

A. GLOSSARY

Anchor Systems:

Large Anchor System – A large anchor system cannot be deployed by hand, thus requires the use of a crane or boom to lift and deploy. Typically, any anchor over 50 pounds is considered a large anchor.

Small Anchor System – A small anchor system can be deployed by hand, without the aid of a boom or crane. Typically, any anchor less than 50 pounds is consider a small anchor.

Application Rate – Refers to the volume of sprayed product divided by the surface area covered by the spray and is usually expressed in liters/hectare or gallons/acre.

Branch – ICS organizational level based on functional or geographic responsibility. A Branch is below a Section and above a Division or Group in an ICS organization chart.

Broken Ice – An operating environment where a body of water has incomplete coverage of ice. Broken ice varies from less than 10% coverage to greater than 90% coverage. Oil spill response operations in broken ice are generally limited to less than 70% coverage.

Buddy System – An arrangement in which persons are paired for mutual safety or assistance.

Calm Water – An operating environment where the sea state is usually less than 1 foot and currents are less than 0.8 knots. Includes waters that are very sheltered from wind and waves or very small bodies of water. This is the least demanding operating environment for water borne oil spills.

Cold Zone – A zone in the site layout of a spill response. The Cold Zone is also called the Support Zone and is free of oil contamination. Support facilities, staging areas, warm-up trailers, command posts, etc. are located in the Cold Zone.

Competent Person – An individual with the skill, knowledge, practical experience and training to enable him/her to assess the risks arising from work activities involving substances hazardous to health.

Coverage Rate – Refers to the surface area covered by the spray divided by the length of time required to spray it. It is usually expressed in hectares/hour or acres/hour.

Decant – To remove free-water from an oil/water mixture by drawing the water off the bottom of the oil/water interface.

Decontamination Plan – A plan approved by the Unified Command for the removal of oil contamination from personnel and equipment.

Demobilization Plan – A plan approved by the Unified Command for the orderly and timely demobilization of resources no longer needed in the oil spill response.

Division – ICS organizational level based responsibility for a defined geographic area or function. A Division is usually assigned to a specific area, such as the Gulf of Alaska Division or the Yukon River Division. A Division is below a Branch and above a Task Force or Strike Team.



Appendices

- Dispersant** – A chemical formulation containing surface active agents (surfactants) that lowers the surface tension between oil and water and facilitates the breakup and dispersion of oil into the water column in the form of finely divided droplets to allow for natural biodegradation.
- Emulsification** – A process by which oil forms an emulsion or “mousse” consisting of many small droplets of water incorporated into the oil.
- Encounter Rate** – For dispersant applications, refers to the area of oil that can be sprayed in a specific time. This can be calculated as the ship or aircraft spraying speed multiplied by the width of the spray deposits on the surface. For mechanical recovery applications, it is area of oil that is contained in a specific time. This is calculated as the width of the boom opening times the speed of advance.
- Environmental Unit** – ICS organizational category that is part of the Planning Section. The Environmental Unit is responsible for: the identification and prioritization of environmentally sensitive areas to be protected; wildlife response; acquiring permits for dispersant, in-situ burning, and land access; and shoreline assessments.
- Fast Water** – An operating environment where the sea state is usually less than 1 foot but the current exceeds 0.8 knots. Fast Water includes rivers, streams and marine waters with moderate to strong tidal currents.
- Flash point** – The temperature at which a liquid gives off sufficient vapor to ignite in the presence of an open flame.
- Geographic Response Strategy (GRS)** - GRS are site-specific spill response methods used to protect sensitive coastal environments from the deleterious effects of petroleum or other hazardous substance spills. GRS provide first responders with specific guidance for a rapid deployment of pre-identified actions to protect priority sensitive sites.
- Geotextile** – A manufactured fabric material, usually woven from Polyester or Polypropylene, used in earth construction projects. Geotextile is oleophilic and will act as a passive recovery material, while allowing water to pass through the fabric. Geotextile can be used to protect a shoreline or soil from oil contamination at oil recovery locations.
- Group** – ICS organizational level-based responsibility for a particular function, such as Non-mechanical Operations Group, Wildlife Recovery Group, or Shoreline Protection Group. A Group is below a Branch and above a Task Force or Strike Team.
- Hot Zone** – A zone in the site layout of a spill response. The Hot Zone is also called the Exclusion Zone and is where oil contamination is found. The Hot Zone perimeter is established by the Safety Officer. Site safety assessment and site entry criteria are applied to the Hot Zone in order to prevent the spread of contamination, and to ensure the health and safety of responders and the public.
- Incident Commander** – The individual responsible for the management of all incident operations.
- Intermediate Storage** – Secondary or tertiary storage for oil, recovered liquids, and oily solid wastes collected from a recovery operation. Storage devices that receive wastes from primary storage or other intermediate storage devices, such as a rigid tank that is filled from a vacuum truck or a tank truck filled from a portable tank.



- Marsh** – A wetland operating environment that is considered sensitive to disturbance from oil spill response activities. Marshes are low-lying, waterlogged land that are poorly drained and difficult to cross on foot or vehicle. Care must be taken in oil spill operations to minimize the disturbance of marshes and prevent introducing oil below the surface.
- Mousse** – An emulsified mixture of water in oil. Mousse typically has a thick consistency compared with fresh oil, and can incorporate up to 75 percent water into the oil, increasing apparent oil volume by up to four times. Colours can range from red, orange or tan to dark brown. Mousse can be easily confused with algal scum collecting in convergence lines, algae patches, or kelp. See also emulsification.
- Open Water** – An operating environment where the sea state can reach 6 feet and moderate waves and white caps may occur. Includes open waters that are not sheltered from wind and waves. This is the most demanding operating environment for water borne oil spills.
- Operations Section** – ICS organizational category responsible for all operations directly applicable to the primary mission of the incident.
- Operations Section Chief** – The individual responsible for executing all field operations approved by the Unified Command. The Operations Section Chief reports directly to the Incident Commander.
- Payload** – Refers to the total amount of dispersant carried by the aircraft or ship.
- Preapproval** – The state of being accepted for use as a spill treatment agent in a particular location without further bureaucratic authorization procedures under the conditions set forth by the responsible authorities.
- Preauthorization** – Same as preapproval.
- Primary Storage** – The initial storage for oil, recovered liquids, and oily solid wastes collected directly from a recovery operation. The initial storage once the oil, oily liquid, or oily solid waste is picked-up, such as a mini-barge associated with a skimming vessel or a portable tank associated with a shore-side recovery tactic.
- Protected Water** – An operating environment where the sea state can reach 3 feet and small waves and white caps may occur. Protected Waters have limited shelter from wind and waves. Protected Water falls between Open Water and Calm Water in the classification scheme.
- Safety Officer** – A member of the Command Staff responsible for monitoring and assessing safety hazards or unsafe situations, and for developing measures to ensure personnel safety.
- Sheen** – A very thin layer of oil (less than 0.003 millimeters in thickness) floating on the water surface. Sheen is the most commonly-observed form of oil during the later stages of a spill. Depending on thickness, sheens range in color from dull brown for the thickest sheens to rainbows, grays, silvers, and near-transparency in the case of the thinnest sheens. Natural sheens can result from biological processes.
- Site Safety Plan** – A plan prepared by the Safety Officer and approved by the Unified Command that establishes safety procedures and practices for the incident.
- Slick** – Oil spilled on the water, which absorbs energy and dampens out surface waves, making the oil appear smoother (or slicker) than the surrounding water.



Appendices

- Solid Ice** – An operating environment where a body of water has complete coverage of ice. Spill response activities may occur on Solid Ice only after it is determined that the ice is of sufficient thickness to safely support response personnel and equipment.
- Sortie** – Refers to each dispersant application run.
- Spreading** – The thinning out of an oil slick onto the surface of water.
- Staging Area** – Location where incident personnel and equipment are available for tactical deployment. Can serve as a check-in location for equipment and personnel reporting to the incident.
- Staging Area Manager** – The individual responsible for overseeing and managing the Staging Area. The Staging Area Manager reports to the Operations Section Chief.
- Streamers** – A narrow line of oil, mousse, or sheen surrounded on both sides by clean water. Streamers result from the combined effects of wind, currents, and/or natural convergence zones. Heavier concentrations are often present in the centre, with progressively lighter sheen along the edges. Streamers are also often called “fingers”, “ribbons”, or “windrows”.
- Strike Team** – An ICS operations team that consists of the same kind and type of resources with common communication and leader.
- Supervisor** – The individual responsible for the command of a Division or Group.
- Tar ball** – Oil weathered into a pliable ball up to approximately 30 cm. Sheen may or may not be present.
- Task Force** – A group of resources with common communications and a leader assembled for a specific mission.
- Tundra** – An operating environment that is considered sensitive to disturbance from oil spill response activities. Tundra has permanently frozen subsoil. Tundra is often waterlogged land that is poorly drained and difficult to cross on foot or vehicle. Care must be taken in oil spill operations to minimize the disturbance of tundra that can cause melting of the subsurface ice and permanent damage to the ecosystem.
- Unified Command** – A command team that allows all parties responsible for the incident to manage the incident by establishing a common set of objectives and strategies. This is accomplished without relinquishing agency responsibility, authority, or accountability. The Unified Command is comprised of the Responsible Party Incident Commander, Federal On-Scene Coordinator, and State On-Scene Coordinator and may also include a Local On-Scene Coordinator.
- Unified Plan** – The State/Federal contingency plan for Alaska, officially titled Alaska Federal/State Preparedness Plan for Response to Oil & Hazardous Substance Discharges/Releases (Unified Plan).
- Warm Zone** – A zone in the site layout of a spill response. The Warm Zone is also called the Contamination Reduction Zone and is where decontamination activities occur. The Warm Zone allows for an orderly transition from the Hot Zone to the Cold Zone. Workers shed contaminated clothing and equipment and personnel are decontaminated in the Warm Zone.
- Waste Management Plan** – A plan approved by the Unified Command that establishes waste management practices and procedures for the incident.



Waste Management Specialist – An individual with the skill, knowledge, practical experience and training to enable him/her to assess the character of a waste or hazardous material and determine the proper handling and disposal methods.

Weathering – The chemical and physical changes that occur once oil has spilled, including spreading, evaporation, dissolution, photo-oxidation, dispersion, biodegradation, and emulsification.

Windrows – Oil or sheen oriented in lines or streaks in the direction of the wind. Windrows typically form early during a spill when the wind speed is at least 10 knots (5.1 meters per second). Sheen is the form of spilled oil that most frequently windrows.



B. ACRONYMS & ABBREVIATIONS

ACC	- Alaska Chadux Corporation
ACS	- Alaska Clean Seas
ADDS	- Airborne Dispersant Delivery System
ADEC	- Alaska Department of Environmental Conservation
ADFG	- Alaska Department of Fish and Game
ADNR	- Alaska Department of Natural Resources
APSC	- Alyeska Pipeline Service Company
ARRT	- Alaska Regional Response Team
ASTM	- American Society for Testing and Materials
ATV	- All Terrain Vehicle
BPXA	- BP Exploration Alaska
CISPRI	- Cook Inlet Spill Prevention and Response Inc.
CPAI	- ConocoPhillips Alaska Inc.
CPC	- Chemical Protective Clothing
C-Plan	- Contingency Plan
DOC	- US Department of Commerce
DOI	- US Department of the Interior
DOR	- Dispersant-to-oil ratio
EPA	- US Environmental Protection Agency
FC	- Field Command
FLIR	- Forward Looking Infrared
FOSC	- Federal On-Scene Coordinator
FRP	- Facility Response Plan
GIS	- Geographic Information System
GRD	- Geographic Resources Database
GPS	- Global Positioning System
GRS	- Geographic Response Strategy
GT	- Gross Ton
HAZWOPER	- Hazardous Waste Operations and Emergency Response
HEPA	- High Efficiency Particulate Air (filter)
HP	- Horsepower
H2S	- Hydrogen Sulfide Gas
IAP	- Incident Action Plan
IC	- Incident Commander
ICS	- Incident Command System
IMT	- Incident Management Team



- IPIECA – International Petroleum Industry Environmental Conservation Association
- IPEC – Integrated Petroleum Environmental Consortium
- ISB – In-situ Burning
- LEL – Lower Explosive Limit
- LOSC – Local On-Scene Coordinator
- MSDS – Material Safety Data Sheet
- NAVSUPSALV – Navy Supervisor of Salvage
- NCP – National Contingency Plan
- NMFS – National Marine Fisheries Service, US Department of Commerce
- NOAA – National Oceanic and Atmospheric Administration, US Department of Commerce
- NTV – Non-tank Vessel
- OSHA – Occupational Safety and Health Administration
- OSRO – Oil Spill Response Organization
- OV – Organic Vapor
- PFD – Personal Flotation Device
- PID – Photo Ionization Detection
- PPE – Personal Protection Equipment
- PRAC – Primary Response Action Contractor
- RP – Responsible Party
- RPS – Response Planning Standard
- SAM – Staging Area Manager
- SAR – Search and Rescue
- SCBA – Self-Contained Breathing Apparatus
- SEAPRO – Southeast Alaska Petroleum Resource Organization
- SERVS– Ship Escort Response Vessel Service
- SMART– Special Monitoring of Applied Response Technologies
- SOSC – State On-Scene Coordinator
- SPCC – Spill Prevention Control and Countermeasures Plan
- SSC – Scientific Support Coordinator
- STAR – Spill Tactics for Alaska Responders
- UC – Unified Command
- USCG – US Coast Guard
- USFWS – US Fish and Wildlife Service
- VRP – Vessel Response Plan



C. ESTIMATING AMOUNT OF SPILLED OIL

SPILL VOLUME ESTIMATION

Oil in or on Soils

- It is difficult to estimate the amount and extent of subsurface pollution from hydrocarbons spilled and trapped in soil.
- Hydrocarbons in soil may exist in three phases:
 - As vapors within the pore spaces
 - As residual liquid attached to or trapped between soil particles
 - As dissolved components of oil in moisture surrounding soil particles
- Generally, oil retention increases with: decreasing grain size, poorer sorting of soils, and increasing oil viscosity.
- Oil retention of initially water-saturated soils is generally lower than initially dry soils.
- The “retention capacity” factor for different types of soils provides an estimate of volume of liquid retained per unit pore volume. The following are rules of thumb for retention capacity of soil types:

	Silt	Sand	Gravel
Crude Oil & Other Persistent Oils	12% - 20%	4% - 13%	0% - 5%
Diesel	7% - 12%	2% - 8%	0% - 2%
Gasoline	3% - 7%	1% - 5%	0% - 1%

Oil on Ice and Snow

- Field experience and data from actual spills indicate that oil-holding capacities of ice and snow range as high as 1,600 barrels per acre.
- Equations for estimates:

$$V \text{ (bbl)} = (4.14 \times 10^5) \times A \text{ (mi}^2\text{)} \times t \text{ (in.)}$$

$$V \text{ (bbl)} = 647 \times A \text{ (acres)} \times t \text{ (in.)}$$



$$V \text{ (bbl)} = (1.48 \times 10^{-2}) \times A \text{ (ft}^2\text{)} \times t \text{ (in.)}$$

$$V \text{ (gal)} = 42 \times V \text{ (bbl)}$$

V = Volume of oil spill

A = Area of oil slick or contaminated zone

t = Thickness of oil slick or contaminated zone
(with snow, t = equivalent oil thickness)

Oil on Water

- Oil Color – The BONN Agreement Oil Appearance Code (BAOAC) Oil Layer Thickness Estimates:

CODE	Description	Layer Thickness Interval (μm)	Litres per Km^2
1	Sheen (silvery/grey)	0.04 - 0.30	40 - 300
2	Rainbow	0.30 - 5.0	300 - 5,000
3	Metallic	5.0 - 50	5,000 - 50,000
4	Discontinuous true oil colour	50 - 300	50,000 - 200,000
5	Continuous true oil colour	More than 200	More than 200,000

- Equations for estimates:

$$V \text{ (bbl)} = 4.14 \times 10^5 A \text{ (mi}^2\text{)} \times t \text{ (inches)}$$

$$V \text{ (bbl)} = 647 A \text{ (acres)} \times t \text{ (inches)}$$

$$V \text{ (bbl)} = 1.48 \times 10^{-2} A \text{ (ft}^2\text{)} \times t \text{ (inches)}$$

$$V \text{ (gal)} = 0.624 A \text{ (ft}^2\text{)} \times t \text{ (inches)}$$

V = Volume of oil spill

A = Area of slick at thickness t

t = Thickness of oil slick

Encounter Rate Calculations

- Calculations used to estimate the amount of oil moving past in a stream, entering a collection boom, or in a windrow/patch of oil.

$$\text{EnR (gpm)} = 37 \times W \text{ (ft)} \times V \text{ (ft/sec)} \times t \text{ (in)}$$

$$\text{EnR (bbl/hr)} = 53.33 \times W \text{ (ft)} \times V \text{ (ft/sec)} \times t \text{ (in)}$$

$$\text{EnR (bbl/day)} = (1.28 \times 10^3) \times W \text{ (ft)} \times V \text{ (ft/sec)} \times t \text{ (in)}$$

W = Width of oil swath



V = Velocity in feet per second (1 knot = 1.68 ft/sec)

t = Thickness of oil slick

ESTIMATING SPILL SOURCE VOLUMES AND FLOW RATES

Leak Rate Calculations

One drop/second = 1 gallon per day

Thin stream breaking to drops = 24 gallons per day

Small stream (about 1/8 inch) = 84 gallons per day

Large stream (about 1/4 inch) = 936 gallons per day

A simple rule of thumb is to divide 10,000 by the number of seconds it takes to fill a five-gallon pail.

Estimates for Capacity

- Pipeline per linear foot
 - For volume in gallons per foot: square the inside diameter (in inches) and multiply by 4 percent (0.04)
 - For volume in barrels per foot: square the inside diameter (in inches) and divide by 1,000
 - To find the volume of a pipeline in barrels per mile: square the inside diameter (in inches) and multiply by 5.13
- For vertical cylindrical tanks:

$$V \text{ (gal)} = 0.0034 d \text{ (in.)} \times d \text{ (in.)} \times h \text{ (in.)}$$

$$V \text{ (gal)} = 5.88 D \text{ (ft)} \times D \text{ (ft)} \times H \text{ (ft)}$$

d = diameter in inches

D = diameter in feet

h = height of liquid in inches

H = height of liquid in feet

NOTES:

The National Oceanic and Atmospheric Administration publishes an observer's guide that contains more information on estimating oil spill volumes.

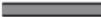
Information in this Appendix was taken from the Alaska Clean Seas Technical Manual Vol. 1, and the BONN Agreement Oil Appearance Code (BAOAC).



D. LEGEND OF ICONS USED ON MOST ALASKA GRS MAPS

STRATEGY ICONS

The following symbols are used in Geographic Response Strategies in Alaska.

	Paved Road		Mariculture Pens
	Improved Gravel Road		Marsh
	Un-improved Gravel Road		Sand Bar
	ATV Trail		Salmon Spawning Stream
	Hiking Trail		Nesting
	Bridge		Keeper Beach
	Landing Strip		Seabird Colony
	Small Gravel Strip		Exclusion Zone
	Helicopter Landing Zone		Snare Boom
	Staging Area		Sorbent Boom
	Dock		Tidal-seal Boom
	Boat Ramp		Calm-water Boom
	USGS Navigation Light Marker		Protected-water Boom
	Direction True North		Protected-water Boom/Flood Tide
	Restricted Access, contact Unified Command before entering		Open-water Boom
	Buildings		Open-water Boom/Flood Tide
	Cabin		Fast-water Boom
	Camping		Dam
	Water Depths, fathoms & tenths		Gate
	Rocks Awash at Low Tide		Anchor
	Eddy		Skimmer
	Eagles Nest		Equipment
	Seal Haulout		Mooring
	Reef		Bears in Area, guards needed



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CONVERSIONS AND EQUIVALENTS

AREA (s.=statute, n.=nautical)		
multiply	by	to derive
meters ²	10.76	feet ²
feet ²	0.0929	meters ²
kilometers ²	0.4	s. miles ²
s. miles ²	2.6	kilometers ²
s. miles ²	0.8	n. miles ²
n. miles ²	1.3	s. miles ²
kilometers ²	0.3	n. miles ²
n. miles ²	3.4	kilometers ²

TEMPERATURE	
calculate	to derive
5/9(°F - 32°)	°C
(9/5 °C) + 32°	°F

VOLUME		
multiply	by	to derive
barrels	42	gallons
barrels	5.6	feet ³
barrels	159	liters
barrels	0.2	meters ³
feet ³	7.5	gallons
gallons	3.8	liters

WEIGHT		
multiply	by	to derive
kilograms	2.2	pounds
metric tons	0.984	long tons
metric tons	1,000	kilograms
metric tons	2,204.6	pounds
long tons	1,016.05	kilograms
long tons	2240	pounds
short tons	907.2	kilograms
short tons	2,000	pounds

DENSITY ESTIMATIONS			
Material	Barrels/Long Ton		Notes
	Range	Average	
Crude Oils	6.7-8.1	7.4	1 long ton equals 2200 lbs As a general approximation, use 7 bbl. (300 US gallons) per metric ton of oil. 6.4 bbl/long ton is neutrally buoyant in fresh water. Open ocean neutral buoyancy values are generally in the 6.21-6.25 bbl/long ton range.
Aviation Gasolines	8.3-9.2	8.8	
Motor Gasolines	8.2-9.1	8.7	
Kerosenes	7.7-8.3	8.0	
Gas Oils	7.2-7.9	7.6	
Diesel Oils	7.0-7.9	7.5	
Lubricating Oils	6.8-7.6	7.2	
Fuel Oils	6.6-7.0	6.8	
Asphaltic Bitumens	5.9-6.5	6.2	

Specific gravity of 1 or an API of 10 equals the density of fresh water.

Specific Gravity <1 or an API > 10 indicates product is lighter than fresh water.

API Gravity = (141.5 / Specific Gravity)-131.5

Weight of Fresh Water: 8.3 pound/gallon

Weight of Sea Water: 8.5 pounds/gallon

Note: Exact weight depends on temperature and salinity

OIL THICKNESS ESTIMATIONS			
CODE	Description	Layer Thickness Interval (m)	Litres per Km ²
1	Sheen (silvery/grey)	0.04 - 0.30	40 - 300
2	Rainbow	0.30 - 5.0	300 - 5,000
3	Metallic	5.0 - 50	5,000 - 50,000
4	Discontinuous true oil colour	50 - 300	50,000 - 200,000
5	Continuous true oil colour	More than 200	More than 200,000

COMMONLY USED EQUATIONS	
Circle: Area = 3.14 x radius ²	Cylinder/Pipe/Tank: Volume = 3.14 x radius ² x length
Circumference = 3.14 x diameter	Rectangle/Square: Area = length x width
Sphere/Tank: Area = 4 x 3.14 x radius ²	Cube/Block/Tank: Volume = length x width x height
Volume = 1.33 x 3.14 x radius ³	