



Standard Guide for Ecological Considerations for the Use of Bioremediation in Oil Spill Response—Sand and Gravel Beaches¹

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1. Scope

1.1 This guide covers considerations and recommendations for the use of biodegradation enhancing (bioremediation) agents to assist in minimizing the impact of oil spills on sand and gravel beaches. Aesthetic and socioeconomic factors are not considered, although these and other factors are often important in spill response.

1.2 This is a general guide only, which assumes that the oil is biodegradable and that the bioremediation agent selected can be used safely (in terms of ecological impact and human health) and effectively when applied correctly and used in compliance with relevant government regulations. Oil considered for bioremediation includes crude oils and certain refined petroleum products.

1.3 This guide addresses the application of bioremediation agents alone or in conjunction with other technologies.

1.4 This guide applies to freshwater, estuarine, and marine beach environments.

1.5 In making bioremediation-use decisions, appropriate government authorities must be consulted as required by law.

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.* In addition, it is the responsibility of the user to ensure that such activity takes place under the control and direction of a qualified person with full knowledge of any potential or appropriate safety and health protocols.

2. Terminology

2.1 Definitions:

2.1.1 *aerobes*—organisms that require air or free oxygen for growth.

2.1.2 *anaerobes*—organisms that grow in the absence of air or oxygen, and do not use molecular oxygen in respiration.

2.1.3 *bioaugmentation*—addition of microorganisms (predominantly bacteria) to amplify the biodegradation rate of target pollutants.

2.1.4 *biodegradation*—chemical alteration and breakdown of a substance to usually smaller products caused by microorganisms or their enzymes.

2.1.5 *bioremediation agents*—inorganic and organic compounds and microorganisms that enhance biological degradation processes, predominantly microorganismal.

2.1.6 *biostimulation*—addition of limiting nutrients to enhance the rate of biodegradation of target pollutants by indigenous species (predominantly bacteria).

2.1.7 *ecosystem*—organisms and the surrounding environment combined in a community that is self-supporting.

2.1.8 *identification*—process of designating an unknown organism by comparing it with known organisms.

2.1.9 *indigenous*—native to a given habitat or environment.

2.1.10 *marine*—relating to the ocean.

2.1.11 *methemoglobinemia*—acquired blood disorder leading to oxygen deprivation, stupor, and death from exposure to nitrates in drinking water.

2.1.12 *nutrient*—a substance that supports organismal growth.

2.1.13 *refined petroleum products*—products derived by way of various treatment processes from crude oil, a highly complex mixture of paraffinic, cycloparaffinic, and aromatic hydrocarbons that contain a low percentage of sulphur and trace amounts of nitrogen and oxygen compounds. Hydrocarbon products made from the refining of crude oils are specified in Section 5 of the Annual Book of ASTM Standards.²

2.1.14 *species*—a taxonomic category characterized by individuals of the same genus that are mutually similar and are able to interbreed.

2.1.15 *toxicity*—the property of a material, or combination of materials, to adversely affect organisms.

3. Significance and Use

3.1 The purpose of this guide is to provide remediation managers and spill response teams with guidance on an alternate means (called bioremediation) of safely and effectively cleaning up oil spills on beaches that takes advantage of natural microbial degradation processes.

3.2 This guide can be used in conjunction with other ASTM guides addressing oil spill response operations.

¹ This guide is under the jurisdiction of ASTM Committee F-20 on Hazardous Substances and Oil Spill Response and is the direct responsibility of Subcommittee F20.24 on Bioremediation and Safety Audit.

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² Annual Book of ASTM Standards, Vols 05.01, 05.02, 05.03, 05.04, and 05.05.