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Standard Guide for Use of Chemical Shoreline Cleaning Agents: Environmental and Operational Considerations[1]

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1. Scope

1.1 This guide covers the use of chemical cleaning agents on oiled shorelines. This guide is not applicable to other chemical agents nor to the use of such products in open waters.

1.2 The purpose of this guide is to provide information that will enable spill responders to decide whether to use chemical shoreline cleaning agents as part of the oil spill cleanup response.

1.3 This is a general guide only. It is assumed that conditions at the spill site have been assessed and that these conditions are suitable for the use of cleaning agents. It is assumed that permission has been obtained to use the chemical agents. Variations in the behavior of different types of oil are not dealt with in this guide and may change some of the parameters noted herein.

1.4 This guide covers two different types of shoreline cleaners: those that disperse oil into the water and those that disperse little oil into the water under low energy levels. The selection criteria for these two types can differ widely. This guide does not cover dispersants.

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1.5 The values stated in SI units are to be regarded as standard. No other units of measurement are included in this standard.

1.6 *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 appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 *ASTM Standards:*[2]

F1686 Guide for Surveys to Document and Assess Oiling Conditions on Shorelines

3. Significance and Use

3.1 This guide is primarily intended to assist decision-makers and spill-responders in contingency planning, spill response, and training.

3.2 This guide is not specific to site or type of oil.

4. Background

4.1 Chemical shoreline cleaning agents are formulations designed to be applied to oil and to remove oil from the shoreline above the low water line.

4.2 Chemical shoreline cleaning agents are generally used differently from chemical dispersants, which are used to treat oil spills in offshore waters.

4.3 Chemical shoreline cleaning agents are sometimes known as surface washing agents, shoreline cleaners, or beach cleaners.

4.4 The basic application method for shoreline cleaning agents is to spray the product onto the oil and leave the agent to penetrate the oil and then either flush away the oil or let a rising tide wash it away. The oil may be washed directly into containment areas for recovery **(1)**.[3]

4.5 The fundamental advantage of using a shoreline cleaning agent is that oil can be removed rapidly without using excessive temperatures or pressures, which can be harmful to biota on and in ~~beaches~~shorelines **(~~2,~~3~~1~~-3)**.

4.6 Laboratory effectiveness tests have been developed and many products have been tested **(~~4-6~~(1, 4, 5)**~~. Field effectiveness~~

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[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.

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

~~tests are being developed (7,8.~~ **Field effectiveness tests have been developed (1).**

4.7 Laboratory testing shows that effectiveness may differ in saltwater and freshwater ~~(6,9~~(1).

4.8 There are differences in action mechanisms between dispersants and shoreline cleaning agents. Composition of the two products differ ~~(4, 9-13~~(1, 6).

4.9 Before specialized products were developed, dispersants were used as shoreline cleaning agents with varying results (~~14~~7).

4.10 The aquatic toxicity of the treating agents varies widely and is a factor in choosing products ~~(3,9~~(1, 8).

4.11 The amount of oil dispersed into water primarily depends on energy used to remove the oil from the substrate, especially for dispersing shoreline treating agents. The energy level is difficult to measure, but may be estimated from indicators such as the pressure of the rinse water ~~(1-3~~(1) .

4.12 The ease of oil removal from a beach depends very much on the type of oil, its degree of weathering and the type of beach. For example, a highly-weathered oil is difficult to remove by any means ~~(~~(1, 2) .

5. General Considerations for Using Chemical Shoreline Cleaning Agents

5.1 Two basic types of shoreline cleaners are available: those that disperse oil into the water column, and those that disperse little oil into the water column at low energy levels.

5.2 Considerations for the use of shoreline cleaning agents that disperse are the same as those for using dispersants in the specific habitat.

5.3 Shoreline cleaning agents that do not disperse have very little impact on the water column.

5.4 Regulatory authorities may have additional criteria and regulations regarding the acceptability and use of shoreline cleaning agents.

5.5 Shoreline treating agents should be used in accordance with manufacturer's recommendations.

5.6 The decision of whether to use or not to use shoreline cleaning agents always involves tradeoffs. Using a non-dispersing shoreline cleaning agent moves oil out onto the water where it must be recovered. Using a dispersing cleaning agent moves oil into the water column. Therefore, adverse effects on water organisms may be increased in the water column (in the case of a dispersing agent) by removing it from the shoreline.

5.7 Shoreline cleaning agents are used primarily as a cleanup method and not as a spill control method. Since some shorelines are more vulnerable to the longer lasting impacts of spilled oil, an acceptable tradeoff may be to protect these sensitive environments by removing the oil and either recovering it or putting it into a less sensitive environment. When dispersing-type agents are used, the tradeoff that must be evaluated is the long-term impact of the residence time of spilled oil that is stranded on shorelines as opposed to the short-term impact of the presence of dispersed oil in the water column. For non-dispersing agents, the trade-off that must be evaluated is the difficulty of recovering the released oil versus the impact of the long residence time of spilled oil that is stranded on shorelines and the possibility of re-oiling adjacent shoreline.

5.8 It has been found that some shoreline cleaning agents are equally effective in fresh and salt water, while others are not. The salinity of the water involved may therefore be a factor, and the effectiveness of the particular product in that salinity ~~(9~~(1).

6. Environments Covered

6.1 *Shorelines Generally*—Shorelines vary extensively in their composition and their retention of oil (Guide F1686). Several classification schemes are available for oiled shorelines as well as guides to other cleanup methods (~~15~~10, ~~16~~11).

6.2 *Seagrasses*—Seagrass-dominated shorelines can be found in shallow marine environments from the tropics to Arctic regions. Seagrass beds form a discreet ecosystem that traps material derived from terrestrial sources and then exports large quantities of organic matter to the open sea. The presence of an extensive network of roots and rhizomes facilitates not only the sediment-binding of the grass beds but also the transport of materials back out to sea. Oil can adhere to the seagrasses and cause damage.

6.3 *Mangroves*—Mangrove ecosystems are intertidal forests dominated by various species of woody halophytes, commonly called mangroves. There are 12 families and more than 54 species of mangroves. Mangrove ecosystems occur in tropical low-energy depositional areas. Mangroves tend to promote the deposition of organic and mineral matter and their extensive root systems are important in stabilizing intertidal sediments. They are important ecologically as they provide the structural basis for many species of animals and plants. Mangroves are particularly prone to damage from oiling as they have respiratory openings on roots that can be clogged ~~(17~~(11).

6.4 *Tidal Flats*—Tidal flats are usually broad intertidal areas of unconsolidated sediments that have little slope and are usually protected from direct wave action. They are composed of sediments of varying characteristic grain size depending on the amount of wave and current energy present. Tidal flats may be covered by seagrasses, marsh grass, or mangroves, the environments which are discussed elsewhere in this guide. Tidal flats are important to the coastal ecosystem because of the high biological productivity. Oil retention on tidal flats is largely transitory and oil will often be carried to the supra-tidal regions.

6.5 *Sandy ~~Beaches~~Shorelines*—Sandy ~~beaches~~shorelines are composed of sediments ranging from 0.06 to 2.0 mm in size. The composition of the sand itself may vary, but it is usually either siliceous or carbonate. The character of the sediment may be a significant factor in oil retention as oil adheres differently to different types of materials. Wave action can change the profile of a sandy beach and can bury or cover oil.

6.6 *Gravel ~~Beaches~~Shorelines*—Gravel ~~beaches~~shorelines are composed of sediments ranging in size from 2.0 to 63 mm. The