****ATTENTION****

Disclaimer:

The information provided in this document is for guidance purposes only. Specific information on countermeasure categories and products used for oil spill response listed in this document does not supersede the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), Subpart J, Product Schedule rule. 40 CFR Part 300.900 addresses specific authorization for use of spill countermeasures. Part 300.905 explains, in detail, the categories and specific requirements of how a product is classified under one of the following categories: dispersants, surface washing agents, bioremediation agents, surface collecting agents, and miscellaneous oil spill control agents. Products that consist of materials that meet the definitions of more than one of the product categories will be listed under one category to be determined by the EPA. A manufacturer who claims to have more than one defined use for a product must provide data to the EPA to substantiate such claims. However, it is the discretion of Regional Response Teams (RRTs) and On Scene Coordinators (OSCs) to use the product as appropriate and within a manner consistent with the NCP during a specific spill.

For clarification of this disclaimer, or to obtain a copy of a current Product Schedule, please go to the website www.epa.gov/emergencies or contact the EPA National Contingency Plan Product Schedule Information Line at (202) 260-2342.

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Selection Guide for Oil Spill Response Countermeasures

Volume I – Decision Making

June 30, 2009

Revision 5.0

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325 Mason Avenue
Cape Charles, Virginia 23310

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Columbia, SC 29201

SELECTION GUIDE REFERENCE MATERIALS

The information contained within this selection guide was primarily developed from data supplied to the authors by the product vendors, as well as from the following sources:

USEPA, National Contingency Plan Product Schedule Notebook, March 2009 revision. Accessible from the EPA website **www.epa.gov/emergencies/** or by calling (202) 260-2342.

Walker, A.H., J. Michel, G. Canevari, J. Kucklick, D. Scholz, C.A. Benson, E. Overton, and B. Shane. 1993. Chemical Oil Spill Treating Agents. Marine Spill Response Corporation, Washington, DC. MSRC Technical Report Series 93-015. 328 p.

Harless Performance Guild, Inc. 1995. Human Performance Technology. Newnan, GA.

Any additional reference materials specific to a product/technology category are provided at the conclusion of the Category summaries within Part B of this Selection Guide: Review/Selection of Options.

ACKNOWLEDGEMENTS

The authors would also like to gratefully acknowledge the assistance of the many individuals for the development and refinement of this Selection Guide. The editors made every effort to respond to all comments received. Individuals who participated in the initial development and this subsequent updates of this document are detailed in Appendix H.

FRONT COVER PHOTO CREDITS

National Oceanic and Atmospheric Administration Web Page Photo Gallery
US Coast Guard Web Page Photo Gallery
Hyattsville, MD, Volunteer Fire Department Web Page Photo Gallery
Boise, ID Fire Department Web Page Photo Gallery

Selection Guide Overview

Context

The first line of oil spill cleanup operations on surface waters has been, and will continue to be, mechanical countermeasures such as booms and skimmers. However, when the limitations of mechanical countermeasures are met and oil threatens or continues to threaten the public interest or the environment, other response countermeasures and technologies should be considered. The effective and timely evaluation of these countermeasures may play a critical role in a successful oil spill response.

This Selection Guide is a compilation of information and guidance on the use of oil spill response technologies and actions that may be unfamiliar to Federal or state on-scene coordinators or local incident commanders. This lack of familiarity should not be equated with inexperience. Decision-makers may have the impression that these products and technologies don't work, aren't worth the trouble, or could jeopardize natural resource protection. Instead, once better understood, many of the technologies or products included in this Guide can be beneficial to removal actions and public safety, and provide additional protection to threatened resources and environmentally sensitive areas.

While many aspects of oil spill response operations are predictable, each incident is different because of the type and amount of product spilled, the location of the spill, the weather, or sea conditions, water body (fresh, coastal, estuarine or open ocean waters) and what resources are threatened. Because of the potential complexities of effective oil spill response management, this Guide has been designed to simplify the evaluation of options for real-time response to actual oil spills.

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Shortcut to Table of Contents

SELECTION GUIDE OVERVIEW (CONTINUED)

About The Selection Guide

The primary objective of this guide is to provide information and guidance to responders for the timely evaluation of oil spill response technologies that are regulated under the NCP Product Schedule (40 CFR Part 300.900), i.e., ***chemical and biological products*** and ***response countermeasures***, for a wide range of oil spill conditions and circumstances. The Guide contains information on ***12 types of products / countermeasures within 2 separate volumes:***

- The first volume includes ***decision-making information***, which includes information to conduct proactive evaluations by response decision-makers of a preliminary technology category, individual product, or technology during planning or incident-specific use. This information has been designed to be applicable nationwide.
- The second volume contains ***guidance procedures to implement and monitor their use***, as well as document lessons learned. Volume II is region-specific and should be further developed by each Regional to address their specific needs and requirements for the use of these technologies.

Scope

The Selection Guide includes information on response technologies to counter the effects of spilled oil on land, on fresh water, and coastal (estuarine to open ocean) waters.

Updates And Website Access

The development of new or improved products or technologies for oil spill cleanup continues as new technologies and products evolve. Unfortunately, much of the new information concerning the efficacy of products (or technologies) in particular situations is not immediately available to responders and when it becomes available, may be "too little, too late" to have a positive impact on the operation. Similarly, the successes (or failures) of products or technologies in actual field use and under varying circumstances should be accessible to the spill response community as a whole. The Selection Guide seeks to be a source of "best available" information to responders, as well as a repository for incident feedback to keep this information and guidance current.

Information required by 40 CFR Part 300.900 (Subpart J) for the NCP Product Schedule Notebook for each individual product can be easily accessed from www.epa.gov/emergencies under NCP Product Schedule "Quick Finder" heading. The Selection Guide will be updated periodically as new information or new emerging technologies and funding become available. The Selection Guide is available in both as an electronic down-loadable file and in an on-line interactive format.

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SELECTION GUIDE OVERVIEW (CONTINUED)

Intended Users

The intended users for this guide are ***all oil spill decision-makers***, both experienced and less experienced. They include members of the Unified Command, e.g., Federal On Scene Coordinators (FOSC), state on scene coordinators (SOSC), Industry, Incident Commander, and resource trustees, among others.

When to Use

The guide should be used:

- During spill ***response*** by the Planning Section.
- During pre-spill ***planning*** in developing Area Contingency Plans and Facility Response Plans.
- To assist decision-makers in evaluating ***vendor requests*** to use their product(s) at ***any time***.

Components of this document were developed as a job aid, i.e., sections were designed with sufficient detail to enable the decision-maker to make informed judgments for small spills without requiring outside technical support, e.g., ERT or SSC.

OSCs also need to comply with all requirements for the consultation under:

- The Endangered Species Act Section 7 Memorandum of Agreement
- The Programmatic Agreement for the Protection of Historic Sites, and
- Compliance with the Magnuson-Steven Act for Essential Fish Habitat.

Development Background

This Selection Guide was initially developed under the Work Plan of the Region III Regional Response Team (RRT) Spill Response Countermeasures Work Group in cooperation with the Region IV Regional Response Team. This revision was sponsored by the USCG District 7 in coordination with EPA.

Comments from EPA, USCG, and State OSCs and resource trustees representing Regions III, IV, and IX have guided the development of this Selection Guide, along with the input of the Selection Guide Development Committees.

For more information on the Selection Guide development, refer to Appendix H

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SELECTION GUIDE OVERVIEW (CONTINUED)

Basic Reasoning

EPA and USCG OSCs indicated how they would consider using these oil spill response technologies. Their basic ***sequence of logic to consider*** using specific technologies during an incident is as follows:

- Decide if the technology(s) might provide value?
- Decide if the OSC has the authority to use it within its useful timeframe?
- If so, can it be here in time?
- If so, does it have application requirements that exceed the window of opportunity?
- If not, does it have unacceptable environmental, health and safety risks associated with its use?
- If it has special operational requirements, is there an identified specialist (technical contact) who can provide timely advice on its effective use?

Using Response Countermeasures

Once a decision has been made to use a specific countermeasure, then the ***next actions*** required to use them in the "right" way include the development of:

- A testing plan to determine the applicability of the response technology for the current incident conditions;
- An operations plan to effectively implement their use;
- A monitoring plan to document their effectiveness; and
- A report on the lessons learned from using them.

How To Proceed

The step action table below describes how to proceed within this Selection Guide:

IF you have:	**AND:**	**THEN:**
Used this guide and job aid in the past	Do not require any background information	Proceed to Part A: Screen Incident.
	Need a refresher on policy and guidance	Read the Decision Process and FAQs and then begin with Part A: Screen Incident.
NOT used this guide before	→	It is recommended you read the background information, beginning with Decision Process.

HOW TO USE THIS SELECTION GUIDE

Follow The Sequence

The Selection Guide provides a step-by-step process for determining which categories of technologies, and specific products might be useful in various oil spill situations, during pre-spill planning or response. To document the rationale in making a technology selection, we strongly recommend that users complete the Selection Guide Worksheets as you proceed through the sequence of steps.

To evaluate requests for consideration by specific vendors, users can also go directly to Part B, the Review/Select Options section of the Guide to review information on specific products.

First Step

Table 1 contains an overview of basic information for each technology category, which orients the user on the specific technologies that are included in the Selection Guide, to give you a starting point on terminology and meaning.

Now – Screen The Incident (Environmental Matrices)

To consider the applicability of the technologies to a scenario or situation, matrices are provided to screen the incident by various characteristics. Three matrices are prepared to evaluate situations where the oil to be treated is on Fresh Waters, Adjacent Lands, or Coastal Waters. Using the matrices facilitates a first-cut evaluation of the potential applicability of a technology category based on incident-specific characteristics including:

a) the response phase,
b) oil type,
c) treatment volume,
d) weather conditions,
e) decision authorities,
f) identification of a response problem or "consideration," and
g) monitoring considerations.

Assuming a specific technology or countermeasure may provide value, proceed to Part B.

NOTE: The user may need to conduct an individual evaluation using more than one environmental matrix if the incident specific conditions warrant.

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Next – Part B, Review Types of Products (Concise Text Descriptions)

For each countermeasure or product category, a 2 to 3 page summary provides concise information to better define the product category, and identify potential concerns associated with its use. This section defines how these types of products work, that is, their mechanism of action. This section also describes:

- when to consider using them
- what kind of decision authority is required when considering the use of a particular technology class
- their availability,
- application requirements,
- health and safety issues,
- operational constraints,
- limiting factors / best management practices,
- waste generation and disposal issues,
- monitoring requirements / suggestions, and
- where to look or go for technical assistance.

Tables that contain specific information on each product in that category immediately follow these descriptions.

Then – Select a Specific Product (Detailed Comparisons in Tables)

When a specific type of product is identified as potentially beneficial for a situation, the tables in Part B: Review-Select Option allows a detailed comparison of other products within that category. The information compiled in these tables allows for easy comparisons of individual product information such as: toxicity data, efficacy test results, operational considerations, availability, whether it can be used in fresh or salt water, and several other specific types of information that assists in making a well-reasoned decision.

For More Information…

See the Appendices

The appendices in the last section provide additional information, including a detailed glossary of terminology, and an overview on toxicity and how to interpret toxicity data.

DECISION PROCESS

Who And How

The ***decision flow chart*** at the end of this section visually describes how decisions are made for these technologies in the US.

The National Oil and Hazardous Substances Pollution Contingency Plan (NCP) gives the FOSC primary responsibility for directing response efforts and coordinating all other efforts at the scene of a discharge or release (40 CFR § 300.105). This includes directing response efforts and coordinating all other efforts at the scene of a discharge or release.

FOSC Duties

The FOSC is charged with initiating defensive actions as soon as possible to prevent, minimize, or mitigate threat(s) to the public health, welfare or the environment of the United States. This includes the use of chemicals and other materials to restrain the spread of the oil and mitigate its effects (40 CFR § 300.310). As part of the national response priorities, all necessary containment and removal tactics are to be used in a coordinated manner to ensure a timely, effective response that minimizes adverse impacts to the environment (40 CFR § 300.317). This may include the use of products listed on the NCP Product Schedule and in this Selection Guide.

Decision Input And Concurrence

The FOSC is not the sole decision-maker regarding a product's use for mitigating a spill. The FOSC must first obtain concurrence of the incident-specific EPA representative to the RRT and, as appropriate, the RRT representatives from the state(s) with jurisdiction over the navigable waters threatened by the release or discharge, and, as practicable, in consultation with the DOC and DOI natural resource trustees.

There can be a pre-authorization or pre-approval agreement in place for a product or technology regulated by the NCP Product Schedule. In this case, the FOSC can proceed with the product's use according to the pre-authorization policy.

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DECISION PROCESS (CONTINUED)

What About Local Government Incident Commanders?

Decisions for public safety issues for fires are under the purview of the lead public emergency response agency. Fire Departments and HAZMAT teams have the authority to "hose down" a spill using a chemical countermeasure if they determine that the spilled oil could cause an explosion and/or threaten human health. However, the use of a specific product, even in a situation designed to prevent or reduce the threat to human health and safety, requires that the lead emergency response agency notify the FOSC of this use.

One Exception … For Hazard To Human Life

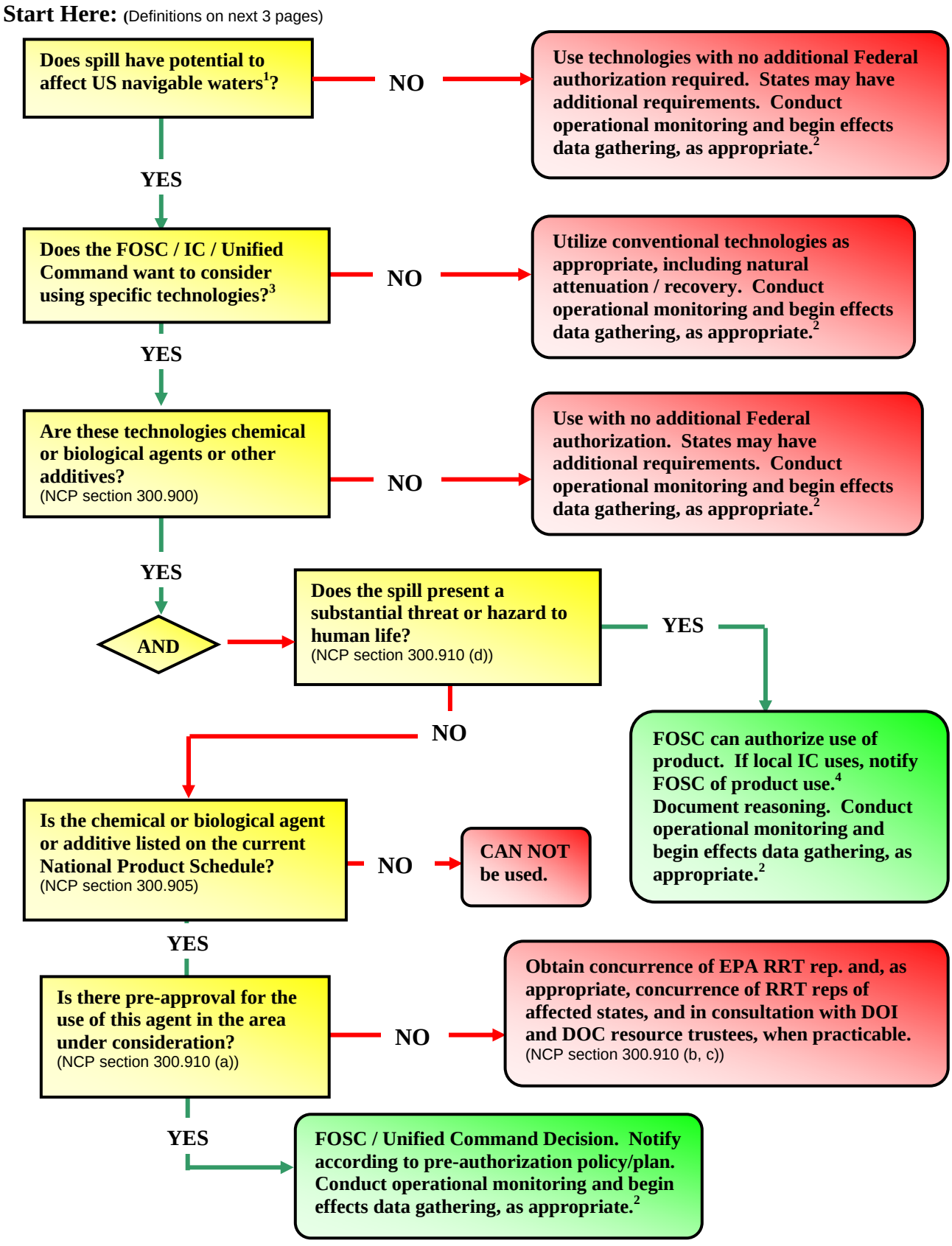
"The Federal OSC may authorize the use of any dispersant … other chemical agent, including products not listed on the NCP Product Schedule, without obtaining the concurrence of the EPA representative to the RRT and, as appropriate, the RRT representatives from the states with jurisdiction over the navigable waters threatened by the discharge or release, when, in the judgment of the OSC, the use of the product is necessary to substantially reduce a hazard to human life. *Please note that, although* ***non-listed products can*** *be used,* ***listed products should*** *be used whenever possible.*

OSC Notifications

Whenever the FOSC authorizes the use of a product pursuant to the exception language in the regulations (see paragraph above), the FOSC is to inform the EPA RRT representative, and as appropriate, the RRT representatives from the affected states, and, when practicable, the DOI/DOC resource trustees of the use of a product, including products not on the Schedule, as soon as possible.

Once the threat to human life has subsided, the continued use of a product shall be in accordance with paragraphs 300.910 (a, b, and c)." (NCP section 300.910 (d)).

Approval Process
for Using Products on the National Product Schedule



DECISION PROCESS FLOW CHART DEFINITIONS

#1 US Navigable Waters

The United States Coast Guard defines navigable waterways as those waters that are subject to the ebb and flow of the tide and/or are presently used, or have been used in the past, or may be susceptible for use to transport interstate or foreign commerce. A determination of navigability, once made, applies laterally over the entire surface of the waterbody, and is not extinguished by later actions or events which impede or destroy navigable capacity (33 CFR Part 329.4).

The Oil Pollution Act of 1990 (OPA) defines navigable waterways far more narrowly than the case law has defined such a waterway under the Clean Water Act (CWA). While the Clean Water Act can define a navigable waterway as wetlands, tributaries, and even groundwater, the OPA limits that definition directly to a discharge into a waterway that empties into a coastal region.

The US EPA defines Navigable Waterways of the United States to be "navigable waters" as defined in section 502(7) of the Federal Water Pollution Control Act [FWPCA] (Pub. L 92-500) also known as the Clean Water Act (CWA) and includes, but is not limited to:

A. All navigable waters of the United States, as defined in judicial decisions prior to the passage of the 1972 Amendments of the FWPCA (Pub. L. 92-500), and tributaries of such waters;
B. Interstate waters;
C. Intrastate lakes, rivers, streams which are utilized by interstate travelers for recreational or other purposed; and
D. Intrastate lakes, rivers, and streams from which fish or shellfish are taken and sold in interstate commerce.

[Taken from 40 CFR part 300 as defined by section 502(7) of the Federal Water Pollution Control Act [FWPCA] (Pub. L 92-500) also known as the Clean Water Act (CWA) means the waters of the US including the territorial seas. This term includes, but is not limited to:

A. All navigable waters of the United States, as defined in judicial decisions prior to the passage of the 1972 Amendments of the FWPCA (Pub. L. 92-500), and tributaries of such waters;
B. Interstate waters;
C. Intrastate lakes, rivers, streams which are utilized by interstate travelers for recreational or other purposed; and
D. Intrastate lakes, rivers, and streams from which fish or shellfish are taken and sold in interstate commerce.

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#2 Operational Monitoring

(a.k.a. effectiveness monitoring) is defined by Pond *et al*. (1997) as monitoring that "provides qualitative information, through visual observations [or other specified method] by trained personnel in real-time, during the actual response, to influence operational decision-making."

Effects monitoring (a.k.a. long-term data gathering) is defined as data that "provides quantitative information on the use of [a product] and the real effects following a spill to influence planning and future research" (Pond *et al.*, 1997). The longer time (weeks, or even months) involved with obtaining results from effects monitoring dictates that sampling should not be used to influence incident-specific decision-making. However, response and trustee agencies should begin gathering effects monitoring data as soon as practicable. Effects monitoring information collection is a long-term process, and the results are typically not available in real-time to affect decision-making.

During a response, operational personnel need to be able to ensure the success of a response technique, and in particular, be able to direct, redirect, or discontinue the use of the response technique. Operational monitoring could be as simple as visually monitoring the effectiveness of a particular boom. Is it placed correctly? Is it functioning as expected? Is there any oil remaining to be captured with the particular boom? Or as complete as using Tier 3 Special Monitoring of Applied Response Technologies (SMART) protocols for dispersant use or in-situ burn monitoring.

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#3 Chemical and Biological Agents Are defined in this Selection Guide as:

Response Options that Require Approval
Bioremediation agents
Dispersants
Elasticity Modifiers
Emulsion Treating Agents
In-situ Burning on Land
In-situ Burning in Inland Waters
Shoreline Pre-treatment Agents**
Solidifiers
Sorbents*
Surface Collecting Agents**
Surface Washing Agents
Mixed Products***

* Not required to be listed on the NCP Product Schedule.

** As of this publication (June 2009), there were no products listed on the NCP Product Schedule for these product categories. Products reviewed in this category may be listed under Miscellaneous Oil Spill Control Agents.

*** Mixed products are those products that consist of materials that meet the definitions of two or more of the product categories on the NCP Product Schedule [40 CFR Part 300.915(h)]. As of this publication, there are no mixed products listed.

#4 OSC Decisions for public safety issues for fires are under the purview of the lead public emergency response agency. Fire Departments and HAZMAT teams have the authority to "hose down" a spill using a chemical countermeasure if they determine that the spilled oil could cause an explosion and/or threaten human health. However, the use of a specific product, even in a situation designed to prevent or reduce the threat to human health and safety, requires that the lead emergency response agency notify the FOSC of this use.

References

USEPA. 1994. 40 CFR Part 300, National Oil and Hazardous Substances Pollution Contingency Plan; Final Rule. In: Federal Register, Vol. 59, No. 178, Thursday, September 15, 1994. pp. 47, 384-47, 495.

Pond, R., J.H. Kucklick, and A.H. Walker. 1997. Dispersant Use: Real-time Operational Monitoring and Long-term Data Gathering. Prepared by Scientific and Environmental Associates, Inc., Alexandria, VA. Prepared for Marine Preservation Association, Scottsdale, AZ. 23 p.

USING A PRODUCT DURING A RESPONSE

Concurrence	The Federal OSC may authorize the use of chemical or biological control agents listed on the NCP Product Schedule with the concurrence of the incident-specific EPA representative to the RRT and, as appropriate, the RRT representatives from the state(s) with jurisdiction over the navigable waters threatened by the release or discharge, and, as practicable, in consultation with the DOC and DOI natural resource trustees.
Incident-Specific	RRTs or Area Committees are encouraged to address the desirability of using agents listed on the Product Schedule and develop pre-authorization or pre-approval plans, as appropriate. The EPA representative to the RRT and the RRT representatives from the state(s) with jurisdiction over the navigable waters to which the pre-authorization plan applies and the DOC and DOI natural resource trustees shall review and either approve, disapprove or approve with modification these pre-authorization plans. When a pre-authorization plan exists, the FOSC can proceed with the product's use according to the pre-authorization policy.
Pre-Authorized	Prior to seeking this concurrence, the FOSC must determine what, if any countermeasures from the Product Schedule would be applicable for the incident-specific spill conditions. Decision support guidance for choosing appropriate spill countermeasure technologies begins with several basic questions. These questions lead to the systematic approach for the Spill Countermeasure Technologies developed in the Selection Guide.

USING A PRODUCT DURING A RESPONSE (CONTINUED)

Pre-Approval Policies

In many cases, RRTs have developed pre-approval policies for use of certain countermeasures. Refer to the region-specific policies and/or plans that can be collected and stored in your region-specific Tabs in Volume II of this Selection Guide. This is especially true in the case of dispersants, in-situ burning, solidifiers, and surface washing agents for many regions around the country. These pre-approval policies facilitate a more rapid decision making process and response using spill countermeasure technologies under appropriate incident-specific conditions. Refer to the appropriate region at www.rrt.nrt.org for more region-specific pre-approval information.

Incident-Specific Authorization

If there is no pre-approval, the incident-specific RRT members must be convened for an incident-specific authorization. Concurrence must be obtained from EPA and the state(s) in consultation with DOI and DOC. This approval process is often carried out in a phone conference with the incident-specific RRT members.

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LIST OF TABLES

List of Products and Their Location Within This Selection Guide*.

The following table provides the decision-maker with a quick reference guide to the products listed on the NCP Product Schedule as of June 2009 (Column 1 and 2 in **bold faced type**). In several instances, products are included in this document that are not currently listed on the Product Schedule (shaded lines). These products (primarily solidifiers) have had an extensive body of research conducted on them in the past, and most of these products are still readily available and being used by spill communities outside the US. However, under the rules established by the NCP (40 CFR Subpart § 300.915), these products would be considered chemical agents, and require listing on the NCP Product Schedule prior to their use in the US. The information for these non-listed products is contained in Appendix G unless otherwise stated in the last column.

Some products on the NCP Product Schedule are listed in a Miscellaneous category, which doesn't convey the function of the product to the reader. In those cases, the authors re-evaluated the products in terms of their mechanism of action and assigned them into functional countermeasure categories [e.g., Miscellaneous products ⇒ Surface Washing Agents (PES 51)]. The classification system for all products as evaluated in this Selection Guide is presented in Column 3.

#	PRODUCT NAME	PRODUCT CLASSIFICATION ON THE NCP PRODUCT SCHEDULE	PRODUCT CLASSIFICATION WITHIN THIS SELECTION GUIDE	CATEGORY REFERENCE PAGES	PAGE(S) FOR PRODUCT-SPECIFIC INFO
1	**Alsocup**	**Miscellaneous**	Solidifier	83 to 85	86 to 88
2	**Aquaclean**	**Surface Washing Agent**	Surface Washing Agent	105 to 108	109 to 110
3	**Aqua N-Cap™ Polymer**	**Miscellaneous**	Solidifer	83 to 85	88 to 90
4	**BET BIOPETRO**	**Bioremediation Agent**	Bioremediation Agent	35 to 39	40 to 41
5	**BG-Clean™ 401**	**Surface Washing Agent**	Surface Washing Agent	105 to 108	109 to 110
6	**Biogee-HC (Microbes HC)**	**Removed from Product Schedule**	Bioremediation Agent	Appendix G	221 to 222
7	**Biodispers**	**Dispersant**	Dispersant	47 to 51	53 to 54
8	**Biosolve®**	**Surface Washing Agent**	Surface Washing Agent	105 to 108	109 to 110
9	**Bioworld Bioremediation Hydrocarbon Treatment Product**	**Bioremediation Agent**	Bioremediation Agent	35 to 39	40 to 41
10	**BR (Biota Earth)**	**Removed from Product Schedule**	Bioremediation Agent	Appendix G	221 to 222
11	**CIAgent**	**Miscellaneous**	Solidifier	83 to 85	86 to 88
12	**CN-110**	**Surface Washing Agent**	Surface Washing Agent	105 to 108	109 to 110
13	**Corexit® EC7664A**	**Surface Washing Agent**	Surface Washing Agent	105 to 108	111 to 112

#	PRODUCT NAME	PRODUCT CLASSIFICATION ON THE NCP PRODUCT SCHEDULE	PRODUCT CLASSIFICATION WITHIN THIS SELECTION GUIDE	CATEGORY REFERENCE PAGES	PAGE(S) FOR PRODUCT-SPECIFIC INFO
14	**Corexit® EC9500A**	**Dispersant**	Dispersant	47 to 51	53 to 54
15	**Corexit® EC9527A**	**Dispersant**	Dispersant	47 to 51	53 to 54
16	**Corexit® EC9580A**	**Surface Washing Agent**	Surface Washing Agent	105 to 108	111 to 112
17	**Corexit OC-5**	**Not Listed on NCP**	Surface Collecting Agent	Appendix G	225
18	**CytoSol**	**Surface Washing Agent**	Surface Washing Agent	105 to 108	111 to 112
19	**Dispersit SPC 1000™**	**Dispersant**	Dispersant	47 to 51	53 to 54
20	**Do-All #18**	**Surface Washing Agent**	Surface Washing Agent	105 to 108	111 to 112
21	**Enviro-Bond 403****	**SORBENT; Not required to be listed on NCP**	Solidifier	83 to 85	86 to 88
22	**Elastol**	**Miscellaneous**	Elasticity Modifier	63 to 65	64
23	**Enviroclean**	**Surface Washing Agent**	Surface Washing Agent	105 to 108	113 to 114
24	**Enzyt (Liquid/Crystal)**	**Removed from Product Schedule**	Bioremediation Agent	Appendix G	221 to 222
25	**E-SAFE©**	**Surface Washing Agent**	Surface Washing Agent	105 to 108	113 to 114
26	**F-500**	**Surface Washing Agent**	Surface Washing Agent	105 to 108	113 to 114
27	**Finasol OSR 52**	**Dispersant**	Dispersant	47 to 51	55 to 56
28	**Gold Crew SW**	**Surface Washing Agent**	Surface Washing Agent	105 to 108	113 to 114
29	**Imbiber Beads****	**SORBENT; Not required to be listed on NCP**	Solidifier	83 to 85	89 to 90
30	**Inipol EAP 22**	**Bioremediation Agent**	Bioremediation Agent	35 to 39	40 to 41
31	**JD-109**	**Dispersant**	Dispersant	47 to 51	55 to 56
32	**JD-2000™**	**Dispersant**	Dispersant	47 to 51	55 to 56
33	**JE 1058BS**	**Bioremediation Agent**	Bioremediation Agent	35 to 39	40 to 41
34	**Land and Sea Restoration Product 001**	**Bioremediation Agent**	Bioremediation Agent	35 to 39	42 to 43
35	**Mare Clean 200**	**Dispersant**	Dispersant	47 to 51	55 to 56
36	**Micro-Blaze®**	**Bioremediation Agent**	Bioremediation Agent	35 to 39	42 to 43
37	**Nale-it**	**Surface Washing Agent**	Surface Washing Agent	105 to 108	115 to 116
38	**Nature's Way HS**	**Surface Washing Agent**	Surface Washing Agent	105 to 108	115 to 116
39	**NEOS AB 3000**	**Dispersant**	Dispersant	47 to 51	57 to 58

#	PRODUCT NAME	PRODUCT CLASSIFICATION ON THE NCP PRODUCT SCHEDULE	PRODUCT CLASSIFICATION WITHIN THIS SELECTION GUIDE	CATEGORY REFERENCE PAGES	PAGE(S) FOR PRODUCT-SPECIFIC INFO
40	**Nochar A610**	**Removed from Product Schedule**	Solidifier	83 to 85	91 to 92
41	**Nochar A650**	**Removed from Product Schedule**	Solidifier	83 to 85	91 to 92
42	**Nokomis 3-AA**	**Dispersant**	Dispersant	47 to 51	57 to 58
43	**Nokomis 3-F4**	**Dispersant**	Dispersant	47 to 51	57 to 58
44	**Oil Herder**	**Not Listed on NCP**	Surface Collecting Agent	Appendix G	225
45	**Oil Spill Eater II**	**Removed from Product Schedule**	Bioremediation Agent	Appendix G	221 to 222
46	**Oppenheimer Formula**	**Bioremediation Agent**	Bioremediation Agent	35 to 39	42 to 43
47	**PES-51**	**Miscellaneous**	Surface Washing Agent	105 to 108	115 to 116
48	**Petro-Clean**	**Surface Washing Agent**	Surface Washing Agent	105 to 108	117 to 118
49	**Petro-Green ADP-7**	**Surface Washing Agent**	Surface Washing Agent	105 to 108	117 to 118
50	**Petrotech 25**	**Surface Washing Agent**	Surface Washing Agent	105 to 108	117 to 118
51	**Premier 99**	**Surface Washing Agent**	Surface Washing Agent	105 to 108	117 to 118
52	**Pristine Sea II**	**Bioremediation Agent (Biological Additive)**	Bioremediation Agent	35 to 39	42 to 43
53	**Procleans**	**Surface Washing Agent**	Surface Washing Agent	105 to 108	119 to 120
54	**PRP (WAPED)**	**Removed from Product Schedule**	Bioremediation Agent	Appendix G	223 to 224
55	**PX-700™**	**Miscellaneous**	Surface Washing Agent	105 to 108	115 to 116
56	**RapidGrab 2000™**	**Miscellaneous**	Surface Collecting Agent	101 to 103	104
57	**Rubberizer*** **	**SORBENT; Not required to be listed on NCP**	Solidifier	83 to 85	86 to 88
58	**S-200**	**Bioremediation Agent**	Bioremediation Agent	35 to 39	44
59	**SAF-Ron Gold**	**Dispersant**	Dispersant	47 to 51	57 to 58
60	**SC-1000™**	**Surface Washing Agent**	Surface Washing Agent	105 to 108	119 to 120
61	**Sea Brat #4**	**Dispersant**	Dispersant	47 to 51	59 to 60
62	**Sheen-Magic©**	**Surface Washing Agent**	Surface Washing Agent	105 to 108	119 to 120
63	**SPI Solidification Particulate** **	**Removed from Product Schedule**	Solidifier	83 to 85	91 to 92

#	PRODUCT NAME	PRODUCT CLASSIFICATION ON THE NCP PRODUCT SCHEDULE	PRODUCT CLASSIFICATION WITHIN THIS SELECTION GUIDE	CATEGORY REFERENCE PAGES	PAGE(S) FOR PRODUCT-SPECIFIC INFO
64	**Simple Green®**	**Surface Washing Agent**	Surface Washing Agent	105 to 108	119 to 120
65	**Sorbents****	**May be required to be listed; Check Appendix E**	Sorbents	93 to 100	93 to 100
66	**Spillclean**	**Surface Washing Agent**	Surface Washing Agent	105 to 108	121 to 122
67	**Spillremed**	**Bioremediation Agent**	Bioremediation Agent	35 to 39	44
68	**Split Decision SC**	**Surface Washing Agent**	Surface Washing Agent	105 to 108	121 to 122
69	**Step One**	**Bioremediation Agent**	Bioremediation Agent	35 to 45	44
70	**SX-100®**	**Removed from Product Schedule**	Surface Washing Agent	Appendix G	227
71	**System E.T. 20**	**Bioremediation Agent**	Bioremediation Agent	35 to 39	44
72	**Topsall #30**	**Surface Washing Agent**	Surface Washing Agent	105 to 108	121 to 122
73	**VB591™ Water**	**Bioremediation Agent**	Bioremediation Agent	35 to 39	45
74	**VitaBugg**	**Removed from Product Schedule**	Bioremediation Agent	Appendix G	223 to 224
75	**Waste Set PS #3200®**	**Miscellaneous**	Solidifier	83 to 85	89 to 90
76	**Waste Set PS #3400®**	**Miscellaneous**	Solidifier	83 to 85	89 to 90
77	**WMI-2000**	**Bioremediation Agent**	Bioremediation Agent	35 to 39	45
78	**ZI-400**	**Dispersant**	Dispersant	47 to 51	59 to 60
79	**Zyme-Flow**	**Miscellaneous**	Emulsion Treating Agent	67 to 70	69

***** **WARNING**: Ensure that the revision date of this Guide is consistent with the most recent version of the NCP Product Schedule. If dates are not consistent, the information could be outdated. **NOTE**: As of this publication, there are only five product categories on the NCP Product Schedule: Dispersants, Bioremediation Agents, Surface Collecting Agents, Surface Washing Agents, and Miscellaneous Oil Spill Control Agents.

** Not currently listed or required to be listed for use in the US.

*** EPA has determined that this product is a Sorbent. Therefore, this product does not need to be listed on the NCP Product Schedule.

NOTE: In the US, any chemical agent or other additive (excluding sorbents) that may be considered for use during an oil spill response must be listed on the NCP Product Schedule. For definitions, refer to glossary.

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FAQS - NATIONAL CONTINGENCY PLAN (NCP) PRODUCT SCHEDULE AND POLICIES

What Is The National Product Schedule?	Section 311(d)(2)(G) of the CWA requires that EPA prepare a schedule of dispersants, other chemicals, and other spill mitigating devices and substances, if any, that may be used in carrying out the NCP (40 CFR § 300.900; a.k.a. Subpart J).
What Does It Contain?	It contains a list of dispersants and other chemical or biological products that have met the data requirements set forth by § 300.915 of the NCP. Inclusion of a product on the NCP Product Schedule indicates only that the technical product data requirements have been satisfied.
Caution	Being listed on the National Product Schedule does **NOT** mean that the product is recommended or endorsed by the EPA for use on an oil spill. The Unified Command while managing a response determines whether there is a need for a product listed on the NCP Product Schedule to control a particular spill. **In most cases, the FOSC must gain incident-specific approval to use the product.** However, some states, e.g., California, also have an acceptance list. For further clarification and details, refer to the Decision Process section and Subpart J (40 CFR § 300.900), which is included in full as Appendix D in this volume.
How Are Products Listed?	To list a product on the NCP Product Schedule, a manufacturer must submit technical data (e.g., effectiveness and toxicity data) on the product to the EPA. Specific guidelines for vendors are contained in 40 CFR, Subpart J, "Use of Dispersants and Other Chemicals § 300.915 – Data Requirements" and are also available online at http://www.epa.gov/emergencies/content/ncp/index.htm#schedule. Following data submission, the EPA reviews the data to confirm completeness and that the procedures specified were followed.
Schedule Updates	The Product Schedule is updated as needed; when a new product is listed or when there are updates to existing product information.

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FAQS -NCP PRODUCT SCHEDULE AND POLICIES (CONTINUED)

Schedule Access	To access the NCP Product Schedule, contact the NCP information line: (202) 260-2342, or www.epa.gov/emergencies/contact_us.htm/. During a spill response, decision-makers may not have immediate access to the Internet; it is advisable that decision makers have backup personnel in their office, which can access the necessary information in a timely manner.
What Products Must Be Listed?	Any chemical or biological agent that would be used in the environment as part of the spill response and clean-up which cannot be completely contained and recovered is required to be listed on the NCP Product Schedule.
Who Decides What Must Be Listed?	It is the job of the EPA Office of Emergency Management (headquarters) to determine whether products must be listed on the NCP Product Schedule in order to be used during a response.
When Can Non-Listed Products Be Used?	If use of a product will be confined to primary or secondary containment areas that can be cleaned and the material fully recovered, such as in a concrete berm or isolated sewage system with no access to other waterways, then non-listed products may be used to respond to the incident.

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Examples Of Inappropriate Product Use

Fire departments and HAZMAT teams are authorized to "hose down" a spill using a chemical countermeasure if they determine that the fuel could cause an explosion and threaten human health. Nevertheless, they should make every attempt to contain the fuel/chemical mixture and prevent it from entering storm drains or other environments where 100 percent product/oil recovery or containment is not possible.

Inappropriate uses often occur when treated areas are washed clean and the runoff contaminates surrounding areas or enters storm drains or sewer systems directly. Examples of where this may happen include:

- Roads
- Parking lots
- Fields
- Railroads
- Storm drains
- Hangers and storage areas without waste containment systems

OSCs should establish a working relationship with local responders to explain that these products can be used without their permission but in accordance with the NCP.

Can Bioremediation Be Used On Land?

Even if bioremediation products are going to be used on land, their use still must be authorized. This authorization would be granted by the RRT and the OSC if the spill has or may impact navigable waters. State and local regulations may apply to the application of bioremediation agents, regardless of the impact to navigable water.

Sorbents, Do Not Have To Be Listed, Right?

Normal sorbent materials can be used without being listed ***unless*** they incorporate environmentally reactive chemicals or bioremediation agents to assist with their function. Some states, e.g., California, have restrictions on the use of loose sorbents as well. More information on sorbents is provided on the following pages.

Continued on Next Page

What Does It Mean If A Product Is Not Listed?	Products that are not on the NCP Product Schedule may not have performed even simple toxicological testing or efficacy testing (e.g., many sorbents, which by definition are not required to be listed on the NCP Product Schedule). These products may not have been regulated or evaluated by the reporting process as specified by the NCP Product Schedule and may pose adverse or unacceptable risks to resources or the environment.
What Are The Limitations Even If The Product Is Listed?	Conversely, being listed on the Product Schedule does not mean that the products have been proven effective or are considered non-toxic. In fact, listed products may be highly toxic to native plants and animals.
Regulatory Reminder	Regulations state that you should use known products on the NCP Product Schedule over chemical or biological agents that have not gone through the listing process as specified in 40 CFR Part 300.915. Additionally, you should always obtain the incident-specific RRT concurrence when using any listed product, unless a pre-approval has been coordinated and authorized by the appropriate RRT. The use of chemical countermeasures on navigable waters and adjoining shorelines of the United States, without the consent of a Federal On-Scene Coordinator may be considered an unpermitted discharge of a pollutant into waters of the United States which is a violation of the Clean Water Act, 33 U.S.C. §§ 1251-1387.
Education Is The Key	It is also important to continually educate yourself about new methods and technologies. Rapidly evolving technologies can change the need for, amount of, and/or mix of spill countermeasure technologies to be used in spill response operations.

FAQS TO CONSIDER FOR TECHNOLOGIES AND PRODUCT USE

Question #1

Does the discharge warrant the use of a product to prevent or substantially reduce a hazard to human life?

YES: Use is authorized as per 40 CFR 300.910 (c)

NO: Use will be governed by pre-approval, case-by-case authorization from the RRT, or applicability of the NCP Product Schedule or other governing state, local, or Federal authority.

Question #2

Is the spill in navigable waters of the United States and adjoining shorelines, the waters of the contiguous zone, in connection with activities under the Outer Continental Shelf Lands Act, activities under the Deepwater Port Act of 1974, or activities that may affect natural resources belonging to, appertaining to, or under the exclusive management authority of the United States, e.g., resources under the Magnuson Fishery Conservation and Management Act of 1976, Endangered Species Act of 1973, and the Migratory Bird Treaty Act as amended?

YES: Authorization is required.

NO: Authorization is not required. Evaluate the product and potential use thoroughly. Products should be used only after considering environmental, health, and safety concerns.

UNKNOWN: Refer to FOSC/SOSC to determine if spill is in navigable waters.

In all cases, OSCs and other decision-makers need to be aware that their decision-making must be in compliance with various Acts, MOAs, and/or Programmatic Agreements. The Area and Regional plans establish policy and guidance for the use of technologies and what is required for such use, including compliance. The policies and guidance's for each region can be maintained in Volume II of this document and are typically available on the appropriate RRT website (www.rrt.nrt.org).

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Question #3 What monitoring is appropriate?

Part C of the Selection Guide provides some general guidance to help plan for appropriate testing and monitoring of each technology class. The Special Monitoring of Applied Response Technologies (SMART) monitoring program is cited for use with dispersant and in-situ burn technologies.

When a product or technology listed in this Selection Guide is used, some level of monitoring is recommended and may be required under OPA and/or the NCP, if only to verify the effectiveness of the technology used and to determine when to stop using a particular response tool. This is also applicable to traditional countermeasure for response.

Note: Verify with state(s) trustees to determine what, if any, additional monitoring standards are necessary according to state regulations.

SORBENTS, SOLIDIFIERS, AND THE NCP PRODUCT SCHEDULE

Description

Sorbents are essentially inert and insoluble materials that are used to remove oil and hazardous substances from water or land through adsorption, in which the oil or hazardous substance is attracted to the sorbent surface and then adheres to it. Sorbents may also use absorption, in which the oil or hazardous substance penetrates the pores of the sorbent material. Sorbents use adsorption and absorption processes alone or in combination.

Solidifiers are products composed of dry, high-molecular weight polymers that have a porous matrix and large oleophilic surface area. Solidifiers form a physical bond with the oil, resulting in increased viscosity of the oil, almost to the point where the oil becomes solidified into a rubber-like solid.

Use

Sorbents and Solidifiers may be used in all areas, as long as they are completely recovered after application. Sorbents are generally manufactured in a particulate form for spreading over a spill or as sheets, rolls, pillows, or booms. Solidifiers are manufactured in various forms, including dry powder, granules, semi-solid materials (e.g., pucks, cakes, balls, sponge designs) or contained in boom, pillows, pads, and socks.

NCP Application

For Sorbents, the NCP Subpart J requirements do not apply if the product is a sorbent that has not been treated with any chemically reactive substance or biological additive. However, IF IN DOUBT, CONTACT EPA TO VERIFY THE CLAIMS OF THE MANUFACTURER. If a product is defined as a sorbent, then its use requires no pre-approval or RRT approval prior to use.

Solidifiers need to be listed on the NCP Product Schedule as Miscellaneous Oil Spill Control Agents because solidifiers can vary in chemical composition, including the use of additives.

Further Information

Contact EPA HQ NCP Product Schedule Information Line at 202-260-2342 or the Oil Programs Product Schedule Coordinator at 202-564-1974 for further information about particular sorbent or solidifier use.

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NCP Product Schedule and Sorbents

The following decision table gives examples of sorbent products that do not need to be listed on the NCP product schedule prior to use. If a sorbent product contains solely those materials listed in column one and it does not incorporate environmentally reactive chemicals or bioremediation agents to assist with its function, it does not have to be listed on the NCP product schedule. Before using loose sorbents or sorbents that consist of particulate matter, check with state regulations to ensure there are no restrictions. To prove this exclusion, a vendor should supply a copy of their exclusion sorbent letter as supplied to them by the EPA Office of Emergency Management, Regulatory and Policy Development Division office (A copy of a draft letter is found in Appendix B). The sorbent letters are also kept on file at EPA and can be verified by an On Scene Coordinator or by calling the Product Schedule Information Line (202-260-2342).

IF sorbent material consists of:	**AND:**	**THEN:**
Organic: Peat moss or straw Cellulose fibers or cork Corn cobs Chicken, duck or other bird feathers	Vendor can supply a valid EPA exclusion sorbent letter for this product	Product can be used. It is recommended to verify with the EPA Product Schedule Information Line at 202-260-2342.
Mineral compounds: Volcanic ash or perlite Vermiculite or zeolite	Vendor can supply a valid EPA exclusion sorbent letter for this product	Product can be used. It is recommended to verify with the EPA Product Schedule Information Line at 202-260-2342.
Synthetic: Polypropylene Polyethylene Polyurethane Polyester	Vendor can supply a valid EPA exclusion sorbent letter for this product	Product can be used. It is recommended to verify with the EPA Product Schedule Information Line at 202-260-2342.
Other compounds or products:	→	Contact EPA Product Schedule Information Line at 202-260-2342 to verify product does not require NCP listing

References

The following reference was developed from the NRT-RRT Fact Sheet (February 2007) – Application of Sorbents and Solidifiers for Oil Spills available from www.nrt.org.

PART A: SCREEN INCIDENT

Introduction	Part A of the Selection Guide provides the means for evaluating, during an actual spill or in a scenario, all potential technologies for responding to spilled oil.
Purpose	In ***Part A: Screen Incident***, you will examine the Oil Spill Technologies Overview matrix (**Table 1**) to determine what technologies might be used for the response. You will then complete Worksheet 1, using the information contained in the Environmental Matrix (**Tables 2a**, **b**, or **c**) that fits the current response conditions being considered.
Note	The first step in the use of this Selection Guide is to screen the incident and determine whether a product or technology category is a viable option for the current response conditions. Part A is a critical step in this progression and **SHOULD NOT** be skipped during the evaluation process. A copy of **Worksheet 1** is also located in **Appendix F**. It has been provided as a blank for photocopying purposes.
Tools Needed to Complete Part A	▪ **Table 1** – Oil Spill Technologies Overview ▪ **Worksheet 1** –Decision-Tracking/Evaluation ▪ **Table 2a, 2b**, **or 2c** – Environment-specific matrix ▪ Environmental Unit Evaluation / Discussion Form
Worksheet Help	At the end of this section, we have provided an example scenario that will walk you through the evaluation processes and demonstrate the information needs to complete **Worksheet 1** and the initial evaluation (Part A - Screen the Incident).

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Step Action Table

Follow the step by step table below for ***Part A: Screen Incident.***

STEP	ACTION
1.	Locate the Oil Spill Technologies Overview (**Table 1**), located immediately after this section.
2.	Review all technologies for possible use and applicability for the current response conditions of concern. This is done to familiarize you with the different technology categories.
3.	Locate **Worksheet 1**, which is immediately after the overview.
4.	Following your review of the technology overview (**Table 1**), mark an "X" under each technology or strategy that you want to consider further on Line A of **Worksheet 1**.
5.	Refer to the "If /Then" chart on the next page to determine the appropriate Environmental Matrix to use and then continue on to step 6. ***Warning: The Environmental Matrices reflect environmental conditions and is NOT based on zones of jurisdiction.*** Note: Matrices (**Tables 2a, 2b, and 2c**) are located immediately after Worksheet 1.

Disclaimer:

The objective of the Oil Spill Technology Overview matrix (**Table 1**) is to give decision-makers an initial sense of what oil spill technologies can be used in different oil spill situations.

Please note that this matrix is not intended to be 100 percent accurate for all situations. Its purpose is to assist decision makers in their initial assessment of the applicability of these technologies (products and strategies) to the situation under consideration.

Many other factors also need to be considered prior to using these technologies. Incident-specific conditions, such as potential environmental impacts, product availability, and advantages and disadvantages should be assessed before making a final decision about whether to use these technologies and, if so, which ones.

Continued on Next Page

If / Then Chart

The "If / Then" Chart below will assist you in selecting the appropriate Environmental Matrix to use.

IF the oil is on:	THEN use this matrix:
Water in a: • Freshwater River or Creek • Lake or Pond	Fresh Waters Matrix (**Table 2a**)
Water in a brackish or salt water: • Bay • Harbor • Inlet • Estuary • Open Ocean	Coastal Waters Matrix (**Table 2b**)
Land that can or does affect surface waters: • Marsh or wetland • Beach • Man-made structure • Storm drain • Shorelines • Ditch • Other land types	Adjacent Lands Matrix (**Table 2c**)

Example Matrix

Below is a partial example of an Environment Specific Matrix.

TABLE 2A: ENVIRONMENT-SPECIFIC MATRIX FOR FRESH WATERS

FRESH WATERS

Includes: River, Creek, Lake, or Pond - Refer to chart on pg 11 for more information

Response Phase	Sorbents	Bioremediation Agents	Dispersants	Elasticity Modifiers	Emulsion Treating Agents	In-situ Burn (ISB)	Shoreline Pre-Treatment Agents	Solidifiers	Surface Collection Agents	Surface Washing Agents**	Monitored Natural Attenuation	Future Products
Emergency (initial response)	+	-		+	+	+	N/A	+	+	N/A	+	
Removal (project phase)	+			+	+	+	N/A	+	+	N/A	+	
Disposal (Transportation, storage, and final disposal)		+	-	-	+	+	N/A	+	-	N/A	+	
Oil Type (33 CFR 154.1020)												
Group 1: Very Light Oil (gasoline and light distillate)			-	-	-	+	N/A	+	+	N/A	+	
Group 2: Light oils (diesel, kerosene, jet fuels and light crudes)	+	+	-	+	-	+	N/A	+	+	N/A	+	
Group 3: Medium Oil (LA crude, AK North Slope, Arabian Crudes)	+	+		+	+	+	N/A	+	+	N/A	+	
Group 4: Heavy Oil (bunker, No. 6 fuel oil, IFO 380, Venezuelan)	+	+			+	+	N/A			N/A	+	
Group 5: Non-floating Oils	+	-	-	-	-	N/A	N/A		N/A	N/A	+	

Continued on Next Page

Step Action Table (Cont'd)

STEP	ACTION
6.	Fill in the title of the appropriate Environmental Matrix on Line B of **Worksheet 1** (*refer to example worksheet below*)
7.	Examine the Environmental Matrix chosen (**Table 2a, 2b, or 2c**) and look at the incident-specific information classifications under each grouping on the left side of the matrix (start with "Response Phase").
8.	Using the Environmental Matrix, fill in the ***Incident-specific Information*** under Line C on **Worksheet 1**. *See example below.*

Incident: Jacks Bay Spill — Worksheet 1 Sample

		Sorbents	Bioremediation Agents	Dispersants	Elasticity Modifiers	Emulsion Treating Agents	In-situ Burn (ISB)	Shoreline Pre-Treatment Agents	Solidifiers	Surface Collection Agents	Surface Washing Agents	Natural Attenuation	Future Products
A.	*Technology Choices of Interest:* *March Choices with an "X"*	X					X					X	
B.	*Environmental matrix used:* Fresh Water												
C.	*Incident-specific Information:*												
	Response Phase: Removal												
	Oil Type: Group 3												
	Oil Condition: Weathered but still mobile												
	Treatment Volume: 1,000 - 10,000 gallons												
	Temperature: above pour point												
	Wind Conditions: Low winds												
	Decision Authority												

EXAMPLE

Continued on Next Page

Step Action Table (Cont'd)

STEP	ACTION
9	Now, copy all the "X"s from your chosen environmental matrix (**Table 2a, 2b, or 2c**) on the ***Incident-specific Information*** for the technologies being evaluated. (R*efer to the example below*.) **NOTE**: When filling in the box for Decision Authority, copy the letters denoting the types of authority required. Do not the same for Monitoring.

Incident: Jacks Bay Spill — Worksheet 1 Sample

		Sorbents	Bioremediation Agents	Dispersants	Elasticity Modifiers	Emulsion Treating Agents	In-situ Burn (ISB)	Shoreline Pre-Treatment Agents	Solidifiers	Surface Collection Agents	Surface Washing Agents	Natural Attenuation	
A.	***Technology Choices of Interest:*** *March Choices with an "X"*	X					X					X	Future Products
B.	***Environmental matrix used:*** Fresh Water												
C.	***Incident-specific Information:***												
	Response Phase Removal	X					X					X	
	Oil Type Group 3	X					X					X	
	Oil Condition Weathered but still mobile	X					X					X	
	Treatment Volume 1,000 - 10,000 gallons	X					X					X	
	Temperature above pour point	X					X					X	
	Wind Conditions Low winds	X					X					X	
	Decision Authority:												
	Special Regulatory Requirements?	No										No	
	Must be on the NCP Product Schedule? (RRT Concurrence is required)												
	RRT Concurrence Required? (but may NOT have to be on the Product Schedule)						Yes						
	Special Permit(s) Required?						Air						
	Recommended Monitoring **SM** - SMART Monitoring **OM** - Effectiveness or Other Monitoring		OM	SM	OM	OM	SM	OM	OM	OM	OM	OM	

Continued on Next Page

Step Action Table (Cont'd)

STEP	ACTION
10.	Can you already rule out any of your initial technology choices of interest (Line A of **Worksheet 1**) just based on the information you have so far? If you can, you may want to do so now. Document your decisions at the bottom/back of **Worksheet 1**.
11.	Review the ***Considerations*** listed under Line D on **Worksheet 1** and check off the ones that are applicable for the current response. Check boxes are provided on the left side of **Worksheet 1**.
12.	Next, copy all the + and – symbols from the ***Considerations*** section of the matrix onto **Worksheet 1**. You only need to copy the symbols that apply to the considerations you have just checked off. See example below.

D. (check)	Spill Conditions	Worksheet 1 Sample									
☐	Oil On Fire or Potential for Fire	--					+				
☐	Night Operations						+				
☒	No Oil Containment and Recovery Options	--					+				+
☐	Oil is Trapped In/On Snow and Ice										
☒	Need to Protect Against Significant Water Column and Benthic Impacts	+					+				+
☐	Site is Access Limited (safety)	?					+				+
☒	Waste Generation is Significant Problem	--					+				+
☒	Water Intakes at Risk	+									+
☒	Oil Trapped in Vegetation	+					+				+
☐	Wildlife Protection										

13.	Discuss which of these criteria and other effects are, or are not, most important for the current response. **NOTE**: Take into account only those criteria that apply to the current and potential response conditions. Use the chart on the following page to assist in the discussions and decisions. **NOTE**: If you are unsure of any of these steps, please refer to the example scenario at the end of this section.

Continued on Next Page

Decision

Use the "If-And-Then" chart below to assist in the decision making process:

IF a technology:	AND there are:	THEN
Appears to be well suited for the situation and response capabilities	No overwhelming negatives	Consider using the technology and proceed to step 14.
Does not seem suited for the situation and response capabilities	No overwhelming reasons to use the technology	Consider other technologies

14.	Locate **Table 3** – Environmental Unit Evaluation / Discussion Form, which is immediately after the environmental matrices.
15.	Using the Environmental Unit Evaluation / Discussion Form (**Table 3**), compile a list of concerns and review the recommendations given for each product or technology category with the Planning Section's Environmental Unit for the potential application areas being evaluated. After considering the information provided in the **Table 3**, try to garner consensus within the Environmental Unit and indicate whether the technology being considered is useful/appropriate for the current response situation ("+"), not useful/inappropriate ("–"), or may be useful/appropriate ("**?**") and insert the correct item in the appropriate box in Line E on **Worksheet 1**. Do this for each technology being considered.

Continued on Next Page

Step Action Table (Cont'd)

STEP	ACTION
20.	Record the top (up to three) product or technology choices from this evaluation under Line F on **Worksheet 1**. Record major advantages and disadvantages for each of the top three choices. Additionally, there is also space available to record any other information that may be useful in the decision-making. **NOTE**: This worksheet can be circulated among the Unified Command in order to document any consensus reached thus far on the specific technologies of interest.
21.	Continue and Proceed to ***Part B: Review/Select Options*** (evaluating individual products or strategies from the categories you identified on **Worksheet 1**).

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Table 1. Oil Spill Response Technologies Overview.

Response Technology	Mechanism Of Action	When To Use	Target Areas	Characteristics Of Effective Products	Limiting Factors	Waste Generation	Oil Types
PHYSICAL COUNTERMEASURES							
Mechanical/Manual Countermeasures, e.g., boom, skimmers, shovels	▪ Mechanical containment and removal of oil from the water surface (i.e., booms, skimmers) ▪ Mechanical and manual removal of oil from shorelines and land (i.e., graders, shovels)	▪ Typically first line of defense during a response ▪ Spills on water, on land or hard surface	▪ Varies	▪ Contains, removes spilled product	▪ Site accessibility ▪ Sea state ▪ Water currents	▪ Varies by method	▪ Varies
Sorbents	▪ Absorption (uptake into the sorbent material) and adsorption (coating of the sorbent surface)	▪ On water to recover oil being released by natural processes from the shoreline ▪ On land to pick up or wipe off stranded oil ▪ On vegetation and hard substrates to coat the oil and reduce wildlife contact threats, enhance weathering	▪ Shorelines at the water/land interface ▪ Hard surfaces or wetlands with recoverable oil ▪ Areas with residual oil after cleanup that still poses wildlife contact hazards	▪ Low application rate ▪ Applied with available equipment ▪ Easy to recover ▪ Oil does not drip out ▪ Good buoyancy	▪ Access to deploy and retrieve products ▪ Weathering of the oil such that it no longer adheres to the sorbent material	▪ Concern if only lightly oiled ▪ Some products may be incinerated or recycled	▪ Light to heavy oils ▪ Viscous oils require specially designed products
CHEMICAL COUNTERMEASURES							
Bioremediation Agents	▪ Accelerate rate of oil degradation by adding nutrients, microbes, and/or surfactants ▪ Surfactants break oil into droplets to increase the surface area	▪ After removal of gross contamination ▪ When further oil removal will be destructive, or ineffective ▪ When nutrients are limiting natural degradation rates	▪ Any size spill in areas where other cleanup methods would be destructive or ineffective ▪ As a polishing tool for any size spill	▪ Treated samples show oil degradation greater than control samples in lab or field tests ▪ Key factors are site-specific	▪ Oxygen, temperature (>60°F), pH 7-8.5 ▪ Moisture ▪ Surface area of oil ▪ Rate of nutrient wash-out, especially for intertidal use ▪ Weathered oil crust or skin	▪ Can significantly reduce volume of oily wastes, if effective	▪ Less effective on heavy refined products or weathered oils ▪ Not for gasoline, which will evaporate
Dispersants	▪ Break oil into small droplets that mix into the water and do not re-float	▪ When dispersing the oil will cause less impact than slicks that strand onshore or affect surface water resources	▪ Open water	▪ Products have to pass a dispersant effectiveness test to be listed	▪ Low effectiveness with heavy, weathered, or emulsified oils	▪ Can significantly reduce volume of oil wastes, if effective	▪ Any oil with a viscosity less than 20,000-40,000cP
Elasticity Modifiers	▪ Increase the cohesiveness of the oil, improving skimmer efficiency	▪ On contained slicks of light oils which are difficult to recover	▪ Small spills on water that can be contained	▪ Low application rate readily mixes with oil treated oil is not sticky	▪ Low water/air temperatures which make oil viscous and mixing more difficult	▪ Will reduce water pickup by skimmers ▪ Treated oil can be re-cycled	▪ Light to medium oils
Emulsion Treating Agents	▪ Composed of surfactants that prevent the formation of, or break, water-in-oil emulsions	▪ To separate water from oil, increasing oil storage capacity ▪ To increase effectiveness of dispersants and *in situ* burning	▪ In tanks containing oily liquids ▪ Open water slicks	▪ Low application rate ▪ Rapid oil/ water separation (within 1-2 hours)	▪ Not possible to predict effectiveness for an oil, but there is a standard test ▪ Will wash out, so emulsion can re-form over time	▪ Will reduce the amount of oily material for handling and disposal	▪ Light to heavy oils
Shoreline Pre-treatment Agents*	▪ Film-forming or wetting agents that prevent oil from adhering to or penetrating the substrate	▪ When the oil is heading towards a sensitive shoreline resource or a resource of historical/ archaeological importance		▪ Application as a thin, even coating ▪ Dissolve or degrade in seawater ▪ Rapid drying time ▪ Low permeability to oil penetration ▪ Readily adhere to substrates ▪ Not be wetted by oil ▪ Low contact toxicity	▪ Very narrow window of effective application ▪ No products available	▪ None	▪ Information not available

Response Technology	Mechanism Of Action	When To Use	Target Areas	Characteristics Of Effective Products	Limiting Factors	Waste Generation	Oil Types
Solidifiers	▪ Most products are polymers that bond with the oil, turning it into a coherent mass	▪ To immobilize oil, preventing further spread or penetration ▪ Apply to edge to form a temporary barrier to reduce vapors	▪ On water, on land ▪ Sheen ▪ Can be applied in ice conditions but cold temperatures extend solidification time ▪ Can be applied to the perimeter of the oil, forming a solid barrier to prevent further spreading, rather than treating entire spill	▪ Low application rate (10-50% by weight) ▪ Cure time of a few minutes to 1 hour some products continue working for a number of hours ▪ Forms a cohesive mass ▪ Easily applied using available equipment	▪ Not effective with viscous oils where mixing is difficult waves will form clumps, not a mass ▪ Must recover the solidified oil	▪ Most products have minimal increase in volume ▪ Generated waste weight equal to the weight of the added solidifier ▪ Most are not reversible, so oil must be disposed of or burned	▪ Works best with sheens and light to moderate oils and sheens ▪ Heavy viscous oils have lower effectiveness and longer solidification time ▪ Longer solidification time or reduced effectiveness with emulsified, viscous oils due to poor mixing ▪ For highly volatile oil such as gasoline, oil will continue to evaporate, although slowly
Surface Collecting Agents*	▪ Have a higher spreading pressure than oil, so they push or compress oil on the water surface	▪ To push oil out from inaccessible areas to recovery devices ▪ To make the slick thicker to increase recovery rates	▪ To push oil from under docks, piers, etc, to recovery devices	▪ High spreading pressure, low evaporation rates, low oil and water solubility, remains liquid at ambient temperature	▪ Rain, winds greater than 5 mph, and moderate currents, all which break the surface film ▪ High oil viscosity	▪ Product does not change the physical condition or volume of oil	▪ Light to medium oils
Surface Washing Agents	▪ Contain solvents, surfactants, and additives to clean oiled surfaces ▪ Can "lift and disperse" like detergents or "lift and float" to allow oil recovery	▪ To increase oil removal, often at lower temperature and pressure ▪ To flush oil trapped in inaccessible areas for vapor suppression in sewers	▪ Oiled, hard-surface shorelines ▪ Where oil has weathered and is difficult to remove ▪ When flushing with containment is possible ▪ Volatile fuel spills in enclosed environments	▪ Soak time less than 1 hr ▪ Single application ▪ Minimum scrubbing, esp. for sensitive substrates	▪ Apply on land only where washwaters can be collected for treatment ▪ Use "lift and float" products on shorelines to allow oil recovery rather than allowing dispersion into water body	▪ Can produce large volumes of washwater which needs collection and treatment	▪ All oil types
IN-SITU BURNING							
In-situ Burning	▪ Removes free oil or oily debris from water surface or land surface by burning oil in place	▪ To quickly remove oil to prevent its spread to sensitive areas or over large areas ▪ To reduce generation of oily waste ▪ When access or oil recovery is limited	▪ Areas on land or water where oil is thick enough for an effective burn	▪ Removal of free oil from the water surface or land surface ▪ Minimal burn residues	▪ Heavy, weathered or emulsified oils may not ignite, even with accelerants ▪ Wind speed and direction could affect smoke plume ▪ Air quality monitoring may be required ▪ Need oil thickness that will sustain burn	▪ Burn residue composed of a semi-solid, tar-like layer may need to be recovered ▪ Erosion in burned on-land areas may occur if burn kills plants in area	▪ Fresh volatile crudes burn best most oil types will burn ▪ Oil thickness required for minimum ignitable slicks increases with oil weathering and heavy-component content
OTHER RESPONSE OPTIONS							
Natural Attenuation	▪ Leave oil in situ and do not treat or recover	▪ Access to spill site is limited or other methods will not provide value	▪ In areas where other response strategies result in more harm than value	▪ Must have monitoring plan in place to assess effectiveness	▪ Resources present in the affected area	▪ Not applicable	▪ Varies

NOTES:

* Indicates product categories for which there were no products listed on the NCP Product Schedule (as of June 2009).

TABLE 2A: ENVIRONMENT-SPECIFIC MATRIX FOR FRESH WATERS

FRESH WATERS

Includes: River, Creek, Lake, or Pond -
Refer to chart on pg 11 for more information

	Sorbents	Bioremediation Agents	Dispersants	Elasticity Modifiers	Emulsion Treating Agents	In-situ Burn (ISB)	Shoreline Pre-Treatment Agents	Solidifiers	Surface Collection Agents	Surface Washing Agents	Monitored Natural Attenuation	Future Products
Response Phase												
Emergency (initial response)	+	-		+	+	+	N/A	+	+	N/A	+	
Removal (project phase)	+			+	+	+	N/A	+	+	N/A	+	
Disposal (Transportation, storage, and final disposal)		+	-	-	+	+	N/A	+	-	N/A	+	
Oil Type (33 CFR 154.1020)												
Group 1: Very Light Oil (gasolines)			-	-	-	+	N/A	+	+	N/A	+	
Group 2: Light oils (diesel, kerosene, jet fuels, and light crudes)	+	+	-	+	-	+	N/A	+	+	N/A	+	
Group 3: Medium Oil (LA crude, AK North Slope, Arabian Crudes)	+	+		+	+	+	N/A	+	+	N/A	+	
Group 4: Heavy Oil (bunker, No. 6 fuel oil, IFO 380, Venezuelan)	+	+			+	+	N/A	-		N/A	+	
Group 5: Non-floating Oils	+	-	-	-	-	N/A	N/A	-	N/A	N/A	+	
Oil Condition												
Fresh oil (retains light fractions)	+	+		+		+	N/A	+	+	N/A	+	
Weathered but still mobile (loss of light fractions)	+	+		+		+	N/A	+	+	N/A	+	
Emulsified (water in oil)	+		-		+		N/A	-		N/A	+	
Highly weathered (tarballs, patties, mats, etc.)			-	-	-	-	N/A	-	-	N/A	+	
Treatment Volume (vs spill volume)												
less than 10 gallons	+	+	-	+			N/A	+	+	N/A	+	
10 to 100 gallons	+	+	-	+		+	N/A	+	+	N/A	+	
100 to 1,000 gallons	+			+	+	+	N/A	+	+	N/A	+	
1,000 to 10,000 gallons	+				+	+	N/A	+		N/A		
10,000 to greater than 100,000 gallons		-			+	+	N/A			N/A		
Temperature												
Above pour point of oil	+	+	+	+	+	+	N/A	+	+	N/A	+	
Below pour point of oil		-	-	-	-		N/A	-	-	N/A	+	
Wind Conditions												
High winds (> 20 knots)	+			-			N/A		-	N/A	+	
Moderate Winds (5 to 20 knots)	+		+		+	+	N/A	+		N/A	+	
Low Winds (less than 5 knots)	+			+		+	N/A	+	+	N/A	+	
Decision Authority (For regional specific policies refer to Vol. II of the Selection Guide)												
Special Regulatory Requirements?		Y	Y	Y	Y	Y	Y	Y	Y	Y		
Must be on the NCP Product Schedule? (RRT Concurrence is required)		Y	Y	Y	Y		Y	Y	Y	Y		
RRT Concurrence Required? (but may NOT have to be on the Product Schedule)		Y	Y	Y	Y	Y	Y	Y	Y	Y		
Special Permit(s) Required?						Y						
Incident Specific Considerations												
Oil On Fire or Potential for Fire	-		+			+						
Night Operations						+						
No Oil Containment and Recovery Options	-		+	-		+		-	-		+	
Oil Has/Is Likely to Sink											+	
Oil is Trapped In/On Ice						+						
Need to Protect Against Significant Water Column and Benthic Impacts	+		-		?	+		+			+	
Site is Access Limited (safety)	-					+		-			+	
Waste Generation is Significant Problem	-		+		+	+		-			+	
Water Intakes at Risk	+		-		-			+	-		+	
Oil Trapped in Vegetation	+					+					+	
Wildlife Protection			+					+				
Recommended Monitoring												
Implement SMART Monitoring?			Y			Y						
Implement Effectiveness or Other Monitoring?	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	

KEY:

(+) = Significant Potential Benefit and/or Consider for Use
(blank) = Not Generally Recommended and/or Limited Potential Benefits
N/A = Not Applicable or Feasible for Use
(?) = Unknown / Case-by-case
(-) = Not Recommended; Do not consider

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TABLE 2B: ENVIRONMENT-SPECIFIC MATRIX FOR ON LAND

ON LAND

Includes: Uplands, shorelines (such as beaches, riverbanks, and tidal flats) vegetated wetlands (swamps, mangroves) man made structures (storm drains, ditches, roads) or other land types - Refer to chart on page 11 for more information

	Sorbents	Bioremediation Agents	Dispersants	Elasticity Modifiers	Emulsion Treating Agents	In-situ Burn (ISB)	Shore-line Pre-treatment Agents	Solidifiers	Surface Collection Agents	Surface Washing Agents	Monitored Natural Attenuation	Future Products
Response Phase												
Emergency (initial response)	+		-	+	-	+		+			+	
Removal (project phase)	+	+	-	+	-	+	-	+		+	+	
Disposal (Transportation, storage, and final disposal)		+	-	-	+	+	-	+	-	-	+	
Oil Type (33 CFR 154.1020)												
Group 1: Very Light Oil (gasolines)	+		-	-	-	+	-	+	+	-	+	
Group 2: Light oils (diesel, kerosene, jet fuels, and light crudes)	+	+	-	+	-	+		+	+	-	+	
Group 3: Medium Oil (LA crude, AK North Slope, Arabian Crudes)	+	+	-	+	+	+		+	+		+	
Group 4: Heavy Oil (bunker, No. 6 fuel oil, IFO 380, Venezuelan)	+	+	-		+	+		-		+	+	
Group 5: Non-floating Oils	+	-	-	-	-	+	-	-		+	+	
Oil Condition												
Fresh oil (retains light fractions)	+	+	-	+		+	+	+	+		+	
Weathered but still mobile (loss of light fractions)	+	+	-	+		+	+	+	+		+	
Emulsified (water in oil)	+	+	-		+		+	-		+	+	
Highly weathered (tarballs, patties, mats, etc.)			-	-	-	-		-	-		+	
Treatment Volume (vs spill volume)												
less than 10 gallons	+	+	-	+				+	+	+	+	
10 to 100 gallons	+	+	-	+		+		+	+	+	+	
100 to 1,000 gallons	+	+	-	+	+	+		+	+	+	+	
1,000 to 10,000 gallons	+	+	-		+	+		+		+	+	
10,000 to greater than 100,000 gallons		+	-		+	+	-					
Temperature												
Above pour point of oil	+	+	-	+	+	+		+	+	+	+	
Below pour point of oil		-	-	-	-			-	-	+	+	
Wind Conditions												
High winds (> 20 knots)	+	+	-	-	+		-	+	-	+	+	
Moderate Winds (5 to 20 knots)	+	+	-		+	+		+		+	+	
Low Winds (less than 5 knots)	+	+	-	+		+		+	+	+	+	
Decision Authority (For regional specific policies refer to Vol. II of the Selection Guide)												
Special Regulatory Requirements?		Y	Y	Y	Y	Y	Y	Y	Y	Y		
Must be on the NCP Product Schedule? (RRT Concurrence is required)		Y	Y	Y	Y		Y	Y	Y	Y		
RRT Concurrence Required? (but may NOT have to be on the Product Schedule)		Y	Y	Y	Y	Y	Y	Y	Y	Y		
Special Permit(s) Required?						Y						
Considerations												
Oil On Fire or Potential for Fire						+						
Oil Contaminated Substrate	+	+				+				+	+	
Oil Has/Is Likely to Sink											+	
Buried Oil		+									+	
Oil Likely to be Remobilized	+							+				
Site is Access Limited		+				+					+	
Oiled Substrate Needs Cleaning Without Significant Habitat Impacts	+	+				?		+		+	+	
Significant Problem of Waste Generation	-	+				+		-			+	
Vapor Supppression												
Oil on Roadways	+							+		+		
Vapors Trapped in Confined Areas										+		
Oil Trapped in Snow and Ice		-				+					+	
Confined Spaces with Water? (sewers, culverts, etc.)												
Recommended Monitoring												
Implement SMART Monitoring?			Y			Y						
Implement Effectiveness or Other Monitoring?	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	

KEY:

(+) = Significant Potential Benefit and/or Consider for Use
(blank) = Not Generally Recommended and/or Limited Potential Benefits
N/A = Not Applicable or Feasible for Use.
(?) = Unknown / Case-by-case
(-) = Not Recommended; Do not consider

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TABLE 2C: ENVIRONMENT-SPECIFIC MATRIX FOR BRACKISH AND SALT WATERS

BRACKISH AND SALT WATERS

Includes brackish and saltwaters in bays, estuaries, harbors, inlets, slough, and open ocean.

Refer to chart on page 11 for more information

	Sorbents	Bioremediation Agents	Dispersants	Elasticity Modifiers	Emulsion Treating Agents	In-situ Burn (ISB)	Shoreline Pre-Treatment Agents	Solidifiers	Surface Collection Agents	Surface Washing Agents	Monitored Natural Attenuation	Future Products
Response Phase												
Emergency (initial response)	+	-	+	+	+	+	N/A	+	+	N/A	+	
Removal (project phase)	+	-		+	+	+	N/A	+	+	N/A	+	
Disposal (transportation, storage, and final disposal)		+	-	-	+	+	N/A	+	-	N/A	+	
Oil Type (33 CFR 154.1020)												
Group 1: Very Light Oil (gasolines)		-	-	-	-	+	N/A	+	+	N/A	+	
Group 2: Light oils (diesel, kerosene, jet fuels and light crudes)	+	-	+	+	-	+	N/A	+	+	N/A	+	
Group 3: Medium Oil (LA crude, AK North Slope, Arabian Crudes)	+	-	+	+	+	+	N/A	+	+	N/A	+	
Group 4: Heavy Oil (bunker, No. 6 fuel oil. IFO 380, Venezuelan)	+	-			+	+	N/A	-		N/A	+	
Group 5: Non-floating Oils	+	-	-	-	-	N/A	N/A	-	N/A	N/A	+	
Oil Condition												
Fresh oil (retains light fractions)	+	-	+	+		+	N/A	+	+	N/A	+	
Weathered but still mobile (loss of light fractions)	+	-	+	+		+	N/A	+	+	N/A	+	
Emulsified (water in oil)	+	-			+		N/A	-		N/A	+	
Highly weathered (tarballs, patties, mats, etc.)		-	-	-	-	-	N/A	-	-	N/A	+	
Treatment Volume												
less than 10 gallons	+	-	-	+			N/A	+	+	N/A	+	
10 to 100 gallons	+	-	-	+		+	N/A	+	+	N/A	+	
100 to 1,000 gallons	+	-	+	+	+	+	N/A	+	+	N/A	+	
1,000 to 10,000 gallons	+	-	+		+	+	N/A	+		N/A	+	
10,000 to greater than 100,000 gallons		-	+		+	+	N/A			N/A		
Temperature												
Above pour point of oil	+	-	+	+	+	+	N/A	+	+	N/A	+	
Below pour point of oil		-	-	-	-		N/A	-	-	N/A	+	
Wind Conditions												
High winds (> 20 knots)	+	-	+	-			N/A		-	N/A	+	
Moderate Winds (5 to 20 knots)	+	-	+		+	+	N/A	+		N/A	+	
Low Winds (less than 5 knots)	+	-		+		+	N/A	+	+	N/A	+	
Decision Authority (For regional specific policies refer to Vol. II of the Selection Guide)												
Special Regulatory Requirements?		Y	Y	Y	Y	Y	Y	Y	Y	Y		
Must be on the NCP Product Schedule? (RRT Concurrence is required)		Y	Y	Y	Y		Y	Y	Y	Y		
RRT Concurrence Required? (but may NOT have to be on the Product Schedule)		Y	Y	Y	Y	Y	Y	Y	Y	Y		
Special Permit(s) Required?						Y						
Considerations												
Limited Oil Handling and Storage Capacity	-		+	-	+	+		-			+	
Oil On Fire or Potential for Fire			+			+						
No Oil Containment and Recovery Options	-		+	-		+		-	-		+	
Light Oil Type - Difficult to Recover/Skim	+		+	+		+		+	+		+	
Oil Will Form an Emulsion			+		+						-	
Oil Has Formed an Emulsion			-		+			-			+	
Oil Has/Is Likely to Sink											+	
Buried Oil											+	
Fast Currents Prevent Effective Booming			+								+	
Need to Protect Against Significant Surface and Shoreline Impacts, Including Marshland	+		+			+		+			+	
Need to Protect Against Significant Water Column and Benthic Impacts	+		-	-		+		+			+	
Significant Problem of Waste Generation	-		+		+	+		-			+	
Recommended Monitoring												
Implement SMART Monitoring?			Y			Y						
Implement Effectiveness or Other Monitoring?	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	

KEY:

(blank) = Not Generally Recommended and/or Limited Potential Benefits (-) = Not Recommended; Do not consider

N/A = Not Applicable or Feasible for Use.

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WORKSHEET 1: SELECTION GUIDE DECISION TRACKING/ EVALUATION WORKSHEET

This worksheet is intended to be photocopied for use during drills and incidents

Date:

Incident:

		Sorbents	Bioremediation Agents	Dispersants	Elasticity Modifiers	Emulsion Treating Agents	In-situ Burn (ISB)	Shoreline Pre-Treatment Agents	Solidifiers	Surface Collection Agents	Surface Washing Agents	Natural Attenuation	
A.	***Technology Choices of Interest:*** ***Mark Choices with an "X"***												Future Products
B.	***Environmental matrix used:***												
C.	***Incident-specific Information:***												
	Response Phase												
	Oil Type												
	Oil Condition												
	Treatment Volume												
	Temperature												
	Wind Conditions												
	Decision Authority:												
	Special Regulatory Requirements?												
	Must be on the NCP Product Schedule? (RRT Concurrence is required)												
	RRT Concurrence Required? (but may NOT have to be on the Product Schedule)												
	Special Permit(s) Required?												
	Recommended Monitoring **SM** - SMART Monitoring **OM** - Effectiveness or Other Monitoring		OM	SM	OM	OM	SM	OM	OM	OM	OM	OM	
D. (check)	**Spill Conditions**												
☐	Oil On Fire or Potential for Fire												
☐	Night Operations												
☐	No Oil Containment and Recovery Options												
☐	Oil is Trapped In/On Snow and Ice												
☐	Need to Protect Against Significant Water Column and Benthic Impacts												
☐	Site is Access Limited (safety)												
☐	Waste Generation is Significant Problem												
☐	Water Intakes at Risk												
☐	Oil Trapped in Vegetation												

WORKSHEET 1: SELECTION GUIDE DECISION TRACKING/ EVALUATION WORKSHEET - PAGE 2

This worksheet is intended to be photocopied for use during drills and incidents

D. (check)	Spill Conditions, Continued	Sorbents		Bioremediation Agents		Dispersants		Elasticity Modifiers		Emulsion Treating Agents		In-situ Burn (ISB)		Shoreline Pre-Treatment Agents		Solidifiers		Surface Collection Agents		Surface Washing Agents		Natural Attenuation	
☐	Wildlife Protection																						
☐	Oil Contaminated Substrates																						
☐	Buried Oil																						
☐	Oil Likley to be Remobilized																						
☐	Oiled Substrates Needs Cleaning Without Significant Habitat Impacts																						
☐	Significant Problem of Waste Generation																						
☐	Vapor Suppression																						
☐	Oil on Roadways																						
☐	Vapors Trapped in Confined Areas																						
☐	Confined Spaces with Water? (sewers, culverts, etc.)																						
☐	Limited Oil Handling and Storage Capacity																						
☐	Oil On Fire or Potential for Fire																						
☐	Light Oil Type - Difficult to Recover / Skim																						
☐	Oil Will Form an Emulsion																						
☐	Oil Has Formed an Emulsion																						
☐	Oil Has / Is Likely to Sink																						
☐	Fast Currents Prevent Effective Booming																						
☐	Need to Protect Against Significant Surface and Shoreline Impacts Including Marshland																						
E.	***Habitat, Sensitive Resources, and Cultural Resources Evaluation*** *Attach decision documentation to this worksheet [from Table 3].*																						
	Habitats (including designated or proposed critical habitat)																						
	Natural Resources (including listed species, NWR, NP, etc.)																						
	Cultural Resources / Historic Properties																						

F.	***Evaluation Results***			
	Top Three Choices:			
	Any Major Advantages:			
	Any Major Disadvantages:			

Additional Comments/Decisions:

Signatures/Date of Review Team:

Table 3: Environmental Unit Evaluation / Discussion Form

The following is a list of discussion points / topics that should be evaluated relative to the use of each product and product category being evaluated for the incident-specific conditions. Members of the Environmental Unit (members are likely to include the RP, Federal and state Natural Resource Trustees, tribes, and other members of the response) need to ***discuss and evaluate*** the likely impacts / effects of using the product being considered on the workers, natural habitat(s) and natural resources for the incident-specific conditions and ultimately reach consensus on recommending or not recommending the use of the product / product category.

Specific targeted questions are provided below to help facilitate this evaluation. Space has been provided in each section to allow the EU participants to incorporate and document additional decision-making needs relative to the incident-specific concerns for the response.

PRODUCT INFORMATION	
Product being evaluated:	
Product category:	

APPLICATION EVALUATION
1. What are the worker and public safety issues associated with the product being considered for use? *Review the MSDS for the product and/or contact the vendor for more information.*
2. List other issues of concern relative to the application of the product under consideration (if any) for review and discussion:
3. Other:
4. Other:
HABITAT
5. What habitat would be treated (e.g., on water, fine-grained sand beach, freshwater marsh, etc.) using the product under consideration?
6. How will the product under consideration's mechanism of action likely affect this habitat? *Refer to the NOAA "**Shoreline Assessment Manual,**" the 1995 API "**Options for Minimizing Environmental Impacts on Freshwater Spill Response**," and the 2001 **Environmental Considerations for Marine Oil Spill Response** (Marine Manual) for additional information.*
7. What percentage of the product under consideration will remain in the environment, if any?
8. If the product under consideration is likely to remain in the environment, what are the likely impacts to the habitat being treated? Are the likely impacts acceptable?
9. Other:
10. Other:

Table 3: Environmental Unit Evaluation / Discussion Form	
RESOURCES AT RISK (RAR) EVALUATION	
Resources at Risk from the product being evaluated? *Summarize the list of species, based on their habits, that are likely to be impacted by the product application. Circle the species of greatest concern for this application.*	
Marine Mammals:	
Terrestrial Mammals:	
Birds - Diving	
Birds – Shorebirds	
Birds - Raptors	
Birds – Wading Birds	
Birds - Waterfowl	
Birds - songbirds	
Fish	
Shellfish	
Amphibians / Reptiles	
Plants	
1. Of the species identified, discuss means to reduce impacts or protect resources (e.g., remove, isolate, or haze)? Is it feasible?	
2. Of the species identified, evaluate and discuss the likely impacts from the application of the product being considered (e.g., impact considered minimal, potential impact possible, impact considered likely, unknown, or application not applicable relative to this resource).	
3. Are the RAR impacts from the product being considered acceptable? *Refer to Worksheet 2 for product specific toxicity information.*	
4. Identify the monitoring requirements during/after the application for resource protection (visual observations, water monitoring, tissue sampling, etc.?)	
5. Other:	
6. Other:	
7. Other:	

PART B: REVIEW/SELECT POTENTIAL OPTIONS AND PRODUCTS

Introduction

This section of the Selection Guide provides the decision-maker with the means for evaluating detailed information for individual strategies and product categories for use when responding to spilled oil.

Purpose

Review all strategies and products in a detailed manner and allow easy comparison of individual products and strategies to evaluate their potential value to the individual response-specific conditions. **Worksheet 2** will be used to facilitate review and comparison of the products.

The general subsections for which summary information is presented for each technology category include:

- Mechanism of action (how it works, what it does)
- When to consider using
- Authority required
- Availability
- General application requirements
- Health and safety issues
- Limiting factors/environmental constraints
- Monitoring requirements/suggestions
- Waste generation and disposal issues
- References

Within each product category, detailed, product-specific information is presented in a table format to facilitate direct comparison of the available products. This includes all the products on the NCP Product Schedule, plus others that are not required to be on the Schedule, such as sorbents. Products that are not currently listed on the NCP, but have been in the past are now located in **Appendix G**. The table organization for each product category is similar, with some variation, to reflect the most relevant decision issues of interest or concern.

Continued on Next Page

Step Action Table Follow the step action table below for Part B: Review/Select Potential Options and Products.

STEP	ACTION
1.	Obtain a blank copy of the Product Selection Worksheet (**Worksheet 2**) to record information for each product category. **Worksheet 2** is on the next page. Another copy is in **Appendix F** for photocopying. ***NOTE***: If two product categories/strategies are being evaluated for an incident, fill out a separate Product Selection Worksheet for each category/strategy.
2.	Record product category/strategy being evaluated on Line A of **Worksheet 2**. Review all information in the general category overview.
3.	Identify up to three products in this category to be reviewed. Record a product name in each column on Line B. *Use another copy of the worksheet if more than three products are being evaluated for a product category.*
4.	Complete questions C, D, E, and F for each product being considered. Record product-specific information in the space available for these questions.
5.	Record the toxicity ratings for Inland Silversides (96h) and Mysid Shrimp (48h) for each product in Line G, where applicable. ***NOTE***: For more information on the toxicity and toxicity ratings and what they mean refer to **Appendix C** of this volume.

Continued on Next Page

PART B: REVIEW/SELECT (CONTINUED)

Step Action Table Continued.

6.	Review product-specific information recorded and compare and contrast products. Rank the products in terms of value to the incident-specific response conditions. Identify those products that are not suitable at this time. Record this information in Line H.
7.	Record any additional comments or information that is pertinent to this decision in Line I.
8.	This worksheet is designed to assist in the decision-making process. In Line J, if a product(s) appears to add value to the response, the completed worksheets can be used to demonstrate consensus and can be FAXed to the incident-specific RRT for review and/or approval.
	NOTE: Identifying potential products for use in the response requires additional evaluation criteria in terms of actually testing the product on the oil and developing monitoring capabilities to determine the extent of effectiveness and when to cease using a product. Continue on to **Part C** to complete your evaluation

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WORKSHEET 2: PRODUCT SELECTION WORKSHEET

This worksheet is intended to be photocopied for each product category evaluated and used during drills and incidents and Faxed to the Incident Specific RRT for review. This worksheet may be used to evaluate 1, 2 or 3 separate products in an individual category.

Name(s):

Date:

Incident:

A:	**Product Category Being Reviewed:**			
	Products of Interest:	**Product No. ____**	**Product No. ____**	**Product No. ____**
B:	**Product Name:**			
C:	**RRT Approval Required? (Y/N)**			
	Other Regulatory Requirements or Permits?			
D:	**Can Product Arrive in Time for an effective application? (Y/N)**			
E:	**Can Product be applied with existing Operational Application Constraints (including safety)? (Y/N)**			
F:	**Can Product be removed from the Environment? (Y/N)** *Provide intelligent ranking*			
G:	**Toxicity of Product alone (Write in numbers and Toxicity Rating. See App E for more information on toxicity and Toxicity Rating)**	Inland silversides (96h): Mysid Shrimp (48h):	Inland silversides (96h): Mysid Shrimp (48h):	Inland silversides (96h): Mysid Shrimp (48h):
	Toxic evaluation for targeted resources for incident conditions for the spill application *Rank: Severe, Moderate, Slight, Minimal, None*			
H:	**Mark as 1st, 2nd, or 3rd Choice or mark as Not Applicable for this incident**			
I:	**Additional Comments/Decisions/Recommendations:**			

J: Initials/Date of Incident-Specific RRT Review of Information:

Sign and Include Date Upon Review

USEPA:	Name: _____ Date:_____	**STATE:**	Name: _____ Date:_____
USCG:	Name: _____ Date:_____	**STATE:**	Name: _____ Date:_____
NOAA:	Name: _____ Date:_____	**TRIBE:**	Name: _____ Date:_____
USDOI:	Name: _____ Date:_____	**OTHER:**	Name: _____ Date:_____

K: Incident RRT Approval:

Planning Section Chief:	Unified Command:

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BIOREMEDIATION AGENTS
(A Category on the NCP Product Schedule)

Mechanism of Action

The objective of bioremediation is to accelerate the rate of hydrocarbon degradation due to natural microbial processes by exploiting ability of microorganisms to convert hydrocarbons to carbon dioxide, water, and innocuous by-products. Two types of bioremediation are practiced:

Nutrient Enrichment (biostimulation) - addition of nutrients (generally nitrogen and phosphorus) and/or possibly oxygen (in areas low or devoid of oxygen) that may be limiting microbial growth due to low background levels to accelerate microbial growth. Assumes nutrient availability is the major limiting factor. Only nutrient additives that are proven to be nontoxic and effective in laboratory or field studies should be used in the environment.

Natural Microbe Seeding (bio-augmentation) - addition of high numbers of oil-degrading microorganisms to accelerate startup of the process; this application requires RRT approval. Assumes indigenous hydrocarbon degraders are low in number or not effective at degrading oil. Will require addition of nutrients if not included in the commercial product.

- The ultimate end products are carbon dioxide, water, and innocuous, incompletely oxidized end products.
- Some products contain surfactants to increase the bioavailability of oil to the cells. Microorganisms can produce their own biosurfactants that have the same effect, thus increasing the rate of microbial degradation.

When to Consider Using

- After other techniques have been used to remove free product and gross contamination or if oiling is light to begin with.
- When further oil removal is likely to be destructive, ineffective, or cost-prohibitive.
- Biostimulation: when nutrients are limiting rates of natural biodegradation.
- Bio-augmentation: when indigenous hydrocarbon microbes capable of degrading hydrocarbons are present in low numbers. Bio-augmentation has not been demonstrated in the scientific literature to be effective on oil spills when applied in the field.

On Water:

- CONSIDER for sheens and sediment contamination in small, static water bodies such as natural ponds and man-made lagoons; aeration may be needed to maintain aerobic conditions.
- NOT for use on oil slicks on flowing water, such as rivers, streams, large lakes, or the open ocean.

- NOT for gasoline spills (due to high evaporation rate without treatment). However, may be used in groundwater applications such as leaks from underground storage tanks or above-ground tanks contaminating the vadose zone.

On Land:

- YES for many conditions, especially where the substrate can be tilled or raked, irrigated, etc.
- YES for small spills of light, medium, or even heavy refined product when run-off can be controlled; along rail yards, along pipeline corridors, etc.
- YES for cleanup of residual oils in abandoned and remote production facilities *in situ*; use of biopiles or biopods consisting of tilling and homogenization of the oil in the sediments, adding bulking agents (organic matter such as wood chips), and nutrients that may include the use of lime. May require multiple treatments over a period of months to years.
- CONSIDER for thick or highly weathered oils on shorelines or land surfaces.

Authority Required

- **Incident–specific RRT approval is required**; Products must be on the NCP Product Schedule in order to be considered for use. Exception: fertilizer is not required to be on the Product Schedule.
- **NOTE**: As of June 2009, fourteen bioremediation agents were listed on the NCP Product Schedule.
- Verify need for applicable state requirements.
  - Prior to listing, product manufacturers must submit efficacy test results to be listed on the Product Schedule. The evaluation criteria were originally established by EPA's Office of Research and Development after concurrence from a 25-member peer-review committee and are noted as minimal standards for acceptance. The reader is referred to the NCP for the current efficacy protocol guidelines.

Availability

- Seldom an issue since they are not used in the emergency phase of a spill. See **Table 4** for product-specific availability. Farm and garden fertilizers are widely available.

General Application Requirements

- Application methods should be designed to minimize detrimental effects on vegetation and soft sediments from foot or vessel traffic, particularly if multiple applications are required.
- Studies have shown that maintenance of nitrate-N concentrations in the interstitial pore water of shorelines in the range of ~2-10 mg/L are sufficient for near-maximum growth of hydrocarbon-degrading microorganisms.

- Liquid products are diluted in water and applied with spray or injection systems, but automatic sprinkler systems are ineffective in saltwater. Dry products may be applied by hand or powder spray systems.
- Another method of application is via a perforated plastic pipe placed at and parallel to the high tide line of a tidal-inundated marine shoreline through which pre-dissolved fertilizer is slowly pumped from a reservoir during a falling or low tide. This will ensure that the nutrients will come in contact with the oiled zone.
- Slow-release nutrients may be used, but they would require knowledge of release rates to ensure sufficient nutrients are released for effective use in the treatment.
- Broadcasting dry, granular fertilizer onto the oiled surface at low or falling tide and washing it into the sediment is another method of application for consideration. Prilled or pelletized (granules formed from molten material) ammonium nitrate, although it is a quick-release product, is surprisingly longer-lasting than would be typically expected.
- Frequent re-application is required for nutrients dissolved in water and applied as a dilute solution (more frequent at spring tides than neap tides), depending on the rate of washout (fast for intertidal areas, slower for rainfall infiltration).
- For oiled inland and/or upland soils, products need to be mixed into the material (adding nutrients, if required) by tilling or disking. Intermittent application (e.g., once per month) is best rather than all at once.
- Regular tilling or other means of aeration is needed to maintain minimum oxygen levels, break up the oil residues, and provide mixing of the product with the oiled soil.
- Irrigation may be needed to maintain minimum moisture content.

Health and Safety Issues

- All products have to be tested to show that they do not contain pathogens.

Limiting Factors/Best Management Practices

- Biodegradation of hydrocarbons requires: oil-degrading microbes, nutrients (N and P), oxygen, moisture, and time, any one of which can be limiting.
- Degradation proceeds faster at warm temperatures (> 60°F), neutral pH (optimum is 6.5-8.5), and high surface area of the contaminant.
- Laboratory measurements of efficacy are under optimal conditions; do not expect these results to reflect what may occur under field conditions.
- Expect degradation to take weeks to months and, depending on the environmental characteristics of the spill area, possibly years, especially where control of moisture, temperature, mixing rate, etc. is limited.
- Avoid using ammonium-based fertilizers adjacent to waterbodies because un-ionized ammonia is toxic to aquatic life at very low levels. Nitrate is just as good a nitrogen source without the ecotoxicity. However, if biostimulation is practiced on land, and the possibility exists that nitrate can contaminate groundwater, then care should be taken to preclude nitrate contamination of the groundwater.

- Check fertilizers for their metal content since some common fertilizers contain relatively high levels of metals.
- Not approved for use on wildlife.

NOTE:
The NCP Subpart J does not explicitly require toxicity testing of bioremediation products. At EPA's discretion, bioremediation agents that contain ingredients such as surfactants and other chemicals, or any other component the EPA designates may cause harm to the environment, may be required to perform the (LC50) toxicity test currently required for all other NCP Product Schedule product categories. Manufacturers of products may have performed their own toxicity tests. For questions relating to toxicity of bioremediation products, please refer to the Oil Program Product Schedule Manager at the EPA Office of Emergency Management, Regulatory and Policy Development Division, Washington, DC. Phone: 202-260-2342.

Monitoring Requirements/Suggestions

- Monitoring is required to ensure that target moisture content, nutrient levels (at least 2-10 mg nitrogen/liter), and oxygen (at least 2 mg/L) are being maintained and to determine re-application frequency.
- Collect samples before and at set intervals after treatment to determine that biodegradation is occurring and at sufficient rates. Specialized chemical analyses are needed to prove degradation (GC/MS of alkanes and aromatics normalized to a conservative biomarker such as hopane). TPH may be measured for frequent analyses, but occasional GC/MS analysis is highly recommended to ensure the foregoing results are being achieved. For example, if all hydrocarbon analytes are decreasing at the same rate, then the cause of this decline is not due to biodegradation but to some physical factor (washout, photo-oxidation, etc.). Microorganisms always metabolize the easiest compounds first, and this is reflected in the relative rates of disappearance of the measured oil components. The sampling plan should cover the expected duration of degradation (months after treatment) and the extent or depth of penetration of the hydrocarbons in the soil or sediment.
- It may be appropriate to monitor for detrimental impacts to water quality and/or sensitive species.

Waste Generation and Disposal Issues

- Effective use of bioremediation agents should significantly reduce the amount of oily wastes generated.

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Table 4. Characteristics of Bioremediation Agents Listed on the NCP Product Schedule (as of June 2009) and fertilizer.

	Fertilizer	BET BIOPETRO	BIOWORLD HYDROCARBON TREATMENT	INIPOL EAP 22	JE1058BS
General Description	Powder or liquid, 10-10-10 nutrient additive, by weight liquid; slight ammonia odor	Powder	Two-part product: a liquid nutrient additive and microbes in a dry powder	Oleophilic liquid	Powder; Nutrient additive
Active Ingredients	Varies by manufacturer;	NP	Nutrients, additives, surfactants, and microbes	Nutrients	Biosurfactant and nutrients additive
Nutrient Composition	Varies - nitrogen, phosphorus, potassium, boron, iron, magnesium, manganese, zinc, sulfur, etc.	NP	Nnitrate, urea, ammonium phosphate, phosphoric acid, potassium	Microemulsion	NP
How does it change the oil behavior?	Provides nutrients for naturally occurring bacteria	NP	Provides nutrients and microbes to increase oil degradation	Softens the oil; can cause oil to lift off substrates	Biosurfactant stimulates degradation of oil by indigenous organisms.
Availability (amount per location)	NA	NP	NP	NP	NP
Application Rate	Varies.	Varies. Contact BET for specific technical advice	1 gallon liquid and 1/2 lb microbes per 2,000 ft^2 of contaminated surface soil with ave. 2,000 ppm TPH	1:10 product to oil	Product:oil ratio of 1:10. No pre-mixing or dilution by water is required
Application Method	Conventional spraying equipment	Contact BET for specific technical advice	Spray liquid neat onto oiled surfaces, add activated microbe solution, then mix with shovel or rate; keep soil moisture at 20%	Spray product neat onto oiled surfaces	Conventional spraying equipment, e.g., powder mist duster attached with boom type multi-hole head; Pre-remove all free product where possible prior to application
Temperature Limitations	Above 35°F	45°-100°F	34-110°F	>52°F	NA

	Fertilizer	BET BIOPETRO	BIOWORLD HYDROCARBON TREATMENT	INIPOL EAP 22	JE1058BS
EPA Efficacy Test (Reports % reduction of components over a 28 day period)	NA	Alkanes: 99% Aromatics: 67% Gravimetric weight decrease: 30%	Alkanes: 97% Aromatics: 8% Gravimetric weight decrease: 96%	Alkanes: 93.87% Aromatics: 23.25% Gravimetric weight decrease: 50%	Alkanes: 92.6% Aromatics: 39.0% Gravimetric weight decrease: NP
Use in Fresh Water?	NA	Yes	Yes	Yes	NP
Use in Salt Water?	NA	Yes	Not for salinity > 5 ppt	Yes	NP
Inland Silversides 96h	NP	NP	8,849	125	8.68
Mysid Shrimp 48h	NP	NP	7,349	35	2.44
Solubility in water	Yes	NP	100%	Dispersible	NP
Other Information	Product has pH of 7.0-7.3	Product works at pH 5.5-8.5 and dissolved oxygen level of 3 to 5 mg/l.	Optimum temperature 80-100°F; optimum salinity 0-1 ppt	Does not contain trace metals	Non-flammable
Application Assistance Information*	Vendor/ Manufacturer	BioEnviroTech 281-351-5594 800-758-3253	BioWorld Products Visalia CA 559-651-2042	Elf Atochem North America, Inc. 2000 Market Street, Suite 1900 Philadelphia, PA 202-659-1810 Serge.kuchto@ceca.fr	Japan Energy Corporation Business Development Department, Bio Research Center, Japan Phone: (81) 48-433-2191 saeki@j-energy.co.jp

NA – Not applicable; NP = Information Not Provided

* For additional technical assistance on product application, contact the supplier listed on the NCP Product Schedule Notebook.

Table 4. Continued.

	Land and Sea 001	Micro-Blaze	Oppenheimer Formula	Pristine Sea II
General Description	Tan dried and ground plant material	Concentrated, white liquid; perfumed; when mixing, add product to water or solution will foam	Powder	Biological Additive Powder or liquid bacterial mixture
Active Ingredients	Microbes, nutrients	Nutrients, microbes, and surfactants	Microbes; oil-absorbing clay mixed with hydrophobic Archaeobacteria	NP
Nutrient Composition	NP	NP	NP	NP
How does it change the oil behavior?	Immediate protection to flora and fauna; Changes oil from a liquid to a non-sticking solid	Surfactant cleaves oil droplets into molecules small enough for microbes to effectively digest	Will absorb sheens and rainbows	NP
Availability (amount per location)	10 tons, San Antonio, TX	10,000 gal, Houston, TX	10 tons in Austin, TX	1,500 lbs in Montpelier, ID
Application Rate	1:3 product to oil	Spills-1:10, product to oil, as 3-6% solution; Soil- 1 gal per 10 yd^3 at 3-6% solution	10 lbs per acre surface on open water; 100 lbs per 1,000 square feet on soil or rocks.	Varies. Contact vendor for assistance.
Application Method	On water, spread over contaminated area at 1 to 3 ratio. On soil, blend to depth equivalent to contamination level	Mix in hand-held sprayers; educt into spray systems; pour concentrate directly on oil**;** in all cases, use broom or pressurized water stream to agitate the solution; then rinse clean with water and vacuum up liquids; **do not** discharge untreated solution to waterbodies.	Spray dry powder directly or as a water mix with nutrients	"Soak at a rate of 1kg to 4L influent waste and 4L tap-water, or add directly to your system."
Temperature Limitations	32 to 135°F; optimal is 77-86°F for microbe activity	>32°F	32-150°F; optimal is 82°F	40°F to 120°F; bioremediation slows below 50ºF
EPA Efficacy Test (Reports % reduction of components over a 28 day period)	Alkanes: 39.2% Aromatics: 46.36% Gravimetric weight decrease: 25%	Alkanes: 94.1% Aromatics: 47.6% Gravimetric weight decrease: 12%	Alkanes: 89.1% Aromatics: 38.2% Gravimetric weight decrease: 10%	Alkanes: 96% *(20 d test)* Aromatics: 90% *(20 d test)* Gravimetric weight decrease: NP
Use in Fresh Water?	Yes	Yes	Yes	Yes
Use in Salt Water?	Yes	Yes, but effectiveness is reduced above 10% salinity	Yes, to 20% salt, optimal is 0.5-3.5%	Yes
Inland Silversides 96h	NP	NP on NCP; 1,390 value provided by vendor	NP	NP

	Land and Sea 001	Micro-Blaze	Oppenheimer Formula	Pristine Sea II
Mysid Shrimp 48h	NP	NP on NCP 1,230 value provided by vendor	NP	NP
Solubility in water	Not Applicable	99% soluble	NP	Non Soluble
Other Information	Optimum pH of 6 – 8	Use as a grease digester in wastewater systems; storage tank cleaning of benzene and other organics; long term bioremediation projects in soil.	www.obio.com Sold under various names.	Improves settling and minimizes foam formation and/or production. No trace metals
Application Assistance Information*	Land and Sea Restoration LLC 4147 Acorn Hill, San Antonio, TX 210-650-5556 Shawn Parker	Verde Environmental, Inc. 713-691-6468 800-626-6598 Garner Environmental Services-409-935-0308 www.micro-blaze.com	Oppenheimer Biotechnology, Inc. Austin, TX 512-474-1016 Jen.neve@obio.com	Fluid Tech., Inc. Las Vegas, NV 702-871-1884 Stan True

NP = Information Not Provided

* For additional technical assistance on product application, contact the supplier listed on the NCP Product Schedule Notebook.

Table 4. Continued.

	S-200	SpillRemed	Step One	System E.T. 20
General Description	Light amber liquid	Liquid	Liquid	Brown powder
Active Ingredients	Nutrients	Microbial Culture	Microbes, Nutrients	Microbes
Nutrient Composition	NP	NP	Phosphoric acid	NP
How does it change the oil behavior?	Bioremediation accelerator	NP	Starts digesting oil particles immediately	No immediate change
Availability (amount per location)	NP	NP	Unlimited Amount- Embarrass, MN	Sufficient to treat 2 million yd^3, Houston, TX
Application Rate	1:10 product to oil; 1 lb/sq. yard of surface area	Apply undiluted over the spill in open water conditions; can be diluted with water for a 1:10 application rate	Provided by vendor at time of purchase	Varies
Application Method	Applied with pressurized sprayers or back pack sprayers	Apply neat; can be diluted to a 1:10	Provided by vendor at time of purchase	Spray reconstituted organisms, broadcast nutrients, mix into affected soils
Temperature Limitations	50-120°F; optimal is 86°F	Use between 32 – 100°F	50-135°F; optimal is 70-90°F	41-95°F ; optimal is 39-95°F
EPA Efficacy Test (Reports % reduction of components over a 28 day period)	Alkanes: 98.0% Aromatics: 10.4% Gravimetric weight decrease: 28%	Alkanes: 97.0% Aromatics: 47.0% Gravimetric weight decrease: NP	Alkanes: 44.03% Aromatics: 54.51% Gravimetric weight decrease: 51%	Alkanes: 99.1% Aromatics: 77.0% Gravimetric weight decrease: 18%
Use in Fresh Water?	Yes	No	Yes	Yes
Use in Salt Water?	Yes	Yes, between 10 and 35 ppt	Yes	Yes, but salt water adapted bacteria must be specified
Inland Silversides 96h	25.33	37.5	NP	NP
Mysid Shrimp 48h	17.67	22.4	NP	NP
Solubility in water		NP	100% soluble	NP
Other Information		www.sarvabioremed.com		
Application Assistance Information*	International Environmental Products, LLC Villanova, PA 610-520-7665 or email at info@iepusa.com	Sarva Bio Remed, LLC Trenton, NJ 609-695-4992 E-mail: sales@sarvabioremed.com Satya Ganti	B&S Research Inc Embarrass, MN 218-984-3757 soilplus@2z.net H.W. Lashmett	Environmental Restoration Services Windsor, CA 619-253-0664 ERS.BTI@gmail.com John Chase

NP = Information Not Provided

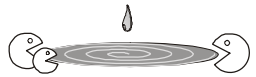
* For additional technical assistance on product application, contact the supplier listed on the NCP Product Schedule Notebook.

Table 4. Continued.

	VB591	WMI-2000
General Description	Yellow powder	Tan powder, with yeast odor
Active Ingredients	Oleophilic compounds	Microbes
Nutrient Composition	NP	None; product requires nutrient supplements
How does it change the oil behavior?	No immediate change	No immediate change
Availability (amount per location)	15,000 lbs.- Houston, TX	500-1,000 lb, Houston, TX
Application Rate	5-15 lbs. of product to 1 barrel of spilled oil	1.4 lb/1,000ft^2 , inoculation concentration of 5-9 billion spores per gram
Application Method	Apply with hand held pressurized dust blowers or boat mounted dust blowers. Follow up application recommended after 48 hours.	Activate culture in water for 2 h, then spray or inject, mix in nutrients, and till/aerate
Temperature Limitations	None	35-100°F, optimal at 45-90°F
EPA Efficacy Test (Reports % reduction of components over a 28 day period)	Alkanes: 96.8% Aromatics: 68.8% Gravimetric weight decrease: 18%	Alkanes: 60.3% Aromatics: 33.3% Gravimetric weight decrease: 44%
Use in Fresh Water?	Yes	Yes
Use in Salt Water?	Yes	Yes
Inland Silversides 96h	NP	NP
Mysid Shrimp 48h	NP	85% survival at 2,500 ppm (24h)
Solubility in water	Soluble	Soluble
Other Information	0.9gm/cc water soluble 2.5gm/100cc oil soluble	Optimal pH 7.0-8.0
Application Assistance Information*	BioNutraTech, Inc. Shell Knob, MO 417-858-1150 shruza@bionutrtech.com www.bionutratech.com	WMI International, Inc. Houston, TX 713-956-4001 Evenings – 713-526-2829 800-460-4507 wmi@wt.net, Frank Lemmond

NP = Information Not Provided

* For additional technical assistance on product application, contact the supplier listed on the NCP Product Schedule Notebook.



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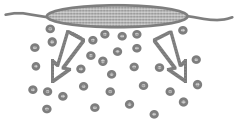


DISPERSANTS
(A Category on the NCP Product Schedule)

Mechanism of Action

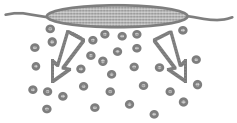
- Mixtures of surfactants and solvents whereby:
  - Surfactants reduce the interfacial tension between oil and water making it easier for waves to make larger numbers of smaller particles.
  - Solvents dissolve any solid surfactant, reduce the viscosity of the product so it can be sprayed effectively, and promote penetration of the dispersant into the oil.
- Prevents small droplets from recoalescing and forming bigger, more buoyant droplets that float to the surface, re-creating sheens.

When to Consider Using

- When dispersing the oil will cause less environmental impact than surface slicks that will strand on sensitive shoreline habitats or impact sensitive water-surface resources (e.g., birds). It is important to note that current dispersed oil toxicity test protocols do not include photoenhanced toxicity, thus, the footprint of the impacts from dispersed oil may be underestimated in areas of high water clarity and translucent pelagic larvae and benthic organisms.
- Dispersants should be considered when other techniques would be inappropriate to use, such as mechanical recovery in rough seas.
- For large spills, consider application to the leading edge or parts of the slick that threatens sensitive resources. Typical offshore dispersant applications are targeted at the thicker portions of the slick so that more oil can be treated.
- 100 % dispersion of the slick is generally not possible. Oil that does not disperse will still need to be addressed by the response.
- Not appropriate for use in areas with high concentrations of early life stages of important species.

Authority Required

- **It is the general practice of the EPA to not allow dispersants use in freshwater. Possible exceptions to this guidance will be region specific.**
- **Incident-specific RRT approval is required** to use dispersants. **NOTE**: As of June 2009, there were fourteen dispersants on the NCP Product Schedule (**Table 5**).
- Products must currently achieve an effectiveness of at least 50% dispersion of the oil (based on the lower 95% confidence interval) in laboratory testing to be listed on the Product Schedule (scores are reported in **Table 5**); EPA is working to increase this requirement to meet a 75% dispersion effectiveness in laboratory testing in the future.



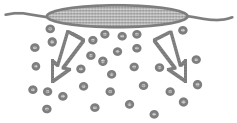
- For dispersant use/consideration, consult your regional response planning requirements and pre-authorization agreement.
- For waters within established pre-approval zones – at FOSC discretion (Incident-specific RRT notification required). Use in shallow water or in areas with low dilution rates could affect both water column and benthic organisms.
- For all other areas – FOSC required to seek incident-specific RRT approval and follow the dispersants use guidance outlined in the appropriate Regional Contingency Plan.

Availability

- Dispersant products are readily available, with stockpiles at selected coastal sites.

General Application Requirements

- There are two primary dispersant delivery systems being used today: aerial and vessel-based systems. Large multi-engine aircraft are best suited to dealing with major off-shore slicks whereas boats, single engine aircraft, and helicopters are suitable for treating smaller slicks closer to the shoreline. Backpack type spray systems have been manufactured and used for applying dispersants but their use is not addressed in detail here.
- Aerial spraying systems include spray buckets (payload of 7-21 bbls) deployed from helicopters; specially equipped multi-engine aircraft (e.g., DC-3, payload of 30 bbls); cargo aircraft fitted with an ADDS (Airborne Dispersant Delivery System) pack (payload of up to 150 bbls); and aircraft usually used for agricultural or pest control purposes, which require minor modification to spray dispersants. Aircraft should be able to operate safely at a low altitude (usually 50-100 ft for larger aircraft) and at relatively low speed (usually 50-150 knots).
- There are two primary types of vessel-based delivery systems; spray booms and water monitors or cannons. Depending on boom height, nozzle pattern, and the desired dispersant to oil application ratio, dispersant can be applied from spray booms at full concentration. However, in both spray booms and water monitors, dispersant is usually diluted with seawater. Proportioning of the dispersant is usually accomplished by use of an eductor or a positive displacement metering pump.
- Dispersants are applied using spraying systems at a target treatment rate of 5 gal per acre of oil (47 liters per hectare), to achieve a dispersant to oil ratio of 1:20; application rates will vary with spill and oil conditions.
- It may be appropriate to conduct an initial test application to determine effectiveness prior to full-scale operations.
- Multiple applications may be needed over a period of days.
- Use vessels when weather grounds aircraft or for smaller spills close to shore or near pre-staged equipment.



- A boat operating at 5 knots while spraying a 40-foot swath can only treat about one half square mile in 12 hours. A slick thickness of 0.1mm in this case equates to treatment of approximately 830 barrels per day assuming the vessel has the necessary dispersant storage and fuel capacity to operate all day. (National Research Council, 1989; API Task Force, 1986; Belore, 1985: Chau *et al.*, 1986; McAuliffe, 1986).
- An additional factor in deciding when to consider vessel based systems are the availability of vessels with sufficient stability to keep the extended spray arms at the desired height and the availability of spotter aircraft to direct the vessel(s) to the thickest portions of the slick.
- Water monitors are gaining popularity on small spills due to the widespread availability of vessel with fire monitors installed. The most critical factors in using this method are selecting a water-compatible dispersant, providing a means of proportioning the dispersant in desired concentration, and producing a spray that maximizes contact of the dispersing agent on the top of the slick with only slight penetrating impetus. The droplet size of the dispersant is important as it needs to be sufficiently large to overcome the effects of wind and evaporative loss but not so large that it will 'punch' through the slick. It is strongly recommended that a metal screen is installed on the monitor nozzle to achieve a droplet size of 400-600µm'.

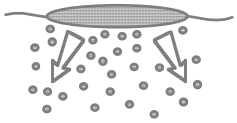
- Good spraying operations include skilled personnel in all positions, spotter aircraft to direct the spray applications, and excellent communications among the group.
- The availability of vessels over dispersant aerial spray assets makes this method attractive in some areas. Spray booms should be rigged as far forward a practicable to avoid interference from the bow wake. On spray booms, fan shaped nozzle patterns permit a more even application than cones that tend to deliver more product at edges of their pattern while the vessel advances.
- Sources of vessel mounted spray equipment are identified in the World Catalog of Oil Spill Response Products and the International Oil Spill Control Directory, and other publications.

Health and Safety Concerns

- Ensure that dispersants are not applied in areas where on-scene personnel could be sprayed or affected by overspray.
- Deploy monitoring crews in vessels only under safe sea conditions.

Limiting Factors/Best Management Practices

- Effectiveness decreases with heavy, weathered, and emulsified oils.
- Effectiveness of current formulations decreases significantly with decreasing salinity.
- Most become ineffective when the viscosity reaches 20,000 cP. In laboratory and meso-scale tests, some of the newer generation of dispersants have shown promise for dispersing higher viscosity oils, extending the 'window of opportunity' for dispersant application.



- A certain amount of energy is required to achieve successful chemical dispersion at sea. In the absence of sufficient wave energy to form and maintain the dispersion of oil droplets into the water column, they may re-surface and form a slick. Field trials indicate that a wind speed between 5- 25 knots is optimum.
- Most pre-approvals specify a minimum water depth (usually 30 feet), distance from shore, or a specific, sensitive resource such as coral reefs, and maximum time after release.
- Other constraints include separation distance from rafting birds and avoidance of spraying over marine mammals and sea turtles because dispersants are not approved for use on wildlife. It may be necessary to haze birds out of the treatment areas.
- Not likely to be 100% effective; often requires mechanical recovery and/or shoreline cleanup.

Monitoring Requirements/Suggestions

- Follow the Special Monitoring of Applied Response Technologies (SMART), which consists of three tiers:
  - Tier I - visual aerial observations by trained observers;
  - Tier II – Tier I and fluorometry sampling of the dispersed plume, tracked by drifters; and
  - Tier III – Tier II and water sampling to validate the quantitative fluorescence values and characterize the composition of the dispersed oil.
- Monitoring is generally a pre-requisite for dispersant approval in any specific incident; however, in most regions, a dispersant application does not have to wait for the monitoring to be on scene to begin its application – often visual observation / monitoring in place is the minimum requirement. Refer to Area and Regional Planning Documents for specific requirements.

Waste Generation and Disposal Issues

- Effective use of dispersants should significantly reduce the amount of oily wastes generated.

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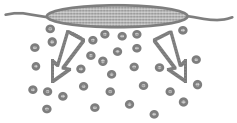

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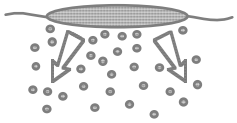

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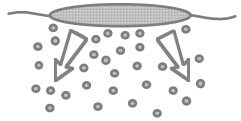
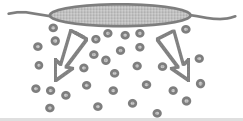


Table 5. Characteristics of Dispersants Listed on the NCP Product Schedule (as of June 2009).

	BioDispers	Corexit® EC9500A	Corexit® EC9527A	Dispersit SPC 1000™
Dispersant Type	Water soluble concentrate	Glycol Ether Concentrate; solvent is paraffinic	Glycol Ether based Concentrate; solvent is ethylene glycol monobutyl ether	Concentrate; surfactants are water based
Availability	Petro Bio Corporation 203-966-4573	Nalco Energy Services L.P. 800-333-7336 281-263-7336 or 281-202-8126 kaventer@nalco.com	Nalco Energy Services L.P. 800-333-7336 or 281-263-7336 or 281-202-8126 kaventer@nalco.com	Maritime Solutions, Inc. 212-747-9044
Application Rate	5% to 10% solution	Apply undiluted at 2-10 gal per acre, or a dispersant:oil ratio of 1:50 to 1:10	Apply undiluted at 2-10 gal per acre, or a dispersant:oil ratio of 1:50 to 1:10	Apply at 2-10 gal per acre; or dispersant:oil ratio of 1:50 to 1:10
Application Method	Recommended application is by aircraft, fireboat monitors or similar apparatus	Spray neat as droplets	Spray neat as droplets; NOT fogged or atomized.	Spray neat as droplets
Temperature Limitations	No known restrictions	Above -30°F	Above -30°F	Above - 25ºF
EPA Dispersant Effectiveness Test (%) – Swirling Flask	Prudhoe Bay Crude: 51.0 S. Louisiana Crude: 63.0 Average of above: 57.0	Prudhoe Bay crude: 45.3 S. Louisiana crude: 54.7 Average of above: 50.0	Prudhoe Bay crude: 37.4 S. Louisiana crude: 63.4 Average of above: 50.4	Prudhoe Bay crude: 40 S. Louisiana crude: 105 Average of above: 73
Use in Salt Water?	Yes	Yes	Yes	Yes
Worker Safety (Level of Protection)	Level D	Level D	Level D	Level D
NCP Reported Toxicity of Dispersant Alone (LC-50, ppm) Note: a low value = high toxicity				
Inland silversides (96h)	13.5	25.2	14.6	3.5
Mysid shrimp (48h)	78.9	32.2	24.1	16.6



	BioDispers	Corexit® EC9500A	Corexit® EC9527A	Dispersit SPC 1000™
NCP Reported Toxicity of Dispersant & No. 2 Fuel Oil (1:10 ratio) (LC-50, ppm) Note: a low value = high toxicity				
Inland silversides (96h)	5.95	2.61	4.49	7.90
Mysid shrimp (48h)	2.66	3.40	6.60	8.20
Solubility in Water	Soluble	Soluble in fresh water; dispersible in sea water	Soluble	Soluble
Application Assistance Information*	PetroBiotech LLC PO Box 813 Newport, NH 03773 203-966-4573 Mr. Frances Sullivan	Nalco Energy Services LP Sugar Land, TX (281) 263-7336 kaventer@nalco.com Kathryn Venter	Nalco Energy Services LP Sugar Land, TX (281) 263-7336 kaventer@nalco.com Kathryn Venter	U.S. Polychemical Corp. Chestnut Ridge, NY 845-356-5530 800-431-2072 bruceg@uspoly.com Bruce Gebhardt

NP = Information Not Provided

* For additional technical assistance on product application, contact the supplier listed on the NCP Product Schedule Notebook.

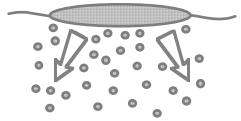
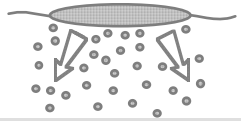


Table 5 Continued.

	Finasol OSR 52	JD-109	JD-2000	Mare Clean 200
Dispersant Type	Surfactants and solvents	NP	NP	Concentrate; solvents are paraffinic hydrocarbons
Availability	ATOFINA Chemicals, Inc. Philadelphia, PA 800-248-2322	GlobeMark Resources Ltd. 254-231-2251 800-890-2396 joannie@globemarkresources.com	GlobeMark Resources Ltd. 254-231-2251 800-890-2396 joannie@globemarkresources.com	Klinview Corporation Irvine, CA 949-753-0821 T. Tanaka Recommended to be used without dilution
Application Rate	26 gal. per ton; 1:5 or 1:50 ratio of dispersant to oil	Apply at 2-10 gal per acre; or dispersant to oil ratio of 1:50 to 1:10	Apply at 2-10 gal per acre; or dispersant:oil ratio of 1:50 to 1:10 at a 5-10% dilution rate	Apply a dispersant:oil ratio of 1:5 (53-66 gal per ton of oil)
Application Method	Undiluted (neat) from boat or aircraft sprayers as coarse droplets	Spray neat as droplets	Spray neat (or diluted with 5-10% water as needed) as droplets	Spray neat as droplets
Temperature Limitations	Above -20 ºC	32º-120ºF	Above 30ºF	Above 21°F
EPA Dispersant Effectiveness Test (%) – Swirling Flask	Prudhoe Bay crude: 32.5 S. Louisiana crude: 71.6 Average of above: 52.1	Prudhoe Bay crude: 26.0 S. Louisiana crude: 91.0 Average of above: 58.5	Prudhoe Bay crude: 60.4 S. Louisiana crude: 77.8 Average of above: 69.1	Prudhoe Bay crude: 63.97 S. Louisiana crude: 84.1 Average of above: 74.1
Use in Salt Water?	Yes	Yes	Yes	Yes
Worker Safety (Level of Protection)	Level D	Level C	Level C	Level D
NCP Reported Toxicity of Dispersant Alone (LC-50, ppm) Note: a low value = high toxicity				
Inland silversides (96h)	11.66	1.9	407.0	1,996.0
Mysid shrimp (48h)	9.37	1.2	90.5	938.0



	Finasol OSR 52	JD-109	JD-2000	Mare Clean 200
NCP Reported Toxicity of Dispersant & No. 2 Fuel Oil (1:10 ratio) (LC-50, ppm) Note: a low value = high toxicity				
Inland silversides (96h)	5.40	3.84	3.59	42.00
Mysid shrimp (48h)	2.37	3.51	2.19	9.84
Solubility in Water	Dispersible; not soluble in sea water.	Soluble; miscible in oil, water, and solvents	Dispersible in fresh and salt water	Not applicable;
Application Assistance Information*	ATOFINA Chemicals Inc. 2000 Market Street. Philadelphia, PA 19103 Phone: (800) 248-2322	GlobeMark Resources Ltd. Houston, TX 254-231-2251 800-890-2396 joannie@globemarkresources.com – Joannie Docter 937-643-1796	GlobeMark Resources Ltd. Houston, TX 254-231-2251 800-890-2396 joannie@globemarkresources.com – Joannie Docter 937-643-1796	Klinview Corporation 8001 Irvine Center Dr.; Suite 450, Irvine, CA 92618 949-753-0821 Mr. T. Tanaka

NP = Information Not Provided

* For additional technical assistance on product application, contact the supplier listed on the NCP Product Schedule Notebook.

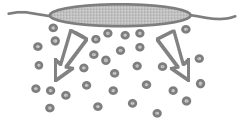
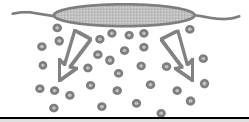


Table 5 Continued.

	Neos AB 3000	Nokomis 3-AA	Nokomis 3F4	Saf-Ron Gold
Dispersant Type	Concentrate; solvents are paraffinic hydrocarbons	Water-based Dispersant; solvents are propylene glycol and water	NP	NP pH – 8.8 Specific Gravity @ 60°F = 1.014
Availability	NEOS Company Ltd. JAPAN 81-78-331-9384 T. Ishii - Manager	Mar-Len Supply, Inc. Hayward, CA 510-782-3555 Frank Winter	Mar-Len Supply, Inc Hayward, CA 510-782-3555 Frank Winter	Saf-Ron International, Inc. Houston, TX 877-853-2947 800-347-8950 Bruce Richards Customer.service@saf-ron.com www.saf-ron.com
Application Rate	Apply a dispersant:oil ratio of 1:4 to 1:2.4 (65-125 gal per ton of oil)	Apply a dispersant:water ratio of full strength to up to 1:30; oil dependent	Apply a dispersant:water ratio of up to 1:30	1:50 to 1:10 application rate; for lighter oils can be diluted at 1:20 to 1:100. Recommended dilution rate for most oils is 1:40
Application Method	Spray neat as droplets	Can be applied as a neat or water-diluted spray	Spray neat on crude or heavy oils; can be diluted for lighter oils.	Can be applied as a neat or water-diluted spray
Temperature Limitations	Above 32°F	Above 32°F	Above 32°F	Above 32°F
EPA Dispersant Effectiveness Test (%) – Swirling Flask	Prudhoe Bay crude: 19.7 S. Louisiana crude: 89.8 Average of above: 54.8	Prudhoe Bay Crude: 63.2 S. Louisiana Crude: 65.7 Average of above: 64.5	Prudhoe Bay Crude: 62.2 S. Louisiana Crude: 64.9 Average of above: 63.6	Prudhoe Bay Crude: 84.8 S. Louisiana Crude: 53.8 Average of above: 69.3
Use in Salt Water?	Yes	Yes	Yes	Yes
Worker Safety (Level of Protection)	Level D	Level D	Level D	Level D



	Neos AB 3000	Nokomis 3-AA	Nokomis 3F4	Saf-Ron Gold
NCP Reported Toxicity of Dispersant Alone (LC-50, ppm) Note: a low value = high toxicity				
Inland silversides (96h)	91.1	34.2	29.8	29.4
Mysid shrimp (48h)	33.0	20.2	32.2	63.0
NCP Reported Toxicity of Dispersant & No. 2 Fuel Oil (1:10 ratio) (LC-50, ppm) Note: a low value = high toxicity				
Inland silversides (96h)	57.00	7.0	100.0	9.3
Mysid shrimp (48h)	25.00	5.56	58.40	3.0
Solubility in Water	Not applicable; For use in Salt water	Soluble in water Specific gravity of 1.031 at 60°F (neat) pH = 9.0 (neat)	Soluble	Soluble
Application Assistance Information*	NEOS Company, Ltd. Kobe JAPAN (81) 078-331-9384 T. Ishii	Mar-Len Supply, Inc Hayward, CA 510-782-3555 Frank Winter	Mar-Len Supply, Inc Hayward, CA 510-782-3555 Frank Winter	Sustainable Environmental Technologies, Inc. PO Box 30516 Mesa, AZ 85275 877-853-2947 Bruce Richards www.saf-ron.com

NP = Information Not Provided

* For additional technical assistance on product application, contact the supplier listed on the NCP Product Schedule Notebook.

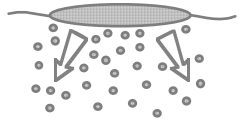
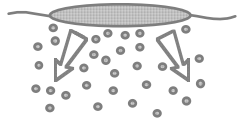


Table 5 Continued.

	Sea Brat #4	ZI-400 Oil
Dispersant Type	Surfactants with propylene glycol solvent	
Availability	Garner Environmental Services LaMarque, TX 800-935-0308 Jack Campbell	Z.I Chemicals Studio City, CA 818-770-6225 sales@zichemicals.com www.zichemicals.com Barnaby Zelman
Application Rate	5% to 10% solution	Heavy oils – 1:1 to 1:10 dilution ratio; Lighter oils – 1:10 to 1:30; agitation may be required for waters warmer than 78 F
Application Method	Recommended application is spray of the diluted solution by aircraft, fireboat monitors or similar apparatus	Recommended application is spray neat or diluted by aircraft, fireboat monitors or similar apparatus; for small spills, drum pump with sprayer can be used
Temperature Limitations	No known restrictions	No limitations – optimum usage is above 35 F.
EPA Dispersant Effectiveness Test (%) – Swirling Flask	Prudhoe Bay Crude: 53.55 S. Louisiana Crude: 60.65 Average of above: 57.10	Prudhoe Bay Crude: 50.1 S. Louisiana Crude: 89.8 Average of above: 69.9
Use in Salt Water?	Yes	Yes
Worker Safety (Level of Protection)	Level D	Level D



	Sea Brat #4	ZI-400 Oil
NCP Reported Toxicity of Dispersant Alone (LC-50, ppm) Note: a low value = high toxicity		
Inland silversides (96h)	30.0	31.8
Mysid shrimp (48h)	14.0	20.9
NCP Reported Toxicity of Dispersant & No. 2 Fuel Oil (1:10 ratio) (LC-50, ppm) Note: a low value = high toxicity		
Inland silversides (96h)	23.00	8.35
Mysid shrimp (48h)	18.00	1.77
Solubility in Water	Soluble	Miscible in oil, water and solvents
Application Assistance Information*	Alabaster Corporation 6921 Olson Pasadena, TX 77505 800-609-2728 Charles Sheffield	Z.I. Chemicals Studio City, CA 818-770-6225 Email: sales@zichemicals.com www.zichemicals.com Barnaby Zelman

NP = Information Not Provided

* For additional technical assistance on product application, contact the supplier listed on the NCP Product Schedule Notebook.

ELASTICITY MODIFIERS

(These Products are listed under Miscellaneous on the NCP Product Schedule)

Mechanism of Action

- Elasticity modifiers increase the viscoelasticity of the treated oil to improve the efficiency of removal by skimmers or other methods.
- They are composed of long-chained, oil-soluble organic polymers, such as polyisobutylene (a chewing gum additive).
- They dissolve in the oil, modifying the oil's mechanical properties.

When to Consider Using

- Elasticity modifiers are more effective on light oil products, significantly increasing the skimming rate and reducing the amount of water collected.
- They should always be applied to contained slicks, so that the treated oil is immediately recovered.
- They are ideal for thin slicks of No. 2 fuel oil or diesel that are very difficult to recover with mechanical equipment or sorbents.
- Not suitable for vegetated habitats or where there is extensive debris mixed in the oil.
- Should not be used in areas where birds or other wildlife cannot be kept away from the treated oil.

Authority Required

- **Incident-specific RRT approval is required**. There is one commercially available elasticity modifier, Elastol (a.k.a., Liquid Elastol), on the National Product Schedule (**Table 6**). Elastol Powder is not on the National Product Schedule and cannot be used in the environment.

Availability

- Elastol is available from various suppliers.

General Application Requirements

- Elastol is sprayed at recommended application rates as follows: 1 gal of Elastol treats 13 gal of gasoline; 34 gal of diesel; 84 gal of medium oil; 150 gal of heavy oil.
- Water spray provides the energy required to mix the product into the oil. Water spray can be used to herd the treated oil towards the skimmer with minimal dispersion into the water column.
- Warm temperatures, wind, and wave action reduce the time for Elastol to dissolve in the oil.

- Special types of skimmers may be required; drum skimmers reportedly work best. Consult the manufacturer for additional information on recovery requirements.
- Do not over apply product, which makes the oil very sticky and more difficult to recover.
- Treat heavy, weathered oils carefully since dissolving time is greatly increased and there is a risk of over application.
- Controlling the quantity of material applied to an oil slick is often very difficult. Thus, the potential to make the oil sticky and even more difficult to recover will be high, as will be the waste of product.
- Treated oil should be stored in wide-mouth containers, and not in bladders or containers with narrow openings where getting the treated oil out can be difficult.
- Use only where the treated oil can be contained and recovered; treated oil can be very sticky and is more likely to adhere to fur, feathers, vegetation, and dry shorelines (though less likely to adhere to wetted shorelines).

Health and Safety Issues

- All products require Level D personal protection with splash protection.

Limiting Factors/Best Management Practices

- Water salinity has no impact on effectiveness.
- Low water/air temperatures make heavy oils more viscous and mixing of the product into the oil more difficult.
- Elastol is insoluble in water and requires relatively low application rates.
- Main environmental concern is for unrecovered, treated oil, which may be more persistent; thus, all treated product is to be recovered, to the extent practicable.
- Treated oil can be very sticky and is more likely to adhere to fur, feathers, vegetation, and dry shorelines (though less likely to adhere to wetted shorelines).
- Not approved for use on wildlife.

Monitoring Requirements/Suggestions

- None generally required other than good practice.
- Make sure that the product is not over-applied.

Waste Generation and Disposal Issues

- Recovered, treated oil can be recycled.
- Since less water is picked up by skimmers, product use should reduce the amount of oily liquids generated.

- The recovered oil can be recycled for use; the product does not affect it.
- The viscoelastic properties of the treated oil can be broken by passing the oil through a shear pump. Also, dilution with untreated oil will render it non-viscoelastic.

References

Michel, J., C.B. Henry, and J.M. Barnhill. 1993. Use of Elastol during the Unocal spill on the Neches River, 24 April 1993. Prepared for Regional Response Team VI, NOAA, Seattle, WA. 10 pp.

Table 6. Characteristics of Elasticity Modifiers Agents Listed on the NCP Product Schedule (as of June 2009).

	Elastol
General Description	Liquid concentrate
Availability	Design Engineering Systems Analysis Alexandria, VA Phone: (703) 461-3912 E-mail: escambos@actionadditivesinc.com Ernest Scambos
Application Rate	Dilution rate of agent:oil varies from 1:50 to 1:200. (.01% to .15% application rate); 1 gal Elastol for 34 gal of diesel to 150 gal of heavy oil
Application Method	Add to oil surface; induct into water spray system
Temperature Limitations	> 0ºF
Use in Fresh Water?	Yes
Use in Salt Water?	Yes
Worker Safety (Level of Protection)	Level D with splash protection
Toxicity (LC-50, ppm) **Note: a low value = high toxicity**	Values derived from using concentrated product (no dilution)
Inland silversides (96 h)	1,333.0
Mysid shrimp (48h)	94.0
Solubility in Water	Insoluble
Is Treated Oil Recoverable?	Yes
Other Information	Most effective with fresher oils; when applied early, can reduce emulsification Waste oil can be treated and recycled Requires special storage system for the treated oils
Application Assistance Information*	Action Additives P.O. Box 293 Alexandria, VA 22313 Phone: (703) 4613912 E-mail: escambos@actionadditivesinc.com Ernest Scambos

* For additional technical assistance on product application, contact the supplier listed on the NCP Product Schedule Notebook.

EMULSION TREATING AGENTS

(These Products would be listed under Miscellaneous on the NCP Product Schedule)

Mechanism of Action

- Used to:
  - prevent the formation of an emulsion (emulsion inhibitors); or
  - break the emulsion into separate oil and water phases (emulsion breakers).
- Also known as demulsifiers.
- Most are composed of water-soluble surfactants that modify the properties of the oil/water interface, by displacing, mixing with, or chemically neutralizing the naturally occurring emulsifying surfactants in the oil, thus inhibiting or destabilizing the emulsion.
- Definition: Water-in-oil emulsions (e.g., mousse) can contain 20-80% water, increasing the volume of oily material by up to a factor of four; can increase the oil viscosity by many orders of magnitude, greatly reducing effectiveness of skimmers and pumps.

When to Consider Using: Emulsion Inhibitors

- To prevent emulsification of oil on the water surface:
- To increase the window of opportunity for other response options, such as dispersants or in-situ burning. Used in field trials in the North Sea in conjunction with dispersants.
- For oils known to form stable emulsions, use to:
  - prevent an increase in the volume of oily material to be recovered,
  - prevent formation of viscous oils that are difficult to pump, and/or
  - increase the recovery rate of skimmers.

When to Consider Using: Emulsion Breakers

- To break emulsions:
- To increase the effectiveness of other response options such as dispersants or in-situ burning. Lab tests showed that treatment with emulsion breakers allowed successful burning of otherwise unignitable emulsions.
- To reduce the volume of oil that must be stored during skimming operations.
- In containers, use to separate water from the oil, so it can be discharged, allowing more effective storage and transport, particularly for on-water systems. A high recovery skimmer can exceed its onboard storage in hours.

Authority Required

- **Incident-specific RRT approval is required** to use emulsion treating agents in the open environment or in closed containers where the separated water is discharged back into the environment without treatment.
- **Incident-specific RRT approval is NOT required** if applied in closed containers and if the separated water is sent to a treatment facility (e.g., wastewater treatment plant).

CAUTION: Contact treatment facility prior to product use. Advise that a treating agent has been added to the separation tank and determine if any addition permits or testing is warranted.

- **NOTE**: As of June 2009, there is only one product listed on the NCP Product Schedule (Zyme-Flow; under Miscellaneous Oil Spill Control Agents) that meets the definition of an emulsion treating agent for this Selection Guide. Refer to **Table 7**.

Availability

- Readily available from many commercial vendors; a mature product for the oil production industry; however, there are no products designed for direct application to surface slick in the NCP Product schedule.
- Developing technology for open-water application; needs more research before use during spill emergencies is viable.
- Potential benefits can be significant when on-scene storage of oily liquids is limited.

General Application Requirements:

- For treating open water slicks:
  - Use systems similar to dispersants (aerial, vessel, hand-held spraying systems), but have lower application rates (100-2,000 ppm). Higher rates are for breaking emulsions; lower rates are for inhibiting emulsification.
  - Like dispersants, some mixing energy, either by wave action or mechanical action, is needed. For emulsion breakers, separation time should be within 1-2 hours.
  - Separation distances from sensitive areas (such as coral reefs) and rafting birds should be specified. Additionally, spraying over marine mammals and sea turtles should also be avoided.
- For treating recovered water from skimming systems, during recovery, the product should be injected as soon as possible into the recovery system containment to minimize water-in-oil emulsions and increase separation to increase decanting effectiveness. When used in decanting systems, the water discharge location should provide rapid dilution.

- Most US regions have guidance for disposal of contact water. Check with your incident-specific Regional Response Team to verify the use of Emulsion treating agents in this fashion.
- Effective in all non-frozen waters with greater efficacy as the temperature increases.

Health and Safety Concerns

- Most products would require Level D personal protection, and a respirator when working with a product in confined spaces (e.g., filling spray systems on aircraft).

Limiting Factors/Best Management Practices

- Not possible to predict the most effective product for each emulsion, but there are standard tests to measure a product's effectiveness for specific emulsions.
- For treatment in decanting systems, the emulsion treating agent will end up in the decanted water. In lab tests, if the water content exceeded 55%, the effectiveness of the ET agent is reduced.
- Emulsion breaking increased with mixing energy, flow rate, and length of flow path.
- The use of emulsifier increased the TPH content of the decanted water in meso scale test; removal of the water from the recovered product will increase the likelihood that the oil could be recycled.
- In field trials of open-water application, treated slicks spread over larger areas and more readily dispersed into the water below.
- Over time (at a rate which is unknown), anionic products will leach out of the oil and an emulsion can form (or re-form). The rate of leaching is higher in fresh water.
- Very few products have toxicity data available, making it difficult to evaluate products for their potential impacts.
- May enhance solubility of oil in the separated water relative to conventional recovery approaches. The presence of dispersed oil and greater solubility of the aromatic compounds could produce discharge water more toxic than that normally generated during gravity separation. Thus, separated water may have to be treated before discharge under certain conditions.
- Not approved for use on wildlife.
- Use is cautioned when in proximity to water treatment plants.

Monitoring Requirements/Suggestions

- Since there is little spill-related experience in the US, monitoring should be conducted to document product effectiveness and effects.

Waste Generation and Disposal Issues

- Use of emulsion treating agents would reduce the amount of oily material generated for handling, transport, and disposal. In containers, separated water would likely have to be tested and/or treated prior to discharge in accordance with applicable state requirements.

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Table 7. Characteristics of Emulsion Treating Agents Listed on the NCP Product Schedule (as of June 2009).

	Zyme-Flow
General Description	Concentrate; contains surface active agents; designed to make heavy crudes pumpable and to break adhesion between oil and soil, rock, or sand
Availability	United Laboratories, Inc. St. Charles, IL 630-377-0900 800-323-2594 Nancy Sherrel - N.sherrel@unitedlabsinc.com
Application Rate	Dilution rate of emulsion treating agent:oil varies from 1:50 to 1:200
Application Method	Pressure spray or soak with agitation to break the emulsion
Temperature Limitations	0ºF Not effective in ice
Use in Fresh Water?	Yes
Use in Salt Water?	Yes
Worker Safety (Level of Protection)	Level D
NCP Reported Toxicity of Emulsion Treating Agent Alone (LC-50, ppm) Note: a low value = high toxicity	
Inland silversides (96 h)	35.0
Mysid shrimp (48h)	26.0
NCP Reported Toxicity of Emulsion Treating Agent & No. 2 Fuel Oil (1:10 ratio) (LC-50, ppm) Note: a low value = high toxicity	
Inland silversides (96 h)	8.7
Mysid shrimp (48h)	1.6
Solubility in Water	Soluble
Is Treated Oil Recoverable?	Yes
Other Information	Effective in all non-frozen waters; salinity not a factor; will not emulsify oil; separated water can be collected and reused Primarily used for cleaning of oil process equipment pH: 7.0 to 8.0
Application Assistance Information*	United Laboratories, Inc. St. Charles, IL 630-377-0900 800-323-2594 Nancy Sherrel - N.sherrel@unitedlabsinc.com

* For additional technical assistance on product application, contact the supplier listed on the NCP Product Schedule Notebook.

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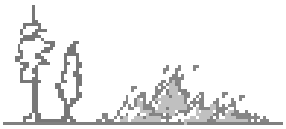


IN-SITU BURNING ON LAND

Description

- This guidance covers use of in-situ burning of oil on land, including wetlands. The objective is to remove free oil and oily debris from the substrate by burning the oil in place.
- This section does NOT address disposal issues by incineration.

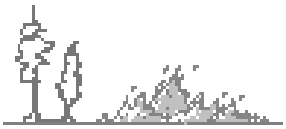
When to Consider Using

Consider in-situ burning under these conditions:

- It is necessary to quickly remove spilled oil to prevent its spread to or impact to sensitive sites or over larger areas.
- Options for transportation and disposal (temporary and/or permanent) of oily wastes are limited, so the amount of wastes generated must be reduced.
- Access to the site is limited by shallow water, soft substrates, thick vegetation, or the remoteness of the location, making it difficult to get cleanup crews and equipment on scene.
- As a final removal technique, when other methods begin to lose effectiveness or become too intrusive.

Favorable conditions include:

- Remote or sparsely populated site.
- Light winds (so the smoke plume rises high into the air and for better fire control).
- Fresh crudes, unemulsified oil (less than 15-20% water), or light/intermediate refined products that burn more readily and efficiently.
- Mostly herbaceous (grassy) vegetation, though some shrubs and trees are fire tolerant.
- Vegetation not in the growing season.
- Unvegetated areas, such as dirt roads, ditches, dry streambeds, idle cropland.
- In wetlands, when there is a water layer covering the substrate (prevents thermal damage to soil and roots, and keeps oil from penetrating substrate). However, a water layer is not mandatory, at a minimum, the soils should be water saturated.
- Snow and ice that provides natural containment and substrate protection.



Authority Required

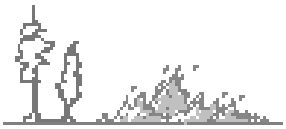
- For inland burns, approval from the appropriate state agencies (including the agency regulating air quality) is required. For inland burns that do not affect navigable waters, approval process may vary by region/state.
- For inland burns with a burn agent being used that may affect navigable waters, RRT approval is required.
- **Incident-specific RRT approval is not required unless a burning agent (**additives that, through physical or chemical means, improve the combustibility of the materials to which they are applied.) is used. However, Trustee notification is strongly recommended, and may be required by the RRT. Verify the notification requirements from your regional contingency planning documents.
- A burn plan should address health and safety issues, burn methods, monitoring plans, and post-burn cleanup and restoration. Use the ISB Evaluation & Response Checklist included in Volume II of this Selection Guide.

General Application Requirements

- Notify local fire and police departments prior to the burn and secure the site. Must have concurrence with local public safety official.
- Areas outside of the planned burn area are wetted down or protected with a firebreak, if needed.
- The free oil and/or oiled combustible materials (vegetation, logs, debris) are ignited. A common accelerant used in prescribed burns is a 70/30 mix of diesel and gasoline, though flame or drip torches, flares, lighters, blowtorches, and hay have been used at oil spills.
- After the initial burn, it may be necessary to re-ignite any remaining oil, extinguish hot spots, or remove burn residues.
- Many regional contingency planning documents and protocols have been developed for ISB on land; verify the notification requirements from your regional contingency planning documents.

Health and Safety Issues

- Make human health and safety of responders and potentially affected populations of primary concern.
- Site conditions (particularly wind speed and direction) will determine whether the smoke plume poses a threat to the public, thus each spill has be evaluated on a case-by-case basis.
- Have a plan for extinguishing the fire. The local fire department may not have the resources to standby, so have specific resources identified.



Limiting Factors/Best Management Practices

- Heavy, weathered, or emulsified oils may not ignite, even with accelerants.
- A crust or residue is often left behind after burning and may need to be broken up or removed, to speed revegetation.
- Prolonged flooding of a burned wetland may kill burned plants if they are completely submerged.
- Erosion may be a problem in burned areas if plant cover is reduced; short-term erosion control measures may be needed.
- The site may need protection from overgrazing, especially since herbivores may be attracted to new growth at burned sites.
- Fire ecologists and practitioners can provide valuable knowledge and experience on the appropriateness of burning oil in different habitats.

Monitoring Requirements/Suggestions

- Since there is very poor documentation on the effectiveness and effects of burning oil on land, monitoring of any burn site is very important.
- Air quality monitoring may be required at the edges of populated areas. USCG and USEPA both have teams with expertise and equipment to provide air monitoring. Follow the SMART (Specialized Monitoring of Applied Response Technologies) plan provided in Volume II of this Selection Guide.
- Describe and photograph the burn site before and after the burn, record detailed information on the burn including oil volume and thickness, area covered by the oil, burn duration, residue type and volume, water depth before/after the burn, visible impacts, post-burn activities (e.g., residue removal methods), restoration efforts and results, etc.

Waste Generation and Disposal Issues

- In-situ burning should significantly reduce the amount of oily wastes generated.

References

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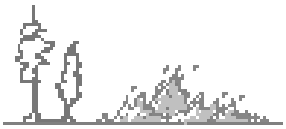

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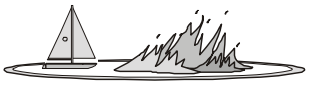


IN-SITU BURNING ON INLAND WATERS

Description

- To remove oil from the water surface by burning the oil in place.
- This section does NOT address disposal issues by incineration.

When to Consider Using

Consider in-situ burning under these conditions:

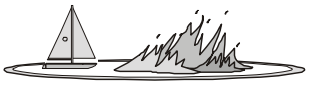
- To quickly remove oil to prevent its spread to sensitive sites or over large areas. Removal rates of 50,000 gal/hour can be achieved for a burn area of 10,000 ft^2; under prime conditions, removal efficiencies can exceed 90%.
- When oil recovery is limited by available oil storage and handling capabilities.
- To reduce the generation of oily wastes, especially where transportation or disposal options are limited.
- Where access to the site is limited by shallow water, ice, or the remoteness of the location.

Authority Required

- Approval from the appropriate state agencies (including the agency regulating air quality) is required. Approval process may vary by region/state. Consult with RRT for approval guidance.
- **Incident-specific RRT approval is not required unless a burning agent (**additives that, through physical or chemical means, improve the combustibility of the materials to which they are applied.) **is used**. However, Trustee notification is strongly recommended and may be required by the RRT. Verify the notification requirements from your regional contingency planning documents.
- A burn plan is required and should address health and safety issues, burn methods, monitoring plans, and post-burn cleanup and restoration. Use the ISB Evaluation & Response Checklist included in Volume II of this Selection Guide.

General Application Requirements

- Notify local fire and police departments prior to the burn, and secure the site.
- Burning oil generates large volumes of black smoke, so consider using radio broadcasts to notify the public and broadcast to mariners of a safety zone in navigable waters.
- The oil slick must be thick enough to ignite and sustain the burn.
- Ignition source can range from a simple match or lighter, to road flares and drip torches, to a “Helitorch.”



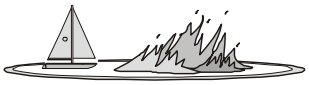
- The oil must be heated to a temperature at which the oil will be vaporized and support combustion in the air above the slick (the hydrocarbons vapors burn, not the liquid itself).
- Accelerants include:
  - gelled gasoline, which is commonly used for aerial ignition;
  - sodium and gasoline, solid propellants (rocket fuels)
  - hand-deployed igniters include rags, paper, sorbents, or drip torches with a 70/30 mix of diesel and gasoline.
- Once 1 m^2 of burning slick has been established, ignition can be considered accomplished.

Health and Safety Issues

- Make human health and safety of responders and potentially affected populations of primary concern.
- Site conditions (particularly wind speed and direction) will determine whether the smoke plume poses a threat to the public, thus each spill must be evaluated on a case-by-case basis.
- Have a plan for extinguishing the fire. For slicks contained in booms, the burn can be terminated by releasing the boom and allowing the oil to spread to less than the minimum thickness.

Limiting Factors/Best Management Practices

- Oil thickness: Minimum ignitable thickness for fresh, volatile, crude oil is 1 mm; for aged, unemulsified crude oil and diesel fuels, 2-3 mm; for residual fuel oils, about 10 mm. Oil must be contained, either naturally, such as by ice, or by booms.
- Maximum wind speed: About 20 knots (10-12 m/s); seas should not exceed 3 ft. Consideration should be made as to the direction of the smoke plume and its proximity to populated areas.
- Effect of emulsification: Little effect on up to 12% water; notable decrease between 12-25% water; and 0% burn efficiency for stable emulsified weathered oil with >25% water, based on lab tests. Will vary with the stability of the emulsion.
- Good visibility: Essential. Burns should be conducted during daylight hours and under VFR conditions so the burn can be observed from aircraft.
- Consult with state and federal resource managers: Need to determine if there are any biological resources of concern in the area, or special constraints.
- Recovery of burn residue: Can form a semi-solid, tar-like layer and may need to be recovered. The burn plan should include methods for residue recovery, as needed. Rules of thumb for residue thickness:
  - Crude oil up to 10-20 mm, residue thickness is 1 mm.
  - Thicker crude slicks generate thicker residues; emulsified slicks are much greater.



  - For light and middle distillate fuels, residue thickness is 1 mm, regardless of slick thickness.

- Sinking burn residue: The burn residue from crude oil burns may sink. Recent studies have predicted that about half of international crude oils would tend to sink in seawater, but only after cooling. A higher percentage of oils would tend to sink in freshwater.
  - It may be possible to collect the burn residues while they are still hot and buoyant. Nets deployed under the burn area might allow capture of sinking residues.
- Recovery of sunken burn residue: It may be necessary to recover sunken burn residue from the bottom, if the amounts are significant and site conditions conducive.

Monitoring Requirements/Suggestions

- Air quality monitoring may be required at the edges of populated areas. USCG and USEPA both have teams with expertise and equipment to provide air monitoring. Follow the SMART (Special Monitoring of Applied Response Technologies) plan contained in Volume II of this Selection Guide.
- The NRT recommends, as an air quality guideline, an upper limit of 150 micrograms of PM-10 per m^3 of air, averaged over 1 hour.

Waste Generation and Disposal Issues

- In-situ burning should significantly reduce the amount of oily wastes generated.

References

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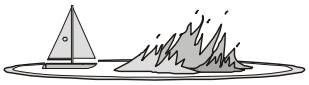

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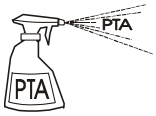


SHORELINE PRE-TREATMENT AGENTS

(Products in this Category would be listed under Miscellaneous on the NCP Product Schedule)

Mechanism of Action

- Shoreline Pre-treatment Agents are applied to the substrate prior to oil landfall to prevent oil from adhering to, or penetrating, the substrate.
- There are two subclasses of products:
  - Film-forming Agents: form a physical barrier that prevents the oil from adhering, staining, absorbing, and contaminating the shoreline, and
  - Wetting Agents: affect the oil/water interface and thus help the water displace the oil from the substrate.

When to Consider Using

- Oil is heading towards a sensitive shoreline resource (e.g., marsh, sheltered tidal flat) or a resource of historical/archaeological importance.
- Use of a specific product on vegetation, live substrates (e.g., oysters and peat sediments) would need to be carefully evaluated. If the product could be washed into shallow nearshore waters, the aquatic toxicity of the product would need to be considered, particularly if sensitive resources are present.

Authority Required

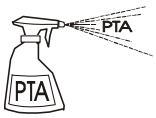
- **Incident-specific RRT approval is required**. **NOTE**: As of June 2009, there are no products listed for shoreline pre-treatment agents on the NCP Product Schedule.

Availability

- No products are currently available in the US.
- There is the potential use of Surface Washing Agents serving as shoreline pre-treatment agents. The use of a listed product in this manner is the decision of the incident-specific RRT.

General Application Requirements

- The characteristics of a shoreline pre-treatment agent include:
  - Product needs to be sprayed as a thin, even coating on the substrate;
  - Are readily available;
  - Dissolve or degrade in seawater;
  - Rapid drying time;
  - Low permeability to oil penetration;



  - Readily adhere to intertidal substrates (e.g., sand, gravel, bedrock); and
  - Not be wetted by oil.
- Application should minimize detrimental effects on vegetation and soft sediments from foot or vessel traffic, particularly if multiple applications are required.

- It should be noted that in a series of studies conducted in the 1970s with promising products, water was the most effective.

- Narrow window of opportunity for use. Timing of application is critical when using shoreline pre-treatment agents; products need to be applied to the oil/shoreline interface just prior to stranding of oil for effective use.
- Oil spill trajectory monitoring would have to be closely monitored.

Health and Safety Issues

- Refer to health and safety information from Surface Washing Agents when proposing to use a surface washing agent as a shoreline pre-treatment agent.

Limiting Factors/Best Management Practices

- Biodegradability of the product – product should degrade rapidly without toxic by-products.
- Not approved for use on wildlife.
- Products should have low contact toxicity as it is applied directly on the intertidal substrates.
- Products should have low application rates and low aqueous toxicity values so that impacts to intertidal and subtidal resources are minimal.
- Products used as a film could potentially smother intertidal biota by reducing oxygen levels.

Monitoring Requirements/Suggestions

- Make sure that the product is not over-applied.

Waste Generation and Disposal Issues

- Not an issue; product should rapidly degrade within the water column or on the substrate surface.

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SOLIDIFIERS

(Products in this Category are listed under Miscellaneous Oil Spill Control Agents on the NCP Product Schedule)

Mechanism of Action

- Solidifiers are products which, when mixed with oil, turn the oil into a rubber-like solid. Solidified oil can range from a firm, cohesive mass to a non-cohesive, granular material.
- Most products are dry, high molecular weight polymers that have a porous matrix and large oleophilic surface area. They bond with the oil liquid and do not allow the oil to be squeezed or leach out. There should be little change in the specific gravity of the treated oil.
- Products that are essentially sorbents are not included because they are considered to be mechanical countermeasures.

When to Consider Using

- On land, to immobilize the oil, to prevent further spread, or penetration into the substrate.
- In marinas and harbors where spills are mostly light refined products that quickly spread into sheens that are difficult to contain and recover
- In confined spaces, because solidification can eliminate the free product and thereby reduce the vapor pressure of volatile oils.
- To the perimeter of the oil, forming a solidified barrier to prevent further spreading, rather than treating the entire spill volume.
- Around drains, forming a solidified barrier to prevent oil runoff.

Authority Required

- **Many RRT's have developed pre-approval / pre-authorization guidelines for the use of Solidifiers;** verify the specific requirements which often include only the use of products on the product schedule from your regional contingency planning documents. This pre-authorization / pre-approval includes only those products on the NCP PS; specific guidelines and assumed that all product and treated oil will be recovered. Consultation with trustees is recommended.
- **NOTE**: As of June 2009, four products considered solidifiers as described in this Selection Guide are listed as Miscellaneous Oil Spill Control Agents on the NCP Product Schedule (**Table 8**); Imbiber Beads, Rubberizer, and Envirobond were designated as a sorbents (refer to Appendix E for more information), but their mechanism of action better aligns them with solidifiers; therefore, Imbiber Beads are included in this table. **Table 9** contains those products that were formerly listed on the NCP Product Schedule. EPA is working on a definition and standard effectiveness test for solidifiers as part of the revision to the NCP.

- **Appendix G** contains information on solidifier products that are not currently listed on the NCP Product Schedule.

General Application Requirements

- Solidifiers are available in various forms, including dry powder, granules, semisolid materials (e.g., pucks, cakes, balls, sponge designs), and contained in booms, pillows, pads, and socks.
- Granular products can be applied by hand or with a portable broadcast system to cover large areas. In recent tests, an all-fiber blower worked better than an air-blast pesticide sprayer and a hydro-seeder.
- On floating oil, mixing is usually needed, and can be done with a strong water spray.
- Booms, pillows, pads, and socks can be used like similar sorbent products.
- Free product application rates vary from 10-50 percent by weight of the liquid to be recovered. Controlling application rates can be difficult, and they are usually higher than specified because of overspray under field conditions.
- Solidification (cure time) can occur immediately or take up to 18 hours to form a firm, cohesive mass.
- Fine-grained powders solidify faster than granules because of the higher surface area of the product and the higher diffusion rate of the oil.
- For free product used on land, recovery is usually by manual pickup or sweeping, and is limited primarily by access. On water, the treated oil must be contained and recovered, using fish netting, wire screens, or hand tools (e.g., rakes, shovels).

Health and Safety Issues

- Workers spreading powdered solidifiers should wear appropriate respiratory protection to prevent inhalation of any product dust.

Limiting Factors/Best Management Practices

- Effectiveness is likely to decrease for emulsified, weathered, thick, or heavy oils because of the difficulty of mixing the product into viscous liquids.
- Water salinity does not have an effect on solidification. Low temperatures slow solidification, mostly by increasing the oil's viscosity.
- Most all products float even after interacting with oil. Under 40 CFR Subpart 300.910 - Authorization of Use, the use of sinking agents or products that will cause the oil to sink is prohibited. 40 CFR Subpart 300.900 is included in its entirety as **Appendix D** in this Volume.

CAUTION: Reject any products that could cause the oil to sink, such as clays.

- When waves are present, formation of small clumps and not one large mass are likely.
- Solidifiers have relatively low toxicity, and many products are considered to be non-toxic. However, there may be concern about the persistence and ingestion risk of unreacted product, since in the field, overspray on water is likely. Thus, applications should be done in controllable areas.
- Like sorbents, the use of solidifiers requires access to deploy, and then recover the product. The potential for physical disturbance of habitats, as well as smothering by excess loose product, should be considered.
- Treated oil is expected to weather more slowly, compared to untreated oil, thus it may be more persistent.
- Use of solidifiers may impair the operation of conventional recovery and storage equipment.

Monitoring Requirements/Suggestions

- None generally required other than good practice.

Waste Generation and Disposal Issues

- Most products pick up oil with minimal increase in volume.
- Most solidifiers are not reversible, so the solid material has to be stored and properly disposed of. Though producers may state that the solidified material can pass leachate tests (and thus be disposed of in non-hazardous landfills), each case will have to be tested.
- Disposal options for large volumes would include use as a fuel source in cement kilns, incinerators, etc. These options would require time for testing and permitting.

References

Michel, J., B. Benggio, and P. Keane. 2008. Pre-authorization for the use of solidifiers: Results and lessons learned. Proc. 2008 International Oil Spill Conference, American Petroleum Institute, Washington, D.C.

NRT. 2007. NRC-RRT Factsheet Application of Sorbents and Solidifiers for Oil Spills.

PERF, 1994. Solidifiers for Oil Spill Response: Phase 1: Solidifier Materials and Effects on Oil. Petroleum Environmental Research Forum (PERF) Project No. 92-16.

PERF, 1996. Oil Spill Solidifiers for Upstream/Downstream Land Application. Petroleum Environmental Research Forum (PERF) Project No. 94-14.

Table 8. Characteristics of Solidifier Products on the NCP Product Schedule (as of June 2009).

	Alsocup	CIAgent	Enviro-Bond 403	Rubberizer
General Description	Granular material	White, odorless powder; block co-polymers	Granular material; block co-polymer	Granular material; mixture of hydro-carbon polymers
Listed in US on NCP Product Schedule?	Yes; Miscellaneous Oil Spill Control Agent	Yes; Miscellaneous Oil Spill Control Agent	No; Received Sorbent Letter From EPA	No; Received Sorbent Letter From EPA
Availability within 48 h	Stockpiles of 2,000 lbs in Chino, CA and 58,000 lbs in Ohio	50,000 lb in 72 hrs 20,000 lb in 48 hr 10,000 lb stockpile in Louisville 20,000 lb in Detroit	45,000 lb. NE 40,000 lb. SE 65,000 lb. Central 80,000 lb. SW 30,000 lb. W	10,000 lb stockpile, San Diego, CA and Houston, TX
Application Rate, % by weight of product to oil (per manufacturer)	10	10-30	14-25	18
Application Rate (PERF tests)	Not tested	diesel: 39 medium crude: 35 Bunker C: 36	diesel: 35 medium crude: 37 Bunker C: 38	diesel: 35 medium crude: 47 Bunker C: 50
PERF Test Comments	NP	Product formed a firm pancake with gasoline, diesel, and Arab medium and Alaska North Slope crudes. With Bunker C and Maya crude, the material solidified but remained sticky	Formed a firm pancake with gasoline and Maya crude. Other oils solidified, but remained either sticky or gummy.	Product solidified all oil types. With gasoline, the pancake was firm; with diesel, it was firm but fell apart when lifted. Crude oils and bunker C solidified but did not form a cohesive mass
Cure Time	Gasoline/Diesel – instantaneous; oil or hydraulic fluids will solidify to form a jell with the consistency of cottage cheese that will break apart when disturbed. Can be removed with a pump.	Gasoline/Diesel-instantaneous; Oil/Hydraulic Fluids-1-2 minutes up to 1 hour	5 minutes	20 minutes

	Alsocup	CIAgent	Enviro-Bond 403	Rubberizer
Solidification Process (from PERF report)	Chemical bond with oil; oil cannot leach once bound with Alsocup	Oil is absorbed into the interior of the particle where a chemical reaction takes place	Chemical bond with oil by cross linking polymers. No heat reaction	Solidification is by a physical bond
Use in Fresh Water?	Yes	Yes	Yes	Yes
Use in Salt Water?	Yes	Yes	Yes	Yes
Can the Oil be Returned to a Liquid	No	No	No	No
Disposal/Recycling Issues	Jelled mass may be recycled for use in rubber products	Can be disposed of in sanitary landfills in most cases	Can be disposed of in sanitary landfills or used as co-generation, or incineration	NP
Menidia beryllina (96-hr)	>100.0	2,227.0	**Toxicity (LC-50, ppm) (Outside Testing)** **Note: a low value = high toxicity**	NP
Mysidopsis bahia (48-hr)	>100.0	2,617.0	NP	NP
Menidia beryllina (96-hr)	14.0	5.93	100,000 (48h)	Insoluble
Mysidopsis bahia (48-hr)	10.0	1.73	Insoluble	Web site: www.rubberizer.com/
Solubility in water	Insoluble	Insoluble	Web site: www.enviro-bond.com	**(800) 542-3036** Local: (858) 274-4585 Fax: (858) 274-4589 E-Mail: info@rubberizer.com
Other Information	Does not absorb water; agitation (manual or wave action) is necessary	See website: www.ciagent.com	On site management: 231-258-0400	

	Alsocup	CIAgent	Enviro-Bond 403	Rubberizer
Application Assistance Information*	REVCOM Associates Corona, CA 951-737-0104 Email: revcom@sbcglobal.net Dave Naylor	C.I Agent Solutions LLC Louisville, KY 502-267-0101 800-255-6073 Dan Parker		

NP = Not provided

- For additional technical assistance on product application, contact the supplier listed on the NCP Product Schedule Notebook.

Table 8. Continued.

	Imbiber Beads	Waste-Set #3200®	Waste-Set #3400®
General Description	The oil is absorbed into the interior of the hydrophobic particles. Beads swell up to 3 times their original size. Composed mostly of alkylstyrene copolymer, minor polyolefin, and less than 1 percent kaolin clay	White, odorless powder; block co-polymer	White, odorless powder; block co-polymer
Listed in US on NCP Product Schedule?	No; Received sorbent certification letter as stated in NCP300.915(g)(4) Certification	Yes; Miscellaneous Oil Spill Control Agent	Yes; Miscellaneous Oil Spill Control Agent
Availability within 48 h	NP	Stockpile in Grand Rapids, MI	Stockpile in Grand Rapids, MI
Application Rate, % by weight of product to oil (per manufacturer)	Imbiber Beads are packaged into packets, pillows, and blankets	20; may vary with viscosity and temperature	20; may vary with viscosity and temperature
Application Rate (PERF tests)	Not tested	Not tested	diesel: 35 medium crude: 30 Bunker C: 35
PERF Test Comments	May reduce vapor rates five to six times Readily available	Not tested	Product formed a firm pancake with gasoline and all crude oils. The Maya crude was solidified after 2 days of stirring. Diesel and bunker C did not form a cohesive pancake; however, the materials solidified
Cure Time	15 minutes or more, depending on product being recovered – refer to www.imbiberbeads.com/main/imbiberbeads_cct.php for specific product absorption times	< 1 minute	< 1 minute
Solidification Process (from PERF report)		Oil is absorbed into the particle interior where a chemical reaction takes place	Oil is absorbed into the particle interior where a chemical reaction takes place

	Imbiber Beads	Waste-Set #3200®	Waste-Set #3400®
Use in Fresh Water?	Yes	Yes	Yes
Use in Salt Water?	Yes	Yes	Yes
Can the Oil be Returned to a Liquid	No	Yes; patented process	Yes; patented process
Disposal/Recycling Issues	NP	NP	NP
Menidia beryllina (96-hr)	NP	>10,000.0	>10,000.0
Mysidopsis bahia (48-hr)	NP	5,431.0	>10,000.0
Menidia beryllina (96-hr)	NP	552.0	442.0
Mysidopsis bahia (48-hr)	NP	58.0	36.0
Solubility in water	Insoluble	Insoluble	Insoluble
Other Information	See website: www.imbiberbeads.com	Land use preferred	Water use preferred
Application Assistance Information*	Imbibitive Technologies America, Inc. Midland, MI 888-843-2323 imtech@imbiberbeads.com	Environmental & Fire Technology, LLC 3374 West River Dr., NW Grand Rapids, MI 49544 616-784-0770 Cal Blystra	Environmental & Fire Technology, LLC 3374 West River Dr., NW Grand Rapids, MI 49544 616-784-0770 Cal Blystra

NP = Not provided

- For additional technical assistance on product application, contact the supplier listed on the NCP Product Schedule Notebook.

Table 9. Characteristics of Solidifier Products that were formerly on the NCP Product Schedule.

	No-Char 610	No-Char 650	SPI Solidification Particulate
General Description	Granular material	Granular material	Sponge-like material, with appearance of ground green erasers
Listed in US on NCP Product Schedule?	No	No	No
Availability within 48 h	5,000 lb stockpile, Indianapolis, IN	3,000 lb stockpile, Indianapolis, IN	4,000-5,000 lb stockpile, Windham, ME
Application Rate, % by weight of product to oil (per manufacturer)	10	10	4
Application Rate (PERF tests)	diesel: 45 medium crude: 45 Bunker C: 50	diesel: 45 medium crude: 45 Bunker C: 50	diesel: 31 medium crude: 42 Bunker C: 67
PERF Test Comments	Formed a firm pancake with gasoline and diesel; diesel pancake was elastic. Works slowly with the crudes taking 1-2 d to form a firm pancake. Bunker C solidified, but the pancake remained weak and broke apart when lifted.	Formed a firm pancake with gasoline and diesel; diesel pancake was elastic. Works slowly with the crudes taking 1-2 d to form a firm pancake. Bunker C solidified, but the pancake remained weak and broke apart when lifted.	All oils solidified but did not form a cohesive mass. Each had a crumbly appearance and broke apart upon lifting
Cure Time	1-2 minutes to 1 hour	1-2 minutes to 1 hour	Immediately, up to hours
Solidification Process (from PERF report)	The bond is both chemical and physical	The bond is both chemical and physical	Total absorption into the porous and oleophilic surface of the polymer.
Use in Fresh Water?	Yes	No, use on land	Yes
Use in Salt Water?	Yes	No, use on land	Yes

	No-Char 610	No-Char 650	SPI Solidification Particulate
Can the Oil be Returned to a Liquid	No	No	No
Disposal/Recycling Issues	NP	NP	NP
Mummichug (96 h)	>500,000 (96h);	NP	NP
Brine Shrimp (48 h)	>500,000 (48h)	NP	NP
Solubility in water	Insoluble	Insoluble	< 1 ppm
Other Information	Preferred for use on water	Preferred for use on water	TBD
Application Assistance Information*	NP	NP	NP

Sorbents

(These Products may be listed under Miscellaneous on the NCP Product Schedule)

Description and Mechanism of Action

- Organic, inorganic, and synthetic materials that remove oil and other hazardous chemicals through *absorption* (uptake into the sorbent material, like a sponge; swells up more than 50% - ASTM) or *adsorption* (coating of the sorbent's surface) by oleophilic (oil-attracting) material.
- Products must be able to sorb oil in the presence of water for use on water.
- Sorbing material can include: natural organic substance (e.g., peat, wood, cotton, straw), synthetic organic substance (e.g., polypropylene, polyurethane), inorganic mineral substance (e.g., clay, vermiculite, diatomite), or a mixture of the three. The material may also be treated with oleophilic and hydrophobic compounds to improve performance. Some products also are treated with nutrients.
- Typically low density (less than 1.0 g/cm^3) allowing the sorbent to initially float on water. However, some products are heavier than water. Natural organic products tend to loose buoyancy and can sink over time.
- Sorbents are produced in the following forms: sheets, pads, blankets, and mats; loose unconsolidated particulate material; pillows and socks; booms; sweeps; and agglomerated unit (e.g., pom pom, yarn, or netting).
- Efficiency depends upon the capacity of the particular sorbent, wave or tidal energy, and viscosity and stickiness of the oil.

When to Consider Using

- In nearshore areas where oil needs to be recovered as it is being removed by natural processes or flushing from a shoreline.
- After active cleanup is terminated, application of loose sorbents may be appropriate where residual oil continues to pose wildlife contact hazards or generate sheens
- Spill conditions vary widely. See **Table 10** for an analysis of the oil types best suited for each sorbent product category.
- When the decision-maker wants or is willing to try sorbents that are different from those normally used.

Authority Required

- **Incident-specific RRT member approval is NOT required** if the product is **NOT** required to be listed on the NCP Product Schedule under the Miscellaneous Oil Spill Control category. **Incident-specific RRT approval WOULD be required** for sorbents that are required to be listed on the NCP Product Schedule. Refer to **Appendix E** for the list of products that have been evaluated by USEPA and determined not required to be listed on the NCP Product Schedule. A draft copy of the official USEPA letter for sorbents not required to be listed on the NCP Product Schedule is provided in **Appendix B** and can also be verified by the EPA NCP Product Schedule Manager at 202-564-1974.

Availability

- Varies widely. See **Table 10** for a description of the alternative sorbent characteristics in addition to the three traditional sorbent materials (polyurethane, polyethylene, and polypropylene). **NOTE**: As of June 2009, there were no sorbent products listed on the NCP Product Schedule.
- This Selection Guide does not address individual product costs due to the very large number of products available, in various forms, for the sorbent categories listed in **Table 10.**

General Application Requirements

- In general, sorbent material is placed on land, the water surface (fresh/estuarine/salt) or along the shore at the waterline.
- Recovery and proper disposal of all sorbent material is expected. Loose particulate sorbent material should be contained in mesh or other material before applying to water. When approved, loose sorbent can be applied to wetlands or hard surface, such as concrete floors with recovery and proper disposal (NOTE: bagasse and peat that are used as sorbents are left in place with no recovery; refer to **Table 10** for specific products that are left in place).
- Under special conditions and when approved for use, loose sorbents can be applied by hand, leaf blower, or other type of broadcaster to reduce the contact hazard with wildlife with residual oil.

Health and Safety Issues

- Varies widely. In general, the greatest potential health effect could result from inhaling loose particulate.

Limiting Factors/Best Management Practices

- All sorbents, conventional or alternative, must be retrieved for proper disposal; **NOTE**: bagasse and peat that are used as sorbents are left in place with no recovery (refer to **Table 10** for more information). Sorbent use may be better for recovering small quantities of oil in order to avoid generating excessive amounts of waste.
- Oiled and unoiled sorbents left in place too long can break apart and present an ingestion hazard to wildlife, or smother animals and plants.
- Not enough is known about the long-term impacts from some of the sorbents when they are purposely or accidently left in the environment.
- Access for deploying and retrieving sorbents should not adversely affect wildlife nor impact soft or sensitive habitats (marshes, sheltered tidal flats, etc.).
- Should not be used in a manner that might endanger or trap wildlife.

- Products that sink, either initially or over time, should not be used in areas where they could be released to water.

Monitoring Requirements/Suggestions

- Monitoring of all sorbent use locations is very important to ensure that all sorbent can be recovered for proper disposal.
- Monitoring may be even more important for sorbents to ensure that oiled sorbents do not sink, the containment systems (e.g., netting) do not break down, or re-application is needed over time.

Waste Generation and Disposal Issues

- Sorbents must be recovered and properly disposed of. Check product specific requirements in **Table 10**.
- Care should be taken to select and use sorbents properly, to prevent generation of large quantities of lightly oiled wastes.
- Recycling of sorbents, rather than disposal, should be emphasized.

References

Cooper, D., S. Penton, K. Rafuse, and A.B. Nordvik. 1994. An evaluation of oil sorbent materials. In: Proc. 1994 Arctic and Marine Oil Spill Program (AMOP). Environment Canada, Vancouver, BC, Canada, pp. 581-592.

NRT-RRT Factsheet. 2007. Application of Sorbents and Solidifiers for Oil Spills. National Response Team Science & Technology Committee. 6 pp.

Overstreet, R. and J.A. Galt. 1995. Physical Processes Affecting the Movement and Spreading of Oils in Inland Waters. NOAA Hazardous Materials Response and Assessment Division, Seattle, WA. Report No. HMRAD 95-7. 46 pp.

Table 10. Characteristics of Sorbents. Developed from Cooper *et al.* (1994).

	Inorganic Minerals			
	Expanded Mineral	**Foamed Glass**	**Silicate Sorbents**	**Sorbent Clay/Treated Clay**
General Description	Formed from minerals that expand upon heating to yield low bulk density material such as perlite and vermiculite	Formed from amorphous silicate glass foam, consisting of spheroid-shaped particles with numerous cells and characterized by very low bulk densities	Formed from silicates, not including clays and treated clays, such as diatomaceous earths and synthetic silicate sorbents These sorbents are normally finely divided powders	Composed of fine particles of aluminum silicates and other materials or any such material that has been treated to be hydrophobic and/or oleophilic; loose
Example	Vermiculite	Sodium/Calcium Borosilicate Glass	Natural Diatomaceous Earth	Treated Kitty Litter
Oil Viscosity Effectiveness Range[1]; (average gm Oil per gm sorbent)	10 to 15,000 cP; (<10) Relatively consistent in sorbent capability	10 to 100 cP; (<10) Product samples unavailable; testing incomplete	10 to 3,000 cP; (< 10) Relatively consistent in sorbent capability	10 to 15,000 cP; (< 10) Relatively consistent in sorbent capability
Anticipated Value	Readily available	Hard to find	Readily available	Readily available

1 For relative oil/product viscosity scales, refer **Table 11**.
2 Traditional sorbent materials.

Table 10. Continued.

	Natural Organics				
	Natural Organics	**Feathers**	**Treated Wood Fiber (Cellulose)**	**Wood Fiber (Cellulose)**	**Treated Natural Organics**
General Description	Composed of naturally derived materials (not including wood fibers) such as peat moss, millet, cotton, sugarcane pulp, etc.; loose	Any sorbent that uses feathers as its oleophilic component, including feathers contained in polysheath	Cellulose-based sorbents such as wood chips, sawdust, cork and paper derivatives which have been treated to become hydrophobic and/or oleophilic	Cellulose-based sorbents such as wood chips, sawdust, cork, and any paper derivatives. Includes cellulose-based sorbents that contain synthetic polymers used for structural integrity; varies	Composed of naturally derived materials (not including wood fibers) such as peat moss, millet, lint extracted from recycled cotton seed, etc., which has been treated to become hydrophobic and/or oleophilic
Example	Puffed Millet Bagasse	Untreated Waterfowl Feathers	Treated Cellulose Treated Coconut fibers	Cellulose Fiber Mat	Heat Treated (activated) Peat Ammoniated Bagasse
Oil Viscosity Effectiveness Range[1]; (average gm Oil per gm sorbent)	10 to 15,000 cP; (< 10) Relatively consistent in sorbent capability	10 to 50,000 cP; (<60) Greatest sorbency between 100 to 3,000 cP	10 to 50,000 cP; (<10 for cellulose; <20 for coconut fibers) Greatest sorbency for coconut fibers between 3,000 to 15,000 cP	10 to 50,000 cP; (<20) Relatively consistent in sorbent capability	10 to 15,000 cP; (~10) Relatively consistent in sorbent capability
Anticipated Value	Readily biodegradable	Limited availability in large quantities	Biodegradable	Biodegradable	Readily biodegradable; Activated peat has been applied to bird and marine mammal sites to reduce contact risks

1 For relative oil/product viscosity scales, refer to **Table 11**.
2 Traditional sorbent materials.

Table 10. Continued.

	Synthetic Organics		
	Polyurethane[2]	**Polyethylene[2]**	**Polypropylene[2]**
General Description	Formed for many of the various polymers that contain -NHCOO- linkages. Such polymers are generally foamed	Formed from polymers of ethylene	Formed from polymers of propylene. Generally bonded together by heat or needle punching and usually come in the form of pads or mats
Example	Polyurethane Foam	Polyethylene Pulp	Polypropylene Mat
Oil Viscosity Effectiveness Range[1]; (average gm Oil per gm sorbent)	10 to 50,000 cP; (10 > 30??) Greatest sorbency between 10 to 1,000 cP	10 to 50,000 cP; (10 > 20??) Greatest sorbency between 100 to 8,000 cP	10 to 50,000 cP; (10 > 20??) Relatively consistent in sorbent capability
Anticipated Value	Readily available	Readily available	Readily available; Sorptive capacity typically 10-25 times its weight.

1 For relative oil/product viscosity scales, refer to **Table 11**.
2 Traditional sorbent materials.

Table 10. Continued.

	Synthetic Organics		
	Cross-Linked Polymers	**Other Polymers**	**Mixtures**
General Description	Plastic sorbents formed from molecules lightly cross-linked to each other, which imparts imbibing qualities to the material, i.e., alkylstyrenes	Polymer-based sorbents that fall outside the other polymer categories such as rubber, collagen, and polymers of formaldehyde	Formed from mixtures of various materials. A single type of sorbent contained within a polysheath does not qualify as a mixture
Example	Alkylstyrene Copolymer	Polyamine Flakes Ground Rubber Flexible Collagen Sponge	Wood Fiber, Clay, and SiO2, combined
Oil Viscosity Effectiveness Range[1]; (Average gm Oil per gm sorbent)	10 to 15,000 cP; (<< 10) Relatively ineffective for all oil viscosities tested	10 to 15,000 cP; (10 > 70 for polyamine flakes; << 10 for ground rubber; 20 > 80 collagen) Greatest sorbency between 100 to 8,000 cP for polyamine flakes Greatest sorbency between 10 to 100 cP for collagen	10 to 15,000 cP; (< 10) Relatively consistent in sorbent capability
Anticipated Value	Readily available		

1 For relative oil/product viscosity scales, refer to **Table 11**.

2 Traditional sorbent materials.

Table 11. Viscosity ranges for oils used in testing by Cooper *et al*. (1994) and other familiar substances (Overstreet and Galt, 1995) at room temperature.

Liquid	Actual Viscosity (cP) of Oil Products (Cooper *et al.*, 1994)	Relative Viscosity (cP) of Oil and Other Products (Overstreet & Galt, 1995)
Water	-	1
Kerosene	-	10
Albert Sweet Mixed Blend (ASMB)	37	-
SAE 10 motor oil	-	100
Saudi Light Crude Oil	250	-
Weathered Saudi Light Crude Oil	700	-
Glycerin or castor oil	-	1,000
Weathered Saudi Light Crude Oil	1,100	-
17% ASMB / 83% Bachaquero Mixture	3,400	-
Corn syrup	-	10,000
Bachaquero Crude	12,200	-
Weathered Bachaquero Crude	24,000	-
Extensively Weathered Bachaquero Crude	40,000	-
Molasses	-	100,000
Peanut butter	-	1,000,000

SURFACE COLLECTING AGENTS
(This is a Category on the NCP Product Schedule)

Mechanism of Action

- Chemicals that "push" or "compress" oil on the water surface into a smaller area, to form thicker slicks that are more readily recovered or burned in loose pack ice.
- They exert a spreading pressure on the water surface greater than the oil slick. They contain special types of surfactants to reduce the surface tension of water, thus increasing the spreading pressure. Also called herding agents.
- Effective agents must have the following characteristics: Remain as a liquid at ambient temperatures of use; High spreading pressure (>35 x 10^{-7} Newtons/m); Low evaporation rate; Low water and oil solubility; Will not disperse or emulsify.

When to Consider Using

- To push oil out from inaccessible areas (e.g., under piers) to recovery devices. Most effective in minimal / low winds where they have something to push against (e.g., docks, boom, ice, or other semi-enclosed areas). Their use in the open sea is more limited and not recommended.
- To collect oil into a smaller area and a thicker slick to increase recovery rates.
- If applied incorrectly, surface collecting agents may push oil into unwanted areas and results in a "bathtub" ring of oil.
- To thicken oil slicks among loose pack ice for the purpose of in-situ burning or enhanced recovery by skimmers. MMS has been sponsoring small- and mid-scale experiments with herding agents in 2003-2007; the result show that they can significantly contract and thicken oil among ice, without concentrating the surrounding ice. The thickened oil ignited and burned at efficiencies comparable to mechanically contained slicks.
- Best used for small spill volumes. Ideally suited for treatment volumes of less than 1,000 gallons.
- For short-term protection in areas where deploying booms is not possible or could cause more damage (e.g., in very shallow water in front of a wetland).

Authority Required

- **Incident-specific RRT approval is required. NOTE**: As of January 2009, there were no surface collecting agents on the NCP Product Schedule. However, as defined in this document, the Product Rapidgrab 2000™ (listed as a Miscellaneous Oil Spill Control Agent) is classified as a surface collecting agent and is addressed in **Table 12**.

Availability

- See the following table (**Table 12**) for the current availability of this product.
- The product found to be most effective in the recent MMS studies was a formulation tested by the U.S. Navy containing 65% Span-20 with 35% 2-ethyl butanol; this product is not currently listed on the Product Schedule.

General Application Requirements

- The product is applied by spray systems (hand-held, vessel-mounted, or from aircraft) in very small quantities (1-15 gallons per mile of spill perimeter, or 0.05-0.5 gal/acre of water surface) to the water surface at the perimeter of a slick.
- Do not allow the product to come into contact with operational parts of oleophilic skimmers such as drums, discs, and rope mops because it will cause oil to be repelled from them. Recent MMS studies have documented that the active ingredient in herding agents (the surfactant) renders sorbent pads less hydrophobic and their water retention increases considerably.

Health and Safety Issues

- Use appropriate level of personal protection for each product (See product comparison tables on the following pages).

Limiting Factors/Best Management Practices

- Limiting factors include rain, winds greater than about 5 mph, breaking waves, and moderate currents, all which will break the surface film, rendering the product ineffective.
- They are more effective on thin films and low viscosity oils.
- Product is sprayed directly on the water surface; thus significant surface microlayer impacts could be realized.
- Applications should be controlled so that the products do not come in contact with vegetation.
- Because of their low application rates and low water solubility, acute toxicity is of most concern in very shallow waters with limited flushing rates and abundant organisms of early life stages.

Monitoring Requirements/Suggestions

- Visual monitoring to determine whether product use is effective, and when reapplication is needed.

Waste Generation and Disposal Issues

- None. The product does not change the physical condition or volume of the oil. The product is not recovered.

References

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Walker, A.H., J. Michel, G. Canevari, J. Kucklick, D. Scholz, C.A. Benson, E. Overton, and B. Shane. 1993. Chemical Oil Spill Treating Agents. Marine Spill Response Corporation, Washington, DC. MSRC Technical Report Series 93-015. 328 p.

Table 12. Characteristics of Surface Collecting Agents listed on the NCP Product Schedule.

	RapidGrab 2000
General Description	Non-ionic liquid formulation with a specific gravity of 0.84
Is Product Listed for Use in US?	Yes. Listed under Miscellaneous on the NCP
Availability within 48 h (see Note below)	GlobeMark Resources, Ltd. Houston, TX Mobile: 254-231-2251 800-890-2396 Joanie Docter – joannie@globalmarkresources.com
Application Rate (per manufacturer)	Spray neat as droplets on the oil sheen. Designed to be used after oil has been contained by booms or other similar apparatus
Spreading Pressure	Not applicable. It works by oil "contraction and congealment into a physical state that greatly simplifies cleanup operations." It is not a herding agent, per se
Solubility in water	Soluble in oil and solvents
Use in Fresh Water?	NP
Use in Salt Water?	NP
Toxicity of Product Alone (LC-50, ppm) Note: a low value = high toxicity	
Inland Silversides 96 h	5.1
Mysid Shrimp 48 h	2.3
Toxicity of Product + No. 2 Oil (LC-50, ppm) Note: a low value = high toxicity	
Inland Silversides 96 h	4.07
Mysid Shrimp 48 h	2.60

NP = Information not provided

Note: As of June 2009, there were no Surface Collecting Agents on the NCP Product Schedule. For this Selection Guide, RapidGrab 2000 (listed on the NCP Product Schedule as a Miscellaneous Oil Spill Control Agent) is classified as a surface collecting agent due to its mechanism of action. The current availability of this product is not known.

SURFACE WASHING AGENTS

(This is a Category on the NCP Product Schedule)

Disclaimer: Decisions for Public Safety Issues for Fires are under the Purview of the Lead Public Emergency Response Agency.

Mechanism of Action

- These products contain surfactants, solvents, and/or other additives that work to remove oil from substrates.
- Many products are essentially industrial cleaners that emulsify the oil, much in the same way that dishwashing soap cleans the grease off dishes. The treated oil is broken into small droplets that are kept in suspension by the surfactant.

"Lift and disperse" products are those for which the product literature states that the oil is dispersed, emulsified, or encapsulated. Thus, the washwater from these products should not be flushed into waterbodies or left untreated, but must be contained, recovered, and properly treated.

"Lift and float" products are those where the released oil is not dispersed but readily floats on the water surface and is recoverable.

When to Consider Using

- On hard-surface shorelines where there is a strong desire to remove oil residues.
- When the oil has weathered so that it cannot be removed from a substrate using ambient water temperatures and low pressures. Surface washing agents may be used to reduce the temperature and/or pressure needed to achieve cleanup endpoints.
- When the oil is trapped in areas inaccessible to physical removal but which can be flushed and the washwaters contained, such as in sewers, storm drains, and ravines. If physical removal is not possible, it may be difficult to properly apply the surface washing agent.
- For volatile fuel spills that have entered sewers, for vapor suppression, and to enhance flushing recovery, as long as all "lift and disperse" washwaters are recovered and prevented from being discharged into the environment.

Authority Required

- Incident-specific RRT approval is required to use surface washing agents in any manner that would cause for them to be released to the environment.
- Verify state requirements for discharge and waste management.
- **NOTE**: As of June 2009, there were 25 surface washing agents listed on the NCP Product Schedule. **For this Selection Guide, PES-51 and PX-700 (listed on the NCP Product Schedule as Miscellaneous Oil Spill Control Agents) are classified as surface washing agents due to their mechanism of action**. Only products listed on the NCP Product Schedule are reported in **Table 13**. **Appendix G, Table G-4** contains information on Surface Washing Agents that have been removed from the NPC Product Schedule.
- Fire Departments and HAZMAT teams have the authority to "hose down" a spill using a chemical countermeasure if they determine that the spilled oil could cause an explosion and/or threaten human health. All runoff should be contained and recovered for proper disposal.

CONTAINMENT AND RECOVERY OF SURFACE WASHING AGENTS SHOULD BE THE NORM, NOT THE EXCEPTION

Availability

- Varies widely by product. See **Table 13** for specific products.

General Application Requirements

- Products are sprayed either neat or diluted with water. For small applications, hand-held units such as hudson sprayers are used; larger, diluted applications use eduction systems coupled with fire hoses, power washers, etc.
- Application rates vary widely and may be difficult to monitor and control.
- There is some period for soaking or scrubbing, and then the area is flushed with water. Thus, in tidal areas, application should be timed to allow soaking before tidal inundation.
- Heated water (in both spray and flush) is sometimes required for very sticky oils.
- All released oil must be recovered, so systems are needed to contain and treat the washwater from "lift and disperse" products, which can require considerable operational support.
- Washwaters from using "lift and float" products may be discharged after oil separation, **though** there will be site-specific requirements.
- The toxicity of the product and the recoverability of the treated oil should be carefully evaluated when determining potential impacts at the treatment site.

- Only those products which have been documented to be safe to use on vegetation (through independent field studies) should be applied to vegetated areas.
- Use may be restricted in areas with sensitive nearshore resources, such as seagrass beds, or during sensitive time periods, such nearshore spawning or fish migration.
- Water velocity at the impacted area must be less than 1 knot. This will help ensure refloated oil does not escape containment and contaminate clean beaches down current.
- The treated area should not be exposed to breaking waves. The surface washing agents require a soaking time. Flushing from waves will reduce effectiveness of the agent(s).

Health and Safety Issues

- All products required Level D personal protection with splash protection. Always consult the MSDS for proper PPE. Many Surface Washing Agents contain skin, eye, and lung irritants.
- Slips, trips, and falls from working on oily surfaces may be of concern.

Limiting Factors/Best Management Practices

- On shorelines, there are usually restrictions on direct spraying of intertidal biota and flushing across sensitive substrates.
- Under no conditions should washwaters from land surfaces be allowed to enter waterbodies without proper treatment. Check with wastewater plant operators before washwaters are flushed into sewers to make sure that they can accept the wastes.
- Use of lift and float products may be required, to allow oil recovery. An exception would be in high energy environments where the oil cannot be recovered (so it would be better to let it disperse rather than re-oil adjacent areas).
- Test areas must be accessible to observers, monitors, sample collectors, and contract workers.
- Also consider personnel health and safety when selecting test areas.
- High wind and high temperatures can reduce the effectiveness of certain surface washing agents through product evaporation.
- Shoreline cleaner testing is not recommended near operating water intakes. Oil lifted from the substrate may disperse into the water column or escape floating containment, potentially fouling water supplies.

Monitoring Requirements/Suggestions

- Conduct effectiveness testing of selected products to determine the best one for the spill conditions.
    - Effectiveness testing will be required by EPA as soon as a protocol has been developed.

- May need effects monitoring if sensitive resources are at risk during use.
- On shorelines, "first use" monitoring of sensitive biota should be conducted to make sure that adverse effects are not occurring under actual use conditions.
- For land application, monitor downstream waterbodies to detect fish kills or other impacts from inadvertent discharges from the cleanup area. Immediately contain any discharges.

Waste Generation and Disposal Issues

- Because released oil must be recovered, waste generation is a function of recovery method. Sorbents are often used with "lift and float" products. Local conditions will determine whether the water must also be collected and treated, or can be discharged safely.
- When the oil is dispersed, all of the washwater must be contained and treated prior to discharge, often to wastewater treatment plants if the oil concentrations are low. For high oil concentrations, oil recovery can be increased by the use of emulsion-breaking agents.

References

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Michel, J., A.H. Walker, D. Scholz, and J. Boyd, 2001. Surface-washing agents: product evaluations, case histories, and guidelines for use in marine and freshwater habitats. Proc. 2001 International Oil Spill Conference, American Petroleum Institute, Washington, D.C., pp. 805-813.

Region 5 Regional Response Team Surface Washing Agent protocols.

Thumm, S.J., C. Henry, and J. Gahn. 2003. Use of surface washing agents during the M/V Genmar Hector oil spill. Proc. 2003 Intl. Oil Spill Conference. 3 p.

Table 13. Characteristics of Surface Washing Agents Listed on the NCP Product Schedule (as of June 2009).

	Aquaclean	BG-Clean 401	Biosolve	CN-110
General Description	Alkaline, green, water-based detergent concentrate	Slightly alkaline detergent concentrate	Thick, pink, water-based detergent concentrate	Clear amber; slightly viscous liquid
Availability (amount per location)	As needed on demand; manufacturer at Madison, Indiana	BioGenesis Enterprises, Inc., Oak Creek, WI	At least 5,000 gal at Westford, MA; 200-1000 gal each in NY, CA, OK, IL, and Alberta, Canada	Varies; manufactured in Broussard, LA; distributed by LK Enterprises in Oceanside, CA
Application Rate	Spray 33%-50% solution to cover contaminated area	Dilution in water at 1:5 to 1:100 Used on all hydrocarbons except asphalts	1:6 product to oil, applied as a .5%-6% solution	1 gal/75-100 ft2
Application Method	Pressure spray solution on oiled area, then agitate using solid stream of rinse water	High- pressure spray at 60-70 gpm for recent spills; Weathered crude – 20 gpm; respray after soak with high pressure water stream at 60-70 gpm Best effects when applied with heated water between 100-180^{o}F	Pressure spray solution on oiled area, then agitate using solid stream of rinse water	Spray neat product on oiled area, let soak, then rinse, preferably with fresh water. Can be used in pressure washers at no more than 10% dilution. Diluted product can be sprayed prior to oil contamination to act as a repellant
Soak Time	3-5 minutes	15-30 minutes for weathered oils	None	30-60 minutes
Temperature Limitations	Water temp. should be above 41°F	NP	Keep from freezing	Water temp. should be above 32°F
Effectiveness in Environment Canada lab test	Not tested	Not tested	Not tested	Not tested
Use in Fresh Water?	Yes	NP	Yes	Yes
Use in Salt Water?	Dilute product & rinse with fresh water	Yes	Yes	Yes
Toxicity (LC-50, ppm) Note: a low value = high toxicity	Mummichug 70.7 (96h); Brine shrimp 11.7 (48h) Did not enhance toxicity of No. 2 fuel oil		Fathead minnow > 750 (96h); Rainbow trout 9 (96h); Algae growth 30 (72h)	Did not enhance toxicity of No. 2 fuel oil

	Aquaclean	BG-Clean 401	Biosolve	CN-110
Inland silversides 96 h	6.50	13.10	7.40	7.40
Mysid shrimp 48 h	2.10	2.86	1.30	1.19
Solubility in water	100%	100%	100%	Not available
Other Information	100% solution pH = 11.8; 1% pH = 10; Manufacturer recommends use as industrial cleaner, not for use in the environment	pH = 8.227 Specific gravity = 1.006	Contains no nutrients, enzymes or bacteria cultures; primarily used for vapor suppression Specific gravity = 1.025	pH = 11.4 Product can be used as a repellant - when applied to surface, will not allow oil to adhere Specific gravity = 1.025
Is Treated Oil Recoverable?	No; the oil is dispersed	No; the oil is dispersed	No: the oil is dispersed	Yes; released oil can be skimmed
Application Assistance Information*	Madison Chemical Company, Inc. Madison, WI 812-273-6000 Cara Cyrus	BioGenesis Enterprises, Inc. Oak Creek, WI 414-571-6230 Dr. Moshen Amiran	The Westford Chemical Corp. Westford, MA 978-392-0689 508-885-1113 800-225-3909 Ron LaRoche www.biosolve.com	Chemex, Inc. Broussard, LA 318-837-9148 Mr. Gale Campbell

* For additional technical assistance on product application, contact the supplier listed on the NCP Product Schedule Notebook.

NP Not provided

Table 13. Continued.

	Corexit EC7664	Corexit EC9580A	CytoSol	Do All #18
General Description	Water-based concentrate containing non-ionic surfactants	Surfactants in a de-aromatized hydrocarbon-based solvent. Yellow.	Biosolvent containing methyl esters derived from vegetable oils and bioremediation enhancers; No surfactants or emulsifiers; Amber color	Water-based cleaner; does not contain solvents
Availability (amount per location)	**NOTE**: This product is no longer manufactured, distribution only	Varies; Sugar Land, TX; 3-5 days lead time for production of 400 bbl/day	Distributors: Point Richmond and Carson, CA; Seattle, WA	20 to 40 drums in Damon, Texas; 4-5 day lead time for additional product
Application Rate	1:25 product to oil, applied as 1-3% solution at 1 gal/10-15 ft2	1:2.5 product to oil, applied at 1 gal (neat)/100 ft2	Between 0.5:1 and 1:1 product to oil applied neat	Pre-soak with 1:3 dilution solution, wait 30-45 minutes, then high-pressure flush with 1:15 solution
Application Method	Spray solution on oiled area, then rinse. Never spray as a fog or mist; droplets only For heavy or weathered oils, a pre-soak with a hydrocarbon-based cleaner is recommended	Spray neat product on oiled area, soak, then rinse with high-pressure water; for persistent oil, use hot-water rinse	Spray neat product on contaminated area, let soak, then rinse with water deluge or gentle spray	Spray, mop, agitate, soak, steam or pressure wash product on affected area then rinse
Soak Time	None	0-30 minutes	At least 1 hour; longer in cold weather	30-45 minutes
Temperature Limitations	None	None	NP	None
Effectiveness in Environment Canada lab test	Freshwater: 25% Saltwater: 27%	Freshwater: 69% Saltwater: 53%	Not tested	Not tested
Use in Fresh Water?	Yes	Yes	Yes	Yes
Use in Salt Water?	Yes	Yes	Yes	Yes
Toxicity (LC-50, ppm) Note: a low value = high toxicity	Mummichug >1,000 (96h); Rainbow trout 850 (96h); Zebra fish >10,000 (48h); Brine shrimp >10,000 (48h) Did not enhance toxicity of No. 2 fuel oil	Mummichug >10,000 (48h); Rainbow trout >10,000 (96h); Brine shrimp 2,400 (48h); Oyster larvae 38 (48h) Did enhance toxicity of No. 2 fuel oil for shrimp	Did not enhance toxicity of No. 2 fuel oil for shrimp; slight increase in toxicity for silversides	

	Corexit EC7664	Corexit EC9580A	CytoSol	Do All #18
Inland silversides 96 h	15.15	13.20	24.30	9.38
Mysid shrimp 48 h	18.34	9.06	7.00	0.57
Solubility in water	100%	Insoluble	14 ppm in fresh water; 7 ppm in sea water	100% soluble
Other Information	Can be used to water-wet surface so oil will not adhere to it pH = 6.14 Specific gravity = 1.02	Lab and field tests on salt marshes and mangroves show little effects on plants when exposed to this product; Used/tested at multiple spills Specific gravity = 0.81	Product tested on spills on mussel beds, gravel beach, and on stream vegetation, with good results Used/tested at multiple spills Specific gravity = 0.89	pH: 13.1 Specific gravity = 1.07
Is Treated Oil Recoverable?	No; the oil is dispersed	Yes; at least partially in quiescent conditions	Yes; released oil can be skimmed. Remaining oil is biodegraded in 6-12 weeks	No; the oil is dispersed
Application Assistance Information*	Nalco Energy Services, LP Sugar Land, TX 800-333-3714 281-263-7336 Mobile - 281-202-8126 Kathryn Venter – kaventer@nalco.com	Nalco Energy Services, L.P. Sugar Land, TX 800-333-3714 281-263-7336 Mobile – 281-202-8126 Kathryn Venter – kaventer@nalco.com	CytoCulture International, Inc. Point Richmond, CA 510-233-0102 Mobile – 561-762-5440 Randall von Wedel – vwedel@aol.com www.cytoculture.com	Radcob Solutions, Inc. 4800 North State Road 7, Suite #105 Lauderdale Lakes, FL 33319 954-249-2178 Adam Goldberg

* For additional technical assistance on product application, contact the supplier listed on the NCP Product Schedule Notebook.
NP Not provided

Table 13. Continued.

	ENVIROCLEAN	E-SAFE	F-500	Gold Crew SW
General Description		Blend of surfactants and organic solvents in aqueous solution; Clear green color; Light citrus odor		Water-based degreaser
Availability (amount per location)	Enviro Clean Products LC, Oklahoma City, OK	PLUTUS Environmental Technologies, Inc, Sieverville, TN	Distributor in Fayetteville, GA	3,500 gal, San Diego, CA 1,000 gal, Houston, TX
Application Rate	1-2% solution to flush; 3% solution for lighter oils; 6% solution and up to 1 hour soak time for heavy oils	1 gal (neat)/100ft2 of contaminated surface area	1 part product:8 parts hydrocarbon:32 parts water	Dilute 1:10 or higher depending on type of oil or refined product
Application Method	Dilute prior to use; apply via manual pressure applicator (hand pump) or other like equipment (pressure or steam equipment for weathered or in low temperatures); Soak with flushing / recovery;	Pressure spray to cover affected area, soak with water; repeat applications may be required for heavy concentrations; Proposed for final treatment of fuels spills in soils; till soils prior to application	Standard fire apparatus spray nozzle with agitation	First soak, then pressure or steam wash the area with 1%-5% solution
Soak Time	Up to 1 hour	NP	NP	15-60 minutes
Temperature Limitations	$30^oF – 120^oF$	$40^o – 110^oF$	33^o-211^oF	25^oF to 120^oF
Effectiveness in Environment Canada lab test	Not tested	Not tested	Not tested	Not tested
Use in Fresh Water?	NP	NP	Yes	Yes
Use in Salt Water?	Yes	Yes	Yes	Yes
Toxicity (LC-50, ppm) **Note: a low value = high toxicity**				
Inland silversides 96 h	8.13	8.77	<10.00	6.34
Mysid shrimp 48 h	1.76	14.20	32.00	2.70

	ENVIROCLEAN	E-SAFE	F-500	Gold Crew SW
Solubility in water	100% soluble	Soluble	100% soluble	100% soluble
Other Information	pH = 8.63 Specific gravity = 1.028	Optimum conditions are 72°F and moderate humidity; higher temperature or lower humidity will increase need for repeated applications pH = 8.04 Specific gravity = 1.01	Effective on both polar and non-polar hydrocarbons; Primarily a wetting agent for firefighting pH = 7.0 Specific gravity = 0.99	pH: 9.76 Specific gravity = 1.035 www.goldcrew.net Vapor suppression Boom cleaning Bioaugmentation
Is Treated Oil Recoverable?	No; the oil is dispersed	No; the oil is dispersed	No; the oil is dispersed	No; the oil is dispersed
Application Assistance Information*	Enviro Clean Products, LLC Oklahoma City, OK 405-373-4545 Jonathan Behymer – info@envirocleanps.com	PLUTUS Environmental Technologies, Inc. Sevierville, TN 865-453-0060 James Hatcher	Hazard Control Technologies, Inc. Fayetteville, GA 770-719-5112 Mobile – 770-331-3709 Fred Love	Gold Crew Products & Services LLC Orange, CA 714-228-8781 Jim Figueira

* For additional technical assistance on product application, contact the supplier listed on the NCP Product Schedule Notebook.

NP Not provided

Table 13. Continued.

	Nale It	Nature's Way Power Clean	PES-51	PX-700
General Description	NP	Degreaser composed of aqueous blend of surfactants/emulsifiers; aerobic microbes can be added Pale green liquid	Clear liquid containing biosurfactants and d-limonene as a solvent	Liquid with surfactant and citric acid; product literature describes it as a "microbial catalyst" Brown liquid with a slight marine odor
Availability (amount per location)	Distributor in Elemore City, OK	660 gal immediately; 6,000 gal/day, Houston, TX, national distribution	2,000 gal, San Antonio, TX; 1,000 gal, Seattle, WA; 7 day lead time	+800 gal Cocoa, Fl; 48 hour production lead time
Application Rate	1:20 product:water	1 gal (neat)/200-2,000 ft2 or 2-12oz./gallon of water	1:5 product to oil, applied as 1 gal/150-200 ft2	1 gal/1,000 ft2 removal of oily sheen; 1:25 solution for equipment cleaning; 1:50 for immersing wildlife to remove oil
Application Method	May be applied with a pressure washer	Spray, pressure wash, mop, agitate and rinse; Hot water should not be used with this product.	Spray neat product on oiled area, then rinse with high-pressure, ambient water	Spray neat product on oiled area, then rinse with high-pressure, ambient water
Soak Time	NP	5 minutes to overnight	2-5 minutes	N/A; may need to reapply with heavy oils
Temperature Limitations	None	32°F to 120°F	None	None
Effectiveness in Environment Canada lab test	Not tested	Not tested	Fresh water: 23% Salt water: 21%	Not tested
Use in Fresh Water?	Yes	Yes	Yes	NP
Use in Salt Water?	Yes	Yes	Yes	Yes

	Nale It	Nature's Way Power Clean	PES-51	PX-700
Toxicity (LC-50, ppm) **Note: a low value = high toxicity**	Toxicity of No.2 fuel oil is slightly increased for shrimp and silversides	Did not enhance toxicity of No. 2 fuel oil	Mummichug 1,425 (96h); Fathead minnow 810 (96h); Rainbow trout 14 (96h); Brine shrimp 665 (48h); Pacific oyster larvae 19 (48h); Bay mussel larvae 10 (48h) Did not enhance toxicity of No. 2 fuel oil	Toxicity data derived for concentrated (undiluted) product
Inland silversides 96 h	3.82	3.91	435.0	5.65
Mysid shrimp 48 h	1.84	1.07	14.50	2.77
Solubility in water	100% soluble in fresh and salt water	100% soluble	Insoluble	Soluble
Other Information	pH = 6.8 to 7.2 Specific gravity = 1.02 Listed by Florida DEP as a surfactant to enhance bioremediation of oil in soils and groundwater	pH = 8 to 9.5 Specific gravity = 1.01 Other Nature's Way products have microbes, and biocatalysts, but are not listed on the NCP. In TX is listed as a bioremediation enhancement agent	pH = 6.7 Extensive use in decon of response equipment; On NCP Product Schedule as Miscellaneous Spill Control Agent Used/tested at multiple spills	pH = 3.5 to 4.0 On NCP Product Schedule as Miscellaneous Spill Control Agent Primary use is sludge reduction in wastewater treatment plants
Is Treated Oil Recoverable?	No; the oil is dispersed	No; the oil is dispersed	Yes; the treated oil readily floats	?; probably not
Application Assistance Information*	SPL Control LLC Elmore City, OK 580-788-2187 Tom Lester	Integra Environmental, Ltd. Houston, TX 713-680-1234 877-866-9197 Cathy Kaiser www.integraenvironmental.com	Practical Environmental Solutions, Inc. San Antonio, TX 210-493-7172 Bill Sims – simsbi@aol.com SEACOR Environmental Products LLC 206-378-4100 866-644-3677	Enviro-Tech Cape Coral, FL 239-997-6300 Charlie Jones

* For additional technical assistance on product application, contact the supplier listed on the NCP Product Schedule Notebook.

NP Not Provided

Table 13. Continued.

	Petro-Clean	Petro-Green ADP-7	Petrotech 25	Premier 99
General Description	pH-neutral blend of nonionic surfactants and emulsifiers Light yellow liquid	Viscous, water-based detergent concentrate, amber colored	Viscous, green, water-based concentrate	Alkaline, red water-based detergent concentrate; Foamy
Availability (amount per location)	NP	1,100 gal, Dallas, TX; can produce 550 gal/day	5-10,000 gal, Charlotte, NC; 10 day lead time for production	10,000 gal, Pembroke, FL; 14 days lead time for production
Application Rate	Varies; 0.5% to 6% solution	25 gallons of product per 1 ton of oil applied as 2-3% solution at 100 barrels/acre	1:10 product to oil as a 3-10% solution or undiluted	Dilution of concentrate with water ranges from 1:5 product to water to as little as 1:50.
Application Method	Spray, power washers, or with eductor	Spray neat or diluted product on contaminated area, then rinse with high-pressure water	Spray 10-40% solution, using either hot or cold water, on contaminated area, then rinse with hot or cold water; or spray neat product, then wipe or scrub before rinse	Spray/mop 5-20% solution on contaminated area, scrub, then rinse well
Soak Time	NP	None	None	None
Temperature Limitations	Above 35°F	None	None	Above 32°F
Effectiveness in Environment Canada lab test	Not tested	Not tested	Freshwater: 0% Saltwater: 0%	Not tested
Use in Fresh Water?	Yes	Yes	Yes	Yes
Use in Salt Water?	Yes	Yes	Yes	Yes
Toxicity (LC-50, ppm) **Note: a low value = high toxicity**	Did not enhance toxicity of No. 2 fuel oil	Slightly enhanced toxicity of No. 2 fuel oil	Mummichug 4,830 (96h); Rainbow trout 1,460 (96h) Brine shrimp 2,480 (48h) Slightly enhanced toxicity of No. 2 fuel oil for mysid shrimp	Did not enhance toxicity of No. 2 fuel oil
Inland silversides 96 h	115.0	10.95	3.40	8.20
Mysid shrimp 48 h	105.0	1.12	1.00	2.50

	Petro-Clean	Petro-Green ADP-7	Petrotech 25	Premier 99
Solubility in water	100% soluble	100% soluble	100% soluble	100% soluble
Other Information	pH = 8.05 (10% solution) Specific gravity = 0.99 Listed in Florida as a bioremediation product www.alabastercorp.com	pH = 10.5 Specific gravity = 1.035	pH =7.5 Specific gravity = 1.03 Approved in France as a freshwater dispersant	pH = 10 to 11.5 Specific gravity = 1.01 www.goldcoastchem.com
Is Treated Oil Recoverable?	No; the oil is dispersed	No; the oil is dispersed	No; the oil is dispersed	No; the oil is dispersed
Application Assistance Information*	Alabaster Corp. Pasadena, TX 281-487-5482 800-609-2728 Charles Sheffield Many other suppliers available and listed on NCP Product Schedule	Petro-Green, Inc. Dallas, TX 972-484-7336 Arnold Paddock	Petrotech America Corp. Newport, NH 617-491-6660 Hans Achtmann	Gold Coast Chemical Products Pembroke Park, FL 954-893-0044 Eli Finkelberg or Sue Freid noslime@bellsouth.net

* For additional technical assistance on product application, contact the supplier listed on the NCP Product Schedule Notebook.

NP Not Provided

Table 13. Continued.

	Procleans	SC-1000	Sheen-Magic	Simple Green
General Description	Concentrate of anionic and nonionic surfactants	Concentrate of nonionic surfactants and seed ester alcohols; Clear, light amber liquid	Blend of surfactants and organic solvents in an aqueous solution Clear liquid; light citrus odor	Green water-based detergent concentrate
Availability (amount per location)	NP	20 drums in Phoenix, AZ; 2 week lead time	PLUTUS Environmental Technologies – Sieverville, TN	Distributor- Sunshine Makers; Huntington Harbor, CA
Application Rate	Apply 10 to 15 gallons of 1:10 solution to one cubic yards of contamination	1:1 to 1:350 product to water depending on application method and surface type	Diesel – 1 ounce per 50 square yards of surface	1:4 product to oil; Dilution of concentrate with water ranges from 1:50 to full strength
Application Method	Apply dilute solution using fire hoses or heated pressure washers onto the contaminated solid surface of the spill	Spray solution on oiled area, let soak, then rinse with water	Light misting of product on contaminated surface	Spray solution on oiled area, let soak for 5-10 minutes, then rinse with water
Soak Time	NP	1-10 minutes	NP	5-10 minutes
Temperature Limitations	NP	28^{o} to 280^{o}F	-8^{o} to 160^{o}F	Keep from freezing
Effectiveness in Environment Canada lab test	Not tested	Not tested	NP	Not tested
Use in Fresh Water?	Yes	Yes	NP	Yes
Use in Salt Water?	Yes	Yes	Yes	Yes
Toxicity (LC-50, ppm) **Note: a low value = high toxicity**				Mummichug 1,690 (48h); Brine shrimp 610 (48h); Grass shrimp 270 (48h); Green lipped mussel 220 (48h); Mud snail 410 (48h) Did not enhance toxicity of No. 2 fuel oil
Inland silversides 96 h	83.73	4.72	7.82	8.30
Mysid shrimp 48 h	83.98	2.13	5.75	4.40

	Procleans	SC-1000	Sheen-Magic	Simple Green
Solubility in water	NP	100% soluble	Soluble	100% soluble
Other Information	pH = 6.8 Specific gravity = 1.01	pH: 10.2 to 10.5 Specific gravity = 1.01	pH = 8.1 Specific gravity = 1.01	pH = 9.5 Specific gravity = 1.026 Extensive use on ships, boats, boom, pilings, survival gear, breathing apparatus, tools, etc.
Is Treated Oil Recoverable?	No; the oil is dispersed	Yes	No; the oil is dispersed	No; the oil is dispersed
Application Assistance Information*	Eximco International, Inc. Houston, TX 713-432-7889 procleans@procleans.com	Gemtek Products Phoenix, AZ 602-265-8586 800-331-7022 Kim Kristoff – techsupport@gemtek.com	PLUTUS Environmental Technologies, Inc. Sevierville, TN 865-453-0060 James Hatcher	Sunshine Makers, Inc. Huntington Harbor, CA 800-228-0709 562-795-6000 Milton Krause

* For additional technical assistance on product application, contact the supplier listed on the NCP Product Schedule Notebook.

NP Not Provided

Table 13. Continued.

	Spillclean	Split Decision	Topsall #30
General Description	Water-based concentrate (30% dilution) and Original Formula (90% dilution); bright red	Water-based concentrate	Alkaline, pink water-based detergent concentrate
Availability (amount per location)	NP	3 Distributors in Texas	Distributors in FL and LA
Application Rate	1 part Original Formula (90% dilution) to 1 part oil	Dilution of concentrate with water ranges from 1:3 product to water to as little as 1:50.	1:5 product to oil
Application Method	For land and surface use only. Concentrate is applied with a squeeze bottle around the oil; the Original Formula is sprayed onto the oily surface. Broom is used to mix the product into the oil until the red color dissipates.	Spray diluted concentration (with water) on oiled surface or water	Spray/mop 0.2 to 20% solution on oiled area, scrub, then rinse well
Soak Time	None	None	3 minutes
Temperature Limitations	>32°F to < 120°F	Keep from freezing	Air and water temp above freezing
Effectiveness in Environment Canada lab test	Not tested	Not tested	Fresh water: not tested Salt water: 14%
Use in Fresh Water?	Not applicable for use on water	Yes	Yes
Use in Salt Water?	Not applicable for use on water	Yes	Yes
Toxicity (LC-50, ppm) **Note: a low value = high toxicity**			Rainbow trout 354 (96h) Did not enhance toxicity of No. 2 fuel oil
Inland silversides 96 h	24.30	0.25	4.60
Mysid shrimp 48 h	10.00	2.06	5.00

	Spillclean	Split Decision	Topsall #30
Solubility in water	100% soluble	100% soluble	100% soluble
Other Information	pH = 7.2 A large spill is considered to be > 2 gallons Best used on small spills of automobile motor oil, gasoline, diesel fuel, and transmission fluid	pH = 7 Specific gravity = 1.075 Works best when applied with pressure washing equipment. Can be diluted up to 1 oz per gallon of water. Mild agitation is usually necessary if applied without pressure	pH = 12.6 Specific gravity = 1.06 Product cannot be used as an open water oil dispersant
Is Treated Oil Recoverable?	No, the oil is dispersed	Yes, forms a loose emulsion with oil that separates within seconds; treated oil can be skimmed from the rinse water or absorbed with an oil sorbent	No; the oil is dispersed
Application Assistance Information*	Super Sat Ventures, Inc. 611 Riverview Drive Thiensville, WI 53092 Phone: (414) 840-9223 Mr. Daniel W. Klein	Mantek Dallas, TX 972-438-0202 800-527-9919 ext. 2020 George Zimmerman	Stutton North Corporation Mandeville, LA 800-357-1323 985-674-0476 David Anton Other suppliers available and listed on NCP Product Schedule

* For additional technical assistance on product application, contact the supplier listed on the NCP Product Schedule Notebook.

NP Not Provided

PART C: IMPLEMENTATION, MONITORING AND REPORTING REQUIREMENTS FOR SPILL COUNTERMEASURES - TECHNOLOGIES AND PRODUCTS

Introduction

This section of the Selection Guide provides the decision-maker with a basic review of developing monitoring plans for evaluating effectiveness of the technology or product being used for the incident-specific response as well as information about capturing lessons learned when any of the products reviewed in this guide are used or are reviewed for a response.

Purpose

Implementation and Monitoring

In the U.S., Regional Response Team policies require that most chemical and biological countermeasure technologies be monitored to determine and document their effectiveness and to obtain data that can be used to consider the environmental effects of their use. The Special Monitoring of Applied Response Technologies (SMART) protocols were developed by the USCG, NOAA, EPA, CDC, and MMS to be used to monitor certain applied technologies. "The SMART protocol has been developed to provide general guidance on establishing a monitoring system for rapid collection and reporting of real-time, scientifically-based information, in order to assist the Unified Command with decision-making [when using these countermeasure technologies]":

Dispersants

In-situ Burning

A Radiation annex has been developed by Region II

The SMART protocol is located under the tab for Monitoring Plans within Volume II of this Selection Guide.

Continued on Next Page

PART C: IMPLEMENTATION, MONITORING AND REPORTING REQUIREMENTS (CONTINUED)

Purpose (Cont'd)

As this Selection Guide discusses other spill countermeasures technologies and products outside of the scope of the existing SMART protocols (dispersants and in-situ burning), the following guidelines for implementation and monitoring have been developed to provide OSCs with guidance strategies for:

- Sorbents
- Elasticity Modifiers
- Emulsion Treating Agents
- Shoreline Pre-treatment Agents
- Solidifiers
- Surface Collecting Agents
- Surface Washing Agents

Tools Needed

- **Worksheet 3**
- Testing Procedures
- Monitoring Procedures
- Lessons Learned

Reporting Lessons Learned

Sharing information within and among the regions whenever spill countermeasures are used is of vital interest and benefit to the response community. To assure this information is captured, OSCs/users are requested to complete the information questionnaire displayed at the end of this section.

The information obtained in this process will be used to continually refine the data presented in Parts A and B of this Selection Guide. It is the intention that this information be maintained on a web-accessible site that will allow OSCs and other spill response decision-makers to evaluate the lessons learned by other OSCs using the individual spill countermeasure.

PART C: IMPLEMENTATION, MONITORING, AND REPORTING REQUIREMENTS (CONTINUED)

INSTRUCTIONS: Follow the step action table below for Part C: Implementation, Monitoring, and Reporting Requirements for Spill Countermeasures

Step Action Table

STEP	ACTION
1.	Obtain a blank copy of the Testing and Monitoring Worksheet (**Worksheet 3**) to record information for each product category or technology . **Worksheet 3** is follows these instructions. Another copy is in **Appendix F** for photocopying. ***Note***: If more than one product category/strategy is being evaluated for an incident, fill out a separate Testing & Monitoring Worksheet for each category/strategy. ***Note:*** The use of this worksheet is required for product use and highly recommended for strategy use.
2.	Identify up to three products in a category or up to three strategies to be reviewed. Record a product name or strategy in each column on Line A. *Use another copy of the worksheet if more than three products or strategies are being evaluated for a product category.*
3.	Complete Line B. Conduct/Record tailgate test to determine whether or not the product is effective on the oil type and at its present conditions and weathering. ***Note:*** A Tail-Gate test may not be applicable for certain strategies such as booming,
4.	After it has been determined that a product or strategy will work on the oil in this situation, record the products or strategies in Line C.

Continued on Next Page

PART C: IMPLEMENTATION, MONITORING, AND REPORTING REQUIREMENTS (CONTINUED)

Step Action Table Continued.

5.	Have either Field Effectiveness or Effects testing been conducted to determine if the product or strategy will work under realistic field conditions? Record Yes or No in Line D.
6.	If Field Effectiveness or Effects testing has been conducted, record the test protocols in the applicable areas under Line E. .
	Record your expected outcomes from a Field Effectiveness or Effects test for the products being tested. You need to determine what is considered effective for your given incident conditions as well as when a product is not considered effective.
7	Record the recommended level of monitoring in Line F.
8.	Review product-specific information recorded and compare and contrast products. Rank the products or strategies in terms of value to the incident-specific response conditions. Identify those products that are not suitable at this time. Record this information in Line G.
9.	Record any additional comments or information that is pertinent to this decision in Line H.
10.	This worksheet is designed to assist in the decision-making as well as implementation process. In Line I, if a product(s) appears to add value to the response or be suitable for the incident, the completed worksheets can be used to demonstrate consensus and can be FAXed to the incident-specific RRT for review and/or approval.

Note: Upon completing **Worksheet 3**, responders will then decide whether or not to recommend the implementation of a product or strategy to the On Scene Coordinator. This evaluation does not determine the best product or strategy to use for the response. Rather the evaluations and worksheets should help to narrow down these options as well as promote discussion between all decision makers and stakeholders to help determine the most beneficial response action for the incident specific conditions.

WORKSHEET 3: TESTING & MONITORING WORKSHEET

This worksheet is intended to be photocopied for each product category evaluated and used during drills and incidents and Faxed to the Incident Specific RRT for review. Use additional paper if needed to record information.

Name(s):				
Date:				
Incident:				
Products of Interest:		**Product No. ____**	**Product No. ____**	**Product No. ____**
A:	**Product Name:**			
B:	**Has a "Tail-Gate" test application proven that product is effective on oil type at this state of weathering? (Y/N)**			
Products to Consider for Additional Testing:		**Product No. ____**	**Product No. ____**	**Product No. ____**
C:	**Products still being considered:**			
D:	**Has a Field Effectiveness Test or Effects Test been carried out? (Y/N)**			
E:	**Describe test protocols:**			
	Test site specifics (environment):			
	Natural resources at risk:			
	Volume of oil to be treated:			
	Application rate(s)/volume used:			
	Application equipment:			
	Other logistical considerations:			
	Physical impacts expected:			
	Is the oil recoverable?:			
	Expected outcomes of test:			
F:	**Recommended Level of Monitoring for this test** (Refer to Part D to Determine)			
G:	**Mark as 1st, 2nd, 3rd Choice or Not Applicable for use during this incident**			

H: Additional Comments/Recommendations on the use of product(s):

I: Initials/Date of Incident-Specific RRT Review of Information:

Sign and Include Date Upon Review

USEPA: Name: _____ Date: _____ **STATE:** Name: _____ Date: _____

USCG: Name: _____ Date: _____ **STATE:** Name: _____ Date: _____

NOAA: Name: _____ Date: _____ **TRIBE:** Name: _____ Date: _____

USDOI: Name: _____ Date: _____ **OTHER:** Name: _____ Date: _____

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OPERATIONAL RESPONSE COUNTERMEASURES MONITORING PLANS & STRATEGIES

NOTE: Operational Monitoring concludes at the end of the response and is based on the removal criteria developed by the incident command.

During oil spill response, there is a need to monitor the use, effectiveness, and effects of response countermeasures to support decisions on whether or not the technologies or products are appropriate for use. The objective of field testing and monitoring is to validate, for the spill-specific conditions, the findings and claims from laboratory tests and previous field use. The two primary measures of field monitoring are: 1. Effectiveness, as indicated by the amount of oil removed, recovered, or degraded; and 2. Effects, as indicated by impacts to organisms, habitats, and property during use of the response countermeasures. Monitoring protocols for dispersants use and in-situ burning have already been developed and are provided by the Special Monitoring of Applied Response Technologies (SMART) program that is contained in Monitoring Tab of Volume II of this Selection Guide; a radiation module has been developed by Region II.

Detailed protocols for long-term monitoring of use of bioremediation agents are not covered in this guidance as monitoring protocols have previously been developed by the EPA/NETAC (1993) and are often further refined at the Regional Response Team level; refer to the appropriate Regional Contingency Plan guidance documents. The guidelines for monitoring protocols have been developed to address the following optional response countermeasures:

- Elasticity Modifiers
- Emulsion Treating Agents
- Shoreline Pre-treatment Agents
- Solidifiers
- Sorbents
- Surface Collecting Agents
- Surface Washing Agents

As each region further evaluates the value-added benefits from using these response countermeasures, the region may establish monitoring requirements as part of their pre-authorization and other guidance documents. It is recommended that you verify the monitoring requirements within the appropriate Regional Contingency Plan.

ELEMENTS OF A GOOD TESTING AND MONITORING PROGRAM

A good operational testing and monitoring program should include the following elements (Mearns, 1995):

Clear Objectives

Define the question(s) to be answered from the testing and monitoring program. They must be able to support decisions on further use of the technique. The conclusion of any monitoring program is at the discretion of the Unified Command members based on the response and the extent of damages.

Meaningful Exposures

Test sites and conditions should use real, operational conditions to the extent practical. It may be difficult to simulate all real conditions in test plots, so evaluators should consider additional impacts from full-scale operations. At a minimum, use samples of the oil in its current weathering stage and application rates and methods as proposed for full-scale use.

Experimental Design

At a minimum, testing should involve replicate observations or sampling at both treated and untreated (control) areas, before and after treatment. Controls should be similar to the treated area in all ways except the treatment. If the testing program includes comparison of different products, then it is even more important to have similar test sites for each product. In some cases, it may be appropriate to use a site (before treatment) as its own control for comparing effectiveness and effects after treatment.

Trained Team for Preparation and Observation

Product testing and monitoring at spills relies heavily on visual observations and an understanding of the products' mechanism of action, chemical components, environmental concerns, and expected or desired results. Thus, it is critical that the team members be skilled in both the design and implementation of field tests and trained in how to observe and monitor. They should be experienced with a broad range of countermeasures. It is usually a complex and difficult task to conduct field tests during an oil spill emergency that offer any real value to decision making. Such tests usually require experienced staff with technical backgrounds in:

- Chemistry
- Biology
- Physical processes
- Environmental engineering

Untrained team members without a background in spill response countermeasures will not be able to provide the Unified Command with appropriate test protocols and meaningful evaluations of the products' operational use and results. OSCs are strongly encouraged to use the specialized teams available to them, such as the Trustees, EPA Environmental Response Team (ERT), the USCG Strike Teams, the NOAA Scientific Support Coordinator (SSC), or Superfund Technical Assessment and Response Teams (START), when they consider evaluating, testing, and monitoring specialized response countermeasures during spill.

TESTING AND MONITORING PROCEDURES

Five levels of testing and monitoring are outlined below. Depending on the questions to be answered, any level can be used at a spill. Testing is not always progressive; some products or types of products have been shown to have little toxicity and thus the primary question is whether the product is effective on a particular oil type or under unique spill conditions. **Table 14** at the end of this section is a matrix of the types of questions to be answered by each level of testing and monitoring, for specific product categories.

Generic Testing Guidance

Level T-1: "Tail-gate Testing"

The objective is to determine if the product or technology works to some minimum degree with the oil under the current spill conditions. Use existing information, from laboratory tests or previous field applications, to select the most promising product(s). Then conduct on-scene tests to evaluate product effectiveness for the specific oil type, temperature, substrate, etc. Often, the tests are conducted on samples of oil from the spill site and placed in buckets, aquaria, etc. The test platform can be the tail-gate of a truck. The tests can be used to compare product effectiveness, but be aware that such tests are highly qualitative, have low reproducibility, and there are no standard field test protocols to follow. Use common sense in interpreting the results, and repeat the tests if the results are not clear.

An example of the approach for "tail-gate" testing for solidifiers is listed below.

Objective: To ascertain the ability of solidifiers to solidify the spilled oil under current field conditions.

1. For on-water applications, use containers of at least 1 liter volume. Fill half-full with water from the spill site.
2. Collect a large bucket of the oil to be solidified. Add a measured amount of oil to each 1 liter container, enough to cover the water surface in the container (create a surface slick).
3. Measure out the recommended amount of solidifier for the oil volume in the 1 liter containers. While stirring vigorously, add 1/5 of the recommended amount of

solidifier, stir for 1 minute, then repeat for a total of 5 additions, or until there is no more visible free oil.

4. Record the total amount of solidifier added at this point.
5. Leave the solidified oil in the water for up to 1 hour before making observations. Leave it longer if necessary, recording the time needed to finish curing.
6. Describe the solidified oil, using the one of each of the following visual descriptors in each column. Also note if free oil remains.

Extent of Solidification	Texture	Tackiness	Other
Solidified	Firm mass	Sticky	Holds together when lifted
Cohesive	Elastic	Non-sticky	Breaks apart when lifted
Non-cohesive	Weak	Crumbly	

Level T-2: Field Effectiveness Testing

The objective is to determine if the product(s) or technology works on the oil under realistic field conditions. Write out a detailed testing protocol that is reviewed and approved by both agency representatives and operations staff. The response operations will usually have to conduct the tests, and they can suggest changes that will make the test more realistic. They also need a list of equipment that they are expected to provide.

Use small areas or test plots in the physical setting and under actual field conditions. Follow the manufacturer's recommendations for application rate and methods. Always have a comparison, which can be other products, other technologies, or no action. Measures of effectiveness can be visual, as long as they are objective and well defined (e.g., change in percent cover of oil on the substrate), or based on sampling and chemical analysis (e.g., change in oil content of samples collected before and after treatment). Be sure to evaluate:

- Application equipment, whether it is effective and produces the specified application rate.
- What logistics are required (and thus potential problems for full-scale operations).
- Physical impacts from use, such as trampling.
- Undesirable changes in treated oil behavior (e.g., a surface washing agent that disperses the oil).
- Recoverability of the treated oil, effectiveness of removal methods.
- The amount and nature of residual treated oil and free product remaining.

Level T-3: Effects Testing

The objective is to determine if the product(s) or technology results in impacts to natural resources that are likely to cause more harm than other techniques, including natural recovery. Write out a detailed testing protocol for agency review and approval. Points to consider include:

- Use resident organisms as identified by applicable agencies that are characteristic of, or important to, the spill location.
- The results should be measurable in a short time, within 1-2 days.
- Include "oil only" and "treatment, no oil" controls where appropriate.
- Physical changes to the treated substrate or habitat may be the most significant impact.
- It is difficult to conduct controlled experiments under emergency field conditions, and the results will be only semi-quantitative at best.

As an example, during the evaluation of the use of surface washing agents at the *Morris J. Berman* spill in Puerto Rico, the biological effects monitoring program consisted of:

- Descriptive nearshore survey of the first treatment site, recording general biota condition and behavior before and after treatment;
- Transplant studies using sea urchins, snails, and mussels suspended in the water immediately adjacent to three sites: 1. oiled and treated with the product; 2. oiled and untreated; and 3. unoiled and untreated. The animals were recovered after 1 tidal cycle and observed for differences in behavior.
- Water sampling to measure concentrations of oil and product.

Monitoring

Level M-1: Operational First-Use Monitoring

The objective is to determine if full-scale operational use of the product or technology is effective and does not have unacceptable impacts. Again, it is necessary to have a detailed monitoring plan for approval by agency representatives. Operations will need to know that monitoring will be conducted, so plans can be made to give monitoring staff site access and notification as needed.

Level M-2: Continued Operational Monitoring

The objective is to routinely monitor the progress of cleanup using the approved technologies and assess the need for modifying cleanup methods. Field monitors should visit cleanup sites to ensure that the approved methods are being properly implemented. Oil weathering, temperature changes, or other physical processes, may render approved methods ineffective, requiring either termination of cleanup or testing of other methods.

Reporting Lessons Learned

Sharing information within and among the regions whenever spill countermeasures technologies are used is of vital interest and benefit to the response community. To assure this information is captured, OSCs/users are requested to complete the information questionnaire displayed at the end of this section (Section 3).

The information obtained in this process will be used to continually refine the data presented in Parts A and B of this Selection Guide. It is the RRT's intention that this information be maintained on a web-accessible site that will allow OSCs and other spill response decision-makers to evaluate the lessons learned by other OSCs using the individual spill countermeasure technologies. Additional, federal agencies

Table 14. The types of questions to be answered by different levels of testing and monitoring for specific types of oil-spill treating agents.

	"TAIL-GATE" TESTING	EFFECTIVENESS FIELD TESTS	EFFECTS FIELD TESTS	OPERATIONAL FIRST USE MONITORING
Elasticity Modifiers	Does the product make the oil more visco-elastic?	Can the product be applied at the proper dosage under field conditions? Is recovery of the treated oil improved?	Does the treated oil stick more to vegetation/debris?	Can all of the treated oil be recovered so there is little risk of exposure to animals and habitats? Can application rates be controlled?
Emulsion Treating Agents	Does the product break the emulsion? How long does it take?	Does the product break the emulsion under field conditions?	What is the toxicity of the separated water? Can it be released without treatment?	Are there any immediate impacts to fish, shellfish, insects, etc. in the treatment areas?
Solidifiers	Does product solidify spilled oil? What are properties of solidified oil in small containers?	Is the application equipment effective? What are properties of solidified oil in the field? Is recovery and removal efficient?	What are the risks of treated oil residues? What are risks of overspray product?	Observe that product still effective. Is there excessive substrate disturbance during retrieval?
Sorbents	Does product sorb the oil? Does the oil/sorbent float? What is the actual application rate? Does the oil drip out of the sorbent?	Application equipment effective? What is the field-scale application rate? Are the actual recovery and removal methods efficient?	Does the oil/sorbent float or sink on water? What is the amount and risk of product overspray?	Is the product still effective? Does the oil/sorbent remain floating during typical operational periods? Can the teams contain and recover the oil/sorbent?
Surface Collecting Agents	Does the product herd the oil? Does the product quickly dissolve or evaporate?	Does the product herd the oil under field conditions? How often is it necessary to re-apply the product?	Are there any immediate impacts to fish, shellfish, insects, etc. in the test area?	Are there any immediate impacts to fish, shellfish, insects, etc. in the treatment areas?
Surface Washing Agents	Does the product improve the rate of oil removal from samples of the substrate? Is the treated oil dispersed?	Is oil removal from the substrate improved under field conditions? Can the flushing pressure and temperature be reduced? What fraction of the treated oil is recoverable?	Is there a change in the condition of biota before and after product use? Are animals in the adjacent water affected after treatment, either lethally or sub lethally?	What are the oil concentrations in water adjacent to treated areas? Is there any change in biota condition over the course of product use?

SUGGESTED MONITORING PROTOCOLS FOR SURFACE WASHING AGENTS

Surface Washing Agent: Tail-Gate Test Guidelines

Objectives:

1. Compare the effectiveness of different surface washing agents vs. flushing with water.
2. Determine if the released oil will sink.
3. Determine the amount and rate at which treated oil floats.

Equipment/Supplies:

- Protective sheeting to cover test area (e.g., visqueen)
- Surface washing agent(s) to be tested
- Hudson sprayer for application of product
- Pressure washing system
- Containers for each test (e.g., bucket, kiddie pool)
- Placards for labeling tests
- Sorbent materials (may want to include different types such as pads and snare)
- Glass jars
- Camera, stopwatch, and field notebook
- Appropriate PPE

Suggested Protocols:

1. Determine the minimum and maximum spray temperatures and pressures to be tested.
2. Cover test area with protective sheeting.
3. Collect representative samples of the substrate to be treated.
4. Randomly place several in to each container. It is important to have the same surface area for treatment and degree of oiling for each test. Based on the oiled surface area to be treated, calculate the amount of product to be applied, following the manufacturer's recommended application rate.
5. Place labels on each container to identify each test unit and photograph prior to treatment.
6. Apply the product at the recommended rate and soak time. Use appropriate PPE.

7. Describe and photograph the oil behavior after application.
8. For each test, flush the treated oil with the selected minimum pressure and temperature spray until no more oil is released. Record the time.
9. Collect a water sample from below the surface immediately after termination of flushing in a labeled glass container. Describe and photograph the amount of oil dispersed into the water. Record the time it takes for most of the oil to float to the surface.
10. Record the amount of oil released and floating on the water surface in each container immediately after flushing and after 5 minutes.
11. Then increase the temperature and/or pressure incrementally to the maximums to be tested. Repeat the observations and photography of the amount of oil removed and dispersed.
12. At the end of the test, use sorbents to remove the floating oil, describing how well the oil is sorbed and any differences among products.
13. Remove the treated substrate from the containers and place on sorbent pads. Describe and photograph the percent oil removal, oil thickness, etc.
14. Discuss with observers oil removal rates, oil recovery rates, and amount of dispersed oil among treatments and select the best product(s) or method(s) for further consideration.

Surface Washing Agent: Effectiveness Field Test Guidelines

Objectives:

1. Compare the effectiveness of different surface washing agents vs. flushing with water on the actual oil and substrates under field conditions.
2. Determine the amount and rate at which treated oil floats.
3. Determine the temperatures and pressures needed to reach cleanup endpoints.

Equipment/Supplies:

- Surface washing agent(s) to be tested
- Hudson sprayer
- Pressure washing system
- Deluge system
- Containment boom
- Sorbent materials (may want to include different types such as pads and snare)
- Materials to delineate each test area

- Placards for identifying each test area
- Glass jars
- Camera and field notebook
- GPS unit, thermometer, wind gauge
- Appropriate PPE

Suggested Protocols:

1. Select field test site. It must be big enough for all treatments being tested, which usually includes comparison of a surface washing agent vs. flushing and a no treatment comparison. It is recommended that the treatment site size be selected for application of at least 2 and no more than 5 gallons of product, following the manufacturer's recommended application rate. All treatment areas should be similar in substrate type and oiling degree.
2. Delineate and identify each treatment site. Record the GPS coordinates.
3. Place a double boom around each treatment site. The dimensions of the boomed area should be based on consideration of the changes in water level expected during the test (from tides or wind) and the current speed and direction (so that there is enough time for any dispersed oil to refloat).
4. Place appropriate sorbent material inside the inner boom. If a large amount of oil may be released, use vacuum pumps, portable skimmers, etc. as needed to quickly recover all the released oil.
5. Describe and photograph each site prior to treatment.
6. Apply each product, following the manufacturer's recommendations and using appropriate PPE. Record air temperature, wind speed, and conditions (e.g., sunny, overcast, rain) during each test.
7. For each test, including water alone, flush at the selected minimum temperature and pressure. Use the deluge system to wash the released oil to the water. Describe and photograph oil behavior during flushing (floating, dispersed), and estimate how much oil accumulates inside the boom.
8. Collect a water sample from inside the boom at different times and locations (e.g., inside the outer boom, outside the boom at different distances) during and after flushing to visually inspect for dispersed oil. It may be necessary to collect 1 liter water samples for chemical analysis of the total petroleum hydrocarbons, depending on resource agency requirements. The analytical method chosen should have appropriate method detection levels.
9. Inspect the treated area. Determine if cleanup endpoints can be met. If not, increase the temperature and/or pressure incrementally up to the maximum selected, or until the cleanup endpoint could be met.
10. Repeat the water sampling described above for the maximum temperature and pressure used.

11. Estimate how much oil was released from each treatment site. Recover all released oil. Describe how well the sorbents recover the oil.
12. Describe and photograph the treated area. Estimate the percent oil removed from treated surfaces, oil removal from untreated surfaces such as sides and undersides, oil thickness, etc. Inspect the treatment area for physical impacts from use, such as trampling, transport of oiled sediments into the nearshore water, or damage of the substrate or habitat from high pressures and temperatures.
13. Leave booms and clean sorbents in place for at least 1 day or 2 tidal cycles and inspect for continued oil release.
14. Review the logistical requirements for full-scale operational use and determine if site conditions are suitable.
15. Discuss with observers oil removal rates, oil recovery rates, amount of dispersed oil among treatments, and logistical requirements and recommend the best approach and guidelines for operational use.

Surface Washing Agent: Effects Test Guidelines

Objectives:

1. Determine if there is a change in the condition of biota before and after product use in the treatment area.
2. Determine if animals in the adjacent water are affected after treatment, either lethally or sublethally.

Equipment/Supplies (will vary according to site-specific test protocols):

- Quadrats (0.25 m^2 and 1.0 m^2)
- Site markers (appropriate for substrate type)
- 30 m fiberglass tape measure, marked in cm
- Hand counter
- Box screen with 5 mm mesh; Sieve with 0.5 mm mesh
- Large tub or bucket
- Hand coring device (0.01 m^2 or similar size)
- Rubber stopper for coring device
- Mesh bags of the appropriate mesh
- Identification field guides/charts
- 10% buffered formalin
- Waterproof labels

- Chain of custody forms
- Glass jars for water samples
- Large cooler and ice (for preservation of water samples)
- Camera and field notebook
- Appropriate PPE
- Aquaria for each site (in office/lab)

Suggested Protocols:

1. Study design should include oil/treated site, oil only site, and unoiled/reference site, if possible considering site conditions.
2. At each site prior to the first operational use or test, establish at least one transect throughout the entire intertidal zone and describe/photograph the intertidal communities (species, behavior, condition), grain size characteristics, oiling, and other features at appropriate intervals. Where there are abundant intertidal fauna, use the quadrats to quantify epifauna (% cover by dominant and key indicator species) and sediment cores to quantify infauna (density by species). Another transect quantification method could be the point-contact method, where a random series of points is generated and whatever occurs along the transect at those points is recorded. This reduces the equipment requirement because the tape is all that's needed.
3. Collect resident organisms from unoiled habitats that are characteristic of and important to the spill location. The species should have behavioral responses that can be visually detected within a few days (e.g., byssal thread attachment for mussels, ability to right themselves for gastropods, sea urchins that can respond to stimuli of their spine, gapping behavior in bivalves). Transplant sufficient number of healthy organisms in the mesh bags at each site. Make sure that the bags remain under water during low tide. Consider nearshore current direction so that the oiled/treated bag is placed downstream of the treatment area.
4. Observe the use of the product, noting the temperatures and pressures of the spray applications and the flushing. Record the amount of product applied and any physical damage during application.
5. Collect water samples adjacent to the mesh bag over time, to provide data on actual exposures. Have the samples analyzed for PAHs (Modified EPA Method 8270). May also be appropriate to test for the chemical agents in the product(s) being used. Request quick turnaround of the chemical results from the laboratory as needed.
6. Repeat the intertidal transect on day 1 and 2 after treatment. Make sure to record physical impacts and changes to substrate as well as biota.
7. Retrieve the mesh bags after one tidal cycle. Place all animals in separate aquaria for observation for 24-48 hours, at a minimum. Make sure that the environmental conditions in the aquaria are suitable for the transplanted organisms (salinity, oxygen, light/dark periods). Record behavioral responses of each group.

8. Compile the results and discuss with agency resource managers on tradeoffs, suggestions on methods to reduce impacts, and recommendations for further use and operational monitoring requirements.

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SELECTION GUIDE USE TRACKING

Dear Selection Guide User:

We need your assistance in helping the editors increase the quality of the information contained in the Guide. Sharing information within and among the regions whenever spill countermeasures technologies are used is of vital interest and benefit to the response community. To assure this information is captured, Selection Guide users are requested to complete the information questionnaire form and return this form via email to dscholz@seaconsulting.com or mail it to Debra Scholz, SEA Consulting, Inc. 868 Robert E. Lee Blvd., Charleston, SC 29412. Thank you for your assistance in this matter!

NCP PRODUCT SCHEDULE PRODUCT USE SPILL INFORMATION FORM	
Name of Spill/Vessel/Location/Incident:	
Date of Spill (mm/dd/yy):	
Location of Spill:	
Latitude:	**Longitude:**
Oil Product:	
Oil Type (USCG Classification code): ❑ Group I ❑ Group II ❑ Group III ❑ Group IV ❑ Group V	
Estimated Volume Released (Gallons):	**(Barrels):**
Source of Discharge / Release:	
Resources at Risk:	
Technical Information on Product(s) Used / Evaluated	
Product / Response Countermeasure Used / Considered for Use:	
How was this Countermeasure Used (*purpose, application quantity, date, method, etc.***):**	

NCP PRODUCT SCHEDULE PRODUCT USE SPILL INFORMATION FORM	
Shoreline Types Impacted:	
Incident summary (*specifics*):	
Behavior of Oil Before and/or After Treatment:	
Other Countermeasures Used and Mitigation Efforts:	
Lesson Learned from Product Use:	
Recommendations for Future Product Use: *Please attach any necessary data and/or reports to this form.*	
Contact Information	
Name:	
Position:	
Agency:	
Mailing Address:	
Phone:	**FAX:**
Cell:	**Email:**
Questions / Submittal Information	
Contact 843-367-5126 for additional assistance/questions. Submit this form via email to dscholz@seaconsulting.com or mail it to Debra Scholz, SEA Consulting, Inc. 868 Robert E. Lee Blvd., Charleston, SC 29412. Thank you for your assistance in this matter.	

APPENDICES

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Appendix A
Glossary

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GLOSSARY

This glossary was partially developed using definitions found in the following:

- Using Oil Spill Dispersants on the Sea, Committee on Effectiveness of Oil Spill Dispersants, National Academy Press, Washington, D.C., 1989.
- Spill Response Glossary, Compiled by: National Oceanic and Atmospheric Administration, Hazardous Materials Response and Assessment Division, Scientific Support Coordination Branch.
- Glossary of Terms Related to Health, Exposure, and Risk Assessment, Air Risk Information Support Center (Air RISK), USEPA, 1989.
- Oil Spill Response: Products and Technology Reference Guide, USEPA, Scientific and Environmental Associates, Research Planning, Inc., Ecosystem Management & Associates, Inc., 1998.

absorbent A material that picks up and retains a liquid distributed throughout its molecular structure causing the solid to swell (50% or more). The absorbent is at least 70% insoluble in excess fluid.

absorb / absorption The take up of a substance *into* another substance.

accelerant An agent used to promote ignition or spreading of a fire, such as gelled gasoline, diesel/gasoline mixes, and fuel-soaked rags.

acute toxicity The inherent potential or capacity of a material (e.g., oil, chemicals) to cause adverse effects in a living organism after only a short period of exposure (generally less than 4 days).

ADDS Airborne Dispersant Delivery System

adjacent lands For the purpose of this document, adjacent lands are described as land that can or does affect surface waters, including marsh, wetlands, manmade structures, storm drains, beaches, creeks, ditches, or ponds.

adsorbent An insoluble material that is coated by a liquid on its surface including pores and capillaries without the solid swelling more than 50% in excess fluid. There are three types of adsorbents:

Type I adsorbent (roll, film, sheet, pad, blanket, web) – A material with length and width much greater than thickness and which has both linear form and strength sufficient to be handled either saturated or unsaturated.

Type II adsorbent (loose) – An unconsolidated particulate material without sufficient form and strength to be handled except with scoops or similar equipment.

Type III adsorbent (enclosed, e.g., pillows) – Adsorbent material contained by an outer fabric or netting which has permeability to oil, but with openings sufficiently small so as to substantially retain the sorbent material within the fabric or netting.

adsorb / adsorption The take-up of a liquid *at the surface* of a substance. Involves molecular attraction at the surface of the substance.

aerobic Requiring oxygen; aerobic organisms require free oxygen to breathe.

ambient Surrounding. Ambient conditions are those in the surrounding environment, such as ambient temperature, humidity, etc.

anaerobic Refers to the absence of molecular oxygen. Anaerobic organisms are able to live and grow where there is no free oxygen.

API Gravity A scale of specific gravities for petroleum fluids. Based on a simple inverse relationship with specific gravity. API Gravity = [(141.5/Specific Gravity)-131.5]

aromatic Aromatic hydrocarbons are composed solely of carbon and hydrogen atoms in various arrangements that include at least one benzene ring. Aromatic hydrocarbons are generally considered to include compounds that can be toxic, carcinogenic, or both, and give oil its smell.

barrel Equal to 42 United States gallons at 60° F.

benthic Pertaining to the bottom of a body of water.

biodegradation The process by which bacteria and other living organisms break down oil. The ultimate end products from biodegradation are carbon dioxide and water.

biological additive Microbiological cultures, enzymes, or nutrient additives that are deliberately introduced into an oil discharge for the specific purpose of encouraging biodegradation to mitigate the effects of the discharge.

bioremediation Acceleration of natural microbial degradation of a material by adding or enhancing one or more of the key rate-controlling factors, such as nutrients, oxygen, temperature, surface area, and moisture.

bioremediation agents Microbiological cultures, enzyme additives, or nutrient additives that are deliberately introduced into an oil discharge and that will significantly increase the rate of biodegradation to mitigate the effects of the discharge.

biosurfactant A naturally occurring surfactant.

booms Floating barriers used for the collection, diversion, deflection, and containment of spreading liquids.

brackish Intermediate in salinity (0.50 to 17.00 parts per thousand) between fresh water and seawater.

burning agents Additives that, through physical or chemical means, improve the combustibility of the materials to which they are applied.

centipoise (cP) A unit of measurement for dynamic viscosity.

CERCLA The Comprehensive Environmental Response, Compensation and Liability Act of 1980, as amended by the Superfund Amendments and Reauthorization Act of 1986.

chemical agents Elements, compounds, or mixtures that coagulate, disperse, dissolve, emulsify, foam, neutralize, precipitate, reduce, solubilize, oxidize, concentrate, congeal, entrap, fix, make the pollutant mass more rigid or viscous, or otherwise facilitate the mitigation of deleterious effects or the removal of the pollutant from the water. Chemical agents include biological additives, dispersants, miscellaneous oil spill control agents, and burning agents, but do not include sorbents.

chemical treating agents Products used in treating oil spills, including dispersants, bioremediation agents (nutrient additions), herding agents, emulsion treating agents, solidifiers, elasticity modifiers, surface washing agents, and miscellaneous oil spill control agents.

chronic / chronic toxicity An effect in which the organism of interest is exposed to the contaminant for a significant stage of its life cycle, generally weeks to years.

coastal waters For the purpose of this document is defined as water in the open ocean.

countermeasure An action implemented to counter the effects of an oil or hazardous material spill.

CWA Clean Water Act.

discharge Any emission (other than natural seepage), intentional or unintentional, and includes, but is not limited to, spilling, leaking, pumping, pouring, emitting, emptying, or dumping. Discharge as defined by section 311(a)(2) of the CWA, includes, but is not limited to, any spilling, leaking, pumping, pouring, emitting, emptying, or dumping of oil, but excludes discharges in compliance with an NPDES permit under section 402 of the CWA, discharges resulting from circumstances identified and reviewed and made a part of the public record with respect to a permit issued or modified under section 402 of the CWA, and subject to a condition in such permit, or continuous or anticipated intermittent discharges from a point source, identified in a permit or permit application under section 402 of the CWA, that are caused by events occurring within the scope of relevant operating or treatment systems. For purposes of the NCP, discharge also means substantial threat of discharge.

dispersant Those chemical agents that disperse, emulsify (oil-in-water emulsions), or solubilize oil into the water column or promote the surface spreading of oil slicks to facilitate dispersal of the oil into the water column.

dispersant:oil ratio The amount of dispersant required to treat the oil in question. A 1:20 ratio would mean one gallon of is dispersant needed for each 20 gallons of oil to be treated.

disperse To break oil into small particles that are then mixed into the water column.

dissolution The process of dissolving into water. Petroleum hydrocarbons dissolve slowly due to their low solubility and mineral salts present in the oil.

eduction Using a flow of air or water to pick up another liquid in a sort of vacuum (e.g., a way of pumping using the Venturi Principal). Eduction equipment is often used with dispersants; a process that mixes the neat dispersant with water or seawater for application.

effectiveness / efficacy The ability to produce the desired effect.

effluent Washwaters, runoff, outflow.

elasticity modifier A product which imparts elasticity to the oil. Although the viscosity of the oil is increased, it remains a liquid.

emulsion A suspension of oil in water or water in oil. Water-in-oil emulsions may contain 20 - 80% water. Emulsions may be temporary or permanent.

emulsion breaker An emulsion treating agent that breaks an emulsion into separate oil and water phases.

emulsion inhibitor An emulsion treating agent that, if applied to spilled oil before emulsification occurs, prevents emulsion formation.

emulsion treating agent A product that breaks or prevents water-in-oil emulsions by modifying the properties of the oil-water interface to inhibit or destabilize water-in-oil emulsions.

encapsulate To surround an oil droplet with a surfactant which prevents the droplet from re-coalescing. This term is often used by vendors in describing how their products work, meaning the same process as chemical dispersion.

environment As defined by section 101(8) of CERCLA, means the navigable waters, the waters of the contiguous zone, and the ocean waters of which the natural resources are under the exclusive management authority of the United States under the Magnuson Fishery, Conservation and Management Act; and any surface water, ground water, drinking water supply, land surface or subsurface strata, or ambient air within the United States or under the jurisdiction off the United States.

enzyme Natural or man-made proteins which are used to speed up the rate of chemical reactions, such as the chemical breakup of oil into final products of carbon dioxide and water.

ETA Emulsion treating agents.

exposure The contact reaction between a chemical or physical agent and a biological system (plant, animal, bacteria, etc.).

fertilizer A substance or agent used to promote the growth of plants, bacteria, and other organisms. Nitrogen and phosphorous are common constituents of fertilizers.

fresh / freshwater salinity or salt content less than 0.5 parts per thousand (ppt).

habitat The chemical, physical, and biological setting in which a plant or animal lives.

herding agent A product that pushes or compresses a liquid on the surface of the water column by exerting a higher spreading pressure than the liquid.

hydrophilic "Water loving;" attracted to water, mixes easily with water.

hydrophobic "Water fearing;" separates from water, does not mix well with water. Oil is typically hydrophobic.

imbibe To take in, as moisture into a sponge.

immiscible Describing liquids that will not mix with each other, such as oil and water.

in situ burning The burning of spilled oil in place.

incident Any occurrence or series of occurrences having the same origin, involving one or more vessels, facilities, or any combination thereof, resulting in the discharge or substantial threat of discharge of oil.

indigenous Existing or growing naturally in a region; native.

inland waters For the purposes of this document, inland waters is defined as water in a Bay, Harbor, Inlet, Estuary, Slough, River, or Lake.

inland zone The environment inland of the coastal zone, excluding the Great Lakes and specified ports and harbors on inland rivers. The term inland zone delineates an area of federal responsibility for response action. Precise boundaries are determined by USEPA/USCG agreements and identified in Federal regional contingency plans (RCP).

interfacial tension The tendency of a liquid surface, in contact with an immiscible liquid, to contract. The imbalance of forces at the liquid-liquid interface is due to the difference in molecular forces in the two immiscible liquids.

intertidal The part of the shoreline that lies between the highest and lowest tide levels.

IPIECA International Petroleum Industry Environmental Conservation Association.

ITOPF International Tanker Owners Pollution Federation Limited.

LC50 or LC_{50} Lethal concentration of a product that causes 50 percent mortality to the test organism over a stated period of time. Length of exposure is usually 24 to 96 hours.

marine Of, or on, the sea. Waters with a salinity above 17 parts per thousand and typically connected to the sea.

mechanism of action The fundamental physical and/or chemical processes involved in, or responsible for, the interaction between a chemical treating agent and spilled oil.

microbe A single-cell organism such as a bacterium.

miscellaneous oil spill control agent Any product, other than a dispersant, surface washing agent, surface collecting agent, bioremediation agent, burning agent, or sorbent that can be used to enhance oil spill cleanup, removal, treatment, or mitigation.

miscible Capable of being mixed at any ratio without separation of the two liquids.

mobile oil Oil on the land or water that is not contained.

National Strike Force Coordination Center (NSFCC), authorized as the National Response Unit by CWA sections 311(a)(23) and (j)(2) and amended by the section 4201 of the Oil Pollution Act of 1990 (OPA), means the entity established by the Secretary of the department in which the USCG is operating at Elizabeth City, North Carolina with responsibilities that include administration of the USCG Strike Teams, maintenance of response equipment inventories and logistic networks, and conducting a national exercise program.

natural resources Includes land, fish, air, wildlife, biota, drinking water supplies, and other such resources belonging to, managed by, held in trust by, appertaining to, or

otherwise controlled by the United States (including the resources of the exclusive economic zone), any State or local government or Indian Tribe, or any foreign government.

NCP National Oil and Hazardous Substances Pollution Contingency Plan 40 CFR Parts 9 and 300.

neat Applied without dilution.

non-persistent Non-persistent oils are those refined oil products that will be completely removed from the affected environment through natural weathering processes.

non-surfactant-based solvents A sub-class of shoreline cleaners that lower the viscosity of the oil and are primarily petroleum distillates similar to kerosene.

OHMSETT A US national oil spill response test facility in Atlantic Highlands, NJ. Currently operated and maintained by MAR, Incorporated under contract to the US Department of Interior, Minerals Management Service (MMS). This facility is a dedicated to testing full-scale oil spill response equipment; conducting research on innovated spill response technology; and conducting training sessions with oil.

oil As defined by section 311(a)(1) of the CWA, means oil of any kind or in any form, including, but not limited to, petroleum, fuel oil, sludge, oil refuse, and oil mixed with wastes other than dredged spoil. Oil, as defined by section 1001 of the OPA means oil of any kind or in any form, including, but not limited to, petroleum, fuel oil, sludge, oil refuse, and oil mixed with wastes other than dredged spoil, but does not include petroleum, including crude oil or any fraction thereof, which is specifically listed or designated as a hazardous substance under subparagraphs (A) through (F) of section 101(14) of the Comprehensive Environmental Response, Compensation, and Liability Act (42 U.S.C. 9601) and which is subject to the provisions of that Act.

oleophilic "Oil loving;" a substance that is attracted to, or mixes well with, oil.

on-scene coordinator (OSC) The Federal OSC is predesignated by EPA or the USCG to coordinate and direct Federal responses under Subpart D, or the official designated by the lead agency to coordinate and direct removal actions under Subpart E, of the NCP. The state OSC is predesignated by state statutes.

operational monitoring A real-time evaluation process which provides measurement or observation activity (using trained observers) to ensure the success of a response and, in particular, to direct or redirect the response decision.

oxidation (or reduction-oxidation reaction) is the molecular transfer of electrons through a chemical reaction in which atoms lose electrons (hydrogen) or gain oxygen resulting in a change in the molecule's oxidation number. This may also be conducted through covalent bonding within the molecule.

oxidation agent A product which enhances photo-oxidative degradation of a material.

parts per billion Parts per billion (ppb) unit of concentration. One ppb is roughly equivalent to one teaspoon in 1,300,000 gallons.

parts per million Parts per million (ppm) unit of concentration. One ppm is roughly equivalent to one teaspoon in 1,300 gallons.

parts per thousand Parts per thousand (ppt) unit of concentration. One ppt is roughly equivalent to one teaspoon in 1.3 gallons.

penetration For purposes here, penetration refers to the ability of a substance, such as a chemical product, to work through thick oil, or seep into oil coated substrate.

photo-oxidation The process by which the components in oil are chemically transformed through a photo-chemical reaction (in the presence of oxygen) to produce compounds which tend to be both more water soluble and toxic (in the short term) than the parent compounds.

polymer A large molecule (macromolecule) composed of repeating structural unites typically connected by covalent chemical bonds.

ppb See parts per billion.

ppm See parts per million.

ppt See parts per thousand.

release As defined by section 101(22) of CERCLA, means any spilling, leaking, pumping, pouring, emitting, emptying, discharging, injecting, escaping, leaching, dumping, or disposing into the environment (including the abandonment or discarding of barrels, containers, and other closed receptacles containing any hazardous substance or pollutant or contaminant). See NCP for list of exclusions.

remove / removal As defined by section 311(a)(8) of the CWA, refers to the removal of oil or hazardous substances from the water and shorelines or the taking of such other actions as may be necessary to minimize or mitigate damage to the public health or welfare or to the environment. As defined by section 101(23) of CERCLA, remove or removal means the cleanup or removal of hazardous substances from the environment; such actions as may be necessary taken in the event of the threat of release of hazardous substances into the environment; such actions as may be necessary to monitor, assess and evaluate the release or threat of release of hazardous substances; the disposal of removed material; or the taking of such other actions as may be necessary to prevent, minimize, or mitigate damage to the public health or welfare or to the environment, which may otherwise result from a release or threat of release. The term includes, in addition, without being limited to, security fencing or other measures to limit access, provision of alternate water supplies, temporary evacuation and housing of threatened individuals not otherwise provided for, action taken under section 104(b) of CERCLA, post-removal site control, where appropriate, and any emergency assistance which may be provided under the Disaster Relief Act of 1974. For the purpose of the NCP, the term also includes enforcement activities related thereto.

response niche Application for which a countermeasure is best suited. The appropriate application is determined by considering: the type and volume of oil spilled; spill location; habitats affected; weather/time of year; and other factors.

saline Containing salt; e.g., saline water.

salinity The concentration of salt in a solution, such as water. Usually measured as Parts per thousand (ppt). Ocean water is typically 35-36 ppt.

sheen A thin layer of floating oil. May appear as silver (0.00007 mm), rainbow (0.00015 mm) or gray (0.001 mm), depending on thickness.

shoreline pre-treatment agent A product which prevents oil from adhering to the shoreline by reducing the oil adherence (a wetting agent) and penetration (a film-forming agent).

sinking agents means those additives applied to oil discharges to sink floating pollutants below the water surface, as described in 40 CFR Part 300.910(e).

slick / oil slick A smooth area on the water due to a thin layer of floating oil.

SMART Special Monitoring of Applied Response Technologies.

solidifier A product which mixes with oil to turn it into a rubber-like solid; Typically composed of dry, high molecular weight polymers that have a porous matrix and large oleophilic surface area, forming a physical (not chemical) bond with the oil.

soluble / solubility A product is considered “quite soluble” in water if its solubility is greater than 1 ppt. A product is considered “sparingly soluble” in water if its solubility is between 1 ppt and 1 ppm. A product is considered “very sparingly soluble” in water if its solubility is between 1 ppm and 1 ppb. A product is considered “essentially insoluble” in water if its solubility is 1 ppb or less.

solvent Any substance into which another substance will dissolve (e.g., sugar will dissolve in water, which is a common solvent). For purposes here, a solvent is generally any chemical agent that will dissolve oil.

sorbent An insoluble material or mixture of materials used to recover liquids through the mechanisms of absorption or adsorption, or both (ASTM F726-99). Any oleophilic material which is used to take up oil through absorption or adsorption. Essentially made from inert and insoluble materials that are used to remove oil and hazardous substances from water through adsorption, in which the oil or hazardous substance is attracted to the sorbent surface and then adheres to it; or by absorption, in which the oil or hazardous substance penetrates the pores of the sorbent material; or a combination of the two. These are true sorbents that act in the same manner as other sorbents do. They are only referred to as being ‘alternative’ because they are not made of the materials typically associated with sorbents. (i.e., not made of polypropylene, cotton, etc.).

specific gravity The ratio of the mass of a liquid compared to the mass of an equal volume of pure water, at the same temperature.

spreading pressure The force exerted against a fixed barrier as a liquid is compressed into a smaller surface area.

substrate The substance or base on which, or the medium in which, an organism lives and grows, or the surface to which a fixed organism is attached; e.g., soil or rocks.

subtidal The part of the coastal zone that lies below the lowest low tide level, so that it is always underwater.

surface collecting agent Those chemical agents that form a surface film to control the layer thickness of oil.

surface tension The tendency of a liquid surface, in contact with air, to contract. This is because of the imbalance of forces on the molecules in the bulk liquid as opposed to those at the liquid surface in contact with air.

surface washing agent Any product that removes oil from solid natural and man-made surfaces, such as beaches, rocks, concrete, and asphalt, through a detergency mechanism and does not involve dispersing or solubilizing the oil into the water column. This product is normally applied as a soaking treatment during low tide so that it has time to work prior to flushing as the tide rises.

surface collecting agent Those chemical agents that form a surface film to control the layer thickness of oil.

surfactant Also referred to as surface-active agents, this is a chemical compound that contains both an oil-soluble and water-soluble ends on the molecule. Both naturally occurring and chemically manufactured varieties exist.

toxic Having an adverse effect on a living organism.

toxicity The inherent potential or capacity of a material (e.g., oil, chemicals) to cause adverse effects in a living organism.

vadose zone The portion of earth between the land surface and the zone of saturation; also termed the unsaturated zone. It extends from the top of the ground surface to the water table. It is also defined as the region of aeration above the water table.

vapor suppression For oil spills; the light weight components of oil evaporate and if confined in an enclosed space could cause an explosion. Certain chemical products can reduce the evaporation (suppress the vapors) of light-weight components (e.g., fire fighting foams).

viscosity Flow resistance; viscosity may be reported in one of two ways for oil spill related issues.

Dynamic viscosity (μ) referring to internal friction of a substance (e.g., oil) that is a function of the oil type and temperature and is measured in Centipoise units (cP). The lower the viscosity, the thinner the fluid (e.g., water = 1 cP, molasses = 100,000 cP).

Kinematic viscosity (ν) the fluids dynamic viscosity divided by its density which is measured in stoke (St) units and is often reported as centistoke (cSt). Since the density of oil is not too different from that of water, rough calculations of oil

viscosity are not very sensitive, numerically, to interchanging values between dynamic and kinematic viscosities.

volatility The tendency for the components in a liquid to vaporize.

weathering Alteration of the physical and chemical properties of a material through natural processes, including evaporation, dissolution, photo-oxidation, emulsification, and biodegradation.

wetting agent A shoreline pre-treatment agent that causes the oil not to adhere to the shoreline.

window of opportunity An interval of time during which conditions are favorable and an opportunity exists for the countermeasure to be implemented effectively.

Appendix B

Example of Certification Letter from USEPA for an Applied Sorbent Product's Exclusion from the NCP Product Schedule

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Example of Certification Letter from USEPA for an Applied Sorbent Product's Exclusion from the NCP Product Schedule.

NOTE: Any certification letter provided by the vendor for any product, must be on official USEPA Oil Program Center Letterhead and have a valid signature of the NCP Product Schedule Coordinator. If there is any question on any document, contact the EPA's Office of Emergency Management (Headquarters) Product Schedule Manager (202-564-1974).

Dear _____:

We have received and reviewed the information you submitted on your company's sorbent _____(product name)_____. Our review indicates that this product meets the definition of a "sorbent" as specified in Title 40 of the Code of Federal Regulations (CFR), sections 300.5 and 300.915(g) of the National Contingency Plan (NCP). Based on this review, ___(product name)_____ is not required to be listed on the NCP Product Schedule.

So that you may be prepared to provide On-Scene Coordinators with a certification as referenced in section 300.915(g)(4) of the NCP, the following statement should be reproduced, dated, and signed on your corporate letterhead:

> [SORBENT NAME] is a sorbent material and consists solely of the materials listed in section 300.915(g)(1) of the NCP.

Enclosed for your review is a copy of section 300.915(g) from the NCP. Should you have questions, please contact me at (202) 260-2342.

Sincerely,

NCP Product Schedule Manager
EPA Office of Emergency Management, Regulation and Policy Development Division

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Appendix C

Understanding Toxicity, Exposure, and Effects
Related to Spill Response Countermeasures

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UNDERSTANDING TOXICITY, EXPOSURE, AND EFFECTS RELATED TO SPILL RESPONSE COUNTERMEASURES

INTRODUCTION

This brief guidance information was developed to assist the decision-maker in determining the potential impacts/injuries to resources from the spilled oil and from oil treated with various spill countermeasure products. This is an overview on toxicity, exposure, and effects from contact with spilled oil. Due to the nature and breadth of this topic, only generalities are provided for exposure effects. Decision-makers will need to coordinate with resource specialists to gather and evaluate species-specific information on toxicity, exposure, and effects.

Determining adverse impacts consists of a three-step process:

1. Evaluate the toxicity of the spilled substance and how the toxicity may change when spill response countermeasures (products) are used to combat the spilled oil,
2. Determine the resources at risk, routes of exposure to the oil and/or the oil mixed with the spill countermeasures products; and
3. Determine and document potential toxic effects exhibited by the resources of concern.

Decision-makers need to have a clear understanding of what toxicity is, potential routes of exposure, and potential toxic effects from exposure to understand how adverse effects can occur during oil spills. The reader is reminded that adverse effects can occur both from spilled oil and the countermeasures used to control the oil. To determine the options that result in the optimal environmental benefit, the toxicities of various control options must be compared to each other and the toxicity of the spilled oil.

The following information in this overview was developed from Boyd *et al*., (2001).

WHAT IS TOXICITY?

Rand and Petrocelli (1985) define toxicity as the "inherent potential or capacity of a material [e.g., oil or chemically treated oil] to cause adverse effects in a living organism." Adverse effects are responses outside the "normal" range for healthy organisms and can include behavioral, reproductive, or physiological changes, such as slowed movements, reduced fertility, or death. Toxic effects are a function of both the duration of exposure to the chemical and the concentration of the chemical. In the aquatic environment, the concentration of a chemical, as well as its transport, transformation, and fate, is controlled by:

- Physical and chemical properties of the compound (such as a compound's solubility or vapor pressure);

- Physical, chemical, and biological properties of the ecosystem (such as salinity, temperature, water clarity, or water depth); and
- Sources and rate of input of the chemical into the environment (Rand and Petrocelli, 1985; Capuzzo, 1987; Gilfillan, 1992).

How is Toxicity Measured?

To determine the toxic impact of a chemical on a living resource, an estimate of the range of chemical concentrations that produce some selected, readily observable, and quantifiable response during a given time of exposure needs to be defined (Rand and Petrocelli, 1985). This is referred to as a dose-response relationship and is usually measured in parts per million (ppm) or parts per billion (ppb).

Often, toxicity data are expressed as the **L**ethal **C**oncentration required to kill **50** percent of the test species (LC50) or the **E**ffective **C**oncentration required to adversely affect **50** percent of the test species (EC50) in some specified way. LD50 is the **L**ethal **D**ose of a toxicant (through direct ingestion) required to kill **50** percent of the animals tested.

LC50 vs. EC50

For LC50, the endpoint is mortality over a specified time. Length of exposure is usually 24 to 96 hours. In some tests, the endpoint is not mortality, but a non-lethal response such as immobility, developmental abnormality, etc. In these cases, results are expressed as EC50, where a significant, defined, effect is seen in 50% of the population over a specified time period, usually 24 or 48 hours (Rand and Petrocelli, 1985). **Table C-1** provides some generalities on rating toxicity data for various generic categories of resources.

Toxicity testing provides us with important information about the effects of oil; however there are some complicating factors that one should keep in mind when looking at toxicity data. Markarian *et al.* (1993) cautions that use of the term "Lethal Concentration" is inappropriate for testing with oil products. This is because an LC50, for example, should measure the lethal concentration of a single compound. However, oil is a mix of compounds and often the exact mixture is not known. Seeing an LC50 result for oil does not immediately indicate how the measured concentration was developed. This can make comparisons of oils difficult, because various approaches can provide different results, which are of different scientific relevance (Markarian *et al.*, 1993). Although experts concur that LC50 data are not the best suited measure of toxicity for oil, it is very often the only type of measurement available.

Another complicating factor for those reading toxicity tests with oil products is how the concentration is expressed. Concentrations expressed as the total oil per unit volume (nominal concentration) are misleading because much of the oil is not soluble in the water and, therefore, not available to water column organisms. Using this nominal concentration will produce overestimates of exposure concentrations and toxicities (NRC, 1989; Lewis and Aurand, 1997). More realistic testing methods measure concentration based on the water-accommodated fraction (WAF) of the oil, which is the fraction of an oil product that

remains in the water phase after mixing and settling (CONCAWE, 1983; Singer and Tjeerdema, 1994).

Table C-1. Relative toxicity of substances (adapted from USFWS, 1984; Hunn and Schnick, 1990).

Toxicity Rating	Aquatic 96-hour LC50	Avian Oral 96-hour LD50 ($mg_{substance}/Kg_{bird}$)	Mammalian Oral 96-hour LD50 ($mg_{substance}/Kg_{animal}$)
Practically Non-toxic	100 – 1,000 mg/L	> 5,000	>15,000
Slightly Toxic	10-100 mg/L	1,000-5,000	5,000-15,000
Moderately Toxic	1-10 mg/L	200-1,000	500-5,000
Highly Toxic	0.1-1.0 mg/L	40-200	50-500
Extremely Toxic	<0.1 mg/L	<40	5-50

Photoenhanced Toxicity of Polynuclear Aromatic Hydrocarbons (PAHs)

Laboratory studies have indicated that the aquatic toxicity due to PAHs increases by 12 to 50,000 times when the tests are conducted under ultraviolet light compared to the normal conditions of fluorescent light (NRC, 2005). This increase occurs when ultraviolet radiation is absorbed by the double bonds of the PAHs, exciting them and leading to the formation of products that are very toxic. These reactions are of greatest importance when the PAHs bioaccumulate in the tissues of aquatic organisms. Photoenhanced toxicity of oil is of potential concern for translucent pelagic larvae and epibenthic or benthic organisms living in shallow water areas; it may not be of concern for animals that are opaque or live below the photic zone (NRC, 2005).

WHAT IS EXPOSURE?

Exposure refers to the amount of contact an organism has with a chemical, physical, or biological agent. When assessing toxicity, it is necessary to know the exposure. The most significant factors are the kind, duration, and frequency of exposure, as well as the concentration of the chemical (Rand and Petrocelli, 1985). NOAA's Damage Assessment Center summarized the factors to be considered when assessing exposure to subtidal and intertidal organisms along shorelines (NOAA, 1996):

- **Oil type** – physical and chemical characteristics of the oil.

- **Spill volume** – size of the discharge or amount in shoreline area.
- **Duration and frequency** – how often and for how long organisms are exposed to oil and or chemical countermeasures.
- **Shoreline type** – high-energy shorelines may reduce the chance for long-term aquatic exposure, but may also result in the oil being deposited along or above the high tide line. Sediment grain size will also affect exposure, with coarse-grained sediments allowing for more rapid and deeper penetration.
- **Tide stage** – subtidal organisms are at less risk than intertidal organisms, since they won't come in contact with the floating oil.
- **Weather conditions** – floods or storm-driven tides may strand oil in places it would not normally go. Weather conditions can also accelerate or retard oil weathering.

Toxic effects can be produced by acute (short-term) or chronic (long-term) exposures. Acute exposures occur when an organism is in contact with a chemical for a brief time period. Toxicity testing for acute effects usually involves effects that occur within a four-day period (96 hr) or less. In the case of oil spills, negative effects from acute exposure are usually seen early in the spill. This is because the oil, including the light and medium-weight components that may evaporate, is most concentrated during the first few days. Alternatively, chronic exposures are longer duration (weeks to years), and generally involve daily exposure to smaller amounts of oil or residual weathering compounds from oil.

Routes of Exposure

Following a spill on water or on land, resources can be exposed to oil through four different routes:

1. **Direct contact** – This is the most visible route of exposure to an observer. When a plant or animal comes into direct contact with oil, it may only become lightly oiled. However, it could also become completely coated with oil, making it unable to move, function, or survive. Once an organism is physically coated with oil, the chances of exposure through the other three methods described below will increase dramatically.

2. **Ingestion** – Both direct and indirect. Direct ingestion occurs when an organism eats food coated with oil or even ingests the oil itself. Direct ingestion of oil may occur accidentally, such as when a bird attempts to clean oil from its feathers. Indirect ingestion occurs when an organism eats prey or food tainted with oil. This food is not necessarily coated with oil itself, but has been exposed to it previously. For example, an eagle could ingest oil indirectly by eating an animal that swallowed oil during a spill the week before.

3. **Inhalation** – Inhalation may occur when animals breathe in evaporating oil components or oil mists created from storm and wave action. Inhalation usually occurs when animals on the surface (e.g., seabirds, otters, and seals) breathe while swimming in/through a slick.

4. **Absorption** – This occurs when an organism absorbs the oil, or toxins from the oil, directly through its skin or outer membranes. Typical examples of organisms to which this could apply are benthic or intertidal mollusks, worms, fish, and plants.

ADVERSE EFFECTS

Potential Effects

NOTE: *The information presented in this section is very general and should only be viewed as a starting point in your understanding of how adverse effects can occur. Specific impacts are very species- and situation-dependent. For spill preparedness and incident response, experts on the local resources must always be consulted and consider the implications of scenario- or incident-specific conditions.*

As mentioned previously, adverse effects are responses outside the "normal" range for healthy organisms and can include behavioral, reproductive, or physiological changes, such as slowed movements, reduced fertility, or death. **Table C-2** provides general guidance on potential effects experienced by various resource categories that are typically affected by spills of oil.

Often, toxicity is viewed as the ability of a substance to kill an organism. **It is important to keep in mind that toxic substances usually cause effects other than death in most organisms.** Actual effects depend on a number of variables. Sublethal effects are often difficult to quantify or even observe and may, or may not, be important to the future survival of the organism. Mackay and Wells (1981), NRC (1985), and Mielke (1990) summarize factors that determine the severity of ecological impacts from an oil spill. These include:

- Concentration of oil and the duration of the exposure;
- Type of oil involved;
- Whether the oil is fresh, weathered, or emulsified;
- Whether a coastal, estuarine, or open ocean area is involved and whether it is a nesting, wintering, or migratory ground for sea birds;
- Season of the year with respect to bird migration and whether organisms are dormant or actively feeding and reproducing;
- Oceanographic conditions such as currents, sea state, coastal topography, and tidal action;

- Whether adult or juvenile life forms are present;
- Whether the oil is in solution, suspension, or adsorbed onto suspended particulates or sediment;
- Distribution of oil in the water column;
- Effects of oil on competing biota;
- An ecosystem's previous history of exposure to oil or other pollutants; and
- Cleanup procedures used.

Table C-2. Generalized list of effects, by resource category and route of exposure. Adapted from Scholz et al., (1992) and RPI (1991).

		Routes of Exposure			
Resource Category	**Examples**	**Direct Contact**	**Ingestion**	**Inhalation**	**Absorption**
Birds	Seabirds Gulls and terns Raptors Shorebirds Wading birds Waterfowl	▪ Fouling of plumage / matting ▪ Hypothermia ▪ Loss of buoyancy ▪ Reduced egg survival ▪ Nest abandonment ▪ Reduced reproductive success ▪ Death	Preening, consuming oiled prey can result in: ▪ Anemia ▪ Pneumonia ▪ Intestinal irritation ▪ Kidney damage ▪ Altered blood chemistry ▪ Decreased growth ▪ Impaired osmoregulation ▪ Decreased Production and viability of eggs ▪ Death		
Fish	Anadromous Marine pelagic Demersal groundfish Reef fish Estuarine fish	Changes in: ▪ Feeding ▪ Growth ▪ Development ▪ Recruitment	▪ Adults ingesting oil metabolized into water-soluble compounds that are excreted as feces or urine ▪ Tumor production and other abnormalities ▪ Death		▪ Chemosensory ability may be reduced ▪ Changes in feeding, avoidance behaviour, reproduction ▪ Elevated respiration, decreased respiration ▪ Reduction in activity in larvae ▪ Reduced schooling behaviour ▪ Reduced growth with long-term exposure ▪ Death

		Routes of Exposure			
Resource Category	**Examples**	**Direct Contact**	**Ingestion**	**Inhalation**	**Absorption**
Marine Mammals	Whales Dolphins Porpoises Seals Sea lions Walruses Sea otter	▪ Irritation to eyes and skin ▪ Increased metabolism ▪ Temporary reduction in feeding efficiency ▪ Loss of insulative property (fur bearers) ▪ Death	Direct consumption can result in: ▪ Irritation / destruction of intestinal linings ▪ Organ damage ▪ Neurological disorders ▪ Bioaccumulation of toxins ▪ Death Indirect consumption can result in: ▪ Transfer of toxins to young via lactation ▪ Obsessive grooming behavior ▪ Degenerative liver lesions, kidney failure ▪ Endocrine imbalances ▪ Diarrhea ▪ Death	▪ Absorption into the circulatory system ▪ Mild irritation / permanent damage to respiratory surfaces and mucosal membranes ▪ Death May also affect: ▪ Lungs and other organs ▪ Nervous system	
Reptiles	Sea turtles Alligators Marine Lizards	▪ Increased number of eggs remaining unhatched ▪ Hatchling morphology (weight, size) ▪ Reddening and sloughing off of skin ▪ Reduced viability ▪ Increased chance for infection ▪ Coated flippers ▪ Contaminated mouthparts ▪ Death	▪ Reduction in feeding efficiency ▪ Starvation ▪ Death	▪ Increased dive time and diving deeper in young turtles ▪ Increased respiratory rates ▪ Decreased blood glucose levels ▪ Death	▪ Impairment of immune system can result in increased production of white blood cells ▪ Interference of salt gland can result in water imbalance and internal ion regulation ▪ Death

		Routes of Exposure			
Resource Category	**Examples**	**Direct Contact**	**Ingestion**	**Inhalation**	**Absorption**
Shellfish	Shrimp Lobster Crab Oyster Clam Mussel Scallop Squid Octopus	▪ Decreased or abnormal growth ▪ Increased mucous production ▪ Damage to soft tissues ▪ Decreased respiration ▪ Death	▪ Tainting ▪ Decreased feeding ▪ Death		
Other Invertebrates	Corals Annelid Worms Polychaetes Urchin Starfish	▪ Impaired larval settlement ▪ Growth reduction ▪ Bleaching or expulsion of Zooxanthellae (corals) ▪ Death	▪ Impaired feeding response ▪ Impaired polyp retraction (corals) ▪ Increased mucous production ▪ Impaired sediment clearance ability (corals) ▪ Death		For corals: ▪ Reduced growth ▪ Reduced reproduction / gonad damage ▪ Muscle atrophy ▪ Tissue death ▪ Death
Plankton	Phytoplankton Bacterioplankton Zooplankton		▪ May exhibit an increase in abundance due to increased food supply, i.e., spilled oil (zoo) ▪ Excretion of oil droplets as unmodified oil in fecal pellets (zoo) ▪ Death		▪ Reduced photosynthetic efficiency (phyto) ▪ Reduction in algal growth (phyto) ▪ Decreases in biomass (zoo) ▪ Lower feeding rate (zoo) ▪ Lower reproduction rates (zoo) ▪ Death
Marine Plants	Algae Kelp Seagrasses Wetland plants	▪ Smothering ▪ Bleaching ▪ Sloughing off of leaves ▪ Death of plant			▪ Sloughing off of leaves ▪ Death of plant

Some biological species produce large numbers of young to overcome natural losses (e.g., most invertebrates) making it less likely that any localized impacts will have a discernible effect on the adult population (ITOPF, 1987). Although most vertebrates of concern during a spill do not do this (e.g., seabirds, marine mammals), it is still unlikely that there will be serious effects on the overall population in most spill situations. However, it must be emphasized that this is not always the case, especially with threatened and endangered species. The loss of only a few individuals of a threatened or endangered species could have a large impact on the entire population. Also, early life stages (larvae and juveniles) of most resources are generally more sensitive to the effects of oiling than adults (ITOPF, 1987). This increased sensitivity may be related to life stage-specific or seasonal dependency on metabolic processes that are not critical functions in the adult forms (Capuzzo, 1987; Lewis and Aurand, 1997).

Changes in Effects from Exposure to Oil Treated with Spill Countermeasure Products

Table C-3 (next page) provides a visual summary of the changes in potential routes of exposure following the addition of spill countermeasure products.

Bioremediation Agents

Bioremediation agents are seldom used during the emergency phase of a spill, and they are typically used as a polishing tool after other techniques have been used to remove free product or when further response options are likely to be destructive, ineffective or cost-prohibitive. Therefore, the addition of these products to the spilled oil is only likely to occur after extensive weathering of the product has occurred. Exposures are assumed to remain unchanged when oil is treated with bioremediation agents relative to oil that is left untreated.

Dispersants

When dispersants are applied during a spill, they act to break up the oil into smaller droplets that are more likely to be removed from the surface by wave action and mixed downward into the water column. Dispersants can be used as an isolated response option for a particular portion of the spill or as the response option of choice to deal with the spill as a whole. In either case, dispersants will increase oil exposure to some organisms while reducing exposure for others. When dispersants are applied, exposure to oil will typically decrease for surface-dwelling and intertidal resources, but increase for water column and bottom-dwelling resources. This is one reason that dispersants are not usually applied to a spill directly over shallow sensitive habitats such as a coral reef or seagrass bed. Without dispersant application the oil may stay on the surface and not contact the reef, whereas with dispersant application the shallow habitat may be showered with droplets of oil.

Elasticity Modifiers and Solidifiers

Both elasticity modifiers and solidifiers, when added to spilled oil, are designed to change the viscosity of the oil, allowing for easier pick up/removal. These products are only used

for contained oil and all product/oil mixtures are to be recovered; therefore their potential for altering exposure to resources is limited to small spill volumes. The product/oil mixture is designed to remain floating and reject any products that might cause the oil to sink. When applied, these products will not alter the routes of exposure; surface dwelling and intertidal resources could still be affected by the spilled oil/mixture. Elasticity modifiers make the oil more sticky and the treated oil is more likely to adhere to fur, feathers, vegetation, and dry shorelines, thus potentially increasing exposure to resources if the treated oil is not recovered. Solidifiers can reduce the vapor pressure of volatile oils and transform the spilled oil into a coherent mass. The potential for physical disturbance of habitats, as well as smothering, may be an additional factor when determining potential exposures to the oil/product mixtures.

Emulsion Treating Agents

Emulsion treating agents (ETAs) are used to prevent emulsification of the oil on the water surface and to increase the window of opportunity for other response options (e.g., dispersants, *in situ* burning, skimming). Most are composed of water-soluble surfactants that modify the properties of the oil/water interface, thus inhibiting the emulsification process. Over time (rate undetermined) ETAs will leach out of the oil/product mixtures and emulsions may form. It is speculated that the ETAs may enhance the solubility of the oil into the water. The potential for exposure is not likely to change for surface-dwelling or intertidal species as the ETAs do not displace the oil within the water column. However, water column resources may be exposed if the ETA enhances the solubility of the oil into the water.

In-situ Burning

In-situ burn technology is designed to remove oil from the water surface or on land by burning the oil in place. When used effectively, in-situ burns can achieve removal rates of 50,000 gal/hour for a burn area of 10,000 ft^2 and removal efficiencies can exceed 90%. This makes in-situ burning a response option for further consideration when you want to prevent the spread of oil to sensitive sites or over large areas. However, burning oil generates large volumes of black smoke. Site conditions (particularly wind speed and direction) will determine whether the smoke plume poses a threat to the public, thus each spill has been evaluated on a case-by-case basis. In general in-situ burning removes the threat from the oil slick from the water surface through combustion of the oil product; effectively removing the oil from the water surface to the atmosphere. However, in-situ burns are not 100% effective, and the residues can form a semi-solid, tar-like layer that may need to be recovered from the water surface. Also, some of the burn residue from crude oil burns may sink, thus exposing water column and bottom-dwelling resources to the oil in a new form.

Shoreline Pre-treatment Agents

Shoreline pre-treatment agents are designed to be utilized when oil is heading towards a sensitive shoreline resource (e.g., marsh, sheltered tidal flat) or a resource of historical/archaeological importance. Pre-treatment agents are applied directly onto the substrate prior to oil landfall to prevent oil from adhering to or penetrating the substrate. Therefore, they could have direct toxic effects to sensitive resources from both chemical exposure and physical smothering, depending on the product type and actual application

Table C-3. Generalizations on the changes in routes of exposure from spilled oil***** for resources before and after spill countermeasures products are applied.

	Surface-dwelling	Water Column	Bottom-dwelling	Intertidal
Generic Resource Exposure to Spilled Oil*, by Location	High	Low	NE	High
Changes in Resource Exposure With Treated Oil, by Response Countermeasure				
Bioremediation Agents	—	—	—	—
Dispersants	↓↓	↑↑	↑	↓
Elasticity Modifier	↑	—	—	↑
Emulsion Treating Agents	—	↑	—	—
In-situ Burning (on water)	↓↓	↑	↑ to ↑	↓
In-situ Burning (on land)	↓	—	—	↓
Shoreline Pre-treatment Agents	—	—	—	↓ to ↓
Solidifiers	↑	—	—	↑
Surface Collecting Agents	↓	—	—	↓ to ↓
Surface Washing Agents	↑a; —b	—a; ↑b	—a,b	↑a,b

* This exposure rating assumes a spill of a medium crude oil from a tanker in offshore waters, with the potential for shoreline impacts, likely.

a –"lift and float" products; **b** –"lift and disperse" products

Key to Table

NE minimal to no potential exposure expected

— not likely to change potential exposure

↓ small reduction in potential exposure possible

↓ moderate reduction in potential exposure likely

↓↓ dramatic reduction in potential exposure likely

↑ small increase in potential exposure possible

↑ moderate increase in potential exposure likely

↑↑ dramatic increase in potential exposure likely

rate. As these products are not directly applied to the oil, they do not change the exposure of resources to the oil. They do however, work to reduce impacts to shoreline habitats from the surface slicks. Exposure to surface dwelling resources is not likely to change, except that these products may reduce potential exposures to isolated resources and intertidal resources if applied effectively.

Surface Collecting Agents

Surface collecting agents are designed to push or compress the oil on the water surface into a smaller area to form thicker slicks that are more readily recovered. Surface collecting agents are applied to the water, not the oil. These products are not used as the sole response option and are designed to be used to protect a specific, finite resource. As these products are not directly applied to the oil, they do not change the exposure of resources to the oil. They do, however, work to reduce the area exposed by the surface slick. Exposure to surface dwelling and intertidal resources within the slick is not likely to change, except that these products may reduce the *potential* for exposures to isolated resources.

Surface Washing Agents

Surface washing agents are designed to clean the oil from substrates using a combination of surfactants, solvents, and/or other additives. They are not applied to surface slicks on the water; they are applied to assist in the removal of weathered oil and for oil that is trapped in inaccessible areas where wash waters can be recovered and treated. Surface washing agents come in two forms: “lift and float” products and “lift and disperse” products. Surface coatings treated with lift and float products will reintroduce oil to the surface dwelling resources in the treatment area as the treated substrates are washed off; these products should be used in conjunction with sorbent booms to recapture the oil. Lift and disperse products would change exposures from surface dwelling resources to potentially include intertidal, water column, and bottom-dwelling resources.

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Appendix D
40 CFR 300.900;
Subpart J – Use of Dispersants and Other Chemicals

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Subpart J-Use of Dispersants and Other Chemicals

Source: 59 FR 47453, Sept. 15, 1994, unless otherwise noted.

§ 300.900 General.

(a) Section 311(d)(2)(G) of the CWA requires that EPA prepare a schedule of dispersants, other chemicals, and other spill mitigating devices and substances, if any, that may be used in carrying out the NCP. This subpart makes provisions for such a schedule.
(b) This subpart applies to the navigable waters of the United States and adjoining shorelines, the waters of the contiguous zone, and the high seas beyond the contiguous zone in connection with activities under the Outer Continental Shelf Lands Act, activities under the Deepwater Port Act of 1974, or activities that may affect natural resources belonging to, appertaining to, or under the exclusive management authority of the United States, including resources under the Magnuson Fishery Conservation and Management Act of 1976.
(c) This subpart applies to the use of any chemical agents or other additives as defined in subpart A of this part that may be used to remove or control oil discharges.

§ 300.905 NCP Product Schedule.

(a) Oil Discharges.
(1) EPA shall maintain a schedule of dispersants and other chemical or bioremediation products that may be authorized for use on oil discharges in accordance with the procedures set forth in §300.910. This schedule, called the NCP Product Schedule, may be obtained from the U.S. Environmental Protection Agency, Oil Program Center, 1200 Pennsylvania Avenue, NW, Washington, DC 20460. The telephone number is 1-202-260-2342.
(2) Products may be added to the NCP Product Schedule by the process specified in §300.920.
(b) Hazardous Substance Releases. [Reserved]

§ 300.910 Authorization of use.

(a) RRTs and Area Committees shall address, as part of their planning activities, the desirability of using appropriate dispersants, surface washing agents, surface collecting agents, bioremediation agents, or miscellaneous oil spill control agents listed on the NCP Product Schedule, and the desirability of using appropriate burning agents. RCPs and ACPs shall, as appropriate, include applicable preauthorization plans and address the specific contexts in which such products should and should not be used. In meeting the provisions of this paragraph, preauthorization plans may address factors such as the potential sources and types of oil that might be spilled, the existence and location of environmentally sensitive resources that might be impacted by spilled oil, available product and storage locations, available equipment and adequately trained operators, and the available means to monitor product application and effectiveness. The RRT representatives from EPA and the states with jurisdiction over the waters of the area to which a preauthorization plan applies and the DOC and DOI natural resource trustees

shall review and either approve, disapprove, or approve with modification the preauthorization plans developed by Area Committees, as appropriate. Approved preauthorization plans shall be included in the appropriate RCPs and ACPs. If the RRT representatives from EPA and the states with jurisdiction over the waters of the area to which a preauthorization plan applies and the DOC and DOI natural resource trustees approve in advance the use of certain products under specified circumstances as described in the preauthorization plan, the OSC may authorize the use of the products without obtaining the specific concurrences described in paragraphs (b) and (c) of this section.

(b) For spill situations that are not addressed by the preauthorization plans developed pursuant to paragraph (a) of this section, the OSC, with the concurrence of the EPA representative to the RRT and, as appropriate, the concurrence of the RRT representatives from the states with jurisdiction over the navigable waters threatened by the release or discharge, and in consultation with the DOC and DOI natural resource trustees, when practicable, may authorize the use of dispersants, surface washing agents, surface collecting agents, bioremediation agents, or miscellaneous oil spill control agents on the oil discharge, provided that the products are listed on the NCP Product Schedule.

(c) The OSC, with the concurrence of the EPA representative to the RRT and, as appropriate, the concurrence of the RRT representatives from the states with jurisdiction over the navigable waters threatened by the release or discharge, and in consultation with the DOC and DOI natural resource trustees, when practicable, may authorize the use of burning agents on a case-by-case basis.

(d) The OSC may authorize the use of any dispersant, surface washing agent, surface collecting agent, other chemical agent, burning agent, bioremediation agent, or miscellaneous oil spill control agent, including products not listed on the NCP Product Schedule, without obtaining the concurrence of the EPA representative to the RRT and, as appropriate, the RRT representatives from the states with jurisdiction over the navigable waters threatened by the release or discharge, when, in the judgment of the OSC, the use of the product is necessary to prevent or substantially reduce a hazard to human life. Whenever the OSC authorizes the use of a product pursuant to this paragraph, the OSC is to inform the EPA RRT representative and, as appropriate, the RRT representatives from the affected states and, when practicable, the DOC/DOI natural resources trustees of the use of a product, including products not on the Schedule, as soon as possible. Once the threat to human life has subsided, the continued use of a product shall be in accordance with paragraphs (a), (b), and (c) of this section.

(e) Sinking agents shall not be authorized for application to oil discharges.

(f) When developing preauthorization plans, RRTs may require the performance of supplementary toxicity and effectiveness testing of products, in addition to the test methods specified in §300.915 and described in appendix C to part 300, due to existing site-specific or area-specific concerns.

§ 300.915 Data requirements.

(a) Dispersants.

(1) Name, brand, or trademark, if any, under which the dispersant is sold.

(2) Name, address, and telephone number of the manufacturer, importer, or vendor.

(3) Name, address, and telephone number of primary distributors or sales outlets.

(4) Special handling and worker precautions for storage and field application. Maximum and minimum storage temperatures, to include optimum ranges as well as temperatures that will cause phase separations, chemical changes, or other alterations to the effectiveness of the product.

(5) Shelf life.

(6) Recommended application procedures, concentrations, and conditions for use depending upon water salinity, water temperature, types and ages of the pollutants, and any other application restrictions.

(7) Effectiveness. Use the Swirling Flask effectiveness test methods described in appendix C to part 300. Manufacturers shall submit test results and supporting data, along with a certification signed by responsible corporate officials of the manufacturer and laboratory stating that the test was conducted on a representative product sample, the testing was conducted using generally accepted laboratory practices, and they believe the results to be accurate. A dispersant must attain an effectiveness value of 45 percent or greater to be added to the NCP Product Schedule. Manufacturers are encouraged to provide data on product performance under conditions other than those captured by these tests.

(8) Dispersant Toxicity. For those dispersants that meet the effectiveness threshold described in paragraph (a)(7) above, use the standard toxicity test methods described in appendix C to part 300. Manufacturers shall submit test results and supporting data, along with a certification signed by responsible corporate officials of the manufacturer and laboratory stating that the test was conducted on a representative product sample, the testing was conducted using generally accepted laboratory practices, and they believe the results to be accurate.

(9) The following data requirements incorporate by reference standards from the 1991 or 1992 Annual Books of ASTM Standards. American Society for Testing and Materials, 1916 Race Street, Philadelphia, Pennsylvania 19103. This incorporation by reference was approved by the Director of the Federal Register in accordance with 5 U.S.C. 552(a) and 1 CFR part 51.1

(i) Flash Point-Select appropriate method from the following:

(A) ASTM-D 56-87, "Standard Test Method for Flash Point by Tag Closed Tester;"

(B) ASTM-D 92-90, "Standard Test Method for Flash and Fire Points by Cleveland Open Cup;"

(C) ASTM-D 93-90, "Standard Test Methods for Flash Point by Pensky-Martens Closed Tester;"

(D) ASTM-D 1310-86, "Standard Test Method for Flash Point and Fire Point of Liquids by Tag Open-Cup Apparatus;" or

(E) ASTM-D 3278-89, "Standard Test Methods for Flash Point of Liquids by Setaflash Closed-Cup Apparatus."

(ii) Pour Point-Use ASTM-D 97-87, "Standard Test Method for Pour Point of Petroleum Oils."

(iii) Viscosity-Use ASTM-D 445-88, "Standard Test Method for Kinematic Viscosity of Transparent and Opaque Liquids (and the Calculation of Dynamic Viscosity)."

(iv) Specific Gravity-Use ASTM-D 1298-85(90), "Standard Test Method for Density, Relative Density (Specific Gravity), or API Gravity of Crude Petroleum and Liquid Petroleum Products by Hydrometer Method."

(v) pH-Use ASTM-D 1293-84(90), "Standard Test Methods for pH of Water."

(10) Dispersing Agent Components. Itemize by chemical name and percentage by weight each component of the total formulation. The percentages will include maximum, minimum, and average weights in order to reflect quality control variations in manufacture or formulation. In addition to the chemical information provided in response to the first two sentences, identify the major components in at least the following categories: surface active agents, solvents, and additives.

(11) Heavy Metals, Cyanide, and Chlorinated Hydrocarbons. Using standard test procedures, state the concentrations or upper limits of the following materials:

(i) Arsenic, cadmium, chromium, copper, lead, mercury, nickel, zinc, plus any other metals that may be reasonably expected to be in the sample. Atomic absorption methods should be used and the detailed analytical methods and sample preparation shall be fully described.

(ii) Cyanide. Standard calorimetric procedures should be used.

(iii) Chlorinated hydrocarbons. Gas chromatography should be used and the detailed analytical methods and sample preparation shall be fully described. At a minimum, the following test methods shall be used for chlorinated hydrocarbon analyses: EPA Method 601-Purgeable halocarbons (Standard Method 6230 B) and EPA Method 608-Organochlorine pesticides and PCBs (Standard Method 6630 C).2103

(12) The technical product data submission shall include the identity of the laboratory that performed the required tests, the qualifications of the laboratory staff, including professional biographical information for individuals responsible for any tests, and laboratory experience with similar tests. Laboratories performing toxicity tests for dispersant toxicity must demonstrate previous toxicity test experience in order for their results to be accepted. It is the responsibility of the submitter to select competent analytical laboratories based on the guidelines contained herein. EPA reserves the right to refuse to accept a submission of technical product data because of lack of qualification of the analytical laboratory, significant variance between submitted data and any laboratory confirmation performed by EPA, or other circumstances that would result in inadequate or inaccurate information on the dispersing agent.

(b) Surface washing agents.

(1) Name, brand, or trademark, if any, under which the surface washing agent is sold.

(2) Name, address, and telephone number of the manufacturer, importer, or vendor.

(3) Name, address, and telephone number of primary distributors or sales outlets.

(4) Special handling and worker precautions for storage and field application. Maximum and minimum storage temperatures, to include optimum ranges as well

as temperatures that will cause phase separations, chemical changes, or other alterations to the effectiveness of the product.

(5) Shelf life.

(6) Recommended application procedures, concentrations, and conditions for use depending upon water salinity, water temperature, types and ages of the pollutants, and any other application restrictions.

(7) Toxicity. Use standard toxicity test methods described in appendix C to part 300.

(8) Follow the data requirement specifications in paragraph (a)(9) of this section.

(9) Surface Washing Agent Components. Itemize by chemical name and percentage by weight each component of the total formulation. The percentages will include maximum, minimum, and average weights in order to reflect quality control variations in manufacture or formulation. In addition to the chemical information provided in response to the first two sentences, identify the major components in at least the following categories: surface active agents, solvents, and additives.

(10) Heavy Metals, Cyanide, and Chlorinated Hydrocarbons. Follow specifications in paragraph (a)(11) of this section.

(11) Analytical Laboratory Requirements for Technical Product Data. Follow specifications in paragraph (a)(12) of this section.

(c) Surface collecting agents.

(1) Name, brand, or trademark, if any, under which the product is sold.

(2) Name, address, and telephone number of the manufacturer, importer, or vendor.

(3) Name, address, and telephone number of primary distributors or sales outlets.

(4) Special handling and worker precautions for storage and field application. Maximum and minimum storage temperatures, to include optimum ranges as well as temperatures that will cause phase separations, chemical changes, or other alterations to the effectiveness of the product.

(5) Shelf life.

(6) Recommended application procedures, concentrations, and conditions for use depending upon water salinity, water temperature, types and ages of the pollutants, and any other application restrictions.

(7) Toxicity. Use standard toxicity test methods described in appendix C to part 300.

(8) Follow the data requirement specifications in paragraph (a)(9) of this section.

(9) Test to Distinguish Between Surface Collecting Agents and Other Chemical Agents.

(i) Method Summary-Five milliliters of the chemical under test are mixed with 95 milliliters of distilled water and allowed to stand undisturbed for one hour. Then the volume of the upper phase is determined to the nearest one milliliter.

(ii) Apparatus.

(A) Mixing Cylinder: 100 milliliter subdivisions and fitted with a glass stopper.

(B) Pipettes: Volumetric pipette, 5.0 milliliter.

(C) Timers.

(iii) Procedure-Add 95 milliliters of distilled water at 22 °C, plus or minus 3 °C, to a 100 milliliter mixing cylinder. To the surface of the water in the mixing cylinder, add 5.0 milliliters of the chemical under test. Insert the stopper and invert the cylinder five times in ten seconds. Set upright for one hour at 22 °C, plus or minus 3 °C, and then measure the chemical layer at the surface of the

water. If the major portion of the chemical added (75 percent) is at the water surface as a separate and easily distinguished layer, the product is a surface collecting agent.

(10) Surface Collecting Agent Components. Itemize by chemical name and percentage by weight each component of the total formulation. The percentages should include maximum, minimum, and average weights in order to reflect quality control variations in manufacture or formulation. In addition to the chemical information provided in response to the first two sentences, identify the major components in at least the following categories: surface action agents, solvents, and additives.

(11) Heavy Metals, Cyanide, and Chlorinated Hydrocarbons. Follow specifications in paragraph (a)(11) of this section.

(12) Analytical Laboratory Requirements for Technical Product Data. Follow specifications in paragraph (a)(12) of this section.

(d) Bioremediation Agents.

(1) Name, brand, or trademark, if any, under which the agent is sold.

(2) Name, address, and telephone number of the manufacturer, importer, or vendor.

(3) Name, address, and telephone number of primary distributors or sales outlets.

(4) Special handling and worker precautions for storage and field application. Maximum and minimum storage temperatures.

(5) Shelf life.

(6) Recommended application procedures, concentrations, and conditions for use depending upon water salinity, water temperature, types and ages of the pollutants, and any other application restrictions.

(7) Bioremediation Agent Effectiveness. Use bioremediation agent effectiveness test methods described in appendix C to part 300.

(8) Bioremediation Agent Toxicity [Reserved].

(9) Biological additives.

(i) For microbiological cultures, furnish the following information:

(A) Listing of each component of the total formulation, other than microorganisms, by chemical name and percentage by weight.

(B) Listing of all microorganisms by species.

(C) Percentage of each species in the composition of the additive.

(D) Optimum pH, temperature, and salinity ranges for use of the additive, and maximum and minimum pH, temperature, and salinity levels above or below which the effectiveness of the additive is reduced to half its optimum capacity.

(E) Special nutrient requirements, if any.

(F) Separate listing of the following, and test methods for such determinations: Salmonella, fecal coliform, Shigella, Staphylococcus Coagulase positive, and Beta Hemolytic Streptococci.

(ii) For enzyme additives, furnish the following information:

(A) Listing of each component of the total formulation, other than enzymes, by chemical name and percentage by weight.

(B) Enzyme name(s).

(C) International Union of Biochemistry (I.U.B.) number(s).

(D) Source of the enzyme.

(E) Units.
(F) Specific Activity.
(G) Optimum pH, temperature, and salinity ranges for use of the additive, and maximum and minimum pH, temperature, and salinity levels above or 105 below which the effectiveness of the additive is reduced to half its optimum capacity.
(H) Enzyme shelf life.
(I) Enzyme optimum storage conditions.

(10) For nutrient additives, furnish the following information:
(i) Listing of each component of the total formulation by chemical name and percentage by weight.
(ii) Nutrient additive optimum storage conditions.

(11) Analytical Laboratory Requirements for Technical Product Data. Follow specifications in paragraph (a)(12) of this section.

(e) Burning Agents. EPA does not require technical product data submissions for burning agents and does not include burning agents on the NCP Product Schedule.

(f) Miscellaneous Oil Spill Control Agents.
(1) Name, brand, or trademark, if any, under which the miscellaneous oil spill control agent is sold.
(2) Name, address, and telephone number of the manufacturer, importer, or vendor.
(3) Name, address, and telephone number of primary distributors or sales outlets.
(4) Brief description of recommended uses of the product and how the product works.
(5) Special handling and worker precautions for storage and field application. Maximum and minimum storage temperatures, to include optimum ranges as well as temperatures that will cause phase separations, chemical changes, or other alternatives to the effectiveness of the product.
(6) Shelf life.
(7) Recommended application procedures, concentrations, and conditions for use depending upon water salinity, water temperature, types and ages of the pollutants, and any other application restrictions.
(8) Toxicity. Use standard toxicity test methods described in appendix C to part 300.
(9) Follow the data requirement specifications in paragraph (a)(9) of this section.
(10) Miscellaneous Oil Spill Control Agent Components. Itemize by chemical name and percentage by weight each component of the total formulation. The percentages should include maximum, minimum, and average weights in order to reflect quality control variations in manufacture or formulation. In addition to the chemical information provided in response to the first two sentences, identify the major components in at least the following categories: surface active agents, solvents, and additives.
(11) Heavy Metals, Cyanide, and Chlorinated Hydrocarbons. Follow specifications in paragraph (a)(11) of this section.
(12) For any miscellaneous oil spill control agent that contains microbiological cultures, enzyme additives, or nutrient additives, furnish the information specified in paragraphs (d)(9) and (d)(10) of this section, as appropriate.

(13) Analytical Laboratory Requirements for Technical Product Data. Follow specifications in paragraph (a)(12) of this section.

(g) Sorbents.

(1) Sorbent material may consist of, but is not limited to, the following materials:

(i) Organic products-

(A) Peat moss or straw;

(B) Cellulose fibers or cork;

(C) Corn cobs;

(D) Chicken, duck, or other bird feathers.

(ii) Mineral compounds-

(A) Volcanic ash or perlite;

(B) Vermiculite or zeolite.

(iii) Synthetic products-

(A) Polypropylene;

(B) Polyethylene;

(C) Polyurethane;

(D) Polyester.

(2) EPA does not require technical product data submissions for sorbents and does not include sorbents on the NCP Product Schedule.

(3) Manufacturers that produce sorbent materials that consist of materials other than those listed in paragraph (g)(1) of this section shall submit to EPA the technical product data specified for miscellaneous oil spill control agents in paragraph (f) of this section and EPA will consider listing those products on the NCP Product Schedule under the miscellaneous oil spill control agent category. EPA will inform the submitter in writing, within 60 days of the receipt of technical product data, of its decision on adding the product to the Schedule.

(4) Certification. OSCs may request a written certification from manufacturers that produce sorbent materials that consist solely of the materials listed in paragraph (g)(1) of this section prior to making a decision on the use of a particular sorbent material. The certification at a minimum shall state that the sorbent consists solely of the materials listed in §300.915(g)(1) of the NCP. The following statement, when completed, dated, and signed by a sorbent manufacturer, is sufficient to meet the written certification requirement:

[SORBENT NAME] is a sorbent material and consists solely of the materials listed in §300.915(g)(1) of the NCP.

(h) Mixed products. Manufacturers of products that consist of materials that meet the definitions of two or more of the product categories contained on the NCP Product Schedule shall submit to EPA the technical product data specified in this section for each of those product categories. After review of the submitted technical product data, and the performance of required dispersant effectiveness and toxicity tests, if appropriate, EPA will make a determination on whether and under which category the mixed product should be listed on the Schedule.

§ 300.920 Addition of products to Schedule.

(a) Dispersants.

(1) To add a dispersant to the NCP Product Schedule, submit the technical product data specified in §300.915(a) to the U.S. Environmental Protection Agency, Oil Program Center, 1200 Pennsylvania Avenue, NW, Washington, DC 20460. A dispersant must attain an effectiveness value of 45 percent or greater in order to be added to the Schedule.

(2) EPA reserves the right to request further documentation of the manufacturers' test results. EPA also reserves the right to verify test results and consider the results of EPA's verification testing in determining whether the dispersant meets listing criteria. EPA will, within 60 days of receiving a complete application as specified in §300.915(a) of this part, notify the manufacturer of its decision to list the product on the Schedule, or request additional information and/or a sample of the product in order to review and/or conduct validation sampling. If EPA requests additional information and/or a product sample, within 60 days of receiving such additional information or sample, EPA will then notify the manufacturer in writing of its decision to list or not list the product.

(3) Request for review of decision. (i) A manufacturer whose product was determined to be ineligible for listing on the NCP Product Schedule may request EPA's Administrator to review the determination. The request must be made in writing within 30 days of receiving notification of EPA's decision to not list the dispersant on the Schedule. The request shall contain a clear and concise statement with supporting facts and technical analysis demonstrating that EPA's decision was incorrect.

(ii) The Administrator or his designee may request additional information from the manufacturer, or from any other person, and may provide for a conference between EPA and the manufacturer, if appropriate. The Administrator or his designee shall render a decision within 60 days of receiving the request, or within 60 days of receiving requested additional information, if appropriate, and shall notify the manufacturer of his decision in writing.

(b) Surface washing agents, surface collecting agents, bioremediation agents, and miscellaneous oil spill control agents.

(1) To add a surface washing agent, surface collecting agent, bioremediation agent, or miscellaneous oil spill control agent to the NCP Product Schedule, the technical product data specified in §300.915 must be submitted to the U.S. Environmental Protection Agency, Oil Program Center, 1200 Pennsylvania Avenue, NW, Washington, DC 20460. If EPA determines that the required data were submitted, EPA will add the product to the Schedule.

(2) EPA will inform the submitter in writing, within 60 days of the receipt of technical product data, of its decision on adding the product to the Schedule.

(c) The submitter may assert that certain information in the technical product data submissions, including technical product data submissions for sorbents pursuant to §300.915(g)(3), is confidential business information. EPA will handle such claims pursuant to the provisions in 40 CFR part 2, subpart B. Such information must be submitted separately from non-confidential information, clearly identified, and clearly

marked "Confidential Business Information." If the submitter fails to make such a claim at the time of submittal, EPA may make the information available to the public without further notice.

(d) The submitter must notify EPA of any changes in the composition, formulation, or application of the dispersant, surface washing agent, surface collecting agent, bioremediation agent, or miscellaneous oil spill control agent. On the basis of this data, EPA may require retesting of the product if the change is likely to affect the effectiveness or toxicity of the product.

(e) The listing of a product on the NCP Product Schedule does not constitute approval of the product. To avoid possible misinterpretation or misrepresentation, any label, advertisement, or technical literature that refers to the placement of the product on the NCP Product Schedule must either reproduce in its entirety EPA's written statement that it will add the product to the NCP Product Schedule under §300.920(a)(2) or (b)(2), or include the disclaimer shown below. If the disclaimer is used, it must be conspicuous and must be fully reproduced. Failure to comply with these restrictions or any other improper attempt to demonstrate the approval of the product by any NRT or other U.S. Government agency shall constitute grounds for removing the product from the NCP Product Schedule.

DISCLAIMER

[PRODUCT NAME] is on the U.S. Environmental Protection Agency's NCP Product Schedule. This listing does NOT mean that EPA approves, recommends, licenses, certifies, or authorizes the use of [PRODUCT NAME] on an oil discharge. This listing means only that data have been submitted to EPA as required by subpart J of the National Contingency Plan, §300.915.

Appendix E

List of Sorbent Products Not Required
to be Listed on the NCP Product Schedule

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List of Sorbent Products Not Required to be Listed on the NCP Product Schedule.

List of Sorbents Not Required to be Listed on the NCP Product Schedule		
Product Name	**Manufacturer/Vendor**	**Letter Sent; Letter Updated***
A+ Absorbent	A+ ABSORBENT Ferweda General Contracting 11325 Highway 22 Angora, MN 55703 Mr. Eugene Ferweda	10/30/2006
Absorbrite	Absorbrite Inc. 169 South Main Street Suite 464 New City, NY 10956 Mr. Neal Bidnick	05/23/2002
Abzorbit	Abzorbit, Inc. 1925 North Main Avenue Newton, NC 28658 Ph: (828) 464-9944 Ms. Stephanie Setzer	03/22/1999
Adsorb-it™	Eco-Tec-Inc. P.O. Box 690 Vaughn, WA 98394 Mr. Herbert Pearse	06/01/2005
Adsorbun	Adsorbun USA, LLC 3403 Fir Forest Drive Spring, TX 77388 Ph: (713) 591-1000 Fax: (281) 353-9636 Mr. Sean O'Boyle	12/01/2004
All-Sorb 1	Nature Treat, Inc. 111 Tubing Road Broussard, LA 70518 Ph: (318) 839-1171 Fax: (318) 839-1169 Mr. C. Edward Wilkerson	09/09/1999
AmeriZorb	AmeriZorb Recovery, L.L.C. 2640 Old Olympic Highway South Shelton, WA 98584 Mailing Address: P.O. Box 2576 Belfair, WA 98528 Ph: (360) 427-3998 Fax: (360) 432-9651 Ms. Shannon Kelley	11/01/2005

List of Sorbents Not Required to be Listed on the NCP Product Schedule		
Product Name	**Manufacturer/Vendor**	**Letter Sent; Letter Updated***
BioMatrix (formerly Nature-Sorb)	Kenex Hemp LTD RR #8 24907 Winter Line Road Chatham, ON, Canada N7M5J8 Ph: (519) 351-9922 Fax: (519) 351-6122 Mr. Art Caron	12/15/2000
Bravo	ESSI #551, 3553 31 Street NW Alastair Ross Technology Centre Calgary, Alberta, Canada T2L 2K7 Ms. Chantelle Camirand – Lee	12/08/2006
Cansorb	AVP Cansorb RR #1 Berwick, Nova Scotia Canada BOP 1EO Ph: (902) 538-8022 Ph: (800) 565-1410 Fax: (902) 538-9609 Mr. Edward L. Peill	11/22/1995
Cattail Down	c/o Ms. Donna Sorenson 55 West 100 North Richfield, UT 84701 Mr. Jerald Oldroyd	02/21/2001
Cotton Gin Trash	150 Pleasant Creek Road Rogue River, OR 97537 Ph: (541) 582-1051 Fax: (541) 582-4357 Dr. J.A. Pinckard	01/30/1997
Crunch Oil	MC Equipment & Tools Inc./Crunch Oil 2545 NW 74th Avenue Miami, FL 33122 Ph: (786) 200-2065 Ph: (305) 577-9792 Fax: (305) 867-7426 Mr. Leonard Werner, President	03/23/2004
Dica-Sorb	Grefco Minerals Inc. 23705 Crenshaw Boulevard Suite 101 Torrance, CA 90505	No letter
ENVIRO-BOND 403	Petroleum Environmental Technologies, Inc. 5581 Rapid City Road Rapid City, MI 49676-0087 Ph: (616) 258-0400 Fax: (616) 258-0403 Mr. Larry F. Thompson	05/01/1998

List of Sorbents Not Required to be Listed on the NCP Product Schedule		
Product Name	**Manufacturer/Vendor**	**Letter Sent; Letter Updated***
Envirosorb	Sammie Bonner Construction Co., Inc. P.O. Box 316 Toxey, AL 36921 Mr. Sammie Bonner	04/25/2002
Exsorbet	Waste Solutions, Corp. 8400 Brookfield Avenue Suite 200 Brookfield, IL 60513 Ph: (708) 387-0900 Fax: (708) 387-2599 Mr. Anthony Castellano	11/08/2000
FyBX Fibers	FyBX Corporation 3145 Medlock Bridge Road Norcross, GA 30071 Ph: (770) 242-8024 Ms. Tracy Bergquist	01/05/2000
Geo-Sorb	Trade Development International 2010 Corporate Ridge Suite 700 McLean, VA 22102 Ph: (703) 734-0014 Fax: (703) 847-1408 Ms. Florence Aaron	01/03/1996
Green Stuff®	D2L Products, LLC P.O. Box 2052 Colleyville, TX 76034 Mr. Dennis Tewell	05/06/2009
HSS SORB	Hydrocarbon Spills Solution, Corp. 3554 Coco Lake Drive Coconut Creek, FL 33073 Ph: (954) 725-9428 Fax: (954) 725-9428 Mr. Denis Sharkey	06/25/1999
Imbiber Beads	Imbibitive Technologies 4800 James Savage Road Midland, MI 48642 Ph: (517) 496-0474 Fax: (517) 496-0469 Dr. Richard H. Hall	12/11/1995
Katchall/X-TEX	Katchall Filtration Systems, LLC 10420 Beaumont Avenue Suite H Cherry Valley, CA 92223-4431 Mr. Kip B. Searcy	09/28/2005

List of Sorbents Not Required to be Listed on the NCP Product Schedule		
Product Name	**Manufacturer/Vendor**	**Letter Sent; Letter Updated***
MEGA Sorbent	PTC Enterprises, Inc. 8206 Braesdale Lane Houston, TX 77071 Ph: (713) 973-6861 Ph: (301) 934-3541 Fax: (301) 609-7928 Mr. James E. Impero	05/17/2000
Micro-Crumb Rubber	D.K.M., Inc. 11222 South La Cienega Boulevard Suite 350 Inglewood, CA 90304 Ph: (310) 338-1414 Fax: (310) 338-1122 Mr. Joseph Militonian	01/22/2001
MOP FSC #201	Mop Environmental Solutions, Inc. 7 West Bath Road Bath, NH 03740 Ph: (603) 747-2200 Fax: (603) 747-2203 Mr. Charles Diamond	12/02/1998; 07/08/2008*
MOP FSC #301	Mop Environmental Solutions, Inc. 7 West Bath Road Bath, NH 03740 Ph: (603) 747-2200 Fax: (603) 747-2203 Mr. Charles Diamond	03/19/2001; 07/08/2008*
MOP FSC #401	Mop Environmental Solutions, Inc. 7 West Bath Road Bath, NH 03740 Ph: (603) 747-2200 Fax: (603) 747-2203 Mr. Charles Diamond	12/09/1998; 07/08/2008*
OARS	AB-TECH Industries 4110 North Scottsdale Road Suite 235 Scottsdale, AZ 85251 Ph: (602) 874-4000 Ph: (800) 545-8999 Fax: (602) 970-1665 Mr. Glenn R. Rink	08/05/1996
Oclansorb	Premium Supply Company Inc. P.O. Drawer A El Campo, TX 77437 Ph: (800) 392-7736 Mr. Carl M. Sanders Mr. David K. Scott	09/19/1995

List of Sorbents Not Required to be Listed on the NCP Product Schedule		
Product Name	**Manufacturer/Vendor**	**Letter Sent; Letter Updated***
Oil Buster	Universal Remediation, Inc. 1405 Parkway View Drive Pittsburgh, PA 15205 Ph: (412) 788-2444 Fax: (412) 788-0111 Mr. John Opsasnik	06/09/2004
Oil Gator	Product Services Marketing Group Director Technical Service 20354 Empire Avenue Bend, OR 97701 Ph: (800) 393-5468 Ms. Tami Maddox	07/08/1998
Oilik	115 Forster Avenue Mt. Vernon, NY 10552-2316 Ph: (914) 668-9108 Fax: (914) 668-2370 Dr. Angelo J. Skalafuris	No letter
Oil Sponge G. P. Premium Absorbent	Phase III, Inc. 916 Baseline Road Suite 101 Mesa, AZ 85204-6603 Mr. Darryl Goodchild	06/10/2004
OttiMat™	World Response Group 1452 North Krome Avenue, #101-D Florida City, FL 33034 Mr. Blair Blacker (CEO)	09/23/2008
Peat Sorb™	Zorbit Technologies, Inc. 3605 32nd Street Port Huron, MI 48060 Ph: (810) 364-0228 Ph: (800) 927-6947 Fax: (810) 364-0217 Mr. Rick Thornton	03/14/2000
PetroGuard™	Guardian Environmental Technologies, Inc. P.O. Box 2344 Ph: (860) 350-2200 Fax: (860) 350-3776 New Preston, CT 06777 Mr. William Litwin	11/06/2008
PetroLite™	Guardian Environmental Technologies, Inc. P.O. Box 2344 New Preston, CT 06777 Mr. William Litwin	11/06/2008

List of Sorbents Not Required to be Listed on the NCP Product Schedule		
Product Name	**Manufacturer/Vendor**	**Letter Sent; Letter Updated***
P.O.L. Sorb	A.R.K. Enterprises, Inc. A.W.B.E. Hub Zone Manufacturing Company P.O. Box 725 Peculiar, MO 64078	08/05/2004
Pristine Sea	Fluid Tech, a division of IMPACT Services, Inc. 2865 S. Jones Boulevard Suite 200 Las Vegas, NV 89146 Ph: (702) 871-1884 Fax: (702) 871-3629 Mr. Scott Rowsell	05/05/1995; 05/13/2009*
QuiKleen	Burgess ENT LLC 204 Stonecrest Circle Concord, NC Ph: (800) 650-2067 Mobile: (704) 607-2539 Fax: (704) 795-9838 Ms. Bonnie Burgess	08/20/2004
RamSorb	Williams Environmental 835 West Goodale Boulevard Columbus, OH 43212 Ph: (800) 999-0933, ext. 499 Mr. Larry Kraft	11/23/1998
Recoverit	Advanced Containment Recovery US, LLC 1807 Williams Street Pascagoula, MS 39567 Mr. Gary Kessell	03/29/2007
Remediator, The	Enviro-Marine 100 Lewis Drive Suite 10-A Greenville, SC 29605 Ph: (864) 242-5799 Fax: (864) 242-5799 Mr. William F. Lehr	07/07/1999
Rubberizer	Haz-Mat Response Technologies, Inc. 4626 Santa Fe Street San Diego, CA 92109 Mr. Phil Stagg	04/07/1998; 03/31/2008*
SD1	Mansfield & Alper, Inc. 1124 Purina Drive Gainesville, GA 30501 Ph: (770) 718-3051 Fax: (770) 718-3044 Mr. Hal Alper	04/18/1997

List of Sorbents Not Required to be Listed on the NCP Product Schedule		
Product Name	**Manufacturer/Vendor**	**Letter Sent; Letter Updated***
SPC, ENV, and SF	QA/Product Development Engineer Sorbent Products 645 Howard Avenue Somerset, NJ 08873 Mr. John Toman	3/17/2003
SeaFoam	Huntsman Polyurethanes 286 Mantua Grove Road West Deptford, NJ 08066-1732 Ph: (856) 423-8300 Ph: (800) 257-5547 Fax: (856) 423-8501 Mr. Larry Winger	03/09/2001
Sea Sweep	Sea Sweep, Inc. 2121 S. Oneida Suite 635 Denver, CO 80224 Ph: (303) 759-8118 Fax: (303) 757-7987 Mr. William L. Mobeck	01/13/1995
S.O.A.K	T&H Enterprizes 5120 Tevey Longview, TX 75605 Ph: (903) 663-4098 Mobile: (903) 895-4641 Mr. Steve Tilley Mr. Damon Handley	No letter
Sorbitec HG	SorbitALL Industries P.O. Box 1090 600 Highway 9 Hanna, Alberta TOJ IPO	04/26/2006
Sphag Sorb	Environmental Cleanup Systems P.O. Box 2234 Lee's Summit, MO 64063 Ph: (816) 347-8176 Ph: (800) 528-3046 Fax: (816) 347-8179 Mr. Paul Downey	05/05/2000
Spill-sorb	Moore Green 5300 Forrest Park Drive Mobile, AL 36618 Ph: (334) 316-3830 Mobile: (334) 454-3658 Fax: (703) 603-9116 Ms. Cyndi Lepori Mr. Frank Moore	01/30/2001

List of Sorbents Not Required to be Listed on the NCP Product Schedule		
Product Name	**Manufacturer/Vendor**	**Letter Sent; Letter Updated***
Spill King™ Absorbent	Atlantic Smart Technologies, Inc. 103 West Indian Crossing Circle Jupiter, FL 33458 Ph: (561) 624-9645 Ph: (561) 776-0066 Fax: (561) 776-4655 Mr. Robert Irving	02/03/2006
Super-Buoyant Boom	Mansfield & Alper, Inc. 1124 Purina Drive Gainesville, GA 30501 Ph: (770) 718-3051 Fax: (770) 718-3044 Mr. Hal Alper	04/18/1997
Suprasec X1002	Brixham Environmental Laboratory Freshwater Quarry Brixham Devon TQ5 8BA Ph: (01803) 882882 Fax: (01803) 882974 Dr. Sarah Barrett	12/1997
Swansorb	Swansorb Inc. P.O. Box 477 Gardena, California 90248 Ms. Gail Gordon	
Upsorb B.V.	Upsorb B.V. Klarinetweg 16c 4337 RA Middleburg The Netherlands Mr. Matthias Svensson	04/28/2008
Versipad	Mansfield & Alper, Inc. 1124 Purina Drive Gainesville, GA 30501 Ph: (770) 718-3051 Fax: (770) 718-3044 Mr. Hal Alper	04/18/1997
White Lightening	Spill Control Technology International, LLC 517 South Cannon Boulevard Kannapolis, NC 28083 Mr. Tom Stone	12/20/2006
XEXTEX	XEXTEX 70 E Sunset Way #188 Issaquah, WA 98072 Mr. Jerry Brownstein	06/25/2001

List of Sorbents Not Required to be Listed on the NCP Product Schedule		
Product Name	**Manufacturer/Vendor**	**Letter Sent; Letter Updated***
Zeolite	Bear River Company P.O. Box 643 Thompson Falls, MT 59873 Ph: (888) 973-8722 Mr. Mike Flourish	02/06/2003
Zorbolite	Global Environmental of California 5750 Labath Avenue Suites B&C Rohnert Park, CA 94928 Ph: (707) 763-7208 Fax: (707) 769-9670 Mr. Archie L. King	No letter
Zugol	Oscar Enterprises Inc. 1275 N. Chrisden Street Suite G 103 Anaheim Hills, CA 92807 Mr. Oscar Rubnerth	07/24/2002

If you have any questions about the claims of a particular product or to verify a product's status on the NCP Product Schedule, contact the USEPA Oil Program Center at **202-260-2342** or visit http://www.epa.gov/emergencies/content/ncp/index.htm to review the most recent version of the Product Schedule to determine if the product in question has been listed.

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Appendix F
Copies of Worksheets/Forms/Templates

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WORKSHEET 1: SELECTION GUIDE DECISION TRACKING/ EVALUATION WORKSHEET

This worksheet is intended to be photocopied for use during drills and incidents

Date:

Incident:

		Sorbents	Bioremediation Agents	Dispersants	Elasticity Modifiers	Emulsion Treating Agents	In-situ Burn (ISB)	Shoreline Pre-Treatment Agents	Solidifiers	Surface Collection Agents	Surface Washing Agents	Natural Attenuation	Future Products
A.	***Technology Choices of Interest:*** ***Mark Choices with an "X"***												
B.	***Environmental matrix used:***												
C.	***Incident-specific Information:***												
	Response Phase												
	Oil Type												
	Oil Condition												
	Treatment Volume												
	Temperature												
	Wind Conditions												
	Decision Authority:												
	Special Regulatory Requirements?												
	Must be on the NCP Product Schedule? (RRT Concurrence is required)												
	RRT Concurrence Required? (but may NOT have to be on the Product Schedule)												
	Special Permit(s) Required?												
	Recommended Monitoring **SM** - SMART Monitoring **OM** - Effectiveness or Other Monitoring		OM	SM	OM	OM	SM	OM	OM	OM	OM	OM	
D. (check)	**Spill Conditions**												
☐	Oil On Fire or Potential for Fire												
☐	Night Operations												
☐	No Oil Containment and Recovery Options												
☐	Oil is Trapped In/On Snow and Ice												
☐	Need to Protect Against Significant Water Column and Benthic Impacts												
—	Site is Access Limited (safety)												
	Waste Generation is Significant Problem												
	Water Intakes at Risk												
	Oil Trapped in Vegetation												

WORKSHEET 1: SELECTION GUIDE DECISION TRACKING/ EVALUATION WORKSHEET - PAGE 2

This worksheet is intended to be photocopied for use during drills and incidents

D. (check)	Spill Conditions, Continued	Sorbents		Bioremediation Agents	Dispersants	Elasticity Modifiers	Emulsion Treating Agents	In-situ Burn (ISB)	Shoreline Pre-Treatment Agents	Solidifiers	Surface Collection Agents	Surface Washing Agents	Natural Attenuation	
☐	Wildlife Protection													
☐	Oil Contaminated Substrates													
☐	Buried Oil													
☐	Oil Likley to be Remobilized													
☐	Oiled Substrates Needs Cleaning Without Significant Habitat Impacts													
☐	Significant Problem of Waste Generation													
☐	Vapor Suppression													
☐	Oil on Roadways													
☐	Vapors Trapped in Confined Areas													
☐	Confined Spaces with Water? (sewers, culverts, etc.)													
☐	Limited Oil Handling and Storage Capacity													
☐	Oil On Fire or Potential for Fire													
☐	Light Oil Type - Difficult to Recover / Skim													
☐	Oil Will Form an Emulsion													
☐	Oil Has Formed an Emulsion													
☐	Oil Has / Is Likely to Sink													
☐	Fast Currents Prevent Effective Booming													
☐	Need to Protect Against Significant Surface and Shoreline Impacts Including Marshland													
E.	***Habitat, Sensitive Resources, and Cultural Resources Evaluation*** *Attach decision documentation to this worksheet [from Table 3].*													
	Habitats (including designated or proposed critical habitat)													
	Natural Resources (including listed species, NWR, NP, etc.)													
	Cultural Resources / Historic Properties													
F.	***Evaluation Results***													
	Top Three Choices:													
	Any Major Advantages:													
	Any Major Disadvantages:													

Additional Comments/Decisions:

Signatures/Date of Review Team:

Table 3: Environmental Unit Evaluation / Discussion Form

The following is a list of discussion points / topics that should be evaluated relative to the use of each product and product category being evaluated for the incident-specific conditions. Members of the Environmental Unit (members are likely to include the RP, Federal and state Natural Resource Trustees, tribes, and other members of the response) need to ***discuss and evaluate*** the likely impacts / effects of using the product being considered on the workers, natural habitat(s) and natural resources for the incident-specific conditions and ultimately reach consensus on recommending or not recommending the use of the product / product category.

Specific targeted questions are provided below to help facilitate this evaluation. Space has been provided in each section to allow the EU participants to incorporate and document additional decision-making needs relative to the incident-specific concerns for the response.

PRODUCT INFORMATION	
Product being evaluated:	
Product category:	

APPLICATION EVALUATION
1. What are the worker and public safety issues associated with the product being considered for use? *Review the MSDS for the product and/or contact the vendor for more information.*
2. List other issues of concern relative to the application of the product under consideration (if any) for review and discussion:
3. Other:
4. Other:

HABITAT
5. What habitat would be treated (e.g., on water, fine-grained sand beach, freshwater marsh, etc.) using the product under consideration?
6. How will the product under consideration's mechanism of action likely affect this habitat? *Refer to the NOAA "**Shoreline Assessment Manual,**" the 1995 API "**Options for Minimizing Environmental Impacts on Freshwater Spill Response**," and the 2001 **Environmental Considerations for Marine Oil Spill Response** (Marine Manual) for additional information.*
7. What percentage of the product under consideration will remain in the environment, if any?
8. If the product under consideration is likely to remain in the environment, what are the likely impacts to the habitat being treated? Are the likely impacts acceptable?
9. Other:
10. Other:

Table 3: Environmental Unit Evaluation / Discussion Form	
RESOURCES AT RISK (RAR) EVALUATION	
Resources at Risk from the product being evaluated? *Summarize the list of species, based on their habits, that are likely to be impacted by the product application. Circle the species of greatest concern for this application.*	
Marine Mammals:	
Terrestrial Mammals:	
Birds - Diving	
Birds – Shorebirds	
Birds - Raptors	
Birds – Wading Birds	
Birds - Waterfowl	
Birds - songbirds	
Fish	
Shellfish	
Amphibians / Reptiles	
Plants	
1. Of the species identified, discuss means to reduce impacts or protect resources (e.g., remove, isolate, or haze)? Is it feasible?	
2. Of the species identified, evaluate and discuss the likely impacts from the application of the product being considered (e.g., impact considered minimal, potential impact possible, impact considered likely, unknown, or application not applicable relative to this resource).	
3. Are the RAR impacts from the product being considered acceptable? *Refer to Worksheet 2 for product specific toxicity information.*	
4. Identify the monitoring requirements during/after the application for resource protection (visual observations, water monitoring, tissue sampling, etc.?)	
5. Other:	
6. Other:	
7. Other:	

WORKSHEET 2: PRODUCT SELECTION WORKSHEET

This worksheet is intended to be photocopied for each product category evaluated and used during drills and incidents and Faxed to the Incident Specific RRT for review. This worksheet may be used to evaluate 1, 2 or 3 separate products in an individual category.

Name(s):

Date:

Incident:

A:	**Product Category Being Reviewed:**			
	Products of Interest:	**Product No. ____**	**Product No. ____**	**Product No. ____**
B:	**Product Name:**			
C:	**RRT Approval Required? (Y/N)**			
	Other Regulatory Requirements or Permits?			
D:	**Can Product Arrive in Time for an effective application? (Y/N)**			
E:	**Can Product be applied with existing Operational Application Constraints (including safety)? (Y/N)**			
F:	**Can Product be removed from the Environment? (Y/N)** *Provide intelligent ranking*			
G:	**Toxicity of Product alone (Write in numbers and Toxicity Rating. See App E for more information on toxicity and Toxicity Rating)**	Inland silversides (96h): Mysid Shrimp (48h):	Inland silversides (96h): Mysid Shrimp (48h):	Inland silversides (96h): Mysid Shrimp (48h):
	Toxic evaluation for targeted resources for incident conditions for the spill application *Rank: Severe, Moderate, Slight, Minimal, None*			
H:	**Mark as 1st, 2nd, or 3rd Choice or mark as Not Applicable for this incident**			
I:	**Additional Comments/Decisions/Recommendations:**			

J: Initials/Date of Incident-Specific RRT Review of Information:

Sign and Include Date Upon Review

USEPA:	Name: _____ Date:_____	**STATE:**	Name: _____ Date:_____
USCG:	Name: _____ Date:_____	**STATE:**	Name: _____ Date:_____
NOAA:	Name: _____ Date:_____	**TRIBE:**	Name: _____ Date:_____
USDOI:	Name: _____ Date:_____	**OTHER:**	Name: _____ Date:_____

K: Incident RRT Approval:

Planning Section Chief:	**Unified Command:**

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WORKSHEET 3: TESTING & MONITORING WORKSHEET

This worksheet is intended to be photocopied for each product category evaluated and used during drills and incidents and Faxed to the Incident Specific RRT for review. Use additional paper if needed to record information.

Name(s):	
Date:	
Incident:	

	Products of Interest:	**Product No. ____**	**Product No. ____**	**Product No. ____**
A:	**Product Name:**			
B:	**Has a "Tail-Gate" test application proven that product is effective on oil type at this state of weathering? (Y/N)**			
	Products to Consider for Additional Testing:	**Product No. ____**	**Product No. ____**	**Product No. ____**
C:	**Products still being considered:**			
D:	**Has a Field Effectiveness Test or Effects Test been carried out? (Y/N)**			
E:	**Describe test protocols:**			
	Test site specifics (environment):			
	Natural resources at risk:			
	Volume of oil to be treated:			
	Application rate(s)/volume used:			
	Application equipment:			
	Other logistical considerations:			
	Physical impacts expected:			
	Is the oil recoverable?:			
	Expected outcomes of test:			
F:	**Recommended Level of Monitoring for this test** (Refer to Part D to Determine)			
G:	**Mark as 1st, 2nd, 3rd Choice or Not Applicable for use during this incident**			

H: Additional Comments/Recommendations on the use of product(s):

I: Initials/Date of Incident-Specific RRT Review of Information:

Sign and Include Date Upon Review

USEPA:	Name: _____ Date:_____	**STATE:**	Name: _____ Date:_____
USCG:	Name: _____ Date:_____	**STATE:**	Name: _____ Date:_____
NOAA:	Name: _____ Date:_____	**TRIBE:**	Name: _____ Date:_____
USDOI:	Name: _____ Date:_____	**OTHER:**	Name: _____ Date:_____

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SELECTION GUIDE USE TRACKING

Dear Selection Guide User:

We need your assistance in helping the editors increase the quality of the information contained in the Guide. Sharing information within and among the regions whenever spill countermeasures technologies are used is of vital interest and benefit to the response community. To assure this information is captured, Selection Guide users are requested to complete the information questionnaire form and return this form via email to dscholz@seaconsulting.com or mail it to Debra Scholz, SEA Consulting, Inc. 868 Robert E. Lee Blvd., Charleston, SC 29412. Thank you for your assistance in this matter!

NCP PRODUCT SCHEDULE PRODUCT USE SPILL INFORMATION FORM	
Name of Spill/Vessel/Location/Incident:	
Date of Spill (mm/dd/yy):	
Location of Spill:	
Latitude:	**Longitude:**
Oil Product:	
Oil Type (USCG Classification code): ❑ Group I ❑ Group II ❑ Group III ❑ Group IV ❑ Group V	
Estimated Volume Released (Gallons):	**(Barrels):**
Source of Discharge / Release:	
Resources at Risk:	
Technical Information on Product(s) Used / Evaluated	
Product / Response Countermeasure Used / Considered for Use:	
How was this Countermeasure Used (*purpose, application quantity, date, method, etc.***):**	

NCP PRODUCT SCHEDULE PRODUCT USE SPILL INFORMATION FORM	
Shoreline Types Impacted:	
Incident summary (*specifics*):	
Behavior of Oil Before and/or After Treatment:	
Other Countermeasures Used and Mitigation Efforts:	
Lesson Learned from Product Use:	
Recommendations for Future Product Use: *Please attach any necessary data and/or reports to this form.*	
Contact Information	
Name:	
Position:	
Agency:	
Mailing Address:	
Phone:	**FAX:**
Cell:	**Email:**
Questions / Submittal Information	
Contact 843-367-5126 for additional assistance/questions. Submit this form via email to dscholz@seaconsulting.com or mail it to Debra Scholz, SEA Consulting, Inc. 868 Robert E. Lee Blvd., Charleston, SC 29412. Thank you for your assistance in this matter.	

Appendix G
Products Removed from the
NCP Product Schedule

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Table G-1. Bioremediation Products Removed from the Product Schedule.

	BioGee HC	BR	ENZYT	Oil Spill Eater II
General Description	Liquid	Tan, free-flowing powder, yeast odor	Available as liquid or solid (Crystal)	Amber liquid, ferment smell
Active Ingredients	Microbes	Microbes, Enzymes, Nutrients, Surfactant	Microbes	Nutrients, Enzymes, and Surfactants
Nutrient Composition	NP	Urea, methylene urea, ammonium phosphate	None, product requires nutrient supplements	Nutrient enhancement product with nitrogen, phosphorus, and readily available carbon and vitamins
How does it change the oil behavior?	No immediate change	No immediate change	No immediate change	Emulsifies oil (breaks the oil into droplets) in 3-10 minutes; complete bioremediation occurs in 2-30 days
Availability (amount per location)	NP	2,000 lbs, Stormville, NY	NP	1,000-2,000 gal, Dallas, TX
Application Rate	1 gal/yd^3 soil; 0.25 gal/1,000 ft^2 water surface	0.5 lb/ton or 0.5-3 lb per 1,000 ft^2 soil; 2 lb/100,000 gal water	0.5 gal liquid or 1.5 lb solid/yd^3 soil, or /600 gal water	1 gal product/50 gal crude oil, as a 2% solution; 1 gal product /100 gal light oil at 1% solution
Application Method	Spray	Mix product into a slurry (1 lb/gal); apply immediately with low pressure, coarse spray to saturate the area.	Spray solution	Mix 1-2% solution using ambient water; spray on oiled surface. Reapply if oil persists on water and shorelines. On soils, use same application rate, keep soils moist, till area 1x/week, add more product as needed. Can be applied by any eductor spray system.
Temperature Limitations	34-140°F; optimal is 83°F	35-186°F	50-113°F	28°F to 120°F; bioremediation slows below 40°F
EPA Efficacy Test (Reports % reduction of components over a 28 day period)	Alkanes: NP Aromatics: NP Gravimetric weight decrease: 13%	Alkanes: 52% Aromatics: 27% Gravimetric weight decrease: 25%	Alkanes: 27% Aromatics: 0% Gravimetric weight decrease: 26%	n-paraffins NA Aromatics NA Gravimetric weight decrease: Under Review (contact EPA)
Use in Fresh Water?	Yes	Yes	Yes	Yes

	BioGee HC	BR	ENZYT	Oil Spill Eater II
Use in Salt Water?	Yes, salinity may have slight effects	Yes, up to 6% salinity	Not effective where salinity is >6%	Yes
Inland Silversides 96h	NP	NP	NP	NP on NCP; 58 value provided by vendor
Mysid Shrimp 48h	NP	NP	NP	NP on NCP; 152 value provided by vendor
Solubility in water	Assume 100% soluble	NP	Liquid is miscible with water; solid is 90% soluble with water	100% soluble
Other Information	Product works at pH 4.5-9.5, optimally at pH 7.0	Dispersible	Product works at pH 5.5-9.0, optimally at 6.5-8.5	Does not contain trace metals. Eliminates adhesion, and reduces fire hazard and toxicity in 3-10 minutes. Light end sheen disappears immediately upon application.
Application Assistance Information*	RMC Bioremediation 318-219-3929 Fax: 318-219-3920 www.rmcbio.com	Product works at pH 4.5-9.5, optimally at pH 6-7	Acorn Biotechnical Corp. 713-861-6087 800-982-1187 www.acornbiotechnical.com	Oil Spill Eater International 972-669-3390

Table G-1: continued.

	PRP	Vita-Bugg
General Description	Granular, yellow powder (0.25 to 500 micrometers) with a wax coating that makes it float, oleophilic, and hydrophobic	Powder
Active Ingredients	Enzymes	Nutrients
Nutrient Composition	Enzyme names: oxidoreductases, transferases, hydrolases, lyases, isomerases, and lipases	Oleophilic
How does it change the oil behavior?	Immediate change – binds the oil. Does not allow the oil to sink or emulsify. Reduces stickiness	No immediate change
Availability (amount per location)	10,000lbs.- Houston, TX 10,000lbs.- Houma, LA 60,000lbs- Pittsburgh, PA	15,000 lbs.- Houston, TX
Application Rate	1:2 product to oil; 50 lb/1,000 ft^2 of contaminated surface, 1 ton of PRP covers 40,000 ft^2 to a depth of ¼ inch	5-15 lb/bbl oil; 6 lb/1,000ft^2
Application Method	Apply dry powder to small spills; for large spills and in open waters, mix or educt with water and spray affected area.	Use conventional powder spraying equipment to apply product; additional applications at 48-72 h as needed
Temperature Limitations	Wax is sensitive to heat at 85°F, melts at 120°F	None
EPA Efficacy Test (Reports % reduction of components over a 28 day period)	Alkanes: 12% Aromatics: 3% Gravimetric weight decrease: 1%	Alkanes: 97% Aromatics: 73% Gravimetric weight decrease: 18%
Use in Fresh Water?	Yes	Yes
Use in Salt Water?	Yes	Yes

	PRP	Vita-Bugg
Inland Silversides 96h	NP on NCP: 354,000 (48h) reported by vendor	NP
Mysid Shrimp 48h	NP on NCP 68,000 reported by vendor	NP
Solubility in water	Insoluble	Soluble
Other Information	www.oilspillrem.com sales@oilspillrem.com	www.bionutratech.com 0.9gm/cc- water soluble 2.5gm/100cc oil soluble
Application Assistance Information*	Petro Rem, Inc. 412-279-9745	BioNutraTech, Inc. 281-894-7371

Table G-2: Surface Collecting Agents Removed from Product Schedule.

	Corexit OC-5	Oil Herder
General Description	Liquid with a specific gravity of 0.918	Liquid with a specific gravity of 0.86
Is Product Listed for Use in US?	No	No
Availability within 48 h (see Note below)	Unknown at present Previously, a 3-5 day lead time for production of up to 400 drums per day was required	Unknown at present Previously, a 7 day lead time for production of 15,000 gal per day was required
Application Rate (per manufacturer)	1-2 gal per lineal mile	15 gal per lineal mile
Spreading Pressure	High (45 x 10^{-7} Newtons/m)	High (46 x 10^{-7} Newtons/m)
Solubility in water	Insoluble	40%, the solvent is the soluble fraction
Use in Fresh Water?	Yes	Yes
Use in Salt Water?	Yes	Yes
Toxicity (LC-50, ppm) Note: a low value = high toxicity	Fathead minnow >4,500 (96h); Zebra fish >10,000 (48h)	Zebra fish <1,000 (96h)
Mummichug 96 h	4,800	>1,000
Brine shrimp 48 h	4,800	2.5

NP = Information not provided

Note: As of August, 2008, there were no Surface Collecting Agents on the NCP Product Schedule. The two products listed above are the only two known products to have been developed specifically for and commercially marketed as surface collecting agents. The current availability of these products is not known.

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Table G-3: Surface Washing Agents Removed from Product Schedule.

	SX-100
General Description	NP
Availability (amount per location)	Distributor in Colorado Springs, CO
Application Rate	Up to 1:200 product to water, contact manufacturer for specific rates
Application Method	Contact manufacturer for specific application methods
Soak Time	NP
Temperature Limitations	32^{o}-130^{o}F
Effectiveness in Environment Canada lab test	NP
Use in Fresh Water?	Yes
Use in Salt Water?	Yes
Toxicity (LC-50, ppm) **Note: a low value = high toxicity**	Did not enhance toxicity of No.2 fuel oil for shrimp of silversides
Inland silversides 96 h	32
Mysid shrimp 48 h	32
Solubility in water	100% soluble
Other Information	Effective on spills where landfall has occurred or for soil remediation efforts
Is Treated Oil Recoverable?	NP
Application Assistance Information*	X Products and Services 719-576-8047

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Appendix H
Synopsis of Document Preparation

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2009 Update

The authors would also like to gratefully thank the following individuals who took part in the January 12-16, 2009 Workshop in Columbia, SC as part of the 2009 Selection Guide Update Committee. These participants, representing the various levels of oil spill response decision-making, came together and revised the document to address the needs of all decision-makers. The June 2009 Volume I –Decision-making Development Committee Members included:

Al Allen – Spilltec
Brad Benggio – NOAA SSC
CDR Edward Bock – USCG GST
Mary Evans – Genwest
David Fritz – BP
Gregory Hogue – US DOI
Richard Jardine – USEPA OSC Region IV
Patrick Keane – USCG District 7
Ed Levine – NOAA SSC
Dr. Jacqueline Michel – RPI
William "Nick" Nichols – EPA ERD
Kelly Reynolds – ITOPF
Debbie Scholz – SEA, Inc.
Christina Tant – USCG District 7
Albert Venosa – EPA
Vince Zenone – EPA OSC Region III

Many thanks also go out to the EPA, USCG, and NOAA for funding this effort.

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2003 Update

The Selection Guide for Oil Spill Applied Technologies could not have been updated without the dedication and assistance of the following people. The Authors' and Sponsors would like to acknowledge their invaluable assistance in this document preparation.

The 2003 Volume I –Decision-making Development Committee Members include:

John Allen, NRC
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