ANNEX F

APPENDIX I: ALASKA REGIONAL RESPONSE TEAM OIL DISPERSANT AUTHORIZATION PLAN

This document is also available on the Alaska Regional Response Team website at:

http://alaskarrt.org/

or at the Alaska Department of Environmental Conservation website at:

http://dec.alaska.gov/spar/perp/plans/uc/Annex%20F%20(Jan%2010).pdf

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Alaska Regional Response Team

Oil Dispersant Authorization Plan

Revision 1

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[Month/Year of plan approval to be inserted here]

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1.0 BACKGROUND AND OVERVIEW[1]

1.1 Introduction

The purpose of the Alaska Regional Response Team (ARRT) Oil Dispersant Authorization Plan is to outline the process to be used following an oil discharge in Alaska when dispersant use is being considered in a Preauthorization Area or in an Undesignated Area. In addition, this plan streamlines and facilitates the dispersant use authorization process, establishes a Preauthorization Area for Alaska, and provides a framework to identify areas where dispersant use should be avoided. Moreover, this plan will result in an Alaska-based regulated dispersant response capability.

The previous statewide guidelines and guidelines specific to Cook Inlet were approved by the ARRT in April 1986. Specific guidelines for Prince William Sound were approved by the ARRT on March 6, 1989. This plan, which was approved by the ARRT on ________, supersedes all previous statewide and area-specific dispersant guidelines/plans[2]. In effect for all marine waters in Alaska[3], this plan is subject to periodic review and update by the ARRT.

1.2 Background

The capability to respond to an oil discharge in Alaska can be hampered by great distances, underdeveloped transportation networks, limited labor force, finite mechanical spill cleanup technology, severe weather, and other conditions. The use of dispersants may provide a response tool in addition to mechanical recovery and *in-situ* burning. See Figure 1 for a conceptual marine spill response decision chart.

Dispersants are chemical agents consisting of surfactants, solvents, and other compounds specifically designed to enhance dispersion of oil into water by generating larger numbers of small droplets of oil that are entrained into the water column by wave or tidal action. These small submerged oil droplets are then subject to natural processes, such as dissolution, volatilization from the water surface, biodegradation, and sedimentation resulting from interactions with suspended particulate material. Oil spill dispersants do not actually reduce the total amount of oil in the environment. Rather, they may change the inherent characteristics of the dispersed oil, thereby changing the oil's transport, fate, and potential effects.

As noted by the National Academy of Sciences[4] review of ongoing research on the use of dispersants as an oil spill response technique and the impact of dispersed oil on marine and coastal ecosystems, there are many uncertainties regarding the efficacy [effectiveness] and toxicity of dispersant use. Decisions to use dispersants involve trade-offs between decreasing the

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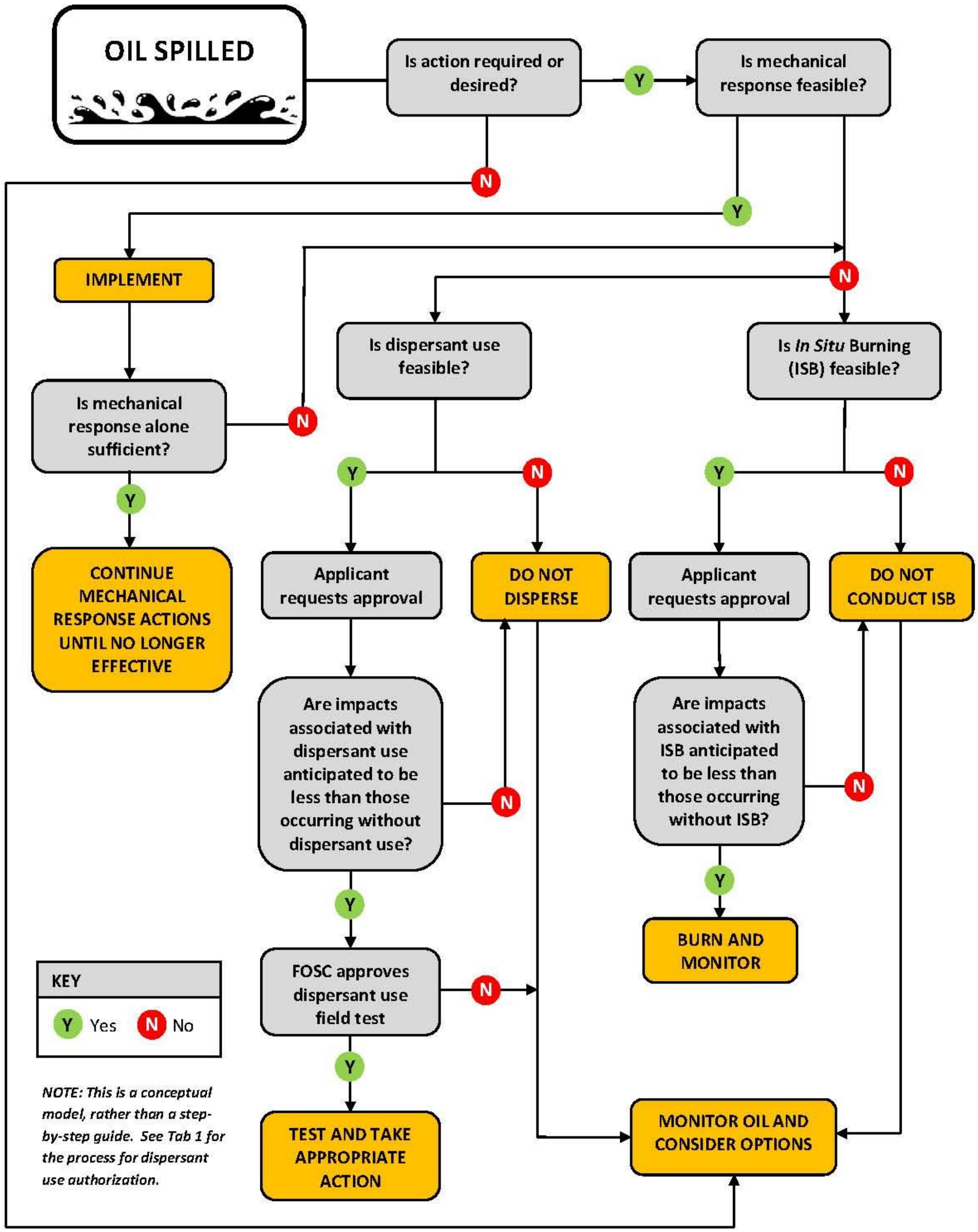
[1] Prior to the Alaska Regional Response Team approving this plan, Endangered Species Act Section 7 consultation with the U.S. Fish and Wildlife Service and National Marine Fisheries Service will be completed.

[2] This plan no longer includes Preauthorization Areas inside Prince William Sound or Cook Inlet.

[3] For the purposes of this document, "marine waters in Alaska" is defined to include all waters seaward of the mean low water line along the coast of Alaska outward to the 200 mile Exclusive Economic Zone.

[4] Oil Spill Dispersants Efficacy and Effects. 2005. National Academy of Sciences, available at: http://dels.nas.edu/resources/static-assets/materials-based-on-reports/special-products/oil_spill_dispersants_key_findings_final.pdf

Figure 1. Conceptual Marine Spill Response Decision-Making



potential risk to water surface and shoreline habitats while increasing the potential risk to organisms in the water column. This trade-off reflects the complex interplay of many variables, including, but not limited to, the type of oil spilled; the volume of the spill; sea state and weather; water depth; water temperature; water salinity; degree of turbulence; presence, relative abundance, and life stages of potentially-affected wildlife and marine organisms; and the use of those resources. Prior to authorizing dispersant use in marine waters in Alaska, the Federal On-Scene Coordinator (FOSC) needs to consider factors including, but not limited to, valuable commercial, subsistence, and recreational fisheries, as well as large and important populations of birds and marine mammals, including threatened and endangered species.

Key questions to consider during the dispersant use decision-making process include:

- Will the selected dispersant work effectively on the oil discharged and in the given circumstances?
- Can the dispersant be effectively applied to the oil?
- What are the environmental trade-offs of dispersant use and do they support the use of the dispersant in a given circumstance?

As stated in a May 2012 Government Accountability Office report, "Every oil spill is different, and the conditions—such as weather, oil type and volume, currents, and location—surrounding any unanticipated release of oil into the ocean are highly variable. Given this variability, no one study can account for all the potential permutations."[5]

1.3 Dispersant Use Authorizations

This document constitutes a dispersant use preauthorization plan and a case-by-case dispersant use authorization process in accordance with the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) - Subpart J (Section 300.910). This plan is included in Annex F of *The Alaska Federal/State Preparedness Plan for Response to Oil and Hazardous Substance Discharges/Releases (Unified Plan).*

Subpart J Section 300.910 of the NCP addresses the concurrence and consultation requirements for dispersant use authorizations. Specifically, it addresses dispersant use decision-making in the following circumstances:

- In accordance with the NCP - Subpart J (Section 300.910(a)), the [Federal] On-Scene Coordinator (OSC) may authorize the use of certain products without obtaining spill-specific concurrences under specified circumstances described in the preauthorization plan where the U.S. Environmental Protection Agency (EPA) Regional Response Team (RRT) representative, the state with jurisdiction over the waters of the area to which a preauthorization plan applies, and the U.S. Department of the Interior (DOI) and U.S. Department of Commerce (DOC) natural resource trustees approve the preauthorization plan in advance[6].

[5] Oil Dispersants: Additional Research Needed, Particularly on Subsurface and Arctic Applications. 2012. U.S. Government Accountability Office. A Report to Congressional Requestors. GAO-12-585.

[6] In Alaska, the natural resource trustee authorities are vested in the DOI and DOC ARRT representatives; state authorities for oil spill response are vested in the Alaska Department of Environmental Conservation ARRT representative.

- In accordance with the NCP - Subpart J (Section 300.910(b)), for spill situations that are not addressed by the preauthorization plan, the [Federal] OSC, with concurrence of the EPA representative to the RRT and, as appropriate, the concurrence of the RRT representative from the state with jurisdiction over the navigable waters threatened by the release or discharge, and in consultation with the DOI and DOC natural resource trustees, when practicable, may authorize the use of dispersants on oil discharges provided that the products are listed on the NCP Product Schedule[7].

- In accordance with the NCP – Subpart J (Section 300.910(d), the [Federal] OSC may authorize the use of any dispersant without obtaining the concurrence of the EPA representative to the RRT and, as appropriate, the RRT representative from the state with jurisdiction over the navigable waters threatened by the release or discharge, when, in the judgment of the [Federal] OSC, the use of the product is necessary to prevent or substantially reduce a hazard to human life. In that case, the [Federal] OSC is to inform (as soon as possible) the EPA RRT representative and, as appropriate, the RRT representative from the affected state and, when practicable, the DOI and DOC natural resource trustees[8] of the use of a product, including products not on the NCP Product Schedule. Once the threat to human life has subsided, the continued use of dispersant must follow the approval process described in Section 300.910(a) or (b).

1.4 Dispersant Areas

<u>Preauthorization Area</u>

The Preauthorization Area for Alaska is shown on Figure 2 and is described as follows: commencing at Cape Suckling in position 59-59.35N 143-53.49W, thence proceeding south to the outermost extent of the Exclusive Economic Zone (EEZ) at position 56-18.00N 144-00.00W, thence proceeding westerly along the outermost extent of the EEZ until it intersects with the outermost extent of the maritime boundary line (MBL) at position 51-21.49N 167-40.44W, thence proceeding northeast along the outermost extent of the MBL to position 54-54.00N 171-58.50W, thence proceeding easterly remaining 100 nautical miles offshore to position 55-45.00N 167-00.00W, thence proceeding southeasterly to Cape Sarichef at position 54-35.90N 164-55.65W, thence proceeding northwesterly to the outermost extent of the Contiguous Zone at position 54-52.43N 165-26.00W, thence proceeding westerly along the outermost extent of the Contiguous Zone following along the entire Aleutian Islands chain rounding Attu Island counter clockwise and entering the North Pacific Ocean, thence proceeding easterly along the outermost extent of the Contiguous Zone along the southern coast of the Aleutian Islands and south of the Shumagin Islands into the Gulf of Alaska and along the eastern coast of the Kodiak Archipelago, thence proceeding south of the Kenai Peninsula and Prince William Sound until reaching position 59-29.00N 144-03.00W, and thence proceeding north connecting to Cape Suckling at position 59-59.35N 143-53.49W. It should be noted, the Preauthorization Area excludes any avoidance areas identified in certain Subarea Contingency Plans (SCPs), as noted below in this section.

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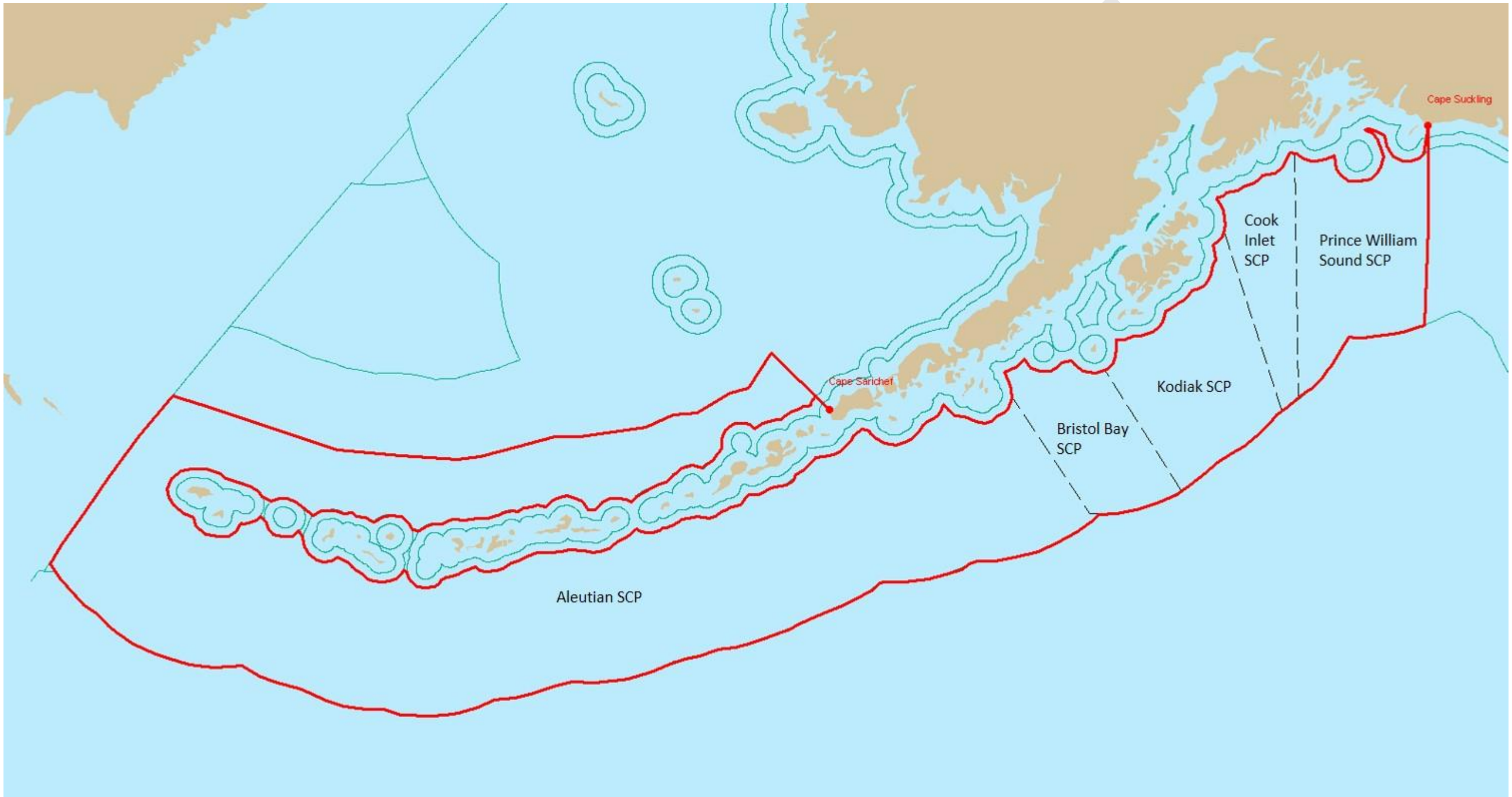
[7] In Alaska, the natural resource trustee authorities are vested in the DOI and DOC ARRT representatives; state authorities for oil spill response are vested in the State On-Scene Coordinator.

[8] In Alaska, the natural resource trustee authorities are vested in the DOI and DOC ARRT representatives

Figure 2. Preauthorization Area



Note: The boundaries of the Preauthorization Area and of the subarea contingency plans (SCPs) that overlap the Preauthorization Area are shown in this figure. As described below in Section 1.4, Federal On-Scene Coordinators shall use this figure in conjunction with Section I (Dispersant Use Avoidance Areas) of the appropriate SCPs identified in this figure. Section I of the SCPs identifies areas within the Preauthorization Area that have been reclassified as an avoidance area where requests for dispersant use shall be considered using the Process for Case-by-Case Dispersant Use Authorization in Tab 1, Part 1B.

This Preauthorization Area ensures the USCG can require certain vessel and facility response plan holders in Alaska to maintain a minimum dispersant use capability in accordance with a USCG August 31, 2009 rulemaking, 33 CFR Parts 154 and 155 "Vessel and Facility Response Plans for Oil: 2003 Removal Equipment Requirements and Alternative Technology Revisions; Final Rule (Final Rule)." This includes tank vessels that carry crude oil and stop at one or more U.S. ports at some point during their transit.

The boundaries of the Preauthorization Area were based on the location of common shipping routes followed by crude oil vessels regulated under the Final Rule. The 24 nautical mile boundary, which corresponds to the U.S. contiguous zone (a feature commonly depicted on nautical charts), excludes nearshore sensitive areas from the Preauthorization Area.

This Preauthorization Area overlaps offshore areas included in several SCPs; i.e., the Prince William Sound, Cook Inlet, Kodiak Island, Bristol Bay, and Aleutian Islands SCPs as shown on Figure 1. Following approval of this plan by the ARRT, the appropriate USCG FOSC, EPA FOSC, and Alaska Department of Environmental Conservation (ADEC) State On-Scene Coordinator (SOSC) shall engage federal and state natural resource trustees, federally-recognized tribes, and stakeholders in a process to identify locations where dispersant use should be avoided within the Preauthorization Area where the Preauthorization Area overlaps their respective SCP. Any identified locations shall be included in Section I (Dispersant Use Avoidance Areas) of each SCP and posted online (see http://alaskarrt.org/Documents.aspx?f=175). This process shall be completed within 24 months following ARRT approval of this plan. Any avoidance area identified in an SCP shall no longer be considered part of the Preauthorization Area for dispersant use. Rather the avoidance area shall be automatically reclassified as an Undesignated Area where requests for dispersant use shall follow the process for Case-by-Case Dispersant Use Authorization in Tab 1, Part 1B. Any preauthorization area within an SCP, for which this process is not completed within 24 months following ARRT approval of this plan, will be removed as a pre-authorized area until such time the process is completed.

Undesignated Areas

Undesignated Areas include all marine waters in Alaska outside of the Preauthorization Area. These Undesignated Areas overlap offshore areas included in several SCPs as noted above. Following approval of this plan by the ARRT, the appropriate USCG FOSC, EPA FOSC, and ADEC SOSC shall engage federal and state natural resource trustees, federally-recognized tribes, and stakeholders in a process to identify locations where dispersant use should be avoided within the Undesignated Areas where the Undesignated Areas overlap their respective SCP. Any identified locations shall be included in Section I (Dispersant Use Avoidance Areas) of each SCP and posted online (see http://alaskarrt.org/Documents.aspx?f=175).

2.0 DISPERSANT USE POLICIES, CRITERIA, AND CONDITIONS/STIPULATIONS

2.1 Policies

The following policies shall be followed whenever dispersant use is considered and/or authorized:

- The primary method for cleaning up oil will be mechanical removal.
- The use of dispersants may provide an alternative response tool when conditions prevent using mechanical recovery and/or *in-situ* burning.
- Dispersant delivery in a mechanical recovery area will not displace or interfere with mechanical or other response operations.
- All requests for dispersant use will follow the appropriate process in Tab 1.
- Prolonged applications of dispersants that exceed 96 hours, or the use of dispersants subsea (i.e., below the water surface), are not preauthorized.
- All input related to dispersant use authorizations will be provided to the FOSC within the timeframe requested by the FOSC. The FOSC will provide sufficient time for that input.
- The preauthorization of dispersant use (inside the Preauthorization Area) only applies to crude oil. Requests for dispersant use for any other type of oil (e.g., diesel fuel, jet fuel, intermediate fuel oils, bunker oils) will be considered using the Process for Case-by-Case Dispersant Use Authorization in Tab 1, Part 1B.
- The evaluation of trade-offs will consider the criteria identified below in Section 2.2. The basis for these decisions will be documented.
- One or more dispersant application field tests to determine the effectiveness of oil dispersion under existing site-specific environmental conditions will be conducted. The resulting information will be analyzed to determine whether full-scale dispersant application(s) will begin. A dispersant application field test is defined as one aircraft sortie or one vessel-based application swath.
- Any atypical use of dispersants[9] or any use of dispersant subsea (i.e., below the surface) in a Preauthorization Area or in an Undesignated Area will only be considered using the Process for Case-by-Case Dispersant Use Authorization in Tab 1, Part 1B.
- All dispersant applications (including field tests) will include effectiveness monitoring as outlined in the Special Monitoring of Applied Response Technologies (SMART) Tier 1, Tier 2, and Tier 3 protocols (see Tab 3, Part 1). In the event SMART Tier 2 and Tier 3 monitoring is not operationally feasible in the Preauthorization Area, the request for dispersant use or continued use will be considered via the Process for Case-by-Case Dispersant Use Authorization in Tab 1, Part 1B.
    - Monitoring for effectiveness of dispersant use and any other factors (or "key indicators") established by the FOSC in consultation with the EPA, DOI, and DOC

[9] Atypical use of dispersants is defined to include: (1) full scale dispersant application ongoing for, or expected to exceed or exceeding 96 hours following the dispersant application field test, and/or (2) the use of dispersants subsea; i.e., below the water surface.

ARRT representatives and, when appropriate, the State On-Scene Coordinator (SOSC), will be conducted by a qualified third party (who is acceptable to the Unified Command and the EPA, DOI, and DOC ARRT representatives and, when appropriate, the SOSC) or by the USCG Strike Team/SMART Team. All SMART Tier 1, 2, and 3 monitoring will be performed in accordance with procedures in the most current SMART protocols (see Tab 3, Part 1).

- For every dispersant application, the FOSC will ensure that all required monitoring is conducted. The resulting information will be analyzed and used on a daily basis to determine whether dispersant application(s) will continue, be postponed, or cease and whether any modification(s) need to be made.
- Environmental monitoring atypical use of dispersants will be guided by the NRT "Environmental Monitoring for Atypical Dispersant Operations" (see Tab 4, Part 2).
- All monitoring that includes sampling will be conducted in accordance with a Quality Assurance Project Plan that addresses sample collection methodology, handling, chain of custody, and decontamination procedures (see Tab 4, Part 2, Section 4).

2.2 Criteria

The following criteria will be considered in dispersant use decision-making within marine waters in Alaska:

- Bathymetry - it is generally recognized that adequate mixing and dilution of dispersants should occur if applied in waters deeper than 10 fathoms (or 60 feet) depth provided there is sufficient energy for mixing. The 10 fathom contour is a standard depth contour line included on National Oceanic and Atmospheric Administration marine charts.
- Distance from shore - an adequate buffer needs to be established to reduce the chances of applying dispersants to sensitive shorelines/nearshore areas and to ensure that drifting dispersant and/or dispersed oil mixtures do not adversely affect intertidal and benthic biota.
- Wind and currents - areas where there is generally little movement of water would not provide sufficient mixing energy for effective dispersant use. With higher wind speeds (beginning at 12-14 meters per second (26.8 to 31.3 miles per hour)), the benefits of dispersant application start to diminish compared to natural dispersion.
- Salinity - most dispersants are made for use in saltwater and are not effective in fresh water or waters with a salinity of less than 15 parts per thousand.
- Temperature - dispersant effectiveness will be affected by ambient water temperatures, with more complete dispersion in warmer waters.
- Response equipment - the availability and time to mobilize response equipment may affect whether dispersants can be used.
- Shoreline types - certain shoreline types (e.g., gravel, mixed sand and gravel, coarse-grained sand beaches, and marshes) may trap oil for long periods. The amount of wave energy (e.g., protected inlets vs. high-energy exposed beaches) will also affect oil retention and persistence.

- Sensitive habitats - certain habitats where biota breed, rear young, feed, or congregate (e.g., eelgrass beds, kelp beds, saltwater marshes, and designated critical habitats for threatened or endangered species) may be adversely affected by oil and/or dispersed oil.
- Sensitive species including threatened or endangered species – these species may be adversely affected by oil and/or dispersed oil.
- Other areas designated for special use or protection - these areas (e.g., national and state parks, national wildlife refuges, and wildness areas) may be adversely affected by oil and/or dispersed oil.
- Historic properties - these resources (e.g. archeological and historic resources) may be adversely affected by oil and/or dispersed oil.
- Human use activities - these activities (e.g., subsistence, fishing, and boating activities) may be adversely affected by oil and/or dispersed oil.
- Public and private facilities – these facilities (e.g., fish hatcheries, aquaculture and mariculture facilities, public water intakes, and docks) may be adversely affected by oil and/or dispersed oil).

2.3 Conditions/Stipulations

The following conditions and stipulations shall be included in any dispersant application field test and in any subsequent authorization of full-scale dispersant application(s):

- All dispersant application field tests will be conducted on a representative portion of the oil slick.
- All dispersant applications will be conducted in accordance with the conditions and procedures identified in Tab 1. Dispersant application effectiveness and potential trade-offs associated with its use will be evaluated on a daily basis, informing the FOSC's decision to continue, postpone, modify, or cease dispersant application based on that day's monitoring information.
- Dispersant applications will only be carried out in daylight conditions.
- Dispersants will only be applied in areas where the water depth is ≥ 10 fathoms (60 feet) and at sufficient distances from shore to ensure that sensitive near-shore and benthic habitats are not affected by dispersants and/or dispersed oil.
- Dispersants applications will maintain a minimum 500 meters (1,640 feet) horizontal separation from swarming fish[10], rafting flocks of birds, marine mammals in the water, and/or marine mammal haul-outs.
- To avoid disturbances at walrus haul-outs, any dispersant-related aircraft will comply with any Federal Aviation Administration Temporary Flight Restriction(s) and Notice to Airmen and/or aviation restrictions issued by the U.S. Fish and Wildlife Service (FWS). In addition, any dispersant-related vessel(s) will comply with any USCG Notice to Mariners and/or FWS restrictions for walrus haul-outs.

[10] Swarming fish include schools of fish that are active and visible at the surface of the water.

- Any monitoring required by FWS and/or National Marine Fisheries Service for Endangered Species Act Section 7 compliance will be conducted.
- DOI and/or DOC will provide a specialist in aerial surveying of marine mammals and pelagic birds to accompany a Tier 1 monitoring team to help ensure compliance with the above requirements. If DOI and/or DOC cannot provide the appropriate specialist(s), a third party acceptable to the DOI and/or DOC will be identified to accompany the monitoring team.
- Any atypical use of dispersants will be guided by the NRT "Environmental Monitoring for Atypical Dispersant Operations" (see Tab 4, Part 2).
- Other incident-specific conditions/stipulations: ________________________________
  ____
  ____
  ____

TAB 1. PROCESS FOR DISPERSANT USE AUTHORIZATION

Part 1A: Process for Dispersant Use in the Preauthorization Areas

The following information outlines the procedure that shall be followed when the Federal On-Scene Coordinator (FOSC) has made a decision to authorize the use dispersants on a crude oil discharge within the dispersant Preauthorization Area[1]:

1. The FOSC directs the Responsible Party (RP) to mobilize resources for dispersant use, while the RP and the Environmental Unit (EU) of the Incident Command immediately begin to complete the checklists contained in Parts 2-3. This checklist information will be used to inform the decision to authorize dispersant use and establish the parameters of the incident-specific use, as appropriate. If there is no RP identified, the FOSC, serving as the "Requestor," may direct mobilization of resources for dispersant use as noted above.
2. The FOSC immediately notifies the following entities of the decision to authorize the use dispersants:
    - U.S. Environmental Protection Agency (EPA) Alaska Regional Response Team (ARRT) representative
    - U.S. Department of the Interior (DOI) ARRT representative
    - U.S. Department of the Commerce (DOC) ARRT representative
    - State On-Scene Coordinator (SOSC)
    - Representative for each appropriate federally-recognized tribe
    - Representative for each appropriate stakeholder group (e.g., local government(s), Native corporation(s), regional citizens' advisory council(s))
3. The FOSC directs appropriate entities (i.e., previously-agreed upon third party (or parties) and/or USCG Strike Team/Special Monitoring of Applied Response Technologies [SMART] Team) to mobilize Tier 1, 2, and 3 monitoring capabilities.
4. The FOSC initiates, as appropriate, Endangered Species Act (ESA) Section 7 consultation(s) with U.S. Fish and Wildlife Service and/or National Marine Fisheries Service (NMFS) representatives in accordance with the ESA Memorandum of Agreement (see Annex K of the *Unified Plan*).
5. The FOSC initiates, as appropriate, Essential Fish Habitat consultation with a NMFS representative.
6. The National Oceanic and Atmospheric Administration (NOAA) Scientific Support Coordinator (SSC) and EU, in coordination with the Operations Section, provide any necessary supporting information (e.g., ADIOS model runs, currents, water temperature, salinity, and fish and wildlife observations) required in Parts 2-3. The completed Parts 2-3 are submitted by the EU Leader to the FOSC. The FOSC completes Questions 1-17 in Part 4. The completed Parts 2-4 are provided to other members of the Unified Command (UC) and representatives identified in Step 2 above.

[1] These steps assume that the FOSC will be working within a Unified Command structure and that all input related to dispersant use authorization(s) will be provided to the FOSC within the timeframe required by the FOSC.

Tab 1, Part 1A: Process for Dispersant Use in Preauthorization Areas, Cont.

7. An individual representing the FOSC holds a teleconference (at a time determined by the FOSC) with individuals identified in Step 2 above, appropriate members of the EU, and the UC for the purpose of informing the FOSC's decision to use dispersants.
8. The FOSC completes Questions 18-20 in Part 4, documents any changes to Parts 2-4, and completes Part 5 prior to proceeding with a dispersant application field test (following Steps 9-15 below, as appropriate) or postponing or cancelling the field test.
9. The Dispersant Field Task Force (DFTF)[2] advises the FOSC that dispersant application and monitoring personnel, equipment, and supplies are staged and ready to deploy for a dispersant application field test.
10. The DFTF, under the supervision of the FOSC, conducts a dispersant application field test and all required monitoring.
11. The NOAA SSC, using the results of the SMART Tier 1, 2, and 3 monitoring, determines whether the dispersant is effectively dispersing the oil, documents the basis for that determination, and provides the information to the EU.
12. The EU provides to the FOSC, other members of the UC, and individuals identified in Step 2 above, a recommendation on whether full-scale dispersant application(s) should commence with any modification(s) and/or any additional monitoring requirements.
13. An individual representing the FOSC holds a teleconference (at a time determined by the FOSC) with individuals identified in Step 2 above, appropriate members of the EU, and the UC for the purpose of informing the FOSC's decision to authorize any full-scale dispersant application(s) or to postpone or cancel authorization of dispersant application(s). [The frequency of teleconferences following any first full-scale dispersant application will be determined on an incident-specific basis by the FOSC, the EPA, DOI, and DOC ARRT representatives and, when appropriate, the SOSC. Those teleconferences will inform the FOSC's decision to continue, postpone, modify, or cease authorization of full-scale dispersant application(s).]
14. The FOSC determines whether to authorize full-scale dispersant application(s) with any modification(s) and/or any additional monitoring requirements will begin, be postponed, or cancelled; documents any revisions to Parts 2-5; and provides the information to the rest of the UC and individuals identified in Step 2 above. For any atypical use of dispersants[3], any additional dispersant use will be considered via the Process for Case-by-Case Dispersant Use Authorization in Tab 1, Part 1B.
15. After the response for this incident has been completed, the FOSC will complete a Dispersant Use After-Action Report (as required in Tab 3) for submittal to all signatories in Part 5, all members of the UC, ARRT, and National Response Team, , and other individuals identified in Step 2 above The report will also be posted on the ARRT public website.

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[2] The DFTF includes all dispersant application and dispersant monitoring teams.

[3] Atypical use of dispersants is defined to include: (1) full scale dispersant application ongoing for, or expected to exceed or exceeding 96 hours following the dispersant application field test, and/or (2) the use of dispersants subsea; i.e., below the water surface.

Tab 1, Part 1B: Process for Case-by-Case Dispersant Use Authorization

The following information outlines the procedure that shall be followed when the application of dispersants into marine waters in Alaska is being proposed as a response option for discharges of any oil in Undesignated Areas and/or discharges of oil, other than crude oil, in a Preauthorization Area[1].

1. The Responsible Party (RP), serving as the Requestor, notifies the Federal On-Scene Coordinator (FOSC) of their intention to prepare and submit a Dispersant Use Request (see Part 2). Depending on the timing and need to move quickly, the FOSC may direct the RP to begin mobilizing equipment, materials, and personnel in preparation to implement the dispersant use plan to be proposed. [If there is no RP identified, the FOSC may serve as the Requestor.]
2. The FOSC immediately notifies the following entities of the RP's intent to submit a Dispersant Use Request:
   - U.S. Environmental Protection Agency (EPA) Alaska Regional Response Team (ARRT) representative
   - U.S. Department of the Interior (DOI) ARRT representative
   - U.S. Department of Commerce (DOC) ARRT representative
   - State On-Scene Coordinator (SOSC)
   - Representative for each appropriate federally-recognized tribe
   - Representative for each appropriate stakeholder group (e.g., local government(s), Native corporation(s), regional citizens' advisory council(s))
3. Depending on the timing and need to move quickly, the FOSC directs appropriate entities (i.e., previously-agreed upon third party (or parties) and/or USCG Strike Team/Special Monitoring of Applied Response Technologies [SMART] Team) to mobilize Tier 1, 2, and 3 monitoring capabilities.
4. The FOSC initiates, as appropriate, Endangered Species Act (ESA) Section 7 consultation(s) with U.S. Fish and Wildlife Service and/or National Marine Fisheries Service (NMFS) representatives in accordance with the ESA Memorandum of Agreement (see Annex K of the *Unified Plan*).
5. The FOSC initiates, as appropriate, Essential Fish Habitat consultation with a NMFS representative.
6. The National Oceanic and Atmospheric Administration (NOAA) Scientific Support Coordinator (SSC) and Environmental Unit (EU), in coordination with the Operations Section, provide any necessary supporting information (e.g., ADIOS model runs, currents, water temperature, salinity, and fish and wildlife observations) required in Parts 2-3. The completed Parts 2-3 are submitted by the EU Leader to the FOSC. The FOSC completes Questions 1-17 in Part 4.
7. An individual representing the FOSC holds a teleconference (see procedure listed below) with individuals identified in Step 2 above, the Unified Command (UC), and appropriate members of the EU for the purpose of the EPA, DOI, and DOC ARRT representatives and, when appropriate, the SOSC, to take action on the Dispersant Use Request.

[1] These steps assume that the FOSC will be working within a Unified Command structure and that all input related to dispersant use authorization(s) will be provided to the FOSC within the timeframe requested by the FOSC.

Tab 1, Part 1B: Process for Case-by-Case Dispersant Use Authorization, Cont.

Teleconference Procedure for Dispersant Application Field Test

Individual representing the FOSC:

- Confirms when the FOSC requires input from all parties identified in Step 2 above.
- Provides to all parties identified in Step 2 above, information on the teleconference time and call-in number, and copies of Parts 2-4.
- Chairs the teleconference and: (1) conducts roll call, recording name, title, and affiliation of teleconference participants; (2) requests (from the Requestor) a brief summary/overview of the plan for the proposed dispersant application field test (field test); (3) directs questions to the appropriate UC or EU representative(s); (4) requests input from the EPA, DOI, and DOC ARRT representatives and, when appropriate, the SOSC; (5) requests input from federally-recognized tribes and stakeholders; (6) facilitates development of a consensus recommendation (if possible) by the EPA, DOI, and DOC ARRT representatives and, when appropriate, the SOSC, on the proposed field test, including any special considerations, constraints, permit requirements, and/or special authorizations; (7) queries the EPA, DOI, and DOC ARRT representatives and, when appropriate, the SOSC, for their summary input on the proposed field test; and (9) verbally summarizes input received.
- Prepares and provides as soon as possible to the EPA, DOI, and DOC ARRT representatives and, when appropriate, the SOSC, a draft written summary of the teleconference results along with the names, titles, and affiliations of teleconference participants. Incorporates as soon as possible any corrections to the summary provided by the EPA, DOI, and DOC ARRT representatives and, when appropriate, the SOSC, and immediately provides the final summary to the UC with a copy to each teleconference participant.

8. The FOSC completes Questions 18-20 in Part 4 and documents any changes to Parts 2-4; the FOSC, the EPA, DOI and DOC ARRT representatives and, when appropriate, the SOSC, complete Part 5, prior to proceeding with a dispersant application field test (following Steps 9-15 below, as appropriate) or postponing or cancelling the field test as determined in the above procedure.
9. The Dispersant Field Task Force (DFTF)[2] advises the FOSC that dispersant application and monitoring personnel, equipment, and supplies are staged and ready to deploy for a dispersant application field test.
10. The DFTFs, under the supervision of the FOSC, conducts a dispersant application field test and all required monitoring.
11. The NOAA SSC, using the results of the SMART Tier 1, 2, and 3 monitoring, determines whether the dispersant is effectively dispersing the oil, documents the basis for that determination, and provides the information to the EU.
12. The EU provides to the UC and individuals identified in Step 2 above, a recommendation on whether full-scale dispersant application(s) should commence with any modification(s) and/or any additional monitoring requirements.

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[2] The DFTF includes all dispersant application and dispersant monitoring teams.

13. An individual representing the FOSC holds a teleconference (see procedure listed below) with individuals identified in Step 2 above, the UC, and appropriate members of the EU for the purpose of the EPA, DOI, and DOC ARRT representatives and, when appropriate, the SOSC, to take action on a request for full-scale dispersant application(s). [The frequency of teleconferences following any first full-scale dispersant application will be determined on an incident-specific basis by the FOSC, the EPA, DOI, DOC ARRT representatives and, when appropriate, the SOSC. Those teleconferences will reconsider the decision to continue, postpone, or cease full-scale dispersant application(s). For any atypical use of dispersants[3] , a teleconference will be held to reconsider the decision to continue dispersant application(s).

Teleconference Procedure for Full-Scale Dispersant Application

Individual representing the FOSC:

- Confirms when the FOSC requires input from all parties identified in Step 2 above.
- Provides to all parties identified in Step 2 above, information on the teleconference time and call-in number and any revisions to Parts 2-4 made following any dispersant application field test(s) and/or the EU's recommendation regarding whether full-scale dispersant application(s) should commence with any modification(s) and/or any additional monitoring requirements.
- Chairs the teleconference and: (1) conducts roll call, recording name, title, and affiliation of teleconference participants; (2) requests (from the Requestor) a brief summary/overview of the plan for the proposed full-scale dispersant application (full-scale application); (3) directs questions to the appropriate UC or EU representative(s); (4) requests input from the EPA, DOI, and DOC ARRT representatives and, when appropriate, the SOSC; (5) requests input from appropriate federally-recognized tribes and stakeholders; (6) facilitates development of a consensus recommendation (if possible) by the EPA, DOI, and DOC ARRT representatives and, when appropriate, the SOSC, on the proposed full scale application, including any special considerations, constraints, permit requirements, and/or special authorizations; (7) queries the EPA, DOI, and DOC ARRT representatives and, when appropriate, the SOSC, for their summary input on the proposed full-scale application; and (9) verbally summarizes input received.
- Prepares and provides as soon as possible to the EPA, DOI, and DOC ARRT representatives and, when appropriate, the SOSC, a draft written summary of the teleconference results along with the names, titles, and affiliations of teleconference participants. Incorporates as soon as possible any corrections to the summary provided by the EPA, DOI, and DOC ARRT representatives and, when appropriate, the SOSC, and immediately provides the final summary to the UC with a copy to each teleconference participant.

[3] Atypical use of dispersants is defined to include: (1) full scale dispersant application ongoing for, or expected to exceed or exceeding 96 hours following the dispersant application field test, and/or (2) the use of dispersants subsea; i.e., below the water surface.

Tab 1, Part 1B: Process for Case-by-Case Dispersant Use Authorization, Cont.

14. The FOSC documents any changes to Parts 2-4. In addition, the FOSC, the EPA, DOI and DOC ARRT representatives and, when appropriate, the SOSC complete Part 5 prior to commencing, postponing, or cancelling full-scale dispersant application(s) as determined through the above procedure. Any revisions to Parts 2-5 will be provided to the rest of the UC and individuals identified in Step 2 above.
15. After the response for this incident has been completed, the FOSC will complete a Dispersant Use After-Action Report (as required in Tab 3) for submittal to all signatories in Part 5, all members of the UC, ARRT, , and National Response Team, and other individuals identified in Step 2 above. The report will also be posted on the ARRT public website.

Tab 1, Part 2: Dispersant Use Request

INCIDENT NAME		**Date Prepared:**	
		Time Prepared:	
INCIDENT LOCATION		**REQUESTOR INFORMATION**	
Latitude:		Name:	
Longitude:		Affiliation:	
Description:		Address:	
		Phone:	
		Cell Phone:	
Incident Date:		Fax:	
Incident Time:		Email:	

Areas dispersants to be applied in: ☐ Preauthorization Area ☐ Undesignated Area

BASIC DATA

Type of incident (check one):

- ☐ Grounding
- ☐ Transfer operations
- ☐ Explosion
- ☐ Collision
- ☐ Allision
- ☐ Blowout
- ☐ Other ______________________________

Oil discharged: API:

- ☐ North Slope Crude ____________________
- ☐ Cook Inlet Crude ____________________
- ☐ Residuals ____________________
- ☐ Diesel #2 ____________________
- ☐ JP4 ____________________
- ☐ Other: ____________________

Estimated volume of oil discharged/discharge rate:
____________ gallons; _________ gallons per ______

Potential oil discharge volume estimate:
______________ gallons

Oil discharge status (check one):

- ☐ Continuous
- ☐ Intermittent
- ☐ One time only, now stopped

Current estimate of water surface covered by oil as of:
Date/Time: ___________ Area: __________ sq. mi.

Did source burn?	☐ Yes	☐ No
Is source still burning?	☐ Yes	☐ No
Is oil easily emulsified?	☐ Yes	☐ No

RESPONSE CONSIDERATIONS

Why is mechanical recovery ineffective and/or inadequate?
Is the mechanical recovery insufficient? If so, why?
____
____
____
____

Will *in-situ* burning (ISB) also be used?	☐ Yes	☐ No
Will mechanical recovery also be used?	☐ Yes	☐ No
Will dispersant use impede mechanical recovery?	☐ Yes	☐ No

If yes, explain how this will be resolved:
____
____
____

ADIOS MODEL

Has ADIOS been run by a qualified person? ☐ Yes ☐ No
Identify individual and affiliation: ____________________
If yes, please fill out the following ADIOS input parameters:
Wind speed ___________ Water temp. ___________
ADIOS output parameters to be specified:

- Percentage evaporation
- Viscosity change
- Water percentage or emulsification over a 5-day period

Tab 1, Part 2: Dispersant Use Request, Cont.

WEATHER AND SEA CONDITIONS

Check boxes and enter wind values in the following table:

	Present Condition	12-hour Forecast	24-hour Forecast
Clear			
Partly cloudy			
Overcast			
Rain			
Snow			
Fog			
Wind speed (knots/mph)			
Wind direction (from)			

Visibility (miles): ______________________________

Tidal state at _______________ o'clock (check one):

☐ Slack tide ☐ Incoming (flood) ☐ Outgoing (ebb)

✓ **Attachment 1:** Graph with tidal information for 3 tidal cycles.

Dominant current (net drift):

Speed (knots): __________ Direction (to): ___________

Sea state: present condition (check one)

☐ Calm ☐ Choppy ☐ Swell

Sea state: 24-hour forecast (check one)

☐ Calm ☐ Choppy ☐ Swell

Waves (height estimate), present condition: __________ feet

Waves (height estimate), 24-hr forecast: ____________ feet

Depth of water at slick: ______________________ feet

Water temperature: _________________ degrees C and F

Water salinity: ______________________ parts/thousand

If ice is present, describe: _________________________

____

____

Next sunrise: ____________ Next sunset: _____________

WILDLIFE INFORMATION

Have fish swarms, birds, and/or marine mammals been observed near the oil slick?

☐ Yes ☐ No If yes, please answer the following:

Type observed (e.g., birds, sea otters, seals, whales, fish)	Estimated Number

*(Include in the chart being submitted as **Attachment 2** the proximity of the above observed fish and wildlife)*

DISPERSANT USE PLAN

Proposed date and time for application of dispersants:

Date: _______________ Time: _______________

Distance to nearest staging area (airport/facility):

_____________ mi

What is the dispersant proposed for use?

☐ ____

Material Safety Data Sheet (MSDS) attached? ☐ Yes ☐ No

What is the proposed dispersant to oil ratio? _____:_____

How much total dispersant per acre is proposed?

______________________ gallons

What is the estimated percentage of spill slick area to be treated? ___________________ percent

Who will apply the dispersants?

Individual/Affiliation: ___________________________

Application Method	Estimated Dispersant Capacity Per Sortie	Estimated Number of Sorties
☐ Boat	______________	______________
☐ C-130	______________	______________
☐ CASA	______________	______________
☐ Helicopter	______________	______________
☐ Other:	______________	______________

Distance from source: _____________ miles

Distance from nearest shoreline: _____________ miles

✓ **Attachment 2:** Provide a chart with a distance scale. Chart must include: 1) estimated spill trajectory and landfalls with time; 2) location and distance of proposed dispersant application relative to zone boundaries, proposed dispersant application field test location, and other response activities including ISB; 3) dispersant tactic summary and how it will augment the mechanical response, if used; and 4) fish and wildlife locations relative to the oil slick.

DISPERSANT USE HEALTH AND SAFETY PLAN

Does the site-specific health and safety plan cover the dispersant use plan? ☐ Yes ☐ No

✓ **Attachment 3**: Relevant portion of health and safety plan, including MSDS.

Tab 1, Part 2: Dispersant Use Request, Cont.

DISPERSANT SYSTEM APPLICATION

Application system design:

- Designed specifically for this purpose? ☐ Yes ☐ No
- Used previously for this purpose? ☐ Yes ☐ No
- Tested to be effective and safe? ☐ Yes ☐ No
- Meet manufacturer's recommendations? ☐ Yes ☐ No

Application personnel are trained and/or experienced in the use of dispersants and this application system? ☐ Yes ☐ No

Aerial application system:

- A qualified Dispersant Controller will be in a separate aircraft over the spray area(s)? ☐ Yes ☐ No
- Dispersant Controller will be able to direct operations and avoidance of fish and wildlife? ☐ Yes ☐ No

Boat application system:

- A qualified Dispersant Controller will oversee operations? ☐ Yes ☐ No
- System components meet relevant ASTM standards? ☐ Yes ☐ No

✓ **Attachment 4**: Description of dispersant application system and application team personnel name(s), title(s), affiliation(s), and qualifications.

COMMUNICATIONS PLAN

Describe the communications plan to be used for communications between and among the Unified Command, Dispersant Controller, SMART Team, and dispersant applications platform(s):

DISPERSANT MONITORING

Indicate the SMART monitoring to be used:

- Tier 1: ☐ Yes ☐ No
- Tier 2: ☐ Yes ☐ No
- Tier 3: ☐ Yes ☐ No

Describe other monitoring to be used:

Describe monitoring platform(s) that will be used:

Identify name, title, affiliation, and qualification of each monitoring team member:

SIGNATURES

Requestor:

____

Requester's Printed Name and Signature

Requester contact cell phone: __________________________

Date and time submitted to FOSC and, when appropriate, the SOSC:

________________________ _______________

Date | Time

Received by:

________________________ _______________

FOSC Printed Name and Signature | Date/Time

________________________ _______________

SOSC Printed Name and Signature | Date/Time

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Tab 1, Part 3: Incident-Specific Resources at Risk

A. Information Considered

- ☐ Sensitive Areas information in the subarea contingency plan(s) (SCPs) for this incident, including any locations where dispersant use should be avoided
- ☐ Relevant Geographic Response Strategies in appropriate SCPs for this incident
- ☐ Incident-specific on-scene observations (e.g., by responders, local agency representatives, and local residents); identify name/affiliation: ___________________________________
- ☐ Others: ____

B. Biological Species (may not be a complete list of species present)

	Present/Absent/ or Unknown	Other Relevant Information	Used for Subsistence?
Endangered/Threatened/Candidate Species:			
Migratory birds (specify)			
Sea otters (southwest Distinct Population Segment)			
Polar bears			
Seals (specify)			
Toothed whales (specify)			
Baleen whales (specify)			
Sea Lions			
Other Species:			
Seabirds			
Diving birds (unlisted populations)			
Waterfowl (unlisted populations)			
Shorebirds			
Raptors (unlisted populations)			
Sea Otters (unlisted populations)			
Walruses			
Fur seals			
Other seals (unlisted populations)			
Toothed whales (unlisted populations)			
Baleen whales (unlisted populations)			
Ungulates			
Bears (brown and/or black)			
Furbearers			
Fish:			
Pelagic and larval			
Bottomfish			
Intertidal mollusks			
Crustacea			
Plankton (including larval species)			

Tab 1, Part 3: Incident-Specific Resources at Risk, Cont.

C. Habitat Types

	Present/Absent/Unknown	Other Relevant Information
Salt/brackish-water marshes		
Eelgrass beds/kelp beds		
Tidal mudflats		
Sheltered rocky shores/shallow reefs		
Gravel beaches		
Mixed sand and gravel beaches		
Coarse-grained sand beaches		
Peat shorelines		
Inundated low-lying tundra		
Ice (seasonal, multi-year)		
Marine mammal haul-outs/rookeries		
Migratory bird nesting colonies		
Fish spawning grounds		
Others:		

D. Special Designations

	Present/Absent/Unknown	Other Relevant Information
ESA designated critical habitats		
Essential Fish Habitat		
Legislatively-designated areas		
Native allotments		
Others:		

E. Historic Properties

	Present/Absent/Unknown	Other Relevant Information
Historic Resources		
Archaeological Resources		
Others:		

F. Other Considerations

	Present/Absent/Unknown	Other Relevant Information
Commercial harvest areas		
Subsistence harvest areas		
Recreational use areas		
Mariculture facilities		
Commercial facilities/activities		
Public infrastructure		
Others:		

Tab 1, Part 4: FOSC Dispersant Authorization Checklist*

	YES	NO	CONSIDERATIONS
1.	☐	☐	***Dispersant Use Request Received:*** The Requestor has submitted a completed Dispersant Use Request (Part 2).
 2a. 2b. 2c. 2d. 2e. 2f. 2g.	 ☐ ☐ ☐ ☐ ☐ ☐ ☐	 ☐ ☐ ☐ ☐ ☐ ☐ ☐	***Notifications:*** The following entities have been notified of the potential dispersant use for this incident: a) State On-Scene Coordinator (SOSC) b) U.S. Environmental Protection Agency (EPA) Alaska Regional Response Team (ARRT) representative c) U.S. Department of the Interior (DOI) ARRT representative d) U.S. Department of Commerce (DOC) ARRT representative e) Appropriate federally-recognized tribes (identify representative(s)): ________________________ f) Appropriate stakeholders (e.g., local governments, Native corporations, regional citizens' advisory councils) (identify representative(s)): ____ g) Agreed-upon monitoring team(s) and/or USCG Strike Team/Special Monitoring of Applied Response Technologies (SMART) Team.
3.	☐	☐	***Endangered Species Act (ESA) Consultations:*** The U.S. Fish and Wildlife Service (FWS) and/or National Marine Fisheries Service (NMFS) ESA contact(s) have been notified and, if appropriate, ESA Section 7 consultation(s) have begun in accordance with the ESA Memorandum of Agreement.
4.	☐	☐	***Essential Fish Habitat (EFH) Consultations:*** NMFS EFH contact has been notified and, if appropriate, EFH consultations have begun.
5.	☐	☐	***Dispersability:*** Available technical and scientific information, including results from the ADIOS model, suggests that the discharged oil is dispersible. The analysis delineates the conditions and timeframe in which the oil is no longer dispersable. Identify source(s) relied upon: ______________________________
6.	☐	☐	***NCP Listed Dispersant:*** The dispersant to be used is listed on the current NCP Product Schedule, is considered appropriate for the existing environmental and physical conditions, and its use is consistent with the recommended application information provided in the NCP Product Schedule Technical Notebook. Identify source(s) relied upon: ____
 7a. 7b. 7c. 7d.	 ☐ ☐ ☐ ☐	 ☐ ☐ ☐ ☐	***Response Considerations:*** a) Has mechanical response been deemed to be ineffective and/or inadequate? If yes, specify reason(s) (e.g., availability, effectiveness, timeliness, sea state, spatial coverage, weather conditions): ____ b) Is dispersant application being used to supplement mechanical recovery? c) Is *in-situ* burning being considered in conjunction with mechanical recovery and dispersant use? d) Is a map illustrating timing, tactics, and proximity of each response option to each other attached?
  8a. 8b.	 ☐ ☐	 ☐ ☐	***Dispersant Availability and Timeliness:*** Sufficient dispersant application and monitoring equipment has been confirmed to be available: a) to meet the conditions of use in the Dispersant Use Plan (see Part 2), and b) to be deployable within the conditions and time frame the oil will be dispersible.
9.	☐	☐	***Weather and Sea Conditions:*** Predicted weather and sea conditions are conducive to dispersant application by the chosen system or platform. (Generally, for aerial application, wind ≤ 25 kts (28.77 mph), visibility ≥ 3 nm (3.45 miles), and ceiling ≥1,000 ft. Generally for boat application, a sea state that will allow the vessel to be used to conduct an effective and safe spray operation.) Identify any updated conditions: ____
10.	☐	☐	***Personal Protective Equipment (PPE):*** PPE for all personnel involved in, or affected by, dispersant application conforms to the site-specific health and safety plan and has been confirmed to be available.
    11a. 11b.	 ☐ ☐	 ☐ ☐	***General Adequacy of Dispersant Spray System and Personnel Competency:*** Note: The general criteria for evaluating the suitability for use of any dispersant system is the ability of the Requestor to demonstrate to the satisfaction of the FOSC, the following: Has the application system been: a) Specifically designed for its intended purpose, <u>or</u> b) If not specifically designed for dispersant use, used previously and deemed to be effective and appropriate, and will be used again in a similar manner, <u>or</u>

Tab 1, Part 4: FOSC Dispersant Authorization Checklist, Cont.

	YES	NO	CONSIDERATIONS
11c.	☐	☐	c) If not specifically designed and not previously used for dispersant application, deemed to be effective and appropriate by some other specific means; if so, identify specific means: _________
11d.	☐	☐	d) Is the design and operation of the application system such that it can reasonably be expected to apply the chemical dispersant in a manner consistent with the dispersant manufacturer's recommendation, especially with regards to dosage rates, and concentrations?
11e.	☐	☐	e) Will the dispersant application be supervised by personnel that have experience, knowledge, specific training, and/or recognized competence with chemical dispersants and the type of system to be used?
			Aerial Application Operational and Technical Issues: In the case of aerial application of dispersants:
12a.	☐	☐	a) Is there a Dispersant Controller who will be over the spray area(s) in a separate aircraft from the dispersant aircraft while dispersants are being applied?
12b.	☐	☐	b) Is the Dispersant Controller qualified and able to direct the dispersant aircraft to maintain a 500 meter (1,640 feet) horizontal separation between the dispersant application and swarming fish, rafting flocks of birds, marine mammals in the water, and marine mammal haul-outs?
12c.	☐	☐	c) Is the aircraft spray system capable of producing dispersant droplet sizes that provide for optimal dispersant effectiveness (generally 250-500 µm), by following manufacturer and ASTM guidance?
			Boat Application Operational Technical Issues: If the system involves spray arms or booms that extend over the edge of a boat and has fan type nozzles that spray a fixed pattern of dispersant, has the Requestor confirmed that the dispersant application will comply with all of the following ASTM standards?
13a.	☐	☐	a) **ASTM F 1413-92** *Standard Guide for Oil Spill Dispersant Application Equipment: Boom and Nozzle Systems*
13b.	☐	☐	b) **ASTM F 1460-93** *Standard Practice for Calibrating Oil Spill Dispersant Application Equipment: Boom and Nozzle Systems*
13c.	☐	☐	c) **ASTM F 1737-96** *Standard Guide for Use of Oil Spill Dispersant Application Equipment during Spill Response: Boom and Nozzle Systems*
			Monitoring Protocols/Deployment:
14a.	☐	☐	a) Have the agreed-upon monitoring team(s) and/ or USCG Strike Team SMART Team been activated?
14b.	☐	☐	b) Are they prepared to fly over the response area to conduct Tier 1 visual monitoring during every dispersant application?
14c.	☐	☐	c) Are they prepared to implement the Tier 2 and Tier 3 water column monitoring component of the SMART monitoring protocols for every dispersant application?
14d.	☐	☐	d) Are wildlife observers prepared to accompany Tier 1 monitors to watch for swarming fish, rafting flocks of birds, marine mammals in the water, and marine mammal haul-outs?
14e.	☐	☐	e) Are there additional monitoring requirements? If so, identify: _________________________ and indicate if appropriate entities are prepared to implement any additional requirement?
15.	☐	☐	***Communications:*** Has a communications plan been developed that will allow communications between and among the Unified Command, Dispersant Controller, all monitoring team(s), and dispersant applications platform(s)?
16.	☐	☐	***Natural Resource Trustee Input:*** Has the FOSC received input from natural resource trustees on incident-specific resources at risk (see Part 3)?
			Conditions/Stipulations: Will the following application conditions and stipulations be included in any dispersant application?
17a.	☐	☐	a) All dispersant application field tests will be conducted on a representative portion of the slick.
17b.	☐	☐	b) Dispersant application will be in accordance with the approved dispersant application plan.
17c.	☐	☐	c) Dispersants will only be applied in areas where the water depth is ≥ 10 fathoms (60 feet).
17d.	☐	☐	d) Dispersant applications will maintain a minimum 500 meters (1,640 feet) horizontal separation from swarming fish, rafting flocks of birds, marine mammals in the water, and marine mammal haul-outs.

Tab 1, Part 4: FOSC Dispersant Authorization Checklist, Cont.

	YES	NO	CONSIDERATIONS
17e.	☐	☐	e) Federal Aviation Administration Temporary Flight Restrictions and Notice to Airmen and/or FWS flight and vessel restrictions to avoid disturbing walrus on haul-outs will be followed.
17f.	☐	☐	f) Dispersant applications will only be carried out in daylight conditions.
17g.	☐	☐	g) DOI and/or DOC (or a third party observer acceptable to DOI and/or DOC) will provide a specialist in aerial surveying of marine mammals and/or pelagic birds to accompany the SMART observer.
17h.	☐	☐	h) Monitoring protocols required by EPA, State, and/or DOI and DOC natural resource trustees (e.g., ESA compliance) will occur.
17i.	☐	☐	i) Prolonged dispersant application will be guided by the NRT “Environmental Monitoring for Atypical Dispersant Operations.”
17j.	☐	☐	j) SMART Tier 1, 2, and 3 monitoring will occur during any dispersant application.
18.	☐	☐	***SOSC, EPA, DOI, and DOC Input:*** Has the FOSC received input from the EPA, DOI, and DOC ARRT representatives and, when appropriate, the SOSC on the dispersant request?
19.	☐	☐	***Federally-Recognized Tribe Input:*** Has the FOSC received input from appropriate federally-recognized tribes?
20.	☐	☐	***Stakeholder Input:*** Has the FOSC received input from appropriate stakeholders on the dispersant request?

* If “no” is checked for any of the above questions, the FOSC will document in Tab 1, Part 4, reasons for making that determination and what, if anything, may be done to change the response to “yes.”

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Tab 1, Part 5: Dispersant Use Authorization Document[1]

Incident: ____

U.S. Department of the Interior Consultation by DOI ARRT Representative (for case-by case authorization only):

- ______Does not support the use of dispersants (reasons attached)
- ______Agrees with dispersant use in the selected areas under attached conditions
- ______Agrees with dispersant use as requested in the application form

Signature	Printed Name	Time/Date

U.S. Department of Commerce Consultation by DOC ARRT Representative (for case-by-case authorization only):

- ______Does not support the use of dispersants (reasons attached)
- ______Agrees with dispersant use in the selected areas under attached conditions
- ______Agrees with dispersant use as requested in the application form

Signature	Printed Name	Time/Date

U.S. Environmental Protection Agency Concurrence by EPA ARRT Representative (for case-by-case authorization only):

- ______No dispersants may be applied (reasons attached)
- ______Dispersants may be used in the selected areas under attached conditions
- ______Dispersants may be applied as requested in the application form

Signature	Printed Name	Time/Date

State of Alaska Concurrence by State On-Scene Coordinator (for case-by-case authorization only):

- ______No dispersants may be applied (reasons attached)
- ______Dispersants may be used in the selected areas under attached conditions
- ______Dispersants may be applied as requested in the application form

Signature	Printed Name	Time/Date

Federal On-Scene Coordinator Decision

- ______No dispersants may be applied (reasons attached)
- ______Dispersant use is postponed (reasons attached)
- ______Dispersants may be used in the selected areas under attached conditions
- ______Dispersants may be applied as requested in the application form (reasons attached for the basis of determining that dispersant use would minimize overall environmental impacts)

Signature	Printed Name	Time/Date

[1] This document shall be completed, as appropriate, for both a dispersant application field test and any subsequent request for full-scale application. Where signatures cannot be immediately obtained in person or via email or fax, verbal input will suffice until signatures can be obtained.

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TAB 2. DISPERSANT USE AFTER-ACTION REPORT

A draft dispersant use after-action report shall be prepared within 30 days of completion of the dispersant operation(s) or a timeframe agreed upon by the ARRT. The draft shall be to all signatories in Tab 1, Part 5, for a two-week review and comment period or a timeframe agreed upon by the ARRT. The final report, which shall address all comments received by the signatories, shall be submitted to all signatories in addition to UC, ARRT, and National Response Team members and all individuals identified in Step 2 of Tab 1, Part 1A and/or Part 1B.

The Dispersant Application After-Action Report shall focus on the following elements of the dispersant application and shall include the elements identified in the Report Outline below:

- An overview of the incident (prepared by the FOSC)
- A description of how the dispersant application(s) were conducted (prepared by the Requestor)
- A description of how Tier 1 monitoring was conducted and the results (prepared by the Tier 1 Monitoring Team)
- A description of how Tier 2 and Tier 3 monitoring was conducted and the results (prepared by the Tier 2 and 3 Monitoring Team)
- Description of how other dispersant monitoring was conducted and the results, if applicable (prepared by the individuals/team conducting the monitoring)
- Description of any adverse environmental effects associated with the dispersant application, such as impacts to fish and/or wildlife (e.g. disturbance, unintentional over-spray)
- Other elements requested by the FOSC or the ARRT

Report Outline

I. Incident Overview
   A. Background information
      1. Cause or potential cause of spill, if known
      2. Type and amount of oil spilled
      3. Location of spill
      4. Movement of oil slick, including any trajectories
      5. Weathering and behavior of oil
      6. Other pertinent information
   B. Response actions taken/effectiveness (e.g., mechanical recovery, protective booming, *in-situ* burning, dispersant use)
   C. Summary of decision-making process resulting in the authorization of a request for the use of dispersants, including the evaluation of whether the selected dispersant would work effectively on the oil discharged, if the dispersant could be effectively applied to the oil, and trade-offs associated with the potential impacts of dispersants, dispersed oil, and non-dispersed oil on the environmental and human-use areas, including when compared to other response options.

TAB 2. DISPERSANT USE AFTER-ACTION REPORT, Cont.

Report Outline, Cont.

II. Description and the Dispersant Application
   A. Description of dispersant application (including all dispersant application field test(s))
      1. Type and amount of dispersant applied
      2. Type(s) of aircraft and/or vessel(s) used and dispersant system(s) used
      3. Personnel directly involved in dispersant application (e.g., Dispersant Controller) and summary of their qualifications and experience
      4. Location (shown on a map of appropriate scale), date, time, ratio of dispersant to oil, and total amount of dispersant applied for each dispersant application
      5. Weather conditions at time(s) of each application, including sea state, water temperature, water salinity
      6. Staging area, distance to region of application, and specifics regarding logistics (including time) involved in supporting the dispersant application
      7. Communications used
      8. Interaction between UC and field units carrying out guidance received
      9. Spotter aerial observations
      10. Description of any adverse environmental effects associated with the dispersant application, such as impacts to fish and wildlife (e.g., disturbance, unintentional over-spray)
      11. Health and Safety Plan requirements (including Personal Protective Equipment)
   B. Lessons learned
      1. What worked well
      2. What needed improvement
      3. Recommendations

III. Description and Results of Tier 1 (Visual) Monitoring
   A. How the monitoring was carried out (e.g., method, vehicle, monitors, etc.)
      1. Specifics regarding equipment and suitability of vessel(s) used
      2. Description of observations regarding the dispersal of oil
      3. Communications used and any associated problems
      4. Operational support from the staging area, etc.
      5. Interaction between the Incident Management Team (IMT) and the field units carrying out guidance received from the IMT
   B. Results of Tier 1 monitoring, including a copy of the National Oceanic and Atmospheric Administration (NOAA) Scientific Support Coordinator's (SSC) documentation on monitoring results and the Environmental Unit's (EU) recommendation to the FOSC
   C. Lessons learned
      1. What worked well
      2. What needed improvement
      3. Recommendations

IV. Description and Evaluation of Tier 2 and Tier 3 (Water Column) Monitoring
   A. How the monitoring was carried out (e.g. method, vehicle, monitors, etc.)
      1. Specifics regarding equipment and suitability of the vessel(s) used

TAB 2. DISPERSANT USE AFTER-ACTION REPORT, Cont.

Report Outline, Cont.
2. Description of observations regarding the dispersal of oil 3. Communications used and any associated problems 4. Operational support from the staging area, etc. 5. Interaction between the IMT and the field units carrying out guidance received from the IMT B. Results of Tier 2 and Tier 3 monitoring, including a copy of the NOAA SSC's documentation on monitoring results and the EU's recommendation to the FOSC C. Lessons learned 1. What worked well 2. What needed improvement 3. Recommendations V. Description and Evaluation of Additional Monitoring, if conducted A. How the monitoring was carried out (e.g. method, vehicle, monitors, etc.) 1. Specifics regarding equipment and suitability of the aircraft/vessel(s) used 2. Description of observations 3. Communications used and any associated problems 4. Operational support from the staging area, etc. 5. Interaction between the IMT and the field units carrying out guidance received from the IMT B. Results of monitoring C. Lessons learned 1. What worked well 2. What needed improvement 3. Recommendations VI. Additional Elements (as requested by the FOSC or ARRT) Appendix [*This will include completed copies of Tab 1, Parts 2, 3, 4, and 5*]

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TAB 3. MONITORING PROTOCOLS

Part 1: Special Monitoring of Applied Response Technologies (SMART)

SPECIAL
MONITORING of
APPLIED
RESPONSE
TECHNOLOGIES

Developed by:

U.S. Coast Guard
National Oceanic and Atmospheric Administration
U.S. Environmental Protection Agency
Centers for Disease Control and Prevention
Minerals Management Service

Smoke rising from the *New Carissa*, February 1999. Photo by USCG

v. 8/2006

SMART is a living document

SMART is a living document. We expect that changing technologies, accumulated experience, and operational improvements will bring about changes to the SMART program and to the document. We would welcome any comment or suggestion you may have to improve the SMART program.

Please send your comments to:

SMART Mail
NOAA OR&R
7600 Sand Point Way N.E.
Seattle, WA 98115
USA

Fax: (206) 526-6329

Or email to:
smart.mail@noaa.gov

SMART approval status

As of January, 2001 EPA Regions II, III, and VI adopted SMART. It was reviewed and approved by the National Response Team (NRT).

Acknowledgments

Gracious thanks are extended to the members of the SMART workgroup for their tireless efforts to generate this document, to the many reviewers who provided insightful comments, and to the NOAA OR&R Technical Information Group for assistance in editorial and graphic design.

SMART is a Guidance Document Only

Purpose and Use of this Guidance:
This manual and any internal procedures adopted for its implementation are intended solely as guidance. They do not constitute rulemaking by any agency and may not be relied upon to create right or benefit, substantive or procedural, enforceable by law or in equity, by any person. Any agency or person may take action at variance with this manual or its internal implementing procedures. Mention of trade names or commercial products does not constitute endorsement or recommendation for their use by the USCG, NOAA, EPA, CDC, or the Government of the United States of America.

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v. 8/2006

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INTRODUCTION

The need for protocols to monitor response technologies during oil spills has been recognized since the early 1980s. Technological advances in dispersant applications and in situ burning (referred to as *applied response technologies*) have resulted in their increased acceptance in most regions in the U.S. Many regions have set up pre-approval zones for dispersant and in-situ burn operations, and established pre-approval conditions, including the requirement for monitoring protocols. This reaffirms the need for having national protocols to standardize monitoring, especially when the Federal Government assumes full responsibility for the response under the National Oil and Hazardous Substances Pollution Contingency Plan (Title 40 CFR Part 300). Protocols are also needed to serve as guidelines for assisting or overseeing industry's monitoring efforts during spills.

In November 1997, a workgroup consisting of Federal oil spill scientists and responders from the U.S. Coast Guard, the National Oceanic and Atmospheric Administration, the U.S. Environmental Protection Agency, and the Centers for Disease Control and Prevention, convened in Mobile, Alabama to draft guidelines for generating this protocol. The workgroup built upon currently available programs and procedures, mainly the Special Response Operations Monitoring Program (SROMP), developed in 1994, and lessons learned during spill responses and drills. The result of this collaboration is the Special Monitoring of Applied Response Technologies (SMART) program.

SMART establishes a monitoring system for rapid collection and reporting of real-time, scientifically based information, in order to assist the Unified Command with decision-making during in situ burning or dispersant operations. SMART recommends monitoring methods, equipment, personnel training, and command and control procedures that strike a balance between the operational demand for rapid response and the Unified Command's need for feedback from the field in order to make informed decisions.

SMART is not limited to oil spills. It can be adapted to hazardous substance responses where particulate air emissions should be monitored, and to hydrocarbon-based chemical spills into fresh or marine water.

General Information on SMART Modules

A. General Considerations and Assumptions

Several considerations guided the workgroup in developing the SMART guidelines:

1. SMART is designed for use at oil spills both inland and in coastal zones, as described in the National Oil and Hazardous Substances Pollution Contingency Plan.

2. SMART does not directly address the health and safety of spill responders or monitoring personnel, since this is covered by the general site safety plan for the incident (as required by 29 CFR 1910.120).

3. SMART does not provide complete training on monitoring for a specific technology. Rather, the program assumes that monitoring personnel are fully trained and qualified to use the equipment and techniques mentioned and to follow the SMART guidelines.

4. SMART attempts to balance feasible and operationally efficient monitoring with solid scientific principles.

5. In general, SMART guidelines are based on the roles and capabilities of available federal, state, and local teams, and NOAA's Scientific Support Coordinators (SSC). The SSC most

often fills the role of Technical Specialist, mentioned throughout the document. Users may adopt and modify the modules to address specific needs.

6. SMART uses the best available technology that is operationally practical. The SMART modules represent a living document and will be revised and improved based on lessons learned from the field, advances in technology, and developments in techniques.

7. SMART **should not** be construed as a regulatory requirement. It is an option available for the Unified Command to assist in decision-making. While every effort should be made to implement SMART or parts of it in a timely manner, **in situ burning or dispersant application should not be delayed** to allow the deployment of the SMART teams.

8. SMART is not intended to supplant private efforts in monitoring response technologies, but is written for adoption and adaptation by any private or public agency. Furthermore, users may choose to tailor the modules to specific regional needs. While currently addressing monitoring for in-situ burning and dispersant operations, SMART will be expanded to include monitoring guidelines for other response technologies.

9. It is important that the Unified Command agree on the monitoring objectives and goals early on in an incident. This decision, like all others, should be documented.

B. Organization

The SMART document is arranged in modules. Each module is self-sustaining and addresses monitoring of a single response technology. The modules are divided into three sections:

Section 1: Background Information provides a brief overview of the response technology being used, defines the primary purpose for monitoring, and discusses monitoring assumptions.

Section 2: Monitoring Procedures provide general guidelines on what, where, when, and how to monitor; information on organization; information flow; team members; and reporting of data.

Section 3: Attachments provide detailed information to support and expand sections 1 and 2.

MONITORING DISPERSANT OPERATIONS

1. BACKGROUND

1.1 Mission Statement

To provide a monitoring protocol for rapid collection of real-time, scientifically based information, to assist the Unified Command with decision-making during dispersant applications.

1.2 Overview of Dispersants

Chemical dispersants combine with oil and break a surface slick into small droplets that are mixed into the water column by wind, waves, and currents. The key components of a chemical dispersant are one or more surface-active agents, or surfactants. The surfactants reduce the oil-water interfacial tension, thus requiring only a small amount of mixing energy to increase the surface area and break the slick into droplets.

Several actions must occur for a surface oil slick to be chemically dispersed:

- The surfactant must be applied to the oil in an appropriate ratio;
- The surfactant must mix with the oil or move to the oil/water interface;
- The molecules must orient properly to reduce interfacial tension;
- Energy (such as waves) must be applied to form oil droplets; and
- The droplets must not recoalesce significantly.

Dispersants can be applied by air from airplanes and helicopters, by land using pumping/spray systems, or by boat. They are usually applied in small droplets and in lower volumes than the oil being treated.

1.3 Monitoring Dispersant Application

When dispersants are used during spill response, the Unified Command needs to know whether the operation is effective in dispersing the oil. The SMART dispersant monitoring module is designed to provide the Unified Command with real-time feedback on the efficacy of dispersant application. Data collected in Tier III of the SMART dispersant protocol may be useful for evaluating the dilution and transport of the dispersed oil. **SMART does not monitor the fate, effects, or impacts of dispersed oil.**

Dispersant operations and the need to monitor them vary greatly. Therefore, SMART recommends three levels (or tiers) of monitoring.

1. Tier I employs the simplest operation, visual monitoring, which may be coupled with Infra Red Thermal Imaging or other remote detection methods.

2. Tier II combines visual monitoring with on-water teams conducting real-time water column monitoring at a single depth, with water-sample collection for later analysis. **While fluorometry remains the most technologically advantageous detection method, other approaches may be considered. The performance-based guidelines provided in attachment 10 define SMART Dispersant Module Criteria for instrument selection and validation**

3. Tier III expands on-water monitoring to meet the information needs of the Unified Command. It may include monitoring at multiple depths, the use of a portable water laboratory, and/or additional water sampling. Tier III monitoring might for example include the redeployment of the monitoring team to a sensitive resource (such as near a coral reef system) as either a protection strategy or to monitor for evidence of exposure. In addition, Tier III might include the use of the monitoring

package for activities unrelated to actual dispersant operations such as monitoring of natural dispersion or to support surface washing activities where water column concerns have been identified. Any Tier III operation will be conducted with additional scientific input from the Unified Command to determine both feasibility and help direct field activities. The Scientific Support Coordinator or other Technical Specialists would assist the SMART Monitoring Team in achieving such alternative monitoring goals.

2. MONITORING PROCEDURES

2.1 Tier I: Visual Observations

Tier I recommends visual observation by a trained observer. A trained observer, using visual aids, can provide a general, qualitative assessment of dispersant effectiveness. Use of guides such as the NOAA *Dispersant Application Observer Job Aid* is recommended for consistency. Observations should be photographed and videotaped to help communicate them to the Unified Command, and to better document the data for future use.

When available, visual monitoring may be enhanced by advanced sensing instruments such as infrared thermal imaging. These and other devices can provide a higher degree of sensitivity in determining dispersant effectiveness.

Visual monitoring is relatively simple and readily done. However, visual observations do not always provide confirmation that the oil is dispersed. Tier II provides a near real-time method using water column monitoring via a direct reading instrument and water sampling.

2.2 Tier II: On-Water Monitoring for Efficacy

Sometimes dispersant operations effectiveness is difficult to determine by visual observation alone. To confirm the visual observations, a monitoring team may be deployed to the dispersant application area to confirm the visual observations by using real-time monitoring and water sampling. SMART defines it as Tier II monitoring.

Tier II prescribes single depth monitoring at 1-meter but rough field conditions may force continuous flow monitoring at increased depths of up to 2 meters. Water sampling may be conducted in concert with in-situ monitoring rather than collecting samples from the flow-through hose. Such a change may reduce direct comparisons between field instrument and laboratory verifications, but the data is still expected to meet mission requirements.

A water-column monitoring team composed of at least one trained technician and a support person is deployed on a suitable platform. Under ideal circumstances, the team collects data in three primary target locations: (1) background water (no oil); (2) oiled surface slicks prior to dispersant application, and (3) post-application, after the oil has been treated with dispersants. Data are collected in real-time by both a built-in data-logging device and by the technician who monitors the readings from the instrument's digital readout and records them in a sampling log. The sampling log not only provides a backup to the data logger, but allows the results to be communicated, near real-time, to the appropriate technical specialist in the Unified Command. Data logged by the instrument are used for documentation and scientific evaluation.

The field team should record the time, instrument readings, and any relevant observations at selected time intervals. Global Positioning System (GPS) instruments are used to ascertain the exact position of each reading.

If feasible, water samples should be collected in bottles to validate and quantify monitoring results. Samples should be collected at the outlet port or discharge side of the monitoring instrument to ensure the integrity of the readings. Exact time and position is noted for each sample taken to correlate the instrument reading. The number of water samples taken reflects the monitoring effort. Generally, five samples collected for each data run is considered adequate in addition to background samples. The water samples are stored in a cooler and sent to a laboratory for future analysis.

2.3 Tier III: Additional Monitoring

Tiers I and II provide feedback to the Unified Command on the effectiveness of dispersant application. If dispersants are effective and additional information on the movement of the dispersed oil plume is desired, SMART Tier III procedures can address this need.

Tier III follows Tier II procedures, but collects information on the transport and dispersion of the oil in the water column. It helps to verify that the dispersed oil is diluting toward background levels. Tier III is simply an expanded monitoring role that is intended to meet the needs of the Unified Command.

Tier III monitoring may be conducted as follows:

1. Multiple depths with one instrument: This monitoring technique provides a cross-section of relative concentrations of dispersed oil at different depths, measuring the dilution of dispersed oil down to background levels. When transecting the dispersant-treated slick (as outlined for Tier II) the team stops the vessel at location(s) where elevated readings are detected at 1 meter and, while holding position, the team monitors and collects samples at multiple increments down to a maximum depth of 10 meters. Readings are taken at each water depth, and the data recorded both automatically in the instrument data logger and manually by the monitors. Manual readings should be taken at discreet time intervals of 2 minutes, 5 minutes, etc. as specified by the Monitoring Group Supervisor or as indicated in a written sampling plan developed by the Dispersant Technical Specialist.

2. Transect at two different depths: This technique also looks at changes in concentration trends, but uses two monitoring instruments at different depths as the monitoring vessel transects the dispersed oil slick while making continuous observations. It is done as follows:

   Monitoring is conducted at two different depths, 1 and 5 meters, or any two water depths agreed upon by the Incident Commander or the Unified Command. Two sampling setups and two separate monitoring instruments are used on a single vessel. The vessel transects the dispersant-treated slick as outlined in Tier II, except that now data are collected simultaneously for two water depths. While the data logger in each instrument automatically records the data separately, the monitoring team manually records the data from both instrument simultaneously at discrete time intervals of 2 minutes, 5 minutes, etc, as specified by the Monitoring Group Supervisor or the sampling plan developed by the Dispersant Technical Specialist. Comparison of the readings at the two water depths may provide information on the dilution trend of the dispersed oil.

3. Water parameters: In addition to instrument data, the Unified Command may request that water physical and chemical parameters be measured. This can be done by using a portable lab connected in-line with the instrument to measure water temperature, conductivity, dissolved oxygen content, pH, and turbidity. These data can help explain the behavior of the dispersed oil. The turbidity data may provide additional information on increased concentrations of dispersed oil if turbidity is elevated. The other physical and chemical parameters measure the characteristics of the water column that could possibly affect the rate of dispersion.

4. As in Tier II, water samples are collected, but in greater numbers to help validate instrument readings.

Calibration and documentation used for Tier II are valid for Tier III as well, including the use of a check standard to verify instrument response. Because of the increased complexity of Tier III, a dispersant technical specialist (e.g., member of the scientific support team) should be on location to assist the monitoring efforts.

A critical point to keep in mind is that in the hectic and rapidly changing conditions of spill response, flexibility and adaptability are essential for success. The sampling plan is dictated by many factors such as the availability of equipment and personnel, on-scene conditions, and the window of opportunity for dispersant application. The need for flexibility in sampling design, effort, and rapid deployment (possibly using a vessel of opportunity), may dictate the nature and extent of the monitoring. To assist the monitoring efforts, it is important that the unified command agrees on the goals and objectives of monitoring and chooses the Tier or combination thereof to meet the needs of the response.

2.4 Mobilizing Monitoring Resources

Dispersant application has a narrow window of opportunity. Time is of the essence and timely notification is critical. It is imperative that the monitoring teams and technical advisors are notified of possible dispersant application and SMART monitoring deployment as soon as they are considered, even if there is uncertainty about carrying out this response option. Prompt notification increases the likelihood of timely and orderly monitoring.

The characteristics of the spill and the use of dispersants determine the extent of the monitoring effort and, consequently, the number of teams needed for monitoring. For small-scale dispersant applications, a single visual monitoring team may suffice. For large dispersant applications several visual and water-column monitoring teams may be needed.

2.5 Using and Interpreting Monitoring Results

Providing the Unified Command with objective information on dispersant efficacy is the goal of Tier I and II dispersant monitoring. When visual observations and on-site water column monitoring confirm that the dispersant operation is not effective, the Unified Command may consider evaluating further use. If, on the other hand, visual observations and/or water column monitoring suggest that the dispersant operation is effective, dispersant use may be continued.

When using fluorometry, the readings will not stay steady at a constant level but will vary widely, reflecting the patchiness and inconsistency of the dispersed oil plume. Persons reviewing the data should look for trends and patterns providing good indications of increased hydrocarbon concentrations above background. As a general guideline only, a fluorometer signal increase in the dispersed oil plume of five times or greater over the difference between the readings at the untreated oil slick and background (no oil) is a strong positive indication. This should not be used as an action level for turning on or off dispersant operations. The final recommendation for turning a dispersant operation on or off is best left to the judgment of the Technical Specialist charged with interpreting the data. The Unified Command, in consultation with the Technical Specialist, should agree early on as to the trend or pattern that they would consider indicative or non-indicative of a successful dispersant operation. This decision should be documented.

2.6 SMART as Part of the ICS Organization

SMART activities are directed by the Operations Section Chief in the Incident Command System (ICS). A "group" should be formed in the Operations Section to direct the monitoring effort. The head of this group is the Monitoring Group Supervisor. Under each group there are teams: Visual

Monitoring Teams and Water Column Monitoring Teams. At a minimum, each monitoring team consists of two trained members: a monitor and an assistant monitor. An additional team member could be used to assist with sampling and recording. The monitor serves as the team leader. The teams report to the Monitoring Group Supervisor, who directs and coordinates team operations, under the control of the Operations Section Chief.

Dispersant monitoring operations are very detailed. They are linked with the dispersant application, but from an ICS management perspective, they should be separated. Resources for monitoring should be dedicated and not perform other operational functions.

2.7 Information Flow and Data Handling

Communication of monitoring results should flow from the field (Monitoring Group Supervisor) to those persons in the Unified Command who can interpret the results and use the data. Typically this falls under the responsibility of a Technical Specialist on dispersants in the Planning Section of the command structure. For the U.S. Coast Guard, the technical specialist is the Scientific Support Coordinator. Note that the operational control of the monitoring groups remains with the Operations Section Chief, but the reporting of information is to the Technical Specialist in the Planning Section.

The observation and monitoring data will flow from the Monitoring Teams to the Monitoring Group Supervisor. The Group Supervisor forwards the data to the Technical Specialist. The Technical Specialist or his/her representative reviews the data and, most importantly, formulates recommendations based on the data. The Technical Specialist communicates these recommendations to the Unified Command.

Quality assurance and control should be applied to the data at all levels. The Technical Specialist in the Planning section is the custodian of the data during the operation. The data belongs to the Unified Command. The Unified Command should ensure that the data are properly stored, archived, and accessible for the benefit of future monitoring operations.

3. ATTACHMENTS

The following attachments are designed to assist response personnel in implementing the SMART protocol. A short description of each attachment is provided below. Attachments may be modified as required to meet the stated objectives. **These attachments are still valid related to the use of the Turner Design AU-10 instrument package. Should monitoring teams choose to change to alternative instrument packages, like protocols would be required to insure proper training, documentation, and QA/QC.**

Number	Title	Description
3.1	Roles and Responsibilities	Detailed roles and responsibilities for responders filling monitoring positions
3.2	Command, Control, and Data Flow	An ICS structure for controlling monitoring units and transferring monitoring results
3.3	Dispersant Observation General Guidelines	General guidelines for Tier I monitoring
3.4	Dispersant Observation Training Outline	Outline of what should be covered for Tier I observation training
3.5	Dispersant Observation Checklist	Equipment and procedure checklist for Tier I monitoring
3.6	Dispersant Observation Pre-Flight List	A checklist for getting air resources coordinated and ready for Tier I monitoring
3.7	Dispersant Observation Reporting Form	A form for recording Tier I observations
3.8	Dispersant Monitoring Training Outline	A training outline for water column monitoring done in Tiers II and III
3.9	Dispersant Monitoring Job Aid Checklist	A list of the tasks to accomplish before, during, and after the monitoring operations
3.10	Dispersant Monitoring Performance Guidelines	A list of performance guidelines for monitoring dispersants
3.11	Dispersant Monitoring Field Guidelines	Field procedures for using Tier II and III monitoring protocols
3.12	Dispersant Monitoring Water Sampling	Procedures for collecting water samples for Tiers II and III
3.13	Dispersant Monitoring Recorder Sheet	A form for recording fluorometer readings for Tiers II and III

3.1 Roles and Responsibilities

3.1.1 Visual Monitoring Team

The Visual Monitoring Team is ideally composed of two persons: a Monitor and an Assistant Monitor.

The Monitor:
- Functions as the team leader
- Qualitatively measures dispersant effectiveness from visual observation
- Communicates results to the Monitoring Group Supervisor.

The Assistant Monitor:
- Provides photo and visual documentation of dispersant effectiveness
- Assists the Monitor as directed.

3.1.2 Water-Column Monitoring Team

The Water-Column Monitoring Team is composed of a minimum of two persons: a Monitor and Assistant Monitor. They shall perform their duties in accordance with the Tier II and Tier III monitoring procedures.

The Monitor:
- Functions as the team leader
- Operates water-column monitoring equipment
- Collects water samples for lab analysis
- Communicates results to the Monitoring Group Supervisor.

The Assistant Monitor:
- Provides photo and visual documentation of dispersant effectiveness
- Assists Monitor as directed
- Completes all logs, forms, and labels for recording water column measurements, water quality measurements, interferences, and environmental parameters.

3.1.3 Monitoring Group Supervisor

The Monitoring Group Supervisor:
- Directs Visual Monitoring and Water Column Monitoring teams to accomplish their responsibilities
- Follows directions provided by the Operations Section in the ICS
- Communicates monitoring results to the Technical Specialist in the Planning Section
- The Monitoring Group Supervisor may not be needed for a Tier I deployment. In these cases, the Visual Monitoring Team monitor may perform the duties of the Monitoring Group Supervisor.

3.1.4 Dispersant Monitoring Technical Specialist (Federal: NOAA SSC)

The Technical Specialist or his/her representative:
- Establishes communication with the Monitoring Group Supervisor
- Advises the Group Supervisor on team placement and data collection procedures
- Receives the data from the Group Supervisor
- Ensures QA/QC of the data, and analyzes the data in the context of other available information and incident-specific conditions
- Formulates recommendations and forwards them to the Unified Command
- Makes the recommendations and data available to other entities in the ICS
- Archives the data for later use, prepares report as needed.

3.2 Command, Control, and Data Flow

In general, dispersant monitoring operations take place as an integral part of the Incident Command System (see Figures 1 and 2).

Dispersant monitoring operations are tactically deployed by the Operations Section Chief or deputy, in cooperation with the Technical Specialist (SSC) in the Planning Section regarding the specifics of the monitoring operations, especially if they affect the data collected. The Monitoring Group Supervisor provides specific on-scene directions to the monitoring teams during field deployment and operations.

The observation and monitoring data flow from the Monitoring Teams to the Monitoring Group Supervisor. After initial QA/QC the Group Supervisor passes the data to the Technical Specialist to review, apply QA/QC if needed, and, most importantly, formulate recommendations based on the data. The Technical Specialist forwards these recommendations to the Unified Command.

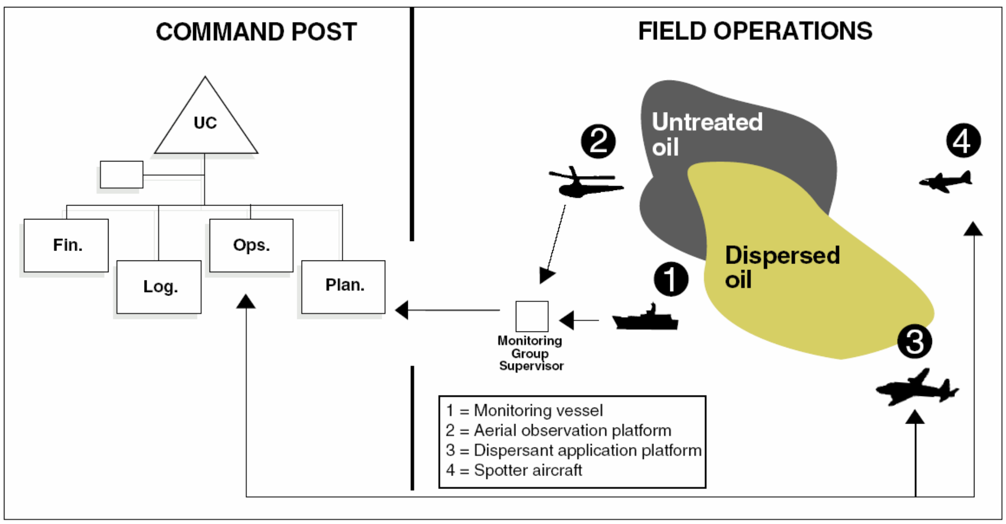

Figure 1. Command, control, and data flow during dispersant monitoring operations.

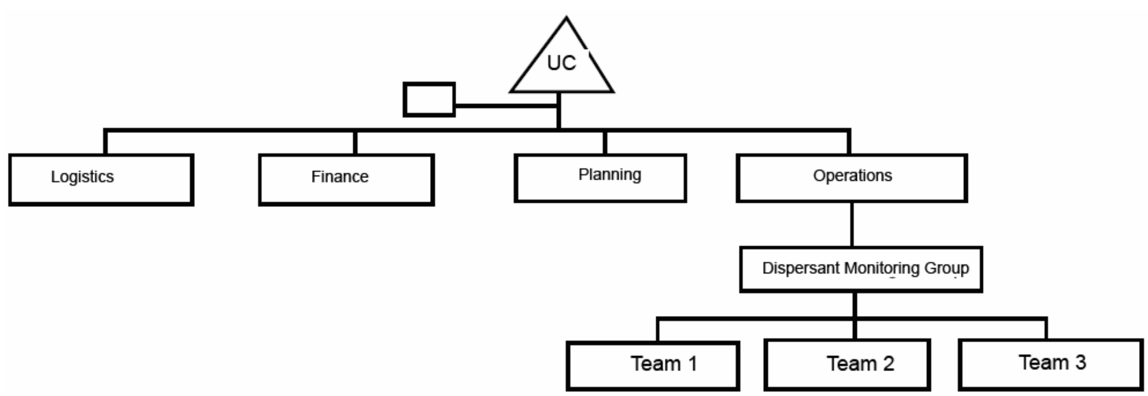

Figure 2. The Dispersant Monitoring Group in the ICS structure.

3.3 Dispersant Observation General Guidelines

3.3.1 Goal

The goal of Tier I monitoring is to identify oil, visually assess efficacy of dispersants applied to oil, and report the observations to the Unified Command with recommendations. The recommendations may be to continue, to modify, or to evaluate further monitoring or use because dispersants were not observed to be effective.

3.3.2 Guidelines and Pointers

3.3.2.1 Reporting Observations

- The observer does not make operational decisions, e.g., how much dispersant to apply, or when and where to apply it. These decisions are made at the Operations Section level, and the observer makes observations based on those decisions.

- Different observers at the same site may reach different conclusions about how much of the slick has been dispersed. For that reason, a comprehensive standard reporting criteria and use of a common set of guidelines is imperative. Use of the NOAA *Dispersant Application Observer Job Aid* is highly encouraged.

3.3.2.2 Oil on the Water

- Oil surface slicks and plumes can appear different for many reasons including oil or product characteristics, time of day (different sun angles), weather, sea state, rate at which oil disperses. The use of the NOAA *Open Water Oil Identification Job Aid for Aerial Observation* is highly recommended.

- Low-contrast conditions (e.g., overcast, twilight, and haze) make observations difficult.

- For best viewing, the sun should be behind the observer and with the aircraft at an altitude of about 200 - 300 feet flying at a 30-degree angle to the slick.

3.3.2.3 Dispersant Applications

- During dispersant application, it may be impossible to determine the actual area of thickest oil concentrations, resulting in variable oil/dispersant application rates. This could lead to variations in the effectiveness of application. The observer should report these conditions.

- Initial applications may have a herding effect on the oil. This would cause the slick to appear to be shrinking when, in fact, it is the dispersant “pushing” the oil together. Due to this effect, in some cases, the oil slick may even disappear from the sea surface for a short time.

- After dispersant application, there may be color changes in the emulsified slick due to reduction in water content and viscosity, and changes in the shape of the slick, due to the de-emulsification action of the dispersant.

- Many trials have indicated that dispersants apparently modify the spreading rates of oils, and within a few hours treated slicks cover much larger areas than control slicks.

- In some situations, especially where there may be insufficient mixing energy, oil may resurface.

3.3.2.4 Effective/Ineffective Applications

- Dispersed oil plume formation may not be instantaneous after dispersant application. In some cases, such as when the oil is emulsified, it can take several hours. A dispersed oil plume may not form at all.
- The appearance of the dispersed plume can range from brown to white (cloudy) to no visible underwater plume (this is why Tier II may be necessary).
- Sometimes other things such as suspended solids may resemble dispersed oil.
- The visibility of the dispersed plume will vary according to water clarity. In some cases, remaining surface oil and sheen may mask oil dispersing under the slick and thus interfere with observations of the dispersed oil plume.
- Dispersed oil plumes are often highly irregular in shape and non-uniform in concentration. This may lead to errors in estimating dispersant efficiency.
- If a visible cloud in the water column is observed, the dispersant is working. If a visible cloud in the water column is not observed, it is difficult to determine whether the dispersant is working.
- If there are differences in the appearance between the treated slick and an untreated slick, the dispersant may be working.
- Boat wakes through oil may appear as a successful dispersion of oil; however, this may be just the vessel wake breaking a path through the oil (physically parting the oil), not dispersing it.

3.4 Dispersant Observation Training Outline

Below is a suggested outline for dispersant observation training.

Topics and sub-topics	Duration
Observation Platforms	30 min.
• Helo or fixed-wing, separate from application platform • Safety considerations: daylight; safe flying conditions • Logistical considerations: personnel; equipment; communication • Planning an over-flight	
Oil on water	1 hour
• Physical properties • Different types of oil • Chemistry, crude vs. refined product • Appearance and behavior • Effects of wind, waves, and weather	
How dispersants work	45 min.
• Method of action • Compatible/incompatible products • Appropriate environmental conditions (wave energy, temperature, salinity, etc.) • Oil weathering • Oil slick thickness • Beaching, sinking, etc.	
Dispersant application systems	45 min.
• Platform: boat, helo, plan • Encounter rate • Importance of droplet size • Dispersant-to-oil ratio (dosage)	
• Effective application	45 min.
• Hitting the target • Dispersal into water column • Color changes • Herding effect	
• Ineffective application	30 min.
• Missing the target • Oil remaining on surface • Coalescence and resurfacing	
• Wildlife concerns	30 min.
• Identifying marine mammals and turtles • Rafting birds	
• Documenting observations	30 min.
• Estimating surface coverage • Photographs: sun reflection effects, use of polarizing filter, videotaping • Written notes and sketches	
• Reporting observations	30 min.
• Calibrating eyeballs • Recommended format • Information to include • Who to report to • Coordination with water-column monitoring	

3.5 Dispersant Observation Checklist

Below is a dispersant observation checklist. Check √ the items/tasks accomplished.

Check √	Item
	Observation Aids
	Base maps / charts of the area
	Clipboard and notebook
	Pens / pencils
	Checklists and reporting forms
	Handheld GPS with extra set of batteries
	Observation job aids (*Oil on Water & Dispersant Observation*)
	Still camera
	Extra film
	Video camera
	Binoculars
	Safety Equipment
	Personal flotation device
	Emergency locator beacon
	Survival equipment
	NOMEX coveralls (if available)
	Coldwater flotation suit (if water temperature requires)
	Intercom
	Direct communications back to the Incident Command Post
	Safety Brief
	Preflight safety brief with pilot
	Safety features of aircraft (fire extinguishers, communications devices, emergency locator beacon, flotation release, raft, first aid kit, etc.)
	Emergency exit procedures
	Purpose of mission
	Area orientation / copy of previous over-flight
	Route / flight plan
	Duration of flight
	Preferred altitude
	Landing sites
	Number of people on mission
	Estimated weight of people and gear
	Gear deployment (if needed, i.e., dye marker, current drogue)
	Frequency to communicate back to command post

3.6 Dispersant Observation Pre-Flight List

Spill Information	
Incident Name:	
Source Name:	
Date / Time Spill Occurred	
Location of Spill: Latitude	Longitude
Type of Oil Spilled:	Amount of Oil Spilled:

Weather On Scene	
Wind Speed and Direction	
Visibility:	Ceiling:
Precipitation:	Sea State:

Aircraft Assignments

Title	**Name**	**Call Sign**	**ETD**	**ETA**
Spotter (s)				
Sprayer (s)				
Observer (s)				
Monitor (s)				
Supervisor				

Safety Check

Check all safety equipment. Pilot conducts safety brief

Entry/Exit Points

	Airport	**Tactical Call Sign**
Entry:		
Exit:		

Communications (complete only as needed; primary/secondary)

Observer to Spotter (air to air)	VHF	UHF	Other
Observer to Monitor (air to vessel)	VHF	UHF	Other
Observer to Supervisor (air to ground)	VHF	UHF	Other
Supervisor to Monitor (ground to vessel)	VHF	UHF	Other
Monitor to Monitor (vessel to vessel)	VHF	UHF	Other

3.7 Dispersant Observation Reporting Form

Names of observers/Agency: ____

Phone/pager: ___________________ Platform: _____________________

Date of application: __________ Location: Lat.: _________ Long.: _________

Distance from shore: ________________

Time dispersant application started: _________ Completed: _____________

Air temperature: ______ Wind direction ________ Wind speed: _________

Water temperature: _____ Water depth: ______ Sea state: __________

Visibility: _____________________

Altitude (observation and application platforms): ______________________

Type of application method (aerial/vessel): __________________________

Type of oil: ________________________________

Oil properties: specific gravity ______ viscosity _______ pour point _________

Name of dispersant: ____

Surface area of slick: ____

Operational constraints imposed by agencies: ____________________________

Percent slick treated: _____ Estimated efficacy: _______________________

Visual appearance of application: _____________________________________

Submerged cloud observed?____

Recoalescence (reappearance of oil): ___________________________________

Efficacy of application in achieving goal (reduce shoreline impact, etc.): __________

____

Presence of wildlife (any observed effects, e.g., fish kill): ___________________

Photographic documentation: ____

Lessons learned: ____

____

3.8 Fluorometry Monitoring Training Outline

3.8.1 General[1]

Training for Tier II and III monitoring consists of an initial training for personnel involved in monitoring operations, Group Supervisor training, and refresher training sessions every six months. Emphasis is placed on field exercise and practice.

3.8.2 Basic Training

Monitor Level Training includes monitoring concepts, instrument operation, workprocedures, and a field exercise.

Topic	Duration
Brief overview of dispersant monitoring. Review of SMART: What is it, why do it, what is it good for.	1 hour
Monitoring strategy: who, where, when. Reporting	1 hour
Basic instrument operation (hands-on): how the fluorometer works, how to operate: brief description of mechanism, setup and calibration, reading the data, what the data mean, troubleshooting; using Global Positioning Systems; downloading data; taking water samples	3 hours
Field exercise: Set up instruments within available boat platforms, measure background water readings at various locations. Using fluoroscein dye or other specified fluorescent source monitor for levels above background. Practice recording, reporting, and downloading data.	3-4 hours

3.8.3 Group Supervisor Training

Group Supervisor training may include:
- Independent training with the monitoring teams; or
- An additional structured day of training as suggested below

Topic	Duration
Review of ICS and role of monitoring group in it, roles of Monitoring Group Supervisor, what the data mean, QA/QC of data, command and control of teams, communication, and reporting the data.	1 hour
Field exercise. Practice deploying instruments in the field with emphasis on reporting, QA/QC of data, communication between teams and the Group Supervisor, and communication with the Technical Specialist.	3-6 hours
Back to the base, practice downloading the data.	30 min.
Lessons learned.	30 min.

[1] This training is designed for fluorometers. Other instruments could provide valid results, and may be suitable for SMART operations.

3.8.4 Refresher Training

Topic	Duration
Review of SMART: What is it, why do it, what is its purpose.	15 min.
Monitoring and reporting: Who, where, and when; level of concern; what the data mean; communication; and reporting the data	30-45 min.
Basic instrument operation (hands-on): how the fluorometer works and how to operate it; brief description of the mechanism, setup, calibration, reading data, and troubleshooting; using GPS.	2 hours
Downloading data	30 min.
Field exercise: Outside the classroom, set up instrument on a platform, and measure background readings. Using fluorescence or other common input sources, monitor fluorescence levels. Practice recording, reporting, and downloading data.	1-3 hours
Lessons learned	30–45 min.

3.9 Dispersant Monitoring Job Aid Checklist

This checklist is designed to assist SMART dispersant monitoring by listing some of the tasks to accomplish before, during, and after the monitoring operations.

Check √	Item	Do
	Preparations	
	Activate personnel	• Contact and mobilize the monitoring teams and Technical Specialist (SSC where applicable)
	Check equipment	• Check equipment (use checklists provided) • Verify that the fluorometer is operational • Include safety equipment
	Obtain deployment platforms	Coordinate with incident Operations and Planning Section regarding deployment platforms (air, sea, land)
	Amend site safety plan	Amend the general site safety plan for monitoring operations.
	Monitoring Operations	
	Coordinate plan	• Coordinate with the Operations Section Chief • Coordinate with Technical Specialist
	Conduct briefing	• Monitoring: what, where, who, how • Safety and emergency procedures
	Deploy to location	Coordinate with Operations Section.
	Setup instrumentation	• Unpack and set up the fluorometer per user manual • Record fluorometer response using the check standards
	Evaluate monitoring site	• Verify that the site is safe • Coordinate with spotter aircraft (if available)
	Conduct monitoring (See attachment 11 for details)	• Background, no oil present • Background, not treated with dispersants • Treated area
	Conduct data logging (see attachment 12)	• Date and time • Location (from GPS) • Verify that the instrument data logger is recording the data • Manually record fluorometer readings every five minutes • Record relevant observations
	Conduct water sampling (see attachment)	• Collect water samples post-fluorometer in certified, clean, amber bottles for lab analysis
	Conduct photo and video documentation	• Document relevant images (e.g., monitoring procedures, slick appearance, evidence of dispersed oil)
	Conduct quality assurance and control	• Instrument response acceptable? • Check standards current? • Control sampling done at oil-free and at untreated locations? • Water samples in bottles taken for lab analysis? • Date and time corrected and verified? • Any interfering factors?

	Report (by Teams)	Report to Group Supervisor: • General observation (e.g., dispersed oil visually apparent) • Background readings • Untreated oil readings • Treated oil readings
	Report (by Group Supervisor)	Report to Technical Specialist: • General observation • Background readings • Untreated oil readings • Treated oil readings
	Report by Technical Specialist (SSC)	Report to Unified Command: • Dispersant effectiveness • Recommendation to continue or re-evaluate use of dispersant.
	Post monitoring	
	Conduct debrief	• What went right, what can be done better • Problems and possible solutions • Capture comments and suggestions
	Preserve data	• Send water samples to the lab • Download logged data from fluorometer to computer • Collect and review Recorder data logs • Correlate water samples to fluorometer readings • Generate report
	Prepare for next spill	Clean, recharge, restock equipment

3.10 Dispersant Monitoring Performance Guidelines

SMART does not require nor endorse a specific instrument or brand for dispersant monitoring. Rather, SMART specifies performance criteria, and instruments meeting them may be used for monitoring.

1) Instrument package must be field rugged and portable. Instrument package must be able to operate from a vessel or small boat under a variety of field conditions, including air temperatures between 5 and 35°C, water temperatures between 5 and 30°C, seas to 5 feet, humidity up to 100%, drenching rain, and even drenching sea spray. The criteria for field deployment should be limited by the safety of the field monitoring team and not instrument package limitations.
2) Instrument package must be able to operate continuously in real-time or near-real time mode by analyzing seawater either in-situ (instrument package is actually deployed in the sea) or ex-situ (seawater is continuously pumped from a desired depth).
3) Monitoring depth must be controllable to between 1 meter and 3 meters. Discrete water sampling for post-incident laboratory validation is required at the same depths as actual instrument monitoring. Note, actual analysis of water samples collected may or may not be required by the FOSC.
4) Instrument must be able to detect dispersed crude oil in seawater. To allow a wide range of instruments to be considered, no specific detection method is specified. If fluorometry is used, the excitation and emission wavelengths monitored should be selected to enhance detection of crude oil rather than simply hydrocarbons, in order to reduce matrix effects (for the Turner AU-10, long wavelength kits developed for oil detection are preferred over the short wavelength kits developed by the manufacture for other applications).
5) Instrument must be able to provide a digital readout of measured values. Given that different oils that have undergone partial degradation due to oil weathering will not provide consistent or accurate concentration data, measured values reported as "raw" units are preferred for field operations over concentration estimations that might be misleading as to the true dispersed oil and water concentrations.
6) In additional to a digital readout (as defined above), the instrument must be able to digitally log field data for post-incident analysis. Data logging must be in real-time, but downloading of achieved data is not required until after the monitoring activity, i.e., downloading the raw data to a computer once the boat has returned from the field operation is acceptable.
7) For instrument validation prior to operational use, the instrument must have a minimum detection limit (MDL) of 1 ppm of dispersed fresh crude oil in artificial seawater and provide a linear detection to at least 100 ppm with an error of less than 30% compared to a known standard. The preferred calibration oil is Alaskan North Slope Crude or South Louisiana Crude (the oils specified by the EPA's Dispersant Effectiveness). Similar dispersible crude oils may be used if availability is a limitation (diesel fuel is not a suitable substitute). Some method of instrument calibration or validation is required on-scene prior to any operational monitoring for Quality Assurance/Quality Control (QA/QC). In the past, the use of a fluorescent dye at a concentration that would provide an equivalent value of 18 ppm for fresh ANS Crude was used for both calibration and field validation.

3.11 Dispersant Monitoring Field Guidelines

3.11.1 Overview

Dispersant monitoring with fluorometers employs a continuous flow fluorometer at adjustable water depths. Using a portable outrigger, the sampling hose is deployed off the side of the boat and rigged so that the motion of the boat's propeller or the wake of the sampling boat does not disrupt the sampling line. The fluorometer is calibrated with a check standard immediately prior to use in accordance with the operator's manual. In addition, water samples are collected for confirmation by conventional laboratory analysis.

3.11.2 Tier II Monitoring Operations

3.11.2.1 Monitoring Procedures

Monitoring the water column for dispersant efficacy includes three parts:
1. Water sampling for background reading, away from the oil slick;
2. Sampling for naturally dispersed oil, under the oil slick but before dispersants are applied; and
3. Monitoring for dispersed oil under the slick area treated with dispersants.

3.11.2.2 Background sampling, no oil

En route to the sampling area and close to it, the sampling boat performs a monitoring run where there is no surface slick. This sampling run at 1-meter depth (or deeper depending on sea state conditions) will establish background levels before further sampling.

3.11.2.3 Background sampling, naturally dispersed oil

When reaching the sampling area, the sampling boat makes the sampling transects at 1-meter depths across the surface oil slick(s) to determine the level of natural dispersion before monitoring the chemical dispersion of the oil slick(s).

3.11.2.4 Monitoring of dispersed oil

After establishing background levels outside the treated area, the sampling boat intercepts the dispersed subsurface plume. The sampling boat may have to temporarily suspend continuous sampling after collecting baseline values in order to move fast enough to intercept the plume. The sampling boat moves across the path of the dispersed oil plume to a point where the center of the dispersed plume can be predicted based on the size of the treatment area and the locations of new coordinates. The sampling boat may have to be directed by an aerial asset to ensure correct positioning over the dispersed slick.

When conducting the monitoring, the transects consist of one or more "legs," each leg being as close as possible to a constant course and speed. The recommended speed is 1-2 knots. The monitoring team records the vessel position at the beginning and end of each leg.

The instrument data may be reviewed in real time to assess the relative enhanced dispersion of the water-soluble fraction of the oil. Figure 1 shows an example of how the continuous flow data may be presented.

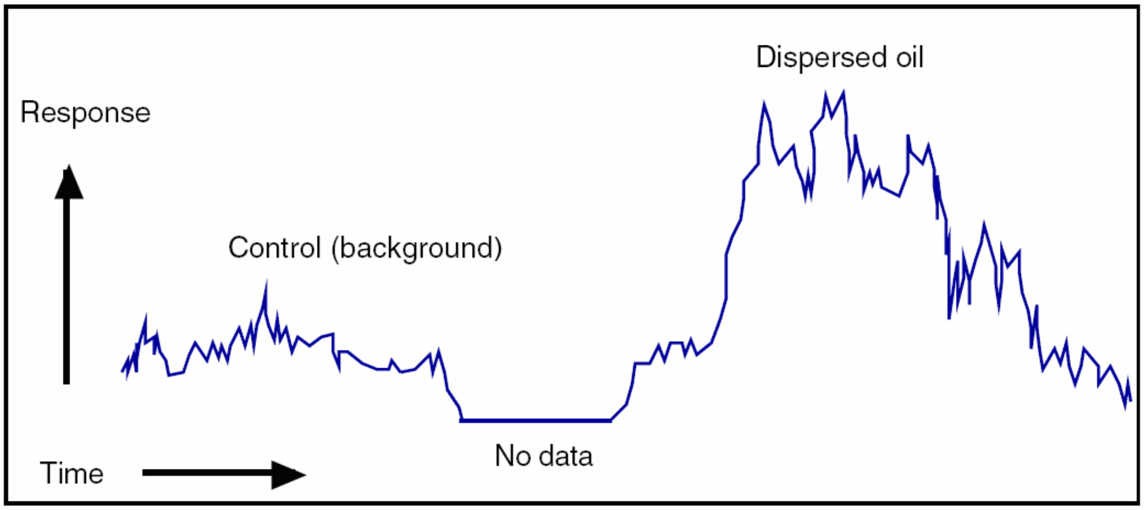

Figure 1. Example of a graphical presentation of fluorometer data.

3.11.3 Tier II Monitoring Locations: The Box Coordinates Method

The observation aircraft identifies the target slick or target zone for the sampling vessel by a four-corner box (Figure 2). Each corner of the box is a specific latitude/longitude, and the target zone is plotted on a chart or map for easy reference. The sampling vessel positions near the slick and configures the fluorometer sampling array. The pre-application sampling transect crosses the narrow width of the box. After completing the sampling transect, the sampling vessel waits at a safe distance during dispersant application. Data logging may continue during this period. Fifteen to twenty minutes after dispersants have been applied, the observation aircraft generates a second box by providing the latitude and longitude coordinates of the four corners corresponding to any observed dispersed oil plume. The post-application transect is identical to the pre-application transect. If no plume is observed, the sampling vessel samples the same transect used for pre-application.

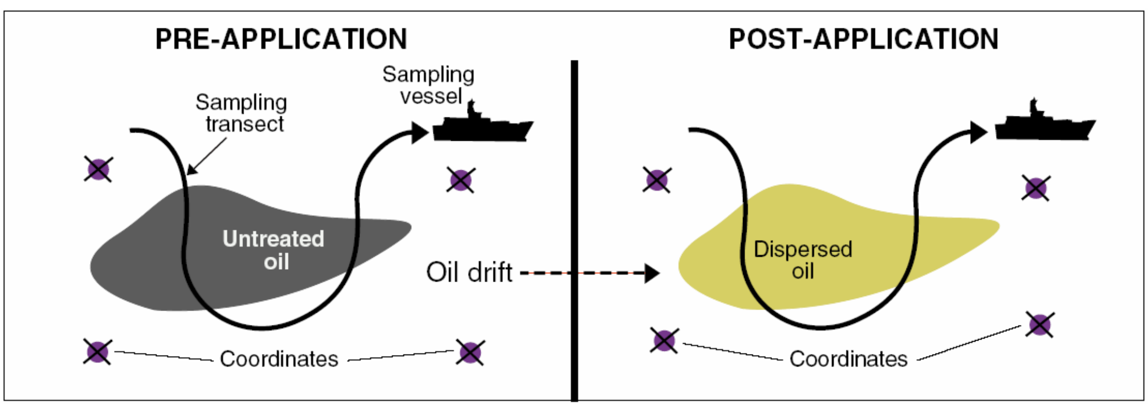

Figure 2. The box coordinates Method.

3.11.4 Tier III Monitoring Operations

If monitoring indicates that dispersant application is effective, the Unified Command may request that additional monitoring be done to collect information on the transport and dilution trends of the dispersed oil. Tier III may be conducted to address this information need. Tier III is highly flexible. Any Tier III operation will be conducted with additional scientific input from the Unified Command to determine both feasibility and help direct field activities. The Scientific Support Coordinator or other Technical Specialists would assist the SMART Monitoring Team in achieving such alternative monitoring goals.

3.11.4.1 Multiple Depths with One Instrument

This monitoring technique provides a cross section of relative concentrations of dispersed oil at different depths. To conduct this operation, the team stops the vessel while transecting the dispersant-treated slick at a location where the fluorometry monitoring at the one-meter depth indicated elevated readings. While holding steady at this location, the team lowers the fluorometer sampling hose at several increments down to approximately ten meters (Figure 7). Monitoring is done for several minutes (2-3 minutes) for each water depth, and the readings recorded both automatically by the instrument's data logger and manually by the monitoring team, in the data logging form. This monitoring mode, like Tier II, requires one vessel and one fluorometer with a team to operate it.

3.11.4.2 Simultaneous Monitoring at Two Different Depths.

If two fluorometers and monitoring setups are available, the transect outlined for Tier II may be expanded to provide fluorometry data for two different water depths (one and five meters are commonly used). Two sampling set-ups (outriggers, hoses, etc.) and two separate fluorometers (same model) are used, all on a single vessel, with enough monitoring personnel to operate both instruments. The team transects the dispersant-treated slick as outlined in Tier II, but simultaneously collect data for two water depths (Figure 7).

While the data logger in each instrument is automatically recording the data separately, the monitoring teams manually record the data from both instruments at the same time. Comparison of the readings at the two water depths may provide information on the dilution trend of the dispersed oil.

If requested by the Unified Command, water chemical and physical parameters may be collected by using a portable water quality lab in-line with the fluorometer to measure water temperature, conductivity, dissolved oxygen content, pH, and turbidity. These data can help explain the behavior of the dispersed oil.

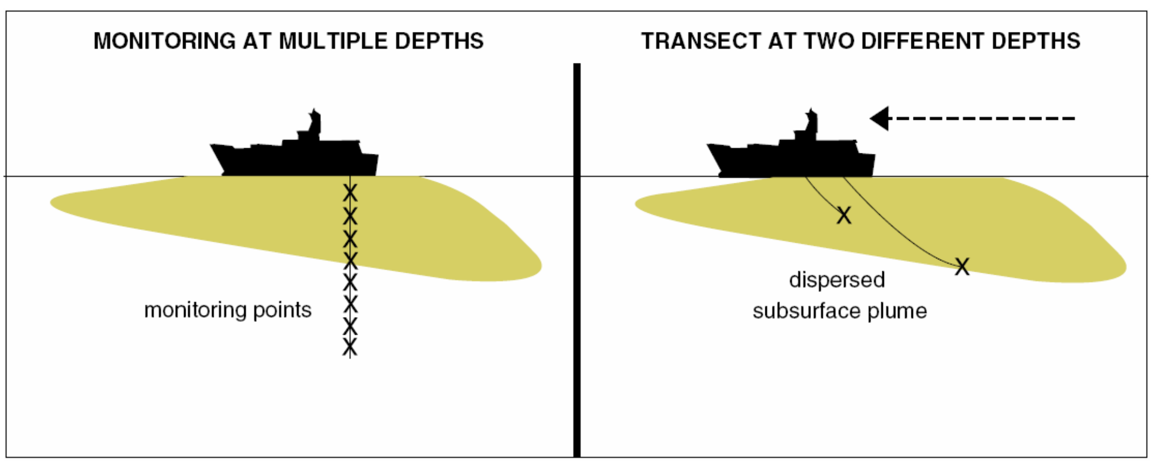

Figure 3: Monitoring options for Tier III.

3.12 Dispersant Monitoring Water Sampling

3.12.1. Purpose

Collection of water samples during Tier II and III monitoring should assist in correlating instrument readings in the field to actual dispersed oil concentrations in the water column. The samples provide validation of the field monitoring. The following guidelines were drafted for flow-through fluorometers. The procedures must be modified for alternative instruments. Such modifications might include discrete water sampling in concert with monitoring. The guidelines provided below are general, and should serve as an initial starting point for water sample collection. The number of samples collected may vary, depending on the operation and the need for verification.

3.12.2. Guidelines

3.12.2.1 Equipment

1. Certified pre-cleaned amber 500-ml bottles with Teflon™-lined caps.
   - For Tier II, a minimum of six bottles is required.
   - For Tier III, a minimum of thirteen bottles is required.

2. Labels for bottles documenting time and location of collection.

3. Observation notes corresponding fluorometer readings to water sample collection, and any other observations.

3.12.2.2 Procedure

1. Open valve for water sample collection and allow water to run for ten seconds before opening and filling the bottle.

2. Fill the bottle to the top and allow no headspace in bottles after sealing.

3. Label bottle with exact time of initial filling from the fluorometer clock as well as sampling depth, transect, and the distance of water hose from the outflow port of the fluorometer to the actual collection point of the water sample (to account for residence time of water in the hose)

4. Store filled bottles in a cooler with ice while on the monitoring vessel. Keep refrigerated (do not freeze) after returning to shore and send to the laboratory as soon as possible.

5. Measure and record the length of the hose between the fluorometer outlet and the bottle end, hose diameter, and flow rate (by filling a bucket). This will assist in accurately linking water sample results to fluorometer readings.

3.12.2.3 Number of Samples

1. Collect one water sample per monitoring depth during the background (no oil) transect. The fluorometer readings prior to collection should be relatively constant.

2. Collect two samples per monitoring depth during the pre-dispersant monitoring (under untreated oil slick). Try to collect water samples correlating with representative fluorometer values obtained.

3. Collect approximately three samples per monitoring depth during the post-dispersant transects. These samples should represent the range of high, middle, and low values obtained from the fluorometer screen.

4. Label the bottles and store them in a cooler with ice. Do not freeze. Enter water sample number, time, and correlated fluorometer reading in the Recorder Log for future data processing

3.13 Dispersant Monitoring Recorder Form

Date:_________________ Fluorometer #:______________
Project: ________________________ Platform: __________________________
Monitoring Start/End Time: __________
Team members: ____
On-scene weather (log all possible entries) Wind direction from: _____ Wind speed: _______
Sea state: ___________ Cloud cover: ____________ Visibility: _____________
Air temp. :__________ Sea temp.: _____________

Comments should include: Presence or lack of surface oil or dispersed oil plume, whether conducting background run, transect in relation to slick, instrument or gear problem, or any other noteworthy event. Positions should always be recorded when a sample is taken. Otherwise, a log entry every five minutes is sufficient.

Time	Water depth	Fluorometer reading	GPS reading	Sample taken?	Comments & observations
			lat:_______________ long:		
			lat:_______________ long:		
			lat:_______________ long:		
			lat:_______________ long:		
			lat:_______________ long:		
			lat:_______________ long:		
			lat:_______________ long:		
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			lat:_______________ long:		
			lat:_______________ long:		
			lat:_______________ long:		

MONITORING IN-SITU BURNING OPERATIONS

1. BACKGROUND

1.1 Mission Statement

To provide a monitoring protocol for rapid collection of real-time, scientifically based information to assist the Unified Command with decision-making during in situ burning operations.

1.2 Overview of In situ Burning

In situ burning of oil may offer a logistically simple, rapid, and relatively safe means for reducing the net environmental impact of an oil spill. Because a large portion of the oil is converted to gaseous combustion products, in situ burning can substantially reduce the need for collection, storage, transport, and disposal of recovered material. In situ burning, however, has several disadvantages: burning can take place only when the oil is not significantly emulsified, when wind and sea conditions are calm, and when dedicated equipment is available. In addition, in situ burning emits a plume of black smoke, composed primarily (80-85%) of carbon dioxide and water; the remainder of the plume is gases and particulates, mostly black carbon particulates, known as soot. These soot particulates give the smoke its dark color. Downwind of the fire, the gases dissipate to acceptable levels relatively quickly. The main public health concern is the particulates in the smoke plume.

With the acceptance of in situ burning as a spill response option, concerns have been raised regarding the possible effects of the particulates in the smoke plume on the general public downwind. SMART is designed to address these concerns and better aid the Unified Command in decisions related to initiating, continuing, or terminating in situ burning.

2. MONITORING PROCEDURES

2.1 General Considerations

In general, SMART is conducted when there is a concern that the general public may be exposed to smoke from the burning oil. It follows that monitoring should be conducted when the predicted trajectory of the smoke plume indicates that the smoke may reach population centers, and the concentrations of smoke particulates at ground level may exceed safe levels. Monitoring is not required, however, when impacts are not anticipated.

Execution of in situ burning has a narrow window of opportunity. It is imperative that the monitoring teams are alerted of possible in situ burning and SMART operations as soon as burning is being considered, even if implementation is not certain. This increases the likelihood of timely and orderly SMART operations.

2.2 Sampling and Reporting

Monitoring operations deploy one or more monitoring teams. SMART recommends at least three monitoring teams for large-scale burning operations. Each team uses a real-time particulate monitor capable of detecting the small particulates emitted by the burn (ten microns in diameter or smaller), a global positioning system, and other equipment required for collecting and documenting the data. Each monitoring instrument provides an instantaneous particulate concentration as well as the time-weighted average over the duration of the data collection. The readings are displayed on the instrument's screen and stored in its data logger. In addition, particulate concentrations are logged manually every few minutes by the monitoring team in the recorder data log.

The monitoring teams are deployed at designated areas of concern to determine ambient concentrations of particulates before the burn starts. During the burn, sampling continues and readings are recorded both in the data logger of the instrument and manually in the recorder data log. After the burn has ended and the smoke plume has dissipated, the teams remain in place for some time (15-30 minutes) and again sample for and record ambient particulate concentrations.

During the course of the sampling, it is expected that the instantaneous readings will vary widely. However, the calculated time-weighted average readings are less variable, since they represent the average of the readings collected over the sampling duration, and hence are a better indicator of particulate concentration trend. When the time-weighted average readings approach or exceed the Level of Concern (LOC), the team leader conveys this information to the In-Situ Burn Monitoring Group Supervisor (ISB-MGS) who passes it on to the Technical Specialist in the Planning Section (Scientific Support Coordinator, where applicable), which reviews and interprets the data and passes them, with appropriate recommendations, to the Unified Command.

2.3 Monitoring Locations

Monitoring locations are dictated by the potential for smoke exposure to human and environmentally sensitive areas. Taking into account the prevailing winds and atmospheric conditions, the location and magnitude of the burn, modeling output (if available), the location of population centers, and input from state and local health officials, the monitoring teams are deployed where the potential exposure to the smoke may be most substantial (sensitive locations). Precise monitoring locations should be flexible and determined on a case-by-case basis. In general, one team is deployed at the upwind edge of a sensitive location. A second team is deployed at the downwind end of this location. Both teams remain at their designated locations, moving only to improve sampling capabilities. A third team is more mobile and is deployed at the discretion of the ISB-MGS.

It should be emphasized that, while visual monitoring is conducted continuously as long as the burn takes place, air sampling using SMART is not needed if there is no potential for human exposure to the smoke.

2.4 Level of Concern

The Level of Concern for SMART operations follows the National Response Team (NRT) guidelines. As of March 1999, the NRT recommends a conservative upper limit of 150 micrograms of PM-10 per cubic meter of air, averaged over one hour. Furthermore, the NRT emphasizes that this LOC does not constitute a fine line between safe and unsafe conditions, but should instead be used as an action level: If it is exceeded substantially, human exposure to particulates may be elevated to a degree that justifies precautionary actions. However, if particulate levels remain generally below the recommended limit with few or no transitory excursions above it, there is no reason to believe that the population is being exposed to particulate concentrations above the EPA's National Ambient Air Quality Standard (NAAQS).

It is important to keep in mind that real-time particulate monitoring is one factor among several, including smoke modeling and trajectory analysis, visual observations, and behavior of the smoke plume. The Unified Command must determine early on in the response what conditions, in addition to the LOC, justify termination of a burn or other action to protect public health. The Unified Command should work closely with local Public Health organizations in determining burn termination thresholds.

When addressing particulate monitoring for in situ burning, the NRT emphasizes that concentration trend, rather than individual readings, should be used to decide whether to continue or terminate the burn. For SMART operations, the time-weighted average (TWA) generated by the particulate monitors should be used to ascertain the trend. The NRT recommends that burning not take place if the air quality in the region already exceeds the NAAQS and if burning the oil will add to the particulate exposure concentration. SMART can be used to take background readings to indicate whether the region is within the NAAQS, before the burn operation takes place. The monitoring teams should report ambient readings to the Unified Command, especially if these readings approach or exceed the NAAQS.

2.5 SMART as Part of the ICS Organization

SMART activities are directed by the Operations Section Chief in the Incident Command System (ICS). It is recommended that a "group" be formed in the Operations Section that directs the monitoring effort. The head of this group is the Monitoring Group Supervisor. Under each group there are monitoring teams. At a minimum, each monitoring team consists of two trained members: a monitor and assistant monitor. An additional team member could be used to assist with sampling and recording. The monitor serves as the team leader. The teams report to the Monitoring Group Supervisor who directs and coordinates team operations, under the control of the Operations Section Chief.

2.6 Information Flow and Data Handling

Communication of monitoring results should flow from the field (Monitoring Group Supervisor) to those persons in the Unified Command who can interpret the results and use the data. Typically, this falls under the responsibility of a Technical Specialist on in-situ burning in the Planning Section of the command structure.

The observation and monitoring data will flow from the Monitoring Teams to the Monitoring Group Supervisor. The Group Supervisor forwards the data to the Technical Specialist. The Technical Specialist or his/her representative reviews the data and, most importantly, formulates recommendations based on the data. The Technical Specialist communicates these recommendations to the Unified Command.

Quality assurance and control should be applied to the data at all levels. The Technical Specialist is the custodian of the data during the operation, but ultimately the data belongs to the Unified Command. The Unified Command should ensure that the data are properly archived, presentable, and accessible for the benefit of future monitoring operations.

3. ATTACHMENTS

The following attachments are designed to assist response personnel in implementing the SMART protocol. A short description of each attachment is provided below.

Number	Title	Description
3.1	Roles and Responsibilities	Provides detailed roles and responsibilities for responders filling monitoring positions
3.2	Command, Control, and Data Flow	A suggested ICS structure for controlling monitoring units and transferring monitoring results
3.3	ISB Monitoring Training Outline	General training guidelines for ISB monitoring
3.4	ISB Monitoring Job Aid Checklist	A checklist to assist in assembling and deploying SMART ISB monitoring teams
3.5	ISB Monitoring Equipment List	A list of equipment needed to perform SMART operations
3.6	ISB Monitoring Instrumentation Requirements	Abbreviated performance requirements for particulate monitors
3.7	ISB Monitoring Recorder Sheet	A template for manual recording of burn data
3.8	ISB Monitoring Possible Locations	An example of monitoring locations for offshore ISB operations
3.9	ISB Monitoring Data Sample: Graph	An example of real ISB data

3.1 Roles and Responsibilities

3.1.1 Team Leader

The Team Leader
- Selects specific team location
- Conducts monitoring
- Ensures health and safety of team
- Ensures monitoring QA/QC
- Establishes communication with the group supervisor
- Conveys to him/her monitoring data as needed

3.1.2 Monitoring Group Supervisor

The Group Supervisor
- Oversees the deployment of the teams in the group
- Ensures safe operation of the teams
- Ensures QA/QC of monitoring and data
- Establishes communication with the field teams and the command post
- Conveys to the command post particulate level trends as needed
- Addresses monitoring technical and operational problems, if encountered

3.1.3 In-Situ Burn Technical Specialist

The Technical Specialist or his/her representative
- Establishes communication with the Monitoring Group Supervisor
- Receives the data from the Group Supervisor
- Ensures QA/QC of the data
- Analyzes the data in the context of other available information and incident-specific conditions, formulates recommendations to the Unified Command
- Forwards the recommendations to the Unified Command
- Makes the recommendations and data available to other entities in the ICS, as needed
- Archives the data for later use

Role and function	Training	Number
Monitoring Team Leader Leads the monitoring team	SMART Monitor Training	3
Monitor Assistant Assists with data collection.	SMART Monitor Training	3
Group Supervisor Coordinates and directs teams; field QA/QC of data; links with UC.	SMART Monitor training. Group Supervisor training	1 per group
Technical Specialist Overall QA/QC of data; reads and interprets data; provides recommendations to the Unified Command	SMART Monitor training. Scientific aspects of ISB	1 per response

3.2 Command, Control, and Data Flow

In general, in situ burn monitoring operations take place as an integral part of the Incident Command System (Figures 1 and 2).

ISB monitoring operations are directed by the Operations Section Chief or deputy. The Operations Section Chief provides the Monitoring Group Supervisor with tactical directions and support regarding deployment, resources, communications, and general mission as adapted to the specific incident. The Operations Section consults with the ISB monitoring Technical Specialist about the specifics of the monitoring operations, especially if they affect the data collected. The Monitoring Group Supervisor provides specific direction to the monitoring teams during field deployment and operations.

The observation and monitoring data flow from the Monitoring Teams to the Monitoring Group Supervisor. After initial QA/QC the Group Supervisor passes the data to the Technical Specialist. The Technical Specialist or his/her representative reviews the data, applies QA/QC if needed, and, most importantly, formulates recommendations based on the data. The Technical Specialist forwards these recommendations to the Unified Command.

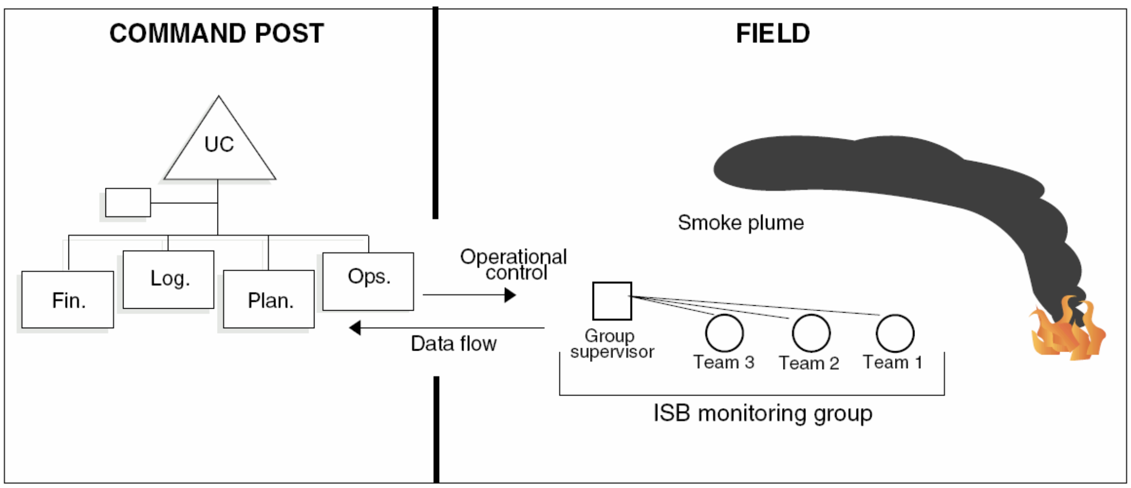

Figure 1. Command, control, and data flow during in-situ burning monitoring operations.

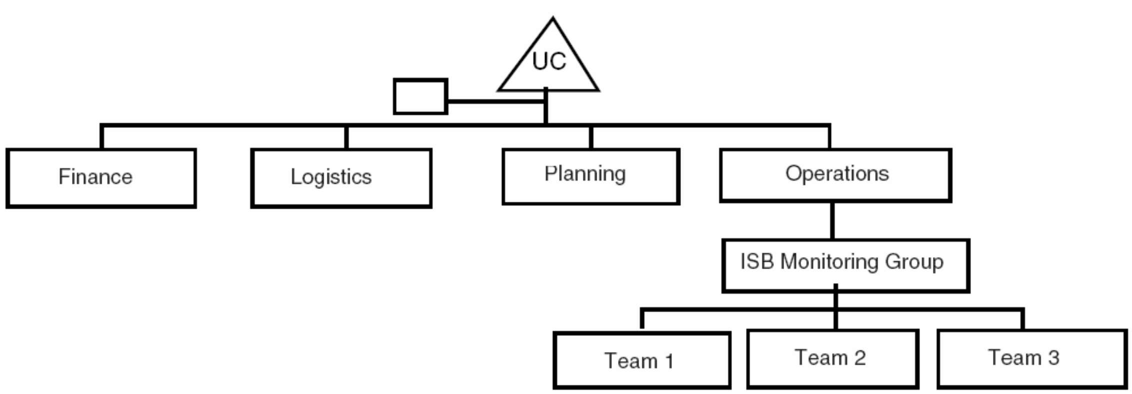

Figure 2. ISB Monitoring Group in the ICS organization.

3.3 ISB Monitoring Training Outline

3.3.1 General

Training for in-situ burning monitoring operations consists of an initial Monitor Level Training for all, Group Supervisor Training for supervisors, and refresher training sessions every six months for all.

3.3.2 Monitor Level Training

The Monitor Level Training includes monitoring concepts, instrument operation, work procedures, and a field exercise.

Topic	Duration
• Brief review of in-situ burning. • Review of SMART: What is it, why do it, what is it good for.	1 hour
• Monitoring strategy: Who, where, when. • Open water, inland. • Reporting: What and to whom • LOC: What is the LOC, how to report it. • Instantaneous reading vs. TWA, use of recorder data sheet	1 hour
• Basic instrument operation (hands-on): How the particulate monitoring instrument works, and how to operate it: brief description of mechanism, setup, and calibration, reading the data, what do the data mean; trouble shooting. • Using GPS • Downloading data	2 hours
Field exercise: Set up the instruments outdoors and measure background readings. Using a smoke source monitor for particulate levels, practice recording the data and reporting it. When done, practice downloading the data.	4 hours

3.3.3 Group Supervisor Training

Group Supervisor training may include two options:
• Independent training at each unit; or
• An additional structured day of training as suggested below

Topic	Duration
• Review of ICS and the role of the Monitoring Group in it • Roles of Monitoring Group Supervisor • What the data mean • QA/QC of data • Command and control of teams • Communication with the Technical Specialist	1 hour
Field exercise: Practice deploying instruments in the field with emphasis on reporting, QA/QC of data, communication between teams and the group supervisor, and group supervisor to the Technical Specialist.	3-6 hours
Back to the base, practice downloading the data	30 min.
Lessons learned	30 min.

3.3.4 Refresher Training

Topic	Duration
Review of SMART: What is it, why do it, what is it good for.	15 min.
• Monitoring and reporting: Who, where, and when • Level of concern • What do the data mean • Reporting the data • Work with the Technical Specialist (SSC).	30-45 min.
• Basic instrument operation (hands-on): How the monitoring instrument works, how to operate it; brief description of mechanism, setup, and calibration; • Reading the data, trouble-shooting. • Using GPS.	2 hours
Downloading data	30 min.
• Field exercise: Outside the classroom, set up the instrument and measure background readings. Using a smoke source, monitor particulate levels. • Practice recording the data and reporting it. • Back to the base, download data.	1-2 hours

3.4 ISB Monitoring Job Aid Checklist

This checklist is designed to assist SMART in situ burning monitoring by listing some of the tasks to accomplish before, during, and after the monitoring operations.

Check √	Item	Do
	Preparations	
	Activate personnel	Notify monitoring personnel and the Technical Specialist (SSC where applicable)
	Conduct equipment check	• Check equipment using equipment checkup list. • Verify that the monitoring instruments are operational and fully charged • Include safety equipment
	Coordinate logistics	Coordinate logistics (e.g., deployment platform) with ICS Operations
	Amend Site Safety Plan	Amend site safety plan to include monitoring operations
	Monitoring Operations	
	Monitoring Group setup	• Coordinate with Operations Section Chief • Coordinate with Technical Specialist
	Conduct Briefing	• Monitoring: what, where, who, how • Safety and emergency procedures
	Deploy to location	Coordinate with Operations Section Chief
	Select site	• Safe • Consistent with monitoring plan • As little interference as possible • Communication with Group Supervisor and UC possible
	Set up instrumentation	Unpack monitoring instruments and set up, verify calibration, if applicable
	Mark position	• Use GPS to mark position in recorder sheet • Re-enter position if changing location
	Collect background data	Start monitoring. If possible, record background data before the burn begins
	Collect burn data	• Continue monitoring as long as burn is on • Monitor for background readings for 15-30 minutes after the smoke clears
	Record data	Enter: • Instantaneous and TWA readings every 3-5 minutes, or other fixed intervals • Initial position from GPS, new position if moving • Initial wind speed and direction, air temperature, relative humidity, re-enter if conditions change
	Conduct quality assurance and control	• Verify that instrument is logging the data • Record data, location, relative humidity, temp, wind, interferences in the recorder data sheet • Note and record interference from other sources of particulates such as industry, vehicles, vessels

	Report by team	Report to Group Supervisor: • Initial background readings • TWA readings (every 15 min.) • TWA readings when exceeding 150 µg/m^3, (every 5 min.) • Interferences • Safety problems • QA/QC and monitoring problems
	Report by Group Supervisor	Report to the Technical Specialist (SSC): • Initial background readings • TWA, when exceeding 150 µg/m^3 • Data QA/QC and monitoring problems
	Report by Technical Specialist (SSC)	Report to the Unified Command: • TWA consistently exceeding 150 µg/m^3 • Recommend go/no-go
	Post Monitoring	
	Debrief and lessons learned	• What went right, what went wrong • Problems and possible solutions • Capture comments and suggestions
	Preserve data	• Download logged data from monitoring instrument to a computer • Collect and review Recorder data logs • Generate report
	Prepare for next burn	Clean, recharge, restock equipment

3.5 ISB Monitoring Equipment List

(For each team, unless otherwise noted)

Check √	Item	Qty	Remarks
	Particulate monitoring instrument, accessories and manuals	1 or more	
	Computer and cables	1/group	Should include downloading software
	Printer	1/group	
	Recorder data sheets	10	
	Write-in-the-rain notebooks, pens	3	
	Job aid check list	1	
	GPS	1	
	Extra batteries for GPS	1 set	
	Radio	1	
	Cell phone	1	
	Binoculars	1	
	Stop watch	1	
	Camera	1	digital camera or camcorder optional
	Film	3	
	Thermometer	1	
	Humidity meter	1	
	Anemometer	1	

3.6 Particulate Monitor Performance Requirements

SMART does not require nor endorse a specific brand of particulate monitoring instrument. Rather, SMART specifies performance criteria, and instruments meeting them may be used for ISB monitoring.

Performance Criteria

- Rugged and portable: The monitor should be suitable for field work, withstand shock, and be easily transportable in a vehicle, small boat or helicopter. Maximum size of the packaged instrument should not exceed that of a carry-on piece of luggage
- Operating temperature: 15-120 ºF
- Suitability: The instrument should be suitable for the media measured, i.e., smoke particulates
- Operating duration: Eight hours or more
- Readout: The instrument should provide real-time, continuous readings, as well as time-weighted average readings in ug/m3
- Data logging: The instrument should provide data logging for 8 hours or more
- Reliability: The instrument should be based on tried-and-true technology and operate as specified
- Sensitivity: A minimum sensitivity of 1 µg/m^3
- Concentration range: At least 1-40000 µg/m^3
- Data download: The instrument should be compatible with readily available computer technology, and provide software for downloading data

3.7 ISB Monitoring Possible Locations

Monitoring locations are dictated by the potential for smoke exposure to human populations. In general, the monitoring teams deploy where the potential for human exposure to smoke is most probable. Precise monitoring locations should be flexible and determined on a case-by-case basis. In the figure below, one team is deployed at the upwind edge of a sensitive location (e.g., a town). A second team deploys at the downwind end of this location. Both teams stay at the sensitive location, moving only to improve sampling capabilities. A third team is more mobile, and deploys at the discretion of the Group Supervisor.

It should be emphasized that, while visual observation is conducted continuously as long as the burn takes place, air sampling using SMART is not required if there is no potential for human exposure to the smoke.

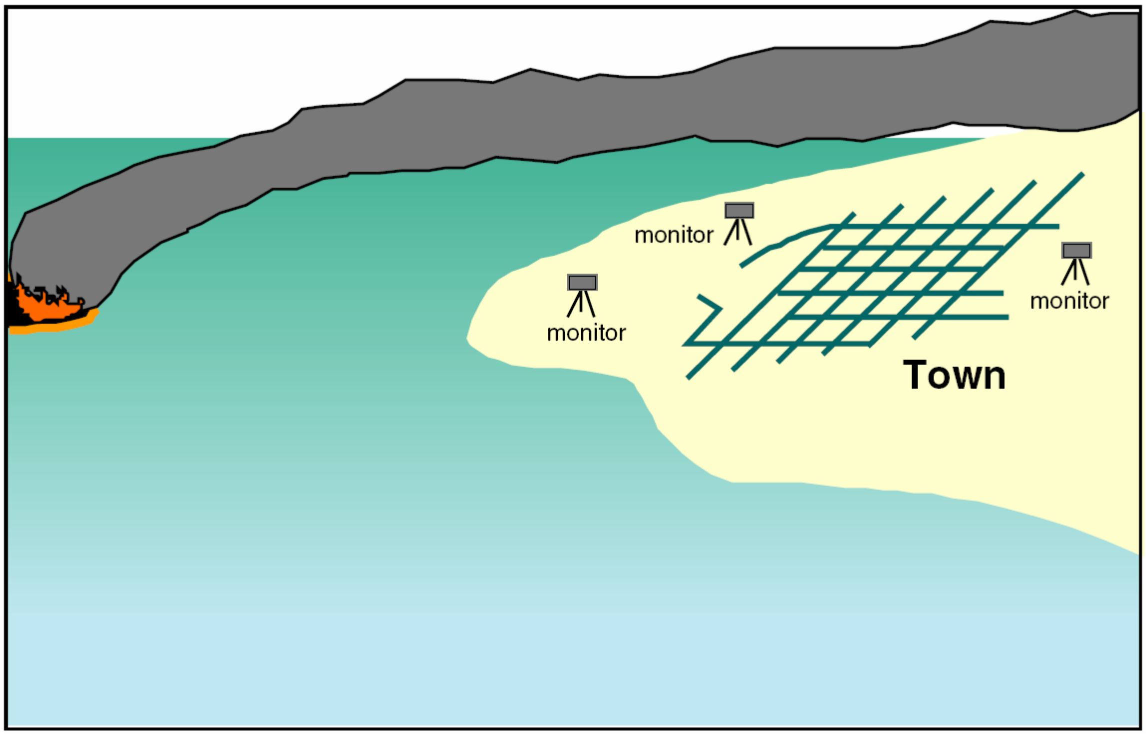

Figure 1. Possible locations of monitors (not to scale).

3.8 ISB Monitoring Recorder Sheet

Date: __________ General Location: ________________________________

General information	Weather information
Recorder name	Temperature
Operator name	Wind direction
Vehicle/vessel #	Wind speed
Monitoring Instrument #	Relative humidity
Burn #	Cloud cover
Calibration factors:	

Comments should include: location of the smoke plume relative to the instrument, interfering particulate sources, any malfunction of the instrument

Time	GPS reading	Particulates concentration	Comments & observations
	lat:_______________ long:	Inst: ________ TWA:	
	lat:_______________ long:	Inst: ________ TWA:	
	lat:_______________ long:	Inst: ________ TWA:	
	lat:_______________ long:	Inst: ________ TWA:	
	lat:_______________ long:	Inst: ________ TWA:	
	lat:_______________ long:	Inst: ________ TWA:	
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	lat:_______________ long:	Inst: ________ TWA:	
	lat:_______________ long:	Inst: ________ TWA:	

3.9 ISB Monitoring Data Sample: Graph

The graph below represents field monitoring data from a test burn smoke plume near Mobile, Alabama, on September 25, 1997, after the data were downloaded from the instrument. The graph (Figure 1) portrays the differences between the transient instantaneous readings (Conc.) and the time weighted average readings (TWA). Note that while instantaneous readings varied widely, the TWA remained relatively constant throughout the burn. The TWA provides an indication of the concentration trends, which is a more stable and reliable indicator of exposure to particulates.

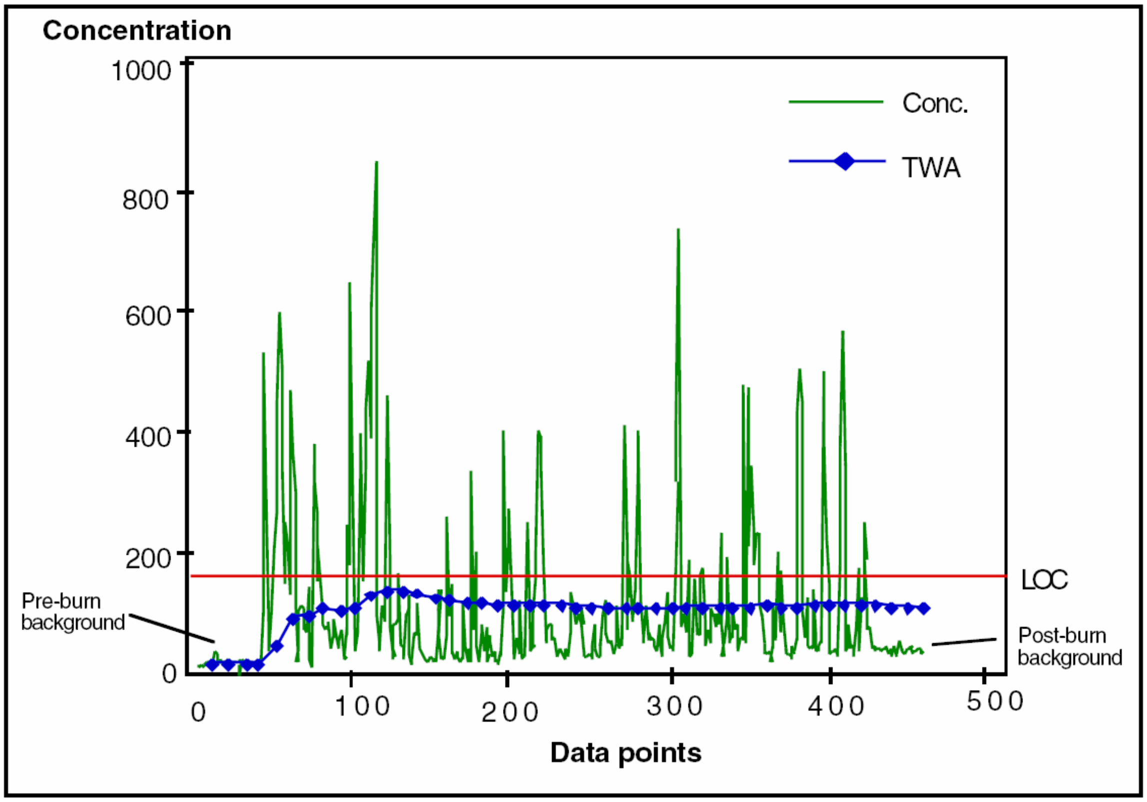


Figure 1. Graph of instantaneous and TWA particulate concentrations

SMART RESOURCES

Comments and suggestions on the SMART program and document
Fax: (206) 526-6329; Email: smart.mail@noaa.gov

SMART Web Sites
http://response.restoration.noaa.gov/smart

In-situ Burning Page
http://response.restoration.noaa.gov/ISB

Dispersant Guided Tour
http://response.restoration.noaa.gov/dispersantstour

Dispersant Application Observer Job Aid
http://response.restoration.noaa.gov/dispersants_jobaid

US Coast Guard
http://www.uscg.mil/

USCG National Strike Force
http://www.uscg.mil/hq/nsfweb

NOAA OR&R
http://response.restoration.noaa.gov

EPA ERT
http://www.ert.org

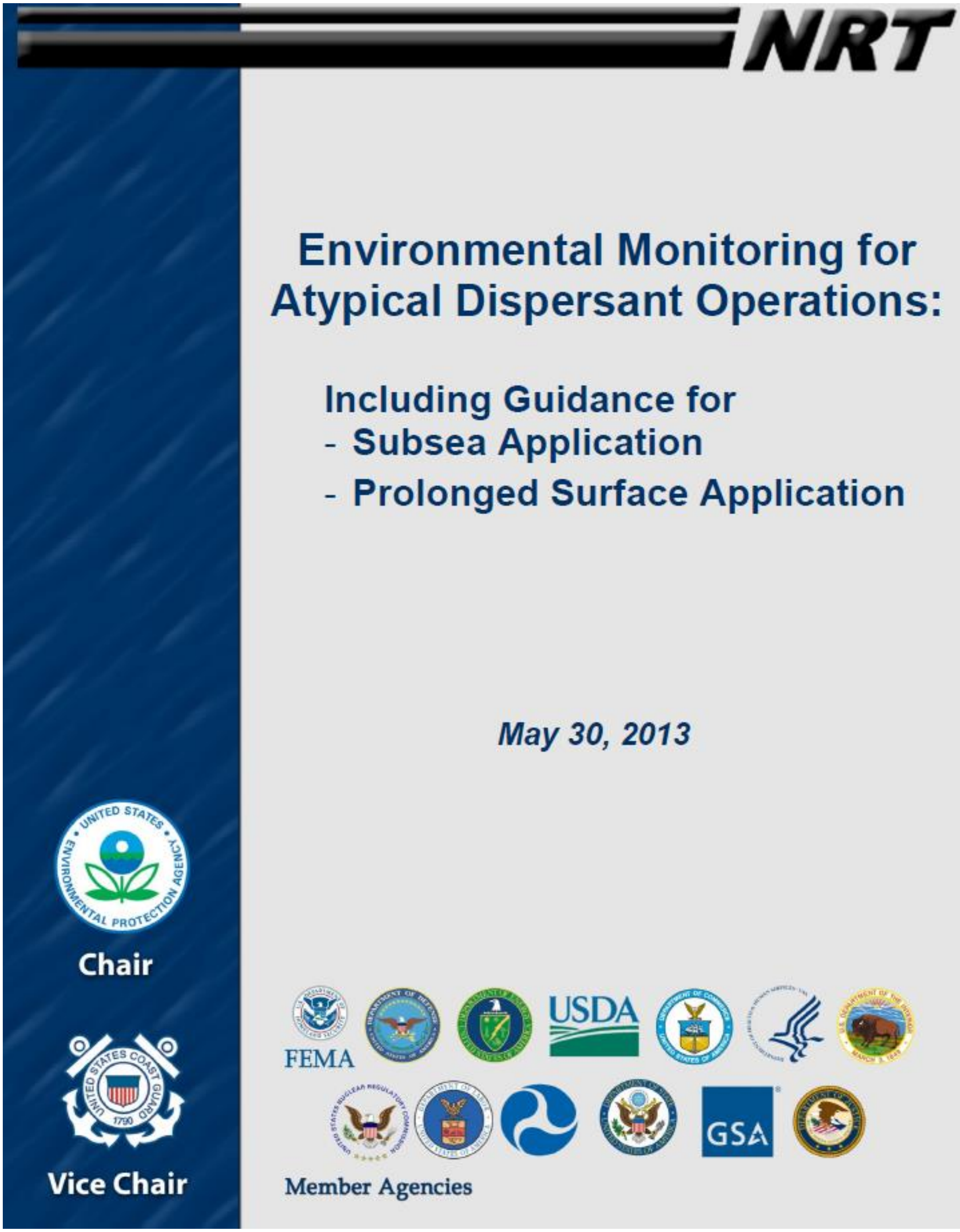
CDC
http://www.cdc.gov/

MMS Oil Spill Response Research Program
http://www.mms.gov/taroilspills/

OHMSETT Facility
http://www.ohmsett.com/

TAB 3. MONITORING PROTOCOLS

Part 2: Environmental Monitoring for Atypical Dispersant Operations



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PREFACE

During the *Deepwater Horizon* event in the Gulf of Mexico, dispersant was applied using novel techniques and in amounts never seen in U.S. waters. For the first time, dispersant was injected at the source of the release at depths of nearly a mile, and in quantities approximating three quarters of a million gallons. In addition, aircraft and vessels deployed dispersant to the surface at volumes topping 1,000,000 gallons over the course of the response, quantities unsurpassed in North America. Such atypical uses of dispersant during a response were neither envisioned nor incorporated into existing Regional Response Team (RRT) dispersant use plans, nor were they addressed in the existing Special Monitoring of Applied Response Technologies (SMART) monitoring program.

Therefore, the National Response Team (NRT) developed the *Environmental Monitoring for Atypical Dispersant Operations: Including Guidance for Subsea Application and Prolonged Surface Application* (approved May 30, 2013) to assist On-Scene Coordinators (OSCs) and RRTs in making incident-specific decisions regarding atypical dispersant use, including expedited decision making.

The *Environmental Monitoring for Atypical Dispersant Operations* is a living document envisioned to continue addressing monitoring challenges as they become necessary; and, as resources allow, other atypical dispersant applications. In its current version, this document contains the following:

- ***Subsea Application Guidance –*** generally applies to the subsurface ocean environment, focusing particularly on operations in waters below 300 meters and below the average pycnocline.

- ***Prolonged Surface Application Guidance –*** supplements and complements the existing protocols as outlined in the SMART monitoring program where the duration of the application of dispersants on discharged oil extends beyond 96 hours from the time of the first application.

The *Environmental Monitoring for Atypical Dispersant Operations* may be adopted and/or modified to address specific needs. The RRTs may also use this guidance to inform their planning and response activities in an ocean environment, consistent with national policy. This guidance does not negate existing pre-authorization plans developed in accordance with 40 CFR 300.910(a) of the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). The NRT urges RRTs to actively engage with members of federal, state, local, tribal, and industry groups in using the guidance. The NRT's Science and Technology Committee expects that changing technologies, accumulated experience, and operational improvements will bring about revisions to the document.

Comments should be submitted to the attention of the NRT Science and Technology Committee Chair at NRTSandTCommittee@sra.com.

ACKNOWLEDGEMENTS

The National Response Team (NRT) acknowledges and thanks the NRT member agencies, and state and federal agencies participating on the Regional Response Teams (RRTs), for their contributions in preparing this document.

Core contributing participation includes the following:

- U.S. Environmental Protection Agency
  - Office of Emergency Management
  - Office of Research and Development
- U.S. Coast Guard
  - Office of Marine Environmental Response Policy
  - Gulf Strike Team
- National Oceanic and Atmospheric Administration
  - Office of Response and Restoration
- U.S. Department of the Interior
  - Office of Environmental Policy and Compliance
  - Bureau of Ocean Energy Management
  - Bureau of Safety and Environmental Enforcement
- SRA International, Inc. (Contractor)
  - Energy, Environment, and Organizational Performance

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1.0 BACKGROUND AND OVERVIEW

1.1 Introduction

The *Environmental Monitoring for Atypical Dispersant Operations* provides a resource for the Regional Response Team (RRT), in accordance with 40 CFR 300.910 of the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), when considering the atypical use of dispersants before and during an oil discharge. This document, developed by National Response Team (NRT) member agency representatives, is intended for use when responding to oil discharges and for RRT development of Regional Contingency Plans and expedited decision making addressing dispersant use of this nature.

The data generated by the measures below are meant for use as an operational response decision-making tool and not as a part of the long-term Natural Resources Damage Assessment (NRDA) data gathering efforts that may apply to the dispersant operation or other parts of the response. However, all of the data collected as a function of the guidance may be made available to NRDA personnel as soon as practicable.

While this document does not recommend specific cut-off points for dispersant applications (e.g., based on quantity of oil, amount of dispersant applied, duration of application), it does recommend “key indicators” the On-Scene Coordinator (OSC), and other decision makers should consider during dispersant monitoring and application activities. These key indicators should be revisited repeatedly throughout the incident to help determine whether and when dispersants should be applied or continue to be applied. Actions taken based on key indicator data should also consider the resource tradeoffs associated with dispersant use.

This document is intended solely as guidance, does not constitute rulemaking or limit future rulemaking in any way by any agency and may not be relied upon to create any right or benefit, substantive or procedural, enforceable by law or in equity, by any person. Any agency or person may take action at variance with this guidance. Mention of trade names or commercial products does not constitute endorsement or recommendations for their use by the U.S. Environmental Protection Agency (EPA), U.S. Coast Guard (USCG), U.S. Department of Commerce (DOC) including the National Oceanic and Atmospheric Administration (NOAA), U.S. Department of the Interior (DOI) including the Bureau of Ocean Energy Management (BOEM) and the Bureau of Safety and Environmental Enforcement (BSEE), or the Government of the United States of America.

1.2 Guidance Objectives

The monitoring guidance does not impose regulatory requirements on oil development and production companies or impose Oil Spill Response Plan (OSRP) requirements. It is intended for use as a planning tool by each RRT, to be tailored to regional-specific concerns, needs, and environmental considerations. RRTs should use the guidance when modifying or reviewing existing Regional Contingency Plans to address lessons learned from the *Deepwater Horizon* event.

The guidance provides recommendations to RRTs for making incident-specific decisions concerning atypical dispersant applications. Authorization of the use of dispersants is governed by 40 CFR 300.910 of the NCP. The guidance recommends sampling and monitoring protocols that should be in place when atypical dispersant use for applicable situations is authorized.

1.3 General Scope and Assumptions

1) The guidance does not directly address the health and safety of spill responders or monitoring personnel, which is covered by the general site safety plan for the incident (as required by 29 CFR 1910.120). Field personnel should be trained under the Occupational Safety and Health Administration (OSHA) Hazardous Waste Operations and Emergency Response (HAZWOPER) requirements, as appropriate.

2) It is important that the Unified Command (UC) agree on the sampling and monitoring objectives, goals, and associated procedures and plans early on in an incident. However, the UC may modify these objectives and goals based on incident-specific circumstances. Authorization of use for all dispersant applications must be done in accordance with 40 CFR 300.910 of the NCP. Decisions to apply dispersants, like all other decisions, should be documented.

3) The OSC, with the concurrence of EPA and, as appropriate, the states, and in consultation with DOC and DOI natural resource trustees, retains the authority to direct the collection of data and/or to grant temporary deviation from one or more of the sampling or monitoring recommendations if deemed necessary due to incident-specific circumstances, field observations, and/or input from key stakeholders and technical specialists.

4) The OSC should establish a Dispersant Environmental Monitoring Unit (DEMU), comprised of government, academia (as practical) and the Responsible Party's (RP's) technical specialists, as appropriate, to coordinate and oversee the implementation of sampling and monitoring activities. The DEMU should be established as a part of Environmental Unit (EU) unless otherwise directed by the OSC, and in consultation with the OSC's Scientific Support Coordinator (SSC).

5) This document is not designed to be a monitoring plan specific to an individual oil discharge event. It is designed to provide general guidance for the development of a sampling and monitoring plan tailored to the actual discharge, taking into account the needs of a particular region. As such, prior to any atypical dispersant application, the RP should develop a detailed sampling and monitoring plan in coordination with the DEMU.

6) The guidance does not provide training on monitoring for a specific technology. Rather, the guidance assumes that monitoring personnel are fully trained and qualified to use the equipment and techniques mentioned and to follow those guidelines.

7) While the guidance should inform such policies, it is not intended to preempt or replace any RRT agreements currently in place that address dispersant operations discussed below.

8) The guidance attempts to balance feasible, operationally efficient, and scientifically sound monitoring activities with the understanding that atypical dispersant applications necessitate specific considerations beyond those addressed by Special Monitoring of Applied Response Technologies (SMART).

9) The NRT intends to revise and improve the guidance based on lessons learned from the field, advances in technology, and developments in techniques as appropriate, but recommends using the best available technologies and practices.

10) Relevant definitions can be found in 40 CFR 300.5 of the NCP. To the extent that other terms are defined herein, it is solely for clarity of this guidance.

11) The RP or appropriate technical specialist should consult with the manufacturer to identify any dispersant-specific marker compounds for monitoring purposes and confirm its suitability for use. Information on dispersant-specific markers should be used to advise the OSC and incorporated into all monitoring plans.

12) The guidance encourages a joint effort between governmental and RP personnel when the RP has been identified and is acting as a coordinating member of the UC established for the response. All monitoring data collected should be directed to the DEMU. Data management should be overseen by the Federal Government with full transparency and data sharing within the UC and with the RP.

13) The guidance is not intended to provide action levels or specific ecological levels of concern. These levels should be developed during case-by-case discussions between the UC and key stakeholders. However, action levels and levels of concern should be compatible with the ecological risk screening tools recommended in the guidance in order for these tools to be most useful.

14) The guidance provides a framework for the collection, analyses, and dissemination of pertinent data to key stakeholders so resource-tradeoff decision making can be supported.

15) Sections 3.0 *Communications and Reporting*, 4.0 *Quality Assurance Project Plan*, 5.0 *Airborne Volatile Organic Compounds*, 6.0 *Ecological Toxicity Assessment*, and 7.0 *Action Levels* apply to all atypical dispersant applications addressed in this guidance.

1.4 Dispersant Environmental Monitoring Unit (DEMU)

1) The DEMU, under the direction of the OSC, coordinates and oversees the implementation of the sampling and monitoring activities set forth in this guidance and, as appropriate, any additional sampling and monitoring activities required by circumstances of the particular response.

2) The DEMU is established within the EU under the Planning Section of the UC (see Figure 1), unless otherwise directed by the OSC. The DEMU is co-led by EPA and NOAA.

3) The SSC directly coordinates with the DEMU to ensure an unfiltered data flow to the OSC and government decision-makers, including the EPA representative and the federal Natural Resources Trustees.

4) As required, the DEMU will establish and operate task forces, in coordination with the Dispersants Group in the Operations Section, in order to facilitate sample collection, analysis and reporting.

5) The RP, when identified, has primary responsibility for sampling and monitoring activities during a response to a spill incident under the direction of the OSC, including financial and logistical support for the DEMU and any subordinate task force activities.

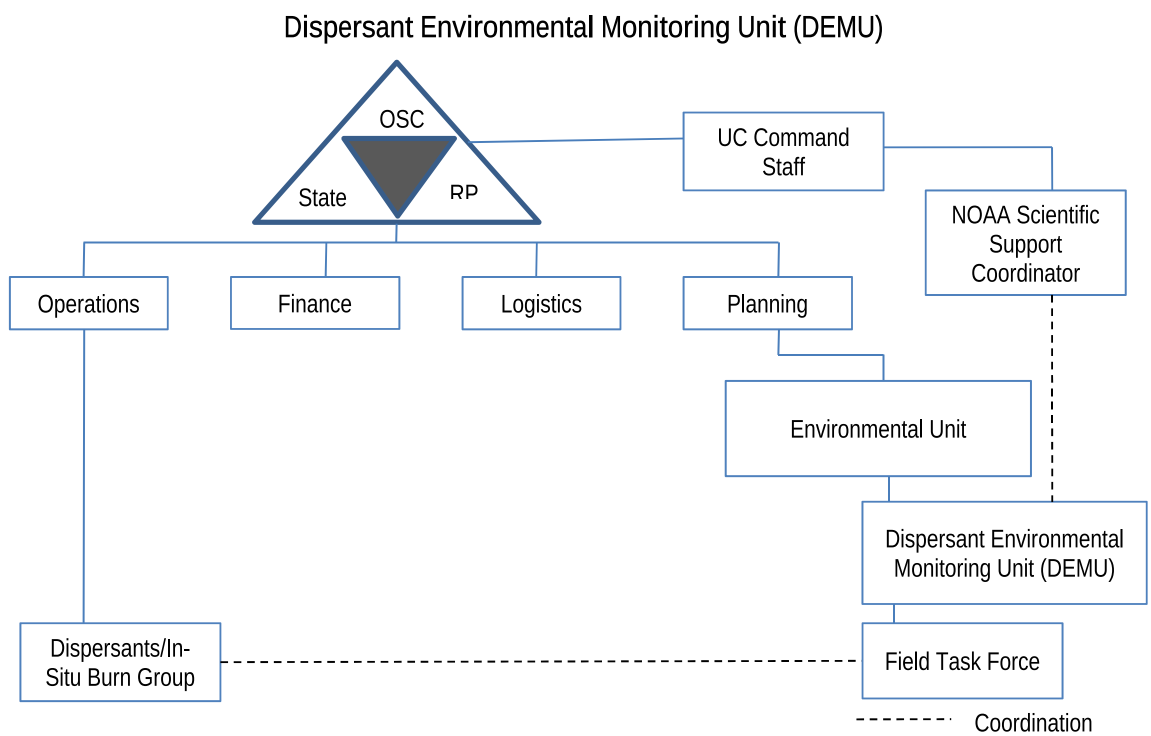

Figure 1: Dispersant Environmental Monitoring Unit (DEMU) Organization and Coordination

2.0 MONITORING GUIDANCE

2.1 Subsea Application Guidance

2.1.1 Background and Overview

<u>Introduction</u>

The *Subsea Application Guidance* was developed by NRT member agency representatives for RRT use in responding to and planning for oil discharges. This guidance is designed to assist

OSCs and state and federal agencies participating in the authorization, continued observation, and monitoring of subsea applications on oil discharges.

<u>Subsea Application Guidance General Scope and Assumptions</u>

1) The *Subsea Application Guidance* is intended for use on oil discharges originating from oil exploration, production and/or transmission facilities (e.g., in cases where there is a loss of well control).

2) These recommendations generally apply to dispersant use in response to subsea discharges at depths greater than 300 meters and below the average pycnocline.

3) The DEMU, in accordance with incident-specific objectives, should coordinate the development and implementation of a sampling and monitoring plan prior to the deployment of any subsea dispersants.

2.1.2 Pre-Incident Subsea Monitoring Recommendations

RRTs and Area Committees should know what resources (e.g., recreational, economic, biological, ecological) are potentially at risk in areas where subsea dispersant use may be considered. To better inform the resource tradeoffs in the decision making process of the response, RRTs and Area Committees should also consider the risks to resources that may be affected if subsea dispersants are not used. Among the sources of information that may be used to identify resources at risk are the following:

- National Environmental Policy Act (NEPA) Environmental Impact Statement(s);
- Exploration Plans;
- Development and Production Plans or Development Operations Coordination Documents;
- Population and community level ecology data;
- Relevant models (e.g., circulation, ecological, trajectory);
- Subject matter experts; and/or
- Any other relevant documents in which biological resources are identified.

2.1.3 Subsea Application Monitoring Recommendations

The sampling and monitoring plan for subsea dispersant applications should include the following:

- Site Characterization;
- Source Oil Sampling;
- Water Sampling and Monitoring; and
- Sediment Sampling and Monitoring.

<u>Site Characterization</u>

1) Best estimate of the oil discharge flow rate, periodically reevaluated as conditions dictate, including a description of the method, associated uncertainties, and materials;

2) Best estimate of the discharge flow rate of any associated volatile petroleum hydrocarbons, periodically reevaluated as conditions dictate, including a description of the method, associated uncertainties, and materials;

3) Identity of and rationale for the dispersant to be used, including the recommended dispersant-to-oil ratio for the intended application;

4) Description of the methods and equipment to be used for dispersant injection and application, including a plan for observation (not limited to visual);

5) Actual injection rate of the dispersant in gallons/minute; and

6) Estimated total length of time of dispersant injection.

<u>Source Oil Sampling</u>

For an incident-specific authorization, it is important for the OSC to have specific chemical data on the source oil, and samples collected for fingerprinting profile analysis before directing subsea dispersant application. Additional samples may be collected and stored for future analysis. The DEMU should coordinate sampling of the source oil, including associated volatile petroleum hydrocarbons (e.g., methane) and production fluids (e.g., drilling fluids), as soon as possible. Sample collection should be as follows:

1) Collect representative source oil samples at the source of the oil discharge, securing the samples in three or more Seewald Samplers or equivalent isobaric gas-tight samplers.[1]

2) Conduct chemical analyses, consistent with gas chromatography-mass spectrometry (GC-MS) analysis (see Water Sampling and Monitoring below, item 5.c.i). Document the methods and analyses used to fingerprint the source oil so as to distinguish between the oil associated with subsea discharge and other potential sources of oil (e.g., seeps, pipelines) to the maximum extent practicable.

3) If methane is present in the discharge, use an *in situ* methane detection method that provides sufficient sensitivity to detect changes in the environment in which the device is operating. Given that the biodegradation of methane may contribute to oxygen depression, understanding methane concentrations can inform the key indicator factors for dissolved oxygen. The sensitivity of the device(s)/method(s) to low concentrations of methane should be used as a factor in determining device selection, relative to other available devices and/or methods.

[1] Refer to http://www.whoi.edu/oceanus/viewArticle.do?id=89768&sectionid=1000

4) Include in the analysis an estimated rise rate through the water column for non-dispersed oil to the surface as a function of droplet size, density (or specific gravity) along the thermal gradient of the water column, and kinematic viscosity.

<u>Water Sampling and Monitoring</u>

Understanding the fate and concentrations of chemically and physically dispersed oil in the water column is critical. To accomplish this, a combination of hydrodynamic modeling, real-time data, and discrete water sample analysis is vital to ensure decision makers have the information necessary to authorize the continuation or modification of subsea dispersant operations. As with all dispersant operations, data retrieved and analyzed from water column measurements is intended to help decision makers and key stakeholders consider dispersant operations as a part of the broader oil discharge mitigation effort and weigh the risks associated with continuing the operation against those injuries the operation is intended to minimize. The DEMU should coordinate the reporting of water column measurements described below.

1) *Oceanographic Data.* Identify and implement a plume model with a validated methodology to predict the location and behavior of the subsurface oil plume, which is critical to properly monitor oil fate, dispersant effectiveness, and water column concentrations. Provide a subsea current analysis that characterizes the subsurface circulation, bathymetry, and oceanographic conditions, critical to model accurately. Note that subsea plume behavior forecasting and sample collection targeting may be improved by the installation of Acoustic Doppler Current Profilers (ADCPs) on the ocean floor with the capability of real-time telemetry.

2) *Microbial Oxidation.*
    a. *Dissolved oxygen* is an indicator of potential injury in the subsea ecological system. An increase in organic carbon loading enhances microbial activity, thereby increasing respiration and depleting oxygen. The monitoring plan should be particularly sensitive to signs of hypoxia. The DEMU should coordinate the analyses of *in situ* dissolved oxygen (DO) using industry standard sensing devices calibrated using Winkler titrations. In addition, water samples should regularly measure *ex situ* DO using Winkler titrations to verify measurements from industry standard sensing devices, particularly at depths where evidence of oxygen depression is indicated or predicted as a function of the dispersant operation.
        - **Key Indicator:**
            - Approaching hypoxia (e.g., 2 milligrams per liter or as appropriate for the region).
    b. *Carbon dioxide* is another potential indicator of microbiological activity in the subsea environment and may help distinguish between microbial activity associated with hydrocarbon consumption and naturally occurring dissolved oxygen drawdown. The DEMU may require, if practicable, the use of a properly calibrated *in situ* carbon dioxide sensor (e.g., Contros HydroC™ carbon dioxide sensor or equivalent instrument) to quantify carbon dioxide formation from biodegradation.
        - **Key Indicator:**
            - Confirmatory data.

3) *Oil Droplet Size Distribution* is an indicator of dispersant effectiveness and can be used to inform plume modeling. The DEMU should coordinate the deployment of a droplet size analyzer, such as, but not limited to, a Laser In-Situ Scattering and Transmissometry (LISST). It should be capable of reaching the depth of the sea floor from the vessel(s) for continuous sampling of surface water during transits, to provide droplet size counts information, which potentially distinguishes between dispersed and non-dispersed oil. A particle size distribution analysis focused on droplet size ranging from at least 2.5 to 100 μm should be conducted, with measurements for droplet size distribution between 2.5 and 2,000 μm, if practicable, for trajectory analysis. A baseline analysis should be conducted to determine droplet size distribution prior to dispersant application.
    - **Key Indicator:**
        - Observations of relative significant changes in the droplet size range indicating dispersant effectiveness.

4) *Continuous Water Column Data* is useful for providing a continuous data stream and background information for other data obtained. In addition, fluorometric data should be used to help track and model the dispersed plume. The DEMU should ensure that a sufficient number of vessels are equipped with the Conductivity, Temperature, Depth recorder (CTD) rosette package with one or more properly calibrated fluorometer(s), targeted to the type of oil discharged and capable of operating at depth (including to the sea floor) in which the dispersed oil plume may travel. A 2-way communication cable spooled to the ship should be used to ensure that profile data can be viewed as the rosette package is deployed to appropriate depths.
    - **Key Indicator:**
        - Observations of relative significant changes in the fluorometric output indicating the possible presence of a dispersed plume.
        - Identification of the pycnocline and the thermocline.

5) *Discrete Water Sampling.* The DEMU, should coordinate the development of Standard Operating Procedures (SOPs) for collecting water samples throughout the range of the water column, including background or reference samples that address the spatial distribution of dispersed oil using applicable analytical methods. Oceanographic monitoring should be conducted while collecting water samples (see item 1 above), if practicable and as appropriate.
    a. Take discrete water samples at depths specified in the sampling and monitoring plan. The CTD rosette package (see item 4 above) should be capable of collecting discrete samples in the water column using a sufficient number of Go-Flo sampling bottles, or equivalent, with a volumetric capacity to provide water samples for all analyses, and using the live feed data stream. If practicable, vessels should have onboard GC with flame ionization detector (FID) capability to determine total petroleum hydrocarbons (TPHs).
    b. Conduct an oil analysis to determine the effects of the dispersed oil plume on aquatic life (e.g., toxicity) through standard testing methodologies. The analysis should be designed and implemented to determine whether the dispersed oil will persist in the

water column and the likelihood the dispersed oil will come in contact with the benthos community.

c. Water sample analysis should include:
   i. GC-MS analysis of aliphatic hydrocarbons, monocyclic (e.g., benzene, toluene, ethylbenzene, and xylene up to C_3-benzenes), polycyclic, and other aromatic hydrocarbons (PAHs) including alkylated homologs (e.g., 2-, 3-, and 4-ring PAHs (C_0-C_4-naphthalenes, C_0-C_3-fluorenes, C_0-C_3-dibenzothiophenes, C_0-C_4-phenanthrenes-anthracenes, C_0-C_4-naphthobenzothiophenes, C_0-C_2-pyrenes-fluoranthenes, C_0-C_4-chrysenes, and the pyrogenic PAHs)), and hopane and sterane biomarker compounds, TPH, and volatile organic compounds;
   ii. Dispersant constituents;
   iii. Ultraviolet (UV)/visible fluorescence for fluorescence intensity ratio (FIR). The RP should conduct spectrofluorometric analyses on discrete water samples using the two fixed emission wavelength spectrofluorometers (e.g., 340 and 445 nm) targeted to the source oil or a scanning spectrofluorometer on board ship to determine the FIR; and
   iv. Turbidity.

- **Key Indicators:**
    - Comparison of water sample data to ecological toxicity (ecotoxicity) benchmarks for aquatic organisms in order to assess potential toxicity risks.
    - Comparison to available Species Sensitivity Distribution (SSD) curves (see Section 6.0 *Ecological Toxicity Assessment*).
    - The FIR ranges that indicate effective chemical dispersion of the oil.

<u>Sediment Sampling and Monitoring (i.e., physical, chemical, and biological)</u>

Under certain circumstances sediment sampling and monitoring may be necessary for operational response decision making. Sediment sampling can be a means of gathering additional information on subsea dispersant effectiveness and oil transport by means of sedimentation. If the OSC, with the concurrence of EPA and, as appropriate, the states, and in consultation with DOC and DOI, determines sediment sampling and monitoring is warranted, the DEMU should coordinate the development of SOPs for collecting sediment samples, including reference areas (i.e., located in the same geographic area with similar characteristics but not impacted by the discharge). These SOPs should address the spatial distribution of dispersed oil using applicable analytical methods. In addition, observations on benthic fauna should be collected and analyzed (i.e., comparing the species composition and percentage impacted by dispersed oil or subsea dispersant to reference area analyses). The sampling and monitoring plan should include appropriate sediment sampling for quantitative analysis including, but not limited to, oil when applicable.

1) Sediment sampling and monitoring should include analysis of sediment from reference areas to serve as benchmark information. This information should be collected prior to any exposure to oil or direct application of dispersant.
    a. The analysis of reference data should include, but is not limited to, water and sediment in the immediate vicinity of the discharge, in the direction of likely transport (i.e., a direction that may periodically shift due to changes in the subsea currents), and in any direction toward the shoreline(s).

        - **Key Indicators:**
            - Observation of relative differences between samples for reference areas and potentially impacted areas.

2.2 Prolonged Surface Application Guidance

2.2.1 Background and Overview

Introduction

The *Prolonged Surface Application Guidance* is designed to supplement the existing monitoring protocols outlined in SMART where the duration of the application of dispersants on discharged oil extends beyond what was originally envisioned by SMART, the need for which was demonstrated during the *Deepwater Horizon* event. This guidance is designed to assist the OSC and those state and federal agencies participating in the authorization and monitoring of dispersant applications on oil discharges on the surface of the water.

Prolonged Surface Application Guidance General Scope and Assumptions

1) The *Prolonged Surface Application Guidance* is intended to supplement and not replace SMART protocols. This guidance assumes SMART monitoring activities through Tier 3 have already been deployed by the UC.

2) This guidance defines prolonged dispersant operations as **any operation expected to exceed 96 hours[2] or that has already exceeded 96 hours from the time of the first application of any dispersant.**

3) Monitoring should be implemented within 96 hours of an oil discharge where prolonged surface application of dispersants is anticipated, or earlier at the direction of the OSC.

4) Surface application of dispersants should be inclusive of dispersant applied via aircraft or vessel to the sea surface and either impacting or potentially impacting the upper 10 meters of the water column. In the event the SSC believes oceanographic circumstances justify monitoring to a greater depth, this definition may be expanded to include the water column from the surface to the mix layer.

[2] Timeframe based on 96 hours being a common exposure duration used in toxicological studies of dispersants.

2.2.2 Prolonged Surface Application Monitoring Recommendations

SMART Protocols

This guidance assumes that SMART protocols will be used for initial confirmation of dispersant effectiveness and deployed at the earliest time practicable for the response conditions. Additional guidance offered in this document focuses on issues not currently considered by the existing SMART program and should be considered as a supplement to and not a replacement for the existing SMART program.

Assessment of the Potential Dispersibility of Oil

In a prolonged dispersant operation, despite the possibility of a continuous source of fresh oil, it is likely that some portion of floating oil will eventually weather[3] to the point where dispersants no longer have the desired effect. By delineating an outer boundary, mission planners can better target aerial sorties and, by defining visual characteristics of non-dispersible oil, can improve the on-site pilot/spotter target determination. Having a better understanding of the oil characteristics under environmental conditions and providing trained spotters better visual cues will result in more appropriate targets selected, less chemical dispersant applied to poor quality targets, and greater stakeholder confidence that the dispersant used will be applied in the most effective manner.

Weathering of oil will not be entirely homogeneous throughout the impact area due to variations in temperature, wind speed, sea state, etc. However, it may be possible to define the outer limit of dispersibility by field testing, and to correlate it to appearance and/or modeling. SMART protocols were designed to evaluate the chemical effectiveness of a specific dispersant sortie on a specific target under existing environmental conditions. It was never intended to provide insight into oil at various stages of weathering that might result from a long, continuous release that might require a prolonged response.

The DEMU should examine the extent to which the oil in question remains susceptible to the selected dispersant under the actual field conditions. The DEMU can then provide site-specific guidance based on visual characteristics (i.e., predominately changes in color), geographic, or other cues. This examination can be informed by additional data generated from laboratory weathered and tested oil coupled with oil fate modeling.[4] Recommended modeling and field approaches are as follows:

1) *The Modeling Approach.*
    a. The oil in question should be weathered in the laboratory and tested as to its dispersibility using the same test employed by the DEMU field task force.
    b. As oil viscosity is an indicator of its dispersibility, measurement of increases in viscosity under artificial weathering conditions and comparison of these data to findings in the field can help calibrate predictive fate models.

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[3] Oil "weathering" describes the process of changes in the oil chemical and physical condition as a result of evaporation, photo-oxidation, water entrainment, and other factors.
[4] One such model is the NOAA *ADIOS-2*.

2) *The Field Approach.*
    a. Verify oil dispersibility based on weathering as a function of distance from the source and/or appearance.
    b. Using a boat equipped with dispersant spray arms and dispersant of the same type used for surface application, apply dispersant to previously untreated oil. Application rates, dispersant to oil ratios, and mixing times should resemble field operations as closely as possible.
    c. If time and logistics allow, try increasing the sampling mixing time for more viscous oils and emulsions.
    d. Shipboard equipment should include a field effectiveness test (such as SINTEF-FET and the Australian Nat-DET plan), a particle analyzer (such as a LISST), and a handheld thermal imaging camera to measure temperature differentials between effective and less effective dispersant/oil interactions.
    e. Samples of the treated and untreated oil should be obtained for both laboratory and shipboard analysis.
    f. Shipboard analysis and monitoring should include measurements of viscosity and effectiveness, as well as full photo documentation of oil before and after treatment.

3) *Reporting and Documentation.*
    a. The results of the field tests should be reported to the DEMU as soon as possible, or at least daily.
    b. *Spotters Guide.* Compile the results of field tests and laboratory analysis into a spotter's guide for use by both the DEMU and the SMART Spotters. The guide may include:
        i. Photographs of oil where dispersants are known to be effective and/or oil that is considered too weathered to be dispersed;
        ii. Geographic boundaries beyond which the oil is too weathered to be dispersed;
        iii. Model outputs; and
        iv. Other useful information.

<u>Water Column Loading and Assessment</u>
In the event of prolonged application of dispersant on the surface of the water in response to an oil discharge, personnel should be concerned about increasing concentrations of chemically dispersed oil in the water column. The UC should be prepared to implement SMART Tier 3 protocols. Further, the DEMU should deploy a field task force specifically and exclusively responsible to monitor and quantify water column loading over the timeframe of the approved dispersant operation. The field task force should use the same type of equipment and methods as those used by tactical SMART teams implementing SMART Tier 3 sampling protocols, including any additional methods and/or equipment (e.g., particle size analyzers) instructed by the UC. The protocols should compare water column data gathered as part of the application mission, taken at the highest probable concentration of chemically dispersed oil (immediate post application of the dispersant), with data collected 24 hours later. The data comparison should also include data gathered from samples collected in designated reference areas away from the dispersant operation.

1) *Sample Area.*
   a. Dispersed oil sampling should be conducted in the predicted plume of the oil that was dispersed 24 hours earlier. The DEMU should utilize trajectory and oceanographic models and, if appropriate, oil surrogates such as drogues and drifters, to guide the field task force to the most likely location of the plume.
   b. In order to not potentially contaminate the samples collected 24 hours following dispersant application with freshly dispersed oil, avoid water column loading sampling in areas where dispersant needs to be applied because of the presence of surface oil.

2) *Reference Areas.*
   a. Identify several suitable reference areas that are not impacted by the dispersant operation; it is not necessary that the reference areas be outside the oil-impacted area, provided chemical dispersants have not been used in the general vicinity.
   b. Sampling methods and equipment used in the reference areas should be the same as those employed in the study area.

3) *Sample Collection.*
   a. All sampling should be conducted in the manner prescribed by the SMART Tier 3 monitoring protocol and/or any supplemental protocols, including specifically the collection of discrete water samples at several depths up to 10 meters for laboratory for analysis.
   b. Carefully track both the location of the sampling and the time, and adjust as necessary to account for expanded monitoring depths.

4) *Water Column Loading Data Analysis.*
   a. Fluorometric and particle size data should be provided daily for analysis, processing, and dissemination to the UC and key decision makers. The UC may also want to consider collecting UV/visible fluorescence data to determine the FIR as an additional measure of dispersant effectiveness.
      i. Data should be charted to display a minimum of three data plots, including for immediate post application, for 24-hours post application, and for reference areas to confirm dispersant effectiveness.
   b. Discrete water samples should be analyzed within 24 hours, on-board ship if possible, using a GC with FID or MS detectors, to determine TPH and resolvable constituents. Because of the heterogeneous nature of oil in the water column, it is recommended that multiple samples be composited for analysis.

3.0 COMMUNICATIONS AND REPORTING

Effective communications and timely reporting of sampling and monitoring data is critical to inform decisions regarding the continued relative benefit of using a dispersant. Timely reporting is also crucial for effective communications with the general public. Sampling data and monitoring results addressed in the sampling and monitoring plan, including any additional or modified data requests approved by the UC, should be reported to the DEMU. The DEMU technical specialists should review and interpret the data and formulate recommendations for use in operational decision-making. The DEMU should report to the OSC those analyses relative to established action levels that would trigger modifications in the operation, including any “shut down” criteria. The OSC should communicate this information to the RRTs and the NRT as appropriate, through the RRT.

The DEMU should coordinate the design and implementation of a communication plan that addresses the UC established incident-specific goals and objectives. In response to a release and prior to the application of any dispersant, the DEMU should submit this communication plan to the OSC for review and approval, and should begin implementation upon notice from the OSC.

The communication plan should include a protocol addressing sample tracking, data management, data format, and mutually accessible digital data storage determined by the UC. A mutually accessible digital data storage protocol should be established. All data collected and/or analyzed by the RP or the government (with the exception of data and/or analysis strictly associated with NRDA or legal investigations) will be available to both the RP and the government.

The communication plan should also address data reporting, both for field data provided to the DEMU, and for analyses supported by that data provided to the OSC and key decision makers. Key indicator data for “shut down” criteria should be reported daily to the RRT with jurisdiction, and any agreed upon specific key indicators and/or benchmark data, as requested by the RRT with jurisdiction. These key indicators/benchmark data may be reported to the NRT, as appropriate, through the RRT.

All relevant sampling and monitoring results from field analytical teams and onshore laboratories, including collection methods and sampling locations, should be reported daily to the DEMU for review and evaluation. However, the UC may approve alternative reporting periods for specific sampling and monitoring activities based on its priorities, the time restrictions required for various analyses, and the time sensitivity of the measurement or data relative to future operational decisions. If practicable, real-time monitoring information and visual observations (e.g., trained aerial spotters) should be reported. Anomalies observed in the field, in the analysis, or resources at risk as well as key indicator data approaching defined action levels should be reported to the DEMU as soon as possible.

DEMU data reports should characterize the site, dispersant effectiveness, oil behavior, and any other relevant information specific to the incident. The reports guide operational decision-making and help communicate recommendations to pertinent stakeholders. Data analyses should be informed by, for example:

1) Droplet size distribution and FIR, which account for other key factors namely percent oil, percent water, and percent dispersant. The droplet size distribution analysis should include a discussion and analysis on the number mean diameter (NMD) and/or the volume mean diameter (VMD).

2) The actual amount of dispersant applied for the previous 24-hour period, in hourly intervals.

3) Variations in the planned subsea dispersant application plus or minus 10 percent of the previous daily average.

4) Water column loading and measurement reports.

5) Dispersing potential assessment reports and recommendations.

6) Updated subsea transport estimate of oil, dispersant, and dispersed oil plumes using the most current trajectory modeling as available.

4.0 QUALITY ASSURANCE PROJECT PLAN

The sampling and monitoring plans should include a Quality Assurance Project Plan (QAPP)[5] to address sample collection methodology, handling, chain of custody, and decontamination procedures to ensure the highest quality data will be collected and maintained. Discrete samples should be tested at a laboratory approved by the OSC, with the concurrence of EPA and, as appropriate the states, and in consultation with DOC and DOI. Triplicate samples should be collected and tested. All samples should be archived for potential future analysis. Where technically practicable, all samples should be at least 1 liter.

The QAPP should include the following components and criteria:

1) An introduction that identifies project objectives and the project staff.

2) A site description and background.
    a. The site description should include bathymetry, subsea currents (including temporal variations), and other relevant geological features.
    b. The site description should include relevant oil seeps or other potential sources of contamination (e.g., recent oil discharges), and relevant oil and/or natural gas infrastructure (e.g., oil platforms, subsea pipelines).

3) A description of the sampling and monitoring recommendations.
    a. A brief overview of sampling activities, data quality objectives, and health and safety implementation strategies (frequently, this references another specific document, but should be included in the QAPP).
    b. The actual sampling and/or monitoring approach, to ensure data repeatability and consistent procedures. The approach should describe sampling, monitoring, and field quality control (QC) procedures; spoil or waste disposal procedures resulting from this effort; and specimen/data handling issues.
    c. Management procedures to document how the samples will be procured, handled, and delivered. Address the expeditious and timely transport of samples to laboratories

[5] The QAPP should be consistent with EPA's QA/R-4 and 5 (http://www.epa.gov/quality/qa_docs.html).

where necessary, in order to minimize delays due to weather or other operational delays.

d. Instructions to address sample preservation (including acidification issues), containers, and hold times.

4) The analytical approach to determine what laboratory tests will be run, any special instructions, how the data will be verified, and how the data will be reported.

5) Quality assurance (QA) to address chain of custody procedures, field records including logs, and qualitative data handling, including photographs.

6) If multiple atypical dispersant applications are implemented, the DEMU is responsible for ensuring the effective coordination of all recommendations. The results from the monitoring plan should be provided daily to the OSC.

5.0 AIRBORNE VOLATILE ORGANIC COMPOUNDS

Volatile organic compounds (VOCs) should be measured in the vicinity of fresh oil. While this document does not specifically address worker safety, the data collected in this effort should be reported to the DEMU and the natural resource trustees to assess overall exposure to birds, marine mammals, and reptiles, all of whom breathe at the air–water interface. VOC data collected on a regular basis should be shared with the OSC and the natural resource trustees for the purposes of gauging potential environmental impacts to trustee resources.

1) The DEMU should address the need to monitor within the vicinity of the surfacing oil plume, including individual constituents of the VOCs.

2) The DEMU should coordinate the development of a diagram identifying the time and location of all VOC samples taken, and its reporting as instructed by the UC. The diagram should also identify any potential sources that may contribute to VOCs (e.g., vessel exhaust, oil collected on containment vessels).

3) The DEMU should coordinate the recording of the meteorological conditions (particularly wind speed) with all VOC measurements.

4) The DEMU should coordinate the collection and analyses of corresponding representative water samples and report the individual VOC constituents.

6.0 ECOLOGICAL TOXICITY ASSESSMENT

The DEMU, in consultation with the UC, should develop an ecological toxicity (ecotoxicity) assessment plan that incorporates ecotoxicity benchmarks derived by using a Species Sensitivity Distribution (SSD). SSDs are a probability distribution of the sensitivity of a group of species to a toxicant.

1) The toxicity plan should use the best available technology at the time of the response.

2) Monitoring for ecotoxicity should occur concurrently with dispersed oil sampling for fluorometry, particle size, and water quality (e.g., DO). Ecotoxicity may be assessed by comparing TPH concentrations in water samples collected at appropriate depths to TPH-based ecotoxicity benchmarks (EBs). The ecotoxicity assessment should also be performed in areas where no dispersant has been applied to allow determination and comparison of ecotoxicity from physically dispersed and chemically dispersed oil.

3) EBs should be derived using the SSD approach and made available to the UC. SSDs should be developed for representative oils (e.g., crude oils) using existing acute toxicity values for mortality or immobility (e.g., 48-hr and 96-hr lethal concentration, 50 percent (LC_{50})) where sufficient species diversity is available (e.g., toxicity data for 10 or more species). The EBs should be computed from the fifth percentile of the SSD as the HC_5 (hazard concentration, 5 percent). EBs may be developed for specific oils or for oil types (e.g., crude, middle distillate, heavy oil). Chronic toxicity benchmarks may be derived by applying a safety factor to the acute toxicity EBs. The development of the actual safety factors should be the responsibility of the approving authorities (including the federal natural resource trustees) with input from appropriate technical specialists.

4) Water samples collected for comparison of aqueous TPH concentrations to EBs should be analyzed within 24 hours of collection and reported within 48 hours of analysis to the UC, via the DEMU.

5) The UC may also consider additional ecotoxicity testing methods, in consultation with subject matter experts, to monitor whole water samples with considerations for:
    a. Site conditions (e.g., location of the discharge, weather conditions at the discharge, field water temperature);
    b. Operational relevance;
    c. Field ecological receptors at risk;
    d. Test organism availability; and
    e. Availability of testing equipment and/or laboratories.

   All sample collection and testing should be conducted using standardized sampling and test protocols. If standardized protocols cannot be followed due to existing conditions or alternate tests/methods are available, the test methods proposed for use should first be specifically approved through the OSC, with the concurrence of EPA and, as appropriate, the states, and in consultation with DOC and DOI.

7.0 ACTION LEVELS

1) The RRT in the incident specific authorization plan may establish action thresholds relative to the key indicators from monitoring operations. The OSC may propose new or alternative

action thresholds to the RRT. These thresholds and the actions they elicit should consider dispersant, oil, and dispersant mixed with oil toxicity data available on the NCP Product Schedule and SSDs for the chemical dispersant in use and other appropriate references, including region-specific toxicity data that may have been required by the RRT as part of a preauthorization process. These action thresholds should consider as much as practicable, region-specific biological data and input from the Scientific Support Coordinator, local resource managers, and other subject matter experts.

2) The actions prescribed, along with modifications in the operation, may include “shut down” criteria. These criteria should relate to specific key indicators and/or UC defined benchmarks in conditions such as, but not limited to, dramatic changes in dissolved oxygen, total petroleum hydrocarbon levels remaining in the water column after a defined period of time, persistent water column toxicity, and species of particular sensitivity (e.g., endangered species, whales, and rafting birds) moving into the area. **Any “shut down” criteria developed should consider the resource tradeoffs associated with dispersant use.**

APPENDIX A: ACRONYMS

ADCPs – Acoustic Doppler Current Profilers
BOEM – Bureau of Ocean Energy Management
BSEE – Bureau of Safety and Environmental Enforcement
CFR – Code of Federal Regulations
CTD – Conductivity, Temperature, and Depth Recorder
DEMU – Dispersant Environmental Monitoring Unit
DO – Dissolved Oxygen
DOC – (U.S.) Department of Commerce
DOI – (U.S.) Department of the Interior
EBs – Ecotoxicity Benchmarks
EU – Environmental Unit
EPA – (U.S.) Environmental Protection Agency
FID – Flame Ionization Detector
FIR – Fluorescence Intensity Ratio
GC-MS – Gas Chromatography-Mass Spectrometry
HAZWOPER – Hazardous Waste Operations and Emergency Response
HC – Hazard Concentration
LC – Lethal Concentration
LISST – Laser In-Situ Scattering and Transmissometry
NCP – National Oil and Hazardous Substances Pollution Contingency Plan
NEPA – National Environmental Policy Act
NMD – Number Mean Diameter
NOAA – National Oceanic and Atmospheric Administration
NRDA – Natural Resources Damage Assessment
NRT – National Response Team
OSC – On-Scene Coordinator
OSHA – Occupational Safety and Health Administration
OSRP – Oil Spill Response Plan
PAH – Polycyclic Aromatic Hydrocarbons
QA – Quality Assurance
QAPP – Quality Assurance Project Plan
QC – Quality Control
RP – Responsible Party
RRT – Regional Response Team
SMART – Special Monitoring of Applied Response Technologies
SOP – Standard Operating Procedure
SSC – Scientific Support Coordinator
SSD – Species Sensitivity Distribution
TPH – Total Petroleum Hydrocarbons
UC – Unified Command
USCG – United States Coast Guard
UV – Ultraviolet
VMD – Volume Mean Diameter
VOC – Volatile Organic Compounds