IN THE UNITED STATES DISTRICT COURT
FOR THE EASTERN DISTRICT OF LOUISIANA

In Re: Oil Spill by the Oil Rig "Deepwater Horizon" in the Gulf of Mexico, on April 20, 2010	* * * * * * * * * * *	**MDL NO. 2179** **SECTION J** **HONORABLE CARL J. BARBIER** **MAGISTRATE JUDGE SHUSHAN**

EXPERT REPORT OF ELLIOTT TAYLOR, PH.D.

August 15, 2014

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TREX-013246.000002

I. INTRODUCTION

1. My name is Elliott Taylor, Ph.D., and I am a scientist with over 30 years of experience in preparing for and responding to major oil spills, with an emphasis on shoreline response. I have been involved in the development of the Shoreline Cleanup Assessment Technique ("SCAT"), which is the accepted global standard for evaluating shoreline oiling and making cleanup recommendations. During the *Deepwater Horizon* Response, I served as the Lead Technical Adviser for the SCAT program in Mississippi, Alabama, and Florida.

2. I was retained by BP Exploration & Production Inc. ("BPXP")[1] to evaluate:

   a. the nature, extent, and degree of effectiveness of efforts to assess and treat shoreline oiling; and

   b. the impact to and recovery of the oiled shoreline, including beaches and marshes.

3. In addition to my education, experience, and the knowledge and information gained from my work on the *Deepwater Horizon* Response, I have reviewed and/or relied on the materials that are cited in this report and set forth in Appendix I to this report.

4. I am a principal at Polaris Applied Sciences, Inc. and others at Polaris, working under my direction and supervision, have assisted me in this matter. I am being compensated in this matter at a rate of $255 per hour. I have not previously testified as an expert at trial or in deposition. A list of my publications for the past ten years is attached as Appendix B.

B. Summary of Opinions

5. Based on the evidence I have reviewed and the analyses I have performed, I have reached the following opinions in this case to a reasonable degree of certainty:

   - The vast majority of the Gulf Coast shoreline was not oiled due to natural processes and the Unified Command's, including BP's, mitigation efforts;[2]

   - Unified Command's, including BP's, efforts to assess and treat shoreline oiling were comprehensive, thorough, and effective at cleaning the shoreline and accelerating recovery. The scope and thoroughness of the shoreline response, including the SCAT program, was unprecedented; and

   - The affected shorelines, including sandy beaches and marshes, have shown substantial recovery over time. Vegetation along marsh shorelines that were lightly or less oiled appeared to be largely indistinguishable from unoiled adjacent areas

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[1] Although BPXP is the Responsible Party and defendant in this case, for simplicity, the report will refer to BP.

[2] Analysis of the behavior and transport of oil-related materials in the environment is beyond the scope of this report.

within a year of the spill. Marsh shorelines that were impacted by moderate oiling experienced substantial recovery of vegetation within one to two years of the spill. For marsh shorelines that were impacted by heavy oiling, the vegetation at most of those initially heavily oiled sites appears to be recovering and, with the exception of a few of the most heavily oiled sites, appears to be comparable to or near the vegetation level of background sites.

II. QUALIFICATIONS AND EXPERTISE

6. I have more than 30 years of experience in preparing for and responding to major oil spills around the world, with an emphasis on shoreline response. My expertise includes oil spill response planning, implementation and management of the SCAT process, oil spill cleanup techniques and technologies, and oil fate and persistence on the shoreline. I have been involved in the development of the oil spill response process called SCAT (Shoreline Cleanup Assessment Technique), which was used in response to the *Deepwater Horizon* oil spill to assess shoreline oiling in order to direct shoreline treatment. Additional information about my experience and expertise is set forth in my CV, attached as Appendix A.

A. Educational Background

7. I earned a Bachelor of Science degree in oceanography from Universidad Autonoma de Baja California, received graduate training at the Scripps Institute of Oceanography at the University of California San Diego, and earned a doctorate in oceanography from Texas A&M University. I have taught undergraduate and graduate level courses in geology and oceanography and have taught courses world-wide on oil spill preparedness and SCAT. I have also conducted extensive field and laboratory research on beach and offshore sediment properties, and oceanography, as well as oil fate and persistence.

B. Professional Background

8. Since 1998, I have been a principal at Polaris, an environmental consulting firm specializing in technical and scientific support for oil spill response. In this role, my primary responsibilities are to provide spill response support as a technical adviser in incident management, planning, shoreline clean-up monitoring, natural resources damage assessment, and environmental affairs. I am an active researcher in oil spill countermeasures and planning with recent contributions made to the American Petroleum Institute ("API"), Marine Spill Response Corp., and Environment Canada.

9. I have responded to more than a dozen oil spills and I have been an Environmental Unit Leader or Team Member on emergency response for spill incidents including: *Exxon Valdez* (1989 and follow-up through 2006), *Barge 101* Alaska (1992), *Greenhill blowout* Louisiana (1992), *New Carissa* Oregon (1999), Bolivia *Transredes pipeline* (2000-2001), *Johnson Creek* Oregon (2004), *SOTE Pipeline* Ecuador (2004), *Torm Mary* Texas (2005), *Barge PB20* Washington (2005), *Selendang Ayu* Alaska (2004), *Kab 121 Well* Gulf of Mexico (2007), and *Lemon Creek* BC, Canada (2013). During these spill responses, I was responsible for assessing the nature and extent of oiling, recommending appropriate treatment for the oiled shoreline, and evaluating the fate and persistent of oil on the shoreline.

10. I have been implementing and helping to refine the SCAT process in the United States and around the world since 1989. I have contributed to manuals and field guides issued by the API concerning shoreline cleanup and response. In the past year, I have reviewed and collaborated on new API guidelines for shoreline response building on the experiences learned from response to the *Deepwater Horizon* incident including protection of sand beaches, detection of buried oil, inlet protection, and mechanical cleanup of oiled and shorelines.

11. I have experience in evaluating oil persistence and recovery having studied the shorelines and oil residue in Prince William Sound for years following the *ExxonValdez* spill. On other spills, I have evaluated the efficacy of the recommended treatments as a standard activity of SCAT in which teams review the shoreline post-treatment and determine if endpoints have been reached.

12. I am recognized as an oil spill expert by the International Maritime Organization ("IMO"), a United Nations specialized agency with responsibility for international shipping and prevention of marine pollution by ships. As an IMO expert consultant, I have been on teams conducting IMO model courses in oil spill response and have worked on regional and national planning initiatives. The IMO has also recommended me to lead multiple oil spill preparedness programs for several different sovereign governments, including Costa Rica, Nicaragua, Equatorial Guinea, and Mexico.

13. I have been responsible for the preparation of more than 100 oil spill contingency plans for companies throughout the United States, Canada, Caribbean, South America, the Middle East, Russia, and Africa. These comprehensive plans detail the procedures that would be used to control, contain and recover oil, if a spill were to occur, including implementation of the SCAT process.

14. I was the Technical Lead for the API on workshops and development of "Assessment of Oil Spill Response Capabilities: A Proposed International Guide for Oil Spill Response Planning and Readiness Assessment," presented in a special session of the 2008 International Oil Spill Conference. I also served as the Technical Lead on the follow-up initiatives sponsored by the joint Latin America Petroleum Industry (ARPEL) for development of the Oil Spill Response Planning and Readiness Assessment Manual and RETOS (Excel application) in 2011 and the 2014 upgrade.

C. Experience on the *Deepwater Horizon* Spill Response

15. BP hired Polaris to serve as its representative in the SCAT process for the *Deepwater Horizon* oil spill.[3] I began working on implementation of the SCAT program within days after April 20, 2010, and was a SCAT Coordinator and then Lead Technical Adviser for the SCAT program in Mississippi, Alabama, and Florida ("the Eastern States") until January 2013. I was directly responsible for supervising more than 50 SCAT personnel who surveyed the shoreline from the Mississippi/Louisiana border through Wakulla County, Florida.

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[3] Michel Deposition, p. 25 (Aug. 1, 2014).

16. In addition to my team, I worked closely with other members of the *Deepwater Horizon* shoreline response and SCAT programs, including federal and state representatives, to develop and implement procedures for assessment and treatment of shoreline oiling throughout the Gulf Coast. As part of my job, I have reviewed substantial volumes of data collected through the SCAT process. I also provided advice on shoreline treatment strategies and techniques to Unified Command, the entity managing the response to the *Deepwater Horizon* oil spill, which is composed of the Federal On-Scene Coordinator (the United States Coast Guard), State On-Scene Coordinators from each Gulf Coast state, and BP. I participated in numerous meetings with the Shoreline Program Managers, Environmental Unit leads, staff at the Incident Command Posts and subsequently at Gulf Coast Restoration Office branch offices, local officials and media, and SCAT Coordinators and Technical Advisers in Houma, Louisiana.

17. I have spent a significant amount of time on the Gulf Coast in connection with the *Deepwater Horizon* shoreline response and SCAT program. Specifically, I spent approximately 15 weeks working in the Gulf region from the end of April to December 2010 and made multiple trips to the Gulf shore after that time. I visited numerous sites in Mississippi, Alabama, and Florida in my role as Technical Lead for the SCAT program, including aerial surveys and ground surveys pre-oiling, at maximum oiling, and multiple times during cleanup. I led two area-wide SCAT team calibration efforts in 2011 and 2012 and conducted SCAT training with field surveys in Alabama and Mississippi. I visited beaches along portions of the Louisiana barrier islands (Fourchon, Grand Isle, and Grand Terre) during cleanup activities. In addition, I made a series of site evaluations of certain Louisiana wetlands on March 27, 2012, including aerial observations from a helicopter and ground observations from a boat. The aerial observations encompassed large portions of Louisiana wetlands, including the wetland areas from Barataria Bay west to Terrebonne Bay, and from Terrebonne Bay east toward South Pass near Venice, Louisiana. By boat, I evaluated some of the wetland areas from Myrtle Grove Marina to portions of northern Barataria Bay. At seven sites, I was able to get off the boat to examine the wetland areas.

III. UNIFIED COMMAND FRAMEWORK FOR SHORELINE RESPONSE

18. During the *Deepwater Horizon* Response, the federal government led the Response and set up a Unified Command structure that brought together government and non-government responders to coordinate an effective response.[4] The Federal On-Scene Coordinator ("FOSC") managed the Response, had the "final say" about whether specific response actions would be undertaken, and was authorized to direct and approve all response activities, including shoreline cleanup efforts.[5] The FOSC directed BP's response actions during the Response, including its efforts to locate and treat shoreline oiling.[6] BP, as a

4 Hein Deposition, p. 27 (July 9, 2014); Hanzalik Deposition, p. 21 (June 17, 2014).

5 Hein Deposition, pp. 24, 28 (July 9, 2014); Federal On-Scene Coordinator Report at TREX 9105.0025 (TREX 9105) (hereinafter "FOSC Report").

6 FOSC Report at TREX 9105.0025 (TREX 9105).

Responsible Party, played an active role in shoreline cleanup by providing funding, resources, and personnel and cooperatively participating in Unified Command.[7]

19. During the summer of 2010, the shoreline response program operated from Incident Command Posts at Houma, Louisiana, and Mobile, Alabama. The Houma Incident Command Post addressed shoreline oiling and response in Louisiana while the Mobile Incident Command Post did so for the Eastern States (Mississippi, Alabama, and Florida). In the fall of 2010, Unified Command consolidated command from these two posts into a Gulf Coast Incident Management Team ("GC-IMT") located in New Orleans.[8]

IV. UNIFIED COMMAND'S EFFORTS TO PROTECT THE SHORELINE FROM OILING

20. The *Deepwater Horizon* spill released oil into the waters of the Gulf of Mexico. To prevent impact to the shoreline, the first lines of defense in an offshore oil spill are the offshore and nearshore mitigation efforts. For the *Deepwater Horizon* spill, the *potential* impact of the spill was greatly reduced by Unified Command's, including BP's, efforts to fight the spill offshore and nearshore and to prevent the oil from reaching shore. Such efforts were instrumental in limiting the amount of oil that reached the shoreline.[9] Indeed, the amount of shoreline oiling that occurred was substantially less than what scientists had feared.[10] In the following section, I briefly describe offshore and nearshore spill response operations, as well as natural degradation and dispersion, that reduced the potential for shoreline oiling.

A. Natural Degradation and Dispersion Reduced Shoreline Oiling

21. Much of the MC252 oil released into the sea never reached the shoreline, in part, because of the natural processes of degradation and dispersion.[11] MC252 oil released into the sea

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7 FOSC Report at TREX 9105.0006, 025 (TREX 9105); Hein Deposition, pp. 28-30 (July 9, 2014).

8 Hein Deposition, p. 30 (July 9, 2014).

9 Hein Deposition, pp. 247, 254 (July 9, 2014); Austin Deposition, pp. 96, 103, 172, 252 (July 17, 2014); Kulesa Deposition, pp. 122, 223-224 (July 15, 2014); Utsler Deposition, p. 313 (June 27, 2014); Morrison Deposition, p. 172 (June 20, 2014); Interview Summary Form: Mike Utsler, pp. 1, 3-4, 6-7 (Oct. 22, 2010) (Exhibit 12295); Incident Specific Preparedness Review at TREX 009124.0016, 052, 055, 056 (TREX 9124) (hereinafter "ISPR") (concluding that "the use of [*in situ* burning] for this incident, coupled with dispersant applications, significantly reduced the amount of oil that might otherwise have impacted near-shore habitats and environmentally sensitive areas"); Hanzalik Deposition, pp. 43, 46-49 (June 17, 2014) (former Federal-On-Scene Coordinator testifying that *in situ* burning and dispersant application were effective in "preventing substantial amounts of oil from reaching the shoreline").

10 Grunwald, *The BP Spill: Has the Damage Been Exaggerated?*, TIME Magazine (July 29, 2010) (NOAA consultant stating that "[t]he impacts have been much, much less than everyone feared"); Vergano, Jervis, et al., *Measuring Full Damage From BP Oil Spill is Still Hard*, USA Today (Apr. 18, 2011) (NOAA consultant stating that "the amount of shoreline oiling is not as big as people feared").

11 An analysis of the natural processes of degradation and dispersion of MC252 oil is beyond the scope of this report. Lubchenco Deposition, pp. 87-90, 209-211 (July 10, 2014); *see also* Lubchenco, McNutt, et al., *Science in Support of the* Deepwater Horizon *Response*, pp. 6-7 (Dec. 11, 2012) (Exhibit 12500).

underwent changes due to natural processes, in addition to what was removed through spill response intervention.[12] Major oil weathering processes included evaporation, natural dispersion (small oil droplets), dissolution, photo-oxidation, and biodegradation.[13] Estimates vary on the percentages of MC252 oil that weathered through natural processes, and conservative estimates are that 25% evaporated or dissolved and 13% naturally dispersed.[14]

B. Offshore and Nearshore Mitigation Efforts

22. Operating within the Unified Command framework, BP engaged in myriad offshore mitigation efforts to prevent oil from reaching the shoreline.[15] Offshore, the mitigation efforts focused on skimming,[16] controlled *in situ* burning,[17] dispersant application,[18] and oil collection from near the wellhead to floating storage on tankers.[19] These spill response

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12 Miller Deposition, pp. 84, 86-87 (July 10, 2014); *see also* Lewan, Warden, et al., *Asphaltene Content and Composition as a Measure of* Deepwater Horizon *Oil Spill Losses Within the First 80 Days*, p. 2 (June 8, 2014) (Exhibit 12376) (estimating that during the first 80 days after the incident, approximately 61 percent of the original spilled oil was lost to evaporation and photo-oxidation); Email from Rear Adm. Korn to Rear Adm. Sturm, Rear Adm. Zukunft, et al. (Aug. 12, 2010) (Exhibit 12378) ("I think our experts believe that much if not most of the unaccounted for oil has either biodegraded or is part of the 42,000 tons of tarballs recovered.").

13 OSAT, Summary Report for Sub-Sea and Sub-Surface Oil and Dispersant Detection: Sampling and Monitoring, pp. 2, 6 (Dec. 17, 2010) (Exhibit 12237) (hereinafter "OSAT-1") (stating that "naturally occurring physical processes and the use of dispersants as a response option led to substantial quantities of dissolved and dispersed oil in the subsurface environment"); FOSC Report at TREX 9105.0054 (TREX 9105); Miller Deposition, p. 84 (July 10, 2014).

14 *See* United States' Third Supplemental Response to Defendants' First Set of Discovery Requests, p. 5 (July 9, 2014) (Exhibit 12198).

15 Santner, Cocklan-Vendl, et al., *The Deepwater Horizon MC252-Macondo Shoreline Cleanup Assessment Technique (SCAT) Program*, p. 5 (Feb. 15, 2011) (Exhibit 13005) (NOAA's SCAT Deputy Coordinator describing the efforts at sea to burn, recover, or disperse the floating oil from coming ashore as "phenomenal"); Hanzalik Deposition, pp. 27-32, 40-51, 81-83 (June 17, 2014); Hein Deposition, pp. 37-40, 49-50, 63-81, 116-117, 130-136 (July 9, 2014); Austin Deposition, pp. 96-97, 172-178, 202, 236 (July 17, 2014); Utsler Deposition, pp. 297-313 (June 27, 2014).

16 Hein Deposition, pp. 46, 48-49 (July 9, 2014).

17 FOSC Report at TREX 9105.0065-067 (TREX 9105) (stating that the response included "the largest *in situ* burn operation in U.S. history," and that *in situ* burning was a safe and effective way to remove large volumes of oil from the ocean surface); Hein Deposition, p. 46 (July 9, 2014).

18 FOSC Report at TREX 9105.0062 (TREX 9105) ("There was a consensus from the [late May 2010] LSU meeting that, up to that point, the use of dispersants and the effects of dispersed oil into the water column had generally been less environmentally harmful than allowing the oil to migrate on the surface into the sensitive wetlands and near-shore coastal habitats."); Lubchenco Deposition, pp. 99-100 (July 10, 2014); Kulesa Deposition, p. 210 (July 15, 2014); Utsler Deposition, pp. 241-242 (June 27, 2014); Deepwater Horizon Dispersant Use Meeting Report, p. 8 (June 4, 2010) (Exhibit 11839); Written Statement of Westerholm, Hearing on the Use of Dispersant for the Deepwater Horizon BP Oil Spill, p. 6 (Aug. 4, 2010) (Exhibit 12506).

19 ISPR at TREX 009124.0118 (TREX 9124) ("Of all oil spill response techniques used in the Deepwater Horizon incident, containment of the oil escaping at different spill sources on the seafloor proved to be one of the most

strategies were used to minimize the amount of oil that would reach the water surface, remain floating, and possibly reach shorelines.

23. In addition to offshore operations, BP engaged in extensive nearshore and onshore mitigation efforts to prevent oil from reaching the shore. The nearshore is generally defined as within state water or up to 3 nautical miles offshore. Methods and techniques utilized in the nearshore included booming of priority sensitive areas, oil recovery through skimming, and use of other barriers to prevent oil from reaching the shoreline.[20] In addition to conventional boom, Unified Command utilized various other barriers to prevent oil from reaching the shoreline, including closing off tidal channels to backshore ponds and lagoons, the use of silt curtains along portions of shorelines, floating rigid barriers, Hesco baskets, and Tiger boom.

Figure 1: Clockwise from upper left, sheet pile barriers, "Tiger" dam, Hesco baskets, and floating nearshore boom.

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successful methods in recovering large amounts of oil being discharged from the Macondo well."); FOSC Report at TREX 9105.0041-042 (TREX 9105).

[20] FOSC Report at TREX 9105.0005, 075 (TREX 9105) (stating that all priority environmental sites within the states of Mississippi and Alabama were boomed, and that a two-tiered booming system was deployed in Florida); ISPR at TREX 009124.0122-124, 132 (TREX 9124); Austin Deposition, pp. 178-181 (July 17, 2014); Kulesa Deposition, p. 61 (July 15, 2014) (agreeing that BP and the Coast Guard "were attempting to deploy boom in the most effective way possible"); Hanzalik Deposition, pp. 48, 210-211, 224, 262 (June 17, 2014); Hein Deposition, pp. 47-49 (July 9, 2014).

24. The offshore and nearshore mitigation tools, including *in situ* burning, surface application of dispersants,[21] and skimming, prevented substantial amounts of oil from reaching the shoreline.[22] The United States estimates that approximately 75% of the oil released from the MC252 well did not reach the shoreline. Instead, it was evaporated or dissolved, or was dispersed (naturally or chemically), burned, skimmed, or removed from the Gulf of Mexico via collection efforts.[23]

25. Due to the location of the release and natural processes, as well as the strategic and large-scale efforts to prevent oil from reaching the shoreline, the vast majority of the Gulf of Mexico shoreline was never oiled by MC252 oil. By October 2010, the SCAT teams had surveyed over 3,600 miles of Gulf of Mexico shoreline from Louisiana to Florida. There was ***no oil observed*** on over 3,100 miles, or approximately 85%, of the total miles surveyed.[24] In 2010, SCAT teams surveyed approximately 2,760 miles of Louisiana's wetland shorelines and found that, as a result of oil trajectories and the significant offshore and nearshore mitigation efforts, only 430.5 miles were oiled to *any* degree.[25] By October 2010, the degree of oiling in the Eastern States of Mississippi, Alabama, and Florida, was predominantly (97%) in the Light to Trace Oiling Categories, reflecting the success of offshore mitigation efforts.[26]

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21 Although the offshore mitigation efforts, including dispersant application, were effective, shoreline oiling increased after the EPA placed limitations on the application of aerial and subsea dispersants. *See* FOSC Report at TREX 9105.0057 (TREX 9105) (identifying a strong correlation between limitations on dispersants and increased shoreline oiling).

22 FOSC Report at TREX 9105.0064 (TREX 9105) (concluding that "dispersants were an effective response tool, and prevented millions of gallons of oil from impacting the sensitive shorelines of the GOM states"); ISPR at TREX 009124.0016, 052, 055-056 (TREX 9124) (concluding that *in situ* burning "proved to be an effective tool" during the response, and that this burning, "coupled with dispersant applications, significantly reduced the amount of oil that might otherwise have impacted near-shore habitats and environmentally sensitive areas"); Hanzalik Deposition, pp. 43, 46-48 (June 17, 2014) (former Federal-On-Scene Coordinator testifying that *in situ* burning and dispersant application were effective in "preventing substantial amounts of oil from reaching the shoreline").

23 *See* United States' Third Supplemental Response to Defendants' First Set of Discovery Requests, p. 5 (July 9, 2014) (Exhibit 12198).

24 Owens, Santner, et al., *Shoreline Treatment During the Deepwater Horizon-Macondo Response*, p. 8 (Feb. 2011) (Exhibit 13006); Michel, Owens, et al., *Extent and Degree of Shoreline Oiling*, p. 4 (June 2013) (Exhibit 12199).

25 Owens, Santner, et al., *Shoreline Treatment During the Deepwater Horizon-Macondo Response*, p. 3 (Feb. 2011) (Exhibit 13006).

26 Owens, Santner, et al., *Shoreline Treatment During the Deepwater Horizon-Macondo Response*, p. 4 (Feb. 2011) (Exhibit 13006).

V. THE *DEEPWATER HORIZON* SHORELINE RESPONSE EFFECTIVELY ASSESSED AND TREATED SHORELINE OILING

26. Not only did Unified Command and BP mount an offshore campaign to fight the spill, but they rapidly established a comprehensive plan to respond to shoreline oiling. By April 28, 2010, before any MC252 oil reached the shore, Unified Command had established a shoreline program to assess and treat oiled shoreline.[27]

27. After oil came ashore, Unified Command utilized SCAT to assess and document the location, degree, and character of shoreline oiling using standard methods and terminology.[28] Next, multiple stakeholders from the federal and state governments and BP determined appropriate cleaning techniques and cleanup endpoints for the affected shorelines.[29] The overriding principle remained constant throughout the *Deepwater Horizon* shoreline response: cleanup should not delay recovery or cause more damage than the oil itself.[30] The *Deepwater Horizon* SCAT program was a robust, valuable, and effective tool at assessing and treating shoreline oiling.[31]

28. The shoreline response program for the *Deepwater Horizon* oil spill consisted of four "stages" as well as the procedures set out in the Deepwater Horizon Shoreline Clean-up Completion Plan (SCCP), which I address in Section V.D.[32] The shoreline program addressed oiling in a rigorous, systematic manner, and included repeated shoreline surveys and treatment actions.[33] The staged shoreline response program, including the SCAT process, enabled dramatic reductions in shoreline oiling as well as accelerated shoreline recovery.

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27 Michel, Owens, et al., *Extent and Degree of Shoreline Oiling*, p. 4 (June 2013) (Exhibit 12199); Owens, Santner, et al., *Shoreline Treatment During the Deepwater Horizon-Macondo Response*, p. 1 (Feb. 2011) (Exhibit 13006).

28 Michel Deposition, p. 69 (Aug. 1, 2014).

29 Michel, Owens, et al., *Extent and Degree of Shoreline Oiling*, p. 4 (June 2013) (Exhibit 12199); Near Shore and Shoreline Stage I and II Response Plan, Mobile Sector (N9G007-000107).

30 Santner, Cocklan-Vendl, et al., *The Deepwater Horizon MC252-Macondo Shoreline Cleanup Assessment Technique (SCAT) Program*, p. 6 (Feb. 15, 2011) (Exhibit 13005); Michel Deposition, pp. 160-161 (Aug. 1, 2014).

31 Santner, Cocklan-Vendl, et al., *The Deepwater Horizon MC252-Macondo Shoreline Cleanup Assessment Technique (SCAT) Program*, p. 9 (Feb. 15, 2011) (Exhibit 13005); Michel Deposition, p. 266 (Aug. 1, 2014).

32 *See* Michel Deposition, p. 94 (Aug. 1, 2014).

33 *See* Shoreline Clean-up Completion Plan (Exhibit 12184); Near Shore and Shoreline Stage I and II Response Plan for LA Division (N5C001-001879); SCAT - Shoreline Treatment Implementation Framework for LA (CGL001-0221060); DWH 2011 Shoreline Plan for LA (HCG289-007051); DWH 2011 Shoreline Cleanup Assessment Technique Plan for AL / FL / MS (HCG390-015082); Gulf Coast Incident Management Team Phase III Response Activities Completion Plan (US_PP_USCG258785); Owens, Santner, et al., *Shoreline Treatment During the Deepwater Horizon-Macondo Response*, pp. 1, 3 (Feb. 2011) (Exhibit 13006).

A. The Shoreline Cleanup Assessment Technique is a Well-Established Method for Evaluating Shoreline Oiling and Making Treatment Recommendations

29. SCAT is a multi-step, systematic approach to assessing shoreline oiling and developing cleanup treatment recommendations.[34] The objective of SCAT is to identify shoreline cleanup operations that will accelerate the removal and natural weathering of stranded oil so that the ecosystem can return to pre-spill conditions as soon as possible using practices that are best for the environment.[35] The SCAT process involves systematically segmenting the shoreline into discrete segments based on a combination of factors, such as physical features, distance, and natural barriers.[36] Then, SCAT teams survey the shoreline segments, by aerial, boat, and ground surveys, to document the shoreline oiling conditions as well as the presence of sensitive natural and cultural resources.[37] Where SCAT teams locate shoreline oiling, they record detailed information about the extent and character of oiling conditions, including the oil distribution (*i.e.*, length and width of bands, locations, and percent oil within bands), oil character (*e.g.*, fresh, tarball), oil thickness, and oil depth.[38] The SCAT teams' assessments include both surface and buried (or subsurface) oil.

Figure 2: SCAT teams surveyed the shoreline on foot and by boat.

30. SCAT teams also recommend appropriate treatment procedures based on the level and type of oiling and the shoreline characteristics.[39] The SCAT data is used to determine the

[34] Michel Deposition, pp. 36-38 (Aug. 1, 2014).

[35] FOSC Report at TREX 9105.0084 (TREX 9105); Email from Nantel to Yender, Michel, et al. (Sept. 20, 2010) (Exhibit 13009) (outlining the strategy for teleconferences with Alabama and Mississippi officials and the media regarding the SCAT program); Michel Deposition, pp. 61-62, 159-160 (Aug. 1, 2014); SCAT Shoreline Response Completion Strategy (July 20, 2010) (US_PP_NOAA077047).

[36] FOSC Report at TREX 9105.0084 (TREX 9105).

[37] FOSC Report at TREX 9105.0084 (TREX 9105); Near Shore and Shoreline Stage I and II Response Plan, Louisiana Division (Exhibit 13012); MC 252 Stage III, SCAT-Shoreline Treatment Implementation Framework for Louisiana (CGL001-0221078) (Exhibit 13013); Michel Deposition, pp. 67, 267 (Aug. 1, 2014).

[38] Michel Deposition, pp. 93-94 (Aug. 1, 2014).

[39] FOSC Report at TREX 9105.0084 (TREX 9105); Hein Deposition, pp. 56-59 (July 9, 2014); Hanzalik Deposition, pp. 219-221 (June 17, 2014); Michel Deposition, pp. 62-63, 71-72 (Aug. 1, 2014).

appropriate response for a specific shoreline segment, *i.e.*, how best to remove oil given the different shoreline habitats, type and degree of shoreline oiling, site-specific processes, and resources at risk.[40] The SCAT data is also used to evaluate changes in oiling levels over time and shoreline recovery.

31. For the past 25 years, SCAT has been the accepted standard around the world for evaluating shoreline oiling to guide response activities.[41] The SCAT process is a well-established and internationally recognized component of spill response and is part of procedures adopted by the National Oceanic and Atmospheric Administration ("NOAA"), Environment Canada, the U.S. Coast Guard and the Environmental Protection Agency ("EPA"), and numerous U.S. Area Contingency Plans.[42] Moreover, it is used in oil spill response programs in many other countries.[43] The *Deepwater Horizon* SCAT program utilized the traditional SCAT model, but as discussed below, enhanced and tailored certain aspects to accommodate the circumstances encountered during the *Deepwater Horizon* Response.

B. The *Deepwater Horizon* SCAT Program Comprehensively Assessed and Documented the Nature and Extent of Shoreline Oiling

32. The *Deepwater Horizon* SCAT process took a rigorous and thorough approach to assessing and documenting the nature and extent of shoreline oiling.[44] Further, the SCAT process was particularly valuable and effective in making treatment recommendations for oiled shoreline.[45] My team and others at Polaris worked on behalf of BP with representatives from the Gulf States, NOAA, the Department of Interior ("DOI"), and the U.S. Coast Guard to cooperatively implement SCAT in the geographic area from the Florida Keys through Louisiana.[46] The SCAT program was managed consistently across all affected states.[47]

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40 Michel, Owens, et al., *Extent and Degree of Shoreline Oiling*, pp. 1-2, 4 (June 2013) (Exhibit 12199).

41 Miller Deposition, p. 49 (July 10, 2014); Austin Deposition, p. 169 (July 17, 2010); Michel, Owens, et al., *Extent and Degree of Shoreline Oiling*, p. 1 (June 2013) (Exhibit 12199).

42 Michel, Owens, et al., *Extent and Degree of Shoreline Oiling*, p. 1 (June 2013) (Exhibit 12199); NOAA, Shoreline Cleanup and Assessment Technique (SCAT), http://response.restoration.noaa.gov/oil-and-chemical-spills/oil-spills/resources/shoreline-cleanup-and-assessment-technique-scat html (last visited Aug. 15, 2014).

43 *See also* Email from Rear Adm. Nash to Rear Adm. Landry, Rear Adm. Zukunft, et al. (Mar. 22, 2011) (Exhibit 12542) (explaining that SCAT is a "[h]ighly professional, stakeholder inclusive, unified approach to evaluating oiled beach and marshes, and consultation on methods to clean up or to determine 'no further treatment' was appropriate, appeared to be effective").

44 Michel Deposition, pp. 62-64 (Aug. 1, 2014) (NOAA SCAT Coordinator testifying that the *Deepwater Horizon* Response involved "[t]he systematic documentation of shoreline oiling through time," "[e]xpert assessment of the potential fate and effects of the stranded oil," and "the provision of ongoing data on response progress").

45 Michel, Owens, et al., *Extent and Degree of Shoreline Oiling*, p. 2 (June 2013) (Exhibit 12199).

46 Hanzalik Deposition, p. 224 (June 17, 2014) (agreeing that BP and other entities in the Unified Command "work[ed] cooperatively and effectively together through the SCAT process to assess the degree and location of shoreline oiling ... [and] to propose shoreline treatment recommendations"); Hein Deposition, pp. 56-57, 67-68 (July 9, 2014) (acknowledging that BP and other Unified Command members "work[ed] cooperatively together

33. At the outset of the Response, Unified Command prepared, reviewed, and approved a SCAT Shoreline Cleanup Plan setting forth the key SCAT processes and ensuring that shoreline responders were operating from a common set of objectives and methods.[48] Aerial SCAT reconnaissance and SCAT ground surveys began on May 4, 2010 before MC252 oil reached the shore, complementing offshore aerial surveillance that had been implemented during the initial response.[49] Before oil arrived onshore, the SCAT teams collected data on background oiling along the Gulf Coast, although their surveys were not intended to and did not comprehensively assess all background oiling along the entire coast. Background oiling is the chronic concentration of oil residue or tarballs that are present on the shoreline over the long term without a major oil spill event. Sources of background oiling include natural hydrocarbon seeps from the sea floor, commercial shipping activities, and offshore oil production in the Gulf.[50] Background oiling is commonplace on the Gulf Coast around oil production facilities and ports.[51] The May 2010 SCAT surveys that took place before the arrival of MC252 oil found that there were as many as 309 tarballs per mile of sand beach and over 2,100 tarballs along 390 miles of the Gulf Coast.[52].

34. The SCAT teams were staffed with objective and trained inter-agency personnel that represented the interests of the lead federal and state agencies and BP.[53] Each SCAT team had, at a minimum, a BP representative, a federal representative, and a state representative.[54]

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through the SCAT process to assess the extent of the oiling," "to identify shoreline treatment recommendations," and "to clean up the oiling that occurred").

47 FOSC Report at TREX 9105.0082 (TREX 9105); Michel Deposition, pp. 69-70 (Aug. 1, 2014) (agreeing that "consistency among [SCAT] teams over time was essential," and that "a deliberate effort was made to maintain the same cadre of team leaders throughout the response").

48 Deepwater Horizon [MC-252] Shoreline Cleanup Assessment Team (SCAT) Plan, Mobile Sector (PCG075-059933).

49 Owens, Santner, et al., *Shoreline Treatment During the Deepwater Horizon-Macondo Response*, p. 3 (Feb. 2011) (Exhibit 13006).

50 Deepwater Horizon 2011 Shoreline Cleanup Assessment Technique (SCAT) Plan for Alabama / Florida / Mississippi (N7X010-000026); GoMRI Poster (BP-HZN-2179MDL09111855).

51 *See* Memo from Cpt. Hanzalik to RRT VI Participants, p. 4 (May 13, 2010) (Exhibit 12509) ("MMS estimates that natural oil seeps discharge up to 40 million gallons of oil a year into the Gulf of Mexico…."); Lubchenco Deposition, pp. 217:2-5, 223:21-224:4 (July 10, 2014) (explaining that hydrocarbons naturally seeped into the Gulf of Mexico prior to and during the Response).

52 GoMRI Poster (BP-HZN-2179MDL09111855-856). This background oiling is consistent with pre-MC252 scientific studies in which tarball concentrations were noted as typically ranging from 0.5 – 47 g/m for LA (Henry et al., 1993) to 0.2 - 1.2 g/m on FL coasts (Romero et al., 1981).

53 *See* Hein Deposition, pp. 55-57 (July 9, 2014); Hanzalik Deposition, pp. 219-220 (June 17, 2014); Michel Deposition, pp. 23-32 (Aug. 1, 2014); FOSC Report at TREX 9105.0084 (TREX 9105); Santner, Cocklan-Vendl, et al., *The Deepwater Horizon MC252-Macondo Shoreline Cleanup Assessment Technique (SCAT) Program*, p. 4 (Feb. 15, 2011) (Exhibit 13005).

54 Near Shore and Shoreline Stage I and II Response Plan, Mobile Sector (N9G007-000107).

The same group of SCAT field team leaders was maintained throughout the program to provide a professional and high-quality knowledge base.[55] Teams also included, as appropriate, representatives for cultural resource protection (archaeologists), natural resource advisers, local government (*e.g.*, Louisiana parishes), and representatives of landowners, land management, or trustee interests.[56] With input from various stakeholders, Unified Command achieved a unified and cooperative approach to the SCAT process.[57]

35. The *Deepwater Horizon* SCAT program divided the Gulf coastline into relatively small segments or zones, which typically ranged in size from a few hundred meters to a few kilometers, depending on the characteristics of the shoreline.[58] The SCAT teams systematically and repeatedly surveyed segments primarily on foot although some areas were limited to surveys by boat, meticulously searching for and documenting oiling conditions.[59] Additionally, aerial reconnaissance missions helped guide the SCAT teams to shoreline oil. When warranted, teams also dug pits or trenches to search for subsurface oil, as well as searched for oil in nearshore waters.[60] As described below in Section V.C, SCAT teams reported the results of these surveys to Unified Command for use in planning shoreline treatment activities. The SCAT teams made every effort to survey every Gulf Coast shoreline that was at risk of oiling in addition to all shoreline areas where MC252 oil was observed by SCAT, operations personnel, or other responders under the Unified Command team.[61] For example, SCAT surveys extended to the western border of Louisiana, despite the fact that no oil was observed by SCAT west of Vermillion Parish, Louisiana.[62] Similarly, although the SCAT teams did not observe any oil east of Franklin County, Florida, SCAT surveys

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55 Owens, Santner, et al., *Shoreline Treatment During the Deepwater Horizon-Macondo Response*, p. 3 (Feb. 2011) (Exhibit 13006).

56 Hein Deposition, pp. 80-81 (July 9, 2014); *see also* Michel Deposition, pp. 36, 151 (Aug. 1, 2014).

57 FOSC Report at TREX 9105.0084 (TREX 9105); OSAT-3, Investigation of Recurring Residual Oil in Discrete Shoreline Areas in Louisiana, p. ii (Dec. 2013), *available at* http://www restorethegulf.gov/release/2014/05/02/operational-science-advisory-team-iii-louisiana (hereinafter "OSAT-3 (Louisiana)"); Santner, Cocklan-Vendl, et al., *The Deepwater Horizon MC252-Macondo Shoreline Cleanup Assessment Technique (SCAT) Program*, p. 9 (Feb. 15, 2011) (Exhibit 13005).

58 *See* Hein Deposition, p. 57 (July 9, 2014); Michel Deposition, pp. 72-73 (Aug. 1, 2014) (agreeing that shoreline segments in Louisiana were divided "carefully and accurately").

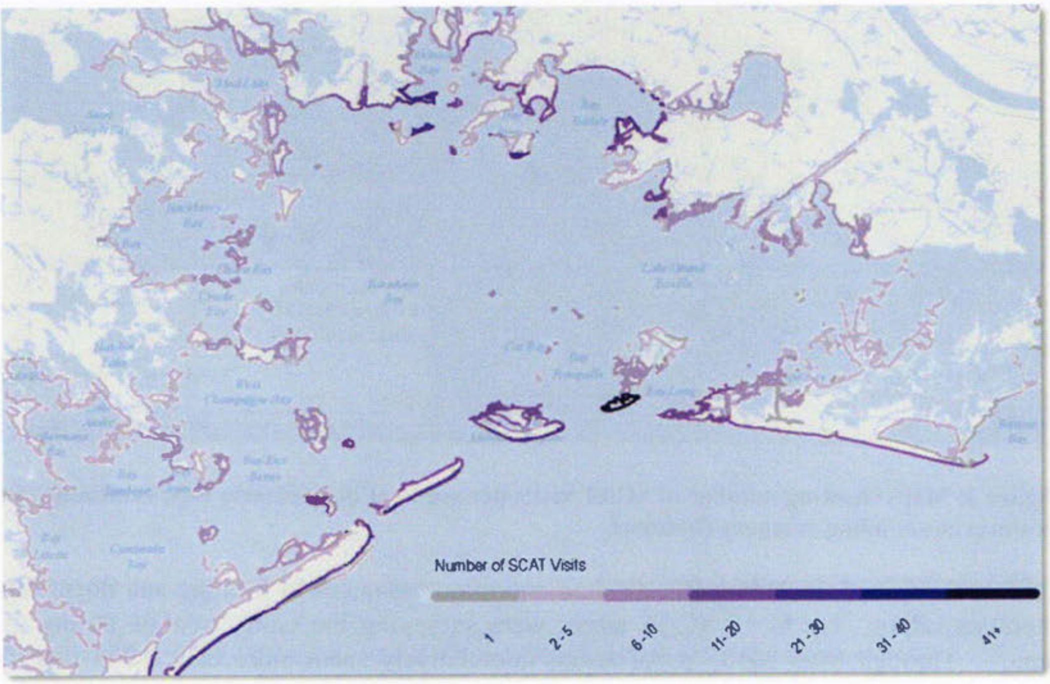
59 *See* Hein Deposition, p. 58 (July 9, 2014) (admitting that SCAT surveys "extended beyond areas where MC252 oil had been observed"); Michel, Owens, et al., *Extent and Degree of Shoreline Oiling*, p. 2 (June 2013) (Exhibit 12199).

60 Hein Deposition, pp. 57-58, 67 (July 9, 2014).

61 *See* Hein Deposition, pp. 58-59 (July 9, 2014); Email from Michel to Debosier et al. (Aug. 15, 2012) (Exhibit 13007) (explaining the "the SCAT Program has made every effort to survey every shoreline that was at risk of oiling during this spill"); Michel Deposition, p. 157 (Aug. 1, 2014).

62 Texas reported trace oiling along 36 miles (58 kilometers) of their coast, but did not use the Unified Command SCAT teams and was surveyed only once. *See* Michel, Owens, et al., *Extent and Degree of Shoreline Oiling*, p. 6 (June 2013) (Exhibit 12199); Michel Deposition, pp. 144-145 (Aug. 1, 2014).

extended east through Wakulla County, Florida. Moreover, SCAT teams made repeated visits to shorelines at risk of oiling and re-surveyed areas that were never oiled for reasons of thoroughness and in response to requests from States and Unified Command. The maps in Figure 3 reflect the number of repeat SCAT visits conducted in Barataria Bay, Louisiana, including to shoreline segments where oil was never observed. This highlights the rigorous and thorough nature of the SCAT process.



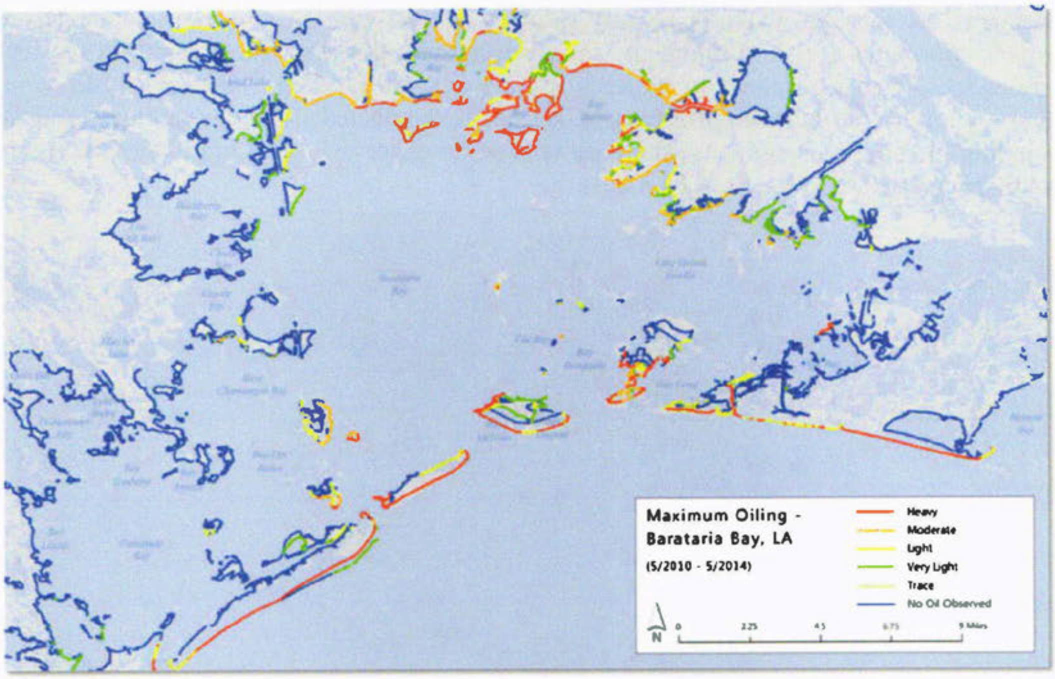


Figure 3: Maps showing number of SCAT visits per segment in Barataria Bay, Louisiana (top) and maximum oiling category (bottom).

36. Unified Command, including BP, devoted enormous resources to locating and documenting shoreline oiling. Up to 18 SCAT teams were surveying the Gulf coastline at any given time.[63] Through May 2013, SCAT teams cumulatively spent more than 7,000 field days conducting surveys of more than 4,000 shoreline segments.[64] SCAT teams were deployed daily with the exception of days with weather or safety concerns.[65] In total, SCAT teams surveyed ***more than 4,300 miles*** of shoreline in the Gulf, from Wakulla County, Florida through Louisiana.[66] Because SCAT teams conducted repeat surveys on the shore,

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63 Michel, Owens, et al., *Extent and Degree of Shoreline Oiling*, p. 2 (June 2013) (Exhibit 12199).

64 *See* Michel Deposition, pp. 87-88 (Aug. 1, 2014) (agreeing that "SCAT teams completed an extensive number of surveys and worked an extensive number of … field days").

65 Deepwater Horizon [MC-252] Shoreline Cleanup Assessment Team (SCAT) Plan, Mobile Sector (PCG075-059933, 937) ("SCAT survey teams will be briefed daily on safety, tides, currents and weather forecast information…. In the event of lightning, high winds or seas, or other hazardous weather SCAT operations will be immediately suspended and team members will return to the command post."); *see also* Michel Deposition, pp. 153-154 (Aug. 1, 2014) (describing Louisiana as a "tough place" for SCAT teams to work, in part, because portions of its shoreline were only accessible by boat and posed unsafe conditions such as wind, waves, and lightning).

66 *See* Email from Michel to Debosier, Csulak, et al. (Aug. 15, 2012) (US_PP_NOAA147896, 897) (explaining that as of August 15, 2012, "4,385 miles of unique shoreline in Louisiana have been surveyed").

repeatedly surveying the same shoreline segment over time, the SCAT teams ultimately surveyed ***more than 28,000 miles*** by ground survey.[67]

37. As a result of painstaking and rigorous efforts to locate and document MC252 oiling on the shoreline, the SCAT data is the most comprehensive and reliable source of data about the extent and degree of shoreline oiling associated with the *Deepwater Horizon* oil spill.[68] Indeed, a large number of stakeholders, including federal agencies, relied on the quality and objectiveness of the SCAT field data to support decision-making at all levels of the Response.[69] Although there are other sources of information about MC252 oil in the Gulf of Mexico, such as satellite or aerial imagery, such sources are not reliable indicators of the extent and degree of shoreline oiling.

38. Following each SCAT field survey, SCAT teams completed detailed data forms that described the survey observations, including the size and location of the segment searched, the type and location of any oil observed, and the duration and method of survey (*i.e.*, on foot, by boat, etc.).[70] Daily debriefings typically were held to capture key findings and assist in preparing daily SCAT summary reports for Unified Command.

39. Oil observed by SCAT teams was classified as either heavy, moderate, light, very light, or trace, using a standardized, objective categorization system that takes into account the width of the oil band, the distribution of oil in that band, and the average thickness of the oil (see Oiling Category Matrix in Appendix C).[71] The SCAT teams also carried hand-held devices that collected data concerning GPS coordinates and took geo-referenced photographs of shoreline oiling during surveys.[72] This data was subjected to rigorous automated and visual review to confirm quality.[73] Final, agreed-upon data forms were transmitted to Unified Command.

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67 *See* SCAT Data.

68 Email from Michel to Debosier, et al. (May 24, 2014) (BP-HZN-2179MDL09216014) (NOAA's SCAT Coordinator acknowledged that "the SCAT data collected for the Louisiana and Eastern States were complete, well-documented, and suitable to use for tabulation of shoreline oiling statistics.")

69 Michel Deposition, pp. 70-71, 81-82 (Aug. 1, 2014).

70 Michel Deposition, pp. 81-82 (Aug. 1, 2014) (agreeing that SCAT data "was the most important data collected to support the [shoreline] cleanup effort").

71 Michel, Owens, et al., *Extent and Degree of Shoreline Oiling*, p. 2 (June 2013) (Exhibit 12199); Michel Deposition, pp. 106-107 (Aug. 1, 2014). "Trace" also is used as a category representing "tarball" conditions; that is, no distinct oiling band or continuous oiling but instead discrete oiled particulates less than 10cm in diameter.

72 *See, e.g.*, SCAT photographs (BP-HZN-2179MDL08998242; BP-HZN-2179MDL08998243; BP-HZN-2179MDL08997661).

73 Michel Deposition, pp. 70, 304-305 (Aug. 1, 2014).

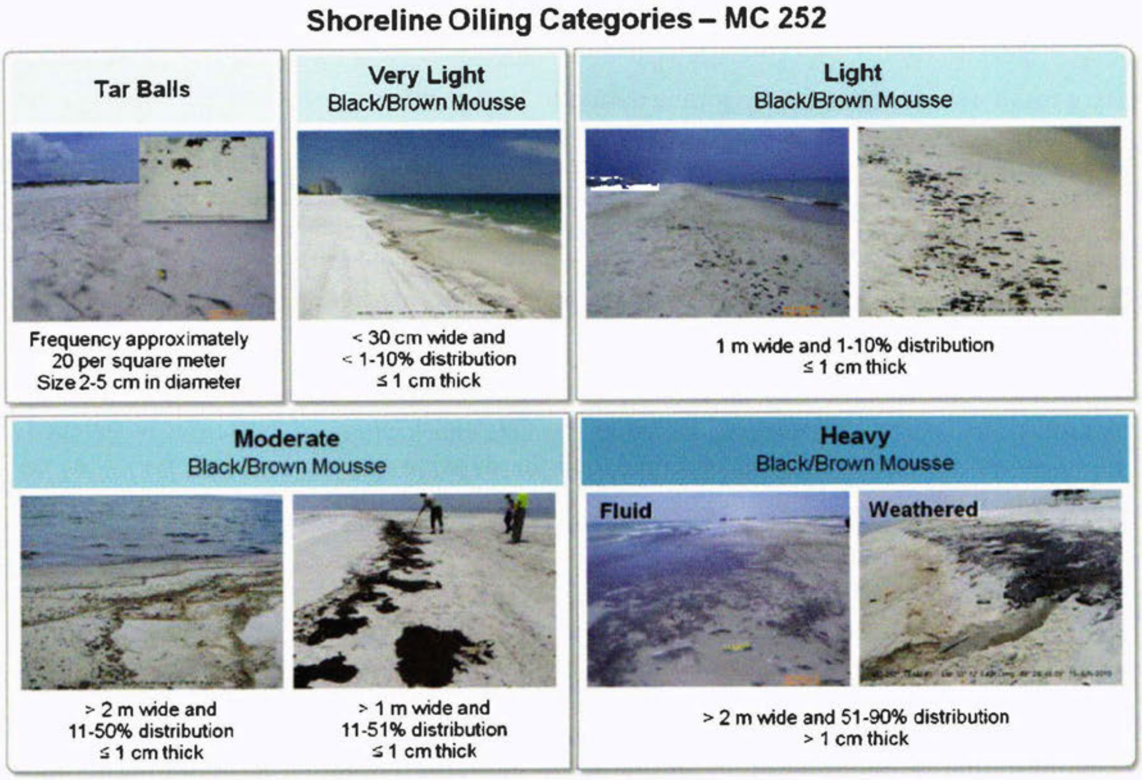

Figure 4: Shoreline oiling categories for *Deepwater Horizon* shoreline response

40. The information in the data forms was used to create maps that reflect the character and level of oiling on the shoreline over time, including the Maximum Oiling Observed map, which shows all the SCAT segments that were surveyed and the highest level of oil observed in each segment (heavy, moderate, light, etc.).[74] A map depicting maximum oiling levels and changes in oiling levels over successive years is shown below in Figure 5.

[74] Michel, Owens, et al., *Extent and Degree of Shoreline Oiling*, p. 4 (June 2013) (Exhibit 12199). NOAA, EPA, and the University of New Hampshire published these maps on the Environmental Response Management Application ("ERMA") website. *See* ERMA Deepwater Gulf Response, http://gomex.erma.noaa.gov/ (last visited Aug. 15, 2014).

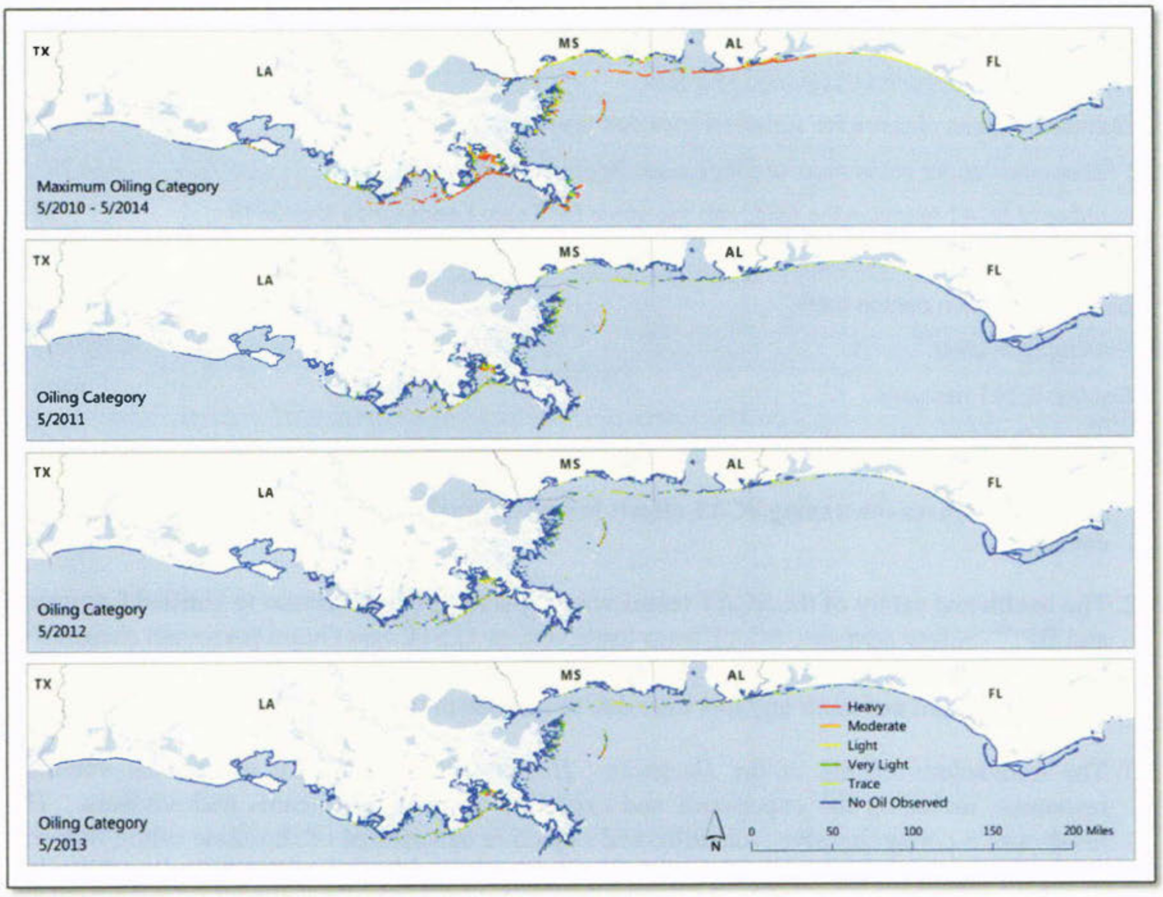

Figure 5: The SCAT survey data was used to characterize shoreline surface oiling throughout the response. The maximum oiling category (top panel) shows the highest category ever documented for each segment. By May 2011, 88% of the 4,324 miles of total shoreline surveyed had no observed oil.

41. The level of effort that SCAT teams dedicated to surveying the Gulf Coast, locating and assessing oil conditions, and searching for buried oil, was unprecedented and is reflected in a summary statistics table:[75]

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[75] *See also* Shoreline Clean-up Completion Plan (Exhibit 12184); FOSC Report at TREX 009105.0009 (TREX 9105); Snorkel Survey and Sampling Procedures for Sunken Oil (PCG012-003244); Email from Rear Adm. Nash to Rear Adm. Landry, Rear Adm. Zukunft, et al., pp. 5-6 (Mar. 22, 2011) (Exhibit 12542) ("[SCAT] is still underway, but the highly professional, stakeholder inclusive, unified approach to evaluating oiled beach [sic] and marshes, and the consultation on methods to clean up or to determine that 'no further treatment' was appropriate, appeared to be effective."); Michel Deposition, p. 89 (Aug. 1, 2014) (stating that the SCAT teams "did a great job" despite operating in "tough conditions").

SCAT Team Efforts	Total
Miles of shoreline surveyed by aerial reconnaissance	110,853
Miles of shoreline surveyed (ground and boat)	4,380
Cumulative miles of shoreline surveyed (includes repeat surveys)	28,374
Pits/trenches/auger holes excavated (includes Snorkel SCAT)	414,721
Number of SCAT teams in the field, with the same BP Team Leads since May 2010	26
SCAT Field Team Leader days	7,126
SCAT Field Team person days	32,578
Photographs taken	>300,000
Snorkel SCAT missions	1,771
Safety – Number of lost work days	0

Figure 6: Figures concerning SCAT efforts to survey the shoreline and document oiling conditions

42. The health and safety of the SCAT teams was of paramount importance to Unified Command and BP.[76] Safety advisers, SCAT team leads, and/or U.S. Coast Guard personnel assigned to SCAT teams ensured personnel adhered to job safety analyses and safe work practices. SCAT teams did not incur any lost time due to injuries in over three years of field activity.[77]

43. The tremendous efforts of the *Deepwater Horizon* SCAT program utilized all available resources, including the experience and expertise of the SCAT teams and advisors. The result was a comprehensive, scientific and objective assessment of shoreline oiling that was an essential part of the successful effort to minimize the impacts of MC252 oil on the Gulf shorelines.

C. Shoreline Treatment Accelerated the Removal and Natural Weathering of Oil

44. With BP's active participation, Unified Command implemented a rigorous program to clean oiled shorelines, tailoring the cleanup to the nature of oiling and the affected shoreline. The objective of shoreline cleanup operations was to accelerate the removal and natural weathering of stranded oil so that the ecosystem could return to pre-spill conditions.[78] The

[76] Near Shore and Shoreline Stage I and II Response Plan, Mobile Sector (N9G007-000107).

[77] *See also* Hein Deposition, p. 53 (July 9, 2014) (acknowledging that "safety was a top priority of the Coast Guard, BP, and others in the Unified Command"); Austin Deposition, p. 204 (July 17, 2014); Kulesa Deposition, pp. 124-125 (July 15, 2014); Utsler Deposition, pp. 181-183 (June 27, 2014); *see generally* SCAT Team Field Safety Plan (US_PP_NOAA148658).

[78] Email from Nantel to Yender, Michel, et al. (Sept. 20, 2010) (Exhibit 13009) (outlining the strategy for teleconferences with Alabama and Mississippi officials and the media regarding the SCAT program). Notably, background oiling was a reality in the Gulf of Mexico region prior to the *Deepwater Horizon* spill. *See* GoMRI Poster (BP-HZN-2179MDL09111855).

shoreline cleanup program, which involved extensive cleanup activities across the Gulf, met this objective.[79]

45. After the SCAT teams assessed the extent and degree of oiling, they made recommendations about appropriate cleanup methods for the oiled shorelines. They also helped to identify ecological, historical, and cultural resources on the affected shorelines, so that cleanup strategies could account for these sensitive resources and avoid additional damage. The SCAT teams set forth their cleanup recommendations in forms called Shoreline Treatment Recommendations, which were submitted to the FOSC for approval.[80] Once approved, the Shoreline Treatment Recommendations were effectively a "work order" for the Operations teams to conduct cleanup activities.[81] After the Operations teams completed their cleanup activities, SCAT teams returned to the shoreline to determine whether the segment had achieved the cleanup endpoints or whether the Operations teams should return for additional treatment.

1. Shoreline Treatment Recommendations Were Properly Tailored to Particular Shoreline Types and Oiling Levels

46. The Shoreline Treatment Recommendations were carefully tailored to achieve a net environmental benefit for affected shorelines and ensure that further damage was not caused by cleanup techniques.[82] The concept of net environmental benefit was critical to treatment recommendations for shoreline oiling. This concept requires the shoreline treatment to benefit the environment and accelerate natural recovery.[83]

47. During the *Deepwater Horizon* Response, a Shoreline Treatment Recommendation was typically comprised of descriptions of the shoreline segment and the surface and buried oil observed there; recommended treatment techniques;[84] constraints or considerations for

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[79] FOSC Report at TREX 9105.0084 (TREX 9105); OSAT-3 (Louisiana) at ii-iv; Santner, Cocklan-Vendl, et al., *The Deepwater Horizon MC252-Macondo Shoreline Cleanup Assessment Technique (SCAT) Program*, p. 2 (Feb. 15, 2011) (Exhibit 13005); Michel Deposition, pp. 159-160 (Aug. 1, 2014).

[80] *See* Hanzalik Deposition, pp. 220-221 (June 17, 2014); Hein Deposition, pp. 55, 59 (July 9, 2014); Austin Deposition, p. 170 (July 17, 2014); Michel Deposition, pp. 44-45 (Aug. 1, 2014); Near Shore and Shoreline Stage I and II Response Plan, Mobile Sector (N9G007-000107); Shoreline Treatment Recommendation for Pensacola Beach (FL 4-005) (BP-HZN-2179MDL08751112-28).

[81] Hein Deposition, pp. 59-60 (July 9, 2014); Michel Deposition, pp. 44-46 (Aug. 1, 2014); Deepwater Horizon 2011 Shoreline Cleanup Assessment Technique (SCAT) Plan for Alabama / Florida / Mississippi (N7X010-000026); Shoreline Treatment Recommendation for Pensacola Beach (FL-4-005) (BP-HZN-2179MDL08751112-28).

[82] FOSC Report at 9105.0085 (TREX 9105); Michel Deposition, pp. 115-118 (Aug. 1, 2014).

[83] *See* Hein Deposition, pp. 185-186 (July 9, 2014); Michel, Owens, et al., *Extent and Degree of Shoreline Oiling*, p. 2 (June 2013) (Exhibit 12199); Michel Deposition, pp. 177-178 (Aug. 1, 2014); Stage III SCAT Shoreline Treatment Implementation Framework (Louisiana) (Exhibit 13013).

[84] Hein Deposition, pp. 59-60 (July 9, 2014).

operations (safety, environmental, cultural); guidelines or Best Management Practices designed to mitigate the potential effects of cleanup activities on natural and cultural resources;[85] and cleanup endpoints.[86]

48. The Shoreline Treatment Recommendations were crafted in a way that maximized stakeholder involvement. In particular, Shoreline Treatment Recommendations were developed in collaboration with the U.S. Coast Guard, NOAA, National Marine Fisheries Service, Fish and Wildlife Service, and state-specific agencies.[87] The recommended treatment techniques and cleanup endpoints were developed by Technical and Core Working Groups and approved by Unified Command.[88]

49. The SCAT teams identified cleanup techniques that could be considered to treat oiled habitats: beaches, marshes, and other (typically manmade). Beach oiling could typically be addressed using mechanical techniques, including large- to small-scale sifters, manual cleanup techniques, and sand washing. Early in the Response, the goal was to remove stranded oil as quickly as possible and before it penetrated the substrate or was buried by clean sand. Mechanical removal was appropriate for quick removal of large amounts of stranded oil. Large-scale excavation and sifting on select beaches in Florida and Alabama, denoted Operation Deep Clean, was used to sift sand down to pre-determined depths to sort for and remove oiled material. To avoid excessive removal of sand during cleanup operations, SCAT-Operations liaisons closely monitored cleanup activities and provided guidance to prevent excessive sediment removal.[89]

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85 Hein Deposition, p. 62 (July 9, 2014).

86 *See, e.g.*, Shoreline Treatment Recommendation issued for NW Grand Terre I (Exhibit 13011).

87 FOSC Report at 9105.0084-85 (TREX 9105); Michel Deposition, pp. 204-207 (Aug. 1, 2014); STR Review Process Flow for Louisiana and Eastern States (HCE013-007909).

88 Michel, Owens, et al., *Extent and Degree of Shoreline Oiling*, p. 2 (June 2013) (Exhibit 12199); Hein Deposition, p. 59 (July 9, 2014); Hanzalik Deposition, p. 220 (June 17, 2014).

89 Near Shore and Shoreline Stage I and II Response Plan, Mobile Sector (N9G007-000107-121).

Figure 7: Example of sand cleanup techniques used (clockwise from top left: manual collection with screen rakes and shovels, light mechanical sieve, large-scale excavation and sieving (such as "Operation Deep Clean"), and sand washing (MI SWACO system, Grand Isle).)

50. For wetlands and marshes, treatment approaches properly accounted for the greater care and sensitivity required to treat these shorelines. After the removal of bulk oil early in the Response, natural recovery was the preferred and appropriate approach for the vast majority of oiled marshes.[90] Natural recovery is the least intrusive technique that avoided additional damage to vegetation and in particular, to root systems. There are many examples of oiled wetlands in the Gulf of Mexico that have recovered naturally and quickly, *i.e.*, on the order of months.[91] In contrast, historically, aggressive cleanup in marshes has resulted in longer

[90] Michel, Owens, et al., *Extent and Degree of Shoreline Oiling*, p. 5 (June 2013) (Exhibit 12199); Near Shore and Shoreline Stage I and II Response Plan, Mobile Sector (N9G007-000107); Michel Deposition, pp. 241-242 (Aug. 1, 2014).

[91] SCAT Shoreline Response Completion Strategy (July 20, 201) (US_PP_NOAA077047).

recovery times relative to those that received limited treatment and were left to natural recovery despite lingering oil.[92]

51. Although natural recovery was the appropriate technique for most oiled marshes, there were exceptions. For certain of the most heavily oiled marshes in Northern Barataria Bay, there were concerns that recovery could be at risk without intervention. Therefore, in the fall of 2010, a series of marsh treatment field tests were conducted to assess viability and effects of various techniques on oiled marshes. A series of sites established in Barataria Bay (LAPL0-034-30) were established in which plots were treated through raking, flushing, and vegetation cutting and compared to oiled, untreated areas (*see* Appendix H).[93] The goal was to identify treatment techniques that would improve oil weathering and enhance habitat recovery without causing further harm.[94] Based on the results of these treatment tests, it was determined that mechanical raking and cutting promoted marsh recovery and did not have any obvious detrimental effects to the marsh. The treatment testing results were used to develop cleanup recommendations that were implemented on approximately 7 miles of heavily oiled marshes.[95] Signs of initial recovery have been observed at the sites where cleanup was applied.[96] This testing confirmed that, consistent with prior experience with oil spills in wetland areas, natural recovery is the preferred and appropriate method of treating the majority of oiled marshes, but that in the most heavily oiled areas, raking and cutting would enhance the natural recovery process.

52. Unified Command, including BP, utilized traditional methods of shoreline cleanup, including manual, mechanical, and in-situ treatment, but also adopted innovative treatment techniques. The Alternative Response Technologies (ARTES) program was launched to vet and test

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92 *See* Baker, Guzman, et al., *Long-Term Fate and Effects of Untreated Thick Oil Deposits on Salt Marshes* (Mar. 1993), *available at* http://ioscproceedings.org/doi/pdf/10.7901/2169-3358-1993-1-395; Sell, Conway, et al., *Scientific Criteria to Optimize Oil Spill Cleanup* (Feb. 1995), *available at* http://ioscproceedings.org/doi/pdf/10.7901/2169-3358-1995-1-595; Zengel & Michel, Deepwater Horizon *Oil Spill: Salt Marsh Oiling Conditions, Treatment Testing, and Treatment History in Northern Barataria Bay, Louisiana* (Apr. 2013) (Exhibit 13015); *See* Michel & Rutherford, *Impacts, Recovery Rates, and Treatment Options for Spilled Oil in Marshes* (May 2014), *available at* http://www researchgate net/publication/261406689_Impacts_recovery_rates_and_treatment_options_for_spilled_oil_in_marshes.

93 Zengel & Michel, *Deepwater Horizon Oil Spill Salt Marsh Treatment Tests: Monitoring Results* (2012), INTECOL Wetland Conference, *available at* http://www.conference.ifas.ufl.edu/intecol/presentations/014/0140%20Zengel%20&%20Michel%20%20INTECOL%202012%20revised%20final.pdf.

94 Rutherford, Zengel, et al., *Cleanup of Heavily Oiled Salt Marsh During the Deepwater Horizon Oil Spill: I. Ecological Effects and Initial Recovery (Marsh Vegetation)*, p. 1 (US_PP_NOAA157524).

95 Zengel & Michel, Deepwater Horizon *Oil Spill: Salt Marsh Oiling Conditions, Treatment Testing, and Treatment History in Northern Barataria Bay, Louisiana*, pp. 1-2 (Apr. 2013) (Exhibit 13015); Michel, Owens, et al., *Extent and Degree of Shoreline Oiling* (June 2013) (Exhibit 12199).

96 Rutherford, Zengel, et al., *Cleanup of Heavily Oiled Salt Marsh During the Deepwater Horizon Oil Spill: I. Ecological Effects and Initial Recovery (Marsh Vegetation)*, p. 1 (US_PP_NOAA157524).

proposed treatment technologies and methodologies.[97] Certain techniques and equipment for shoreline cleanup, including the Sand Shark sifting system, a sand washing plant, and surf washing, proved to be innovative and effective.[98] Unified Command and BP did not merely rely on existing equipment and techniques; instead, they tested and tailored new approaches to shoreline cleanup.[99]

2. Shoreline Treatment Recommendations Were Crafted to Minimize Any Impact Associated with Cleanup Activities

53. Not only did SCAT teams account for the level of oiling and the type of shoreline (*e.g.*, marsh versus amenity beach), but they also considered a variety of factors when developing Shoreline Treatment Recommendations, including minimizing sediment and/or vegetation loss to avoid erosion, and protection of critical wildlife habitat and archeological and cultural resources.[100]

54. Unified Command established and BP staffed the Natural Resource Adviser program to assist Operations teams in minimizing potential injury of cleanup operations to natural resources. The Natural Resource Adviser program consisted of approximately 100 professional biologists who were hired by BP and embedded within the Operations teams in the field. Their role was to identify endangered species and to determine whether cleanup operations were complying with Best Management Practices relating to wildlife.[101] BP developed GPS-based hand-held technology for the Natural Resource Advisers so they could share information about wildlife in the field in near real-time. During typical oil spill responses, resource advisers only participate in cleanup operations on federal lands. It was unprecedented to utilize Natural Resource Advisers to accompany SCAT and Operations teams when surveying and cleaning non-federal lands during the *Deepwater Horizon* Response. This enhanced the quality of the Response and minimized the potential impact of cleanup operations on wildlife.

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97 Stage III SCAT Shoreline Treatment Implementation Framework (Louisiana), pp. C-15, D-14 (Exhibit 13013).

98 Email from Michel to Stanton, Levine, et al. (Nov. 26, 2011) (US_PP_NOAA155139) (NOAA SCAT Coordinator acknowledging that new technologies and innovations were developed during the Response).

99 Hein Deposition, p. 63 (July 9, 2014); *see also* Lubchenco, McNutt, et al., *Science in Support of the* Deepwater Horizon *Response*, p. 6 (Dec. 2012) (Exhibit 12500) (finding that "[r]esponse to future deep spills globally will benefit from the many scientific breakthroughs applied to DWH").

100 Hein Deposition, pp. 62, 131-136, 160-164 (July 9, 2014) (agreeing that best management practices were "designed" and "implemented to minimize the impacts to federally listed species during the response," and that BP provides resources and personnel to aid in the removal of submerged oil mats even though the mats posed a minimal threat to human health, aquatic invertebrates, and fish); Austin Deposition, p. 170 (July 17, 2014); Michel Deposition, p. 183 (Aug. 1, 2014) (agreeing that "the environmental benefit analysis was conducted based on experience and well-established practices that cleaning beyond a certain level particularly in wetlands can delay rather than accelerate recovery").

101 Hein Deposition, pp. 72-76 (July 9, 2014); FOSC Report at TREX 9105.0084 (TREX 9105); Michel Deposition, pp. 193-199, 202 (Aug. 1, 2014).

55. Unified Command also implemented a program that successfully minimized the potential impact of cleanup activities on cultural and archaeological resources along the Gulf shore. Cultural Resource Advisers provided advice to the SCAT program concerning potential impacts and protection measures for cultural resources, and went into the field to monitor Operations teams during shoreline treatment to ensure compliance with Best Management Practices.[102]

56. The extent of efforts taken by Unified Command and BP to ensure the protection of wildlife, cultural, and archaeological resources from the potential impacts of cleanup activities, and the scope of independent monitoring of those efforts by Natural and Cultural Resource Advisors, was unprecedented and helped reduce the potential impacts of the spill on those resources and helped avoid impact from spill response activities.

3. Unified Command Chose Cleanup Endpoints That Were Designed to Create a Net Environmental Benefit for the Affected Shoreline

57. During the *Deepwater Horizon* Response, a key objective for cleanup operations was to undertake treatment to the extent that it would accelerate natural recovery. At the forefront of cleanup operations was the principle that cleanup operations should not cause more damage than the oil itself.[103] A set of "No Further Treatment" guidelines was approved for affected shorelines and provided guidance to responders about when to cease cleanup operations.[104] For illustrative purposes, in the fall of 2010, the No Further Treatment guidelines for oiled amenity beaches in the Eastern States was "no visible oil above background levels," meaning that no further treatment was required once beaches met that endpoint. During the same time period, the No Further Treatment guidelines for coastal wetlands dictated that no further treatment was required once there was no flushable oil on the vegetation or soil.[105]

58. In approving the No Further Treatment standards, Unified Command took into account concerns about the effects of both the oil and the treatment option on environmental, cultural and recreational resources (*i.e.*, tourist beaches), while recognizing that in some cases cleanup activities could cause more harm than allowing oil to naturally attenuate. Separate standards were established for different shoreline types (amenity vs. non-residential and special management area sand beaches, coastal marshes, mangroves, and man-made structures). (*See* Appendix D: No Further Treatment Guidelines for Eastern States and Louisiana).

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[102] Santner, Cocklan-Vendl, et al., *The Deepwater Horizon MC252-Macondo Shoreline Cleanup Assessment Technique (SCAT) Program*, p. 5 (Feb. 15, 2011) (Exhibit 13005); Michel Deposition, pp. 199-201 (Aug. 1, 2014).

[103] Email from Nantel to Yender, Michel, et al. (Sept. 20, 2010) (Exhibit 13009) (outlining the strategy for teleconferences with Alabama and Mississippi officials and the media regarding the SCAT program).

[104] Michel, Owens, et al., *Extent and Degree of Shoreline Oiling*, p. 2 (June 2013) (Exhibit 12199); Michel Deposition, pp. 39, 139-140, 160-162 (Aug. 1, 2014).

[105] Stage III SCAT Shoreline Treatment Implementation Framework (AL, FL, MS) (IMU005-000138, 148).

59. A shoreline segment could reach cleanup endpoints even if there were some amount of oil remaining on the segment. This is because treatment endpoints approved by the FOSC for certain shoreline segments, such as non-residential beaches, allowed for small amounts of visible oil.[106] Residual oil was non-toxic and did not present a threat to human or wildlife.[107] The government-commissioned Operational Science Advisory Team assessed the toxicity of oil residues in late 2010 and early 2011 and concluded that the environmental effects of the residual oil remaining are relatively minor, and that aquatic and wildlife resources would likely experience a greater threat from further cleanup beyond established guidelines than from allowing the oil that remains on beaches to naturally attenuate.[108] Furthermore, the No Further Treatment guidelines accounted for background oiling by, for example, dictating that cleanup activities could cease when there was "no visible oil above background levels."[109]

60. In my opinion, the No Further Treatment guidelines were rigorous, environmentally protective standards which resulted in the acceleration of recovery for treated shoreline areas while protecting the environment from additional harm, *i.e.*, a net environmental benefit and a reduction of the environmental impacts of the spill.

4. The SCAT - Operations Liaison Teams Improved Communication Between SCAT and Operations Teams

61. Once the Shoreline Treatment Recommendations were approved, they were handed off to Operations teams to implement the treatment recommendations. In order to improve communications, ensure consistency, and effectively coordinate the treatment recommendations across the area of the response, a new role was created at all Incident Command Posts: SCAT-Operations Liaisons.[110] The SCAT-Operations Liaison teams were a key innovation during the Response that enhanced the effectiveness of shoreline treatment efforts.[111]

62. The SCAT-Operations Liaison Team was created on May 20, 2010, and was staffed by oil spill response specialists. A SCAT-Operations Liaison was responsible for ensuring that cleanup instructions were understood, properly implemented, and that the intended cleanup

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106 Hein Deposition, p. 108 (July 9, 2014).

107 *See* Hein Deposition, p. 161 (July 9, 2014) (testifying that, based on the OSAT report and governmental testing, "the MC252 tarballs found on the beaches are non-toxic").

108 OSAT-2, Summary Report for Fate and Effects of Remnant Oil in the Beach Environment, p. 2 (Feb. 10, 2011) (Exhibit 12238) (hereinafter "OSAT-2"); Lubchenco Deposition, p. 213 (July 10, 2014); *see also* Email from Capt. Austin to Neary (June 23, 2010) (Exhibit 12485) (noting that "[t]here is incredible resiliency to our environment," and cautioning against conducting clean-up operations that could "do more damage").

109 Deepwater Horizon 2011 Shoreline Cleanup Assessment Technique (SCAT) Plan for Alabama / Florida / Mississippi (N7X010-000026); Eastern Core Group: Meeting Minutes (Jan. 26, 2011) (US_PP_NOAA182774).

110 FOSC Report at TREX 9105.0082 (TREX 9105).

111 Santner, Cocklan-Vendl, et al., *The Deepwater Horizon MC252-Macondo Shoreline Cleanup Assessment Technique (SCAT) Program*, p. 1 (Feb. 15, 2011) (Exhibit 13005).

results were achieved.[112] The SCAT-Operations Liaisons also provided advice and support, as needed, in equipment selection and operation, and training and organization of the workforce, liaised with U.S. Coast Guard observers and local stakeholder representatives, and reported cleanup progress to the SCAT program leadership. By mid-September 2010, SCAT-Operations Liaisons were embedded into the branches, facilitating even better communications with the field teams. The liaisons provided tighter communication in the field with Operations teams concerning appropriate treatment methods for oiled shoreline.[113]

5. After the Operations Teams Treated the Shorelines, SCAT Teams Re-Surveyed the Segment

63. After the Operations teams cleaned the shoreline segments in accordance with Shoreline Treatment Recommendations, SCAT teams conducted follow-up ground inspections to assess whether the segments met the No Further Treatment guidelines.[114] Using information from those surveys, Unified Command determined whether the treated segment satisfied the No Further Treatment standards and could be moved to the next phase of the response. Segments that did not achieve the standards received further treatment and were then re-surveyed by SCAT. This process was repeated until the segment satisfied the standards in the No Further Treatment guidelines.

64. Due to the extremely rigorous cleanup endpoints, many segments cycled in and out of SCAT surveys, cleanup activities, and SCAT inspections. The use of "no visible oil" as an end-point for amenity beaches was highly restrictive and nearly unachievable, particularly in light of diminishing residual oil on the shorelines in quantity and size, and the existence of background, naturally-occurring tarballs on these same beaches. The extensive, repeated efforts to cleanup, monitor, and inspect these amenity beach segments until the "no visible oil" criteria was met, were unprecedented and praise-worthy.[115]

D. The Multi-Stage Shoreline Response Program Was Thorough and Rigorous

65. Unified Command, with BP's support and participation, implemented a multi-staged approach to shoreline treatment that took into account changes in oiling conditions and seasonal factors.[116] At each stage, the SCAT teams surveyed the shoreline and recommended treatment, and the Operations teams conducted cleanup activities to agreed-upon cleanup endpoints. In early stages, shoreline cleanup involved bulk oil removal as oil came ashore.[117]

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[112] Stage III, SCAT-Shoreline Treatment Implementation Framework (Louisiana), p. 12 (Exhibit 13013).

[113] Santner, Cocklan-Vendl, et al., *The Deepwater Horizon MC252-Macondo Shoreline Cleanup Assessment Technique (SCAT) Program*, p. 12 (Feb. 15, 2011) (Exhibit 13005).

[114] Hein Deposition, p. 67 (July 9, 2014).

[115] *See* Michel, Owens, et al., *Extent and Degree of Shoreline Oiling*, p. 5 (June 2013) (Exhibit 12199).

[116] Michel, Owens, et al., *Extent and Degree of Shoreline Oiling*, pp. 1-2 (June 2013) (Exhibit 12199).

[117] Michel, Owens, et al., *Extent and Degree of Shoreline Oiling*, p. 2 (June 2013) (Exhibit 12199).

Shoreline treatment then moved into stages of cleanup that progressively strived for minimal oil levels on sensitive habitats and for no oil on amenity beaches.[118]

66. Stages I and II primarily involved on-water recovery of floating oil in nearshore areas and initial removal of bulk oil on the shoreline.[119] The response completed Stages I and II by approximately September 2010.

67. Stage III began in the fall of 2010 when Unified Command determined that there was no more recoverable oil on the water.[120] The single objective of Stage III was to "ensure shorelines are treated to the degree required to address stakeholder concerns over natural and cultural resources as well as recreational and economic uses."[121] Stage III involved shoreline cleaning, protection, monitoring, resurvey, and further cleaning as necessary to achieve clearly defined cleanup goals.[122] Treatment recommendations were designed to not cause more damage than the oil itself and instead, to reduce oiling levels to lowest practical levels based primarily on net environmental benefit principles.[123] When the target cleanup levels were achieved, then the shoreline was monitored and maintained to assess natural attenuation of any oil residues within individual segments.[124] Treatment guidelines were developed to sufficiently reduce oiling levels to enable natural attenuation to continue through the 2010-2011 winter months. Stage III ended in approximately March 2011.

68. Stage IV began in Spring 2011 with a survey of shorelines within the affected area. SCAT teams assessed the status of shoreline oiling after the winter and proposed treatment, where appropriate.[125] A primary objective of the Stage IV plan was to ensure that there was a positive net environmental benefit from cleanup operations and to avoid cleanup actions that

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118 Michel, Owens, et al., *Extent and Degree of Shoreline Oiling*, p. 5 (June 2013) (Exhibit 12199).

119 Hein Deposition, pp. 86-87 (July 9, 2014); Michel Deposition, pp. 94-99 (Aug. 1, 2014); Near Shore and Shoreline Stage I and II Response Plan, Mobile Sector (N9G007-000107); Near Shore and Shoreline Stage I and II Response Plan, Louisiana Division (Exhibit 13012).

120 Santner, Cocklan-Vendl, et al., *The Deepwater Horizon MC252-Macondo Shoreline Cleanup Assessment Technique (SCAT) Program*, p. 2 (Feb. 15, 2011) (Exhibit 13005); Stage III SCAT Shoreline Treatment Implementation Framework (AL, FL, MS) (IMU005-000138); Michel Deposition, pp. 100-101 (Aug. 1, 2014).

121 Stage III SCAT Shoreline Treatment Implementation Framework (AL, FL, MS) (IMU005-000138).

122 Michel, Owens, et al., *Extent and Degree of Shoreline Oiling*, p. 2 (June 2013) (Exhibit 12199); FOSC Report at TREX 9105.0083 (TREX 9105).

123 Stage III SCAT Shoreline Treatment Implementation Framework (AL, FL, MS) (IMU005-000138); Stage III SCAT Shoreline Treatment Implementation Framework (Louisiana) (Exhibit 13013).

124 FOSC Report at TREX 9105.0083 (TREX 9105).

125 Michel, Owens, et al., *Extent and Degree of Shoreline Oiling*, p. 2 (June 2013) (Exhibit 12199); Deepwater Horizon 2011 Shoreline Cleanup Assessment Technique (SCAT) Plan for Alabama / Florida / Mississippi (N7X010-000026); Deepwater Horizon 2011 Shoreline Plan for Louisiana (Exhibit 13014).

would delay recovery or would do more harm than allowing oil residue to attenuate naturally.[126]

69. The Shoreline Clean-up Completion Plan (SCCP), approved in November 2011, defined a process to determine whether a segment had achieved the relevant cleanup standards and could be moved out of the response.[127] Under the SCCP, shoreline oiling conditions documented by SCAT teams were compared against cleanup "endpoints," meaning that once a segment met the final criteria, shoreline treatment was completed.[128] The endpoints for Louisiana and the Eastern States were challenging to meet and set a very high bar for segments to be moved out of the Response.[129] The SCCP endpoints were developed through consensus by representatives from BP and the federal and state governments.[130]

70. The exacting and rigorous standards set forth in the SCCP are illustrated by the waterfall diagrams, which are charts tracking the number of times that Operations teams and SCAT teams respectively cleaned and surveyed a given segment before it was moved out of the response. Appendix E contains a waterfall chart tracking one Florida shoreline segment's cycle of SCAT surveys, cleanup activities, and inspections under the SCCP. Operations teams visited the segment 26 times over a 9 month period, cleaning up observable oil on 15 occasions, and SCAT teams inspected the segment 8 times before it was finally determined to have met the cleanup endpoints and moved out of the Response. In this example, as well as for many other amenity beach segments, the Operations teams were removing miniscule amounts of oil from the beach – as little as 0.01 lbs. of residual oil during one cleanup visit – which was smaller than a tic tac but enough to prevent the segment from moving out of the Response.

71. As a result of the phased shoreline response program, SCAT teams surveyed many segments of the Gulf shoreline multiple times.[131] Surveying segments repeatedly allowed SCAT to assess changes in oiling over time, assists in understanding the effectiveness of shoreline treatment activities, and provides an understanding of the shoreline's seasonal variability. In addition to the repeated surveys conducted during the shoreline response stages, for any segment that received treatment, SCAT teams were required to survey the segment at least

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126 Deepwater Horizon 2011 Shoreline Plan for Louisiana (Exhibit 13014).

127 Michel, Owens, et al., *Extent and Degree of Shoreline Oiling*, p. 4 (June 2013) (Exhibit 12199); Deepwater Horizon Shoreline Clean-up Completion Plan (SCCP) (Exhibit 12184).

128 Michel Deposition, p. 43-44 (Aug. 1, 2014).

129 Hein Deposition, pp. 70, 93 (July 9, 2014) (describing as "rigorous" the standards that were set under the SCCP to move shoreline segments out of the response); Email from Michel to McCleneghan (Oct. 30 2011) (Exhibit 13003) (NOAA SCAT Coordinator referencing "impossible endpoints" in SCCP).

130 Michel, Owens, et al., *Extent and Degree of Shoreline Oiling*, p. 4 (June 2013) (Exhibit 12199).

131 Hein Deposition, p. 57 (July 9, 2014); Lubchenco Deposition, pp. 206-207 (July 10, 2014).

three times before Unified Command would consider whether removal actions were complete under the SCCP and whether to move the segment out of the Response.[132]

72. Efforts to include various stakeholders and ensure sustained coordination and cooperation among stakeholders were exemplary. Various stakeholders provided input to, reviewed, and approved the Stage I-IV and SCCP plans.[133] One way in which stakeholders were included was through the creation of Core Groups and Technical Working Groups.[134] Core Groups comprised key stakeholder representatives and made key decisions on recommended treatment methods, options, and goals for shoreline treatment.[135] Core Groups were developed to ensure full stakeholder inclusion in the shoreline response and the preparation of the staged shoreline plans.[136] Unified Command created Technical Working Groups to deliver clear technical guidance to the Core Groups relating to oiling conditions to be treated, treatment methods, and best practices for treating sand shores, coastal marshes, and man-made shorelines.[137] BP participated in the Core and Technical Working Groups, providing expertise and guidance on approaches to shoreline treatment.

73. The rigorous standards applied in the *Deepwater Horizon* Response were more stringent than would typically be applied in an oil spill, resulting in extraordinary efforts to clean and survey many segments before they were approved by the FOSC to be moved out of the Response. The end result was an extended, successful effort to reduce the impacts of the spill on the Gulf shoreline.

VI. UNIFIED COMMAND ENGAGED IN EXTENSIVE EFFORTS TO LOCATE AND REMOVE RESIDUAL OIL

74. The massive shoreline cleanup effort along the Gulf Coast removed much of the stranded oil residue from the spill.[138] Nonetheless, certain types of residual oil located in the near shore,

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132 Hein Deposition, p. 97 (July 9, 2014).

133 Although Louisiana participated in the preparation of the Stage IV Plan for Louisiana and Shoreline Cleanup Completion Plan, it did not sign the plans.

134 Santner, Cocklan-Vendl, et al., *The Deepwater Horizon MC252-Macondo Shoreline Cleanup Assessment Technique (SCAT) Program*, p. 8 (Feb. 15, 2011) (Exhibit 13005); MC252 Deepwater Horizon Marsh Technical Working Group: Minutes from Telecon (Aug. 28, 2010) (US_PP_NOAA082640); Michel Deposition, pp. 103-104 (Aug. 1, 2014).

135 Stage III SCAT Shoreline Treatment Implementation Framework (AL, FL, MS) (IMU005-000138-232); Stage III SCAT Shoreline Treatment Implementation Framework (Louisiana) (Exhibit 13013).

136 Santner, Cocklan-Vendl, et al., *The Deepwater Horizon MC252-Macondo Shoreline Cleanup Assessment Technique (SCAT) Program*, p. 6 (Feb. 15, 2011) (Exhibit 13005).

137 Santner, Cocklan-Vendl, et al., *The Deepwater Horizon MC252-Macondo Shoreline Cleanup Assessment Technique (SCAT) Program*, p. 7 (Feb. 15, 2011) (Exhibit 13005); Stage III SCAT Shoreline Treatment Implementation Framework (AL, FL, MS) (IMU005-000138); Michel Deposition, pp. 103-104 (Aug. 1, 2014).

138 OSAT-2 at 1 (Exhibit 12238); Buried Oil Report Louisiana Area of Response, pp. 47-48 (Mar. 2014) (Exhibit 13016); *see also* BP Press Release, *Active Shoreline Cleanup Operations from Deepwater Horizon Accident*

surf zone, and sandy beach areas remained particularly challenging to locate and remove. With BP's support and participation, Unified Command implemented extremely comprehensive programs to effectively locate and, where feasible, remove residual oil.[139] These efforts were informed by shoreline geomorphology (*i.e.*, analysis of natural landforms), tidal levels, timing of oiling, and detailed coastal analyses. As a result of the targeted efforts, future re-mobilization of residual oil along the Gulf's shoreline is likely to be isolated, discrete, and limited.

A. Overview of Residual Oil

75. In addition to oil that was visible on beach and marsh surfaces, some MC252 oil also became buried or was deposited in the surf zone and portions of sandy beach areas. This residual oil typically fell into three categories: (i) Subtidal Oil Mats; (ii) Small Surface Residue Balls; and (iii) Supratidal Buried Oil. The formation of residual oil is well understood and therefore, the locations of residual oil are predictable.

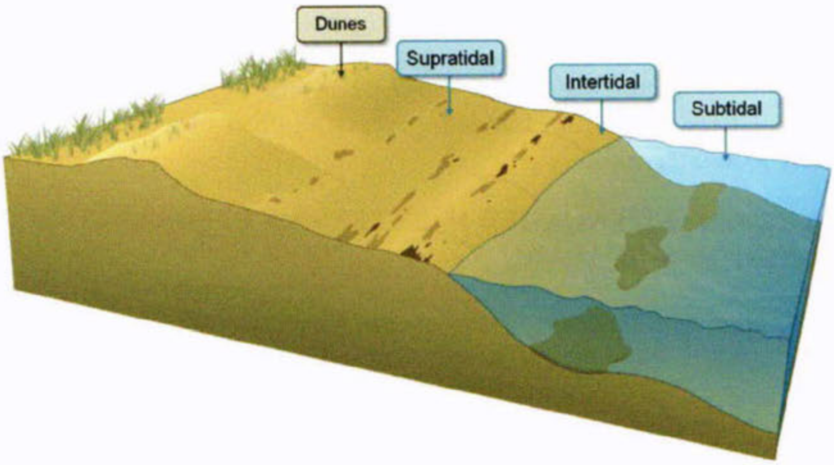

Figure 8: Illustration of beach shoreline and oiling with primary locations of residual oil

76. Subtidal Oil Mats exist in the subtidal zone in troughs between the water's edge and the first sand bar.[140] The potential for the formation of Subtidal Oil Mats existed when weathered oil at the water surface mixed with sand and settled, or surface oil arriving near coastlines was stranded or seeped into the sand at very low tide. Later, these deposits may have been

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End, p. 2 (Apr. 15, 2014) (BP-HZN-2179MDL08964317) ("More than 100,000 tons of material was collected from the [shoreline] cleanup efforts.").

139 OSAT-3, Investigation of Recurring Residual Oil in Discrete Shoreline Areas in the Eastern Area of Responsibility, pp. i-iii (Oct. 2013) (Exhibit 11826) (hereinafter ("OSAT-3 (Eastern States)"); Hein Deposition, pp. 57-68 (July 9, 2014); Michel Deposition, p. 89 (Aug. 1, 2014) (NOAA SCAT Coordinator testifying that SCAT teams "made a great effort" to locate buried oil during the shoreline response).

140 OSAT-3 (Eastern States) at 8-9 (Exhibit 11826); OSAT-2 at 5 (Exhibit 12238); OSAT-3 (Louisiana) at iii.

covered by sand.[141] Certain natural processes, such as storms, can break apart Subtidal Oil Mats and deposit pieces of the Subtidal Oil Mats on beaches.

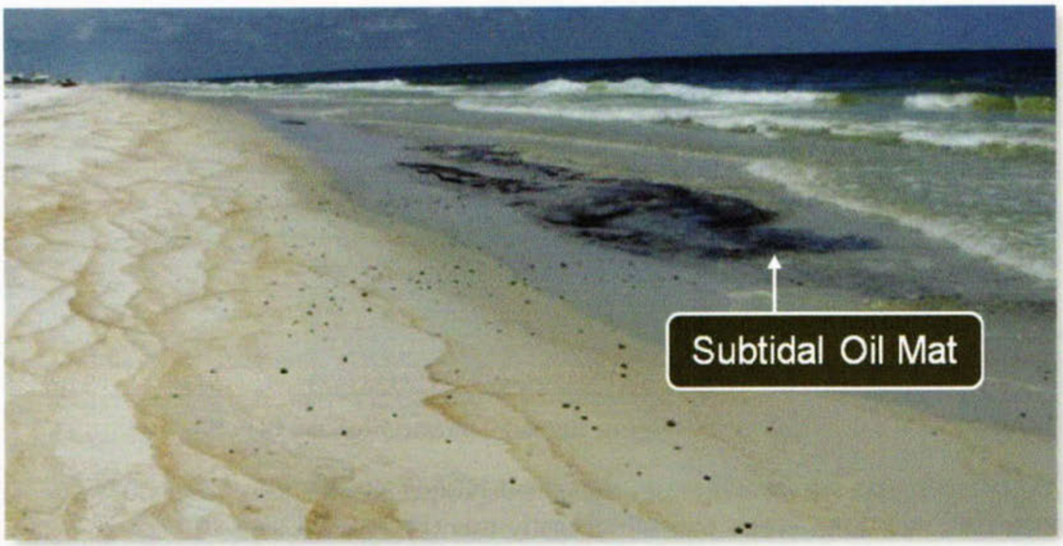

Figure 9: Photograph of Subtidal Oil Mat in intertidal zone

77. Small Surface Residue Balls are typically oil residue that results from the weathering or breaking up of larger deposits.[142] Small Surface Residue Balls are sand grains held together by a very thin coating of oil, typically composed of 80 percent or more sand.[143] They may appear as "tarballs," patties, or mats along sand beaches.

[141] OSAT-3 (Eastern States) at 7 (Exhibit 11826).

[142] OSAT-3 (Eastern States) at 8-9 (Exhibit 11826); OSAT-2 at 5 (Exhibit 12238).

[143] OSAT-2 at 12 (Exhibit 12238) (finding that Surface Residual Balls were comprised of 87-96% sand).

Figure 10: Small Surface Residue Ball

78. Supratidal Buried Oil is oil residue originally deposited near the top of sandy beaches during high tides and storm events that subsequently was covered and buried by sand. Supratidal Buried Oil is typically found below the six-inch surface cleaning depth near sensitive habitats.[144] Natural processes, including seasonal beach erosion and tropical storms, can uncover buried oil.

79. Residual oil poses little, if any, human health risk and is non-toxic.[145] Chemical testing performed at the direction of the FOSC on residual oil samples collected between October 2010 and January 2011 as part of OSAT-2 analysis determined that chemicals of concern from a human health and ecotoxicity standpoint had largely been depleted from residual oil.[146]

80. Although residual oil is non-toxic, there may be other factors, such as aesthetics, political concerns, or adverse public perception, which weigh in favor of removing residual oil. To that end, Unified Command and BP engaged in extensive efforts to locate and, where feasible, remove residual oil. Nonetheless, not all submerged or buried oil has been removed from the Area of Response due to a combination of ecological, operational, and safety considerations. And, certain Gulf States including Louisiana objected to the mechanical removal of buried oil from their sandy beaches early in the Response, leaving buried oil to be remobilized by erosion and storms at a later date.[147] Although further remobilization of

144 OSAT-2 at 5, 8 (Exhibit 12238).

145 Deepwater Horizon 2011 Shoreline Cleanup Assessment Technique (SCAT) Plan for Alabama / Florida / Mississippi (N7X010-000026).

146 OSAT-3 (Eastern States) at 9 (Exhibit 11826).

147 Email from Michel to Capt. Hein, et al. (Oct. 14, 2010) (Exhibit 13017) (explaining that Louisiana insisted on no mechanical removal of any oil from its beaches, which meant that oil was buried on the sand beaches of Louisiana).

residual oil may occur, the conditions needed to remobilize and the locations of these occurrences are generally predictable and instances of remobilized oil should be isolated and limited.[148] And, as discussed in more detail below, BP remains committed to the removal of residual MC252 oil that is uncovered in the future.

B. Unified Command Engaged in Targeted and Comprehensive Efforts to Locate and Remove Residual Oil

1. Snorkel SCAT and Pits, Trenches, and Auger Holes

81. Starting in July 2010, SCAT and Operations teams successfully worked to locate and mitigate Subtidal Oil Mats, Small Surface Residue Balls, and Supratidal Buried Oil.[149] SCAT teams dug pits or trenches to characterize any subsurface oil as part of routine surveys.[150] In addition, extensive auger work was completed on sand beaches where more intrusive work, such as digging thousands of holes and extensive use of mechanical equipment, would not be a significant environmental concern.[151] By the end of 2012, ***over 180,000 pits, trenches, and auger holes*** had been used to search for buried oil for removal.[152]

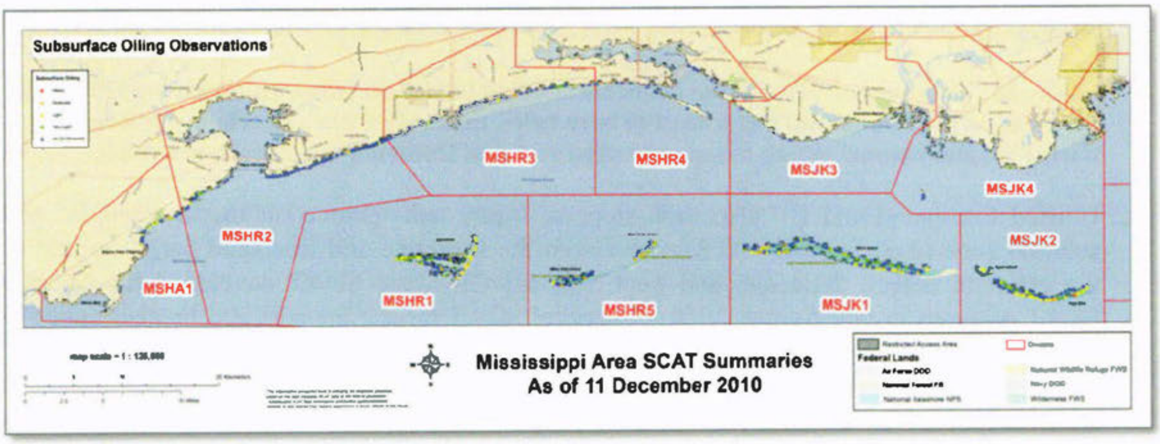

Figure 11: SCAT map showing subsurface oiling observations in Mississippi.

[148] OSAT-3 (Eastern States) at iv (Exhibit 11826); OSAT-3 (Louisiana) at iii.

[149] Hein Deposition, pp. 120-124 (July 9, 2014); GCIMT Strategic Plan: Nearshore Submerged Oil Mats -- Ongoing Efforts and Path Forward (HCG289-006951, 957).

[150] Hein Deposition, p. 57 (July 9, 2014).

[151] Hein Deposition, p. 67 (July 9, 2014); Michel, Owens, et al., *Extent and Degree of Shoreline Oiling*, p. 5 (June 2013) (Exhibit 12199); Michel Deposition, pp. 85-86, 91 (Aug. 1, 2014).

[152] Michel, Owens, et al., *Extent and Degree of Shoreline Oiling* (June 2013) (Exhibit 12199).

Figure 12: Examples of activities to delineate residual buried oil (clockwise from top left: oiled sand lens in pit, mechanical auger used to bore holes, excavation work to exhume recoverable buried oil, and manual sifting to separate oiled material from non-oiled beach material).

82. Unified Command and BP also took steps to locate and remove oil in the intertidal and subtidal zone (*e.g.*, Subtidal Oil Mats between the shoreline and first sand bar). As part of the effort to detect, delineate, and treat Subtidal Oil Mats, SCAT developed the Snorkel SCAT program in late August 2010.[153] Snorkel SCAT targets the surf and breaker zones in wading depths of up to five feet, often encompassing distances out to the first sand bar.[154] Using snorkeling gear or wading in chest-high water, SCAT teams systematically surveyed areas suspected to contain Subtidal Oil Mats.[155] A typical Snorkel SCAT team was comprised of at least five team members and may have included representatives from the Coast Guard and affected state, as well as safety representatives, Natural Resource Advisers, Tribal Monitors and archaeologists.[156]

153 Hanzalik Deposition, p. 265 (June 17, 2014); Hein Deposition, pp. 58, 66 (July 9, 2014); Deepwater Horizon Containment and Response: Harnessing Capabilities and Lessons Learned (Exhibit 6113); OSAT-3 (Eastern States), Appendix B; Taylor & Farrar, *The Macondo Oil Spill Shoreline Response Programme: 3. Snorkel SCAT "Taking the Plunge,"* Arctic Marine Oilspill Program (2011).

154 Hein Deposition, p. 121 (July 9, 2014).

155 *See* Hein Deposition, p. 58 (July 9, 2014); GCIMT Strategic Plan: Nearshore Submerged Oil Mats -- Ongoing Efforts and Path Forward (HCG289-006951, 957).

156 OSAT-3 (Eastern States) Appendix B: Snorkel SCAT Methodologies and Standard Operating Procedures, *available at* http://www.restorethegulf.gov/release/2014/01/15/operational-science-advisory-team-report-iii.

Figure 13: Snorkel SCAT team investigating area for subtidal oil and example of subtidal oiled sand on shovel.

83. Efforts to locate subtidal buried oil were not haphazard, but rather targeted and well-informed. Target areas were identified based on observations from aerial and shoreline teams and from cleanup operations. Where a Subtidal Oil Mat was found, Snorkel SCAT teams delineated and characterized the type of oil and its distribution, mapped its size, and provided recommendations for treatment and recovery to Unified Command.[157] Snorkel SCAT was an extremely useful tool that was utilized effectively to locate, delineate, and assist in removal of recoverable subtidal oil. This new addition to the SCAT process proved to be a consistent and viable approach to characterizing subtidal oiling conditions for Shoreline Treatment Recommendations and Unified Command approval.

84. During the Response, questions were raised about whether there were Subtidal Oil Mats beyond the first sandbar (*i.e.*, between the first and second sandbars). To investigate this possibility, Unified Command implemented the Submerged Oil Mats Tactical Plan in the summer of 2011 in Florida and Alabama. Scientists used sonar methods, video observations, sediment sampling, coring, and laboratory analysis to look for Subtidal Oil Mats. These tools identified 33 "anomalies" where sediment characteristics appeared similar to those expected for Subtidal Oil Mats. When those areas were investigated, however, none were found to contain oil. In light of this, Unified Command determined that there was no evidence of Subtidal Oil Mats beyond the first sandbar.[158]

85. The Natural Resource Damages ("NRD") process for the *Deepwater Horizon* oil spill also considered submerged oil in subtidal areas. A cooperative study was conducted from June to August 2011 by state and federal trustee agencies and BP to evaluate the presence of submerged oil in nearshore areas. The study evaluated more than 330 sites in Louisiana, Mississippi, Alabama, and Florida that represented a variety of habitat types, including wetlands, and a variety of shoreline oiling conditions that included areas of heavy oiling.

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[157] Summary Technical Report for Submerged Oil Mat Tactical Plan: Phase I Execution, p. 4 (Exhibit 12188); Hein Deposition, pp. 121-122 (July 9, 2014).

[158] Summary Technical Report for Submerged Oil Mat Tactical Plan: Phase I Execution, pp. 3-6 (Exhibit 12188).

More than 50 sites were located in Barataria Bay, Louisiana. No oil mats were observed at any of the sampling locations at any of the sites across the Gulf.[159]

86. BP engaged in efforts to locate residual oil, even in instances where Unified Command determined that such efforts were not required. For example, during the Response, BP conducted sampling of seafloor sediment at offshore sand borrow areas, which are areas where sand is collected for beach re-nourishment projects in Florida, Alabama, and Mississippi. Although there was no indication of MC252 oil being present in those sand borrow areas, Gulf Coast officials asked Unified Command to conduct sampling for MC252 oil.[160] After Unified Command denied this request, BP stepped up and conducted sampling in borrow areas in Mississippi, Florida, and Alabama so that future beach re-nourishments projects could proceed with confidence that the source sand was unlikely to contain MC252 oil.[161] Unified Command did not direct BP to conduct or fund the sampling effort.[162] Notably, the sampling program did not detect any MC252 oil in the sand borrow areas.[163]

2. OSAT-3, the Buried Oil Project, and the Louisiana Augering and Sequential Recovery ("LAASR") Initiative

87. By 2013, the FOSC recognized that, despite efforts to locate and remove residual oil, discrete areas of shoreline in Louisiana and the Eastern States were experiencing periodic remobilization of residual oil. This was preventing these segments from reaching the cleanup endpoints and moving out of the Response. To address this, the FOSC chartered the third Operational Science Advisory Team (OSAT-3) to analyze data, aerial photographs, and hydrodynamic models to report on the likely sources and locations of residual oil and make recommendations to recover the material.[164] Under the umbrella of OSAT-3, the Buried Oil Project was implemented to locate, delineate, and, where feasible, recover weathered oil deposits. Teams utilized aerial imagery, beach profiles, and hydrodynamic modeling to identify and investigate areas with higher potential to contain residual buried oil.[165] Of the 15 high-probability areas identified in Louisiana, recoverable oil material was found in five of them. The Buried Oil Project represented a targeted and comprehensive effort to identify locations where residual oil was likely to have formed and remain. BP representatives actively participated on the OSAT-3 team and Buried Oil Project and worked to determine

[159] Data Summary Report, Submerged Oil Characterization Across Multiple Habitats for Assessment of Persistent Exposures in Nearshore Sediments, 2011 (Aug. 9, 2012) (BP-HZN-2179MDL09189281).

[160] Hein Deposition, pp. 144-45 (July 9, 2014).

[161] Hein Deposition, pp. 146-47 (July 9, 2014).

[162] Hein Deposition, pp. 146-48 (July 9, 2014).

[163] GCRO Sampling Memorandum (June 20, 2012) (BP-HZN-2179MDL08471470, 472).

[164] OSAT-3 (Eastern States) at i (Exhibit 11826); OSAT-3 (Louisiana) at i.

[165] OSAT-3 Appendix D: Buried Oil Report, Louisiana Area of Response (Mar. 2014), p. 4.

the likely locations of residual oil and the feasibility and net environmental benefit associated with removal.

88. In the Eastern States, OSAT-3 and the Buried Oil Project identified 114 areas that had the potential for residual oil. Fourteen of those sites were investigated: of those sites, buried oil deposits were found in two areas: on Fort Morgan Amenity/Bureau of Land Management (BLM) property on April 15, 2013, where approximately 4 pounds of oiled material was recovered; and on Pensacola Beach, Florida on April 5, 2013, where approximately 450 pounds of oiled material was recovered. After wildlife restrictions and other constraints precluded investigation of the remaining areas of potential interest, the FOSC consulted with stakeholders for the Eastern States (*i.e.*, the States of Florida, Alabama, and Mississippi, and the U.S. Department of the Interior) and issued a series of directives that ended further Buried Oil Project investigations in the Eastern States.[166]

89. In addition to the Buried Oil Project, Unified Command implemented the Louisiana Augering and Sequential Recovery ("LAASR") Initiative in 2013 to investigate buried oil onshore.[167] LAASR was a comprehensive effort to locate and remove material that potentially remained buried under layers of sand. This effort used beach profile data, SCAT observations, and trends in collection of residual oil to identify target areas for evaluation. LAASR involved drilling 14,459 auger holes at Fourchon Beach, Elmer's Island, Grand Isle, and Grand Terre I and II. A similar approach had been used in the Eastern States prior to Operation Deep Clean and in select locations following that operation, typically in limited sensitive areas on barrier islands and in supratidal locations.

90. SCAT personnel determined that 12,494 of the auger sites had no oil observed and 1,465 had some amount of oil that fell below endpoints, meaning that no removal action was necessitated.[168] At sites where oil above cleanup endpoints was found, removal operations recovered over 2 million pounds of mixed material.[169]

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[166] OSAT-3 (Eastern States) Appendix G: Buried Oil Project, Eastern States Area of Response, November 2013, *available at* http://www restorethegulf.gov/release/2014/01/15/operational-science-advisory-team-report-iii.

[167] OSAT-3 (Louisiana) Appendix D, p. 5.

[168] OSAT-3 (Louisiana) Appendix D, p. 22.

[169] OSAT-3 (Louisiana) Appendix D, pp. 22, 31.

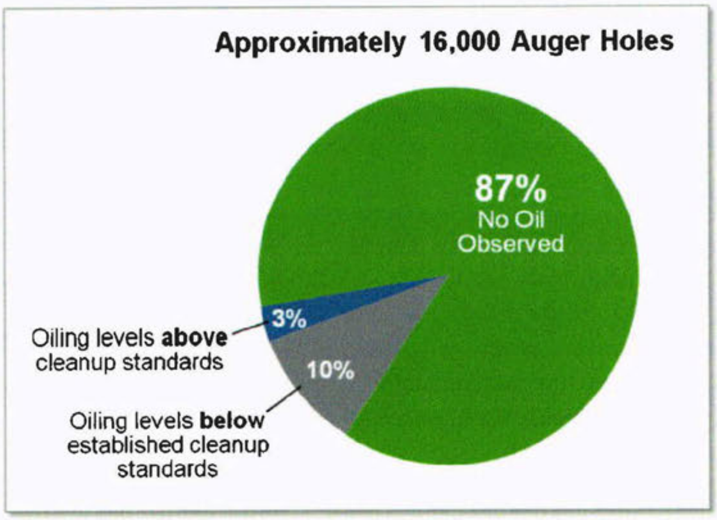

Figure 14: Pie chart illustrating the number of auger holes that had no oil observed, oiling levels that were below established cleanup standards and did not require cleanup, and oiling levels above cleanup standards.

91. Based on extensive investigation in Louisiana and the Eastern States, the OSAT-3 team concluded that there are isolated and identifiable areas along the Gulf Coast where submerged or buried oil deposits may remain. Nonetheless, they determined that as a result of natural processes, Response efforts (including Snorkel SCAT and auger projects), and the OSAT-3 activities, the potential for extensive buried oil deposits to remain within the Area of Response is low.[170] The OSAT-3 team also determined that further remobilization of weathered oil in the Area of Response may occur, but the conditions needed to remobilize and the locations of such remobilization are "generally predictable."[171]

92. The combined efforts of Snorkel SCAT, OSAT-3, the Buried Oil Project, and LAASR focused on shoreline geomorphology, tidal levels, timing of oiling, and detailed coastal processes analyses to determine where residual oil could have remained buried during 2012-2013. Collectively, these successful efforts resulted in the removal of nearly 6 million pounds of mixed material (*e.g.*, oil and sand) in Louisiana alone and allowed more shoreline segments to progress out of the active response.[172] The efforts to locate and remove residual and buried oil throughout the Response were extraordinary, beyond what would typically be required in a spill response, and effective in their mitigation of the impacts of the spill and, in particular, minimizing the risk of future re-mobilization or unburying of residual oil.

170 OSAT-3 (Louisiana) at v.

171 OSAT-3 (Louisiana) at v.

172 OSAT-3 (Louisiana) Appendix D, p. 5.

VII. THE *DEEPWATER HORIZON* SHORELINE RESPONSE PROGRAM EFFECTIVELY REDUCED SHORELINE OILING LEVELS AND ACCELERATED SHORELINE RECOVERY

93. The *Deepwater Horizon* shoreline response program effectively addressed shoreline oiling. At the height of the shoreline response operation, Unified Command had thousands of workers and a wide variety of tools at its disposal to remove oil, including new oil recovery and treatment technologies deployed for the first time during the *Deepwater Horizon* spill response.[173]

A. The Level of Shoreline Oiling Rapidly Decreased Over Time

94. Initial shoreline oiling was first reported on May 8, 2010, on the Chandeleur Islands offshore Louisiana. Initial oiling in the Eastern States was first observed on June 1, 2010 on Dauphin Island (AL) and Petit Bois Island (MS). At the peak of shoreline oiling (June-July 2010), approximately 1,100 miles of the coast contained *some* oil, although only approximately one-third of the oiled shoreline (approximately 360 miles) was categorized as heavy or moderate oiling.[174]

95. The level of shoreline oiling across the Gulf decreased rapidly over time due to extensive efforts to identify and document shoreline oiling conditions and undertake cleanup activities that provided a net environmental benefit.[175] By the fall of 2010, three months after the well was capped, the level of shoreline oiling had fallen dramatically. Of the 220 miles of shoreline that were characterized as heavily oiled from June-July 2010, only 33 miles or 15% remained heavily oiled by October 2010.

96. Approximately one year after the spill, the number of miles of shoreline on which *any* MC252 oiling was documented had decreased by roughly 50%, from 1,100 miles to approximately 530 miles. None of the amenity beaches in Alabama, Mississippi, and Florida were classified as having "heavy" or "moderate" oiling one year after the spill due to extensive, effective deep cleaning efforts.[176]

97. Approximately two years after the spill, the number of miles of shoreline on which *any* MC252 oiling was documented had decreased to less than 430 miles, of which approximately 15 miles were classified as heavy or moderate oiling. As of April 2012, more than 90% of the total miles of shoreline surveyed by SCAT were reported as having no oil observed, and

[173] Hanzalik Deposition, pp. 262-265 (June 17, 2014); Hein Deposition, pp. 84-85 (July 9, 2014); Kulesa Deposition, pp. 48, 156-157 (July 15, 2014); Utsler Deposition, p. 312 (June 27, 2014); Email from Lt. Kulesa to Pino, Nunan, et al. (June 17, 2010) (Exhibit 12460).

[174] *See* Michel, Owens, et al., *Extent and Degree of Shoreline Oiling*, p. 6 (June 2013) (Exhibit 12199); SCAT Database; email from Lt. Kulesa to Grubbs, Borges, et al. (June 23, 2010) (Exhibit 12462) ("While this is the largest discharge in our nation's history, the environmental impact from this has been relatively minimal.").

[175] *See* Hein Deposition, pp. 111-112 (July 9, 2014); Email from Hein to Pratt (June 25, 2011) (Exhibit 12191).

[176] *See* Michel, Owens, et al., *Extent and Degree of Shoreline Oiling* (June 2013) (Exhibit 12199); SCAT Database.

less than one-half of one percent were categorized as moderate or heavy oiling. Most of the oil remaining two years after the spill was located in areas where additional cleanup would not provide a net environmental benefit or where the shoreline cleanup endpoints had been met.[177] (*See* Appendix G: Summary of Reduction in Oiling Levels Over Time).

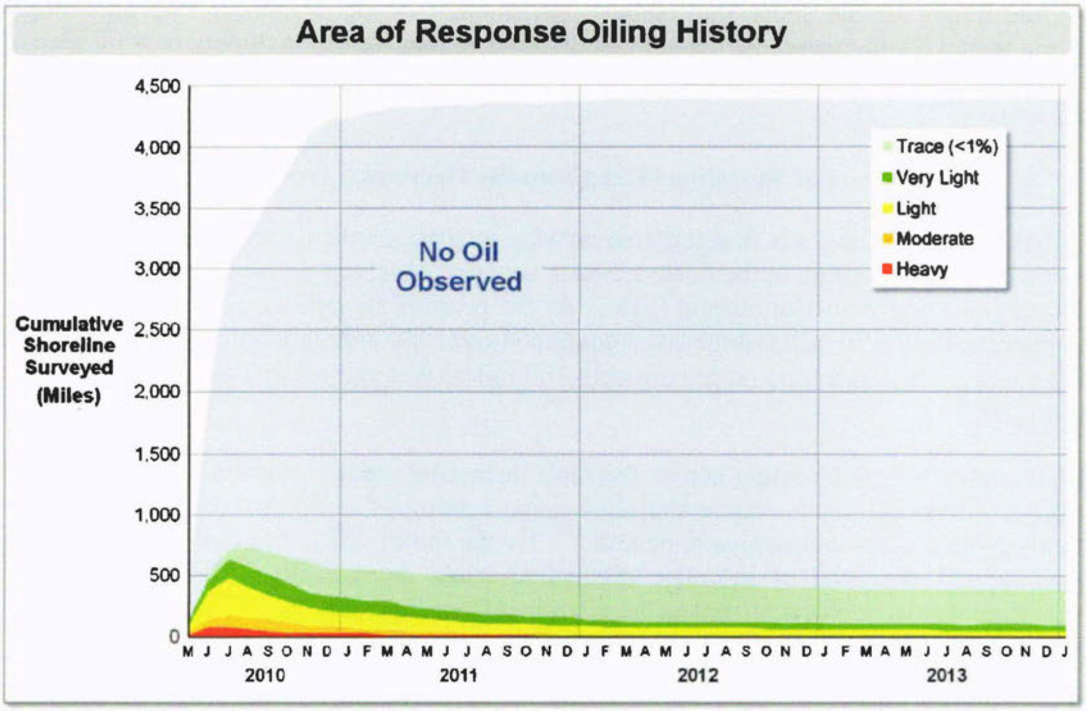

Figure 15: Changes in oiling levels over time across Gulf Coast Area of Response.

B. The Level of Oiling on Sand Beaches Decreased Dramatically Over Time

98. The maximum extent of any oiling along Gulf Coast sand beaches was approximately 560 miles. The maximum of characterized as heavy to moderately oiled was 170 miles. The extensive cleanup operations were successful at quickly reducing the oiling levels. In December 2010, SCAT documented 26.2 miles of heavy to moderately oiled sand beaches. The high of 29.4 miles of heavy oiled beach in July 2010 was down to 9.7 miles by December 2010.[178] One year later in December 2011, approximately 3 miles of beach remained heavily oiled and this was largely because the oil was on sensitive habitats (*e.g.*, Department of Interior-managed lands) where the potential impacts of a major cleanup were considered to outweigh the benefits of the removal of weathered, residual oil.

99. The miles of beaches characterized as very light, light, moderate, or heavy oiling (*i.e.*, oiled but excluding trace oiling), decreased from the SCAT-documented 283 miles in July 2010 to

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177 *See* Michel, Owens, et al., *Extent and Degree of Shoreline Oiling* (June 2013) (Exhibit 12199); SCAT Database.

178 SCAT Database.

148 miles by the end of 2010 and to approximately 53 miles by December 2011.[179] Trace oiling accounted for 84% or more of the residual oil documented by SCAT from December 2011 through December 2013 on sand beaches. *See* Appendix F for a detailed breakdown of surface oiling by beach habitat.

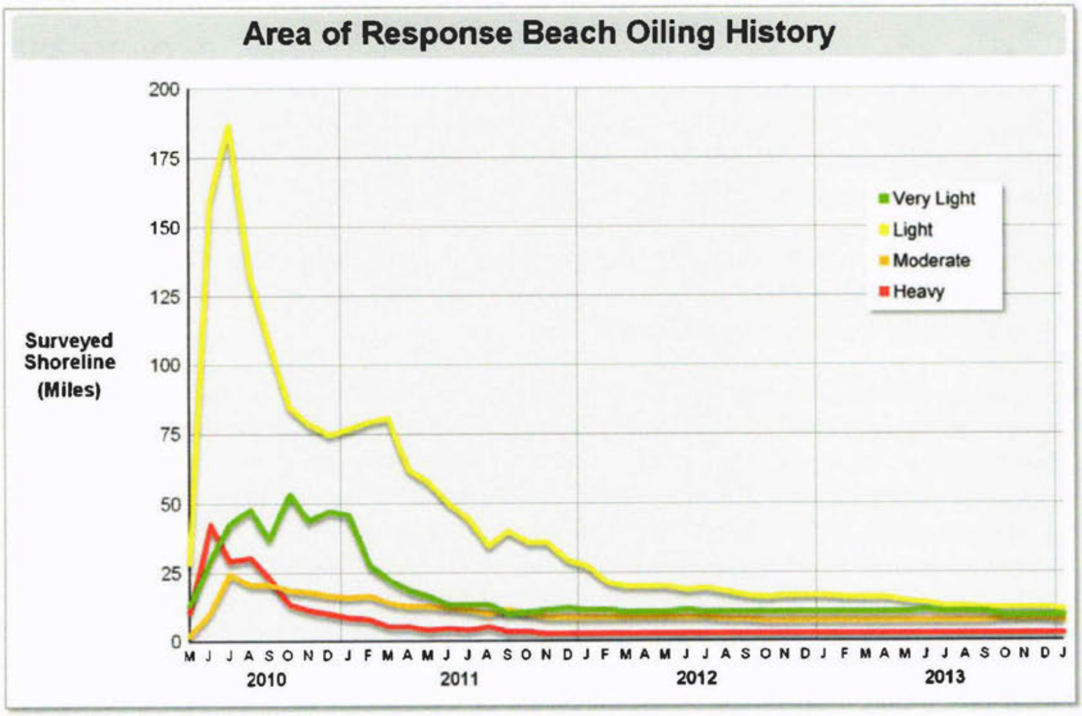

Figure 16: Changes in oiling levels over time on beaches in the Area of Response.

100. The iterative operational and SCAT sweeps conducted along sand beaches from 2011 through completion removed the trace amounts of oil that were exposed or remobilized, including non-MC252 oil.

C. The Level of Oiling on Marshes and Wetlands Decreased Dramatically Over Time

101. Most of the marsh shoreline in Louisiana was never affected by MC252 oil. Along the marshes that were oiled, the MC252 oil typically only impacted the fringe of the marsh.[180] The objective for marsh treatment was to remove pooled or thick oil from the marsh to allow

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179 Michel, Owens, et al., *Extent and Degree of Shoreline Oiling* (June 2013) (Exhibit 12199); SCAT Database.

180 *See, e.g.*, Silliman, van de Koppel, et al., *Degradation and Resilience in Louisiana Salt Marshes After the BP-*Deepwater Horizon *Oil Spill*, p. 3 (July 10, 2012), *available at* http://www.pnas.org/content/109/28/11234 full.pdf+html (finding that oil cover on marsh surfaces dropped precipitously at impacted sites at distances beyond 10 meters from the shoreline); Michel, Owens, et al., *Extent and Degree of Shoreline Oiling* (June 2013), p. 8 (Exhibit 12199) (finding that along most of the marshes, the oil stranded along the marsh edge and bulk oiling usually spread into the marsh no more than about 10–15 m perpendicular to the shoreline).

for natural degradation of residual oil and promote recovery. In conjunction with that objective, Unified Command sought to minimize damage associated with cleanup activities and ensure that cleanup did not do more harm than the oil. Treatment in marshes was allowed along approximately 44 miles of the marsh fringe, representing about 9 percent of the oiled marsh length.[181]

102. Most of the marsh shoreline that was oiled occurred in Louisiana. By October 2010, the level of heavily oiled marsh in Louisiana had fallen from its maximum of 55.9 miles to 14.9 miles of marsh, a 74% reduction within three months of maximum oiling. Approximately one year after oiling (28 May 2011), the heavy oiled marsh was reduced to 8.9 miles. The last SCAT survey data from May 2014 showed 1.4 miles of Louisiana marsh were categorized as heavily oiled.[182] This dramatic reduction in oiling levels – from 55.9 miles down to 14.9 miles within months and then down to 1.4 miles by the end of active response – is due to strategic removal of bulk oil through treatment that had proven effective in field tests and to natural attenuation and recovery.

103. As part of the Natural Resources Damages Assessment, BP undertook Post Response Shoreline Surveys (PRSS) in February-April 2014 to assess oiling conditions at 81 sites that had not been surveyed since 2012. In 2012, these sites in Louisiana marshes had been categorized as moderate to heavy oiling and designated for No Further Treatment based on their sensitive habitats. These sites had not been surveyed since approximately May 2012 and even in 2014, were still categorized in the SCAT database as moderate to heavy based on 2012 surveys. Pre-PRSS the sites were characterized as representing 3.3 and 9.8 miles as heavy and moderate oiling, respectively. Once the 2014 PRSS surveys were completed, those same segments were found to actually represent 0.1 and 0.3 miles of heavy and moderate oiling, respectively, reflecting natural attenuation between the time of the pre-PRSS survey and the post-PRSS survey.[183]

181 Michel, Owens, et al., *Extent and Degree of Shoreline Oiling* (June 2013), p. 1 (Exhibit 12199).

182 SCAT Database.

183 Post Response Shoreline Survey Workplan (BP-HZN-2179MDL08421542- 08429376).

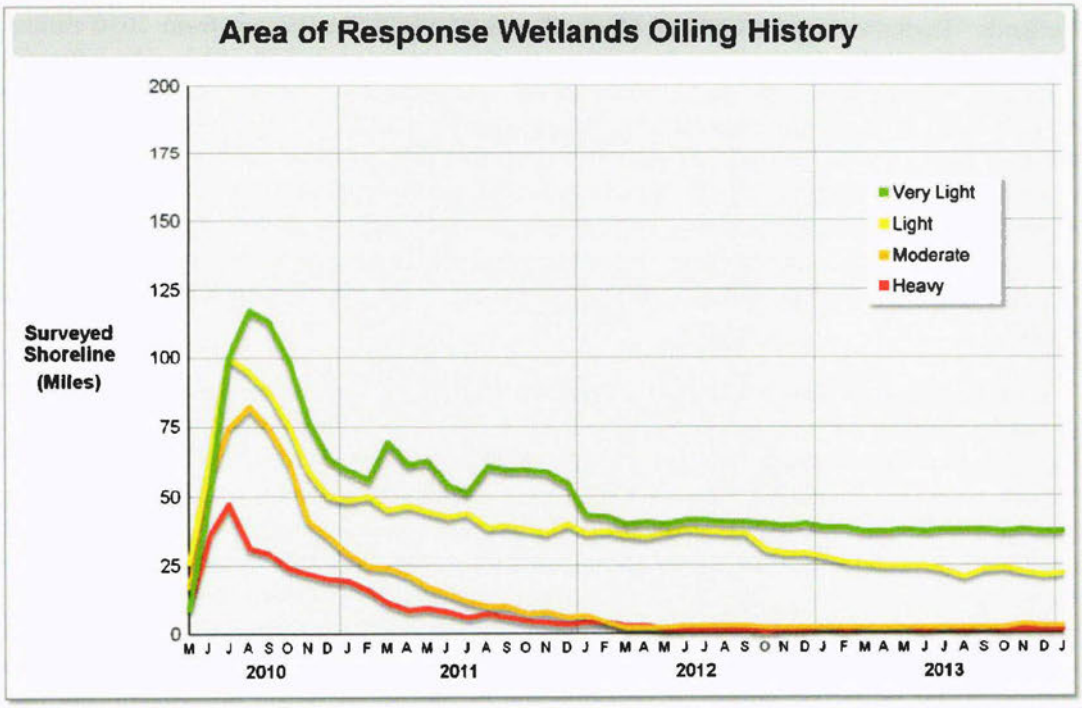

Figure 17: Changes in oiling levels over time on wetlands in the Area of Response.

104. These levels of reduction in shoreline oiling demonstrate the success of the shoreline cleanup efforts in mitigating the impacts of the spill on the Gulf shoreline.

D. The Marshes and Wetlands Are Experiencing Substantial Recovery

105. Significantly oiled marshes can show visible impacts to vegetation, but vegetation regrowth typically occurs following oiling, provided that additional impacts, such as from over-aggressive cleanup, do not further harm plants and, in particular, root systems. Marsh recovery following oiling from a crude oil spill can vary depending on a number of factors (see Mendelssohn et al., 2012). Wetland vegetation, as the foundation for the marsh habitat, shows substantial regrowth in nearly all cases of oiled marsh. For the *Deepwater Horizon* spill, factors that aided in vegetation recovery include the degraded character of the MC252 oil that reached the shoreline (loss of volatile and more toxic hydrocarbons), limited contact with marsh (predominantly fringe oiling), limited oiling (at peak oiling in July 2010, 85% of the marsh shoreline that was observed by SCAT as oiled was characterized as moderate or less), and the limited penetration of oil into the marsh soils.[184]

106. A substantial amount of data has been collected to assess the impacts to and recovery of the marsh habitat where MC252 oil reached the shoreline. I have reviewed SCAT data, the available data from the cooperative workplan developed by the NRD trustees and BP entitled "Sampling and Monitoring Plan for the Assessment of MC252 Oil Impacts to Coastal

[184] Michel, Owens, et al., *Extent and Degree of Shoreline Oiling* (June 2013) (Exhibit 12199).

Wetlands Vegetation in the Gulf of Mexico" (the "CWVA") collected from 2010 through Spring 2013, and the data collected by BP under that workplan in Fall 2013. The latter data consist of a time series of visual observations and objective measurements at over 200 wetland sites of varying degrees of oiling (including unoiled for reference), featuring different species of predominant marsh vegetation and wetland habitats, in Louisiana, Mississippi, and Alabama. These data include visual observations such as oil height on the vegetation, sediment surface oiling, and oil extent into the marsh, as well as potential impact parameters over time such as above and below ground biomass, chlorophyll content, and live and dead plant cover. The CWVA also collected soil chemistry data such as TPH and PAH content.

107. Similar types of data relating to vegetation impact and recovery were collected at 55 Louisiana wetland sites by researchers from Louisiana State University and Applied Coastal Research and Engineering: Drs. Irv Mendelssohn and Mark Byrnes, under the Survey of Impacts from the Deepwater Horizon Oil Spill to Wetland Vegetation and their Recovery in Coastal Louisiana ("Wetland Vegetation Impact and Recovery Data"). That study has assembled an extensive time series of information. The Wetland Vegetation Impact and Recovery Data consist of visual observations of the condition of the shoreline vegetation (such as live and dead plant cover), assessments of the presence of oil on vegetation and in the soil, and a determination of the penetration of oil into the marsh. The data collection and analysis under these two studies is still ongoing as part of the NRD assessment, but these studies provide substantial information about the impacts to and recovery of the wetlands.

108. My assessment of the decrease in wetland vegetation oiling and marsh recovery is focused on observational evidence of residual oil, soil and bare ground, vegetation regrowth (abundance or biomass, height), and comparisons between sites that had different initial oiling conditions and unoiled sites. My analysis of recovery focuses on vegetation, which is the foundation for marsh habitat,[185] and a proxy used extensively in past marsh recovery assessments and studies (e.g., Baker, 1993, 1999; Michel and Rutherford, 2013 2014; NOAA, 2013; Sell et al., 1995).

109. Using Wetland Vegetation Impact and Recovery Data from 55 sites in Louisiana, I compared the average canopy height of cordgrass in marshes that were initially lightly to heavily oiled versus the average canopy height of cordgrass in non-oiled locations. This provides an indication of vegetation impacts and recovery for the oiled sites. The regrowth of marsh grass for the marsh shoreline sites that were initially lightly oiled (14 sites) and moderately oiled (9 sites) appears no different to non-oiled sites in less than one year (Spring 2011). Sites that were initially categorized as heavily oiled (10 sites) showed average canopy heights comparable to the non-oiled portions of transects by Fall 2011 in cases where the remaining oil had decreased to moderate or low categories.[186] Where remaining oil was

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185 Mendelssohn, Anderson, et al., *Oil Impacts on Coastal Wetlands: Implications for the Mississippi River Delta Ecosystem after the* Deepwater Horizon *Oil Spill*, p. 5 (June 2012), *available at* http://bioscience.oxfordjournals.org/content/62/6/562 full.pdf+html.

186 Mendelssohn, Anderson, et al., *Oil Impacts on Coastal Wetlands: Implications for the Mississippi River Delta Ecosystem after the* Deepwater Horizon *Oil Spill* (June 2012), *available at* http://bioscience.oxfordjournals.org/content/62/6/562 full.pdf+html.

categorized as heavy (5 of the 10 sites), average canopy height indicates full recovery by Fall 2013.

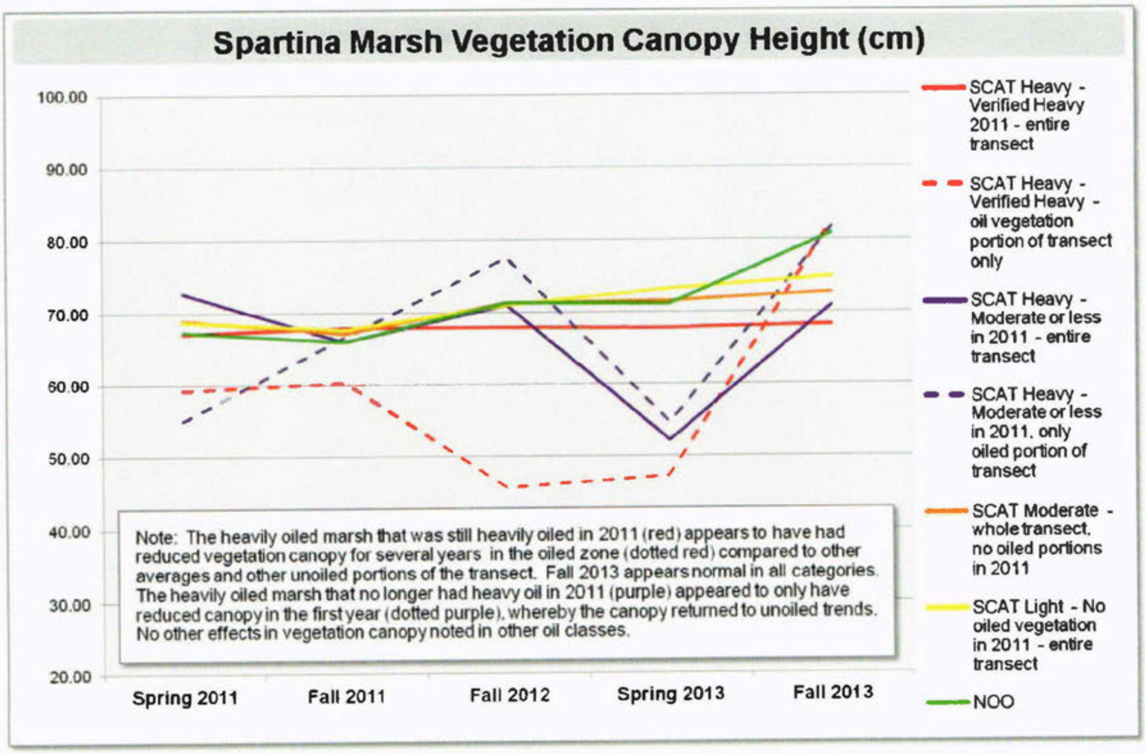


Figure 18: Graph of Spartina marsh vegetation canopy height from Spring 2011 through Fall 2013.

110. In addition to assessing the marsh vegetation canopy height in oiled and unoiled sites, I analyzed Wetland Vegetation Impact and Recovery Data relating to the total live and total dead cover and wrack measurements at the same 55 study sites. Live cover is the percent of the study plot covered with live vegetation. The overall averages of total live cover from Fall 2011 through Fall 2013 for initially lightly oiled sites are approximately the same as non-oiled sites. The initially moderately oiled sites are within the standard deviation of unoiled sites. For initially heavily oiled sites, there appears to be less overall live cover than non-oiled sites. The results from percent live cover, as well as comparisons between percent dead cover and wrack, suggest that most oiled sites reached vegetation levels comparable with background (unoiled) sites within a year with the exception of some initially heavily, and possibly moderate, oiled sites.

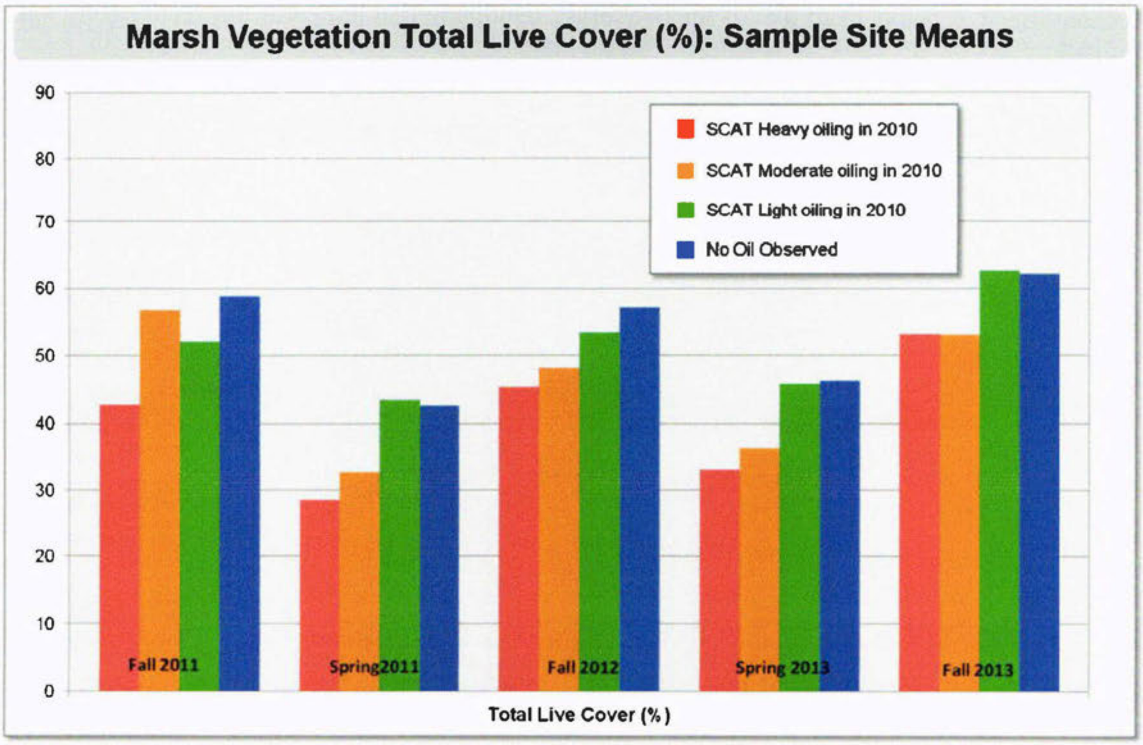
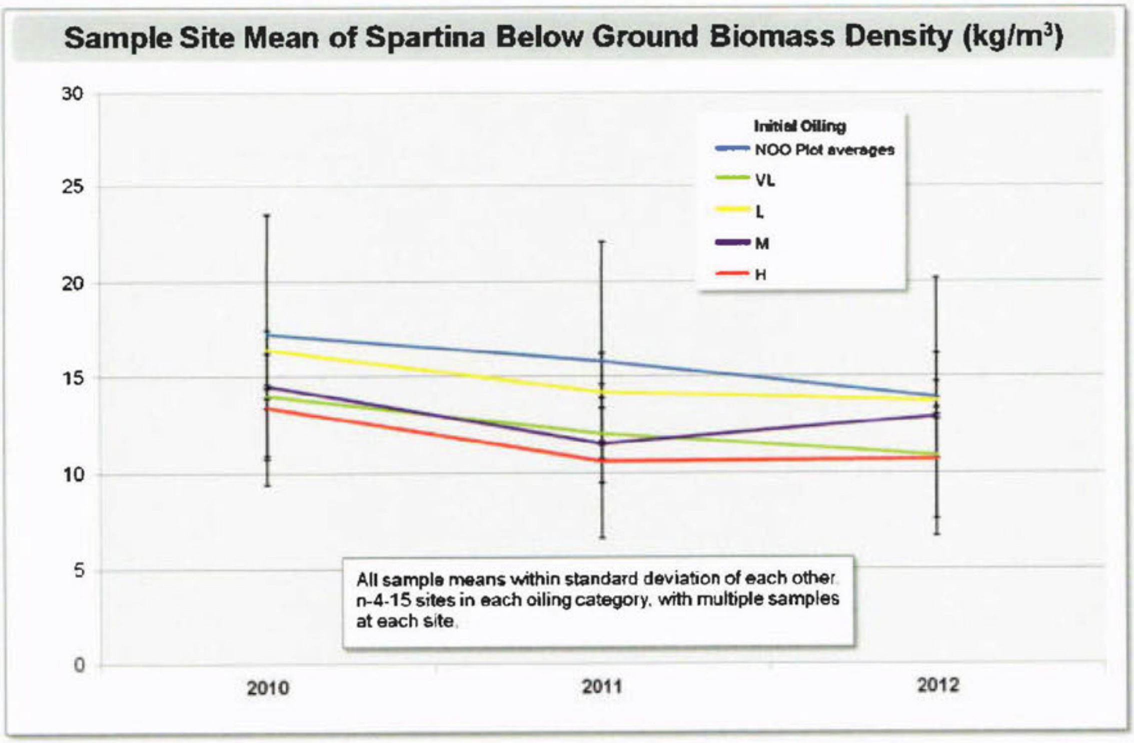
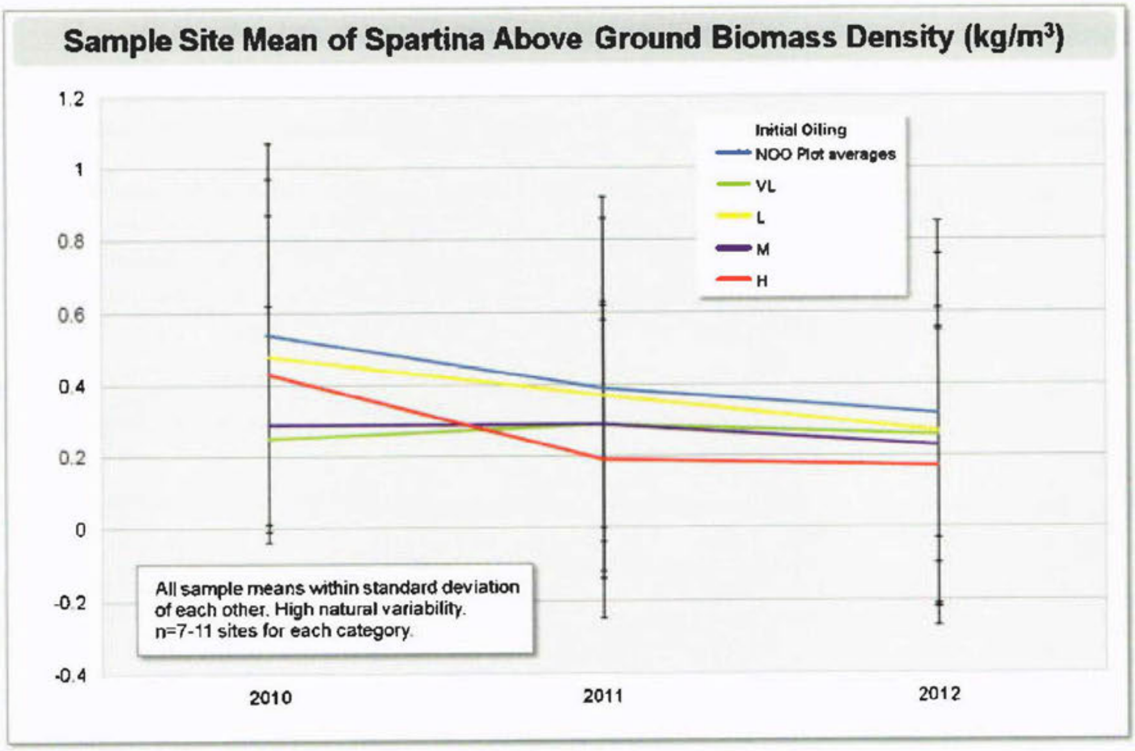


Figure 19: Graph of Total Live Cover Percentage from Fall 2011 through Fall 2013.

111. I have also undertaken an analysis of the above-ground and below-ground biomass measurements from the CWVA, the cooperative study of over 200 marsh sites. Biomass is a measure of plant material collected and analyzed from a specific sample, here separated into above-ground (stems and leaves) and below-ground (roots). This analysis shows that all sites sampled in the fall of 2010 through 2012 had, on average, a slight decrease in biomass; however, considering the range of values measured for the averages and their standard deviation (see bars in graphs), the sites have no significant differences through time or relative to unoiled sites, reflecting the natural variability of vegetation within and between plots and through time. For example, taking the range represented by the non-oiled sites and the initially heavily oiled sites, the average below-ground biomass for the initially heavily oiled sites decreased slightly from 13.4±6.6 kg/m^3 in Fall 2010 to 10.7±4 kg/m^3 in Fall 2012. By comparison, the non-oiled sites decreased from 17.2±6.3 to 13.9±4.95 kg/m^3 over that same time; however, the average plus/minus the standard deviation in both datasets overlap. These results indicate that any limited effects of oiling (or treatment at some sites) falls within the natural range of variability of vegetation in these areas. The variability of marsh vegetation is related to a number of factors, including storm events, which have measurable effects on marsh vegetation and can introduce significant variability on marsh fringes. One such example during the time frame of these studies is Hurricane Isaac, which made landfall in Louisiana in August 2012.


Sample Site Mean of Spartina Below Ground Biomass Density (kg/m³)
30
25
20
15
10
5
0
Initial Oiling
NOO Plot averages
VL
L
M
H
All sample means within standard deviation of each other. n-4-15 sites in each oiling category, with multiple samples at each site.
2010
2011
2012


Sample Site Mean of Spartina Above Ground Biomass Density (kg/m³)
1.2
1
0.8
0.6
0.4
0.2
0
-0.2
-0.4
Initial Oiling
NOO Plot averages
VL
L
M
H
All sample means within standard deviation of each other. High natural variability. n=7-11 sites for each category.
2010
2011
2012

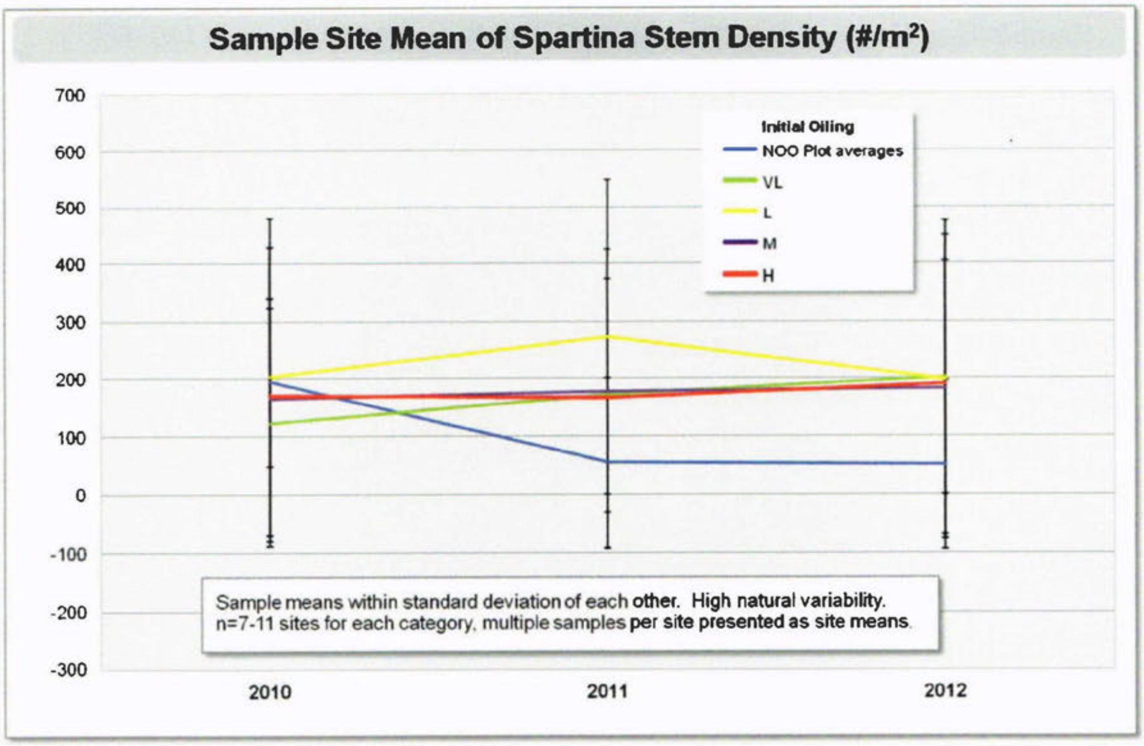


Figure 20: Graphs of Spartina above and below ground biomass density and stem density

Based on my review of the currently available data and scientific publications, I have developed the following opinions regarding the impacts of oil on the marshes and the recovery to date:

(i) The vast majority of the oiled wetland shoreline (83%) had a maximum oiling level of moderate, light, very light, or trace oiling. For oiled shorelines in those categories (*i.e.*, moderate, light, very light, or trace oiling), the vegetation was generally undistinguishable from non-oiled areas within a year. This observation conforms with marsh recovery at numerous historical spill sites.[187]

(ii) The marsh shoreline that was initially categorized as "heavy" oiling decreased rapidly from a maximum of 86.1 miles to less than 15 miles by Oct 2010[188] as a

[187] *See* Michel & Rutherford, *Impacts, Recovery Rates, and Treatment Options for Spilled Oil in Marshes*, p. 4 Figure 2 (May 2014), *available at* http://www researchgate net/publication/261406689_Impacts_recovery_rates_and_treatment_options_for_spilled_oil_in_marshes; *See also* Email from Michel to Kusma (July 20, 2010) (US_PP_NOAA159300) (NOAA SCAT Coordinator acknowledging that "there can be no long-term impacts for very large spills"); Silliman, van de Koppel, et al., *Degradation and Resilience in Louisiana Salt Marshes After the BP*-Deepwater Horizon *Oil Spill*, p. 5 (July 10, 2012), *available at* http://www.pnas.org/content/109/28/11234 full.pdf+html; Lin & Mendelssohn, *Impacts and Recovery of the* Deepwater Horizon *Oil Spill on Vegetation Structure and Function of Coastal Salt Marshes in the Northern Gulf of Mexico*, p. 5 (Feb. 27, 2012).

[188] SCAT Stage III Dashboard Oct. 11, 2010.

result of natural attention and shoreline treatment strategies. By May 2012, 1.4 miles of marsh remained characterized as heavy oiling. Marsh habitat that had a maximum oiling level of heavy (17% of the maximum oiled marsh/wetlands in the AOR) includes sites where vegetation appears reduced on the marsh fringe when compared to control (unoiled) sites.[189] Nonetheless, the vegetation at most of those heavily oiled sites appears to be recovering over time and, with the exception of a few of the more persistently heavily oiled sites, appear to be comparable or near the vegetation level of background sites as of their most recent observations.

(iii) Oil observations and observations of reduced vegetation show that oiling was almost exclusively limited to the marsh edge or fringe and, with very few exceptions, there does not appear to be evidence to support observable oiling or impacts to the interior of the marshes. Further, because vegetation impact was primarily limited to the fringe of the marsh, and given the background rates of rapid land loss that are endemic to the Gulf coast (especially Louisiana)[190], the marsh edges of some of the study sites, both oiled and unoiled, have naturally eroded. Many of the impacted marsh areas would have been lost to erosion over the last four years, even if the accident had never occurred. Indeed, during the past half-century rapid relative sea-level rise at the southern margin of the basin (0.94 cm/yr, Grand Isle tide gage: 1947-2006) and erosional processes within Barataria Bay have led to substantial wetland loss, converting more than 425 square miles of wetlands to open water (4,000 acres/yr) since 1935. Conversion of wetlands to intertidal and subtidal environments is a result of several linked processes including subsidence, marsh front erosion, and catastrophic scour during major hurricanes.

112. The following photographs are illustrative of the recovery seen in initially heavily oiled segments of the marshes.

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[189] Through BP's early restoration commitment and other efforts, shoreline habitats that were impacted as a result of the spill are being addressed. *See, e.g.*, BP, Gulf of Mexico: Four Years of Progress, https://www.thestateofthegulf.com/media/70884/4-Years-of-Progress-Fact-Sheet-4-15-14.pdf (last visited Aug. 15, 2014); NOAA, Early Restoration Projects Atlas, http://www.gulfspillrestoration.noaa.gov/restoration/early-restoration/early-restoration-projects-atlas/?utm_source=Early+Restoration+Atlas&utm_campaign=early+restoration+atlas&utm_medium=email; Hanzalik Deposition, pp. 261-262 (June 17, 2014); Utsler Deposition, p. 312 (June 27, 2014).

[190] Couvillion, Barras, et al., *Land Area Change in Coastal Louisiana from 1932 to 2010*, p. 1 (2011), *available at* http://pubs.usgs.gov/sim/3164/downloads/SIM3164_Pamphlet.pdf.

Figure 21: Example of sites initially heavily oiled in July 2010 and vegetation regrowth (top is CWVA 910; bottom is CWVA 1326).

113. Overall, the data that I reviewed support my opinion that the *Deepwater Horizon* shoreline program was effective in helping to mitigate the impact of the spill. Even where oil reached the shoreline, the thoroughness of the shoreline assessment and cleanup process, and the stringent environmental protectiveness that was utilized in making decisions about whether to clean and how to clean the shoreline, resulted in an acceleration of the natural recovery processes which helped reduce the impacts to the Gulf shoreline environment.

E. Unified Command Has Concluded the Active Shoreline Response

114. The objective of the Shoreline Cleanup Completion Plan was to allow Unified Command to determine if segments had reached No Further Treatment criteria and could be moved out of the active response.[191] Unified Command moved the first shoreline segments out of the response in November 2011 and included shoreline SCAT segments on which no oil or rare

[191] Michel, Owens, et al., *Extent and Degree of Shoreline Oiling*, p. 4 (June 2013) (Exhibit 12199).

traces had ever been observed or segments for which landowners, including the Fish and Wildlife Service, requested that cleanup activities conclude.[192]

115. The process of moving segments that had achieved No Further Treatment standards out of the response continued throughout 2012. By 2013, Unified Command declared that active cleanup had concluded in Alabama, Florida, and Mississippi, and in 2014, the active cleanup concluded in Louisiana.[193] The active shoreline response program concluded with signing of all segments out of the response and back under the National Contingency Plan (NCP) in May 2014.

Figure 22: Dates when Gulf States and Dept. of Interior were moved out of active response

116. The shoreline cleanup lasted approximately four years, in part, because of the rigorous and stringent endpoints negotiated under the Shoreline Clean-up Completion Plan and interpretation of the endpoint criteria. The interpretation and generally applied criteria of the "no visible oil" portion of the endpoint standards set forth in the SCCP for amenity beaches were more stringent and exacting than any standards that I have seen in my 30 years of spill response experience. In practice, a segment could be prevented from moving out of the response and subject to additional rounds of cleanup if a tarball the size of a tic-tac was found on it. In addition to the exacting standards set forth in the SCCP, certain actions taken by the Gulf States threatened to hinder or stall the progress of the Response. For example, according to the Federal On-Scene Coordinator, Alabama's State On-Scene Coordinator failed to meet expectations during the shoreline cleanup and was removed from his position under federal pressure. In another example, NOAA's SCAT Coordinator expressed concern

[192] Certain segments moved out of the response by "exception" as opposed to by meeting the cleanup endpoints set forth in the Shoreline Cleanup Completion Plan. One such exception in Louisiana was the Chandeleur Islands, which the U.S. Fish and Wildlife Service had requested not be further surveyed on account of the environmental sensitivity and the difficulty SCAT teams had in accessing the area. Michel Deposition, pp. 122-123 (Aug. 1, 2014).

[193] *See* BP Press Release, *Active Cleanup from Deepwater Horizon Accident Ends in Florida, Alabama and Mississippi* (June 10, 2013), http://www.bp.com/en/global/corporate/press/press-releases/active-cleanup-for-deepwater-horizon-accident-ends.html.

that methods used by parish governments to clean oiled marshes could increase damage to the marshes.[194] Although Unified Command was able to overcome such obstacles and progress the shoreline response, such actions threatened to delay the cleanup.

F. BP is Committed to Cleaning Up Any Residual MC252 Oil From the Gulf Coast

117. Even after a segment has been moved out of the response, there is a plan in place to address any residual MC252 oil that appears on the Gulf shoreline.[195] Calls to report shoreline oiling are received at the National Response Center ("NRC"), the federal government's single point of contact for reporting all shoreline oiling. When shoreline oil is reported, the U.S. Coast Guard investigates the oiling report and, if the oil is visually consistent with MC252 residual oil and the U.S. Coast Guard determines that cleanup is appropriate, it notifies BP as the Responsible Party.[196] In most instances where the oil is visually consistent with MC252 residual oil, there is not a significant amount of material and the U.S. Coast Guard removes it and recovers the cost of removal from BP. However, in instances where the U.S. Coast Guard determines that the amount of material or the complexity of recovery is beyond its capabilities, the U.S. Coast Guard dispatches BP to remove the residual oil.

118. BP is responding to U.S. Coast Guard dispatch to remove residual oil within 4 to 24 hours depending on the time of notification and location-specific conditions. In order to meet these requirements, BP established and still maintains stations in Louisiana and the Eastern States staffed with field personnel, equipment, and vessels to quickly respond to dispatches to remove residual oil.[197] This approach has proven effective: the U.S. Coast Guard has issued 150 directives to BP to respond to reports of oiling that were deemed visually consistent with MC252. In every case, BP has responded quickly and followed the guidelines of the U.S. Coast Guard. Indeed, in most cases, BP has dispatched within 4 hours of being contacted by the U.S. Coast Guard. BP has never missed a deadline to respond to an oiling report.[198]

119. It bears noting that in many instances where the U.S. Coast Guard dispatched BP to cleanup NRC reports of shoreline oiling, subsequent chemical fingerprinting indicated that the oil was not from the Macondo Well. Specifically, out of the 150 instances where the U.S. Coast Guard directed BP to remove shoreline oiling that was reported through the NRC call

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194 Hein Deposition, pp. 212-14 (July 9, 2014); Memo from Capt. Sparks to Gulf Coast Incident Management Team (Oct. 29, 2013) (US_PP_NOAA107257); Email from Michel to Hein (Oct. 14, 2010) (Exhibit 13017); Email from Michel to Mendelssohn (May 29, 2010) (US_PP_NOAA145131, 133) (NOAA's SCAT Coordinator expressing concern and criticism of the parishes' marsh cleaning techniques).

195 Deepwater Horizon Shoreline Clean-up Completion Plan (SCCP), p. 5 (Exhibit 12184).

196 Brief Description of the NRC Process / Middle R Process (BP-HZN-2179MDL09096164).

197 Brief Description of the NRC Process / Middle R Process (BP-HZN-2179MDL09096164).

198 Brief Description of the NRC Process / Middle R Process (BP-HZN-2179MDL09096164).

process, 93 samples were taken and 71 of those samples (or approximately 76%) were interpreted as non-MC252 oil.[199] BP nonetheless swiftly removed the oiling under the NRC process.

G. Select Shoreline Segments Show Effectiveness of Shoreline Response Program

120. Attached as Appendix H are summaries for sites selected to represent segments from amenity beaches and marshes from the Gulf States. Each site summary includes a segment history (oiling, SCAT surveys, treatment, and sign-out). Maps of segment surface oiling conditions show the change in oil level through time. Subsurface oil maps show the locations of pits, trenches, and Snorkel SCAT efforts undertaken to identify buried or submerged residual oil and define areas for treatment. Photographs showing examples of initial oiling, cleanup operations, and post-treatment are provided.

[199] Brief Description of the NRC Process / Middle R Process (BP-HZN-2179MDL09096164).

VIII. CLOSING STATEMENT

This report represents my analysis and opinions, which have been prepared to a reasonable level of professional and engineering certainty. Should additional information become available, I reserve the right to supplement and/or revise any of my analysis and opinions. If requested, I can and will competently testify regarding the contents, analysis, and opinions in this report.

By: ______________________ Date: 15 Aug. 2014

Appendix A: Curriculum Vitae

Dr. Taylor is recognized as a leader in formulation of response planning organizations, development of contingency plans, and technical support for environmental issues in oil spill response. He has over 25 years of experience in oil spill response and for the past several years has been a technical advisor for the shoreline program on the *Deepwater Horizon* spill. He has managed the preparation of comprehensive spill preparedness programs for international operations in North and South America, Africa, Middle East, and Russia entailing risk assessment, prevention measures, coordination with national to local officials, shoreline and sensitive area mapping, equipment selection and warehousing, and training and exercises. Dr. Taylor is on the IMO roster of technical experts and consultants for oil spill response having led international workshops and activities in training, planning, and response capacity assessment.

EDUCATION
Texas A & M University, College Station: Ph.D., Oceanography, 1984
University of California, San Diego: Graduate Studies, 1977-1979
Universidad Autónoma de Baja California, México: B.Sc., Oceanography, 1977

PROFESSIONAL HISTORY
POLARIS Applied Sciences, Inc., Principal, 1998-Present
TAYLOR Environmental and Marine Services, Inc., Owner, 1993-1998
Woodward-Clyde Consultants, Senior Project Scientist, 1989-1993
University of Washington: Visiting Scholar (oceanography) and Lecturer (geology), 1989
Texas A & M University: Ocean Drilling Program, Staff Scientist, and Dept. of Geology, Assistant Professor, 1984-1989; Dept. of Oceanography, Graduate Research Assistant, 1979-1984
Scripps Institution of Oceanography, UCSD, Laboratory Assistant II, 1977-1979
Universidad Autonoma de Baja California, Teaching Assistant, 1973-1976

REPRESENTATIVE EXPERIENCE
Dr. Taylor is scientist with over 30 years of experience in environmental and marine sciences. His projects in oil spill response include planning, regulatory compliance, spill exercises, response evaluation, technical support in environmental and shoreline assessment, baseline studies, sediment quality and transport, coastal processes and marine geology. Dr. Taylor has taught undergraduate and graduate level courses in geology and oceanography. As an International Maritime Organization (IMO) expert consultant, he has been on teams conducting IMO model courses in oil spill response (OPRC) and has worked on regional and national planning initiatives. Dr. Taylor's field experience encompasses river, lake, harbor, coastal and deep-sea programs and spill response technical support worldwide. His extensive field and laboratory research includes studies of onshore to offshore marine geology and oceanography. He has provided leadership and management to numerous multi-disciplinary research programs

that required coordinating project teams for both industry and international scientific programs. Examples of recent spill response project experience include:

- Environmental Unit leader or team member on emergency response for spill incidents including: Exxon Valdez (1989 and follow-up through 2006), Barge 101 Alaska (1992), Greenhill blowout (1992), New Carissa (1999), Bolivia Transredes pipeline (2000-2001), Johnson Creek (Oregon) (2004), SOTE Pipeline (Papallacta, Ecuador) (2004), Torm Mary (Texas) (2005), Barge PB20 (Washington), Selendang Ayu (Alaska, 2004), Barge Millicoma (Oregon-Washington) (2005), Kab 121 Well (PEMEX Gulf of Mexico, 2007), Lemon Creek (BC) (2013), and Deepwater Horizon MC252 spill (U.S. Gulf of Mexico, April 2010 to April 2013).

- Contracted oil spill expert to support international missions for IMO, IPIECA, RAC-REMPEITC Carib for workshops on environmental risk assessments and national oil spill contingency planning. Workshops delivered in Anguilla, Antigua, Belize, Costa Rica, Nicaragua, St. Maarten, St. Vincent-Grenadines.

- Contracted oil spill expert to support international missions for IMO, IPIECA, and the GI WACAF (West Africa) Initiative for workshops on environmental risk assessments and national oil spill contingency planning in Equatorial Guinea.

- Technical leader for aerial video survey and coastal environmental sensitivity mapping of the Angola coastline, development of oil spill response tactics for key sensitive sites, and preparation of pre-SCAT geodatabase.

- Technical lead for the American Petroleum Institute on workshops and development of "*Assessment of Oil Spill Response Capabilities: A Proposed International Guide for Oil Spill Response Planning and Readiness Assessment*", presented in a special session of the 2008 International Oil Spill Conference. As a follow-up to that initiative, Dr. Taylor completed the ARPEL Oil Spill Response Planning and Readiness Assessment Manual and RETOS (Excel application) in 2011 and led the workshops on use and application held in Rio de Janeiro (2011) and Trinidad (2012). Dr. Taylor led the effort for a 2014 upgrade to the ARPEL OSR readiness assessment manual and the RETOS tool, both freely available from the ARPEL website.

- Oil spill technical expert for proposed pipeline development and expansions in British Columbia: Northern Gateway and Trans Mountain pipelines. Activities include spill response planning and preparedness, development of preliminary tactical control points, oil testing, literature reviews, and information request support and expert witness testimony for the National Energy Board application and hearing process.

- Principal lead in development of the Gulf of Mexico Regional Oil Spill Contingency Plan for Pemex Exploration and Production. Effort entailed shoreline sensitivity atlas, logistics and spill equipment database, plan analysis and integration with platform (Tier 1) emergency plans, and recommended additional spill response resources and locations. Project encompassed all of Pemex Exploration and Production activities in the Gulf of Mexico (platforms, pipelines, marine terminals, and floating storage systems – FSO, FSPOs).

- Technical leader and oil spill expert for coastal environmental sensitivity mapping and spill response atlas for a proposed marine terminal in north British Colombia (Canada) and for river tactics along proposed pipeline route from Alberta.

- Expert review of marine spill response capability assessment of Mexico (Navy and PEMEX) representing the IMO through the RAC-REMPEITC Carib office.

- Technical Leader for Exxon Neftegas Ltd. for Sakhalin I regional and facility oil spill contingency plans, equipment readiness, training, and implementation. Project encompasses production alongshore and offshore, on-land and submarine pipelines and flowlines, processing facilities, and marine terminal for conditions ranging from open water to ice-covered operations.

- Spill planning expert on review team for European Bank for Regional Development (EBRD) and Lender's assessment of spill response readiness (plans and implementation) for Caspian Sea development, including ACG Offshore operations and BTC pipeline operations in Azerbaijan, Republic of Georgia, and Turkey.

- Principal lead in development of the Qatar spill response preparedness program, entailing an Oil Spill Contingency for the State of Qatar, audit of existing capabilities and preparation of recommendations for equipment, personnel, and training, development of the Halul Marine Terminal Spill Response Plan, development of the Qatar Coastal Sensitivity and Oil Spill Atlas, and formulation of the Qatar Spill Response Centre.

- Key member of team for preparation of the Sakhalin Energy Corporate Oil Spill Response Plan and template for seven area plans (offshore, pipeline, and terminals), including the Spill Response Plan for the Molikpaq Platform.

- Response Plan Coordinator for more than 100 oil spill contingency plans and spill prevention plans developed to support vessel owners and facility operators throughout the U.S. and Canada. Plans formulated to address state requirements, OPA 90, and/or the Canadian Shipping Act for vessels, marine-transportation related facilities, inland facilities, pipelines, and mobile facilities.

- Developed the Chad/Cameroon General Oil Spill Response Plan, Construction Phase Spill Plans for Chad and Cameroon, and six Area-Specific Spill Response Plans for along the 1000 km pipeline route, oil field areas, and offshore terminal. Formulated equipment recommendations and specifications and also developed and implemented a 3-year spill training and exercise regime.

- IMO-certified trainer on oil spill response having provided OPRC Model courses (Level 2) for the SE Pacific Regional Seas program (Chile, Peru, Ecuador, Colombia, Panama) and Caribbean Regional Seas program, in Spanish.

- Technical trainer for oil spill response planning, incident command system, and shoreline assessment, and facilitator in the design and implementation of spill response tabletop and field exercises. Courses and exercises have been provided to BP, Burrard Clean, ExxonMobil, Chevron, Valero, Trumble, PDVSA, Crowley Marine Services, Southern Peru Copper, Captains of Ports Venezuela, Canadian Coast Guard, PetroEcuador, PEMEX, Taiwan EPA, and numerous others.

- Senior Project Coordinator for the development of oil and acid spill response capabilities for Southern Peru Copper, Ltd. Operations at port coastal facilities, railroad right-of-way, and two remote Andean mine sites. Program includes specification and requisitioning of spill response equipment, vessels and HAZMAT trailers, preparation of prevention and response manuals, and training and exercises for field teams and company management.

- Senior Project Coordinator for the development of oil spill response manuals for cleanup organizations, including Clean Sound (WA), Burrard Clean (British Columbia), Great Lakes Response Corp., Eastern Canada Response Corp., ALERT (New Brunswick), and Alaska Chadux Corp.

- Project Manager for the development of oil spill prevention and contingency plan training programs, for facilities and vessels, in Texas, California, Washington, Oregon, and Alaska. Projects entailed preparation of course curricula, handouts, train-the trainers programs, supplementary training videotapes, tabletop exercises, and exercise evaluation guidelines.

A list of refereed scientific and technical publications is available upon request.

AFFILIATIONS

American Geophysical Union
The Oceanography Society
Marine Technology Society

COMMITTEES

ASTM Committee F-20 (Oil Spill)
Scientific Advisory Committee for California Oiled Wildlife Care Network (2000 - 2004)
Sound Experience Board of Directors and Education Committee Chairman (2004-2008)

OTHER SKILLS

Bilingual: English/Spanish

Appendix B: List of Publications (Environmental Issues)

TAYLOR, E., G. Challenger, J. Rios, J. Morris, M.W. McCarthy, and C. Brown, 2014. Dilbit Crude Oil Weathering on Brackish Water: Meso-scale Tests of Behavior and Spill Countermeasures. Proc. of the 35th Arctic Marine Oilspill Program (AMOP) Technical Seminar on Environmental Contamination and Response: June 3-5, 2014: Canmore (Alberta), Canada.

TAYLOR, E., M. Moyano, and A. Steen, 2014. Upgraded RETOS™: An International Tool to Assess Oil Spill Response Planning and Readiness. Proc. 2014 International Oil Spill Conference, American Petroleum Institute, Washington, DC.

Michel, J, E.H. Owens, S. Zengel, A. Graham, Z. Nixon, T. Allard, W. Holton, P.D. Reimer, A. Lamarche, M. White, N. Rutherford, C. Childs, G. Mauseth, G. Challenger, E. TAYLOR, 2013. Extent and Degree of Shoreline Oiling: Deepwater Horizon Oil Spill, Gulf of Mexico, USA. PLOS One: http://dx.plos.org/10.1371/journal.pone.0065087

TAYLOR, E., Ramos, J. and Coatanroch, G., 2012. National Contingency Planning and IMO Workshops in the Caribbean Region. Proc. 2012 Interspill Conference. London, UK. 5pp.

TAYLOR, E. and T. Farrar. 2011. The Macondo Oil Spill Shoreline Response Programme: 3. Snorkel SCAT "Taking the Plunge". Proc. of the 34th Arctic Marine Oilspill Program (AMOP) Technical Seminar on Environmental Contamination and Response: October 4-6, 2011: Banff (Alberta), Canada.

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TAYLOR, E. and Reimer, D., 2008. Oil persistence on beaches of Prince William Sound – A review of SCAT surveys conducted from 1989 to 2002. Marine Pollution Bull., 56, p. 458-474.

Owens, E.H., TAYLOR, E., 2007. Guidelines to Evaluate Oil Spill Contingency Plan Adequacy, Response Competency, and Sustained Readiness. Proceedings SPE Asia Pacific Health, Safety, Security and Environment Conference and Exhibition, Bangkok, Thailand. 6 pp.

Owens, E.H., TAYLOR, E, and Dickins, D.F., 2007. Defining Best International Practices for Oil Spill Response Planning. Proceedings Annual Symposium Petroleum Association of Japan, Tokyo, 11 pp.

Owens, E., TAYLOR, E., and Parker-Hall, H., 2007. Chapter 2. Spill site investigation in environmental forensic investigations. *In* Oil Spill Environmental Forensics; Fingerprinting and Source Identification, Eds. Z. Wang and S. Stout. Academic Press, MA. USA., p. 55-72.

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TAYLOR, E., 2003. The use of dispersants to minimize the effects of oil spills in sheltered marine environments. Proc., *Pipeline Conference & Exposition 2003*, October 22-24, Rio de Janeiro, Brazil, Brazilian Petroleum and Gas Institute, Ref. IBP418_03.

TAYLOR, E., Buselli, E., Jackson, J., and Geddes, B., 2001. Application of a comprehensive spill management program for oils and bulk hazardous liquids- Southern Peru Copper Corporation. Proc. 2001 International Oil Spill Conference. API. Washington, DC., p.517-522. http://www.ioscproceedings.com/doi/pdf/10.7901/2169-3358-2001-1-517

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TAYLOR, E. and Geddes, B., 1999. A hazards analysis program for spill prevention and contingency planning. In: Proc. of the 22th Arctic and Marine Oil Spill Program Tech. Sem., June 2-4, Calgary, Env. Canada., p.705-718.

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POLARIS Applied Sciences, Inc., 2013. A Comparison of the Properties of Diluted Bitumen Crudes with other Oils. Report prepared for Trans Mountain Pipeline, 26 pp. http://www.crrc.unh.edu/sites/crrc.unh.edu/files/comparison_bitumen_other_oils_polaris_2014.pdf

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Appendix C: Oiling Category Matrix

When conducting surveys during the response, SCAT teams documented the observed thickness, width, and distribution of oil in each shoreline segment. Based on this information, segments were then classified as heavy, moderate, light, very light, or trace — classifications that helped guide SCAT coordinators as they drafted Shoreline Treatment Recommendations, which were in turned utilized by the Operations teams to treat the shorelines.

Oil Thickness	Oil Band (Width of Oiled Area)		Oil Distribution				
			91-100%	51-90%	11-50%	1-10%	<1%
Thick Oil >1.0 cm	Wide	>6ft	Heavy	Heavy	Heavy	Moderate	Light
	Medium	3 to 6 ft	Heavy	Heavy	Heavy	Moderate	Light
	Narrow	1 to 3 ft	Heavy	Heavy	Moderate	Light	Light
	V.Narrow	<1 ft	Moderate	Moderate	Light	Light	Light
Cover 0.1-1.0 cm	Wide	>6ft	Heavy	Heavy	Heavy	Moderate	Light
	Medium	3 to 6 ft	Heavy	Heavy	Heavy	Moderate	Light
	Narrow	1 to 3 ft	Heavy	Heavy	Moderate	Light	Light
	V.Narrow	<1 ft	Moderate	Moderate	Light	Light	Light
Coat 0.01-0.1cm	Wide	>6 ft	Moderate	Moderate	Moderate	Light	V. Light
	Medium	3 to 6 ft	Moderate	Moderate	Moderate	Light	V. Light
	Narrow	1 to 3 ft	Moderate	Moderate	Light	V. Light	V. Light
	V.Narrow	<1 ft	Light	Light	V. Light	V. Light	V. Light
Stain <0.01	Wide	>6ft	Light	Light	Light	V.Light	V.Light
	Medium	3 to 6 ft	Light	Light	Light	V.Light	V.Light
	Narrow	1 to 3 ft	Light	Light	V.Light	V.Light	V.Light
	V.Narrow	<1 ft	V.Light	V.Light	V.Light	V.Light	V.Light
Film/ Sheen		n/a	Sheen	Sheen	Sheen	Sheen	Sheen

Appendix D: No Further Treatment Guidelines For Eastern States and Louisiana

During the response, SCAT personnel crafted Shoreline Treatment Recommendations that were based, in part, on the applicable "No Further Treatment" guidelines for each shoreline segment. These guidelines outlined the circumstances under which it would be appropriate to cease cleanup operations on a particular shoreline segment and set a high bar in doing so. Moreover, the guidelines for the Eastern States (Florida, Mississippi, and Alabama) contained certain endpoints — both for sand beaches and for marshes — that were distinct from endpoints that applied in Louisiana. The charts below discloses the No Further Treatment guidelines for sand shorelines in the Eastern States. I've highlighted the key differences between guidelines in the Eastern States and Louisiana.

Stage 4 2011 NFT Guidelines for Sand Shorelines – Eastern States

Beach Type	Treatment Methods Recommended	Surface Oil NFT Guidelines	Subsurface Oil NFT Guidelines
Residential/Amenity Beaches (e.g. Dauphin Island, Gulf Shores, Orange Beach, Pensacola) excluding recreational areas in federal parks or wildlife refuges	• Mechanical (grooming sifting) • Manual removal • Sediment tilling • *In situ* sediment relocation • Natural attenuation	No visible oil above background levels, or as low as reasonably practical considering the allowed treatment methods and net environmental benefit	No visible oil above background levels, or as low as reasonably practical considering the allowed treatment methods and net environmental benefit
Non-Residential Beaches (e.g. Eglin AFB)	• Mechanical (grooming -sifting) • Manual removal • Sediment tilling • Natural attenuation	< 1% visible surface oil and oiled debris; and no SRBs >5 cm (~2 inches), or as low as reasonably practical considering the allowed treatment methods and net environmental benefit	No subsurface oil exceeding 3 cm (~1¼") in thickness and patchy (10-50%) distribution that is greater than Oil Residue
Other Beaches in Special Management Areas (state and federal wildlife refuges, parks, wilderness areas)	• Mechanical (grooming -sifting) • Manual removal • Sediment tilling • Natural attenuation	< 1% surface oil and oiled debris; no SRBs >2.5 cm (~1 inch), or as low as reasonably practical considering the allowed treatment methods and net environmental benefit	Subject to direction of Special Area Managers: No subsurface oil exceeding 3 cm (~1¼") in thickness and more than patchy (10-50%) distribution that is greater than Oil Residue

Table 1. Stage 4 2011 NFT Guidelines for Sand Beaches in Louisiana			
Beach Type	**Treatment Methods Recommended**	**Surface Oil NFT Guidelines**	**Subsurface Oil NFT Guidelines**
Residential Beaches (e.g. Grand Isle and 100 yards on either side of the public access point on Elmers Island)	• Mechanical removal • Manual removal • Grooming • Sediment tilling • Sediment relocation	No visible oil that is MC 252, or as low as reasonably practical considering the allowed treatment methods and net environmental benefit	No visible subsurface oil above stain, or as low as reasonably practical considering the allowed treatment methods and net environmental benefit
Non-Residential Beaches (e.g. Grand Terre(s), East Timbalier) and Non-Federal Special Management Areas (e.g. South Pass, Whiskey Island)	• Manual removal • Mechanical removal • Sediment tilling • Natural attenuation	<1% distribution of oil and oiled debris, or as low as reasonably practical considering the allowed treatment methods and net environmental benefit	No subsurface oil exceeding 1 inch in thickness and patchy (<50% distribution) this is greater than Oil Residue, or as low as reasonably practical considering the allowed treatment methods and net environmental benefit
Beaches in Federal Special Management Areas (e.g. Chandeleur Islands)	• Manual removal • Natural attenuation	< 1% surface oil and oiled debris, or as low as reasonably practical considering the allowed treatment methods and net environmental benefit	No attempt to remove subsurface

Stage 4 2011 NFT Guidelines for Coastal Marshes and Mangroves – Eastern States	
Treatment Methods Recommended	**NFT Guidelines**

• Low-pressure, ambient-temperature flushing
• Sorbents (on water)
• Manual removal
• Use of sorbents (on substrate)
• Vacuum
• Vegetation cutting
	• No flushable oil on the vegetation or soils
	• No release of sheens that can affect sensitive resources
	• No thick oil residues at the edges of:
	  o The marsh
	  o The beach/shell berm/overwash areas
	• No thick or pooled oil in the marsh interior, including isolated oiling patches within the marsh
	• No more thick or pooled oil in the marsh interior or below the vegetation that cannot be accessed by other means

Natural attenuation	For all other oiling conditions

Stage 4 2011 NFT Guidelines for Coastal Marshes ad Mangroves - LA	
Treatment Methods Recommended	**NFT Guidelines**

• Low-pressure, ambient-temperature flushing
• Use of sorbents (on water)
• Manual removal
• Sorbents (on substrate)
• Vacuum
• Vegetation cutting
	• No flushable oil on the vegetation or soils
	• No release of sheens that can affect sensitive resources
	• No thick oil residues at the edges of:
	  o The marsh
	  o The beach/shell berm/overwash areas
	• No thick or pooled oil in the marsh interior, including isolated oiling patches within the marsh
	• No more thick or pooled oil in the marsh interior or below the vegetation
	• No oil that is sticky to fur and feathers
	Or as low as reasonably practical considering the allowed treatment methods and net environmental benefit

Natural attenuation	For all other oiling conditions

Appendix E: Waterfall Chart (FLWA1-005)

SCAT records track the number of times that SCAT and Operations teams surveyed and cleaned, respectively, a shoreline segment before moving that segment out of the response. In Walton County, Florida (FLWA1-005), for example, a single shoreline segment was visited by Operations teams 26 times over 9 months and was inspected 8 times by SCAT teams before cleanup activities were deemed complete and the segment was moved out of the response. This chart, known as a "waterfall chart" demonstrates how a single segment could cycle in and out of survey and cleanup activities before being moved out of the active response.

FLWA1-005	Date	P&M Collection	PIST 1	PIST 2	SIR1 (1st)	SIR1 (2nd)	MON1 (1st)	MON1 (2nd)	MON2 (1st)	MON2 (2nd)	SIR2 (1st)	SIR2 (2nd)
Ops Sweep	7-Jun-11	1.50 lbs. / 3										
Ops Sweep	14-Jun-11	1.00 lbs. / 3										
Ops Sweep	18-Jul-11	0.25 lbs. / 3										
Ops Sweep	12-Aug-11	NOO / 4										
Ops Sweep	24-Aug-11	0.13 lbs. / 4										
Ops Sweep	29-Aug-11	NOO / 4										
Ops Sweep	6-Sep-11	NOO / 2										
Ops Sweep	9-Sep-11	NOO / 8										
Ops Sweep	12-Sep-11	0.75 lbs. / 4										
Ops Sweep	26-Sep-11	0.06 lbs. / 4										
Ops Sweep	10-Oct-11	0.25 lbs. / 8										
Ops Sweep	29-Oct-11	0.16 lbs. / 3										
												02 Nov - SCCP Signed
Ops Sweep	12-Nov-11	0.25 lbs. / 3										
Ops Sweep	14-Nov-11	NOO / 9										
Ops Sweep	22-Nov-11	NOO / 6										
Ops Sweep	28-Nov-11	NOO / 9										
Ops Sweep	5-Dec-11	0.06 lbs. / 3										
Ops Sweep	19-Dec-11	NOO / 3										
Ops Sweep	9-Jan-12	NOO / 3										
Ops Sweep	16-Jan-12	0.06 lbs. / 3										
PIST 1	24-Jan-12		2 / 0.0045									
PIST 2	29-Jan-12			7 / 0.011 lbs								
Ops Sweep	30-Jan-12	0.01 lbs. / 3										
PIST 1	5-Feb-12		NOO	-								
SIR1.1	10-Feb-12				9 / 0.009 lbs							
SIR1.2	13-Feb-12											
Ops Sweep	14-Feb-12	0.01 lbs. / 3										
PIST 1	19-Feb-12		NOO	-								
SIR1.1	23-Feb-12				1 / 0.003 lbs							
SIR1.2	26-Feb-12					1 / 0.001 lbs						
Ops Sweep	29-Feb-12	NOO / 3										
Ops Sweep	9-Mar-12	NOO / 3										
Ops Sweep	12-Mar-12	0.01 lbs. / 3										
Ops Sweep	27-Mar-12	0.01 lbs. / 3										

FL ALARP Collection Data 005.xlsx - FLWA1-005 OPS data current as of 27 Mar 2012; vetted by Planning thru 21 Mar 2012 2012-03-29

Appendix F: Detailed Breakdown of Surface Oiling by Beach and Marsh Habitats

The degree of oiling observed in sand beaches and marshes across the Gulf of Mexico fell significantly in the years following the *Deepwater Horizon* incident. As of June 22, 2013, almost no heavy, moderate, or light oiling was observed on the shorelines of Alabama, Florida, and Mississippi. In Louisiana, observed decreases in heavy, light, and very light oiling ranged from 35 to 89 percent between October 10, 2010, and June 22, 2013.

DETAILED BREAKDOWN OF SURFACE OILING BY BEACH HABITAT								
Shoreline Habitat	Total Surveyed	Heavy	Moderate	Light	Very Light	Trace (<1%)	No Oil Observed	Oiled as of Last Survey
	Miles	Miles	Miles	Miles	Miles	Miles	Miles	Miles
Alabama Beach Habitat								
10-Oct-10	121.1	0.3	0.0	11.7	0.3	42.3	66.4	54.7
28-May-11	121.6	0.0	0.0	6.5	0.7	48.3	66.1	55.5
26-May-12	92.7	0.0	0.0	0.6	0.0	50.3	41.8	50.9
22-Jun-13	91.1	0.0	0.0	0.0	0.0	46.0	45.1	46.0
Florida Beach Habitat								
10-Oct-10	355.7	1.4	0.0	12.2	0.0	102.8	239.3	116.4
28-May-11	366.0	0.0	0.0	0.5	0.1	78.6	286.8	79.2
26-May-12	333.3	0.0	0.0	0.0	0.0	68.0	265.3	68.0
22-Jun-13	335.9	0.0	0.0	0.0	0.0	59.9	275.9	59.9
Louisiana Beach Habitat								
10-Oct-10	226.4	10.4	7.1	34.4	16.8	21.0	136.8	89.6
28-May-11	368.2	4.5	12.8	41.0	22.4	57.9	229.7	138.5
26-May-12	372.9	2.8	7.6	14.0	11.0	79.6	258.0	115.0
22-Jun-13	378.6	2.8	7.5	13.4	11.0	81.8	262.0	116.6
Mississippi Beach Habitat								
10-Oct-10	133.7	6.1	0.7	29.6	0.3	34.4	62.6	71.1
28-May-11	163.4	0.0	0.0	12.6	1.1	73.1	76.6	86.8

26-May-12	114.1	0.0	1.0	5.4	0.0	65.5	42.2	71.9
22-Jun-13	116.0	0.0	0.0	0.5	0.0	68.2	47.4	68.6

DETAILED BREAKDOWN OF SURFACE OILING BY MARSH HABITAT

Shoreline Habitat	Total Surveyed	Heavy	Moderate	Light	Very Light	Trace (<1%)	No Oil Observed	Oiled as of Last Survey
	Miles	Miles	Miles	Miles	Miles	Miles	Miles	Miles
Alabama Marsh Habitat								
10-Oct-10	104.4	0.00	0.2	0.7	0.0	2.4	101.0	3.4
28-May-11	109.4	0.0	0.0	0.1	0.0	0.0	109.3	0.1
26-May-12	129.0	0.0	0.0	0.0	0.0	2.3	126.7	2.4
22-Jun-13	122.0	0.0	0.0	0.0	0.0	1.8	120.2	1.8
Florida Marsh Habitat								
10-Oct-10	95.7	0.0	0.0	0.0	0.0	0.0	95.7	0.0
28-May-11	94.9	0.0	0.0	0.0	0.0	0.0	94.9	0.0
26-May-12	114.8	0.0	0.0	0.0	0.0	0.0	114.8	0.0
22-Jun-13	102.1	0.0	0.0	0.0	0.0	0.0	102.1	0.0
Louisiana Marsh Habitat								
10-Oct-10	2249.5	14.9	54.2	53.2	64.7	10.1	2052.4	197.1
28-May-11	2820.9	8.9	17.0	39.9	52.3	18.8	2684.0	136.9
26-May-12	2843.5	1.1	2.3	36.2	39.8	21.3	2742.9	100.6
22-Jun-13	2858.1	1.6	1.7	24.4	37.4	21.4	2771.6	86.5
Mississippi Marsh Habitat								
10-Oct-10	116.7	0.0	0.8	2.3	3.6	1.5	108.5	8.2
28-May-11	113.2	0.0	0.2	1.7	1.2	5.0	105.1	8.1
26-May-12	138.7	0.0	0.0	0.2	0.0	6.1	132.5	6.3
22-Jun-13	131.7	0.0	0.0	0.0	0.0	5.0	126.7	5.0

Appendix G: Summary of Reduction in Oiling Levels Over Time

The success of BP and Unified Command's cleanup efforts is evident when examining the aggregate changes in shoreline oiling across the entire Gulf of Mexico between April 2010 and May 2014. At the height of the response, a maximum of approximately 1,100 miles of shoreline were estimated to be oiled; however, by May 10, 2014, that number decreased to less than 400 miles — a 64 percent reduction. Moreover, a significant majority of those approximately 400 miles experienced trace oiling (as opposed to heavy, moderate, light, or even light oiling).

Summary of Oiling Change								
SCAT Survey Summaries	Total Surveyed	Heavy	Moderate	Light	Very Light	Trace (<1%)	No Oil Observed	Oiled as of Last Survey
	Miles	Miles	Miles	Miles	Miles	Miles	Miles	Miles
Max Oil*	4376.8	222.1	138.5	397.6	199.2	144.4	3275.0	**1101.9**
10-Oct-10	3633.1	33.6	64.3	146.9	96.5	216.4	3075.0	**557.8**
28-May-11	4324.7	13.5	30.1	104.7	81.6	286.3	3808.5	**516.3**
26-May-12	4374.3	4.0	10.8	57.1	51.6	302.2	3948.6	**425.7**
22-Jun-13	4376.9	4.5	9.3	39.1	49.3	289.6	3985.1	**391.8**
10-May-14	4380.5	4.0	10.1	33.8	47.8	297.5	3986.7	**393.2**

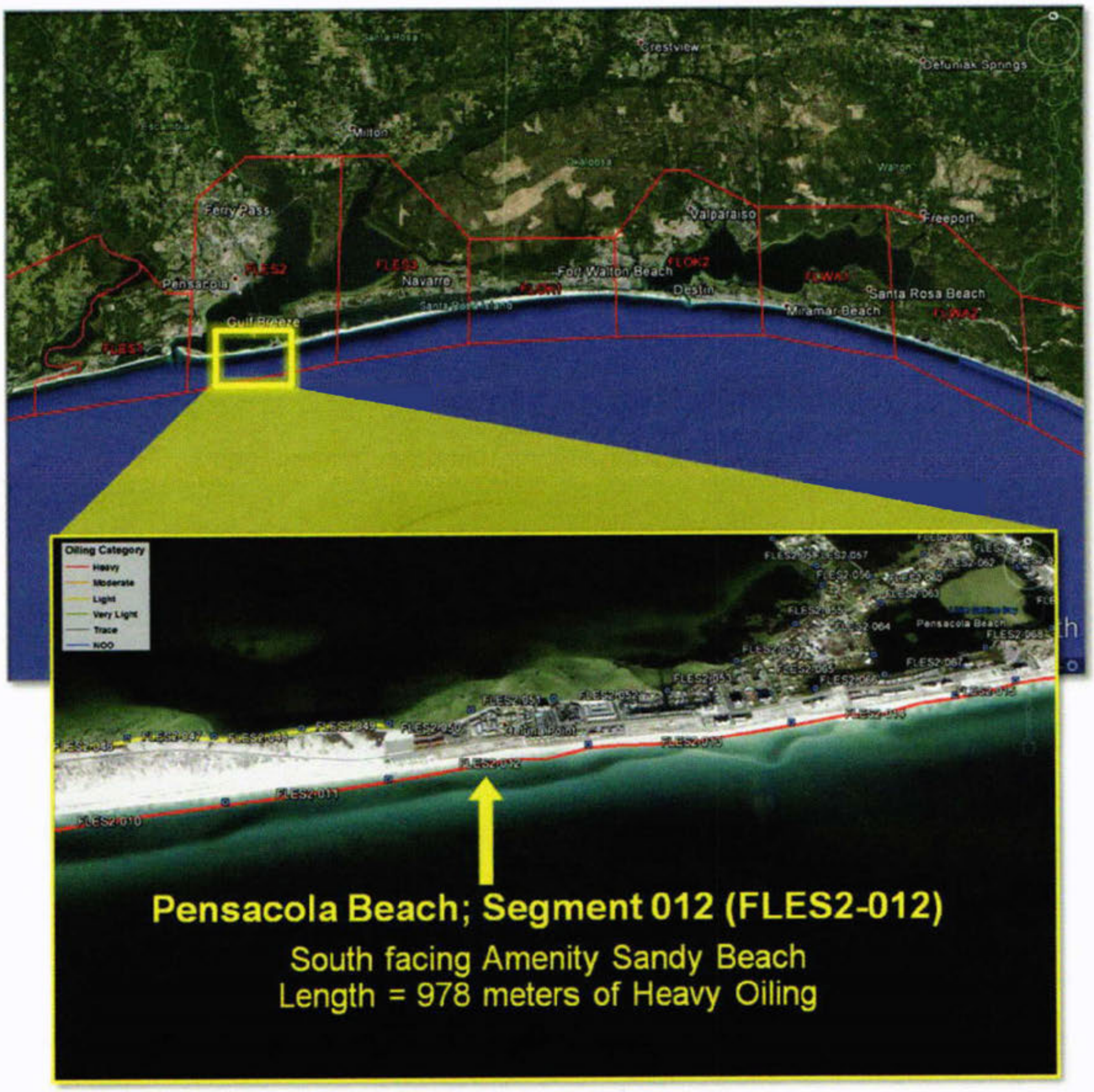
**Max oil is derived from post QA/QC checks of SCAT GIS and data (per May 2013 analysis)*

Appendix H: Oiling and Shoreline Treatment Documentation for Examples of Beach and Marsh Sites (FLES2-012 – Pensacola, FL; LAPL01-034-30 – Barataria Bay, LA)

This appendix provides examples of the oil assessment and treatment documentation for sites selected to represent segments from amenity beaches and marshes from the Gulf States. Each site summary includes a segment history, including oiling, SCAT surveys, treatment, and sign-out. Maps of segment surface oiling conditions show the change in oil level through time. Subsurface oil maps show the locations of pits, trenches, and Snorkel SCAT efforts undertaken to identify buried or submerged residual oil and define areas for treatment, as appropriate. Photographs showing examples of initial oiling, cleanup operations, and post-treatment are also provided.

FLES2-012 – Pensacola, FL

Most of the MC252 oiling in Florida occurred either on public beaches, either amenity beaches or along National Park Service beaches of the GUIS Barrier Islands. FLES2-012 is located on the high-use, amenity well sorted, fine-to medium grained sand beach at Pensacola. Oiling was categorized as heavy at peak oiling in late June 2010. One month later, the same beach was categorized as light oiling. As a high-use area, the cleanup target were *no visible oil above background levels, or as low as reasonably practical considering the allowed treatment methods and net environmental benefit.* The beach in the area is mechanical raked by the city as part of the grooming process and also is re-nourished periodically. Treatment included mechanical sifters (Beach Tech and Sand Shark) and manual cleanup (see example STR FL-4-005) and tests were done post-sieve operations to assess tilling as an option to enhance natural attenuation of residual SRBs. Extensive work was done to search for and delineate recoverable oil that was buried at some point, as evidenced in the pit and trench locations throughout the segment. Shoreline profiles across the beach show the erosion and build-up of the beach along this shoreline and a characteristic of the sand beaches of most of the Eastern States. Erosion removes sand (and residual oil) from the shoreline whereas deposition and beach build-up may re-deposit and/or cover residual oil. Snorkel SCAT surveyed subtidal areas along the segment but did not record occurrences of recoverable subtidal oiled material. SCAT conducted 48 surveys along this segment throughout the three years in which it was in active response.


Crestview
DeFuniak Springs
Milton
Ferry Pass
Valparaiso
Freeport
Pensacola
FLES2
FLES3
Navarre
Fort Walton Beach
FLOK2
Destin
Santa Rosa Beach
Miramar Beach
Gulf Breeze
Oiling Category
Heavy
Moderate
Light
Very Light
Trace
NOO
Pensacola Beach
Pensacola Beach; Segment 012 (FLES2-012)
South facing Amenity Sandy Beach
Length = 978 meters of Heavy Oiling

Date	Significant Segment Events
May 10, 2010	First SCAT Survey. No Oil Observed.
June 4, 2010	OPS crews working in segment; trace <1% oiling (mousse) in UITZ
June 23, 2010	Heavy oiling documented
July 30, 2010	Till / Plow test
August 1, 2010	3 Profile Sites established
October 21, 2010	Stage III STRs (FL-3-002 & FL-3-012) is approved and activated
Nov. 1, 2010 through Jan. 25, 2010	Operation Deep Clean (Subsurface)
March 24, 2011	Stage IV SCAT survey; <1% trace oiling, develop Stage IV STR
April 28, 2011	Stage IV STR – FL-4-005 is approved and activated
June 16-19, 2011	Snorkel SCAT subtidal investigation (sporadic SRB/VL)
September 8, 2011	Post Tropical Storm Lee survey finds no change in conditions
November 8, 2011	First SCCP Survey; trace <1% SRBs
September 6, 2012	Post Hurricane Isaac survey finds no change in surface oiling
June 14, 2013	Final SCAT Survey (Trace <1%). A total of 12 SRBs found in the MITZ and recovered
June 27, 2013	FOSC signs segment out of Response

June 23, 2010 – FLES2-012 Oiling Photographs

45 shoreline SCAT surveys

Segment	SegLength	Date	Status	Stage	Type	PriOilCat
FLES2-012	948	2013-Jun-27	NCP	SCCP	Exception-UC	
FLES2-012	948	2013-Jun-14	NCP (Pending)	SCCP	Survey	Light TB Oiling
FLES2-012	948	2013-May-31	NCP (Pending)	SCCP	Exception-FOSC	
FLES2-012	948	2013-Apr-10	STR (Maintenance)	SCCP	Survey	Light TB Oiling
FLES2-012	948	2012-Nov-19	STR (Maintenance)	SCCP	MON	Negligible TB Oiling
FLES2-012	948	2012-Oct-13	STR (Maintenance)	SCCP	MON	Light TB Oiling
FLES2-012	948	2012-Sep-06	STR (Maintenance)	SCCP	MON	Light TB Oiling
FLES2-012	948	2012-Aug-13	STR (Maintenance)	SCCP	MON	Light TB Oiling
FLES2-012	948	2012-Jul-07	STR (Maintenance)	SCCP	MON	Light TB Oiling
FLES2-012	948	2012-Jun-11	STR (Maintenance)	SCCP	MON	Light TB Oiling
FLES2-012	948	2012-May-22	STR (Maintenance)	SCCP	MON	Light TB Oiling
FLES2-012	948	2012-Apr-16	STR (Maintenance)	SCCP	MON	Light TB Oiling
FLES2-012	948	2012-Mar-10	STR (Maintenance)	SCCP	MON	Light TB Oiling
FLES2-012	948	2012-Feb-03	STR (Maintenance)	SCCP	MON	Light TB Oiling
FLES2-012	948	2012-Jan-04	STR (Maintenance)	SCCP	MON	Light TB Oiling
FLES2-012	948	2011-Nov-08	STR (Maintenance)	SCCP	MON	Light TB Oiling
FLES2-012	948	2011-Oct-07	STR (Maintenance)	4	Survey	Light TB Oiling
FLES2-012	948	2011-Sep-08	STR (Maintenance)	4	Survey	Light TB Oiling
FLES2-012	948	2011-Aug-12	STR (Maintenance)	4	Survey	Heavy TB Oiling
FLES2-012	948	2011-Jul-07	STR (Maintenance)	4	Survey	Moderate TB Oiling
FLES2-012	948	2011-Jun-06	STR (Maintenance)	4	Survey / SIR	Negligible TB Oiling (SIR result: FTR)
FLES2-012	948	2011-May-09	STR (Maintenance)	4	Survey	Light TB Oiling
FLES2-012	948	2011-May-03	STR (Maintenance)	4	Survey	Negligible TB Oiling
FLES2-012	948	2011-Apr-28	STR (Maintenance)	4	Survey	Light TB Oiling
FLES2-012	948	2011-Apr-28	Active	4	STR #FL-4-005	
FLES2-012	948	2011-Apr-04	STR (Maintenance)	4	Survey	Negligible TB Oiling
FLES2-012	948	2011-Mar-24	STR (Specific)	4	Survey	Light TB Oiling
FLES2-012	948	2011-Mar-13	Pre-Inspection NFT	III.1	Survey	Light TB Oiling
FLES2-012	948	2011-Feb-05	Pre-Inspection NFT	III.1	Survey	Moderate TB Oiling
FLES2-012	948	2011-Jan-25	Active	III.1	STR #FL-3-036	
FLES2-012	948	2011-Jan-09	Pre-Inspection NFT	III.1	Survey	Negligible TB Oiling
FLES2-012	948	2010-Dec-08	STR (Continue)	III.1	Survey	Light TB Oiling
FLES2-012	948	2010-Oct-21	Active	III.1	STR #FL-3-012	
FLES2-012	948	2010-Oct-21	Active	III.1	STR #FL-3-002	
FLES2-012	948	2010-Sep-19	STR (Specific)	III.1	Survey	Light
FLES2-012	948	2010-Sep-04	STR (General)	I-II	Survey	Light
FLES2-012	948	2010-Aug-21	STR (Continue)	I-II	Survey	Light
FLES2-012	948	2010-Aug-15	STR (Continue)	I-II	Survey	Light
FLES2-012	948	2010-Aug-10	NFT	I-II	Survey	Light
FLES2-012	948	2010-Jul-21	NFT	I-II	Survey	Light
FLES2-012	948	2010-Jul-16	STR (General)	I-II	Survey	Light
FLES2-012	948	2010-Jul-07	STR (General)	I-II	Survey	Moderate
FLES2-012	948	2010-Jun-26	STR (General)	I-II	Survey	Light
FLES2-012	948	2010-Jun-25	STR (General)	I-II	Survey	Heavy
FLES2-012	948	2010-Jun-23	STR (General)	I-II	Survey	Heavy
FLES2-012	948	2010-Jun-18	NFT	I-II	Survey	Light
FLES2-012	948	2010-Jun-11	NFT	I-II	Survey	Light
FLES2-012	948	2010-Jun-04	NFT	I-II	Survey	Light
FLES2-012	948	2010-Jun-01	NOO	I-II	Survey	NOO
FLES2-012	948	2010-May-23	NOO	I-II	Survey	NOO
FLES2-012	948	2010-May-10	NOO	I-II	Survey	NOO

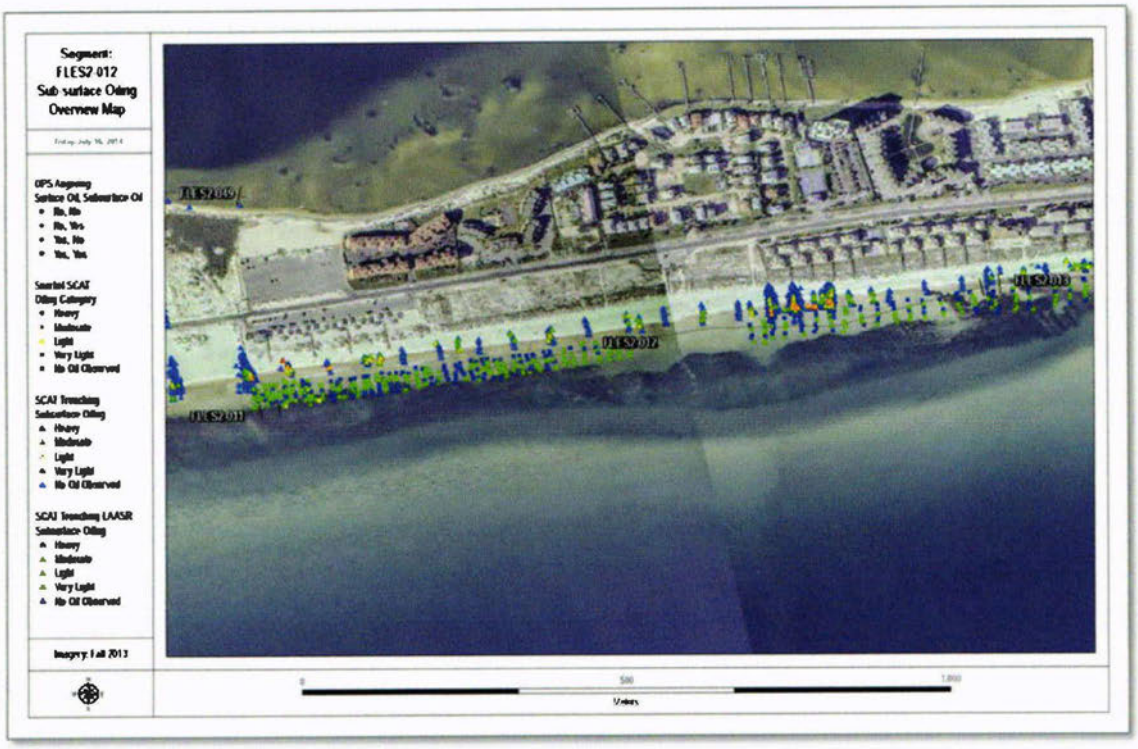
Shoreline Treatment Recommendations (STRs)

Stage II STRs	FL-002, FL-009	May 27, 2010; July 15, 2010
	• **Manual**: Removal of non-MC252 tarballs • **Mechanical**: Beach Sifter	
Stage III STRs	FL-3-002, FL-3-012, FL-3-036	Oct. 21, 2010; Jan. 25, 2011
	• **Manual/Mechanical:** Beach Tech/ Sand Sifter/ Sand Shark / Plow • **Mechanical:** Wet and Dry Tilling Trial to determine effectiveness • **Mechanical:** Long-reach track hoe / Front end loader for SOMs	
Stage IV STRs	FL-4-005	April 28, 2011
	• **Manual/Mechanical:** Surface Oil only • Amenity Beach Maintenance • No beach wrack shall be removed • 10 foot buffer zone from the toe of the dune • Clean up frequency – minimum of once per day	

July 30, 2010 – Tilling / Plow Testing


Subsurface Oiling
as of 06 May 2013
Heavy
Moderate
Light
Very Light
No Oil Observed
FLES2-042
Google earth

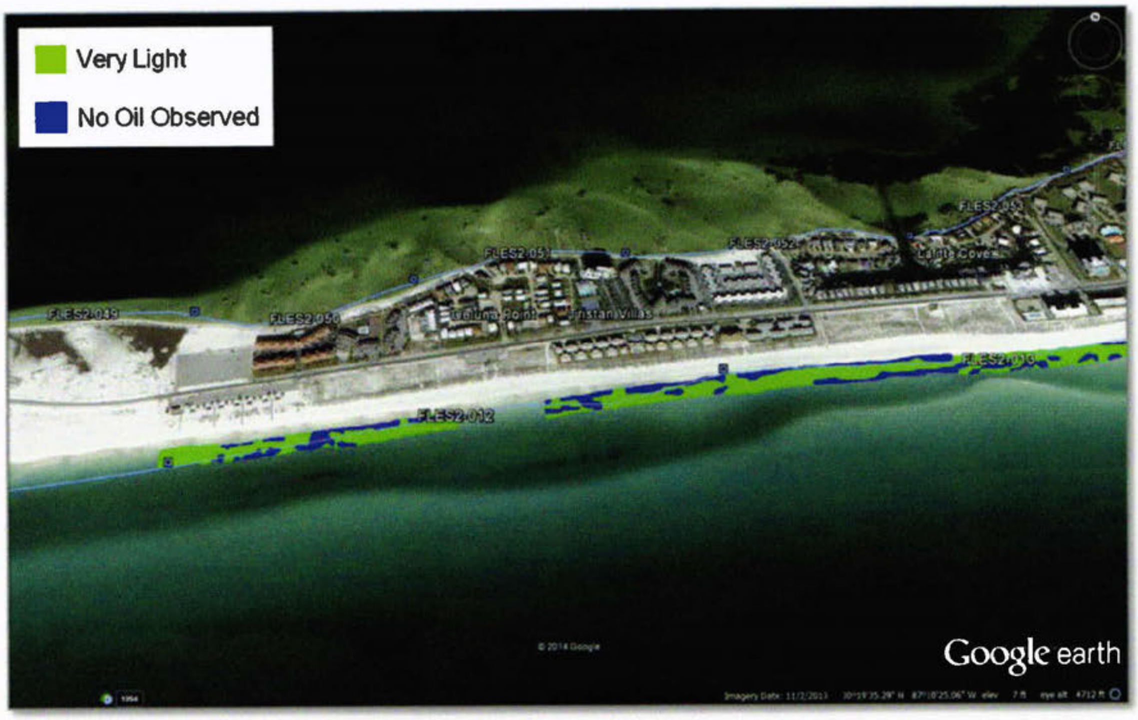
Segment FLES2-012 Sub-surface Oiling Overview



659 Subsurface pit/trench data

Division	Segment Number	Survey Date	Trench Name	Way Point #	Tidal Zone	Pit/Trench Depth (cm)	Oiling Interval Top (cm)	Oiling Interval Bottom (cm)	Distribution	Oil Character	Oiling Category Code
FLES2	012	07-Jul-2012	3	434	SU	55.00	0.00	0.00		NOO	NOO
FLES2	012	07-Jul-2012	4	435	SU	60.00	0.00	0.00		NOO	NOO
FLES2	012	07-Jul-2012	5	436	UI	65.00	0.00	0.00		NOO	NOO
FLES2	012	07-Jul-2012	6	437	SU	55.00	0.00	0.00		NOO	NOO
FLES2	012	07-Jul-2012	7	438	SU	60.00	0.00	0.00		NOO	NOO
FLES2	012	07-Jul-2012	8	439	SU	60.00	0.00	0.00		NOO	NOO
FLES2	012	07-Jul-2012	9	440	SU	55.00	0.00	0.00		NOO	NOO
FLES2	012	13-Aug-2012	1	517	SU	60.00	0.00	0.00		NOO	NOO
FLES2	012	13-Aug-2012	2	518	SU	70.00	0.00	0.00		NOO	NOO
FLES2	012	13-Aug-2012	3	519	UI	70.00	0.00	0.00		NOO	NOO
FLES2	012	13-Aug-2012	4	520	SU	55.00	0.00	0.00		NOO	NOO
FLES2	012	13-Aug-2012	5	521	SU	70.00	0.00	0.00		NOO	NOO
FLES2	012	13-Aug-2012	6	522	UI	70.00	0.00	0.00		NOO	NOO
FLES2	012	13-Aug-2012	7	523	SU	50.00	0.00	0.00		NOO	NOO
FLES2	012	13-Aug-2012	8	524	SU	65.00	0.00	0.00		NOO	NOO
FLES2	012	13-Aug-2012	9	525	UI	60.00	0.00	0.00		NOO	NOO
FLES2	012	13-Oct-2012	1	781	UI	60.00	0.00	0.00		NOO	NOO
FLES2	012	13-Oct-2012	2	782	SU	50.00	0.00	0.00		NOO	NOO
FLES2	012	13-Oct-2012	3	783	SU	45.00	0.00	0.00		NOO	NOO
FLES2	012	13-Oct-2012	4	784	UI	50.00	0.00	0.00		NOO	NOO
FLES2	012	13-Oct-2012	5	785	SU	55.00	0.00	0.00		NOO	NOO
FLES2	012	13-Oct-2012	6	786	SU	50.00	0.00	0.00		NOO	NOO
FLES2	012	13-Oct-2012	7	787	UI	55.00	0.00	0.00		NOO	NOO
FLES2	012	13-Oct-2012	8	788	SU	55.00	0.00	0.00		NOO	NOO
FLES2	012	13-Oct-2012	9	789	SU	50.00	0.00	0.00		NOO	NOO
FLES2	012	19-Nov-2012	1	832	UI	55.00	0.00	0.00		NOO	NOO
FLES2	012	19-Nov-2012	10	843	SU	60.00	0.00	0.00		NOO	NOO
FLES2	012	19-Nov-2012	11	844	SU	60.00	0.00	0.00		NOO	NOO
FLES2	012	19-Nov-2012	12	845	SU	50.00	0.00	0.00		NOO	NOO
FLES2	012	19-Nov-2012	2	833	SU	50.00	0.00	0.00		NOO	NOO
FLES2	012	19-Nov-2012	3	834	SU	50.00	0.00	0.00		NOO	NOO
FLES2	012	19-Nov-2012	4	835	SU	50.00	0.00	0.00		NOO	NOO
FLES2	012	19-Nov-2012	5	837	UI	60.00	0.00	0.00		NOO	NOO
FLES2	012	19-Nov-2012	6	838	SU	60.00	0.00	0.00		NOO	NOO
FLES2	012	19-Nov-2012	7	839	SU	60.00	0.00	0.00		NOO	NOO
FLES2	012	19-Nov-2012	8	840	SU	60.00	0.00	0.00		NOO	NOO
FLES2	012	19-Nov-2012	9	842	UI	60.00	0.00	0.00		NOO	NOO

Snorkel SCAT surveys – 16-19 June 2011 (NOO and VL).



June 23, 2010 – Heavy Oiling

Aug. 12, 2011 – Trace <1% SRBs

Sept. 8, 2011 – SCAT Post Tropical Storm Lee Survey
No change; trace SRBs from 0.5 cm to 3 cm max

June 14, 2013 – Final SCAT Survey (Trace <1%) 12 SRBs (1.75-3.5cm) found and removed

FOSC signed segment out of Response on June 27, 2013

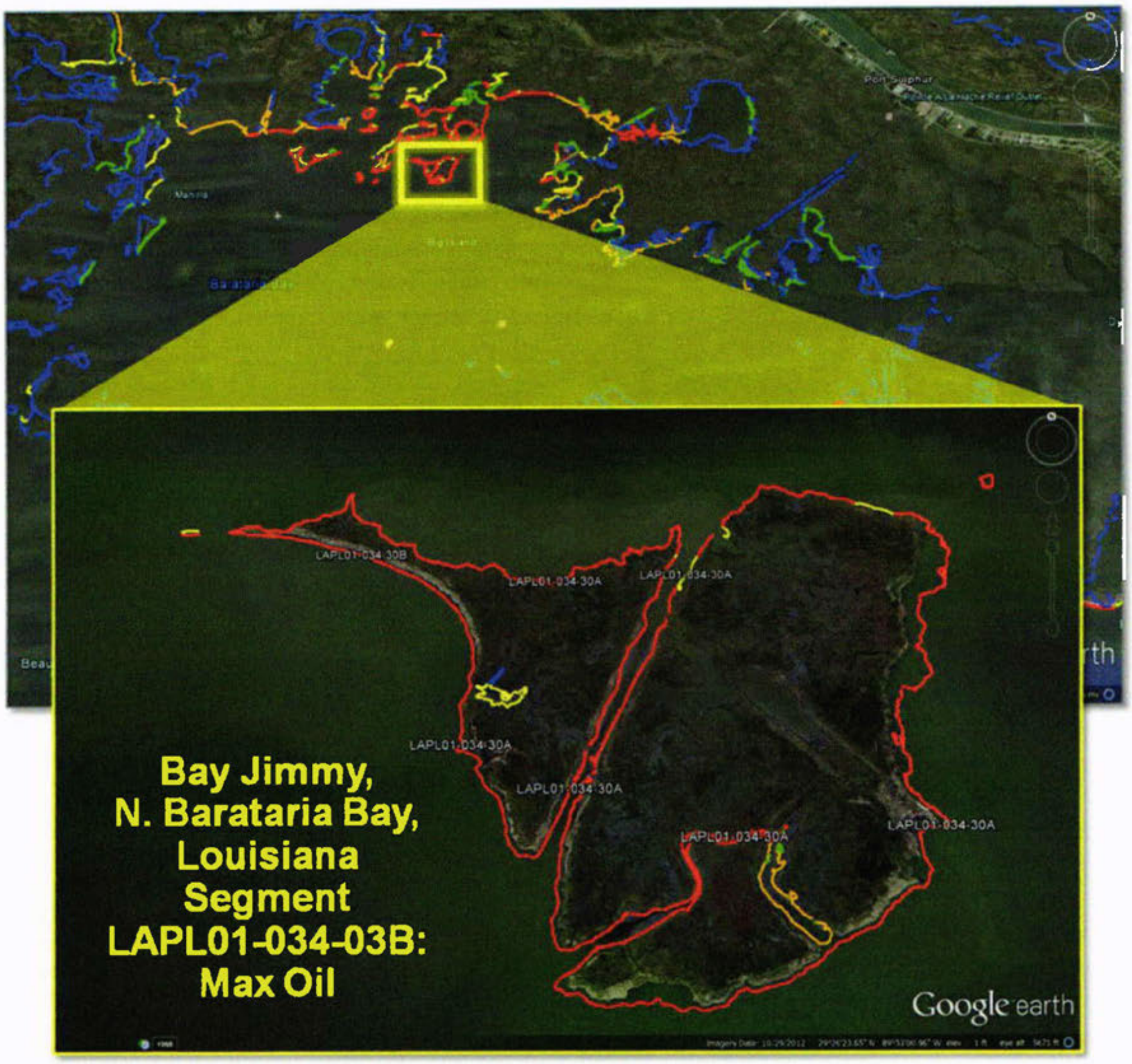
LAPL01-034-30 – Barataria Bay

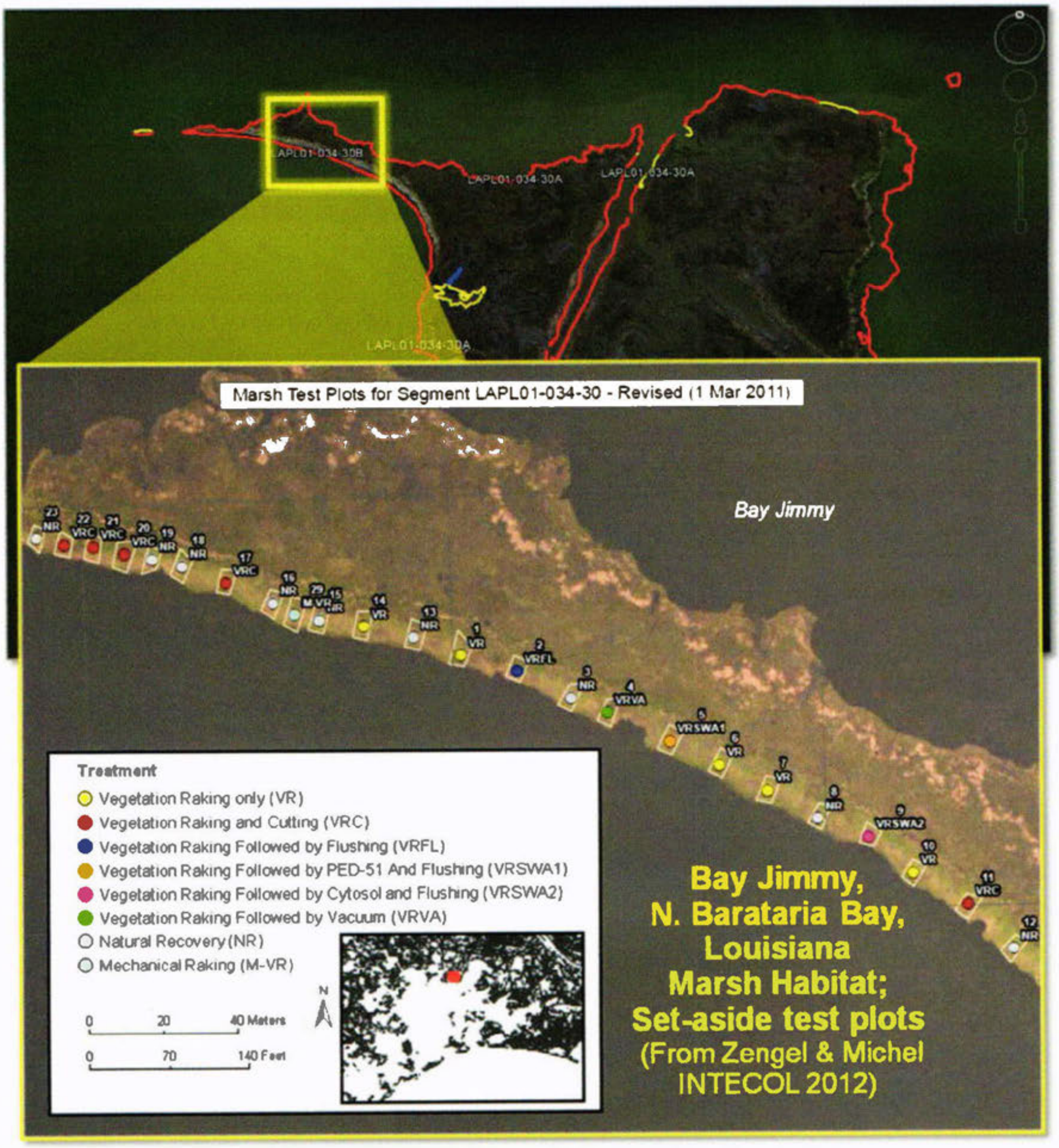
Most of the MC252 oiling along wetlands and marshes occurred in Louisiana. Barataria Bay had shorelines with no oil observed to heavy oiling. Zones and segments in LAPL01-034-30 exhibited the same ranges. Zone K corresponds to a marsh island/platform in the north central portion of the bay that was heavily oiled. Vegetation in Zone K included Spartina (cordgrass) and mangrove. A portion of Zone K, later split out as a set-aside subsegment -034-30B, was identified and established as a location for testing different treatment techniques. The NOAA (2013)[200] technical report describes in detail the area, oiling conditions, and testing results. The goal was provide information to the response community on marsh shoreline treatment options, to compare effectiveness and effects of oil and treatment on marsh vegetation relative to the various method used and to untreated plots, and ultimately form a sound basis for defining STRs. Initial oiling at the site occurred from late May into early June 2010. The stranded oil was characterized generally as continuous surface thick oil on the marsh platform and on marsh stems. The oil character was mostly emulsified oil although darker and less emulsified oil was noted in the adjacent water into August 2010. Treatment on the series of test plots included vacuum, skimming, flushing, mechanical and manual raking, scraping, and vegetation cutting, and natural attenuation (monitoring without treatment). Tests were conducted at different times with several operational pauses (see Significant Events).

SCAT surveyed portions of the segment 38 times over the course three years, although the set-aside sites were monitored much more frequently. As noted in the NOAA (2013) report: "The subsequent vegetation raking and cutting treatments formed the basis for the development of STR S3-045, which was applied to roughly 11 km of shoreline. Continued monitoring also led to STR improvements over time. Monitoring also provided information regarding longer-term effectiveness and effects of the various methods nearly one year post-treatment. Monitoring indicated that the treatments that formed the basis of the STR did not cause greater damage to the marsh or hinder marsh recovery, but actually enhanced recovery as compared to other methods, including no treatment. Finally, the natural recovery (no treatment) and partial treatment plots allowed useful comparisons with the STR treatments. The STR S3-045 treatments were successful at removing or reducing very heavy oiling conditions in the marsh, while also enhancing the weathering and degradation of oil that remained. Most importantly, it appears that the appropriate balance was struck: the STR treatments were intensive enough to be effective, without being too aggressive and causing excessive disturbance or additional widespread marsh damage. The lack of oil remobilization and re-current oiling in the STR treatment areas during recent storms, as compared to similar areas that had not been treated, coupled with no obvious indications of increased erosion resulting from the treatments alone, further indicates that the treatments were effective and appropriate. The diligent and careful work of the Operations teams, including the constant use of walk boards on the marsh and the involvement of the SCAT/agency field advisors-monitors, working closely with Operations everyday on the marsh, were critical in striking this balance."

[200] NOAA Technical Memorandum, NOS O&R 4-2, 2013. Deepwater Horizon Oil Spill: Salt Marsh oiling Conditions, Treatment Testing, and Treatment History in Northern Barataria Bay, Louisiana (Interim Report October 2011)

Stage 4 STRs to treat hotspots in the area were implemented between Summer 2011 and Summer 2013. All treatment was completed by 15 August 2013 with continued plans to monitor natural attenuation of lingering residual oil and recovery.




LAPL01-034-30B
LAPL01-034-30A
LAPL01-034-30A
LAPL01-034-30A
Marsh Test Plots for Segment LAPL01-034-30 - Revised (1 Mar 2011)
Bay Jimmy
Treatment
Vegetation Raking only (VR)
Vegetation Raking and Cutting (VRC)
Vegetation Raking Followed by Flushing (VRFL)
Vegetation Raking Followed by PED-51 And Flushing (VRSWA1)
Vegetation Raking Followed by Cytosol and Flushing (VRSWA2)
Vegetation Raking Followed by Vacuum (VRVA)
Natural Recovery (NR)
Mechanical Raking (M-VR)
0 20 40 Meters
0 70 140 Feet
N
Bay Jimmy,
N. Barataria Bay,
Louisiana
Marsh Habitat;
Set-aside test plots
(From Zengel & Michel
INTECOL 2012)

Date	Significant Segment Events LAPL01-034-30B
May 29, 2010	First SCAT Survey. No Oil Observed
June 16, 2010	Heavy oiling documented by SCAT
June – Sept. 2010	Gross oil removal using vacuuming, skimming and flushing
October 11, 2010	Various treatment methods begin on Set-asides plots
Nov. 2010 through Feb. 2011	Operational pause
February 2011	Stage III STR for Mechanical excavation, cutting and pickup
June 2011	Gross oil removal completed
July 20, 2011	Stage IV STR for maintenance and hotspot treatment
Feb. – Nov. 2012	Operational Pause
Jan. – July 2013	Set aside treatment of hotspots
August 10, 2013	Segment is split into 2 segments (Set asides become Segment B)
August 15, 2013	Final Operations treatment; and FOSC signs NOAA recommend natural attenuation of Segment B (set asides area)
March 25, 2014	FOSC signs segment out of Response by Exception
As of July 17, 2014	NO NRC calls have been received

LAPL01-034-30B Oiling Photographs

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TREX-013246.000093

38 Shoreline SCAT Surveys

Segment	Date	Status	Stage	Type	PriOilCat
LAPL01-034-30	2013-Aug-10	Partitioned	SCCP	Split into A, and B	
LAPL01-034-30	2013-Jul-13	SIR1 (MON)	SCCP	MON	Heavy
LAPL01-034-30	2013-Jul-02	SIR1 (MON)	SCCP	MON	NOO
LAPL01-034-30	2013-Jun-12	SIR1 (MON)	SCCP	MON	Light TB Oiling
LAPL01-034-30	2013-Jun-12	SIR1 (MON)	SCCP	MON	Heavy
LAPL01-034-30	2013-Apr-07	SIR1 (MON)	SCCP	SIR1	Heavy
LAPL01-034-30	2013-Mar-26	PIST (RFI)	SCCP	PIST	Heavy
LAPL01-034-30	2013-Mar-15	STR (Maintenance)	SCCP	SIR1	Heavy
LAPL01-034-30	2013-Feb-27	SIR1 (MIT)	SCCP	SIR1	Heavy
LAPL01-034-30	2013-Feb-22	PIST (RFI)	SCCP	PIST	Heavy
LAPL01-034-30	2013-Jan-31	STR (Maintenance)	SCCP	PIST	Heavy
LAPL01-034-30	2013-Jan-18	STR (Maintenance)	SCCP	PIST	Heavy
LAPL01-034-30	2012-Dec-04	STR (Maintenance)	SCCP	Other	Heavy
LAPL01-034-30	2012-Mar-28	PIST (RFI)	SCCP	Other	Heavy
LAPL01-034-30	2012-Mar-28	PIST (RFI)	SCCP	Other	Heavy
LAPL01-034-30	2012-Feb-17	PIST (RFI)	SCCP	PIST	Light
LAPL01-034-30	2012-Feb-05	STR (Maintenance)	SCCP	PIST / SIR	Light (SIR result FTR)
LAPL01-034-30	2012-Jan-28	STR (Maintenance)	SCCP	PIST	Light
LAPL01-034-30	2011-Oct-12	STR (Continue)	4	Survey / SIR	Light (SIR result FTR)
LAPL01-034-30	2011-Sep-29	STR (Continue)	4	Survey / SIR	Light (SIR result FTR)
LAPL01-034-30	2011-Sep-12	NFT	III.1	Survey / SIR	Heavy (SIR result NFT)
LAPL01-034-30	2011-Aug-30	STR (Continue)	III.1	Survey / SIR	NOO (SIR result FTR)
LAPL01-034-30	2011-Aug-15	STR (Continue)	III.1	Survey / SIR	Light (SIR result NFT)
LAPL01-034-30	2011-Aug-13	STR (Continue)	III.1	Survey / SIR	Light (SIR result NFT)
LAPL01-034-30	2011-Aug-11	STR (Continue)	III.1	Survey / SIR	Heavy (SIR result FTR)
LAPL01-034-30	2011-Aug-06	STR (Continue)	III.1	Survey / SIR	Light (SIR result FTR)
LAPL01-034-30	2011-Jul-23	STR (Continue)	III.1	Survey / SIR	Light (SIR result FTR)
LAPL01-034-30	2011-Jul-20	STR (Continue)	III.1	Survey / SIR	Light (SIR result FTR)
LAPL01-034-30	2011-Jul-17	STR (Continue)	III.1	Survey / SIR	Light (SIR result NFT)
LAPL01-034-30	2011-Jul-16	STR (Continue)	III.1	Survey / SIR	Light (SIR result NFT)
LAPL01-034-30	2011-Jun-07	STR (Continue)	III.1	Survey / SIR	Moderate (SIR result FTR)
LAPL01-034-30	2010-Sep-13	STR (Specific)	III.1	Survey	Heavy
LAPL01-034-30	2010-Aug-01	STR (Continue)	I-II	Survey	Heavy
LAPL01-034-30	2010-Jul-15	STR (Continue)	I-II	Survey	Heavy
LAPL01-034-30	2010-Jun-24	STR (Continue)	I-II	Survey	Heavy
LAPL01-034-30	2010-Jun-16	STR (Specific)	I-II	Survey	Heavy
LAPL01-034-30	2010-May-29	NOO	I-II	Survey	NOO

Shoreline Treatment Recommendations (STRs)

Stage II STRs	S-158	August 20, 2010
	• **Removal of gross oil:** Vacuuming, skimming, and flushing	
Stage III STRs	S3-008.r.1, S3-045.r.1 / r.2 / r.3 and r.4	
	• **Removal of gross oil**: Vacuuming and Skimming (Marsh vacuuming cancelled per S3-008.r.1 on Nov. 6, 2010) • Manual teams following mechanical teams for polishing	
Stage IV STRs	S4-032.r1 / r.2 / r.3	
	• Reoccurring Maintenance trips • Treat hotspots (identified by SCAT) during winter months • Treat hotspots at the request of SCAT	

All treatment ends on August 15, 2013. Monitoring and Natural Attenuation.

2013 Photographs

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TREX-013246.000096

LAPA01-034-30B - Subsurface Oiling