WRIA 7
Geographic Response Plan

(WRIA 7-GRP)

NON-FLOATING OILS RESPONSE OPTIONS AND CONSIDERATIONS

Information about potential response options in the planning area

December 2020

Introduction

This chapter is purposely broad in scope and should not be considered comprehensive. This material is intended to provide general information during the first phase of a spill response. During an actual incident, additional information about the spill scenario, impacted areas, weathering properties of the oil, and sunken oil survey methods and recovery options will be available from private organizations or federal, state, tribal, and local government agencies.

The information provided in this chapter may be useful in:

- Assisting the Environmental Unit (EU) in identifying locations where non-floating oil may sink or collect during a spill response, and in identifying survey and response strategies for sunken oil.
- Providing non-floating oil "context" to responders, clean-up workers, and others during the initial phase of a spill response in the GRP area.
- Briefing responders and incident command staff that may be unfamiliar with environmental conditions related to non-floating oils in the GRP area.
- Providing background information for personnel involved in media presentations and public outreach during a spill incident.

Background

Traditional response and preparedness methods focus on containing and recovering floating oil through the use of containment booms and on-water skimmers. However, not all oils float. Oils that sink or become suspended in the water column cannot be successfully recovered with floating oil techniques. Priority should be given to preventing, minimizing, and containing heavy oil and potentially non-floating oil spills at their source. Additionally, since many oils may initially float, rapid and aggressive surface oil recovery efforts should be pursued in the early phase of a spill.

The following general definitions from the American Petroleum Institute (API) characterize oil behavior when spilled in the environment (API 2016):

- Floating oil – spilled oil that remains on the surface of the water.
- Submerged oil – spilled oil in the water column, below the water surface, including oil that is in temporary suspension due to turbulence. Submerged oil may refloat or sink in the absence of turbulence.
- Sunken oil – spilled oil that is on the bottom of the water body.
- Non- floating – can describe oil that becomes submerged in the water column or sinks to the bottom.

Some oils may float, submerge, and sink in a single spill and oil that has sunk to the bottom can become re-suspended and spread further by currents (API 2016).

Properties of Oil as Non-Floating Indicators

Crude oil is made up of hydrocarbons ranging from volatile, light materials (such as propane and benzene) to more complex heavy compounds (such as bitumen, resins, and waxes). Light crudes like Bakken are made of mostly light and medium weight hydrocarbons that may evaporate quickly or dissolve in the water column; after it is spilled to the environment and subjected to natural physical weathering, small amounts of any remaining heavy ends could be at risk of sinking. Heavy crudes like diluted bitumen are composed mostly of medium and heavy compounds with the potential to only minimally evaporate into air or dissolve into water, and may readily agglomerate and sink or adhere to soil and sediment, particularly after its lighter portions have evaporated. Refined petroleum products (such as gasoline or diesel) are made of specific ranges of hydrocarbons. An oil's viscosity, density, and other inherent properties of crude, refined oil, and waste petroleum products are strong determinants of the potential for the oil to sink (API 2016).

A review of the operations within Washington State identified the following oil types transferred by vessel, pipeline, and rail as having potential non-floating properties based on the oil-to-water density and waterbody characteristics:

- All crude oils
- Heavy fuel oils, including those transferred to vessels in marine waters
- Vacuum gas oil
- Used and waste oils
- Asphalt and asphalt products
- Decant oil

For more information about the bulk oil facilities that operate within this planning area, and the volume of oil transfers over water, please refer to the Ecology Spills Map.

Oil Weathering Details

Physical weathering describes how the oil changes when spilled into the environment. Weathering processes may include evaporation, biodegradation, natural dispersion, adhesion to materials, interaction with mineral fines, emulsification, dissolution, photo-oxidation, and sedimentation. Certain types of physical weathering may lead to submergence or sinking of some portion of the oil spilled into the environment (uSCAT Manual).

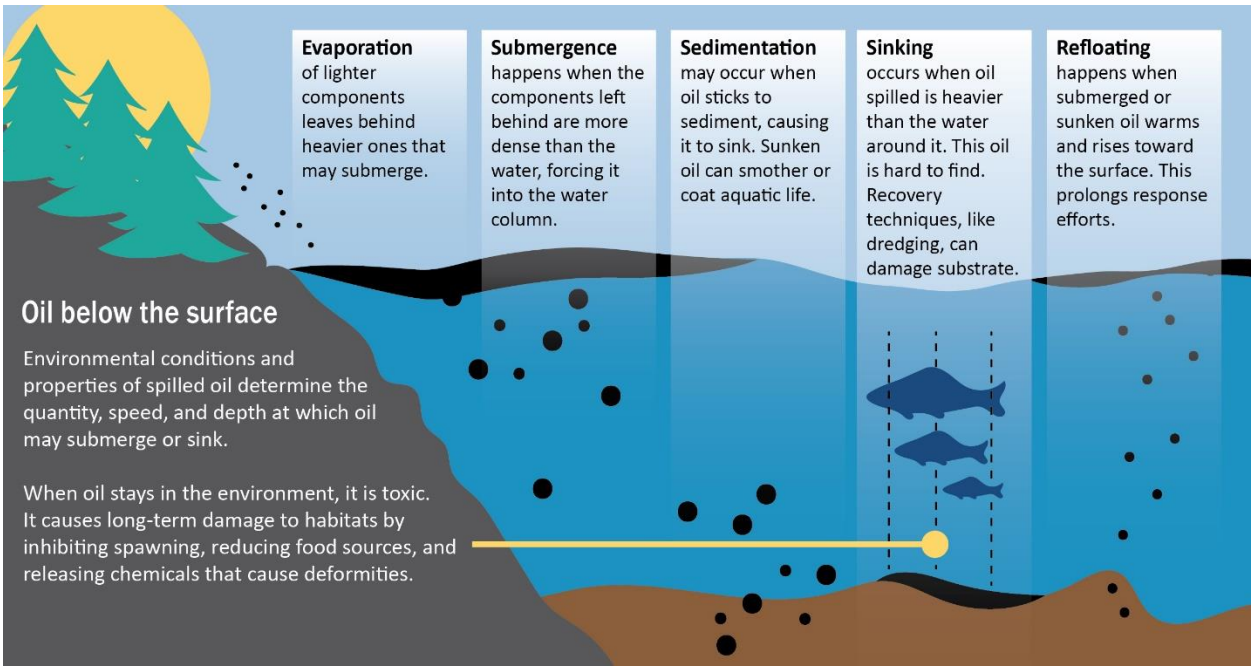

Figure 1: Behaviors of non-floating oil when spilled into the environment. (Ecology, 2018)

Non-floating Oil Risk Assessment

A detailed identification of the species and habitats found in the water column and along the bottom of the waterway is incorporated into the Resources at Risk section of this GRP.

Early Assessment Guidance

Initial sinking oil risk assessments conducted during the early hours of a spill should focus on the oil properties. Ongoing observations and data collection support updates of the risk assessment, based on how the oil weathers and behaves in the environment. The NOAA ADIOS weathering model may be used to help predict how the oil product will change over time. If these models and real time observations indicate that the oil is sinking, a variety of surveying or recovery methods may be selected to confirm sunken oil and locate the areas where it is collecting.

Subsurface Survey and Response Considerations

Survey and recovery methods must be selected with care using the environmental conditions of the water and sensitivity of resources in the area, and must ensure more harm is not done when recovering the oil. See Table 3-2 in the API Technical Report on Sunken Oil Detection and Recovery to learn about how survey methods are chosen. Once these surveys have confirmed the location, amount, and characteristics of sunken oil, a customized plan to remove the sunken oil can select the most effective and non-damaging methods for the environment. The API report and the USCAT manual both detail a variety of methods to survey and recover sunken oil in a range of environments.

Information considered during a spill response may include spill location, oil type and characteristics, weather, trajectory, seasonal species data, and overflights or other real-time verification methods. Along with spill-specific modeling, information on this interactive map can help the Environmental Unit and Operations Section select effective survey and recovery methods.

The map includes the following layers, which may be used during a response:

Potential Spill Origin Points

These layers show regulated oil facilities where a spill of non-floating oil could originate. They also represent potential safety risks for survey and cleanup crews to be aware of while operating in the area.

- Regulated Oil Facilities
    - Class 1: Refineries and large storage terminals that transfer oil in bulk, some of which handle non-floating oil.
    - Class 3: Facilities that fuel commercial vessels holding over 10,500 gallons.
    - Class 4: Facilities that fuel commercial vessels under 10,500 gallons.
- Railroads: Regulated railroads that carry bulk oil as cargo. Some railroads only carry biological oils, which have not been rated as potentially non-floating.
- Petroleum Products Pipelines: Some pipelines carry crude oil; others pose a potential safety hazard, and need to be considered when selecting cleanup methods. Due to security restrictions required by the Department of Homeland Security, the pipelines cannot be viewed by the public past a certain zoom level. Responders in the command post have access to a secured layer to view exact locations.

Hazards and safety concerns

Cleanup crews may be harmed by contaminated sediments. Towed or dragged equipment could snag on underwater pipelines and damage the pipeline or the survey boat.

- Superfund Sites: Includes sites that have not yet been cleaned, as well as sites where remediation has been completed. In some cases remediation in a waterway may include “capping” contaminated sediments with clean soil, so disturbing the riverbed could release buried toxins. These sites will be evaluated prior to selecting a cleanup strategy.
- Hazardous Sites: Includes sites that have not been evaluated for cleanup with Superfund money, but may still contain hazardous materials or sediment. They may require testing or additional safety precautions.
- Natural Gas Pipelines: Where buried under a riverbank, they could snag cleaning equipment. Due to security restrictions required by the Department of Homeland Security, the pipelines cannot be viewed by the public past a certain zoom level. Responders in the command post have access to a secured layer to view exact locations.

River height and current speed

Some survey methods are only effective within certain river flow ranges. If a river is flowing at a high rate some methods may not be safe or effective. If a river is too low and shallow, it may be inaccessible to boats and equipment.

- River Flow Data Stations: Real-time and historic data about river height, volume, or visibility.
- Current Streamflow: Visual cue of current river state compared to average conditions.
- NHD Hydrography: Digitized lines and outlines of waterbodies, including some buried drains. May be used during a response to anticipate where a spill may travel, or to trace the source of an unknown spill.

Natural collection areas

As oil flows downstream, it may collect behind certain known barriers, such as dams and natural spillways.

- Dams: As oil travels in the water column or along the riverbed, it may collect in the calm, deep pools above dams. Dams may also pose a safety hazard to boat and cleanup crews. Responders in the command post have access to a more detailed layer.
- Fish Barriers: In addition to dams, includes other man-made structures that may create a natural collection spot.

Resources at Risk

Some survey and recovery methods could damage historic sites, cultural sites, or water intakes.

- Historic Register Layers: Bridges, dams, piers, and other structures in the waterway have historical significance and may require permits and special considerations to minimize damage during cleanup operations.
    - Historic Register Properties: Historic structures that have been evaluated and deemed significant enough to be listed on the National Register of Historic Properties or the Washington Historic Register by the Department of Archaeology and Historic Preservation (DAHP).
    - Historic Register Districts: Neighborhoods and other large areas with shared historic significance and special protections.
    - Archaeological information is not shown on the public map due to privacy and other legal restrictions. Secured layers with this information are available to the Environmental Unit, tribal archaeologists, and DAHP during a response and will also be considered prior to cleanup.
- Water Right Diversions: Each point represents an applications for water rights. Permanent or seasonal water intakes located in the water column could be damaged by either non-floating oil or certain cleanup methods. Water intakes are used for drinking water utilities, crop and livestock irrigation, other commercial uses including fish hatcheries, or even

private use such as watering lawns. This layer can help responders alert the owners of the intakes during a spill, or select cleanup methods that will not damage the intakes.

- Irrigation Districts: Coordinated irrigation districts maintain contacts and usage information, and can help alert area farmers about water contamination or restrictions.