ENVIRONMENTAL REMEDIATION OF THE USTS *TEXAS CLIPPER* FOR USE AS AN ARTIFICIAL REEF IN THE GULF OF MEXICO

7 September 2007

Submitted by:

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ACRONYMS

ACM ....Asbestos Containing Material
ACOE ...................................U.S. Army Corps of Engineers
AWOIS ....Automated Wreck and Obstructions Information System
BMP ....National Guidance: Best Management Practices for Preparing Vessels Intended to Create Artificial Reefs
CONTRACTOR ....Resolve Marine Group, Inc. (primary) and ESCO Marine, Inc. (subcontractor)
DOT ....US Department of Transportation
EA ....Environmental Assessment
EEZ ....Exclusive Economic Zone
EFH ....Essential Fish Habitat
ESCO ....ESCO Marine, Inc. (see CONTRACTOR above)
FONSI ....Finding of No Significance
GLO ....Texas General Land Office
GMFMC ....Gulf of Mexico Fishery Management Council
GSMFC ....Gulf States Marine Fisheries Commission
HEPA ....High Efficiency Particulate Filtration Apparatus
MARAD ...............................U.S. Maritime Administration
MMS ....................................U.S. Minerals Management Service
MSDS ....Material Safety Data Sheet
NAAQS.................................National Ambient Air Quality Standards
NEPA ....National Environmental Policy Act
NMFS ....National Marine Fisheries Service
NOAA ....National Oceanic Atmospheric Administration
NOS ....National Ocean Service (NOAA)
NTU ....Nepheloid Turbidity Unit
OCS ....Outer Continental Shelf
ODS ....Ozone Depleting Substance
OSHA ....Occupational Safety and Health Administration
PCBs ....Polychlorinated Biphenyls
PPE ....Personnel Protection Equipment
ppm ....parts per million
ppt ....parts per thousand
RCRA....................................Resource Conservation and Recovery Act
RFP ....Request for Proposal
RFQ.......................................Request for Qualifications
SHIP......................................*Texas Clipper* (including its life as the USS *Queens* and SS *Excambion*)
SSCI ....Separation Systems Consultants, Inc.
TAMU...................................Texas A&M University
TARP ....Texas Parks and Wildlife Department Artificial Reef Program
TCEQ ....Texas Commission on Environmental Quality (formerly TNRCC)
TDH ....Texas Department of Health

TNRCC ....Texas Natural Resources Conservation Commission (see TCEQ)
TPH..Total Petroleum Hydrocarbon
TPWD ....Texas Parks and Wildlife Department
TSCA ....Toxic Substances Control Act
USCG ...................................U.S. Coast Guard
USDA ...................................U.S. Department of Agriculture
USEPA ....Environmental Protection Agency
USFWS .................................U.S. Fish and Wildlife Service
UTB.......................................University of Texas – Brownsville and South Most College

ENVIRONMENTAL REMEDIATION OF THE USTS *TEXAS CLIPPER* FOR USE AS AN ARTIFICIAL REEF IN THE GULF OF MEXICO

EXECUTIVE SUMMARY

This report discusses the various processes and methods used in the environmental remediation of the USTS *TEXAS CLIPPER* ship for use as an artificial reef. It also includes a review of the Texas Artificial Reef Program, a brief history of the ship, hull modifications, and reefing plans.

Texas is very active in the establishment of artificial reefs in the Gulf of Mexico and has one of the strongest reef programs in the nation. The Texas Artificial Reef Program (TARP) is managed by the Texas Parks and Wildlife Department, Coastal Fisheries Division.

After nearly 10 years of negotiations between the U.S. Maritime Administration (MARAD) and TARP, the USTS *Texas Clipper* was transferred to the State of Texas on 4 October 2006. The U.S. Environmental Protection Agency (USEPA) issued a *Conditional Liberty Ship Act Certificate Regarding USTS Texas Clipper* I on 13 June 2006, which authorized TARP to proceed with its remediation plan. On 3 November 2006, the ship was towed from the MARAD reserve fleet in Beaumont, Texas and arrived at the ESCO Marine, Inc. ship scrapping yard in Brownsville, Texas. Resolve Marine Group, Inc. is the primary contractor responsible for remediation, hull modifications, towing and sinking the ship. ESCO Marine, Inc. is a subcontractor for Resolve Marine and conducted the remediation and major hull modifications.

Remediation was conducted for all hazardous and non-hazardous wastes onboard the *Texas Clipper*. The remediation goal was to meet or exceed guidelines in the National Guidance: Best Management Practices for Preparing Vessels Intended to Create Artificial Reefs (BMP) published by the USEPA and MARAD. The BMP gives guidance for remediation of hazardous and non-hazardous materials typically found on vessels intended to be used as artificial reefs.

TARP contracted with Separations Systems Consultants, Inc. (SSCI) in 2004 for a Hazardous Materials Assessment of the ship to quantify all hazardous and non-hazardous materials that required remediation. This report was the basis for pre-remediation estimates that was used by the contractor for cost estimating and judging the completeness of remediation. Additionally, SSCI produced a cleanup verification plan in 2005 that allowed TARP and SSCI to monitor and clear the removal of PCB materials on a deck-by-deck basis.

Environmental remediation included abatement of: 7,000 gal of hydrocarbons; 1,680 yd^3 of asbestos; a total of 393,270 lbs of PCBs in the form of electrical wiring, gaskets and insulation, and sand media from sand blasting; 1,410 yd^3 of debris and floatables; and 330,452 gal of waste water.

TARP, SSCI, and the U.S. Coast Guard (USCG) have verified removal of hazardous and non-hazardous wastes through numerous visual inspections and reviewing manifests. SSCI and the contractor conducted wipe samples for profiling materials to be disposed of and verification sampling for PCBs, asbestos, and non-hazardous liquids. The USCG visually inspected the surfaces of fuel tanks, the engine room area, and fill piping for hydrocarbons and found those areas to be satisfactory. TARP and SSCI entered fuel tanks and determined they met BMP guidelines. The USCG and TARP will perform another visual inspection of the ship a day before towing to the reef site begins.

This report is in a chronological form similar to the BMP. It is the opinion of TARP and SSCI that ALL obvious pollutants have been remediated to the best of our ability to a level that meets or exceeds the BMP guidelines. The proposed action is to use the ship for the creation of an artificial reef in the Gulf of Mexico, offshore Texas.

RESPONSIBLE AGENCY: Texas Parks and Wildlife Department
Artificial Reef Program

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ENVIRONMENTAL REMEDIATION OF THE USTS *TEXAS CLIPPER* FOR USE AS AN ARTIFICIAL REEF IN THE GULF OF MEXICO

PART 1.0 INTRODUCTION

1.1 Overview of the Texas Artificial Reef Program

Texas is very active in the establishment of artificial reefs in the Gulf of Mexico and has one of the strongest reef programs in the nation. The program is managed by the Texas Parks and Wildlife Department, Coastal Fisheries Division (TPWD). The Artificial Reef Program's strengths are derived from its flexibility in creating reef sites, the process used for evaluating reef material and placement location, and the support it has received from the leaders and citizens of Texas. A detailed description of the Texas Artificial Reef Program and conservation efforts/goals can be found in Attachments A, B, and C. A brief summary of the Texas Artificial Reef Program follows.

Resource managers have been involved in artificial reef development off the Texas coast for over 50 years. The donation of 12 obsolete WWII Liberty Ships in 1975-76 formed the foundation of the current Artificial Reef Program (TARP) and represents the first successful reef development activity in Texas utilizing stable, durable, and complex material. In 1989, the Texas Legislature directed the Department to develop the artificial reef potential off Texas, and the Texas Artificial Reef Plan was adopted in 1990, creating the Artificial Reef Program. In addition to ships, Texas legislation allows the oil and gas industry to donate their obsolete petroleum structures as artificial reefs in a program termed Rigs-to-Reefs in lieu of the standard salvage and removal option required by federal law. The Texas Artificial Reef Program currently has over 90 obsolete petroleum structures located at 58 reef sites (Figure 1), and has received over $10 million in donations. Other materials used in the construction of reefs include: 20 vessels such as a T2 Tanker, several tugboats, a navy YR dive barge, and several commercial barges; and 937 land based materials such as concrete culverts, concrete reef balls, and one-ton quarry blocks. TARP continues to obtain material and assesses each donation on a case- by- case basis to determine its appropriateness to the program.

1.2 Use and Acquisition of the *Texas Clipper* Ship as an Artificial Reef

Vessels (ships) have been used as artificial reef material in marine environments worldwide for years. Ships are durable and stable materials that form complex habitats that enhance marine productivity (GSMFC 2004; NOAA 2007). With the lack of natural hard substrate in the Gulf of Mexico off shore of Texas and the steadily increasing popularity of sport diving and fishing, the demand for increased marine habitat make the use of a ship as an artificial reef a highly attractive option. Benefits of using ships as artificial reefs include: 1.) social and economic benefits to the local community through the recreational/charter fishing and diving industry; 2.) vessels have life spans as reefs that can exceed 50 years; 3.) due to high vertical profiles, vessels attract both pelagic and demersal fishes; 4.) vessels have a heritage of popularity among fishermen and fisheries managers; and 5.) depending on location, vessels can hold a large biomass of commercially and

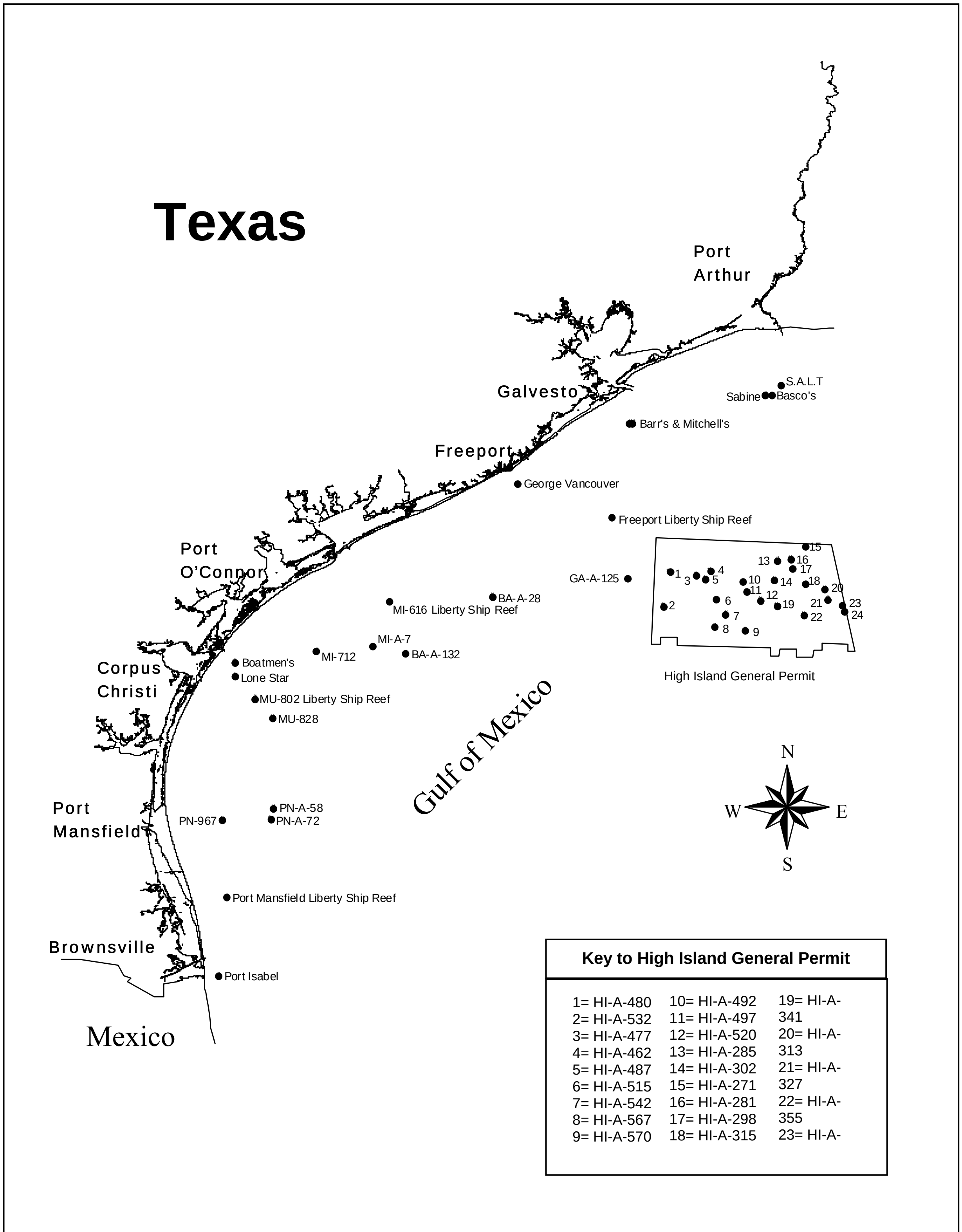

Figure 1. Artificial reef locations along the Texas coast in the Gulf of Mexico.

recreationally important fish species (GSMFC 2004).

In 1997, the TARP Advisory Committee (composed of representatives from academia, the oil industry, conservation groups, the shrimp fishery, diving and fishing groups, Texas Department of Transportation, marine archeology, and the Texas General Land Office) proposed to create an artificial reef from the recently retired USTS *Texas Clipper* ship (**SHIP**). This ship was chosen for use as an artificial reef and dive attraction offshore Texas because of its historical ties to the State of Texas and Texas A&M University. The ship is 473ft long, 66ft in breadth at its widest point, and 81ft tall from the keel to the top of the upper-most deck. It weighed 7,790 lightship displacement tons and had a full load displacement of over 13,000 tons before modified for reefing. (A brief history of the ship is presented in PART 2.0 below).

The first application to the U.S. Maritime Administration (MARAD) for transfer of the ship from the MARAD reserve fleet to TPWD was submitted in 1999. A U.S. Fish and Wildlife Service (USFWS) grant to reimburse some of the reefing costs was awarded in the same year. TARP submitted several applications for transfer of the ship and overcame numerous administrative hurtles including: personnel changes within MARAD; changes in the application procedures and forms; and federal reviews of PCB policies on ships to be used for artificial reefs.

A dilemma in the MARAD application process became obvious with their requirement to have a contract for remediation and reefing in-place prior to approval of the SHIP application. Awarding a contract contingent on the transfer of the SHIP placed TARP in a precarious situation and against State of Texas contracting rules. TARP had conducted a screening of potential contractors to perform the remediation and sinking through a Request for Qualifications (RFQ). The RFQ process eliminated all but three contractors. A Request for Proposal (RFP) was then developed requiring a turn-key operation from complete environmental preparation to sinking at the selected reef site (Attachments D and E). The RFP was based in part from a hazardous materials survey of the SHIP by Separations Systems, Inc. (SSCI) (Attachments F, G, H) and an idealized sink plan drafted by Wild Well Control, Inc., both consultants hired by TARP to aid in the monitoring and advisement of the project.

Final proposal and price negations were completed on 23 January 2006 and the contract awarded to Resolve Marine, Inc. (Port Everglades, Florida) for $3.9 million. Resolve Marine, Inc. is the overall contractor for the project and the expert in sinking ships as reefs. They subcontracted the majority of the environmental remediation to ESCO Marine, Inc. (Brownsville, Texas). Throughout this document, both contractors are collectively known as **CONTRACTOR.** To comply with State of Texas contracting rules and meet MARAD's application requirements, a "Letter of Intent to Award Contract" was drafted to the CONTRACTOR on 23 January 2006 contingent on transfer of the SHIP. The final MARAD application was submitted in February 2006.

As TARP waited for transfer approval from MARAD, the SHIP developed a hole in its hull and sank on its stern in 22 ft of water in the MARAD reserve fleet in Beaumont, Texas. This occurrence expedited negotiations between the U.S. Environmental Protection Agency (USEPA), MARAD, and TPWD for transfer of the vessel. TPWD received a *Conditional Liberty Ship Act Certificate Regarding USTS Texas Clipper* I from USEPA on 13 June 2006 (Attachment I). The MARAD transfer certificate to TPWD was later received on 4 October 2006 (Attachment J).

A formal notice to proceed was given to CONTRACTOR on 4 October 2006. Towing preparations were made to insure hull integrity during the voyage from Beaumont to Brownsville. As a condition of the transfer negotiations and the request of USEPA, MARAD removed all liquid hydrocarbons that were easily accessible from the SHIP before it left the Beaumont harbor. This reduced the risk of a spill if the SHIP were to become a hazard during tow. Also, MARAD conducted a scamping of the hull to meet US Coast Guard (USCG) requirements to reduce the transport of invasive marine life between water bodies.

On 3 November 2006, the SHIP left the MARAD reserve fleet in route to the ESCO Marine, Inc. ship yard in Brownsville, Texas. The tow took 3 days. Once at the ship yard, remediation and hull modifications began. A generalized table of major events in the SHIP project is given in Table 1.

Table 1. Generalized table of major events and milestones during the Texas Clipper artificial reef project.

EVENT	DATE
Artificial Reef Advisory Committee plans to acquire and reef SHIP	1997
USTS *Texas Clipper* ship reserved for TARP by MARAD	1998
First MARAD application submitted	1999
USFWS grant awarded	1 June 1999
Delays by MARAD and second application submitted	1999 - 2003
Hazardous Materials Survey conducted on SHIP	11 November 2004
Request for Qualifications from interested contractors	2004
Request for Proposals from selected contractors	13 January 2005
U.S. Army Corps of Engineers reef site permit approved	8 August 2005
Third MARAD application submitted	16 February 2006
SHIP sinks on stern in MARAD reserve fleet	May 2006
USEPA issues Conditional Liberty Ship Act Certificate to TPWD	13 June 2006
TPWD awards contract to Resolve Marine, Inc.	15 September 2006
MARAD issues Certificate of Transfer to TPWD	4 October 2006
Notice to Proceed issued to Contractor	4 October 2006
SHIP leaves MARAD reserve fleet in Beaumont, Texas	3 November 2006

SHIP arrives at ESCO Marine, Inc. ship yard, Brownsville, Texas	6 November 2006
USCG buoy approval permit	30 November 2006
Remediation and hull modifications of SHIP	November 2006 – August 2007

1.3 Goal of *Texas Clipper* Ship Artificial Reef Project

The SHIP will serve as a premier dive attraction and provide much needed habitat for marine life in the Gulf of Mexico. The reef site is located approximately 17 nautical miles east of the Brownsville, Texas ship channel near South Padre Island. Water depth at the site is 135 ft. The ship has been modified for sinking in an upright position on the ocean floor and will have a 50-ft clearance between the surface and the highest point of the ship. Divers will descend from the surface to the top of the ship at 50 ft and proceed to the promenade deck at 80 ft. They will then have access to the inside of the vessel at selected points. Ship masts were left standing, and their tops cut and welded onto the deck. The ship was modified to leave as much of its overall appearance as possible for habitat and diver attraction.

1.3.1 Conservation Goals

1.3.1.1 Long-Term Management/Monitoring: An artificial reef is an effective management tool for fishery resources when developed with clear and realistic objectives. Reef management begins with defining the reef objectives, and developing strategies to achieve those objectives. Reef management strategies must also comply with any specific reef permit provisions, and existing regulations or resource management programs. Once the SHIP reef is in place, monitoring and maintenance becomes part of the management process. Management and monitoring of fisheries at artificial reefs in Texas is implemented through TARP in coordination with regional fisheries management councils to comply with the National Fishing Enhancement Act. ACOE site permits specify the terms and conditions for operation, maintenance, monitoring, and managing the use of the artificial reef for compliance with all applicable provisions and as are necessary to ensure the protection of the environment and human safety and property (33 CFR 320).

Compliance monitoring typically documents the stability and structural integrity of the artificial reef throughout its life. Accurately establishing the reef position and depth for navigation is essential. TARP, in conjunction with the University of Texas – Brownsville and South Most College (UTB), will conduct biological monitoring of the artificial reef to assure compliance with provisions contained in the applicable reef permits and other applicable laws, and to evaluate the performance of the reef in terms of its objectives. The documentation of fish assemblages and settling organisms (fouling community) will occur in a planned two year study. Additional biological studies will be planned in the future in addition to routine annual monitoring.

In addition, a study of the corrosion of ship metal under sea will aid the National Oceanic and Atmospheric Administration (NOAA) in its work in preserving shipwrecks such as the USS *Arizona* in Hawaii. NOAA has teamed with Texas A&M University-College Station (TAMU) to conduct a corrosive study of the SHIP by taking pre-sinking hull core samples, followed by hull measurements after sinking over a one year period.

1.3.2 Social Benefits

Accomplishment of the objective will provide a new artificial reef site that will enhance fishery resources by creating habitat to improve recruitment and spawning potential of reef associated species, and will offer a significant site for recreational sport fishermen and divers. The complexity of the structure profile will provide habitat for numerous marine species including demersal and pelagic finfishes. In addition to TARP studies, UTB will conduct an economic impact assessment of the SHIP on the local communities. TAMU has drafted a pre-reefing economic assessment of the local area upon which the UTB study will use as an economic baseline.

1.3.2.1 Sport Fishery Benefits: Artificial reefs enhance the fishing opportunities for hook and line anglers targeting fish associated with artificial reefs. There are over 1.2 million saltwater recreational anglers (16 years and older) in Texas. In a 1990 study, 47% (564,000) of Texas anglers fished from a boat in the Gulf of Mexico and approximately 300,000 to 400,000 anglers had fished at offshore platforms or artificial reefs (Ditton et al. 1990). In a more recent survey, party boats on the Texas coast took an estimated 372 trips to TARP reefs or about 1,310 trips to any artificial reef in the previous twelve months. Trips to artificial reefs accounted for 40% of the total number of trips taken offshore by the survey group (Ditton et al. 1995).

With this heavy demand for fishing on artificial structures, the creation of the *Texas Clipper* reef will help meet these demands and aid in increasing optimum yield of finfish and other marine life.

1.3.2.2 Sport Diving Benefits: Most recreational diving in Gulf of Mexico waters off Texas occurs at the Flower Gardens National Marine Sanctuary, approximately 192 nm to the northeast of the selected site. The preferred diving depth for most dive charters is 70-100 ft (Ditton et al. 1999). The SHIP will have a 50-ft clearance and normal diving depths will range from 50–100 ft. The SHIP has been specifically modified to accommodate scuba diving.

An estimated 250,000 divers reside in Texas and annual economic impacts to the state are about $2 million per year (Ditton et al. 1999). Approximately 50% of diving activities occur in salt water. With ever increasing demands for diving resources, the *Texas Clipper* will provide more diving opportunities. In addition, a public relations campaign is being developed to increase awareness within the diving community and within the state and nation on this new diving destination. A local community-sponsored “Dive Week” has already been planned on South Padre Island for fall 2007 to bring awareness of the SHIP reef to local and visiting divers and fishermen.

1.3.3 Biological Benefits

The sinking of SHIP will create 76,000 ft^2 of hard exterior surface habitat that will enhance biological resources at the Texas site. The site will be subsequently managed in accordance with the TARP artificial reef management plan for the site which incorporates biological resource considerations.

The SHIP reef site is expected to simulate the biological benefit of natural hard banks such as those studied by Rezak et al. (1985) in southern Gulf waters off Texas. Sixty-six species of fish has been observed on the south Texas banks with 42 species being primary reef species. SHIP will provide substrate for habitat-limited sessile invertebrates such as barnacles, oysters, mussels, bryozoans, hydroids, sponges, and corals to attach to. Motile invertebrates and fish species will be able to use the encrusting organisms as a source of food and shelter. SHIP will provide the basis for the development of an interactive food web. The high vertical profile of SHIP would attract both pelagic (animals that live in the open sea, away from the sea bottom) and demersal (fish that live on or near the ocean bottom, commonly referred to as benthic) fishes. SHIP will also provide habitat for species that feed nocturnally over soft bottoms away from the artificial reef, but which return during the day for cover. In addition to resident species, SHIP may attract transient species which may be present at a reef for periods of a few hours to a few days.

It is expected that resident fish species dependent upon sessile and motile invertebrates present on a mature reef site as a food source or for protection would colonize SHIP and would include blennies (Blenniidae), small grazers such as butterfly fishes (Chaetodontidae) and large grazers such as sheepshead (*Archosargus probatocephalus*). Resident fish species relying on reef sites for cover that may be present may include the Atlantic spadefish (*Chaetodipterus faber*) and red snapper (*Lutjanus campechanus*). Other fish such as lookdowns (*Selena vomer*), Atlantic moonfish (*Vomer setipinnis*) and creolefish (*Paranthis furcifer*) may be present feeding on macrozooplankton and suspended particulate matter. SHIP will provide cover and habitat for soft bottom motile species, such as shrimp, swimming crabs, and fish – a common prey for red snapper. In addition, red snapper, tomtate (*Haemulon aurolineatum*), and various grouper species may be present feeding at areas away from the reef at night and returning during the day for cover. It is anticipated that large pelagic predators, such as mackerels (Scombridae) and jacks (*Caranx spp*.), may be present near the reef site in the pursuit of schools of prey species such as scad (*Decapterus punctatus*) and sardines (*Sardinalla spp*.). Frequent visitors to the reef site are predicted to be other fish that feed on resident reef species, such as barracuda (*Sphraena barracuda*), almaco jack (*Seriola rivoliana*), hammerhead sharks (*Sphyrna spp*.), and cobia.

Currently, no endangered or threatened species are known to utilize this area as primary habitat for foraging, breeding, or resting nor has this area been designated as critical habitat. The reef site is at a depth of 130 to 135 ft. Marine mammal species commonly found on the continental shelf or along the shelf break (approximately 328 ft) will not be impacted, especially since no explosives will be used in the sinking activities. Further, the endangered sperm whales and common dolphins are not likely to be encountered at the depths for the proposed site (130 to 135 ft). The addition of the artificial reef may have a positive impact on endangered turtles such as the hawksbill, green, leatherback, loggerhead, and Kemp's Ridley which could utilize the site for habitat and feeding.

No explosives will be utilized for vessel sinking and protective measures to avoid any harm to marine species will be employed during the sinking process. As all hazardous wastes and materials have been removed from SHIP, based on USEPA and MARAD guidelines, there will be no risk of exposure to sediments, demersal fish and reef invertebrates, dolphins and fish eating birds. Based on these considerations, the proposed action will not affect threatened and endangered species.

In addition, this project will have a positive effect on Essential Fish Habitat (EFH). U.S. waters have undergone extensive analysis in recent years in response to overfishing and other threats to marine fisheries. Congress passed the Sustainable Fisheries Act in 1996 as an amendment to the 1976 Fishery Conservation and Management Act emphasizing the protection of essential fish habitat (EFH). Eight national fishery management councils were established to incorporate EFH into its existing and new fishery management plans. Creating new, and enhancing existing, habitat is one of the recommendations in the *Generic Amendment for Addressing Essential Fish Habitat Requirements in (existing) Fishery Management Plans of the Gulf of Mexico* (GMFMC 1998). Habitat added by artificial reefs, especially off the coast of Texas, are essential to increasing hard surface area for sessile organisms to attach to.

Because no explosives will be used, the sinking action is not expected to result in the take of fish in the vicinity at the time. Therefore, managed fish populations are not anticipated to be adversely impacted. It is anticipated that the creation of the artificial reef from the SHIP will result in the creation of hard surface reef habitat that will enhance fish populations and diversity at the site.

1.4 Participants

1.4.1 Primary Contact

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1.4.2 Consultants

Separation Systems Consultants, Inc.
Mr. Douglas Jackson, Certified Environmental Professional
17041 El Camino Real, Suite 200
Houston, Texas 77058
(281) 486-1943 \ 1942 (office)
(281) 486-7415 (fax)
djackson@sscienvironmental.com
www.sscienvironmental.com

Role: Mr. Jackson is a hazardous wastes remediation consultant who evaluated hazardous substances, including PCBs, on the ship. He developed the PCB-post cleanup sampling plan which was followed during the cleanup phase of the ship to insure all remaining PCB levels on board the ship do not exceed 50 ppm. He also tracked all hazardous materials removed and insured compliance with all hazardous material state and federal regulations.

Wild Well Control, Inc.
Mr. Scott Vickers, Sr. Marine Engineer
2202 Oil Center Court
Houston, Texas 77073
(281) 784-4700 (office)
(281) 784-7415 (fax)
svickers@marinehazard.com
www.wildwell.com

Role: Mr. Vickers is a marine architect contracted to provide consultation in the sinking process. He evaluated the CONTRACTOR's sinking plan and provided advice to TARP concerning hull modifications.

Scott Neidigk
TexStar Labs
11115 Mills Road
Suite 111
Cypress, Texas 77429
Voice (281) 890-8170
Fax (281) 890-2827
scott.neidigk@sbcglobal.net

Role: Mr. Neidigk is a hazardous wastes remediation consultant who was subcontracted through SSCI to evaluate the remediation of hazardous substances, including asbestos and PCBs, on the ship. He tracked all hazardous materials removed, took post-cleanup samples, visually inspected fuel tanks, reviewed disposal manifests, checked workers credentials, and insured all remediation was in compliance with state and federal regulations for hazardous materials.

1.4.3 Other Agencies

U.S. Fish and Wildlife Service
Division of Federal Assistance
Mr. Harold Namminga, Sport Fish Restoration Manager
P. O. Box 1306
500 Gold SW, Suite 9019
Albuquerque, New Mexico
Voice (505) 248-7461
Fax (505) 248-7471 harold_namminga@fws.gov

Role: Manager of Federal Aid Grant (F117D) approved in 1999 for total of $1,000,000 towards reefing ship as marine habitat. Coordinated review and approval of NEPA requirements.

U.S. Maritime Administration
Office of the Ship Disposal Programs
Mrs. Zoe Goss, Contracting Officer Representative
MAR-640, Mail Drop #1

1200 New Jersey Avenue, SE
Washington, DC 20590-00001
Voice (202) 366-0270
zoe.goss@dot.gov

Role: Artificial Reef Coordinator in Ship Disposal Program. Maintained contact with TARP Artificial Reef Coordinator concerning progress of remediation of the SHIP and cleanup schedule. Insured that SHIP was disposed of as an artificial reef and met all federal requirements as stated in the original MARAD transfer document.

U.S. Coast Guard
CW04 Rentz
Marine Safety Division
3505 Boca Chica Blvd.
Brownsville, TX 78521
(956) 546-2786
Troy.Rentz@uscg.mil

Role: Inspection of fuel tank filling pipes and tanks for hydrocarbon remediation and general cleanliness of SHIP. Advised TARP about areas that contained hydrocarbons needing cleanup and reviewed CONTRACTOR's remediation actions.

1.4.4 Contractors Performing Remediation, Hull Modifications and Sinking

Resolve Marine Group, Inc.
Mr. Joseph Farrell Jr., President
Denise Johnston, Vice President
2550 Eisenhower Blvd., Suite 204
P.O. Box 165485
Port Everglades, Florida 33316
(954) 764-8700 ext 106 (office)
(954) 764-8724 (fax)
djohnston@resolvemarine.com

Role: Primary contractor with ESCO Marine, Inc. below. Performed oversight on cleanup operations and hull modifications. Will conduct the sinking of the ship.

ESCO Marine, Inc.
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Brownsville, TX 78521
(956) 831-8300 (office)
(956) 838-5700 (fax)
rjaross@escomarine.com

Role: Subcontractor with Resolve Marine Group, Inc. above. Performed all cleanup and hull modifications at their dock facilities in Brownsville, TX.

PART 2.0 DESCRIPTIONS AND HISTORY OF SHIP

2.1 The Three Lives of the *Texas Clipper*

The 473-foot ship *Texas Clipper* was launched on September 12, 1944 as the USS *Queens* (APA-103), a WWII transport and attack ship. It carried troops and wounded from battlefields in the Pacific and was the first attack troop transport into Iwo Jima following the ferocious battle for the island. After the war, she served as the S.S. *Excambion*, a passenger \ cargo vessel. In 1965, she was loaned to Texas A&M University-Galveston as a maritime training vessel for the Texas Maritime Academy and renamed the *Texas Clipper*. Upon retirement, she was berthed at the MARAD Fleet Reserve facility in Beaumont, Texas.

General facts about the Texas Clipper include:

- Built in 1944 at Bethlehem Steel shipyard, Sparrows Point, MD: Hull 4421 while under construction, later MC Hull 1677
- Converted in 1948 at Bethlehem Steel shipyard, Hoboken, NJ
- Official vessel number 256835
- Maritime Commission design type: C3-S-A3 as *Queens*; P1-S1-DR1 later
- Call letters EYEBROW as *Queens*; KVWA later
- Length: 473 ft 1 in
- Beam: 66 ft 5 in
- Gross tonnage 6,736 as *Queens*; 9,644 later
- Net tonnage: 6,196
- Displacement, loaded: 13,143 tons and 25 ft draft as *Queens*; 14,893 tons later
- Displacement, light: 7,571 tons as Queens; 7,627 later
- Speed: 16.5 knots cruising (14800 mi. radius); 17.6 knots maximum
- Fuel: Bunker "C" oil; consumption 0.8 barrels/mile at cruising speed
- Cargo capacity: 150,000 ft^3 as *Queens*; 362,000 ft^3 afterward
- Engines: Bethlehem geared turbine drive single-pass cross-drum reactional heater-oil burning water-tube boilers (Babcock & Wilson) produced 450 lb / 750^o F steam to a turbine
- Turbine provided 8,000 shaft horsepower to a 19-ft. four-blade propeller at 96 rpm resulting in a 16.5-knot cruising speed
- Three 300-kw Westinghouse turbo-generators, operating on 450 bl steam, produced electrical power
- Water supply: two evaporators produce 16,000 gal/day
- One 60 kw diesel generator
- People: *Queens*: 559 crew / 1,843 troops max.; *Excambion*: 125 crew / 131 passengers; *Clipper*: 250 total

2.1.1 USS *Queens* Era (1944-1946)

Figure 2. USS *Queens* during the war years, 1944 – 1946.

At least 230 attack transports (APA)—the backbone of an amphibious war—sailed during the Second World War. By 2007, only five were in existence. One of the five, the only one in the Windsor class, was *USS Queens* (APA 103).

On 12 September 1944, *Queens* (named after a borough/county in New York) was launched; on December 16, commissioned—both at Sparrows Point shipyards near Baltimore. *Queens* cruised at 16.5 knots and carried two 5-inch cannons, 2 twin 40 mm guns; 2 twin 20 mm guns; and 18 single-mount 20 mm guns. The ship was never to fire her guns in battle.

Under the command of USNR Captain John J. Mockrish, *Queens* carried 47 officers and 512 enlisted men on its maiden voyage through the Panama Canal to Pearl Harbor. In March 1945, the ship landed supplies and reinforcements at Iwo Jima and carried wounded marines to hospital facilities in Guam. One marine died on board.

Queens trained for an invasion of Japan that would never occur. On 22 September 1945, *Queens* took occupation troops into Sasebo, Japan, about 30 miles north of Nagasaki, site of an atomic-bomb explosion 44 days earlier.

As part of Operation Magic Carpet, *Queens* returned more than 3,400 homebound troops and passengers stateside. On 10 June 1946, the ship, under USNR Commander Cyril B. Hamblett, was decommissioned in Norfolk, Virginia, and laid up in the nearby James River for a year. *Queens* was awarded the American Campaign, the Asiatic-Pacific Campaign, the Navy Occupation Service, and the World War II Victory ribbons.

2.1.2 *SS* Excambion (1948-1959)

Figure 3. SS Excambion from 1948-1959. Conversion from Queens to Excambion: All defense features removed. After-set of kingposts lengthened. After-house and main superstructure enlarged. Cigar-shaped funnel installed. Raised boat deck 6 in. to form new promenade deck; 'tween deck in no. 4 hold lowered 7 in. to create refrigerated orlop deck. Existing trunks and hatches enlarged. Soundproofed bulkheads. Air conditioning in all staterooms and public spaces. Installed smoke detection and automatic firescreen doors and watertight doors. New water-evaporating system installed. Jumbo boom aft of foremast removed. Top hamper on foremast removed. After crow's nest removed. Radar mast added just forward of funnel; radar antennae relocated from foremast. Mine-sweeping paravane-rigging fitting removed from top of stem. Portholes, sideports, fueling ports, and veranda windows cut in hull.

The first fully air-conditioned ships in the world were the postwar Four Aces, the jewels of the fleet operated by American Export Lines. The Four Aces included *Excalibur*, *Exeter*, *Exochorda*, and *Excambion*.

In December 1947, *Queens* arrived at Bethlehem Steel's shipyard in Hoboken, New Jersey, for conversion to a combiliner that would carry both cargo and passengers. On 22 June 1948, *Queens* was renamed *Excambion*. The ship had 3 masts, 2 pairs of kingposts, and 16 cargo booms (cargo would prove more lucrative than passengers). It could carry 4,400 tons of freight (362,000 ft^3) in five holds, and 30,000 ft^3 of goods needing refrigeration.

On 3 December, *Excambion* left on its maiden voyage as a cruise ship under command of Captain W.W. Kuhne. Fares started at $850. On routine 6-week roundtrips, the ship carried a crew of 125 and up to 125 passengers from New York City to Mediterranean ports like Barcelona, Marseille, Naples, Beirut, Alexandria, Iskenderun, Latakia, Piraeus, Livorno, and Genoa.

By 1956, due to Mid-East violence, outbound voyages attracted only about a third of the normal number of passengers, but return voyages were packed with refugee families of American soldiers and diplomats. On 9 December 1957, *Excambion*, substituting for the Moore-McCormack ship *Brazil*, took its only non-Mediterranean voyage to South American ports.

On 12 March 1959, *Excambion* completed its last cruise as a liner. American merchant marine passenger service was being phased out because of competition from the new jet passenger service. For the next seven years, *Excambion* was laid up in the Hudson River Ready Reserve Fleet anchorage at Jones Point, New York.

2.1.3 USTS *Texas Clipper* (1965-1996)

Figure 4. USTS Texas Clipper era from 1965-1996. Alterations made during service at Texas Maritime Academy: Crow's nest removed. No. 1 hatch cargo booms removed. Foremast booms removed. Aftermast booms removed. Swimming pool removed. Wooden decks removed. Chain telegraphs replaced. Awning rails removed. Wooden doors on P-deck removed.

By the time it was placed in the reserve fleet in 1996, the oldest active ship in the entire American merchant marine fleet was *Texas Clipper*.

In 1965, the federal government lent *Excambion* to the 3-year-old Texas Maritime Academy (forerunner of Texas A&M University of Galveston) to train cadets as officers for the American merchant marine. Towed from the Hudson River to Galveston, where it arrived on May 16—the ship was renamed *Texas Clipper*.

On 15 June 1965, under the command of Captain Bennett M. Dodson (USN-retired), *Texas Clipper* departed on its maiden voyage to Northern Europe with about 120 cadets. The ship's itinerary changed each year to ports in the Gulf of Mexico, Caribbean, Atlantic, Pacific, Arctic, and Mediterranean. It carried a complement of up to 250 officers, faculty members, crew and cadets. One of its more popular programs was the onboard prep-cadet summer school at sea: freshmen enrolled in two college courses, stood watches, and helped maintain the ship.

Finally, after 30 consecutive summer training cruises, the sailing days of the 50-year-old ship were over. On 4 August 1994, under the command of Captain Peter Jaime Bourgeois, *Texas Clipper* completed its final training cruise. For the next two years, it was used as a dockside dormitory for Seaborne Conservation Corps, an educational and job-training program for at-risk high school students.

In May 1996, the ship added a roman numeral to its name when its successor *Texas Clipper II* arrived on campus. *Texas Clipper I* was towed to reserve moorings in Beaumont, Texas, where it stayed for ten years. In 2006, it was towed to the ESCO Marine, Inc. ship yard in Brownsville, Texas were it underwent remediation and hull modifications to become an artificial reef 17 miles off the southern coast of Texas as an artificial reef.

2.2 Historical Research and Maritime Heritage Promotion

The SHIP has a long and eventful life. To promote this maritime heritage for the benefit of those who served on her, the State of Texas, and the maritime community in general, TARP contracted the historical research with two researchers. Mr. Barto Arnold (Institute of Nautical Archeology at TAMU) conducted historical research on the ship's role as the USS *Queens* and SS *Excambion*. Dr. Stephen Curley (TAMU-Galveston) combined this research with the history of the ship as the *Texas Clipper* for a more complete history.

This historical document of the SHIP was completed in 2007 and will be used to draft brochures, write popular magazine articles, inform the general public, document the nautical heritage of the ship, and be the foundation of a future book outlining the ship's history with its use as an artificial reef.

In addition, two bronze plaques describing the significance of the SHIP have been produced and are mounted on the Navigation (N) deck.

A pre-reefing ceremony was held at the Convention Center at South Padre Island, Texas on 31 March 2007 and was attended by: the general public, TPWD Artificial Reef Advisory Committee, TAMU-Galveston, State of Texas government, and other agencies and dignitaries. A large contingent of students and sailors who served aboard the SHIP was also present. Several news media groups have expressed an interest in covering the sinking and the producers of the TV series Mega Movers (History Channel) have been filming a documentary of the cleanup/reefing project.

During the remediation process, an interesting discovery was made. A 22 ft mural that was thought to have been destroyed or removed was found behind layers of wallpaper and paint in the after bar area of the Promenade deck. In 1948, artist Saul Steinberg, whose cartoons appeared on the cover of the *New Yorker* magazine, was commissioned to create a mural of life aboard a cruise liner for each of the ships known as the Four Aces. The *Excambion* was one of these ships and the only one extant at this time. The mural was "lost" in the 1970s after remodeling and was not seen again until workers found it during remediation. TARP has been working with the Saul Steinberg Foundation (New York) and the Menil Art Museum (Houston, Texas) on efforts to have it restored and exhibited in a new home. The value of the mural has not been determined since one this large from Steinberg has never been auctioned. However, Steinberg's other pieces command high values and are well known in the art community. Steinberg was born in Romania in 1914 and died in 1999. Upon death, his will created a trust that formed the non-profit foundation. The Steinberg Foundation manages the copy rights on his work and promotes the study of Steinberg's contribution to 20th century art. More information on the Steinberg Foundation can be found at www.saulsteinbergfoundation.org.

PART 3.0 ACQUISITION OF ARTIFICIAL REEF SITE OCS BLOCK SOUTH PADRE ISLAND 1122

3.1 Geographical location of *Texas Clipper* Reef Site

The Texas Artificial Reef Program employs a thorough protocol for selection of artificial reef sites. There are currently 58 reef sites in the program with sizes ranging from 40 to 380 acres, depths 30 to 310 ft, and distance off shore from 6 to 100 nm (Figure 1). New reef sites are analyzed to evaluate water depth, bottom type and proximity to natural reefs, presence of shipwrecks and other non-natural obstructions, and impact to commercial fisheries.

The SHIP reef site was selected after evaluations of 33 permitted reef sites off Texas. These sites did not have adequate water depths to accommodate the SHIP and were rejected as not meeting all the criteria previously established for the SHIP reef site. The reef site is located in federal waters of the Exclusive Economic Zone (EEZ) in the western portion of the Gulf of Mexico in Outer Continental Shelf Block South Padre Island 1122 (Figure 5). The nearest municipality is Port Isabel, Texas which is 23 nm from the reef site.

The permitted reef site (ASCOE permit #23782) is 17 nm from Brazos Santiago Pass (Attachment K). The SHIP will be placed at a depth of 134 ft (Mean Low Water) with a minimum navigational clearance of 50 ft in accordance with the USCOE permit application. It will be within the confines of a designated 2,640-ft by 2,640-ft area and oriented north to south, parallel to prevailing and likely storm currents (Figure 6). Because of this water depth, the force of currents produced by a major storm event will be reduced. The relatively high profile of SHIP (80 ft from keel to top of wheel house) will minimize the build-up of sediment on the ship from large-scale waves or transport phenomena.

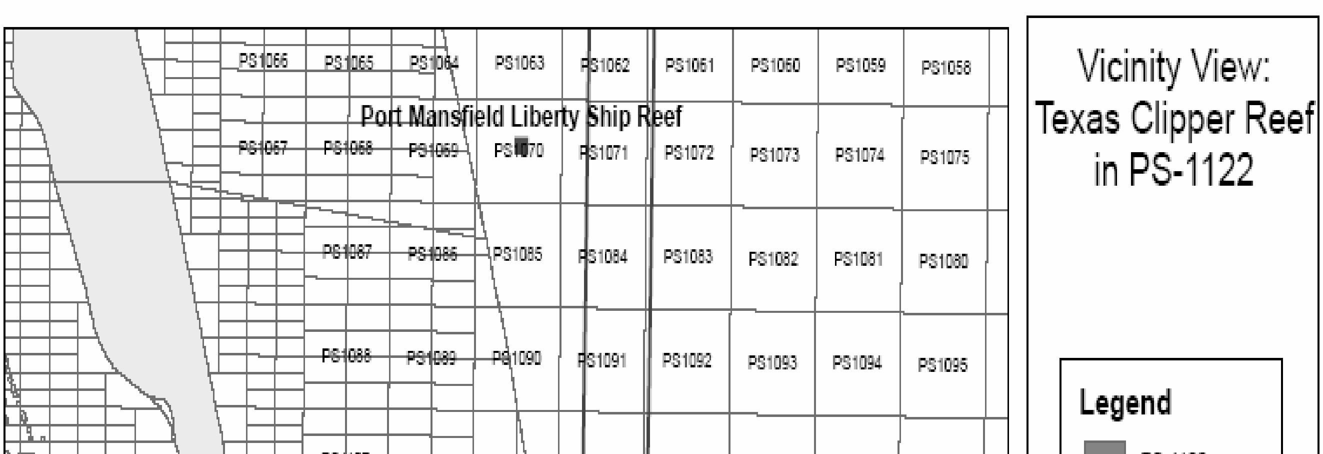


Figure 5. Vicinity Map of proposed Texas Clipper Reef in OCS Block PS-1122.

Coordinates of the reef site are:

	Latitude	Longitude
Permitted Center	26° 11' 11.228"	96° 51' 20.508"
NW Corner	26° 11' 24.471"	96° 51' 34.808"
NE Corner	26° 11' 24.130"	96° 51' 05.829"
SE Corner	26° 10' 57.985"	96° 51' 06.208"
SW Corner	26° 10' 58.326"	96° 51' 35.185"

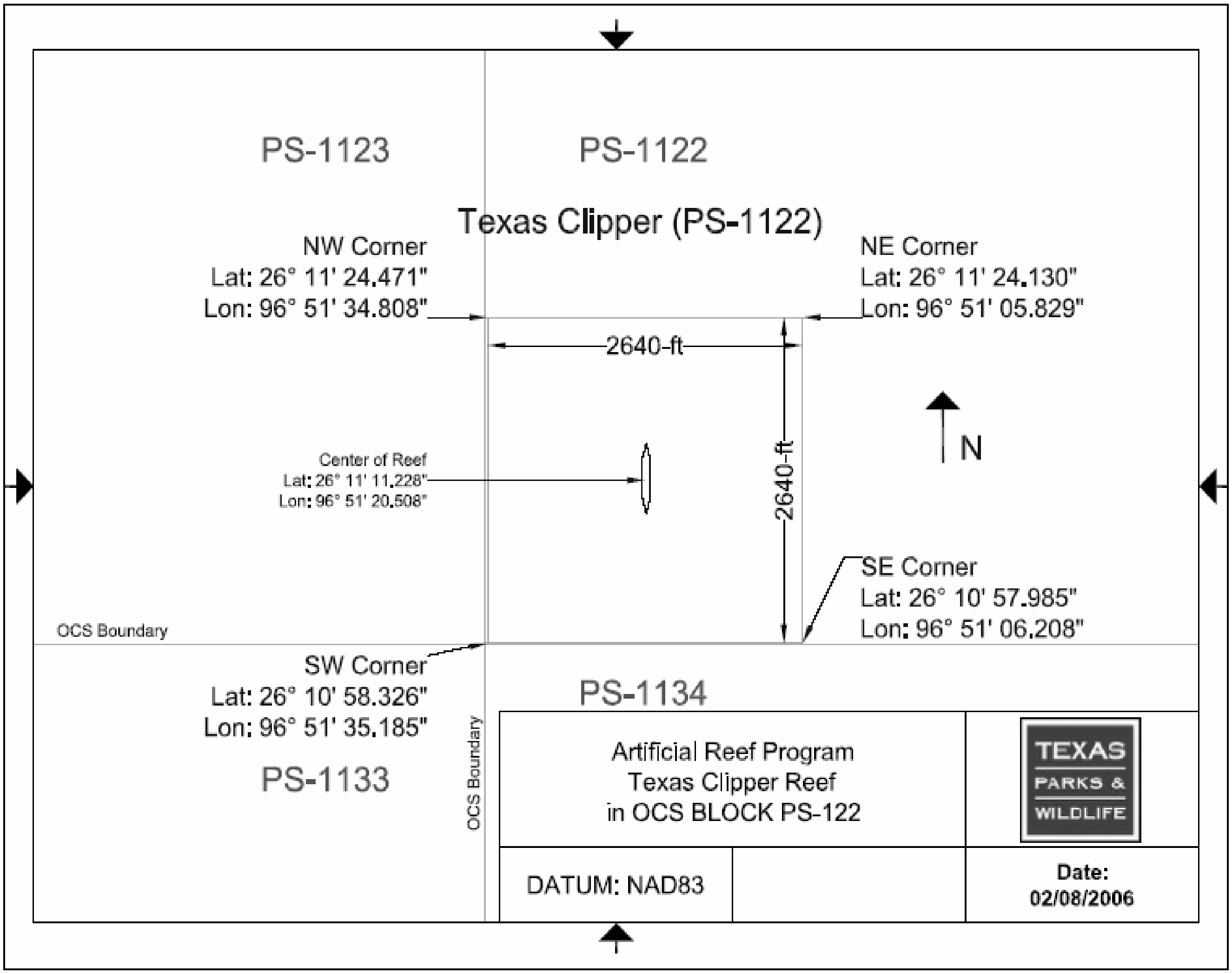


Figure 6. Specific layout of the Texas Clipper inside the reef site.

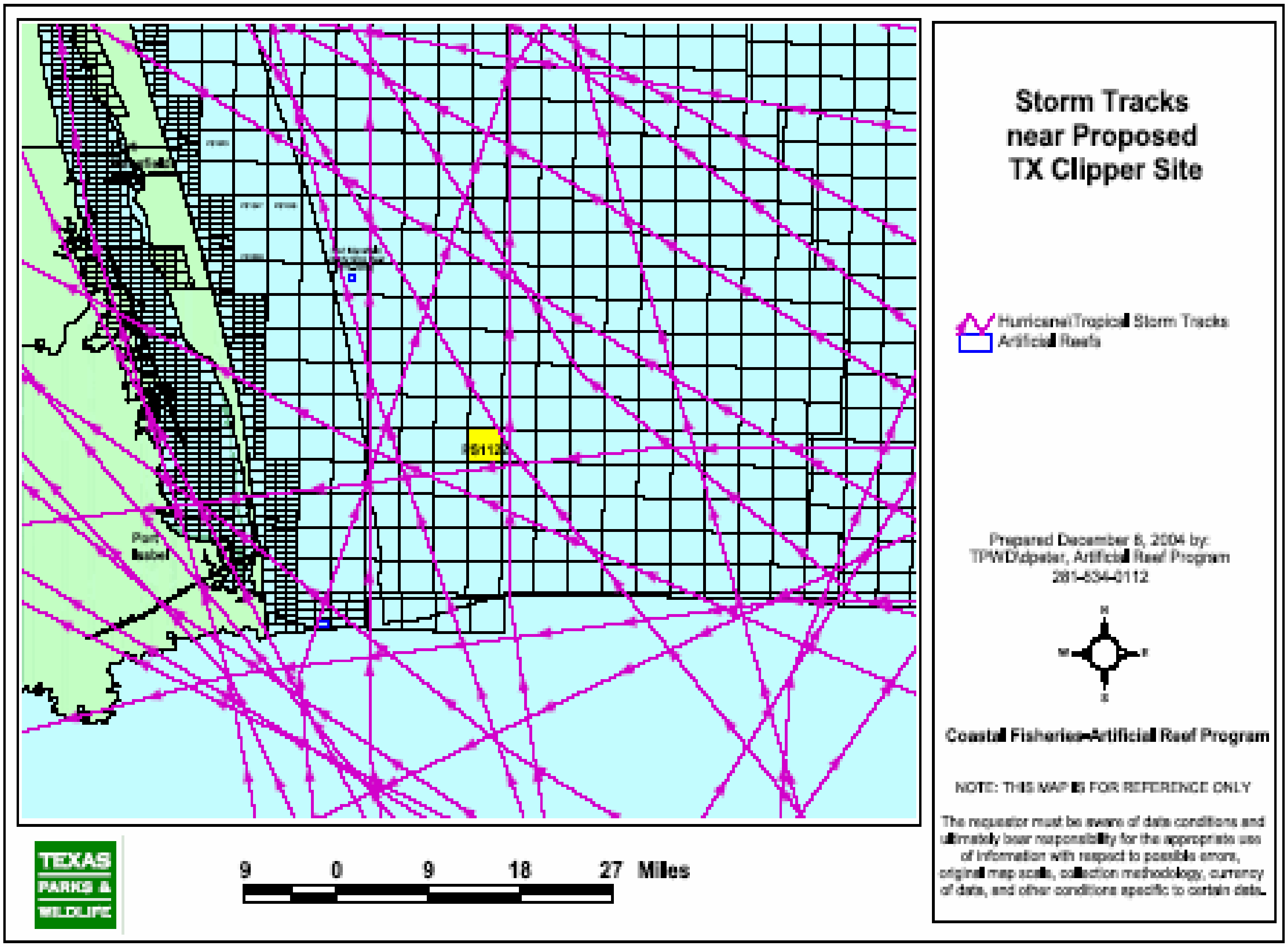


Figure 7. Texas offshore hurricane track map.

Hurricane events are the most severe weather activity in the Gulf of Mexico; high winds and larger-than-normal wave crests create bottom disturbances. However, due to the size of the ship, it is not anticipated hurricane-driven currents would move the reef. A site hurricane track map for the proposed reef site is shown in Figure 7.

3.2 Gulf of Mexico Environment and Conditions

The following environmental and conditions sections are excerpts from the Disposition of the USTS *Texas Clipper*: Environmental Assessment submitted to the USFWS to comply with the National Environmental Policy Act (NEPA) requirements. The USFWS reviewed the document and issued TARP with a FONSI (Finding Of No Significant Impact) for negative impacts of the ship reef on the environmental and cultural resources (Attachment L).

The approach used in the evaluation of direct and indirect environmental consequences was to consider the potential of this reefing project to impact any one of four primary environmental and socioeconomic concerns. These are: *Physical Environment* (including air, water, and substrate resources, energy utilization, and noise); *Biological Environment* (including benthic, and pelagic organisms, fish, marine mammals, and threatened and endangered species); *Socioeconomic Environment* (including navigation, and costs and benefits); and *Cultural Resources* (including both historic vessels and submerged resources). The potential for impacts from the reefing of the SHIP is described below.

3.2.1 Physical Environment

Texas has approximately 367 mi of open Gulf shoreline. Texas state waters extend from the shoreline seaward to 9 nm (Figure 1). The habitat types located in the marine environment in the Gulf are varied. Thriving coral reefs, seagrass meadows, non-vegetated bottom, drowned reefs related to ancient shorelines, manmade structures, salt diapirs and large rivers influence water characteristics on the inner continental shelf and contribute to the diversity of the marine habitat in the Gulf. This diversity of habitat directly influences the species associated with these varying habitat types (Rezak et al. 1985).

In Texas waters, the Gulf of Mexico continental shelf varies in width from about 108 nm off east Texas to 59 nm off southwest Texas. The continental shelf occupies about 35% of the surface area of the Gulf and provides habitats that vary widely from the deeper waters. The Texas shelf is dominated by mud or sand-laden terrigenous sediments deposited by the Mississippi River. Vertical relief of banks on the Texas shelf varies from less than one foot to over 492 ft. These banks exist in water depths of 72-984 ft (Rezak et al., 1985).

3.2.1.1 Air Quality: Ambient air quality is a function of the size, distribution and activities directly related to populations in association with the resulting economic development, transportation and energy policies of the region. Meteorological conditions and topography may confine, disperse or distribute air pollutants. Assessments of air quality depend on multiple variables such as the quantity of emissions, dispersion rates, distances from receptors and local meteorology. Due to the variable nature of these independent factors, ambient air quality is a dynamic process.

The Clean Air Act established the National Ambient Air Quality Standards (NAAQS); the primary standard to protect public health and a secondary standard to protect public welfare. The Clean Air Act Amendments of 1990 established classification designations based on regional monitored levels of ambient air quality. There are five classifications of non-attainment that are defined in the 1990 Clean Air Act Amendments: marginal, moderate, serious, severe and extreme. These designations impose mandated time tables and other requirements necessary for attaining and maintaining healthy air quality in the U.S. based on the seriousness of the regional air quality problem (MMS 1996).

With the exceptions of Galveston and Houston Counties, the state of Texas has no non-attainment areas for criteria pollutants among its coastal counties (USEPA 2004). Galveston and Houston Counties are located greater than 226 nm from the proposed location, and therefore, do not have a significant impact to air quality in the vicinity. The proposed site is well offshore and is located in an area that is not classified for priority pollutants under the Clean Air Act.

Reefing activities will produce few air emissions. There will be low levels of air emissions associated with routine activities of towing the ship to the site and the sinking actions/monitoring. Carbon monoxide and ozone are the primary air pollutants resulting from the reefing activities. The principal sources of these pollutants are transportation, mechanized equipment, and combustion equipment. Related air emissions would not be different from normal traffic upon U.S. waterways. There may be a localized increase in air emissions from boating activities at locations at and in transit to the site. However, based on the offshore location and good air quality in nearby coastal counties, any resultant emissions are anticipated to quickly dissipate and not adversely impact the environment's air quality.

3.2.1.2 Water Quality: Water quality is a key environmental factor in maintaining healthy marine populations of fishes and other organisms. Water quality in the Gulf of Mexico is influenced by freshwater inflows from rivers. These waters carry fine sand sediments that affect water clarity and quality, as well as substrate deposition.

A three-year study conducted by the Minerals Management Service (MMS) gathered samples for water quality, sediment samples, and specimens, as well as measurements of salinity and temperature in the Gulf of Mexico near South Texas at depths of 60-440 ft (Flint and Rabalais 1980, 1981). The study found that the biotic communities were moderately diverse and ecologically pristine. The distribution and abundance of benthic invertebrates and fishes was predominantly dependent on the depth and type of substrate. Contaminations by trace metals and hydrocarbons were relatively non-existent in the water column, sediments, and organisms.

Based on the remediation of the SHIP in PART 4.0 below, BMP standards have been met or exceeded and no adverse effects to marine water quality are anticipated from the reefing.

3.2.1.3 Salinity: Salinity is a fundamental environmental factor because all organisms contain 80-90% water, and internal salt concentrations must be maintained within a certain range in each species. Each species or life stage within a species is adapted to a particular external environment. Surface salinities in the Gulf vary seasonally. During months of low freshwater input, surface salinities near the coastline range between 29 and 32 parts per thousand (ppt). High freshwater input conditions during spring and summer months result in strong horizontal salinity gradients with salinities less than 20 ppt on the inner shelf. The waters in the open Gulf are characterized by salinities between 36.0 and 36.5 ppt (MMS 1997).

Bottom salinities of the Gulf of Mexico were measured by Darnell et al. (1983) for the northwestern Gulf during the freshest and most saline months (May and August). During May, all the nearshore waters showed salinity readings of 30 ppt or less from Louisiana to about the level of Galveston Bay, Texas. Water of full marine salinity (36 ppt) covered most of the shelf deeper than 98-131 ft. During August, the entire shelf south of Galveston showed bottom salinities of full marine salinity (36 ppt). Bottom water salinities of the mid to outer shelf remained fully marine throughout the year.

TPWD (2002) reported water quality data from 1985–2000. Salinity in Texas waters of the Gulf ranged from an average of 29 ppt in waters bordering Louisiana to 33 ppt near Mexico.

Salinity averaged 31 ppt for all Gulf waters sampled off Texas combined.

No adverse effects to marine water salinity are anticipated from the reefing.

3.2.1.4 Temperature: Water temperature determines not only which species are present in a population, but also much of the timing of their life cycles. Species demanding high dissolved oxygen (DO) are commonly associated with lower water temperatures since low temperatures allow more oxygen to be dissolved. The metabolic rate of most aquatic species is directly determined by water temperature. An increase in water temperature of 10^{o} C causes a doubling of the metabolic rate. Thus, higher water temperature stimulates rapid growth, but can reduce the DO available to support it (USEPA 1994).

From 1985–2000, TPWD measured temperature in Gulf waters from Louisiana to near Mexico. Average temperature was 22^{o} C for all waters with a range of 20 to 26^{o} C (TPWD 2002).

No adverse effects to marine water temperature are anticipated from the reefing.

3.2.1.5 Dissolved Oxygen and Turbidity: The dissolved oxygen (DO) level in water is one of the primary factors determining survivability of populations. As DO drops from 2 to 0 ppm, the number of species surviving tends to shift rapidly to favor anaerobic bacterial populations. The primary cause of DO depletion is metabolism of nutrient loads, mostly by bacteria. The primary sources of DO are surface mixing and photosynthesis of phytoplankton populations (USEPA 1994). DO levels in Gulf waters off Texas averaged from 7-8 ppm annually from 1982–2000 (TPWD 2002).

Turbidity is a function of suspended and dissolved material in the water column (organic and inorganic). High levels of turbidity can reduce or block light from penetrating beyond the upper layers of the water column. This reduces photosynthesis by aquatic plants and can cause layers of silt and other debris to impact marine organisms, especially sessile types. Turbidity in Texas Gulf waters varied with freshwater inflow and runoff, but averaged 8 NTU in the Gulf annually from 1987–2000 (TPWD 2002).

No adverse effects to marine water dissolved oxygen and turbidity are anticipated from the reefing.

3.2.1.6 Water Currents: Water currents at the reef site are characterized as mild; warm-core and cold-core eddies/rings which may spin off from the Loop Current in the western portion of the Gulf of Mexico. Wind driven currents typically have speeds of less than 0.5 knot and are tempered by depth and distance from estuaries. No significant sediment transport by typical currents is expected at the site location based on its depth in excess of 130 ft. In addition, the high elevation of the ship prevents burial by transported sediments. Tidal range averages 2 ft or less.

No adverse effects to marine water currents are anticipated from the reefing.

3.2.1.7 Circulation Patterns: Britton and Morton (1989) discussed circulation patterns and tides for the Gulf. The pattern of sea surface circulation in the Gulf is created as major incursions of water from the tropical Caribbean enter the Gulf via the Yucatan Channel, circulate and exit via the Strait of Florida. While circulation of surface waters varies seasonally, it consists of two major elements: 1) a sweeping S-shaped element in the eastern Gulf, and 2) a complex double loop that focuses upon the south central Texas shore in the western Gulf.

In the vicinity of the reef site, coastal sands move northward from Mexico to the mouth of the Rio Grande and along central Padre Island within a nearshore bar and trough system. About 43 nm north of the Rio Grande and along central Padre Island, the longshore bar and trough system fails to parallel the shoreline. Here, a series of open grooves, called "blind guts" by local fishermen, create treacherous waters for mariners. This area is also called "Big Shell" after the large accumulation of shell debris that collects here. This is the northern limit of beach sands derived from the Rio Grande. From here northward, beach sands have the characteristics of sediments brought to the Gulf by central Texas rivers. The distribution of beach sands suggests that north of Big Shell Beach, longshore currents push sand in a southwesterly direction (Britton and Morton 1989).

No adverse effects to marine water circulation patterns are anticipated from the reefing.

3.2.1.8 Sea Floor Characteristics: The Gulf of Mexico coastline exhibits a shelf extending from 35-95 nm off the Texas coast. The coast has 36 different banks, which rise off the shelf floor. The seabed at the proposed site is flat to gently sloping and composed of mud, clay, and fine-grained sand.

Cochrane Technologies was contracted to characterize the substrate of the reef site in 2003. Water depths across OCS Block PS 1122 vary between 132 ft below MLLW along most of the western block line increasing in an easterly direction to 139 ft below MLLW feet along the eastern limits. The contours reflect very flat seabed with an overall slope to the east at a rate of about 2 ft/mile (approximately 0.02° incline). Fathometer data indicate very smooth seabed devoid of any significant topographic anomalies such as outcrops or depressions. Reference material indicates that the seafloor and shallow sediments consist mainly of sand and silty sand, with sand content reported to be at 50%. Side scan sonar data showed a very uneventful seafloor with no visible obstacles or debris. The data set revealed few seafloor gas vents or strands of floating seaweed (Attachment M).

Sub bottom profiler data generally resolved less than 10 ft of the uppermost sedimentary record over the reef site. Deeper penetration was achieved over some of the buried channel areas. The data resolution was extremely limited presumably due to the presence of biogenic gas. Gas charged sediments are quite efficient in absorbing the emitted seismic pulse thereby lessening the returns. Another factor could be the type of sediments encountered along the seafloor. Sandy soils are typically very difficult to penetrate seismically. Survey data illustrate a shallow sedimentary section over the survey area and show the channeling that is present over this tract, which lies within the fluvial system of the ancient Rio Grand River delta.

The collected data show a well defined thin veneer below the seafloor. It may represent an unconformable surface separating the thin Recent above from the underlying thicker early Holocene section. Cut and fill channels were seen just below the unconformity over much of the survey area.

The channels occur just below the seafloor even thought in some instances they appear to be incised from the seafloor. It is thought that the channels and auxiliary segments were incised during the early Holocene. Their fill is generally acoustically amorphous, lacking any internal bedding or stratification. Channel axial depths (thalweg) were very limited and generally less than 10 ft. The plotted channel margins are in most cases the visible channel cuts seen within "acoustic windows" in areas where acoustic penetration resumes.

The reef site avoids those areas of subsurface and surface channelization identified by the Cochrane Technologies survey. In addition, placing a ship on the ocean floor as an artificial reef covers the natural substrate, replacing it with the artificial reef substrate. The amount and type of the natural substrate that is thus eliminated is dependent upon the size of the ship. The SHIP will cover approximately 20,000 ft^2 of substrate surface. However, approximately 76,000 ft^2 of hard surface artificial reef habitat will be created. Reefing of SHIP will add hard-surface substrate to an environment that is largely devoid of natural hard-bottom outcroppings and natural reefs.

3.2.2 Biological Resources

The biological resources in the vicinity of the Texas site are characterized by habitats typical of many locations with sandy substrates in the Northwestern Gulf of Mexico. The area includes minimal hard-bottom coverage. The soft, muddy seabed floor does not offer much substrate for attachment of algae or invertebrates. The reef area currently supports relatively few fish species.

<u>3.2.2.1 Protected Habitats:</u> Based on a review of information available from NOAA and MMS, no Marine Protected Areas or critical habitat areas are listed in the western Gulf of Mexico region that includes the proposed site. There are no natural coral reefs present within this part of the Gulf of Mexico.

<u>3.2.2.2 Marine Mammals:</u> Twenty-nine species of marine mammals are known to occur in the Gulf of Mexico (Davis and Schmidly 1994). Of these, 28 species are cetaceans; 7 mysticete (i.e. baleen whales), 21 odontocete (i.e., toothed whales and dolphins), and 1 sirenian species (manatee) (Jefferson and Schiro 1997). The most common species found in all water depths offshore of Port Isabel, Texas, is the bottlenose dolphin, *Tursiops truncatus*. The sperm whale is the only endangered cetacean likely to occur in the northern Gulf of Mexico, and is predominantly found in deep ocean waters (over 1,600 ft in depth). Recent studies have attempted to determine the distribution and abundance of whales and dolphins in areas along the continental slope in the north-central and western Gulf of Mexico using aerial and shipboard surveys, shipboard acoustic surveys, hydrographic data, and tagging and tracking of sperm whales. Davis et al. (1998) found that there were three distinct depth ranges for the presence of cetaceans in the area. Species found on the continental shelf or along the shelf break (328 ft) included the Atlantic spotted dolphin and bottlenose dolphin. Species found along the mid-to-upper slope (1,313 ft) consisted only of Risso's dolphin. Sperm whales, pygmy/dwarf sperm whales, pantropical spotted dolphins, striped dolphins, and *Mesoplodon spp*. were found in deep waters along the mid-to lower slope in water over 3,280 ft deep (Davis et al. 2002).

Fritts and Reynolds (1981) reported on aerial surveys of marine mammals, birds, and sea turtles that were conducted at four survey areas in the Gulf of Mexico. This pilot study was designed to develop techniques and collect preliminary data on vertebrate fauna of the OCS waters. Sperm whales were documented in waters off Texas.

Reefing of the SHIP will be conducted without the use of explosives, so no significant adverse impact on marine mammals is anticipated. If marine mammals are present in the area during the sinking, work will be halted until such time as the area is deemed safe to continue the operation.

3.2.2.3 Sea Turtles: Marine turtles are common in the eastern Gulf of Mexico but virtually absent from western Gulf survey areas. A recent study by McDaniel et al. (2000) reports that the relative abundance of sea turtles sighted is greater in the eastern Gulf than the western Gulf. Nearshore sea turtle abundances were proportionately higher than in offshore western Gulf areas, with the greatest density of sea turtles found in the depths of 0-60 ft. No endangered or threatened species are known to utilize this area as primary habitat for foraging, breeding, or resting, nor has this area been designated as critical habitat.

As stated above, reefing of the SHIP will be conducted without the use of explosives, so no significant adverse impact on marine turtles is anticipated. If marine turtles are present in the area during the sinking, work will be halted until such time as the area is deemed safe to continue the operation.

3.2.3 Socioeconomic Environment

Review of information regarding features relevant to the affected socioeconomic environment identified the following:

3.2.3.1 Fishing: Commercial shrimping is a highly productive industry within the Gulf of Mexico. The Texas shrimp fishery is one of the most valuable and one of the largest seafood industries in the U.S. TPWD sells about 3,500 commercial shrimp boat licenses and about 600 non-commercial shrimp trawl licenses each year. Texas commercial landings exceeded 41 million pounds of shrimp in 2001, worth more than $148 million to the commercial fishermen. Preliminary data on shrimping frequency indicates a high level of shrimping occurs in the Gulf of Mexico waters in the vicinity of the proposed area (Culbertson et al. 2004). McDaniel et al. (2000) reported that shrimping intensities in the western Gulf of Mexico were highest near shore and tapered off gradually at deeper depths. Data provided by Dr. Benny Gallaway of LGL Associates (Bryan, Texas) indicate shrimping frequency is lowest in the selected reef site (personal correspondence).

Recreational fishing for red snapper (*Lutjanus campechanus*), king mackerel (*Scomberomorus cavalla*), dolphin (*Coryphaena hippurus*), yellowfin tuna (*Thunnus albacares*), blackfin tuna (*Thunnus atlanticus*), cobia (*Rachycentron canadum*), wahoo (*Acanthocybium solanderi*), shark (various species), amberjack (*Serioloa dumerili*) and vermilion snapper (*Rhombloplites aurorubens*) are often caught offshore of Port Isabel, Texas in the vicinity of the proposed area (Green et al. 2002).

The future colonization of SHIP by marine organisms will be economically and recreationally important, as additional fish species will provide recreational anglers and divers a new and unique location. Due to the size of SHIP, anglers will have more fishing sites to choose from, thereby easing fishing pressures in other areas of that portion of the Gulf.

Artificial reefs have been documented to enhance the fishing opportunities for hook-and-line anglers targeting fish associated with artificial reefs. There are over 1.2 million saltwater recreational anglers in Texas. Ditton et al. (1995) found that of all Texas saltwater fishermen, 47% (564,000) fish within the Gulf of Mexico from a boat and approximately 300,000 - 400,000 anglers fish at offshore platforms or artificial reefs. Party boats take about 10,335 customers offshore to local Texas reefs and 35,724 offshore to all artificial reefs. Trips to artificial reefs accounted for 40% of the total number of offshore trips.

With this heavy demand for fishing on artificial structures, the creation of SHIP reef will help increase optimum yield of finfish and other marine life. The addition of SHIP reef site and its proximity to shore and metropolitan areas will help facilitate access and utilization of fishery resources for recreational and commercial fishermen, a need as noted under the National Fisheries Enhancement Act (33 USC 2101).

3.2.3.2 Diving: Most recreational diving in Gulf of Mexico waters off Texas occurs at the Flower Gardens National Marine Sanctuary, approximately 192 nm to the northeast of the selected site. The preferred diving depth for most dive charters is 70-100 ft (Ditton et al. 1999). TPWD reef sites off Galveston, Port Aransas, and Freeport are reported as the most popular destinations for boat captains. These areas are visited most frequently in the summer months (June-August), and visited less frequently in the spring (Ditton et al. 1995).

The reefing of the SHIP will provide the state of Texas with a premier artificial reef dive attraction that will enhance recreational opportunities in the Gulf of Mexico. It is anticipated that this reef will increase the economy of local communities and reduce diving and fishing pressure on some of the natural reefs. In 2000, a similar reefing of a ship occurred by the San Diego Oceans Foundation. They scuttled the Canadian destroyer escort HMCS *Yukon* off the San Diego coastline, turning the ship into an artificial reef. Since its transformation into a reef, the *Yukon* has become the site of 10,800 dives each year, including 6,000 by out-of-town divers, for a contribution of $4.5 million to the local economy. In addition, marine life on and around the *Yukon* has and continues to increase in species richness and diversity (San Diego Oceans Foundation 2005).

As mentioned above, the colonization of SHIP will be economically and recreationally important to recreational divers by providing a new and unique location to dive. Diving charters to SHIP site will ease diving impacts on the popular Flower Gardens Banks National Marine Sanctuary.

3.2.4 Cultural Resources

Over 400 shipwrecks have been documented in the Gulf of Mexico. The Automated Wreck and Obstructions Information System data documents no sunken vessels in the immediate vicinity of the reef site in PS 1122. Cultural resources near the proposed Texas site will not be impacted by the addition of SHIP to this site.

3.2.4.1 Cumulative Effects: No cumulative negative impacts on the marine environment are expected from the reefing of the SHIP. The ship has been cleaned of all hazardous materials and waste prior to sinking; the ship will not be leaking or discharging any liquids or materials. Increased fishing and diving activities may result over time as the artificial reef matures and species colonize and visit the reef; however, these activities would be similar to other fishing and diving areas. Therefore, no significant negative impacts to the marine environment are expected.

An increase in recreational fishing and diving is anticipated at the SHIP site, which will have a positive impact on the local economy. Commercial fishing will not be impacted since trawlers generally avoid the area due to the proximity of hangs at the site. Neighboring petroleum lease blocks will not be affected by the presence of reefed material at this site. It is not anticipated that oil and gas drilling will occur near the proposed Texas site.

3.3 Hazard Study of Reef Site

In 2003, the TPWD contracted with Cochrane Technologies, Inc. (Lafayette, LA) to conduct a Hazard Study of South Padre Island Area OCS Block PS-1122, offshore Texas. The purpose of the survey was to determine bottom and sub bottom conditions within the OCS area in preparation for the creation of an artificial reef for the SHIP. Results are presented below and the complete document with hazard maps is located in Attachment M.

The survey grid consisted of 18 north-south track lines spaced 300 m apart and six east-west tie lines spaced 900 m apart. The survey grid was designed to provide complete lateral coverage with the side scan sonar system and a representative sampling with the fathometer, sub bottom profiler, and magnetometer systems. All aspects of the fieldwork were carried out in accordance with federal guidelines in effect at the time of the survey and are detailed in Attachment M. Geophysical data collected from the remote sensing systems were reviewed for geologic interpretation and for evidence of man-made hazards. The survey results pertinent to future lease development were projected on bathymetry and hazard maps.

Cochrane Technologies (2004) reported that the seafloor over PS-1122 (which includes the reef site) is very smooth and free of topographic irregularities such as depressions or relict reefs. The bathymetry data indicated the seafloor slopes to the east at a rate of about 2 ft per mile. Water depths, within the survey limits, range between a minimum of 132 ft below Mean Lower Low Water (MLLW) in the western block line to 138 ft below MLLW along the eastern block line. Side scan sonar records showed very few seafloor gas vents or pockmarks. Also detected on this data set were strands of floating and water column seaweed. There was no debris or obstacles noted on the seafloor. The magnetometer system deployed during the survey recorded one small magnetic deflection without a known point source, but inflection was too small to represent significant ferromagnetic mass. The sub bottom profiles revealed cut and fill channels and associated erosional surfaces incised from 12 ft below the seafloor.

The complexity of the shallow sediment structure and numerous channel incisions with irregular channel bottoms made site selection of the proposed reef site very important in this OCS block. Cochrane Technologies recommended that each proposed reef site location be examined for its specific suitability to support a bottom seated structure. Sub bottom data records, for the purposes of this study, were considered the most important tool within an array of other sensors deployed during this data collection effort. All incised channel areas located by Cochrane Technologies were avoided in the final determination of the proposed reef site location.

3.3.1 Petroleum Lease Blocks

MMS information indicates that F-W Oil Exploration, LLC is the lease owner of OCS blocks PS-1113, PS-1123, and PS1133 which adjoin the western edge of PS-1122. PS-1122 and the other five adjoining lease blocks are not currently being leased. The only effect the proposed reef site will have on future leases, is that no structure or pipeline can be placed in the designated reef site or closer than 1,000 ft to the reef boundary per current MMS guidelines.

3.3.2 Oil and Gas Platforms

Lease block information available from MMS indicates no oil or gas platforms are located in the vicinity of the proposed reef site. The nearest oil and gas platforms are located over 19 nm from the proposed reef site. MMS' Plans of Exploration and Development database does not indicate that the current owners/lessees have any immediate plans to drill in the area.

3.3.3 Communications Cables

NOAA NOS Chart 11301 indicates no communication cables are present in the vicinity of the proposed site.

3.3.4 Safety Fairways (Shipping Channels)

There are no shipping channels present in the proposed SHIP site. Shipping channels are respectively located 5 nm due west and 7 nm due south of the proposed site.

3.3.5 Submerged Pipelines and Other Structures

Cochrane Technologies (2004) surveyed the reef site in 2003 using a magnetometer along all survey lines. Prior to the survey, they reviewed available data base information which indicated the reef site to be devoid of existing oil and gas structures. The magnetic records define only one small magnetic anomaly measuring 5 gammas but it does not have any sonar confirmation and likely represents an article of ferrous debris from prior drilling, construction, or shipping activities. The position of this magnetic anomaly was noted and the reef site avoids that area.

There are no oil and gas pipelines present near the proposed SHIP site. The nearest documented oil and gas pipelines are located over 19 nm from the proposed reef site.

3.4 Method of Marking Location

The site will be marked according to TARP and USCG requirements. A 10-ft lighted yellow spar marker buoy will be used to identify and notify mariners of the existence of an artificial reef site. The marker buoy is constructed of closed cell foam and enclosed with a protective polyurethane skin. This marker buoy design is collision survivable and has been successfully utilized by the TARP for over ten years. TARP received approval for buoy FR-TX-50 from the USCG on 30 November 2006 (Attachment N).

The overall dimensions of the marker buoy will be 10 ft tall and 2 ft in diameter. A USCG approved light will be mounted on top of the buoy. The marker buoy will be tethered with a 5/8 inch stud link chain to the forward anchor chain of the SHIP. The marker buoy will be anchored at least 300 ft from the ship to discourage boats from using it as a mooring buoy and also to prevent it from being obscured by boats attached to the mooring buoys.

Two tear drop shaped mooring buoys will be attached to the reefed ship in order to provide locations for utilizing the ship without the use of anchors. The mooring buoys will be attached to the bow and stern sections of the ship. They are constructed of impact resistant materials and marked according to U.S. Coast Guard regulations. The mooring buoys will be tethered with a 1 5/8-in poly line and connected with a 1 1/8-in steel shackle attached to a stainless steel U-bolt welded on the ship. At the ship level, steel cable runs between the mooring locations to aid SCUBA diver orientation. The tear drop shaped mooring buoy system has been successfully used in the Flower Gardens National Marine Sanctuary (Gulf of Mexico) for over 15 years.

PART 4.0 REMEDIATION OF HAZARDOUS MATERIALS

4.1. Hazardous Materials Baseline Study

Texas Parks and Wildlife Department (TARP) contracted Separation Systems Consultants, Inc. (SSCI) to complete a Hazardous Materials Assessment for the *Texas Clipper* in October 2004 and a Sampling and Analysis Plan for PCB Removal in October 2005. They also assisted with monitoring the clean-up CONTRACTOR (Resolve Marine Services, Inc. and ESCO Marine, Inc.), conducted verification sampling following PCB removal, and assisted with preparation of documentation for the vessel cleanup.

SSCI completed fieldwork for the 2004 Hazardous Materials Assessment during three events. The first event, conducted during the period 7-10 June 2004, focused on an initial asbestos survey, review of available documentation and interviews with MARAD personnel, assessment of sampling requirements for chemical analyses, assessment of debris and miscellaneous materials, and collection of photographs, drawings and notes. Mr. Scott A. Neidigk (Texas Department of Health (TDH) Asbestos Inspector No. 60-0573) completed the asbestos survey. SSCI is TDH Asbestos Management Planner Agency No. 20-0059.

Following analysis of bulk material samples for asbestos, the results of the first fieldwork event were summarized in tabular form and provided to TPWD for review. In addition, a proposal was provided to complete a second event that would include collection of samples for chemical analysis and measurement of amount (i.e., square feet and linear feet) of asbestos containing materials (ACM) identified during the first event.

The second event completed on 8 July 2004, included collection of paint from exterior and interior surfaces. Samples were analyzed for total metals (RCRA 8 Metals, Methods SW6020 and SW7471A), and PCBs (Method SW8082). In addition, the asbestos survey was completed.

The third event completed on 23 September 2004, included collection of suspected PCB containing material (other than paint) from exterior and interior areas. The samples collected including electrical wiring, insulating materials, door gaskets, caulk, gaskets, light fixture ballasts, and other miscellaneous materials associated with the ship's electrical system. Samples were analyzed for PCBs (Method SW8082).

The sampling was designed to provide information that would be useful in estimating the location and quantities of hazardous materials to be handled by contractors in preparing the *Texas Clipper* for reefing. Sampling was limited to material that was accessible without destruction or dismantling of the SHIP's structures. Additional sampling and analysis activities were required during contractor operations to evaluate materials that were encountered behind walls and ceilings, and other inaccessible areas.

The asbestos survey included a minimum of three samples for each homogenous area (e.g., thermal insulation systems, flooring, walls, ceilings, etc.) found on each deck. Paint sampling included one sample of each paint color found on the interior and exterior areas of each deck. Sampling for suspected PCB containing materials (other than paint) included one sample of each category of material (e.g., electrical wiring, insulating materials, door gaskets, caulk, gaskets, light fixture ballasts, and other miscellaneous materials associated with the ship's electrical system) found on the interior and exterior areas of each deck.

The SSCI pre-cleanup assessment of the SHIP is presented in Attachments F and G and the post-cleanup PCB sampling procedures in Attachment H.

4.2. Remediation and Modification Overview

4.2.1 Contractor Performing Remediation

As stated in Section 1.2 above, Resolve Marine Group, Inc.(Fort Lauderdale, FL) was awarded the contract for complete remediation of the SHIP, hull modifications, and sinking. Specific contact information is given in Section 1.4.4. Resolve Marine Group, Inc. is the primary contractor for the project and provided oversight on cleanup operations and hull modifications and will conducted the planning and sinking of the ship. They subcontracted with ESCO Marine, Inc. (Brownsville, TX) who completed all cleanup and hull modifications at their dock facilities in Brownsville, Texas. Resolve Marine Group and ESCO Marine are jointly known as **CONTRACTOR** throughout this section.

The CONTRACTOR is responsible for the employment of trained and technically qualified personnel to perform the requirements of the TARP contract. In addition, the CONTRACTOR is responsible for employing and maintaining the personnel, organizational and administrative control necessary to ensure the performance of personnel meets or exceeds all contract specification requirements.

ESCO Marine personnel performed the majority of the tasks associated with the hull modifications and general remediation. It utilized the services of certain specific qualified subcontractors for only a few tasks, mainly dealing with the disposal of regulated/hazardous wastes and sand blasting of PCB material off bulkheads and ceilings.

All actual cutting and removal tasks were performed by ESCO personnel. It is important to note that ESCO utilizes a Staff Leasing company, ITS Enterprises, Inc., which furnishes its entire workforce and provides them with the necessary workman's compensation and longshoreman's insurance. The hiring and overseeing of every aspect of the employee's performance and responsibilities is retained by ESCO.

Labor hours are collected in standard time-clock fashion and submitted to ITS for payment on a weekly basis by the Clerk. ITS then issues payroll checks, which are in turn billed along with insurance and overhead to ESCO. ESCO tracks and presents all hours to ITS for payment organized by vessel.

4.2.2 Scope of Work

The scope of the project is to clean, prepare, and sink the 473-foot ship *Texas Clipper* to provide a new artificial reef to enhance fishery resources in the Gulf of Mexico offshore of Texas. The SHIP was cleaned of debris, loose items, and hazardous materials to a level that meets or exceeds BMP guidelines and complies with health and safety statutes and regulations as set forth by the USEPA, MARAD, and the State of Texas.

Hull modifications were made to insure the SHIP will meet depth clearance requirements established for the permitted reef site and to allow limited penetration of the SHIP by scuba divers while insuring diver safety. Hull modifications were also made to insure the SHIP will sink in an upright position on the Gulf bottom. Hull modifications were designed and executed in a manner to insure the SHIP's original external characteristics were retained as much as possible.

The TARP is responsible for preparing the SHIP in accordance with the USEPA and MARAD guidelines for vessel cleanup and disposal as stated in the *National Guidance: Best Management Practices* (BMP) *for Preparing Vessels Intended to Create Artificial Reefs* (available at **www.epa.gov/owow/oceans/habitat/artificialreefs/documents/0605finalreefguidance.pdf**). These materials include, but are not limited to: fuels and oil, asbestos, polychlorinated biphenyls (PCBs), paints, other materials of environmental concern (e.g., mercury, refrigerants), and debris (e.g., vessel debris, floatable, introduced material).

All loose paint was removed. All asbestos and electrical wiring was removed. All machinery, nonferrous materials of salvageable quality, and pollutants was removed or cleaned and left in place. Holes were made in the side of the ship to allow for air and water circulation and for some limited diver access. The upper deck area was made diver-safe; with doors/hatches either sealed shut or welded open. All hazardous conditions were ameliorated, such as removal of glass and sharp objects that could injure divers. The U.S. Coast Guard will perform one final inspection for pollutants and debris before the SHIP is towed to the reef site.

The CONTRACTOR completed remediation work under the guidelines of the ESCO Marine Environmental Management Plan (stated as ESCO BMP) (Attachment O). Specific to the SHIP, the following waste streams were tested, abated and remediated:

- Oils, Fuels and Greases;
- Chromate Ballast Water;
- Waste Water Collection;
- Asbestos;
- Polychlorinated Biphenyls including:
  - All liquid PCB-containing components
  - All solid PCB-containing materials
  - All paint and/or painted surfaces which tested positive for PCB's in concentrations ≥ 50 ppm;
- Paints including:
  - All loose paint from walls, bulkheads, decks and hull
  - Sweep and dispose of loose paint on deck surfaces;
- Other Hazardous Materials:
  - Batteries
  - Refrigerants
  - Halons
  - Mercury
  - Antifreeze
  - Coolants
  - Fire extinguishing agents
  - Black and gray water from tanks and piping;
- Solids/Debris/Floatables
  (Any loose items and materials which may float or be transported into the water column at sinking including, but not limited to):
  - Trash
  - Wood scraps
  - Light Bulbs
  - Floor tiles
  - Carpet and padding
  - A/C Equipment
  - Furniture
  - Ductwork
  - Wood paneling
  - Ceiling tiles
  - Plate glass
  - Machinery
  - Items left from remediation.

The CONTRACTOR was also tasked with preserving unique items still aboard the *Texas Clipper* which included artifacts, documents and ships' equipment. CONTRACTOR removed the following for use by TARP and TAMU to preserve the nautical heritage of the SHIP:

- Texas A&M Logo signs from stack;
- *Texas Clipper* nameplates;
- All brass portholes and light cages;
- Wooden hatch covers;
- Propeller (left in place);
- Glass globes;
- All documents, drawings, photographs.

All subcontractors used for waste disposal and laboratory analyses are listed in PART 9.0 below and manifests for all materials removed are in Attachment P.

4.3 Location and Description of Where Work was Performed

All work during cleanup was performed at the ESCO Marine, Inc. Scrap and Dismantling Yard located at 16200 Joe Garza Sr. Rd., Brownsville, Texas 78521. The yard is located at the Port of Brownsville on the north side of the Brownsville Ship Channel.

The facility consists of approximately 52 acres of land, including a 2-story office building with a medical station, eating facilities, accounting, environmental safety office and management offices. The facility is owned by the Port of Brownsville and is leased to ESCO Marine for three years with an option to renew for an additional five years. ESCO Marine, Inc. has a current automatically renewing lease with the Port of Brownsville for up to 30 years (September 2034), at which time ESCO will have the option to renew the lease.

The *Texas Clipper* was docked at ESCO's facility during the entire remediation and preparation for sinking process. The SHIP was located alongside the channel on the furthest east side of the ESCO yard (side-saddle). The yard has the capacity for up to six mooring areas to accommodate six vessels, two of which can be of approximately 600 ft in length and one of approximately 1100 ft in length.

ESCO's yard is capable of comfortably positioning and mooring up to six C-4 type vessels or larger at any given time; two in the slip and four alongside the ship channel on each side of the slips and in the middle. The yard is currently set up with deadmen that have been buried at least 15 ft below the yard's surface. There is one such deadman every 100 ft on either side of slips, allowing for placement of up to 12 security lines per vessel (2 per deadman).

4.3.1 Brownsville Facility Preparation for Ship Arrival

Prior to the arrival of the *Texas Clipper* in Brownsville, Texas, the ESCO facility was inspected to ensure environmental and worker safety. Pollution booms were made ready for deployment completely around the vessel to guard against any pollution discharge. A full complement of pollution response equipment was staged at the facility and the CONTRACTOR's Environmental Emergency Response subcontractor was notified as to start date of operations and was on 24-hour call.

The SHIP was completely surveyed to identify worker hazards (unsafe deck and structure hazards, weakened handrails, etc). Areas of hazard were marked, repaired and/or removed. Workers maintained all work areas by removing unneeded items, set up areas for temporary storage of containerized waste, spill kits, and a general area for placing of an on-board office, decontamination trailer, supply containers, and waste containers. Confined spaces such as tanks were not entered until atmospheric readings had been obtained and a confined space program in place by a marine chemist/competent person.

4.3.2 Mooring, Security, and Worker Safety during Remediation and Modification

Upon arrival of the SHIP at ESCO's slip, it was moored alongside the channel and secured to the bank with lines tied to deadmen. The vessel was secured with two fixed lines of 3-in rope/wire rope and anchor chain at the bow, and an additional 10 spring lines of 3-in rope throughout amidships.

There is a good security system to protect the SHIP and workers at ESCO Marine. A guard at the gate controls ingress and egress of all personnel and materials, and a 24-hour guard is maintained on the premises and rail.

Safety was of paramount importance in this project. Both TARP and CONTRACTOR supported the safety and health rules as set forth in the Occupational Safety and Health Act of 1970. Each ESCO Marine employee was required to comply with these safety and health standards as well as ESCO's Health and Safety Procedures Manual. When deficiencies in procedures or worksite hazards were identified, events were reviewed and corrective action taken.

4.4 Inspection of Preparation Process

Inspections during and after the preparation process were conducted by TARP and its Consultants as listed in Section 1.4.2 above. A final walk-through will occur by the USCG just prior to towing of SHIP to the reef site to insure no loose debris is present. Final approval of cleanup and preparation for sinking will occur with approval from the USEPA. Inspections are documented in photographs (computer compact disc) which depicts a series of "before" and "after" remediation \ hull modification photos (Attachment AA)

4.5 Materials of Concern

4.5.1 Oil and Fuel

<u>4.5.1.1 Clean-up Goal for Oil and Fuel:</u> The cleanup goal for oil and fuel is to remove liquid hydrocarbons (fuels, oils) and semi-solids (greases) so that no visible sheen is remaining on the tank surfaces (this includes all interior fittings, piping, structural members) or on the water surface when the equipment is flooded after sinking; and no film or visible accumulation (i.e., spills on decking or rugs) is remaining on any vessel structure or component.

4.5.1.2 General Identification of Contaminant: The fuels and oils onboard the SHIP may be contaminated from long exposure to other substances or surfaces. Although these substances may not be used by ESCO Marine, Inc., they are often of value to recycling firms for fuel blending programs.

It is ESCO Marine's policy to attempt to dispose of fuels and oils through a recycling firm that will recycle and pass on to fuel blending programs. In such cases, a TCEQ licensed contractor must be present and a U.S. Coast Guard approved Spill Prevention and Emergency Response Plan, in accordance with the Oil Pollution Prevention regulation (40 CFR part 112), in place before extraction of any fuels or oils from ESCO Marine site, or vessels. At ESCO Marine, MidState Environmental Services removes and transports such oils for recycling.

Fuels and/or oils that were extracted were sampled and tested by the prospective recycler of the material. Samples were labeled and recorded by location of extraction. Tests performed for fuel oil included Total Halogenated Chlorides to determine any possible hazardous contamination, and a Sulfur test to determine the possible application of the fuels during fuel blending, as well as a PCB Test. In order for fuel blending to be possible the total chlorides test must show less than 1000 ppm.

The extraction of fuel oils and lubes in bulk, for the purpose of recycling and/or fuel blending were extracted by on-site trained personnel. All used oil materials were placed in a 500 barrel Frac tank for large quantities, or DOT approved containers and labeled appropriately according to regulations [40 CFR 279.22(c)(1)], for smaller quantities.

4.5.1.3 Pre-Cleanup Assessment, Survey, and Assumptions: While it had been planned for SSCI to collect samples of water, fuel oil, diesel oil, and lube oil for chemical analysis during the Hazardous Materials Assessment, conversations with MARAD personnel lead to the conclusion that the work could not be safely completed at that time. Since opening the storage tanks to gain access for sample collection would pose a risk of explosion, it was decided (in communication with TARP personnel) that this work could be more economically performed during ship decontamination activities. In addition, conversations with MARAD personnel identified uncertainties about which tank sounding ports (or scuttles) should be used for sample collection and sounding. An attempt was made to confirm previous MARAD tank soundings but the ship was listing to such a degree that the Trim Table used to estimate volumes from the soundings was not valid.

The results of MARAD soundings completed in 1996 and 2000 are presented in Attachment F. MARAD soundings for water, lube oil, diesel oil, and fuel oil completed in 1996 and 2000 were evaluated and the two soundings were in relatively close agreement. It was estimated that total fuels and oils ranged from 307,919 gal in 1996 to 318,727 gal in 2000. Using this information, an estimate of over 366,536 gal was calculated based on volumes plus a 15% error and this quantity was built into the TARP remediation contract. The results of the soundings showed a relatively large volume of fuel oil relative to the volume of water (148,913 gal of water; 210,274 gal of fuel oil; 1,826 gal of diesel oil, and 5,523 gal of lube oil).

In May 2006, the SHIP developed a hole in its hull and sank on its stern end in the MARAD Reserve Fleet harbor, Beaumont, Texas. After the ship was raised and the hull patched, the USEPA required MARAD to remove all oil and fuel from the ship before it could be towed from the facility. As part of the transfer agreement between MARAD and TPWD, all fuel tanks were pumped down to a non-suction level and any obvious fuels and oils removed before the SHIP's re-location to the Port of Brownsville. Only residual levels (1 – 7 inches) of fuel and oil remained in tanks after MARAD removal. The basic assumption when the SHIP arrived in Brownville, Texas was that there would be very minimal amounts of fuel or oil remaining in tanks.

4.5.1.4 Remediation of Oil and Fuels Including Hydraulic Oil, Lubricants, Grease, Sludge, Bilge Water and Sump Oil: The SHIP carried stores of fuels and lubricants for its propulsion and auxiliary systems. The CONTRACTOR was responsible for preparing SHIP in accordance with the BMP. All liquid hydrocarbons (fuels, oils) and solid or semisolid hydrocarbons (greases) were removed and CONTRACTOR provided TARP with manifests documenting removal and disposal. CONTRACTOR was allowed to salvage any of the fuels and oils for recycling and/or resale. Specifically, CONTRACTOR performed the following:

1) Removed ALL liquid hydrocarbons (fuels and oils) and semi-solid hydrocarbons (grease) from the SHIP including but not limited to ALL tanks, inner bottom voids, and interconnected or attached piping, and ALL piping running through bilge areas of machinery spaces so that the SHIP met BMP standards and no visible sheen of hydrocarbons remained on tank surfaces, interior fittings, piping, etc. All structural tanks, non-structural tanks, inner bottom voids, and interconnected or attached piping; and all piping running through bilge areas of machinery spaces were assumed to be contaminated by hydrocarbons or chromated ballast water unless proven otherwise by inspection.

2) Opened ALL tanks and inner bottom voids, interconnected or attached piping, and all piping running through bilge areas of machinery spaces to provide human access and entry for inspection by TARP, SSCI, and the USCG.

3) Removed and disposed of ALL combustion engine oil filters and strainer elements.

4) Used a sequence of methods to remove fuels and oils which included a combination of suction pumping, power washing, physical scraping, Biodiesel and BaadBugs-Super Concentrate Surface Cleaner™ (MSDSs in Attachment Q). The sequence of cleaning involved opening tanks and piping, pumping out any residual liquids remaining from the MARAD removal prior to SHIP transfer to TARP, physically scraped voids, Biodiesel added as a thinner, power washing, and pumping of residuals to a holding tank on shore. BaadBugs™ was then applied to tank surfaces and interior voids. The product contains hydrocarbon-eating organisms that were allowed to work for several days before power washing was repeated. This sequence was repeated until tanks or piping was visually inspected and cleared by TARP, SSCI, and the USCG.

5) Inspected all machinery for sump oil accumulations. These oils were extracted and tested for PCBs. (Sump oils tested less than 5 ppm for PCBs and were recycled).

6) Removed covers on winch systems and machinery that were to remain in place, drained liquid hydrocarbons, and cleaned as in the sequence in 4) above.

7) Exercised spill prevention during the handling of petroleum and petroleum products by operating under the CONTRACTOR's Spill Prevention and Emergency Response Plan (previously reviewed by ESCO Marine, Inc. and by USCG and the GLO). ESCO also employed trained response crews on site equipped with all necessary equipment and supplies to handle any spills.

4.5.1.5 Results of Hydrocarbon Remediation and Verification : A total of 330,452 gallons of hydrocarbon contaminated liquids was removed from the SHIP by the CONTRACTOR. This quantity reflects waste and rain water accumulation during the clean-up process and incoming sea water that leaked into the ship in two areas of the hull (see section 4.5.6 below). These waters were assumed to contain hydrocarbons and removed accordingly. Approximately 7,000 gallons of hydrocarbons was recycled by MidState. Also, 7,040 lbs of oil sludge was removed from settling tanks and disposed of at US Ecology Texas L.P. in Robstown, Texas. Manifests are presented in Attachment P, Tabs P1-P2.

All fuel tanks and inner bottoms were pumped and cleaned according to the procedure in 4.5.1.4, 4) above with the exception of a forward tank on the port side which filled with seawater after a compromise in the hull. The tank was treated with BaadBugs™ over a two-week period, and then pumped down using high capacity pumps that enabled workers to get inside the tank to repair the hull. The tank was then cleaned in similar fashion as the other tanks.

During the tank cleaning phase, the SHIP began listing to port and required ballasting by filling up fuel tanks and sealing them. Before the tanks were sealed, TARP and SSCI visually inspected the interior of the tanks and found them clean of any significant amounts of hydrocarbons. Due to a miscommunication with the Brownsville, Texas USCG office, USCG personnel were not present to enter the tanks during this time but made visual inspections from tank opening levels at a later date.

TARP was advised that USCG standard policy is not to certify that a vessel is clean for reefing but to aid the vessel owner and contractor in determining that all obvious pollutants have been removed. The Brownsville USCG office was instrumental in providing inspections and advice on hydrocarbon removal and insured that all piping and visual hydrocarbons were removed. They performed several on-board inspections and found that obvious pollution hazards were removed (Attachment R).

No significant amounts of hydrocarbons remain on board the SHIP that would cause a visible sheen on the ocean surface after reefing.

4.5.2. Asbestos

4.5.2.1 Clean-up Goal for Asbestos: The cleanup goal for asbestos is to remove ALL asbestos containing materials from the ship by a certified asbestos remediation company contracted through ESCO Marine, Inc. and dispose of all ACM through USEPA approved means. The

CONTRACTOR's responsibility was to provide TARP with appropriate documents certifying the ship is asbestos-free.

4.5.1.2 General Identification of Contaminant: The SHIP was surveyed visually upon its arrival in Brownville to determine the location of items potentially containing asbestos or ACM and using the baseline study provided by SSCI. Particular attention was given to thermal insulation for machinery and piping, wall insulation on living quarters, machining rooms, floor and wall tiles, and ventilation insulation. ESCO Marine's dismantling projects fall under both NESHAP [40 CFR 61 Subpart M] and the Toxic Substances Control Act (TSCA) for environmental issues and (29 CFR 1915.1001) for health and safety issues.

In addition to the Hazardous Materials Assessment by SSCI, bulk sampling was used in representative interior compartments of the vessel where asbestos was suspected (Attachment S) and conducted as follows: The sampling was conducted from insulation in the funnel, red rubber flooring of the Promenade deck, fibrous powder under flooring tiles, and several areas in the engine room. Any sample that revealed detectable asbestos fibers, whether friable or non-friable, was generalized to include the whole extent of the independent medium and was abated accordingly. For example, tan fibrous powder (similar to concrete) under floor tiles contained 5% Amosite so all of that material was treated as ACM throughout the ship. All samples were labeled appropriately to include: specific location descriptions citing deck, room and medium to allow for easy tracking of the samples.

All ACM samples collected by the CONTRACTOR were analyzed by Envirotest, utilizing Polarized Light Microscopy (PLM) and Transmission Electron Microscopy (TEM). Detailed chain of custody was maintained for all samples. The analysis of the samples was the basis for determining the extent and scope of the abatement work to be performed by the abatement contractor and profiling for disposal (Attachment S).

4.5.2.3 Pre-Cleanup Assessment, Survey, and Assumptions: Quantities of asbestos observed before the SHIP cleanup are found in the SSCI hazardous materials assessment. Results of asbestos analyses are found in Attachment F, Appendix 2, Table 2 and asbestos surveys are presented in Attachment F, Appendix 3, Table 1.

Asbestos was the most common material of concern found on the *Texas Clipper*. It was found throughout the ship, and all was severely damaged and friable. Estimated quantities of asbestos in the floors, walls, ceilings, and thermal insulation totaled more than 194,000 ft^2. It appeared that all of this material must be removed, and it was likely that additional asbestos would be found behind walls and bulkheads and above the ceiling during the decontamination project. A later estimate of asbestos by the CONTRACTOR and TARP lowered the amount to 2,835 yd^3 which was used in the final contract.

Air sampling for asbestos was performed by SSCI during the second fieldwork event on 8 July 2004 (Attachment S). Air monitors were worn by four persons during the inspection. The results obtained were all less than 0.003 fibers per cubic centimeter air. These results were below all action levels of respiratory protection as defined by the Occupational Safety & Health Administration (OSHA), the Environmental Protection Agency (EPA), or the Texas Department of Health (TDH).

4.5.2.4 Remediation of Asbestos: Remediation methods for asbestos are detailed in Attachment O and summarized here.

All asbestos abatement work was performed by state licensed asbestos abatement workers employed by ESCO Marine, Inc. SSCI reviewed the records of workers to insure CONTRACTOR was in compliance with all licenses, certificates, training certificates and physical test results for all personnel who worked on the abatement project (Attachment T). The contractor also submitted to copies of their daily log sheets (Attachment T) and the results of air monitoring samples (Attachment S).

As an industrial facility in Texas conducting abatement in non-public structures, the TDH does not require the Asbestos Abatement Contractor to have a TDH License Number, but that they maintain current training records onsite during the abatement. However, TDH was notified through a 10-day Abatement/Demolition Notification.

Any area identified as a "regulated area" was clearly marked in accordance with [29 CFR 1915.1001(k) (7)]. There was no demolition work performed in the immediate vicinity of identified ACM until all the ACM was appropriately abated. Certain sections of the SHIP were worked prior to complete abatement. In those events, work in certain areas was performed by personnel that were trained in Asbestos Awareness.

Dependent on the situation, one of several methods was utilized to abate ACM. The most common method was to utilize the construction of a negative pressure enclosure. In this method, gross abatement took place in conjunction with wet removal methods and amended water usage until encapsulation. Another method used when appropriate for dealing with pipe thermal insulation in small quantities was the glove-bag technique. Finally, in areas of excessive amounts of pipe in hard-to-reach places, the pre-wrap method was utilized. In this process, pipe thermal insulation is glove-bagged in certain sections where the cut to the pipe will be made. Prior to the cut, the ACM is double wrapped from one abated section to the other in polyethylene-sheets. Upon completion of cutting the wrapped section of pipe is removed and transferred to a predetermined location. When sufficient wrapped pipe is accumulated, the area is enclosed in negative pressure and abatement can commence.

Once ACM was removed, ESCO Marine utilized a vacuum process for wetting and bagging the loose asbestos with a VecLoader Hepa Vac II. This is a completely self-contained, trailer mounted, vacuum unit capable of evacuating asbestos fibers and any other hazardous waste stream requiring HEPA filtration. At an operating rate of up to 14 tons per hour, the Hepa Vac transports material through a 5-in smooth bore suction hose at distances up to 800 ft.

From the pick up point, the collected material travels through the hose to a cyclone separator, where it is bagged directly from the vacuum. Bagging is accomplished using a new, totally enclosed valve assembly designed especially for the Hepa Vac. It allows an operator total control of the bagging process by isolating the material as it flows from the cyclone collector into the collection bag. To give flexibility in positioning the bagging station at the job site, the cyclone separator discharge spout can be elevated to any position up to 8 ft 6in above the ground. At the pick up point, one man operates the suction hose. At the bagging station, another man operates the unit, wets the asbestos, and fills the bags. The bags are placed inside a lined container for disposal. The asbestos filtering process is described in Attachment O.

Once ACM was abated and removed from regulated areas, CONTRACTOR contracted with Ambiotec Environmental Consultants to perform Final Clearance sampling on areas that were abated (Attachment S). The results of this analysis determined whether or not the area may be opened for workers to begin other remediation work. No work occurred in abated areas until the final clearance was obtained.

The material was wetted and double bagged in 6-mil Polyethylene disposal bags, in accordance with [40 CFR 61.150(a) (1)], and then loaded into a specified asbestos container provided by Browning Ferris Industries (BFI). This container was clearly labeled with warnings as to prevent accidental handling by untrained personnel. The ACM remained in these sealed containers until full enough to be hauled away by BFI.

All of the SHIP's ACM was transported and disposed of in accordance with 40 CFR 61.150 through the BFI Rio Grande Valley Regional Disposal Facility in Donna, Texas. The loads were transported in containers loaded with a maximum of 39 yd^3.

Manifests were completed at the ESCO Marine yard by ESCO as the generator and BFI as the transporter. The manifests were then completed at Donna, Texas when the container was delivered at the landfill. ESCO retained an interim copy of the manifest while the load was in transit, and later matched it with a completed copy of the manifest once BFI completed the document. All manifests will be maintained onsite throughout the life of ESCO Marine and copies are presented in Attachment P, Tab P-3.

4.5.2.5 Results of Asbestos Remediation and Verification : A total of 1,680 yd^3 of asbestos was removed from the SHIP, representing ALL ACM located. Removal included ceiling tiles, wall boards, floor tiles, pipe insulation, and some fibrous flooring. Manifests are presented in Attachment P, Tab P-3. Ambiotec Environmental Consultants performed a Final Clearance sampling report on each deck area that was abated and results indicate that all abated areas were certified as asbestos-free (Attachment S). TARP and SSCI inspections showed no visible traces of asbestos on the SHIP.

No ACM-containing materials remain on board the SHIP.

4.5.3 PCB Containing Materials

4.5.3.1 Clean-up Goal for PCBs: The clean-up goal for Polychlorinated biphenyl (PCB) containing materials is to remove all solid material containing PCBs greater than or equal to (≥) 50 milligrams per kilogram (mg/kg or ppm), remove all liquid materials containing PCBs, and to decontaminate surfaces with PCB containing coatings to less than or equal to (≤) 10 micrograms per 100 square centimeters ($\mu g/100\ cm^2$).

4.5.3.2 General Identification of Contaminant: Although restrictions on PCB use have been in place for over twenty years, many older vessels still have regulated PCB containing materials in place. On the SHIP, PCBs were expected to be found in electrical components (transformers, capacitors, and other electrical equipment), in electric cables, paint and ventilation gaskets. All liquid materials including sealed source fluid filled electronic components containing PCBs were considered suspect. All solid material containing PCBs were to be removed to a level of <50 ppm to meet or exceed BMP guidelines. CONTRACTOR was tasked with removal and disposal of ALL liquid and solid PCB-containing materials as listed in the TARP contract (Attachments D, E). CONTRACTOR was also tasked with removal and disposal of ALL paint and/or painted surfaces that tested positive for PCBs per the Hazardous Materials Assessment.

ESCO Marine, Inc. followed best management practices (Attachment O), based on regulations 29 CFR 1915, and 40 CFR 761, the Hazardous Materials Assessment, and TARP contract tasking for use in identifying and removing PCBs in the SHIP. It was assumed that the following materials contained PCB's ≥50 ppm and required removal:

- All electrical cable (Stratum I);
- All ventilation gaskets (Stratum II);
- All felt gaskets (Stratum III);
- All other Stratum III media such as fiberglass insulation, cork insulation, caulking, grout, adhesives, various rubber & plastic products and fluorescent light ballast casings;
- All circuit breakers and voltage regulators.

In addition, all transformers and capacitors were inspected to determine if they contain heat transfer fluids or are dry. After this determination was made the items were separated and sampled for disposal, as per 40 CFR 761.62. Any and all tanks containing fluids, oils, lubricants, and/or greases were to be sampled independently.

4.5.3.3 General Sample Collection for Verification of PCB Removal: SSCI was contracted to verify that all PCBs have been removed or reduced below the USEPA standard of 50 ppm. Sampling and verification procedures are detailed in Attachment H and paraphrased below:

Samples for PCB analysis were collected from surfaces where PCB containing material was removed, and suspect PCB-containing liquids (e.g., heat transfer fluids, oils, lubricants, greases, fuel oil, diesel, and bilge water). Liquid PCBs were assumed to be present in electrical capacitors by the CONTRACTOR, and since they were in a closed system they were not sampled but disposed of as PCB waste. Collection of paint samples required the use of sampling equipment, which was decontaminated between uses at each sample location in the following manner:

- Wash thoroughly with a laboratory detergent (Alconox or equivalent) to remove any particulate matter and/or surface films.
- Rinse thoroughly with clean potable water.
- Rinse thoroughly with clean deionized water.
- Rinse with pesticide-grade isopropanol.
- Rinse thoroughly with organic free deionized water.
- Air dry.

- Wrap decontaminated equipment in aluminum foil (shiny side out) for storage and transportation.

The effectiveness of decontamination procedures was evaluated through the collection and analysis of equipment blanks.

Wipe samples were collected to assess the presence of contaminants on various types of hard surfaces. The major objectives for wipe or surface samples were:

- To establish whether or not a contaminant is present.
- To determine the level and extent of contamination.
- To measure decontamination efficiencies and/or effectiveness.

This procedure was applicable to the collection of wipe samples on hard surfaces such as floors, walls, and equipment. Wipe samples were an effective means for collecting a specimen of ambient constituents deposited or settled on surfaces as a result of some contaminant-releasing incident. Surface areas of personal contact, machinery, floors or those areas associated with air handling systems were typical sample locations.

The Code of Federal Regulations (CFR) Part 767 [Polychlorinated Biphenyls (PCBs) Manufacturing, Processing, Distribution in Commerce, and Use Prohibitions] addresses PCB decontamination verification procedures under Subpart P [Sampling Non-Porous Surfaces for Measurement-Based Use, Reuse, and On-Site of Off-Site Disposal Under §761.61(a)(6) and Decontamination Under §761.79(b)(3)]. The applicable procedures outlined under 5761.302 (Proportion of the total surface area to sample), §761.304 (Determining sample location), §761.306 (Sampling 1 meter square surfaces by random selection of halves), §761.308 (Sample selection by random number generation on any two-dimensional square grid), 5761.310 (Collecting the sample), 5761.312 (Compositing of samples), §761.314 (Chemical analysis of standard wipe test samples), and §761.316 (Interpreting PCB concentration measurements resulting from this sampling scheme) are consistent with the methodology presented in the USEPA Guidance (USEPA, 1995).

If results of sampling indicated that the PCB concentration at one or more locations was greater than 50 mg/kg, the area or areas to be re-treated were delineated using the sample locations with PCB concentrations less than 50 mg/kg. The re-treated areas were re-sampled in accordance with the USEPA Guidance (USEPA, 1995).

In implementing the procedures for sampling, a minimum of eight (8) samples for each homogenous decontamination area were collected and analyzed to allow calculation of the upper 95% tolerance limit (UTL) for the residual PCB concentration. The minimum eight-sample standard is cited in "Use of Statistics for Determining Soil/Groundwater Cleanup Levels under the Texas Risk" (TNRCC, 1998), and the standard is now accepted under the Texas Risk Reduction Program.

The UTL was calculated as follows (see Attachment H, Appendix 5):

- Calculate the mean (x) and the standard deviation (S) from the data set.

- Obtain the appropriate tolerance factor (k) for the number of samples (n) as reported in Lieberman (1958) and shown in Attachment H, Appendix 5, Table 1.
- UTL = x + kS

Re-treatment was conducted until the 95% UTL PCB concentration for a homogenous decontamination area was less than 50 mg/kg. Recommended equipment and supplies are listed in Attachment H.

Wipe sample procedures used were as follows:

A. Wipe Area - The standard wipe area is 100 cm^2. When a specific project requires a different sample area, it will be specified in the site-specific work plan. If specific site conditions prevent the use of a contiguous 100 - cm^2 arc at a single location, smaller areas from the same general location may be sampled and composited to form one sample for analysis.

B. Solvent - Hexane (pesticide grade or equivalent) will be used for PCB wipe sampling.

C. Collecting the Wipe Sample - Prepare wipe collection pads by placing the 100% cotton sterile gauze pads into the wide-mouth glass jar with gloved hands or forceps. Saturate the pads with hexane.

D. Begin the sampling procedure by collecting a field blank by wiping the entire outer surface area of a new disposable glove with a prepared gauze pad. The field blank will determine if specific analytical interferences may be present in the gauze pads, solvent, or the gloves. This procedure is repeated at a frequency of 5% of samples collected (1 per 20 samples), or at least once for each day that samples are collected.

E. Locate the area to be sampled and mark it with pencil or a non-interfering tape (e.g., masking tape) using a decontaminated template or disposable template. The templates can have square, rectangular, or circular openings. If reusable templates are being used, they will be decontaminated by wiping with a gauze pad dipped in hexane and then the template will be rinsed in hexane.

F. Put on a new pair of gloves and press the sampling pad within the designated sample area. With straight, even strokes, draw the pad across the area, slightly overlapping each stroke. For a circular template, wiping begins at one point with the swab moving along the edge in a clockwise direction. The motion is repeated using progressively smaller circular patterns until the entire area is wiped. A similar motion is used for a square template. The wiping begins at the upper left corner and follows a clockwise direction around the perimeter, which is then followed by parallel strokes in a left-to-right direction until the area is sampled. The rectangular template requires wiping the perimeter and then making additional passes along the length of the template until the area is sampled. Change the wiping direction with a clean pad and repeat the pattern until confident that all of the surface contaminant has been removed. Therefore two or more pads will be used and placed in the appropriate pre-labeled sample container for the sample location.

G. After wiping the surface, the potentially contaminated side of the swab is folded inward and placed in either a glass sample container with a Teflon-lined screw cap or a metal sample container with metal screw cap using either gloved hand or forceps. Forty-ml VOA bottles can be used as wipe sample containers. Latex gloves will be worn during sampling and will be changed between samples to prevent cross contamination. It is strongly recommended that a photograph be taken of each sample location with the sample identification visible. The photographs should have identifiable reference points when possible. The preferred procedure will be to mark the sample identification on disposable templates and tape them back in position after collecting each sample. Then, photographic documentation and measuring can occur with relative positions of each sample more accurately recorded.

4.5.3.4 Pre-Cleanup Assessment, Survey, and Assumptions: The October 2004 SSCI Hazardous Materials Assessment (Attachment F) did not find any PCB-containing liquid materials on-board the SHIP. The CONTRACTOR sampled and analyzed liquids from the vessel's tanks and compartments to determine PCB concentrations and found none (Attachment U). However, the CONTRACTOR did find 4,000 lbs of liquid PCBs in the form of transformers and capacitors.

The Hazardous Materials Assessment also evaluated PCB-containing electrical wires, cables, gaskets, insulation and electrical equipment. The survey included the collection of 57 samples of suspected PCB-containing materials from Decks A, B, C, N, O, P and S. The sampling followed a stratified random sampling scheme that considered variation between decks and the three tiers of material identified in the EPA Guidance (USEPA 1995). Specifically, the materials included electrical wiring, insulating materials, door gaskets, caulk, gaskets, light fixture ballasts, and other miscellaneous materials associated with the SHIP's electrical system. The detected PCB concentrations included Aroclor 1248, 1254, and 1260.

Total PCB concentrations ranged from below detection limits (15 samples or about 26%) to 1,580 mg/kg for a sample of wiring on A-Deck. In addition to the A-Deck sample, there were 10 samples with total PCB concentrations that exceeded the 50-mg/kg threshold (about 19% of the total number of samples). Included with the < 50-mg/kg samples were two samples from C-Deck with detection limits that exceeded 50 mg/kg. Laboratory analysis indicated that matrix interference in several samples required the use of dilutions that raised the detection limits. The table below provides a detailed description for the 11 samples that were < 50-mg/kg.

Table 2. Suspect PCB containing materials and location on SHIP.

Suspect PCB Containing Material/Location	Total PCBs (mg/kg)
Navigation Deck, wire bundle protruding from wall between portholes (Photo 1)	610
Officers Deck, Cork Duct Insulation in Radio Room (Photo 2)	55
Promenade Deck, Cork Duct Insulation above ceiling (Photo 3)	67
A Deck, Cork Duct Insulation in Room 135 Restroom (Photo 4)	730
A Deck, Wire Insulation at Starboard Aft Entrance Stairwell (Photo 5)	1580
A Deck, ¾ inch Wire Insulation in Cargo Gear Locker Starboard Forward (Photo 6)	360
A Deck, Cork Duct Insulation across from A 110 Port side	59

Suspect PCB Containing Material/Location	Total PCBs (mg/kg)
B Deck, 1/4 inch Wire Insulation in Water Tight Door #7	59
C Deck, Engine Room, ¾ inch Wire Insulation in Electrical Panel	220
C Deck, Engine Room, 1/8 inch Wire Insulation, Water Transfer Pump Electrical Panel (Photo 7)	< 400
C Deck, Engine Room, ¼ inch Wire Insulation, Water Transfer Pump Electrical Panel (Photo 7)	< 110

Three additional samples were collected from the Promenade or P-Deck for PCB analysis of rubber gasket material, the surface of wood decking material, and the deck surface below the wood decking material. The results for these three P-Deck samples were below detection limits for the two deck samples, and well below 50 mg/kg for the rubber gasket material.

The Hazardous Materials Assessment also analyzed paints and coatings on the SHIP. A collection of 28 samples was made for PCB analyses from interior and exterior painted surfaces. The sampling followed a stratified random sampling scheme that considered variation between decks, exterior surfaces, interior surfaces, and paint colors. The results are presented in Appendix 1, Table 1 of Attachment F, along with the laboratory reports. All of the detected PCB in paint concentrations was for Aroclor 1260. Aroclor 1260 is a mixture of different congeners of chlorobiphenyl and the relative importance of the environmental fate mechanisms generally depends on the degree of chlorination. In general, the persistence of the PCB congeners increases with an increase in the degree of chlorination. Screening studies have shown that Aroclor 1260 is resistant to biodegradation. Although biodegradation of Aroclor 1260 may occur very slowly in the environment, no other degradation mechanisms have been shown to be important in water.

The concentrations of Aroclor 1260 in paint ranged from below detection limits (12 samples, or about 39% of the samples), to 70 mg/kg for interior red paint found on "N" (or Navigation) Deck. The N-Deck sample was the only PCB in paint concentration that exceeded the 50-mg/kg threshold (about 3% of the total number of samples).

The Hazardous Materials Assessment included collection of wipe samples from three oil-stained areas. The results, presented in Appendix 1, Table 1 (Attachment F), showed no detectable PCBs in these stained areas.

Overall, the PCB assessment estimates included: 25,000 ft^2 paint, 100,000 lbs of electrical cabling, and 20,000 lbs of gaskets and insulation. An additional 2,000 lbs of PCB liquid materials was factored into the contract even though none were found in the assessment.

<u>4.5.3.5 Remediation of PCBs:</u> Remediation methods for PCBs are detailed in Attachment O and summarized here. PCB samples taken were labeled with the following information: a unique identification number, type of material or item sampled, location sample was collected, date of collection, name of collector, amount of sample collected, and analytical method used. This labeling process allowed samples to be traced by the deck and compartment from which they were extracted.

Qualified field personnel from ESCO Marine and SSCI performed all sampling. USEPA methods 8080, 8081, or 8082, as required, with Soxhlet extraction were used to evaluate all samples. All samples were accompanied with a proper chain of custody (Attachment V).

All gaskets, electrical cable, transformers, capacitors, circuit breakers, and all other potential media that were assumed or tested positive for PCBs ≥50 ppm were removed by personnel with 29 CFR 1910 certification. All electrical cables were removed through bulkheads, ceilings, and decks. In addition, all gaskets in air handling systems (ducts) were removed by cutting them out of the duct system or removing all of the duct work. Numerous visual inspections were made by the CONTRACTOR, SSCI, and TARP to insure complete removal of all electrical cables, insulation, and gaskets.

ESCO Marine removed PCB items from the SHIP according to the cutting and hull modification schedule developed. All Stratum I, II, and III were handled as PCB Bulk Product Waste as described in 40CFR section 761.62. Items were placed into a lined 30-yd^3 open top container. Any fiberglass insulation was first placed into high-density, 6-mil polyethylene disposal bags. A PCB label was placed on the container, indicating the out-of-service date on which the first items were placed into that respective container. Items placed inside the container afterwards were considered to have been generated on the original date placed on the container until the container was full and ready for disposal.

ESCO Marine, Inc. did not maintain any PCB Bulk Product Waste on its premises for more than 30 days. The container in which this waste was stored was covered to prevent rainfall contamination and was placed in an area designated for container storage.

All items containing PCBs ≥5 ppm liquid PCBs were identified and removed. These items were handled more carefully than solid PCBs since the potential for spills and leaching of contaminants into the soil or water was higher. They were put into barrels and placed in a container, which was then transferred from the vessel to the ground by a crane.

Only one area on the SHIP was identified in the Hazardous Materials Assessment as having PCBs ≥50 ppm in paint. This was in red interior paint on the Navigation deck (N-deck) which was removed along with the wall during asbestos abatement.

ESCO Marine, Inc. disposed of all its PCB Bulk Product Waste, according to 40 CFR 761.62, in the BFI landfill in Donna, Texas or US Ecology landfill in Robstown, Texas. The appropriate TCEQ approval, Form TCEQ-0152 for disposal of a special waste, has been renewed. Manifests will be maintained at ESCO Marine for the duration of the company's life (Attachment P, Tabs P-4 – P-7).

4.5.3.6 Special Case Remediation of PCB-containing Black Tar Material: CONTRACTOR completed removal of the wall and ceiling panels on N-Deck, and verification sampling for removal of PCBs was completed on 24 January 2007. Removal of the panels revealed a hard, black coating on the ship's bulkhead. In accordance with the October 2005 Sampling and Analysis Plan for PCB Removal Verification (SAP-PCB; Attachment H), wipe samples were collected and analyzed. The following lists the critical elements of the SAP-PCB as regards wipe samples:

1. Sets of random coordinates were generated to allow collection of a minimum of eight (8) 100-cm^2 wipe samples.

2. The laboratory (e-Lab Analytical, Inc.) provided wipe sample collection kits. Toluene was used as the wipe sample solvent.

3. A minimum of eight random sample coordinates was located, and wipe samples collected.

4. Wipe samples were delivered to the laboratory under chain of custody for analysis of PCB concentration by EPA Method 8082 (Toluene Extraction).

5. If PCBs were detected in any of the wipe samples, the 95% Upper Tolerance Limit (UTL) for the PCB concentration was computed.

6. If PCBs were not detected, or if the 95% UTL PCB concentration was less than or equal to 10 ug/100 cm^2 the deck was judged to pass the verification sampling.

7. If the 95% UTL PCB concentration was greater than 10 ug/100 cm^2 the deck was judged to fail the verification sampling and CONTRACTOR was directed to re-clean the deck.

8. The deck was re-sampled as described above until the results were judged to pass the verification sampling.

Results for the January 2007 N-Deck verification sampling results and laboratory reports with along all PCB verification sampling events are presented in Attachment W. Wipe sampling of the bulkhead on the N-deck yielded PCB concentrations of < 0.5 mg/100 cm^2 to 39 mg/100 cm^2 (we took the critical concentration to be 10 mg/100 cm^2, USEPA (1995)). A bulk sample of the coating scraped from the bulkhead at the 39 mg/100 cm^2 sample location yielded a PCB concentration of 105 mg/kg (the critical concentration is 50 mg/kg). TCLP testing of the coating showed no detectable PCB in the leachate. Overall, PCBs were detected in seven of the nine samples collected and the 95% UTL of 60 ug/100 cm^2 exceeded 10 ug/100 cm^2, the N-Deck was judged to fail the verification sampling.

Since the hard, black coating on the ship's bulkhead was not observed during the October 2004 Hazardous Materials Assessment, additional investigations were completed to determine the extent of this material on the other decks and identify the best method for removal. This additional investigation showed that the material was also present on A-, B-, C-, O- and P-Decks (Table 3).

Table 3. Total surface area by deck to be remediated for the PCB-containing black tar material.

Deck	Surface Area (ft^2)
N-deck	2,440
O-deck	6,084

P-deck	14,000
A-deck	30,000
B-deck	43,200
C-deck	350
Total	96,074

Test areas were set up on the B- and O-Decks, and pre- and post -treatment samples were collected. Pre-treatment samples were bulk samples of the black coating scraped from 25 cm^2 areas. Post-treatment samples were wipe samples collected from 100 cm^2 areas of the cleaned, primer-coated bulkhead. The results obtained are listed below:

B-Deck Pre-treatment – 1.8 mg/kg PCB
B-Deck Post-treatment – < 1.25 ug/100 cm^2 PCB

O-Deck Pre-treatment – 370 mg/kg PCB
O-Deck Post-treatment – < 2.5 ug/100 cm^2 PCB

In addition to the O-Deck post-treatment wipe sample, two bulk samples of the primer paint coat beneath the black coating were collected. This primer coat proved to be very difficult to remove by scrapping, and it was determined that the primer coat should be treated as an impervious material. Analysis of the two bulk samples of primer coat showed PCB concentrations of < 0.66 and 4.1 mg/kg.

The results indicated that the black coating could be successfully removed. The method favored by the Contractor was sand blasting (see section 4.5.3.6 for removal method discussion). Since the single B-Deck bulk sample showed a PCB concentration less than 50 mg/kg, the decision was made to conduct a verification sampling event for B-Deck using bulk samples instead of wipe samples. Bulk sampling was conducted in a similar manner as steps 1-8 above. The following lists the critical elements of the SAP-PCB as regards bulk samples:

1. Sets of random coordinates were generated to allow collection of a minimum of eight (8) 25-cm^2 scrape area (bulk) samples.

2. The laboratory (e-Lab Analytical, Inc.) provided sample collection kits.

3. A minimum of eight random sample coordinates was located, and bulk samples collected.

4. Bulk samples were delivered to the laboratory under chain of custody for analysis of PCB concentration by EPA Method 8082 (Toluene Extraction).

5. If PCBs were detected in any of the bulk samples, the 95% Upper Tolerance Limit (UTL) for the PCB concentration was computed.

6. If PCBs were not detected, or if the 95% UTL PCB concentration was less than or equal to 50 mg/kg the deck was judged to pass the verification sampling.

7. If the 95% UTL PCB concentration was greater than 50 mg/kg the deck was judged to fail the verification sampling, and the Contract was directed to re-clean the deck.

8. The deck was re-sampled using the wipe sample methodology until the results were judged to pass the verification sampling.

The results for the April 2007 B-Deck verification sampling are presented in Attachment W along with PCB verification sampling. Since PCBs were detected in all of the eight samples collected and the 95% UTL of 969 mg/kg exceeded 50 mg/kg, the B-Deck was judged to fail the verification sampling. The decision was made to treat all of the black coating as PCB containing material, and remove it completely from Decks A, B, C, N, O and P.

On 18 May 2007 verification sampling was completed for Decks N, O and P using the SAP-PCB procedure for wipe sample testing. PCBs were not detected in any of the eight samples collected for both N- and O- decks, and these decks were judged to pass the verification sampling. PCBs were detected in all of the eight P-Deck samples. While only one sample exceeded 10 ug/100 cm^2 (P-Deck Point 3, 36 ug/100 cm^2), the 95% UTL was 45 ug/100 cm^2. P-deck was judged to fail the verification sampling, and CONTRACTOR was directed to re-clean the bulkhead.

On 15 June 2007 verification sampling was completed for Decks A, B, C and P using the SAP-PCB procedure for wipe sample testing. PCBs were not detected in any of the eight samples collected for each of A-, B- and C-decks, and these decks were judged to pass the verification sampling. PCBs were detected in two of the P-Deck samples. The 95% UTL was 0.768 ug/100 cm^2. P-deck was judged to pass the verification sampling (Attachment W).

Sand media used in remediation (sand blasting) was tested by Ana Lab and showed low concentrations of PCB but high levels of lead (Attachment V). All sand media was disposed of at the US Ecology Texas, L.P. in Robstown, Texas. Manifests for sand media are presented in (Attachment P, Tab P-7).

4.5.3.7 Criteria for Decontamination Method Selection for Large Areas Containing PCBs: In considering methods to remove the black tar-like material, the CONTRACTOR tested five different removal methods and, along with TARP, evaluated each one on its effectiveness, timeliness of removal, cleanup issues, costs and worker safety.

Method 1: The first method involved hydro-blasting. Using a small area of P-deck, CONTRACTOR set up a containment area to test the use of hydro-blasting in cleaning the bulkheads. ESCO Marine used a hydro-blasting system offered by Flow International Corporation from Kent, Washington called the HUSKY® ultrahigh-pressure waterjet system. It is generally used for metal surfaces that might require removal of PCB paints as determined through sampling and analysis based on Toxic Substances Control Act (TSCA) requirements.

The system consists of a high-efficiency and output pump which drives water to ultrahigh-pressures of 40,000 psi through waterjet systems and up to three, concurrently running, A-3000 handheld cleaning tools, which can be maneuvered by properly trained personnel to abate all PCB-contaminated paint from the surface of a metal piece or structure. The equipment features high efficiency water utilization which can limit consumption of water to between 2.5 and 3 gallons per minute. Pressurized water travels from the pump through a high-pressure hose to a pneumatically powered A-3000 handheld jet cleaning tool controlled by an ESCO employee. Paint-coated metal surfaces can typically be abated to NACE Visual Standard No. 3 at a rate of approximately 300 ft^2/h.

Use of hydro-blasting on SHIP proved problematic in that water could not be retained in the containment area. Due to the numerous holes in deteriorated decking, water drained to other areas of the ship and contaminated additional areas. Although this method was considered the easiest and least costly, it was determined as not acceptable.

Method 2: Involved the use of d-LIMONENE® (www.floridachemical.com), a technical grade biodegradable solvent occurring in nature as the main component of orange peel. The MSDS is referenced in Attachment Q). The product dripped onto plastic covering the deck area, creating a very slippery work surface. It also did not appear very effective and required much manual labor in rubbing the material on the bulkhead. This method was not deemed acceptable by itself and other methods were tested.

Method 3: The third method tested the use of Amstar® (www.amstar-usa.com), a corrosion preventative coating. This product was investigated to determine its usefulness in coating the PCB material and neutralizing or binding the PCB components so that they would not leach into the ambient ocean water. A quadrant was delineated on the P-deck bulkhead and Amstar applied. Quadrant 1 had 1 coat of Amstar, quadrant 2 had 2 coats, etc. up to the last quadrant which had 4 applications. Testing showed a good removal with 4 coatings (Attachment X) and PCBs did not leach back into a seawater environment as tested but lead concentration increased.

TARP evaluated the findings and found that an application of several layers of Amstar throughout bulkheads and ceilings of SHIP would be costly but could be done in a timely manner. In discussing the findings with Ms. Lou Roberts (USEPA, Region 6 – Dallas, Texas) and Mr. Craig Brown (USEPA, Region 4 – Atlanta, Georgia) it was determined that Amstar was not an acceptable method because the product was never approved for use in PCB remediation and no application to the USEPA has been submitted. Mr. Hiroshi Dodohara (USEPA, Chemical Engineer, Fibers and Organic Branch, Washington, D.C.) had been in contact with Mr. Steve Mitchell (Amstar®) for approximately four years concerning the submission of PCB disposal approval for their PCB treatment/destruction technology.

For Amstar to be accepted, the application process would have needed to be completed which could have taken months to one year or longer. TARP made a business decision to reject Amstar and evaluate other techniques.

Method 4: Method four evaluated Easy Degreaser (Royal Chemical Corporation). The MSDS is found in Attachment Q. The forward section of the N-deck was used as the test case for this product.

The degreaser was applied by hand which was problematic in covering all surfaces effectively and in a timely manner. The product dripped onto plastic covering the deck area, creating a very slippery work surface. In addition, residue left on the bulkhead after application was difficult to remove. Due to these factors, the degreaser was deemed not acceptable.

Method 5: Method five involved testing BIODIESEL™, a product created for use as a fuel for vehicles and generally composed of methyl esters from lipid sources. The product is very safe and poses no significant health risks. The MSDS is located in Attachment Q.

As was found in with the degreaser above, the product was time consuming to apply because it required hand application and wiping. Not all areas of the bulkhead could be reached by hand and any spillage on the deck caused some worker safety issues. However, the product was effective in removing the PCB material. TARP rejected the use of BIODIESEL™ on a large scale, although it was applied in other uses such as small areas and fuel tanks to aid the cleanup of hydrocarbons.

Method 6: The final and most efficient method tested was sand blasting. This is the conventional method for decontaminating PCB coated metal surfaces and traditionally has been the preferred method due to faster removal rates.

However, several pitfalls exist for abrasive blasting in today's environmental and safety-conscious work environment. When abrasive media strikes a substrate, it pulverizes the coating into minute particles. These particles tend to stay airborne for prolonged periods, possibly contaminating the surrounding environment. Consequently, projects involving abrasive blasting require CONTRACTOR to construct a comprehensive containment system to capture the abrasive and prevent fugitive dust from settling in uncontaminated areas of the vessel or water way. Assembling and disassembling such a containment system on a daily basis consumes valuable time and increase labor costs. In addition, abrasive blasting consumes a significant amount of abrasive media that the CONTRACTOR must collect, transport and recycle and/or dispose of at the project's conclusion. Generally, ESCO Marine, Inc. considers the time and cost of administering such constraints to nullify any apparent gain in process rate and speed as compared to hydro-blasting.

After considering these disadvantages, having ruled out hydro-blasting above, a test area was setup on the N-deck were the degreaser and biodiesel was used previously. Testing showed that in a timely manner, sand blasting could remove the PCB material. It also removed the underlying orange primer paint that was previously tested to not contain PCBs. TARP and the CONTRACTOR accepted the costs and labor involved with the technique as the most effective manner in clearing all bulkheads and ceilings of all decks that contained the black tar-like material.

Each deck was sealed off with plastic to contain the spent media and dust. After sand blasting, SSCI conducted wipe samples (as discussed in section 4.5.3.5 above) to clear each deck. Two separate sand blasting crews were hired by ESCO Marine, Inc. to perform the work. One crew was more efficient and thorough that the other, and in a few cases, a deck area had to be re-sand blasted in order to met TARP's PCB requirements. Disposal of sand media is discussed in section 4.5.3.5 above.

4.5.3.8 PCB Remediation Safety: Safety precautions were followed at all times to ensure safe operation of equipment and reduce worker injury. All precautions were taken by workers operating and maintaining equipment. Blast Technicians practiced and promoted safety at all times to avoid potential injuries and unnecessary production shutdowns. Safety precautions were also posted on the equipment.

Operators of the high-pressure water jet cutting system treated the system cautiously. The water jet is a high-energy cutting tool capable of cutting many non-metallic materials such as composites, plastics, and wood products. Misuse of this equipment or carelessness in its application could have been extremely hazardous to operating personnel. There were no significant worker injuries during the PCB removal.

4.5.3.9 Results of PCB Remediation and Verification : The CONTRACTOR removed all of the suspected PCB containing materials in 4.5.3.3 above. All gaskets in air handling systems (ducts) were removed by cutting them out of the duct system or removing all of the duct work. All gaskets, electrical cable, transformers, capacitors, circuit breakers, and all other potential media that were assumed or tested positive for PCBs ≥50 ppm were removed. All electrical cables were removed through bulkheads, ceilings, and decks.

A total of 72,250 lbs of PCB-containing electrical wires and cables, 165,070 lbs of PCB-containing gaskets and insulation, and 4,000 lbs of liquid PCBs (in the form of capacitors and transformers) were removed. In addition, PCB-contaminated sand media from sand blasting operations totaled 317,020 lbs. Manifests are presented in Attachment P, Tabs P-4 – P-7. Complete removal was verified through visual inspection by the CONTRACTOR, SSCI, and TARP and sampling by SSCI and TARP.

No PCB-containing materials with PCBs greater than or equal to 50 ppm remain on board the SHIP.

4.5.4 Paint

4.5.4.1 Clean-up Goal for Paint: The cleanup goal for paint is to remove harmful exterior and hull antifouling systems that are determined to be active, remove exfoliated paint, and all paint testing with PCBs ≥50 ppm.

4.5.4.2 General Identification of Contaminant: After visual inspection by the CONTRACTOR and TARP, much of the exterior paint was exfoliated and required removal in accordance with TARP contract goals. PCB-laden red paint on an area of the interior walls of the N-deck was identified in the Hazardous Materials Assessment as having PCBs ≥50 ppm.

4.5.4.3 Pre-Cleanup Assessment, Survey, and Assumptions: In addition to the PCB analyses described above, paint samples were analyzed in the Hazardous Materials Assessment (Attachment F) for the RCRA 8 Metals, which include arsenic, barium, cadmium, chromium, lead, silver, and mercury. One composite sample of paint from the hull below the water line was analyzed for tri-n-butyltin. Results of these analyses are presented in Attachment F. Based on this sampling, the only painted surface that showed markedly high metals concentrations was white exterior paint found on

“O” (or Observation) Deck. The O-Deck sample was found to have 8,560 mg/kg chromium and 47,300 mg/kg. This sample was further analyzed using the Toxicity Characteristic Leaching Procedure (TCLP, Method SW1311/ 6020/7471A). The results of the TCLP testing showed that the paint exhibited the hazardous characteristic of a leachable chromium concentration over 5.0 mg/l; the paint had a TCLP chromium concentration of 13.5 mg/l. This information was used by the CONTRACTOR to determine disposal options.

A hull inspection was conducted while the ship was in the MARAD Reserve Fleet, Beaumont, Texas during the Hazardous Materials Assessment in 2004. Results of the inspection showed the hull to be completely covered with algae. Analysis of the paint showed only a trace concentration of 0.080 mg/kg tri-n-butyltin (Attachment F, Appendix 2, Table 5). In addition, there was no record of any anti-fouling paint added to the ship hull since it was docked at TAMU-Galveston in 1994 as a floating class room or after it was berthing at the U.S. Maritime Reserve Fleet in 1996. The heavy growth of algae and no record of any anti-fouling paint added to the hull since at least 1994 are indicative of an inactive anti-fouling system.

Based on the Hazardous Materials Assessment, a total of 10,000 lbs of paint was added into the TARP contract for removal as necessary under the PCB category.

4.5.4.4 Remediation of Paint: Exfoliated paint was removed through scrapping and sweeping. There were no residual paint products in cans, buckets and other containers on the SHIP that required removal.

All ESCO Marine workers used safety equipment will removing paint. Cutters were required to cut metal only while wearing a half mask non-powered respirator equipped with an organic vapor cartridge and a high efficiency particulate filter (HEPA). All the employees who were required to don respirators were subjected to a pulmonary function test to determine their capacity to wear them, fit tested and instructed in the proper usage, care, and storage of their respirator.

Paint that was removed through the sand blasting of PCB-containing material above was disposed of along with PCB-laden sand media (section 4.5.3.9 above).

4.5.4.5 Results of Paint Remediation and Verification: There was no record that antifouling paint on the hull was maintained since at least 1994 (and possibly many years before that) and hull inspections by SSCI during the Hazardous Materials Assessment showed complete coverage of the hull by algae. We concluded that the antifouling paint was not active, met the conditions of the BMP, and did not require removal. All loose paint on deck surfaces were accumulated, stored, and combined with the sand blasting media used in the removal of PCB-containing material above. It was disposed of by US Ecology, L.P. at Robstown, Texas. The combined manifests are presented in Attachment P, Tab P-7.

No PCB-containing paint remains on board the SHIP. Exfoliated paint has been removed to reduce debris during reefing. No residual paints in cans, buckets, etc. were found.

4.5.5 Solids, Debris and Floatables

4.5.5.1 Clean-up Goal for Debris and Floatables: The cleanup goal for solids, debris and floatables is to remove loose debris, including materials or equipment that is not permanently attached to the vessel that could be transported into the water column during the sinking event.

4.5.5.2 General Identification of Debris and Floatables: The CONTRACT removed and disposed of all trash, loose debris, cleaning materials, and any floatable materials or equipment that was not permanently attached to the SHIP or could be transported into the water column during the sinking of the SHIP. Equipment, machinery or components that were heavy, bulky or otherwise negatively buoyant, and cleaned was inspected and remained onboard. Solids, debris, and floatables that were removed included but were not limited to:

- Trash;
- Wood scraps;
- Light Bulbs;
- Wooden paneling;
- Ceiling tiles;
- Carpets/pads;
- Flooring tiles; and
- Plate glass.

Any materials, equipment, scrap, etc. resulting from accomplishment of the contract, except those items identified in the TARP contract as *Items to Be Salvaged for Retention by TPWD*, became the property of CONTRACTOR to be disposed of or salvaged for resale.

4.5.5.3 Pre-Cleanup Assessment, Survey, and Assumptions: Inspection of the *Texas Clipper* showed that there would be miscellaneous equipment, material, and debris that would require removal from every deck on the ship. These items are listed in Appendix 3, Table 2 of the Hazardous Materials Assessment (Attachment F).

Specific items to be removed included: desk chairs, cushions, mattresses, desks, couches, tables, trash, paper items, lockers, bed frames, fire hoses, carpet, wood decking, rope, wash machines, and numerous other items. Based on this assessment, 1,500 yd^3 of non-hazardous waste removal was placed into the TARP contract.

4.5.5.4 Remediation of Debris and Floatables: During the SHIP cleanup phase, CONTRACTOR separated non-hazardous materials removed by category. All materials known to be non-hazardous, such as non-contaminated wood, papers, furniture, mattresses, office equipment etc., were handled as such.

CONTRACTOR stored all non-hazardous solid waste in 30 yd^3 roll-off boxes, protecting them from the elements, and accumulating them for no longer than the time required to fill the roll-offs. All non-hazardous waste was transported by ESCO to the local licensed and accredited Brownsville Municipal Solid Waste landfill (9000 FM 802, Brownsville, Texas 78521). Weight tickets are presented in Attachment P, Tab P-8), and bills of lading will be kept onsite for the duration of the project.

4.5.5.5 Results of Debris and Floatables Remediation and Verification: A total of 1,410 yd^3 of debris and floatables was removed from the SHIP. Manifests are presented in Attachment P, Tab P-8. Verification of removal was completed by TARP and SSCI through visual inspections and checking manifests.

No loose solids, debris, or floatable items remain on board the SHIP. The TARP and USCG has conducted numerous inspections for debris and will conduct a complete inspection of the SHIP again before it leaves dockside and is towed to the reef site.

4.5.6 Other Materials of Environmental Concern

4.5.6.1 Clean-up Goal for Other Materials: The cleanup goal for other materials of concern is to remove other materials that may negatively impact the biological, physical, or chemical characteristics of the marine environment.

4.5.6.2 General Identification of Other Materials: Ships can contain a wide variety of other materials, many of them potentially hazardous, including antifreeze solutions in machinery exposed to low temperatures, batteries, HALON, and other hazardous materials. The following assumptions and CONTRACTOR tasking included:

- Ozone depleting substances occur in shipboard air conditioning and refrigeration systems (largely Freon systems). Recovery of any refrigerants will be accomplished as part of ship preparation.
- Mercury may be present in fluorescent light bulbs and in some shipboard gauges. Mercury materials will be removed as part of ship preparation.
- Materials which may negatively impact the biological physical or chemical characteristics of the marine environment will be removed as part of ship preparation.
- Hazardous and non-hazardous wastes generated by the vessel preparation activity will be managed in accordance with all applicable federal, state, and local regulations.

Additional items of concern that would require removal if found included but were not limited to:

- Batteries;
- Antifreeze;
- Coolants;
- Fire extinguishing agents; and
- Black and gray water from tanks and piping.

4.5.6.3 Pre-Cleanup Assessment, Survey, and Assumptions: Appendix 3, Table 2 of the Hazardous Materials Assessment (Attachment F) presents a catalog of other materials of concern. This includes equipment and instruments, which could contain materials of concern such as mercury in instruments and gauges, and refrigerants in kitchen equipment.

Based on the Hazardous Assessment and some presumptions that other materials of concern may be present on the ship, TARP added several categories to the contract: 5,000 lbs of hazardous solid waste, 1,000 gallons of hazardous liquid waste, and 400,000 gallons of non-hazardous liquid waste.

In addition, the Hazardous Materials Assessment found visible mold growth in many interior areas of the ship. Five swab samples were collected during the July 2004 fieldwork event, and examined to identify the genus of mold present (Attachment G). The result of these analyses of the TexStar Lab Fungal Sampling Report showed significant growths of Cladosporium and Stachybotrys. The assumption made was that once the ship arrived in Brownsville, portholes and windows would be opened and exterior hull cuts made to create air circulation which would reduce the fungus. In fact, fungus was reduced and all remaining fungus was removed along with interior walls and tiles early in the remediation process.

4.5.6.4 Remediation of Other Materials: TARP and the CONTRACTOR prepared for the remediation of other materials of concern by reviewing ESCO Marine's Standard Operating Procedures (Attachment O) which are paraphrased below:

Lead and Other Heavy Metals: Lead is always a concern when dismantling an obsolete vessel, as is cadmium, barium and other heavy metals. ESCO Marine's primary concerns, when dealing with lead and other heavy metals, are environmental health and safety. The main source of lead in a vessel, other than the actual metal that may contain different percentages of lead, is paint.

The only lead encountered was in exfoliated paint and sand media from the sand blasting of the PCB-containing black tar-like material addressed in section 4.5.3.6 above. All workers were protected from lead particles at all times by the use of approved respiratory protection, and other PPE, all included in ESCO's Lead Program.

Mercury: Mercury can be present in gauges and control panels. The mercury within these items does not become a hazard unless the items become broken or their interiors are otherwise exposed. ESCO employees took every effort to keep these items intact during all aspects of removal and handling. Thermostats containing mercury were to be handled as a Universal Waste as dictated by 40 CFR 273.13.

All items that may have potentially contained mercury were carefully extracted from the vessel and placed in containers to prevent any leakage of mercury in case they become broken. Inspection by the CONTRACTOR found that all gauges were steam operated and did not contain mercury. The metal was then recycled.

Ozone Depleting Substances: Ozone depleting substances are typically found in compressors and other refrigeration equipment found aboard vessels. They typically do not pose a danger to the environment unless they are released into the atmosphere. However, these substances must be identified recovered and recycled/disposed of prior to either selling or scrapping a potentially contaminated piece of machinery or equipment.

An initial assessment of the vessel was conducted by the CONTRACTOR to determine which items potentially contained ozone-depleting agents, or refrigerants. Items that were suspect for refrigerants were sampled to determine the presence of Class I or Class II ozone depleting substances (ODS) as defined in 40 CFR Part 82. If refrigerants were found to contain relevant concentrations of these substances they would be subject to recovery by a qualified transportation and disposal company.

Inspections by the CONTRACTOR revealed that any previous ODS had been removed or leaked out and those items were treated as regular equipment and scrapped.

Bilge Water, Storm water, and Waste Water: There are no specific sources of wastewater generated by daily operations at the ESCO Marine facility. All water released from the facility is the result of storm water or water released as the result of a fire emergency. These types of discharges are discussed in the Spill Prevention, Containment, and Emergency Response Plan, and in the Storm Water Pollution Prevention Plan, which are available through the CONTRACTOR.

Bilge water in ships can be contaminated with oil and oily wastes from fuel and lubricant leakage of equipment. Bilge water may also be contaminated with other potentially hazardous materials such as solvents, leachate, paint dust, and pesticides. Ballast water may also be contaminated with oily residues. In some ships, the ballast water has been treated with sodium chromate corrosion inhibitor, a hazardous material. Regulated bilge and ballast water was removed as part of SHIP preparation. In addition, all waste water generated as a result of remediation activities was contained, removed and disposed of according to waste water disposal regulations.

All wastewater resulting from the cleaning (i.e. decontamination and washing, rinsing of tanks and lines, etc.) was contained aboard the SHIP. Scuppers, and gutters on the decks were blocked to prevent rainwater from running off the deck and into coastal waters.

CONTRACTOR sampled bilge water tanks and depositories upon the SHIP's arrival at the ESCO Marine yard in Brownsville, Texas. Every bilge water tank or depository was sampled independently. All samples were tested for Total Petroleum Hydrocarbon (TPH), PCBs, and Chromium. Testing by Ana Lab showed that bilge water could be pumped into FRAC tanks on shore that was used to store hydrocarbons (Attachment U). Water was allowed to separate from hydrocarbons in these tanks, and then moved to the Brownsville Port Ballast Water Disposal Pit on site for evaporation. Manifests are listed in Attachment P, Tab P-1.

MidState Environmental Services extracted, transported and disposed of water that could not be separated in the FRAC tanks and one load of waste water after the evaporation pit became full (Attachment P, Tab P-2). This is included in the non-hazardous liquid load described in section 4.5.1 above (Fuels and Oils).

Chromated Ballast Water: Obsolete vessels may contain accumulations of chromium in their ballast and bilge water tanks. Therefore, it is standard operating procedure for ESCO Marine to sample any fluids contained within these tanks and evaluate them for total chromium.

CONTRACTOR removed and disposed of all ballast water from tanks and piping. All structural tanks, non-structural tanks, inner bottom voids, and interconnected or attached piping; and all piping running through bilge areas of machinery spaces were assumed to be contaminated by hydrocarbons or chromated ballast water unless proven otherwise by inspection. The removal of water was handled by trained ESCO personnel with current certifications of hazardous materials.

ESCO sampled all ballast tanks and bilge tanks from bow to stern of the SHIP to detect specific levels of chromium. The samples were labeled according to tank name and location and tracked until the disposal process is complete. Tests showed concentrations of chromium below 5 ppm (0.00178 - 0.00464 mg/l; Attachment U) and not considered hazardous.

Fluorescent Light Bulbs and Incandescent Lights: Chapter 40 of the Code of Federal Regulations, Section 273.9 states; "*Lamp,* also referred to as "universal waste lamp" is defined as the bulb or tube portion of an electric lighting device. A lamp is specifically designed to produce radiant energy, most often in the ultraviolet, visible, and infra-red regions of the electromagnetic spectrum. Examples of common universal waste electric lamps include, but are not limited to, fluorescent, high intensity discharge, neon, mercury vapor, high pressure sodium, and metal halide lamps".

CONTRACTOR removed light housings which were treated as PCB bulk waste. Fluorescent and incandescent light bulbs, considered Universal Waste as dictated by (40 CFR 273) and the Texas Administrative Code (30 TAC Section 335.261), were not found.

4.5.6.5 Results of Other Materials Remediation and Verification: Visual inspections by TARP, SSCI, and CONTRACTOR found that the only Other Materials located on the SHIP was in the form of lead paint found in the sand media from the PCB removal event, and bilge\storm\waste water in tanks below decks. Paint was disposed of along with the PCB sand media at US Ecology in Robstown, Texas (discussed in section 4.5.3). Bilge\storm\waste water was separated from fuels and oils in FRAC tanks. From 330,452 gallons of non-hazardous liquid removed, approximately 7,000 gallons of oil was recycled. The remaining 323,452 gallons were pumped into the Brownsville Ballast Water Disposal pit to undergo evaporation.

No Other Materials of concern remain on board the SHIP. Some storm runoff waters have reentered the engine room area and are being pumped out as necessary. Fuel and ballast tanks contain ocean water that was intentionally pumped into them by the CONTRACTOR to stabilize the vessel.

4.5.7 Precautionary Procedures and Disposal

While remediating and modifying the SHIP hull from aboard the vessel, or while applying the blow torch to any part of the vessel from which there is the possibility of slag dropping into the ocean, the CONTRACTOR placed floating containers in the water beside the section of the vessel that was being cut. This will be done so that any falling slag, which may contain traces of lead-contaminated paint, would be prevented from falling into the ocean water. All slag collected in these containers were piled and apportioned to be shipped out with loads of scrap. All mills that purchase scrap are equipped to handle relatively high levels of lead in metal form during the foundry process.

Other primary precautions to protect the environment were closely tied to the safety and health precautions. All materials used to protect employees from lead contamination were handled in a special manner. First, the uniforms that the employees used remained in the yard at the end of every workday. These uniforms are washed on site, and wash water collected and filtered prior to discharge. This allowed workers to have clean, uncontaminated uniforms every morning, but more importantly, to prevent lead contamination off the ESCO Marine site.

Second, workers were required to shower at the premises prior to leaving the facility. All the water from these showers was gathered in an underground storage tank. When the tank reaches a certain level, the water is pumped from the tank through a lead filtration system containing a 50-µ filter and a 500-µ filter in succession. The water is then deemed safe to drain into the sewer system.

Finally, all protective equipment that workers utilized was disposed of according to regulations. All HEPA filters from workers' respirator masks were disposed of in a metal drum marked "Lead Waste Only." The same was done to used filters from the water filtration device. These drums remained closed at all times while not in use, and when full they were disposed of according to ESCO's registration with TCEQ as "Debris Contaminated with Lead." A company such as VOPAK typically disposes of the waste at an approved site.

4.6 Remediation Summary

TARP contracted with Resolve Marine Group, Inc. (Port Everglades, Florida) to complete remediation of the SHIP in 2006. Resolve Marine was the chosen contractor based on their experience in reefing ships as artificial reefs. Resolve Marine subcontracted the remediation with ESCO Marine, Inc., an experienced and well known ship scrapping facility in Brownsville, Texas. The remediation goal was to meet or exceed BMP guidelines for all hazardous and non-hazardous materials typically found on vessels intended to be used as artificial reefs. A list of all waste disposal operators and laboratories used by the CONTRACTOR and SSCI are listed in PART 9.0 below.

TARP contracted with SSCI in 2004 for a Hazardous Materials Assessment of the SHIP to quantify all hazardous and non-hazardous materials that would need to be removed or remediated. This report was the basis for pre-remediation estimates that was used by the CONTRACTOR for cost estimating. Additionally, SSCI produced a cleanup verification plan in 2005 that allowed TARP and SSCI to monitor and clear the removal of PCB materials on a deck-by-deck basis.

The above sections address the removal of hydrocarbons (fuels and oils), asbestos, PCBs, debris, non-hazardous liquid wastes, and other materials of concern. Overall removals are presented in Table 4 below.

Table 4. Total amounts of hazardous and non-hazardous materials remediated from the *Texas Clipper*.

Material Remediated	Quantity
Hydrocarbons	7,000 gal
Oil Sludge	7,040 lbs

Asbestos	1,680 yd^3
PCBs (solid)	72,250 lbs
PCBs (liquid)	4,000 lbs
PCB contaminated paint \ sand blast media	317,020 lbs
Debris and floatables	1,410 yd^3
Non-hazardous liquid wastes (bilge water, etc.)	330,452 gal
Other materials (batteries, antifreeze, refrigerants, etc.)	None Found

TARP, SSCI, and USCG verified **COMPLETE** removal of hazardous and non-hazardous wastes through numerous visual inspections and checking manifests. SSCI and CONTRACTOR also conducted wipe samples for profiling materials for disposal and verification sampling for PCBs, asbestos, and non-hazardous liquids. The USCG visually inspected the surfaces of fuel tanks, the engine room area, and fill piping for hydrocarbons and found those areas to be satisfactory. TARP and SSCI entered fuel tanks and determined they met BMP guidelines. The USCG and TARP will perform another visual inspection of the SHIP a day before towing to the reef site begins.

It is the opinion of TARP and SSCI that ALL pollutants have been remediated to the best of our ability to a level that meets or exceeds the BMP guidelines as documented herein and through the manifests of hazardous and nonhazardous wastes.

PART 5.0 HULL MODIFICATIONS AND PREPARATION OF SHIP FOR SINKING

5.1 Hull and Structural Modifications

Hull Modification documents were accomplished in accordance with the requirements of the solicitation as specified in Attachments D and E with diver safety as the foremost consideration. The CONTRACTOR made hull modifications in such a manner as to maintain the internal structural integrity of the SHIP so it would be structurally sound for towing and sinking, and to maintain its overall form once it has been sunk. The SHIP will be sunk in an upright position on the ocean floor, and maintain authorized depth clearances above the upper-most portion of the SHIP.

To maintain the outside visual integrity of the SHIP, external hull modifications were made as listed below. CONTRACTOR accomplished the following hull modifications but not limited to:

1. Lowered funnel (stack). CONTRACTOR removed the funnel to the same level as the maximum height of the top of the wheel house so it did not extend above the forward S-deck railing;

2. Lowered masts/cranes/rigging. CONTRACTOR removed portions of masts, booms and rigging to a height that did not exceed the maximum height of the top of the wheelhouse (S-deck) in accordance with Attachment E. The portions of these structures that were cut were repositioned and welded in place on the deck of the SHIP. CONTRACTOR consulted with TARP to determine final positioning of these materials.

TARP created optimum habitability of the interior of the SHIP for marine organisms by providing for adequate circulation of sea water throughout the SHIP. This was done by placing bulkhead and deck openings in strategic areas of the SHIP.

Further, in regard to Diver safety, CONTRACTOR accomplished the following including but not limited to:

- Removal of wire, pipes and fixtures in passageways;
- Cutting interior and exterior superstructure openings;
- Sealed off lower reaches of the hull;
- Opened the engine room area as much as possible to remove diver entanglements;
- Removed hooks and head bangers and other projections which may entangle a diver;
- Removed interior doors/hatchways;
- Removed windows (P-Deck);
- Removed non-structural bulkheads;
- Removed or welded open\shut dogable exterior hatches and interior watertight doors;
- Cut deck hatchways to 4-ft x 4-ft openings with rounded corners and flush with the deck where possible;
- Made exterior openings in decks A, O and P. Such openings were in the shape of exterior watertight doors (48 in x 68 in) with upper corner radius cuts of no less than 6 in. Cuts were to deck level with no lip were possible;
- Exterior openings on decks B, C and decks below C (96 in x 60 in) with upper corner radius cuts of no less than 6 in;
- Sealed openings/hatchways as designated;
- Removed or sealed covers for all deck-penetrating hatchways 2-ft x 2-ft and larger;
- Removed all steel cargo hold covers.

5.1.1 Production Methods for each Phase of Superstructure and Hull Dismantlement / Modification

It is important to emphasize the fact that the cleanup and hull modifications of the SHIP was achieved in phases. As such, the cleanup and abatement of certain hazardous and regulated substances and even the removal of debris and furniture and fixtures in some areas of the SHIP took place simultaneously with actual cutting of other areas, which were cleaned and abated. In order to accomplish this simultaneous task management, ESCO's management and supervisors meet weekly and daily if necessary to schedule task precedence and overlap.

Actual physical cutting of the vessel took place while the vessel was moored alongside the channel. Pieces were pre-cut to no larger than 10 tons.

Watertight integrity was kept throughout the modification phase of the SHIP by having all longitudinal and transverse bulkheads kept intact at least 5 ft above the waterline. This process was strictly adhered to and no holes or other protrusions were made through any bulkheads, and the water-tight integrity of the ship was rigidly maintained during cutting operations. The Cutting Superintendent ensured that the vessel was not placed in an extreme sagging movement by taking off material evenly along the vessel's entire profile -- bow to stem.

The Ship Dismantling Supervisor in charge of the explosion meter ensured that while cutting material from bottom holds and the engine room, no pipes had been cut into before being opened up, and monitored for any explosive gases or oil residue.

During the cutting process, ESCO placed small catching barges and floating containers along the ship's port/starboard sides and the aft end of the ship to prevent any slag or other residue from entering the water. The SHIP was also encircled with an oil containment boom to contain any accidental oil spills. ESCO Marine has a variety of dismantling equipment available to conduct its ship dismantling operations.

5.1.2 Methods and Procedures to Identify and Segregate all Material

Large pieces removed from the vessel were placed on the ground alongside either one of the slips for further scrapping. These pieces were previously cleaned onboard prior to any cutting being performed. Any additional cleaning occurred at this stage.

Pre-cleaning consisted of removal of any asbestos, PCBs, trash and debris. Waste was transferred directly into appropriately labeled and maintained containers that were staged within proximity of the SHIP alongside the channel. Once full these containers were removed from the premises by qualified contractors as described in PART 4.0.

The clean pieces of metal were scattered throughout the yard in proximity to the gas/water lines which are available throughout the yard where ground cutters systematically cut them into 2-ft x 5-ft pieces using propane and oxygen for torch cutting. Further sorting of the pieces was conducted on the ground by the Non-Ferrous Foreman and non-ferrous metal was separated and staged in inventory for storage and eventual sale. The scattered scrap was gathered by the magnet-crane operator and piled in strategically located areas that facilitated loading into barges, trucks or rail. ESCO has the capability of loading into any of these media.

Reusable materials and equipment such as pumps, motors etc. were moved to the chemical/reusable storage building. ESCO Marine has detailed procedures for handling all hazardous and non-hazardous materials produced by operations (Attachment O).

5.1.3 Deck-by-Deck Modifications

Complete deck-by-deck hull modifications are found in Attachment E. Figure 8 lays out specific deck levels of the SHIP while the following figures lists specific hull modifications completed by the CONTRACTOR on a deck-by-deck level. Instructions given for modifying the SHIP included but were not limited to:

<u>All Decks:</u> *General Hull Modifications*

- All dogable exterior **WATER-TIGHT** doors are to remain open and welded into position.
- All interior and exterior hatch covers are to be removed, unless otherwise specified herein.
- Cut out the deck around each 13-in x 23-in hatchway (scuttle) to a dimension of 4 ft x 4 ft with rounded corners, unless otherwise specified herein.
- Remove covers on all deck-penetrating hatchways measuring 2 ft x 2 ft or larger.
- All holes cut into the decks, bulkheads or hull will have corners rounded with a radius of no less than 6 in.
- All exterior openings cut into decks O, P and A should mimic the shape of exterior watertight doors. These openings should be 48 inches wide x 68 inches tall and be removed all the way to the deck level (i.e. no bottom lip should be present). These exterior openings should have upper corners rounded with a radius of no less than 6 in.
- Remove all steel cargo hold covers.
- Permanently fix all interior water-tight doors in an open position, unless otherwise specified herein.
- NOTE: All exterior handrails will be left in place, unless otherwise specified herein.
- Once ship is cleaned and hazardous wastes are remediated, TARP, CONTRACTOR, marine architect will reevaluate hull modifications and CONTRACTOR may be required to make additional cut-outs of walls, bulkheads or exterior portions of the hull.

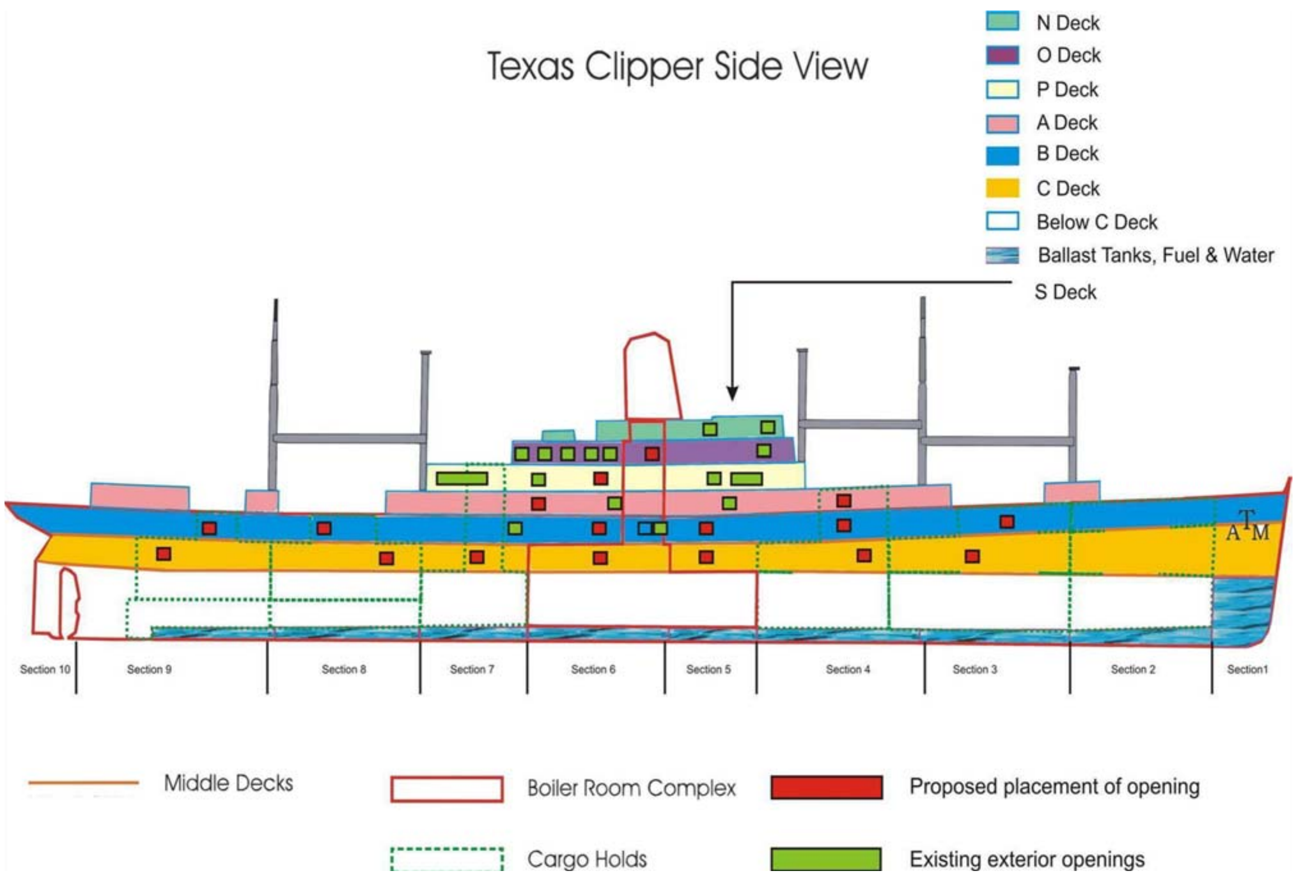
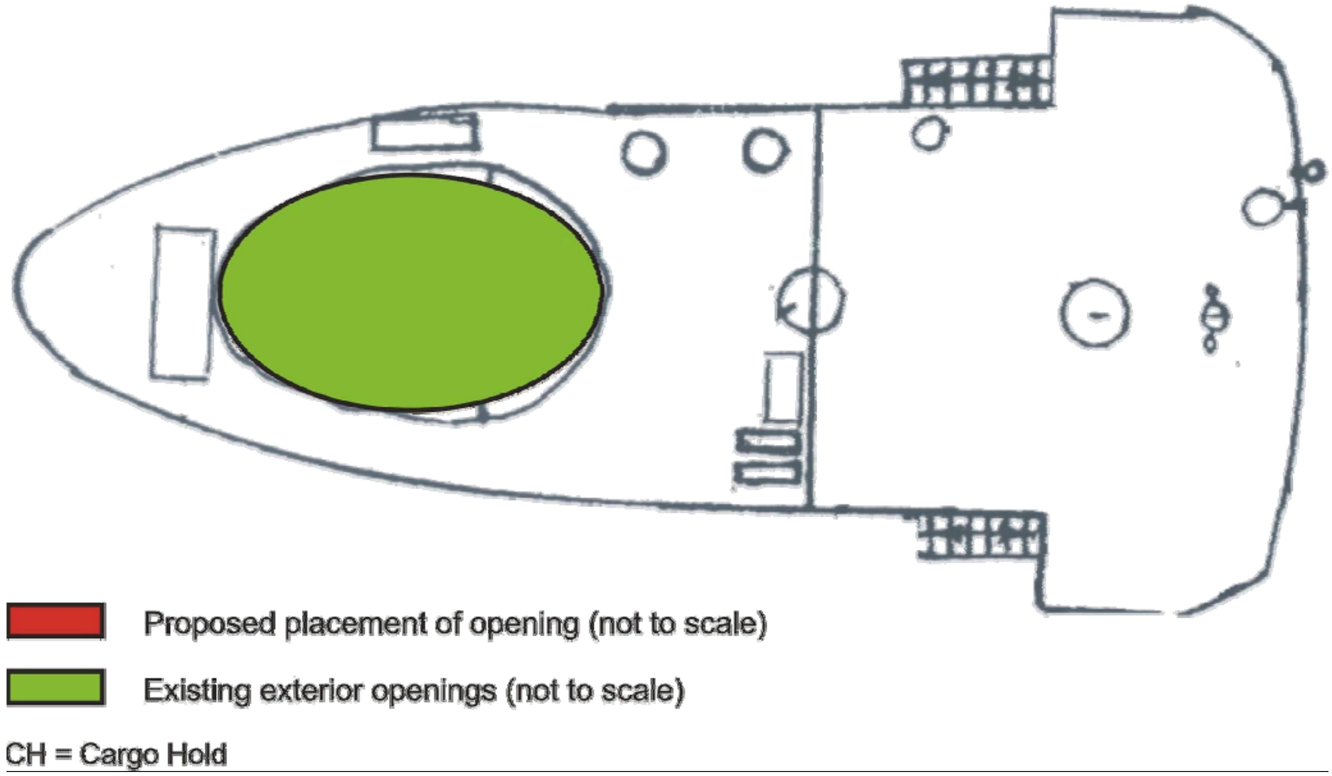


Figure 8. Texas Clipper ship with decks designated.

S-Deck

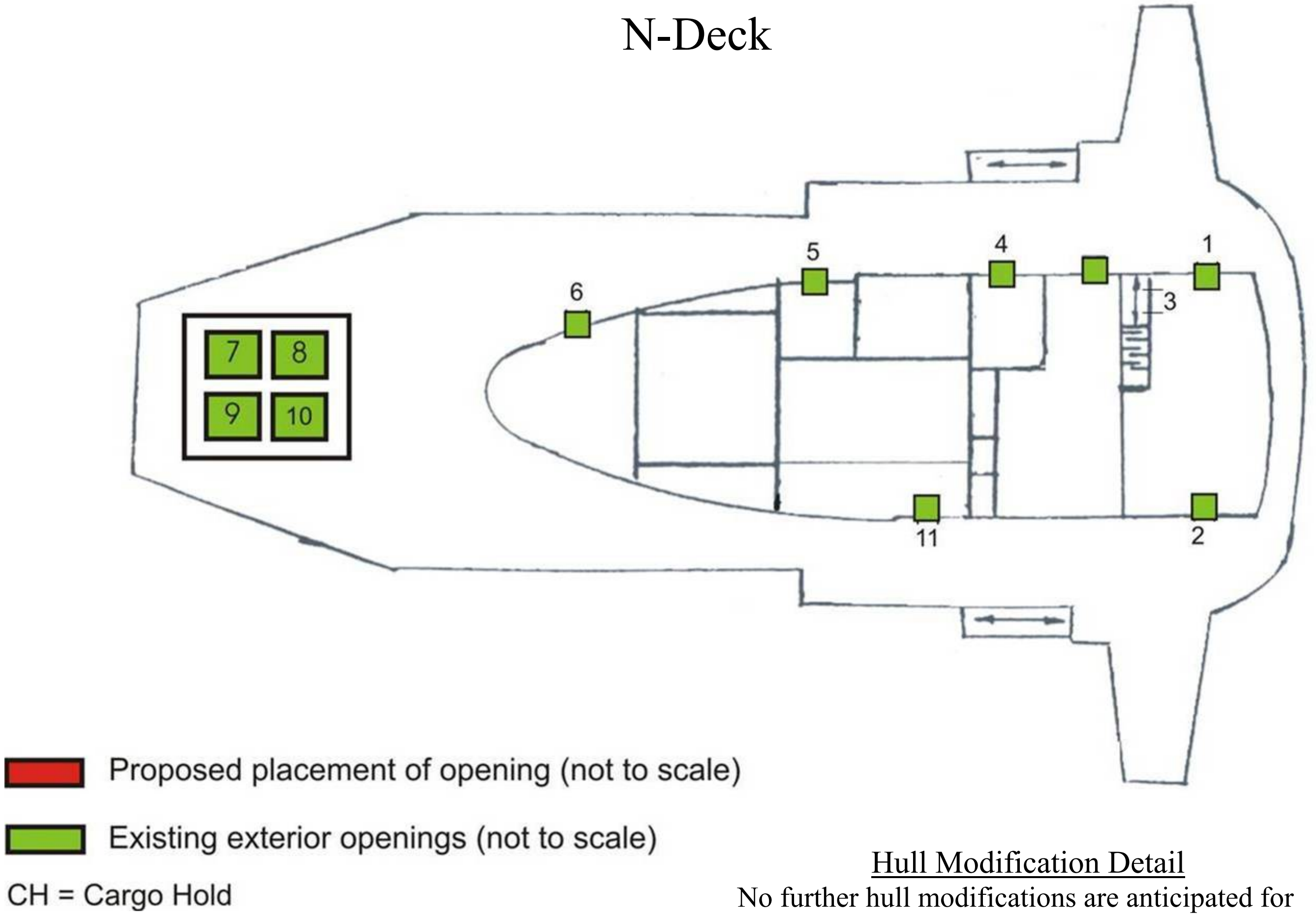


Hull Modification Detail

- Cut stack to level of forward S-Deck railing.
- Hand rail will remain in place. [This will add complexity and a place for divers to hang onto in a current.]

Figure 9. Specifications for S-deck.

N-Deck

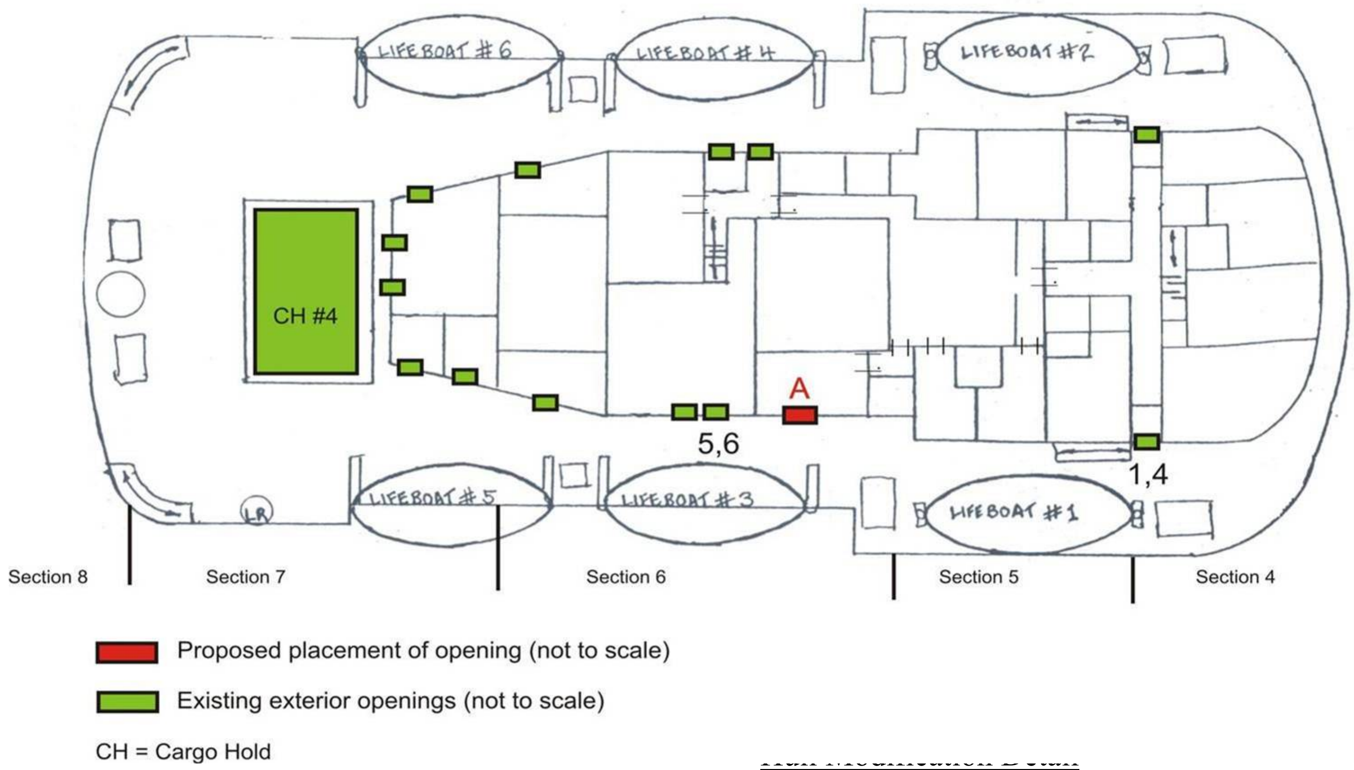


Hull Modification Detail

No further hull modifications are anticipated for this deck.

Figure 10. Specifications of N-deck.

O-Deck

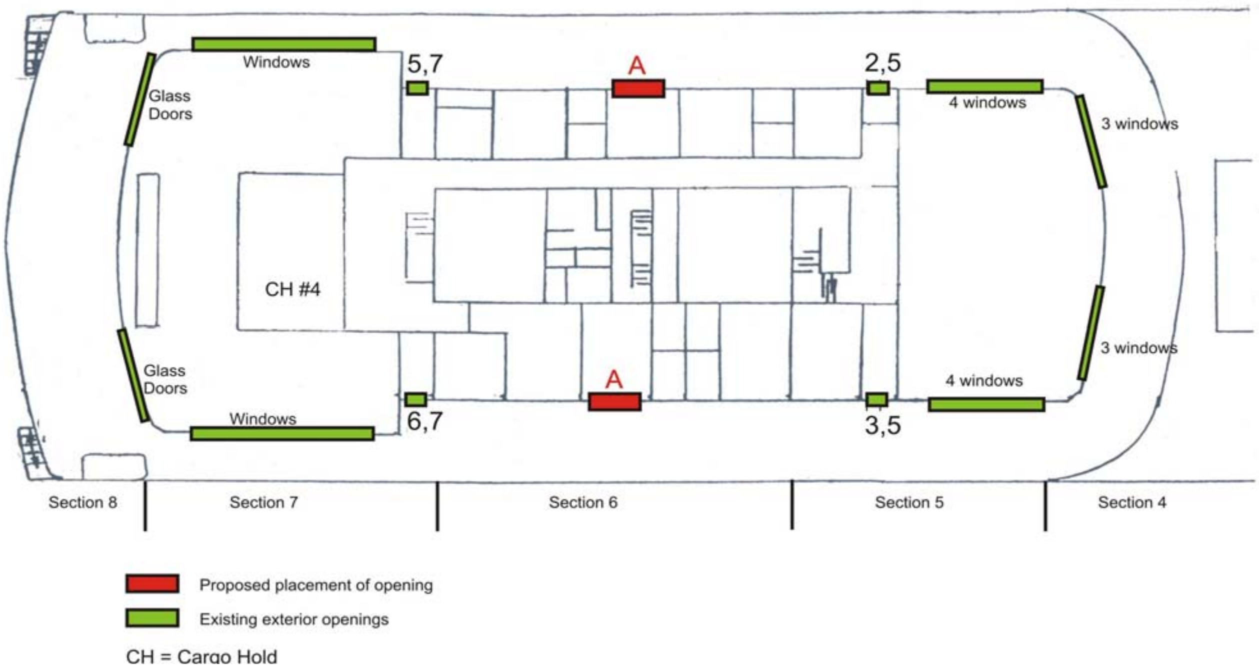


- NOTE: All openings cut into this deck should mimic the shape of exterior watertight doors. These openings should be 48 inches wide x 68 inches tall and be removed all the way to the deck level (no bottom lip should be present). These exterior openings should have upper corners rounded with a radius of no less than 6 inches.

- Cut an opening (**A**) into the starboard side aft of door 1, 4 but forward of the wall near opening 5, 6.

Figure 11. Specifications of O-deck.

P-Deck

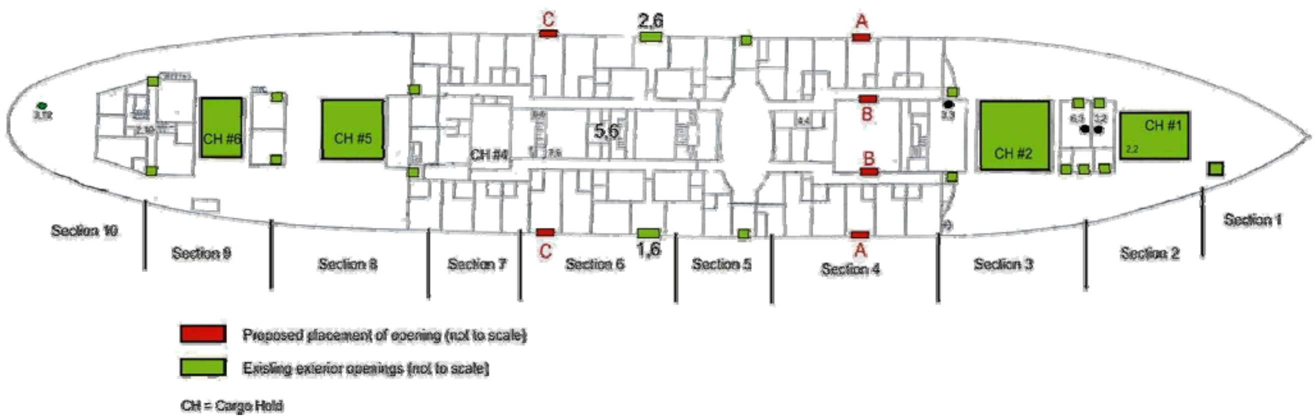


<u>Hull Modification Detail</u>

- NOTE: All openings cut into this deck should mimic the shape of exterior watertight doors. These openings should be 48 inches wide x 68 inches tall and be removed all the way to the deck level (no bottom lip should be present). These exterior openings should have upper corners rounded with a radius of no less than 6 inches.
- Remove windows (**A**), including center support member, on the port and starboard exterior wall halfway between the respective sets of doors (2, 5 & 5, 7 and 3, 5 & 6, 7). NOTE: Railing will be left intact on fore and aft houses. [This will add complexity and a place for divers to hang onto in a current.]

Figure 12. Specifications of P-deck.

A-Deck



<u>Hull Modification Detail</u>

- NOTE: All openings cut into this deck should mimic the shape of exterior watertight hatchways. These openings should be 48 inches wide x 68 inches tall and be removed all the way to the deck level (no bottom lip should be present). These exterior openings should have upper corners rounded with a radius of no less than 6 inches.
- Cut one opening in the port and one in the starboard exterior hull in the middle of Section 4 (**A**).
- Cut one opening in the port and one in the starboard cargo hold #3 walls in Section 4 (**B**).
- Cut out hull separation between windows of veranda rooms (1, 6 & 2, 6) on port and starboard in Section 6.
- Cut one opening in the port and one in the starboard exterior hull in the aft rooms of Section 6 (**C**).
- NOTE: Once ship is cleaned, TPWD and CONTRACTOR will meet to reevaluate whether stairs at 5, 6 actually need to be cut out.

Figure 13. Specifications of A-deck.

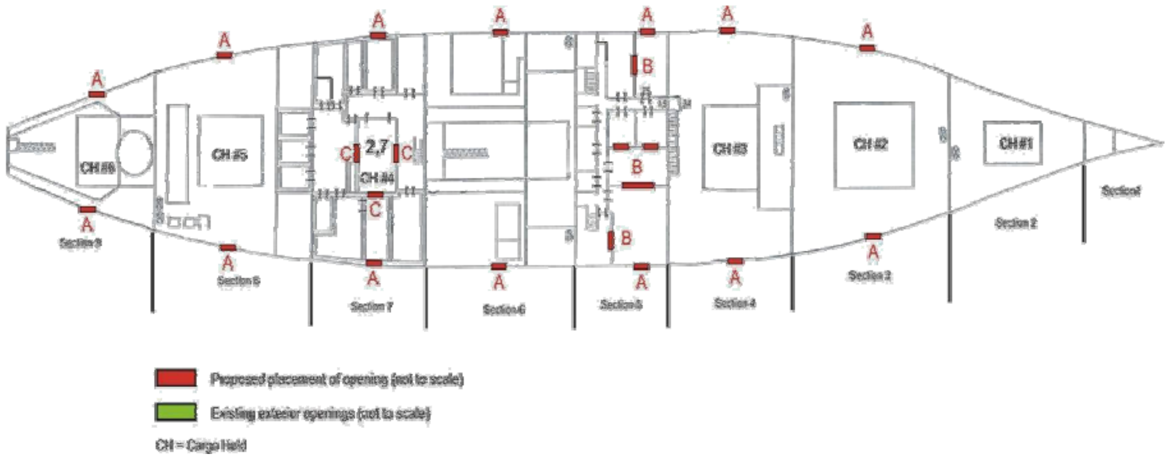
B-Deck

<u>Hull Modification Detail</u>

- NOTE: All openings cut into this deck should be 96 inches wide x 60 inches tall and be removed all the way to the deck level (no bottom lip should be present); all corners should be rounded with a radius of no less than 6 inches.
- Cut one opening in the port and one in the starboard cargo hold #3 walls in Section 4 (**B**).
- Cut one opening in the port and one in the starboard exterior hull in the middle of each of Sections 3; 4; 5; 6; 8; 9 (**A**).
- Permanently seal (weld closed) off openings (hatchways) 2, 6 and 8, 6 [to prevent access to area below].
- Permanently seal off (weld closed) opening 7, 6 [since it goes up but does not appear to have any other openings].
- Permanently seal (weld closed) off opening 2, 10 to shaft alley.

Figure 14. Specifications of B-deck.

C-Deck

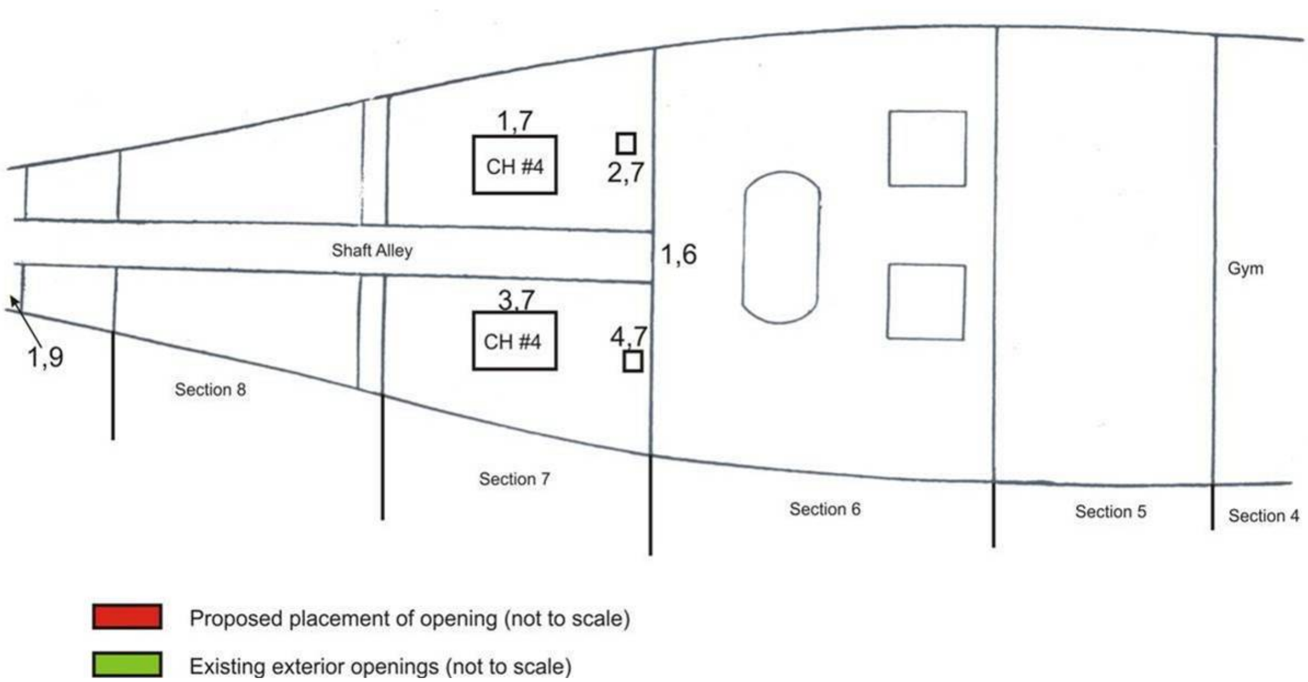


<u>Hull Modification Detail</u>

- NOTE: All openings cut into this deck should be 96 inches wide x 60 inches tall and be removed all the way to the deck level (no bottom lip should be present); all corners should be rounded with a radius of no less than 6 inches.
- Cut one opening in the port and one in the starboard exterior hull in Sections 3; 4; 5; 6; 7; 8; 9 (**A**)
- Cut openings through the interior walls in Section 5 (**B**) [to open the Section up].
- In Section 7 (freezer area) cut one opening in each of the 3 sides of the interior cargo hold 4 opening (**C**) [to compliment the one on the port side].

Figure 15. Specifications for C-deck.

Below C-Deck



<u>Hull Modification Detail</u>

- NOTE: All openings cut into this deck should be 96 inches wide x 60 inches tall and be removed all the way to the deck level (no bottom lip should be present); all corners should be rounded with a radius of no less than 6 inches.
- Shut and permanently seal (weld closed) water tight door to shaft alley (1, 6).
- Fill shaft alley with sand.
- Seal (weld closed) escape hatch at aft of shaft alley (1, 9).
- Remove 9' x 12' deck platting in cargo hold #4 (1, 7 and 3, 7).
- Cut out hatchways (2, 7 and 4, 7) making holes 4 feet x 4 feet with rounded corners.
- NOTE: Will need to re-evaluate Section 5 & Section 6 (Engine Area below C-deck) once equipment has been removed or cleaned.

Figure 16. Specifications of below C-deck.

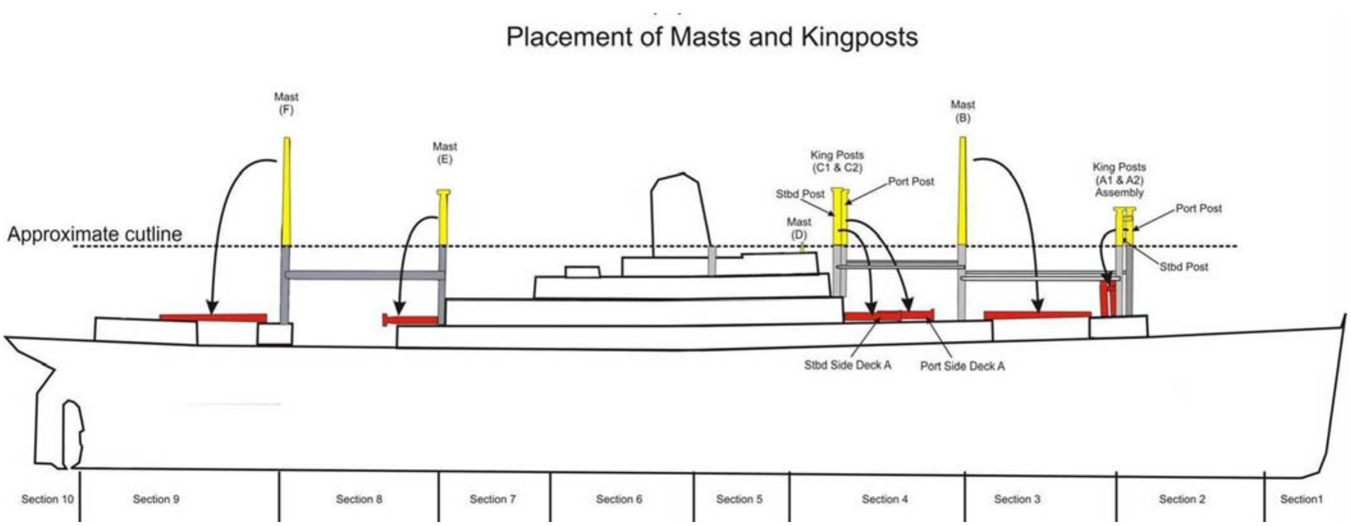


Figure 17. Masts and posts modifications (see details below).

Masts and Posts (See Diagram Above)

- Cut all masts and king posts at rail height on the forward portion of the S-deck.
- Permanently affix two U-bolt mooring connections (one will be a backup mooring buoy anchoring point) to the top of each mast and king post [these U-bolts will be used to attach mooring buoys].
- Permanently affix two U-bolt mooring connections (one will be a backup mooring buoy anchoring point) to the top of the radar mast on S-deck.
- The cutoff portions of each mast and king posts will be permanently affixed to the ship as follows:
    - Forward (bow) kingposts A.1 and A.2 (Sections 2-3)
        - Permanently secure (weld) kingpost assembly to base of kingpost in vertical position.
    - Forward mast B (Sections 3-4)
        - Permanently secure (weld) to kingpost A in horizontal position at height of cut from B to A, pointing in bow direction.
    - Forward (bow) kingposts C.1 and C.2 (Section 4)
        - Permanently secure (weld) to starboard and port side of deck in horizontal position
    - Radar mast D (S deck) (Section 4)
        - Permanently secure (weld) radar dome ONLY; mast to remain in position.
    - Aft mast E (Sections 7-8)
        - Permanently secure (weld) cut portion of mast in horizontal position from mast E to mast F, oriented to stern and laying on top of house on A deck.
    - Aft mast F (Sections 8-9)
        - Permanently secure (weld) cut portion of mast in horizontal position from mast F to stern of ship, extending over stern if required.
- Permanently affix steel cables in a manner such that cables are tightly run between the top of the masts and the top of S-deck.

- NOTE to CONTRACTOR: Use cable that already exists on board the ship. These should be attached to different attachment points than the mooring U-bolts described above.
- Weld booms in place in their original horizontal positions.
- NOTE: Cables will be made of steel and not less that 3/4 inches nor greater than 1 ¼ inch in diameter.

All hull modifications were completed as directed by TARP with the exception of two exterior hull cuts in aft section of C-deck. These cuts were to low to the water line and interfered with the sink plan.

5.2 Procedures for Vessel Sinking

Upon arrival of SHIP at the reef site, the vessel will be secured to hold its position prior to sinking. A computer-generated sinking plan has been developed to provide the CONTRACTOR and TARP with guidelines for optimum hull modifications to facilitate sinking of the ship so it remains in an upright position (Attachment Y). Resolve Marine, Inc. has developed a technical sinking plan which will be used during the sinking process. Their plan has been reviewed by TARP's consultant, Wild Well Inc. The USCG will approve the tow plan and provide a buffer zone around the ship during sinking to keep the public at a safe distance. TPWD game wardens will also provide for public safety.

Hull modifications have included the installation of water values in the exterior walls of lower decks. These values will be opened using "T" handles that have been installed to open the values from several decks above (similar to opening domestic waterlines). The ship will be sunk in a controlled manner by flooding and without the use of explosives.

5.2.1 Computer Modeling of Vessel (HECSALV Software)

TARP contracted with Wild Well Inc. to develop guidelines and a probable plan for sinking the SHIP without the use of explosives so that it settles on the ocean bottom in an upright position. A final report was produced in January 2005 and has been modified by Glosten Associates (Consulting Marine Engineers, Seattle, Washington), a subcontractor for Resolve Marine Group, Inc. (Attachment Y).

All of the vessel analysis was carried out using the ship salvage engineering software HECSALV. HECSALV (developed by Herbert Software Solutions, Inc. / Herbert Engineering Corp.) is used by commercial, governmental and military organizations worldwide. Key users include classification societies (American Bureau of Shipping, Lloyd's Register, and Germanischer Lloyd), the United States Coast Guard, the UK Ministry of Defense and several major commercial marine salvers. HECSALV is the emergency response software for several major oil companies including BP, Shell, Exxon Mobil, ChevronTexaco and ConocoPhillips. HECSALV's origins stem as the commercially available version of the salvage engineering software (POSSE) developed by Herbert Engineering Corp. for the US Navy Supervisor of Salvage (SUPSALV).

Within HECSALV, a 3-D wire frame model was made of the hull, holds, tanks and all watertight compartments within the hull and super structure. In addition, ship information such as lightship weight, center of gravity, and tank tables were developed. HECSALV was used in the analysis to calculate:

- Intact stability (without flooding)
- Free floating stability after flooding
- The transition from free floating after flooding to a stranded condition with the bow grounded on the sea floor

The following is an overview of the major steps in the flooding sequence. It was initially suggested by Wild Well, Inc. to sequence the flooding such that the vessel would submerge by the bow. This was shown to be the easiest and most direct approach as the spaces of Hold 1 through Hold 3 provide a very large flooding capacity and act to provide the maximum trim and immersion to allow progressive flooding towards the aft of the vessel. The lowest flooding point on all Holds and the Engine Room (i.e. the bottom point of the steel removal) was included to represent the progressive flooding through openings (diver access) in the hull. This was estimated to be approximately 5 ft above the waterline at each Hold (and at the Engine Room), when final ballast operations have ceased.

Resolve Marine Group, Inc. disagreed with sinking the ship bow-first. They have reefed numerous ships, including the ex-CV-34 *Oriskany* in spring 2006. Their operational sinking plan will use a controlled flooding approach in which all portions of the ship are flooded equally. Resolve Marine, Inc. has developed its own methodical approach to sinking large vessels in such a manner as to maximize the probability of a successful sinking with the vessel landing upright and intact on the sea floor. They have successfully used their approach and techniques to sink numerous large vessels in this fashion.

The operational plan from Resolve Marine, Inc. was reviewed by Glosten Associates on 31 October 2005. Their conclusions were that Resolve Marine, Inc.'s plan of using controlled parallel flooding to sink the SHIP provides a positive stability and allows the SHIP to sink down on its keel without rolling over to one side. Subsequent modifications of the plan have been made to date.

5.2.2 Towing Preparation

Numerous companies are available for handling the tow from the *Texas Clipper's* location at the ESCO Marine yard in Brownsville, Texas to the reef site 17 nm offshore of Port Isabel. Typically, towing brokers will advise which tugs with the required horsepower are available on a 7 – 10 day notice, weather permitting.

The SHIP will to be prepared and approved for towing by both Resolve Marine Group's insurance underwriter and USCG before departing the MARAD facility. A Towing Plan will be filed with the Brownsville, Texas USCG office with copies forwarded to insurance underwriters.

Tow preparations will be under the supervision of Mr. Todd Schauer, Naval Architect and Marine Engineer and Mr. Frank Leaky (Resolve Marine Group Salvage Master). Mr. Leaky will be CONTRACTOR's 24-hour point of contact. The following work will be performed prior to the departure of the *Texas Clipper* from Brownsville, Texas:

1. *Texas Clipper* will be inspected as to present condition and any work performed at its present mooring in Brownsville, Texas.

2. An underwater inspection, if required, would be performed by a certified Diving Surveyor under the supervision of the CONTRACTOR's Naval Architect.

3. The steering rudder(s) would be locked in place at zero degrees.

4. All valves, including overboard and sea suction hull penetration valves in the engine room and pump room will be verified to be shut and they will be wired in a closed position.

5. All bulkheads, outside hatch openings, weather deck vents, watertight doors, portholes and manhole covers will be inspected and secured for watertight integrity.

6. Any loose gear and/or equipment would be safely secured. This would include hatch booms and other related items.

7. All debris and trash would be removed from the weather deck.

8. White towing marks 6 ft up from the waterline would be painted on the port and starboard sides of the vessel at the bow and stern to make sure the tug monitors daily that the draft on the ship has not changed while under tow.

9. Boarding (Jacob's) ladders will be placed port and starboard to allow easy accessibility in case of an emergency in order to board the vessel (and for other reasons) while under tow.

10. An emergency tow wire, bridle and towing lights will be installed and secured. Towing Lights (navigation lights/day shapes) will be maintained and kept operational throughout the transit.

11. Several electric submersible 2" to 3" pumps will be installed on-board, subject to the Naval Architect's recommendations to comply with the emergency monitoring response system described below. A diesel generator set will be placed on deck to supply power to the pumps. A 24-hr fuel supply would be maintained on board.

12. The Naval Architect will review conditions of trim and stability and carry out any recommendations offered to place vessel in a suitable condition for towing.

13. Appropriate machinery and equipment will be placed onboard to properly secure mooring lines as required.

14. Weather will be reviewed prior to departure of tow to make certain of wind and sea conditions along the towing route. Weather would be monitored for the entire tow with action taken to secure the tow for safe shelter or course in the event of adverse weather.

15. A Towing Plan will be filed with USCG offices at ports of entry and copies forwarded to insurance underwriters.

5.2.3 Towing Evolution to Reefing Site

The following represent normal procedures for offshore towing and will be modified as appropriate:

The tug company contracted to perform the tow will be requested to set up a water level monitoring system consisting of color-coded lights in strategic position in the vessel to determine critical levels when a vessel might be taking in water. This system will operate in conjunction with several electric submersible pumps installed throughout the vessel. CONTRACTOR will utilize an onboard generator to power and activate the already installed liquid activator sensors.

A diesel generator set will be placed on the deck of the vessel, powering pumps located in each of the locations referenced above. The generator and pumps will be remotely controlled and activated from the tow tug when any of the warning lights are detected.

CONTRACTOR subscribes to a service (Reading Information Technologies, Inc., www.riti.com) which relays particular maritime weather short and long-term forecasts. Arrangements are made to have the weather forecast reports provided to the surveyor, who in turn distributes it to the tug captain, as well as to CONTRACTOR management to make important determinations. CONTRACTOR will receive daily progress reports on the advancement of the vessel as it is towed.

The CONTRACTOR may decide to employ a riding crew of four people for the relatively short tow to the reef site. This will provide a higher degree of monitoring capability and much more rapid emergency response capability in the unlikely event that there is a problem.

CONTRACTOR will obtain all permits, clearances and authorizations required for departure from Brownsville, Texas. They will coordinate all vessel movements with both the local pilots and USCG, as required.

5.2.4 Protective Measures to be used during Reefing

No explosives will be utilized for the SHIP sinking. Consequently, any noise transmitted to the ocean environment as a result of the sinking will be minimal.

TARP will coordinate with the USCG, National Marine Fisheries Service and USFWS as part of the sinking plan to ensure safety of personnel participating and/or observing the sinking action and to minimize the risks to marine life.

A safety zone radius of about 1,000 yd or more will be established around the reef site to exclude all ship and submarine traffic not participating in the sinking action. Specific radius will be determined by the USCG on site. Any traffic within this radius will be warned to alter course or would be escorted from the site. Notices to Airmen and Mariners would be published in advance of the sinking exercise as coordinated with the USCG. An immediate "STOP WORK" would be ordered if any unauthorized craft entered the safety zone and could not be contacted. The "STOP WORK" would continue until the safety zone was clear of unauthorized vessels.

Weather that supports the ability to conduct final sinking preparation activities is required for maximum safety for all workers and observers involved in the activity. Operations are most affected by wind, visibility, and ocean surface conditions. Higher winds typically increase wave height and create “white cap” conditions, both of which compromise safety of personnel participating and/or observing the sinking action. Weather conditions will be monitored closely to provide the largest good weather window for all activities needed to tow, moor, conduct final on-sight hull modifications, and sinking. Weather conditions considered marginal or poor will cause a “STOP WORK” order.

PART 6.0 PERMITS, APPROVALS, AND SECURITY

TARP was issued a US Army Corps of Engineers 404 reef site permit, number 23782, on 8 August 2005 (Attachment K). A USCG permit was received for buoy FR-TX-50 from the USCG on 30 November 2006 (Attachment N). The reef site is located outside Texas state waters so no Texas General Land Office surface lease is needed.

NEPA requirements have been met through the publication of an Environmental Assessment, complete with Section 7 Endangered / Threatened Species Assessment and a Finding of No Significance (FONSI) issued by the USFWS, Region 2 on 15 August 2005 (Attachment L).

The remediation plan for the SHIP was approved by the USEPA, Region 6 (Dallas, Texas) and a Conditional Liberty Ship Act Certificate Regarding USTS Texas Clipper I issued on 13 June 2006 (Attachment I). Shortly after, MARAD and TARP completed the transfer of the *Texas Clipper*. TARP was issued the Certificate of Transfer from the United States of America to State of Texas on 4 October 2006. Responses to USEPA (Washington, D.C.) concerns about the MARAD application for the SHIP were submitted to Ms. Zoe Washnis (Goss), Artificial Reef Coordinator, Ship Disposal Program for MARAD, in a letter dated 31 August 2006 and forwarded to Ms. Barbara Keeler (USEPA Region VI) (Attachment Z).

All towing requirements, including the liquid load plan, float plan, approvals, and notice to mariners, will be made with the USCG by the CONTRACTOR prior to the tow to the reef site. The USCG regional headquarters in Corpus Christi, Texas will be responsible for public safety during the sinking event and will coordinate with the TPWD Law Enforcement Division and the US Department of Homeland Security. The Governor of Texas has expressed a desire to attend the reefing event, as have other dignitaries, which will require added security through the Texas Department of Public Safety.

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USEPA (U.S. Environmental Protection Agency). 1994. Freshwater inflow action agenda for the Gulf of Mexico: First generation. Management Committee Report USEPA 800-B-94-006, Washington, D.C.

______. 1995. Enclosure 4, November 30,1995, Sampling Ships for PCBs Regulated for Disposal (Interim Final Policy), 21 pp.

______. 2004. "Green Book Nonattainment Areas for Criteria Pollutants." [http://www.epa.gov/oar/oaqps/greenbk/]. 2004.

PART 8.0 LIST OF ATTACHMENTS (Long Title)

A. Texas Artificial Reef Fishery Management Plan. 1990. By: C. Dianne Stephan, Brett G. Dansby, Hal R. Osburn, Gary C. Matlock, Robin K. Reichers, and Ralph Rayburn. Fishery Management Plan Series Number 3. Texas Parks and Wildlife Department, Austin.

B. The Texas Artificial Reef Program: Over 50 Years of Marine Habitat Enhancement in the Gulf of Mexico. 2003. By: J. Dale Shively, Jan C. Culbertson, Douglas D. Peter, John A. Embesi, and Paul C. Hammerschmidt. Texas Parks and Wildlife Department, Management Data Series No. 196. Austin.

C. Subtitle H. Artificial Reefs; Chapter 89. Artificial Reefs. Texas Parks and Wildlife Department Laws, As Amended through the 2005 Second Call Session of the 79th Legislature. State of Texas 2005-2006, Thomson-West Publishing, Austin.

D. Request for Proposals and Contract Documents for Creating an Artificial Reef with the Texas Clipper Ship: Environmental Remediation, Diver-Safe Modifications, and Sinking (with Appendix 2 – Hazardous Materials Assessment). 13 January 2005. Texas Parks and Wildlife Department Artificial Reef Program, Austin. [Without Appendices].

E. Addendums. Creating an Artificial Reef with the Texas Clipper Ship: Environmental

Remediation, Diver-Safe Modifications, and Sinking. 28 April 2005. Texas Parks and Wildlife Department Artificial Reef Program, Austin.

F. Hazardous Materials Study, Texas Clipper Artificial Reef Project. 11 November 2004. Separation Systems Consultants, Inc., Houston, Texas.

G. Fungal Sampling on Texas Clipper. 29 July 2004. TexStar Labs, LLC., Houston, Texas.

H. Sampling and Analysis Plan for PCB Removal Verification, Texas Clipper Artificial Reef Project. October 2005. Separation Systems Consultants, Inc., Houston, Texas.

I. U.S. Environmental Protection Agency. 13 June 2006. A Conditional Liberty Ship Act Certificate Regarding USTS Texas Clipper I. Dallas, Texas.

J. U.S. Maritime Administration. 4 October 2006. Certificate of Transfer from the United States of America to State of Texas. Washington, D.C.

K. Department of the Army Regulatory Permit Application – 23782. 8 August 2005. US Army Corps of Engineers, Corpus Christi, Texas.

L. Finding of No Significant Impact (FONSI) from Evaluation of Environmental Assessment Submitted by TPWD in compliance of Federal Aid Grant F-117-D. 15 August 2005. USFWS, Albuquerque, New Mexico.

M. Marine Geophysical Hazard Study of Block 1122 South Padre Island Area. January 2003. Cochrane Technologies, Inc., Lafayette, Louisiana.

N. Private Aids to Navigation Application for Texas Clipper Marker Buoy FR-TX-50. 30 November 2006. Texas Parks and Wildlife Department Artificial Reef Program, Austin.

O. ESCO Marine, Inc. Environmental Management Plan (BMP) Best Management Practices. (Submitted as Section 6 of the CONTRACTOR's proposal on 14 July 2005). Brownsville, Texas.

P. Manifests by material of hazardous and non-hazardous wastes removed from the Texas Clipper and MSDS for specific products used during remediation.

Q. Material Safety Data Sheets (MSDS) for products used during remediation.

R. Ocean Disposal Artificial Reef Inspection Form, 25 July 2007, USCG – Brownsville, Texas.

S. Asbestos, airborne filter, and clearance sampling during remediation.

T. Certificates and log-in sheets for asbestos workers from ESCO Marine, Inc.

U. Profile sampling of liquids in tanks conducted by ESCO Marine, Inc.

V. Profile sampling of PCBs conducted by ESCO Marine, Inc.

W. Profile and Verification sampling of PCB black tar-like material on bulkheads and ceilings by SSCI.

X. Laboratory results of the removal of PCB black tar-like material using Amstar®.

Y. Texas Clipper Sinking Plan Evaluation for Resolve Marine Services, Inc. 1 August 2007. The Glosten Associates. Seattle, Washington.

Z. Responses to USEPA (Washington, D.C.) concerns about MARAD application for the *Texas Clipper*. Mailed to: Ms. Zoe Washnis (Goss), Artificial Reef Coordinator, Ship Disposal Program for MARAD, 31 August 2006.

AA. Photo documentary of *Texas Clipper* during towing, remediation, and hull modification: Before and After. Photos on compact disc.

PART 9.0 SUB-CONTRACTORS USED BY SEPARATIONS SYSTEMS CONSULTING, INC., RESOLVE MARINE GROUP, INC. AND ESCO MARINE, INC. TO SAMPLE OR DISPOSE OF HAZARDOUS AND NON-HAZARDOUS WASTES

e-Lab Analytical, Inc.
10450 Stancliff Rd., Suite 210
Houston, Texas 77099-4338
(281) 530-5656 (office)
(281) 530-5887 (fax)
Certification: T104704231-06-TX

BFI Waste Services of Texas, LP
9402 West Expressway 83
Harlingen, Texas, 78550
(956) 423-7316
Texas Department of Health Permit (TDH) # 40-0278
Texas Commission on Environmental Quality, Permit (TCEQ) # 34732
USEPA Transportation ID Number: TXD107079105
Role: Transport and disposal of asbestos, PCB bulk waste, and trash.

Ana-Lab Corporation
P.O. Box 9000
Kilgore, TX 75663-9000
(903) 984-0551
A2LA Accredited
Role: Analyze samples for the presence of PCBs.

MidState Environmental Services, L.P.
P.O. Box 261180
Corpus Christi, Texas 78426
Robstown Transport Yard
(866) 387-2171
USEPA ID # TXR000051227 - No Expiration Date
Texas Transporter ID # A85752 - No Expiration Date
Role: Transport of waste petroleum hydrocarbons and water; Chromium waste and liquids.

VOPAK, USA 125 North “G” Street
Harlingen, TX 78550
(956) 423-2489
USEPA ID Number: TXD988040507 - No Expiration Date
TCEQ - ID Number: 81418 - No Expiration Date
Role: Transport of liquid PCB and hazardous materials.

BFI Rio Grande Valley Landfill
FM 493 & Mile 12 Road
Donna, Texas
(956) 464-7871
TDH Permit # - Not applicable
TCEQ Permit # - H1948
USEPA Permit # - Not applicable
Role: Disposal facilities.

US Ecologists Texas, L.P.
P.O. Box307
3.5 Miles on Petronila Road
Robstown, Texas 78380
(800) 242-3209
USEPA ID # TXD069452340 - No Expiration Date
Point of Contract – Glenda Felkner
Role: Disposal facilities; RCRA Waste / PCB bulk solid waste ≤ 500 ppm PCBs.

Envirotest LTD
2209 N. Padre Island Dr. Suite 1
Corpus Christi, Texas 78408
(361) 887-9400
TDH Asbestos Consultant Agency Number: 10-0006
Role: Bulk asbestos removal and air monitoring.

ANA-LAB Corporation
2600 Dudley Rd.
Kilgore, TX 75662
(956) 831-6437
A2LA Accreditation Certificate Number: 637.01 – Valid through May 2001, Renewal in process.
USEPA ID Number: TX00063
TDH ID Number: 2110076
Role: Analyzing samples of paint, PCB, oil.

AMBIOTEC Environmental Consultants
1101 East Harrison
Harlingen, TX 78551
(956) 423-7807
TDH Asbestos Consultant Agency Number: 10-0130
TCEQ, Correction Action Specialist Number: RCAS00208
Role: Asbestos air sampling.

Chemical Response and Remediation Contractors, Inc.
One Eighth Mile North Primera Rd.
Harlingen, TX 78552
(956) 365-4252
USEPA ID Number: TXR000040014
TCEQ, ID Number: 86580
Role: Emergency response contractor; HazMat spill abatement.