



Designation: F2204/F2204M – 22

Standard Guide for Describing Shoreline and Inland Response Techniques¹

This standard is issued under the fixed designation F2204/F2204M; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This guide describes methods to clean and remediate stranded oil on marine and lake shorelines, on river banks and other inland water body shorelines, and terrestrial habitats. The primary goal of any countermeasure is to aid recovery while minimizing additional impact.

1.2 This guide describes 22 different tactics that are available for consideration. These options range from natural recovery to active physical or biochemical intervention.

1.3 The tactics listed might not be appropriate under all possible circumstances, and multiple countermeasures could be appropriate on the same shoreline, river bank, lake shore or terrestrial habitat.

1.4 This guide describes technical considerations for selecting appropriate response countermeasures or techniques.

1.5 Selection of specific countermeasures for use during a spill response is guided by properties of the oil, degree of oiling, site accessibility, geomorphology, substrate and vegetation type, mobility of available equipment, hydrologic (coastal and inland) and meteorological conditions, and the presence of sensitive natural and archeological resources. It is advisable to consult with appropriate regulatory authorities since certain response options may require government authorization or approval, or both.

1.6 This guide does not address response to submerged, sunken or buried oil.

1.7 The values stated in either SI units or inch-pound units are to be regarded separately as standard. The values stated in each system may not be exact equivalents: therefore, each system shall be used independently of the other. Combining values from the two systems may result in non-conformance with the standard.

1.8 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appro-*

priate safety, health, and environmental practices and determine the applicability of regulatory limitations prior to use.

1.9 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

2. Referenced Documents

2.1 *ASTM Standards:*²

F1686 Guide for Surveys to Document and Assess Oiling Conditions

F1687 Guide for Terminology and Indices to Describe Oiling Conditions on Shorelines

F1872 Guide for Use of Chemical Shoreline Cleaning Agents: Environmental and Operational Considerations

F2205 Guide for Ecological Considerations for the Use of Chemical Dispersants in Oil Spill Response: Tropical Environments

F2532 Guide for Determining Net Environmental Benefit of Dispersant Use

3. Key Terms

3.1 *Shoreline and Inland Habitats*—For the purpose of this guide, marine and estuarine shorelines, river banks, and lake shores will be collectively referred to as shorelines, shores, or shore-zones. Shore types include a range of impermeable (bedrock, ice, and man-made structures), permeable (flats, beaches, and man-made), and coastal wetland (marshes, mangroves,) habitats. Other non-shoreline, inland habitats include wetlands (pond, fen, bog, swamp, tundra, and shrub) and drier terrains (grassland, desert, forests), and will be collectively referred to as either wetlands or terrains, respectively.

3.2 *Mixed Sediment Substrates*—These are described based on the size of the inorganic sediments (Guide **F1687**). The penetration and retention of oil is largely controlled by sediment size. Only light oils (for example, a diesel) can penetrate

¹ This guide is under the jurisdiction of ASTM Committee **F20** on Hazardous Substances and Oil Spill Response and is the direct responsibility of Subcommittee **F20.17** on Shoreline and Inland Countermeasures.

Current edition approved Sept. 1, 2022. Published October 2022. Originally approved in 2002. Last previous edition approved in 2016 as F2204 – 16. DOI: 10.1520/F2204-22.

² For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

sand, whereas all but the more viscous oils can easily penetrate into pebbles and cobbles (“coarse sediment”). Substrates composed of mixed sands, pebbles, and cobbles are sometimes referred to as “gravel.” The surface layer often has predominantly coarse sediments with increasing amounts of sand in the subsurface. In mixed-sediment substrates, coarser fractions (pebbles and cobbles) are infilled with the finer sediments (sands and granules) so that these substrates are permeable only for some medium oils and all light oils. Pebble-cobble (“coarse sediment”) substrates have open interstitial spaces, so oil typically penetrates them, but can be easily remobilized by wave flushing, tidal pumping, or by river currents.

3.3 Debris—Scattered organic or inorganic materials that have washed up onto shorelines, wetlands, or accumulated in rivers and streams, or a combination thereof. These materials are not part of a natural habitat, such as sediments, attached animals (for example, mussels or barnacles), live sea grasses, or aquatic plants. Accumulations of large logs that have washed ashore on sedimentary coasts or mid-channel islands can provide protection against wave action and, in some areas, are considered to be a critical element of the shore zone. Likewise, log jams or beaver dams in rivers and streams can provide critical habitat. A decision to remove oiled logs and other debris may require approval from regulatory agencies.

3.4 Hot versus Warm Water Washing—Washing oil from a substrate (solid or otherwise) typically uses ambient (unheated) water pumped from the adjacent water body. The removal of sticky or weathered stranded oil can require an increase in pressure or temperature, or both, to be effective. Conventional water heaters raise water temperatures up to 160°F [70°C]. An operational example is the successful use of warm washing during the *Exxon Valdez* response. Hot water washing involves heating water to temperatures greater than 160°F [70°C]. Hot water heaters are occasionally combined with high-pressure spray systems, require more energy than warm-water heaters, and are only applicable for removal of small amounts of oil (“spot washing”) on man-made structures.

3.5 Waste Generation—Each spill response technique, generates different volumes and types of waste depending on the amount and type of spilled oil and the substrate materials. The types of waste generated during spill response include: oily water or liquids, oiled sediments, or oiled debris. Recovered oil and oil-water mixtures are usually temporarily stored prior to recycling, treatment or disposal, or a combination thereof. Operational waste is generated by cleanup or treatment activities and can include personal protective equipment, sorbents, and packaging. Waste management can be an issue during response, particularly in remote areas where disposal options are limited and travel distances to approved sites are long. Estimates of the types and volumes of potential waste should be included in the countermeasure selection process. **(1)³**

3.6 Response Techniques—For the purpose of this guide, the term, “response techniques,” will be used to generically refer to

response countermeasures, clean-up techniques, tactics, or methods, or a combination thereof.

4. Significance and Use

4.1 Once the extent and type of oiling has been defined and documented using proper procedures (see Guides **F1686** and **F1687**), decisions are made on the appropriate course of action for site cleaning and restoration. In some cases, natural recovery (accompanied by monitoring) can be the preferred approach whereas in other cases, active response may be preferred and appropriate. This guide summarizes the principal response techniques available for shoreline, wetland, and terrain habitats.

4.2 This guide is intended to minimize the potential for added impact to the environment from use of response techniques in an overly-aggressive manner or in unsuitable conditions or habitats.

4.3 In Section 5, typical considerations, which can limit the applicability of a given technique are addressed in *Constraints*. An example that is applicable to all techniques other than natural recovery, is special permission will likely be needed for any response operations at sites with known culturally or historically important resources. Also, in Section 5, a synopsis of main trade-offs from use of a particular technique is provided in *Environmental Effects*.

5. Onshore Response Techniques

5.1 This section lists and describes those techniques that can be considered for use in an onshore (shoreline, wetland, or terrestrial) oil spill response. Some of these options may require special consideration and authorization prior to work. Also, some of these techniques have greater personnel and equipment requirements or can generate more waste relative to others. Tradeoffs need to be considered when selecting an appropriate option(s), particularly in remote areas. In most cases, government agencies will be involved in the decision-making process. Government approval may be required for some techniques, and these are typically considered on a case-by-case basis. Contingency plans should provide for use of a range of techniques. The response techniques described in this guide are consistent with Environment and Climate Change Canada (ECCC), US NOAA, and American Petroleum Institute terminology. **(2, 3, 4, 5)**

Natural Recovery	5.2
Barriers/Berms	5.3
Manual Oil Removal/Cleaning	5.4
Mechanical Oil Removal	5.5
Sorbents	5.6
Vacuums	5.7
Debris Removal	5.8
Mixing (“dry” or “wet”)	5.9
Sediment Relocation	5.10
Vegetation Cutting/Removal	5.11
Flooding (Deluge)	5.12
Low Pressure, Ambient Water Flushing	5.13
High Pressure, Ambient Water Flushing	5.14
Low Pressure, Warm Water Flushing	5.15
High Pressure, Warm Water Flushing	5.16
Hot Water, High Pressure Cleaning	5.17
Sand/Grit Blasting	5.18
Solidifiers	5.19
Surface Washing Agents	5.20

³ The boldface numbers in parentheses refer to the list of references at the end of this standard.