased crown volume and production. Any and all open areas or areas within the stand that have a residual stocking density below 100 trees per acre shall be inter-planted with seedlings of various native conifers with an emphasis on western redcedar.

Stand 58 and 59:
Stands 58 and 59 are smaller (11.8 and 1.7 acre) stands that have been thinned within the last decade or so; the thinning has lead to the development of stand characteristics which are indicative of small diameter high density Douglas-fir. These stands shall be pre-commercially thinned to a residual spacing of 16' O.C. to achieve a residual stocking density of 170 trees per acre; whereby, leave trees shall be native conifers with good from, good health, a vigorous crown and a high propensity for increased crown volume and production.

Stand 60 and 61:
Stands 60 and 61 are smaller (6.4 and 2.4 acre) sized long and narrow stands that snake through other stands in the southern portion of the installation. These stands are consistent with what appears to be derelict roadways that were used in the past to access harvesting units within the installation. At the present, these stands are primarily open (devoid of standing timber) with some portions covered with very small diameter trees and shrubs. These stands shall have all stems and shrubs cut and left lie in the stand followed by scarring at a spacing of 10' O.C. to expose bare mineral soil in preparation of planting with seedlings of various native conifers. However, if there are portions of these stands that have become populated by native conifer regeneration, then those stems are not to be cut but shall be retained and if needed inter-planted with seedlings of various native conifers.

Stand 214:
Stand 214 is a small (2.6 acre) stand that lies along the shoreline (eastern installation boundary) in the north-central portion of the installation. The stand consists of moderate diameter moderately dense red alder and Douglas-fir. The stand shall be leave tree release thinned at no set residual spacing to achieve a residual stocking density of 100 trees per acre; whereby, leave trees shall be stems with good from, good health, a vigorous crown and a high propensity for increased crown volume and production.

Any other stands not specifically addressed above will be considered eligible for pre-commercial thinning, timber stand improvement treatments, clearing and planting or any other silvicultural treatment that will enhance stocking and long term forest and tree productivity. In all forest areas, diseased trees may be cut down. Prescriptions will follow the silvicultural criteria and goals discussed for all other stands.

Zelatched Point:
Zelatched Point is a small naval installation that is located on the western side of the Toandos peninsula. There are no defined stands for this installation; thus, a single overlying prescription shall be made that will apply to the entire installation cover area. Zelatched point has multiple cover types, which are represented primarily by moderate diameter moderate density Douglas-fir and red alder with proportions of the installation being open and devoid of standing timber which surrounds a naval facility and a heli-pad. Any and all standing timber shall be managed first and foremost for hazard tree abatement, retention of slope stability and for the support of mission related projects. However, the standing timber shall only be thinned using a single tree selection, leave tree release thinning at no set residual spacing to achieve a residual stocking density of 100 trees per acre; whereby, leave trees shall be native conifers with good from, good health, a vigorous crown and a high propensity for increased crown volume and production. Any and all open areas in the standing timber or areas within the standing timber with densities below 100 trees per acre shall be inter-planted with seedlings of various native conifers. Within the areas of Zelatched Point that are open and devoid of timber, the areas shall have all ground cover vegetation cut and disposed of offsite followed by ripping with a 12” ripping shank to churn the soils in preparation of planting with seedlings of various native conifers. This prescription applies to all areas except those with a direct link to the naval facility or to the heli-pad which will be managed strictly for hazard tree abatement and for the support of mission related projects.

NAVAL BASE KITSAP, CAMP WESLEY HARRIS, COMPARTMENT 9

Stand 1:
Stand 1 is a moderate (25.3 acre) sized tract that consists of small to moderate diameter moderately dense Douglas-fir and western hemlock. This stand shall be thinned to a residual spacing of 20' O.C. to achieve a residual stocking density of 100 trees per acre; whereby, leave trees shall be native conifers with good form, good health, a vigorous crown and a high propensity for increased crown volume and production. After thinning, this stand shall be inter-planted with seedlings of various shade tolerant native conifers.

Stand 2:
Stand 2 is a larger (40.5 acre) sized tract that consists of small diameter highly dense Douglas-fir and western hemlock. This stand shall be pre-commercially thinned to a residual spacing of 16' O.C. to achieve a residual stocking density of 170 trees per acre; whereby, leave trees shall be native conifers with good from, good health, a vigorous crown and a high propensity for increased crown volume and production.

Stand 3:
Stand 3 is a smaller (3.8 acre) stand that represents an extensive wetland/bog that has scattered patches of shore pine and various hardwoods. This stand shall be managed for wetland function and vitality along with wildlife habitat. Due to large extent of this wetland, no harvesting shall occur within the area. Planting shall occur on the drier islands found in the wetland with seedlings of various native conifers and hardwoods, with an emphasis on western redcedar.

Stand 4 and 5:
Stands 4 and 5 are smaller (3.3 and 3.3 acre) tracts that consist of moderate diameter moderate to low density Douglas-fir. The stands shall be single tree selection thinned at no set residual spacing in order to achieve a residual stocking density of 85 trees per acre; whereby, leave trees shall be native conifers with good form, good health, a vigorous crown and a high propensity for increased crown volume and production. The stands shall be inter-planted with seedlings of various native conifers following thinning.

Stand 6:
Stand 6 is a smaller (1.8 acre) stand that represents a small scale wetland that is occupied primarily by shrub species. There is no recorded standing timber in this stand and the primary management objective shall be for the improvement of wetland function and vitality. The stand shall be planted with seedlings of western redcedar in order to increase the productivity of the stand and increase wetland function.

Stand 7:
Stand 7 is a large (63.3 acre) tract that was almost completely thinned to a rather wide residual spacing, leaving primarily moderate to large diameter Douglas-fir, within the last decade. There is one area within the stand near the southern boundary of the installation that consists of moderately dense moderate diameter Douglas-fir. That portion of the stand shall be thinned to residual spacing of 20' O.C. to achieve a residual stocking density of 100 trees per acre; whereby, leave trees shall be native conifers with good form, good health, a vigorous crown and a high propensity for increased crown volume and production. The entire stand shall be inter-planted with seedlings of various native conifers with an emphasis on Douglas-fir, after thinning is completed.

Stand 9:
Stand 9 is a small (0.5 acre) area that represents a small wetland/bog in the southeastern corner of the installation. The stand has no recorded standing timber and consists of primarily shrub and ground cover vegetation. This stand shall be planted with seedlings of western redcedar to provide increased habitat and wetland function.

Stand 10:
Stand 10 is a smaller (7.8 acre) tract that consists of small to moderate diameter moderately dense Douglas-fir and western redcedar. This stand shall be thinned to a residual spacing of 20' O.C. to achieve a residual stocking density of 100 trees per acre; whereby, leave trees shall be native conifers with good form, good health, a vigorous crown and a high propensity for increased crown volume and production.

Stand 11:
Stand 11 is a moderate (23.6 acre) tract that was thinned, within the last decade, to a wide residual spacing which left moderate diameter Douglas-fir as the residual stand. The entire stand shall be inter-planted with seedlings of various native conifers in an attempt to bring the stand back into a productive stocking level. If inter-planting is unsuccessful, the stand shall have a regeneration harvest conducted; whereby, all standing timber with a diameter greater than 8" shall be removed from the stand to open up space and light to replant the site with seedlings of various native conifers.

Stand 12:
Stand 12 is a moderate (24.3 acre) sized tract that consists of large diameter moderately dense Douglas-fir and western hemlock. This stand shall be single tree selection, leave tree release thinned at no set residual spacing to achieve a residual stocking density of 100 trees per acre; whereby, leave trees shall be native conifers with the largest diameters, good form, good health, a vigorous crown and a high propensity for increased crown volume and production. Any and all open areas or areas within the stand that have residual stocking densities below 100 trees per acre shall be inter-planted with seedlings of various native conifers.

Stand 13:
Stand 13 is a smaller (3.1 acre) stand that represents an open area with scattered small diameter shore pine stems. This stand is to be surveyed for the presence of wetlands; if any wetlands are found they are to be marked, flagged and mapped using GPS. If no wetlands are found, than the stand shall have all non-native vegetation removed and disposed of offsite followed by ripping with a 12" ripping shank in preparation of planting with seedlings of various native conifers. If wetlands are found within the stand, the site shall be scarred at a spacing of 12' O.C. in preparation of planting with seedlings of western redcedar.

Stand 14:
Stand 14 is a moderate (15.7 acre) sized stand that consists of small diameter highly dense Douglas-fir and shore pine. The stand shall be pre-commercially thinned to a residual spacing of 16' O.C. to achieve a residual stocking density of 170 trees per acre; whereby, leave trees shall be native conifers with good health, good from, a vigorous crown and a high propensity for increased crown volume and production.

Stand 15 and 17:
Stands 15 and 17 are small (1.7 and 1.6 acre) tracts that represent small wetlands that have primarily small regeneration as the overlying standing timber. The stands shall be planted and inter-planted with seedlings of western redcedar in order to develop a more stable ecosystem to improve wetland function and vitality.

Stand 16:
Stand 16 is a smaller (2.7 acre) stand that is adjacent to wetlands along most of the stand boundaries; thus, it would be beneficial to retain a cover of standing timber to maintain consistent water levels and sediment control for the surrounding wetlands. This stand consists of moderate diameter moderate density Douglas-fir. The stand shall be single tree selection thinned at no set residual spacing in order to achieve a residual stocking density of 100 trees per acre; whereby, leave trees shall be native conifers with good from, good health, a vigorous crown and a high propensity for increased crown volume and production. All yarding operation shall be conducted using a sound strategy in order to minimize soil disturbances during logging operations. The stand shall be inter-planted with seedlings of western redcedar in order to develop a stable surrounding environment for the adjacent stands' wetlands.

Stand 18:
Stand 18 is a larger (58.1 acre) tract that consists of moderate diameter moderate to high density Douglas-fir with some western hemlock and shore pine. The stand shall be thinned to a residual spacing of 18' O.C. to achieve a residual stocking density of 134 trees per acre; whereby, leave trees shall be native conifers with a low number of lower stem branches, a straight good formed bole, good health, a vigorous crown and a high propensity for increased crown volume and production. There is an easement that runs through the southern extent of the stand for a county road. The first one tree length into the stand from the county road shall be managed first and foremost for the abatement of hazard trees. Portions of this stand along the northern boundary adjacent to the old firing range are at the moment (summer 2010) inundated with standing water pools from a plugged culvert downstream on the installation. Once the culvert has been unplugged and the water has been

drained, this portion of the stand shall have all dead or dying trees removed and shall be replanted with seedlings of various native conifers to restore habitat lost from chronic flood conditions.

Stand 19:
Stand 19 is a moderate (14.9 acre) sized stand that represents the entire extent of the derelict rifle range. Due to a plugged culvert downstream on the installation, a large proportion of this stand is under a significant amount of water (summer 2010). Once the culvert has been unplugged and the water has been drained, the site is to have all non-native vegetation removed and disposed of off base. Following vegetation removal the site shall be graded to return the area to the approximate original contour prior to the construction of the rifle range. Following the grading, the site shall be ripped using a 12" ripping shank to churn the soils in preparation of planting with seedlings of various native conifers with an emphasis on shore pine and Douglas-fir. The seedlings should have drip irrigation installed and utilized for the first two years or until the seedlings have become well established. After 5 years or complete seedlings establishment, the area shall be fertilized with an approved nitrogen providing fertilizer to enhance the growth and competitiveness of the planted stems. Approved herbicides may be required to keep invasive species from occupying the site prior to the establishment of a shade regime to control the non-native vegetation.

Stand 20:
Stand 20 is a smaller (6.1 acre) tract that consists of smaller to moderate diameter moderately dense shore pine. The stand is currently (summer 2010) inundated with immense amounts of water from a plugged downstream culvert within the installation. The chronic flood conditions have caused significant mortality and loss of crown vigor which will lead to more mortality in the coming year or two. Since the stand lies directly along Seabeck Hwy., the abatement of hazard trees is a top priority and shall be incorporated in the regeneration harvest prescribed herein. After the culvert is unplugged and the water is drained, this stand shall have a regeneration shelterwood harvest conducted to remove all dead and dying stems in the first entry by thinning to a residual spacing of 30' O.C. to achieve a residual stocking density of 48 trees per acre; whereby, leave trees shall be native conifers with a vigorous crown, with good seeding qualities and without any loss of vigor. After thinning, the stand shall be inter-planted with seedlings of various native conifers. After a period of five years or until the planted seedlings have become well established, the stand shall be harvested again to remove the residual standing timber in the regeneration cut to release the stand to complete regeneration.

Stand 21, 22, 23, 24, 25, 26 and 27:
These stands are smaller (<9.6 acre) in size with similar stand characteristics, in that, they consist of moderate diameter moderately dense Douglas-fir and shore pine. Some of these stands have boundaries that run along either roadways (Seabeck Hwy.) or naval facilities; thus, the first one tree length into any stand from a roadway or naval facility shall be managed for the abatement of hazard trees. The stands shall be thinned to a residual spacing of 20' O.C. to achieve a residual stocking density of 100 trees per acre; whereby, leave trees shall be native conifers with good from, good health, a vigorous crown and a high propensity for increased crown volume and production. Any and all open areas or area within the stands that have residual stocking densities below 100 trees per acre shall be inter-planted with seedlings of various native conifers.

Stand 28:
Stand 28 is a small (3.5 acre) tract that consists of small diameter highly dense Douglas-fir and shore pine. The western boundary of this stand lies within one tree length of a roadway and thus, shall be managed for the first one tree length from the roadway into the stand for the abatement of hazard trees. The stand shall be pre-commercially thinned to a residual spacing of 16' O.C. to achieve a residual stocking density of 170 trees per acre; whereby, leave trees shall be native conifers with good form, good health, a vigorous crown and a high propensity for increased crown volume and production.

Stand 29:
Stand 29 is a small (0.8 acre) stand that is primarily populated by shrubs with some scattered standing timber. The stand lies along a county road and thus the whole stand shall be managed for hazard tree abatement. Any and all open areas or areas with standing timber densities below 100 trees per acre shall have all non-native vegetation removed and disposed of off base followed by ripping with a 12" ripping shank to churn the soil in preparation of planting with seedlings of various native conifers.

Stand 30:
Stand 30 is a smaller (5.2 acre) tract that consists of small diameter highly dense Douglas-fir. There is a county road easement that runs through stand 30; thus, the first one tree length into the stand form the easement shall be managed first and foremost for the abatement of hazard trees. The rest of the stand shall be pre-commercially thinned to a residual spacing of 18' O.C. to achieve a residual stocking density of 134 trees per acre; whereby, leave trees shall be native conifers with good form, good health, a vigorous crown and a high propensity for increased crown volume and production.

Stand 31:
Stand 31 is a smaller (2.9 acre) tract that consists of moderate diameter moderately dense Douglas-fir and western hemlock. This stand shall be thinned to a residual spacing of 20' O.C. to achieve a residual stocking density of 100 trees per acre; whereby, leave trees shall be native conifers with good form, good health, a vigorous crown and a high propensity for increased crown volume and production.

Stand 32 and 34:
Stands 32 and 34 are moderate (10.3 and 16.3 acre) sized tracts that have similar characteristics, in that they consist of small diameter highly dense Douglas-fir and shore pine. These stands shall be pre-commercially thinned to a residual spacing of 16' O.C. to achieve a residual stocking density of 170 trees per acre; whereby, leave trees shall be native conifers with good form, good health, a vigorous crown and a high propensity for increased crown volume and production.

Stand 33:
Stand 33 is a moderate (15.8 acre) sized stand that represents a contiguous open area that includes the sole remaining naval facility on the installation along with derelict shooting ranges and parking lots. The portion of this stand that is west of the Seabeck Hwy. is inundated with significant volumes of water from a plugged culvert that crosses Seabeck Hwy. within this stand. Once the culvert is unplugged and the water is drained, this portion of the stand along with the rest of the stand shall have all non-native vegetation removed from the site followed by ripping with a 12" ripping shank to churn the soil in preparation of planting with seedlings of various native conifers. Those operations previously outlined shall occur on any and all open areas that are not roadways, parking lots, drainage ditches, naval facilities or landscaping for a naval facility.

Stand 35:
Stand 35 is a small (2.6 acre) tract that consists of moderate diameter moderate to low density Douglas-fir and shore pine. The stand shall be thinned to a residual spacing of 20' O.C. to achieve a residual stocking density of 100 trees per acre; whereby, leave trees shall be native conifers with good from, good health, a vigorous crown and a high propensity for increased crown volume and production.

Any other stands not specifically addressed above will be considered eligible for pre-commercial thinning, timber stand improvement treatments, clearing and planting or any other silvicultural treatment that will enhance stocking and long term forest and tree productivity. In all forest areas, diseased trees may be cut down. Prescriptions will follow the silvicultural criteria and goals discussed for all other stands.

NAVAL BASE KITSAP: NAVY HOSPITAL, JACKSON PARK, BREMERTON NAVAL SHIPYARD AND NAVY RAILROAD RIGHT-OF-WAY

Navy Hospital:

Naval Hospital Bremerton is a stand alone installation that, just recently, has come under the jurisdiction of Naval Base Kitsap. The installation is small, in terms of overall acreage, with low volumes of standing timber; thus, there are no delineated stands within the installation. Any and all prescriptions found in this section shall be applied to the Navy Hospital as a whole. The installation primarily contains scattered small clumps of standing timber that are located between buildings and/or parking lots; however, there is one smaller sized contiguous block of timber within the installation. The close proximity of all standing timber within this installation to roadways, parking lots, naval facilities, walkways, etc. leads to the primary management objective of retention of aesthetic qualities, hazard tree abatement and support of mission related projects. The sole contiguous block of timber within this installation has a walking trail with associated picnic areas and resting benches throughout the stand. The contiguous block also has many areas with openings and areas with low stocking densities; thus, this area shall be inter-planted with seedlings of various native conifers. Any and all open areas outside of the contiguous block of timber may be either planted in the natural ground cover or planted by scarring the ground prior to planting; when planting, seedlings of various native conifers shall be used at all times.

Jackson Park:

Jackson Park as an installation is the primary housing/residence location for enlisted uniformed naval personnel and their families; thus, the entire installation is a residential community with many residents and patrons. All of the standing timber within Jackson Park is within one tree length of roadways, housing structures, walkways, playgrounds and/or parking lots; thus the primary management objective for the area is retention of aesthetic qualities, the abatement of hazard trees in order to ensure the safety and structural stability of installation residents, patrons and property. The installation shall also be managed for the support of mission related naval family support projects. Any and all open areas that are not directly associated to the landscaping of a residence or naval facility shall have all non-native vegetation removed and disposed of off base. Following vegetation removal, the areas are to be ripped with a 12” ripping shank in preparation of planting with seedlings of various native conifers. Following planting, drip irrigation shall be installed for the first two years and utilized during the dry season to ensure seedling survival. Mechanical and chemical control of invasive species may be required for a period of five years or until a full shade regime has been established to block invasive species growth.

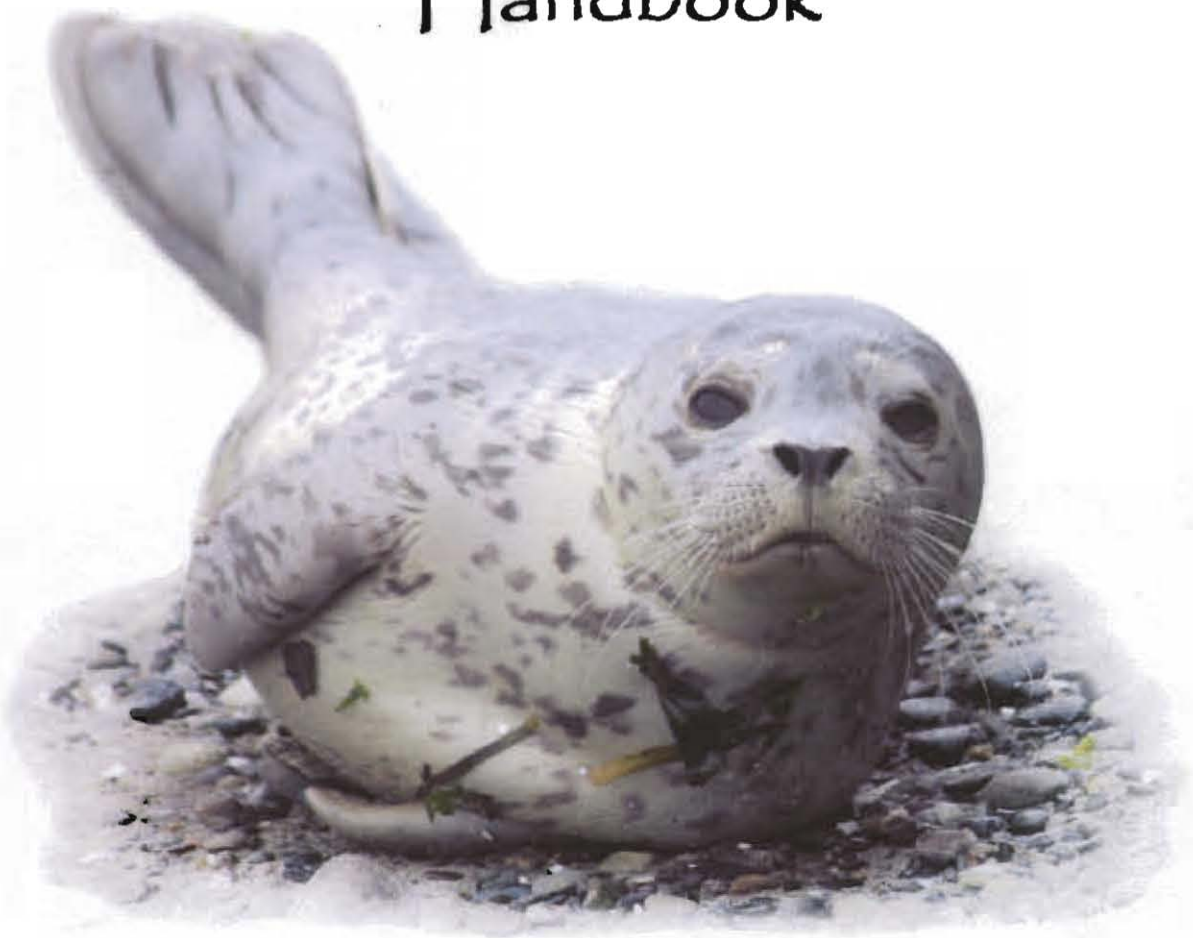
Bremerton Naval Shipyard:
NBK, Bremerton is a moderate sized installation that houses the Puget Sound Naval Shipyard along with many support oriented facilities. Much of the installation does not contain standing timber; the standing timber that is present on the installation is primarily located within the residential hilltop area and is not in contiguous blocks. It serves primarily to provide aesthetic values to the residents and patrons of the installation. Thus, all timber on this installation shall be managed for aesthetics, historic values, abatement of hazards and for the support of mission related projects. Trees that contribute to the character of the historic district and the very large sequoia tree will be protected and retained as long as possible.

This installation has considerable invasive species and noxious weeds. Thus site conversions should occur; whereby, all non-native or noxious vegetation shall be removed and disposed of offsite followed by either ripping with a 12" ripping shank on large areas or scalping or using an auger for each seedling on small areas, in preparation of planting with seedlings of various native conifers with an emphasis on shore pine. In order to ensure seedling survival and full tree establishment, drip irrigation should be installed and utilized for the first two to five years after planting. The use of mechanical and chemical abatement techniques shall be considered on conversion sites to keep the invasive or noxious vegetation at bay for a period of five years or until a full shade regime has been established which will inhibit the growth of the non-desired vegetation.

Navy Railroad Right-Of-Way:
The Navy railroad right-of-way spans 44 miles from NBK Bangor in Silverdale, WA to Shelton, WA with a Spur track that connects the main line to NBK Bremerton. Much of the right-of-way consists of small strips of timber that range in width and in cover type on either side of the tracks. These stands shall be managed primarily with a reactionary philosophy in that trees will be removed or thinned in response to the presence of hazard trees, insect outbreaks, pathogen outbreaks, wind throw, adjacent landowner clearing or thinning along with any other emergent circumstances, conditions or requirements that may arise in the near future. The right-of-way shall also be managed for the support of mission related activities and projects and railroad safety objectives. Under no circumstance shall any Navy timber be felled in the vicinity of a salmon bearing stream without appropriate documentation and approvals for the operation. When applicable, the open areas resulting from tree removal or thinning shall be site prepped and planted with seedlings of various native conifers that are applicable to the site. In the event of timber trespass within the right-of-way, the navy shall have the right to salvage any and all merchantable timber that was removed or dropped from the right-of-way. Also, the trespass area shall be returned to its pre-disturbance condition; whereby the site shall be replanted with various native conifers that represent the previous cover type.

This Page Intentionally Left Blank

Northwest Marine Mammal Stranding Network Handbook



2011

National Marine Fisheries Service
(NOAA Fisheries Service)
Protected Resources Division
7600 Sand Point Way NE
Seattle, WA 98115

Northwest Marine Mammal Stranding Network (NWMMSN) Handbook 2010-2011

1. Introduction
    a. Marine Mammals in Washington and Oregon
    b. What is the stranding network?
    c. Who is involved?
    d. Who has jurisdiction over certain marine mammal species?
    e. Why is the stranding network important?
    f. Marine Mammal Health and Stranding Response Program
2. Contacts
    a. Call List 2010-2011
    b. GIS Maps
3. Protocol
    a. Northwest Marine Mammal Stranding Network Protocol
    b. Guidelines for Handling Live Stranded Marine Mammals
    c. NMFS Decision Process for Responding to Live Marine Mammals that are Stranded or Otherwise in Distress
    d. NW MMSN Protocol Species Specific Response
    e. Sea Turtle Protocol
        i. Riverhead Foundation for Marine Research and Preservation: Cold-Stunning Care Procedures
        ii. Sea Turtle Rehabilitation Guidelines - Seattle Aquarium
    f. Bullet Recovery Protocol
    g. Chain of Custody Form
    h. Health Guidelines
        i. Working with Marine Mammals and Your Health
        ii. Health Advisory: Marine Mammal Diseases
        iii. Healthy Advisory: *Coxiella* 2009
        iv. Zoonotic Diseases
        v. Health risks for marine mammal workers
    i. Deterring Problem Seals and Seal Lions
    j. Seal and Sea Lion Facts of the Columbia River & Adjacent Nearshore Marine Areas
4. Level A
    a. Level A Form Guidance
    b. Level A Report Version 2007 (expires 10/31/2010)
    c. Guide to the MMSN Report, Level A Responder
    d. Definitions or Terms for the Level A Version 2007
5. Specimen Requests
    a. Species Requests
        i. Specimen Request Form
        ii. Specimen Request & Cooperating Researchers Contact Information
        iii. 2010-2011 Specimen Requests

b. Cooperating Researchers
    i. Cooperating Researchers Form
    ii. 2009 Cooperating Researchers
c. Marine Mammal Parts
    i. Marine Mammal parts possession and transfer guidance
    ii. Registration of Collected Marine Mammal Part

6. Education
    a. Sharing the Shore with Harbor Seal Pups in Washington State
    b. Protecting Marine Mammals
    c. Be Whale Wise!
    d. Seal and Sea Lion Posters (in the front pocket of your handbook)
    e. Educational Links!
    f. Share the Shore! Kids activity sheet
7. Species ID
    a. Marine Mammals in Washington and Oregon
    b. Age Class Length and Weight for Pinnipeds and Cetaceans
        i. Pinnipeds
            1. Morphology of Pinnipeds & Internal anatomy
            2. Phocidae vs. Otaridae
            3. Distinguishing between Steller & California sea lions
            4. Skull Identification
            5. Guide to Pinnipeds
            6. Species Information
                a. Harbor Seal
                    i. Harbor Seal Pupping Timeframes in WA
                b. Northern Fur Seal
                c. Guadalupe Fur Seal
                d. Northern Elephant Seal
                e. California Sea Lion
                f. Steller Sea Lion
            7. Pinniped Species ID Photo Page
        ii. Cetaceans
            1. Morphology of Cetaceans & Internal anatomy
            2. Mysticeti vs. Odontoceti & Dolphin vs. Porpoise
            3. Species Information
                a. Harbor Porpoise
                b. Dall's Porpoise
                c. Gray Whale
                    i. Gray Whale Examination Form
                d. Killer Whale Fact Sheet
                e. Cetacean Species ID Photo Page
        iii. Other Species
            1. Sea Otters and River Otters
                a. Sea Otter vs. River Otter
                b. Washington/Oregon Sea Otter Stranding Data Form
            2. Sea Turtle Guide

Introduction

Marine Mammals in Washington and Oregon

1. Cetaceans - Order Cetacea
    a. Mysticetes (Baleen Whales) - Suborder Mysticeti
        i. **Family Balaenidae**
            1. Northern Pacific Right Whale* - *Eubalaena glacialis*
        ii. **Family Balaenopteridae**
            1. Blue Whale * - *Balaenoptera musculus*
            2. Fin Whale * - *Balaenoptera physalus*
            3. Sei Whale * - *Balaenoptera borealis*
            4. Minke Whale - *Balaenoptera acutorostrata*
            5. Humpback Whale *- *Megaptera novaeangliae*
        iii. **Family Eschrichtiidae**
            1. Gray Whale - *Eschrichtius robustus*
    b. Odontocetes (Toothed Whales) - Suborder Odontoceti
        i. **Family Physeteridae**
            1. Sperm Whale * - *Physeter macrocephalus*
        ii. **Family Kogiidae**
            1. Dwarf Sperm Whale - *Kogia simus*
            2. Pgymy Sperm Whale - *Kogia breviceps*
        iii. **Family Ziphiidae (Beaked Whales)**
            1. Baird's Beaked Whale - *Berardius bairdii*
            2. Cuvier's Beaked Whale - *Ziphius cavirostris*
            3. Hubb's Beaked Whale - *Mesoplodon carlhubbsi*
            4. Stejneger's Beaked Whale - *Mesoplodon stejnegeri*
        iv. **Family Phocoenidae (Porpoises)**
            1. Harbor Porpoise - *Phocoena phocoena*
            2. Dall's Porpoise - *Phocoenoides dalli*
        v. **Family Delphinidae (Dolphins)**
            1. Striped Dolphin - *Stenella coeruleoalba*
            2. Common Dolphin - *Delphinus spp.*
            3. Pacific White-sided Dolphin - *Lagenorhynchus obliquidens*
            4. Risso's Dolphin - *Grampus griseus*
            5. False Killer Whale - *Pseudorca crassidens*
            6. Short-finned Pilot Whale - *Globicephala macrorhynchus*
            7. Northern Right Whale Dolphin - *Lissodelphis borealis*
            8. Killer Whale - *Orcinus orca*
                a. *Southern Resident Killer Whale* *

* Listed as Endangered under the Endangered Species Act
** Listed as Threatened under the Endangered Species Act

2. Pinnipeds - Order Pinnipedia
    a. Sea lions and Fur seals
        i. **Family Otariidae**
            1. California Sea Lion - *Zalophus californianus*
            2. Steller Sea Lion ** - *Eumetopias jubatus*
            3. Northern Fur Seal - *Callorhinus ursinus*
            4. Guadalupe Fur Seal** - *Arctocephalus townsendi*
    b. True seals
        i. **Family Phocidae**
            1. Harbor Seal - *Phoca vitulina*
            2. Northern Elephant Seal - *Mirounga angustirostris*
3. Other Marine Mammals
    a. Sea otters
        i. **Family Mustelidae**
            1. Sea Otter - *Enhydra lutris*

* Listed as Endangered under the Endangered Species Act
** Listed as Threatened under the Endangered Species Act

The Northwest Region Marine Mammal Stranding Network
Background Information

What is the Northwest Marine Mammal Stranding Network?

The National Oceanic and Atmospheric Administration (NOAA) Northwest Marine Mammal Stranding Network was established in the early 1980's under the Marine Mammal Protection Act (MMPA). Members of the network respond to marine mammal stranding events along the Washington and Oregon coasts and is part of a nationwide network.

Who is involved?

The network is composed of cooperating scientific investigators and institutions, volunteer networks and individuals. Other organizations also involved are wildlife and fisheries agencies and state and federal law enforcement. Participants are trained in systematic data collection and are experienced in handling a variety of marine mammal stranding related tasks. Data are collected for inclusion in a national database to establish baseline information on marine mammal communities and monitor their health. For more information on the National Marine Mammal Health & Stranding Response Program (MMHSRP) please visit the national website, http://www.nmfs.noaa.gov/pr/health/

Who has jurisdiction over marine mammals? Are marine mammals protected by law?

All marine mammals are protected by the Marine Mammal Protection Act (MMPA) of 1972. The MMPA prohibits, with certain exceptions, "take" of marine mammals in U.S. waters and by U.S. citizens on the high seas, and the importation of marine mammals and marine mammal products into the U.S. The definition of "take" in the MMPA is "To harass, hunt, capture, or kill or attempt to harass, hunt, capture, or kill any marine mammal." Under the MMPA NOAA Fisheries is responsible the protection of whales, dolphins, porpoises, seals and sea lions. The U.S. Fish and Wildlife Service maintains jurisdiction over manatees, sea otters, polar bears and walrus. For more information about the MMPA please visit, http://www.nmfs.noaa.gov/pr/laws/mmpa/ Some marine mammals are also protected under the Endangered Species Act (ESA).

Are any marine mammals in Washington and Oregon listed under Endangered Species Act (ESA)?

Yes. Species listed as threatened or endangered under the ESA include Sei Whale, Fin Whale, Blue Whale, Humpback Whale, Northern Right Whale, Sperm Whale, Killer Whale, and the Steller Sea Lion. For more information please visit, http://www.nmfs.noaa.gov/pr/laws/esa/

Why is the stranding network important?

Every year there are hundreds of reports of stranded marine mammals throughout Washington and Oregon. Each case can hold important information about the species which can contribute to scientific research or public education. Public education can reduce negative interactions between marine mammals and the public and raise awareness of marine life in our communities.

MARINE MAMMAL HEALTH AND STRANDING RESPONSE PROGRAM

National Marine Mammal Stranding Network

The National Marine Mammal Stranding Network consists of volunteer stranding networks in all coastal states. These networks are authorized through Stranding Agreements with the National Marine Fisheries Service (NMFS) regional offices. Network member organizations respond to live and dead stranded marine mammals on the beach, take biological samples, transport animals, rehabilitate sick or injured marine mammals and potentially release them back to the wild. NMFS oversees, coordinates, and authorizes stranding network activities through one national and six regional stranding coordinators. NMFS also provides training to network members.

Marine Mammal Disentanglement Network

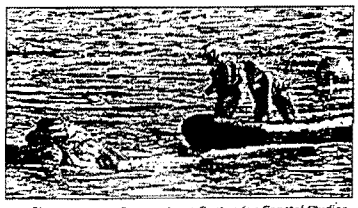


Photo courtesy Provincetown Center for Coastal Studies

The Disentanglement Network is a partnership between NMFS, the Provincetown Center for Coastal Studies, the U.S. Coast Guard, State agencies, National Marine Sanctuaries, and other entities. The Network is responsible for monitoring and documenting whales that have become entangled in gear as well as conducting rescue operations. The network established protocols for all aspects of response, including animal care and assessment, vessel and aircraft support, and media and public information. Multiple levels of training are required for animal welfare and human safety.

John H. Prescott Marine Mammal Rescue Assistance Grant Program

The Prescott Grant Program provides grants to eligible stranding network participants and researchers for:

- Recovery and treatment of stranded marine mammals;
- Data collection from living or dead stranded marine mammals; and
- Facility upgrades, operation costs, and staffing needs directly related to the recovery and treatment of stranded marine mammals and collection of data from living or dead stranded marine mammals.

Since the inception of the program in 2001, over $16,000,000 has been disbursed in 187 grant awards. There is an annual competitive program as well as funding made available throughout the year for emergency response.

Marine Mammal Unusual Mortality Event and Emergency Response Program

The Working Group on Marine Mammal Unusual Mortality Events made up of federal and non-federal experts from a variety of biological and biomedical disciplines, including federal agency representatives, and two international participants from Canada and Mexico. The Working Group advises NMFS with regards to marine mammal Unusual Mortality Events (UMEs). The Program coordinates emergency response, investigations into causes of mortality and morbidity, evaluates the environmental factors associated with UMEs, provides training and resources as possible, and oversees the Marine Mammal Unusual Mortality Event Fund.

MMHSRP Information Management Program

The MMHSRP Information Management Program is responsible for the development and maintenance of a variety of databases, websites and other tools for disseminating information within the program, Network, and to the public. A major recent accomplishment was the rollout of a web-accessible national Level A database for reporting and sharing near-real time stranding data to all regions. The Marine Mammal Tissue Bank inventory will become web-accessible to the public in 2006. Data access policies are being developed to codify protocols for data accuracy, quality assurance, and public access to stranding network data.

Marine Mammal Health Biomonitoring, Research, Development and Banking Programs

Photo courtesy NIST

The MMHSRP coordinates national biomonitoring, research and banking efforts to analyze the health and contaminant trends of wild marine mammal populations. The program collects information to determine anthropogenic impacts on marine mammals, marine food chains, and marine ecosystems. In addition, the program uses information to analyze the contribution of environmental parameters to wild marine mammal health trends. Finally, the program operates the National Marine Mammal Tissue Bank, a joint effort with the National Institute of Standards and Technology, as a long-term repository of samples for future retrospective evaluations.

http://www.nmfs.noaa.gov/pr/health/

Contacts

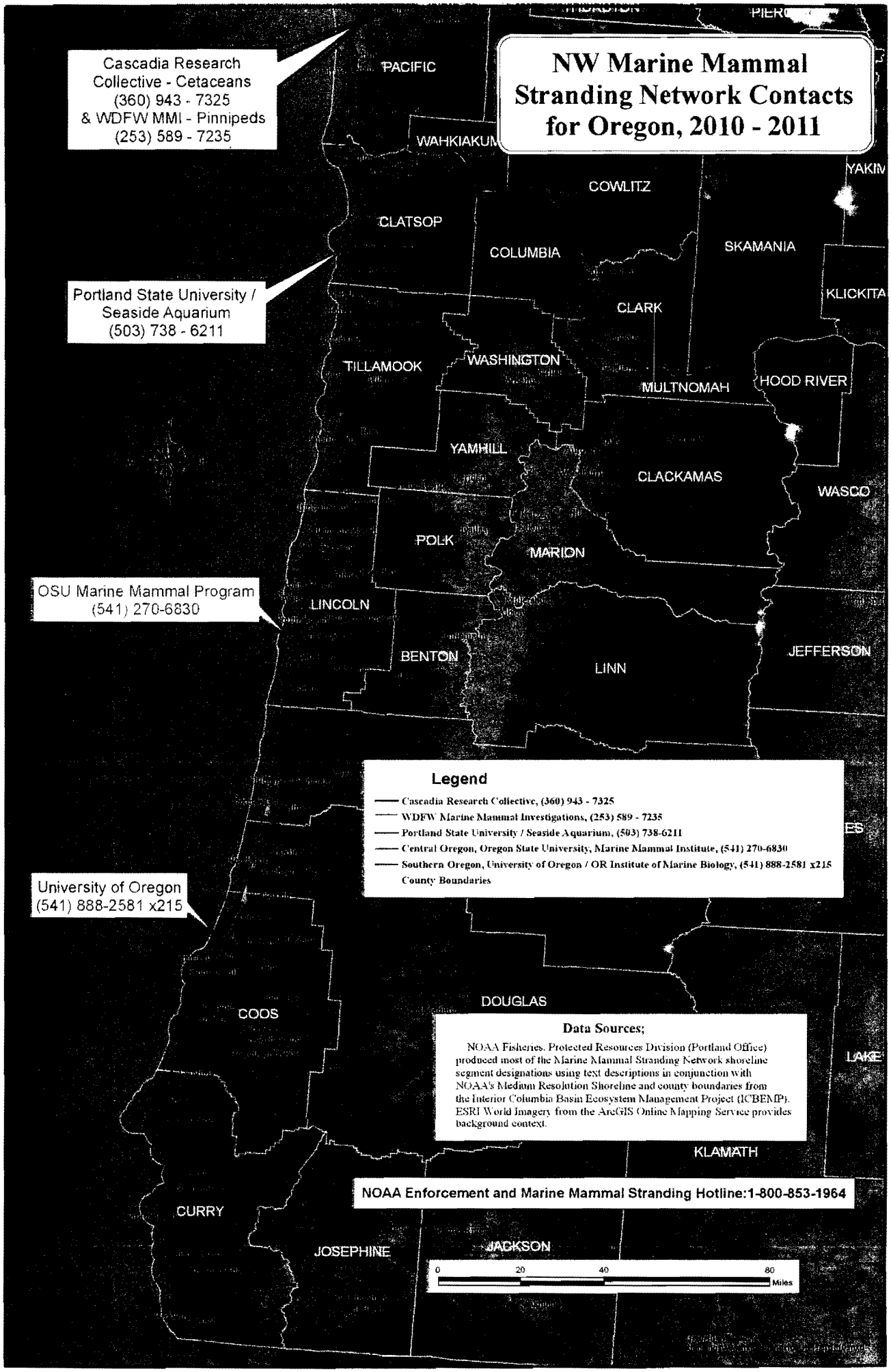
WA/OR Marine Mammal Stranding Call List 2010-2011

To report a stranded marine mammal please call your local stranding network. Please view WA and OR GIS maps for detailed response areas, numbers below correspond with GIS maps.

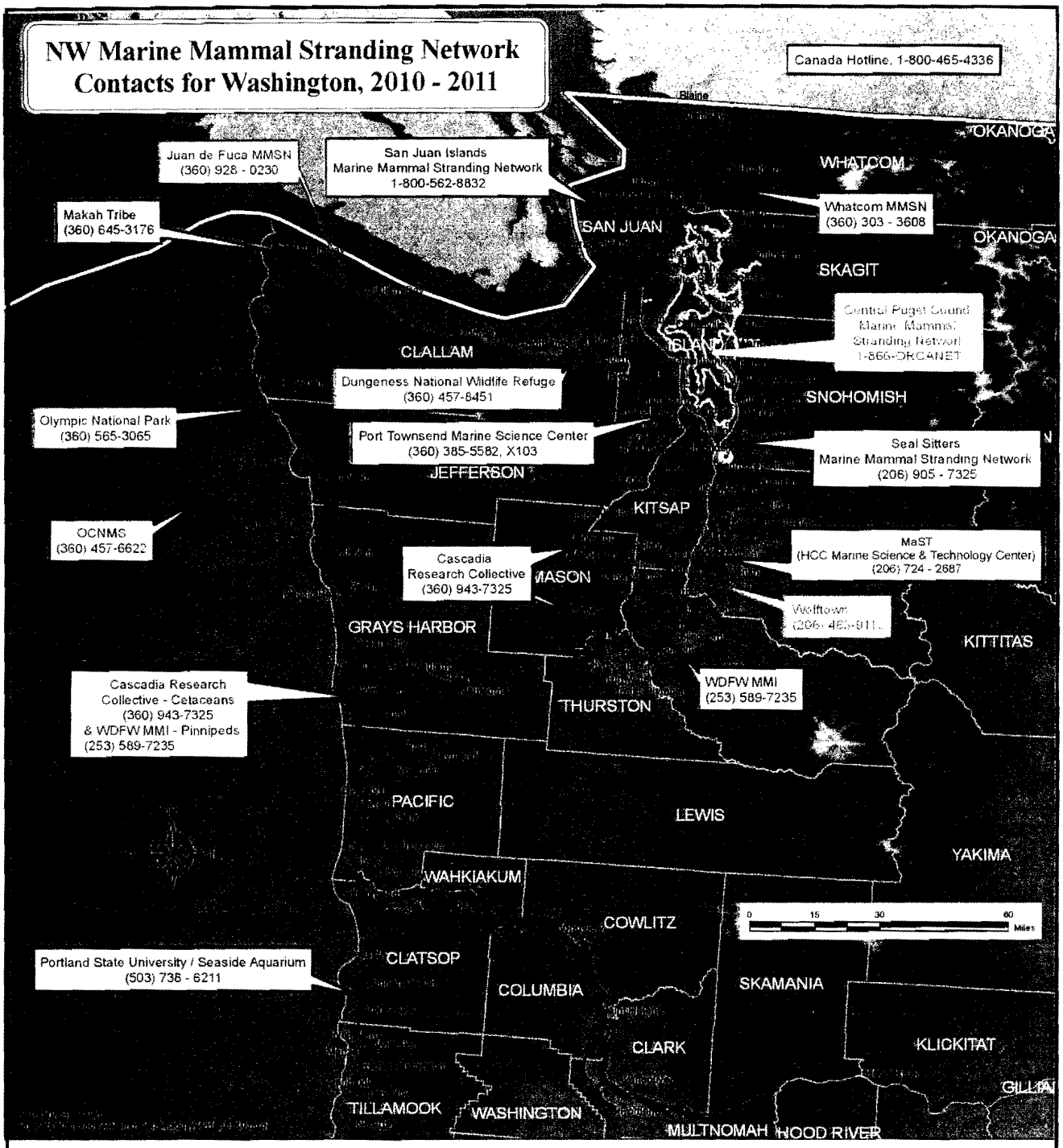
Organization and Response	Contact	Phone #
NOAA Fisheries Marine Mammal Hotline	Hotline (Checked 7 days/wk.)	206-526-6733
WA Department of Fish and Wildlife/ Marine Mammal Investigations #8	(If no answer Press #2,will page staff 7 days/wk)	253-589-7235
Kitsap, Pierce, S. King, E. Mason Co., *Outer Coast- Grays Harbor / N. Pacific Co.- Co faciliting response- Pinnipeds	State-wide live cetacean stranding, tagged seals and sea lions, out of habitat and unusual mortality events.	
Cascadia Research Collective #9 Thurston and W. Mason Co. *Outer Coast- Grays Harbor/N. Pacific- Co- facilting response- Ceteacans	Office # (Checked 7 days/wk.)	360-943-7325
	Response to large whales statewide.	
U.S. Fish and Wildlife	Toll Free Pager	1-877-326-8837 (1-87SeaOtter)
Olympia	Call this pager for sea otter cases only please.	
West Seattle Seal Sitters	Dispatch	206-905-7325
Sno-King MMSN	Rachel Mayer	206-526-4863
Central Puget Sound MMSN #3	Susan Berta	1-866-ORCANET (672-2638)
Whidbey Island, Camano Island, Skagit Co.. N.Snohomish Co.	Report all stranded marine mammals and whale sightings.	
Olympic Coast Marine Mammal Stranding Association #5 Port Angeles to Makah Reservation	Rich Osbourne	360-928-0230

WA/OR Marine Mammal Stranding Call List 2010-2011		
Organization and Location	Contact	Phone #
Whatcom Co. MMSN #1	Mariann Brown Carrasco	360-303-3608
N.Skagit, Whatcom Co.		
San Juan Co. MMSN #2	The Whale Museum	1-800-562-8832
San Juan Islands		
PTMSC/ East Jefferson Co. MMSN #6	Port Townsend MSC Hotline	360-385-5582 x103
Hood Canal, Quimper Peninsula	Chrissy McLean	360-385-5582 x109
Dungeness National Wildlife Refuge #4	Barbara VanderWert, Mary	360-457-8451
Dungeness Spit	Marsh, and Pamela Dick	
Olympic Coast NMS #12	Mary Sue Brancato	360-457-6622 x20
Port Angeles, Outer Coast	Ed Bowlby	360-457-6622 x17
Makah Tribe #10	Receptionist	360-645-3160
Clallam Bay to Cape Flattery, Outer Coast	Jon Scordino	360-645-3176
Olympic Coast National Park #11	Park Dispatch	360-565-3115
Wolftown -Vashon/ Maury Isl. #7	T Martino	206-463-9113
Portland State University- S. Pacific Co. #13	Keith Chandler	503-440-4040

Other important numbers...		
NOAA Enforcement	Weekdays	206-526-6133
Statewide	Weekends	1-800-853-1964
Dept. of Emergency Management	Hotline	1-800-258-5990
Derelict Fishing Gear	Hotline	1-800-477-6224
PAWS Wildlife - Lynnwood	Rehab Clinic	425-412-4040
Wolf Hollow - Friday Harbor	Rehab Clinic	360-378-5000
OREGON STATEWIDE	HOTLINE NUMBER	541-270-6830


NW Marine Mammal Stranding Network Contacts for Oregon, 2010 - 2011
Cascadia Research Collective - Cetaceans (360) 943 - 7325 & WDFW MMI - Pinnipeds (253) 589 - 7235
Portland State University / Seaside Aquarium (503) 738 - 6211
OSU Marine Mammal Program (541) 270-6830
University of Oregon (541) 888-2581 x215
PACIFIC
WAHKIAKUM
COWLITZ
CLATSOP
COLUMBIA
SKAMANIA
KLICKITA
CLARK
TILLAMOOK
WASHINGTON
MULTNOMAH
HOOD RIVER
YAMHILL
CLACKAMAS
WASCO
POLK
MARION
LINCOLN
BENTON
LINN
JEFFERSON
DOUGLAS
COOS
LAKE
KLAMATH
CURRY
JOSEPHINE
JACKSON
Legend
Cascadia Research Collective, (360) 943 - 7325
WDFW Marine Mammal Investigations, (253) 589 - 7235
Portland State University / Seaside Aquarium, (503) 738-6211
Central Oregon, Oregon State University, Marine Mammal Institute, (541) 270-6830
Southern Oregon, University of Oregon / OR Institute of Marine Biology, (541) 888-2581 x215
County Boundaries
Data Sources;
NOAA Fisheries, Protected Resources Division (Portland Office) produced most of the Marine Mammal Stranding Network shoreline segment designations using text descriptions in conjunction with NOAA's Medium Resolution Shoreline and county boundaries from the Interior Columbia Basin Ecosystem Management Project (ICBEMP). ESRI World Imagery from the ArcGIS Online Mapping Service provides background context.
NOAA Enforcement and Marine Mammal Stranding Hotline:1-800-853-1964
0
20
40
80
Miles

NW Marine Mammal Stranding Network Contacts for Washington, 2010 - 2011



NOAA Enforcement and Marine Mammal Stranding Hotline: 1-800-853-1964

Data Sources;

NOAA Fisheries, Protected Resources Division (Portland Office) produced most of the Marine Mammal Stranding Network shoreline segment designations using text descriptions in conjunction with NOAA's Medium Resolution Shorelines and county boundaries from the Interior Columbia Basin Ecosystem Management Project (ICBEMP).

Olympic Coast National Marine Sanctuary (2002):
Mineral Management Center, Mapping and Boundary Branch

Dungeness National Wildlife Refuge:
U.S. Fish and Wildlife Service, Division of Realty & Refuge Information

Olympic National Park (1995):
WA ownership data from ICBEMP WA Department of Natural Resources

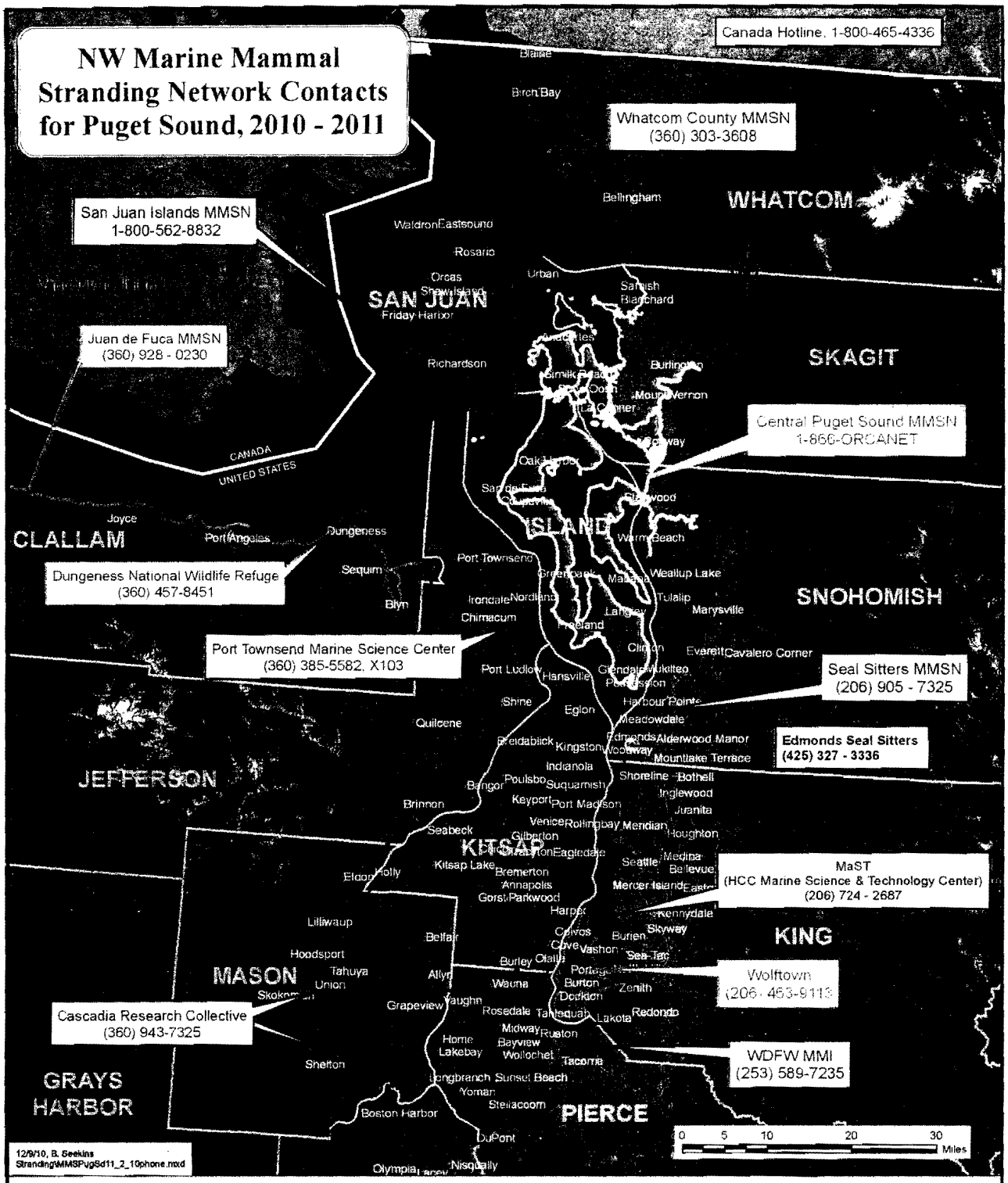
U.S. Exclusive Economic Zone (1995): NOAA, Special Projects Office

Canadian Shoreline:
Global Self-Consistent, Hierarchical, High-resolution Shoreline Database (1999).
P. Wessel & W.H.F.Smith

ESRI World Imagery from ArcGIS Online Mapping Service

Legend

- Edmonds Seal Sitters, (425) 327 - 3336
- Port Angeles, Olympic Coast National Marine Sanctuary, NOAA, (360) 457-6622
- Whatcom Marine Mammal Stranding Network, (360) 303 - 3608
- Seal Sitters Marine Mammal Stranding Network (206) 905 - 7325
- Juan de Fuca Marine Mammal Stranding Network, (360) 928 - 0230
- Sno-King MMSN, (206) 526-4863
- West Seattle Seal Sitters, (206) 905-7325
- MaST, HCC Marine Science & Technology Center, (206) 724 - 2687
- East Jefferson County, Port Townsend Marine Science Center, (360) 385-5582, X103
- Vashon & Maury Islands, Wolftown, (206) 463-9113
- Cascadia Research Collective, (360) 943-7325
- WDFW Marine Mammal Investigations, (253) 589-7235
- Northern OR & Long Beach, WA, Portland State University / Seaside Aquarium (503) 738 - 6211
- Dungeness National Wildlife Refuge & Protection Island, (360) 457 - 8451
- Makah Tribe, (360) 645-3176
- Central Puget Sound, Marine Mammal Stranding Network, 1-866-ORCANET
- Exclusive Economic Zone Boundary
- Olympic Coast National Marine Sanctuary Boundary, NOAA, (360) 457-6622
- San Juan Islands, The Whale Museum, 1-800-562-8832
- Olympic National Park, (360) 565-3065



NOAA Enforcement and Marine Mammal Stranding Hotline: 1-800-853-1964

Data Sources;

NOAA Fisheries, Protected Resources Division (Portland Office) produced most of the Marine Mammal Stranding Network shoreline segment designations using text descriptions in conjunction with NOAA's Medium Resolution Shorelines and county boundaries from the Interior Columbia Basin Ecosystem Management Project (ICBEMP).

Dungeness National Wildlife Refuge:
U.S. Fish and Wildlife Service, Division of Realty & Refuge Information

U.S. Exclusive Economic Zone (1995): NOAA, Special Projects Office

Canadian Shoreline:
Global Self-Consistent, Hierarchical, High-resolution Shoreline Database (1999). P. Wessel & W.H.F.Smith

Legend

- Edmonds Seal Sitters, (425) 327 - 3336
- Port Angeles, Olympic Coast National Marine Sanctuary Office (360) 457-6622
- Exclusive Economic Zone Boundary
- Whatcom Marine Mammal Stranding Network, (360) 303 - 3608
- Juan de Fuca Marine Mammal Stranding Network, (360) 928 - 0230
- Seal Sitters Marine Mammal Stranding Network, (206) 905 - 7325
- MaST, HCC Marine Science & Technology Center, (206) 724 - 2687
- East Jefferson County, Port Townsend Marine Science Center, (360) 385-5582, X103
- Vashon & Maury Islands, Wolftown, (206) 463-9113
- WDFW Marine Mammal Investigations, (253) 589-7235
- Cascadia Research Collective, (360) 943-7325
- Dungeness National Wildlife Refuge Protection Island, (360) 457-8451
- Central Puget Sound, Marine Mammal Stranding Network, 1-866-ORCANET
- San Juan Islands, The Whale Museum, 1-800-562-8832
- Canada
- County Boundaries

Contact information for Specimen Requests and Cooperating Researchers 2010-2011

Organization	Researcher	Contact Phone Number	Email
American Cetacean Society	Uko Gorter	206-781-4860	info@acspugetsound.org
Applied Osteology	Dr. Mike Etnier	360-738-8292	metnier@u.washington.edu
Bullards Beach State Park	Pamela Stevens	541-347-2209	Pamela.Stevens@state.or.us
Burke Museum	Jeff Bradley	206-685-7417	jebrad@u.washington.edu
Canadian Dept. of Agriculture	Dr. Stephen Raverty	604 556-3026	Stephen.Raverty@gov.bc.ca
Cascadia Research Collective	Gregg Schorr	206-931-4638 360-943-7325	GSchorr@cascadiaresearch.org
	John Calambokidis	360-943-7325 360-280-8349	calambokidis@cascadiaresearch.org
	Jessie Huggins	206-949-7924	jhuggins@cascadiaresearch.org
CPSMMSN	Matt Klope	360-257-1468	Matt.klope@navy.mil
	Sandy Dubpernell	360-678-3765	Sandradubpernell@yahoo.com
East Jefferson Co. MMSN	Chrissy McLean	360-301-3141 360-385-5582 x109	cmclean@ptmsc.org
Linn Benton Community College	Carolyn J. Lebsack	541-917-4999	lebsacc@linnbenton.edu
NMML	Pat Gearin	206-526-4034	pat.gearin@noaa.gov
NMML	Jim Thomason	206-526-6316	jim.thomason@noaa.gov
NMML	Bob DeLong	206-526-4038	Robert.Delong@noaa.gov
NWFSC	Brad Hanson	206-300-0282	brad.hanson@noaa.gov
NWFSC	Dr. Elizabeth Frame	206-302-2402	Elizabeth.Frame@noaa.gov
Makah Tribe	Jon Scordino	360-645-3176	mtcmmbiologist@centurytel.net
Oregon State University	Dr. Bruce Mate	541-867-0202	bruce.mate@oregonstate.edu
Oregon State University	Jim Rice	541-270-6830 541-567-0446	Jim.Rice@oregonstate.edu
PSU – Biology	Dr. Debbie Duffield	503-725-4078	duffieldd@pdx.edu
San Juan Co. MMSN	Amy Traxler	360-472-1852	amy@whalemuseum.org
	Dr. Joe Gaydos	360-914-1083	jkgaydos@ucdavis.edu
Skulls Unlimited International	Jay Villemarette	405-794-9300	jay@skullsunlimited.com
SWFSC	Dr. Susan J. Chivers	858-546-7093	Susan.chivers@noaa.gov
University of Oregon	Dr. Madonna Moss	541 346-6076	mmoss@uoregon.edu
WDFW MMI	Dyanna Lambourn	253-208-2427	Lambodml@dfw.wa.gov

Specimen Requests
Pinnipeds

Organization & Researcher	Species	Condition codes	Tissue type/sample requested	Sample container	Sample storage	Description of purpose
WDFW MMI Dyanna Lambourn	Harbor Seal (All age classes, please notify asap of all tagged or branded harbor seals)	Fresh Dead (Code 2)	Whole animal	Any	Keep animal cool or on ice	To conduct through necropsies for cause of mortality and to collect life history information
WDFW MMI Dyanna Lambourn	Other pinnipeds	Fresh Dead (Code 2)	Whole animal	Any	Keep animal cool or on ice	Same as above
Applied Osteology Dr. Mike Etnier	Harbor seal, California sea lion, Steller sea lion, and Guadalupe fur seals	Any	Single tooth, one hind limb including the pelvis, and one front limb including the scapula	Any	Frozen	Development of size-at-age curves
CPSMMSN Matt Klope	Northern Fur Seal	Any Adult	Skull, Baculum	Any	Fresh, frozen	Educational collection
CPSMMSN Matt Klope	Steller Sea Lion	Any Adult	Skull, Baculum	Any	Fresh, frozen	Educational collection
Univ. of OR Dr. Madonna Moss	Northern Fur Seal (adult male)	Carcass, skeletonized	Skeletal remains	Any	frozen	Comparative collection
Univ. of OR Dr. Madonna Moss	Steller sea lion (pup, juvenile, or adult female)	Carcass, skeletonized	Skeletal remains	Any	frozen	Comparative collection
NMML Pat Gearin Jim Thomason	Steller sea lion	N/A	Skulls and skeletal material, stomachs, skin for genetics, whiskers	Tissues in whirlpaks, stomachs in plastic bags	Tissues can be frozen	Research
NMML Pat Gearin Jim Thomason	California sea lion	N/A	Skulls from branded/tagged animals	Plastic bags	Frozen	Research
NMML Bob DeLong	Guadalupe Fur Seals	N/A	Skeletal remains	Any	Frozen	Research

Specimen Requests
Cetaceans

Contact Information	Species	Condition codes	Tissue type/sample requested	Sample container	Sample storage	Description of purpose
OSU Dr. Bruce Mate	Sperm Whale	2 and 3	Notification of stranding	No samples requested	N/A	Testing radio tag deployment and attachment methodology
OSU Dr. Bruce Mate	All Baleen whale species	2 and 3	Notification of stranding	No samples requested	N/A	Same as above
NMML Pat Gearin Jim Thomason	Killer whale	N/A	Skulls/skeletal material	Any	N/A	Research/education
NMML Pat Gearin Jim Thomason	Beaked whales Pilot whale	N/A N/A	Skulls and skeletal material Skulls	Any	N/A N/A	Research and education
NMML Pat Gearin Jim Thomason	Kogia sp. False killer whale	N/A N/A	Skulls and skeletal material Skulls and skeletal material	Any	N/A N/A	Research and education
NMML Pat Gearin Jim Thomason	Gray whale	N/A	Skulls/skeletal, skin and blubber	Tissues in whirlpacks	Tissues can be frozen	Research and education
NMML Pat Gearin Jim Thomason	Humpback whale	N/A	Skulls and skeletal material	Any	N/A	Research and education
NMML Pat Gearin Jim Thomason	Balaenopterid whales	N/A	Skulls and skeletal material	Any	N/A	Research and education
Makah Tribe Jon Scordino	Gray Whale Gray Whale	All Fresh Dead	Baleen plates (3-5) Notification of stranding	Any No sample requested	Fresh or Frozen	Research – stable isotopes and genetics, humane kill methods research

Specimen Requests
Cetaceans

Contact Information	Species	Condition codes	Tissue type/sample requested	Sample container	Sample storage	Description of purpose
Brad Hanson & Dr. Stephen Raverty	Killer Whale – all ecotypes	Any – contact for Killer Whale protocol	Please contact Brad Hanson or Dr. Stephen Raverty			Full health assessment
Brad Hanson & Dr. Stephen Raverty	Harbor porpoise	1,2,3	Blubber (dorsal, lateral, ventral), muscle, liver, kidney, skin, stomach, dorsal fin, lower jaw, milk, mammary gland,, thyroid, trachea., lung, pulmonary lymph node, blood from heart, spleen, adrenals, small intestine, large intestine, fecal sample, bladder, uterus, testes, urine	Whirlpak Aluminum foil Plastic container Vial (skin) Red top tubes (blood)	Frozen Frozen Formalin DMSO Frozen	Full health assessment
Brad Hanson & Dr. Stephen Raverty	Dall's porpoise	1,2,3	Same harbor porpoise request See above ↑	Same harbor porpoise request See above ↑	Same harbor porpoise request See above ↑	Same harbor porpoise request See above ↑
CPSMMSN Matt Klope	Dall's Porpoise	Any Adult	Skull	Any	Fresh, Frozen	Education collection
East Jefferson Co. MMSN	Dall's Porpoise	2,3	Skeletal remains	Any	Any	Educational programs
American Cetacean Society	All Cetaceans	Any	Baleen or Teeth	Any	Frozen baleen	Educational programs
Bullards Beach State Park	Gray Whale or Humpback Whale	Any	Vertebrae, Rib bones, Baleen	Any	Any	Educational programs
Gregg Schorr	All Mysticetes, All Odontocetes (except porpoises, common, spinner, or spotted dolphins)	2, or only slightly decomposed	Entire dorsal fin or measurements if dorsal fin cannot be collected	Please follow detailed protocol provided by the requestor	Frozen	Development of satellite tag attachment methods as part of a collaborative study.

Specimen Requests
All Species

Contact Information	Species	Condition codes	Tissue type/sample requested	Sample container	Sample storage	Description of purpose
PSU – Biology Dr. Duffield	All cetaceans	2-early 4	Whole stomachs & repro tracts - * if not being taken	Ziploc	Frozen (only -20)	Feeding ecology, fatty acids, stable isotopes; pending Prescott
PSU – Biology Dr. Duffield	All cetaceans & all pinnipeds	Code 1-early code 4	Blood (vial), muscle (2x2x2 inches), blubber (2x2x2 in.)	Ziploc	Frozen (only -20)	Molecular wt. forensic database, current Prescott
PSU – Biology Dr. Duffield	All cetaceans, Steller, fur seals	2-late 4	Skulls and skeletons - * if not being taken	Bags	Frozen or dry	For Vertebrate Biology Museum curation, PSU; research, current Prescott
Burke Museum	All cetaceans and pinnipeds	2,3	Any tissue, prefer fresh tissues of spleen, kidney, liver, heart, and muscle.	Whirlpak or your preference	Frozen or alcohol (NO FORMALIN)	Archival museum storage for later use by researchers. *All tissue archived will later be available to qualified researchers.
Burke Museum	All cetaceans and pinnipeds	Mummified or skeletal remains	Entire skeleton, or skull, and/or baculum	Any	Keep dry	Archival museum storage for later use by researchers.
CPSMMSN	All local cetaceans and pinnipeds	2-4 with unbroken bones	Skulls, small skeleton, baculum	Frozen	Frozen	Reconstruction, Education Note: Will accept any skulls suspected to have ballistics trauma for reconstruction/evidence.
Dr. Elizabeth Frame, NWFSC	All cetaceans and pinnipeds	1 @ 2, possibly 3	Feces, urine, blood, stomach contents, milk (if possible)	Whirlpak	Frozen	Research

Cascadia Research Collective John Calambokidis & Jessie Huggins	Any Cetacean **we will respond to and/or conduct examination if PR is unable to.	Any, except skeleton only.	Genetics (skin) and contaminants (blubber) **if these samples are already being sent to NMFS by the necropsy agency for analysis, we do not need a sample specifically for CRC.	Sterile (wrapped in foil or in sterile glass jar); Skin in cryovial.	Frozen	Research
Linn Benton Community College	Northern Elephant Seal, all Cetaceans	Any	Northern elephant seal skull, whale parts such as baleen, vertebrae, flipper bones, and teeth. Porpoise or dolphin skull or whole skeleton.	Any	Any	Educational Programs
SWFSC Dr. Susan J. Chivers	All cetacean species	1-5	Skin with blubber if code 1 or 2; Size: approx. 1 cm^2	Cryo-vial or whirlpak (We can supply & pay shipping.)	Frozen, and 20% DMSO or ethanol	Molecular genetics: research on phylogeny and stock structure
Skulls Unlimited International – Jay Villemarette	All Pinnipeds & Cetaceans	Any	Skeletal remains	Any	Any	Educational Programs

Cooperating Researchers

Please fill out this form if you have an interest in cooperating with stranding network members outside of your primary response area. This form is to identify specific stranding situations where you would be interested in assisting with response.

Requesting group/organization/researcher:

Stranding situations of interest

Species	Condition of animal (Live, dead, condition code)	Geographic area you can assist with response	Contact information (provide primary and alternate contacts and phone numbers)	Speed of response (will respond same day/24 hrs if able to assist)	Resources available (people, tow vessel, necropsy equip.)	Purpose (Prescott grant, research project)

Cooperating Researchers
Pinnipeds

Researcher	Species	Condition of animal	Geographic area you can assist with response	Contact information	Speed of response	Resources available	Purpose
NMML	Steller sea lion	Dead	Northern WA coast, Puget Sound	Pat Gearin 206-526-4034 Cell-206-498-5650	Will vary depending on field schedule	Vessels, people, and equipment	research
NMML	California sea lion	Dead	Northern WA coast, Puget Sound	Pat Gearin 206-526-4034 Cell-206-498-5650	Will vary depending on field schedule	Vessels, people and equipment	research
WDFW MMI	Harbor seals *Please notify asap of tagged or branded harbor seals, will collect for necropsy.	Fresh Dead	WA Statewide	Office 253-589-7235 Dyanna Lambourn 253-208-2427	Will try to respond within 24 hours if available	Necropsy experience	To conduct through necropsies for cause of mortality and to collect life history info
WDFW MMI	All other pinnipeds *Contact for strandings of Guadalupe Fur Seals	Live- Out of Habitat or Fresh Dead	WA Statewide	Office 253-589-7235 Dyanna Lambourn 253-208-2427	Will try to respond within 24 hours if available	Necropsy experience	To assist other network members.

Call the following researchers to assist with stranding response. Researchers may be able to provide support and resources to network members.

Cooperating Researchers
Cetaceans

Researcher	Species	Condition of animal	Geographic area you can assist with response	Contact information	Speed of response	Resources available	Purpose
NMML	Large cetaceans For collection of skulls or skeletal material	Dead	Northern WA coast, Puget Sound	Pat Gearin 206-526-4034 Cell-206-498-5650	Will vary depending on field schedule	Vessels, people and equipment	Research and education/display
Cascadia Research	All Cetaceans **we will respond to and/or conduct examination if PR is unable.	Any	Any	Office: 360-943-7325 JohnCalambokidis Cell: 360-280-8349 Jessie Huggins Cell: 206-949-7924	Same day	People, necropsy equipment and expertise, small boats	Research
CPSMMSN	Orcas, Sperm Whales, or Baleen Whales	Any	Island or Skagit Co.	Orca Network 360-678-3451	24 hours if able to assist	Researchers, necropsy equipment, boat	Research and Prescott Grant
East Jefferson Co. MMSN	Large Whale Porpoise or dolphin	Any Alive	North Olympic Peninsula, Whidbey Island, Hood Canal	Chrissy McLean 360-385-9745 or 360-301-3141	24 hours, depends on the time of year	People	Education
WDFW MMI	Any species	Live or Dead	WA Statewide	Office 253-589-7235 Dyanna Lambourn 253-208-2427	Will try to respond within 24 hours if available.	Necropsy experience and equipment to move animals.	To assist other network members.
San Juan Co. MMSN	Any species	Live or Dead	Whatcom & Skagit Co.	Amy Traxler 360-472-1852 Joe Gaydos 360-914-1083	Depends on situation or time of year	Munson landing craft; personnel; necropsy equipment, vet expertise	Interest in necropsy results

Call the following researchers to assist with stranding response. Researchers may be able to provide support and resources to network members.

Cooperating Researchers
All Species or Other

Researcher	Species	Condition of animal	Geographic area you can assist with response	Contact information	Speed of response	Resources available	Purpose
Oregon State University	Mass stranding or unusual mortality events which require additional support	N/A	Washington, Alaska, British Columbia, and California	Jim Rice 541-270-6830 Cell 541-867-0446	Depends on situation. At least one day for travel.	4x4 truck, necropsy equipment	Cooperation; work is Prescott supported
Stephanie Norman, DVM	Any species, cetaceans or pinnipeds	Any	Any	Hm: 425-398-4115 Cell:206-321-0249	Can respond same day/24 hrs depending on distance to stranding site	Minimal necropsy equipment; veterinary expertise	Prescott grant; assist with other researchers' projects

Call the following researchers to assist with stranding response. Researchers may be able to provide support and resources to network members.

Marine Mammal parts possession and transfer guidance for Stranding Network

From	To	Authorizations needed	Comments
Stranding Network	NMFS employee	No additional authorization needed for NMFS employee to receive non-ESA parts from stranding network (216.22) [collection and transfer of ESA listed species (216.37)]	All parts should be labeled with the Field ID # and/or NMFS ID # and transfers reported to NMFS Regional Stranding Coordinator within 30 days
	Other stranding network members	No additional authorization needed for other stranding network members to receive parts from stranding network (216.22) [collection and transfer of ESA listed species (216.37)]	All parts should be labeled with the Field ID # and/or NMFS ID #, transfer information should be included on Level A form
	Researchers (in the U.S.)	Researchers must have a letter from the RA (216.22) or for ESA listed (216.37) or researchers must have an MMPA and/or ESA scientific research permit as appropriate to receive parts of same species listed in permit (216.37)	All parts should be labeled with the Field ID # and/or NMFS ID # and transfers reported to NMFS Regional Stranding Coordinator within 30 days
	Labs for diagnostic tests (in the U.S.)	No additional authorization needed for laboratories to receive parts from stranding network (216.22 and 216.37)	All parts should be labeled with the Field ID # and/or NMFS ID #, ESA parts should be accompanied by copy of permit
	Labs for diagnostic tests-outside the U.S. or researchers working on studies – outside the U.S.	CITES export/import needed for species on CITES list Researchers outside the U.S. need to have scientific research permit as appropriate in their country to receive parts for research projects	All parts should be labeled with the Field ID # and/or NMFS ID # and should be accompanied by copies of the appropriate CITES and/or research permits for ESA parts
	Museum collections, scientific or educational institutions (in U.S.)	Museums, scientific and educational institutions need a letter from the RA authorizing them to receive parts from the stranding network (216.22)	All parts should be labeled with the Field ID # and/or NMFS ID # and notification or transfer of the parts must be submitted to the Regional Stranding Coordinator
	Museum collections, scientific or educational institutions (outside the U.S)	Museums, scientific and educational institutions need a letter from the AA authorizing them to receive parts from the stranding network (216.22) and CITES export as needed	
	Retained by stranding network for their own educational purposes	No additional authorization is needed for stranding network members to retain parts for educational purposes	All parts should be labeled with the Field ID # and/or NMFS ID # Level A form should include information on retention of parts

United States Department of Commerce
National Oceanic and Atmospheric Administration
National Marine Fisheries Service
Office for Law Enforcement

Registration of Collected Marine Mammal Parts

"Any bones, teeth or ivory of any dead marine mammal may be collected from a beach or from land with in ¼ of a mile of the ocean. The term "ocean" includes bays and estuaries. Marine mammal parts so collected may be retained if registered within 30 days with an agent of the National Marine Fisheries Service. Title to any marine mammal parts collected under this section is not transferable unless consented to, in writing, by the Secretary." (50 C.F.R. 216.26)

NAME OF REGISTRANT: _____

ADDRESS: _____

_____

_____

DESCRIPTION
OF ARTICLE: _____

_____

_____

_____

LOCATION/DATE
OF COLLECTION: _____

_____

_____

I certify the above to be true and correct to the best of my knowledge

Signature _____ Date _____

(AGENCY USE ONLY)

Date of Registration _____ **Registration Number:** _____

Registering Agent _____ Agent Duty Station _____

Protocol

Northwest Marine Mammal Stranding Network Protocol

1. When you receive a phone call about a stranded marine mammal.
    a. Ask for the reporting parties name, phone number, record the date and time of the call, species, status (dead, alive, injured, ect.) and the location.
    b. Investigate the case and determine if it is appropriate to respond.
    c. Determine your course of action.
        i. If you are not going to respond to the case gather sufficient information and fill out a Level A form if appropriate.
        ii. If you decide not to respond to a case convey your decision to the reporting party and reasons to validate your response.
        iii. If the stranding is not in your response area, consult the Call List and Map and pass information on to the correct organization.

2. Responding to a case.
    a. Arrive at the site.
    b. Confirm the circumstances of the stranding. (Consult the protocol for Species Specific Response if necessary).
        i. Identify the species, condition, and location of the animal.
        ii. If the animal is alive, review the guidelines for handling live stranded marine mammals.
            1. Evaluate whether the animal is actually stranded (legal definition) and determine whether capture and relocation or transport to rehab is warranted.
            2. Considerations for relocation or rehabilitation include:
                a. The animal is sick or injured, and the injury or sickness is treatable,
                b. Negative interactions between the animal and the public, for example, harassment,
                c. Availability of space in rehabilitation facilities.
        iii. If the animal is dead, review the specimen request lists or contact your local stranding network coordinator to see if there are requests for samples.
            1. If you plan to leave the animal and it is on public property inform local authority about disposal options. These include, tow out into the water, burial, leave on the beach, or coordinate with local authorities.
    c. Take pictures of the animal if possible and fill out a Level A Data sheet.

i. If you need guidance on how to fill out the Level A consult "The Examiner's Guide to the Marine Mammal Stranding Report Level A Data" included in your stranding binder.
ii. Level A's should be submitted to NOAA Fisheries within 30 days of the date the Level A was filled out.

d. Please contact NOAA Enforcement at 1-800-853-1964 if...
i. You believe the case is a potential violation of the MMPA
ii. It is a live animal that needs to be removed for the protection of the public
iii. It is an endangered species that may need to be secured to prevent future enforcement problems
iv. The animal is shot
v. Is being harassed
1. When you contact NOAA Enforcement be sure to give information of where the case is, who is involved, when, and what the potential violation is. Please leave your contact information, this will allow NOAA Enforcement to contact you for additional information and will increase the chances that the case can be fully investigated.

3. Public Education
a. Sometimes when you respond to a case the only thing you will need to do is post signs or educate the reporting party.
b. Several documents in this stranding binder can help you educate the public. These documents include:
i. "Sharing the Shore with Harbor Seals"
ii. "Sharing the Sound with Killer Whales"
iii. "Be Whale Wise"

Guidelines for Handling Live Stranded Marine Mammals

1. The term "stranding" means an event in the wild which –
    a. A marine mammal is dead and is –
        i. On a beach or shore of the United States; or
        ii. In waters under the jurisdiction of the United States (including any navigable waters); or
    b. A marine mammal is alive and is –
        i. On a beach ore shore of the United States and is unable to return to the water;
        ii. On a beach or shore of the United States and, although able to return to the water, is need of apparent medical attention; or
        iii. In the waters under the jurisdiction of the United States (including any navigable waters), but is unable to return to its natural habitat under its own power or without assistance. 16 U.S.C. 1421g
    c. Important note: Seals and sea lions commonly use shoreline habitats for normal activities such as resting and thermoregulation.

2. Live seals and sea lions should be left on the beach undisturbed and observed for a minimum of 24-48 hours before any action is taken to remove the animal. This observation period is very important and can be used to determine if the animal can return to the water if it wants to.
    a. Note: Exceptions to this observation period may include aggressive animals that pose a threat to public safety or animals that are clearly suffering and may require rapid treatment or euthanasia.

3. It is very helpful to post signs near a live marine mammal to inform the public that the animal should not be approached, touched, or disturbed.
    a. Note: NOAA Fisheries guidelines recommend that people and pets not approach seals and sea lions closer than 100 yards.

4. If it is determined that a marine mammal needs to be removed from the beach and transported for medical treatment the following facilities are authorized to receive marine mammals.
    a. Wolf Hollow Wildlife Center 240 Boyce Rd. Friday Harbor, WA 360-378-5000
    b. PAWS Wildlife Center 15305 44th Ave. W Lynnwood, WA 425-787-2500

    * Leave a copy of the Level A with the rehabilitation facility so they have a record of the Field ID # and case history when completing their Rehabilitation Disposition Report.

5. If a marine mammal is entered into a rehabilitation facility a Level A data form must be filled out and needs to be sent to NOAA Fisheries within 30 days. The rehabilitation facility must fill out a final "Marine Mammal Rehabilitation Disposition Report" which gives details of the condition, treatment, and results of the case.

6. All live animals taken into rehabilitation are to be released back into the wild unless other arrangements have been made with the NOAA Fisheries stranding coordinator. All marine mammals that are released from rehab should be tagged, prior to release, for monitoring purposes. They should also be released in the vicinity of the site where the animal was originally taken.

7. Live marine mammals captured by private citizens or other unauthorized persons should be returned to the original beach and left undisturbed unless circumstances do not permit such action. The name and addresses of these persons should be reported to NOAA Enforcement at 206-526-6133 for enforcement action. There is also a 24 hour, toll free enforcement hotline to report violations at 1-800-853-1964.
   * When you call the hotline specify that this is a report of a violation and request to speak to the agent on call.

8. Safety measures
   a. Remember, safety comes first! Marine mammals are wild animals and will bite. They carry diseases which may be transmittable to humans. Use caution and wear gloves.
   b. For more information consult "Working with Marine Mammals and Your Health" in the Protocol section in your stranding binder.

NMFS Decision Process for Responding to Live Marine Mammals that are Stranded or Otherwise in Distress

February 2009

NOAA's National Marine Fisheries Service (NMFS) and the Marine Mammal Stranding Network have developed protocols and procedures for responding to live marine mammals that are stranded or otherwise in distress to ensure the health, welfare and safety of both the animals and the human responders. These protocols balance the need for standardized procedures while allowing flexibility to address specific needs of different situations for diverse species and habitats, as well as unforeseen circumstances. Protocols and procedures for cetaceans (whales, dolphins and porpoises) can be different than the ones for pinnipeds (seals and seal lions) since their biology is significantly different. Human and animal safety is the top priority for NMFS and the Network. NMFS and the Network evaluate several factors before intervening. Each event is different and requires consideration of the following factors by NMFS in consultation with the Network and outside experts:

What are the species and group composition involved in the event?

- Responses to small cetaceans or pinnipeds (*e.g.*, bottlenose dolphins or harbor seals, which are < 8 feet) are not the same as for large whales (*e.g.*, right whales, which are > 40 feet).
- Different species have specific group compositions and social behaviors (*e.g.*, bottlenose dolphins can occur singly or in groups of < 20 individuals, whereas Atlantic white-sided dolphins can occur in groups of > 100). The presence of mother-calf pairs is a consideration since young and naïve animals can be particularly vulnerable to disturbance.
- Pelagic (deep water) species like pilot whales, common dolphins, and Atlantic white-sided dolphins are out of habitat and at risk of stranding in shallow waters. In contrast, coastal species such as bottlenose dolphins are adept at navigating shallow river and estuarine systems, which are part of their normal habitat.
- Animals from species that are listed as endangered or threatened (*e.g.*, Hawaiian monk seals, right whales) may require extraordinary rescue efforts in order to support recovery of the population.

Is the situation caused by human activities or a natural event?

- Animals in distress as a result of human activities are prime candidates for response and intervention. This includes animals entangled in fishing gear or marine debris, injured from a vessel collision, or trapped in a habitat area by human activities (*e.g.*, physical barriers, oil spills, construction noise, etc.).
- Animals that are out of habitat or displaced by severe weather or oceanographic events (*e.g.*, hurricanes, tsunamis, El Niño, underwater earthquakes, etc.) can be candidates for intervention if they cannot leave the area on their own accord and/or their health is declining. For example, NMFS and the Network routinely rescue dolphins washed inland by hurricanes or ice seals that have ventured off course to temperate or tropical areas, especially when the animals are in habitats that can compromise their health. Animals are initially monitored prior to conducting an intervention to allow every opportunity for them to leave on their own.
- Animals that may be naturally expanding their range and exploring new habitats should be left alone. Intervention may be warranted, however, if animals become a "nuisance" and are having a negative effect on the environment, private property or public safety.

Are resources available to ensure the safety and welfare of both the animals and the responders?

- Intervention can be risky and dangerous for both the animals and human responders. The Network includes highly trained personnel with different expertise. NMFS helps coordinate rescue activities to ensure the appropriate people are deployed to a particular event with an adequate number of personnel and sufficient equipment or facility resources for the rescue operation and veterinary care. NMFS and the Network coordinate with local officials and interested parties during events.
- Rescue operations are only approved if all safeguards can be maintained for the animals, rescue team members, and the public. If safety cannot be maintained, then rescue operations must stand down until appropriate safeguards can be put into place.

References:

Geraci, J.R. and V.J. Lounsbury. 2005. Marine Mammals Ashore: A Field Guide for Strandings (Second Edition). National Aquarium in Baltimore, Baltimore, MD. 371 pp. [*Sponsored by NOAA/NMFS*] http://www.aqua.org/research_marinemammalsashore.html

Gulland, F.M.D., F.B. Nutter, K. Dixon, J. Calambokidis, G. Shorr, J. Barlow, T. Rowles, S. Wilkin, T. Spradlin, L. Gage, J. Mulsow, C. Reichmuth, M. Moore, J. Smith, P. Folkens, S. Hanser, S. Jang, and C.S. Baker. 2008. Behavioral responses to herding efforts of a cow-calf pair of humpbacks whales (*Megaptera novaeangliae*) in the Sacramento River Delta, California. Aquatic Mammals, 34(2):182-192.
http://www.nefsc.noaa.gov/njdolphins/BIBLIOGRAPHY/Gulland%20et%20al.%202008.pdf

NMFS and USFWS. 1997. DRAFT Release of Stranded Marine Mammals to the Wild: Background, Preparation, and Release Criteria. Draft NOAA Tech. Memo. NMFS-OPR-XX. 76 pp.
http://www.nmfs.noaa.gov/pr/pdfs/health/release.pdf

NMFS. 2007. Interim Best Practices for Marine Mammal Stranding Response, Rehabilitation, and Release. In: Draft Programmatic Environmental Impact Statement for the Marine Mammal Health and Stranding Response Program March 2007, Volume II: Appendices A-D.
http://www.nmfs.noaa.gov/pr/health/eis.htm

Reynolds, J.E. and D.K. Odell (Eds.). 1991. Marine Mammal Strandings in the United States: Proceedings of the Second Marine Mammal Stranding Workshop, Miami, Florida, December 3-5, 1987. NOAA Technical Report NMFS 98. 157 pp.
http://www.nmfs.noaa.gov/pr/pdfs/health/marine_mammal_strandings.pdf

Southall, B.L., R. Braun, F.M.D. Gulland, A.D. Heard, R.W. Baird, S.M. Wilkin and T.K. Rowles. 2006. Hawaiian melon-headed whale (*Peponocephala electra*) mass stranding event of July 3-4, 2004. NOAA Technical Memorandum NMFS-OPR-31. 73 pp.
http://www.nmfs.noaa.gov/pr/pdfs/health/stranding_melonheadedwhales_final_report.pdf

St. Aubin, D.J., J.R. Geraci and V.J. Lounbury. 1996. Rescue, Rehabilitation, and Release of Marine Mammals: An Analysis of Current Views and Practices. NOAA Tech. Memo. NMFS-OPR-8. 65 pp.
http://www.nmfs.noaa.gov/pr/pdfs/health/rescue.pdf

Touhey, K.M., C. Merigo, M.J. Moore, and K. Patchett. 2003. Mass stranding prevention: the effecitveness of herding and acoustic deterrence. Spoken presentation at the 15th Biennial Conference on the Biology of Marine Mammals, Greensboro, NC.
http://www.nefsc.noaa.gov/njdolphins/BIBLIOGRAPHY/touhey.pdf

Additional information available on the Internet:

NOAA/NMFS' Marine Mammal Health and Stranding Response Program
http://www.nmfs.noaa.gov/pr/health/

Marine Mammal Stranding Network Participants
http://www.nmfs.noaa.gov/pr/health/networks.htm

John H. Prescott Marine Mammal Rescue Assistance Grant Program
http://www.nmfs.noaa.gov/pr/health/prescott/

Documentary "Saving Springer: Orphan Orca"
http://sos.noaa.gov/datasets/extras/saving_springer.html

Northwest Marine Mammal Stranding Network Protocol
Specific Species Response

1. Pinnipeds
    a. Pinniped tags can be plastic, metal, neoprene, VHF, UHF or a brand.
        i. Otariids (sea lions and fur seals) are tagged on the fore flipper; Phocids (seals) are tagged on the rear flippers.
    b. Harbor Seals
        i. Look for tags, brands, record placement, tag color and the tag number if possible. If tags are present please call WDFW/Marine Mammal Investigations (MMI) at 253-589-7235.
        ii. Blue tag = Male/Yellow tag = Female
            1. Red tag = Rehab animal
        iii. Do you see any signs of human interaction?
            1. Entanglement? Shot?
    c. Harbor Seal pups
        i. Observe the pup for 48 hours before taking any action. If it is tagged call WDFW/MMI at 253-589-7235.
        ii. Post a sign and cordon off the area if possible.
            1. Keep people and dogs away.
            2. Harbor seal moms are very shy and will not come to shore if people or other animals are around.

Timing of Harbor Seal Pupping and Weaning in Washington & Oregon

Area	Pupping Months	Weaning Months (4-6 weeks after birth)
Columbia River, Willapa Bay, Grays Harbor	Early April - July	August
Olympic Peninsula Coast	May – June	August
San Juan Islands, Eastern bays of Puget Sound	June - August	October
Southern Puget Sound	July – September	October
Hood Canal	July – October	November

- This table was provided by the Washington Department of Fish and Wildlife, Marine Mammal Investigations.

    d. California sea lion
        i. Confirm species ID.
        ii. Look for tags, brands, record placement, tag color and number if possible.
        iii. Do you see any signs of human interaction?
            1. Entanglement? Shot?

e. Steller sea lion
    i. Confirm species ID.
    ii. Look for tags, brands, record placement, tag color and number if possible.
    iii. Do you see any signs of human interaction?
        1. Entanglement? Shot?
    iv. If the animal is to be removed from the wild or euthanized contact Brent Norberg or Lynne Barre at NOAA Fisheries, 206-526-6733 for authorization under the ESA.

f. Northern Elephant Seal
    i. Confirm species ID.
    ii. This species will haul out during molting season and may stay in the same area for weeks at a time.
    iii. When they are molting they look like they are in very poor shape, but this is normal.
    iv. If they are in a public area for days to weeks you can call WDFW/MMI at 253-589-7235.

g. Northern Fur Seal
    i. This species occasionally strands on the outer coast of Washington and Oregon.
    ii. May be entangled in fishing gear or debris.
    iii. CAUTION: may be extremely aggressive!

h. Guadalupe Fur Seal
    i. Confirm species ID, they can be easily confused with Northern Fur Seals. Look at the shape of the snout and the hairline on the foreflippers.
    ii. This species is rarely seen north of Central California. In 2007, 19 animals stranded in Washington and Oregon which was qualified as an Unusual Mortality Event (UME).
    iii. Please report any strandings to Kristin Wilkinson with NOAA Fisheries at 206-526-4747.

2. Cetaceans
    a. Killer Whales
        i. Photograph the animal if possible and contact NOAA Fisheries at 206-526-4745.

b. Gray Whales
    i. Photograph the animal if possible and contact Cascadia Research Collective at 360-943-7325.
    ii. If on tribal land, notify Brent Norberg or Lynne Barre at NOAA Fisheries at 206-526-6733 to coordinate response.

c. Humpback Whales
    i. Photograph the animal if possible and contact Cascadia Research Collective at 360-943-7325.

d. Minke, Sperm, Blue Whales
    i. Photograph the animal if possible and contact Cascadia Research Collective at 360-943-7325.

e. Harbor porpoise, Dall's porpoise, and Beaked whales
    i. Call the NOAA Fisheries hotline at 206-526-6733.

f. Northern Pacific Right Whale
    i. This species is very unlikely to be seen.
    ii. ALL SIGHTINGS, ALIVE OR DEAD should be reported to Brent Norberg at NOAA Fisheries immediately at 206-526-6733.
    iii. Photos are extremely important.

3. Other species
    a. Sea Turtles
        i. USFWS and NOAA Fisheries share jurisdiction.
        ii. Call the NOAA Fisheries hotline at 206-526-6733 before removing turtles from the beach.
        iii. Please review the Sea Turtle stranding protocol in the Protocol section of this handbook.
    b. Sea Otters
        i. USFWS has jurisdiction.
        ii. Contact Deanna Lynch at 360-753-9545 or page 1-87-SEAOTTER.

Sea Turtle Protocol*

*Marine Mammal Stranding Network responders are not authorized to pick up sea turtles due to their endangered species status (50 CFR 17.21). To respond to a sea turtle stranding you must coordinate and receive permission from the Northwest Regional Coordinator, Brent Norberg or stranding specialist, Kristin Wilkinson.

1. When you receive a phone call about a stranded sea turtle.
    a. Ask for the reporting parties name, phone number, record the time and the date of the call, species (or description, size, length, weight, etc.), status (alive, dead, injured, etc.) and the exact location. Ask if they have taken any photos and if they can email them to you for your review before responding.
    b. If you are unsure of the species of the turtle, utilize the sea turtle identification guide in the back of your Northwest Marine Mammal Stranding Network handbook. The sea turtle guide can be found under the Species ID tab, located under "Other Species".
    c. If you are confident a sea turtle stranding has taken place, call Kristin Wilkinson with NOAA Fisheries as soon as possible at 206-526-4747 (office) or 206-550-6208 (cell). Please keep in mind you need permission to respond to this stranding according to 50 CFR 17.21
2. Responding to a case.
    a. Arrive at the site.
    b. Confirm the circumstances of the stranding.
        i. Identify the species, condition, and location of the animal.
        ii. If the animal is alive, review the Cold-Stunning Care Procedures provided by the Riverhead Foundation for Marine Research and Preservation which can be found under the "Protocol" tab in your Northwest Marine Mammal Stranding Network handbook. The protocol details three procedures that you can conduct on the beach to determine if the animal is alive or dead. (Nose touch, Head lift, and Eye touch.)
            1. In some cases, the only way to know that a cold stunned turtle cannot be recovered is to do an ECG to determine if the animal has a heartbeat. In a cold stunned turtle the heart rate can go down to 1-2 beats per minute. The Riverhead Foundation has not had success hearing a heart beat using a stethoscope, the use of an ECG is best.
        iii. If you think the animal is alive…

1. Contact NOAA Fisheries immediately. Kristin Wilkinson can be contacted at 206-526-4747 (Office) or at 206-550-6208 (Cell).
2. NOAA Fisheries will contact the Seattle Aquarium, Shawn Larson at 206-386-4359 (Office) or at 206-618-3762 (Cell). Angela Smith is the alternate contact at the Seattle Aquarium and can be contacted at 206-386-4359 (Office). Shawn or Angela will determine if there is rehabilitation space for the animal. If Seattle Aquarium cannot accept the animal for rehabilitation, NOAA will contact Judy Tuttle at the Oregon Coast Aquarium, 541-867-3474 x5322.
3. Arrange transport for the animal to the rehabilitation facility.
    a. DO NOT place the animal in water or attempt to warm the animal during transport! Rapid warming may cause irreversible damage to a cold-stunned turtle. Instead, consider using a foam insert that has been soaked in water. The saturated foam allows the sea turtle to absorb water via the cloacae and ensures the animal is stable during transport. If possible, do not transport the animal in a heated vehicle; keep the turtle in an unheated trunk or in the back of a truck.

iv. If the animal is dead…
1. Collect the carcass of the animal and contact NOAA Fisheries. Kristin Wilkinson can be contacted at 206-526-4747 (Office) or at 206-550-6208 (Cell). We collect sea turtle stranding data and will need case details for our records. Photos of the animal are appreciated.
2. NOAA Fisheries will then contact the United States Fish and Wildlife Service, Linda Belluomini at 503-231-6283. According to 50 CFR 17.21 reports must be made to the USFWS within 5 days.

3. Determine your course of action.
    i. Live sea turtles need to be picked up as soon as possible. Sea turtles that strand in our region are usually "cold stunned", which is a process that causes sea turtles to become immobile due to the decrease in water temperature (usually below 50°F) making it impossible for them to escape the cold water and migrate to warmer water (Riverhead Foundation).

A cold stunned sea turtle may appear to be dead, but may be alive!

ii. Dead sea turtles should be collected if possible. **All 7 species of marine turtles are listed under the Endangered Species Act (ESA);** 6 of those species fall under the jurisdiction of the NOAA Fisheries Office of Protected Resources. For more information on sea turtles please visit: http://www.nmfs.noaa.gov/pr/species/turtles/

iii. If the stranding is not in your response area, consult the Call List and Map (located under the "Contacts" tab in the Northwest Marine Mammal Stranding Network handbook) and pass information on to the correct organization.

Riverhead Foundation For
MARINE
RESEARCH &
PRESERVATION

COLD-STUNNING CARE PROCEDURES

On initial assessment or admit to the facility please make a determination of the Health Class Assessment (HCA) before **ALL** other procedures. Determination of the appropriate HCA should be correlated with cloacal temperature (C°). All level (A) data fields should be filled out immediately with information regarding field number, species, stranding/recovery location, date and time. Measurements, weight, physical description and photo and video documentation should be recorded in as short of time as possible. The procedures taken with an animal are generally dependent on the HCA number assigned to the animal upon admittance. (i.e, Class 4 cold-stunned animals are assessed as critical and subsequently all medical treatments must not be interfered with or delayed for the purposes of acquiring level A data). All animals coming to the facility must have individual health records.

DEFINITION OF TERMS

Nose-Touch.... The distal portion of the nose in sea turtles is soft. This tissue is moderately innervated and most live healthy turtles produce a strong to moderate flinch response when touched. Most cold-stunned animals exhibit a response to the touching of this area. However, it is not 100% reliable and is clearly subject to over-use. Therefore, when doing this please watch carefully to avoid having to repeat the procedure too soon. The method is a moderate to slight tap, but with not so much force that you move the head.

Head-Lift.... When sea turtles breathe they lift their head at a much higher angle to the horizontal line of the body. In many live healthy animals lying on a floor this appears to be near 45% or possibly greater. In cold-stunned animals this is often missing or greatly reduced.

Eye-Touch.... Most animals do not like anything touching their eyes or eyelids. Sea turtles are no different and will respond to having an upper eyelid touched. On cold-stunned animals the upper eyelid should be lightly touched and then carefully monitored for as subsequent flinch response (menance).

HEALTH CLASS ASSESSMENTS (HCA)

CLASS I

A. Strong swimming attempts or actual swimming attempts.
B. Responses to all touch tests including nose, eye (menance, pupillary light reflex), and manual contact with extremities (nociception)
C. Body not limp when lifted off floor.
D. Reverse pressure against attempts at forced movement of extremities and or head and neck. Tone and flexor reflex characterized as strong
E. Some crawl attempts when placed on floor. This may or may not be present.
F. Strong inspiratory head-lift (45 ° degree or greater)

CLASS II

A. Moderate to strong movements of animal, movements are slowed but not jerky. Swim-like movements are present but characterized as weak.
B. Nose or eye-touch produces a localized, flinch response (menance and pupillary light reflex).
C. Nose or eye-touch produces some slight generalized extremity response but is decreased distally.
D. Limited reversed pressure to forced movement may be present but clearly fatigues almost immediately (Flexor reflex present although tone is weakened).
E. Crawl attempts either absent or produce no net movement.
F. Body posture is limp or the ability to hold up the extremities is present but very weakly and generally only for a limited length of time. This effect dissipates with time and the extremities will gradually go limp.
G. Inspiratory head lift present but may appear weak (< 45° degree).

CLASS III

A. Animal either does not move or movements clearly not under CNS control, as they are jerky and relatively uncontrolled. Swim-like movements are absent.
B. Nose or eye-touch (menance or pupillary light reflex) absent or very weak in response. Response may be jerky.
C. Body posture is limp when lifted off the floor. The head and neck may support themselves slightly. Length of time may be a very short duration CNS jerk may be observed
D. No reverse pressure against forced movements, but when released sometimes a slow jerky CNS movement of front flippers. Little to no flexor reflex or tone noted in flippers.
E. No crawl attempts.
F. Head-lift either absent or very slight.
G. There may be partial freezing of extremities.

CLASS IV

A. No movement by animal on own without touching.
B. Nose nociception or eye-touch (menance or pupillary light relflex) absent or very slight.
C. Body completely limp.
D. No response to forced movement. No flexor reflexes noted
E. No crawl attempts.
F. Animal's posture is completely limp including neck and head.
G. No head-lift or apparent breathing (Dead?)
H. Extremities may be partially frozen.

TREATMENT PROTOCOLS BASED ON CLASS ASSESSMENTS

Please take note that no protocol can take the place of direct and constant observation. It is very important to check on ALL animals every hour and more often if the condition warrants. Although in the past a 24-hour watch has been maintained on initially critical animals it is not necessary most of the time. Water quality for these animals is important. Particularly at times of stress such as cold-stunning as these animal's immune systems are often compromised.

CLASS I ANIMALS:

Class I turtles are characterized as fairly alert and mobile. Although these animals do not present as critically ill all efforts should be made to conduct a complete and thorough medical evaluation upon admittance to the facility.

Initial Medical Evaluation of Class I Cold Stunned Sea Turtles

1. Staff member is to perform a complete physical examination
    a. All information is to be recorded onto the ***Cold Stunned Sea Turtle Health Assessment Form (HAF)***(Appendix 1.0)
        i. Complete admission data sheet (standard morphs.)
        ii. Weigh the animal (kgs)
        iii. Record the initial cloacal temperature taken en situ on the (HAF) sheet and insert the cloacal probe and document the core body temperature, ambient and water temperatures onto the individual animal's ***Cold Stunned Initial Assessment/Triage Form.*** (Appendix 2.0)
        iv. Assess and photograph the carapace and plastron, flippers, tail, and head, noting any lesions or epibiotic growth.
        v. Subjectively assess nutritional status and body condition
        vi. Conduct a neurologic examination and record all findings onto the (HAF). Video tape the examination.
        vii. Evaluate heart rate with Doppler (Normal heart rate is 30-35 bpm).

viii. Evaluate respiratory rate. Take note of angle of inspiratory head-lift and record onto sheet.

b. Perform oral examination and debridement of the oral cavity if necessary.
c. Use fluorescent corneal stain to detect corneal damage or ulceration.
d. Assess hydration status both subjectively and objectively.

2. Conduct hematology and plasma biochemical assessment
   a. Collect blood for the following parameters
      i. Hematocrit (Take sample directly from syringe)
      ii. Electrolytes
      iii. Blood glucose
      iv. Blood gas status (metabolic and respiratory acidosis)
         1. Use IDEXX VetStat analyzer
      v. Submit blood to Antech for a complete blood count and plasma chemistry profile (***AE160 Comp. Reptilian Profile***)
      vi. Archive plasma for future study (Indicate the number of plasma and RBC samples on blood form).
3. Obtain a cloacal lavage, fecal sample, or cloacal swab for parasitology, cytology, and microbiology
4. Develop a treatment plan on the basis of physical examination, blood glucose, electrolyte, and blood gas status.

These turtles can often be placed in seawater directly. The water in which they are placed should not however be warm. It should be a few degrees (2-4°C) above the ambient water temperatures (i.e., water temperature from stranding location). Also please be aware of pH when mixing fresh warm water with the salt water. Usually it is best to put the turtles into one of the small tanks at first with up to a 16 to 30 cm water depth. Then monitor the animal for up to 3 minutes. If it is swimming strongly raise the water and watch again. If it continues to swim strongly put a heater in the water and let it warm the water over the next 4 to 6 hours. If the animal is assessed as doing well move it to a main-line tank and watch for the presence of positive buoyancy (floats). If the animal does not have the rear floats then it's doing well. If positive buoyancy is observed continue to monitor animal hourly. If at any stage in the process there is either no improvement or a decrease in one of the class definition characteristics then back up one step and take it slower. These animals generally respond very well to initial treatment and overall to rehabilitation.

CLASS II ANIMALS:

Class II turtles are characterized as alert although sluggish. These turtles will generally respond well to all neurologic evaluations but these findings may diminish with time.

Initial Medical Evaluation of Class II Cold Stunned Sea Turtles

1. Staff member is to perform a complete physical examination
   a. All information is to be recorded onto the ***Cold Stunned Sea Turtle Health Assessment Form (HAF)***(Appendix 1.0)
      i. Complete admission data sheet (standard morphs.)

ii. Weigh the animal (kgs)
iii. Record the initial cloacal temperature taken en situ on the (HAF) sheet and insert the cloacal probe and document the core body temperature, ambient and water temperature onto the individual animal's ***Cold Stunned Initial Assessment/Triage Form..*** (Appendix 2.0)
iv. Assess and photograph the carapace and plastron, flippers, tail, and head, noting any lesions or epibiotic growth.
v. Subjectively assess nutritional status and body condition
vi. Conduct a neurologic examination and record all findings onto the HAF. Video tape the examination.
vii. Evaluate heart rate with Doppler. (Normal heart rate is 30-35 bpm)
viii. Evaluate respiratory rate. Take note of angle of inspiratory head lift and record onto sheet.

b. Perform oral examination and debridement of the oral cavity if necessary.
c. Use fluorescent corneal stain to detect corneal damage or ulceration.
d. Assess hydration status both subjectively and objectively.

2. Conduct hematology and plasma biochemical assessment
   a. Collect blood for the following parameters
      i. Hematocrit (Take sample directly from syringe)
      ii. Electrolytes
      iii. Blood glucose
      iv. Blood gas status (metabolic and respiratory acidosis)
         1. Use IDEXX VetStat analyzer
      v. Submit blood to Antech for a complete blood count and plasma chemistry profile (***AE160 Comp. Reptilian Profile***)
      vi. Archive plasma/RBC for future study (Indicate the number of plasma and RBC samples on blood form).
3. Obtain a cloacal lavage, fecal sample, or cloacal swab for parasitology, cytology, and microbiology
4. Develop a treatment plan on the basis of physical examination, blood glucose, electrolyte, and blood gas status.

These turtles can also often be placed into water almost immediately, particularly if the head-lift is strong. However, they should not be placed in a full level of water initially. Place them in water that is 3-4 cm in depth and up to 6-7 cm if the head-lift is good. If they are dry or dehydrated make the water mixture 50% fresh water. Sometimes the weaker animals can be placed on foam to raise the mid-body up. This enables the flippers to angle down slightly and promote a little easier movement for them. Manual movement of flippers is important in Class II for the weaker animals to stimulate circulation if they do not do this on their own. Flipper movement is important due to shock and possible concurrent cardiovascular collapse. Cardiovascular collapse occurs due to decreased circulation during shock. The important effort for these animals is to increase vessel flow through increased movements. Due to their anatomical design the movement of front flippers aid in circulation.

Initial water temperatures should be 2-3°C above ambient water temperatures. DO NOT increase water temperature for 2-4 hours except passively (i.e. sunlight). If the turtle becomes more active within 2-4 hours begin raising the water temperature but do not raise the water level. If the temperature reaches 13-15°C and the animal is walking/swimming and more Class I features appear raise the water level approximately 10 cm every 30-60 minutes. Observe the animal for stronger and stronger activities. They will still float but begin to show interest or attempts at diving. At this point, provided the temperatures are similar, within 3°C, move the animal into a main-line tank.

If during the above process any lack of forward progress or slipping backwards is noted, back up to the previous point and proceed more slowly.

CLASS III ANIMALS:

Class III turtles generally present as compromised animals which generate a poor neurologic assessment. Respiratory and cardiovascular parameters are often impaired.

Initial Medical Evaluation of Class III Cold Stunned Sea Turtles

1. Staff member is to perform a complete physical examination
   a. All information is to be recorded onto the ***Cold Stunned Sea Turtle Health Assessment Form (HAF)***(Appendix 1.0)
      i. Complete admission data sheet (standard morphs.)
      ii. Weigh the animal (kgs)
      iii. Record the initial cloacal temperature taken en situ on the (HAF) sheet and insert the cloacal probe to document the core body temperature, ambient and water temperatures onto the individual animal's ***Cold Stunned Initial Assessment/Triage Form.***(Appendix 2.0)
      iv. Assess and photograph the carapace and plastron, flippers, tail, and head, noting any lesions or epibiotic growth.
      v. Subjectively assess nutritional status and body condition
      vi. Conduct a neurologic examination and record all findings onto the (HAF). Video tape the examination.
      vii. Evaluate heart rate with Doppler. If no cardiac sounds are detected with Doppler, use echocardiography (if available). (Normal heart rate is 30-35 bpm) Bradycardia is common, with the heart rate at admission generally 1 to 12 bpm
         1. **If cardiac activity is weak, depressed or irregular administer epinephrine (1cc,IT,IC) and atropine sulfate (.04-1.0 mg/kg IM).**
      viii. Evaluate respiratory rate.
         2. If turtle is non-responsive and no inspiratory head lift is noted proceed with resuscitation attempts.
         3. Establish a patent airway via orotracheal intubation and deliver 100% oxygen at a rate of 2-3 breaths per minute. Take care to debride the oral cavity to prevent any introduction of aspirate into the lungs.

a. Endotracheal tube size 2.0 – 3.0 for small Lk and Cm
b. Secure endotracheal tube with tape and protect tube from the mouth closing down on it.
c. If respirations are weak, or not present administer **Dopram (5-10 mg/kg IM, IV).**
d. Once respirations are visible and turtle is moving around remove endotracheal tube and monitor respirations every ½ hr with cardiac activity.

2. Assess hydration status both subjectively and objectively.
    a. Establish intravenous catheterization via the dorsal cervical sinus or jugular vein.
        i. Collect blood for evaluation of hematocrit, total protein, osmolality, glucose, sodium, potassium, chloride and blood urea nitrogen.
        ii. Collect blood for blood gas analysis (VetStat)
        iii. Total amount of blood to be taken will be 3-5% of the body weight.
            a. Hematocrit (Take sample directly from syringe)
            b. Electrolytes
            c. Blood glucose
            d. Blood gas status (metabolic and respiratory acidosis)
                a. Use IDEXX VetStat analyzer
        iv. Submit blood to Antech for a complete blood count and plasma chemistry profile **(AE160 Comp. Reptilian Profile)**
        v. Archive plasma/RBC for future study (Indicate the number of plasma and RBC samples on blood form).
    b. Use fluorescent corneal stain to detect corneal damage or ulceration.
    c. Obtain a cloacal lavage, fecal sample, or cloacal swab for parasitology, cytology, and microbiology
    d. Develop a treatment plan on the basis of physical examination, blood glucose, electrolyte, and blood gas status.
    e. Fluid therapy should be directed by blood parameters and clinical response. If hypoglycemia is detected administer 50% dextrose solution IV or iCe. Rate of administration will usually range from 1% to 3% body weight per 24 hours.

These animals are critical. The successful care of these animals involves far less flexibility and far more attention. Initially, these animals are in greater need of gradual thermal increase with concurrent circulatory increase then they are of water. Dehydration is important here but the means to control that have to be approached differently. Many of these turtles should not be placed in any water unless severely dehydrated. When

placed in water these animals should be placed in no more water than necessary to bring the surface of the water in contact with the cloacae. These animals are best moistened with a sponge periodically. When moistening the animal be sure to moisten the eyes, head, neck and cloacae.

Warm these turtles very slowly and passively with very indirect light. Temperature rise should not increase beyond .5°C per hour. Pump front flippers every half-hour at first and then after 2-4 hours of this increase to every two hours. Look for any positive responses. During this time the animals often get "stuck" in a plateau. If head-lift becomes more defined or controlled and/or flipper movement is also more controlled raise the water level to just below the nares. These animals also sometimes benefit from placing them on a foam pad so that the flippers lower and make self-movement easier. If the head-lift becomes stronger then proceed to the steps in Class II.

CLASS IV ANIMALS:

Class IV turtles are the most critical animals. In general these animals will present a moribund with poor to nonexistent neurologic assessments. Respiratory and cardiovascular parameters are severely compromised.

Initial Medical Evaluation of Class IV Cold Stunned Sea Turtles

1. Staff member is to perform a complete physical examination
   a. All information is to be recorded onto the ***Cold Stunned Sea Turtle Health Assessment Form (HAF)***(Appendix 1.0)

   Complete admission data sheet (standard morphs.)
   i. Weigh the animal (kgs)
   ii. Record the initial cloacal temperature taken en situ on the sheet on the (HAF) sheet and insert the cloacal probe to document the core body temperature, ambient and water temperatures onto the individual animal's ***Cold Stunned Initial Assessment/Triage Form.*** (Appendix 2.0)
   iii. Assess and photograph the carapace and plastron, flippers, tail, and head, noting any lesions or epibiotic growth.
   iv. Subjectively assess nutritional status and body condition
   v. Conduct a neurologic examination and record all findings onto the (HAF). Video tape the examination.
   vi. Evaluate heart rate with Doppler. If no cardiac sounds are detected with Doppler, use echocardiography (if available). (Normal heart rate is 30-35 bpm). Bradycardia is common, with the heart rate at admission generally 1 to 12 bpm.
      1. **If cardiac activity is weak, depressed or irregular administer epinephrine (1cc,IT,IC) and atropine sulfate (.04-1.0 mg/kg IM).**
   vii. Evaluate respiratory rate.
      1. If turtle is non-responsive and no inspiratory head lift is noted resuscitation attempts should be initiated.

2. Establish a patent airway via orotracheal intubation and deliver 100% oxygen at a rate of 2-3 breaths per minute
    a. Endotracheal tube size 2.0 – 3.0 for small Lk and Cm
    b. Secure endotracheal tube with tape and protect tube from the mouth closing down on it.
    c. If respirations are weak, or not present administer **Dopram (5-10 mg/kg IM, IV).**
    d. Once respirations are visible and turtle is moving around remove endotracheal tube and monitor respirations every ½ hr with cardiac activity.
3. Assess hydration status both subjectively and objectively.
    1. Establish intravenous catheterization via the dorsal cervical sinus or jugular vein.
        i. Collect blood for evaluation of hematocrit, total protein, osmolality, glucose, sodium, potassium, chloride and blood urea nitrogen.
        ii. Collect blood for blood gas analysis (VetStat)
        iii. Total amount of blood to be taken will be 3-5% of the body weight.
            a. Hematocrit
            b. Electrolytes
            c. Blood glucose
            d. Blood gas status (metabolic and respiratory acidosis)
            e. Use IDEXX VetStat analyzer
        iv. Submit blood to Antech for a complete blood count and plasma chemistry profile **(AE160 Comp. Reptilian Profile)**
        v. Archive plasma/RBC for future study (Indicate the number of plasma and RBC samples on blood form).
    a. Obtain a cloacal lavage, fecal sample, or cloacal swab for parasitology, cytology, and microbiology
    c. Perform oral examination and cleaning of the oral cavity.
    d. Develop a treatment plan on the basis of physical examination, blood glucose, electrolyte, and blood gas status.
b. Fluid therapy should be directed by blood parameters and clinical response. If hypoglycemia is detected administer 50% dextrose solution IV or iCe. Rate of administration will usually range from 1% to 3% body weight per 24 hours.

- Fluid therapy should be directed by blood parameters and clinical response. If hypoglycemia is detected administer 50% dextrose solution IV or iCe. Rate of administration will usually range from 1% to 3% body weight per 24 hours.

These animals are the most critical and often don't make it. It is also unclear if they do survive what their real vitality and viability is. However, that question is not germane to the treatment process. Therefore, they should be treated with critical emergency care toward recovery. These animals are amazingly resilient. These animals must be treated as in the previous class but a 24-hour watch is essential. Frequent (10-15 minute intervals) movement of the flippers is essential. Lifting of animal should be minimized. Animals should also not be kept in bright lights.

As is evident from the progressing we have done each class treatment is a step built upon the previous. All above treatment scenarios apply to this group.

Cold Stun Medical Protocol

A. Exam, Weight (kg), Body Temperature (Celsius)
B. Health Class Assessment (HCA)
    a. Correlate with Body Temperature (°C)
    b. Document HCA with digital photography and video
C. Minimum Database
    a. Heart rate (Doppler bpm)
    b. Respiration rate
    c. Bloods
        i. In-house Glucose, Hct, TP and electrolytes
        ii. Comprehensive Reptilian Profile (AE160 Antech)
        iii. Blood gas analysis (VetStat)
D. Increase Body Temperature
    a. Water Blanket
    b. Heat Lamp (Red bulb)
    c. Enema
    d. Warm compresses (i.e., wash towels and/or water filled latex gloves)
E. Class III and IV
    a. Respiratory Dyspnea/Apnea
        i. Intubate
        ii. Oxygen via ventilator or ambu bag
            1. 2-3 breaths per minute
        iii. Catheter
            1. If no breathing or heart beat detected
            2. Dopram 5-10 mg/kg, IM, IV
    b. Cardiac (If No Detectable Heart Beat)
        i. Epinephrine 1cc, IT, IC
        ii. Atropine .04-1.0 mg/kg, IM
        iii. Calcium Gluconate 100 mg/kg, IM
    c. Shock
        iv. IV catheter
            1. Warm IV fluids 10-30 ml/kg/d^{-1}
               or (1-3 % Body Weight/d^{-1})
            2. Corticosteroid (SoluDelta 5mg/kg, IV)
            3. Hetastarch 5 ml/kg, IV, BID
            4. 50 % Dextrose 1 ml/kg, IV

F. Monitor Body Temperature every two hours
G. Vitamins Supplementation
    a. AD_3 0.05 ml /kg IM
    b. B-Complex 0.25 ml/kg SC
    c. Vitamin K .5 mg /kg IM
H. Nutritional Support
    a. Cisapride

Type	Therapeutic	Dosage	Route	Frequency	Duration
Emergency (respiratory)	Dopram	5-10 mg/kg	IM, IV		
Emergency	Epinephrine	1cc	IT, IC		
	Atropine	.04 - 1.0 mg/kg	IM, IV, IT, IC		
	Calicum Gluconate	100 mg/ml	IM		
Emergency (Shock)	SoluDelta	5mg/kg	IV		
	Hetastarch	5 ml/kg	IV	BID	
	50% Dextrose	1 ml/kg	IV		
Fluid Therapy	Lactated Ringers	1-3% TBW/d^{-1}	IV, PO		
	Reptilian Ringers				
Nutritional	AD_3	0.05 ml/kg	IM		
	B-Complex	0.25 ml/kg	SC		
	Vitamin K	.5 mg//kg	IM		

Reptilian Lactated Ringer's Solution	
1 part	Lactated Ringer's
2 parts	2.5 Dextrose/.45 NaCL

Literature Cited and Additional Resources

Wyneken, Jeanette, Mader, Douglas R., Weber, Scott E and Merigo Constance. Medical Care of Sea Turtles. In Mader, DR, editor: *Reptile Medicine and Surgery*. Philadelphia, 2006. WB Saunders.

Whitaker, B.R., and Krum H. 1999. Medical management of sea turtles in aquaria. Pages 217-231 in Flowler, M.E., and Miller, E.R., eds. Zoo and Wild Animal Medicine. W.B. Saunders Company, Philadelphia, PA.

The Seattle Aquarium (SA) is one of two sea turtle rehabilitation facilities in the Pacific Northwest. Oregon Coast Aquarium (OCA) can also accept stranded sea turtles based on available space, but SA is usually contacted first. During the winter, cold-shocked turtles often become stranded on beaches. Stranding reports usually begin in mid-October. Essentially, the sea turtles are swimming in a warm current that suddenly dissipates. The sea turtle may then find itself caught in much colder water (temperatures <50 °F). There are other scenarios in which a turtle may be injured by human activities, such as boating. Boat propellers can do a great deal of damage to the carapace of a sea turtle. Also, during storm events on the coast of the Pacific Northwest, a sea turtle may find itself pummeled against a rocky coastline.

Sea turtles requiring rehabilitation are typically brought to the Seattle Aquarium within 24 hours from an initial report to Washington State Patrol. Of the five sea turtle species known to occur in the waters of the eastern north Pacific Ocean, the Seattle Aquarium has received and successfully rehabilitated Pacific Green (*Chelonia Mydas*), Loggerhead (*Coretta Coretta*), Pacific Ridley (*Lepidochelys Olivacea*), and Hawksbill (*Eretmochelys Imbricata*) turtles.

Although sea turtles are not exhibited at the Seattle Aquarium, a rehabilitation procedure is necessary in order for staff to mobilize when a request for rehabilitation is received by National Marine Fisheries Service.

Preparing to receive the sea turtle

Seattle Aquarium first points of contact are Dr. Shawn Larson and CJ Casson. These Curators will coordinate staff responsible for receiving a stranded sea turtle. Also, Shawn Larson possesses the rehabilitation license for Seattle Aquarium. The National Marine Fisheries Service (NMFS) should be contacted immediately. Transport to SA is coordinated through Washington State Patrol. Woodland Park Zoo should be contacted for veterinary assistance.

Receiving the sea turtle

Upon arrival, the turtle is brought to a treatment space where the turtle is quarantined from birds and bird biologists. The turtle should be checked and monitored for vitals, such as breathing, pulse and consciousness. The turtle should then be checked for dehydration, sunken eyes, skin elasticity, wounds, cuts, plaque, and lethargy.

After initial, physical checking of the turtle, the turtle should be weighed upon a top-loading scale and carapace length and width measured. The turtle's temperature should be taken with the thermometer probe located in the [work-in-progress] turtle stranding kit. Tail length has been used as a secondary physical characteristic for sexing an adult sea turtle (Longer tail = male). However, some of the turtles that strand are juveniles.

A heat lamp should be attached to either the side of the turtle tub or to one of the overhanging pipes. In addition, a thermometer should be placed inside the turtle tub to monitor air temperature. The foam pad, located in the storage area (turtle stranding kit), should be centered at the bottom of the turtle tub. The turtle should then be gently lifted by two or more people and placed upon the foam pad. A cloacal swab sample should be collected and submitted to Phoenix Central Laboratory for culture.

With access to a dosage calculator and/or scripts from the attending veterinarian, SQ (SQ=subcutaneous) reptile ringers should be administered to the turtle at 10ml/kg. The skin between

the rear legs/flippers and torso is a good location to check for hydration and to administer the SQ ringers. The reptile ringer solution is primarily for re-hydration (electrolytes) but also contains Dextrose (temporary supplemental energy source in lieu of actual food). Due to concerns related to potential secondary infection arising from a turtle's compromised state, Baytril (5mg/kg), Itraconazole (5mg/kg) and Tagamet (5mg/kg) should also be administered.

For the first 24 hours after the turtle's arrival, hourly measurements of the tub's air temperature, the turtle's temperature, and its breaths per minutes should be recorded. The air temperature is measured with the temperature readout from the thermometer in the tub. The turtle's temperature should be taken with the thermometer probe located in the turtle stranding kit, and the breaths per minute should be counted using a stopwatch. Additional, vital information should be recorded. The heat lamp should be adjusted so that the air temperature in the tub is raised 1° F every 3-5 hours until the temperature reaches mid to high 70s ° F when the heat lamp is then adjusted to maintain that temperature.

During the veterinary exam, a sample of the turtle's blood is collected for a complete blood chemistry analysis (sample sent to Phoenix Laboratory). After results of the test are received, the turtle will be administered treatments or supplements, as needed. Typical veterinary scripts are calculated as follows:

Vitamin K : 2-2.5 mg/kg
Vitamin E : 2.5ml/kg
Calcium Gluconate : 10mg/kg
Potassium Chloride : 0.735mEq/kg
Calcium Carbonate : 10mg/kg
Vitamin A : 5.0 IU/g
Vitamin D : 0.6IU/g.

There are some cases that may require specific treatments. For example, if the turtle is anemic, Epoetin Alfa (50IU/kg) and Ferric Hydroxide (7.35mg/kg) should be administered. If the turtle has septicemia, Gentocin (8mg/kg), Amoxi-Inject (100mg/ml), and Amikacin (1mh/lb) should be administered.

Next, the turtle tub should be filled so that the waterline does not reach the top of the foam pad. The tub should be filled with salt water from valve 1 (fast fill), and valve 9 should be opened to allow water transport directly into the heating system, through the UV sterilizers, and to the tub. Once the desired level is reached, the system can be set to re-circulate. For the first week, the turtle should be closely monitored while the water level is maintained just below to top edge of the foam pad. If the turtle is responsive and feeding on its own within 3 days, the tub can be filled to its highest level. However, most of the sea turtles that arrive at SA have required some level of force-feeding. The water level is kept low but can be adjusted higher for "swim time" in the early stages of force-feeding. Once the turtle starts to feed well on its own, the turtle tub can be filled with water all the time.

Attempting to feed the sea turtle

Feeding the sea turtle should be attempted only when the turtle is already on SQ lactated ringers. Proteins the turtle should receive may include squid, herring, smelt, capelin, krill and clams. The turtle

may need to be started off on force-feeding. Because sea turtles have powerful bites, caution should be taken when attempting to force-feed. Force feeding requires 2 or more people. The turtle's jaw should be propped open using a short PVC pipe, while cut-up proteins should be placed into the turtle's mouth using metal forceps. Then, the turtle's throat should be gently massaged to induce swallowing.

Once the turtle starts feeding on its own, the water level may be fully raised in the turtle tub. Additionally, feeding should take place twice a day, and feeding records should be taken. The records should include how much of which foods were fed, supplements fed, and how much the turtle consumed. When feces are found, the net should be used to collect it and the sample should be prepared to be sent into the lab.

Cleaning the tank

Sea turtles are messy animals, and the tub should be cleaned often. Once the turtle starts feeding on its own, the tub should be scooped of debris with the net at least 2 times per day and after each feeding. Failure to do so could result in the filters clogging. In addition, the tub should be drained, scrubbed and refilled daily to ensure a clean tub.

To drain the tub, the pump to the turtle tub should first be turned off. Next, valves 8, 11 and 12 should be opened. The filter knob should be switched to the "waste" position, and UV sterilizers and the heater should be unplugged. Following this, the pump should be turned onto "high". The water level should start to lower, and the tub should start to drain. When the tub is drained, valve 8 should be closed the pump turned off. Using the brush and mop located next to the turtle tub, the bottom and sides of the tub should be scrubbed and mopped to remove any debris and residue.

After the tub is scrubbed down and mopped, the tub should be refilled with water. To do so, first the filter should be switched back to the "filter" position. Next, the tub should be refilled with water from the green hose and valves 1 and 9. Warm water flows through the green hose while salt water in valves 1 and 9. Once the water level reaches the desired height, the salinity should be checked with the refractometer. The salinity should be within 28-30 parts per thousand.

If the turtle is not swimming on its own and is still on the pad, clean, dry towels should be replaced daily between the turtle and the foam pad. Otherwise, if the turtle is active, the pad is no longer needed and can be removed; the turtle should swim on its own.

Treating shell and flipper abrasions and lesions

During stranding, a sea turtle can receive lesions and abrasions to the plastron, carapace, head and flippers. These types of wound should be treated daily. With veterinary scripts, the turtle should be given oral tablets of Sulfamethoxazole/Trimethoprim(5:1) at 30mg/kg to help shell wounds. If the turtle has a soft shell, the turtle should be fed a calcium to phosphorus ration of 1.5:1. All wounds should be cleaned out daily. Shell and flipper wounds, along with grayish areas of skin, should first be scrubbed with Betdaine solution. The affected areas should dry for approximately 10 minutes. Next, Amphoderm should be applied to the wounds and let to dry, followed by wiping away the residue. Finally, the

wounds should be scrubbed with Novalsan disinfectant solution. Also, if plaque is found, it should be scrubbed off the turtle. Records of this treatment should be documented.

Treating a fractured shell

Sea turtles can receive shell fractures from boating accidents or sharp rocks during the stranding. WPZ should be contacted for regular help with this kind of injury. If the turtle has a shell fracture, the water level should be lowered so that the fractured shell is kept dry and clean. An x-ray should be done of the turtle to check for other fractures associated with the fractured carapace. To first treat the fracture, the fracture should be cleaned out using Novalsan disinfectant. Next, with veterinary help, the fracture should be covered with Duoderm patches. The patch should be replaced daily. After the patch is removed, the water level should be raised to allow the turtle to swim around. Later, the water level should be lowered to treat the wound, where the fracture is cleaned out with Novalsan and a new Duoderm patch applied. The WPZ veterinarian should be consulted for debriding the wound. With approval from the veterinarian, the Duoderm patch treatment should be stopped.

The new, daily treatment should be started. The fracture should first be flushed with dilate Novalsan to clean the wound. The holes should be packed with Duoderm granule paste, and a Duoderm patch should be applied to cover the wound. Every other day during this treatment, the wound should be debrided.

When the wound has significantly healed over, the Duoderm granule paste treatment should stop. ILEX ointment, white petroleum product, should be applied to the wound instead. Gradually, the water level can be raised and shell treatment reduced.

Treating sunken eyes

After being stranded, a sea turtle's eyes may be sunken into their head. To treat this, a veterinarian should be consulted for help and chloroamphenical should be applied to the eyes daily.

Tagging the sea turtle

A sea turtle is tagged for possible monitoring of the sea turtle following release. Dr. Shawn Larson should tag the sea turtle with a NMFS pit tag a few days before shipping the turtle. Te tag is placed on one of the turtle's front flippers. This is done before the shipping date to watch for any possible infections caused by the tag.

Shipping the sea turtle

Following treatment at SA, the turtle needs to be released in warm waters. The primary institution that released SA rehabilitated sea turtles is Hubbs SeaWorld Reseach Institute. The marketing department at SA is responsible for contacting and coordinating the shipping and airline details. Historically, Alaska Airlines has been donating transportation. Hubbs should be contacted to organize shipping times and confirm space for reception of the turtle.

During this time, the turtle should continue to be fed and the tub cleaned. A wooden crate should be designed to fit he dimensions of the turtle and packing materials. On the day of the shipment, an ext physical should be performed by a veterinarian. Multiple people should help lift and place the turtle into the turtle bag. The bag both physically restrains the turtle and calms the turtle down by covering the turtle's eyes. The turtle should be snuggly fit into the foam padding and crate to ensure a secure flight. A final crate check should be performed prior to leaving SA. The main precaution is to make sure the turtle will not move during shipping.

SA transports the turtle to SeaTac airport. Upon arrival, the crate and turtle should be checked for the last time. The package is placed on the plane and shipped Hubbs. When the turtle arrives to SeaWorld, a notification from Hubbs should be received.

The sea turtle release

After the sea turtle is received by Hubbs, it is kept in one of many tubs and monitored by the institute's staff. The turtle is fed on a regular basis. The turtle should be released from Hubbs in San Diego when the waters off the coast of California reach the mid 70s °F. Upon successful release, a notification should be sent from Hubbs to SA.

Definitions

Tribrissen and Itraconazole

Sample Log

Time (Hours since arrival)	Breaths per Minute	Air Temp (°F)	Body Temp (F)	Additional Comments	Initials
0.00					
1.00					
2.00					
3.00					
4.00					
5.00					
6.00					
7.00					
8.00					
9.00					

10.00					
11.00					
12.00					
13.00					
14.00					
15.00					
16.00					
17.00					
18.00					
19.00					
20.00					
21.00					
22.00					
23.00					
24.00					

Figure 1: Log template for initial 24 hours following arrival

Bullet Recovery Protocol

If a bullet is recovered at a marine mammal case that you are responding to, please follow the below protocol.

1. Determination
    a. Bullets can be analyzed to determine caliber.
    b. Striations on the bullet are similar to fingerprints; they can indicate a single firearm.

2. How to remove the bullet
    a. Be very careful and do not use a hard instrument such as forceps.
    b. Do not try to clean the bullet, a water wash is encouraged (do not scrub or rub) to remove excess organic material unless genetic examinations are to be performed on the organic material.
    c. If the organic material is to be kept on the bullet, allow the blood or tissue to air dry and then package the bullet in paper wrap (NOT PLASTIC). Bullets must be dry before packaging.
    d. If possible pack each bullet separately in a box of cotton so it will not move during transportation. If it is fragmented try to separate the pieces so they do not rub during shipment. Label the container with the number of fragments.
    e. If the carcass has multiple wounds try to recover all of the bullets. Take a photo of each wound and document it so we can cross reference it with a recovered bullet.
    f. Take a tissue sample if possible.

3. Carefully document how the bullet is recovered. For example, photos or video is great.
    a. Documentation is very important because an attorney may question the method used for the retrieval of the bullet.
    b. NOTE: Chain of custody is extremely important. The chain of custody form is provided in this stranding binder. Document whoever is in contact with the bullet and limit the access to the bullet by securing it is a locked container, room, etc.

4. Call the Office for Law Enforcement
    a. All cases involving shootings should be reported to 1-800-853-1964

NOAA Fisheries Office for Law Enforcement

Evidence Chain of Custody Form

CASE NUMBER _____ **ITEM NUMBER** _____

DATE ACQUIRED _____ ○ **SEIZED** ○ **COLLECTED**

SEIZURE TAG # _____ **EVIDENCE BAG #** *(if used)* _____ **COLLECTED BY** _____

EVIDENCE TYPE _____ **QUANTITY** _____ **DESCRIPTION OF ITEM** _____

EVIDENCE TYPES: (if handwriting)

1. Fishing Gear	2. Fish/Seafood
3. Blood/Tissue	4. Photographs
5. Video	6. Audio
7. Firearm	8. Documents
9. Other	***SELECT ONLY ONE***

Select either YES OR NO from each section	CAFRA	GRAND JURY	ABANDONED
	○ YES	○ YES	○ YES
	○ NO	○ NO	○ NO

OWNERSHIP INFORMATION (If applicable)

ACQUIRED FROM _____ **OWNER'S NAME** _____

DESCRIPTION OF LOCATION FOUND _____

RESPONSIBLE SA/EO _____ **DIVISION** _____ **FIELD OFFICE** _____

Chain of Custody Tracking Information

(Use Continuation Sheet if needed)

			DELIVERY METHOD
TRANSFERRED FROM	**RELEASE SIGNATURE**	**RELEASE DATE**	○ US MAIL ○ FEDEX ○ IN PERSON ○ OTHER
TRANSFERRED TO	**RECEIPT SIGNATURE**	**RECEIPT DATE**	○ US MAIL ○ FEDEX ○ IN PERSON ○ OTHER

COMMENTS _____

Chain of Custody Tracking Information
CONTINUATION SHEET

CASE NUMBER ____ **ITEM NUMBER** ____

RESPONSIBLE SA/EO ____ **DIVISION** ____ **FIELD OFFICE** ____

TRANSFERRED FROM ____ **RELEASE SIGNATURE** ____ **RELEASE DATE** ____

DELIVERY METHOD
- ◯ US MAIL ◯ FEDEX
- ◯ IN PERSON ◯ OTHER

TRANSFERRED TO ____ **RECEIPT SIGNATURE** ____ **RECEIPT DATE** ____

- ◯ US MAIL ◯ FEDEX
- ◯ IN PERSON ◯ OTHER

COMMENTS ____

TRANSFERRED FROM ____ **RELEASE SIGNATURE** ____ **RELEASE DATE** ____

DELIVERY METHOD
- ◯ US MAIL ◯ FEDEX
- ◯ IN PERSON ◯ OTHER

TRANSFERRED TO ____ **RECEIPT SIGNATURE** ____ **RECEIPT DATE** ____

- ◯ US MAIL ◯ FEDEX
- ◯ IN PERSON ◯ OTHER

COMMENTS ____

TRANSFERRED FROM ____ **RELEASE SIGNATURE** ____ **RELEASE DATE** ____

DELIVERY METHOD
- ◯ US MAIL ◯ FEDEX
- ◯ IN PERSON ◯ OTHER

TRANSFERRED TO ____ **RECEIPT SIGNATURE** ____ **RECEIPT DATE** ____

- ◯ US MAIL ◯ FEDEX
- ◯ IN PERSON ◯ OTHER

COMMENTS ____

TRANSFERRED FROM ____ **RELEASE SIGNATURE** ____ **RELEASE DATE** ____

DELIVERY METHOD
- ◯ US MAIL ◯ FEDEX
- ◯ IN PERSON ◯ OTHER

TRANSFERRED TO ____ **RECEIPT SIGNATURE** ____ **RECEIPT DATE** ____

- ◯ US MAIL ◯ FEDEX
- ◯ IN PERSON ◯ OTHER

COMMENTS ____

Photo by Jonna Mazet

Safety measures to prevent injury and infections:

Obtain the recommended training, and follow all of your institution's safety procedures for safe animal handling

♦

Wear gloves and other protective gear when handling animals and specimens

♦

Avoid contact with animals if you are ill

♦

Use additional safety equipment when risks of acquiring an infection are high

♦

Use necropsy, husbandry and laboratory procedures that minimize the risk of cuts and injuries

♦

Consult your physician before working with marine mammals if you are pregnant or have other health concerns

♦

Wash hands thoroughly after animal and specimen contact

Knowledge and careful work practices are your best defense!

What you can do:

Care must be taken to **avoid all possible routes of exposure to marine mammal infections**. Although bites and contact with existing wounds are the most common routes, infections can occur through your mouth, eyes, respiratory system and skin.

Report any animal bite, scratch, or other significant exposure to marine animal blood, saliva, or other excretions to the appropriate supervisor.

If you develop an illness or other condition that could be caused by exposure, be sure to **tell your physician that you work with marine mammals**.

Resources for more information:

1. Full report available from the UC Davis Wildlife Health Center at www.wildlifehealthcenter.org

2. "Public Health" by Cowan et al. in L.A. Dierauf and F.M.D. Gulland, *CRC Handbook of marine mammal medicine 2nd ed.* 2001, Boca Raton, FL: CRC Press

3. The Centers for Disease Control and Prevention www.cdc.gov

4. National Institute of Environmental Health Science: Biological Safety http://www.niehs.nih.gov/odhsb/home.htm

Working with Marine Mammals and Your Health

Photo by Deborah Gabris

A guide for marine mammal workers and rehabilitation volunteers

Important information to keep you aware, safe, and healthy

Provided by:

U.S. Marine Mammal Commission
National Marine Fisheries Service
Wildlife Health Center, UC Davis

Important information about marine mammals

Like most animals, marine mammals can carry microbes (bacteria, viruses, fungi) that can cause illness in humans. Many marine mammals that appear healthy and normal can carry organisms that are dangerous to humans.

Marine mammals have been shown to carry many of the pathogens we associate with food poisoning, such as *E. coli*, *Salmonella*, and *Listeria*. Like other wildlife, seals and sea lions can shed the protozoan, *Giardia* in their feces. *Giardia* can cause diarrhea and other symptoms in humans. In rare cases, marine mammals may be infected with very dangerous pathogens, like the rabies virus and the organism that causes tuberculosis.

Pathogens known to be transmitted from marine mammals to people

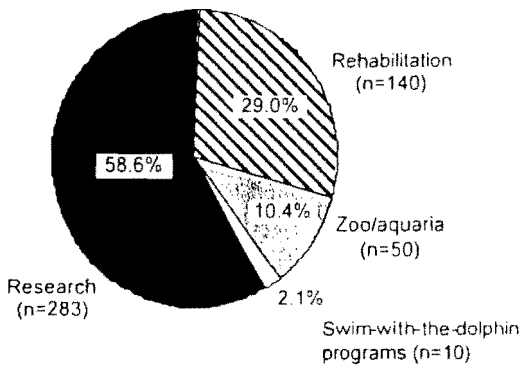
Mycoplasma found in seals can cause "seal finger" in humans. This painful and potentially serious disease can result from a seal bite or the infection of a pre-existing wound. Diligent hand washing is the best defense with infections often responding to tetracycline treatment.

Seal pox is a disease of stranded seals and can be encountered in rehabilitation centers. It can cause pox sores in humans that may persist for up to a year. There is no known effective treatment.

Leptospirosis contracted from seals and sea lions can cause serious disease in humans.

Reported injuries and illnesses in people who work with marine mammals

A total of 483 marine mammal workers responded to a recent survey about their health. The majority of respondents identified research as their primary type of marine mammal contact.



The survey showed that injuries and work-related illnesses are common.

In fact, **over half (54%) of workers reported having at least one injury or illness** that they believed directly resulted from contact with marine mammals. Most were cuts, scrapes, bites, and rashes. About 1 in 10 (11%) marine mammal workers reported developing **seal finger**.

Injury occurred in over half (52%) of workers while handling marine mammals or tissues. Of those injuries, over a third (36%) were severe (e.g. deep wound or fractured bone).

Several dangerous infections were reported by marine mammals workers, including **tuberculosis**, **leptospirosis**, and **brucellosis**.

Photo by Erica Dold

Regardless of experience and training, marine mammal workers are at risk of injury and infection.

Exposure to marine mammals can mean exposure to the infections they carry.

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Northwest Region
7600 Sand Point Way N.E., Bldg. 1
Seattle, WA 98115

NOAA Fisheries Guidelines for Handling Marine Mammals
October, 2006

Health Advisory: Marine Mammal Diseases

Like most animals, marine mammals can carry microbes that can cause illness in humans. Several diseases have possible transmission to humans; these include Brucella, Mycobacterium marinum, Mycoplasma, and Erysipelothrix. Other diseases are documented having public health significance such as the pox virus found in California seal lions and Harbor Seals. The parapox viruses of pinnipeds can cause isolated lesions on the hands of humans that have come in contact with infected marine mammals. This is not a life threatening virus, but an example that when working with marine mammals to use caution.

Recent findings of harbor porpoise strandings in the summer of 2006 bring to our attention a respiratory infection caused by the fungal organism *Cryptococcus gattii. C.gattii* was discovered at the southeastern end of Vancouver Island in 1999 and cases have been present in Dall's porpoise and Harbor porpoises since then. This disease is a recent discovery; human cases were first noted in 1999. However, animal cases were identified prior to 1999 in our region and concern is being raised over its potential to move from species to species. In light of this new finding it is a good time to review a few precautionary measures that will help prevent transmission of marine mammal diseases to humans. They are also applicable to other communicable diseases.

Please follow the below safety measures to prevent injury and illness:

- Obtain the recommended training, and follow all of your institution's safety procedures for safe animal handling.
- Wear gloves and other protective gear when handling animals and specimens.
- Use additional safety equipment when risks of acquiring an infection are high.
- Use necropsy, husbandry, and laboratory procedures that minimize the risk of cuts and injuries.
- Consult your physician before working with marine mammals and advise them of your work with, or any recent exposure to marine mammals if you are pregnant or have other health concerns.
- Wash hands thoroughly after animal and specimen contact.
- If you are bitten, cut, or injured while handling an animal or tissues, seek professional medical attention. Do not rely on first aid alone. Some of the diseases that could be transmitted are rarely encountered and may not be correctly diagnosed if a physician is not provided with an adequate history.

For more information please visit, http://www.vetmed.ucdavis.edu/whc/mmz/

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Northwest Region
7600 Sand Point Way N.E., Bldg. 1
Seattle, WA 98115

NOAA Fisheries Guidelines for Handling Marine Mammals
May 4, 2009

Health Advisory: *Coxiella burnetii*

Marine mammals can be infected with microbes that can also cause illness in humans. A recent finding in a harbor seal *(Phoca vitulina)* stranding in May 2008 in Westport, WA showed that the pregnant animal was dying of protozoal encephalitis and the placenta was suspected to be infected with an intracellular bacterium, known as *Coxiella burnetti.* A second suspect case of *C. burnetii* was identified from a pregnant female Steller sea lion *(Eumetopia jubatus)* that stranded fresh dead in Westport, WA. Cattle, sheep, and goats are the primary reservoirs of *C. burnetii.* Infection has been noted in a wide variety of other animals, including other species of livestock and in domesticated pets. *Coxiella burnetii* does not usually cause clinical disease in these animals, although abortion in goats and sheep has been linked to *C. burnetii* infection. Organisms are excreted in milk, urine, and feces of infected animals. Most importantly, during birthing the organisms are shed in high numbers within the amniotic fluids and the placenta. The organisms are resistant to heat, drying, and many common disinfectants. These features enable the bacteria to survive for long periods in the environment.

Humans are very susceptible to the disease, and very few organisms may be required to cause infection. Infection of humans usually occurs by inhalation of these organisms from air that contains airborne dust contaminated by dried placental material, birth fluids, and excreta of infected herd animals or by direct contact with these fluids. Veterinarians, farmers and others with occupational or recreational exposure to animals and their tissues are most likely to be affected.

In humans, infection is known as Q fever. Most acute cases of Q fever begin with sudden onset of one or more of the following: high fevers (up to 104-105° F), severe headache, general malaise, myalgia, confusion, sore throat, chills, sweats, non-productive cough, nausea, vomiting, diarrhea, abdominal pain, and chest pain. The disease can cause pneumonia, hepatitis and persistent weight loss. Most patients recover within several months; only 1%-2% of people with acute Q fever die of the disease.

Over the course of the last 8 years a number of pregnant harbor seals and post partum placentas have been evaluated microscopically and this is believed to be the first recognized case of *Coxiella* infection in a marine mammal in the Pacific Northwest. A previous case was reported in a harbor seal taken to rehabilitation and electively euthanized due to protozoal encephalitis at Marin County, California. Efforts to enhance collection and evaluation of reproductive tissues from harbor seals in the Pacific Northwest may be considered to further define the extent of infection and possible contribution to impaired reproductive performance.

In light of this new finding it is a good time to review a few precautionary measures that will help prevent transmission of marine mammal diseases to humans. They are also applicable to other communicable diseases.

Please follow the below safety measures to prevent injury and illness:

- Obtain the recommended training, and follow all of your institution's safety procedures for safe animal handling.
- Wear gloves and other protective gear when handling animals and specimens.
- When handling, collecting or moving aborted tissues, placentas, amniotic fluid, or fetal tissues from a pregnant animal, use special precautions such as a face mask.
- Use additional safety equipment when risks of acquiring an infection are high.
- Use necropsy, husbandry, and laboratory procedures that minimize risk of cuts and injuries.
- Consult your physician before working with marine mammals and advise them of your work with, or any recent exposure to marine mammals if you are pregnant or have other health concerns.
- Wash hands thoroughly after animal and specimen contact.
- If you are bitten, cut, or injured while handling an animal or tissues, seek professional medical attention. Do not rely on first aid alone. Some of the diseases that could be transmitted are rarely encountered and may not be correctly diagnosed if a physician is not provided with an adequate history.

For more information on Q fever please visit:
http://www.cdc.gov/ncidod/dvrd/qfever/index.htm.

Zoonotic Diseases

Zoonotic diseases are diseases that can be transmitted from animals to humans. There are known zoonotic diseases that come from marine mammals and have been transmitted to people working with them. A table is provided that contains examples of some of these diseases. This information is meant to educate volunteers on the importance of taking precautionary measures while working with marine mammals.

Use common sense and follow the guidelines put forth in the "Working with Marine Mammals and your Health".

Pathogens	**Symptoms**
Brucella spp.	Flu-like symptoms, bone pain
Calicivirus	Skin blisters / skin lesions
Coxiella burnetti	Q-Fever, headache, confusion, sore throat, chills, sweats.
Erysipelothrix sp.	
Leptospira sp.	Chills, headaches, myalgia, eye pain. Mild symptoms.
Mycoplasma spp. (Seal Finger)	Typically occurs after a pinniped bite and can cause swelling and severe pain in the joint of hands.
Seal poxvirus	Skin lesions

*Information in the above table is provided by the Programmatic Environmental Impact Statement for the Marine Mammal Health and Stranding Response Program and Marine Mammals Ashore: A Field Guide for Strandings.

For more information please visit:
http://www.vetmed.ucdavis.edu/whc/MMZ/dz_index.htm

Vol. 81: 81–92, 2008
doi: 10.3354/dao01942

DISEASES OF AQUATIC ORGANISMS
Dis Aquat Org

Published August 19

Contribution to DAO Special 3: 'Marine vertebrate zoonoses'

OPEN ACCESS

Health risks for marine mammal workers

Tania D. Hunt[1], Michael H. Ziccardi[1], Frances M. D. Gulland[2], Pamela K. Yochem[3], David W. Hird[1,4], Teresa Rowles[5], Jonna A. K. Mazet[1,4,*]

[1]Wildlife Health Center, School of Veterinary Medicine, and [4]Department of Medicine and Epidemiology, University of California, One Shields Avenue, Davis, California 95616, USA

[2]The Marine Mammal Center, Golden Gate National Recreation Area, Sausalito, California 94965, USA

[3]Hubbs-SeaWorld Research Institute, 2595 Ingraham Street, San Diego, California 92109, USA

[5]National Marine Fisheries Service, Office of Protected Resources (F/PR2), East-West Highway, Silver Spring, Maryland 20910, USA

ABSTRACT: Marine mammals can be infected with zoonotic pathogens and show clinical signs of disease, or be asymptomatic carriers of such disease agents. While isolated cases of human disease from contact with marine mammals have been reported, no evaluation of the risks associated with marine mammal work has been attempted. Therefore, we designed a survey to estimate the risk of work-related injuries and illnesses in marine mammal workers and volunteers. The 17-question survey asked respondents to describe their contact with marine mammals, injuries sustained, and/or illnesses acquired during their period of marine mammal exposure. Most respondents, 88% (423/483), were researchers and rehabilitators. Of all respondents, 50% (243/483) reported suffering an injury caused by a marine mammal, and 23% (110/483) reported having a skin rash or reaction. Marine mammal work-related illnesses commonly reported included: 'seal finger' (*Mycoplasma* spp. or *Erysipelothrix rhusiopathiae*), conjunctivitis, viral dermatitis, bacterial dermatitis, and non-specific contact dermatitis. Although specific diagnoses could not be confirmed by a physician through this study, severe illnesses were reported and included tuberculosis, leptospirosis, brucellosis, and serious sequelae to seal finger. Risk factors associated with increased odds of injury and illness included prolonged and frequent exposure to marine mammals; direct contact with live marine mammals; and contact with tissue, blood, and excretions. Diagnosis of zoonotic disease was often aided by veterinarians; therefore, workers at risk should be encouraged to consult with a marine mammal veterinarian as well as a physician, especially if obtaining a definitive diagnosis for an illness becomes problematic.

KEY WORDS: Marine mammal · Disease · Zoonoses · Occupational hazards · Seal finger

INTRODUCTION

Despite the fact that marine mammals can become sick due to infection with, or be healthy carriers of, viral, bacterial, fungal, and protozoal zoonotic pathogens (disease agents transmissible between animals and humans), the risk of acquiring disease by scientists, wildlife rehabilitators, and animal trainers handling marine mammals is not well understood (Buck & Schroeder 1990, Geraci & Ridgway 1991, Cowan et al. 2001). An example of a commonly seen marine mammal zoonotic disease includes 'seal finger,' a common skin infection reported in whalers and sealers caused by a mycoplasmal organism carried in the mouth and on the skin of marine mammals (Baker et al. 1998, Hartley & Pitcher 2002). Epidemics of food-borne illnesses, such as salmonellosis, trichinellosis, and toxoplasmosis, have also been reported in the native peoples of Arctic and Australasian regions who harvest marine mammals as part of a traditional diet (Cawthorn 1997, Tryland 2000). For example, botulism Type E, characterized by symmetric flaccid paralysis, was reported in western Alaska in people who had eaten a beached whale (McLaughlin et al. 2004).

*Corresponding author. Email: jkmazet@ucdavis.edu

Zoonotic disease transmission as a result of occupational contact between marine mammals and humans has been reported, and these include infections of marine mammals with zoonotic agents, such as *Staphylococcus aureus* and *Vibrio parahemolyticus* (Palmer et al. 1991, Cowan et al. 2001), as well as gastritis and localized skin infections in attending veterinarians (P. Schroeder pers. comm.). Although hundreds of seal finger or seal finger-like cases have been reported in fishermen and sealers, only 8 cases in scientists or rehabilitators have been described in the scientific literature (Rodahl 1953, Markham & Polk 1979, Sargent 1980, Eadie et al. 1990, Cawthorn 1994, Baker et al. 1998, Hartley & Pitcher 2002). Cases of seal finger-like diseases in fishermen are more likely to be caused by *Erysipelothrix rhusiopathiae* acquired from fish (thereby more aptly named 'fish-handlers disease'), whereas cases acquired from marine mammals are presumably mostly caused by *Mycoplasma* spp. (Robson et al. 1998, Cowan et al. 2001). Other reports of marine mammal workers acquiring skin diseases include: 1 case of *Mycobacterium marinum* from a bottlenose dolphin *Tursiops truncatus* (Flowers 1970); 4 cases of *Erysipelothrix rhusiopathiae* from a beached pilot whale *Globicephala melaena* (Chastel et al. 1975); 1 case of a calicivirus, San Miguel sea lion virus, from northern fur seals *Callorhinus ursinus* (Smith et al. 1998); and 3 cases of sealpox from grey seals *Halichoerus grypus* (Hicks & Worthy 1987, Clark et al. 2005). Infections with *M. marinum* and *E. rhusiopathiae* caused painful dermal abscesses at the site of contamination, while the viral infections (sealpox and San Miguel sea lion virus) resulted in edematous nodules or vesicles.

In addition to skin infections, generalized zoonotic infections have been observed in marine mammal workers. One case of *Blastomyces dermatitidis* acquired from a bottlenose dolphin has been reported; a veterinarian treating the affected animal experienced a pustular dermatitis with lymphangitis and lymphadenitis (Cates et al. 1986). Similarly, transmission of *Mycobacterium bovis* from a New Zealand fur seal *Arctocephalus forsteri* to an oceanarium worker has been documented (Thompson et al. 1993), with the seal trainer experiencing a tuberculous pneumonia and severe airway obstruction. Lobo's disease (keloidal blastomycosis), caused by the fungus *Lacazia loboi* (formerly *Loboa loboi*), has also been transmitted from a captive bottlenose dolphin to a handler (Symmers 1983). Three researchers acquired leptospirosis from California sea lion *Zalophus californianus* carcasses and experienced acute nephritis and clinical signs consistent with acute renal failure (Baker et al. 1998). One laboratory worker developed brucellosis after handling tissues from an infected seal (Brew et al. 1999). Finally, 4 aquarium workers suffered severe purulent conjunctivitis caused by influenza A virus acquired from harbor seals *Phoca vitulina* (Webster et al. 1981).

These case reports document the potential for organisms in marine mammals to infect humans. However, they do not provide information on risk factors associated with humans acquiring such infections. Animal trainers, veterinarians, and volunteers who staff wildlife rehabilitation centers treating sick and injured marine mammals, as well as field researchers and workers at aquaria and oceanaria that exhibit marine mammals to the public, are likely to be at risk. During certain recreational activities, the public may also be at risk of transmitting diseases to and contracting diseases from marine mammals. Thousands of people visit oceanaria where contact with marine mammals (or the water in which they swim) is common. Many also participate in 'swim-with-the-dolphin' programs. In 1989, over 8000 people participated in these 'swim-with' programs in the USA alone (National Marine Fisheries Service 1990). While information on the injurious attacks made by dolphins on humans is available, less attention has been paid to the potential for transmission of infectious diseases (exceptions include Johnston & Fung 1969, Myers 1970, Streitfeld & Chapman 1976, Polley 2005). In addition, the interaction between diseased marine mammals and humans in these occupational contexts may increase the flow of pathogens between marine mammals and humans and contribute to the emergence of infectious disease.

The purpose of this study was to evaluate the risk of human injury and illness associated with marine mammal rehabilitation, captive management, and research activities by surveying a sample of people involved in these activities. While the results help to identify risk factors for marine mammal workers, the survey instrument was designed to protect the anonymity of the respondents; therefore, all injuries and illness were self-reported, and corroboration of specific diagnoses by physicians was not possible.

MATERIALS AND METHODS

Survey administration and participants. A 17-item questionnaire (Appendix 1) was formulated to evaluate risk of injury and illness associated with occupational contact with marine mammal species. After piloting the questionnaire with a small group of marine mammal workers and obtaining reviews by experts in the field, it was made available via the internet to over 5000 potential responders from 72 countries. Participants were sought primarily by email notices posted on the MARMAM listserv.[1] A paper-based version of the same questionnaire was also

made available to participants at both the Biennial Conference on the Biology of Marine Mammals (November 28 to December 3, 2001, Vancouver, British Columbia, Canada) and the International Association for Aquatic Animal Medicine (May 4 to 8, 2002, Albufeira, Portugal), as well as to individuals upon request. Postcards containing the questionnaire's web address were also provided at the conferences. Respondents participated in the survey in complete anonymity. Responses originating from the web-based questionnaire were collected electronically; the paper-based responses were received by mail at the Wildlife Health Center, University of California, Davis, California, USA.

Questionnaire content. The 17 questions (Appendix 1) allowed for evaluation of the respondents' interactions with marine mammals and the description of injuries and illnesses suffered by respondents during the time in which they were exposed to marine mammals. Questions regarding respondents' association with marine mammals addressed the primary nature of occupational contact (research, rehabilitation, zoo and aquaria employment, and 'swim-with-the-dolphin' programs), the duration and frequency of contact, the type of marine mammal-specific occupational training received, and specific modes of contact (direct contact with live marine mammals while out of water or while in the water with them, contact with water in which a marine mammal swam, contact with marine mammal excretions and/or vomitus, contact with tissue or blood samples from marine mammals, cleaning or repairing enclosures or equipment used in the care of marine mammals, and contact with dead marine mammals). Participants could select only one primary type of occupational contact but were allowed to indicate more than one type of training and specific modes of contact. Questions regarding respondents' injuries and illnesses were designed to explore the nature and duration of the injuries and associations with marine mammal contact. Note that injuries and illnesses were attributed by the respondents to their marine mammal contact; confirmation of each diagnosis by a physician was not possible using only the survey instrument. Additional questions concerned the demographics and health of the respondents and allowed respondents to describe any specific diagnoses and treatments received for their reported illnesses and injuries, including the success of those treatments.

[1]MARMAM is an edited e-mail discussion list which focuses on marine mammal research and conservation, run through the University of Victoria; publishers: Robin Baird & Megan Ferguson (marmamed@uvic.ca); http://whitelab.biology.dal.ca/marmam.htm

Data analysis. The prevalence of 4 health outcomes (trauma, skin rash/reaction, respiratory illness, and prolonged malaise) were calculated from the total number of respondents. The outcomes were further examined for severity and occurrence subsequent to or as a result of marine mammal contact.

Logistic regression was used to evaluate potential risk factors associated with the 4 outcomes using the backward stepwise likelihood ratio method (Daniel 1999). Odds ratios and 95% confidence intervals (CIs) were calculated in order to assess the magnitude of associations (SPSS, v. 11.0.1). Where appropriate, interaction terms among contact types, and duration and frequency of contact were included in the model.

RESULTS

Survey response and respondent characteristics

A total of 483 responses were received (45% male and 55% female respondents), 413 of which were collected via the internet. Respondents most frequently reported research as their primary type of occupational marine mammal contact (n = 283) (Fig. 1). Nearly 80% (386) of respondents reported receiving training in animal restraint and handling, 76% in tissue and blood sampling, 44% in infectious disease prevention protocols, and 49% in occupational safety. Most respondents (392) had substantial exposure to marine mammals with >5 yr of experience and/or >50 d yr^{-1} of contact (Figs. 2 & 3).

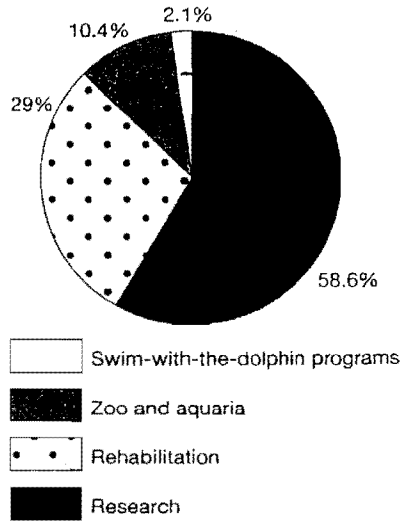


Fig. 1. Primary type of marine mammal contact reported by marine mammal workers (n = 483)

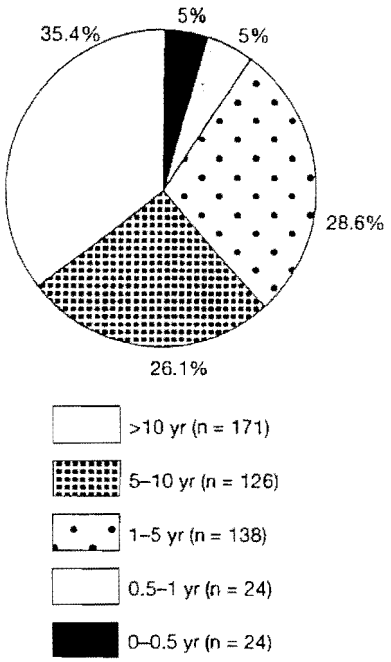


Fig. 2. Duration (yr) of marine mammal contact reported by marine mammal workers (n = 483)

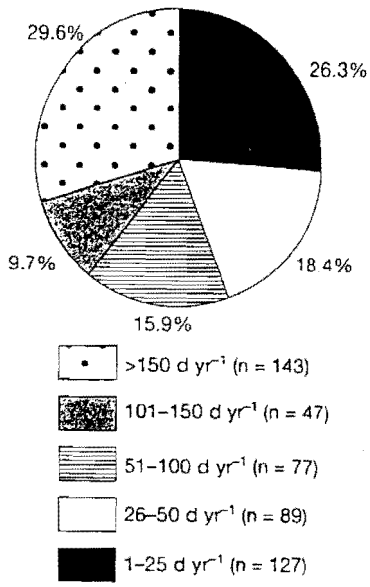


Fig. 3. Frequency (d yr^{-1}) of marine mammal contact reported by marine mammal workers (n = 483)

Of all 483 respondents, 64% (308) reported having had an injury or illness during the time they were in contact with marine mammals and 54% (261) believed they had contracted an illness or injury as a direct result of marine mammal contact. Types of injuries and illnesses are shown in Table 1.

Table 1. Self-reported health problems attributed to marine mammal contact by marine mammal workers (n = 483). Number of commonly reported health problems are detailed in sub-categories

Health problem	Total
Trauma	**251**
Deep wounds	77
Bites	38
Wounds requiring stitches	26
Fractures	10
Skin reactions	**72**
Erysipelothrix rhusiopathae[a]	4
Erysipeloid infections[b]	3
Mycoplasma spp.[b]	2
Other bacterial infections[a]	5
Sealpox	2
Inflammation post necropsy	4
Contact dermatitis	4
Non-specific rashes	10
Respiratory illness	**18**
Tuberculosis pneumonia	2
Bronchitis	2
Non-specific irritation	12
Generalized symptoms & prolonged illness	**14**
Brucellosis[b]	2
Leptospirosis[a, b]	2
Erysipelothricosis[a]	1
Tuberculosis pneumonia[a]	1
Conjunctivitis	3
Systemic effects after traumatic injury (no specific etiology given)	5

[a]Agent was cultured from patient
[b]Agent was suspected in diagnosis

Trauma

A total of 251 (52%) respondents suffered a traumatic injury as a result of working with marine mammals. Injuries were primarily located on the extremities (n = 218; 89%) but were also incurred on the torso or abdomen (20; 8%) and on the face (11; 4%). Ninety (36%) of those reporting trauma suffered 1 or more severe injuries, including: a deep wound (77), a deep wound requiring stitches (26), or a fractured bone (10). Other severe injuries described included a dislocated shoulder and an amputation. Also, 38 (15%) reported having been bitten. Of the total number of reported injuries, 5 were self-inflicted traumas, including needle sticks and necropsy knife cuts.

The results of a multivariate logistic regression analysis showed that statistically significant risk factors ($p < 0.05$) associated with traumatic injuries included marine mammal contact duration of >5 yr; contact frequency of >50 d yr^{-1}; and having contact specifically with live animals, excretions and/or vomi-

tus, or blood and tissue samples. The factors related to time carried the highest risk, with those exposed most frequently having 23 times (95% CI 5.3–99.3) greater odds of experiencing a traumatic injury and those exposed for the longest duration having 19 times (95% CI 3.9–87.4) greater odds of experiencing a traumatic injury than workers with less exposure. Having both exposure to enclosures and equipment and a contact duration of >5 yr also quadrupled the odds of injury (95% CI 1.3–10.5) above workers who primarily had contact with marine mammal carcasses and a shorter contact duration. Conversely, having worked with tissue or blood samples combined with >5 yr of marine mammal experience decreased odds for injury. Interacting with live marine mammals combined with a contact frequency of >50 d yr^{-1} was similarly protective for trauma (Table 2).

Table 2. Risk factors for injury of marine mammal workers. Adjusted odds ratios calculated using multivariate logistic regression; reference category for each estimate includes respondents not reporting exposure to the specific risk factor of interest (95% CI: confidence interval). EF: exposure frequency; ED: exposure duration

Risk factors	Number at risk (n = 483)	Adjusted odds ratio (95% CI)
ED >5 yr	297	18.5 (3.93–87.40)
EF >50 d yr^{-1}	267	23.0 (5.32–99.28)
Contact with live marine mammals	385	7.1 (2.10–23.901)
Contact with tissue/blood samples	407	3.0 (1.33–6.78)
Contact with marine mammal excretions/vomitus	365	3.3 (1.72–6.53)
Cleaning or repairing enclosure/equipment	259	1.3 (0.73–2.28)
Cleaning or repairing enclosure/equipment & ED >5 yr	159	3.7 (1.33–10.50)
Contact with tissue/blood samples & ED >5 yr	266	0.1[a] (0.22–0.58)
Contact with live marine mammals & EF >50 d yr^{-1}	236	0.1[a] (0.22–0.50)

[a]Protective

Table 3. Risk factors for skin rash/reaction in marine mammal workers. Adjusted odds ratios calculated using multivariate logistic regression; reference category for each estimate includes respondents not reporting exposure to the specific risk factor of interest (95% CI: confidence interval)

Risk factors	Number at risk (n = 483)	Adjusted odds ratio (95% CI)
Exposure duration >5 yr	297	1.8 (1.15–2.79)
Exposure frequency >50 d yr^{-1}	267	1.7 (1.10–2.72)
Contact with marine mammal excretions/vomitus	365	2.2 (1.08–4.27)
Cleaning or repairing enclosures/equipment	259	1.9 (1.12–3.14)

Skin conditions

From the total number of respondents, 113 (23%) reported having a skin rash or reaction during the time they worked with marine mammals; 73 of these (64%) reported that their skin rash or reaction occurred after direct contact with a marine mammal, while 36 (32%) reported that the ailment appeared after a bite from a marine mammal. The odds of workers acquiring a skin rash or reaction were doubled by having marine mammal contact for >5 yr (95% CI 1.2–2.8) or >50 d yr^{-1} (95% CI 1.1–2.7); by having contact with marine mammal excretions and/or vomitus (95% CI 1.1–4.3); and by cleaning or repairing enclosures or equipment (95% CI 1.1–3.1; Table 3).

Illnesses commonly reported by survey participants included seal finger (*Mycoplasma* spp. or *Erysipelothrix rhusiopathiae*); viral dermatitis (poxvirus or herpesvirus); bacterial infections (including *Clostridium perfringens*, *Staphylococcus aureus*, *Mycobacterium marinum*, *Corynebacter* spp., *Pseudomonas* spp., *Vibrio* spp., *Pseudomona* spp.); and non-specific contact dermatitis. The number of respondents that reported seal finger was 55 (11%); however, no statistically significant risk factors specifically associated with acquiring seal finger were identified.

Respiratory illness

Out of all of respondents, 18% (n = 89) reported experiencing respiratory illness during the time they worked with marine mammals. Of these, only 20% (18) believed their ailment to be the result of marine mammal contact. Seven of these worked in a rehabilitation setting, 8 in research, and 3 in an oceanarium. Increased frequency of contact was associated with a higher risk of respiratory illness, with workers exposed >50 d yr^{-1} being 3 times more likely to have a respiratory illness than workers with less annual exposure (95% CI 1.9–5.4).

Generalized symptoms and prolonged malaise

Of all respondents, 6% (n = 30) reported having suffered prolonged malaise while they worked with marine mammals. Of these, 30% (9) believed their ill-

ness was due to marine mammal contact. Most of these cases (5 of 9) were never definitively diagnosed despite all 9 workers seeking medical treatment. There were no statistically significant risk factors associated with prolonged malaise.

DISCUSSION

While the internet has become a useful tool for administering health surveys, it possesses many of the same flaws of paper-based or in-person surveys. Persons who have experienced a significant impact to their health are much more likely to remember it and to recount it in such a survey, while people who have not experienced adverse health are less likely to respond, leading to a possible non-response bias (Kuusi et al. 2004). Therefore, our data may overestimate the actual risk of injury and illness in people who contact marine mammals. On the other hand, 58.6% of the survey respondents were members of the research community. As a result of their scientific training, these respondents may have been more likely to require evidence of causation rather than assume that their injuries and illnesses were linked with their marine mammal exposure. The potential for overestimation of prevalence of injury and illness might have been countered by responding scientists' conservative linkages of those injuries and illnesses to marine mammal causes. Written comments by respondents provided evidence that many were aware of the health risks associated with their occupational activities and were making informed decisions regarding their work with marine mammals. One respondent commented, 'Considering the hundreds of necropsies and many months of crawling through fur seal rookery muck (splashed in the face many times), I feel I have really suffered very little in spite of the risks to which I was exposed.' It is also feasible that there could have been rare cases of death resulting from marine mammal contact, making the affected individual unavailable for response. Such deaths are undoubtedly extremely rare or coincidental to marine mammal contact and are unlikely to have influenced estimates; however, we were contacted by the spouse of a marine mammal worker whose husband died after a bite from a pinniped reportedly as a result of a severe hypersensitivity reaction (data not included in analyses).

The most common health problems reported by marine mammal workers were traumatic injuries. Over half of participants reported having been injured by a marine mammal. The analysis of risk factors suggests that individuals who worked in marine mammal facilities or research >5 yr and those exposed to such work >50 d yr^{-1} had the highest risk for injury. It is logical that prolonged and frequent exposure increased risk for injury proportionately with frequency of contact.

Most injuries described were cuts and scrapes, followed in frequency by bites. It appears that individuals who worked with *live* marine mammals >50 d yr^{-1} acquired the skills to mitigate injury, as these occupational exposures in combination were protective. This finding is interesting but not unexpected, as individuals allowed to handle marine mammals on a regular basis are likely the most highly trained and trusted employees.

Cleaning or repairing enclosures or equipment was not a significant individual risk factor for injury. Yet when combined with prolonged exposure (>5 yr), this duty carried an increased risk, making workers over 3 times more likely to be injured than cleaning or repairing enclosures or equipment alone. The interaction between these 2 factors supports the logical assertion that prolonged exposure to a risk factor may increase workers' odds of injury. In addition, individuals who had years of experience with these cleaning and repairing duties may have become less vigilant about safety precautions.

While the highest risks of traumatic injury were associated with direct exposure to live marine mammals, people who had contact with tissue or blood samples and those who contacted excretions and vomitus did have elevated and nearly equivalent odds of injury. Given the nature of the exposure, it is likely that the techniques used to collect and process biological samples involved needles, knives, and scalpels, placing the workers at risk of cuts and scrapes. In contrast to the findings associated with cleaning or repairing enclosures, experience (>5 yr) in these workers decreased risk, suggesting that marine mammal workers in technically-demanding or highly-trained positions may be more careful or have developed techniques to safely perform their duties and avoid personal harm. It may also be possible that individuals in these technically-demanding positions have advanced into more administrative positions over time, thereby increasing their duration of exposure but decreasing their frequency of contact and risk of injury over the years.

Although it is difficult to generalize among different types of occupational exposure, our findings are consistent with the reported nonfatal cases of work-related injuries and illnesses that are recorded by employers under the Occupational Safety and Health Administration's Survey of Occupational Injuries and Illnesses. This study found injuries to be the most common health problem reported in USA workers, and skin ailments to be the second most prevalent non-fatal illness (National Institute for Occupational Safety and Health 2000). Nearly one quarter of our respondents reported experiencing a skin rash or reaction. As with

injury, people with longer and more frequent exposure were at higher risk for skin ailments. These skin reactions were often associated with exposure to excretions/vomitus and cleaning or repairing activities, and may have been in part due to the handling of caustic and harsh cleaning solutions, as most of the skin reactions were described as contact dermatitis or rashes. Rashes were a common written complaint in individuals handling dead marine mammals. Reaction to something on or growing in decomposing whale flesh was repeatedly described. For example, one survey respondent reported that 'the rash was contracted immediately following direct and prolonged contact with deteriorating whale carcasses; the areas affected were those that were in direct contact with the carcasses; other members of the team had same symptoms after the same type of contact with same animals.'

The skin disease commonly referred to as seal finger deserves particular discussion. More than 10% of participants reported having experienced seal finger, and at least half of those affected sought diagnostics and treatment from a physician. *Mycoplasma phocacerebrale* was identified as the likely etiologic agent (Baker et al. 1998); however, seal finger was previously described as being caused by *Erysipelothrix rhusiopathiae*. Cutaneous infections resulting from both of these organisms are clinically similar. The inoculation site is usually extremely painful, swollen, and erythematous with lymphadenitis being common (Thompson et al. 1993, Robson et al. 1998, Hartley & Pitcher 2002). Unfortunately, the recommended treatments are very different. *E. rhusiopathiae* is responsive to penicillins, cephalosporins, and erythromycin, while *Mycoplasma* spp. are usually resistant to the aforementioned antibiotics and responsive to tetracyclines. Improper treatment of infections caused by either of these organisms could result in local and hematogenous spread, leading to tenosynovitis, osteomyelitis, and, in the case of *E. rhusiopathiae*, endocarditis. This severity was illustrated by one participant who reported suffering a prolonged malaise >6 mo with 'life threatening toxemia/encephalopathy' as a sequela to a 'minor skin cut' acquired while working with a harbor porpoise carcass. *E. rhusiopathiae* was cultured from the infection, and despite treatment with 3 different antibiotics, amputation of the affected digit 'proved life-saving.'

Prolonged malaise and respiratory illnesses were infrequently reported; therefore, substantial risk factors were not identified. However, considering the seriousness of the diseases suspected or reportedly diagnosed (including tuberculosis, brucellosis, and leptospirosis), educating workers and volunteers about these zoonotic diseases is very important. They may be difficult to diagnose and can be debilitating or life-threatening for the patient. One participant suffered for more than 6 mo from a tuberculous pneumonia that her physician attributed to her work with dolphins. Unfortunately, the documentation provided in the survey response did not allow for other possible routes of transmission to be examined. Nonetheless, this marine mammal rehabilitation volunteer experienced night sweats, weight loss, chronic fatigue, and anemia; she was treated for 9 mo with isoniazid for the tuberculosis and 'dozens of antibiotics' for secondary bacterial infections. She wrote that she 'had always been an extremely healthy person,' but now is in search of 'continued medical assistance.' Another participant suffered multiple relapses of a respiratory illness (2 to 4 times per year with a 2 to 4 wk duration) during his 3 yr of rendering marine mammal tissues. His illness was characterized by 'non-specific symptoms,' and differential diagnoses included chronic fatigue syndrome, multiple sclerosis, and brucellosis (since 10% of the tissues with which he worked were positive for *Brucella* spp.). A specific diagnosis was never confirmed. This researcher was treated with various antibiotics, some of which improved symptoms temporarily, but the illness recurred.

These cases illustrate a common complaint among respondents: their physicians were inadequately informed about the pathogens that could be transmitted from marine mammals. The variability in risk communication from physician to patient appeared to be very high, with some physicians immediately investigating possible marine mammal zoonoses and others dismissing potential transmission altogether. For example, one participant was told by his physician that there were 'no diseases that could be transmitted from whales to humans — so don't worry about it.' When knowledgeable, patients educated their physicians about the pathogens that marine mammals carry. Multiple respondents reported consulting with wildlife and zoo veterinarians in order to provide adequate information to their physicians on follow-up visits. Since this survey was completed, a pinniped researcher contacted us for advice about confirmation of a diagnosis of a chronic illness characterized by severe headaches: the person had been diagnosed as having leptospirosis by a physician, although all laboratory tests were negative. After a veterinarian's suggestion, further tests were performed indicating the person was suffering from brucellosis, and treatment was changed accordingly.

The prevalence of these severe health problems should not be estimated from these survey results since the occurrences were rare and involved a level of self-diagnosis that may not be completely reliable. However, the accounts of the above participants' illnesses are not unlike case reports of similar illnesses found in the scientific literature in which the suspected organ-

ism was demonstrated by laboratory testing as being linked to a marine mammal. In 1988, a seal trainer from Western Australia was diagnosed with tuberculosis caused by *Mycobacterium bovis*. Diagnosis was made after the trainer developed night sweats, weight loss, exercise intolerance, and a dry productive cough. Bacterial isolates from the trainer and the seals with which he worked were identical based on gel electrophoresis (Brew et al. 1999). Similarly in 1999, a laboratory worker handling marine mammal isolates of *Brucella* suffered from 'continuing headaches, lassitude, and severe sinusitis.' *Brucella* organisms cultured from blood samples of the researcher were indistinguishable from the marine mammal *Brucella* isolate (Brew et al. 1999).

People who work with and around marine mammals are at risk for incurring injury and acquiring zoonotic diseases. Individuals working with marine mammals at least 1 d wk^{-1} are at the greatest risk of injury. Full-time workers and committed volunteers should be advised of the associated risks, and should be encouraged to take the proper safety precautions to minimize exposure to zoonotic diseases. Longer and more frequent exposure to marine mammals increases workers' odds of experiencing a skin ailment, and workers in contact with marine mammal carcasses, excretions, and vomitus must be especially diligent in personal hygiene. Although rare, serious sequelae can result from a seemingly minor skin wound or respiratory infection.

Based on these findings, continued adherence to safety guidelines and the use of protective clothing are recommended to decrease the occurrence of adverse health effects in marine mammal caretakers and researchers. Training of workers, students, and volunteers handling marine mammals should include education on disease risks associated with the zoonotic pathogens that both people and animals carry. Facilities housing marine mammals are encouraged to evaluate risks to their staff and volunteers through disease screening and prevention programs. This information and descriptions of commonly and infrequently reported ailments and their treatments are now available to physicians caring for patients who have contact with marine mammals at www.vetmed.ucdavis.edu/whc/mmz.

Acknowledgements. This study was funded by the United States Marine Mammal Commission through research agreement number K005486-01. The authors thank T. J. Ragen and R. H. Mattlin for aiding project initiation and coordinating funding. We gratefully acknowledge the critical review and contributions of M. J. Weise and J. P. Schroeder.

LITERATURE CITED

Baker AS, Ruoff KL, Madoff S (1998) Isolation of *Mycoplasma* species from a patient with seal finger. Clin Infect Dis 27:1168–1170

Brew SD, Perrett LL, Stack JA, Macmillan AP, Staunton NJ (1999) Human exposure to *Brucella* recovered from a sea mammal. Vet Rec 144:483

Buck CD, Schroeder JP (1990) Public health significance of marine mammal diseases. In: Dierauf LA (ed) Handbook of marine mammal medicine: health, disease, and rehabilitation. CRC Press, Boca Raton, FL, p 163–173

Cates MB, Kaufman L, Grabau JH, Pletcher JM, Schroeder JP (1986) Blastomycosis in an Atlantic bottlenose dolphin. J Am Vet Med Assoc 189:1148–1150

Cawthorn MW (1994) Seal finger and mycobacterial infections of man from marine mammals: occurrence, infection and treatment. Conservation Advisory Science Notes No. 102, Department of Conservation, Wellington

Cawthorn MW (1997) Meat consumption from stranded whales and marine mammals in New Zealand: public health and other issues. Conservation Advisory Science Notes No. 164, Department of Conservation, Wellington

Chastel C, Masure O, Balouet G, Laban P, Lucas A (1975) [The student, the cetacean and swine-fever: a minor epidemic after dissection of a globicephale.]. Nouv Presse Med 4:1803–1805 (in French with English abstract)

Clark C, McIntyre PG, Evans A, McInnes CJ, Lewis-Jones S (2005) Human sealpox resulting from a seal bite: confirmation that sealpox virus is zoonotic. Br J Dermatol 152: 791–793

Cowan DF, House C, House JA (2001) Public health. In: Dierauf LA, Gulland FMD (eds) Handbook of marine mammal medicine, 2nd edn. CRC Press, Boca Raton, FL, p 767–778

Daniel WW (1999) Biostatistics: a foundation for analysis in the health sciences. Wiley, New York

Eadie PA, Lee TC, Niazi Z, Lawlor D (1990) Seal finger in a wildlife ranger. Ir Med J 83:117–118

Flowers DJ (1970) Human infection due to *Mycobacterium marinum* after a dolphin bite. J Clin Pathol 23:475–477

Geraci JR, Ridgway SH (1991) On disease transmission between cetaceans and humans. Mar Mamm Sci 7: 191–194

Hartley JW, Pitcher D (2002) Seal finger—tetracycline is first line. J Infect 45:71–75

Hicks BD, Worthy GAJ (1987) Sealpox in captive grey seals (*Halichoerus grypus*) and their handlers. J Wildl Dis 23: 1–6

Johnston RG, Fung J (1969) Bacterial flora of wild and captive porpoises: an inquiry into health hazards to man. J Occup Med 11:276–277

Kuusi M, Nuorti JP, Maunula L, Miettinen I, Pesonen H, Von Bonsdorff CH (2004) Internet use and epidemiologic investigation of gastroenteritis outbreak. Emerg Infect Dis 10:447–450

Markham RB, Polk BF (1979) Seal finger. Rev Infect Dis 1: 567–569

McLaughlin JB, Sobel J, Lynn T, Funk E, Middaugh J (2004) Botulism Type E outbreak associated with eating a beached whale, Alaska. Emerg Infect Dis 10:1685–1687

Myers BJ (1970) Nematodes transmitted to man by fish and aquatic mammals. J Wildl Dis 6:266–271

National Institute for Occupational Safety and Health (2000) Worker health chartbook. Department of Health and Human Services, National Institute for Occupational Safety and Health — Publications Dissemination, Cincinnati, OH, p 127–272

National Marine Fisheries Service (1990) Final environmental impact statement on the use of marine mammals in swim-with-the-dolphin programs. National Oceanic and Atmospheric Administration Doc C 55:328. Office of Protected Resources, Silver Spring, MD

Palmer CJ, Schroeder JP, Fujioka RS, Douglas JT (1991)

Staphylococcus aureus infection in newly captured Pacific bottlenose dolphins (*Tursiops truncatus gilli*). J Zoo Wildl Med 22:330–338

Polley L (2005) Navigating parasite webs and parasite flow: emerging and re-emerging parasitic zoonoses of wildlife origin. Int J Parasitol 35:1279–1294

Robson JM, McDougall R, Van Der Valk S, Waite SD, Sullivan JJ (1998) *Erysipelothrix rhusiopathiae*: an uncommon but ever present zoonosis. Pathology 30:391–394

Rodahl K (1953) Speck finger, a severe finger infection observed in arctic sealers. Western J Surg Ob Gy 61:39–43

Sargent E (1980) Tetracycline for seal finger. JAMA 244:437

Smith AW, Berry ES, Skilling DE, Barlough JE and others (1998) *In vitro* isolation and characterization of a calicivirus causing a vesicular disease of the hands and feet. Clin Infect Dis 26:434–439

Streitfeld MM, Chapman CG (1976) *Staphylococcus aureus* infections of captive dolphins (*Tursiops truncatus*) and oceanarium personnel. Am J Vet Res 37:303–305

Symmers WS (1983) Possible case of Lobo's disease acquired in Europe from a bottle-nosed dolphin (*Tursiops truncatus*). Bull Soc Pathol Exot Filiales 76:777–784

Thompson PJ, Cousins DV, Gow BL, Collins DM, Williamson BH, Dagnia HT (1993) Seals, seal trainers, and mycobacterial infection. Am Rev Respir Dis 147:164–167

Tryland M (2000) Zoonoses of arctic marine mammals. Infect Dis Rev 2:55–64

Webster RG, Geraci J, Petursson G, Skirnisson K (1981) Conjunctivitis in human beings caused by influenza A virus of seals. N Engl J Med 304:911

Appendix 1. Questionnaire on marine mammal pathogens that can infect humans. Supported by the Marine Mammal Commission in conjunction with the National Marine Fisheries Service (NMFS)

All information provided is anonymous and strictly confidential

1. How long have you worked in direct contact with marine mammals? (Check one)

☐ Never ☐ 0 to 0.5 years ☐ 0.5 – 1 year ☐ 1 – 5 years ☐ 5- 10 years ☐ More than 10 years

2. On average, how often do (did) you come in contact with marine mammals? (Check one)

☐ 0 days ☐ 1 – 25 days ☐ 26 – 50 days ☐ 51 – 100 days ☐ 101- 150 days ☐ More than 150 days

3. Please indicate situations that describe your work. (Check all that apply)

☐ Direct contact with live marine mammals while you are in the water with them
☐ Direct contact with live marine mammals while you are out of water
☐ Contact with water in which a marine mammal has swum
☐ Contact with marine mammal excretions and/or vomitus
☐ Contact with tissue or blood samples from a marine mammal
☐ Cleaning or repairing enclosures or equipment used in the care of marine mammals
☐ Contact with dead marine mammals

4. The majority of your contact with marine mammals is (was) in the area of: (Select one)

☐ Research ☐ Rehabilitation ☐ Zoo/aquarium ☐ "Swim with" program

5. Please indicate your training related to marine mammals. (Check all that apply)

☐ Animal restraint/handling ☐ Tissue/blood sampling ☐ Infectious disease prevention ☐ Occupational safety

6. During the time in which you HAVE BEEN in contact with marine mammals, did you ever suffer a traumatic injury caused by the animals? ☐Yes ☐No

If Yes, indicate the number of times you had an injury matching the following descriptions (estimates OK).

_____ Located on extremities (i.e. hands, arms)
_____ Located on face
_____ Located centrally (i.e. torso, abdomen)
_____ Superficial scratch or scrape
_____ Cut
_____ Deep wound
_____ Deep wound that required stitches
_____ Fractured bones
_____ Other (describe)
_____

7. During the time in which you were in contact with marine mammals, did you develop a skin rash or reaction? ☐Yes ☐No

If yes, indicate the number of times you had a rash or reaction matching the following descriptions (estimates OK).

_____ Reddened
_____ Painful
_____ Itchy
_____ Nodular (raised and hard)
_____ Swollen (raised and soft)
_____ Involved a joint
_____ Oozing
_____ Blister or fluid filled
_____ Located mainly on hands
_____ Located on other places on the body
Specify_____

Did the lesions ever appear subsequent to direct contact with a marine mammal? ☐Yes ☐No
Did these lesions ever appear after a bite from a marine mammal? ☐Yes ☐No
Were these lesions examined by a medical doctor? ☐Yes ☐No
If yes, what were the doctor's diagnoses? _____

Appendix 1. (continued)

8. During the time in which you Have Been in contact with marine mammals, did you experience any respiratory illnesses? ❑Yes ❑No

If yes, approximately how often

❑ Once or twice ❑Once per year ❑2-4 times per year ❑5-10 times per year

❑More than once per month

How long was the longest episode?

❑ Less than a week ❑ 1-2 weeks ❑2-4 weeks ❑ 1-6 months ❑ More than six months

Do you believe any of these occurrences to be a result of your contact with marine mammals? ❑Yes ❑No

If yes, please explain. _____

_____

Were any of these illnesses diagnosed by a medical doctor? ❑Yes ❑No

What were the doctor's diagnoses? _____

9. During the time in which you were in contact with marine mammals , did you ever experience prolonged malaise? ❑Yes ❑ No

If yes, how often

❑ Once or twice ❑ Once per year ❑ 2-4 times per year ❑ 5-10 times per year

❑More than once per month

How long was the longest episode?

❑ Less than a week ❑ 1-2 weeks ❑ 2-4 weeks ❑ 1-6 months ❑ More than six months

Do you believe any of these occurrences to be a result of your contact with marine mammals? Yes No

If yes, please explain. _____

_____

Was this illness diagnosed by a medical doctor? ❑Yes ❑No

What was the doctor's diagnosis?

_____

10. Please describe any additional symptoms from which you suffered during the time you were in contact with marine mammals? (Check all that appply)

- ❑ Fever
- ❑ Headache
- ❑ Diarrhea
- ❑ Nausea or Vomiting
- ❑ Fatigue and/or weakness
- ❑ Joint pain
- ❑ Yellow skin and eyes
- ❑ Red, runny eyes
- ❑ Ulcers on the eyes

11. Have you ever been diagnosed with complications or disease from any of the following? (Check all that appply)

- ❑ Aeromonas
- ❑ Corynebacterium
- ❑ Mycobacteria tuberculosis
- ❑ Mycoplasma
- ❑ Pseudomonas
- ❑ Streptococcus
- ❑ Poxvirus (Seal & Dolphin Pox)
- ❑ Herpes virus
- ❑ Blastomycoses
- ❑ Brucella
- ❑ Erysipelothrix
- ❑ Mycobacteria bovis
- ❑ Pasteurella
- ❑ Salmonella
- ❑ Vibrio
- ❑ Influenza
- ❑ Rabies
- ❑ Candida
- ❑ Clostridia
- ❑ Leptospira
- ❑ Mycobacteria murium
- ❑ Proteus
- ❑ Staphylococcus
- ❑ Calicivirus (San Miguel Sea Lion Virus)
- ❑ Adenovirus (Sea Lion Hepatitis)
- ❑ Rotavirus
- ❑ Aspergillosis

12. Have you ever had sealfinger? ❑Yes ❑No

13. Do you believe any of your described illnesses to be a result of contact with marine mammals? ❑ Yes ❑ No

If yes, please Explain: _____

_____

_____

Appendix 1. (continued)

14. Have you ever had a positive tuberculosis test during the time you were in contact with marine mammals? ❑Yes ❑No ❑Not tested

If Yes, was this by skin test or chest x-ray

15. Please indicate your gender: ❑ Male ❑ Female

If female, did you ever have a miscarriage during the time you were in contact with marine mammals? ❑ Yes ❑ No

16. Do you consider your immune system to be intact? ❑ Yes ❑No

17. Please list medical treatments for specific problems listed above and their success or failure:

Editorial responsibility: Michael Moore, Woods Hole, Massachusetts, USA

Submitted: November 27, 2007; Accepted: May 28, 2008
Proofs received from author(s): July 25, 2008

Deterring Problem Seals & Sea Lions (Pinnipeds)

http://www.nwr.noaa.gov/Marine-Mammals/Seals-and-Sea-Lions/Index.cfm

Questions & Answers on Potential Deterrence of Pacific Harbor Seals & California Sea Lions from Fishing Gear, Catch & Property

Q. Why is NOAA Fisheries Service talking about the deterrence of Pacific harbor seals and California seal lions?
A. Since the passage of the Marine Mammal Protection Act (MMPA) in 1972, populations of California sea lions and Pacific harbor seals have increased dramatically, and are now considered healthy and robust. The increased abundance has been accompanied by a growing number of interactions with humans, raising concerns by private citizens and government officials who are seeking ways to protect property, fishing gear, and catch from damage by sea lions and seals.

The MMPA generally prohibits the harassment, hunting, capturing, or killing of marine mammals, or any attempt to engage in such activities. However, the law does contain exceptions authorizing certain people under certain circumstances to deter marine mammals from damaging private property, including fishing gear and catch, so long as the methods used do not result in the death or serious injury of an animal. To reduce the risk of causing "serious injury" to an animal, deterrence methods should be chosen that avoid penetration or tearing of skin, or rupture of an eye.

Q. What deterrence methods for Pacific harbor seals and California seal lions are available to the public?
A. NOAA Fisheries Service is developing formal guidelines and regulations for safely and legally deterring marine mammals. That guidance is not yet available, so in the interim, the agency is providing this advice for deterring Pacific harbor seals and California seal lions. *See potential deterrence methods (PDF 48KB).*

There is no single non-lethal deterrence method known to be universally effective in discouraging Pacific harbor seals and California seal lions from engaging in problem behaviors. Nevertheless, these methods and techniques have been found useful, in some circumstances, for deterring problem animals that are damaging property, fishing gear or catch. These lists (PDF 48KB) are methods property owners and fishers may consider for use under the appropriate conditions. **Note:** Some of the methods listed (such as loud noise or pyrotechnics) may not be appropriate for use in some areas, or are subject to prohibition under federal, state or local ordinances. The presence of Endangered Species Act-listed species in some areas may advise against the use of certain methods. Please

consult with local authorities to determine if such prohibitions exist in your area, or if ESA-listed species may be encountered.

Q. Which sea lion and seal species may be deterred by the public?
A. Only marine mammals that are not listed under the Endangered Species Act (ESA) may be deterred to protect private property, including gear and catch (read more). ESA-listed and non-ESA-listed species of sea lions and seals that occur in coastal and inland waterways of California, Oregon and Washington are:

ESA-Listed Species *(may NOT be deterred by public)*	**Non-ESA-Listed Species** *(may be deterred by public)*
Steller Sea Lion *(Threatened)*	Pacific Harbor Seal
	California Sea Lion

Q. May I deter a Pacific harbor seal or California seal lion that is hauled out on a beach or breakwater, or is swimming in an area where I want to fish?
A. The MMPA does not allow private citizens to deter marine mammals from undeveloped property (e.g., a beach) or public property (e.g., a breakwater). Private citizens may deter only Pacific harbor seals and California seal lions that are exhibiting problem behavior resulting in, or that could result in, damage to private property, fishing gear or catch.

Q. Do the MMPA and ESA grant additional authority to government officials?
A. Yes. The MMPA and ESA provide authority to city, county, state and federal government officials or their employees to deter "nuisance" marine mammals to prevent damage to public property or to protect the public from potential threats by a nuisance animal.

Q. What limits or constraints apply to the public when deterring Pacific harbor seals or California seal lions?
A. Deterrence of Pacific harbor seals and California seal lions may not result in the following:

- Serious Injury or Mortality - The MMPA authorizes deterrence using non-lethal methods only. Deterrence cannot result in the death or serious injury of marine mammals. NOAA Fisheries Service has defined "serious injury" in regulations to include an injury that is likely to lead to the death of the affected marine mammal.
- Deterrence of ESA-Listed Species - As noted above, the intended or unintended deterrence of threatened or endangered marine mammals is not allowed.
- Violation of Federal or State Laws or Local Ordinances - The use of some deterrence methods may be prohibited or restricted by federal, state or

local governments. For example, a city or county may prohibit the use of, or require special permits for, pyrotechnics. It is your responsibility to check with appropriate authorities to ensure that any deterrence methods used comply with local, state and federal requirements.

- Risk to Human Safety - Some of these techniques may cause injury to you and/or other people. If you deter a seal or sea lion in such a manner that you cause injury to anyone, you may be liable for your actions.
- Taking of Non-Target Marine Mammals - Deterrence is not authorized if it will result in the death, serious injury, or harassment of non-target marine mammals (i.e., individuals other than those causing damage to private property, gear or catch.

Q. Who may deter sea lions or seals?
A. In summary, certain private citizens, marina owners, government officials, and commercial and recreational fisherman may deter sea lions and seals under certain conditions, as described below:

- Private Citizens - Only the owner of the private property (e.g., a dock or vessel) may deter Pacific harbor seals and California seal lions to prevent damage to their private property.
- Marina Owner - Only the marina owner, or an employee of the owner, or an agent of the owner may deter Pacific harbor seals and California seal lions to prevent damage to the marina.
- Government Officials - City, county, state or federal officials or their employees may deter listed and non-ESA-listed sea lions and seals determined to be "nuisance" animals to prevent damage to private or public property, or to protect the public from potential threats.
- Commercial and Recreational Fishermen - Fishermen can deter Pacific harbor seals and California seal lions from damaging gear or depredating catch, only if they are actively fishing.

Seal & Sea Lion Facts of the Columbia River & Adjacent Nearshore Marine Areas

(May 2006)

Pacific harbor seals, California sea lions and Steller sea lions frequent the lower Columbia River and adjacent nearshore marine areas. Other pinnipeds, such as northern fur seals and elephant seals, are occasionally present in this area, but not in great numbers or for very long.

A 2003 census of California sea lions placed their population at about 250,000 animals. California sea lions are present in the lower Columbia during much of the year except in summer months (June-August) when most animals return to breeding rookeries in southern California.

There are two stocks of Steller sea lions in the North Pacific. The stock found off California, Oregon and Washington, British Columbia and Southeast Alaska – referred to as the Eastern stock – numbers about 31,000 animals. Steller sea lions are present year-round at the mouth of the Columbia River.

Several stocks of Pacific harbor seals make up the species in West Coast waters. The Oregon/ Washington coastal stock is estimated to be about 25,000 animals. They're present throughout the year at the mouth of the Columbia.

All seals and sea lions are protected by the Marine Mammal Protection Act (MMPA). The Eastern stock of Steller sea lions is also listed as a threatened species under the federal Endangered Species Act (ESA).

During a typical day in May, approximately 3,000 Pacific harbor seals, 1,000 Steller sea lions, and 800 California sea lions can be observed resting on haul-out sites (such as jetties) in the Columbia River estuary. These seals and sea lions feed in both the Columbia River and adjacent nearshore marine areas. They eat a variety of marine and estuarine prey, including squid, smelt, herring, flatfish, perch, pollock, hake, rockfish and salmon. Based on scat samples collected from several Pacific Northwest estuary and ocean sites (including the Columbia River estuary), salmon species generally make up 10-30 percent of these animals' diet.

During the spring migration of smelt, lamprey, salmon and steelhead, it's common for seals and sea lions to follow these prey species into fresh water upstream of Longview, Wash. (river mile 67), up to Willamette Falls (RM 129) and Bonneville Dam (RM 145). As many as 300 seals and sea lions are known to feed in these upriver areas. Some of these animals stay for a couple of days in fresh water, and others for longer. During these freshwater hunting trips, some of these animals feed heavily on salmon and steelhead. For example, one such animal – identified by brand #C404 – has been observed eating steelhead and spring Chinook salmon below Bonneville Dam for days to weeks during the spring of 2003 through 2006.

No estimate is available for the percentage of spring salmon or steelhead consumed by seals and sea lions in the Columbia or Willamette rivers. However, direct observation of winter steelhead killed in a small area below Willamette Falls 1996-2002, ranged from 0.3 percent to 5.5 percent of the adult return. In the tailrace of Bonneville Dam, the numbers ranged from 0.4 percent of the spring run of salmonids in 2002, and increased to 3.4 percent in 2005. These estimates pertain only to the Willamette and Bonneville study areas, and do not represent the total pinniped impacts on salmon and steelhead in a given year in the Columbia Basin.

In comparison, California sea lions at the Ballard Locks, in Seattle, Wash., were documented to consume as much as 60 percent of the annual run of winter steelhead.

The MMPA and ESA include provisions that allow federal, state and local governments (employees or officials in the course of their duties) to intentionally take marine mammals, if the taking is done in a humane manner and is for: (a) the protection or welfare of the mammal; (b) the protection of the public health and welfare; or (c) the **non-lethal removal** of nuisance animals.

Implementation of non-lethal deterrence methods on nuisance seal and sea lions is costly and results are variable. Federal and state biologists have found that nuisance seal and sea lion feeding patterns can be disrupted through the use of non-lethal deterrence, but no one technique (or combination of techniques) has been universally effective. For example, fish and wildlife agency personnel using various hazing techniques have been only modestly successful at reducing California sea lion predation on salmon and steelhead below Bonneville Dam. However, the same non-lethal hazing methods have been very successful in reducing Steller sea lion predation on Columbia River sturgeon in the same area.

Members of the public may take steps to deter problem seals and sea lions from damaging their property, fishing gear, and catch. There are methods *(PDF 30KB)* property owners and fishers may consider for use under the appropriate conditions. **Note:** Some of the methods listed (such as loud noise or pyrotechnics) may not be appropriate for use in some areas, or are subject to prohibition under federal, state or local ordinances. The presence of Endangered Species Act-listed species in some areas may advise against the use of certain methods. Please consult with appropriate authorities to determine if such prohibitions exist in your area, or if ESA-listed species may be encountered.

More information on West Coast pinnipeds, their impact on fish stocks, and the increasing interaction between pinnipeds and humans is available at http://www.nwr.noaa.gov/Marine-Mammals/index.cfm.

Level A

Level A form guidance- Is the animal stranded? Do I fill out a Level A form?

Situation	Fill out Level A?
Phone report of dead animal with no network response	YES (if sufficient information and/or photos)
Live seal pups on the beach- fill out Level A if you take action such as assessing injury, relocating the pup, transferring to rehab (no Level A if pup is healthy and the only response was posting signs or babysitting)	YES
All dead animals- including on rookeries if information is available	YES
Oil spills- all dead and live stranded animals that are oiled/suspected oiled	YES
Entanglements Live animals swimming with fishing gear, net, debris (reported or disentanglement response)	NO- provide information to Brent/Lynne- a new reporting form is in development
Dead animals entangled in fishing gear, net, debris (floating or on the beach)	YES
Stranded live pinniped entangled in fishing gear, net, debris [If no response attempted, be cautious about tracking repeated reports to avoid double counting]	YES
Ship strikes Report of live animal with evidence of ship strike or report from a vessel that struck an animal (includes reports from vessels suspecting a strike occurred)	NO- provide information to Brent/Lynne- new reporting form in development
Live stranded animal on the beach with evidence of ship strike	YES
Dead animals with signs of ship strike during exam (on the beach or floaters)	YES
Out of habitat situation where there is a response- (i.e., vessel herding a gray whale out of a river, relocation)	YES
Animal dropped off at your rehab facility without any paperwork	YES- please get Level A information from person transporting the animal and fill out form
Healthy animals on the beach even if you respond to a report to evaluate the condition of animal (i.e., healthy pups, molting elephant seals). If it does not meet definition of stranded, do not fill out Level A. Data on level of effort, number of calls, number of responses can be tracked separately by stranding groups if they so choose.	NO

* The term "stranding" means an event in the wild which - A marine mammal is dead and is - On a beach or shore of the United States; or In waters under the jurisdiction of the United States (including any navigable waters); or A marine mammal is alive and is - On a beach ore shore of the United States and is unable to return to the water; On a beach or shore of the United States and, although able to return to the water, is need of apparent medical attention; or In the waters under the jurisdiction of the United States (including any navigable waters), but is unable to return to its natural habitat under its own power or without assistance. 16 U.S.C. 1421g

MARINE MAMMAL STRANDING REPORT - LEVEL A DATA

FIELD #: _____ NMFS REGIONAL #: _____ (NMFS USE) NATIONAL DATABASE#: _____ (NMFS USE)

COMMON NAME: _____ GENUS: _____ SPECIES: _____

EXAMINER Name: _____ Affiliation: _____

Address: _____ Phone: _____

Stranding Agreement or Authority: _____

LOCATION OF INITIAL OBSERVATION

State: _____ County: _____

City: _____

Body of Water: _____

Locality Details: _____

Lat (DD): _____ . _____ N

Long (DD): _____ . _____ W

☐ Actual ☐ Estimated

How Determined: (check ONE)

☐ GPS ☐ Map ☐ Internet/Software

OCURRENCE DETAILS ☐ Restrand GE# _____ (NMFS Use)

Group Event: ☐ YES ☐ NO

If Yes, Type: ☐ Cow/Calf Pair ☐ Mass Stranding # Animals: _____ ☐ Actual ☐ Estimated

Findings of Human Interaction: ☐ YES ☐ NO ☐ Could Not Be Determined (CBD)

If Yes, Choose one or more: ☐ 1. Boat Collision ☐ 2. Shot ☐ 3. Fishery Interaction

☐ 4. Other Human Interaction: _____

How Determined (Check one or more): ☐ External Exam ☐ Internal Exam ☐ Necropsy

☐ Other: _____

Gear Collected? ☐ YES ☐ NO Gear Disposition: _____

Other Findings Upon Level A: ☐ YES ☐ NO ☐ Could Not Be Determined (CBD)

If Yes, Choose one or more: ☐ 1. Illness ☐ 2. Injury ☐ 3. Pregnant ☐ 4.Other: _____

How Determined (Check one or more): ☐ External Exam ☐ Internal Exam ☐ Necropsy

☐ Other: _____

INITIAL OBSERVATION

Date: Year: _____ Month: _____ Day: _____

First Observed: ☐ Beach or Land ☐ Floating ☐ Swimming

CONDITION AT INITIAL OBSERVATION (Check ONE)

☐ 1. Alive ☐ 4. Advanced Decomposition

☐ 2. Fresh dead ☐ 5. Mummified/Skeletal

☐ 3. Moderate decomposition ☐ 6. Condition Unknown

LEVEL A EXAMINATION ☐ Not Able to Examine

Date: Year: _____ Month: _____ Day: _____

CONDITION AT EXAMINATION (Check ONE)

☐ 1. Alive ☐ 4. Advanced Decomposition

☐ 2. Fresh dead ☐ 5. Mummified/Skeletal

☐ 3. Moderate decomposition ☐ 6. Unknown

INITIAL LIVE ANIMAL DISPOSITION (Check one or more)

☐ 1. Left at Site ☐ 6. Euthanized at Site

☐ 2. Immediate Release at Site ☐ 7. Transferred to Rehabilitation:

☐ 3. Relocated Date: Year:_____ Month:_____Day:___ Facility:_____

☐ 4. Disentangled ☐ 8. Died during Transport

☐ 5. Died at Site ☐ 9. Euthanized during Transport

☐ 10. Other:_____

CONDITION/DETERMINATION (Check one or more)

☐ 1. Sick 7. Location Hazardous

☐ 2. Injured ☐ a. To animal

☐ 3. Out of Habitat ☐ b. To public

☐ 4. Deemed Releasable ☐ 8. Unknown/CBD

☐ 5. Abandoned/Orphaned ☐ 9.Other_____

☐ 6. Inaccessible _____

MORPHOLOGICAL DATA

SEX (Check ONE)

☐ 1. Male

☐ 2. Female

☐ 3. Unknown

AGE CLASS (Check ONE)

☐ 1. Adult ☐ 4. Pup/Calf

☐ 2. Subadult ☐ 5. Unknown

☐ 3. Yearling

☐ Whole Carcass ☐ Partial Carcass

Straight length:_____ ☐ cm ☐ in ☐ actual ☐ estimated

Weight:_____ ☐ kg ☐ lb ☐ actual ☐ estimated

PHOTOS/VIDEOS TAKEN: ☐ YES ☐ NO

Photo/Video Disposition: _____

TAG DATA Tags Were:

Present at Time of Stranding (Pre-existing): ☐ YES ☐ NO

Applied during Stranding Response: ☐ YES ☐ NO

ID#	Color	Type	Placement* (Circle ONE)	Applied	Present
			D DF L LF LR RF RR	☐	☐
			D DF L LF LR RF RR	☐	☐
			D DF L LF LR RF RR	☐	☐

* D= Dorsal; DF= Dorsal Fin; L= Lateral Body
LF= Left Front; LR= Left Rear; RF= Right Front; RR= Right Rear

CARCASS STATUS (Check one or more)

☐ 1. Left at Site ☐ 4. Towed: Lat_____Long_____ ☐ 7. Landfill

☐ 2. Buried ☐ 5. Sunk: Lat_____Long_____ ☐ 8. Unknown

☐ 3. Rendered ☐ 6. Frozen for Later Examination ☐ 9. Other_____

SPECIMEN DISPOSITION (Check one or more)

☐ 1. Scientific collection ☐ 2. Educational collection

☐ 3. Other: _____

Comments: _____

NECROPSIED ☐ NO ☐ YES ☐ Limited ☐ Complete

☐ Carcass Fresh ☐ Carcass Frozen/Thawed

NECROPSIED BY: _____

Date: Year: _____ **Month:** _____ **Day:** _____

PLEASE USE THE BACK SIDE OF THIS FORM FOR ADDITIONAL REMARKS

ADDITIONAL REMARKS

ADDITIONAL IDENTIFIER: _____ (If animal is restranded, please indicate any previous field numbers here)

DISCLAIMER

THESE DATA SHOULD NOT BE USED OUT OF CONTEXT OR WITHOUT VERIFICATION. THIS SHOULD BE STRICTLY ENFORCED WHEN REPORTING SIGNS OF HUMAN INTERACTION DATA.

DATA ACCESS FOR LEVEL A DATA

UPON WRITTEN REQUEST, CERTAIN FIELDS OF THE LEVEL A DATA SHEET WILL BE RELEASED TO THE REQUESTOR PROVIDED THAT THE REQUESTOR CREDIT THE STRANDING NETWORK AND THE NATIONAL MARINE FISHERIES SERVICE. THE NATIONAL MARINE FISHERIES SERVICE WILL NOTIFY THE CONTRIBUTING STRANDING NETWORK MEMBERS THAT THESE DATA HAVE BEEN REQUESTED AND THE INTENT OF USE. ALL OTHER DATA WILL BE RELEASED TO THE REQUESTOR PROVIDED THAT THE REQUESTOR OBTAIN PERMISSION FROM THE CONTRIBUTING STRANDING NETWORK AND THE NATIONAL MARINE FISHERIES SERVICE.

PAPERWORK REDUCTION ACT INFORMATION

PUBLIC REPORTING BURDEN FOR THE COLLECTION OF INFORMATION IS ESTIMATED TO AVERAGE 30 MINUTES PER RESPONSE, INCLUDING THE TIME FOR REVIEWING INSTRUCTIONS, SEARCHING EXISTING DATA SOURCES, GATHERING AND MAINTAINING THE DATA NEEDED, AND COMPLETING AND REVIEWING THE COLLECTION OF INFORMATION. SEND COMMENTS REGARDING THIS BURDEN ESTIMATE OR ANY OTHER ASPECT OF THE COLLECTION INFORMATION, INCLUDING SUGGESTIONS FOR REDUCING THE BURDEN TO: CHIEF, MARINE MAMMAL AND SEA TURTLE CONSERVATION DIVISION, OFFICE OF PROTECTED RESOURCES, NOAA FISHERIES, 1315 EAST-WEST HIGHWAY, SILVER SPRING, MARYLAND 20910. NOT WITHSTANDING ANY OTHER PROVISION OF THE LAW, NO PERSON IS REQUIRED TO RESPOND, NOR SHALL ANY PERSON BE SUBJECTED TO A PENALTY FOR FAILURE TO COMPLY WITH, A COLLECTION OF INFORMATION SUBJECT TO THE REQUIREMENTS OF THE PAPERWORK REDUCTION ACT, UNLESS THE COLLECTION OF INFORMATION DISPLAYS A CURRENTLY VALID OFFICE OF MANAGEMENT AND BUDGET (OMB) CONTROL NUMBER.

Guide to the Marine Mammal Stranding Report
Level A Responder

INTRODUCTION:

The purpose of this guide is to summarize the protocol for completing the Level A Marine Mammal Stranding Report. While many fields are straight forward this guide will take you step by step through the Level A stranding report, focusing on specific sections that can be easily confused. For additional detail consult "The Examiners Guide to the Marine Mammal Stranding Report Level A Data."

HEADER SECTION:

Field #: The responder should assign this number based on the system used by their stranding organization. For example, Year - MonthDate-Case # 2006-0910-01

NMFS Regional # and National Database #: Leave this blank, this number will be assigned by NOAA Fisheries when the report is entered or validated in the national stranding database.

Letterholder: Leave this section blank unless your network has a Stranding Agreement (SA) with NOAA Fisheries.

Name, Affiliation, Address: This is name of the person filling out the Level A form. Affiliation is: The network group you are a volunteer for and the address is either your personal address or the address that your network group uses. If it is a reporting party separate from the stranding network (i.e. phone call from the public) place their information in the correct lines.

LOCATION:

Latitude/Longitude: This is very important information for NOAA Fisheries; please complete this section if possible in decimal degrees (coordinates can be confirmed by GPS, Internet program or a map.)

OCCURANCE DETAILS:

Findings of Human Interaction: Only check YES if you identify evidence of human interaction. If you check YES, you need to provide a detailed description of how the determination was made (external or internal exam, or necropsy). Check NO if the animal was examined and there was no indication of human interaction. Check "Could not be Determined" if there is insufficient evidence to check YES or NO.

INITIAL OBSERVATION/ LEVEL A EXAMINATION:

Fresh Dead: Carcass is in good condition (little scavenger damage, fresh smell, not bloated.)

Moderate Decomposition: Carcass is in fair condition (carcass intact, bloating evident, mild odor, skin cracked or sloughing.)

Advanced Decomposition: Carcass is in poor condition (severe scavenger damage, strong odor, skin sloughing.)

Mummified/Skeletal: Skin over skeletal remains, remaining tissues are desiccated.

Unknown: Check this box if you are unable to determine the condition of the stranded animal.

MORPHOLIGICAL DATA:

Adult: This age class would be used for an animal that is judged or found upon necropsy to be sexually mature.

Subadult: This age class would be used for an animal that is judged to be greater than one year old, but not yet mature.

Yearling: This age class would be used for an animal that is judged to be approximately one year old, using length or time of year.

Pup/Calf: This age class would be used for an animal that is judged to be smaller than yearling size, or in a population where it would be younger than one year old.

Unknown: This age class would be used for an animal if you are unable to determine the age.

Straight Length/Weight: the metric system is preferred; please use the straight length of the animal.

Photos/Videos Taken: Taking photos is very important, please email or send them in with your reports and note under photo/video disposition where these documents are housed.

OTHER:

Make any other comments you feel necessary on the back of the stranding form.

DEFINITIONS OF TERMS FOR LEVEL A
VERSION 2007

ADMINISTRATIVE INFORMATION

Field #: Assign each stranding event a unique identifier. Format is open to each agency's requirements; however, please remain consistent within your agency.

NMFS Regional #: Leave this blank. NMFS will assign a regional number consistent with the National Marine Mammal Stranding Database.

National Database #: Leave this blank. NMFS will assign a national database number consistent with the National Marine Mammal Stranding Database.

Common Name: The common name of the stranded animal. If identity is not determined to species, describe the level to which the remains can be identified. (Example: unknown, pinniped/cetacean, otariid/phocid, or odontocete/mysticete, delphinid/phocoenid, etc.)

Genus/Species: This is the Latin name for the animal in standard binomial nomenclature. If either genus or species is not identifiable, fill in the appropriate blank with "UNKNOWN."

Examiner: Name of the examiner who is submitting the report. This should be the individual who is responsible for preparing the entire level A stranding report, not necessarily the note taker or a public citizen who first reported the animal

Affiliation: Affiliation of the examiner who is submitting the report. This could be the same organization as listed below under "Stranding Agreement or Authority", a Designee organization (designee of an Stranding Agreement holder), the agency of a federal, state, or local government official authorized under MMPA Section 109(h), public, citizen or none.

Address: Mailing address of the examiners Stranding Agreement organization or government agency office.

Phone: Daytime (Work) phone number where the examiner may be reached for further comment. NOTE: Please include only business addresses and phone numbers, to prevent the release of personal information to the public.

Stranding Agreement or Authority: Stranding Agreement holder or agency through which the examiner has been authorized to take marine mammals or marine mammal parts. If the examiner is the member of a "Designee Organization" record the name of the Stranding Agreement holder under whom the examiners organization is designated. If the examiner is operating under 109(h) authority, include the name of the government organization.

LOCATION OF INITITAL OBSERVATION

State, County, and City: The standard state, county, and city names for the stranding location. For floating carcasses (U.S. waters between 3 and 200 miles offshore), fill State with "EEZ" and closest state. This should include boroughs, parishes, provinces, islands, commonwealths, and territories.

Body of Water: The major ocean basin closest to the site where the animal was observed stranded (e.g., Atlantic Ocean, Gulf of Mexico, Pacific Ocean, Gulf of Alaska) and describe the specific location in "Locality Details".

Locality Details: Using known landmarks (access point, mile markers, street addresses etc), describe the precise locality where the animal was found. Compass bearings and relative distances are useful but GPS coordinates are preferred. For animals swimming or floating, this should include the referencing the associated ocean, sea, gulf, bay, inlet, estuary, or river.

GPS Coordinates: Documentation in decimal degrees is **required.** NOTE: Negative longitude represents the Western Hemisphere, positive longitude represents the Eastern Hemisphere, negative latitude represents the Southern Hemisphere, and positive latitude represents the Northern Hemisphere. Note that most GPS units can be set to display latitude and longitude in the decimal degree format and there are many lat/long conversion websites on the internet.

Actual or Estimated: Indicate if the latitude/longitude coordinates are exact (from a GPS unit) or an estimate (based on a map, website, previous strandings, known lat/longs for landmarks, etc.).

How Determined: Indicate how the latitude/longitude coordinates were obtained. Check the box that represents method of data collection:

- **Global Positioning System (GPS)**
- **Map**
- **Software program/Internet website**

OCCURRENCE DETAILS - The occurrence details help define the reason for the response and details associated with the stranding event.

Restrand - Check this box if the animal has previously stranded, either responded to by your organization or another. The animal may have tags from a rehabilitation facility, or may have recognizable and distinctive features. If this box is checked, you should indicate the previous field numbers assigned to this animal (by your facility or others), if known, on the back of the form in the space marked "Additional Identifiers."

GE # - Leave this blank. NMFS will assign a regional designation to represent the "Group Event Number".

Group Event - A group event is a stranding event which involves two or more animals, either simultaneously or over a period of time.

If Yes - identify the type of group event. These designations are not exclusive, more than one option may be selected:

Cow/Calf Pair – this would be two animals stranding where one is the mother and the other is the offspring (a mom/pup pair would also qualify).

Mass Stranding - this is 2 or more cetaceans that simultaneously strand, other than cow-calf pairs.

- **Number of Animals** - Indicate the number of cetaceans involved in the mass stranding, and whether this count is an "Actual" or "Estimate"count.

NOTE: Animals may be involved in other types of group events that will be determined after the Level A data sheet is filled out and submitted. These animals will be assigned a **"Group Event Number (GE#)"** and the group event fields will be incorporated into a separate database in the National Database by the Regional Stranding Coordinator or by the Onsite Coordinator if the case of Unusual Mortality Event. Examples of these types of events include:

- "*hazmat or oil spill*" - any animal affected by a spill of oil or another hazardous material;
- "*pre-event investigation*" - animals sampled after a group event is suspected, but before it has been officially designated as an Unusual Mortality Event by the Working Group on Marine Mammal Unusual Mortality Events (WGMMUME);
- "*unusual mortality event*" - any animal part of a die-off that has been officially designated as a UME by the WGMMUME; and
- "*repeat event*" - animals stranding during a die-off that has been designated as a repeat event by the WGMMUME.

If you wish, you may update your Level A datasheet for your records to reflect the Group Event number that will be listed in the National Database after the Regional Stranding Coordinator has verified the entry.

Findings of Human Interaction - This field does not represent cause of stranding or cause of death. These data should not be used out of context or without verification.

Check "Yes" if there are any signs or evidence of human interaction (HI), whether or not you believe they were the cause of death. If you check "Yes," use the back of this form in ADDITIONAL REMARKS to further explain the nature of the injury (or evidence) and how it was assessed and determined to be human related. If possible, document injuries or marks with photographs or sketches/drawings. Describe the injury or mark, the type of fishing gear recovered the location of any wounds (gunshot, fishing gaff, knife incision, line or net entanglement, etc.). Note any external markings or color patterns and if the injury or mark could be determined as antemortem or postmortem (i.e., if animal

seen with injury when alive or by histological confirmation). Also, describe any relevant circumstances regarding the interaction (e.g., whether the interaction was witnessed). Please indicate if you used the Protocol developed by the Virginia Aquarium and Cape Cod Stranding Network entitled "2006 *Protocol for Examining Marine Mammal for Signs of Human Interaction*" and attach a copy of the completed Form to the Level A Data sheet. Also indicate if you have attended training on this protocol.

Check "No" if the animal was examined and there was no indication of human interaction. Check

"Check Could not Be Determined (CBD)" if there is insufficient evidence to indicate an interaction, the animal was not thoroughly examined, the animal was too decomposed for a thorough examination, there may have been signs of something that may have been a human interaction but you can't tell for sure, or the observer does not feel competent to determine this type of injury (do not guess).

If you checked "Yes", check the box that most accurately details the type of human interaction:

Boat Collision - Check if there are any signs of boat or ship collision such as propeller wounds or blunt trauma from a boat hull.

Shot - Check if there are any signs of gunshots. Add in the comments how this was determined (metal detector, bullet found, etc.)

Fishery Interaction - Check if there are any signs of fishery interaction such as wounds related to fishing gear, or fishing gear attached to the animal.

Other Human Interaction - If you checked "Yes" and there were signs of human interactions other than those listed, please describe in this blank. This could include signs of as ingested plastic, debris entanglement, wounds from other weapons besides firearms (arrows, harpoons, etc.), non-boat vessel related injuries (car or train collision, etc.), mutilation, etc. Use the back of this form under "ADDITIONAL REMARKS" to continue your description, if necessary.

How Determined - If you checked "Yes" or "No", describe how the signs of human interaction were determined:

- **External Exam** – The entire external surface of animal is visually assessed for signs of HI. If the entire surface could not be examined, please state why and which parts were looked at (e.g., large whale could not be turned over, only dorsal surface examined)
- **Internal Exam** - The response included an examination of some or all of the body cavity. However, the condition of the animal or other factors precluded the collection and analysis of samples from internal organs. Please indicate in the

Not Able to Examine - Check this box if you were unable to examine the animal. Some examples would be: the animal was inaccessible (at the bottom of a cliff, on an island, floating, etc.); the animal washed out with the tide before you responded; manpower/time constraints made a response impossible; etc.

Condition at Examination - Check the appropriate box that indicates the physical state of the animal or carcass on the date of the Level A examination:

- **Alive (Code 1):** Check this box if the animal was alive at the initial observation.
- **Fresh Dead (Code 2):** Check this box if the carcass was in good condition (fresh/edible). Normal appearance, usually with little scavenger damage; fresh smell; minimal drying and wrinkling of skin, eyes and mucous membranes; eyes clear; carcass not bloated, tongue and penis not protruded; blubber firm and white; muscles firm, dark red, well-defined; blood cells intact, able to settle in a sample tube; serum unhemolyzed; viscera intact and well-defined, gut contains little or no gas; brain firm with no discoloration, surface features distinct, easily removed intact.
- **Moderate Decomposition (Code 3):** Check this box if the carcass was in fair condition (decomposed, but organs basically intact). Carcass intact, bloating evident (tongue and penis protruded) and skin cracked and sloughing; possible scavenger damage; characteristic mild odor; mucous membranes dry, eyes sunken or missing; blubber blood-tinged and oily; muscles soft and poorly defined; blood hemolyzed, uniformly dark red; viscera soft, friable, mottled, but still intact; gut dilated by gas; brain soft, surface features distinct, dark reddish cast, fragile but can usually be moved intact.
- **Advanced Decomposition (Code 4):** Check this box if the carcass was in poor condition (advanced decomposition). Carcass may be intact, but collapsed; skin sloughing; epidermis of cetaceans may be entirely missing; often severe scavenger damage; strong odor; blubber soft, often with pockets of gas and pooled oil; muscles nearly liquefied and easily torn, falling easily off bones; blood thin and black; viscera often identifiable but friable, easily torn, and difficult to dissect; gut gas-filled; brain soft, dark red, containing gas pockets, pudding-like consistency.
- **Mummified/Skeletal (Code 5):** Check this box if mummified or skeletal remains. Skin may be draped over skeletal remains; any remaining tissues are desiccated.
- **Unknown:** Check this box if the stranded animal was dead at the time of initial observation but information on the condition of the carcass is unavailable.

INITIAL LIVE ANIMAL DISPOSITION - Indicate what action(s) was/were taken to handle a live animal (NOTE: check all that apply at the time of completing the Level A examination):

- **Left at Site:** Check if the animal was reported, and was confirmed stranded by a reliable source and acknowledged by the Regional Coordinator, but no response

was made; or the animal was observed by the response team, but no other actions were taken.

- **Immediate Release at Site:** Check if the animal was reported and treated or evaluated, but was not removed from the site.
- **Relocated:** Check if the animal was evaluated or treated, was removed from the site of stranding, and was transported and released at another site without being admitted to an authorized rehabilitation facility.
- **Disentangled:** Check if the animal had entangling gear removed and was released/swam away.
- **Euthanized at Site:** Check if the animal was found alive but was euthanized by an authorized entity.
- **Died at Site:** Check if the animal was found alive and died before transport to an authorized rehabilitation facility or relocation.
- **Transferred to Rehabilitation:** Check if the animal was transported to an authorized rehabilitation facility.
    - **Date** - Fill in the date of the transfer
    - **Facility** - Fill in the name of the authorized rehabilitation facility to which the animal was transferred.
- **Died during Transport:** Check if the animal was found alive and died during transport to a care facility.

- **Euthanized during Transport:** Check if the animal was found alive and was euthanized during transport to an authorized rehabilitation facility by an authorized entity.

- **Other:** Check if the disposition of the live animal differs from the options listed above and document here.

CONDITION/DETERMINATION - Indicate the condition of the animal at the time of the response This question should help provide your reasoning for the disposition that was selected. (NOTE: Check all that apply).

- **Sick:** Check if the animal appears sick or is behaving oddly, with no external signs of injury.
- **Injured**: Check if the animal shows evidence of physical injury.
- **Out of Habitat**: Check if the animal was found in area not typical for its species. This could include atypical location and time of year for its known life history. Generally an out of habitat case involves a free swimming animal that is reported in an area outside it's normal habitat, tends to remain there for a period of time, and may need intervention to return to it's normal habitat (e.g. a bottlenose dolphin in a freshwater river that doesn't leave on its own accord, an ice seal in Florida, or a humpback whale in an embayment). This does not include a typical live stranding of an offshore species close to the beach.
- **Deemed Releasable:** Check if the animal shows no outward signs of illness or injury.
- **Abandoned/Orphaned:** Check if the animal is a cetacean calf found stranded on

the beach without an adult female, or a pup/calf that has been monitored and determined to be abandoned. The length of time that the animal should be observed without intervention may be up to 48 hours and varies by region; check with your Regional Stranding Coordinator for your regional policy.

- **Inaccessible:** Check if the animal is in an inaccessible location and therefore was not closely examined (condition could not be determined). Examples of inaccessible locations include: at the base of a cliff, areas with dangerous surf conditions, mudflats, islands, ice, etc.
- **Location Hazardous**
  - **To Animal** - Check if the animal is in a location that is deemed hazardous to its health and welfare (i.e. up a freshwater river, pinnipeds found inland, etc.)
  - **To Public** - Check if the animal is in a location that is deemed hazardous to the public (i.e. a crowded public beach, a marina, etc.)
- **Unknown/CBD**: Check if the animal could not be examined or if the condition could not be determined.
- **Other**: Describe any other situation not addressed above.

MORPHOLOGICAL DATA

SEX (Check One): Check the box indicating the animal's sex, or check "Unknown" if unable to determine.

AGE CLASS (check One): Check the box indicating the animal's age class. If possible, use information based on reproductive organs, teeth or accepted length/age data:

- **Adult**: This age class would be used for an animal that is judged or found upon necropsy to be sexually mature.
- **Subadult**: This age class would be used for a animal that is judged to be greater than one year old, but not yet mature.
- **Yearling**: This age class would be used for an animal that is judged to be approximately one year old, using length or time of year.
- **Pup/Calf:** This age class would be used for a stranded animal that is smaller than yearling size, or in a population where it would be younger than one year old.
- **Unknown**: This age class would be used for an animal if you are unable to determine its age.

Whole Carcass: Check the box if the carcass is sufficiently intact for the Level A morphometric data (straight length, weight) to be collected.

Partial Carcass: Check the box if the carcass is **not** sufficiently intact for the Level A morphometric data (straight length, weight) to be collected. If you measure the remains of the carcass, the metric (weight or length) must be entered as "estimated". Also record what part is missing in the ADDITIONAL REMARKS section on the back of this form. If neither length nor weight is measured, enter **"zero"** in the respective blanks.

Straight Length - Record the straight length (not contoured) of the animal on the date of initial examination.

- **cm** = centimeters (preferred)
- **in** = inches
    - **actual** = Check if this was an actual measurement (physical measurement)
    - **estimated** = Check if this was an estimated measurement (visual measurement). For example, if the carcass is not intact (e.g. flukes degraded or severed, head missing, etc. and record what part is missing in the ADDITIONAL REMARKS section on the back of this form.
- **Weight** - Record the weight of the animal on the date of initial examination. Please check if this was an actual or estimated measurement.
    - **kg** = kilograms (preferred)
    - **lb** = pounds
    - **actual** = Check if this was an actual measurement (physical measurement)
    - **estimated** = Check if this was an estimated measurement (visual measurement) or if the carcass was not intact. Record what part is missing in the ADDITIONAL REMARKS section on the back of this form.

PHOTOS/VIDEO Taken - Check "Yes" or "No" to indicate whether visual media was taken of this stranding event.

- **Photo/Video Disposition** - If photos or video were taken of the event, use this line to indicate where these documents are housed.

TAG DATA

Present at Time of Stranding (Pre-exisiting) - Mark **"YES"** if tags or identification markings were pre-existing (present on the animal at the time of stranding).

Applied During Stranding Response - Mark **"YES"** if tags or identification markings were applied by the stranding response organization (i.e. prior to release at stranding or relocation site, to prevent a carcass from being double-counted, etc.).

NOTE: If no tags were present or applied, the responder should check **"NO"** for both boxes and skip the rest of the section.

Document details about the type, color, and placement of identification tags, brands, or markings:

ID# - Write the number(s) of the identifying tag(s), brand(s), or other applied marking(s), if applicable.
Color - Using basic color-names, indicate the identifying color of tags where applicable.
Type - List the type of tag, brand, or other applied marking. For example, radio, PIT, plastic, roto, spaghetti, satellite, freeze brand, bleach mark, paint, etc.
Placement - Circle (ONE) the location of each applied/present marking:
D = dorsal body
DF = dorsal fin

ADDITIONAL REMARKS section the systems examined and not examination as well as examination findings.

- **Necropsy** – a necropsy was done, detailed information was documented, and internal tissues were collected for analysis. Please refer to the definitions and check whether the necropsy was limited or complete in the section below entitled "SPECIEMEN DISPOSITION."
- **Other** – other obvious signs of HI including presence of gear, and eye witness account of a human interaction.

Gear Collected - Check "Yes" if you collected fishery gear from the animal (hook, line, net, etc.). Check "No" if you did not collect any gear, or if there was no gear to collect.

Gear Disposition - If you checked "Yes", use this line to indicate what was done with that gear (i.e. sent to NMFS Enforcement or Regional Stranding Coordinator), or where the gear is housed.

Other Findings Upon Level A - Check "Yes" if there are any signs or evidence of other (non-human related interaction) findings related to the stranding, whether or not you believe they were the cause of death; check "No" if there was no indication of other factors; check "CBD" if there is insufficient evidence to indicate. Non-human related injuries or disease may include signs of infectious or parasitic disease and signs of trauma from beaching, conspecific interactions/aggression, interspecific interactions, scavengers and predators, etc. See above definition of external and internal exam for more description. Also, document if the animal was pregnant and in other findings – include comments.

If Yes, choose one or more – check the box that most accurately details the other factors:

- **Illness**
- **Injury**
- **Pregnant**
- **Other** (indicate what was found)

How Determined (check one or more) – if you noted other findings than HI signs, check how this was determined (please use the back of this form in ADDITIONAL REMARKS section to include more detail):

- **External Exam** (see above for definition)
- **Internal Exam** (see above for definition)
- **Necropsy** (see above for definition)
- **Other** – document the process

INITIAL OBSERVATION

Date - Enter the date the stranded animal was first observed by any witness. This is the earliest known date of observation of the stranded animal.

First Observed - Check the appropriate box that indicates the how the animal was initially observed:

- **Beach or Land**
- **Floating (in the water)**
- **Swimming.**

Condition at Initial Observation - Check the appropriate box that indicates the physical state of the animal or carcass on the date of the initial observation:

- **Alive (Code 1):** Check this box if the animal was alive at the initial observation.
- **Fresh Dead (Code 2):** Check this box if the carcass was in good condition (fresh/edible). Normal appearance, usually with little scavenger damage; fresh smell; minimal drying and wrinkling of skin, eyes and mucous membranes; eyes clear; carcass not bloated, tongue and penis not protruded; blubber firm and white; muscles firm, dark red, well-defined; blood cells intact, able to settle in a sample tube; serum unhemolyzed; viscera intact and well-defined, gut contains little or no gas; brain firm with no discoloration, surface features distinct, easily removed intact.
- **Moderate Decomposition (Code 3):** Check this box if the carcass was in fair condition (decomposed, but organs basically intact). Carcass intact, bloating evident (tongue and penis protruded) and skin cracked and sloughing; possible scavenger damage; characteristic mild odor; mucous membranes dry, eyes sunken or missing; blubber blood-tinged and oily; muscles soft and poorly defined; blood hemolyzed, uniformly dark red; viscera soft, friable, mottled, but still intact; gut dilated by gas; brain soft, surface features distinct, dark reddish cast, fragile but can usually be moved intact.
- **Advanced Decomposition (Code 4):** Check this box if the carcass was in poor condition (advanced decomposition). Carcass may be intact, but collapsed; skin sloughing; epidermis of cetaceans may be entirely missing; often severe scavenger damage; strong odor; blubber soft, often with pockets of gas and pooled oil; muscles nearly liquefied and easily torn, falling easily off bones; blood thin and black; viscera often identifiable but friable, easily torn, and difficult to dissect; gut gas-filled; brain soft, dark red, containing gas pockets, pudding-like consistency.
- **Mummified/Skeletal (Code 5):** Check this box if mummified or skeletal remains. Skin may be draped over skeletal remains; any remaining tissues are desiccated.
- **Unknown:** Check this box if the stranded animal was dead at the time of initial observation but information on the condition of the carcass is unavailable.

LEVEL A EXAMINATION

Date – Enter the date of examination that the animal was responded to and examined by your organization to collect Level A data (location, condition, signs of human interaction, species, sex, age class, length, weight, and any other visual observations). Complete morphometrics and necropsy could be taken later.

L = lateral body
LF = left front flipper/appendage
LR = left rear flipper/appendage
RF = right front flipper/appendage
RR = right rear flipper/appendage
Applied = Check "Applied" for each of the tags, brands, or other makings that were applied after the animal stranded, as part of the stranding or rescue response. If the animal was rehabilitated and released with tags or markings, you may update this part of the Level A form after they are applied.
Present = Check "Present" for each of the tags, brands, or other markings that were already present when the animal stranded.

CARCASS/SPECIMEN DISPOSITION

CARCASS STATUS (Check all that apply) - Check the following boxes to indicate how the carcass was disposed:

- **Left at site** - Check this box if the carcass, including skeleton, was left where it was found to decompose.
- **Buried** - Check this box if most of the carcass, including skeleton, was buried.
- **Rendered** - Check this box if the carcass, including skeleton, was rendered.
- **Towed** - Check this box if the carcass, including skeleton, was towed to sea. Fill in the latitude and longitude of the position where the carcass was left.
- **Sunk** - Check this box if the carcass, including skeleton, was sunk. Fill in the latitude and longitude of the position where the carcass was sunk..
- **Frozen for later examination** - Check this box if all or most of the carcass and/or skeleton was retained and frozen for later examination.
- **Landfill** - Check this box if the carcass, including skeleton, was sent to a landfill or other waste facility.
- **Unknown** - Check this box if the fate of the carcass is unknown or if the carcass was lost.
- **Other** – Check this box if the fate of the carcass is other than what is listed above and document here.

SPECIMEN DISPOSITION (Check all that apply) – Check the following boxes to indicate if nondiagnostic specimens were collected for scientific, educational, or other purposes (i.e., skin for genetics, blubber for contaminants, bones for collection, etc.). The disposition (both transitory and final) of these specimens should be recorded on the back of the form under "ADDITIONAL REMARKS." Please check with your NMFS regional stranding coordinator regarding marine mammal parts authorizations prior to retention and transfer.

- **Scientific collection** - check this box if specimens from the live animal or carcass, including skeletal parts, were retained for scientific research.
- **Educational collection** - check this box if specimens from the live animal or carcass, including skeletal parts, were retained for educational purposes.

- **Other** - check this box if the fate of specimens from the live animal or carcass, including skeletal parts, was other than that above and briefly indicate the disposition.
- **Comments** - List comments regarding disposition of the specimen (i.e., identifying which tissues were collected and retained, differentiating where tissues were sent, etc.).

NECROPSY - Indicate "YES" if a necropsy was completed to obtain Level-C data.

- **Limited Necropsy** - A partial necropsy includes a detailed exam of the carcass in which some of the organs or systems are examined, collected, and analyzed according to established protocols, but either the condition of the animal or other factors limits a complete necropsy. Please indicate in the **ADDITIONAL REMARKS** section the systems examined and not examination as well as examination findings.
- **Complete necropsy** - A complete necropsy consists of a detailed exam where the majority of organs are examined, collected (i.e., if feasible, this could include tissues for histopathology) and analyzed according to established protocols. This will include documenting any internal lesions, bruising, or broken/fractured bones, and
  examining the entire GI tract for lesions, foreign material, gear, and other natural contents (e.g. food), and the lungs/bronchi. A necropsy report is generated and disseminated to the pathologist on record.
- **Carcass Fresh** = Check if the necropsy was conducted on a fresh carcass (not frozen before examination).
- **Carcass Frozen/Thawed** = Check if the necropsy was conducted on a carcass that was frozen and thawed.

NECROSPIED BY - List the name and contact information of the primary person/facility who conducted the necropsy.

Date – List the date when the necropsy was done.

BACK OF FORM

ADDITIONAL IDENTIFIERS: Include any additional information related to the Field ID number or identification of the stranding event. Examples include: previous Field ID numbers if this animal previously stranded; ID numbers assigned by other organizations (including authorized rehabilitation facilities to which the animal is transferred), former identification numbers from scientific research projects, etc.

ADDITIONAL REMARKS: Include comments, and list other data sheets that may have been completed such as human interaction, morphometrics, necropsy, rehabilitation disposition, etc. Include further details or comments on any of the Level A data fields from the front of the sheet.

Specimen Requests

Specimen Request Form

Please fill out this form to request specimens from the stranding network. To obtain specimens you must have prior authorization via a scientific research permit issued by the National Marine Fisheries Service, authorization to salvage as part of official duties, authorization via 16 U.S.C. 1382 (c) or have received prior authorization from the Regional Administrator of the Northwest Region. Specimen requests may be fulfilled by the network at their discretion based on available resources and ability. Specimen requests will be considered independently by the first response stranding network member and do not necessarily require that you or your group is available to assist with the stranding response.

Requesting group/ Organization/researcher Contact information (Phone numbers, e-mail)	

Species	**Condition codes that are acceptable**	**Tissue type/sample requested* (include size of sample requested)**	**Sample container (foil, glass jar, Ziploc/ Whirlpak)**	**Sample storage (fresh, frozen, formalin)**	**Description of purpose (research project, education, Prescott grant)**

*Please attach any relevant sampling protocols with specific directions on taking samples

Ship/Transport instructions (shipping/delivery address if different from above:

Resources available: Are you able to supply sample containers (jars, vials, etc.), shipping materials (boxes, gel packs, coolers), shipping costs (FedEx number)??

Education

Sharing the Shore with Harbor Seal Pups in Washington State

Points to Remember

Haul-outs:

Harbor seals utilize specific shoreline locations on a regular basis as resting places (haul-outs). Haul-outs include beaches, rocks, log booms, floats and buoys. Seals will return to these locations to haul-out but any shoreline or floating feature with easy access to the water can serve as a resting spot.

Harbor seals rest out of the water for several hours each day to regulate body temperature, interact with each other, and sleep. Harbor seals are vulnerable on land and are therefore wary of being approached while out of the water. Some seals, however, may tolerate activity close by. The most frequently reported encounters with seals out of the water involve pups that are too young to have developed protective wariness (escape response).

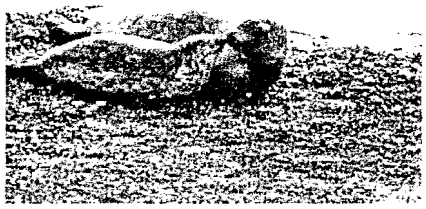
Pups and Pupping:

Pups are born in the spring and summer and the timing of the peak birth period varies geographically.

Location	Time of Year
Columbia River, Willapa Bay, Grays Harbor	Mid-April - June
Olympic Peninsula	May - July
San Juan Islands, Eastern Puget Sound	June - August
Southern Puget Sound	July - September
Hood Canal	August - October

The majority of pups are born at protected haul-out sites, which are called rookeries, but a female may give birth anywhere that there is easy access to the waters edge.

Nursing pups remain with their mothers for 4 to 6 weeks and then are weaned to forage and survive on their own. A nursing pup may double its birth weight by the time it is weaned and uses stored fat reserves as it learns to feed on its own. Up to 50% of the pups born will not survive the first year of life. Contributing factors to pup mortality are; conditions associated with fetal development or premature birth; disease; predation by shoreline predators or domestic dogs; infection; dehydration; or starvation.



Human Interference:

Harbor seals are less mobile and therefore more vulnerable to disturbance or predation while out of the water. Adult seals are more wary and escape to the water more quickly than pups. Females will flee to the water if disturbed or approached and may leave their pups behind.

Although the percentage of successful female/pup reunions has not been documented, anecdotal reports indicate that pups have successfully reunited up to 48 hours after separation. A female seal is more likely to return to reclaim her pup once the disturbance near the pup goes away. If activity continues near the pup, the female may eventually give up trying and the pup will be abandoned. A nursing pup that is separated from its mother will not survive.

Things You Can Do to Promote Responsible Wildlife Viewing

Share the Shoreline

- If you see a seal on the beach, give it space. The NMFS marine mammal viewing guidelines recommend a **MINIMUM** approach distance of 100 yards. The approach limitation will minimize the potential for disturbing a resting animal and/or reduce stress for an animal that may be recovering from illness or injury.
- Observe from a distance using binoculars or a spotting scope if you want to see the animal close up.
- Keep pets away. Dogs are naturally curious about other animals in their environment. Seals pups can easily fall prey to dogs, to avoid a negative interaction dogs should be leashed and kept away from the seals on the beach. Older seals may bite in self defense. Some diseases are infectious to both dogs and seals, and may pose a risk to humans as well, if they come in direct contact with an infected animal.

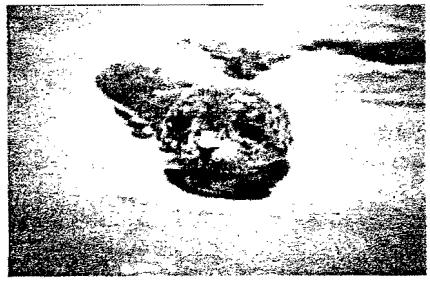
Share Information

- If the beach is regularly patrolled or maintained by a local agency, alert them to the presence of the animal so that they can check on it periodically to determine if there is a need to post informational signs or to intervene in some way. A minimum undisturbed observation period of 24 to 48 hours is recommended to determine whether the pup is being attended by a female. Signs of an attendant female would include; sightings of seal(s) in the water nearby; tracks near the pup; movement of the pup up or down the beach, or in and out of the water.
- Advise neighbors of the animals presence, note its location and when it was first observed.
- Remind others that seal pups need to use shoreline habitat to warm up (**DO NOT** pour water on seal pups); and rest (**DO NOT** handle, cover or attempt to feed seal pups).
- Feeding or baiting seals in the wild is a form of harassment and is harmful. Seals that are fed by humans quickly learn to seek humans for feeding opportunities.
- If the pup has been unattended for 48 hours, or is clearly in distress (injured), contact:

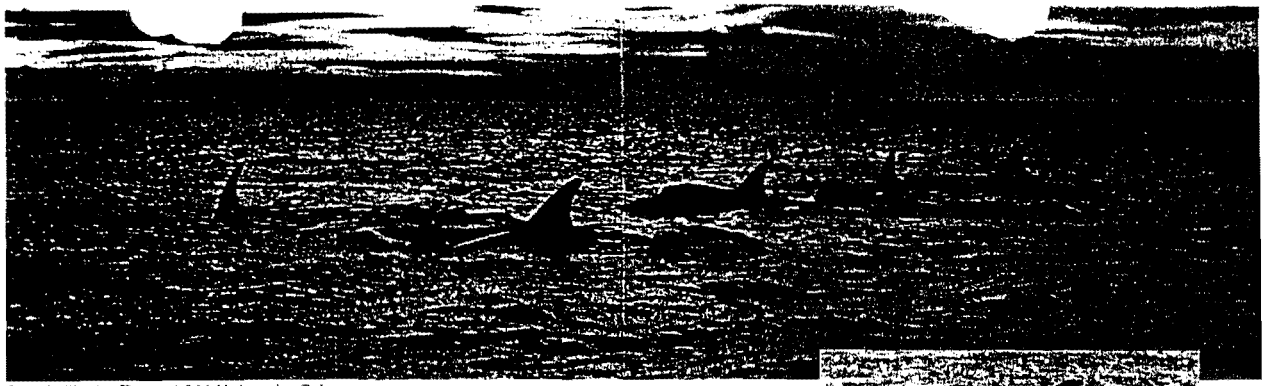
NW Marine Mammal Stranding Network Hotline
1-800-853-1964
or contact local authorities at

Report Harassment

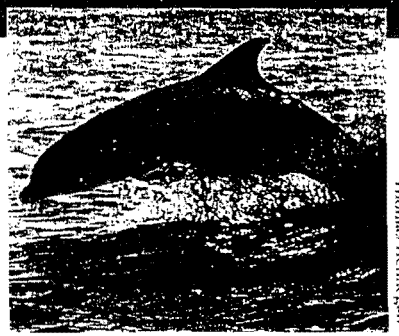
Seals are federally protected from harassment and capture by the public. If you observe incidents of people or pets tormenting, disturbing or attempting to remove a seal from the beach, contact the **NOAA Fisheries Enforcement Hotline (1-800-853-1964)** to report a violation.



U.S. Department of Commerce
Northwest Regional Office
NOAA Fisheries National Marine Fisheries Service



Bernd Würsig, Texas A&M University-Galveston



Thomas Henderson

What you can do ...

- Do not feed marine mammals when you are boating or walking along a pier.
- Maintain a minimum distance of 50 to 100 yards from all animals, whether in the water or on shore, to prevent disturbance or harassment.
- Learn more about marine mammals by visiting a library, nature center or museum and teach others what you know.
- Find out who handles live marine mammal strandings in your area in case you see one. If no separate organization exists, contact the National Marine Fisheries Service, U.S. Fish and Wildlife Service or your state wildlife agency.
- A seal or sea lion pup found alone on shore is generally not abandoned, but has only temporarily been left behind while the mother forages. Leave it alone. Any attempt to move the animal can result in injury or ultimate abandonment by the mother.
- Keep your distance ... respect their beauty, enjoy watching them, but don't feed them, harm them, or swim with them. You can return another day — make sure they can too.

The cooperating agencies' programs are open to all citizens without regard to race, color, sex, handicap, religion, age or national origin. Publication of this document was supported in part by the National Marine Fisheries Service, National Oceanic and Atmospheric Administration, and by Institutional Grant NA16RG0157-01 to Texas A&M University by the National Sea Grant Office, National Oceanic and Atmospheric Administration, U.S. Department of Commerce. Text and design — *Amy Bronsunk*; front panel photo — *Dr. Bernd Würsig*, Texas A&M University-Galveston.

TAMU-SG-93-401
50M September 1992
NA16RG0157-01
A 1-3

Protecting Marine Mammals

Look

from a distance ... but don't touch, feed or harm in the wild

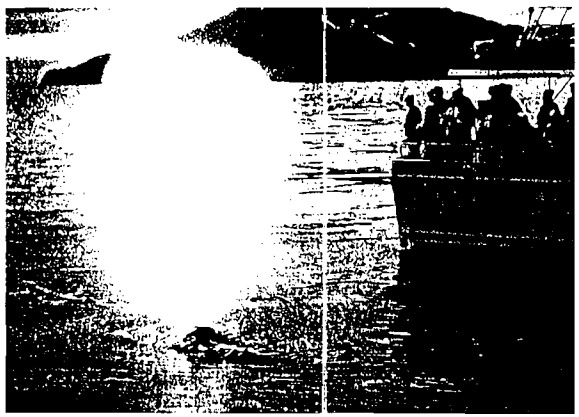
Sea Grant College Program
Texas A&M University

Office of Protected Resources
National Marine Fisheries Service
1335 East-West Highway

Sue Keller, Alaska Sea Grant

Who doesn't get a thrill from watching a dolphin jump through the waves on a summer day? Or a sea lion sun itself on a windswept rock? Or experience a feeling of serenity in watching the migration of majestic whales along the coast?

Who hasn't wanted, at least once, to get even closer to these marine mammals — to join in their antics, to become part of their habitats, to respond to their apparent calls for human contact?



Kurt Byers, Alaska Sea Grant

Why not? What possible harm can we do by hand-feeding dolphins, sea lions or seals? Or by piloting our boats close enough so we can reach out and touch a passing marine mammal? What harm is there in swimming with playful dolphins or porpoise and teaching them to be friendly with humans?

Unfortunately, we can kill them.

Not intentionally, not even today. But our well-meaning actions on a summer's day are putting more and more marine mammals at risk.

These animals are protected by the Marine Mammal Protection Act ... and some by the Endangered Species Act. The National Marine Fisheries Service, which is responsible for managing and protecting whales, dolphins, porpoise, seals and sea lions, has regulations prohibiting feeding marine mammals in the wild and others that specify how close people can get to the animals. We've learned, albeit slowly, that these activities may significantly change the marine mammals' behavior by disrupting their normal feeding and reproductive patterns.

Consider the facts ...

- Feeding marine mammals can affect their ability to cope and live in their natural habitat.
- It reduces the animal's natural wariness of humans and increased interactions with people can lead to injury or death to the marine mammals.
- Feeding marine mammals encourages them to approach boats and increases their chances of colliding with boats. They become more apt to tangle with fishing gear or boat propellers.
- Regular feeding programs may cause migratory animals to remain in areas after their natural primary prey species have left and the animals could be subjected to food shortages and inhospitable conditions.
- Marine mammals who are accustomed to being fed when boats are around and people are in the water may become aggressive in their efforts to get food and could injure swimmers.

Did you know ...

- After dolphin feeding became popular along the Gulf and southern Atlantic coasts, scientists found more stranded dolphins with wounds and scars from boat propellers. More dolphins also began approaching boats and begging for handouts.
- People have been seen trying to feed marine mammals such things as beer, junk food or non-edible foreign objects.
- Marine mammals have been hit by boat propellers, snagged by fish hooks and chased down by high-powered motor boats. Pups or calves too young to feed themselves die when they are separated from their mothers.
- Gunshot wounds are a common cause of death in seals and sea lions on the West Coast and off Florida's east coast, and dolphins have been shot in the Gulf of Mexico.
- In the first year of a program to assess marine mammal interactions with commercial fishing operations, 89 dolphins and porpoise were entangled in coastal gillnets and trawl fisheries
- In Hawaii an increase in vessel traffic may have displaced humpback whales from their traditional nursery areas where they are most protected from predators

A K H Kam, Hawaii Sea Grant

Bernd Würsig, Texas A&M U[illegible]y-Galveston

Be Whale Wise

Marine Wildlife Guidelines for Boaters, Paddlers and Viewers *(Revised 2005)*

Guidelines:

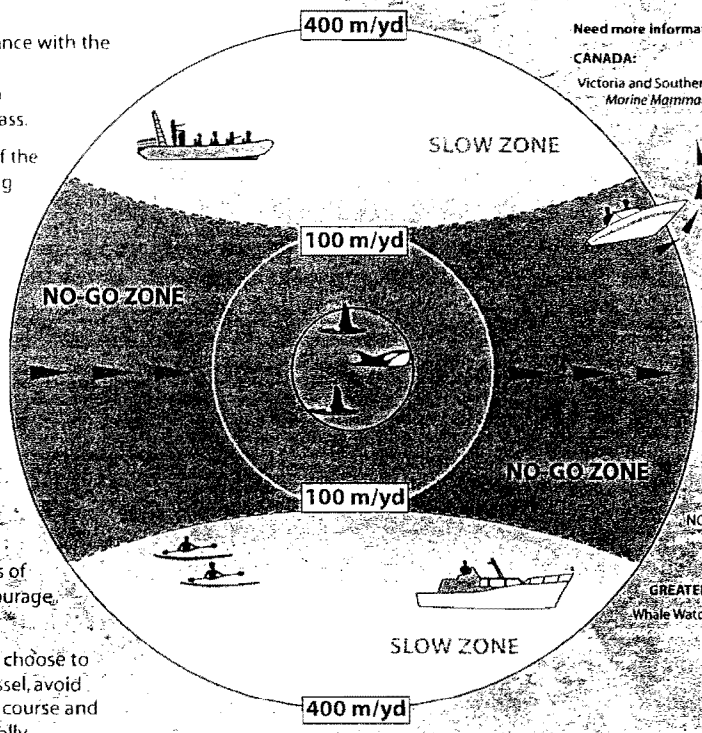
1. BE CAUTIOUS and COURTEOUS: approach areas of known or suspected marine wildlife activity with extreme caution. Look in all directions before planning your approach or departure.
2. SLOW DOWN: reduce speed to less than 7 knots when within 400 metres/yards of the nearest whale. Avoid abrupt course changes.
3. **KEEP CLEAR of the whales' path.** If whales are approaching you, cautiously move out of the way.
4. DO NOT APPROACH whales from the front or from behind. Always approach and depart whales from the side, moving in a direction parallel to the direction of the whales.
5. **DO NOT APPROACH or position your vessel closer than 100 metres/yards to any whale.**
6. If your vessel is not in compliance with the 100 metres/yards approach guideline (#5), place engine in neutral and allow whales to pass.
7. STAY on the OFFSHORE side of the whales when they are traveling close to shore.
8. LIMIT your viewing time to a recommended maximum of 30 minutes. This will minimize the cumulative impact of many vessels and give consideration to other viewers.
9. DO NOT swim with, touch or feed marine wildlife.

Bow and stern-riding porpoises and dolphins:

1. DO NOT drive through groups of porpoises or dolphins to encourage bow or stern-riding.
2. Should dolphins or porpoises choose to ride the bow wave of your vessel, avoid sudden course changes. Hold course and speed or reduce speed gradually.

Seals, sea lions and birds on land:

1. BE CAUTIOUS AND QUIET when around haul-outs and bird colonies, especially during breeding, nesting and pupping seasons (generally May to September).
2. REDUCE SPEED, minimize wake, wash and noise, and then slowly pass without stopping.
3. AVOID approaching closer than 100 metres/yards to any marine mammals or birds.
4. PAY ATTENTION and move away, slowly and cautiously, at the first sign of disturbance or agitation.
5. DO NOT disturb, move, feed or touch any marine wildlife, including seal pups. If you are concerned about a potentially sick or stranded animal, contact your local stranding network where available.



Marine Protected Areas, Wildlife Refuges, Ecological Reserves and Parks:

1. CHECK your nautical charts for the location of various protected areas.
2. ABIDE by posted restrictions or contact a local authority for further information.

To report a marine mammal disturbance or harassment:

CANADA:
Fisheries and Oceans Canada: 1-800-465-4336

US:
NOAA Fisheries, Office for Law Enforcement: 1-800-853-1964

To report marine mammal sightings:

BC Cetacean Sightings Network(BC)
or 1-866-I SAW ONE

The Whale Museum Hotline (WA state)
or 1-800-562-8832

Orca Network (WA state)
or 1-866-ORCANET

Need more information?

CANADA:

Victoria and Southern Gulf Islands:
Marine Mammal Monitoring Project (M3)
or 250-383-2086

Johnstone Strait and Northern Vancouver Island:
Straitwatch
or 250-974-7064

Robson Bight (Michael Bigg) Ecological Reserve:

Fisheries and Oceans Canada:

US:

Washington State, Haro Strait Region:
Soundwatch Boater Education Program
or 360-378-4710

NOAA Fisheries, Northwest Region:

NOAA Fisheries, Office of Protected Species:

GREATER VICTORIA and WASHINGTON STATE:

Whale Watch Operators Association NW:

Fisheries and Oceans Canada | Pêches et Océans Canada | BCParks | aquarium | SEATTLE AQUARIUM | Georgia Strait Alliance | Orca Network

Educational Links!

For background info on marine mammals, please visit:

http://www.nwr.noaa.gov/Marine-Mammals/index.cfm

For information on marine mammal research programs, please visit:

NOAA's National Marine Mammal Lab
http://www.afsc.noaa.gov/NMML/

Cascadia Research Collective
http://www.cascadiaresearch.org/

For information on killer whale research, education programs and to report sightings, please visit:

Center for Whale Research
http://www.whaleresearch.com/

Orca Network
http://www.orcanetwork.org/

The Whale Museum
http://www.whale-museum.org/

Killer Whale Tales
http://www.killerwhaletales.org/

Northwest Fisheries Science Center Marine Mammal Program
http://www.nwfsc.noaa.gov/research/divisions/cbd/marine_mammal/marinemammal.cfm

For information on local zoos and aquariums with marine mammal displays, please visit:

Seattle Aquarium
http://www.seattleaquarium.org/

Oregon Coast
http://www.aquarium.org/

Point Defiance
http://www.pdza.org/

Species ID

Marine Mammals in Washington and Oregon

1. Cetaceans – Order Cetacea
    a. Mysticetes (Baleen Whales) – Suborder Mysticeti
        i. **Family Balaenidae**
            1. Northern Pacific Right Whale* – *Eubalaena glacialis*
        ii. **Family Balaenopteridae**
            1. Blue Whale * – *Balaenoptera musculus*
            2. Fin Whale * – *Balaenoptera physalus*
            3. Sei Whale * – *Balaenoptera borealis*
            4. Minke Whale – *Balaenoptera acutorostrata*
            5. Humpback Whale *– *Megaptera novaeangliae*
        iii. **Family Eschrichtiidae**
            1. Gray Whale – *Eschrichtius robustus*
    b. Odontocetes (Toothed Whales) – Suborder Odontoceti
        i. **Family Physeteridae**
            1. Sperm Whale * – *Physeter macrocephalus*
        ii. **Family Kogiidae**
            1. Dwarf Sperm Whale – *Kogia simus*
            2. Pgymy Sperm Whale – *Kogia breviceps*
        iii. **Family Ziphiidae (Beaked Whales)**
            1. Baird's Beaked Whale – *Berardius bairdii*
            2. Cuvier's Beaked Whale – *Ziphius cavirostris*
            3. Hubb's Beaked Whale – *Mesoplodon carlhubbsi*
            4. Stejneger's Beaked Whale – *Mesoplodon stejnegeri*
        iv. **Family Phocoenidae (Porpoises)**
            1. Harbor Porpoise – *Phocoena phocoena*
            2. Dall's Porpoise – *Phocoenoides dalli*
        v. **Family Delphinidae (Dolphins)**
            1. Striped Dolphin – *Stenella coeruleoalba*
            2. Common Dolphin – *Delphinus spp.*
            3. Pacific White-sided Dolphin – *Lagenorhynchus obliquidens*
            4. Risso's Dolphin – *Grampus griseus*
            5. False Killer Whale – *Pseudorca crassidens*
            6. Short-finned Pilot Whale – *Globicephala macrorhynchus*
            7. Northern Right Whale Dolphin – *Lissodelphis borealis*
            8. Killer Whale – *Orcinus orca*
                a. *Southern Resident Killer Whale* *

* Listed as Endangered under the Endangered Species Act
** Listed as Threatened under the Endangered Species Act

2. **Pinnipeds - Order Pinnipedia**
    a. Sea lions and Fur seals
        i. **Family Otariidae**
            1. California Sea Lion - *Zalophus californianus*
            2. Steller Sea Lion ** - *Eumetopias jubatus*
            3. Northern Fur Seal - *Callorhinus ursinus*
            4. Guadalupe Fur Seal** - *Arctocephalus townsendi*
    b. True seals
        i. **Family Phocidae**
            1. Harbor Seal - *Phoca vitulina*
            2. Northern Elephant Seal - *Mirounga angustirostris*
3. **Other Marine Mammals**
    a. Sea otters
        i. **Family Mustelidae**
            1. Sea Otter - *Enhydra lutris*

* Listed as Endangered under the Endangered Species Act
** Listed as Threatened under the Endangered Species Act

Age Class Length and Weight for Pinnipeds and Cetaceans

* All lengths and weight estimates are provided by: Geraci, J.R, and V.J. Lounsbury. 2005. Marine Mammals Ashore: A Field Guide for Strandings, Second Edition. National Aquarium in Baltimore, Baltimore, MD.

Northern Fur Seal

Age Class	Length (cm & m)	Length (inches or ft.)	Weight
Neonate	0.6 m = 60 cm	23.6 in	4.5-6 kg = 9.9-13.2 lb
Weaning			12-14 kg = 26.4-30.8 lb
Adult Female	1-1.5 m = 100-150 cm	39.37 -59 in	30-60 kg = 66-132 lb
Adult Male	1.9-2.3 m = 190-230 cm	74.8-90.5 in	180-270 kg = 396-594 lb.

Guadalupe Fur Seal

Age Class	Length (cm & m)	Length (inches or ft.)	Weight
Neonate	0.6 m= 60 cm	23.6 in	
Weaning			
Adult Female	1.4-1.7 m = 140-170 cm	55-66.9 in	40-55kg = 88-121 lb.
Adult Male	1.8-2.4 m = 180-240 cm	70.8-94.4 in	160-220kg = 352-484 lb.

Steller Sea Lion

Age Class	Length (cm & m)	Length (inches or ft.)	Weight
Neonate	1 m= 100 cm	39.37 in	16-23 kg=35.2-50.6 lb
Weaning	1.8 m=180 cm	70.86 in	
Adult Female	2.2-2.9 m = 220-290 cm	86.6-114 in	190-350 kg = 418-770 lb.
Adult Male	2.4-3.3 m = 240-330 cm	94.48-129.9 in	410-1100 kg = 902-2420 lb.

California Sea Lion

Age Class	Length (cm & m)	Length (inches or ft.)	Weight
Neonate	0.7 m = 70 cm	27.55 in	6-9 kg = 13.2-19.8 lb.
Weaning			25 kg = 55 lb.
Adult Female	1.5-2 m = 150-200 cm	59.0-78.74 in	50-110 kg = 110-242 lb.
Adult Male	2-2.4 m = 200-240 cm	78.74-94.48 in	250-390 kg = 550-858 lb.

Northern Elephant Seal

Age Class	Length (cm & m)	Length (inches or ft.)	Weight
Neonate	1.2-1.4 m = 120-140 cm	47.24-55.1 in	30-45 kg = 66-99 lb.
Weaning			100-160 kg = 220-352 lb.
Adult Female	2-3.5 m = 200-350 cm	78.74 – 125.9 in	600-900 kg = 1320-1980 lb.
Adult Male	3.8-4.1 m = 380-410 cm	149.6-161.41 in	1200-2300 kg = 2640-5060 lb.

Harbor Seal

Age Class	Length (cm & m)	Length (inches or ft.)	Weight
Neonate	0.7-0.9 m = 70-90 cm	27.5-35.4 in	9-15 kg = 19.8-33 lb.
Weaning	0.9 m = 90 cm	35.4 in	20-29 kg = 44-63.8 lb.
Adult	1.5-1.9 m = 150-190 cm	59-74.80 in	75-120 kg = 165-264 lb.

Gray Whale

Age Class	Length (cm & m)	Length (inches or ft.)	Weight
Neonate	4.6-5 m = 460-500 cm	15.09-163.4 ft.	500-680 kg = 1100-1496 lb.
Weaning			8.5 m = 27.8 ft.
Adult	11-15 m = 1100-1500 cm	36.0-49.21 ft.	16-35 tons

Humpback Whale

Age Class	Length (cm & m)	Length (inches or ft.)	Weight
Neonate	4-4.6 m = 400-460 cm	13.1-15.09 ft.	680-1400 kg = 1496-3080 lb.
Weaning	8-10 m = 800-1000 cm	17.6-22 ft.	
Adult	12-16 m = 1200-1600 cm	26.4-35.2 ft.	30-45 tons

Harbor Porpoise

Age Class	Length (cm & m)	Length (inches or ft.)	Weight
Neonate	0.7-0.9 m = 70-90 cm	27.5-35.4 in	5-6 kg = 11-13.2 lb.
Weaning	1.1-1 m = 100-110 cm	39.37-43.30 in	
Adult	1.4-1.7 m = 140-170 cm	55.1-66.9 in	601-80 kg = 132-176 lb.

Dall's Porpoise

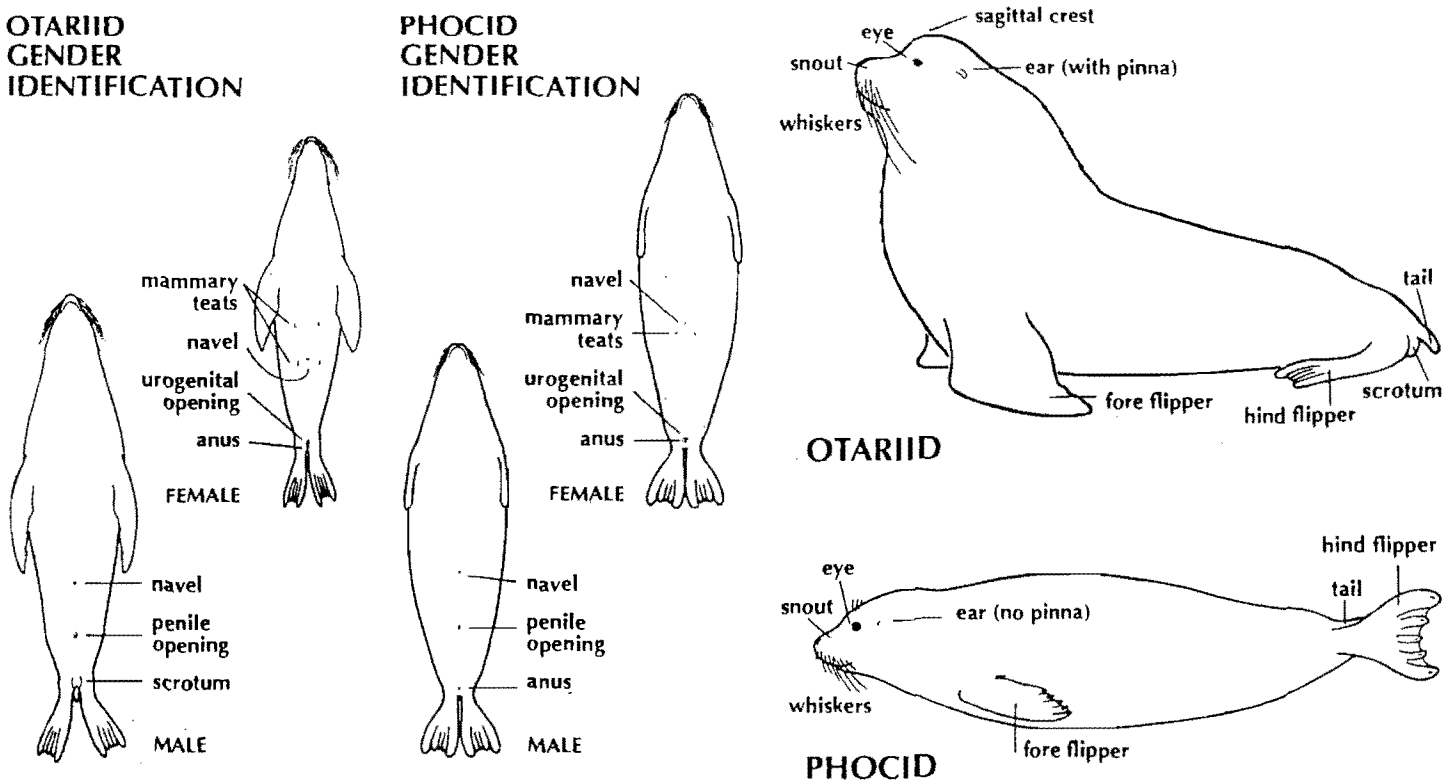
Age Class	Length (cm & m)	Length (inches or ft.)	Weight
Neonate	1 m = 100 cm	39.37 in	11-25 kg = 24.2-55 lb
Adult	1.8-2.2 m = 180-220 cm	70.8-86.61 in	100-200 kg = 220-484 lb.

Killer Whale

Age Class	Length (cm & m)	Length (inches or ft.)	Weight
Neonate	2.1-2.5 m = 210-250 cm	6.88-8.2 ft.	180 kg = 396 lb.
Weaning	4 m = 400 cm	13.12 ft.	
Adult Female	7-8 m = 700-800 cm	22.9-16.24 ft.	4 tons
Adult Male	8-9 m = 800-900 cm	26.24-29.5 ft.	5.6-8 tons

Pinnipeds

Morphology of Pinnipeds



From "Guide to Marine Mammals of Alaska" by Kate Wynne

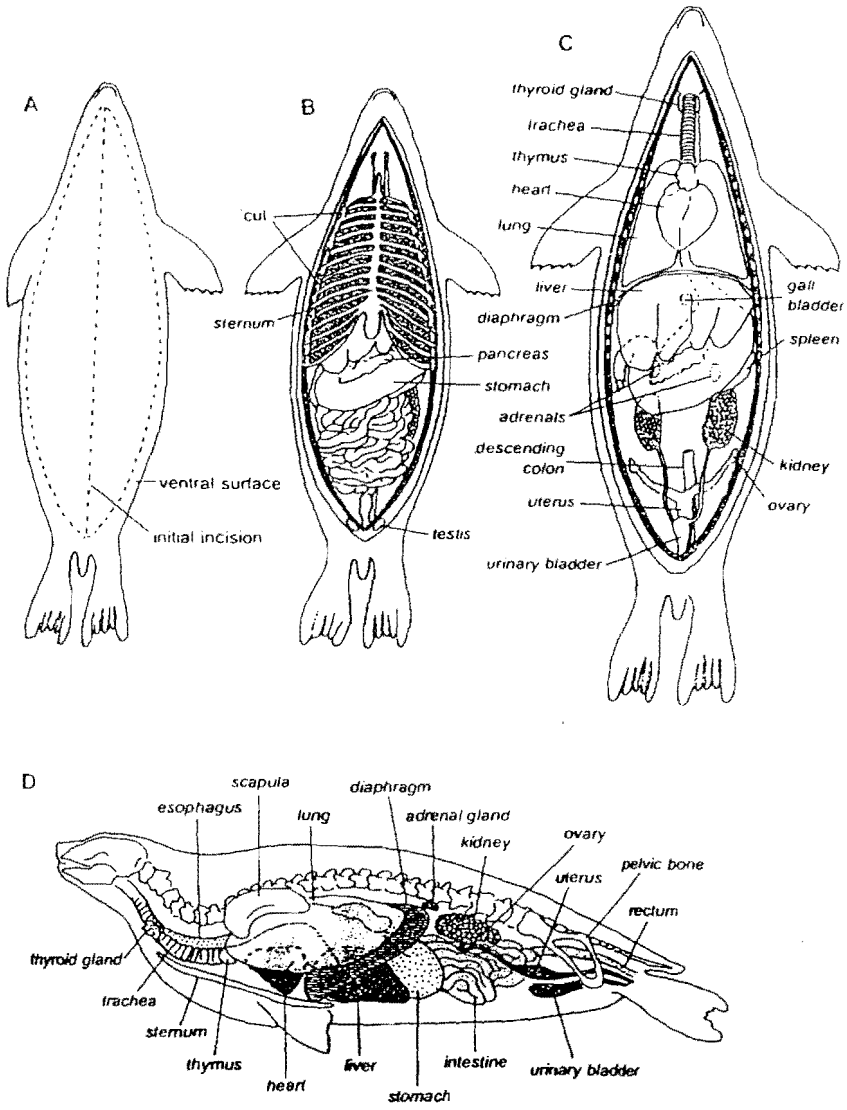
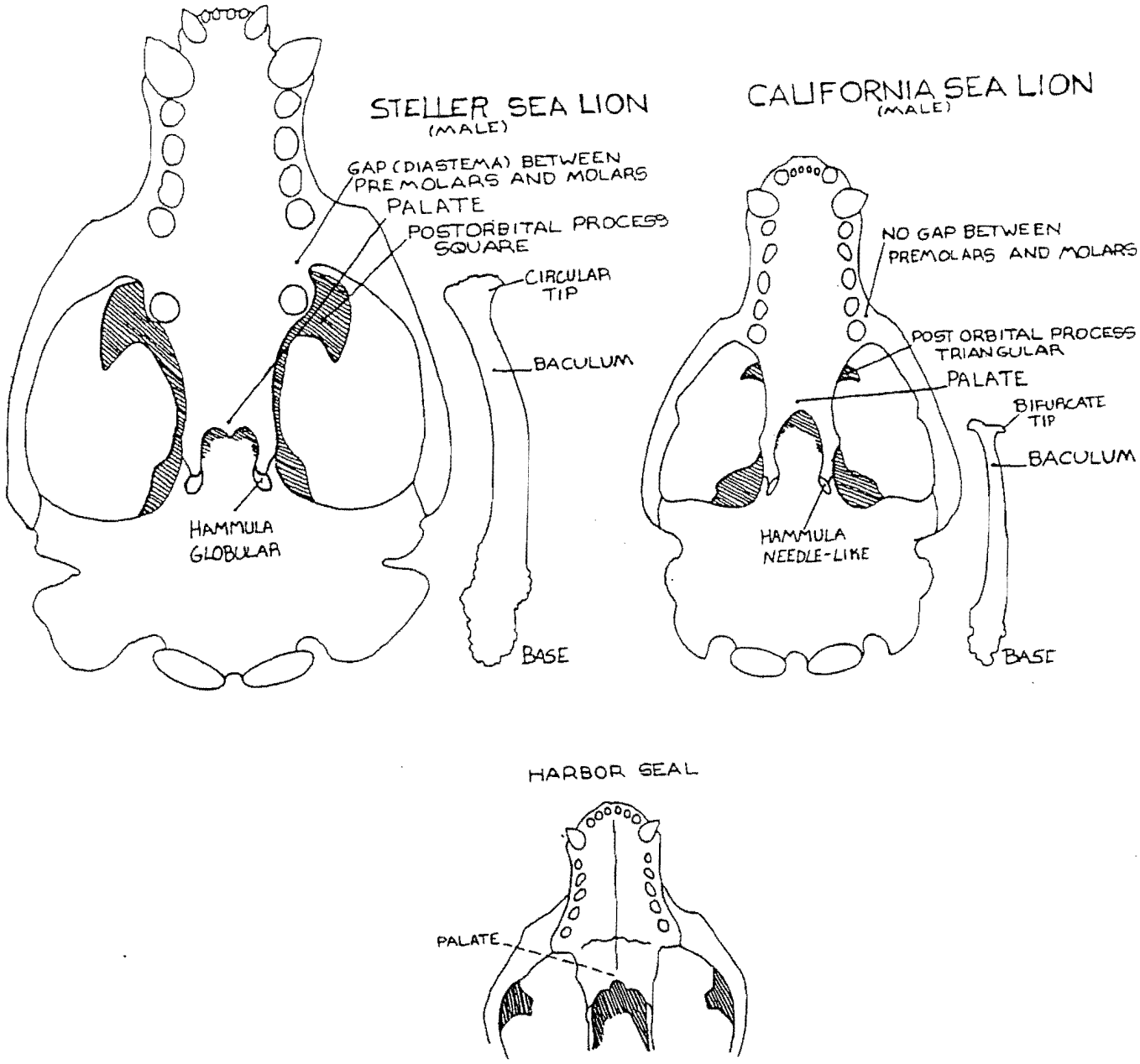


Fig. 10.11. Pinniped dissection and internal anatomy. **A.** Initial incisions. **B.** Ventral view of superficial viscera before removal of sternum and costal cartilages. **C.** Ventral view of major internal organs after removal of intestines (modified from Fay et al. 1979[34] and Winchell 1990[109]). **D.** Lateral view of major internal organs of a phocid seal (modified from Rommel[87]).

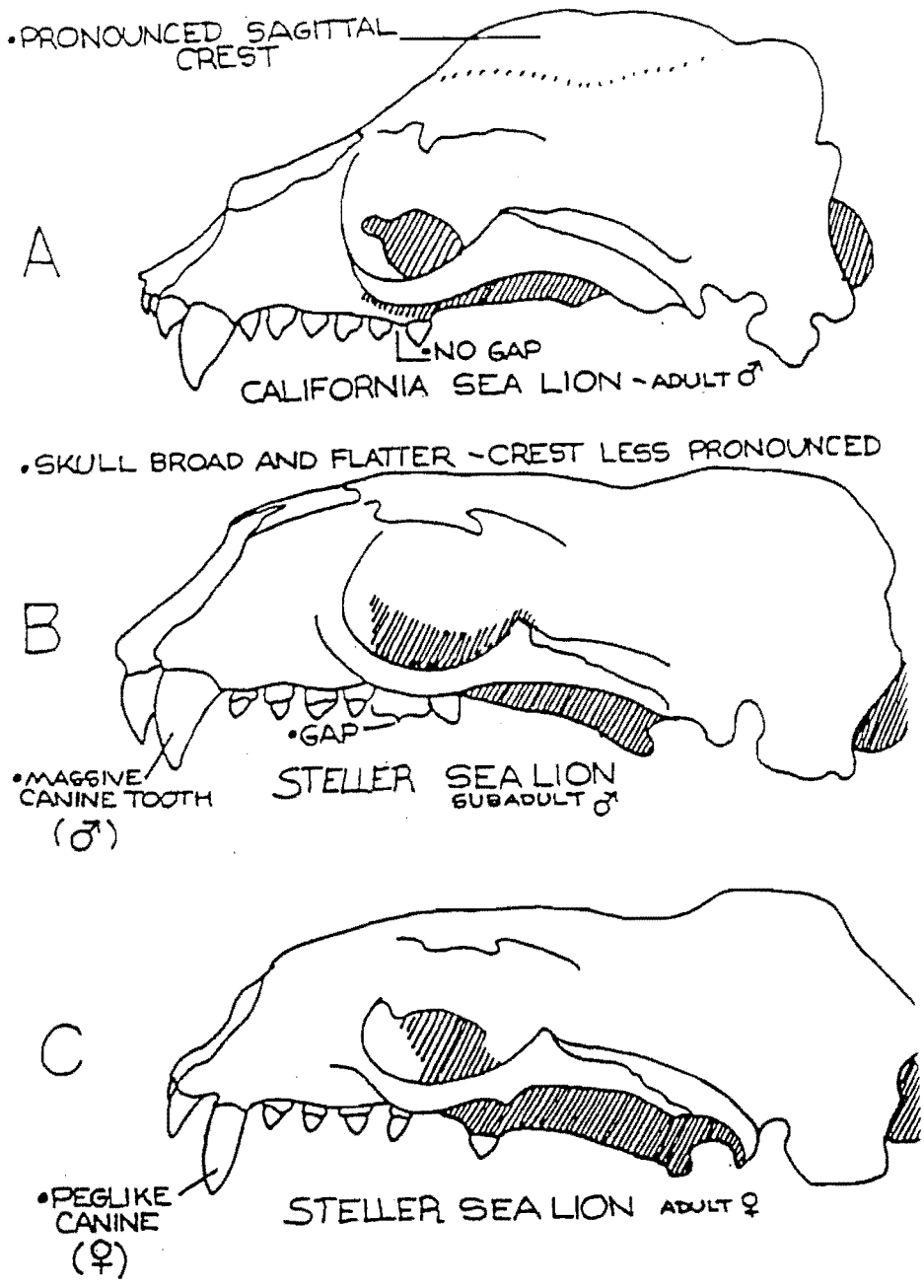
From "Marine Mammals Ashore: A Field Guide for Strandings" by Geraci & Lounsbury

Phocidae Seals	Vs.	Otaridae Sea Lions & Fur Seals
Wriggling undulations, cannot rotate hind limbs forward for "walking" motion.	**Locomotion**	Can walk on all four feet, the hind limbs are rotated forward under the posterior end for support.
Use mainly the hind limbs for propulsion.	**Swimming**	Use mainly the forelimbs for propulsion.
No external ear present.	**Ear Present?**	Small external ear present.
Small fore flippers, less than ¼ of the total body length.	**Flipper Size**	Large fore flippers, about ¼ of the total body length.
Five claws on the hind flippers.	**Claws?**	Three middle claws on the hind flippers.
Often spotted or occasionally banded, no under fur present.	**Coat**	Colors are usually uniform, never spotted or banded and may possess distinct under fur.
Hair covers all flippers.	**Hair on flippers?**	All surfaces of flippers sparsely haired or naked.
Mammae with two or four teats.	**Teats**	Mammae with four teats.
Males are equal to or slightly smaller or larger than females.	**Sexual dimorphism**	Males are larger than females.
Most species monogamous.	**Reproduction**	All species polygynous.

Information was compiled from "Whales and other Marine Mammals of Washington and Oregon" by Tamera Eder.



D. G. Ainley, G.W. Page, L.T. Jones, L.E. Stenzel and R.L. LeValley. 1980. "Beached Marine Birds and Mammals of the North American West Coast: A Manual for Their Census and Identification" FWS/OBS-80/03

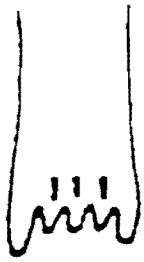


D. G. Ainley, G.W. Page, L.T. Jones, L.E. Stenzel and R.L. LeValley. 1980. "Beached Marine Birds and Mammals of the North American West Coast: A Manual for Their Census and Identification" FWS/OBS-80/03

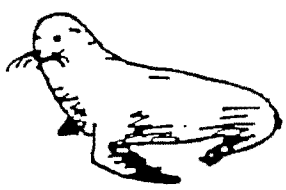
A GUIDE TO PINNIPEDS

-ear pinnae present
-beige & brown whiskers
-short fur

-fore flippers mostly hairless
-fur extends down onto flipper
-nails rudimentary



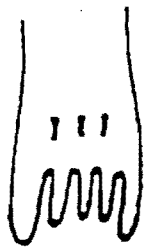
-hind flippers hairless
-nails present on middle 3 digits
-nails located 1/4 of the length of the flipper from the trailing edge
-able to bring hind flippers under the body



CA. SEA LION

-long ear pinnae present
-beige & brown whiskers
-long fur

-fore flippers hairless
-fur line stops at the top of the flipper, cutting straight across
-nails rudimentary



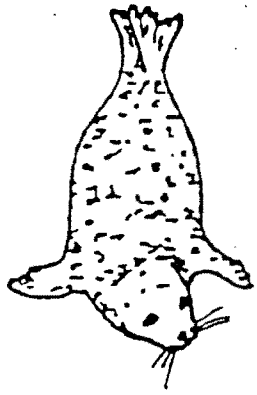
-hind flippers hairless
-nails present on middle 3 digits
-nails located 1/3 of the length of the flipper from the trailing edge
-able to bring hind flippers under the body

NORTHERN FUR SEAL

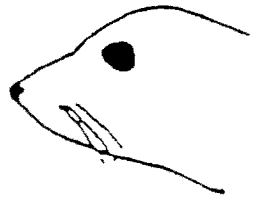
-no pinnae; ear hole visible
-white whiskers

-fore flippers haired
-nails present

-hind flippers haired
-nails present
-hind flippers always behind body

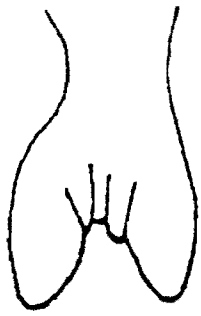


HARBOR SEAL

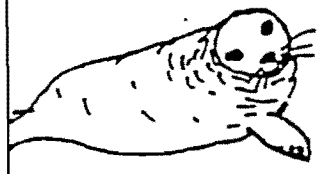


-no pinnae; ear hole not visible
-black whiskers

-fore flippers haired
-nails present
-first digit elongated



-hind flippers haired
-nails absent
-hind flippers always behind body



NO. ELEPHANT SEAL

Harbor Seals

Phoca vitulina

Location: Can be seen in throughout Washington and Oregon, Europe, Asia, and northern coasts of North America.

Size: Males and Females range from 4-6 ft. and a maximum of 310 pounds.

Diet: Rockfish, cod, herring, flounder, and salmon.

Reproduction: Nurseries provide protection for pups; they are sexually mature at 3-7 years. Use the below table to estimate when harbor seal pups are born in your area.

Location	**Time of Year**
Columbia River, Willapa Bay, Grays Harbor	Mid-April - June
Olympic Peninsula	May - July
San Juan Islands, Eastern Puget Sound	June - August
Southern Puget Sound	July - September
Hood Canal	August - January

Table provided by Washington Department of Fish and Wildlife, Marine Mammal Investigations.

Gestation: 10 months.

Lactation: Weaned at 4-6 weeks, milk is 50% fat.

Behavior: Seal pups are temporarily left on shore while their mother forages for food. If you see a seal pup alone on the beach, the best thing to do is stay 100 yards away from the animal, harbor seal mothers are shy and will not return if there are disturbances around the pup. A required 48 hour observation time is necessary to determine if the pup is being attended by the mother or if it has been abandoned.

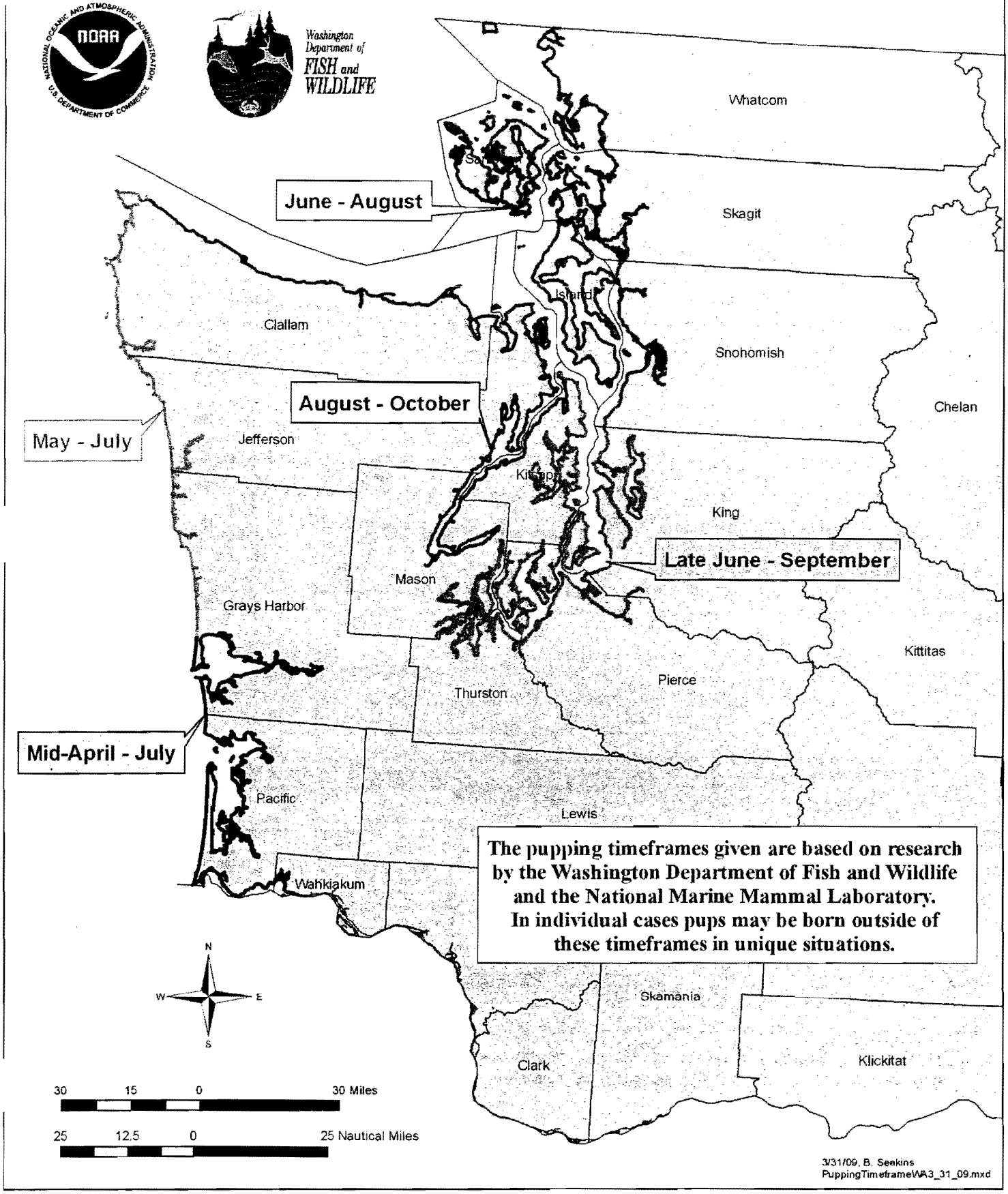
Sleep: Haul out at night and during the day; they have the ability to sleep underwater and come up for air once every 30 minutes, they are unable to sleep at the surface of the water.

Locomotion: On land harbor seals are very awkward, they are unable to move their hind limbs forward to create a "walking" motion, and instead they drag themselves along using their front flippers in a "caterpillar" motion. Locomotion on land is accomplished by wriggling undulations using mainly the front flippers; the hindlimbs cannot be rotated forward and are dragged behind. This does not mean they are injured.

Strandings: Harbor seals are the most common species to strand in Washington and Oregon State. Included below is stranding information from the past five years. Please note that 2006 numbers include only January through June.

Tamera Eder. Whales and other Marine Mammals of Washington and Oregon. Renton, WA: Lone Pine, 2001.

Harbor Seal Pupping Timeframes in Washington State



The pupping timeframes given are based on research by the Washington Department of Fish and Wildlife and the National Marine Mammal Laboratory. In individual cases pups may be born outside of these timeframes in unique situations.

3/31/09, B. Seekins
PuppingTimeframeWA3_31_09.mxd

Northern Fur Seal

Callorhinus ursinus

Location: Found from California through Alaska, across the North Pacific to Japan. Some leave Alaska rookeries in October and November and remain offshore until March through June. Some males stay in the North Pacific while the females and sub-adults spend winter offshore from Southeast Alaska to California.

Size: Males range from 6-7.5 feet and can be up to 620 pounds. Females are 3.5 – 5 feet and are around 120 pounds.

Diet: Mainly feed at night on squid, herring, capelin, and pollock.

Reproduction: Territories are established in May and June and females will arrive and give birth, mating 8-10 days after the pup is born.

Gestation: 10 months

Lactation: Four to five months

Behavior: This species only comes ashore to breed, and is pelagic for 7 to 10 months of the year. This species is known to be aggressive.

Tamera Eder. Whales and other Marine Mammals of Washington and Oregon. Renton, WA: Lone Pine, 2001.

Guadalupe Fur Seal

Arctocephalus townsendi

Location: Breed and pup mainly at Isla Guadalupe, Mexico and Isla Benito del Este, Baja California. It is considered uncommon for animals to be seen north of Central California, although individuals have been stranded or sighted as far north as Alaska. The whereabouts of Guadalupe Fur Seals during the nonbreeding season, from autumn through spring, are generally not known.

Size: Males can be up to 7.3 feet long and up to 490 pounds. Females are ~6 feet and are around 120 pounds.

Diet: Is poorly known but appears to consist of pelagic squid, lanternfish, and mackerel.

Reproduction: Females give birth from early June through July, with a peak in late June. Territories are established by males and breeding occurs one week after females give birth.

Gestation: 11-12 months

Lactation: Nine months

Behavior: Presumably solitary at sea. On land they are mostly asocial and space out to avoid contact with other seals. In nearshore waters, they spend most of their time grooming at the surface.

NW Region: In 2007, 19 Guadalupe Fur Seals stranded in Washington and Oregon. Since Guadalupe Fur Seals are rarely seen this far north, this event was considered to be an Unusual Mortality Event (UME). The UME has since been closed and a team has been identified to investigate the cause of this event. Please report all Guadalupe Fur Seal strandings to the NOAA Stranding Program Office at: 206-526-6733.

National Audubon Society. Guide to Marine Mammals of the World. New York, NY: Chanticleer Press, Inc., 2002.

Northern Elephant Seal

Mirounga angustirostris

Location: Can be found from coastal Baja California to the Gulf of Alaska. Between December and March adult Northern Elephant Seals arrive in California and Mexico to give birth and mate. After pupping and mating, the adults and young migrate to their feeding grounds as far north as the Aleutian Islands. They have one of the longest migrations of any mammal, some have been recorded traveling over 13,000 miles roundtrip.

Size: Males range from 12-16 feet and can weigh up to 5,000 pounds. Females are smaller and range from 7-12 feet and weigh around 2,000 pounds.

Diet: Squid, octopus, small sharks, rays, and large fish. They can dive for 80 minutes and reach depths of 5,000 feet.

Reproduction: Males form harems usually when they are 9-10 years of age, battling for status in the social hierarchy. Females come ashore and within a few days give birth to a pup conceived in the previous breeding season. A few days before her pup is weaned she breeds again and then returns to sea. They fast during mating season and can lose up to 36% of their body weight during this time.

Gestation: 11 months.

Lactation: No more than one month.

Behavior: These animals are polygynous breeders with a social hierarchy. Molting occurs, they shed their short, dense pelage along with large patches of old skin. Molting is a natural condition that takes 4-5 weeks to complete and is not an attractive process, this does not mean they are injured. Sometimes juveniles get "scabby molt" with skin lesions and birds will pick making the process even more gruesome. Elephant seals are vulnerable during molting and some animals will die. Hauling out on shoreline habitat allows the skin to warm up and will help the molting process, do not attempt to feed our pour water on the animal. The best thing you can do is stay 100 yards away from the animal!

Sleep: Rest at the surface of the water.

Tamera Eder. Whales and other Marine Mammals of Washington and Oregon. Renton, WA: Lone Pine, 2001.

California Sea Lion

Zalophus californianus

Location: Coastal waters of the North Pacific, Vancouver Island south to Mexico. Usually seen August to April on the coast of Washington.

Size: Average male is 8 feet and 800 pounds, females are 5 feet and 250 pounds. Nearly all California seal lions in our region are males, which average 600-800 pounds.

Diet: California Sea Lions eat over 50 species of fish, squid, octopus, and mollusks.

Reproduction: Breeding takes place from May to July, but breeding grounds are typically south of Oregon. Males establish their territories and females give birth and then mate one month later.

Gestation: 10 months

Lactation: Weaned by 8 months

Behavior: California sea lions are playful and intelligent, their behavior is rarely aggressive. A common behavior exhibited by sea lions is called "sailing". This is when a sea lion holds their flippers above the water motionless for a long period of time; they are regulating their body temperature. A lot of times people believe the animal is trapped in a net, if you cannot see a buoy or net gear the animal is most likely exhibiting this behavior.

Strandings: California sea lions are becoming more abundant in Washington and Oregon State. With increased populations more reports of strandings occur. The low in the past five years was 22 animals; the highest was in 2004 with a total of 133 animals.

Tamera Eder. Whales and other Marine Mammals of Washington and Oregon. Renton, WA: Lone Pine, 2001.

Steller Sea Lion

Eumetopias jubatus

Location: Can be seen from southern California up to Alaska, throughout the Aleutian Islands and south to Japan. Can be seen in the Pacific Northwest but are considered to be threatened under the Endangered Species Act.

Size: Males are 8.5-11 feet in length and can be up to 2,200 pounds. Females are 6-7 feet and up to 800 pounds.

Diet: Feed primarily on fish, for example, rockfish, herring, and greenling. They also feed on squid, octopus, shrimp, salmon, and other marine species. They have been observed swallowing rocks which is believed to help with digestion.

Reproduction: Hundreds of sea lions congregate at rookery sites that have been used for generations. Males form a harem at rookeries to establish their territory for breeding seasons. Females arrive and give birth in mid-May to June, mating again only two weeks after giving birth. Females are mature at three to seven years of age but males typically do not breed before the age of 10.

Gestation: 10 months

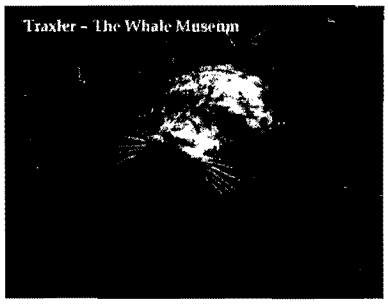
Lactation: One year

Behavior: Steller sea lions are known for their curiosity and playfulness, sometimes leaping from the water and they have been seen jumping across surfaced whales! Sea lions can also be aggressive and will bite if they feel threatened, please stay 100 yards away from these animals!

Strandings: Steller sea lion strandings number anywhere from 5-23 each year from 2002-2006. Some animals are found shot due to competition with fisheries.

Tamera Eder. Whales and other Marine Mammals of Washington and Oregon. Renton, WA: Lone Pine, 2001.

Pinnipeds!



Harbor Seal

Harbor Seal Pup

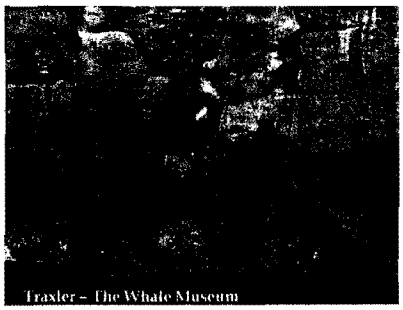
Northern Fur Seal

Guadalupe Fur Seal

Northern Fur Seal

Cascadia Research

← Northern Elephant Seals ↑

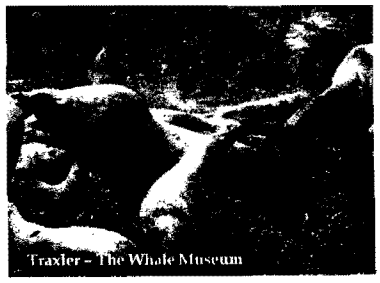


California Sea Lion

California Sea Lion

California Sea Lion

Steller Sea Lion

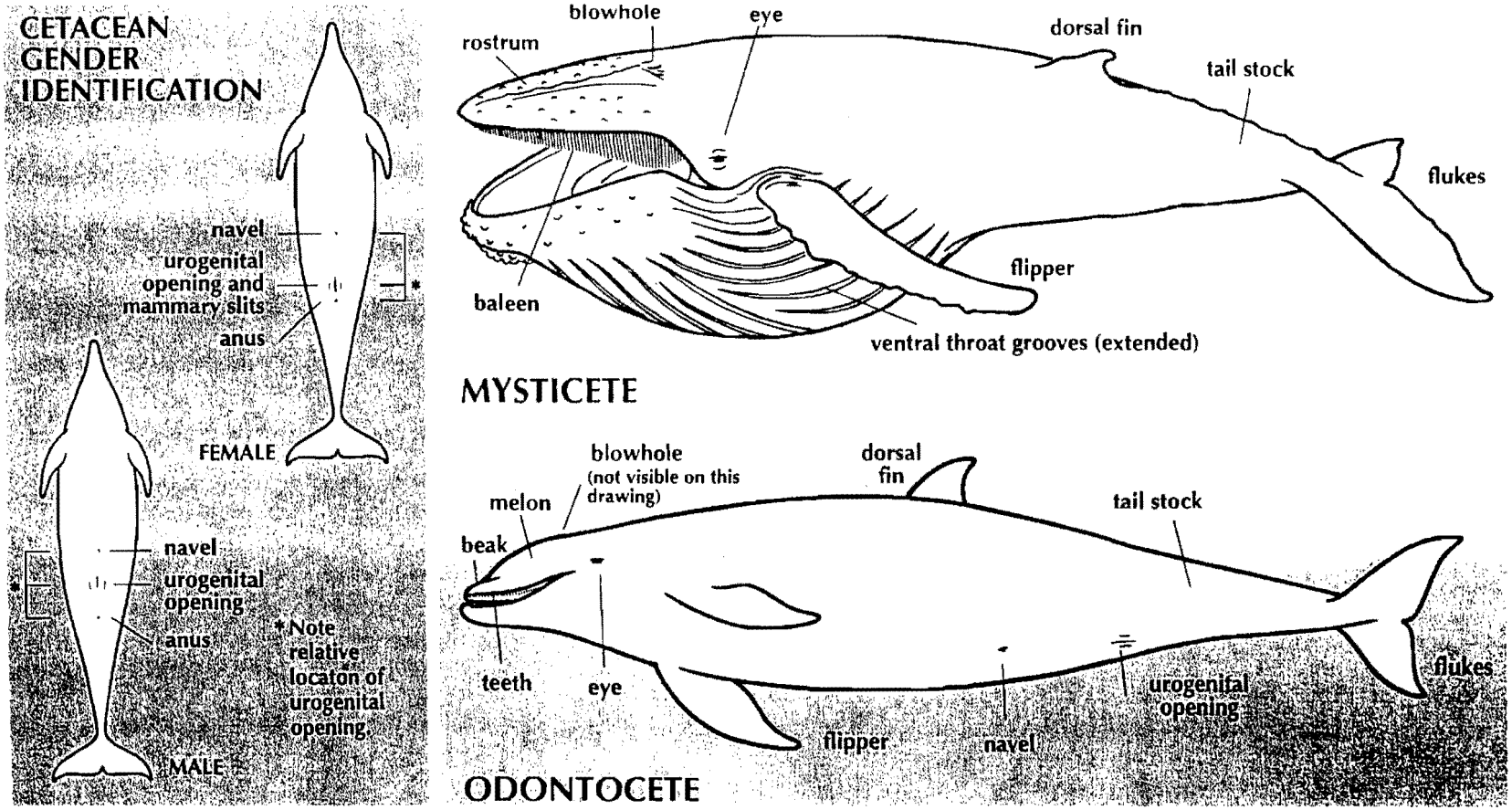


Steller Sea Lion

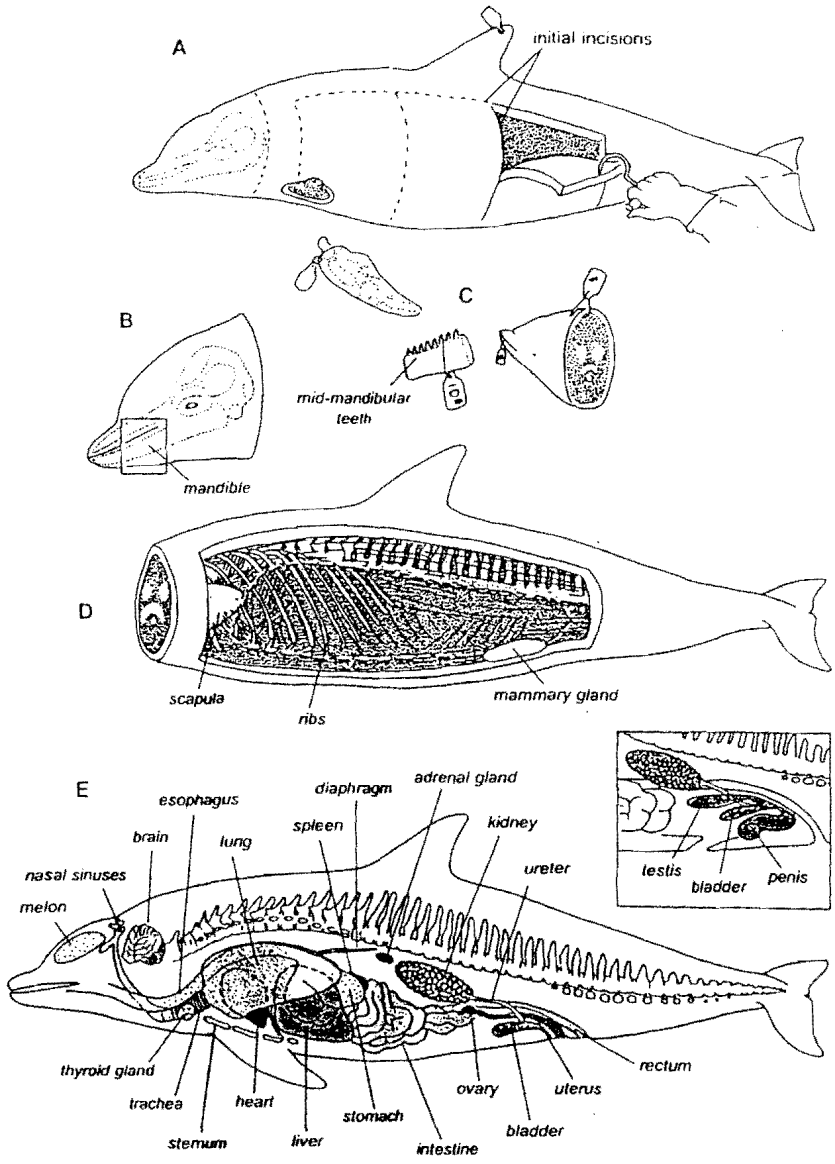
Steller Sea Lion

Cetaceans

Morphology of Cetaceans



Kate Wynne. Guide to Marine Mammals of Alaska. Fairbanks, AK: Alaskan Sea Grant College Program, 1992.



From "Marine Mammals Ashore: A Field Guide for Strandings" by Geraci & Lounsbury

Mysticeti	Vs.	*Odontoceti*
Two	**Blowholes**	One
Symmetrical	**Skull**	Asymmetrical
Baleen	**Feeding**	Teeth
Large	**Tongue Size**	Small
Not present, but doubtful	**Echolocation**	Present
Large	**Size**	Small to Large
Females usually larger than males	**Sexual Dimorphism**	Males usually larger than females
Small groups	**Pods?**	Complex social systems

Dolphin	Vs.	Porpoise
Cone	**Teeth**	Spade
Melon with pronounced beak	**Head**	Blunt with no prominent beak
6-12 feet	**Size**	4-7 feet
Robust	**Body Shape**	Streamlined
All ocean waters	**Preferred waters**	Shallow and nearshore
Six	**Sub-families**	Two
Thirty-three	**# of Species**	Six

* Some exceptions apply to specific species.

Tamera Eder. Whales and other Marine Mammals of Washington and Oregon. Renton, WA: Lone Pine, 2001.

Harbor Porpoise

Phocoena phocoena

Location: Harbor porpoises can be found in cold waters throughout the Northern Hemisphere and occur in coastal waters no deeper than 300 meters.

Size: The average adult is 5 feet in length and weighs a maximum of 150 pounds.

Diet: Preys upon small schooling fish such as herring, mackerel, or smelt. A good feeding ground can attract hundreds of harbor porpoises.

Reproduction: Sexually mature at 3-5 years and they breed in the summer months. Most harbor porpoises have a life span of 10-13 years.

Gestation: 10-11 months.

Lactation: Lasts approximately 8 months.

Behavior: Harbor porpoises are the smallest porpoise in the Pacific Northwest and are considered to be shy. They generally avoid moving vessels and do not bow ride or perform acrobatics. They can be found in groups of 2-10 animals and prefer shallow coastal waters.

Strandings: The Working Group for Unusual Marine Mammal Mortality Events has declared an unusual mortality event for harbor porpoises in Washington and Oregon State for 2006. This is due to an increased number in strandings and an investigation is underway to determine the cause of these strandings.

Tamera Eder. Whales and other Marine Mammals of Washington and Oregon. Renton, WA: Lone Pine, 2001.

Dall's Porpoise

Phocoenoides dalli

Location: Can be found in the North Pacific, are common from the Bering Sea and the Gulf of Alaska and as far south as Baja California. They are found in coastal and pelagic waters and prefer cold temperatures.

Size: Adults average six feet in length and a maximum of 490 pounds.

Diet: Dall's porpoise have been observed feeding on a variety of fish including mackerel, capelin, hake and even squid. The maximum feeding depth has been estimated at 1600 feet and they require large amounts of food at frequent intervals due to their high metabolic rate.

Reproduction: Sexually mature at 3-4 years of age and little is known about their breeding behavior. Observations have been made indicating there are two calving periods, one taking place in February and March, and the other in July and August. Life span of 20 years.

Gestation: 11 ½ months.

Lactation: 2-4 months

Behavior: Are typically seen in groups of 2-20 individuals and they are very fast swimmers, with observations of speeds up to 35 mph. They are common bow riders and are rarely acrobatic.

Strandings: Since 2002 a total of 46 Dall's porpoise have stranded in Washington and Oregon State. Click on the link below for more information.

Tamera Eder. Whales and other Marine Mammals of Washington and Oregon. Renton, WA: Lone Pine, 2001.

Gray Whale

Eschrichtius robustus

Location: This species is a coastal cetacean, usually seen over the continental shelf. During migration most animals pass within about a mile of the shoreline, and gray whales occasionally come into Puget Sound. Gray whales spend April-November in their Arctic feeding grounds and December-April in Mexican breeding areas. Between October and February the species migrates south along the West Coast, returning north between February and July. This round trip migration of 7,400-12,400 miles every year is believed to be the longest of any mammal.

Size: Adult gray whale length is 39-46 feet, with the largest recorded measuring a little longer than 49 feet. Weight is 15-39 tons. A gray whale can live approximately 70 years.

Diet: The gray whale is unique among cetaceans as a bottom-feeder that rolls onto its side, sucking up sediment from the seabed. Bottom-dwelling organisms live in this sediment, and stay in the baleen as water and silt are filtered out. Gray whales feed in shallow waters, usually 150-400 feet deep. Adults can consume 1-1½ tons of food per day during peak feeding periods.

Reproduction: Gray whales are sexually mature at 8 years of age and they breed in November and December during their migration south.

Gestation: 13.5 months

Lactation: Lasts anywhere from 7 to 9 months.

Behavior: They are usually found in groups of 2-3 animals.

Strandings: Gray whale strandings in Washington and Oregon coast are fairly common and provide resources for education and scientific research.

Tamera Eder. Whales and other Marine Mammals of Washington and Oregon. Renton, WA: Lone Pine, 2001.

GRAY WHALE EXAMINATION FORM

General Information

Field No.: _____ Strand Date: _____ Exam Date: _____

Location: _____

_____ Lat: _____ Long: _____

Carcass Description

Sex: ♂/♀/? Condition: _____

_____

_____ Fresh/Slight/Moderate/Advanced Photos: Roll ___ Frames ___

Measurements (centimeters)

Total Length: _____ Max. Flipper Width: _____ Ant. Flipper Length: _____

Fluke width: _____ Blubber Thickness: Dorsal _____ / Lateral _____ / Ventral _____

Examination Notes (samples)

Contaminants (frozen): **Skin/Blubber**: ...in EPA washed jar ❑ ...in foil ❑ ...in Teflon bag ❑

Milk: ...in EPA washed jar ❑ ...in Teflon bag ❑ **Liver**: ...in EPA washed jar ❑ ...in Teflon bag ❑

Disease Screening (frozen): **Blood**: ...whole ❑ ...serum ❑

Toxins/Metals (frozen in clean plastic): **Urine** ❑ **Feces** ❑ **Stomach Contents** ❑ **Liver** ❑ **Kidney** ❑

Histology Tissues (in formalin): **Liver** ❑ **Kidney** ❑ **Lung** ❑ **Gonad** ❑ **Skin/Blubber** ❑

Other Specimens: ❑ (list) _____

Reporting Source: _____

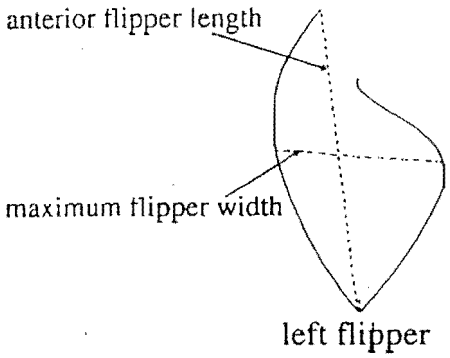
Contact (name and phone of where tissue and data are archived): _____

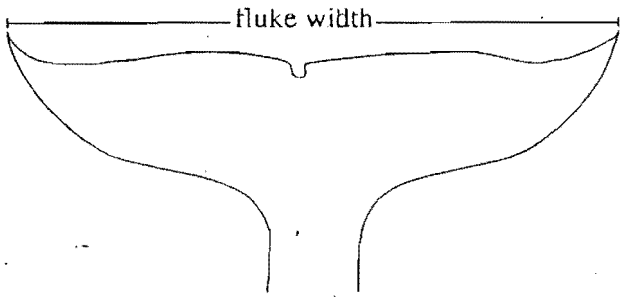
_____

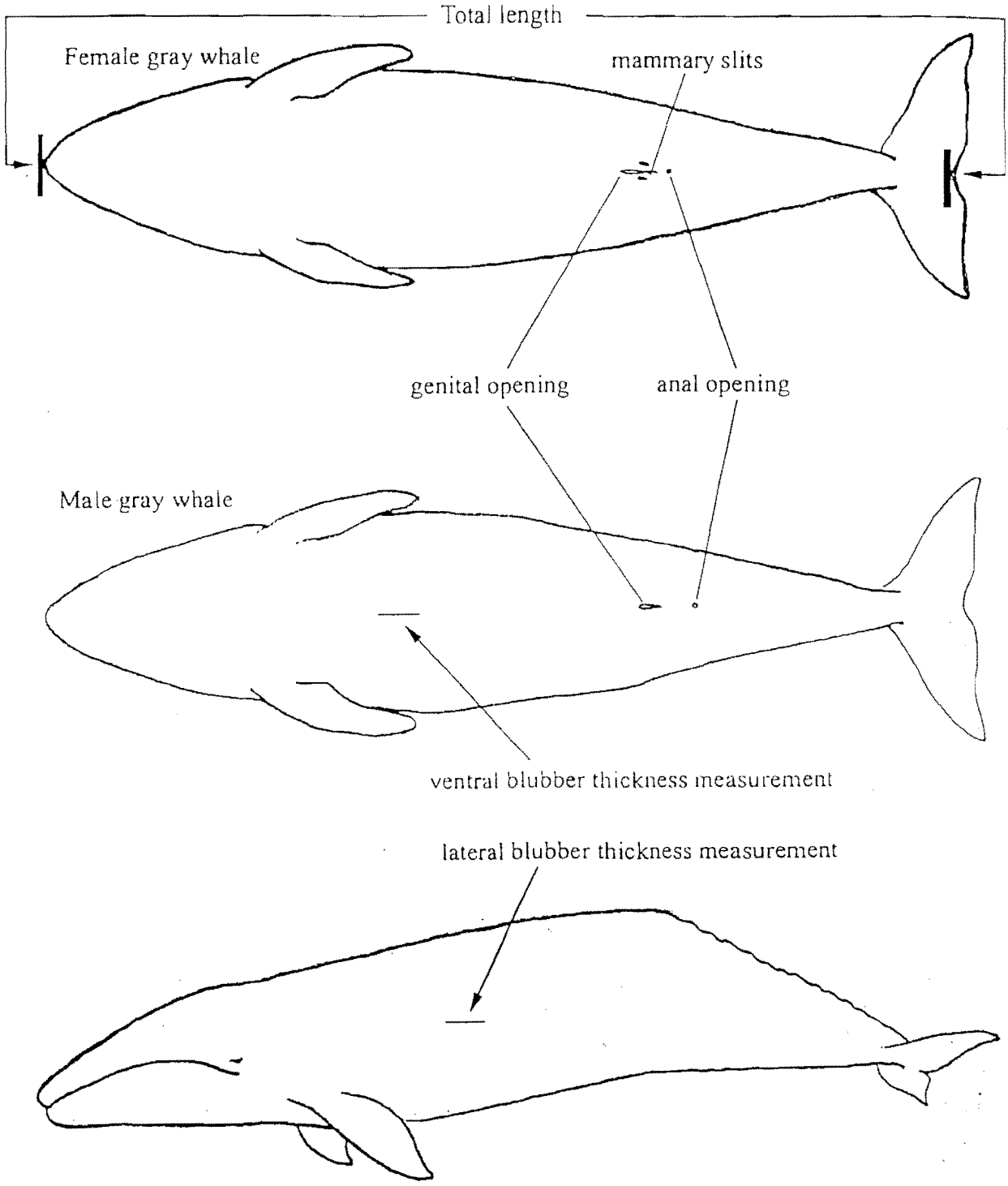
_____

Collector(s): _____ Date: _____

Necropsy by: _____ Date:






Total length
Female gray whale
mammary slits
genital opening
anal opening
Male gray whale
ventral blubber thickness measurement
lateral blubber thickness measurement

U.S. Department of Commerce
Northwest Regional Office
NOAA Fisheries National Marine Fisheries Service

Killer Whale Fact Sheet

(June 2006)

All killer whales are members of the toothed-whale family and belong to the same genus and species, *Orcinus orca*. However, there are two forms of killer whale found in Puget Sound, called "residents" and "transients." Some taxonomists (scientists who study the relationships within and between species) believe that some differences between forms of killer whales may be great enough to further sub-divide the species.

As the terms transient and resident imply, the two forms of killer whales have different behavior and movement patterns, but both forms can be found seasonally in Puget Sound. Transient killer whales travel in smaller groups (called "pods") and hunt other marine mammals for food. Resident killer whales spend more time in the Sound, travel in larger pods and eat mostly fish.

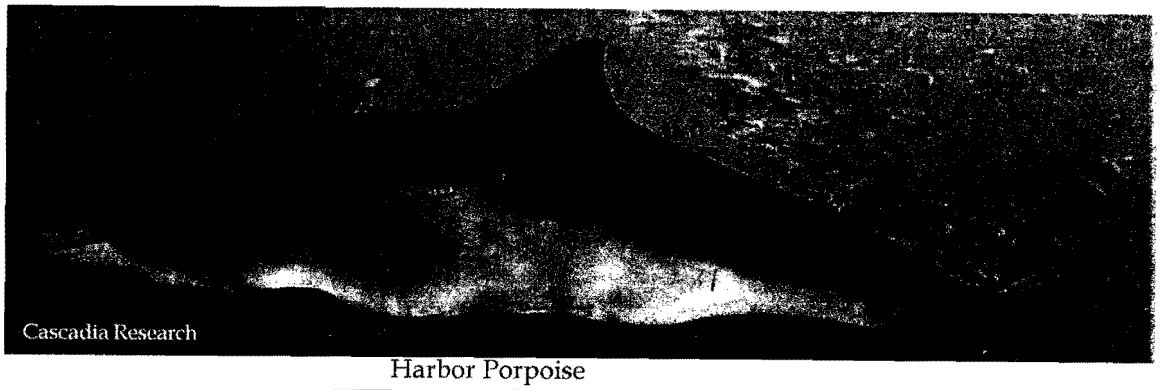
Southern Resident killer whales are fish eating with a seasonal (summer) home range that includes Washington and southern British Columbia waters (Puget Sound, the Strait of Juan de Fuca and the southern Strait of Georgia). Along the north Pacific coast, resident killer whales occur from Oregon and Washington to the Bering Sea. In the Pacific Northwest, the two closest resident killer whale communities (groups of pods that share a common home range), are the Southern Residents and the Northern Residents, which live in northern British Columbia and southeast Alaska.

Killer whales grow to considerable size. The males can reach lengths of 25 feet or more and weigh 10,000 pounds. Females are typically a little smaller. They range all over the world, including the Atlantic Ocean and as far north as Iceland, as far south as Antarctica.

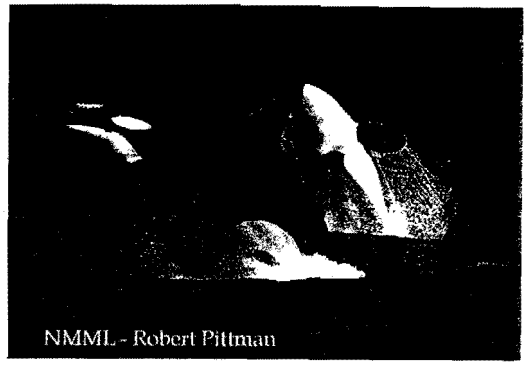
Most of the information we have about Southern Resident killer whales has been collected in Puget Sound during the summer months. Very little is known about their movements or feeding areas during the winter. In 1999, for the first time, scientists observed resident whales from Puget Sound as far south as Monterey, California.

As far as we know, the number of Southern Resident killer whales has never been large, perhaps numbering between 100 and 200 before 1960. Live captures of whales from the Southern Resident community, for the public display industry, reduced the number to fewer than 70 in 1973, when an annual killer whale census of the population began. As of July 2005, the population totaled 90 Southern Residents. The peak number was reached in 1996 when 97 whales were counted. There is no comprehensive world-wide estimate of the total number of killer whales.

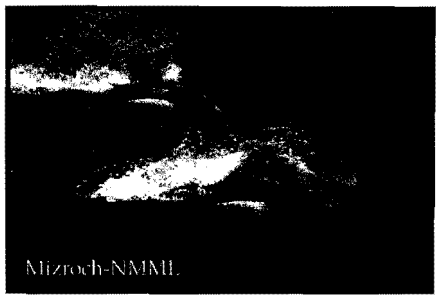
Cetaceans!



Harbor Porpoise

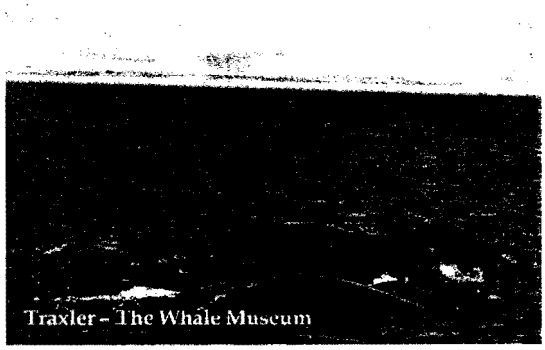


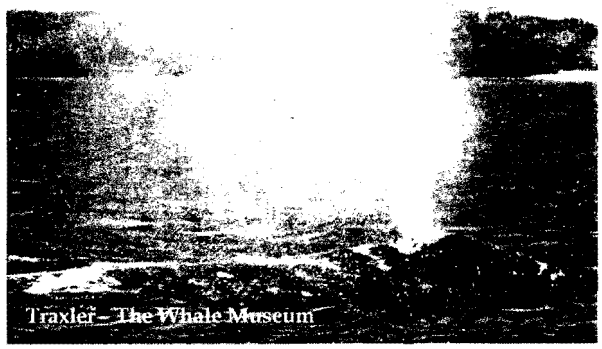
← Killer Whales



Dall's Porpoise

↑ Gray Whales ↓





Other Species

Sea Otters and River Otters

Sea otters are the smallest marine mammal and are a maximum of 100 pounds and ~ 5 feet in length. Sea otters have well rounded teeth adapted for crushing shells of crabs, urchins, and other invertebrates. Sea otters use rocks as tools to dislodge prey and break open their food. They tend to stay in open waters gathering and "rafting" together in groups. There are isolated populations in British Columbia, Washington, California, and Alaska and can be found in offshore kelp beds, rocky inlets, and reefs.

River Otters are about 4.5 feet and weigh 30 pounds. They can be found in coastal marshes, lakes, and streams throughout North America. They are most abundant on the coast in bays and inland marine waters. They live in family groups and construct dens in hollow logs, stumps, roots, or take over the den of a muskrat or beaver.

If you are confused about the differences between Sea Otters and River Otters use the table on the next page!

River Otter
Illustrated by Gary Ross

Sea Otter
Illustrated by Gary Ross

Sea Otter	Vs.	River Otter
Marine only	**Habitat**	Marine and Fresh Water
Congregate in kelp beds, up to 15 individuals	**Group**	Family groups
Maximum of 100 pounds	**Weight**	30 pounds
Long and Soft, 1 million hairs per square inch	**Fur**	Coarse and Dense
Flattened, less than 1/3 of total body length	**Tail**	Round, more than ½ of total body length
On surface, belly up	**Swimming**	Belly down, back almost submerged
Single, carried on the chest	**Young**	Up to 4, never on chest
On back while floating, need to eat 25-30% of body weight each day	**Feeding**	On land or while swimming
Mussels, sea urchins, abalone, and other small invertebrates	**Food Source**	Fish and small invertebrates
At sea, on back	**Sleeping**	On land in dens
Squeal, hiss, snarl, and grunts	**Sound**	High pitched whistles, chuckles, and grunts

To report a dead Sea Otter please call the
United States Fish and Wildlife Sea Otter Hotline:
1-877-326-8837

WASHINGTON/OREGON SEA OTTER STRANDING DATA *Version*: December 20, *2005*	**Return completed sheets to:** Deanna Lynch 510 Desmond Dr. Suite 102 Lacey, WA 98503 Telephone: 360-753-9545 FAX: 360-534-9331 Email: deanna_lynch@fws.gov	**Report stranded (live or dead) sea otters to:** 1-87-SEAOTTER 1-877-326-8837

REFERENCE INFORMATION

WASO: WASOM: _____

Other: NWHC: _____

DATE FOUND: _____ | _____ | _____ (month / day / year) DATE EXAMINED: _____ | _____ | _____ (month / day / year)

FOUND/REPORTED BY: _____ PHONE _____

EXAMINED BY: _____ PHONE _____

RECOVERY AREA: _____

RECOVERY LOCATION: Geographic: _____

Global: _____ (latitude) | _____ (longitude)

CARCASS CONDITION & MORPHOMETRICS

CONDITION: _____ 1 = Alive 2 = Fresh Dead 3 = Moderate Decomposition 4 = Advanced Decomposition 5 = Mummified/Fragment U = Undetermined (see key on reverse for code descriptions)

AGE: _____ 1 = Pup 2 = Immature 3 = Subadult 4 = Adult 5 = Aged Adult 6 = Juvenile U = Undetermined

SEX: _____(male / female / undetermined)

TOTAL LENGTH: _____cm _____in WEIGHT: _____kg _____lb

NOSE SCAR: Size: _____ (≈ diameter of scar or wound) Freshness: _____ (white = healed, pink =healing, red/bleeding = Fresh)

TEETH: _____ 1 = Excellent 2 = Good 3 = Fair 4 = Poor 5 = All Milk Teeth 6 = Some Milk Teeth U = Undetermined

PELAGE COLOR: (grizzling) _____ 1 = None To Slight 2 = To Eyes 3 = To back of head (Lamboidal Crest) 4 = To Chest 5 = To Tail 6 = Natal U = Undetermined (color refers to lightness of fur on head, neck, and belly)

OBVIOUS TRAUMA: _____ (No / Yes / Undetermined, see reverse)

CARCASS DISPOSITION: _____(left on beach, skull taken, recovered)
(If recovered, include name of person recovering and where, when, and time carcass was sent)

MARKING INFORMATION

TAGGED OR TAG EVIDENCE: _____ (yes / no)

Right: _____ (color) | _____ (position) | _____ (number)

Left: _____ (color) | _____ (position) | _____ (number)

KNOWN AGE: _____ (Yes/No) Tag Date: _____ (Day) | _____ (Month) | _____ (Year)

Transmitter frequency

PIT TAG: Working: _____(yes / no / undetermined)

PIT Number: _____

Age At Tagging: _____ (estimate) | _____ (cementum)

Wt At Tagging: _____kg _____lb

DESCRIPTION OF TRAUMA AND/OR FIELD REMARKS (continue on separate sheet if necessary): _____

_____

_____

_____

_____

CONDITION CODES MODIFIED FROM: J.R. Geraci and V. J. Lounsbury. 1993. ***Marine Mammals Ashore: A Field Guide For Strandings.*** Texas A&M Sea Grant Publication. 305pp.

CODE 1: Live Animals--***Uses***: morphometrics; limited life history, external gross pathology, parasitology and microbiology; biopsies; blood studies, including DNA analysis and clinical chemistry.

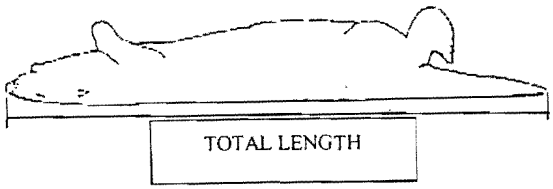
CODE 2: Carcass in Good Condition (Fresh/Edible)-- ***Characteristics***: normal appearance, usually with little scavenger damage; fresh smell; minimal drying and wrinkling of skin, eyes and mucous membranes; eyes clear; carcass not bloated, muscles firm, dark red, well-defined; blood cells intact, able to settle in a sample tube; serum unhemolyzed; viscera intact and well-defined; gut contains little or no gas; brain firm with no discoloration, surface features distinct, easily removed intact. ***Uses***: morphometrics; DNA analysis; life history; parasitology; gross and histopathology; toxicology; microbiology; limited blood studies.

CODE 3: Fair (Decomposed, but organs basically intact)-- ***Characteristics***: carcass intact, bloating evident and skin cracked and sloughing; possible scavenger damage; characteristic mild odor; mucous membranes dry, eyes sunken or missing, muscles soft and poorly defined; blood hemolyzed, uniformly dark red; viscera soft, friable, mottled, but still intact; gut dilated by gas; brain soft, surface features distinct, dark reddish cast, fragile but can usually be moved intact. ***Uses***: morphometrics; DNA analysis; limited life history; parasitology; gross pathology; marginal for toxicology (useful for metals, marginal for organochlorines, poor for biotoxins); histopathology of skin, muscle, lung, and possibly firm lesions.

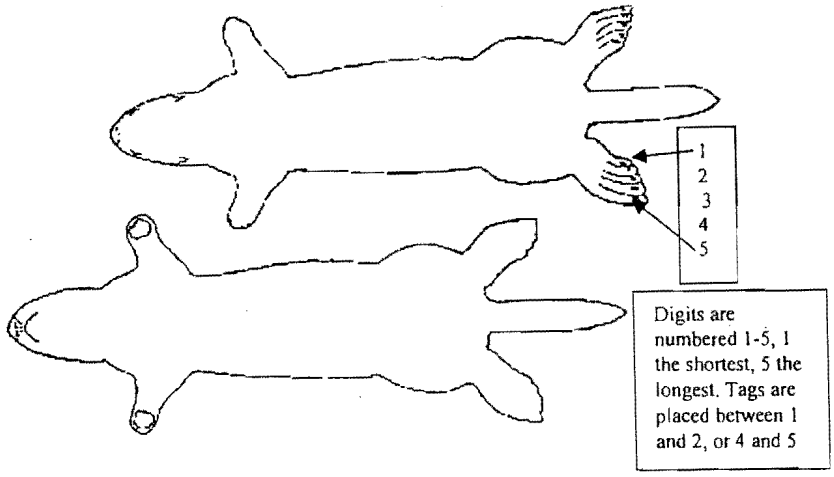
CODE 4: Poor (Advanced decomposition)-- ***Characteristics***: carcass may be intact, but collapsed; skin sloughing, often severe scavenger damage; strong odor; muscles nearly liquefied and easily torn, falling easily off bones; blood thin and black; viscera often identifiable but friable, easily torn, and difficult to dissect; gut gas-filled; brain soft, dark red, containing gas pockets, pudding-like consistency. ***Uses***: morphometrics; limited life history (teeth, baleen, bone, claws, some stomach contents, possibly reproductive condition); limited DNA analysis, parasitology, and gross pathology.

CODE 5: Mummified or Skeletal Remains-- ***Characteristics***: skin may be draped over skeletal remains; any remaining tissues are desiccated ***Uses***: morphometrics; limited life history (teeth, baleen, claws, bone) and DNA analysis..

TOTAL LENGTH: With the carcass in the supine position total length is measured from the tip of the nose to the tip of the tail. If length is measured in any other manner please note how measured on the form.



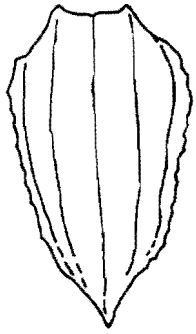
WOUNDS OR TRAUMA: On the illustrations below draw any trauma areas or wounds noted during field examination.



Wider Caribbean Sea Turtles

IDENTIFICATION KEY

Flexible carapace with
- 5 distinct ridges
- no scutes

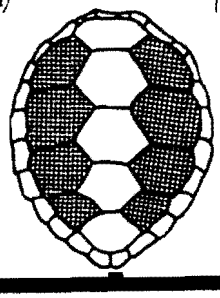


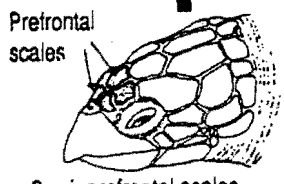
Carapace strongly tapered
Carapace leathery, flexible
Color dark gray or black with white or pale spots
Jaw deeply notched
To 500 kg, "shell" to 180 cm

Leatherback turtle
(Dermochelys coriacea)

Bony carapace (shell) with
- no continuous ridges
- large scutes (shell plates)

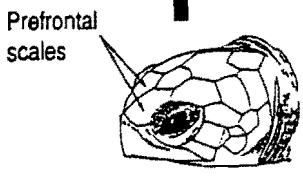
4 pair lateral scutes (shown shaded)





2 pair prefrontal scales
Over-lapping shell scutes
Pointed face, distinct over-bite
Juvenile color/pattern variable
Adult color orange, brown, yellow
To 85 kg, shell to 95 cm

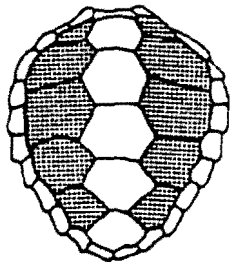
Hawksbill turtle
(Eretmochelys imbricata)



1 pair prefrontal scales
No over-lapping shell scutes
Round face, serrated jaw
Juvenile color/pattern variable
Adult color dark gray green
To 230 kg, shell to 125 cm

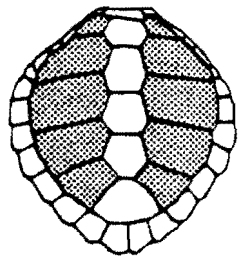
Green turtle
(Chelonia mydas)

5 (rarely 6) pair lateral scutes



Carapace longer than wide
3 bridge scutes
No pores in bridge scutes
Head broad (to 25 cm)
Color red-brown to brown
To 200 kg, shell to 120 cm

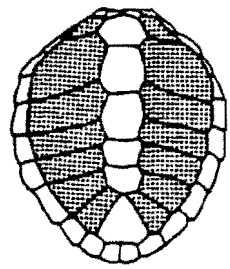
Loggerhead turtle
(Caretta caretta)



Carapace very round
4 bridge scutes with pores
Very rarely south of 16° N
Juvenile color charcoal gray
Adult color dark gray green
To 45 kg, shell to 70 cm

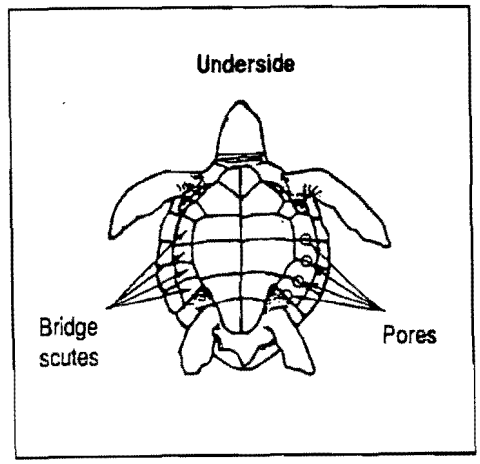
Kemp's Ridley turtle
(Lepidochelys kempii)

6 or more pair lateral scutes



Carapace nearly circular
4 bridge scutes with pores
Very rarely north of 13° N
Juvenile color charcoal gray
Adult color dark gray green
To 45 kg, shell to 70 cm

Olive Ridley turtle
(Lepidochelys olivacea)



Photos: Scott A. Eckert (loggerhead, olive ridley) and others by Peter C. H. Pritchard.

Participants and Attendees

Navy Lead	Last Name	First Name	Organization	Telephone	Email
	Gordon	Brittany	WA Dept Fish and Wildlife	(360) 895-4756	Brittany.gordon@dfw.wa.gov
	Kunz	Cindi	NAVFACNW	360-396-1860	cindi.kunz@navy.mil
	McFeron	Curtis	NMFS	360-534-9309	curtis.mcferon@noaa.gov
	Muck	Jim	USFWS	360-753-9586	jim_muck@fws.gov
	Quan	Jennifer		360-753-2000	jennifer.quan@noaa.gov
	Stockton	Julia	NAVFACNW	360-476-6067	julia.stockton@navy.mil
	Street	Sara	NAVFACNW	3603965394	sara.c.street@navy.mil
	Wagoner	Linda	NAVFACNW	425-304-3466	linda.wagoner@navy.mil
	Waldbillig	Chris	WA Dept Fish and Wildlife	360-874-7258	chris.waldbillig@dfw.wa.gov
	Yasenak	Tyler	NAVFACNW	360-315-2452	Tyler.yasenak@navy.mil

Protected Species

- Proposed and Candidate Species - None.

- State, Local, and other Species - None.

- Threatened and Endangered Species
  - Bocaccio - Sebastes paucispinis
  - Bull Trout - Salvelinus confluentus
  - Chinook salmon - Oncorhynchus (=Salmo) tshawytscha
  - Chum salmon - Oncorhynchus keta
  - Humpback whale - Megaptera novaeangliae
  - Killer whale - Orcinus orca
  - Marbled murrelet - Brachyramphus marmoratus
  - Steelhead - Oncorhynchus (=Salmo) mykiss
  - yelloweye rockfish - Sebastes ruberrimus

INRMP Projects

FY17 Projects

- 68436NR020 : CWA NW NBK Cattail Estuary Restoration
- 68436NR035 : CHE NW NBK INRMP
- 68742CN001 : 1 CR NW Marbled Murrelet Density and Occupancy Surveys
- 68742CN002 : 1 S NW Threatened and Endangered Fish and Forage Fish Habitat Quality Assessments/Improvements and Forage Fish Surveys
- 68436MSF16 : 1 CP NW NBK Magnetic Silencing Facility Demo Study

Support of Installation Mission

7.0. Please identify the mission types related to your reporting unit/site. Select all that apply.

Communications (C4), Education & Training, Helicopter Ops, Logistics, Ordnance Ops, Research & Development, Special Forces, Homeport/Shipyard Ops, Military Construction, Submarine Ops

7.1. To what extent has the Natural Resource program/INRMP supported the current PRIMARY MISSION and potential future mission(s)?

Mission well supported and fully capable

7.2. To what extent has the Natural Resource program/INRMP supported other mission areas (secondary missions)?

Mission well supported and fully capable

7.3. To what extent does the Natural Resources program affect mission-related operational/training activities?

Neutral

7.4. To what extent does the Natural Resources Program/INRMP minimize possible constraints imposed by natural resources regulatory requirements?

Partially minimizes

7.5. If applicable, please provide examples of how unresolved Natural Resources issues areresultinginmission impacts or work arounds.

Projects are routinely altered to avoid impact to sensitive areas, e.g., wetlands, old growth trees, eelgrass beds, fish migration routes. Workarounds are typically available, but designs are sub-optimized.

7.6. If applicable, please provide examples of how the INRMP or Natural Resources program actions have resulted in mission benefits.

Realistic schedules are in place due to the understanding of the consultation requirements with the regulatory agencies. Workarounds to projects are available, with designs typically being sub-optimal.

7.7. What is the level of coordination between natural resources staff and other installation/site(s) departments and military staff?

Effective coordination

7.8. Have stakeholders from every major tenant command participated in the INRMP preparation and review process?

None of the above

Enter then name of your Regional Commander / Commanding Officer.

E. A. Schrader

Enter then rank of your Regional Commander / Commanding Officer.

Captain

Findings

N/A

Recommendations

N/A

Summary Score

Focus Area	Score
1 - Natural Resources Management	0.46
2 - Listed Species Critical Habitat	0.68
3 - Recreation Use and Access and Conservation Law Enforcement	0.93
4 - Sikes Act Cooperation	0.84
5 - Team Adequacy	0.92
6 - INRMP Implementation	0.80
7 - Support of Installation Mission	0.59
NBK BANGOR - Overall Score	0.75

Participants and Attendees

Navy Lead	Last Name	First Name	Organization	Telephone	Email
	Gordon	Brittany	WA Dept Fish and Wildlife	(360) 895-4756	Brittany.gordon@dfw.wa.gov
	Kunz	Cindi	NAVFACNW	360-396-1860	cindi.kunz@navy.mil
	McFeron	Curtis	NMFS	360-534-9309	curtis.mcferon@noaa.gov
	Muck	Jim	USFWS	360-753-9586	jim_muck@fws.gov
	Quan	Jennifer		360-753-2000	jennifer.quan@noaa.gov
	Stockton	Julia	NAVFACNW	360-476-6067	julia.stockton@navy.mil
	Street	Sara	NAVFACNW	3603965394	sara.c.street@navy.mil
	Wagoner	Linda	NAVFACNW	425-304-3466	linda.wagoner@navy.mil
	Waldbillig	Chris	WA Dept Fish and Wildlife	360-874-7258	chris.waldbillig@dfw.wa.gov
	Yasenak	Tyler	NAVFACNW	360-315-2452	Tyler.yasenak@navy.mil

Protected Species

- Proposed and Candidate Species - None.

- State, Local, and other Species - None.

- Threatened and Endangered Species
  - Bocaccio - Sebastes paucispinis
  - Bull Trout - Salvelinus confluentus
  - Chinook salmon - Oncorhynchus (=Salmo) tshawytscha
  - Humpback whale - Megaptera novaeangliae
  - Killer whale - Orcinus orca
  - Marbled murrelet - Brachyramphus marmoratus
  - Steelhead - Oncorhynchus (=Salmo) mykiss
  - yelloweye rockfish - Sebastes ruberrimus

INRMP Projects

FY17 Projects

- 68436NR035 : CHE NW NBK INRMP
- 68742CN001 : 1 CR NW Marbled Murrelet Density and Occupancy Surveys

Support of Installation Mission

7.0. Please identify the mission types related to your reporting unit/site. Select all that apply.

Communications (C4), Helicopter Ops, Research & Development, Education & Training, Logistics, Special Forces, Homeport/Shipyard Ops, Military Construction

7.1. To what extent has the Natural Resource program/INRMP supported the current PRIMARY MISSION and potential future mission(s)?

Mission well supported and fully capable

7.2. To what extent has the Natural Resource program/INRMP supported other mission areas (secondary missions)?

Mission well supported and fully capable

7.3. To what extent does the Natural Resources program affect mission-related operational/training activities?

Neutral

7.4. To what extent does the Natural Resources Program/INRMP minimize possible constraints imposed by natural resources regulatory requirements?

Partially minimizes

7.5. If applicable, please provide examples of how unresolved Natural Resources issues areresultinginmission impacts or work arounds.

Projects are routinely altered to avoid impact to sensitive areas, e.g. wetlands, old growth trees, eelgrass beds, fish migration routes. Workarounds are typically available, but designs are sub-optimized.

7.6. If applicable, please provide examples of how the INRMP or Natural Resources program actions have resulted in mission benefits.

Due to the understanding of the environmental consultation requirements, reasonable timeline for project development occurs. Workarounds to project limitations are available, with design typically being sub-optimized.

7.7. What is the level of coordination between natural resources staff and other installation/site(s) departments and military staff?

Effective coordination

7.8. Have stakeholders from every major tenant command participated in the INRMP preparation and review process?

None of the above

Enter then name of your Regional Commander / Commanding Officer.

E. A. Schrader

Enter then rank of your Regional Commander / Commanding Officer.

Captain

Findings

N/A

Recommendations

N/A

Summary Score

Focus Area	Score
1 - Natural Resources Management	0.90
2 - Listed Species Critical Habitat	0.72
3 - Recreation Use and Access and Conservation Law Enforcement	0.93
4 - Sikes Act Cooperation	0.88
5 - Team Adequacy	0.80
6 - INRMP Implementation	1.00
7 - Support of Installation Mission	0.59
KEYPORT NUWC - Overall Score	0.83

Participants and Attendees

Navy Lead	Last Name	First Name	Organization	Telephone	Email
	Gordon	Brittany	WA Dept Fish and Wildlife	(360) 895-4756	Brittany.gordon@dfw.wa.gov
	Kunz	Cindi	NAVFACNW	360-396-1860	cindi.kunz@navy.mil
	McFeron	Curtis	NMFS	360-534-9309	curtis.mcferon@noaa.gov
	Muck	Jim	USFWS	360-753-9586	jim_muck@fws.gov
	Quan	Jennifer		360-753-2000	jennifer.quan@noaa.gov
	Stockton	Julia	NAVFACNW	360-476-6067	julia.stockton@navy.mil
	Street	Sara	NAVFACNW	3603965394	sara.c.street@navy.mil
	Wagoner	Linda	NAVFACNW	425-304-3466	linda.wagoner@navy.mil
	Waldbillig	Chris	WA Dept Fish and Wildlife	360-874-7258	chris.waldbillig@dfw.wa.gov
	Yasenak	Tyler	NAVFACNW	360-315-2452	Tyler.yasenak@navy.mil

Protected Species

- Proposed and Candidate Species - None.

- State, Local, and other Species - None.

- Threatened and Endangered Species
  - Bocaccio - Sebastes paucispinis
  - Bull Trout - Salvelinus confluentus
  - Chinook salmon - Oncorhynchus (=Salmo) tshawytscha
  - Humpback whale - Megaptera novaeangliae
  - Killer whale - Orcinus orca
  - Marbled murrelet - Brachyramphus marmoratus
  - Steelhead - Oncorhynchus (=Salmo) mykiss
  - yelloweye rockfish - Sebastes ruberrimus

INRMP Projects

FY17 Projects

- 3241612001 : 1 S NW - NBK Bremerton-Listed Fish Surveys
- 68436NR021 : 1 CP NW - NBK Charleston Beach Habitat Replenishment
- 68436NR035 : CHE NW NBK INRMP
- 68742CN001 : 1 CR NW Marbled Murrelet Density and Occupancy Surveys
- 32416FF016 : 1 CP NW NBK Bremerton Forage Fish Surveys
- 32416CHA16 : 4 S NW NBK Bremerton Beach Monitoring

Support of Installation Mission

7.0. Please identify the mission types related to your reporting unit/site. Select all that apply.

Communications (C4), Education & Training, Logistics, Military Housing, Research & Development, Homeport/Shipyard Ops, Military Construction, Submarine Ops

7.1. To what extent has the Natural Resource program/INRMP supported the current PRIMARY MISSION and potential future mission(s)?

Mission well supported and fully capable

7.2. To what extent has the Natural Resource program/INRMP supported other mission areas (secondary missions)?

Mission well supported and fully capable

7.3. To what extent does the Natural Resources program affect mission-related operational/training activities?

Neutral

7.4. To what extent does the Natural Resources Program/INRMP minimize possible constraints imposed by natural resources regulatory requirements?

Partially minimizes

7.5. If applicable, please provide examples of how unresolved Natural Resources issues areresultinginmission impacts or work arounds.

Projects are routinely altered to avoid impact to sensitive areas, e.g. wetlands, old growth trees, eelgrass beds, fish migration routes.

7.6. If applicable, please provide examples of how the INRMP or Natural Resources program actions have resulted in mission benefits.

Workarounds to projects are available, with designs being sub-optimized.

7.7. What is the level of coordination between natural resources staff and other installation/site(s) departments and military staff?

Effective coordination

7.8. Have stakeholders from every major tenant command participated in the INRMP preparation and review process?

None of the above

Enter then name of your Regional Commander / Commanding Officer.

E. A. Schrader

Enter then rank of your Regional Commander / Commanding Officer.

Captain

Findings

N/A

Recommendations

N/A

Summary Score

Focus Area	Score
1 - Natural Resources Management	0.79
2 - Listed Species Critical Habitat	0.62
3 - Recreation Use and Access and Conservation Law Enforcement	0.88
4 - Sikes Act Cooperation	0.85
5 - Team Adequacy	0.84
6 - INRMP Implementation	0.50
7 - Support of Installation Mission	0.59
NBK BREMERTON - Overall Score	0.72

Participants and Attendees

Navy Lead	Last Name	First Name	Organization	Telephone	Email
	Gordon	Brittany	WA Dept Fish and Wildlife	(360) 895-4756	Brittany.gordon@dfw.wa.gov
	Kunz	Cindi	NAVFACNW	360-396-1860	cindi.kunz@navy.mil
	McFeron	Curtis	NMFS	360-534-9309	curtis.mcferon@noaa.gov
	Muck	Jim	USFWS	360-753-9586	jim_muck@fws.gov
	Quan	Jennifer		360-753-2000	jennifer.quan@noaa.gov
	Stockton	Julia	NAVFACNW	360-476-6067	julia.stockton@navy.mil
	Street	Sara	NAVFACNW	3603965394	sara.c.street@navy.mil
	Wagoner	Linda	NAVFACNW	425-304-3466	linda.wagoner@navy.mil
	Waldbillig	Chris	WA Dept Fish and Wildlife	360-874-7258	chris.waldbillig@dfw.wa.gov
	Yasenak	Tyler	NAVFACNW	360-315-2452	Tyler.yasenak@navy.mil

Protected Species

- Proposed and Candidate Species - None.

- State, Local, and other Species - None.

- Threatened and Endangered Species
  - Bull Trout - Salvelinus confluentus
  - Chinook salmon - Oncorhynchus (=Salmo) tshawytscha
  - Steelhead - Oncorhynchus (=Salmo) mykiss

INRMP Projects

FY17 Projects

68436NR035 : CHE NW NBK INRMP

Support of Installation Mission

7.0. Please identify the mission types related to your reporting unit/site. Select all that apply.

Ordnance Ops, Logistics

7.1. To what extent has the Natural Resource program/INRMP supported the current PRIMARY MISSION and potential future mission(s)?

Mission well supported and fully capable

7.2. To what extent has the Natural Resource program/INRMP supported other mission areas (secondary missions)?

Mission well supported and fully capable

7.3. To what extent does the Natural Resources program affect mission-related operational/training activities?

Neutral

7.4. To what extent does the Natural Resources Program/INRMP minimize possible constraints imposed by natural resources regulatory requirements?

Partially minimizes

7.5. If applicable, please provide examples of how unresolved Natural Resources issues areresultinginmission impacts or work arounds.

Projects are routinely altered to avoid impact to sensitive areas, e.g. wetlands, old growth trees, eelgrass beds, fish migration routes.

7.6. If applicable, please provide examples of how the INRMP or Natural Resources program actions have resulted in mission benefits.

Workarounds are typically available, but designs are sub-optimized.

7.7. What is the level of coordination between natural resources staff and other installation/site(s) departments and military staff?

Effective coordination

7.8. Have stakeholders from every major tenant command participated in the INRMP preparation and review process?

None of the above

Enter then name of your Regional Commander / Commanding Officer.

E. A. Schrader

Enter then rank of your Regional Commander / Commanding Officer.

Captain

Findings

N/A

Recommendations

N/A

2017 Natural Resources Annual Report: BREMERTON RR

Summary Score

Focus Area	Score
1 - Natural Resources Management	0.74
2 - Listed Species Critical Habitat	0.25
4 - Sikes Act Cooperation	0.85
5 - Team Adequacy	0.80
6 - INRMP Implementation	1.00
7 - Support of Installation Mission	0.59
BREMERTON RR - Overall Score	0.70

Participants and Attendees

Navy Lead	Last Name	First Name	Organization	Telephone	Email
	Gordon	Brittany	WA Dept Fish and Wildlife	(360) 895-4756	Brittany.gordon@dfw.wa.gov
	Kunz	Cindi	NAVFACNW	360-396-1860	cindi.kunz@navy.mil
	McFeron	Curtis	NMFS	360-534-9309	curtis.mcferon@noaa.gov
	Muck	Jim	USFWS	360-753-9586	jim_muck@fws.gov
	Quan	Jennifer		360-753-2000	jennifer.quan@noaa.gov
	Stockton	Julia	NAVFACNW	360-476-6067	julia.stockton@navy.mil
	Street	Sara	NAVFACNW	3603965394	sara.c.street@navy.mil
	Wagoner	Linda	NAVFACNW	425-304-3466	linda.wagoner@navy.mil
	Waldbillig	Chris	WA Dept Fish and Wildlife	360-874-7258	chris.waldbillig@dfw.wa.gov
	Yasenak	Tyler	NAVFACNW	360-315-2452	Tyler.yasenak@navy.mil

Protected Species

- Proposed and Candidate Species - None.

- State, Local, and other Species - None.

- Threatened and Endangered Species
  - Bocaccio - Sebastes paucispinis
  - Bull Trout - Salvelinus confluentus
  - Chinook salmon - Oncorhynchus (=Salmo) tshawytscha
  - Humpback whale - Megaptera novaeangliae
  - Killer whale - Orcinus orca
  - Marbled murrelet - Brachyramphus marmoratus
  - Steelhead - Oncorhynchus (=Salmo) mykiss
  - yelloweye rockfish - Sebastes ruberrimus

INRMP Projects

FY17 Projects

68436NR035 : CHE NW NBK INRMP

Support of Installation Mission

7.0. Please identify the mission types related to your reporting unit/site. Select all that apply.

Ordnance Ops, Special Forces, Education & Training, Military Housing, Helicopter Ops

7.1. To what extent has the Natural Resource program/INRMP supported the current PRIMARY MISSION and potential future mission(s)?

Mission enhanced, well supported and fully capable

7.2. To what extent has the Natural Resource program/INRMP supported other mission areas (secondary missions)?

Mission well supported and fully capable

7.3. To what extent does the Natural Resources program affect mission-related operational/training activities?

Neutral

7.4. To what extent does the Natural Resources Program/INRMP minimize possible constraints imposed by natural resources regulatory requirements?

Partially minimizes

7.5. If applicable, please provide examples of how unresolved Natural Resources issues areresultinginmission impacts or work arounds.

Projects are routinely altered to avoid impact to sensitive areas, e.g. wetlands, old growth trees, eelgrass beds, fish migration routes.

7.6. If applicable, please provide examples of how the INRMP or Natural Resources program actions have resulted in mission benefits.

Workarounds are typically available, but designs are sub-optimized.

7.7. What is the level of coordination between natural resources staff and other installation/site(s) departments and military staff?

Effective coordination

7.8. Have stakeholders from every major tenant command participated in the INRMP preparation and review process?

None of the above

Enter then name of your Regional Commander / Commanding Officer.

E. A. Schrader

Enter then rank of your Regional Commander / Commanding Officer.

Captain

Findings

N/A

Recommendations

N/A

2017 Natural Resources Annual Report: JACKSON PARK AND NAVAL HOSPITAL

Summary Score

Focus Area	Score
1 - Natural Resources Management	0.79
2 - Listed Species Critical Habitat	0.46
3 - Recreation Use and Access and Conservation Law Enforcement	0.95
4 - Sikes Act Cooperation	0.85
5 - Team Adequacy	0.80
6 - INRMP Implementation	1.00
7 - Support of Installation Mission	0.65
JACKSON PARK AND NAVAL HOSPITAL - Overall Score	0.79

DEPARTMENT OF THE NAVY
NAVAL BASE KITSAP
120 SOUTH DEWEY ST
BREMERTON, WA 98314-5020

5090
Ser PRB4/00933
3 Nov 11

From: Commanding Officer, Naval Base Kitsap, Bremerton, WA
To: Mr. Tye Yasenak, NAVFAC NW Environmental, Bangor, WA

SUBJ: DESIGNATION AS NATURAL RESOURCE MANAGER/COORDINATOR FOR NAVAL BASE KITSAP BANGOR, CAMP WESLEY HARRIS, AND NAVAL BASE KITSAP KEYPORT

Ref: (a) OPNAVINST 5090.1C

1. You are hereby designated as Installation Natural Resources Manager/Coordinator for Naval Base Kitsap Bangor, Camp Wesley Harris, and Naval Base Kitsap Keyport.

2. In accordance with reference (a), you shall oversee natural resources issues, conditions of natural resources, status of Integrated Natural Resource Management Plan objectives, and any potential or actual conflicts between mission requirements and natural resources mandates, ensuring that the NBK CO is informed. As installation Natural Resources Manager/Coordinator, you are responsible for the inherently governmental decisions made on behalf of the installation and CO with regard to Sikes Act compliance.

P. M. DAWSON

DEPARTMENT OF THE NAVY
NAVAL BASE KITSAP
120 SOUTH DEWEY ST
BREMERTON, WA 98314-5020

5090
Ser PRB4/00861
30 Apr 15

From: Commanding Officer, Naval Base Kitsap, Bremerton, WA
To: Ms. Julia Stockton, NAVFAC NW Environmental, Bremerton, WA

Subj: DESIGNATION AS NATURAL RESOURCE MANAGER/COORDINATOR FOR NAVAL BASE KITSAP BREMERTON, CAMP MCKEAN, NAVAL HOSPITAL BREMERTON, AND JACKSON PARK HOUSING COMPLEX

Ref: (a) OPNAVINST M-5090.1

1. You are hereby designated as the Installation Natural Resources Manager/Coordinator for Naval Base (NAVBASE) Kitsap Bremerton, Camp McKean, Naval Hospital Bremerton, and Jackson Park Housing Complex.

2. In accordance with reference (a), you shall oversee natural resources issues, conditions of natural resources, status of Integrated Natural Resource Management Plan objectives, and any potential or actual conflicts between mission requirements and natural resources mandates, ensuring that the NAVBASE Kitsap Commanding Officer (CO) is informed. As installation Natural Resources Manager/Coordinator, you are responsible for the inherently governmental decisions made on behalf of the installation and CO with regard to Sikes Act compliance.

T. A. ZWOLFER