USCG

Development Proposal:

Heavy Oil Tracking Tactics, Techniques and Procedures

Presented to: Ms. Brenda M. Burke (RDC)

BAA Number: HSCG32-07-R-R00013

Title of Proposal: Heavy Oil Tracking Tactics, Techniques and Procedures

Identity of Prime Offeror: SeaTrepid Louisiana LLC

Principal Investigator (PI) contact:
Bob Christ, President
SeaTrepid Louisiana LLC
1250 SW Railroad Ave., Suite 230B
Hammond, LA 70403
Phone: (985)350-6299
Fax: (985)542-2917

Contracting/Business contact: Dianne Cahanin, Controller
(same address as P.I.)

Duration of effort: 3 Months

1250 S.W. Railroad Ave., Suite 230B
P.O. Box 2927
Hammond, LA 70404
Phone: (985)350-6299
Fax: (985)542-2917

May 13, 2007

U.S. Coast Guard Research and Development Center
Attn: Ms. Brenda M. Burke
1082 Shennecossett Road
Groton, CT 06340-6048
Phone: (860) 441-2872

Subject: Proposal for Development of Heavy Oil Tracking TTP Memo

Ms. Burke:

Based upon the offering referenced at BAA NUMBER HSCG32-07-R-R00013, attached is SeaTrepid's proposal to develop the above referenced memo on Detection of Heavy Oil on the Sea Floor.

Please feel free to contact me with any questions or concerns.

Sincerely,

Robert D. Christ, President

attachment

Part 1

EXECUTIVE SUMMARY

SeaTrepid provided ROV support for the DBL 152 cleanup effort in late-2005/early-2006 in conjunction with K-SEA, EPA, NOAA, The Obriens Group and USCG. During that operation, SeaTrepid observed many strengths and weaknesses of the deployed equipment for tracking of heavy oil spilled on the sea floor.

The purpose of this document is to propose the resources needed as well as outline the scope of work necessary for production of a TTP memo for tracking heavy oil spills on the sea floor.

SeaTrepid observed during the DBL 152 cleanup project a fully effective means of tracking the heavy oil as it migrated across the sea floor. With some properly conceived, coordinated, documented and implemented TTPs, currently deployed technology can effectively accomplish the task as outlined in the BAA.

Per the June 2006 document prepared for RDC entitled "ASSESSMENT AND RECOVERY OF SUBMERGED OIL: CURRENT STATE ANALYSIS" authored by Jacqueline Michel, the main operational deficiencies noted in table 5 (Advantages and disadvantages of technologies (DBL-152) for tracking the spills were:

<u>Side Scan Sonar</u>
- Once the oil spread out, had reduced success at oil identification
- Slow turnaround (days) for useful product
- Need validation of targets as oil
- Limited by sea conditions

<u>Remotely Operated Vehicle</u>
- Small survey swath (1 m) because of low visibility
- Use system with umbilical tether; operator would fly a search pattern around the boat, so no exact position of the video image available
- Frequent down days because of poor visibility

The above deficiencies can be readily and inexpensively corrected with currently deployed equipment in use daily in both the military and commercial sectors.

SeaTrepid recommends and proposes to conduct trials with a variety of equipment in order to develop the TTPs for this type of field operation. As discovered during development of ROV TTPs for Port and Harbor Security (USCG Contract Number HSCGG8-04-P-DDX219), many of the field deficiencies could be avoided by testing these procedures in controlled situations with planned equipment availability so as to have the right tool for the job at hand.

Once these TTPs are developed, the USCG can then determine if it is their best interest to organically maintain this capability or license this capability to an outside contractor.

TECHNICAL MERIT

I. Summary of the oil tracking portion of the DBL 152 spill

A. Use of Side Scan Sonar for heavy oil tracking

The side scan sonar in use for the L-3 Klein dual frequency (100/500 kHz) side scan sonar system operated by Storey Fish of American Underwater Search & Survey.

This dual frequency sonar system was effective due to the ability to compare the results of sonar readings between frequencies so as to better characterize the seabed as either sea bottom or oil covered. Lower frequency sonar systems have a higher penetration of bottom materials, but with lower acoustic frequencies surface detail suffers. With higher frequency sonar systems, a better surface details is possible but penetration deeper into the bottom substances decreases as the frequency increases. By comparing the target strength between lower frequency reflectance and higher frequency reflectance a bottom characterization can be gleaned to show oil presence with high probability (and repeatable) results.

On the DBL 152 project, the sonar readings were interpreted on the beach at the end of the work day by experienced ROV professionals then the search area/maps were redrawn based upon the results obtained. The lag time could have been cut significantly had the availability of broadband data links to the beach been present.

For sonar tracking of heavy oil spills, the transducer array can be mounted aboard a tow-fish then towed behind a surface vessel or can be mounted to a autonomous underwater vehicle (AUV) running a pre-programmed route. The best way to determine the advantages/disadvantages of each in this application is to conduct controlled trials in realistic conditions. The strengths and weaknesses of each follows:

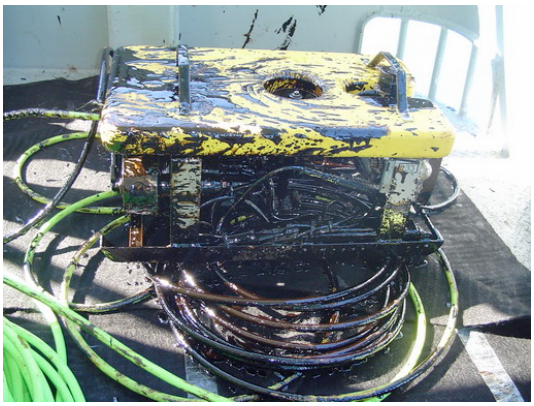
Sonar Mounted to:	Advantages	Disadvantages
Tow Fish	1. Immediate feedback to operator 2. Inexpensive 3. Controlled 4. Data link to beach available	1. More subject to weather 2. Subject to vessel heave due to surface conditions 3. Sonar image smear from vessel heave
AUV	1. Decoupled from surface 2. Multiple vehicles managed from same vessel 3. High sonar image quality	1. Expensive 2. Requires extensive training to operate 3. Difficult to track 4. Limited control once launched

B. Use of Remotely Operated Vehicles for heavy oil tracking

Once the DBL 152 project, two types of ROV systems were used:

1. The Benthos Mini-Rover
2. The Outland 1000 (with onboard sonar and single-function manipulator)

Both systems performed well in visually tracking the parameter of oil. Weaknesses came about when the optical capabilities of the camera systems were degraded due to bottom turbidity. Other acoustic methods including vehicle mounted multi-beam sonar systems as well as acoustic lens sonar systems are available in this application. On the Outland 1000 system, when visibility degraded below 1 meter a ruler was mounted to the vehicle to both 'feel' for the bottom and to take measurements of the depth of the bottom oil.



Photos by Bob Christ, SeaTrepid

Reference was made in Michel (2006) section 5.5 to the inability to track the vehicle subsurface while conducting visual survey work around oil concentrations. Any number of acoustic tracking systems is available on the open market. These were available to both vehicle operators. However, none were specified in the scope of work for the project.

II. Proposed Scope of Work for SeaTrepid's Inclusion within TTP Memo

SeaTrepid proposes the following steps to develop a equipment manufacturer non-specific oil tracking Standard Operating Procedures (SOP) and remote underwater heavy oil tracking memorandum:

1. Draft a listing of anticipated tasks requiring use of sonar and ROV/AUV systems.
2. Draft a proposed set of techniques for deployment based upon the author's experiences.
3. Test these techniques with use of a variety of USCG personnel (both experienced and inexperienced ROV operators), sonar, ROV/AUV models and deployment platforms in a realistic environment at a USCG-specified location.
4. Revise those techniques based upon the testing and inputs from personnel in the field.
5. Develop a basic text on ROV, AUV, sonar and underwater inspection operations.
6. Develop a suggested set of TTPs for deployment of this technology.
7. Develop training materials as well as PQS/JQR standards for field personnel.
8. Reduce to report form for submission.

III. Proposed Outline of Final Report

The final report deliverable to RDC will be published in memorandum form on Underwater Heavy Oil Tracking Tactics, Techniques and Procedures. The end product should be a non-technical SOP targeted to an entry-level field operations specialist on a basic step-by-step format. The substance of the report will be encapsulated within the operations section of the TTP memorandum. A few sections of explanation will be needed for the basics of ROV operations, basic theory of acoustic positioning (so as to properly interpret the outputs from the equipment), side scan sonar operations and basic underwater navigation. The proposed outline for the final report is as follows:

1. Basics of ROV operations
2. Basics of Acoustic Positioning
3. Basics of Side Scan Sonar operations
4. Basics of Underwater Navigation (low/medium/high visibility and/or current, day/night operations, severe weather operations and operations around structures and in open water)
5. Basics of underwater dispersion of heavy oil
6. SOPs for each operation including:
   - Setting of search pattern
   - Placing acoustic transponder grids
   - Side scan sonar (tow-fish and AUV deployed) searches and data interpretation
   - ROV deployment and operations in and around oil spill areas
   - Other non-standard operations
7. Basic Servicing and Troubleshooting of all systems
8. Training Syllabus
9. Classroom presentations for instructor
10. Test Questions and Answers
11. PQS and JQR Standards

IV. USCG Resources Needed for this Operation

SeaTrepid anticipates the need for the following USCG resources at a location of USCG's choosing:

1. Access to a USCG land-mobile vehicle (a general transport van) for testing of shore-based deployment of underwater inspections
2. Access to USCG response boat(s) [along with operational staffing] to test boat-deployed inspections
3. Access to a test area with heavy oil (could use DBL 152 spill site)
4. Access to a variety of operations-level personnel for determination of those best suited for operating the equipment
5. Access to all prior supporting materials on heavy oil tracking and recovery
6. Publication Standards for USCG Training Materials

V. Anticipated Timeframe for Issuance of Report

SeaTrepid anticipates this report to be completed within sixteen weeks of the issuance of the contract. An approximate schedule would be as follows:

- Weeks 1 & 2 – Issuance of an exact schedule based upon the location of testing, issuance of testing protocols and completion objectives, scheduling of equipment and personnel, drafting of suggested TTP for each operation with review/approval of all above by RDC
  Weeks 3 through 8 – Beginning of field testing based upon schedule and steps approved by RDC
- Week 9 – Drafting of results from operational testing
- Week 10 – Field rework of issues identified in the first field tests
- Week 11 through 14 – Development of Training Syllabus, Training Materials, PQS and JQR
- Week 15 – Concluding of final report and circulation of draft to G-OPD
- Week 16 – Issuance of final report

STAFFING

VI. Pricing of This Contract

SeaTrepid's standard pricing is based upon a Time and Expenses structure. This entire project will be completed with the services of a SeaTrepid Project Manager, Field Specialist, technical report writer and an independent technical illustrator. Pricing will be on a day rate of $1,345/day (based upon a 12-hour workday) for a project manager, $1,225 for an experienced operator, $850/day for all technical support personnel plus direct expenses as delineated below.

Details of pricing assumptions are as follows:

120 hours	Development of Schedule, Writing Techniques/Protocols and Coordination with USCG personnel
360 hours	Field Work at USCG location (30 man-days)
80 hours	Development and Writing of Training Syllabus, Training Materials, PQS and JQR (45 man-days)
540 hours	Drafting of final report for circulation to G-OPD
48 hours	Travel to/from USCG location
48 hours	Pre-Contract Award Meetings
1,196 hours	Total or 100 days

Pricing

$13,450	10 days at $1,345/day
$36,750	30 days at $1,225/day
$15,000	Services of Illustrator for inclusion into final report
$48,000	Rental of ROV platforms (10 days x 4 platforms at $1,200/day)
$5,200	Freight Costs for ROV platforms to/from Hammond, LA
$9,000	$300/day Per Diem for 30 days in field
$4,500	Three trips to USCG R&D Center in Groton plus associated expenses
$2,250	Ground staging for 3 field trips to the DBL 152 spill site from Sabine Pass
$134,150	Total Estimated Cost to Produce TTP Report

PAST PERFORMANCE

VII. Most Relevant Past Performance for the Previous Three Years

1. DBL 152 Oil Spill ROV support contracted through K-SEA (barge operator).
2. Currently awaiting a July 2007 publication on "The ROV Manual" co-authored with Robert L. Wernli, Sr. from the USN SPAWAR unit in San Diego.
3. USCG Contract Number HSCGG8-04-P-DDX219 for development of ROV TTPs for Port and Harbor Security. Please contact Mr. Ken McDaniel at USCG Headquarters (G-OPD) at phone number (202)267-1505 for further reference. See also Exhibit A and Exhibit B to this proposal.