Appendix D: Buried Oil Report Louisiana Area of Response March 2014

Buried Oil Report

Louisiana Area of Response

February 2014

Prepared for

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Deepwater Horizon MC252

February 2014

Table of Contents

Executive Summary

Extensive cleanup operations conducted along the oiled Louisiana shoreline since May 2010 removed much of the residual oil from the Deepwater Horizon MC252 Spill of National Significance (MC252 spill). Despite this effort, there remained the possibility of discrete areas of weathered residual oil buried in submerged sediments in nearshore waters or onshore under layers of sand deposited by storms. Starting in November 2012, a series of initiatives were carried out in Louisiana to locate, delineate and recover potential subsurface oil deposits in sandy shoreline areas that were conducive to their formation and persistence.

In Louisiana, a large-scale shoreline cleanup effort started in May 2010 when weathered MC252 oil began washing ashore. Under the direction of the Federal On-Scene Coordinator (FOSC) and guided by the scientific evaluation of multi-agency Shoreline Cleanup Assessment Technique (SCAT) teams, shoreline cleanup progressed through a series of stages. The earliest stages (Stage I and II) focused on monitoring the trajectory of the oil as it migrated towards the shoreline, and then bulk removal once the weathered oil washed ashore. During later stages (Stage III and IV), technical working groups consisting of scientific experts from multiple fields developed Shoreline Treatment Recommendations (STRs) for specific shoreline segments; established a patrolling and maintenance (P&M) period; and defined the criteria for determining when "No Further Treatment" was warranted.

In November 2011, the FOSC approved the Shoreline Clean-up Completion Plan (SCCP), which established cleanup endpoints for various shoreline types in the Area of Response (AOR) and the monitoring and inspection process that would be conducted to document oiling status and determine if segments could be moved out of operational activity. By March 2012, working within the FOSC-directed staged cleanup approach, many shoreline segments in Louisiana's barrier island system had progressed through the cleanup process and were in a regular P&M period. On occasion, the presence of residual buried oil was revealed and the material was recovered.

Material recovery in the Louisiana AOR continued to trend downwards from March to August 2012. However, discrete areas of shoreline continued to experience periodic remobilization of weathered oil, which prevented or delayed some segments from reaching endpoint criteria defined in the SCCP.

Moreover, in late August 2012, Hurricane Isaac came ashore, causing severe shoreline erosion on Louisiana's sandy shorelines and uncovering some material that was previously buried under layers of sand. Prior to Hurricane Isaac, the STRs for these areas had limited the depth to which Operations teams could excavate material. The change in beach morphology provided access to material that was previously unknown or buried at depths where environmental concerns had precluded its recovery, and enabled SCAT teams to reassess treatment options for these shoreline segments.

To locate and remove potential subsurface material, the Gulf Coast Incident Management Team (GCIMT) initiated a series of projects to systematically search for residual oil in sandy shoreline areas where scientific data, SCAT observations and other information indicated that it might be present. From November 2012 to November 2013, 40,189 auger holes and Snorkel SCAT pits were excavated along shoreline segments at Elmer's Island, Fourchon Beach, Grand Isle, Grand Terre I, Grand Terre II, West Chaland, and West Timbalier. In addition, 50 trenches were excavated on Fourchon Beach during November 2013.

The efforts led to the recovery of 5,937,610 pounds of material. Sampling has shown that sand/sediment, water and organic material typically comprise 85-90 percent of the weight of oiled material recovered in Louisiana, with residual oil comprising 10-15 percent. However, at an area on Fourchon Beach where 2.9 million pounds of material were collected, laboratory testing of samples of this material found that on average, residual oil comprised just 1 percent of the overall weight (Appendix J.). Separating oiled material from clean sand was difficult at this location, which increased the amount of sand/sediment, water and organic material collected.

The Louisiana subsurface initiatives included:

- **Buried Oil Project (BOP):** The BOP was established to evaluate, delineate and, where practicable, recover potential buried oil deposits identified by the third Operational Science Advisory Team (OSAT-3), which was chartered by the FOSC on May 23, 2012. The OSAT-3 team integrated various datasets such as aerial imagery, beach profiles, and hydrodynamic modeling data to identify areas – termed polygons – with a higher potential to contain residual buried oil and provided the polygons to the BOP team for field investigation. The project launched throughout the AOR on January 17, 2013. Field investigations in Louisiana began June 11, 2013, following substantial review and discussion with the OSAT-3 team and other key stakeholders.

  The OSAT-3 team identified 15 high-probability areas on four sandy shoreline areas. The BOP team dug 1,594 auger holes and 6,477 Snorkel SCAT pits to investigate. Recoverable material was found in five of the polygons and 84,764 pounds of mixed material were retrieved on Grand Terre I, Grand Terre II, West Chaland, and West Timbalier.

  An area of uncertainty identified by the OSAT-3 team related to resolution of potential buried oil was breaches that were closed off in May 2010 along Gulf-facing segments of Fourchon Beach. Louisiana officials built structures to prevent oil from flowing through the breaches, which had formed over the years. Subsequently, the channels and structures at the breaches combined with significant accretion events, such as storms, to create an environment where sediment collected in a way that was unlike any other area in Louisiana.

Separate from the BOP, trenching and/or Snorkel SCAT activities were conducted at four breach areas on Fourchon Beach and led to the recovery of 2,971,701 pounds of material from October 24, 2013 to December 17, 2013 (Figure 3.4). The investigation and recovery of the material resulted from a gap assessment the GCIMT conducted across the Louisiana AOR.

- **Louisiana Augering and Sequential Recovery (LAASR)/Snorkel SCAT Initiatives:** After Hurricane Isaac eroded the shoreline and uncovered residual oil, the GCIMT launched a comprehensive effort to locate and remove material that potentially still remained buried under layers of sand. Since the OSAT-3 target identification methodology was still in development, this effort used beach profile data, SCAT observations and material collection trends to identify target areas for evaluation. The effort had two components: the Louisiana Augering and Sequential Recovery (LAASR) project, which investigated onshore areas, and Snorkel SCAT, which investigated nearshore waters.

  LAASR was conducted between January 5, 2013 and June 30, 2013, and involved drilling 14,459 auger holes in supratidal and upper intertidal areas at Fourchon Beach, Elmer's Island, Grand Isle, Grand Terre I, and Grand Terre II (Table 3.1). SCAT personnel on the project team determined that 500 sites were above SCCP endpoints (AEP); 1,465 were below endpoints (BEP) and 12,494 had no oil observed (NOO). Removal operations recovered 2,665,147 pounds of mixed material on Fourchon Beach, Elmer's Island, Grand Isle, and Grand Terre II. The LAASR team found no material that required recovery on Grand Terre I.

  The Snorkel SCAT teams investigated Fourchon Beach, Elmer's Island, Grand Isle, Grand Terre I, Grand Terre II and West Timbalier. A total of 17,659 pits were dug in subtidal and lower intertidal zones. As a result of this work, the Operations team collected 215,998 pounds of material on Elmer's Island, Grand Terre I, and Grand Terre II; no material that required recovery was identified at the other three locations. Snorkel SCAT began on November 14, 2012, prior to LAASR, and activity for 2013 ended on November 22, 2013.

Collectively, these initiatives represented a comprehensive effort to search for buried oil accumulations along shoreline areas where material could have been deposited during initial oiling and remained buried. The projects removed nearly 6 million pounds of mixed material and enabled more segments to progress through the SCCP process.

1.0 Introduction and Background

Shoreline cleanup activities were conducted across the Louisiana AOR after weathered oil began making landfall in May 2010. As noted in the OSAT-3 report, due to natural processes and severe weather events, some of this residual oil was buried before it could be removed by cleanup operations. Subsequently, the majority of shoreline and nearshore areas experienced sufficient erosion (vertically and laterally) to breakup and/or redistribute the initial sand/oil deposits. However, some material may have remained buried.

Multi-party SCAT teams – comprised of federal and industry experts, as well as representatives from the Gulf States – have continually and systematically surveyed the shoreline since May 2010 to assess oiling conditions and develop STRs that were implemented at the direction of the FOSC. A wide range of shoreline treatments were undertaken to remove the material and ensure that shoreline segments met the endpoint criteria defined in the Deepwater Horizon SCCP.

By the end of May 2011, all Louisiana shoreline segments had been moved from Stage 3 STR (area-specific cleanup plans) to Stage 4 STR (P&M). P&M activities were on-going from May to July of 2011 with downward trending recovery rates across the entire Louisiana AOR. After Tropical Storm Lee made landfall on September 4, 2011, variances were issued to the STRs to allow additional cleanup efforts in response to material uncovered by the storm. The escalated cleanup activities continued through February of 2012.

Once removal activities related to Tropical Storm Lee were completed in March 2012, material collection totals reverted to pre-storm levels and all segments were returned to normal P&M status. Recovery rates continued to trend downward from March through August 2012.

However, despite this downward trend, there were discrete areas of shoreline that continued to experience periodic remobilization of weathered oil, which prevented or delayed some segments from reaching endpoint criteria defined in the SCCP. In addition, the severe erosion Hurricane Isaac caused when it made landfall in late August 2012 led the SCAT team to determine that further subsurface investigation for residual oil was necessary.

As a result of these factors, the GCIMT embarked on a comprehensive effort to locate, delineate and, where practicable, recover the remaining pockets of buried residual oil in the subtidal, intertidal and supratidal zones. This included the following initiatives:

1) **Buried Oil Project (BOP).** The OSAT-3 team integrated various datasets to identify areas where beach morphologies at the time of initial oiling were conducive to the formation of weathered oil deposits and where these deposits may not have been exposed or broken apart by erosion. The OSAT-3 team identified a number of areas with a higher potential to

contain buried oil and provided these polygons to the BOP team for field evaluation. The focus of BOP was shoreline segments remaining within the active AOR. (See Section 2.2 for more detail on BOP.)

2) **LAASR/Snorkel SCAT Initiatives.** Before the OSAT-3 and BOP work had matured to the point that potential buried oil targets could be identified, Hurricane Isaac made landfall on August 28, 2012 and eroded some beaches, uncovering weathered residual oil that previously had been buried under deep layers of sand. Due to environmental concerns, the existing STRs in these areas had limited how deeply the Operations team could excavate. With the material exposed, the Operations team escalated mechanical cleanup as soon as it was deemed safe to resume activities; the exposed material was removed by December 2012.

   Following this initial work, the Louisiana Augering and Sequential Recovery (LAASR) and Snorkel SCAT efforts were implemented to locate and remove other material that potentially still remained buried under layers of sand. LAASR consisted of onshore augering at Fourchon Beach, Elmer’s Island, Grand Isle, Grand Terre I, and Grand Terre II and was conducted from January 5, 2013 to June 30, 2013. To search in nearshore waters, Snorkel SCAT teams used shovels to excavate pits in subtidal and lower intertidal areas at the same five sandy shoreline areas, as well as West Timbalier. The Snorkel SCAT activity began on November 14, 2012 and activity for 2013 ended on November 22, 2013. (See Section 2.3 for more detail on LAASR/Snorkel SCAT.)

2.0 Materials and Methods

2.1 Overview of Methods of Investigation, Delineation, and Removal Operations

2.1.1 Augering

Augering is a sampling technique whereby an auger stem and bit are drilled into the sand to refusal (i.e., the bit reaches the existing marsh, peat, or clay platform) or to the mechanical limit of approximately 8 feet (2.4 meters). An 18-inch (45-centimeter) diameter auger bit was used to drill holes. This width allowed sufficient room to scrape the sides of the hole and visually evaluate the subsurface sediment along the depth of the hole. In addition to investigating the hole, tailings from the auger bit were inspected for residual oil. After data were recorded, the auger was reinserted into the hole and boring continued until one of the conditions described above was reached. Where the marsh, peat, or clay platform was near the surface, pits were dug with hand tools to prevent penetration into this environmentally sensitive substrate.

Auger crews consisted of a SCAT lead; an operator using a mini-excavator with a 4-foot (1.2-meter) auger and 4-foot (1.2-meter) extension; a spotter; and two people to set the perimeter cones and monitor the work perimeter. The team also could include various combinations of USCG, Department of Environmental Quality (DEQ), Office of Coast Protection and Restoration (CPRA), parish, NOAA, and Natural Resource Advisor (NRA) representatives.

Figure 2.1: USCG Representative Inspects Auger Material in Polygon WT1-002, June 25, 2013

2.1.2 Snorkel Shoreline Cleanup Assessment Technique (Snorkel SCAT)

Snorkel SCAT is a technique used to sample the nearshore for buried oil deposits. Using sharpshooter shovels, team members outfitted in wetsuits took continuous, 6-inch-wide (15-centimeters) samples to a depth of 18 inches (45.7 centimeters). The teams placed "transects" perpendicular to the trend of the beach. Transects were spaced 10 meters apart and sampling pits within a single transect were dug every 5 meters starting at the water's edge and progressing seaward to a water depth of 3 to 4 feet (0.9 to 1.2 meters). At each position along the transects, two samples were collected on either side of the centerline 1 meter apart. Under most circumstances, samples stayed intact on the shovel and if oiled sediment were found, the oiling type, thickness, overburden, and other information were recorded. In some low probability areas on the islands – areas where no technical or operational data indicated that buried oil deposits were likely – the spacing between transects was increased to 20 meters to reduce environmental impact, expedite inspection, and cover a larger area.

Prior to the BOP implementation, a typical Snorkel SCAT team consisted of at least seven team members: a GPS operator, two shovel technicians, a data recorder, two safety boat crewmen and a communication technician. After the BOP implementation, a Real-Time Kinematics (RTK) survey technician was added to all Snorkel SCAT teams. Snorkel SCAT teams also may include USCG, State, safety and NRA representatives; a Tribal Monitor; and an archaeologist.

2.1.3 ***Recovery Techniques Vetted for Use***

During the course of the MC252 spill Response, the GCIMT gained significant experience in removing oiled material from the shoreline. This experience demonstrated that three main techniques were appropriate for the recovery of potential oiled material, with site-specific determinations to be made based on the amount and location of the material, and the judgment of the field team. Before engaging in removal activities, teams carefully considered the applications, benefits, and limitations of these proven techniques, which included:

Manual Recovery: Field technicians use shovels to remove and bag the recovered material. This method is labor-intensive and slow. It is recommended for small and environmentally sensitive areas near or on the surface only.

Mechanical Recovery: Amphibious mini-excavators are used to remove the material. The recovered material is unloaded into aluminium drip pans (approximately 6-feet by 6-feet [1.8-meters by 1.8-meters]) or placed on Geotextile fabric to eliminate or minimize the contamination of clean shoreline, after which technicians use shovels to sort, remove, and bag the oiled material. The mini-excavator significantly increases the efficiency of removing overburden, but bagging the product is labor-intensive. This method is recommended for areas that have substantial overburden.

Water Recovery: Recovery in nearshore waters must be conducted mechanically by an amphibious long-reach excavator (LRE) – fitted with a screened bucket – from shore or in a gently sloping area close to shore. Using an amphibious LRE, a field team performs the excavation and places the recovered material in a front-end loader positioned nearby. The material is unloaded into drip pans for recovery crews to bag.

2.1.4 Operational Work Plans

Once Operations was directed to evaluate, identify and, if appropriate, recover a potential buried oil deposit, local Field Operations assumed day-to-day management of these activities, which were executed with Danos, the Operations contractor. Project teams within the GCIMT oversaw the development of contractor work plans, and the work conducted for each activity.

The collaboratively developed work plans maintained compliance with pre-existing Best Management Practices (BMP) and ensured that the scope of work for each area was communicated to all stakeholders. The plans ensured all applicable considerations (safety, environmental, legal, wildlife, operational concerns, etc.) were identified and addressed, including the necessary approvals, permits, and team composition (including NRA advisors, archaeologists, and safety representatives).

Section members within the GCIMT (Planning, Environmental, Logistics, Safety, Operations, and SCAT teams), representatives from the U.S. Department of the Interior (DOI), and State On-Scene Coordinators (SOSCs) were consulted during this planning phase, in conjunction with USCG oversight. Members of the various work groups and agencies participated in conference calls to review progress, discuss any concerns and opportunities, and maintain communication among the parties involved. Additionally, these stakeholders participated in the review process for STRs (Appendix B), listed below, which provided guidelines and restrictions for field operations for the subsurface projects.

Elmer’s Island	STR-S4-040
Fourchon Beach	STR-S4-039
Grand Isle	STR-S4-041
Grand Terre I	STR S4-019 r.1 (augering) and STR-S4-043 (cleanup)

Grand Terre II	STR-S4-020 r.1 (augering) and STR-S4-042 (cleanup)
West Chaland	STR-S4-045
West Timbalier	STR-S4-046

Danos established a management team for the field investigations of each targeted area. Each Danos work plan included the following topics:

- Scope
- Action List
- Equipment List
- Personnel List
- Safety
- Equipment Staging
- Operations
- Decontamination (Decon)
- Limitations/Constraints
- Schedule
- Reporting

Once activities were ready to commence, Field Operations mobilized the necessary personnel and equipment for the work and identified access points for entry to the work sites (with state/parish approval). Daily activities at the work sites included safety talks and contractor work plan reviews. Oil disposal was handled according to existing disposal procedures. All findings, delineations, and recoveries data were forwarded to the Planning Section to ensure that the data were complete and accurate. Findings from the BOP also were forwarded to the OSAT-3 team to verify/optimize the data analysis process.

BOP contractor work plans for Grand Terre II, West Chaland, and West Timbalier can be found in the Operations Overviews in Appendix C. The Scopes of Work (SOWs) containing the LAASR contractor work plans can be found in Table 2.5.

2.2 Buried Oil Project

The BOP was initiated to evaluate, delineate and, where practicable, recover potential buried oil deposits identified by the OSAT-3 team. The FOSC’s original directive establishing OSAT-3, dated May 23, 2012 (see Appendix A), identified five tasks, which were to be worked in sequence:

Task 1. Evaluate the trends observed in frequency, rate, and potential for remobilization of oil on segments.

Task 2. Determine and record the locations and typical shoreline profiles and morphology for likely source(s) of residual oil or origin of the surface residual balls (SRBs).

Task 3. Define or determine the mechanisms whereby re-oiling phenomena may be occurring.

Task 4. Investigate the potential for mitigating actions that may be taken to reduce these potential occurrences and, to the extent mechanisms are identified, evaluate their feasibility, and the net environmental benefit of employing such methods.

Task 5. Recommend a path forward in order to reach Shoreline Clean-up Completion Plan (SCCP) guidelines or appropriately manage identified areas through alternative methods.

As the OSAT-3 work began in earnest, it became evident that the data analysis and interpretation were of such significance that the time required would be longer than anticipated. The FOSC directed that the BOP and OSAT-3 efforts be conducted simultaneously: "The NOAA SSC (Science Support Coordinator) and SC (Steering Committee) have also concluded that tasks 4 and 5 would be best completed if conducted concurrently outside of the OSAT-3 process through the Buried Oil Project." (See the FOSC directive, dated June 27, 2013, in Appendix A).

The OSAT-3 effort focused on Tasks 1-3, and the BOP effort focused on Tasks 4-5. Using this approach, as the OSAT-3 team conducted its analyses, the team provided information on potential buried oil targets to the BOP team for field evaluation. In addition, the BOP team provided the OSAT-3 team with information on field observations and material collections. The BOP launched on January 17, 2013. The first Louisiana field investigation began on June 11, 2013, following substantial review and discussion with the OSAT-3 team and other key stakeholders.

As noted in the OSAT-3 report, despite the wide range of shoreline treatments undertaken to remove weathered material, there were discrete areas of shoreline that continued to experience periodic remobilization of weathered oil, which prevented or delayed some segments from reaching endpoint criteria defined in the SCCP. Prior operational and SCAT work had strongly indicated or confirmed the presence of buried oil deposits in certain shoreline areas.

The OSAT-3 team integrated the SCAT information with other datasets – including aerial imagery, beach profiles, and hydrodynamic modeling data. After reviewing this analysis, the State of Louisiana created an "areas of concern" list. A committee consisting of Louisiana SOSCs, SCAT, OSAT-3 team, USCG, BP Operations and the BOP team reviewed the list during two meetings, and considered current SCCP status, historical recovery data, SCAT data, and any other issues. Once consensus was reached on which areas needed further investigation, the OSAT-3 team analyzed all available information and identified 15 high-probability polygons for BOP field evaluation:

Grand Terre I:	3 polygons
Grand Terre II:	3 polygons
West Chaland:	5 polygons
West Timbalier:	4 polygons

Figure 2.2: Louisiana Polygon Area Locations

2.2.1 Polygons

After the OSAT-3 team provided the BOP team with the polygons where buried oil may have been deposited during initial oiling and may not have been exposed or broken up by erosion or removed by Response activities, the BOP team implemented an adaptive plan for field evaluations. The plan provided the Field Operations team with guidance on sampling, delineation of potential buried oil deposits, and material removal. Figure 2.3 shows a polygon provided by the OSAT-3 team.

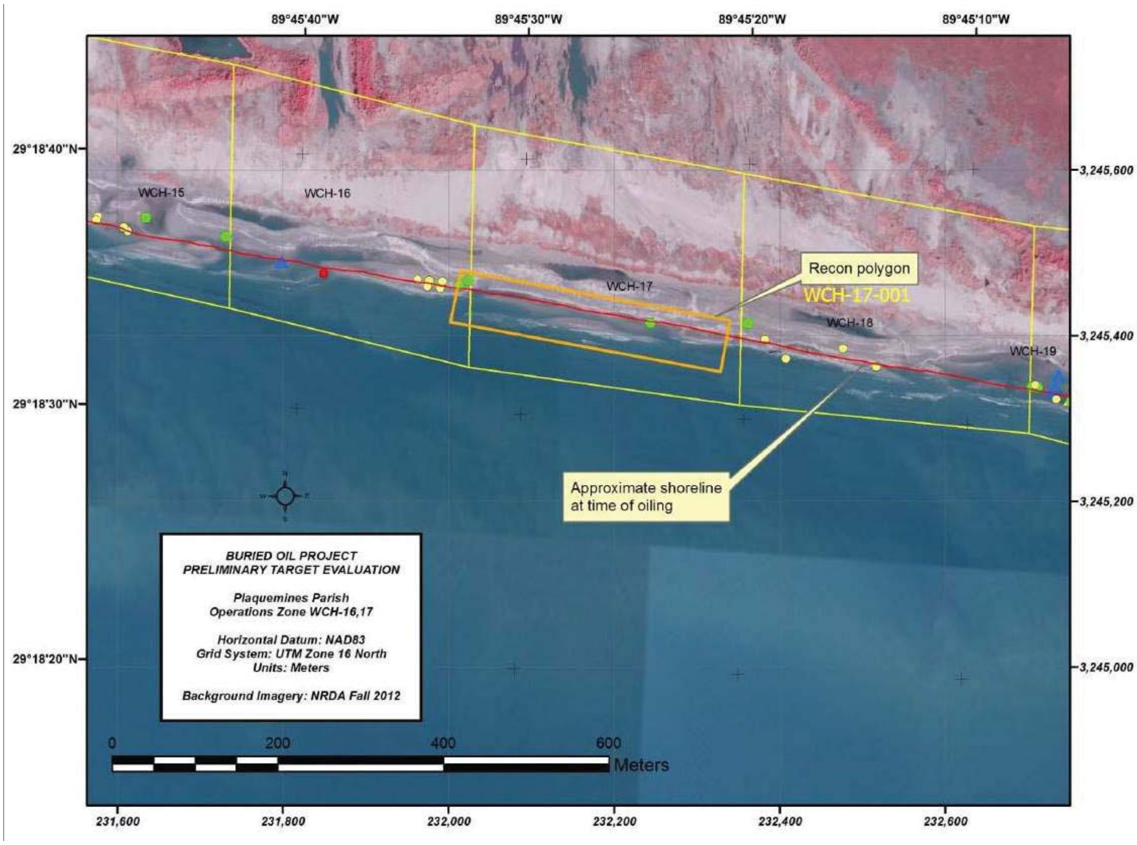

Figure 2.3: Polygon Example – Polygon WCH17-001 on West Chaland

Because the Louisiana polygons identified by the OSAT-3 team fell within or overlapped more than one shoreline segment, in order to simplify any potential investigation, delineation, and recovery activities, Operations organized the areas into Operations Work Zones (Ops Zones). Each polygon was assigned a unique number, which associated it with a specific Ops Zone (Table 2.1). For example, the first polygon located in the West Timbalier area in Ops Zone WT1 was identified as WT1-001. The second polygon in that Ops Zone was identified as WT1-002, and the others followed in sequence.

Paritsh	Polygons	Ops Zone	Segment ID
Grand Terre I			
Jefferson	GT1-10/11 001	GT1-10, GT1-11	LAJF01-024-10
Jefferson	GT1-12 001	GT1-12	LAJF01-024-30
Jefferson	GT1-12 002	GT1-12	LAJF01-024-30
Grand Terre II			
Plaquemines	GT2-7 001	GT2-7	LAPL01-001-10
Plaquemines	GT2-8 001	GT2-8 (extends ~70m into GT2-9)	LAPL01-001-10
Plaquemines	GT2-25 001	GT2-25	LAPL01-002-10
West Chaland			
Plaquemines	WCH-10 001	WCH-10	LAPL01-009-20
Plaquemines	WCH-12 001	WCH-12 (extends ~45m into WCH-11)	LAPL01-003-10
Plaquemines	WCH-12 002	WCH-12	LAPL01-003-10
Plaquemines	WCH-17 001	WCH-17 (extends ~20m into WCH-16)	LAPL01-003-10
Plaquemines	WCH-19 001	WCH-19 (extends ~35m into WCH-20)	LAPL01-003-10, LAPL01-005-30
West Timbalier			
Terrebonne	WT-1 001	WT-1	LATB04-008-10, LATB04-008-20
Terrebonne	WT-1 001 (ext 1)	WT-1	LATB04-008-10, LATB04-008-20
Terrebonne	WT-1 001 (ext 2)	WT-1	LATB04-008-10, LATB04-008-20
Terrebonne	WT-1 002	WT-1 (extends ~3 meters into WT-2)	LATB04-008-10
Terrebonne	WT-9 001	WT-9	LATB04-010-10, LATB04-010-20
Terrebonne	WT-14 001	WT-14	LALF01-036-20, LALF01-031-20

Table 2.1: List of Ops Zones in Louisiana AOR Identified by OSAT-3 for Evaluation by the BOP

As with Ops Zones within the selected BOP areas, the sequential polygon numbering began at the western boundary of each Ops Zone and proceeded eastward. In circumstances where a polygon crossed an Ops Zone boundary, the polygon number was associated with the Ops Zone where the largest amount of the polygon was located.

To develop an operational work plan for each polygon, the physical relationship of the polygon to the current shoreline had to be identified. To make this determination, the BOP and SCAT teams inspected the polygons and documented whether the areas were onshore, in the nearshore area, or overlapped both environments.

2.2.2 Onshore Polygon Sampling

To conduct subsurface investigations of onshore polygons, the BOP team used a statistically-based approach to create sampling grids for excavation that would provide a high level of confidence that the areas investigated were appropriately cleared of potential buried oil. The BOP team engaged a biostatistician (see the reports in Appendix D) to perform several tasks: develop probability-based sampling plans for detecting buried oil deposits; work with the BOP team to implement these plans; and document the plans' theoretical and practical basis. This probability-based sampling was the foundation for optimizing field efforts to detect buried oil deposits. It produced a statistically robust approach to the detection of potential buried oil deposits by applying theoretical principles to the shoreline conditions that were conducive to the initial deposition of weathered oil, to practical consideration on sampling designs (e.g., grids), and to the number of samples required.

Data from previous SCAT work had indicated that 90 percent of the residual buried oil deposits identified in Louisiana were 250 square feet (23.2 square meters) or larger. Using this as the target basis, the biostatistician developed the sampling grid design based on standard statistical parameters: a 95 percent confidence level (that there are no residual oil deposits in the population) with a 5 percent risk that there are weathered oil deposits in the population. (Appendix D, *Probability of Detecting Oiled Mats Using 12- and 18-Inch Augers*, dated July 29, 2013.)

Alongshore gridlines were parallel to the shoreline and each other. Another series of gridlines ran perpendicular to the alongshore lines and parallel to each other. The gridline spacing was 10 meters, and the point spacing (locations where holes were to be excavated) along any given gridline was 10 meters, with the points in every alternate gridline being staggered in-line by 5 meters, resulting in a diamond pattern layout. Although a square pattern could have been used for the grid layout, state representatives preferred the diamond shape.

After the OSAT-3 team identified the polygons, SCAT and Operations personnel conducted polygon field surveys to determine their location relative to the shoreline. The OSAT-3 team overlaid the augering grid pattern on the sampling area and provided unique numbers for the hole locations on the first two polygons, WT1-002 and WT9-001. Thereafter, SCAT team personnel provided the grid overlays and hole numbering.

The SCAT team used the RTK system to locate each gridline intersection, document the coordinates and elevation, and assign each auger hole a unique identification number. The SCAT team then placed a pin flag at each identified auger hole location to mark the area for Operations.

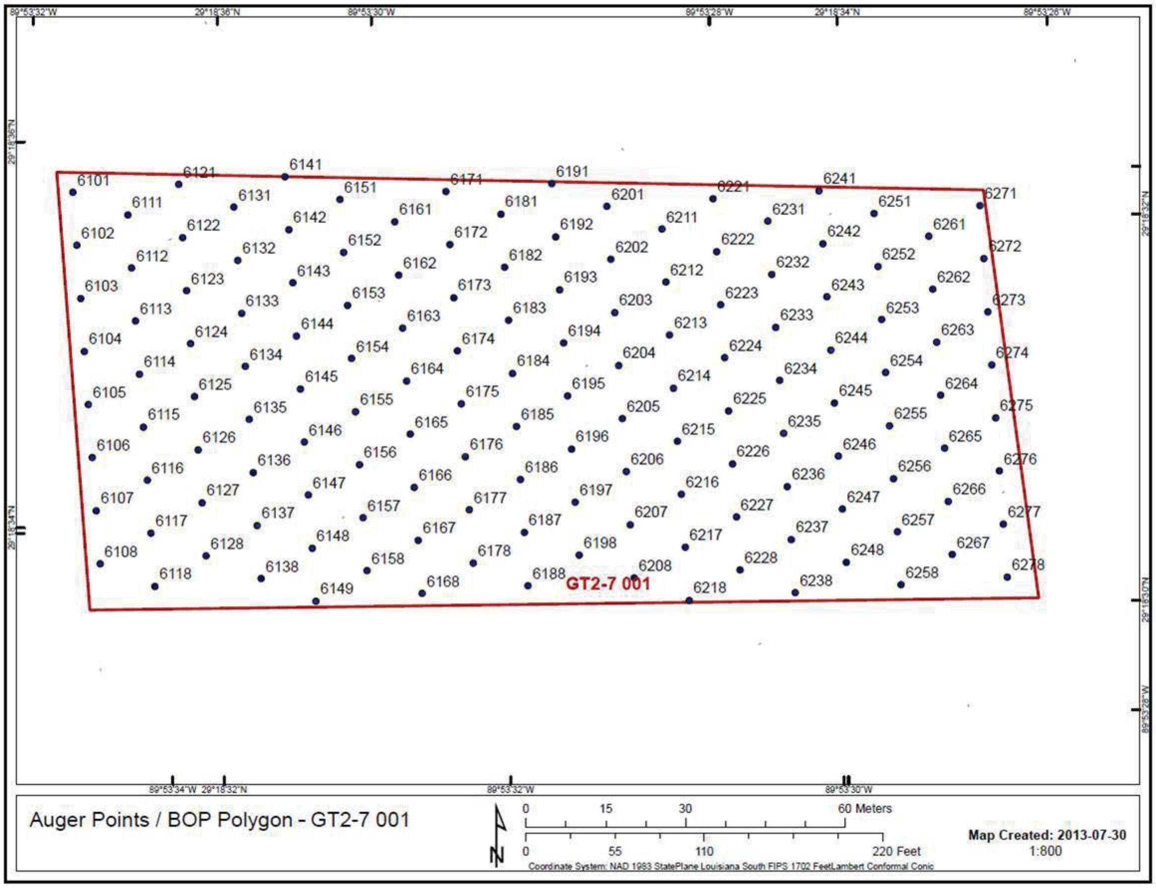

Figure 2.4: Map of BOP Polygon GT2-7-001 Depicting Auger Points in a Diamond Pattern

The sampling grids then were laid out on a map (Figure 2.4) and provided to the BOP team to guide excavation. The team attempted to excavate every auger hole location, but some could not be attempted due to their proximity to restricted areas, such as beach dunes, vegetation, buffer areas for bird habitat, tidal pools, or because of high-tide conditions. If beach conditions improved enough to allow excavation at a later time, and it was deemed practical, these “voided” areas were revisited, and excavation occurred. Hand pits also were excavated in some areas where mechanical equipment was not permitted or was not deemed feasible due to the aforementioned reasons.

2.2.3 Nearshore Polygon Sampling

As with the onshore polygons, the BOP team also used a statistically-based approach to identify transects along which the Snorkel SCAT team would dig sampling pits for polygons located in the subtidal area. (See Appendix D, *Probability of Detecting Oiled Mats Using Snorkel SCAT*, dated July 29, 2013.)

These transects were placed perpendicular to the shoreline and spaced alongshore at a distance of 10 meters to match the gridline spacing used for augering. The Snorkel SCAT team excavated a series of "paired" pit samples, one on each side of a transect, spaced approximately 1 meter apart. The paired pit sample locations began at the waterline and were excavated seaward at 5-meter intervals in the nearshore. In some cases, Snorkel SCAT teams continued their inspections past the polygon's boundary if time permitted.

In the subtidal area, the Snorkel SCAT target excavation depth was at least 4 feet (1.2 meters) below the existing water level, which was about waist-high water. This depth compensated for possible digging at mean higher high water. Snorkel SCAT teams used sharpshooter shovels, which provided an approximate 18-inch (45.7 centimeter) excavation in water depth up to 3 feet (0.9 meters) to achieve the target excavation depth.

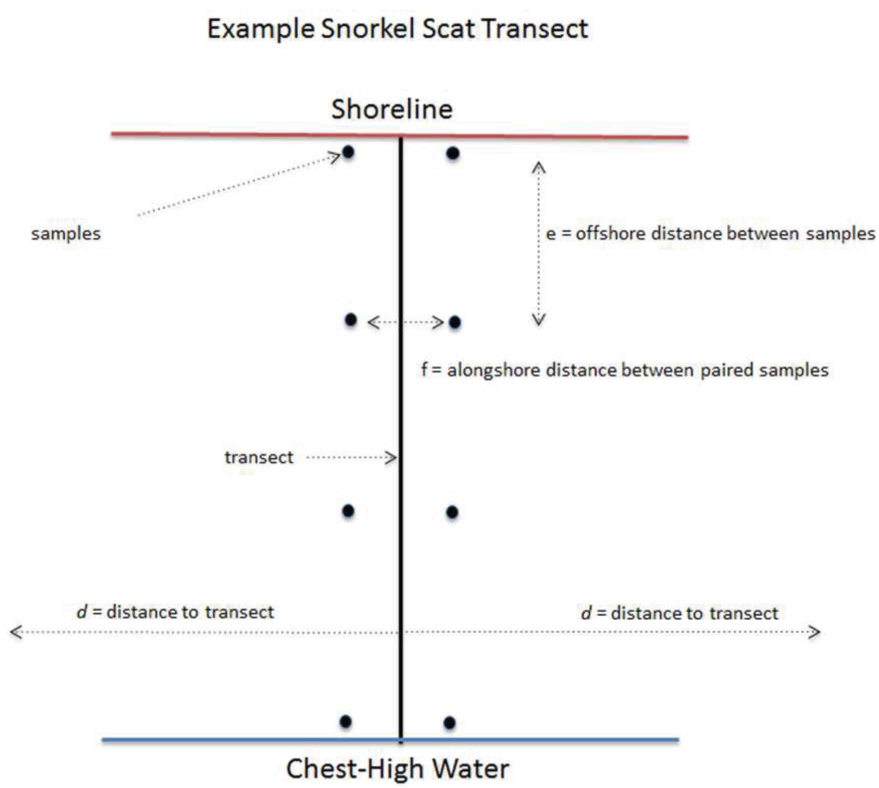

Figure 2.5: Example Snorkel SCAT Transect Diagram

Note: While "chest-high water" is referenced in Figure 2.5, chest-high water generally represents an approximate depth limit in which Snorkel SCAT teams can effectively operate. In the Louisiana AOR, Snorkel SCAT teams did not need to work in water that was deeper than waist-height to achieve the target excavation depth for sampling.

2.2.4 Sampling of Polygons in Both the Onshore and Subtidal Environments

In most cases, a polygon was located both onshore and in the subtidal zone (Figure 2.6). In these instances, both of the sampling methods described in Sections 2.2.2 and 2.2.3 were used. Snorkel SCAT's involvement began at the polygon's waterline where mechanical augering stopped due to hole collapse. In daily planning meetings, teams reviewed shoreline and tide conditions. Based on this information, augering was scheduled to extend as far seaward as dry conditions suitable for augering existed. Snorkel SCAT operations were scheduled to begin in the nearshore area where suitable conditions for pitting began. In some instances, changing shoreline and tide conditions during the course of the day rendered some of the areas planned for either augering or Snorkel SCAT activity inoperable. When possible and where practical, these voided areas were revisited on later dates so that teams could finish sampling these locations.

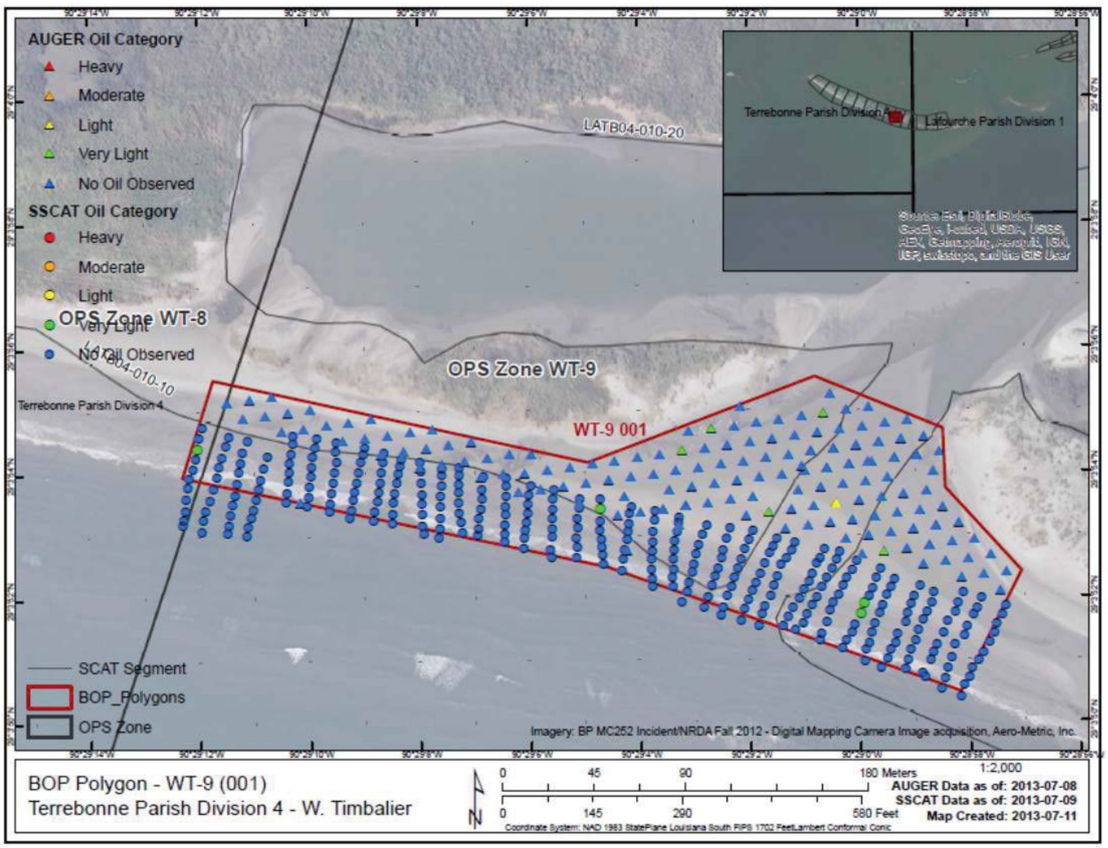

Figure 2.6: WT9-001 Auger and Snorkel SCAT Sampling Locations

2.2.5 Target Depths for Excavation

To effectively locate potential buried oil deposits, the BOP team had to determine the appropriate depth of excavation. Using SCAT and Operations records for documented primary deposits, aerial imagery, tide gauge records, and output from the hydrodynamic models developed for OSAT-3, the OSAT-3 Science team established a maximum vertical depth of investigation of 3 feet (0.91 meters) below mean sea level (MSL) as the target depth.

To ensure valid excavation of the target zone onshore, SCAT personnel used RTK surveying equipment (Figure 2.7) to determine the elevation of each excavation hole. Due to the beach morphology and the typically thin layer of sand above the subsurface peat, the practical guideline for onshore excavation was to auger to a refusal depth by the subsurface peat, marsh, or clay (or until water was encountered), or to the depth limit of the augering equipment, which was approximately 8 feet [2.4 meters]). This established procedure was used successfully in Louisiana prior to the BOP, and was endorsed by state representatives.

Figure 2.7: RTK Setup in WT1-001 for BOP on West Timbalier, June 27, 2013

In water, as noted in Section 2.3.3, the Snorkel SCAT excavation target depth was at least 4 feet (1.2 meters) below the existing water level. SCAT personnel were present during excavations to verify excavation depths and to assess/document any delineation and removal of material.

2.3 Louisiana Augering and Sequential Recovery (LAASR)/Snorkel SCAT

Similar to the BOP, the goal of the LAASR and Snorkel SCAT projects were to thoroughly evaluate areas that could potentially contain buried residual oil. However, unlike the BOP, these investigations did not focus on polygons identified by OSAT-3. Instead, the efforts focused on shoreline Operation Zones within the Louisiana AOR where beach profiles and other data collected by SCAT and Operations indicated that beach morphologies at the time of initial oiling were conducive to the formation of weathered oil deposits and where these deposits may not have been exposed or broken apart by erosion.

When MC252 oil first started coming ashore on Louisiana sandy shoreline areas in May 2010, the beaches were in a highly eroded state. The trend then quickly changed to accretion, and much of the remaining oil that had reached the shoreline was buried.

SCAT teams conducted repetitive beach profile surveys since spring of 2010. Most profiles were established during the late spring and early summer of 2010 as MC252 oil came ashore. These beach profiles have changed significantly since the monitoring took place due to normal seasonal changes in wave energy, the impacts of storm events, and low wave energy recovery periods where beaches accreted. During the course of these natural processes, weathered residual oil was buried and exposed at different points in time. In addition to the seasonal variations, a number of storms caused significant erosion, accretion, and/or mobilization of oil and oiled material. These included:

- Hurricane Alex – Late June, 2010
- Tropical Storm Bonnie – Late July, 2010
- Tropical Storm Lee – Early September, 2011
- Hurricane Isaac – Late August, 2012

As stated earlier, by March 2012, all segments had been returned to normal P&M status after several months of escalated cleanup activities following Tropical Storm Lee. Recovery rates continued to trend downwards through August 2012. Then, Hurricane Isaac made landfall on August 28, 2012 as a Category 1 hurricane with winds of 80 mph spread over a 200-mile area. The storm surge from Hurricane Isaac caused significant erosion of beaches on a number of Louisiana’s sandy shoreline areas, such as Elmer’s Island and Fourchon Beach, which uncovered weathered residual oil that previously had been buried under several feet of sand. Operations escalated mechanical cleanup as soon as it was deemed safe to resume activities. The exposed material was removed by December of 2012.

Following Hurricane Isaac, BP reinitiated its efforts to perform an expansive subsurface cleaning of portions of the Louisiana coastline. A proposal was put before the SOSC in early September 2012. After 3 months of discussion, agreement was reached to proceed with a plan that ultimately became known as LAASR.

The LAASR project began on January 5, 2013 and was completed on June 30, 2013. Operations teams excavated a total of 14,459 holes (Table 2.2) during the course of this project and multi-agency SCAT teams inspected the subsurface profile within the auger holes. These SCAT assessments determined that:

- 500 (3.5 percent) were above SCCP endpoints (AEP)
- 1,465 (10.1 percent) were below SCCP endpoints (BEP)
- The remaining 12,494 (86.4 percent) were no oil observed (NOO)

Location	Number of Holes NOO	Number of Holes BEP	Number of Holes AEP	Number of Auger Holes	Oiled Material Recovered (lbs.)	Start Date	Date Complete
Elmer's Island	1,467	434	21	1,922	84,332	1/15/2013	5/17/2013
Fourchon Beach	5,206	596	24	5,826	1,792,624	1/5/2013	5/14/2013
Grand Isle	4,426	194	433	5,053	404,085	2/9/2013	5/8/2013
Grand Terre 1	527	57	0	584	20	2/6/2013	2/28/2013
Grand Terre 2	868	184	22	1,074	384,086	2/6/2013	6/30/2013
Total	**12,494**	**1465**	**500**	**14,459**	**2,665,147**	**1/5/2013**	**6/30/2013**

Table 2.2: LAASR and Removal Action Results Summary

The augering work involved 11 SOWs comprising 48 separate areas, which covered 7,377 square meters of beach. The cleaning of these areas produced 2,665,147 pounds of oiled sediment from January through June 2013. This material was consistent with material recovered during prior operations and consisted principally of sand/sediment, water, organic material, and residual weathered oil. Additional cleanup of SRBs following the LAASR Project was required in Zone 23 of Grand Terre II (see Section 3.5). This work was completed on August 5, 2013.

In addition to this work, a substantial Snorkel SCAT effort was undertaken to investigate the nearshore environment. Snorkel SCAT operations were previously conducted in the states of Florida, Alabama and Mississippi, and proved to be an effective technique for searching the subtidal zone for submerged residual oil deposits. Prior to Hurricane Isaac, the three Eastern states had reached a phase of material recovery, where Snorkel SCAT activity was the primary method for locating and removing material from nearshore areas. While Louisiana operations had not progressed to this point, it became clear after Hurricane Isaac that Snorkel SCAT reconnaissance could play an immediate and important role in locating, delineating and removing potential remaining subsurface residual oil on Louisiana sandy shoreline areas.

Initial Snorkel SCAT activities in Louisiana were endorsed by the GCIMT and began on November 14, 2012, while the LAASR augering program was still awaiting approval to proceed. Once LAASR received approval, the two types of investigation typically occurred along the same shoreline segments, although not always simultaneously. Snorkel SCAT focused on the subtidal and lower intertidal zones, while LAASR focused on the supratidal and upper intertidal. However, in some areas, Snorkel SCAT sampling was used in lieu of augering due to the dynamic nature of the beach. For example, the spit ends of barrier islands are highly susceptible to erosional-depositional changes that repeatedly buried and uncovered oil deposits. For this reason, Snorkel SCAT was a valuable tool in sampling the spit platform and surrounding nearshore regions.

Through the Snorkel SCAT project, teams dug 17,659 pits in nearshore sediments on Elmer's Island, Fourchon Beach, Grand Isle, Grand Terre I, Grand Terre II, and West Timbalier. A total of 215,998 pounds of material were collected on Elmer's Island, Grand Terre I, and Grand Terre II. No material was recovered on Fourchon Beach, Grand Isle, or West Timbalier through the Snorkel SCAT program. The work was completed on November 22, 2013 (Table 2.3).

Oiled Material Recovered by Snorkel SCAT in Louisiana				
Location	Pits	Oiled Material Recovered	Start Date	Date Complete
Elmer's Island	2,757	24,142	2/12/13	6/19/13
Fourchon	6,057		2/13/13	11/15/13
Grand Isle	3,296		11/14/12	7/20/13
Grand Terre I	3,438	79,556	3/15/13	11/21/13
Grand Terre II	1,760	112,300	4/4/13	8/5/13
West Timbalier	351		6/22/13	11/22/13
Total	**17,659**	**215,998**	**11/14/12**	**11/22/13**

Table 2.3: Oiled Material Recovered through the Louisiana Snorkel SCAT initiative

2.3.1 Project Locations

The areas sampled for LAASR were selected based on knowledge gained from previously collected beach profile datasets and material recovery trends. The GCIMT Planning Section has tracked cleanup activities by Ops Zone since June 2011 and has issued daily reports documenting the amount of material collected and the number of workers. These data have been monitored over time, and areas where weathered residual oil has been remobilized have been noted.

Along with the historical recovery data, the historical profiles and knowledge generated from beach surveys led the SCAT group to propose augering on:

- Elmer's Island
- Fourchon Beach
- Grand Isle
- Grand Terre I
- Grand Terre II

There are between five and 16 profile stations (staked locations used as reference points for measuring beach profiles) on each sandy shoreline areas and these stations were surveyed on 1- to 3-month intervals. The surveys document the accretion or deflation that has occurred since the previous survey. SCAT used these historical data, combined with knowledge of storm events and other environmental factors influencing beach morphology, to determine sampling grid locations for LAASR.

Figure 2.8: LAASR Auger Team at Grand Isle in GI-14 on March 14, 2013

SCAT previously used 10-meter grid patterns for other auger activities and a 10-meter grid pattern was again chosen for the LAASR project to consistently cover the areas of interest. The team leads were allowed to use their discretion to auger additional holes and delineate any buried oil deposits that were located.

The 10-meter grid spacing used for the LAASR project was analyzed statistically; it was determined that the 18-inch auger used provided a 95 percent confidence factor for locating a 25 square meter deposit. (Appendix D, *Probability of Detecting Oiled Mats Using 12- and 18-Inch Augers*, dated July 29, 2013.) The average deposit located by the LAASR project turned out to be 153 square meters, and the mean was 70 square meters. The smallest deposit located was 4 square meters. The extent of the grid areas in comparison to the beach size is shown in Table 2.4. The auger grids covered an average of 60 percent of the available area. All of the stakeholders were in agreement with the auger locations, density patterns and established remediation criteria for this GCIMT-sanctioned activity.

Location	Total Area m^2	Grid Area m^2	Percentage of total	Total Auger Holes	Grid Area Acres	Date Complete
Elmer's Island	442,626	381,337	86	1,922	94	5/17/2013
Fourchon Beach	1,475,760	898,268	61	5,826	222	5/14/2013
Grand Isle	1,231,080	521,303	42	5,053	129	5/8/2013
Grand Terre I	194,708	128,181	66	584	32	2/28/2013
Grand Terre II	368,095	160,959	44	1,074	40	6/30/2013
Total	**3,712,269**	**2,090,048**	**60**	**14,459**	**517**	**6/30/2013**

Table 2.4: LAASR Grid Areas

Sampling sites for Snorkel SCAT surveys were identified by the evaluation of shoreline conditions observed by SCAT teams, chronic remobilization of weathered residual material (SRBs) as observed and collected by Operations, and in some instances, trends identified from beach profile data. Snorkel SCAT teams conducted sampling at Elmer's Island, Fourchon Beach, Grand Isle, Grand Terre I, Grand Terre II, and West Timbalier along a combined shoreline length of more than 20-kilometers. In these areas, Snorkel SCAT leaders determined that the available information indicated that beach morphologies at the time of initial oiling were conducive to the formation of weathered oil deposits that may not have been exposed or broken apart by erosion. The Snorkel SCAT teams commonly took samples from the swash zone to a distance 40 to 75 meters from the shoreline (Figure 16 in Appendix E).

During these operations, Snorkel SCAT teams identified buried oil deposits on Elmer's Island, Grand Isle, Grand Terre I, and Grand Terre II. The findings of the Snorkel SCAT surveys were shown on cumulative maps, such as Figure 7 in Appendix E. Once a buried oil deposit was identified in the nearshore area, the Snorkel SCAT team undertook a more extensive survey of the area. During these surveys, the team recorded coordinates to delineate the extent of a deposit, and drove stakes into the beach directly onshore of the deposit to mark the location for Operations. The Snorkel SCAT team then worked with Operations and other SCAT teams to further investigate potential locations of buried oil deposits, reviewing the amount and type of oiling identified (i.e. fresh or weathered; thick or flat; angular or rounded), in order to prioritize areas for investigation.

Although the beach profile surveys extended to near mean low water (MLW) only, and therefore did not provide direct guidance on potential buried oil in the nearshore zone, the team leads were often able to use the profile data to discern the beach's overall retreat versus its progradation. In some cases, progradation of the beach suggested that the former nearshore was buried by significant overburden. Exceptions to this trend occurred where, despite overall beach erosion, remnant mangrove and marsh platforms persisted and became exposed in the nearshore. Under these conditions, Snorkel SCAT teams were deployed to search for potential isolated buried oil deposits that may have adhered to these remnant platforms (e.g., Fourchon Beach, northern Grand Terre I).

2.3.2 LAASR Augering Activities

LAASR used mechanical augers to facilitate locating potential buried oil deposits for recovery. Each work zone was established by setting four cones at the corners a distance of 20 meters apart. Two people stood at diagonal corners and monitored the perimeter to prevent entry during machine operation. Only the operator and spotter were allowed in the work zone while the excavator was active.

The SCAT team lead was responsible for planning the day's activities. The daily plan took into account the number of teams in the vicinity and maintained working distances to avoid safety issues. The lead also was responsible for establishing the auger grid (typically covering several hundred meters) with pin-flags set at the gridline intersections where the team would excavate the sampling holes. Unlike the BOP, LAASR used a square pattern grid layout for the holes.

Each auger hole initially was bored to a depth of just more than 1 meter and then pulled to the surface (not screwed out). Pulling the auger vertically to the surface helped retain sediment on the auger bit for inspection.

After each auger run, the SCAT lead scraped the inside of the hole with a trowel or shovel looking for evidence of oiled sediment, noting the depth and thickness of layers, NOO or type of oiling, and oil distribution. Tailings from the auger bit also were inspected for residual oil in the sediment. After the data were recorded, the auger was reinserted into the hole and bored to the marsh platform, 2 meters, or depth of refusal, whichever was shallower. The auger bit was retracted from the hole and again, the team inspected the hole and tailings from the stem as well as recorded depth of hole and water table.

If a buried oil deposit was encountered, a series of more closely-spaced holes were bored to define the extent of the deposit. After the deposit was fully delineated, characterized, GPS-located, and photo-documented, the team drove stakes into the beach to define the boundaries of the deposit for later removal by Operations. Additional information such as thickness and depth of overburden usually were written on the stakes.

Any material collected was weighed and disposed of as per GCIMT waste management protocol. The waste totals were tracked in the IMT operations database as auger spoils (Appendix G: **Auger Spoils Report**)

.

Figure 2.9: LAASR Inspection of Auger Material at Grand Isle in GI-11 on February 28, 2013

2.3.3 Data Management/Evaluation

Data generated during LAASR auger activities (including coordinates, oil sediment characteristics, depth, and thickness) were recorded in the field along with the photo numbers. An example of a report is shown in Appendix H (**SCAT Auger Report Example)**. These data were entered into spreadsheets and plotted on GIS maps to produce daily auger reports that were distributed to stakeholders and appropriate Response personnel (Appendix I: **Daily Auger Reports)**. Each auger location was shown on the map as:

- Blue – NOO
- Yellow – BEP
- Red – AEP

Figure 2.10: LAASR Hole Depth Measurement on Grand Isle in GI-11, February 28, 2013

The areas that were AEP were delineated, and Scopes of Work (SOWs) were written and approved by all stakeholders. These SOWs identified the boundary extents of the buried oil deposit, the overburden to be removed, and the approximate thickness of the layers of buried oil deposit. The SOWs also identified the type and quantity of equipment to be used by operations.

BEP areas to be cleaned were identified by sorting the data as follows: Points that had primary and secondary oil characteristics of oiled film or less were removed from consideraton. Then points that had distributions of 10 percent or less were removed. The remaining data were further evaluated using the following criteria:

1. Burial depth
2. Proximity to sensitive habitat
3. Probability of exhumation
4. Thickness
5. Degree below endpoints
6. Oiling character
7. Likelihood to exceed surface endpoints if exposed
8. Areal extent
9. Location relative to the footprint of the Caminada Headlands Project (Fourchon Beach)

SCAT and Operations made additional site visits to the proposed BEP areas after reviewing the oiling characteristics, depth, thickness, and photos to determine the level of oiling and the likelihood that these areas would be exposed in the near future and/or would require additional cleanup activity. Areas that were determined to be likely candidates for remediation were further delineated and SOWs were written. These SOWs are available via links in Table 2.5.

The SCAT team recorded its data daily and uploaded these data to the GCIMT SCAT database (managed by NOAA), which processed the data and published the results in frequent reports.

All of the auger reports are listed by date and can be accessed along with the original emails on SharePoint. The results of the auger surveys are shown in Appendices 3 through 7 or at the following links (Elmer's Island Data, Fourchon Beach Data, Grand Isle Data, Grand Terre I Data, Grand Terre II Data).

Snorkel SCAT collected data from sample locations using the process described in Section 2.2.3. Data collected included: site location; substrate material; surface oiling conditions, if any; type of oiling, if any; amount of oiling, if any; depth of the oiling, if any; and water depth.

The Snorkel SCAT data were then transferred to Shoreline Oiling Summary forms and oiling matrices and used to develop nearshore oiling maps.

2.3.4 Scopes of Work

Prior to undertaking any mechanical recovery actions, a SOW was required. The SOW packages were written by SCAT with input from Operations and routed to stakeholders for review, comment, and subsequent approval by the FOSC. A typical SOW consisted of the following:

1. A description of the conditions in the area to be treated
2. Approved treatment techniques or methodology(s)
3. A listing of approved equipment to be utilized
4. An outline of the work steps
5. Listing of applicable BMPs

Scope of Work	Date	Description	Scope of Work
Elmer's Island Zone 2	February 18, 2013	8 AEP areas totalling 423 m² Oiled zones 3-29 cm thick 40-90 cm overburden active 2/18-3/13/2013	N/A See below February 25
Fourchon Zone 4	February 21, 2013	1 BEP area totalling 616 m² Oiled zone 2-20 cm thick 18-50 cm overburden active 3/7-3/9/2013	No material recovered
Elmer's Island Zone 2	February 25, 2013	Modified the 18 February SOW to allow mechanical removal	83,992 lbs.
Fourchon Zone 1	March 13, 2013	6 AEP areas totalling 493 m² Oiled zone 5-30 cm thick 15-160 cm overburden active	N/A See below March 28
Fourchon Zones 1 and 3	March 28, 2013	7 BEP areas totalling 618 m² Oiled zone 2-76 cm thick 25-116 cm overburden Active	165,450 lbs.
Grand Isle Zones 11, 13, and 14	March 28, 2013	6 AEP areas totalling 664 m² Oiled zone 1-20 cm thick 15-85 cm overburden Active	402,098 lbs.
Grand Terre II Zones 10, 23, and 24	March 28, 2013	5 AEP areas totalling 2,659 m² Oiled zone 3-30 cm thick 40-90 cm overburden Active	312,189 lbs.
Grand Terre II Zones 8-10, 23, and 24	April 8, 2013	13 BEP areas totalling 1,370m² Oiled zone 5-169 cm thick 31-95 cm overburden Active	63,896 lbs.
Grand Terre II Zone 23	June 6, 2013	Mechanically treat areas 1 and 2	6,429 lbs.

Table 2.5: Scopes of Work Issued

2.3.5 Removal Activities

During the LAASR project, Operations excavated 14,459 holes using the grid spacing referenced in Section 2.3.1. Upon locating a buried oil deposit, the team reduced the grid spacing to further delineate any smaller buried oil deposits that may have existed in the area. Operations also extended the delineated areas during cleanup activities when appropriate to make sure the entire buried oil deposit was removed.

A typical removal operation consisted of removing the overburden using a mini-excavator and manually removing the buried oil deposit using shovels and two-person sifting screens. Oiled material that was too wet to sift was piled in the supratidal zone and allowed to dry. Excavation extended to at least the boundaries identified in the SOW, but crews were allowed to extend the excavation further if the oiled material was visible in the sides of the original excavation. The final excavation size was documented using a GPS. A list of the cleanup areas is shown in Table 2.6.

Representatives from the CPRA and Louisiana Department of Wildlife and Fisheries (LDWF), as well as a NRA advisor, were onsite during operational activities.

The coordinates of each cleanup area associated with the approved SOW were documented. This process was designed to ensure the entire area designated in the SOW was cleaned in accordance with the SCCP endpoints. In addition, coordinates also were documented in the majority of the work areas where the excavation activities expanded beyond the original SOW areas. These coordinates were plotted on maps along with the areas from the original SOWs to demonstrate and document additional excavated surface areas. The material removed from each area was weighed on a daily basis and the totals are shown in Table 2.6. A total of 2,665,147 pounds of oiled mixed material were recovered by the LAASR project. The material composition was consistent with material recovered during prior operations and consisted principally of sand/sediment, water, organic material, and residual weathered oil.

Because weather and wave conditions can rapidly cause changes to nearshore areas, sometimes quickly covering exposed oiled material identified by Snorkel SCAT teams before Operations can be dispatched to recover the material, Snorkel SCAT teams typically worked closely with Operations to coordinate the timely removal of oiled material discovered during Snorkel SCAT activities.

Area	Original area (m²)	Final area (m²)	Change in size (m²)	Material Removed (lbs)[1]
Elmer's[2]				
1	30	N/A		1,200
2	12	N/A		3,600
3	14	N/A		0
4	300	N/A		49,800
5	9	N/A		281
6	40	N/A		18,277
7	9	N/A		10,834
8	9	N/A		0
Fourchon				
1	616	N/A		0
2	25	N/A		0
3	150	N/A		67,609
4	36	N/A		192,200
5	105	N/A		190,800
6	98	N/A		217,200
7	78.75	N/A		326,400
8	420	N/A		631,200
9	100	N/A		0
10	224	N/A		94,171
11	25	N/A		40,579
12	150	N/A		30,500
13	144	N/A		0
14	25	N/A		0
15	25	N/A		0
16	25	N/A		200

Area	Original area (m²)	Final area (m²)	Change in size (m²)	Material Removed (lbs)
Grand Isle				
1	40	40	0	326
2	100	930	830	147,749
3	250	505	255	71,277
4	145	1,650	1,505	160,775
5	125	195	70	18,906
6	4	55	51	3,065
Grand Terre 2				
1	1,800	3,070	1,270	294,638
2	444	444	0	1,446
3	25	25	0	498
4	160	160	0	14,468
5	230	230	0	1,138
6	25	560	535	59,675
7	25	25	0	158
8	25	25	0	0
9	105	105	0	2,671
10	25	25	0	0
11	25	25	0	0
12	570	570	0	661
13	70	70	0	0
14	110	110	0	0
15	140	140	0	22
16	25	25	0	635
17	25	25	0	74
18	200	200	0	0
Tilling	5,190	5,190	0	6,429

Table 2.6: LAASR Cleanup Areas

[1] Does not include auger spoils that were collected; auger spoil collections were recorded by island, but not by area.
[2] The areas on Fourchon and Elmer's Island specifically were not sufficiently documented or did not exceed the original work area to a degree that allowed for map plot comparison.

3.0 Results

Through the BOP and LAASR/Snorkel SCAT initiatives, the GCIMT conducted investigation, delineation, and recovery operations across the Louisiana AOR between November 2012 and December 2013 in areas where datasets, including OSAT-3, Operations, and SCAT data, indicated that beach morphologies at the time of initial oiling were conducive to the formation of weathered oil deposits and where these deposits may not have been exposed or broken apart by erosion.

In Louisiana, the beach composition and profile is different from the other states in the Deepwater Horizon Response AOR. The slope of the beaches in Louisiana is shallower, and there is a thinner layer of sand covering the subsurface sediments. Due to this beach morphology, the logistics involved with using large equipment in these locations, a history of large buried oil deposits in some of these areas, and the fact that Louisiana had used augering with success previously in the Response, it was decided that augering would be used to investigate onshore target areas that were identified as part of the BOP and LAASR. The exception to this approach was trenching activities conducted at two breach areas on Fourchon Beach in November 2013.

Material Recovery										
	Holes Excavated					Amount Recovered				
Location	BOP Auger	BOP Snorkel SCAT	LAASR	Snorkel SCAT	Total Holes	BOP	LAASR	Snorkel	Breach Operations	Total Recovery
Elmer's	-	-	1,922	2,757	**4,679**	-	84,332	24,142		**108,474**
Fourchon	-	-	5,826	6,057	**11,883**	-	1,792,624	-	2,971,701	**4,764,325**
Grand Isle	-	-	**5,053**	3,296	**8,349**	-	404,085	-		**404,085**
Grand Terre I	-	864	584	3,438	**4,886**	14,706	20	79,556		**94,282**
Grand Terre II	245	302	1,074	1,760	**3,381**	48,552	384,086	112,300		**544,938**
West Chaland	312	1,740	-	-	**2,052**	5,685	-	-		**5,685**
West Timbalier	1,037	3,571	-	351	**4,959**	15,821	-	-		**15,821**
Total	**1,594**	**6,477**	**14,459**	**17,659**	**40,189**	**84,764**	**2,665,147**	**215,998**	**2,971,701**	**5,937,610**

Table 3.1: Amounts of Buried Oil Material Recovered by the BOP, LAASR and Snorkel SCAT Projects in the Louisiana AOR

The BOP and LAASR teams worked with SCAT and Snorkel SCAT personnel to provide a unified approach to inspecting areas with a high potential for buried oil deposits. In these locations, Snorkel SCAT teams completed the inspection of the nearshore areas where augering operations stopped. After Tropical Storm Karen caused significant shoreline erosion and uncovered buried material at a breach area on Fourchon in October 2013, the GCIMT conducted a gap assessment and identified areas on Fourchon, Grand Isle, Grand Terre II and West Timbalier for additional field investigation. Recoverable material was only found at two similar breach areas on Fourchon.

Combined, the projects removed a total of 5,937,610 pounds of oiled material from seven sandy shoreline areas in Louisiana (Table 3.1). The project locations – identified using datasets such as aerial imagery, data from hydrodynamic modeling, and beach profiles – included Elmer's Island, Fourchon Beach, Grand Isle, Grand Terre I, Grand Terre II, West Chaland and West Timbalier. Summaries of the project results for each of the locations:

3.1 Elmer's Island

On Elmer's Island, 1,922 auger holes were excavated onshore as part of the LAASR project, and 2,757 nearshore pits were excavated by the Snorkel SCAT team (Figures 3.1 and 3.2). The OSAT-3 team did not identify any polygons for BOP investigation on Elmer's Island. LAASR activities commenced on January 15, 2013 and ended on May 17, 2013 (view the [compiled Elmer's Island Data](#)). Snorkel SCAT activities commenced on February 12, 2013 and ended on June 19, 2013.

Figure 3.1: LAASR/Snorkel SCAT Sampling Sites on Elmer's Island

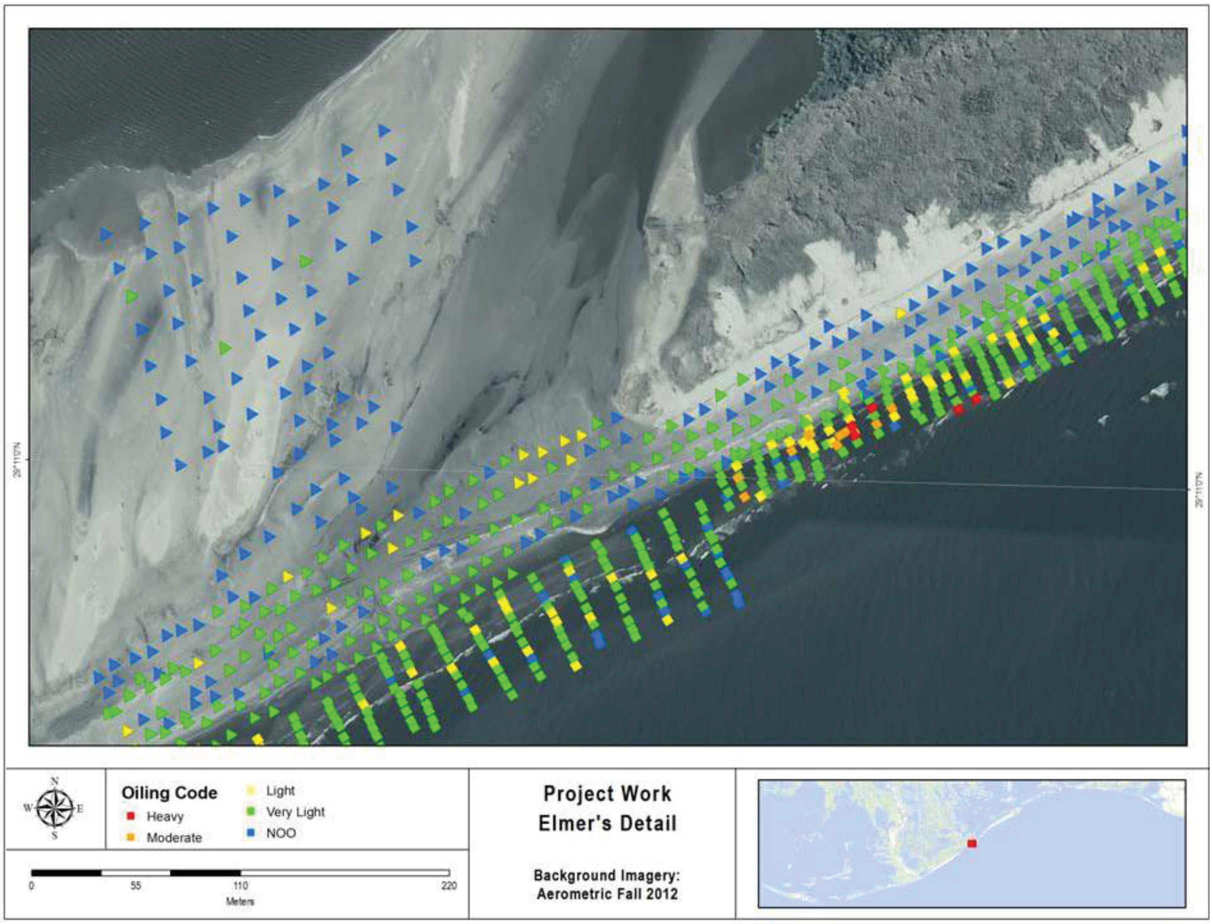

Figure 3.2: Close-up Example of LAASR/Snorkel SCAT Sampling on Partial Elmer's Island Segment

These investigations resulted in the location and removal of 108,474 pounds of weathered residual oil from the beach and nearshore environment (Table 3.2).

Elmer's Island Material Recovery Overview					
	Auger Holes Excavated	Snorkel SCAT Pits Excavated	Amount Recovered Onshore (lbs.)	Amount Recovered in Nearshore (lbs.)	Total Amount Recovered (lbs.)
BOP	-	-	-	-	-
LAASR	1,922	-	57,924	26,408	84,332
Snorkel SCAT	-	2,757	13	24,129	24,142
Total	**1,922**	**2,757**	**57,937**	**50,537**	**108,474**

Table 3.2: Elmer's Island Buried Oil Removal Overview

3.2 Fourchon Beach

On Fourchon Beach, 5,826 auger holes were excavated onshore as part of the LAASR project, and 6,057 nearshore pits were excavated by Snorkel SCAT teams (Figure 3.3). The OSAT-3 team did not identify any polygons for BOP investigation. LAASR activities commenced on January 5, 2013 and ended on February 27, 2013 (view the compiled Fourchon Beach Data). Snorkel SCAT operations began on February 13, 2013 and ended on November 15, 2013.

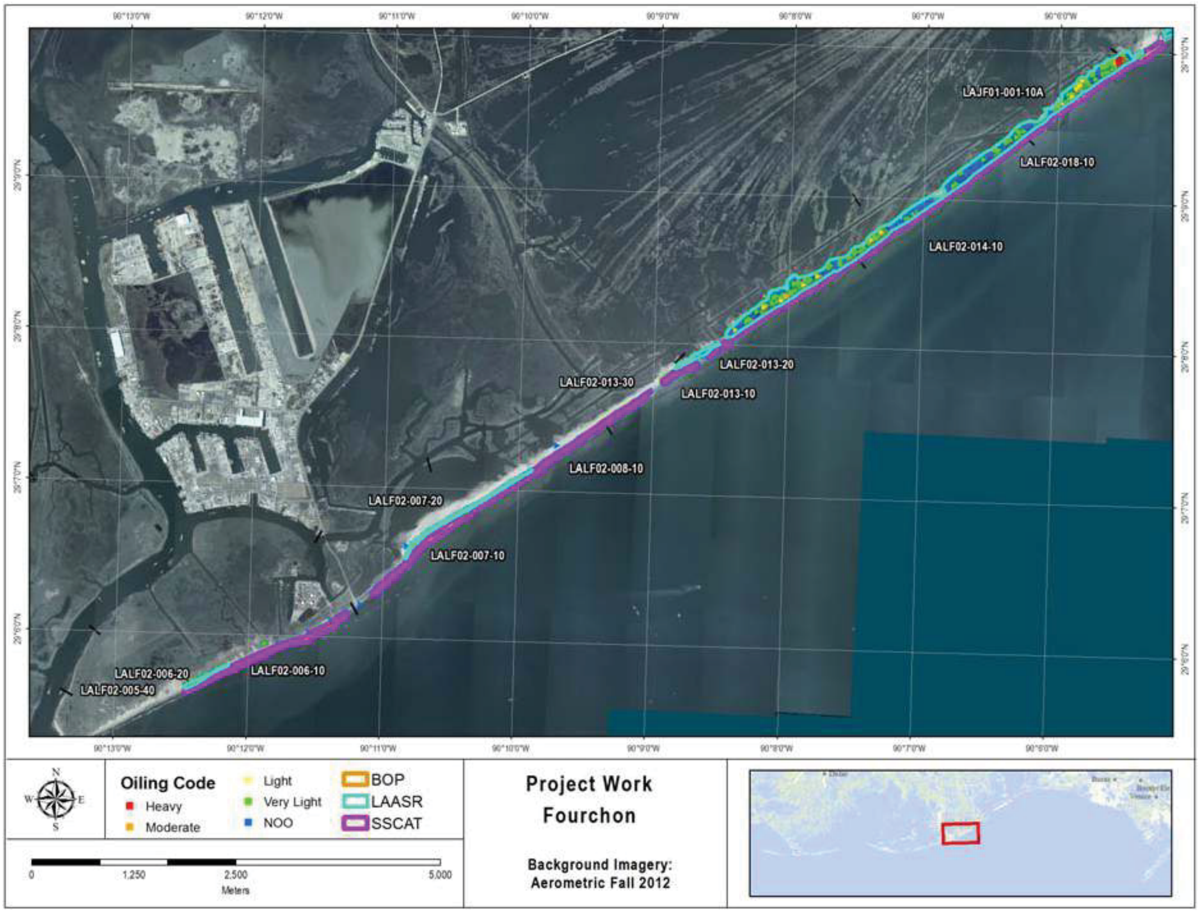

Figure 3.3: LAASR/Snorkel SCAT Sampling Sites on Fourchon Beach

The LAASR investigations resulted in the location and removal of 1,792,624 pounds of weathered residual oil from the beach environment (Table 3.3).

In addition, trenching and/or Snorkel SCAT operations at four breach areas led to the recovery of 2,971,701 pounds of material from October 24, 2013 to December 17, 2013 (Figure 3.4). Deep channels and breach superstructures at these areas combined with significant accretion events such as previous storms to create an environment where sediment collected in a way that was unlike any other area in Louisiana. In October 2013, Tropical Storm Karen caused significant shoreline erosion and uncovered buried material at Breach #2. At this area, 52,800 pounds of material was removed. Operations were then conducted to locate and recover material at Breach #1, #3 and #4.

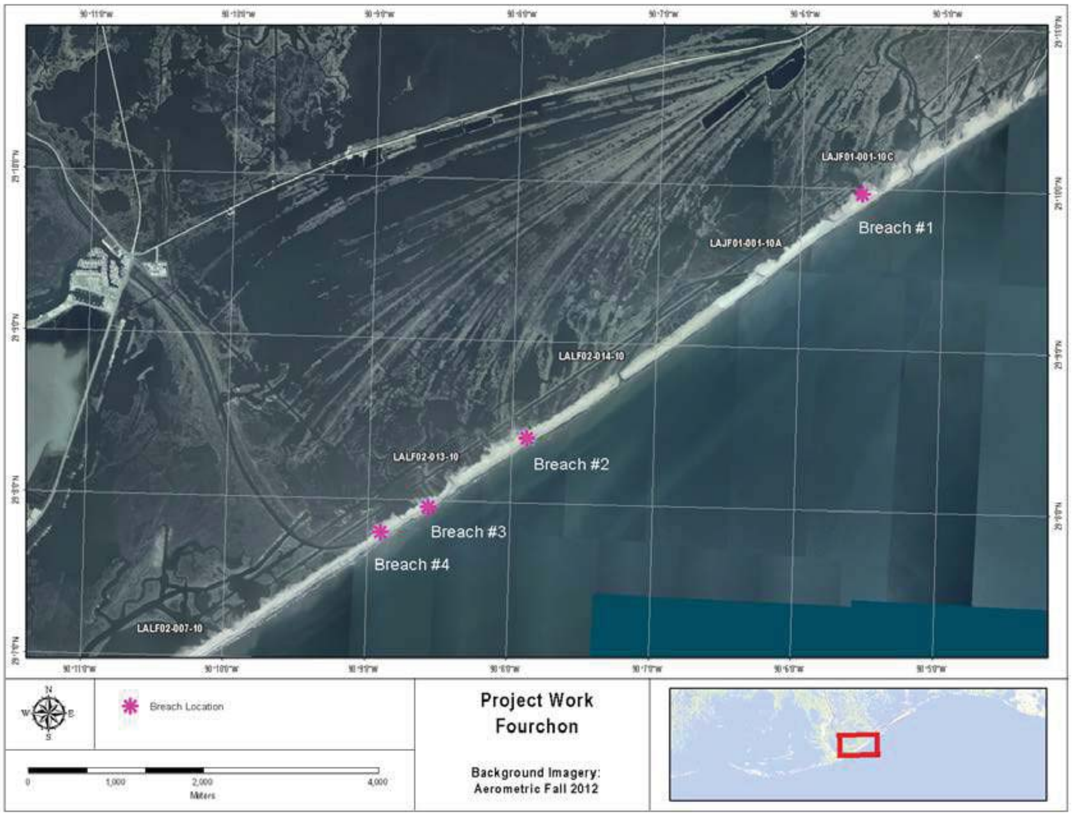

Figure 3.4: Breach areas on Fourchon Beach

Mechanical trenching, Snorkel SCAT and recovery activities were conducted in the intertidal and supratidal zones. Trenching was conducted at Breach #1 and #4 and reached depths of up to nine feet, although teams went deeper in some areas. A total of 2,918,582 pounds of material was collected at Breach #1. At this area, separating oiled material from the surrounding clean sand was difficult, which caused an increase in the volume of material recovered. Testing of samples of material collected found that on average, residual oil comprised 1 percent of the weight of the recovered material, with sand, shells, vegetation and water accounting for 99 percent of the weight. (Appendix J.) No material was collected at Breach #3 and 319 pounds were collected at Breach #4. The operations were conducted under a Scope of Work. (Appendix K.)

Fourchon Beach Material Recovery Overview				
	Auger Holes Excavated	Snorkel SCAT Pits Excavated	Trenches Excavated	Total Amount Recovered (lbs.)
BOP	-	-	-	-
LAASR	5,826	-	-	1,792,624
Snorkel SCAT	-	4,944	-	-
Breach areas		1,113	50	2,971,701
Total	**5,826**	**6,057**	**50**	**4,764,325**

Table 3.3: Fourchon Beach Buried Oil Removal Overview

3.3 Grand Isle

On Grand Isle, 5,053 auger holes were excavated onshore as part of the LAASR project, and 3,296 nearshore pits were excavated by the Snorkel SCAT team (Figure 3.5). The OSAT-3 team did not identify any polygons for BOP investigation on Grand Isle. LAASR activities on Grand Isle commenced on February 9, 2013, and ended on April 20, 2013 (View the compiled Grand Isle Data). Snorkel SCAT operations began on November 14, 2012 and ended on July 20, 2013.

These investigations resulted in the location and removal of 404,085 pounds of weathered residual oil from the beach and nearshore environment (Table 3.4).

Figure 3.5: LAASR/Snorkel SCAT Sampling Sites on Grand Isle

Some of the AEP areas located during LAASR operations on Grand Isle contained small SRBs deposited at various depths, the average of which was approximately 65 centimeters. These areas can be seen in the Daily Auger Reports on SharePoint. These SRBs were not recovered because they were small, at low distributions, deeply buried, and located mainly in the intertidal zone. SCAT recommended no action of these areas because they met the net environmental benefit (NEB) definition.

After completion of the LAASR and Snorkel SCAT work, the State of Louisiana requested that additional actions be recommended on Grand Isle; however, the FOSC on October 17, 2013 concurred with the NOAA SSC that no further response actions were recommended. (See the NOAA SSC correspondence and FOSC concurrence, dated September 25, 2013, in Appendix A.)

Grand Isle Material Recovery Overview					
	Auger Holes Excavated	Snorkel SCAT Pits Excavated	Amount Recovered Onshore (lbs.)	Amount Recovered in Nearshore (lbs.)	Total Amount Recovered (lbs.)
BOP	-	-	-	-	-
LAASR	5,053	-	401,002	3,083	404,085
Snorkel SCAT	-	3,296	-	-	-
Total	**5,053**	**3,296**	**401,002**	**3,083**	**404,085**

Table 3.4: Grand Isle Buried Oil Removal Overview

3.4 Grand Terre I

On Grand Terre I, 584 auger holes were excavated onshore as part of the LAASR project, and 4,302 nearshore pits were excavated as part of the BOP and Snorkel SCAT projects (Figure 3.6). BOP commenced on June 11, 2013 and ended on August 28, 2013; LAASR activities commenced on February 6, 2013 and ended on February 28, 2013 (view the compiled Grand Terre I LAASR Data); and Snorkel SCAT began on March 15, 2013 and ended on November 21, 2013.

These investigations resulted in the location and removal of 94,282 pounds of weathered residual oil from the nearshore environment (Table 3.5).

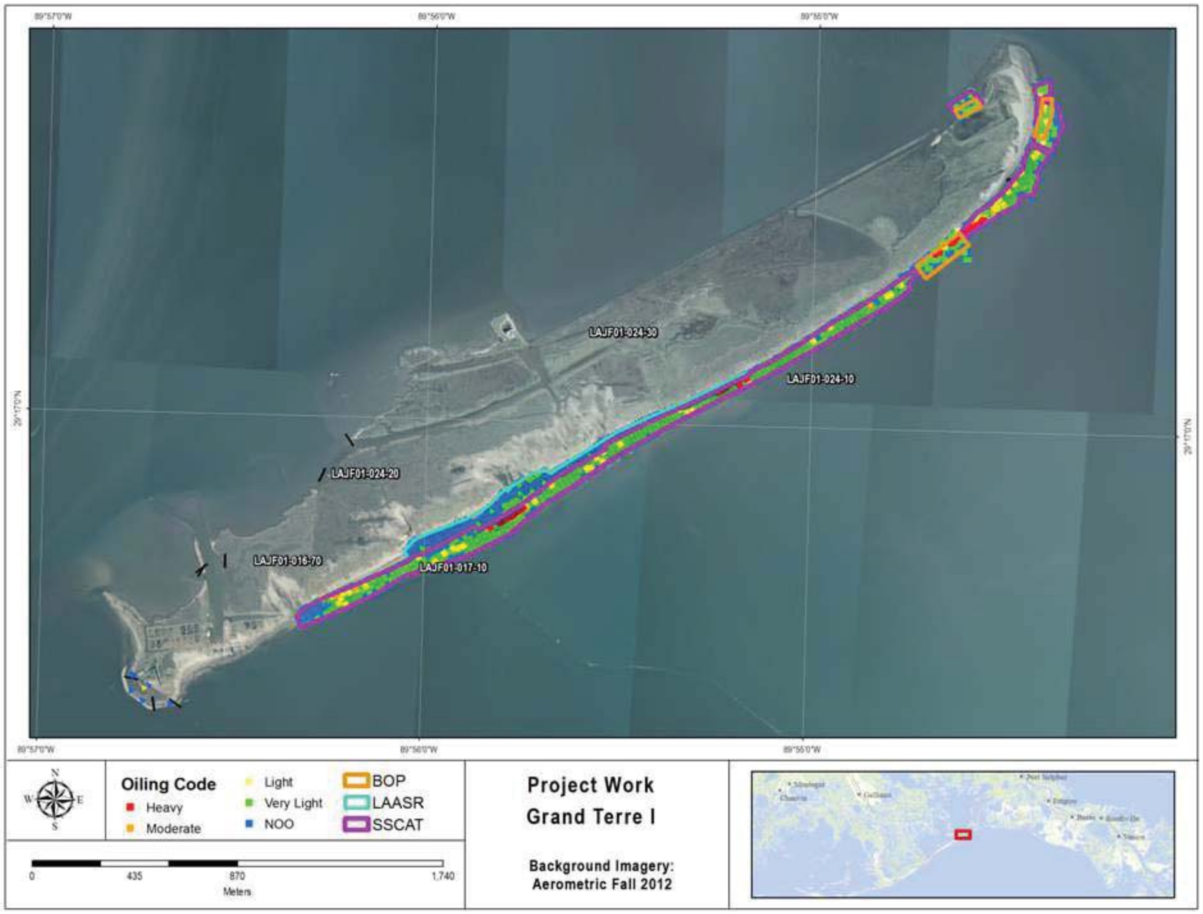

Figure 3.6: LAASR/Snorkel SCAT Sampling Sites on Grand Terre I

BOP field surveys of the two polygons on Grand Terre I revealed that both polygons were in the nearshore area. The Snorkel SCAT team investigated these polygons and located a buried oil deposit, which Operations recovered from LAJF01-024-10 GT1 Ops Zone 11 in July and August 2013. After Snorkel SCAT suggested another buried oil deposit may be located to the west of this location and the matter was addressed at a Technical Advisory Group (TAG) meeting on August 8, 2013, the FOSC concurred with the NOAA SSC's recommendation that Operations complete BOP polygon work in Ops Zone 10 and 11. This recommendation resulted in a variance and revision for STR S4-019.r.1. The subsequent investigation identified two buried oil deposits, which were recovered in a third polygon, GT1-10/11.001. (See the Grand Terre I BOP Operations Overview in Appendix C for the compiled data.) (See the NOAA SSC correspondence and FOSC concurrence, dated September 25, 2013, in Appendix A.)

Grand Terre I Material Recovery Overview					
	Auger Holes Excavated	Snorkel SCAT Pits Excavated	Amount Recovered Onshore (lbs.)	Amount Recovered in Nearshore (lbs.)	Total Amount Recovered (lbs.)
BOP	-	864	-	14,706	14,706
LAASR	584	-	-	20	20
Snorkel SCAT	-	3,438	-	79,556	79,556
Total	**584**	**4,302**	**-**	**94,282**	**94,282**

Table 3.5: Grand Terre I Buried Oil Removal Overview

3.5 Grand Terre II

On Grand Terre II, 1,319 auger holes were excavated onshore as part of the BOP and LAASR projects, and 2,062 nearshore pits were excavated as part of the BOP and Snorkel SCAT projects (Figure 3.7). BOP commenced operations on August 4, 2013 and was completed on August 30, 2013; LAASR commenced on February 6, 2013 and ended on March 21, 2013 (view the compiled Grand Terre II LAASR Data); and Snorkel SCAT started on April 4, 2013 and ended on August 5, 2013.

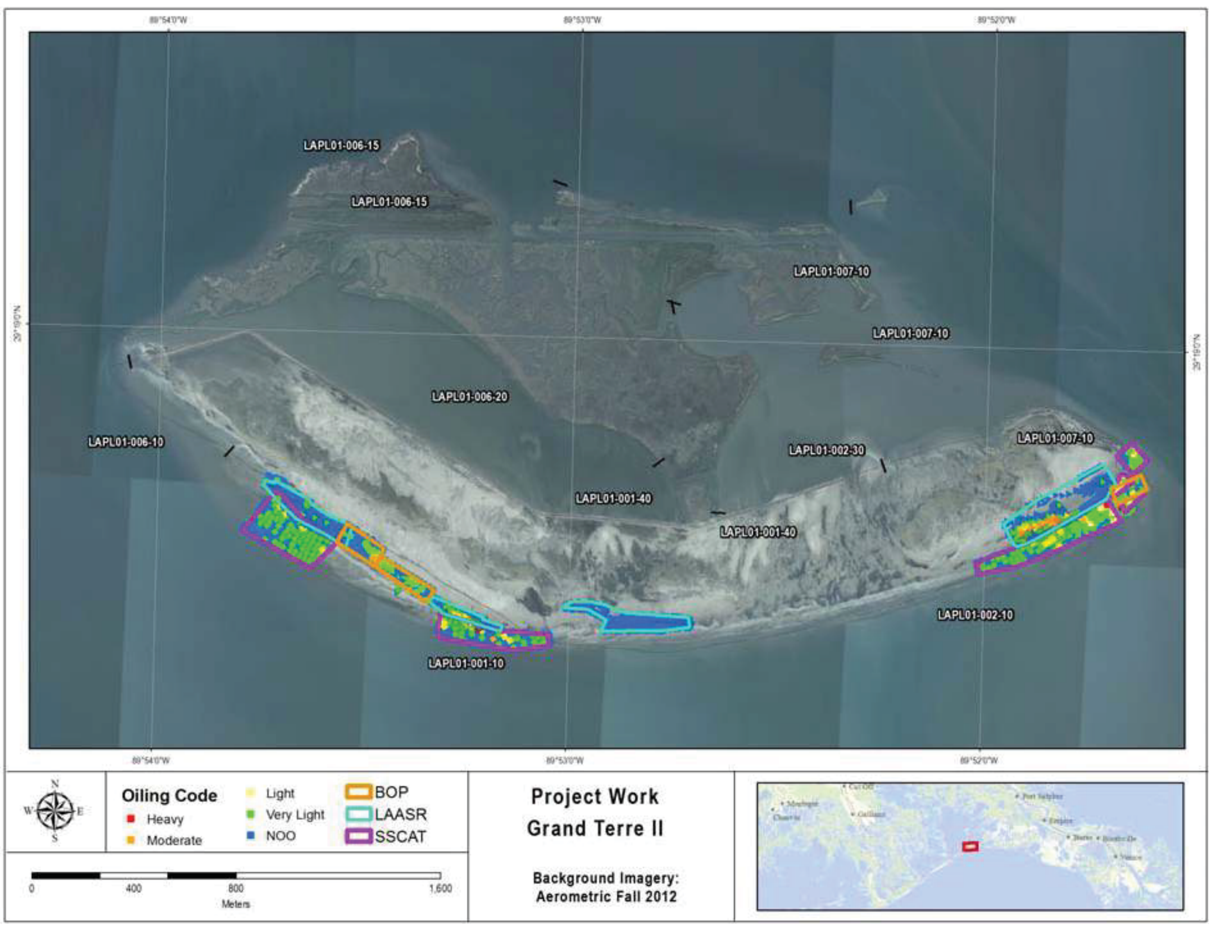

Figure 3.7: LAASR/Snorkel SCAT Sampling Sites on Grand Terre II

These investigations resulted in the location and removal of 544,938 pounds of weathered residual oil from the beach and nearshore environment (Table 3.6).

During the LAASR work on Grand Terre II, it was determined that Ops Zone 23 required additional treatment after removal operations were complete. The areas in this zone still contained distributions of small SRBs following the mechanical removal process. On June 20, 2013, an SOW was approved to use walk-behind mechanical screeners to remove as many of these SRBs as possible, followed by tilling.

Because the area was wet, the walk-behind screeners did not have their typical effectiveness, and Danos personnel picked up the SRBs manually before a disc harrow was used to fluff the sand. The area was manually cleaned again after it was allowed to dry.

This process was repeated until the operations field group (consisting of an NRA, CPRA, Danos supervisor, and BP and SCAT representatives) came to a consensus on the decision to till the area with a rotary tiller. (The sign-off sheet indicating all parties agreed to initiate tilling can be viewed here.) This work was started on July 9, 2013 and completed on August 5, 2013 under STR-S4-042.

BOP field surveys of the three polygons on Grand Terre II conducted on May 14 and 15, 2013 determined that GT2-25-001 was in the subtidal zone, and that GT2-25-007 and -008 were onshore. However, further investigation of these polygons for potential removal operations was delayed until early August due to the onset of bird nesting season on the island.

When BOP operations resumed, teams used augering in the dry portions of the two polygons, and Snorkel SCAT personnel completed investigation of the remainder of the subtidal areas. One buried oil deposit was found and recovered in the polygon at GT2-7-001. (See the Grand Terre II BOP Operations Overview in Appendix C for the compiled data.)

Figure 3.8: Grand Terre II Images

GT2-7 Recovery (left), and GT2-7 BOD removal (right), August 15, 2013

BOP Operations were completed on Grand Terre II on August 30, 2013. However, during delineation of the polygons at GT2-25-007 and -008, a patch of thick, irregular, blocky material was found subsurface, about 2-8 inches deep. On September 25 and 26, 2013, a tractor was used to plow the polygons at these areas. After the plow was used to over-turn and fluff the sand, P&M teams manually swept the area to recover any exposed SRBs and surface residual patties. The plowed area was evaluated and it was determined on October 8, 2013 that no further plowing was required.

Grand Terre II Material Recovery Overview					
	Auger Holes Excavated	Snorkel SCAT Pits Excavated	Amount Recovered Onshore (lbs.)	Amount Recovered in Nearshore (lbs.)	Total Amount Recovered (lbs.)
BOP	245	302	48,552	-	48,552
LAASR	1,074	-	382,257	1,829	384,086
Snorkel SCAT	-	1,760	-	112,300	112,300
Total	**1,319**	**2,062**	**430,809**	**114,129**	**544,938**

Table 3.6: Grand Terre II Buried Oil Removal Overview

3.6 West Chaland

On West Chaland, 312 auger holes were excavated onshore, and 1,740 nearshore pits were excavated as part of the BOP project from June 22, 2013 to July 18, 2013 (Figure 3.9). These investigations resulted in the location and removal of 5,685 pounds of weathered residual oil from the beach environment (Table 3.7). No LAASR project or Snorkel SCAT operations (conducted independently of the BOP) occurred on West Chaland.

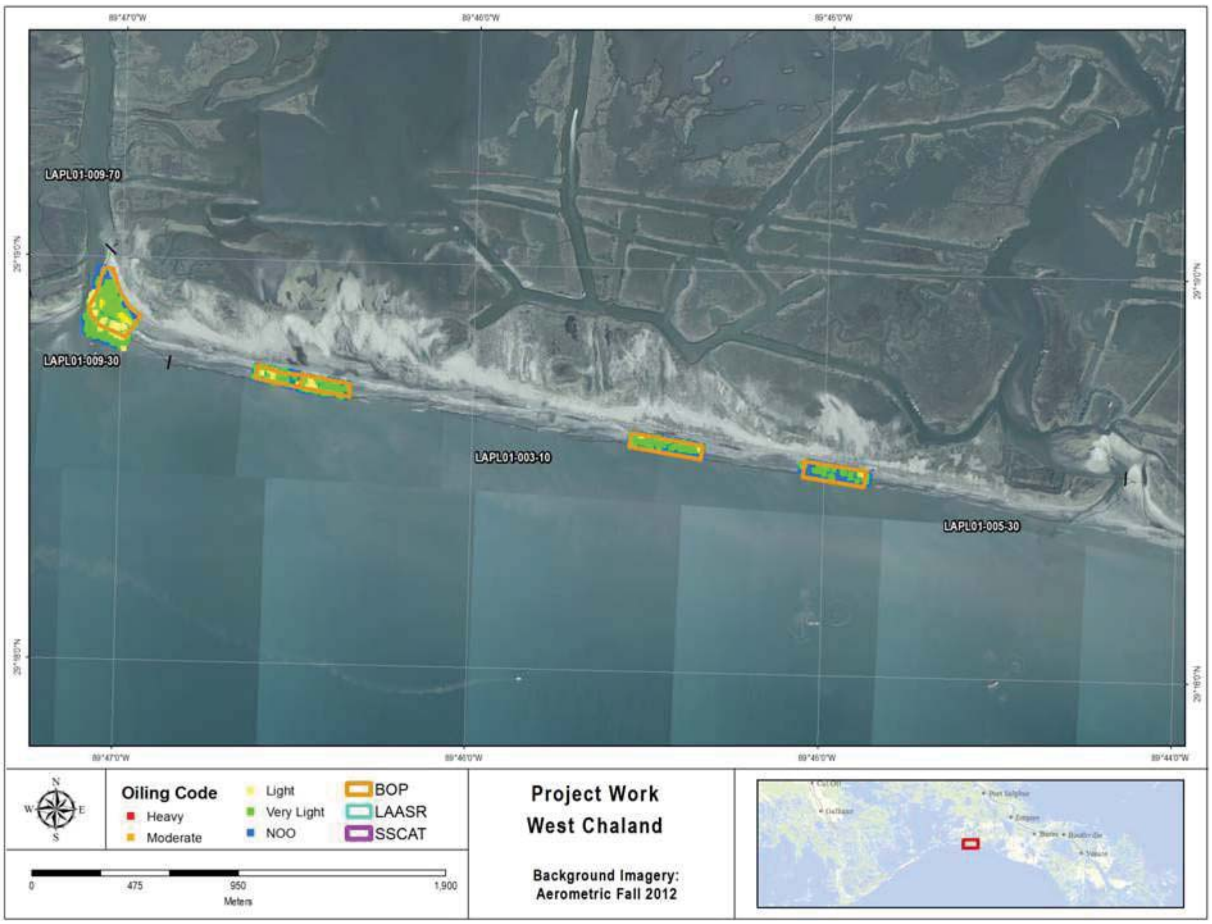

Figure 3.9: LAASR/Snorkel SCAT Sampling Sites on West Chaland

The BOP commenced operations on West Chaland on June 22, 2013. The project experienced delays and temporary shutdowns due to lightning strikes, rough sea conditions and low tide levels. At times, airboats were required to transport personnel to operations areas when low tides prevented vessel access to beaches. The presence of tidal pools and algae also caused minor delays. Additionally, NRA personnel observed the presence of, and monitored, a night hawk; however, this resulted in no significant project delays. (See the West Chaland BOP Operations Overview in Appendix C for the compiled data.)

BOP operations were completed on West Chaland on July 18, 2013. After completion of this work, the State of Louisiana requested that additional actions be recommended in LAPL01-005-30 Ops Zones 19, 20, 21, 22, and 23; however, the FOSC on October 17, 2013 concurred with the NOAA SSC that no further response actions were recommended. (See the NOAA SSC correspondence and FOSC concurrence, dated September 25, 2013, in Appendix A.)

West Chaland Material Recovery Overview					
	Auger Holes Excavated	Snorkel SCAT Pits Excavated	Amount Recovered Onshore (lbs.)	Amount Recovered in Nearshore (lbs.)	Total Amount Recovered (lbs.)
BOP	312	1,740	5,685	-	5,685
LAASR	-	-	-	-	-
Snorkel SCAT	-	-	-	-	-
Total	**312**	**1,740**	**5,685**	**-**	**5,685**

Table 3.7: West Chaland Buried Oil Removal Overview

3.7 West Timbalier

On West Timbalier, 1,037 auger holes were excavated onshore, and 3,922 nearshore pits were excavated as part of the BOP and Snorkel SCAT projects (Figure: 3.11). BOP commenced operations on June 21, 2013 and ended on July 18, 2013; Snorkel SCAT commenced on June 22, 2013 and ended on November 22, 2013. These investigations resulted in the location and removal of 15,821 pounds of weathered residual oil from the beach environment. No LAASR operations occurred on West Timbalier.

The project experienced delays and temporary shutdowns due to lightning strikes, rough sea conditions and low tide levels. Boat transportation was slow due to a no-wake zone from Bayou Lafourche to the Havoline Canal. Low tide levels often required the use of airboats to reach work sites. Efficiency improved when teams began leaving the airboats in the canal overnight.

Figure 3.10: Off-loading at West Timbalier, June 22, 2013

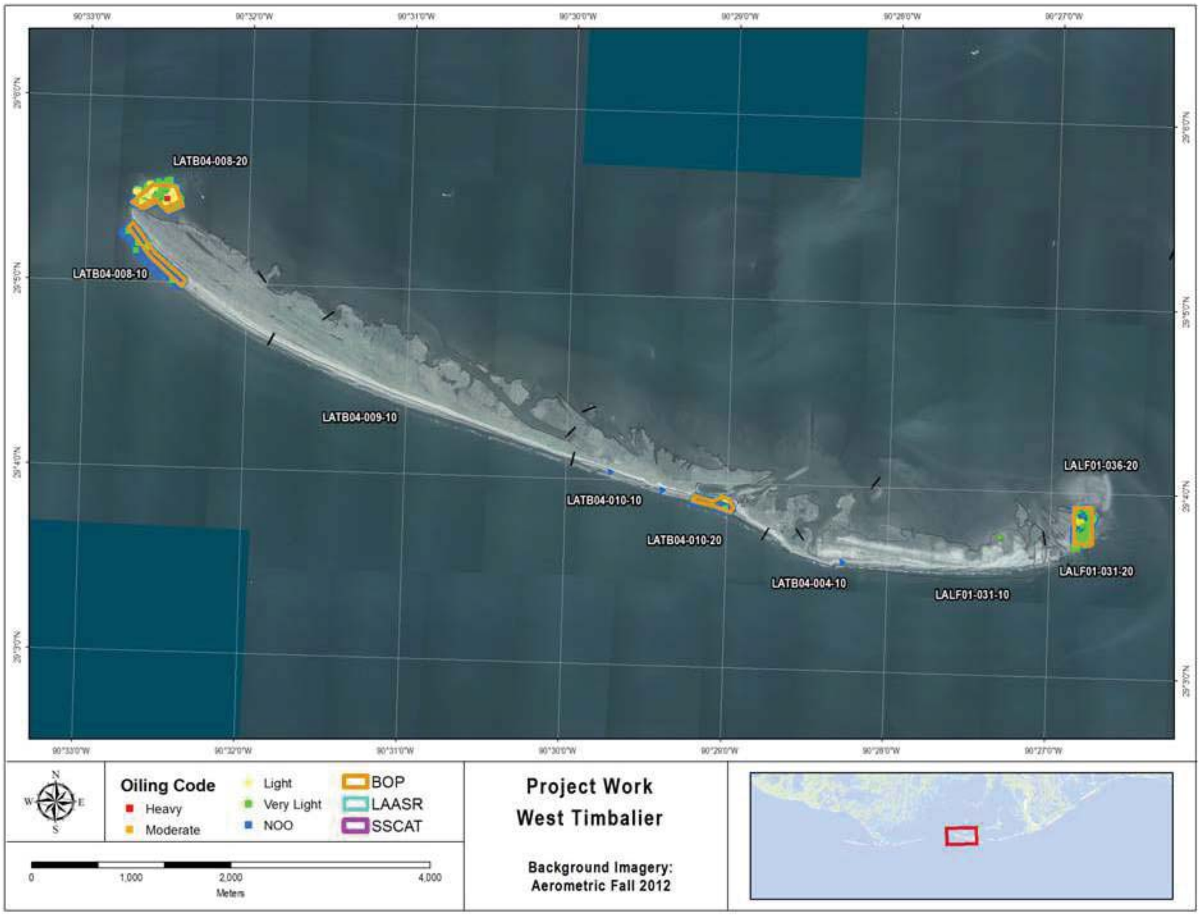

Figure 3.11: LAASR/Snorkel SCAT Sampling Sites on West Timbalier

Additionally, teams encountered limitations related to bird-nesting in WT-1-002. A buffer zone was established until the birds departed, and the NRA allowed work to continue. (See the West Timbalier BOP Operations Overview in Appendix C for compiled data.)

After completion of work on July 31, 2013, the State of Louisiana requested that additional actions be recommended in LATB04-010-010 Ops Zones 7-8; however, the FOSC on October 17, 2013 concurred with the NOAA SSC that no further response actions were recommended. (See the NOAA SSC correspondence and FOSC concurrence, dated September 25, 2013, in Appendix A.)

West Timbalier Material Recovery Overview					
	Auger Holes Excavated	Snorkel SCAT Pits Excavated	Amount Recovered Onshore (lbs.)	Amount Recovered in Nearshore (lbs.)	Total Amount Recovered (lbs.)
BOP	1,037	3,571	15,821	-	15,821
LAASR	-	-	-	-	-
Snorkel SCAT	-	351	-	-	-
Total	1,037	3,922	15,821	-	15,821

Table 3.8: West Timbalier Buried Oil Removal Overview

4.0 Summary

Since the first residual MC252 oil began reaching the Louisiana shoreline in May 2010, a wide range of shoreline treatments were undertaken to remove weathered material and ensure that the various shoreline segments met the appropriate endpoint criteria. However, there were discrete areas of shoreline that continued to experience periodic remobilization of weathered oil, which prevented or delayed some segments from reaching endpoint criteria defined in the SCCP approved by the FOSC in November 2011.

Furthermore, the severe shoreline erosion caused by Hurricane Isaac in late August 2012 uncovered residual oil that was previously buried under several feet of sand. At the time, the Operations team was working under STRs that restricted it from excavating to the depths at which the material was located. The Operations team removed the exposed material and efforts were reinitiated to gain concurrence to perform an expansive effort to locate and recover other subsurface residual oil that might remain on Louisiana's sandy shoreline areas.

Guided by science, the GCIMT executed a systematic and comprehensive effort to locate, delineate and recover discrete pockets of buried oil on Elmer's Island, Fourchon Beach, Grand Isle, Grand Terre I, Grand Terre II, West Chaland, and West Timbalier. From November 2012 to November 2013, 40,189 auger holes and Snorkel SCAT pits were excavated across more than 32 million square feet of shoreline across the seven sandy shoreline areas. In addition, 50 trenches were excavated at breach areas on Fourchon Beach in November 2013.

Key outcomes resulting from the subsurface projects include:

- **Removed a significant amount of residual material from the Louisiana shoreline.** The investigations resulted in the collection of 5,937,610 pounds of material. Sampling has shown that sand/sediment, water and organic material typically comprise 85-90 percent of the weight of material recovered in Louisiana, with residual oil comprising 10-15 percent. However, laboratory testing of samples taken from the 2.9 million pounds of material collected from a breach area at Fourchon Beach found that on average, residual oil comprised just 1 percent of the weight of that material.
- **Provided evidence that substantially all the material that is feasible to recover has been identified and retrieved.** Teams searched in the areas where the potential for subsurface materials was the highest and recovery practicable, and the vast majority of sites excavated either had no visible oil or oiling levels that were below SCCP endpoints. For example, of the 16,053 auger holes excavated through the BOP and LAASR projects, oiling levels above the SCCP endpoints were only found at 3.1 percent of the sites and 86.3 percent of the sites had no visible oiling at all.

- **Addressed shoreline segments that were not meeting endpoints defined by the SCCP.** The OSAT-3 team identified 15 polygons on four sandy shoreline areas for the BOP team to investigate. Buried oil deposits were found in five polygons on Grand Terre I, Grand Terre II, West Chaland, and West Timbalier, and 84,764 pounds of oiled material were recovered.
- **Located and removed material where beach profile data and SCAT and Operations observations and data indicated that subsurface material might remain.** A total of 14,459 auger holes were excavated through the LAASR project and 2,665,147 pounds of material were recovered on Fourchon, Elmer's Island, Grand Isle, Grand Terre I and Grand Terre II. Snorkel SCAT teams dug 17,659 pits in nearshore waters on these five sandy shoreline areas, as well as West Timbalier, and found recoverable material on three – Elmer's Island, Grand Terre I and Grand Terre II. The Snorkel SCAT effort recovered 215,998 pounds of material.

5.0 Acronyms

AEP	Above SCCP Endpoints
AOR	Area of Responsibility
BEP	Below SCCP Endpoints
BMP	Best Management Practice
BOP	Buried Oil Project
CPRA	Coastal Protection and Restoration Authority
DEQ	Department of Environmental Quality
DOI	United States Department of the Interior
FOSC	Federal On-Scene Coordinator
GCIMT	Gulf Coast Incident Management Team
GPS	Global Positioning System
LAASR	Louisiana Augering and Sequential Recovery
LDWF	Louisiana Department of Wildlife and Fisheries
LRE	Long-Reach Excavator
MC252 Spill	Deepwater Horizon MC252 Spill of National Significance
MHHW	Mean Higher High Water
MLW	Mean Low Water
MSL	Mean Sea Level
NEB	Net Environmental Benefit
NOAA	National Oceanographic and Atmospheric Administration
NOLA	New Orleans, Louisiana
NOO	No Oil Observed
NRA	Natural Resource Advisor
NRC	National Response Center
Ops Zone	Operations Work Zone
OSAT-3	Third Operational Science Advisory Team
P&M	Patrolling & Maintenance
RTK	Real-Time Kinematics
SC	Steering Committee
SCAT	Shoreline Cleanup Assessment Technique
SCCP	Shoreline Clean-up Completion Plan
SOSC	State On-Scene Coordinator
SOW	Scope of Work
SRB	Surface Residual Ball
SRPs	Surface Residual Patties
SSC	Scientific Support Coordinator
STR	Shoreline Treatment Recommendation
TAG	Technical Advisory Group
USCG	United States Coast Guard