



Lake Encroachment Permit Application

Under Chapter 11 of Title 29, § 401 *et seq.*



Application Number: 3027-LEP
For Lake Encroachment Permitting Use Only

Submission of this application constitutes notice that the person in Section B intends to encroach beyond the mean water level of a lake or pond, and certifies that the project will comply with Chapter 11 of Title 29, § 401 *et seq.* All information required on this form must be provided, and the requisite fees (Section J) must be submitted made payable to the State of Vermont.

A. Project Information

1. Physical Address (911 Address): Not Applicable

2a. Town - County:

2b. Zip:

3a. SPAN (###-###-####):

(School Parcel Account Number can be obtained from your property tax bill or from your Town Clerk)

3b. Coordinates (decimal degrees, can be found on Google Maps):

Latitude: N44° 28' 49.1"

Longitude: W73° 14' 52.1"

4. Name of Lake/Pond: Lake Champlain (Burlington Bay)

5a. Have you ever applied for a permit with the Agency of Natural Resources associated with this parcel? Yes No

5b. If yes, please describe (e.g., Wetlands, Act 250, Wastewater, etc):

B. Applicant Contact Information

1. Name: Vermont Division for Historic Preservation

2a. Mailing Address: One National Life Drive , Davis Bldg. 6th Floor

2b. Town: Montpelier

2c. State: VT

2d. Zip: 05620

3. Phone: (802) 272-7358

4. Email: scott.dillon@vermont.gov

5a. Have you completed the voluntary Natural Shoreland Erosion Control Certification course? Yes No

5b. If yes, please include the location and year you attended the course:

If no, a list of certified contractors is available online.

C. Application Preparer Information (If the individual preparing the application is not the landowner)

1. Name: Jonathan Eddy

2a. Mailing Address: 214 Battery Street

2b. Town: Burlington

2c. State: VT

2d. Zip: 05401

3. Phone: (802) 865-2771

4. Email: jonathan@waterfrontdiving.com

5a. Have you completed a voluntary Natural Shoreland Erosion Control Certification course? Yes No

5b. If yes, please include the location and year you attended the course:

If no, a list of certified contractors is available online.

D. Project Description

1. Describe the proposed project including the materials and equipment that may be used during construction. Please include: (a) volume of fill added and/or removed; (b) dimensions of proposed project; (c) distance beyond mean water level the project will extend; and (d) linear feet of shoreline impacted. If this project is to remove and replace an existing encroachment, please include the dimensions of the existing structure.

Lake Champlain Transportation Co. (LCT) is donating the ferry M/V *Adirondack* to the State of Vermont, Division for Historic Preservation for the purpose of creating the tenth Vermont Underwater Historic Preserve (UHP) site. Ownership will transfer from LCT to the State upon the sinking of the vessel at the coordinates in section 3b above. The car ferry *Adirondack* is 152' long, 42' in beam and 43' from her keel to the top of the smokestack. The plan is to sink the vessel in 68' of water which would leave her smokestack 25' below the surface at a lake elevation of 93.5 feet above sea level. Dimensions and plans of the vessel are provided in Appendix A, B, C

Lake Encroachment Permit Application

Under Chapter 11 of Title 29, § 401 *et seq.*



VERMONT DEPARTMENT OF
ENVIRONMENTAL CONSERVATION
**WATERSHED
MANAGEMENT DIVISION**
LAKES & PONDS PROGRAM

Application Number:

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5a. Have you ever applied for a permit with the Agency of Natural Resources associated with this parcel? Yes No

5b. If yes, please describe (e.g., Wetlands, Act 250, Wastewater, etc):

B. Applicant Contact Information

1. Name: Lake Champlain Transportation Company

2a. Mailing Address: 1 King Street

2b. Town: Burlington

2c. State: VT

2d. Zip 05401

3. Phone: (802) 578-3030

4. Email: johnp@ferries.com

5a. Have you completed the voluntary course? Yes No

5b. If yes, please include the location and year you attended the course:

If no, a _____ is available online.

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2b. Town: Burlington

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2. Describe the purpose of the proposed project:

In broad terms the purpose of the project is to create an additional site for Vermont's UHP by sinking the Ferry *Adirondack*. This will increase recreational opportunities for both local and visiting divers, and at the same time preserve a piece of Lake Champlain maritime history.

This is not the first time that this has been done for this purpose in fresh water. There are at least 3 examples of comparable sized vessels sunk as dive sites/artificial reefs in fresh water in North America:

1) *Wolff Islander II*: Sunk 3 miles east of Kingston, Ontario on September 21, 1985 by the Comet Foundation. She was a 164 ft long steel ferry that ran between Kingston and Wolf Island from 1946 to 1975. Her location is just off the North side of Wolf Island in about 80 feet of water. She is still a popular dive site 35 years later.

2) *Straits of Mackinac*: Sunk off Chicago on April 10, 2003 in Lake Michigan. She was also a steel ferry, 203 ft long that operated across the Straits of Mackinac from 1928 to 1957. Her location is about 10 miles off Chicago in 75 feet of water. This is also a popular dive site today.

3) *Buccaneer*: Sunk off of Chicago June 18, 2010 in Lake Michigan. She was originally a WWII coastal patrol boat and was converted to a tour/excursion boat that operated out of the Chicago area. She is 98 ft long and rests in 72 ft of water. As with the examples above, *Buccaneer* remains a popular dive site.

It is also believed that creating this artificial reef will provide additional fish habitat to the greater Burlington Bay area. There is certainly anecdotal evidence of this from a diving perspective on the other wrecks of the UHP. Particularly in the Fall, when great numbers of fish can be seen on the wrecks.

3. Describe what less intrusive feasible alternatives have been considered:

Given that the purpose of the project is to create an artificial reef/Underwater Preserve, to minimize intrusion we have decided to put the buoys, or descent lines, on the vessel itself rather than using mooring blocks placed on the lake bottom.

In addition, we have placed the vessel in an area that we feel will best suit our selection criteria yet will have a minimal impact on boating traffic. Please refer to section 5 of this application for a more complete analysis.

4. Describe the public benefits of the proposed project (e.g., erosion control, improvements to boating/swimming/fishing, public access, etc.):

The use of the ferry *Adirondack* as a new dive site within Vermont's UHP system will benefit the local community in a number of different ways including: the long term preservation of this historic vessel, the increased diver awareness of submerged cultural resources in Lake Champlain and their management, and creating a structure that will act as an artificial reef providing the ability to use this site to study several different aspects of this unique freshwater ecosystem.

Historic Preservation

Though it seems counter intuitive, the purposeful sinking of the Ferry *Adirondack* for inclusion within the UHP will effectively preserve the vessel for many years to come. The alternative fate of this ferry is a trip to the scrapping yard where it would be cut up for scrap and disposed of. Lake Champlain is a superb preservative environment which will keep this vessel in a condition in which it can be appreciated and interpreted for generations to come. In its new setting it can be appreciated by, and interpreted to the dive community (both local and visiting), and to non-divers through the use of Remote Operated Vehicles (ROVs). Preserving the *Adirondack* on the bottom of Lake Champlain is also much more cost effective than any of the other potential alternatives. A much more thorough analysis of this is contained in the *Adirondack* information sheet and Question & Answer document provided in Appendix S. . In addition, to further educate the public about the *Adirondack* and historic preservation, we anticipate creating signage for the project. We propose that two interpretive panels be created that share historic pictures of the vessel and give a brief overview of the ADKs history and importance as an integral part of the transportation network of the Champlain Valley. These would be designed along the same protocols provided for Lake Champlain Basin Program signage that currently exists on the Burlington waterfront. One of the panels will be placed on the waterfront, either at Perkins Pier or at the King Street Ferry dock. The

other interpretive panel will be placed aboard the remaining LCT ferry that will be continuing the Burlington-Port Kent crossing so that as the ferry passes the yellow Preserve Buoys marking the Adirondack location passengers would be able to learn about the vessel sunk there and its history.

Artificial Reef

The historic wooden vessels already included in the UHP now act as artificial reefs which attract large numbers of fish and provide habitat for other organisms ranging from crayfish to freshwater sponges. The addition of *Adirondack* to the Preserve system would allow for the creation of another artificial reef on the lake bottom which would also form habitat for all manner of life on the lake bottom. As the *Adirondack* is a steel hulled vessel, it also offers an interesting opportunity to measure and study how rapidly and thoroughly this new habitat is exploited by lake organisms in comparison to the more well understood wooden vessels. Various scientific studies could incorporate the use of volunteer recreational divers to record observations and collect data. In Appendix D, Professor Ellen Marsden of the UVM Rubenstein School discusses a range of studies that could be done in this manner. This added knowledge could then be shared with other freshwater administrators and researchers who are considering adding artificial reefs of this type to their systems.

Diver Awareness

The addition of this large and impressive vessel to Vermont's UHP (and the publicity around its sinking) will provide a significant increase in the awareness of Lake Champlain as a dive destination. This fact should attract a significant number of divers from outside of the area to visit Lake Champlain and experience the new dive site, while learning about the colorful history of the Champlain region. It can be assumed that this will provide a positive economic impact. Although exact statistics are not available, it is believed that annual visitation to the UHP are approximately 1000 diver visits per year. Given the size and appeal of such a vessel we would expect a sizable increase in visitation, to perhaps 1500+ diver visits. The inclusion of the *Adirondack* in the UHP system will also give the local dive community a new site to explore. At this point there are nine sites in Vermont's UHP, and the dive community has been asking for additional sites to be added to the system for some time. The increased exposure to the preserve sites contained within Lake Champlain will also allow divers to learn more about the importance of proper management and access to these non-renewable cultural resources and instill a sense of stewardship for them within the dive community. These concepts could extend to the non-diving public as well through the use of ROV's. The Lake Champlain Maritime Museum currently uses ROV tours as a way to educate the public utilizing the Preserve site of the *Steamer Champlain II*. The *Adirondack* could provide a new and dynamic venue for this purpose.

E. Encroachment Effects

1. What measures are proposed to minimize the project's effects on water quality (e.g., use of a turbidity curtain during construction, heavy equipment will work from shore, etc.)?

The measures proposed are extensive. The guiding standards of preparing the vessel for sinking are outlined in a document found in Appendix E, "Best Management Practices for Preparing Vessels Intended to Create Artificial Reefs." These standards are being applied to the *Adirondack* project as outlined in the document found in Appendix F, "Ferry *MV Adirondack* Reefing Project Vessel Preparation."

In support of ensuring the *Adirondack* contains minimal pollutants, even prior to environmental clean-up, LCT contracted with the environmental firm KD Associates, Inc to do chemical analyses at various locations in the vessel. These analyses found very few contaminants at levels of concern. The results of these analyses may be found in Appendices G, H & I.

The method and procedures to be used in sinking the *Adirondack* will also minimize the effects on the environment. She will be securely held in position with a six-point anchoring system eliminating the possibility of drifting and sinking in an unintended location (see Appendix J) It has been determined that the method of sinking will be the flooding method (see Appendix K) as opposed to utilizing directional explosives, which was another method considered. Flooding, as the method of sinking, will obviously have less impact on the environment.

2. How will the project minimize effects to fish and wildlife habitat (e.g., project is not to commence until July 1 of the calendar year to avoid spring fish spawning)?

The potential adverse effects of this project are being minimized by the environmental mitigation spelled out in the Vessel Preparation Document mentioned above. The *Adirondack* will provide beneficial effects to marine life in several ways, the most notable of which, is creation of habitat. Other potential benefits involve the research opportunities created, as mentioned in Ellen Marsden's document (Appendix D)

To ensure that divers are educated about minimizing the spread of invasive species, the Underwater Historic Preserve Booklet, (see Appendix L, page 4) provided to divers and also available on-line, will be updated to reflect the current threats. Meg Modley, the Aquatic Invasive Species Management Coordinator for the Lake Champlain Basin Program, has provided us with the needed updates (see Appendix M). These changes will be incorporated into new documents/websites prior to the sinking of the vessel.

3. Does the project propose removal of aquatic or shoreline vegetation? If removing shoreline vegetation (e.g., trees, shrubs, groundcover, duff layer), a Shoreland Protection Permit may be needed.

The project does not propose the removal of any aquatic or shoreline vegetation.

4. Describe the surrounding shoreline. What measures are proposed to ensure the project is consistent with the surroundings?

Given that the vessel's proposed sinking location is far from shore there are no measures needed.

5. Will the project impact navigation, recreation, or other public uses? If so, how will these effects be minimized?

In looking at where to place the *Adirondack* we took into consideration several criteria. Chief among them were how we could minimize the impact on navigation yet maximize the recreational opportunities. Other considerations were being near a large population base with support services such as marinas, boat launches, dive shops, and hotels and restaurants for visiting divers. These considerations made the greater Burlington area a logical choice. Proximity to other wrecks of the UHP was a plus as well. This would make dive excursions to multiple sites a great draw for divers, or anticipated ROV tours for the non-diving public. The *OJ Walker* is .3 miles (540 yards) from the proposed site, the Horse Ferry is .4 miles (700 yards) and the *General Butler* is 1.2 miles (2100 yards). In considering the greater Burlington Bay area we also needed to maintain a sufficient distance from Burlington's water intake pipe. The proposed site is 670 yards from the intake. This location was discussed with Steve Roy, Senior Water Resources Engineer for the Burlington Public Works Department. (see Appendices N & O)

Other important considerations were related more to geology, geography and lake force issues. In an effort to gain more insight into these areas, from other very knowledgeable people, we contacted Tom Manley, Associate Professor of Geology at Middlebury College, Fred Fayette a boat captain and owner of the research vessel *Neptune*, Art Cohn, Director Emeritus, of the Lake Champlain Maritime Museum, dive charter boat Captain Larry Boivin, commercial diver and boat captain Pierre LaRocque, the captains of LCT's ferries and of course the U.S. Coast Guard. All have many, many years' experience on Lake Champlain in different disciplines.

Tom Manley has done extensive multi-beam and sub-bottom profile sonar surveys of the Lake. We met with Tom in his office and reviewed data on the lake bottom from the Burlington Harbor area into the broad lake. With his help we were able narrow down the search to those areas which fit our criteria. We did not want the depths greater than about 80', to stay within safe recreational diving limits. We did not want an area with a steep lake bottom slope which would potentially cause problems with the sinking and we wanted an area with some bottom sediment to stabilize the vessel. (see appendix P)

In addressing some of our other concerns we spoke with the various captains about lake force issues. We wanted to select an area that provided as much shelter from the prevailing winds as possible. For example, a suitable site above 80', out in the broad lake, frequently might not be dive-able due to rough conditions. We also sought their guidance about currents, which obviously could cause problems for some divers. Fred Fayette, who,

along with his family owns Juniper Island, shared that the reef which comes off the northeast side of Juniper can cause heavy currents during strong north or south winds.

In addressing concerns about navigational issues we spoke with not only the captains, but also the Coast Guard and LCT. Our goal in finding a site was one that did not restrict navigation in a narrow or congested area. For these reasons we discounted sites inside, or at the mouth of, Shelburne Bay. For the same reasons we discounted sites in between Rock Dunder and Shelburne Point. Due to the fact that much of the lake beyond a mile west of Burlington is well in excess of 100' deep we narrowed our site selection to the north side of Juniper Island, or to the south side of Apple Tree Bay/Lone Rock Point area.

Both of these sites had advantages and disadvantages. The north side of Juniper offered only minimal protection from a south wind and no protection at all from a north wind. An advantage was that boat traffic is somewhat less than south of Apple Tree Bay. The Apple Tree site is much more protected from both a north and south wind. It is also in closer proximity to the other Burlington Bay sites of the UHP. One concern with this location was its' proximity to the Burlington/Port Kent Ferry route. To determine if that was truly an issue LCT applied for a permit with the Coast Guard to deploy a temporary buoy to mark the location. During this deployment, from September 6 to September 15, 2019 a notice to mariners' was posted by the Coast Guard to alert boaters of the buoy location. This also gave time for LCTs' captains to provide feedback if they thought the location posed a hazard to navigation. There was no negative feedback from either the general boating public or the captains.

During this period divers conducted two exploratory dives on the site. They found that there was sediment approximately five feet deep and the bottom contour was fairly flat. Tom Manley had calculated the bottom contour in this area to be a 2% slope prior to the dives.

In evaluating the above considerations, it was decided the site annotated in section 3b of this application, south east AppleTree Shoal and south west of Lone Rock Point, was the best choice for our purposes.

F. Applicant Certification

As APPLICANT, I hereby certify that the statements presented on this application are true and accurate and recognize that by signing this application, I agree to complete all aspects of the project as authorized. I understand that failure to comply with the foregoing may result in violation of the Chapter 11 of Title 29, §401 *et seq.*, and the Vermont Agency of Natural Resources may bring an enforcement action for violations of the Act pursuant to 10 V.S.A. chapter 201.

E-SIGNED by Scott Dillon
on 2020-02-13 14:26:44 EST

Applicant/Landowner Signature: _____ Date: _____

G. Applicant Preparer Certification (if applicable)

As APPLICATION PREPARER, I hereby certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Application Preparer Signature: Jenatha Eddy Date: 2/14/20 J.AE
11/17/19

along with his family owns Juniper Island, shared that the reef which comes off the northeast side of Juniper can cause heavy currents during strong north or south winds.

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Applicant/Landowner Signature: John C Paul Date: 2-14-20

G. Applicant Preparer Certification (if applicable)

As APPLICATION PREPARER, I hereby certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Application Preparer Signature: Janeth Eddy Date: 2-14-20

H. Adjoining Property Owner Notification (For additional information, please see the)

JP I certify, by initialing to the left, that I have notified adjoining property owners of the proposed project using the template sent by U.S. Mail.

I. Additional Required Documentation (Please check to ensure you have completed the following)

- All sections of the application are complete or otherwise indicate "not applicable";
- Application includes site plans with dimensions
- Project description includes distance beyond mean water level the project will extend;
- N/A* Application includes photos of project area.

J. Permit Application Fees

Select the most applicable permit description and requisite fee. If the proposed project involves more than one of the project types, multiple fees may apply. For example, a project involving structural shoreline stabilization and marina improvement will require both fees (2) and (3).

1. Non-structural erosion control project (e.g., dry-laid rip rap):

Administrative Processing Fee: \$155.00	
Total:	

2. Structural erosion control project (e.g., vertical wall replacement)

Administrative Processing Fee: \$250.00	
Total:	

3. Other Projects (e.g., marina improvements, boathouse repair, dredging):

Administrative Processing Fee: \$300.00	
Application Review Fee: 1% of Total Project Cost <input type="checkbox"/>	Enter the Total Project Cost: \$ 1750.00
{\$20,000 max fee, Check box if project cost is over \$2,000,000}	\$ <u>175,000.00</u>

Total Fee: \$ 2050.00

Submit this form and appropriate fee, payable to:
 State of Vermont - Vermont Department of Environmental Conservation
 Watershed Management Division - Shoreland Permitting
 1 National Life Drive, Main 2
 Montpelier, VT 05620-3522

Refund Policy:

- If an application is modified, withdrawn or denied after technical review has commenced; all fees are retained.
- If an application is withdrawn prior to administrative review; all fees will be refunded.
- If an application is withdrawn after administrative review but prior to commencement of technical review, deemed administratively incomplete and returned to applicant, or determined that a permit is not required; administrative fees are retained and permit application review fees will be refunded.

Lake Encroachment Permit Application for the Ferry M/V *Adirondack* Reefing Project

Appendices – Supporting Documentation

- A. Lake Champlain Transportation Company M/V *Adirondack* Specification Sheet (p.2)
- B. Dimensional drawing of M/V *Adirondack* (p.3)
- C. M/V *Adirondack* on bottom profile (p.4)
- D. Scientific Study Opportunities, Professor Ellen Marsden, Rubenstein Lab, University of Vermont. (p.5-6)
- E. National Guidance: Best Management Practices for Preparing Vessels Intended to Create Artificial Reefs. Published May 2006 by US Environmental Protection Agency and the U.S. Maritime Administration (p. 7-83)
- F. Ferry M/V *Adirondack* Reefing Project Vessel Preparation (p.84-87)
- G. KD Associates, Inc – PCB Testing, M/V *Adirondack* – January 2, 2019 (p.88-92)
- H. KD Associates, Inc – Lead in Paint Testing, M/V *Adirondack* – December 12,2018 (p.93-99)
- I. KD Associates, Inc – Asbestos Assessment, M/V *Adirondack* – December 12,2018 (p.100-101)
- J. M/V *Adirondack* Anchoring System Drawing (p.102)
- K. M/V *Adirondack* Sinking Procedure (p.103-106)
- L. Dive Historic Lake Champlain Booklet State of Vermont, Division for Historic Preservation, Lake Champlain Maritime Museum (p.107-122)
- M. Lake Champlain Basin Program Invasive Species Update (p.123)
- N. UHP Proximity Map (p.124)
- O. NOAA Burlington Harbor Water Intake map (p.125)
- P. Bottom Contour Map of Lone Rock Point/Appletree Bay Area (p.126)
- Q. CRB – Geological & Environmental Services, Inc/Artificial Reefs International - (ARI/CRB) Ferry *Adirondack* Evaluation Report – April 22, 2019 (p.127-133)
- R. ARI/CRB – Proposal to Sink M/V *Adirondack* – June 21, 2019 (p.134-139)
- S. M/V *Adirondack* Question & Answer Document (p.140-145)

LAKE CHAMPLAIN TRANSPORTATION COMPANY

SPECIFICATION SHEET FORM/V: ADIRONDACK (EX GOV EMERSON C. HARRINGTON II;
EX MT HOLLY)

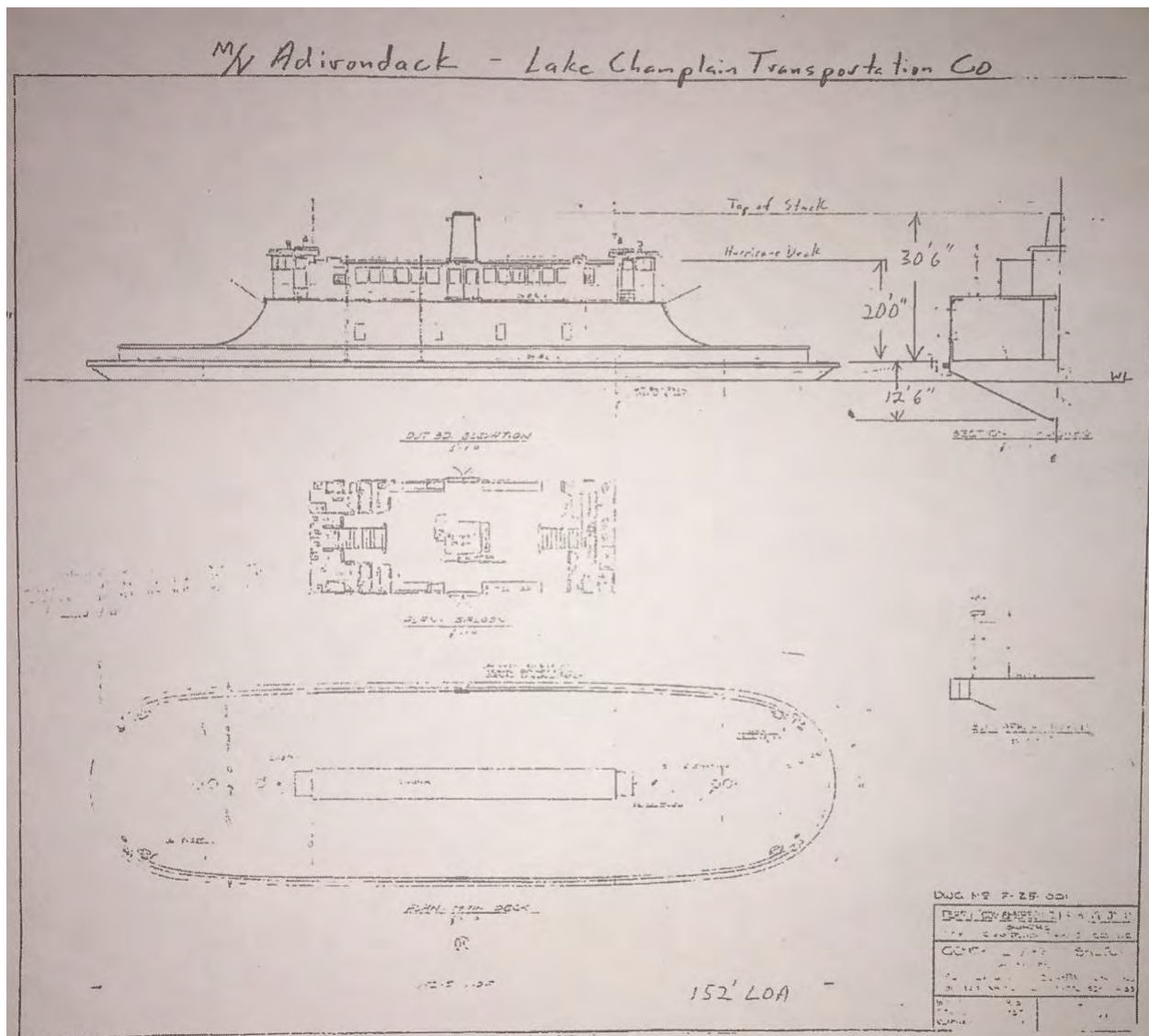
OFFICIAL NUMBER: 211156 CLASS: H HEIGHT ABOVE W.L.: 41' 0"
 TONS: LT. DISPL: 360.8 TONS: LOADED DISPL: 424.8 GROSS: 333 NET: 150
 MLD LENGTH: 130' 0" BEAM: 40' 0" DEPTH: _____
 O.A. LENGTH: 152' 0" O.A. BEAM: 42' 4" DRAFT LT: 8' 6" LOADED: 9' 6"
 FREEBOARD LT: 3' 5" FREEBOARD LOADED: _____ SPEED: 10 KTS
 BUILDER: MERRILL-STEVENSON SHIPYARD DATE: 1913
 REBUILDER: SALISBURY YACHT BUILDING COMPANY DATE: 1937
 PROPULSION MACHINERY: 2 - CATERPILLAR 3412, 542 HP; 2 - ZF-W650 4.057:1 RATIO
 REVERSE/REDUCTION GEARS
 PROPELLERS: 2-60" DIAMETER X 36" PITCH 4 BLADE COLUMBIAN
 GENERATORS: 1-CUMMINS N-495, 30 KW 120 VDC; 1- CUMMINS HIP, 30 KW 120 VDC; 1 15 KW
 120 VAC 1Ø RETARY CONVERTER
 HEATING: 1 HOT AIR IN ER; 1 - STEAM BOILER
 STEERING GEAR: 2-5 HP ELECTRO-MECHANICAL
 CAPACITIES: PASSENGERS: 228 CARS: 30 OR TRUCKS UP TO 20 TONS
 OVERHEAD CLEARANCE: 11' 3" BALLAST: NONE
 FUEL OIL: 4700 US GALLONS LUBE: 120 US GALLONS POT WATER: 160 US GALLONS
 SHELL PLATE: 5/16" & 3/8" DECK PLATE: 5/16"
 ANCHORING GEAR: 1-500 NAVY W/3 SHOTS CHAIN
 FIRE EXTINGUISHING EQUIPMENT: FIXED CO₂: 750 LB BOTTLES IN E. R.; 50 LB SEMI-
 PORTABLE IN E.R.
 SPRINKLER: OVER CAR DECK HOSE: FIVE 1½" 50' AXES: 4
 FIRE EXTINGUISHERS: AII: 2 BIII: 5 BV: 1 CII: 2
 LIFE SAVING EQUIPMENT: RAFTS: 4-50 PERSON IBA BOATS: 1 USCG APPROVED
 LIFE PRESERVERS: 309 ADULT 52 CHILD 4 - RING BUOYS
 RADIO: 2-MODAR; 2-ICOM RADAR: 1-FURUNO MODEL 1940; 1-FURUNO MODEL
 1932 MARK 2

ON BOARD FACILITIES: PASSENGER LOUNGE; MEN'S & WOMEN'S HEAD; SNACK BAR;
 SOUVENIR STAND

FUEL CONSUMPTION: 14 GPH (BURLINGTON - PORT KENT CROSSING)

CREW: 1 - 500 TON MASTER; 1 - CHIEF ENGINEER; 1 - SENIOR DECKHAND; 1 - DECKHAND;
 2 - STEWARDS

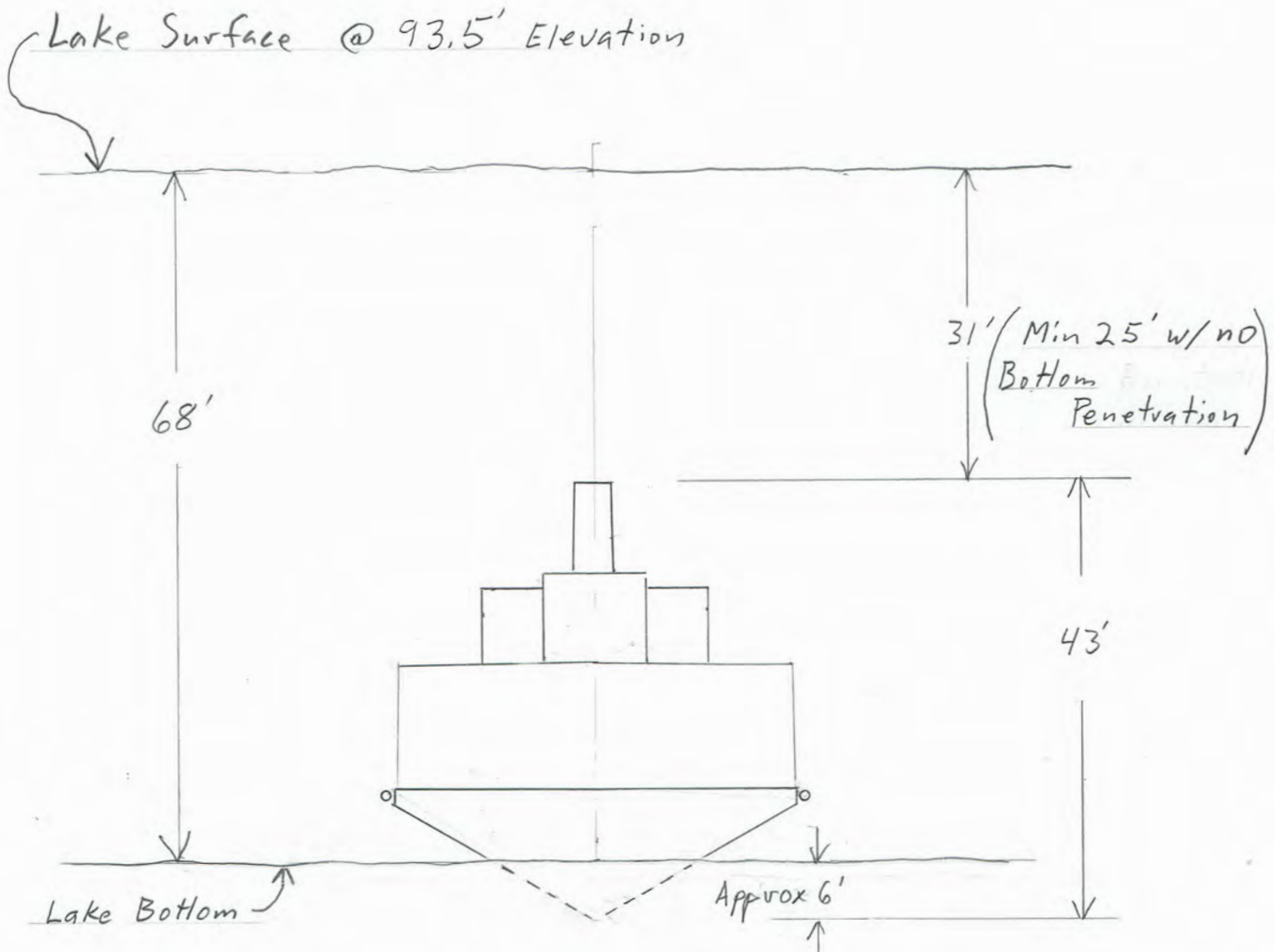
M/V Adirondack – Lake Champlain Transportation Co.

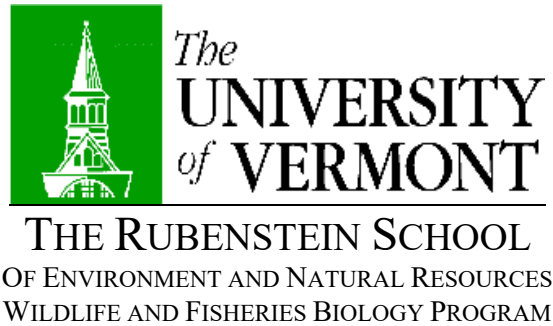


- Depth at site: 68' at 93.5' Lake Level Elevation.
- Height of Vessel: 43'0" Keel to top of Stack
- Minimum depth over stack at proposed site: 25'
- Site Coordinates: N44° 28.819' W73° 14.868'
- Top of Stack to Keel: 30'6" + 12'6" = 43'0"
- Surface to Top of Stack 68 – 43 = 25' (No Bottom Penetration, assuming ~3' penetration of bottom)
- Surface to top of Stack 25' + 3' = 28'

Lake Champlain Transportation Co.
 Adirondack Reefing Project
 Depth and Clearance at Proposed Site
 $N 44^{\circ} 28.819'$ $W 73^{\circ} 14.868'$
 1-20-20, scale $\frac{1}{16}'' = 10'$, JP

Note: Drawing shows no vessel list. There will likely be 5° to 30° list. This would increase the depth of the top of the stack.





Jonathan Eddy
Waterfront Dive Shop
Burlington, VT

Jan 19, 2020

Dear Jonathan:

As a follow-up to our conversations about the ferry sinking/artificial habitat project for Burlington Bay, I have summarized my thoughts about how this project could benefit fish populations and research on artificial reefs.

Habitat degradation and restoration is a major issue in fisheries management and research. Artificial reefs have been discussed and used to remediate habitat loss for several decades; however, several major issues are associated with design and use of artificial reefs:

- Poorly defined objectives – what is the purpose of the reef? What fish species will benefit? At what life stages? Is their natural habitat actually degraded?
- Potentially conflicting objectives – is the purpose of the reef to benefit fish, or anglers?
- Lack of long-term assessment – most post-construction assessment is only 1 to 2 years
- Distinguishing attraction from production – does the reef simply attract fish from elsewhere (and diminish adjacent populations) or improve growth and/or reproductive success?

The ferry sinking project inherently or explicitly addresses several of these issues. The ferry is likely to attract fishes of interest to anglers, and since few species in the lake are of management concern, additional angling pressure is unlikely to be detrimental to the fish populations. The ferry will also serve as an attractive diver destination. The ferry could also be a site of several short- or long-term research projects.

While there is currently no funding in place to conduct a scientific evaluation of the impacts of the ferry, several potential studies would be of interest; several of these studies would benefit from observations by recreational divers.

- Which fish species occupy the ferry? Both anglers and divers can document which species they catch or observe at the site. Use of GoPro cameras to take images of the ferry will enable collection of quantitative data, including relative fish size.
- Does the ferry attract fish species relative to nearby habitat? This may be more challenging to address, because anglers will likely focus on the ferry site rather than

adjacent areas, but catch-per-effort data would be valuable to assess the attraction of fishes to the ferry.

- Is the site used by fish for spawning? Fish presence and behavior would need to be studied as the site becomes occupied.
- Do fish remain at the ferry site (i.e., they become territorial), or is the population of fish constantly moving in and out of the area? Fish can be marked with individually-numbered external colored tags that can be identified by divers and catch-and-release anglers. Mark-recapture data would allow estimation of the number of fish using the site, and whether the site becomes a ‘closed’ population (i.e., few individuals leaving or entering).
- Is the ferry site used by spawning lake trout, or as feeding and refuge habitat for lake sturgeon? Both of these species are of particular management interest and the focus of restoration efforts. Two current research projects in Lake Champlain involve tagging lake trout and lake sturgeon with internal acoustic transmitters. The tags emit a unique signal every two minutes for several years. Signals are picked up by stationary receivers deployed around the lake, and data are used to determine what habitats these fish use during all seasons of the year, and particularly during spawning (lake trout) and as juveniles (sturgeon). A receiver could be deployed on the ferry to document number of visits to the site by each species, relative to adjacent sites currently being monitored.
- Colonization of the ferry by zebra mussels also offers opportunities for research. Zebra mussel populations in Lake Champlain appear to have stabilized, either because they are now limited by availability of hard surfaces to colonize, or they have reached a carrying capacity of food availability. Documentation of the rates and pattern of colonization of the ferry (e.g., which surfaces are colonized first? Will molluscivorous fish suppress mussel populations?) would be of interest, and could involve interested members of the diving community.

I am happy to discuss any of these ideas and address any questions you or others may have.

Sincerely,



J. Ellen Marsden
Professor, Wildlife and Fisheries Biology Program,
University of Vermont



U.S. Environmental Protection Agency

U.S. Maritime Administration

National Guidance: Best Management Practices for Preparing Vessels Intended to Create Artificial Reefs



May 2006

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ACKNOWLEDGEMENTS

This document was jointly developed by the U.S. Environmental Protection Agency's (EPA) Oceans and Coastal Protection Division within the Office of Water and the Department of Transportation's Maritime Administration. To assist in early stages of document development, an interagency workgroup was established by Laura S. Johnson of EPA. The following agencies actively participated on this workgroup:

- Maritime Administration
- National Oceanic and Atmospheric Administration
- United States Army Corps of Engineers
- United States Fish and Wildlife Service
- United States Coast Guard
- United States Department of the Navy
- United States Environmental Protection Agency



Photo courtesy of Laura S. Johnson
Maritime Administration's James River Reserve Fleet, Virginia.

Cover Photos

Top photo: Ex-USS Spiegel Grove en route to artificial reef sink site. Photo courtesy of Andy Newman, Florida Keys News Bureau.

Middle photo: Ex-USS Spiegel Grove resting at its artificial reef site. Photo courtesy of Florida Fish and Wildlife Conservation Commission, Division of Marine Fisheries Management, Artificial Reef Program.

Bottom photo: The scuttling of Navy Dive Tender YDT-14 on April 1, 2000, approximately 18 miles SE of Pensacola Pass, Escambia County, Florida. Photo courtesy of Florida Fish and Wildlife Conservation Commission, Division of Marine Fisheries Management, Artificial Reef Program.

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Photo courtesy of Florida Fish and Wildlife Conservation Commission
 The scuttling of Adolphus Busch on Dec. 5, 1998, approximately 7 miles S of
 Summerland Key, Monroe County, Florida.

EXECUTIVE SUMMARY

This guidance document was developed to satisfy the mandate of Section 3516 of the National Defense Authorization Act for Fiscal Year 2004, which requires that the Maritime Administration (MARAD) and the U.S. Environmental Protection Agency (EPA) jointly develop guidance recommending environmental best management practices to be used in the preparation of vessels for use as artificial reefs. It also responds to MARAD's request for the EPA to provide national environmentally-based best management practices for the preparation of vessels to be sunk with the intention of creating artificial reefs in permitted artificial reef construction areas.

Options for managing obsolete and decommissioned military and commercial vessels include re-use of the vessel or parts of the vessel, recycling or scrapping, creating artificial reefs, and disposal on land or at sea. This document discusses the preparation of obsolete and decommissioned military and commercial vessels when employing the vessel management option of artificial reefing. Artificial reefs should only be developed where such reefs will enhance native marine resources and benefit the natural marine environment. Strategically sited artificial reefs not only can enhance aquatic habitat, but also provide an additional option for conserving, managing, and/or developing fishery resources.

Although the best management practices presented in this document are intended for use when preparing vessels to serve as artificial reef habitat, the best management practices may have applicability to other in-water uses of vessels, such as the creation of recreational diving opportunities. It is recommended that these best management practices be implemented for such in-water uses of vessels, with the caveat that further vessel preparation beyond that employed for artificial reef habitat may be needed. When preparing a vessel for such in-water uses, consideration should be given to vessel stability and integrity prior to and after final placement.

This guidance identifies materials or categories of materials of concern that may be found aboard vessels and specifically identifies where they may be found. For each material or category of material, this document provides a narrative clean-up performance goal and information on methods for achieving those goals in preparation of the vessel prior to sinking. Materials of concern include, but are not limited to: oil and fuel, asbestos, polychlorinated biphenyls (PCBs), paint, solids/debris/floatables, and other materials of environmental concern. Exhibit 1 provides a summary of the narrative clean-up goals for materials of concern.

In keeping with Section 3516 of the National Defense Authorization Act for Fiscal Year 2004, this guidance document addresses only recommended clean-up practices for vessels that are intended to be placed as artificial reefs. It neither endorses such placement nor does it address the potential availability or environmental effects associated with alternatives to placement of vessels as artificial reefs.

Exhibit 1. Summary of Narrative Clean-up Goals for Materials of Concern

Material of Concern	Narrative Clean-up Goal
<i>Oil And Fuel</i>	Remove liquid fuels and oils and semi-solids (greases) so that: no visible sheen is remaining on the tank surfaces (this includes all interior fittings, piping, structural members); no film or visible accumulation is remaining on any vessel structure or component (e.g., on machinery or from spills on decking or carpet). The end result of such clean-up should be that no sheen be visible upon sinking a vessel.
<i>Asbestos</i>	Remove any loose asbestos and asbestos that may become loose during vessel sinking; remove or seal accessible friable asbestos.
<i>Polychlorinated Biphenyls (PCBs)</i>	Remove all manufactured products containing greater than or equal to (\geq) 50 parts per million (ppm) of solid PCBs; remove all liquid PCBs regardless of concentration; remove all materials contaminated by PCB spills where the concentration of the original PCB source is \geq 50 ppm.
<i>Paint</i>	Remove harmful exterior hull anti-fouling systems that are determined to be active; remove exfoliating (peeling) and exfoliated paint.
<i>Solids/Debris/Floatables</i>	Remove loose debris, including materials or equipment that are not permanently attached to the vessel that could be transported into the water column during a sinking event.
<i>Other Materials of Environmental Concern</i>	Remove other materials that may negatively impact the biological, physical, or chemical characteristics of the marine environment.

The narrative clean-up performance goals for the materials of concern highlighted in this guidance should be achieved while preparing a vessel intended for artificial reefing. There are statutory requirements and associated regulations, as well as permit processes applicable to the process of preparing a vessel for reefing that are not highlighted in this document. These include, but are not limited to, issues such as vessel inspections by appropriate authorities and storage and disposal of waste generated during clean-up/preparation. Further, this document does not provide information on how to sink a vessel or the required actions or regulatory procedures/processes associated with the actual act of sinking a vessel.

INTRODUCTION

Several options exist for managing obsolete and decommissioned military and commercial vessels. These options include re-use of the vessel or parts of the vessel, recycling or scrapping, creating artificial reefs, and disposal on land or at sea. This document discusses the vessel management option of artificial reefing. This guidance document was developed to satisfy the mandate of Section 3516 of the National Defense Authorization Act for Fiscal Year 2004, which requires that the Maritime Administration (MARAD) and the U.S. Environmental Protection Agency (EPA) jointly develop guidance recommending environmental best management practices (BMPs) to be used in the preparation of vessels for use as artificial reefs. It also responds to MARAD's request for the EPA to provide national environmentally-based best management practices for the preparation of vessels to be sunk with the intention of creating artificial reefs in permitted artificial reef construction areas.

An interagency workgroup, chaired by EPA, was established to develop the BMPs. The workgroup included representatives from the EPA, U.S. Coast Guard, U.S. Navy, MARAD, U.S. Army Corps of Engineers, National Oceanic and Atmospheric Administration, and the U.S. Fish and Wildlife Service.

Although these best management practices are intended for use when preparing vessels to serve as artificial reef habitat, such best management practices may have applicability to other in-water uses of vessels, such as the creation of recreational diving opportunities. The best management practices presented in this document should be implemented for all permitted in-water uses of vessels; further diver safety preparations may be needed based on the intended in-water use, such as recreational diving.

Objectives of the Guidance Document

The BMPs, jointly developed by EPA and MARAD, are to serve as national guidance for federal agencies for the preparation of vessels for use as artificial reefs. Section 3516 of the National Defense Authorization Act for Fiscal Year 2004 provides that the BMPs are to (1) ensure that vessels prepared for use as artificial reefs “will be environmentally sound in their use as artificial reefs”; (2) “promote consistent use of such practices nationwide”; (3) “provide a basis for estimating the costs associated with the preparation of vessels for use as artificial reefs”; and (4) include measures that will “enhance the utility of the Artificial Reefing Program of the Maritime Administration as an option for the disposal of obsolete vessels.” Appendix A provides further detail on Section 3516 and MARAD's authority to transfer obsolete vessels for artificial reefing. Below is a description of how this document addresses the four requirements of the statute.

- The use of this guidance will help ensure that vessels prepared for use as artificial reefs “will be environmentally sound in their use as artificial reefs.” For each material of concern identified, this document provides a narrative clean-up performance goal and information on methods for addressing those goals in preparation of the vessel prior to sinking. The preparation of vessels in this manner will help ensure that their use as artificial reefs is environmentally sound. The purpose of creating an artificial reef is to benefit the environment by enhancing aquatic habitat and marine resources, as well as

providing an additional option for conserving, managing, and/or developing fisheries resources. This document describes appropriate vessel preparation that could achieve such benefits as an artificial reef and avoid negatively impacting the environment with pollutants. The narrative clean-up performance goals provided in this document, if implemented and complemented with strategic site selection (siting), will maximize the opportunity for these vessels to benefit the environment as artificial reefs.

- The use of this guidance document will “promote consistent use of such practices nationwide” and in turn will also provide measures that will “enhance the utility of the Artificial Reefing Program of the Maritime Administration as an option for the disposal of obsolete vessels.” The best management practices described in this document serve as national guidance for the preparation of vessels for use as artificial reefs. As the use of vessels as artificial reefs is becoming a more common management option for obsolete vessels, the development of this guidance document is timely. Currently, no guidance of this kind is available. The use of this guidance document can enhance the utility of MARAD’s Artificial Reefing Program, by establishing a national approach to cleaning and preparing candidate obsolete vessels, while also promoting consistent use of such practices for vessel-to-reef projects.
- The use of this document will “provide a basis for estimating the costs associated with the preparation of vessels for use as artificial reefs.” Although the best management practices were developed independent of costs associated with clean-up, the narrative clean-up performance goals in this document can be used as a basis for estimating the cost for appropriate vessel preparation. In order to determine the estimated cost to prepare a specific vessel for use as an artificial reef, the narrative clean-up performance goals, along with the vessel preparation BMPs, can be used to scope the volume of work to be accomplished based on a detailed ship-check and implementation of a representative PCB sampling protocol. There is wide variability of ships and associated kinds and amounts of material found on a particular ship, as well as wide variability of remediation and disposal costs in different geographic locations within the U.S. Therefore, it is not possible to provide in this document representative cost estimates associated with the preparation of a ship for reefing. A reasoned estimate of the actual cost of preparation will require a ship-by-ship analysis.

In order to provide some insight into the costs that have been incurred for vessel-to-reef projects, some pertinent vessel-specific information is provided here. Two recent examples of vessels that have been prepared with the intent of serving as artificial reefs are the ex-USS Spiegel Grove and the ex-USS Oriskany. The total cost of reefing the ex-USS Spiegel Grove, which was a MARAD vessel, was \$1.3 million.¹ This total cost includes costs for both vessel clean-up/preparation, as well as costs other than vessel clean-up/preparation. Details of the project cost estimates are presented in Exhibit 2. Vessel specifications for the ex-USS Spiegel Grove are presented in Exhibit 3. The ex-USS Spiegel Grove was cleaned/prepared prior to the availability of the BMPs presented in this document. Further information regarding the ex-USS Spiegel Grove can be found

¹ Communication between Captain Spencer Slate, ex-USS Spiegel Grove vessel-to-reef project co-manager, and Laura S. Johnson, EPA.

at <http://www.fla-keys.com/spiegelgrove/>.

Exhibit 2. Ex-USS Spiegel Grove Total Project Costs

PCB sampling protocol and removal	\$75,000
Reorienting the vessel	\$550,000
Towing and berthing	\$125,000
Other clean-up and scuttling preparation and execution	\$550,000
Ship clean-up time	7 months
Project duration	8 years

Exhibit 3. Ex-USS Spiegel Grove Vessel Specifications

Type of vessel	Landing Ship Dock (LSD)
Overall length	510 feet
Extreme beam	84 feet
Keel date	Sept. 7, 1954
Launch date	Nov. 10, 1955
Decommission date	Oct. 2, 1989
Location of reefed vessel	6 miles off the Florida Keys in the Florida Keys National Marine Sanctuary



Photo courtesy of Andy Newman
Ex-USS Spiegel Grove, once a MARAD vessel, under way to Florida Keys for final sinking preparations.

The total cost of reefing the ex-USS Oriskany, which is a Navy vessel, was \$15.63 million. This total cost includes costs for both vessel clean-up/preparation, as well as costs other than vessel clean-up/preparation. Details of the project cost estimates are presented in Exhibit 4. As noted later in this document, the Navy is required to clean/prepare vessels intended for use as artificial reefs in accordance with this BMP guidance. The Draft BMP guidance was available for the ex-USS Oriskany vessel clean-up/preparation. Vessel specifications for the ex-USS Oriskany are presented in Exhibit 5. Further information regarding the ex-USS Oriskany can be found at <http://peos.crane.navy.mil/reefing/oriskany.htm>.

Exhibit 4. Ex-USS Oriskany Total Project Costs

Ship remediation (BMP-related)	\$8.28M
Flight deck remediation (BMP-related)	\$3.61M
PCB model and risk assessment development (BMP-related)	\$3.74M
Towing and berthing	\$3.07M
Scuttling preparation and execution	\$4.90M
Ship clean-up time	12 months
Project duration	3 years (FY03 through FY06)

Exhibit 5. Ex-USS Oriskany Vessel Specifications

Type of vessel	Essex Class aircraft carrier (CV-34)
Overall length	911 ft
Extreme beam	107 ft
Keel date	May 1, 1944
Launch date	Oct. 13, 1945
Decommission date	Sept. 30, 1976
Location designated for reefing this vessel	23 miles south off Pensacola, Florida



Photo courtesy of U.S. Navy

Ex-USS Oriskany arriving at NAS Pensacola, Florida. March 23, 2006.

If the narrative clean-up goals provided in this document cannot be economically achieved, for example because of very significant amounts of materials of concern on the vessel, then the vessel would not be a good candidate for reefing. The methods, approach, and level of effort for clean-up, as well as worker safety concerns, are directly dependent on the vessel's condition and the amount of materials of environmental concern that are found aboard. Vessels where clean-up could pose potential worker safety risks or could incur high costs may not be good candidate vessels for reefing.²

Some portions of a candidate vessel may be economically salvageable. Any such salvage operations should occur in a manner that will minimize debris and contamination with oils or other products that have to be cleaned up at a later date. This activity should allow for improved access for subsequent clean-up efforts, and the salvage proceeds may help offset some costs for vessel preparation.

Operations associated with salvage, clean-up, and diver access have the potential to adversely impact vessel stability. Failure to consider the impact of these activities on vessel stability before and during scuttling operations could result in premature and uncontrolled capsizing and/or sinking of the vessel. Therefore, vessel stability considerations should be an integral part of the salvage, clean-up, modification (for diver access), transport, and sinking plans of a vessel-to-reef project.

² The BMP guidance does not address worker safety issues. Readers with an interest in such safety issues and concerns should consult other relevant documents, such as those prepared by OSHA, State or local safety agencies, and other relevant EPA documents. For example, EPA's *A Guide for Ship Scrappers – Tips for Regulatory Compliance* presents important information related to environmental and worker safety and health issues for ship scrapping/ship breaking operations when handling specific hazardous materials. This document can be accessed via the World Wide Web at <http://www.epa.gov/oecaerth/resources/publications/civil/federal/shipscrapguide.pdf>.



Photo courtesy of U.S. Navy

Metal recovery and salvage operations onboard the ex-USS Oriskany while being cleaned.

In the process of preparing a vessel for reefing, there are requirements and regulations, including permit processes, appropriate disposal of waste generated during vessel clean-up/preparation, and vessel inspections by appropriate authorities to consider that are not discussed in great detail in this document, with the exception of TSCA requirements applicable to PCBs. Appendix B does provide, however, an overview of principal federal environmental statutes potentially affecting preparation or placement of a vessel for use as an artificial reef. Further, other than siting considerations that would affect how a vessel is prepared for use as an artificial reef, this document does not detail the legal requirements applicable to transfer, siting, or sinking of vessels as artificial reefs in vessel-to-reef projects, except for the overview offered in Appendix B. The information in Appendix B is intended only for the convenience of the reader in order to provide a useful starting point for identifying the principal environmental statutes of interest. On a case-by-case basis, additional federal statutes also may apply, though the federal statutes identified in Appendix B would be most relevant for the preparation of a vessel for use as an artificial reef. The final preparation plan for any particular artificial reef project will necessarily be vessel-specific, and will depend on the characteristics of the vessel and final permitted artificial reef construction site, as well as regulatory considerations. In addition, State and local laws also may apply to vessel preparation, but the document does not attempt to identify such laws in Appendix B.

This guidance identifies materials or categories of materials of concern that may be present aboard vessels, indicates where these materials may be found, and describes their potential adverse impacts if released into the marine environment (Appendix C provides related information). The materials of concern include, but are not limited to: fuels and oil, asbestos, polychlorinated biphenyls (PCBs), paints, debris (e.g., vessel debris, floatables, introduced material), and other materials of environmental concern (e.g., mercury, refrigerants). With the

exception of materials containing PCBs, this document does not comprehensively discuss applicable legal requirements, although those requirements that are directly applicable to vessel preparation must also be met prior to vessel sinking and placement. Because the best management practices described in this document are directed at the environmental concerns associated with using vessels as artificial reefs, other sources of information should also be used with regard to preparation of the vessel from a diver safety perspective or for any other potential in-water uses.

A detailed description and characterization of the potential sources of contamination from a vessel intended for use as an artificial reef should be conducted and a plan developed. The purpose of this plan is to assure that materials potentially contributing to pollution of the marine environment are addressed. Appendix D of this document presents information regarding the development of workplans; Appendix E provides information regarding general principles for clean-up operations.

When preparing a vessel that is intended to serve as an artificial reef, documenting the clean-up procedures used and the contaminants that will remain onboard the vessel is a key element of the BMPs. More specifically, a description of how the BMP narrative clean-up performance goals were achieved, and a visual inspection, are needed to determine whether and how the vessel has been cleaned to the level recommended in this guidance document so the vessel can be managed appropriately. A recommended checklist for documenting vessel clean-up using this guidance can be found in Appendix F. A vessel inspection by qualified personnel should be conducted to confirm satisfactory clean-up/preparation. It also should be noted that applicable regulatory regimes may require such an inspection.

Achieving and verifying satisfaction of the BMP clean-up goals could help support permit applications under the Clean Water Act Section 404 (33 U.S.C. 1344) or Rivers and Harbors Act Section 10 (33 U.S.C. 403), if a permit application is submitted to the U.S. Army Corps of Engineers. Further, robust BMP documentation might prove useful for demonstrating consistency with Coastal Zone Management Act programs (16 U.S.C. 1452, et seq.), as well as for any other State or local certifications necessary to carry out a vessel-to-reef project. Also, EPA officials may find BMP documentation useful as part of their review under EPA certification authority pursuant to the Liberty Ship Act. (Note: this Act only applies to DOT/MARAD-owned obsolete vessels intended for use as an artificial reef for the conservation of marine life.)

This guidance does not substitute for any statute or regulation, nor is it a regulation itself. The document recommends environmental best management practices for use in the preparation of vessels for use as artificial reefs. Associated with the recommended environmental best management practices are narrative environmental clean-up performance goals, as well as recommendations and suggestions in furtherance of those goals. By its terms, the guidance itself does not impose binding requirements on any federal agency, States, other regulatory or resource management authorities, or any other entity. Among other things, the document includes mechanisms to enhance the utility of the Artificial Reefing Program of the Maritime Administration as an option for the disposal of obsolete vessels. It should be noted that under 10 U.S.C. 7306b(c), the Secretary of the Navy must ensure that the preparation of a vessel (that is stricken from the Naval Vessel Register) for use as an artificial reef is conducted in accordance

with the environmental best management practices in this guidance. This latter statutory requirement, not today's guidance document itself, governs the Navy's application and use of this document.

Organization of this Guidance Document

This document describes guidelines for the preparation of vessels in a manner that will help ensure that the marine environment will benefit from their use as artificial reefs. Strategic siting is an essential component of a successful artificial reef project. Before the discussion of vessel preparation is presented, a cursory description of reef site selection recommendations is provided.

For each material or category of material of concern identified, this document provides a narrative clean-up performance goal and information on methods for addressing those goals in preparation of the vessel prior to sinking. Additional information for each material includes a description of its shipboard use and where it may be found on a vessel, as well as its expected impacts if released into the marine environment.

Although the best management practices presented in this document are intended for use when preparing a vessel to serve as artificial reef habitat, it is recommended that these best management practices be implemented for other in-water uses of vessels such as recreational diving. This potential obsolete vessel management option is briefly described in this document.

SITING OF ARTIFICIAL REEFS

Artificial reefs can enhance marine resources and in turn benefit the marine environment; however, creating a successful reef entails more than randomly placing miscellaneous materials in ocean, estuarine, or other aquatic environments. Planning (including siting), long-term monitoring, and evaluation are necessary components of each project to help ensure that the anticipated benefits of artificial reefs are attained. Improperly planned, constructed, or managed reefs may be ineffective, may cause conflict among competing user groups of the reef site, may increase the potential to over harvest targeted species, or may damage natural habitats. In such cases, the anticipated benefits of an artificial reef project may be negated.

Because the purpose of creating an artificial reef is to benefit the environment by enhancing aquatic habitat and marine resources, as well as providing an additional option for conserving, managing, and/or developing fisheries resources, artificial reefs should not cause harm to existing living marine resources and habitats. Properly prepared and strategically sited artificial reefs can enhance fish habitat, provide more access to quality fishing grounds, and provide managers with another option for conserving, managing and/or developing fishery resources.

Placement of a vessel to create an artificial reef should:

- enhance and conserve targeted fishery resources to the maximum extent practicable;
- minimize conflicts among competing uses of water and water resources;
- minimize the potential for environmental risks related to site location;
- be consistent with international law and national fishing law and not create an obstruction to navigation;
- be based on scientific information; and
- conform to any federal, State, or local requirements or policies for artificial reefs.

Additional considerations that may be relevant to the placement of a vessel for the creation of an artificial reef include:

- facilitating access and use by recreational and/or commercial fishermen; and
- facilitating access and use by recreational divers.

Artificial reef project planners should identify the habitat type and/or species targeted for enhancement and determine which biological, physical, and chemical site conditions will be most conducive to meeting the reef objectives. Once these siting conditions, including community settlement and recruitment dynamics, are determined, they should be used in identifying potential construction sites. Existing communities (e.g., infaunal, epifaunal, benthic, demersal, mid-water, surface-oriented) in the area where the artificial reef is to be placed should

be considered prior to placement -- this should include monitoring to establish baselines for the fishing resources.

Caution should be exercised when developing artificial reefs in nearshore areas due to the increased potential for resource competition as well as competition for niche space. Improperly sited reefs might enhance a recreational fish resource at the expense of other species or habitat; it may also alter the ecological balance of the area. For example, sandy estuarine habitat often provides critical nursery grounds for the juveniles of many species of bottom fish. During this life stage, the primary predator protection for these juvenile fish is the absence of large fish -- which are favored by recreational anglers. Oftentimes, sandy estuarine locations tend to be popular choices for siting artificial reefs to attract large fish for recreational fishing, thereby altering existing predatory/prey interactions and creating resource competition. Strategic project planning can minimize these conflicts.

Artificial reefs should not be constructed such that they are placed on or threaten the integrity of natural habitats such as:

- existing coral reefs;
- significant beds of aquatic grasses or macroalgae;
- oyster reefs;
- scallop, mussel, or clam beds;
- existing live bottom (i.e., marine areas supporting growth of sponges, sea fans, corals, and other sessile invertebrates generally associated with rock outcrops); or
- habitats of Endangered Species Act listed species and species of State and local concern.

The goals and priorities of an artificial reef project should direct overall site selection. Within the identified target area, existing natural and artificial reefs and known bottom obstructions should be identified. Exclusion areas for potential artificial reef projects should include, but are not limited to:

- shipping lanes;
- restricted military areas;
- areas of poor water quality (e.g., low dissolved oxygen, dredged material disposal sites);
- traditional trawling grounds;
- unstable bottoms;
- areas with extreme currents, or high wave energy;

- existing right-of-ways (e.g., oil and gas pipelines and telecommunication cables);
- sites for purposes that are incompatible with artificial reef development; and
- areas designated as habitat areas of particular concern or special aquatic sites.

The bottom composition and configuration at an artificial reef site affects reef stability and longevity and should be carefully evaluated in the site selection process. In most cases, soft sediments such as clays, silts, and loosely packed sands should be avoided. Over time, artificial reef materials may sink into these sediments or become partially covered.

Project planners should evaluate vessel-to-reef projects and potential sites with regard to chemical and biological conditions as well as long-term durability and stability, as these will affect future habitat value.

Coastal physical processes can greatly influence a potential artificial reef site. Artificial reef planners should be aware that bottom sediments shift and may change significantly during storms, hurricanes, and geologic events. Materials that present large amounts of surface area may scour deeply into almost any bottom type, depending upon storm events, currents, or wave action.

The principal hydrographic factors to be considered in selecting sites for artificial reef placement include water depth, potential wave height, currents, and tides. Water depth is a significant siting criterion. Artificial reefs should be placed in water at sufficient depths to avoid creating a hazard to navigation – minimum clearance above the reef should accommodate the draft of the largest vessels expected to operate in the vicinity with an adequate safety margin. Water depth at the site may critically affect artificial reef material stability and long-term structural integrity. In large, open bodies of water, average wave energy as a function of water depth is the major concern.

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Guidance for Preparing Vessels to Create Artificial Reef Habitat



Photo courtesy of Laura S. Johnson

Worker sweeping debris during flight deck removal onboard the ex-USS Oriskany.

OIL AND FUEL

Narrative Clean-up Goal: Remove liquid fuels and oils and semi-solids (greases) so that: no visible sheen is remaining on the tank surfaces (this includes all interior fittings, piping, structural members); no film or visible accumulation is remaining on any vessel structure or component (e.g., on machinery or from spills on decking or carpet). The end result of such clean-up should be that no sheen be visible upon sinking a vessel.

What are oil and fuel?

For purposes of this guidance, the term oil includes crude oil; petroleum and petroleum-refined products (e.g., diesel fuel, gasoline, kerosene, and bunkers); and non-petroleum oils such as synthetic oils (e.g., silicone fluids), wood-derivative oils (e.g., resin/rosin oils), animal fats and oil, and edible and inedible seed oils from plants, which might be more relevant for cargo vessels.

Some common refined petroleum products and their characteristics are as follows:

- ***No. 2 Fuel Oil*** is a lightweight substance that flows easily, spreads rapidly, and disperses readily. It is neither volatile nor likely to form emulsions.
- ***No. 4 Fuel Oil*** is a medium weight substance that flows easily and is readily dispersed if treated promptly. It has a low volatility and moderate flash point.
- ***No. 5 Fuel Oil (Bunker B)*** is a medium to heavyweight substance with a low volatility and moderate flash point. Dispersion is very difficult and potentially impossible.
- ***No. 6 Fuel Oil (Bunker C)*** is a thick substance that is difficult to pump and requires preheating for use. No. 6 fuel oil may be heavier than water. It is not likely to dissolve, and is likely to form tar balls, lumps, or emulsions. No. 6 fuel oil is very difficult or impossible to disperse. It has a low volatility and moderate flash point and is especially persistent in the environment.

What are the potential environmental impacts of oil and fuel?

The impacts of fuel and/or oil introduced into the marine environment are influenced by a variety of factors, including the physical properties of the oil, whether the oil is petroleum-based or non-petroleum-based, and the hydrodynamic properties of the receiving waters. Each type of oil has distinct physical properties that affect the way it disperses and breaks down, the hazard it may pose to ecosystems, and the likelihood that it will pose a threat to manmade resources. For example, the rate at which surface dispersion occurs will help to determine the effect of an oil spill on the environment. Most oils spread horizontally into a smooth and continuous layer, called a “slick,” on the water surface.

Petroleum-based and non-petroleum-based oils can have both immediate and long-term adverse

effects on the environment. These oils can be dangerous, or even deadly to wildlife. Light refined petroleum products, such as gasoline and kerosene, spread on water surfaces. The risk of fire and toxic exposure is high, but the products evaporate quickly and leave little residue. Alternatively, heavier petroleum-based refined oil products may pose lesser fire and toxic hazards and do not spread on water as readily. However, heavier oils are more persistent in the environment, and may present a greater clean-up challenge.

Many non-petroleum oils have physical properties similar to those of petroleum-based oils. For example, they both have limited solubility in water, they both create slicks on the water surface, and they both form emulsions and sludge. However, non-petroleum oils tend to be persistent, remaining in the environment for long periods of time.

Oil spills can harm the environment in several ways, including the physical damage that directly impacts wildlife and their habitats and the toxicity of the oil and its constituents, which can poison exposed organisms. Spilled oil in the environment immediately begins to disperse and degrade, with concomitant changes in physical and chemical properties. As these processes occur, the oil threatens natural resources, including birds and mammals as well as a wide range of marine organisms linked in a complex food web. Some organisms can be seriously injured (non-lethal effects) or killed (lethal effects) very soon after contact with the oil in a spill (acute effects); however, non-lethal toxic effects are often more subtle and often longer lasting (chronic effects).

Where are oils and fuels found in a ship?

Diesel fuel and fuel oil may be contained in various tanks throughout a ship. For example, lubricating oil is found in engine sumps, drums of unused lubricating oil in ship storerooms or engineering spaces, and sludge in fuel and cargo tanks. Hydraulic systems and components also contain oils.

The vessel's piping and tank arrangements generally will contain some oil, fuel, sludge, and associated residues. Fuel oil may be found in both integrated and freestanding tanks throughout the ship. Lubricating oils may be found in a variety of tanks depending on their individual use. System oils are generally located in engine room sump tanks, while cylinder oils and lubrication oils will be stored in tanks dedicated for a specific purpose. Other types of fuels and oils may be contained in cargo tanks.

“Used oil” -- any oil that has been refined from crude oil or any synthetic oil that has been used and, as a result of such use, is contaminated by physical or chemical impurities -- also may be found on ships. Used oil includes spent lubricating fluids that have been removed from engine crankcases, transmissions, and gearboxes; industrial oils such as compressor, turbine, and bearing oil; metal working oil; and refrigeration oil.

Spills of fuels and oils may be found near cargo holds, ship store rooms, engineering spaces, and any other equipment that may house fuel and oil.

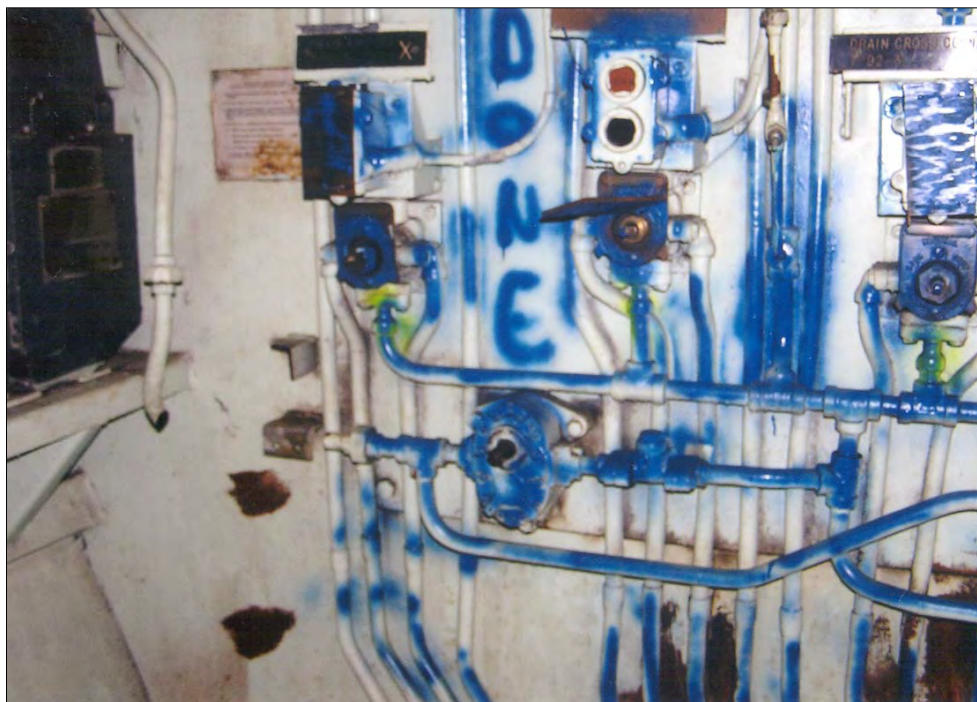


Photo courtesy of Laura S. Johnson

Flushed hydraulic system onboard the ex-USS Oriskany.

How should the vessel be prepared; what are the appropriate BMPs for oil and fuel?

The aim of clean-up is to remove liquid fuels, oils, and grease. Although it is impossible to remove all fuels, oils, and grease, a very thorough clean-up is achievable. In general, all liquid fuels and oils and semi-solids (greases) should be drained, flushed, and cleaned from fuel/lube and fluid system equipment (including piping, interior fittings, and structural members) so that no visible sheen remains on the tanks or other associated fluid system structures. The opening and cleaning of pipes varies according to the type of product that was in the lines. No visual evidence of weeping (oozing or releasing drops of liquid) should exist at openings. An alternative and very effective option for hydrocarbon clean-up is removal of the equipment and piping. Suggested cleaning methods for liquid fuels and oils, and semi-solids are found in Appendix G.

During vessel preparation, an economical way of managing used oil is recycling. It should be noted that additional used oil might be generated during the final preparation of the vessel prior to sinking (e.g., oil for generators). Such used oil and grease should be removed from the vessel before sinking. While the goal is to remove all oil and grease, it may be acceptable to leave old oil and grease in place if it is determined visually to be dried/solidified and therefore is not likely to cause a sheen.

Fuel and Oil Tanks

All fuels and lubricants should be drained from the tanks and the tanks flushed. Merely sealing tanks, whether as the sole means of fuel and oil tank preparation or in combination with partial

tank draining, is insufficient. Over time, the integrity of the sealed tanks will eventually be compromised as marine growth density increases and the ship's underlying structural components decay. The placement of the Liberty ship, Joseph L. Meek, sunk off Escambia County, Florida, in 1976, demonstrated that corrosion of the ship's metal will eventually release residual fuel sealed in tanks into the environment. Although sealing the tanks without removing the contents is not sufficient for managing fuel and oil on a vessel intended to serve as an artificial reef, fuel/lube and fluid system equipment and piping intended to stay on the vessel should be sealed as necessary for the purpose of towing stability once the fuel/oil has been removed. Because these systems need to be opened during vessel preparation for draining and flushing the systems clean, sealing these systems may be necessary to help maintain vessel stability during transit to the designated artificial reef site.

There are several accepted and widely used methods to clean fuel and oil tanks. The appropriate method will be determined by the type of fuel or oil in the tank, the amount of residue in the tank, and the extent of any hard or persistent deposits or residues. In general, lower quality fuels and heavy oils will require more cleaning effort. Similarly, tanks for dirty or water-contaminated oils will require more cleaning effort.

When cleaning tanks, the following factors should be considered: worker access and safety issues, machinery and resources available, and the methods or facilities available to deal with the cleaning residues. It may be necessary to experiment with several cleaning methods to see which best suits the particular circumstance.

Some methods for cleaning tanks are detailed in Appendix G. Regardless of the selected tank cleaning method, the effluent and water must be collected, treated, and disposed of in compliance with applicable regulations. Large volumes will require the services of a pumper truck or barge, while smaller quantities should be collected and stored in drums. Caution should be used during all transfer operations to avoid spills. If transferring large quantities of oil or oil contaminated liquid, a containment boom around the vessel should be used to minimize the extent or spreading of an accidental release.

Structural and Non-structural Tanks

All structural and non-structural tanks are assumed to be contaminated by fuel or oil until proven otherwise. Structural tanks include, but are not limited to: fuel storage/settling/service/day tanks, cargo tanks, oil tanks, structural hydraulic tanks, fresh water tanks, ballast tanks, stabilizer tanks, black and gray water tanks, voids, and cofferdams. At a minimum, liquid fuels and oils in such tanks should be removed.

Tank interiors including deckheads should be cleaned of all fuel and oil. No visible fuel and oil should remain on the tank surfaces (this includes all interior fittings, piping, structural members), or on the water surface when flooded after sinking. No emulsified oil, as determined by visual inspection, should remain. Oil absorbent pads and excess loose oil absorbent material should be removed before sinking.

Gauges and Gauge Lines

Pressure gauges and gauge lines are assumed contaminated with the product that they were intended to measure. Fluid filled gauges should be removed. Pressure gauges and gauge lines

should also be removed to prevent oil seepage from these lines. Lines that remain in place should be flushed, and the lines cleaned.

Special care should be exercised with mercury thermometers and pressure (typically vacuum) measuring devices. These should be removed intact from the vessel. A temperature gauge that does not contain any hazardous material can remain in its position. Other measuring instruments should be removed from the vessel or opened for cleaning, examination, and possible removal.

Combustion Engines

Combustion engines include any reciprocating engine in which fuel is consumed (diesel, gasoline, gases), stirling cycle engines, and gas turbines. The entire fuel/oil system should be drained and flushed. Any items (e.g., oil filters and strainer elements) that can not be flushed should be removed.

Combustion engines and associated manifolds should be thoroughly drained, flushed, and cleaned. Machinery need not be removed if it is completely drained and the sumps flushed and cleaned. Sometimes, engines are removed for reuse or to assure that all oil is removed before reefing. In some cases, it might be less expensive to remove and dispose of the engines than to clean the oil from them. Some methods for cleaning combustion engines are detailed in Appendix E.

Non-combustion Engines, Shafting, Gearing and Stern Seals

Main gear boxes and associated clutches should be drained of all lubricating oils. Internal gear sprayers, lubricating lines, and other components should be removed, or drained. External pedestal and thrust bearings should be drained.

Stern tubes and seals, if of the oil bath type, should be drained of oil. Note that draining the stern tubes and seals may require extraordinary measures to preserve the watertight integrity of the vessel during the clean-up and salvage operation.

Vessels that are equipped with thrusters, Z-drives, or other unconventional propulsion systems will be addressed on a case-by-case basis. The objective is that no oil or fuel remains in the propulsion system.

Steering Gear

Hydraulic pumps and associated piping and fittings should either be removed or drained and flushed clean. Hydraulic telemotor systems should be treated similarly. Grease lines and reservoirs for rudder heads should be removed from the ship, or opened and cleaned. Vessels with combined propulsion and steering systems should be addressed as described in the previous subsection (“Non-combustion Engines, Shafting, Gearing, and Stern Seals”).

Auxiliary Machinery

Auxiliary machinery that has oil as its working fluid should be completely drained and flushed clean. Auxiliary machinery refers to machinery and components that are not an integral part of the main propulsion system of the vessel. The term can include but is not limited to: pumps, motors, compressors, galley equipment, capstans, elevators, and cargo handling machinery.

Many pieces of auxiliary machinery have a lubricating oil system or are in direct contact with oil.

All lubricating oil system components should be stripped from auxiliary machinery, drained and cleaned. Lubricating oil sumps should be drained and cleaned.

Hydraulics

All hydraulic systems should be assumed to have employed a petroleum- or synthetic-based fluid that needs to be cleaned. Hydraulic lines should be removed from the vessel, or opened and blown through with air until clear. Hydraulic fittings (valves and valve blocks of all types, cylinders, pumps, accumulators, filters, coolers) should be removed from the ship or drained clean. Hydraulic sumps should be opened and drained clean.

Grease

All grease reservoirs should be removed from the ship, or opened and cleaned. Grease lines should be removed or blown through until clear and all visible grease accumulations should be removed so that no visible sheen remains. Machinery that employs grease-packed gearboxes (common on deck machinery), as well as grease packed couplings, stuffing boxes, chain sprockets, and worm drives should be opened and cleaned of grease. Grease on chains and sprockets should be removed. Greased cables should be cleaned or removed from the vessel.

Sealed rolling element bearings that contain grease can be left in-situ. Grease in other fittings such as stuffing boxes and glands can be left in situ if the seals are intact and the quantities are small (for example, less than 100 milliliters evenly distributed throughout the component). Any grease on the outside of the sealed bearings should be removed.

Bilge Areas

The bilge area includes all areas that would be subject to contact with oily water, or may be a catch area for spills from cargo holds or storerooms, and interior surfaces which may have been subject to contamination through sprays, spills, or disposal. Bilge areas also include the plating and all surfaces of attached stiffeners and fittings. Bilge areas should be free of visible oils, greases, and sludge. Oil or grease films evident to the touch should be removed. All debris should be removed, particularly any debris contaminated with fuel, oil, or grease. Any cleaning fluids used to clean the bilge should be removed from the vessel. Accumulations of loose oil absorbent material should be limited to those amounts that cannot reasonably be picked up with brooms and vacuums.



Photo courtesy of Laura S. Johnson

Oil absorbent pad in engine room bilge of the ex-USS Oriskany.

Cleaning bilges is frequently complicated by poor access caused by piping, gratings, and equipment. In many cases, it is cheaper and easier to remove the dirty or contaminated items that limit access than to clean the items as well as the bilge. Once clean, bilges are very vulnerable to recontamination. Note the following recontamination issues:

- Piping, valves, and fittings in systems containing fuels, oils, or grease will continue to drip for some time after initial draining. Over a short period of time, these drips can necessitate a major rework cleaning effort. Therefore, drips should be captured whenever possible; drip pans should be emptied frequently.
- Containers used for clean-up are vulnerable to tipping and spilling, especially in conditions -- such as poor lighting -- that are often found in vessels undergoing sinking preparation. Remove containers used for clean-up when they are full.
- Water should not be allowed to enter bilges unless it is part of a planned clean-up effort. Water that otherwise enters the bilge should be handled as oily wastewater.

In general, the approach and methods recommended for cleaning bilges are the same as for cleaning tanks.

Decks and Floor Coverings

Oil and grease films on decks and floor coverings should be cleaned. Floor coverings include ceramic tile, linoleum and linoleum tile, carpet, and any other floor coverings. In compartments subject to fuel and oil spills during the vessel's life (e.g., workshops, compartments with fuel or oil tank overflows or tank covers), the deck covering and underlayment should be examined for oil saturation. Floor coverings or underlayment that has been saturated with fuels, oils, or grease should be removed from the vessel.

Bulkheads and Deckheads

Bulkheads and deckheads should be cleaned of oil and grease films. Where it is evident that a spill or accumulation resulting from leaks has occurred, coverings should be removed to reveal the full extent of the spill or accumulation.

ASBESTOS

Narrative Clean-up Goal: Remove any loose asbestos and asbestos that may become loose during vessel sinking; remove or seal accessible friable asbestos.

What is asbestos?

Asbestos refers to a group of minerals that occur naturally as masses of long silky fibers. There are three main types of asbestos fibers:

- Chrysotile fibers (white asbestos) are fine, silky flexible white fibers. They are pliable and cylindrical, and arranged in bundles. This was the most commonly used asbestos in the United States.
- Amosite fibers (brown asbestos) are straight, brittle fibers that are light grey to pale brown. This was the most commonly used asbestos in thermal system insulation.
- Crocidolite fibers (blue asbestos) are straight blue fibers that are like tiny needles.

There are three other types of asbestos fibers: anthophyllite, tremolite, and actinolite. Unlike most minerals, which turn into dust particles when crushed, asbestos breaks up into fine fibers that may be too small to be seen by the human eye.

Individual asbestos fibers are often mixed with a material that binds them together, forming what is commonly called asbestos-containing material (ACM). There are two kinds of ACM: friable and non-friable.

- **Friable ACM** is any material containing more than 1% asbestos that, when dry, may be crumbled, pulverized, or reduced to powder by hand pressure.
- **Non-friable ACM** is any material containing more than 1% asbestos that, when dry, cannot be crumbled, pulverized, or reduced to powder by hand pressure. Non-friable ACM is divided into two categories.
 1. **Category I** non-friable ACM includes asbestos-containing resilient floor coverings, packings, and gaskets.
 2. **Category II** non-friable ACM includes all other non-friable ACM that is not included in Category I.

Asbestos is resistant to abrasion and corrosion, inert to acid and alkaline solutions, and stable at high temperatures. It is strong yet flexible, non-combustible, conducts electricity poorly, and is an effective thermal insulator.

What are the potential environmental impacts of asbestos?

Asbestos is a naturally occurring mineral. The environmental impacts caused by asbestos are dependent upon 1) whether asbestos is reduced to fibers or is in a non-friable form; and 2) whether the asbestos is air-borne or water-borne.

Even though adverse impacts from asbestos are largely from inhalation -- which is not expected to be an issue in the marine environment -- vessel preparation should eliminate the possibility of pieces of asbestos breaking free from the vessel during the sinking operation or asbestos materials losing surface integrity after the vessel has been placed as an artificial reef. Loose asbestos pieces can lead to rafting and may be capable of washing ashore. These asbestos pieces could dry up, break apart, and be reintroduced into the atmosphere. Exposure to airborne asbestos can negatively impact human health via inhalation.

Once a vessel has settled on the ocean floor, asbestos remaining on the vessel (e.g., intact and undisturbed asbestos insulation) will be covered with bacteria over time. This in turn will cause the asbestos fibers to sink and remain contained within the reef matrix, minimizing any potential direct impacts to the marine environment. (See Appendix C)

Where is asbestos found on a ship?

Asbestos on ships may be found in many materials, including, but not limited to:

- Bulkhead and pipe thermal insulation
- Bulkhead fire shields/fireproofing
- Uptake space insulation
- Exhaust duct insulation
- Electrical cable materials
- Brake linings
- Floor tiles and deck underlay
- Overhead and panel sheeting (cement and cellulose based)
- Steam, water, and vent flange gaskets
- Adhesives and adhesive-like glues (e.g., mastics) and fillers
- Sound damping
- Molded plastic products (e.g., switch handles, clutch facings)
- Sealing Putty
- Packing in shafts and valves
- Packing in electrical bulkhead penetrations
- Asbestos arc chutes in circuit breakers
- Pipe hanger inserts
- Weld shop protectors and burn covers, blankets, and any fire-fighting clothing or equipment
- Any other type of thermal insulating material

NOTE: Asbestos-containing material may be found underneath materials that do not contain

asbestos. Thermal system insulation and surfacing material found in vessels and vessel sections constructed after 1980 may be presumed to be free of asbestos-containing material.



Photo courtesy of Laura Casey

Asbestos pipe wrapping on the ex-USS Oriskany.

How should the vessel be prepared; what are the appropriate BMPs for asbestos?

Asbestos can be found throughout ships, from the top of the bridge to the bilge. Identifying the locations and types of asbestos onboard early in the clean-up process is essential for vessel preparation and may involve qualified asbestos inspectors. Once the type and location of asbestos and asbestos-containing materials are identified, a determination should be made whether to remove, encapsulate, or leave the asbestos undisturbed.

The method of demolition is particularly important to the effective management of asbestos on board ships. If the sinking method for the vessel includes the use of explosives, asbestos-containing material that may become disturbed during detonation should be removed from the vessel.

In addition, any asbestos that is moved or disturbed (including during clean-up operations) or can potentially get dislodged as the vessel sinks should be removed from the vessel. Friable asbestos should be sealed as a precautionary measure to prevent releases of asbestos in high concentrations during the sinking event. Intact and undisturbed asbestos insulation need not be removed.

Engine Room and Engine Compartments

Removal or encapsulation of exposed, disturbed and deteriorated asbestos should be considered since it is likely that the asbestos will break free and create debris during sinking. If the asbestos is to be encapsulated, the encapsulation should be strong enough that its integrity will not be impacted by the preparation for sinking as well as the sinking itself.

The primary source of friable asbestos is pipe wrappings around the main boilers and steam fittings. On most vessels the asbestos coating, which is 1 to 3 inches thick, is covered with canvas and is usually painted. If work needs to be done around the piping and the covering, causing the asbestos to be disturbed, the disturbed material should be removed. If the covering is deteriorated and it is likely that the asbestos will break free during sinking, then removal or encapsulation with an epoxy or other non-water soluble and non-toxic sealer should be considered. Certain boilers and piping are covered with a very friable asbestos paste. If such friable asbestos is not covered with canvas and/or paint, the friable asbestos should be sealed or encapsulated with an epoxy or other non-water soluble and non-toxic sealer.

Throughout the engine room there are numerous asbestos gaskets connecting piping and ductwork. If left intact, these gaskets usually will not release asbestos fibers. However, if the ductwork or piping needs to be cut or removed and vessel debris is created as a result, gaskets should be removed or encapsulated if possible.

In some engine rooms asbestos/cellulose sheets are found behind power and electrical panels or in the overhead where electrical service passes. Undisturbed, this material is not friable. However, once the sheets are exposed to the marine environment, the sheets lose their integrity and can break up and raft. Where possible, these sheets should be removed. Note that asbestos cement sheets may also be used as panels on the vessel. However, these sheets are not water-soluble and therefore should not break apart when exposed to the marine environment. These sheets can stay in place unless cut, drilled or disturbed. Friable asbestos may also be found between bulkheads; this asbestos may remain in place because the asbestos is contained within the bulkheads. If, however, the bulkheads are drilled, cut, or disturbed, the friable asbestos that is now exposed should be encapsulated or removed.



Photo courtesy of Laura S. Johnson
Patched asbestos pipe wrapping on the ex-USS Oriskany.

Ship Interior and Living Spaces

Asbestos was also used in some hatch gaskets mixed with rubber throughout ships, especially in watertight spaces. Under normal circumstances this will only present a problem if grinders or torches are used. In such cases, the gaskets should be removed prior to disturbance.

Asbestos/asphalt floor tile was common from the 1940's to the mid-1970's. This form of asbestos is manufactured with the asbestos encapsulated. If preparation of the vessel requires the tile to be disturbed via grinding, cutting, or burning, those pieces of tile should be removed.

Asbestos sheets both with cement and cellulose may be found especially in the combat information center, the radio room and other spaces where electrical equipment may be found. Cellulose/asbestos panels should be removed but cement panels are safe. As an example, while inspecting an old Navy tug planned for reefing off the coast of Virginia, it was determined that the entire interior of the wheel house was paneled with cellulose/asbestos panels and had to be removed.

Exterior Spaces

There are a few areas on the exterior of ships where asbestos was used. Asbestos may have been mixed with paint and applied as a coating near some vents and hatches. Also, some hatches may have gaskets that contain asbestos. In either case, the material does not need to be removed unless these exterior areas require grinding or cutting.

POLYCHLORINATED BIPHENYLS (PCBs)

Narrative Clean-up Goal: Remove all manufactured products containing greater than or equal to (\geq) 50 parts per million (ppm) of solid PCBs; remove all liquid PCBs regardless of concentration; remove all materials contaminated by PCB spills where the concentration of the original PCB source is \geq 50 ppm.

What are PCBs?

PCBs belong to a broad family of man-made organic chemicals known as chlorinated hydrocarbons. PCBs, which were domestically manufactured from 1929 until their manufacture was banned in 1979, have a range of toxicity and vary in consistency from thin, light-colored liquids to yellow or black waxy solids. Due to their non-flammability, chemical stability, high boiling point, and electrical insulating properties, PCBs were used in hundreds of industrial and commercial applications including electrical, heat transfer, and hydraulic equipment; as plasticizers in paints, plastics, and rubber products; in pigments, dyes, and carbonless copy paper; and many other industrial applications.

What are the potential environmental impacts of PCBs?

PCBs have been demonstrated to cause a variety of adverse health effects. PCBs have been shown to cause cancer in animals and have also been shown to cause a number of serious non-cancer health effects in animals, including effects on the immune system, reproductive system, nervous system, endocrine system, and other health effects. Studies in humans provide supportive evidence for potential carcinogenic and non-carcinogenic effects of PCBs. The different health effects of PCBs may be interrelated, as alterations in one system may have significant implications for the other systems of the body. EPA's peer reviewed cancer reassessment concluded that PCBs are probable human carcinogens. In addition, PCBs are persistent and bioaccumulative. PCBs bioaccumulate in fatty or lipid-rich tissues. PCBs have a limited solubility in aqueous solutions and PCBs can leach into a marine or aqueous environment (sediment and water column) where they can be taken up by organisms in the food web. PCBs bioaccumulate in fish and other animals; PCBs also bind to sediments. As a result, people who ingest fish may be exposed to PCBs that have been released into the environment and bioaccumulated in the fish they are ingesting.

There is a risk of human exposure during vessel preparation and after sinking the vessel. During vessel preparation, typical routes of human exposure include inhalation, accidental ingestion, or dermal contact. After sinking, exposure routes may be limited to accidental ingestion or contact with contaminated water and sediments, or ingestion of contaminated fish, shellfish, or crustaceans. (See Appendix C)

Where are PCBs found on a ship?

Although no longer commercially produced in the United States, PCBs are most likely to be present in vessels deployed before the 1979 PCB ban. For such vessels, PCBs may be found in both the solid (waxy) and liquid (oily) forms in equipment and materials onboard ships. The equipment that may contain PCBs in concentrations of ≥ 50 ppm and the manufactured products containing ≥ 50 ppm of solid PCBs, include:

Materials and items that could contain solid PCBs

- Cable insulation
- Rubber and felt gaskets
- Thermal insulation material including fiberglass, felt, foam, and cork
- Voltage regulators, switches, reclosers, bushings, and electromagnets
- Electronic equipment, switchboards, and consoles
- Adhesives and tapes
- Oil-based paint
- Caulking
- Rubber isolation mounts
- Foundation mounts
- Pipe hangers
- Plastics

Materials and items that could contain liquid PCBs

- Oil used in electrical equipment and motors, anchor windlasses, hydraulic systems, and leaks and spills from such items

Materials and items that could contain either liquid or solid PCBs

- Transformers, capacitors, and electronic equipment with capacitors and transformers inside
- Fluorescent light ballasts
- Surface contamination of machinery and other solid surfaces

Items containing PCBs may be found throughout a ship and are not always easily identifiable or readily accessible. PCBs may be found in a variety of shipboard materials, but the location and concentration can vary from item to item and within classes of items. PCB-containing materials also are likely to vary from ship to ship, and even ships in the same class can contain differing types and amounts of PCB-containing materials. While these materials may be found throughout a ship, several areas on ships may have an increased likelihood of containing PCB-bearing materials: areas or rooms subject to high heat or fire situations such as boiler rooms, engine rooms, electrical/radio rooms, weapons storage areas, or areas with hydraulic equipment. Be aware that these pieces of equipment or systems are vulnerable to leaks and spills, which could leave spill residues behind and contaminate porous materials (e.g., carpet, wood, rubber/plastic mats, paint).



Photo courtesy of Laura S. Johnson

Ex-USS Oriskany electronic equipment stripped of capacitors and transformers.

How should the vessel be prepared; what are the appropriate BMPs for PCBs?

PCBs are regulated for disposal under 40 CFR Part 761, and will be discussed in this context. The PCB regulations require manufactured products containing ≥ 50 ppm of solid PCBs (PCB bulk product waste) and materials contaminated by spills of liquids containing PCBs (PCB remediation waste) to be properly disposed. Although the ship itself is being “reused” or “recycled” as an artificial reef, the PCBs must be properly disposed. Disposal requirements for each type of PCB waste are referenced below (also see Appendix B).

Where there is reason to suspect that equipment or manufactured products containing solid PCBs may contain PCBs ≥ 50 ppm, either remove the equipment or component from the vessel, or provide proof that the equipment or component is free of PCBs, unless a PCB bulk product waste disposal approval has been obtained under 40 CFR 761.62(c) (see below).

Under TSCA regulations, a spill of liquids containing PCBs ≥ 50 ppm is considered an illegal disposal of PCBs. Material(s) contaminated by such a spill must be cleaned or removed and disposed of, unless a risk-based disposal approval has been obtained under 40 CFR 761.61(c). Spill residues and materials contaminated by these spills are regulated differently than bulk product waste (see below).

The design and implementation of a representative sampling and analytical plan can help determine the presence or absence of PCBs in materials containing solid PCBs at ≥ 50 ppm or materials containing PCBs as the result of spills. If the data from the sampling and analytical

plan indicates the absence of PCBs, the ship and its components are not subject to the PCB provisions of TSCA.

Liquid Materials Manufactured with PCBs

Remove all liquid-filled electrical equipment suspected of containing PCBs or PCB-contaminated dielectric fluid, regardless of PCB concentration. Materials such as lubricating oils and greases used for winches and cargo-handling machinery, hydraulic fluids, heat transfer fluids, and waste oils should be removed from the vessel in accordance with the guidance in the “Oil and Fuel” section of this document.



Photo courtesy of Laura Casey

Engine room electrical cabling on the ex-USS Oriskany.

Manufactured Products Containing Solid PCBs

Remove all manufactured products containing ≥ 50 ppm of solid PCBs, which includes, but is not limited to, felt gasket and faying material, cables, paints, rubber gaskets, as well as battle lanterns and fluorescent light ballasts.

Thermally removing PCB-containing materials is generally not authorized without prior written approval. Because PCB sampling and analytical procedures can be expensive and time consuming, there may be situations when the cost of sampling and analysis far exceeds the cost for removal and disposal. In some cases, vessel-to-reef projects have shown that removal of all electrical cables and wires suspected of containing PCBs was the most economical course of action.

While the complete removal of all manufactured products containing ≥ 50 ppm of solid PCBs is recommended, EPA recognizes that in some vessels it may not be feasible to identify and remove every such item. If such materials cannot be feasibly identified and/or removed, an application to EPA for a risk-based approval to dispose of the PCB bulk product waste in a marine environment for purposes of creating an artificial reef is required pursuant to 40 CFR 761.62(c). (EPA's decision includes consideration of a risk assessment submitted by the applicant, and a public participation process. Please consult the responsible EPA office for more information.)³

Materials Containing PCBs as a Result of Spills

Remove all materials containing ≥ 50 ppm of PCBs due to PCB spills. In addition, depending on the concentration of the spilled PCBs and the date when the spill occurred, it may be necessary to remove materials currently containing less than 50 ppm of PCBs due to spills.⁴ If it is not known when a spill occurred, you should generally assume that it occurred after July 1, 1979.

During vessel clean-up/preparation, attention should be directed to locations on the ship that are known to house equipment and systems that typically contain PCB liquids. Because such equipment or systems are vulnerable to leaks and spills during the lifetime of the vessel, the areas surrounding the equipment or systems are likely contaminated by liquids containing PCBs.

If there is no information regarding whether a spill occurred and/or the PCB concentration of any spilled liquid, design and implement a representative sampling plan to verify that there are no PCBs present in the areas surrounding the liquid-filled equipment or systems. If the sampling results indicate presence of PCBs as a result of a spill of liquids containing PCBs, remove the spill residue and the materials contaminated by the spill (e.g., remove paint from a contaminated surface such as a metal deck, strip the contaminated area down to bare metal in accordance with 40 CFR 761.79(b)(i)(B)). If spill residues or materials contaminated by PCB spills cannot be feasibly removed, an application to EPA for a risk-based approval to dispose of the PCBs in a marine environment for purposes of creating an artificial reef is required pursuant to 40 CFR 761.61(c). (EPA's decision includes consideration of a risk assessment submitted by the applicant, and a public participation process. Please consult the responsible EPA office for more information (see footnote # 3).)

³ Any vessel owner and/or sponsor should carefully consider the amount of time, resources and financial commitments necessary to address the identification, removal, and disposal of non-liquid PCB-containing materials and materials contaminated by spills of liquids containing PCBs before finally deciding if a vessel is suitable for reefing, and well in advance of commencing clean-up. EPA strongly recommends vessel owners and/or sponsors to begin discussions as soon as possible with the PCB coordinator for the EPA Region in which the vessel is proposed to be sunk. A list of EPA's current PCB coordinators may be found at www.epa.gov/pcb/coordin.html.

⁴ For PCB spills that occurred between April 18, 1978, and July 1, 1979, and where the original source was ≥ 500 ppm PCBs, remove all materials containing any concentration of PCBs. For PCB spills that occurred after July 1, 1979, and where the original source was ≥ 50 ppm PCBs, remove all materials containing any concentration of PCBs. Remove all materials currently containing ≥ 50 ppm PCBs as a result of spills (of any concentration) that occurred prior to April 18, 1978. Consult the PCB regulations at 40 CFR 761.3, 761.50(b)(3) and 761.61.

PAINT

Narrative Clean-up Goal: Remove harmful exterior hull anti-fouling systems that are determined to be active; remove exfoliating (peeling) and exfoliated paint.

What types of paint and anti-fouling systems are used on ships, and where are they found?

Paint and preservative coatings can be found on both interior and exterior surfaces of a ship. Particularly on older ships, paint may be flammable or may contain toxic compounds, such as polychlorinated biphenyls (PCBs), heavy metals (e.g., lead, barium, cadmium, chromium, and zinc), and biocides. Lead compounds, such as red lead tetraoxide (Pb_3O_4) and lead chromate, have been used extensively in marine paint. Other paints containing biocides, such as organotin (including compounds such as tributyl tin), have been used on the hulls of ships to prevent the buildup of marine organisms (e.g., bacteria, protozoa, barnacles, and algae).

Paints

Paint above the water line (topside paint) is not designed to leach because these paints are designed to protect topside surfaces from physical degradation and do not typically contain antifoulant biocides like that of anti-fouling coatings. However, these paints may contain added biocides.

Anti-fouling System

For most types of candidate vessels for reefing, the paint-related contaminants of concern are limited to exterior hull coatings below the water line. These hull coatings consist primarily of anti-fouling (AF) agents (biocides) such as copper, organotin compounds, and zinc.



Photo courtesy of Laura S. Johnson

Exfoliating ceiling paint on the ex-USS Oriskany before being cleaned.

What are the potential environmental impacts of paints?

Scientific investigations by governments and international organizations have shown that certain anti-fouling systems (AFS) used on vessels pose a substantial risk of both acute and chronic toxicity and other adverse impacts to ecologically and economically important non-target marine organisms. Because this document addresses vessels that would be sunk for the creation of artificial reef habitat, the presence of biocides and other anti-fouling systems that inhibit marine growth are antithetical to this purpose. Furthermore, because anti-fouling systems can be reactivated via physical disturbance and/or biological degradation (e.g., scouring during a storm event or burrowing caused by marine organisms) over time, anti-fouling systems that retain potency may become harmful or be reactivated following the sinking. (See Appendix C)

How should the vessel be prepared; what are the appropriate BMPs for paints?

Anti-fouling Underwater Hull Coatings

If there is minimal active biocide remaining on the vessel, no preparation to the underwater hull area is necessary. It can be assumed that biocide activity is minimal if the anti-fouling coating on a candidate vessel is more than twelve years old **and** essentially all the underwater hull area is covered with marine growth.

When assessing the efficacy of the anti-fouling system, existing documentation relating to the anti-fouling properties of the hull coating could provide supporting information when determining if such coatings should be removed. Sources of such supporting information include, but are not limited to, any documentation related to the following: the type and age of the existing AFS, the most recent repainting or dry-dock cycle, and the most recent underwater hull cleaning. When necessary, such information may be supplemented by a physical, underwater hull examination by trained divers or remote operating vehicles. Repair and maintenance records for the vessel should provide the dates when the vessel was last removed from the water for hull maintenance.

If anti-fouling coatings on candidate vessels are at least twelve years old and essentially all the underwater hull area is covered with marine growth, the AF coatings can be left in place without further evaluation, as they are no longer likely to be harmful. If satisfactory evidence relating to underwater hull coating types and coating application dates is not available, and if the AF coating seems to be inhibiting fouling growth according to established AF paint efficacy, further evaluations should be carried out to ascertain the current anti-fouling properties of the coating. If it is determined that the AFS is active, the system should be removed to prevent the release of the AFS's harmful biocides.

Interior and Exterior, Above the Waterline Paints

In some cases, interior and exterior paints onboard vessels may contribute to debris/floatable materials or contain other contaminants of concern. Interior paint and paint above the waterline should be evaluated according to the guidance presented under the "PCB" and "Solids/Debris/Floatables" sections when appropriate. If paint is found to contain PCBs, then the protocols found in the "PCB" section of this document should be followed.

Removal of intact paints generally is not necessary. Topside paint may contain other constituents, such as trace metals or biocides. Unlike underwater hull paint containing high concentrations of biocides designed to leach rapidly, topside paints are designed for long life. They also may contain significantly lower levels of these substances than hull coatings. However, exfoliating paint (paint that is blistering, peeling, and pitting) and exfoliated paint (paint chips and flakes) should be removed.

SOLIDS/DEBRIS/FLOATABLES

Narrative Clean-up Goal: Remove loose debris, including materials or equipment not permanently attached to the vessel, which could be transported into the water column during a sinking event.

What are solids/debris/floatables?

Solids, debris, and floatables are loose materials that could break free from the vessel during transportation and placement as an artificial reef, thereby adversely affecting the ecological or aesthetic value of the marine environment or posing a risk to humans or animals. These materials can consist of vessel debris and clean-up debris. Vessel debris refers to material that was once part of the vessel or was generated during vessel clean-up operations and has been removed or disconnected from its original location on the vessel. Clean-up related debris is material that was not a part of the vessel, but rather was brought on the vessel during preparation operations.

What are the potential environmental impacts of solids, debris, and floatables?

Marine debris consists of solid materials of human origin discarded at sea. Floatable material/debris is any unsecured foreign matter that floats, remains suspended in the water column, or washes up on shore. Floatable materials can travel long distances in the ocean and be deposited far from their source. The degradability of floatable materials and marine debris influences the persistence of these items in the marine environment. Most marine debris does not biodegrade readily. The longer that introduced materials remain in the marine environment, the greater the threat they pose to the environment.



Photo courtesy of Laura S. Johnson

Solids, debris, floatables, and exfoliating paint on a vessel of the MARAD James River Reserve Fleet.

Some potential impacts of solids/debris/floatables to the marine environment include:

- Marine life is endangered by entanglement, ingestion, or both; injury, infection, and death may often occur when marine animals encounter debris of this nature. For example, floating debris may act as an attractant for marine animals that would try to use it as shelter or a food source, thereby potentially causing injury or death and altering behavior and/or distribution of indigenous species;
- Alteration of the ecosystem and its processes may occur throughout the water column as a result of debris introduced into the marine environment. Debris settling on the bottom may change benthic floral and faunal habitat structure, potentially causing a direct deleterious impact on members of the benthic community (i.e., injury or mortality) or indirect impact to other species linked in the benthic food web;
- Recurring clean-up for coastal communities impacted by the debris -- which could be costly; and
- Increasing the risk of spills and other environmental impacts resulting from potential danger to navigation (e.g., hull damage, damage to propellers, and damage to cooling and propulsion systems).

Where are solids/debris/floatables found on ships?

Solids, debris, and floatables can be found anywhere within the vessel as well as on the decks.

How should the vessel be prepared; what are the appropriate BMPs for solids/debris/floatables?

Vessel Debris

All material or equipment that is not an integral part of a permanently attached appurtenance and that could become separated from the vessel during sinking should be removed from the ship prior to sinking. Ship's surfaces (e.g., decks, bulkheads, overheads, and surfaces of appurtenances) should be thoroughly cleaned to remove all dirt, loose scale, trash, exfoliating paint, paint chips, hazardous materials, and other foreign matter (including netting material). Deck drains should be proven clear of debris. Consideration should also be given to the removal of items that could become a floatable over time (e.g., floatable fiberglass insulation, floatable foam).

When assessing vessel debris removal, consideration should be given to the following:

- no vessel debris contaminated with hydrocarbons or hazardous material should remain in the vessel;
- vessel debris that is heavy and/or bulky fitted equipment, and was disconnected or otherwise detached from the structure of the vessel for cleaning or inspection can

remain in its original compartment subject to issues of diver safety. Otherwise, vessel debris should be contained in a sealed compartment or structural tank that is below the waterline of the ship and underneath the largest section of the superstructure;

- vessel debris should not be placed in a compartment or structural tank that will be sealed until both the compartment and the debris have been inspected; and
- vessel debris remaining on the vessel should always be negatively buoyant.

Any vessel debris determined to be acceptable to remain on the vessel for sinking should be cleaned as understood in the context of this guidance.

Clean-up Related Debris

Clean-up debris that was introduced to the vessel solely for cleaning purposes and final preparation of the vessel should always be removed. This would include items such as tools, generators, warning tape, and temporary wooden covers.

Introduced Debris

Foreign material should not be placed on the vessel solely for disposal. However, material needed for the reefing operation (e.g., clean concrete or rock for ballast) or of a commemorative nature (e.g., plaques and markers) is not considered debris for the purposes this document.

OTHER MATERIALS OF ENVIRONMENTAL CONCERN

Narrative Clean-up Goal: Remove other materials that may negatively impact the biological, physical, or chemical characteristics of the marine environment.

What are other materials of environmental concern?

Refer to the list provided below.

What are the potential environmental impacts of other materials of environmental concern?

When placed in the marine environment, materials of environmental concern can have adverse effects on fish, wildlife, shellfish, recreation, or municipal water supplies. Adverse effects on the environment include any of the impacts mentioned in the preceding sections of the document. The magnitude of the impact of these materials on the marine environment will be related to the nature of the material, the level of toxicity, and the ecological resources that could come in contact with “other material of environmental concern.”

Where are other materials of environmental concern found on ships?

Other materials of environmental concern can be found anywhere within the vessel as well as on the decks.

How should the vessel be prepared; what are the appropriate BMPs for other materials of environmental concern?

Shipboard equipment or materials with constituents that can leach into the water column (e.g., petroleum products, batteries, and/or mercury-containing switches) should be removed from the vessel prior to sinking. Fluorescent light tubes and ballasts should be removed. Waste water resulting from clean-up processes, including but not limited to, decontamination, contaminated rain water, and water from rinsing of tanks and lines, should be properly collected and disposed.

Antifreeze and Coolants

Antifreeze and coolant mediums, other than untreated sea water, should be drained and removed from the vessel, and the equipment should be flushed.

Batteries

All batteries should be removed from the vessel. This includes batteries that are part of fitted equipment.

Fire Extinguishing Systems

Fire extinguishing systems should be fully decommissioned. Except for fire-fighting systems that employ untreated seawater or fresh water, all fire-fighting compounds should be removed from the ship. Storage containers, if left in situ, should be cleaned, flushed, and re-closed for transit. Any lines that have been charged with any fire-fighting product other than untreated seawater or fresh water should be treated in the same manner as fuel lines and oil piping.

Refrigerants and Halons

All refrigerants and halons should be removed from the vessel.

Mercury

Ship system components using mercury (e.g., some gyroscopes, vacuum measurement gauges, some laboratory equipment, some light switches, some older radar displays) should be removed from the vessel. All portable thermometers and other measuring equipment employing mercury should be removed intact from the vessel. Any other extant mercury or items containing mercury should be removed from the vessel. Even minute quantities of mercury may be of concern and should be removed. Note that there is a health hazard associated with airborne mercury.



Photo courtesy of Laura Casey

Mercury removed from smoke detector onboard the ex-USS Oriskany.

Lead

Lead ballast bars, shielding and fittings should be removed from the vessel if the reef site is located in fresh or brackish water.

Black and Gray Water

Remove black water (sewage) and gray water (waste water from sinks, showers, galleys, dishwashers) from the vessel; flush the lines.

Radioactive Materials

Ex-warships, research vessels, and a few other types of vessels may have used equipment containing low-level radioactive material. Residual radioactivity and any source of non-naturally occurring radioactive materials such as luminescent devices should be removed (except where it may safely be left on the ship in accordance with the references below). The Navy is more familiar with addressing this material generally aboard vessels, and as such, the Navy has guidance and established procedures regarding the removal and disposal of radioactive materials. For this reason, it is recommended that the procedures for removal and disposal of radioactive materials follow that provided in DLA INST 4145.8, "Material Management for Radioactive Items in the DoD" and implementing instructions. Another reference that may be useful is the American National Standard Institute's standard N13.12-1999, "Surface and Volumetric Radioactivity Standards for Clearance." This document contains tables of surface contamination criteria developed to allow users of radioactive material to demonstrate that the material or equipment can be safely released with no further regulatory control.

Invasive Species

Assess the presence of invasive species that could be transported to and survive at the artificial reef location on the hull of the ship or from other locations on or in the vessel such as ballast and bilge tanks. If a viable invasive species is found that may be expected to survive at the artificial reef site, that species should be removed or eliminated; the vessel should be clean of all such living organisms.

Considerations for Other In-water Uses of Obsolete Vessels



Photo courtesy of Florida Fish and Wildlife Conservation Commission
Diver exploring the ex-USS Spiegel Grove artificial reef.

DIVING OPPORTUNITIES

The narrative goals set out under the section “Guidance for Preparing Vessels to Create Artificial Reef Habitat” also should be achieved while preparing a vessel for diver opportunities. For example, if preparation for diver use calls for the removal of wall paneling that will in turn expose any materials of concern that were identified in the aforementioned section, the respective narrative goals should be addressed (e.g., if asbestos is exposed once the panel is removed, the objectives of the asbestos narrative goal should be met).

Additional vessel preparation to support the in-water use of recreational diving may include:

- Removal of sharp and protruding objects along the divers' access path which could snag on divers' equipment or otherwise pose a danger to the divers.
- Removal of doors and access hatches and widening of openings to allow safe access for divers.
- Widening of corridors by removal of some wall paneling and provision of large openings in the exterior of the ship to allow light to penetrate and help ensure safe diver access.
- Sealing entrances into restrictive compartments such as the boiler rooms and engine rooms to help ensure diver safety.

When preparing the vessel for diver opportunities, careful consideration also should be given to vessel stability (for transport and sinking operations) as well as vessel integrity (for the life of the vessel once placed at the reef site).

Appendix A

Federal Statutes Related to the Transfer of Obsolete MARAD and Navy Vessels for Use as Artificial Reefs

National Defense Authorization Act for Fiscal Year 2004

The National Defense Authorization Act for Fiscal Year 2004 (PL 108-136) included two provisions relating to the use of vessels as artificial reefs. One such provision, § 3516 (PL 108-136, Div. C, Title XXXV, § 3516, Nov. 24, 2003, 117 Stat. 1795), amended the Bob Stump National Defense Authorization Act for Fiscal Year 2003 (PL 107-314, Div. C, Title XXXV, § 3504(b), Dec. 2, 2002, 116 Stat. 2754; 16 U.S.C. 1220 note) to read in pertinent part as follows:

Title XXXV – Maritime Administration

Subtitle A – Maritime Administration Reauthorization

Section 3516. AUTHORITY TO CONVEY OBSOLETE VESSELS TO UNITED STATES, TERRITORIES, AND FOREIGN COUNTRIES FOR REEFING

(b) Environmental Best Management Practices for Preparing Vessels for Use as Artificial Reefs.—

(1) Not later than March 31, 2004, the Secretary of Transportation, acting through the Maritime Administration, and the Administrator of the Environmental Protection Agency shall jointly develop guidance recommending environmental best management practices to be used in the preparation of vessels for use as artificial reefs.

(2) The guidance recommending environmental best management practices under paragraph (1) shall be developed in consultation with the heads of other federal agencies, and State agencies, having an interest in the use of vessels as artificial reefs.

(3) The environmental best management practices under paragraph (1) shall --

(A) include recommended practices for the preparation of vessels for use as artificial reefs to ensure that vessels so prepared will be environmentally sound in their use as artificial reefs;

(B) promote consistent use of such practices nationwide;

(C) provide a basis for estimating the costs associated with the preparation of vessels for use as artificial reefs; and

(D) include mechanisms to enhance the utility of the Artificial Reefing Program of the Maritime Administration as an option for the disposal of obsolete vessels.

(4) The environmental best management practices developed under paragraph (1) shall serve as national guidance for federal agencies for the preparation of vessels for use as artificial reefs.

(5) Not later than March 31, 2004, the Secretary of Transportation, acting through the Maritime Administration, and the Administrator of the Environmental Protection Agency shall jointly establish an application process for governments of States, commonwealths, and United States territories and possessions, and foreign governments, for the preparation of vessels for use as artificial reefs, including documentation and certification requirements for that application process.

(6) The Secretary of Transportation shall submit to Congress a report on the environmental best management practices developed under paragraph (1) through the existing ship disposal reporting requirements in section 3502 of Floyd D. Spence National Defense Authorization Act for Fiscal Year 2001 (as enacted into law by Public Law 106-398; 1654A-492) [Pub.L. 106-398, Div. C, Title XXXV, § 3502, Oct. 30, 2000, 114 Stat. 1654A-492, which is not classified to the Code]. The report shall describe such practices, and may include such other matters as the Secretary considers appropriate.

The second such provision, § 1013 (PL 108-136, Div. A, Title X, § 1013, Nov. 24, 2003, 117 Stat. 1590), amended Title 10 of the United States Code by adding § 7306b. New § 7306b(a) authorizes the Secretary of the Navy to transfer vessels stricken from the Naval Vessel Register for use as an artificial reef. New § 7306b(c) requires the Secretary of the Navy to ensure that the preparation of a vessel transferred pursuant to 10 U.S.C. § 7306b(a) for use as an artificial reef is conducted in accordance with the environmental best management practices developed pursuant to 16 U.S.C. § 1220 note and applicable environmental laws. The complete text of Section 1013 of the National Defense Authorization Act for Fiscal Year 2004 is as follows:

Title X – General Provisions

Subtitle B – Naval Vessels and Shipyards

Section 1013. TRANSFER OF VESSELS STRICKEN FROM THE NAVAL VESSEL REGISTER FOR USE AS ARTIFICIAL REEFS.

(a) AUTHORITY TO MAKE TRANSFER- Chapter 633 of title 10, United States Code, is amended by inserting after section 7306a the following new section:

Sec. 7306b. Vessels stricken from Naval Vessel Register: transfer by gift or otherwise for use as artificial reefs

(a) AUTHORITY TO MAKE TRANSFER- The Secretary of the Navy may transfer, by gift or otherwise, any vessel stricken from the Naval Vessel Register to any State, Commonwealth, or possession of the United States, or any municipal corporation or political subdivision thereof, for use as provided in subsection (b).

(b) VESSEL TO BE USED AS ARTIFICIAL REEF- An agreement for the transfer of a vessel under subsection (a) shall require that--

(1) the recipient use, site, construct, monitor, and manage the vessel only as an artificial reef in accordance with the requirements of the National

Fishing Enhancement Act of 1984 (33 U.S.C. 2101 et seq.), except that the recipient may use the artificial reef to enhance diving opportunities if that use does not have an adverse effect on fishery resources (as that term is defined in section 2(14) of the Magnuson-Stevens Fishery Conservation and Management Act (16 U.S.C. 1802(14)); and

`(2) the recipient obtain, and bear all responsibility for complying with, applicable federal, State, interstate, and local permits for using, siting, constructing, monitoring, and managing the vessel as an artificial reef.

`(c) PREPARATION OF VESSEL FOR USE AS ARTIFICIAL REEF- The Secretary shall ensure that the preparation of a vessel transferred under subsection (a) for use as an artificial reef is conducted in accordance with--

`(1) the environmental best management practices developed pursuant to section 3504(b) of the Bob Stump National Defense Authorization Act for Fiscal Year 2003 (Public Law 107-314; 16 U.S.C. 1220 note); and

`(2) any applicable environmental laws.

`(d) COST SHARING- The Secretary may share with the recipient of a vessel transferred under subsection (a) any costs associated with transferring the vessel under that subsection, including costs of the preparation of the vessel under subsection (c).

`(e) NO LIMITATION ON NUMBER OF VESSELS TRANSFERABLE TO PARTICULAR RECIPIENT- A State, Commonwealth, or possession of the United States, or any municipal corporation or political subdivision thereof, may be the recipient of more than one vessel transferred under subsection (a).

`(f) ADDITIONAL TERMS AND CONDITIONS- The Secretary may require such additional terms and conditions in connection with a transfer authorized by subsection (a) as the Secretary considers appropriate.

`(g) CONSTRUCTION- Nothing in this section shall be construed to establish a preference for the use as artificial reefs of vessels stricken from the Naval Vessel Register in lieu of other authorized uses of such vessels, including the domestic scrapping of such vessels, or other disposals of such vessels, under this chapter or other applicable authority.'.

(b) CLERICAL AMENDMENT- The table of sections at the beginning of such chapter is amended by inserting after the item relating to section 7306a the following new item:

`7306b. Vessels stricken from Naval Vessel Register: transfer by gift or otherwise for use as artificial reefs.'.

Transfer of Obsolete Vessels by the Department of Transportation

Public Law 92-402 (16 U.S.C. 1220, et. seq.) authorizes the U.S. Maritime Administration (MARAD), under the Department of Transportation, to transfer obsolete ships to any state for use as an artificial reef. In addition, MARAD's authority was amended by Public Law 107-314 section 3504, as amended by Public Law 108-136, to allow MARAD to provide financial assistance to states for environmental preparation, towing, and/or sinking and also allows MARAD to transfer obsolete vessels to U.S. territories and foreign countries for use as artificial reefs.

Title XXVI – Conservation

§ 1220. State applications for obsolete ships for use as offshore reefs

(a) Conservation of marine life

Any State may apply to the Secretary of Transportation (hereafter referred to in this chapter as the "Secretary") for obsolete ships which, but for the operation of this chapter, would be designated by the Secretary for scrapping if the State intends to sink such ships for use as an offshore artificial reef for the conservation of marine life.

(b) Manner and form of applications; minimum requirements

A State shall apply for obsolete ships under this chapter in such manner and form as the Secretary shall prescribe, but such application shall include at least (1) the location at which the State proposes to sink the ships, (2) a certificate from the Administrator, Environmental Protection Agency, that the proposed use of the particular vessel or vessels requested by the State will be compatible with water quality standards and other appropriate environmental protection requirements, and (3) statements and estimates with respect to the conservation goals which are sought to be achieved by use of the ships.

(c) Copies to federal officers for official comments and views

Before taking any action with respect to an application submitted under this chapter, the Secretary shall provide copies of the application to the Secretary of the Interior, the Secretary of Defense, and any other appropriate federal officer, and shall consider comments and views of such officers with respect to the application.

§ 1220a. Transfer of title; terms and conditions

If, after consideration of such comments and views as are received pursuant to section 1220(c) of this title, the Secretary finds that the use of obsolete ships proposed by a State will not violate any federal law, contribute to degradation of the marine environment, create undue interference with commercial fishing or navigation, and is not frivolous, he may transfer without consideration to the State all right, title, and

interest of the United States in and to any obsolete ships which are available for transfer under this chapter if--

- (1) the State gives to the Secretary such assurances as he deems necessary that such ships will be utilized and maintained only for the purposes stated in the application and, when sunk, will be charted and marked as a hazard to navigation;
- (2) the State agrees to secure any licenses or permits which may be required under the provisions of any other applicable federal law;
- (3) the State agrees to such other terms and conditions as the Secretary shall require in order to protect the marine environment and other interests of the United States; and
- (4) the transfer would be at no cost to the Government (except for any financial assistance provided under section 1220(c)(1) of this title) with the State taking delivery of such obsolete ships and titles in an "as-is-- where-is" condition at such place and time designated as may be determined by the Secretary of Transportation.

§ 1220b. Obsolete ships available; number; equitable administration

A State may apply for more than one obsolete ship under this chapter. The Secretary shall, however, taking into account the number of obsolete ships which may be or become available for transfer under this chapter, administer this chapter in an equitable manner with respect to the various States.

§ 1220c. Denial of applications; finality of decision

A decision by the Secretary denying any application for a obsolete ship under this chapter is final.

§ 1220c-1. Financial assistance to State to prepare transferred ship

(a) Assistance authorized

The Secretary, subject to the availability of appropriations, may provide, to any State to which an obsolete ship is transferred under this chapter, financial assistance to prepare the ship for use as an artificial reef, including for--

- (1) environmental remediation;
- (2) towing; and
- (3) sinking.

(b) Amount of assistance

The Secretary shall determine the amount of assistance under this section with respect to an obsolete ship based on—

- (1) the total amount available for providing assistance under this section;
- (2) the benefit achieved by providing assistance for that ship; and
- (3) the cost effectiveness of disposing of the ship by transfer under this chapter and provision of assistance under this section, compared to other disposal options for that ship.

(c) Terms and conditions

The Secretary--

(1) shall require a State seeking assistance under this section to provide cost data and other information determined by the Secretary to be necessary to justify and document the assistance; and

(2) may require a State receiving such assistance to comply with terms and conditions necessary to protect the environment and the interests of the United States.

§ 1220d. "Obsolete ship" defined

For purposes of sections 1220, 1220a, 1220b, and 1220c of this title, the term "obsolete ship" means any vessel owned by the Department of Transportation that has been determined to be of insufficient value for commercial or national defense purposes to warrant its maintenance and preservation in the national defense reserve fleet and has been designated as an artificial reef candidate.

Appendix B

Federal Environmental Laws Relevant for Consideration in the Preparation of a Vessel for Use as an Artificial Reef

This Appendix identifies selected federal statutes relevant for consideration in preparation of a vessel for use as an artificial reef. For these statutes, the Appendix explains their potential relevance and briefly summarizes the relevant provisions. The first set of statutes briefly summarized are environmental laws administered by EPA which may be relevant to the removal of material from vessels or the disposal of such removed material. In addition, although this document focuses on environmental best management practices for vessel preparation, for the reader's convenience the Appendix also briefly summarizes federal statutes establishing permit requirements for the actual placement of the vessel as an artificial reef. Finally, the Appendix briefly describes a number of other significant federal environmental statutes that may affect issuance of such permits or the actual conduct of placement activities.

The information in this Appendix is intended only for the convenience of the reader in order to provide a useful starting point for identifying the principal environmental statutes of interest. The Appendix is not intended to be an exhaustive list of every conceivably relevant statute, nor do the brief summaries in this list alter or replace any requirements, regulations, or applicable guidance under those statutes that are summarized. Readers also should be aware that in 2000, EPA published tips for regulatory compliance for ship scrapping, and that document contains additional guidance that may be useful in preparation of a vessel for use as an artificial reef. See www.epa.gov/oecaerth/resources/publications/civil/federal/shipscrapguide.pdf.

State and local laws also may apply to vessel preparation or placement for use as an artificial reef, and interested readers should consult with appropriate State and local authorities to identify such further requirements.

EPA-Administered Federal Environmental Laws Relevant to Vessel Preparation

- The Clean Air Act (CAA), 42 U.S.C. §§ 7401, et seq., generally addresses the emission of air pollutants. Among other things, it directs EPA to establish minimum national standards for air quality, and assigns primary responsibility to the states to assure compliance with the standards through State Implementation Plans (SIPs). State-specific SIPs may impose requirements that are more prescriptive, more stringent, or more specific than the minimum national standards. Among national standards relevant for vessel preparation, EPA has established a National Emissions Standards for Hazardous Air Pollutants (NESHAP) for asbestos at 40 CFR Part 61 Subpart M. The asbestos NESHAP is intended to minimize the release of asbestos fibers during demolition and renovation activities, which would include asbestos removal when preparing a vessel for use as an artificial reef. EPA has delegated authority to inspect and enforce the asbestos NESHAP to most states, which, as noted, may have requirements that are more stringent than federal requirements. Other NESHAPs also may be relevant to removal of other materials on vessels, and may be found at 40 CFR Parts 61 and 63. In addition, Title VI of the Act directs EPA to establish requirements for the control of substances that contribute to stratospheric ozone depletion, which include substances such as halons used

in fire suppression systems and certain refrigerants, that the best management practices in this guidance recommend be removed from a vessel in preparation for its use as an artificial reef. The recovered ozone-depleting refrigerants and halons should be delivered to an EPA-approved refrigerant and/or halon reclaimer for proper handling. Regulations addressing recycling and reuse of such removed refrigerants and halons, including chlorofluorocarbons and hydrofluorocarbons (sometimes referred to under the trade name Freon), appear at 40 CFR Part 82.

- The Clean Water Act (CWA), 33 U.S.C. §§ 1251, et seq., generally regulates the addition of pollutants from a point source to waters of the United States. The definition of point source includes a “vessel or other floating craft.” CWA requirements are implemented, among other things, through permits under either section 402 (the National Pollutant Discharge Elimination System (NPDES) permitting program) or section 404 (the permitting program for dredged and fill material). Pollutants generated in the preparation of a vessel for use as an artificial reef that are discharged to waters of the U.S., including via contaminated storm water, require NPDES permit authorization. The NPDES permitting program is primarily administered by states, with EPA oversight. In addition to the CWA’s NPDES permitting program, section 311 establishes a program for the prevention and abatement of, and remedial response to, oil and hazardous substance spills. See 40 CFR Parts 110, 112, 116, and 117. Section 311 imposes requirements for reporting the release of oil and hazardous substances, which might be relevant to the preparation of a vessel for use as an artificial reef should preparation result in such a release. Section 311 is jointly administered by EPA and the U.S. Coast Guard, depending on the location of the source. (For discussion of CWA section 404 permitting and the placement of vessels as artificial reefs, refer to the section of this Appendix describing federal laws that establish permitting requirements for placement of artificial reefs).
- The Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), 42 U.S.C. §§ 9601, et seq., better known as the "Superfund Act," addresses cleanup of hazardous substances. CERCLA and its implementation documents empower EPA and other agencies to identify and prioritize sites for cleanup, and to order or carry out environmental remediation. Subject to limited defenses, CERCLA imposes strict liability for environmental cleanup on persons connected to facilities from which there are releases into the environment. CERCLA also mandates reporting to the National Response Center of hazardous substance releases. In conjunction with CWA section 311, CERCLA provides for federal preparation of the National Contingency Plan for responding to a hazardous substances release. As noted regarding CWA section 311, CERCLA is relevant to the preparation of a vessel for use as an artificial reef in its release reporting requirements, particularly for oil and hazardous substances. CERCLA is administered by federal agencies, not states.
- The Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA), 7 U.S.C. §§ 136, et seq., generally regulates the registration, labeling, distribution, sale, and use of pesticides. EPA regulates anti-foulant paints, including those containing organotins, copper, and other pesticidal compounds under FIFRA. EPA has relied on FIFRA and the Organotin Anti-fouling Paint Control Act of 1988 (33 U.S.C. §§ 2401, et seq.) for authority to impose requirements, such as certification and training for applicators and label

requirements dealing with tributyl tin (TBT) application and disposal. TBT anti-fouling paint label requirements include provisions directing that all paint chips, spent abrasives, and any other waste products from paint removal be disposed of in a sanitary landfill. 53 Fed. Reg. 39022, 39038, col. 3 (October 4, 1988). In addition, use of any pesticide in the preparation of a vessel for use as an artificial reef must comply with label requirements. For the most part, FIFRA is administered by EPA, though some states have primary enforcement responsibility for FIFRA use violations.

- The Marine Protection, Research and Sanctuaries Act (MPRSA), 33 U.S.C. §§ 1401, et seq., prohibits, unless authorized by an MPRSA permit, (1) transportation of material from the United States for the purpose of ocean dumping; (2) transportation of material from anywhere for the purpose of ocean dumping by federal agencies or U.S. flagged vessels; and (3) dumping of material transported from outside the United States into the territorial sea of the United States. If any materials removed from vessels being prepared for use as an artificial reef were subsequently proposed for ocean dumping, a permit under the MPRSA would be necessary. Denial of such a permit request, however, would be highly likely because land-based alternatives (the consideration of which are required for MPRSA permit issuance) typically would be available. In addition, it would seem improbable that such a proposal could satisfy the other applicable environmental criteria of the MPRSA and implementing regulations. The MPRSA is administered by EPA and the U.S. Army Corps of Engineers, not states.⁵
- The Resource Conservation and Recovery Act (RCRA), 42 U.S.C. §§ 6901, controls the management of hazardous wastes “from cradle to grave.” If, in the preparation of a vessel for use as an artificial reef, a waste is generated that is specifically listed as hazardous or exhibits any hazardous characteristics, e.g. toxicity, and the waste is not excluded or exempt from the RCRA Subtitle C regulations, then this waste would be considered hazardous waste and subject to all applicable RCRA regulations. See 40 CFR Parts 260 and 261. Depending upon the volume of hazardous wastes that are generated and the length of time the hazardous wastes are accumulated, RCRA regulations provide conditional exemptions from some of the regulatory requirements. In most states, EPA has authorized the State to administer some or all of RCRA requirements under state law in lieu of federal law and, depending on the state, state law may include requirements that are more stringent or prescriptive than federal law. Hazardous waste and used oil must be managed according to RCRA regulations.
- The Toxic Substance Control Act (TSCA), 15 U.S.C. §§ 2601, et seq., bans the manufacture, processing, use, and distribution in commerce of polychlorinated biphenyls (PCBs) and directs EPA to set regulations for the disposal of PCBs. TSCA requirements generally determine the degree of necessary PCB removal from vessels being prepared for use as an artificial reef. Although TSCA imposes requirements for toxic substances other than PCBs, TSCA’s PCB requirements are uniquely relevant to preparation of a

⁵ The MPRSA definition of “dumping” excludes the construction of fixed structures or artificial islands, as well as deposits of materials for the purpose of developing or maintaining fisheries resources, when otherwise regulated by federal or state law (or occurring pursuant to authorized federal or state programs). Because the placement of a vessel to create an artificial reef in waters subject to jurisdiction of the United States is regulated under other federal laws, the actual placement of vessels for use as an artificial reef is not subject to regulation under the MPRSA.

vessel for use as an artificial reef because of the likely presence of PCBs on many obsolete vessels. More specific guidance on the applicability of TSCA's PCB requirements to vessels being prepared for use as an artificial reef is provided in the section of the environmental best management practices addressing PCBs, and readers should refer to that section for further information.

Federal Environmental Laws Establishing Permit Requirements for Placement of Vessels as Artificial Reefs

- Section 404 of the CWA, 33 U.S.C. § 1344, establishes a permitting program for the discharge of dredged or fill material to waters of the United States. Placement of a vessel in waters of the United States as an artificial reef would constitute a discharge of fill material, and therefore would require a CWA section 404 permit. 33 CFR 323.2(e) & (f). For CWA purposes, “waters of the United States” include most inland waters as well as the waters of the territorial sea, which, under the CWA, is measured from the baseline (i.e., the line of ordinary low water along that portion of the coast which is in direct contact with the open sea and the line marking the seaward limit of inland waters) in a seaward direction a distance of three miles. Section 404 permitting is primarily administered by the U.S. Army Corps of Engineers (Corps), using environmental guidelines set out in EPA regulations appearing at 40 CFR Part 230. Among other things, except as provided by 40 CFR 230.5(b) and 230.7(b)(1) (relating to activities covered by an applicable general permit), these guidelines require consideration of practicable alternatives to the proposed discharge, and in the case of proposed discharges to special aquatic sites, presume that all practicable alternatives not involving a discharge into a special aquatic site have less adverse impact on the aquatic ecosystem, unless clearly demonstrated otherwise. 40 CFR 230.5(c); 230.10(a). Special aquatic sites are identified at 40 CFR Part 230 Subpart E and include, among other things, marine sanctuaries and coral reefs. In addition to evaluation for compliance with these guidelines, section 404 permits are also subject to the Corps’ public interest review under 33 CFR 320.4. Corps regulations relevant to the CWA section 404 permitting program appear at 33 CFR Parts 320, 323, 325, 328, and 331. Though EPA has authorized two States to administer the section 404 permitting program for certain waters in those States, these State programs probably would not be relevant to the placement of a vessel for use as an artificial reef because states may not assume section 404 permitting authority for discharges of fill material to waters supporting commercial navigation, waters subject to the ebb and flow of the tide, or waters of the territorial seas, where a former vessel/artificial reef would likely be sited.
- Section 10 of the Rivers and Harbors Act of 1899 (RHA), 33 U.S.C. §§ 403, requires a permit from the Corps for, among other things, the construction of any structure (including artificial reefs) in or over any “navigable water of the United States” as that term is defined at 33 CFR Part 329.⁶ Structures or work outside the limits of “navigable waters of the United States” also require a section 10 permit if the structure or work

⁶ In cases where the waters in which the vessel is being placed for use as an artificial reef are subject to both RHA section 10 and CWA section 404 permitting (e.g., the 3 mile territorial sea), Corps practice is to issue a single consolidated permit satisfying the requirements of both these statutes.

affects the course, location, or condition of the waterbody in such a manner as to impact on navigational capacity. Under section 4(e) of the Outer Continental Shelf Lands Act, 43 U.S.C. § 1333(e), RHA section 10 permit requirements also apply to the creation of structures on the Outer Continental Shelf of the United States, including artificial reefs. 33 CFR 322.3(b). Issuance of permits under RHA section 10 involves a public interest review by the Corps in accordance with 33 CFR 320.4. To help safeguard navigational and other marine uses, Corps permits for artificial reefs have required that permittees notify the National Oceanic & Atmospheric Administration (NOAA) prior to, and upon completion of, the reefing activity, including a drawing certifying the location and configuration of the completed activity. 33 CFR Part 325, Appendix A, special condition B.5. Corps regulations relevant to the RHA section 10 permitting program appear at 33 CFR Parts 320, 322, 325, 329, and 331.

Other Significant Federal Environmental Statutes That May Affect Issuance of Permits or Licenses for Artificial Reefs or the Conduct of Placement Activities.

- The Liberty Ship Act, 16 U.S.C. §§ 1220, et seq., authorizes states to apply to the Secretary of the Department of Transportation (DOT) for the use of DOT-owned obsolete vessels, including obsolete vessels of the Maritime Administration, as an artificial reef for the conservation of marine life. The Liberty Ship Act requires that the state application to DOT include a certification from EPA that the proposed use of the vessel will be compatible with “applicable water quality standards and other appropriate environmental protection requirements.” 16 U.S.C. § 1220 (b). The ability to meet such standards and requirements will be affected by what materials are onboard the vessel.
- The National Fishing Enhancement Act of 1984 (NFEA), 33 U.S.C. §§ 2101, et seq., applies to all artificial reefs in waters of the United States or on the Outer Continental Shelf for the purpose of enhancing fishery resources. Section 204 of NFEA obligates NOAA to issue a national artificial reef plan that addresses issues such as siting and design criteria. Additionally, NFEA section 205 establishes further requirements to be applied by the Corps in the exercise of its previously described permitting authority for placement of artificial reefs under RHA section 10 or CWA section 404. Such requirements are reflected in the previously identified Corps permitting regulations for artificial reefs (e.g., 33 CFR 320.3(o), 322.5(b), and 325.1(d)(8)).
- The Coastal Zone Management Act (CZMA), 16 U.S.C. 1451, et seq., establishes a federal/state partnership to provide for the comprehensive management of coastal resources. Under CZMA section 307(c)(3), applicants for a required federal license or permit to conduct an activity affecting the coastal zone of a state with an approved coastal management program need to provide the federal permitting agency and the relevant state with a certification that the proposed activity complies with the enforceable policies of the state’s approved program and will be conducted in a manner that is consistent with the program. Under CZMA section 307(c)(1), a federal agency activity that affects the coastal zone must be carried out in a manner which is consistent to the maximum extent practicable with the enforceable policies of an approved coastal management program. Relevant implementing regulations established by NOAA (which is responsible for federal administration of the CZMA) appear at 15 CFR Part 930,

Subpart C (consistency for federal agency activities) and Subpart D (consistency for activities requiring a federal license or permit). NOAA's CZMA regulations were recently amended. 71 Fed. Reg. 788 (Jan. 5, 2006). The regulations provide that in the case of federal agency applications for federal licenses or permits, as well certain general permits proposed by a federal agency, review will be conducted under the Subpart C regulations. See 15 CFR 930.31(d) & 930.52. Corps regulations implementing the CZMA for its RHA section 10 and CWA section 404 permit programs appear at 33 CFR 320.3(b), 320.4(h), and 325.2(b)(2).

- The National Environmental Policy Act of 1969 (NEPA), 42 U.S.C. §§ 4321, et seq., requires that federal agencies include in their decision-making processes appropriate and careful consideration of the environmental effects of, and alternatives to, their actions. NEPA section 102(2)(C) includes a requirement for preparation of an environmental impact statements (EIS) for “major federal actions significantly affecting the quality of the human environment.” For proposed federal actions where the environmental effects are unclear, the agency often prepares an environmental assessment, which is a brief and concise document containing sufficient evidence and analysis for the agency to determine whether to prepare an EIS or to issue a finding of no significant impact. 40 CFR 1501.4(b), 1508.9(a)(1), 1508.13. Council on Environmental Quality regulations implementing NEPA appear at 40 CFR Parts 1500 – 1518. Corps regulations implementing NEPA for its RHA section 10 and CWA section 404 permit programs appear at 33 CFR 320.3(d) and Part 325, Appendix B.
- Under Clean Air Act section 309, 42 U.S.C. § 7609, EPA reviews and comments on the environmental impacts of several types of actions of other federal agencies, including all actions subject to the requirement under the National Environmental Policy Act to prepare an Environmental Impact Statement. EPA comments in writing and make those comments available to the public. If EPA determines that the action is unsatisfactory from the standpoint of public health or welfare or environmental quality, EPA refers the matter to the Council on Environmental Quality.
- The Endangered Species Act (ESA), 16 U.S.C. §§ 1531, et seq., addresses the conservation of federally-listed threatened and endangered species and the ecosystems on which those species depend. ESA section 7 requires that federal agencies, in consultation with the National Marine Fisheries Service and/or the U.S. Fish and Wildlife Service⁷, ensure that any action authorized, funded, or carried out by the agency (including issuance of federal permits) is not likely to jeopardize the continued existence of listed species or result in the adverse modification of their designated critical habitat. Whenever such an agency action may affect a listed species or critical habitat, the interagency consultation requirement is triggered, and the ESA section 7 procedural requirements at 50 CFR Part 402 apply. In addition, ESA section 9 generally prohibits anyone from taking listed animal species without authorization. “Take” is defined in ESA section 3(19) to include harming and killing. Authorization to take is generally granted through the section 7 consultation process, in exchange for measures to minimize

⁷ The National Marine Fisheries Service is now referred to as NOAA Fisheries, and is generally responsible for marine species under the ESA. The U.S. Fish and Wildlife Service is generally responsible for terrestrial and freshwater species.

the take. Detailed information regarding ESA compliance can be found online at <http://www.nmfs.noaa.gov/pr/species/esa.htm> and <http://www.fws.gov/endangered/wildlife.html>. EPA's CWA section 404(b)(1) guidelines also address ESA issues in the context of CWA section 404 permitting and appear at 40 CFR 230.30. Corps regulations implementing the ESA for its RHA section 10 and CWA section 404 permit programs appear at 33 CFR 320.3(i) and 325.2(b)(5).

- The Fish and Wildlife Coordination Act, 16 U.S.C. §§ 661, et seq., provides that whenever the waters or channel of a waterbody are proposed or authorized to be modified by a public or private agency under federal permit or license, the agency first shall consult with the USFWS and the head of the state agency responsible for wildlife resources. The purpose of this consultation is to promote conservation of wildlife resources by preventing loss of and damage to such resources and to provide for the development and improvement of wildlife resources in connection with the agency action. Although the recommendations of the Secretary of the Interior and state officials are not binding, the federal agency must give them full consideration. In addition, EPA's CWA section 404(b)(1) guidelines address wildlife issues in the context of section 404 permitting and appear at 40 CFR Part 230, Subpart D. Corps regulations implementing the Fish and Wildlife Coordination Act for its RHA section 10 and CWA section 404 permit programs appear at 33 CFR 320.3(e) and 320.4(c).
- Title III of the National Marine Sanctuaries Act (NMSA), 16 U.S.C. §§ 1431, et seq., authorizes the Secretary of Commerce to designate and manage national marine sanctuaries. Under NMSA section 304(d), federal agency actions (including private activities authorized by federal permits) that are likely to destroy, cause the loss of, or injure sanctuary resources are subject to consultation with the Secretary of Commerce. If the Secretary finds that a federal action is likely to have this effect, the Secretary must recommend feasible alternatives to protect resources, and if the agency does not follow those alternatives it must provide a written statement explaining why. The marine sanctuary program is administered by NOAA, which has promulgated implementing regulations at 15 CFR Part 922. Part 922 specifically identifies all designated marine sanctuaries and their boundaries, as well as applicable regulations and restrictions governing their use. EPA's CWA section 404(b)(1) guidelines also address marine sanctuaries in the context of section 404 permitting and appear at 40 CFR 230.40. Corps regulations implementing these NMSA provisions for its RHA section 10 and CWA section 404 permit programs appear at 33 CFR 320.3(c) and 320.4(i).
- The Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act), 16 U.S.C. §§ 1801, et seq., is the principal federal law addressing the conservation and management of fisheries resources. Among other things, Magnuson-Stevens Act section 305(b)(1) provides that fisheries management plans developed under the Magnuson-Stevens Act must identify essential fish habitat (EFH). Magnuson-Stevens Act section 3(10) defines EFH as "...those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity." Under section 305(b)(2), federal agencies are directed to consult with the Secretary of Commerce with respect to any action to be authorized, funded, or undertaken that may adversely affect any identified EFH. If the Secretary determines the action would adversely affect such EFH, the

Secretary is to recommend measures that could be taken by the agency to conserve the EFH. The agency must respond to such recommendations in writing, including a description of measures proposed by the agency for avoiding, mitigating, or offsetting the impact of the activity on the EFH. Under Magnuson-Stevens Act section 305(b)(4), if the agency's response is inconsistent with the Secretary's recommendations, the agency must explain why. The locations of EFH identified under the Act can be found online at http://www.nmfs.noaa.gov/habitat/habitatprotection/efh/fish_manage_c.htm. NOAA regulations implementing the EFH provisions of the Act appear at 50 CFR Part 600, Subparts J and K.

- The Marine Mammal Protection Act of 1972 (MMPA), 16 U.S.C. §§ 1361, 1362, 1371-1384 note, 1386-1389, 1401-1407, 1411-1417, 1421-1421h, is the principal federal legislation addressing marine mammal species protection and conservation. MMPA section 102 prohibits, with certain exceptions, the take of marine mammals in United States waters and by U.S. citizens on the high seas, and the importation of marine mammals and marine mammal products into the United States. Marine mammals subject to the MMPA are defined in MMPA section 3(6) to include both species that are morphologically adapted to the marine environment (e.g., sea otters, manatees, seals, walrus, dolphins, whales) or which primarily inhabit the marine environment (e.g., polar bears). MMPA section 3(13) provides that "take" means to harass, hunt, capture, or kill, or to attempt to do so. Depending on the species of marine mammal involved, MMPA section 3(12) divides MMPA implementation responsibility between the Department of the Interior (USFWS) and the Department of Commerce (NOAA). Under this division of responsibility NOAA manages the majority of marine mammals, including whales, dolphins, porpoises, seals, and sea lions, while the USFWS manages five species: polar bears, walrus, sea otters, manatees, and dugongs. Relevant implementing regulations appear at 50 C.F.R Part 216 (NOAA) and 50 CFR Part 18 (USFWS). Corps regulations implementing the MMPA for its RHA section 10 and CWA section 404 permit programs appear at 33 CFR 320.3(k).
- Section 401 of the Clean Water Act (33 U.S.C. 1341) requires that any applicant for a federal license or permit (e.g., an EPA-issued NPDES permits or a Corps-issued section 404 permit) to conduct an activity that may result in a discharge into waters of the United States shall provide the permitting agency a certification from the state in which the discharge originates certifying that the license or permit complies with CWA requirements, including applicable state water quality standards. No federal license or permit subject to CWA section 401 may be issued unless the state either grants or waives certification. As a result, CWA section 401 provides states with the ability to preclude the issuance of federal permits or licenses subject to section 401 by denying certification, as well as the ability to indirectly impose conditions upon such federal permits or licenses by placing limitations or conditions on its section 401 certification. EPA regulations implementing CWA section 401 appear at 40 CFR Part 121. Corps regulations implementing the CWA section 401 its RHA section 10 and CWA section 404 permit programs appear at 33 CFR 320.3(a), 320.4(d), and 325.2(b)(1).

Appendix C

*Information related to materials found on scuttled vessels that may have potentially hazardous effects on the marine environment**

*The text provided in this appendix is an excerpt from the 2005 “Policy Statement of the National Marine Sanctuary Program: Artificial Reef Permitting Guidelines.”

Scuttled Vessels

The scuttling of vessels requires particular attention in this policy because of their size and potential toxicological effects on the environment. As discussed above, sunken ships potentially attract divers away from natural reefs and thus may be beneficial to natural reefs in National Marine Sanctuaries. However, there is a wide array of concerns that must be addressed before intentionally sinking a ship.

The removal of petroleum products, hazardous materials, paint cans, batteries, plastics, oil, and fuel is specified on the U.S. Coast Guard’s Ocean Disposal/Artificial Reef Inspection form. Additionally, under the Toxic Substances Control Act (TSCA), the EPA has the authority to gather information on and regulate chemical substances and mixtures imminently hazardous or presenting unreasonable risk of injury to public health or the environment. Despite these controls, some materials of concern may still remain on items used as artificial reef material. Such materials include: asbestos, polychlorinated biphenols (PCBs), iron, lead paint, and antifouling paint. The National Marine Sanctuaries Program (NMSP) should consider the risks associated with materials remaining on vessels to be used as artificial reefs. The NMSP will consult with appropriate agencies (i.e., U.S. EPA, MARAD) to determine the best management practices to use in evaluating materials for pollution potential).

Asbestos is the name given to six naturally occurring minerals that are used as insulators and fire retardants. Several studies have investigated the effects of asbestos on fish (Batterman and Cook 1981, Belanger *et al.* 1990, Belanger *et al.* 1986, Woodhead *et al.* 1983). The findings indicate that asbestos concentrations on the order of 10^6 to 10^8 fibers/L may cause epidermal lesions, epithelial hypertrophy, kidney damage, decreased orientation and swimming ability, degradation of the lateral line, reduced growth, and increased mortality in fish. Undisturbed, non-friable (not easily crumbled) asbestos has been found to be relatively harmless (Garcia and Salzwedel 1995, Montoya *et al.* 1985).

PCBs may still exist in water-tight gaskets, cable insulation, paint, transformers, capacitors, and other components of decommissioned Navy vessels (Martore *et al.* 1996, Eisler and Belisle 1996). These chemicals have been implicated in: reduced primary productivity in phytoplankton; reduced hatchability of contaminated fish and bird eggs; reproductive failure in seals; altered steroid levels and subsequent reproductive impairment in fish and sea stars; reduced fertilization efficiency in sea urchins; and reduced plasma retinal and thyroid hormone levels potentially leading to increased susceptibility to microbial infections, reproductive disorders and other pathological alternation in seals and other marine mammals (Adams and Slaughter-Williams 1988, Brouwer *et al.* 1989, Clark 1992, den Besten *et al.* 1991).

Antifouling paints typically containing tributyltin (TBT) and copper (Cu) are often used to paint vessel hulls to inhibit the growth of organisms below the water line. An IMO convention to

control the use of harmful anti-fouling systems on ships was adopted on October 5, 2001. The convention will prohibit the use of harmful organotin, including TBT, in anti-fouling paints used on ships and establish a mechanism to prevent the potential future use of other harmful substances in anti-fouling systems. TBT has been found to be toxic to non-target, non-fouling organisms at low levels (approximately 7.5-10.5 ng TBT/L). One of its most marked effects has been the induction of shell thickening and growth anomalies in oysters and imposex in the dogwhelk *Nucella lapillus* potentially leading to sterility (Gibbs *et al.* 1998).⁸ The discovery of the highly toxic nature of TBT-based paints has led many countries to ban the use of these paints for non-aluminum hulled vessels less than 25 meters in length. Copper, though an effective antifoulant, has not been shown to cause extensive effects on non-target organisms at relatively low levels. When present in high concentrations, however, copper can be toxic to aquatic life (Sorrenson 1991). In a study conducted when a cargo ship collided with part of the Great Barrier Reef and remained grounded for 12 days, sediment containing 8.0 mg kg super(-1) TBT, 72 mg kg super(-1) Cu and 92 mg kg super(-1) Zn was found to significantly inhibit larval settlement and metamorphosis (Negri *et al.* 2002). At this level of contamination, larvae survived but contracted to a spherical shape and swimming and searching behavior ceased. At higher contamination levels, 100% mortality was recorded. These results indicate that the contamination of sediment by anti-fouling paint has the potential to significantly reduce coral recruitment in the immediate vicinity of the site and that this contamination may threaten the recovery of the resident coral community unless the paint is removed.

Iron, an essential element like copper, can be contributed to the environment from steel hulls of sunken vessels. As an essential element, iron levels will tend to be closely regulated by organisms, and thus, it is unlikely that any pollution-derived effects will be observed except in severe and localized cases (Thompson 1990). Corals living in seawater with high iron concentrations have been shown to incorporate the iron into their skeletons (Brown *et al.* 1991). Studies on phytoplankton and macroalgae indicate that in areas where plant nutrients such as nitrate and phosphate are abundant the availability of iron is actually a limiting factor in growth and biomass (Coale *et al.* 1996, Frost 1996, Matsunaga *et al.* 1994, Takeda 1998, Wells *et al.* 1995). Hence the concern of unnatural iron inputs from artificial reefs seems to center not on the occurrence of adverse toxicological effects in marine organisms, but rather on the alteration of the composition of natural assemblages of algae and species which compete with algae.

Lead paint has been used on the interiors of some vessels. Lead has no biological function and, therefore, exhibits accumulation trends in organisms (Thompson 1990). Corals have been shown to incorporate lead into their skeletons (Dodge and Gilbert 1984). Unicellular algae and sea urchins appear to be the most sensitive marine organisms (Berhard 1980). Growth inhibition has been observed in the algae species *Thalassiosira pseudonana* and *Porphyridium marinum* exposed to lead as well as in sea urchins.

References

- Adams, J.A. and S. Slaughter-Williams. 1988. The effects of PCBs on fertilization and morphology in *Arbacia punctulata*. *Water Air Soil Pollut.* 38: 299-310.
- Batterman, A.L. and P.M. Cook. 1981. Determination of mineral fiber concentrations in fish tissues. *Can. J. Fish. Aquat. Sci.* 38: 952-959.

⁸ Imposex is defined as the development of specific male sexual organs in females.

- Belanger, S.E., K. Schurr, D.A. Allen, and A.F. Gohara. 1986. Effects of chrysotile asbestos on coho salmon and green sunfish: evidence of pathological stress. *Environ. Res.* 39: 74-85.
- Belanger, S.E., D.S. Cherry, and J. Cairns, Jr. 1990. Functional and pathological impairment of Japanese Medaka (*Oryzias latipes*) by long-term asbestos exposure. *Aquat. Toxicol.* 17: 133-154.
- Brouwer, A., P.J.H. Reijnders, and J.H. Koeman. 1989. Polychlorinated biphenol (PCB)-contaminated fish induces vitamin A and thyroid hormone deficiency in the common seal. *Aquatic Toxicology.* 15: 99-106.
- Brown, B.E., A.W. Tudhope, M.D.A. Le Tissier, and T.P. Scoffin. 1991. A novel mechanism for iron incorporation into coral skeletons. *Coral Reefs* 10: 211-215.
- Clark, R.B. 1992. *Marine Pollution*. Clarendon Press, Oxford, 172.
- Coale, K.H., S.E. Fitzwater, R.M. Gordon, K.S. Johnson, and R.T. Barber. 1996. Control of community growth and export production by upwelled iron in the equatorial Pacific Ocean. *Lett. Nature* 379: 621-624.
- den Beston, P.J., J.M.L. Elenbaas, J.R. Maas, S.J. Dieleman, H.J. Herwig, and P.A. Voogt. 1991. Effects of cadmium and polychlorinated biphenols on steroid metabolism and cytochrome P-450 monooxygenase system in the sea star *Asterias rubens L.* *Aquatic Toxicology.* 20: 95-100.
- Frost, B.W. 1996. Phytoplankton bloom on iron rations. *Nature* 383: 475-476.
- Garcia, C.B. and H. Salzwedel. 1995. Successional patterns on fouling plates in the Bay of Santa Marta, Colombian Caribbean. *An. Inst. Invest. Mar. Punta de Betin.* 24: 95-121.
- Gibbs, P.E., P.L. Pascoe, and G.R. Burt. 1988. Sex change in the female dog-whelck, *Nucella lapillus*, induced by tributyltin from antifouling paints. *J. Mar. Biol. Ass. U.K.* 68:715-731.
- Martore, R.M., T.D. Mathews, and M. Bell. 1998. Levels of PCBs and heavy metals in biota found on ex-military ships used as artificial reefs. South Carolina Department of Natural Resources, Charleston, South Carolina.
- Matsunaga, K., Y. Suzuki, K. Kuma, and I. Kudo. 1994. Diffusion of Fe(II) from an iron propagation cage and its effect on tissue iron and pigments of macroalgae on the cage. *J. Appl. Phycol.* 6: 397-403.
- Montoya, A.J., Q.R. Quesada, Z.E. Madriz, M.E. Castro, and P.O. Urpi. 1985. Comparative analysis of substrates for collection of mangrove oyster spat in Viscaya estuary, Limon, Costa Rica. *Rev. Biol. Trop.* 33: 1-6.
- Negri, A.P., L.D. Smith, N.S. Webster, A.J. Heyward. 2002. Understanding ship-grounding impacts on a coral reef: potential effects of anti-foulant paint contamination on coral recruitment. *Mar. Pollut. Bull.* Vol. 44: 111-117.
- Sorrenson, E.M. 1991. *Metal poisoning in fish*. CRC Press, Inc., Boca Raton, 374 pp.
- Takeda, S. 1998. Influence of iron availability on nutrient consumption ratio of diatoms in oceanic waters. *Nature* 393: 774-777.
- Thompson, D.R. 1990. Metal levels in marine vertebrates. In R.W. Furness and P.S. Rainbow (eds.), *Heavy Metals in the Marine Environment*. CRC Press, Inc., Boca Raton, pp 143-183.
- Wells, M.L. N.M. Price, and K.W. Bruland. 1995. Iron chemistry in seawater and its relationship to phytoplankton: a workshop report. *Mar. Chem.* 48: 157-182.
- Woodhead, A.D., R.B. Setlow, and V. Pond. 1983. The effects of chronic exposure to asbestos fibers in the Amazon molly, *Poecilia Formosa*. *Environ. International.* 9:173-176.

Appendix D

Developing Workplans for Vessel Preparation Prior to Reefing

Determining the type and location of the potential sources of contamination from a vessel intended for use as an artificial reef should be conducted as part of a workplan for vessel clean up and preparation. The purpose of such a workplan is to assure that materials of concern potentially contributing to pollution of the marine environment are addressed prior to reefing. The development of a workplan also can allow for more effective clean-up efforts during vessel preparation by considering activities such as recycling and reuse operations and possibly diver safety preparations. Any such salvage operations should occur in a manner that will minimize debris and contamination with oils or other products that have to be cleaned up at a later date. This activity may allow for improved access for subsequent clean-up efforts.

Information which may be useful in the preparation of a workplan could include:

- Asbestos documentation for the vessel;
- PCB documentation for the vessel;
- Documentation that naval vessels have been previously demilitarized and certified to be radiologically decontaminated;
- Documentation that refrigerants and halons have been removed from shipboard systems;
- Information on hazardous materials onboard the vessel;
- Information on exterior hull paint which could include paint type and date of last application;
- General drawings of machinery, compartments, and tank layouts;
- Description of vessel dimensions including size, weight, and superstructure materials;
- Tank soundings describing the volume and contents of fuel oil tanks prior to preparation for reefing;
- List of items with beneficial reuse potential to be salvaged prior to sinking;
- Assessment of applicable laws and regulations, including permit requirements; and
- Reef site surveys and proposed site preparation.

An assessment of the above mentioned information could then direct the actions needed for preparation of the reef project workplan. Some general workplan preparation actions include:

- Assess vessel drawings and dimensions;
- Identify which items will remain on the vessel;
- Identify items to be salvaged prior to sinking;
- Estimate economic viability of the reef project (including permit costs and timeframes);
- Determine if the vessel is a good candidate (i.e., does the workplan fall within reasonable time and financial commitments);
- Coordinate with all regulatory agencies, local, regional, State and federal, as well as stakeholders, during all project phases;
- Apply for and receive the appropriate permits for the project;

- Remove hazardous materials and clean vessel;
- Inspect vessel to clear all findings (that the workplan for removal of materials as well as the vessel clean-up is met);
- Conduct vessel stability analysis;
- Develop strategy for vessel sinking;
- Notify NOAA to update nautical charts once the ship has settled on the ocean floor; and
- Deploy relevant aids to navigation and mooring/marker buoys at the site.

Appendix E

General Principles for a Vessel Clean-up Operation

In order to prepare a vessel intended to create an artificial reef, a workplan should be developed to direct cleaning operations – as described in Appendix D. Salvage operations should take place first, being careful to minimize debris and contamination with oils or other products that will need cleaning sometime during the vessel preparation. Other vessel clean-up preparations to be considered include:

- Re-use/recycle/dispose of all or some vessel components – besides ferrous scrap materials, there may be high-value components onboard the vessel, such as non-ferrous metals (e.g., copper, aluminum, nickel), and re-useable equipment such as generators, machines, pumps, and cranes;
- Generally, clean-up operations should begin at the highest part of the compartment or tank and proceed downwards to the bilge;
- Deal with the large concentrations of oil and hazardous products early in the operation;
- Keep compartments clean and make concerted efforts to avoid spillage during salvage and clean-up operations; and
- Consider removing, instead of cleaning, heavily contaminated machinery and piping. Removal may be quicker and less expensive. Removal may also allow for less overall effort in clean-up as access to the contaminated machinery and piping is improved and ongoing contamination from drips and seepage is minimized.

Appendix F

Recommended Checklist for Documenting Vessel Clean-up Using this Guidance^{9, 10}

- I. Specify particular material of concern
- II. Describe narrative clean-up goal for that material of concern
- III. Conduct surveys and assessments to determine current conditions/amounts of material of concern and document and describe:
 - ✓ Survey design and assessment methodologies
 - ✓ Who conducted survey/assessment
 - ✓ When survey/assessment was conducted
 - ✓ Results of survey/assessment
- IV. Discuss how the narrative clean-up goal for the given material of concern was achieved (vessel preparation/clean-up initiated specifically for vessel-to-reef project)
 - ✓ Who carried out the work?
 - ✓ When was the work completed?
 - ✓ What cleaning method was used? What preparation was done to address this material of concern? How was the narrative clean-up goal achieved?
 - ✓ For some materials, the narrative clean-up goal is the removal of all of that given material (e.g., oil and fuel, solids/debris/floatables, antifreeze and coolants, fire extinguishing systems, batteries, refrigerants and halons, mercury, black and gray water, invasive species). For these materials of concern, has the removal of all the specified material been verified? How much of the material was removed and what was done with it after removal?
 - ✓ For some materials of concern, the narrative goal allows for some materials to remain on the vessel if prepared properly (e.g., asbestos, paint, lead ballast bars, radioactive materials, negatively buoyant vessel debris). For these materials of

⁹ This template would be used for each material of concern as presented in the BMPs (e.g., oil and fuel; asbestos; PCBs; paint; solids/debris/floatables; and batteries, antifreeze, coolants, mercury, radioactive materials and other materials of environmental concern).

¹⁰ This checklist is not a regulatory requirement, nor is it a requirement to submit this information to any particular governmental or quasi-governmental agency, State or Federal. However, this checklist outlines the type of information that might be useful to show that the goals in this guidance document have been met.

concern, how much of the specified material was removed and how much remains on the vessel (e.g., approximately how many lead ballast bars, approximately how much surface area is still covered with paint, how many rooms/compartments still contain friable or nonfriable asbestos-containing material)?

-Was the material prepared with the intention of leaving it on board?

-Is the material encapsulated (friable asbestos) or covered with growth (active anti-fouling paint)? Enclosed in a room (negatively buoyant vessel debris)?

✓ How has the completed work been verified?

V. Identify who prepared this document

✓ Name(s) and title(s)

✓ Contact information

Appendix G

Suggested Cleaning Methods for Oils, Fuels and Semi-solids (Greases)

Tanks

Methods for cleaning tanks include but are not limited to:

- Mechanical Cleaning: Mechanical cleaning involves mechanical removal of sludge and remaining fluids and wiping down all surfaces with oil absorbent material. Although manpower intensive, this cleaning method limits the spread of contamination and does not require large volumes of fluids that are expensive to dispose.
- Steam or Hot Water Cleaning: This method is quite effective, although it requires special equipment and generates large volumes of oily water. If this method is considered, a plan should be developed so that oily water generated during this cleaning method is dealt with in accordance with all applicable regulations. Surfactants or soaps are not recommended, as they tend to emulsify any oil present and make the oily water exceptionally difficult to treat. This would likely create higher disposal costs. In tanks where deckheads and sides are reasonably free of contamination, pressure washing can cause significant contamination of these otherwise clean surfaces through splashing, misting, and carry-over.
- Solvent Washing: Solvent washing may be an option where there are especially difficult residuals or deposits that need removal. Note that the use of solvents will require special handling and disposal of all liquid product generated as wastes.

In rare cases, especially where low-grade fuels have been stored, it may be necessary to resort to advanced tank cleaning methods such as ultrasonic or special solvents. It may also be advantageous to use a combination of several different methods, depending on the nature and location of the contamination. In general, mechanical cleaning would be the first method to try, followed by steam/hot water washing, then solvent washing in extremely difficult situations. Whatever method is selected, the effluent and water should be collected and treated. Large volumes will require the services of a pumper truck or barge, while smaller quantities should be collected and stored in drums and removed from the vessel. Caution should be used during all transfer operations to avoid spills. If transferring large quantities of oil or oil contaminated liquid, a boom around the vessel should be used to minimize the extent or spreading of a release.

Fuel and Oil Pipe Fittings, Piping with Manifolds, and Filling Points

Filling points: All filling stations or deck fittings that were used for receiving fuels or oils should be opened and cleaned. Access to the filling stations and deck fittings is necessary to ensure that they are completely drained and free of such fuels or oils. This will typically require access from the bottom and the top.

Fuel and Oil Piping Including Manifolds: Fuel and oil piping (including non-segregated ballast systems) should be drained of all fuel and oil. The cleaning and opening of pipes varies according to the type of fuel or oil that was contained in the lines. In general, the more viscous the fuel or oil, the more opening of pipes and cleaning activity will be required. For very viscous products (e.g., No. 6 fuel oil or Bunker C fuel as described in the “Oil and Fuel” section of this document), all piping and fittings should be fully opened for visual inspection.

Vertical piping runs should have all valves completely opened and any blanking flanges or spectacle plates removed for cleaning. Horizontal piping runs should be opened at low spots. Once draining of piping systems is completed, no visual evidence of weeping should exist at openings.

Fuel and Oil Piping Fittings: Fittings consist of valves, site glasses, coolers, siphon breakers, and filters. A visual examination of internals, or a cut through the lowest point of the fitting may be useful. Where fittings are of complex construction or have more than one oil-tight compartment (as in coolers), then access to all sub-compartments or components may be necessary. No visual evidence of weeping should exist at openings.

Unless the piping is clearly identified as being part of a non-hydrocarbon system or there is clear evidence to indicate that the system was not part of a hydrocarbon containing system (e.g., seawater piping to coolers, fresh water piping to domestic spaces), it should be assumed that the piping contained fuel or oil. Fittings should be cleaned, or removed from the vessel.

Bilge Compartments and Piping

All piping that runs through the bilge areas of machinery spaces should be assumed to be contaminated by fuel, oil, or greases until proven otherwise. Piping in bilge spaces should follow the clean-up suggestions as presented in the subsection above entitled “Fuel and Oil Piping Including Manifolds.”

Combustion Engines

Structure: Remove access panels, explosion doors, handhold doors, maintenance panels, gear covers, bearing covers/retaining plates, as necessary to remove oil. Visible oil should be removed from all internal components. The surrounding and support structure should be made accessible for inspection, especially the area under the engine. At least one main bearing should be opened to determine if the design allows oil to be trapped, thereby indicating whether all bearings should be opened and cleaned.

Fuel System: All fuel system components should be cleaned or removed from the engine. These include injectors, carburetors, supply,

distribution and return lines, filters, pumps, relief valves, pressure regulating mechanisms, governors, and heat exchangers. Removal of these items will prevent fuel seepage from their connections. If these items are to be sunk with the vessel, they should be opened, cleaned, and prepared for inspection.

Lubricating
Oil System:

Lubricating oil sumps should be drained and opened for cleaning and visual inspection. This may require that additional access openings be made. All lubricating oil piping, both internal and external to the engine, should either be removed or drained. Lubricating oil system components should either be cleaned or removed from the vessel. Internal oil gallery plugs should be removed. Pedestal and thrust bearings should be drained. Engine driven oil pumps should be pulled or cleaned. Engine oil filling and dirty oil drainage arrangements should be removed or cleaned.

Other Systems:

Other components and systems susceptible to contamination with fuels, oils, or greases (e.g., superchargers, turbochargers, air filters) should be examined visually and cleaned if they are present.

REFERENCES

- Delaware Department of Natural Resources and Environmental Control's (DNREC) Program Summary and Endorsement of NYC Transit's Plan to Use Subway Cars as Artificial Reef Material. 2001.
- Environment Canada. 1998. Cleanup Guidelines for Ocean Disposal of Ocean Vessels. Artificial Reef Society of British Columbia website.
[http://www.artificialreef.bc.ca/ARresources/cleanup_guidelines.html]
- Environment Canada. 1998. Cleanup Standards for Ocean Disposal of Vessels. Artificial Reef Society of British Columbia website.
[http://www.artificialreef.bc.ca/ARresources/cleanup_standards.html]
- Lukens, Ronald R. 1997. Guidelines for Marine Artificial Reef Materials. Final report of the Artificial Reef Subcommittee of the Technical coordinating committee Gulf States Marine Fisheries Commission.
[http://www.gsmfc.org/pubs/SFRP/Guidelines_for_Marine_Artificial_Reef_Materials_January_1997.pdf]
- London Convention. Revised 2003. Waste-Specific Guidelines for Vessels Proposed for Disposal at Sea (Waste Assessment Guidelines for Vessels).
[<http://www.londonconvention.org/documents/guidelines/4%20-%20Vessels.pdf>]
- OSPAR Commission. 1999. OSPAR Guidelines on Artificial Reefs in relation to Living Marine Resources. OSPAR Convention for the Protection of the Marine Environment of the North-East Atlantic. (Reference Number: 1999-13). ANNEX 6 (Ref. Section 3.24).
- San Diego Oceans Foundation, Marine Technology Society, and the Artificial Reef Society of British Columbia. 2000. *Proceedings from Artificial Reef Conference: Converting Unused Ships and Structures to Enhance Ocean Environments*. San Diego, California.
- Telephone conversation with Captain Spencer Slate, ex-USS Spiegel Grove vessel-to-reef project co-manager. April 17, 2006.
- U.S. Department of Commerce. 1985. National Artificial Reef Plan. NOAA Technical Memorandum NMFS OF-6. National Marine Fisheries Service. Washington, D.C.
- U.S. Department of Commerce. 2002. Draft National Artificial Reef Plan (February 2002). NOAA, National Marine Fisheries Service. Silver Spring, Maryland.
- U.S. EPA. 2000. A Guide for Ship Scrappers: Tips for Regulatory Compliance. EPA/315-B-00-001. Environmental Protection Agency. Washington, D.C.
- U.S. Navy. Material Management for Radioactive Items in the DoD. DLA INST 4145.8.



U.S. Environmental Protection Agency



U.S. Maritime Administration

EPA842-B-06-002
May 2006

Ferry M/V Adirondack Reefing Project
Vessel Preparation

The vessel preparation will follow the guidelines specified in "U.S. EPA National Guidance: Best Management Practices for Preparing Vessels Intended to Create Artificial Reefs". This document will be here on referred to as "BMP" and a copy is attached.

The tasks involved in preparing the vessel for reefing are as follows:

- I. Hazardous waste mitigation
- II. Ballasting
- III. Anchoring
- IV. Preparing flooding access and air egress holes for proper deployment of *Adirondack*
- V. Means of flooding

I. Hazardous Waste Mitigation

The hazardous materials addressed in BMP are:

- A) Oil and Fuel
- B) Asbestos
- C) PCB's
- D) Paint
- E) Solids/Debris/Floatables
- F) Other materials of environmental concern

A) Oil and Fuel Removal

Most items containing oil and fuel will be removed entirely from the vessel. These include:

- (2) Fuel tanks, 2500 gallons carrying capacity each
- All fuel lines
- (2) Main Engines
- (2) Reverse Gears
- (2) Generator Engines
- Boiler/ Oil burner
- Hot air furnace
- (2) Air Compressors
- Fuel oil day tank
- (2) Lube oil storage tank
- All lube oil piping
- Steering cables and their conduits

A few items will be cleaned of oil and grease and left in place. These will include:

- Line shaft cooper bearings (note: stern bearings are water lubricated and need no cleaning procedure)
- Bilge pump
- Heating boiler
- Steering engine

These items will leave a little equipment of diver interest in place.

B) Asbestos

An initial survey of the M/V Adirondack done by KD Associates of Burlington Vermont on October 6, 2018. No appreciable amounts of asbestos were found. There are small parts of electrical contactors, motor starters, steering clutches and brake linings that are very likely to contain asbestos. All these items will be removed from the vessel and properly disposed of.

C) PCB's

There were two likely sources for PCB's on the M/V Adirondack, one is paint and the other is in older florescent light ballasts and electrical capacitors. An initial survey of M/V Adirondack paint was performed on October 6, 2018 by KD Associated of Burlington Vermont (see attached). Multiple samples of paint were analyzed and none showed action levels of PCB's.

All florescent lights, electronic equipment and electrical equipment that may contain capacitors will be removed from the vessel and properly disposed of.

D) Paint

The bottom paint on the M/V Adirondack is epoxy and vinyl. No anti-fouling paint has been used on her hull. There is a small amount of anti-fouling paint used in her sea chests. It has been five years since her last dry docking, so this paint would mostly be gone. The interior and top sides paints were surveyed and tested for PCBs by KD Associates October 6, 2018 (see attached).. Any/ loose or exfoliating paint no matter what type will be scraped and removed from the vessel, all locations, and properly disposed of.

E) Solids/Debris/Floatables

All loose items; furnishings, cabinets, counters etc. will be removed from the vessel.

The rubber roofing and foam underlayment on the hurricane deck and pilothouse roofs will be removed. The wooden planking of the superstructure will be reinforced with steel strapping to prevent any from coming loose. There will be small boats with nets on hand to collect any debris that does float free at sinking.

G) Other Materials of Environmental Concern:

The sewage holding tank and associated piping will be removed from the vessel.

All electrical wiring will be removed from the vessel,. Any thermometers or thermostats containing mercury would be removed.

All plastic and rubber items; door and window gaskets, toilet seats etc., will be removed from the vessel.

All thermal insulation is minimal but will be removed from the vessel and properly disposed of.

II. Ballasting:

The weight removed from the vessel in the form of equipment, tanks etc. will be added back to the vessel in the form of concrete poured in the lowest part of the bilge. The weight of items removed will be recorded as they are removed in order to check against changes in draft and to guard against adverse stability of the vessel. Additional concrete will also be added to bring the vessel down to its maximum operating draft of 9 feet. This will give the vessel maximum stability for the trip to the sinking site and will help keep the vessel upright on the way to the bottom.

III. Anchoring

The last job prior to sinking is to tow the vessel to the site and anchor it with a spread of four to six anchors. These would each be run out 200 to 300 feet in a star pattern, to keep the vessel on station and in the correct orientation during the sinking process. The anchors and lines will be recovered from the bottom after sinking.

IV. Preparing Flooding and Venting Holes for Proper Deployment:

Openings will be cut to allow water to easily flood all compartments. There will also be some additional openings cut to allow air to vent during the sinking process. These will be done with guidance from representatives of Artificial Reefs International/CRB Geological and Environmental Services (ARI/CRB). All doors and windows will be removed from the vessel or welded open. There will be mooring balls attached directly to the wreck, facilitating locating and diving the wreck.

IV. Preparing Flooding and Venting Holes for Proper Deployment:

Openings will be cut to allow water to easily flood all compartments. There will also be some additional openings cut to allow air to vent during the sinking process. These will be done with guidance from representatives of Artificial Reefs International/CRB Geological and Environmental Services (ARI/CRB). All doors and windows will be removed from the vessel or welded open. There will be mooring balls attached directly to the wreck, facilitating locating and diving the wreck.

V. Means of flooding:

The vessel would be flooded by opening the four sea valves to let the water flow in. Preparation for this requires removing the discharge piping from the (3) 6 inch sea valves and (1) 3 inch sea valve so water can flow directly into the engine room. A 4th 6 inch valve would be added in the stbd aft engine room hull to distribute the water evenly in the space. Several holes would be cut in the water tight bulkheads to let water flow easily into all compartments. Flooding holes would also be cut in the hull plating about 1 foot above the waterline a day or two before the sinking. These holes would be 21" x 21" with 4 ½ " radiused corners. Soft patches of ¾ inch plywood with soft rubber gaskets will be placed over these holes as they are cut. There will be 9 holes on either side of the engine room near the mid point, placed every other frame space. This is to accelerate the flooding rate as the vessel gets lower in the water. This will minimize the time in which the vessel could wallow and take on unwanted list.

Estimate of cost to Lake Champlain Transportation Co. for vessel preparation and deployment:

Labor, prep- Crew of 5 for 3 months, 5 men x 66 days x 8 hrs /day x \$40 / hr =	\$105,600
Labor, vessel deployment and anchor tackle recovery	
Crew of 10 for 2 ten hour days, 10 men x 2 days x 10 hrs/day x \$40/hr=	\$8000
Artificial Reefs International consulting fees	\$28,000
Hazardous Waste disposal, 4000 gallons x \$2.00 / gal	\$8000
Steel for wood reinforcement, 2200 ft of ¼" x 2 inch flat bar	\$4000
Misc. Hardware and supplies	\$2000
Concrete ballast	\$6000
Anchor blocks, 3500 lb	\$600
300 ft of 7/8" chain	\$5400
1500 ft of 1 ½ inch nylon line	\$6800
Plywood and misc lumber	\$600
Total	\$175,000

Please feel free to contact me with questions or concerns.

Respectfully Submitted, 7-23-19

John Paul

Port Engineer
 LAKE CHAMPLAIN TRANSPORTATION CO.
 1 King Street Dock
 Burlington Vermont 05401
 802-864-9804, 802-578-3030 (cell)
 johnp@ferries.com



2 January 2019

Mr. John Paul
Lake Champlain Transportation Co.
1 King Street Dock
Burlington, VT 05401-5293

Re: PCB Testing, M/V Adirondack
K-D Project No. 03012-010

Dear John:

At your request a representative of K-D Associates, Inc. visited the King Street Docks to conduct a screening for the presence of Polychlorinated Biphenyls (PCB's) in representative painted surfaces on the M/V Adirondack. Three paint chip samples were collected. Analysis results are attached.

As the results show, low levels of PCB's were detected slightly above the reporting limits for PCB compounds in some of the samples. All sample results were well below the 50 mg/Kg (ppm) threshold.

Please do not hesitate to call if you have any questions or need further assistance.

Sincerely,

A handwritten signature in black ink, appearing to read 'John P. Madigan', written in a cursive style.

John P. Madigan



EMSL Analytical, Inc.

200 Route 130 North, Cinnaminson, NJ 08077

Phone: (856) 303-2500 Fax: (856) 858-4571 Email: EnvChemistry2@emsl.com

Attn:

**John Madigan
KD Associates, Inc.
41 IDX Drive
Suite 209
South Burlington, VT 05403-7757**

12/28/2018

Phone: (802) 862-7490

Fax: (802) 660-2462

The following analytical report covers the analysis performed on samples submitted to EMSL Analytical, Inc. on 12/14/2018. The results are tabulated on the attached data pages for the following client designated project:

Lake Champlain Transportation

The reference number for these samples is EMSL Order #011810961. Please use this reference when calling about these samples. If you have any questions, please do not hesitate to contact me at (856) 303-2500.

Approved By:

Phillip Worby, Environmental Chemistry
Laboratory Director



The test results contained within this report meet the requirements of NELAP and/or the specific certification program that is applicable, unless otherwise noted.
NELAP Certifications: NJ 03036, NY 10872, PA 68-00367, CA ELAP 1877

The samples associated with this report were received in good condition unless otherwise noted. This report relates only to those items tested as received by the laboratory. The QC data associated with the sample results meet the recovery and precision requirements established by the NELAP, unless specifically indicated. All results for soil samples are reported on a dry weight basis, unless otherwise noted. This report may not be reproduced except in full and without written approval by EMSL Analytical, Inc.

**EMSL Analytical, Inc.**

200 Route 130 North, Cinnaminson, NJ 08077
 Phone/Fax: (856) 303-2500 / (856) 858-4571
<http://www.EMSL.com> EnvChemistry2@emsl.com

EMSL Order: 011810961
 CustomerID: Appendix 6
 CustomerPO: RDA159
 ProjectID:

Attn: **John Madigan**
KD Associates, Inc.
41 IDX Drive
Suite 209
South Burlington, VT 05403-7757

Phone: (802) 862-7490
 Fax: (802) 660-2462
 Received: 12/14/18 9:30 AM

Project: Lake Champlain Transportation

Analytical Results

Client Sample Description 01 **Collected:** 12/6/2018 **Lab ID:** 011810961-0001

Method	Parameter	Result	RL	Units	Prep Date	Analyst	Analysis Date	Analyst
GC-SVOA								
3540C/8082A	Aroclor-1016	ND D	0.89	mg/Kg	12/17/2018	AF	12/18/2018	EH
3540C/8082A	Aroclor-1221	ND D	0.89	mg/Kg	12/17/2018	AF	12/18/2018	EH
3540C/8082A	Aroclor-1232	ND D	0.89	mg/Kg	12/17/2018	AF	12/18/2018	EH
3540C/8082A	Aroclor-1242	ND D	0.89	mg/Kg	12/17/2018	AF	12/18/2018	EH
3540C/8082A	Aroclor-1248	ND D	0.89	mg/Kg	12/17/2018	AF	12/18/2018	EH
3540C/8082A	Aroclor-1254	9.8 D	0.89	mg/Kg	12/17/2018	AF	12/18/2018	EH
3540C/8082A	Aroclor-1260	4.5 D	0.89	mg/Kg	12/17/2018	AF	12/18/2018	EH
3540C/8082A	Aroclor-1262	ND D	0.89	mg/Kg	12/17/2018	AF	12/18/2018	EH
3540C/8082A	Aroclor-1268	ND D	0.89	mg/Kg	12/17/2018	AF	12/18/2018	EH

Client Sample Description 02 **Collected:** 12/6/2018 **Lab ID:** 011810961-0002

Method	Parameter	Result	RL	Units	Prep Date	Analyst	Analysis Date	Analyst
GC-SVOA								
3540C/8082A	Aroclor-1016	ND D	0.99	mg/Kg	12/17/2018	AF	12/18/2018	EH
3540C/8082A	Aroclor-1221	ND D	0.99	mg/Kg	12/17/2018	AF	12/18/2018	EH
3540C/8082A	Aroclor-1232	ND D	0.99	mg/Kg	12/17/2018	AF	12/18/2018	EH
3540C/8082A	Aroclor-1242	ND D	0.99	mg/Kg	12/17/2018	AF	12/18/2018	EH
3540C/8082A	Aroclor-1248	ND D	0.99	mg/Kg	12/17/2018	AF	12/18/2018	EH
3540C/8082A	Aroclor-1254	6.3 D	0.99	mg/Kg	12/17/2018	AF	12/18/2018	EH
3540C/8082A	Aroclor-1260	2.3 D	0.99	mg/Kg	12/17/2018	AF	12/18/2018	EH
3540C/8082A	Aroclor-1262	ND D	0.99	mg/Kg	12/17/2018	AF	12/18/2018	EH
3540C/8082A	Aroclor-1268	ND D	0.99	mg/Kg	12/17/2018	AF	12/18/2018	EH

Client Sample Description 03 **Collected:** 12/6/2018 **Lab ID:** 011810961-0003

Method	Parameter	Result	RL	Units	Prep Date	Analyst	Analysis Date	Analyst
GC-SVOA								
3540C/8082A	Aroclor-1016	ND D	1.0	mg/Kg	12/17/2018	AF	12/18/2018	EH
3540C/8082A	Aroclor-1221	ND D	1.0	mg/Kg	12/17/2018	AF	12/18/2018	EH
3540C/8082A	Aroclor-1232	ND D	1.0	mg/Kg	12/17/2018	AF	12/18/2018	EH
3540C/8082A	Aroclor-1242	ND D	1.0	mg/Kg	12/17/2018	AF	12/18/2018	EH
3540C/8082A	Aroclor-1248	ND D	1.0	mg/Kg	12/17/2018	AF	12/18/2018	EH

**EMSL Analytical, Inc.**

200 Route 130 North, Cinnaminson, NJ 08077
 Phone/Fax: (856) 303-2500 / (856) 858-4571
<http://www.EMSL.com> EnvChemistry2@emsl.com

EMSL Order: 011810961
 CustomerID: Appendix
 CustomerPO: RDA159
 ProjectID:

Attn: **John Madigan**
KD Associates, Inc.
41 IDX Drive
Suite 209
South Burlington, VT 05403-7757

Phone: (802) 862-7490
 Fax: (802) 660-2462
 Received: 12/14/18 9:30 AM

Project: Lake Champlain Transportation

Analytical Results

Client Sample Description 03 *Collected:* 12/6/2018 *Lab ID:* 011810961-0003

<i>Method</i>	<i>Parameter</i>	<i>Result</i>	<i>RL</i>	<i>Units</i>	<i>Prep Date</i>	<i>Analyst</i>	<i>Analysis Date</i>	<i>Analyst</i>
GC-SVOA								
3540C/8082A	Aroclor-1254	ND D		1.0 mg/Kg	12/17/2018	AF	12/18/2018	EH
3540C/8082A	Aroclor-1260	ND D		1.0 mg/Kg	12/17/2018	AF	12/18/2018	EH
3540C/8082A	Aroclor-1262	ND D		1.0 mg/Kg	12/17/2018	AF	12/18/2018	EH
3540C/8082A	Aroclor-1268	ND D		1.0 mg/Kg	12/17/2018	AF	12/18/2018	EH

Definitions:

ND - indicates that the analyte was not detected at the reporting limit
 RL - Reporting Limit (Analytical)
 D - Dilution

Environmental Chemistry Chain of Custody

EMSL Order Number (Lab Use Only):

011810961

PHONE:
FAX:



EMSL ANALYTICAL, INC.
LABORATORY PRODUCTS TRAINING

Report To Contact Name: John Madigan		Bill To Company: SME								
Company Name: K-D Associates, Inc.		Attention To:								
Street: 41 IDX Drive, Suite 209		Street:								
City: So. Burlington		City:								
State/Province: VT		State/Province:								
Zip/Postal Code: 05403		Zip/Postal Code:								
Phone: 802 862 7490		Phone:								
Fax:		Fax:								
Project Name: Lake Champlain Transportation		Email Results To: KDAI								
Purchase Order:		Purchase Order:								
U.S. State where Samples Collected: Vermont		Date of Shipment: 12/13/18								
Number of Samples in Shipment: 3		State Reporting Required? (Y/N) N								
Sample for Compliance? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> If yes, NPDES? <input type="checkbox"/> Other (Specify):		PWS ID #:								
Samples Collected by: EMSL <input type="checkbox"/> Client <input checked="" type="checkbox"/> check one		Samples Received Chilled? (Y/N) N								
Standard Turnaround Time: <input checked="" type="checkbox"/> 2 Weeks		The following TATs are subject to lab approval: <input type="checkbox"/> 1 Week <input type="checkbox"/> 2 Days <input type="checkbox"/> 3 Days <input type="checkbox"/> 4 Days <input type="checkbox"/> 1 Day								
Failure to complete will hinder processing of samples		List Test(s) Needed								
Client Sample ID	Comp	Lab	Collect Date/Time	Matrix	Preservative	Field pH	Field pH	Field Temp. Deg C	Field Temp. Test Time	Comments
01	<input type="checkbox"/>	<input checked="" type="checkbox"/>	12/6/18	0	None					
02	<input type="checkbox"/>	<input checked="" type="checkbox"/>	12/6/18	0						
03	<input type="checkbox"/>	<input checked="" type="checkbox"/>	12/6/18	0						
	<input type="checkbox"/>	<input type="checkbox"/>								
	<input type="checkbox"/>	<input type="checkbox"/>								
Released By (Signature): <i>[Signature]</i>		Date & Time: 12/13/18 5:00 PM		Received By: Dulana Latta		Date & Time: 12/14 9:30 AM				

Appendix G

Please indicate reporting requirements: Results Only Results and QC Reduced Deliverables Disk Deliverable Other

Instructions or Comments:

* Received in plastic 12/14/18

Note: Field pH and Field Temperature are tested on the same day as the date of sample collection. (Lab) Received Temperature: 20.5 °C



12 December 2018

Mr. John Paul
 Lake Champlain Transportation Co.
 1 King Street Dock
 Burlington, VT 05401-5293

Re: Lead in Paint Testing, M/V Adirondack, Throughout
 K-D Project No. 03012-010

Dear John:

At your request a representative of K-D Associates, Inc. visited the King Street Docks to conduct an inspection for the presence of lead in the paint on surfaces of the M/V Adirondack. All work was conducted by a State of Vermont certified Lead Inspector.

Surfaces were classified by color, component and substrate. Testing was specific and in sufficient detail to determine if individual surfaces do or do not contain LBP. All paint sampling was done by XRF testing. No results in the inconclusive range were recorded and no paint chip sampling or laboratory analysis was needed. The survey was conducted using a Niton XLp 300 model (Serial No. 7709) in the Lead-In-Paint K & L variable time reading mode. According to the instruments *Performance Characteristic Sheet*, the inconclusive range for this model is 0.8 to 1.2 mg/cm². Substrate correction is also not needed for this model on metal, brick, concrete, drywall, plaster and wood. The objective of the testing was to find LBP surfaces with the concentration of lead above 1.0 mg/cm² by XRF analysis.

Results of the testing are found on the attached sheets. In general, lead based paint was found to be present on some of the original wood surfaces on the passenger deck, bulkhead paint that has not been replaced, and some original surfaces in the voids.

Please do not hesitate to call if you have any questions or need further assistance.

Sincerely,

John P. Madigan

K-D ASSOCIATES, INC.
LEAD-BASED PAINT INSPECTION RESULTS

Address/Unit No.: M/V Adirondack, King Street Docks

Date: 10/6/18

Room Equivalent: Upper Deck

XRF Serial No.: 26588 Inspector: John P. Madigan, Lead Inspector No.: IT436397

Signature: John P. Madigan

Test Location	Substrate	Component	Color	Condition	XRF Reading (mg/sq.cm)	Correction Value	Corrected Reading	Classification
Interior	Wood	ceiling	White	Good	0.6	n/a	n/a	Neg
"	Wood	Wall	White		0.3			h
"	"	"	"		0.2			2
"	"	"	"		0.2			h
"	"	"	Blue		0.0			r
"	"	"	"		0.0			h
"	"	Door	White		0.0			r
"	"	Stair railing	Blue		1.9			Pos
Exterior	Wood	Wall (Upper)	White		1.2			Pos
"	"	"	"		0.9			Neg
"	"	" (Lower)	"		0.0			"
"	"	"	"	0.0	h			
"	"	Bench	Blue	0.0	h			

Appendices - Ferry Adirondack Project p.94

Appendix H

K-D ASSOCIATES, INC.
LEAD-BASED PAINT INSPECTION RESULTS

Address/Unit No.: M/V Adirondack, King Street Docks

Date: 10/6/18

Room Equivalent Aft Pilot House + Forward Pilot House

XRF Serial No.: 26588

Inspector: John P. Madigan, Lead Inspector No.: IT436397

Signature John P. Madigan

Test Location	Substrate	Component	Color	Condition	XRF Reading (mg/sq.cm)	Correction Value	Corrected Reading	Classification
Interior Aft	Wood	Wall	White	Good	1.2	n/a	n/a	Pos
" "	"	ceiling	"	"	1.9			Pos
" "	Brass	Helm Stand	Brass	"	19.2			Pos
" Forward	Wood	Wall	White	"	1.6			Pos
" "	"	ceiling	"	"	1.8			Pos
" "	Brass	Helm Stand	Brass	"	18.7			Pos
Hull Deck	metal	Stack	Blue	"	0.0			Neg
" "	"	Ventilator	grey	"	0.0			Neg
" "	"	Stack	White	"	0.0			Neg
Stairway	Wood	Wall	White	"	0.2			Neg
" "	"	"	Blue	"	0.2			Neg
" "	"	tread	Grey	"	0.0			Neg

Appendices - Ferry Adirondack Project p.95

Appendix H

K-D ASSOCIATES, INC.
LEAD-BASED PAINT INSPECTION RESULTS

Address/Unit No.: M/V Adirondack, King Street Docks

Date: 10/6/18

Room Equivalent: Auto Deck

XRF Serial No.: 26588

Inspector: John P. Madigan, Lead Inspector No.: IT436397

Signature: John P. Madigan

Test Location	Substrate	Component	Color	Condition	XRF Reading (mg/sq.cm)	Correction Value	Corrected Reading	Classification
Deck	metal	Deck	grey		0.0	n/a	n/a	Neg
	"	"	"		0.0			
	"	"	"		0.0			
	Wood	Walls	"		0.0			
	"	"	"		0.0			
	metal	car rail	green?		0.1			
	"	"	"		0.0			
	"	column	white		0.3			
	"	Wall	grey		0.0			
	"	"	"		0.0			
	Wood	ceiling	"		0.0			
Alt Fiddely	metal	Wall	grey		0.7			Neg
"	"	"	"		0.7			
"	"	Floor	"		0.2			
"	"	Structure	"		0.2			
"	"	tank	"		0.1			

Appendices - Ferry Adirondack Project p.96

Appendix H

K-D ASSOCIATES, INC.
LEAD-BASED PAINT INSPECTION RESULTS

Address/Unit No.: M/V Adirondack, King Street Docks

Date: 10/6/18

Room Equivalent: Engine Room

XRF Serial No.: 26588 Inspector: John P. Madigan, Lead Inspector No.: IT436397

Signature: John P. Madigan

Test Location	Substrate	Component	Color	Condition	XRF Reading (mg/sq.cm)	Correction Value	Corrected Reading	Classification
	metal	ceiling	grey	Good	0.2	n/a	n/a	Neg
	"	"	"		0.07			
	"	Railing	"		0.0			
	"	Hull	"		0.6			
	"	"	"		0.4			
	"	"	"		0.1			
	"	Fuel Tank	"		0.1			
	"	Pump	green		0.0			
	metal	Aft Bulkhead	white	Fair	19.2			Pos
	"	"	"	Fair	17.6			Pos
	"	Starboard Transom	grey	Good	12.5			Pos
	"	"	"		8.1			Pos
	"	Floor	"		0.6			Neg
	"	"	"		0.2			
	"	Engine Cover	yellow		0.0			

Appendices - Ferry Adirondack Project p.97

Appendix H

Calibration Check Test Results

Page 6 of 6Address/ Unit No.: M/V Adirondack, King St. Docks, BurlingtonDevice: Niton XLP 300 XRF Serial No.: SN# 7709Contractor: K-D Associates, Inc. Date: _____Inspector: John P. Madigan Signature: John P. MadiganNIST SRM Used 1.04 mg/cm² Calibration Check Tolerance Used ±0.2 mg/cm²

First Calibration Check:

NIST SRM			First Average	Difference Between Second Average and MIST SRM*
First Reading	Second Reading	Third Reading		
<u>1.03</u>	<u>1.02</u>	<u>1.04</u>	<u>1.03</u>	<u>0.01</u>

Second Calibration Check:

NIST SRM			First Average	Difference Between Second Average and MIST SRM*
First Reading	Second Reading	Third Reading		
<u>1.01</u>	<u>1.02</u>	<u>1.02</u>	<u>1.02</u>	<u>0.02</u>

Third Calibration Check:

NIST SRM			First Average	Difference Between Second Average and MIST SRM*
First Reading	Second Reading	Third Reading		

Fourth Calibration Check:

NIST SRM			First Average	Difference Between Second Average and MIST SRM*
First Reading	Second Reading	Third Reading		

*If the difference of the Calibration Check Average from the NIST SRM film value is greater than the specified Calibration Check Tolerance for this device, consult the manufacturer's recommendations to bring the instrument back into control. Retest all testing combination tested since the last successful Calibration Check test.



12 December 2018

Mr. John Paul
Lake Champlain Transportation Co.
1 King Street Dock
Burlington, VT 05401-5293

Re: Asbestos Assessment, M/V Adirondack
K-D Project No. 03012-010

Dear John:

At your request, K-D Associates, Inc. collected samples of suspect materials from throughout the M/V Adirondack. Attached please find the analysis results for the samples collected. As required in the Vermont Department of Health, Asbestos Control Division protocols, multiple samples of each material were collected and analyzed by polarized light microscopy (PLM) until a positive sample is found or all samples are analyzed. A material is considered positive for asbestos if one sample is found to contain greater than one percent asbestos.

As the results show, all materials sampled were found to be negative for asbestos. The 12" by 12" vinyl floor tile and associated adhesive located throughout the passenger deck was found to be negative for asbestos. Please do not hesitate to call if you have any questions or need additional information or assistance with handling these materials.

Sincerely

A handwritten signature in black ink, appearing to read 'John P. Madigan', written in a cursive style.

John Madigan



Laboratory Results

Report Date: 12/10/2018

Date Received: 12/6/2018

Sample Location: M/V Adirondack

Lake Champlain Transportation Co.
King Street Ferry Dock
Burlington, VT 05401

Customer No.: 03012

Lab Reference No.: 18762

Number Samples Analyzed: 4

Analysis for asbestos type and quantity (visual area estimate and/or point counting) was performed by EPA test method 600/R-93/116, utilizing Polarized Light Microscopy (PLM) and dispersion staining techniques.

Lab No.	Sample Identification	Result
B-18-5130	18MB33901 - 12" x 12' vinyl floor tile, grey, upper deck	No Asbestos Detected
B-18-5131	18MB33902 - Adhesive associated with above sample	No Asbestos Detected
B-18-5132	18MB33903 - 12" x 12' vinyl floor tile, grey, upper deck	No Asbestos Detected
B-18-5133	18MB33904 - Adhesive associated with above sample	No Asbestos Detected

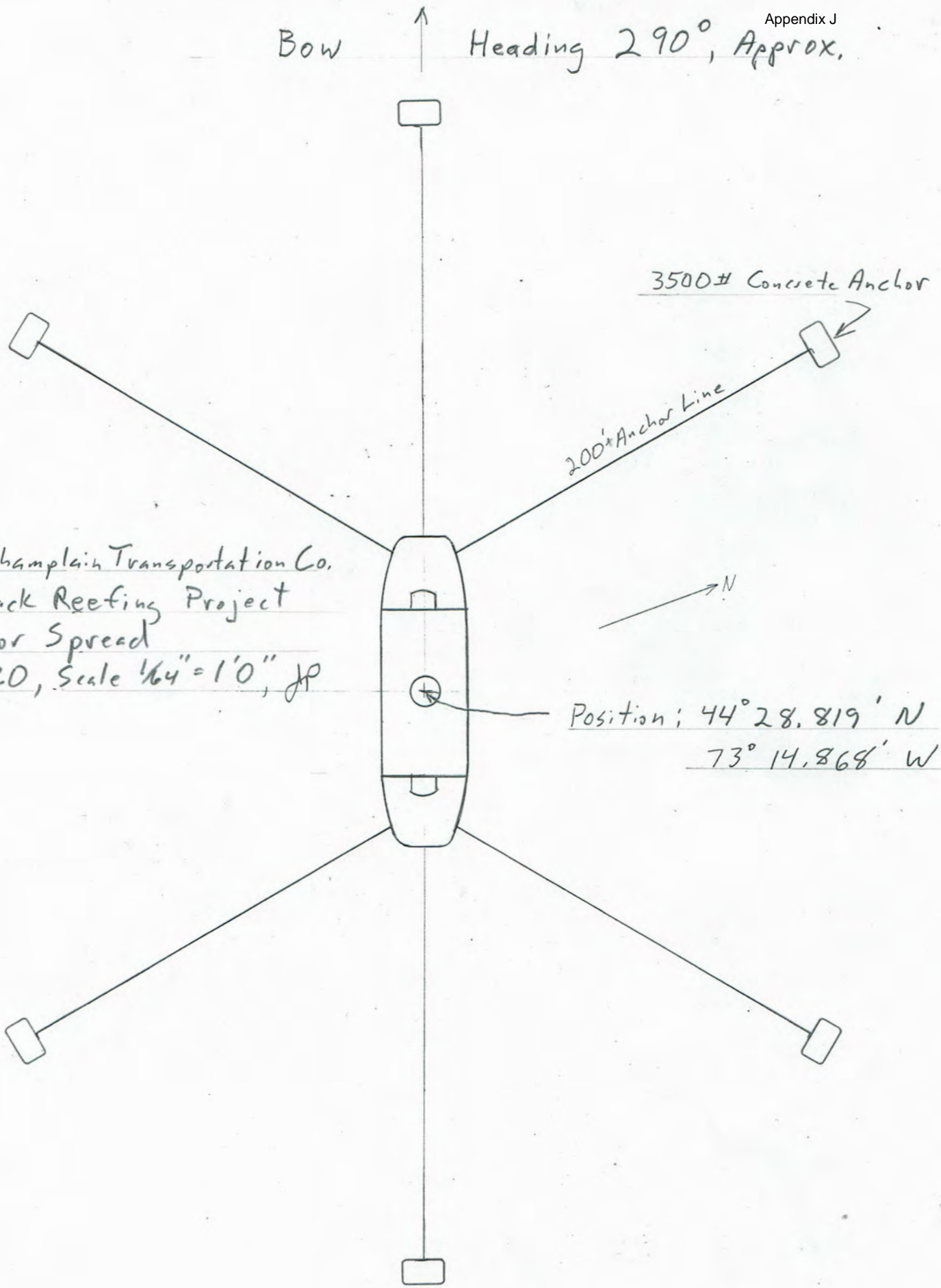
Bryan Schultz
Laboratory Manager

Laboratory Certifications: Vermont #AL278811
Analyst: Bryan Schultz, #PB487404

The results listed above relate only to the items/samples tested. Samples received in good condition unless otherwise noted. K-D Associates assumes no responsibility or liability for the manner in which these results are used or interpreted. The accuracy of PLM may be limited in the analysis of certain sample materials. For PLM results that are "negative" or positive at less than one percent, re-analysis by another analytical method may be appropriate.

Bow

Heading 290°, Approx.



Lake Champlain Transportation Co.
 Adirondack Reefing Project
 Anchor Spread
 1-20-20, Scale 1/64" = 1'0", JP

Position; 44° 28.819' N
 73° 14.868' W

M/V Adirondack Sinking Procedure, Proposed

Establish Safety Protocols

The mission is to sink the Adirondack safely and precisely with no impact to the environment.

All personnel on board the Adirondack during its deployment will be wearing pfd's and be equipped with whistles and flashlights. All Osha requirements will be adhered to.

(6) 3 inch trash pumps will be kept close at hand for emergency de-watering. (3) will go out on board the Adirondack and shifted to miss Piggy just before the sea valves are opened. The other (3) will be kept in reserve on board one or more of the small work boats. There will be a minimum of two small workboats on hand.

Install 2 bilge water level alarms in the engine room the week before the planned sinking.

Establish Security Procedures

All sea valves will be locked closed until the vessel is on station for sinking, using established Lock Out/Tag Out procedure.

The vessel will be monitored for vandals for several weeks before the sinking

The USCG/State Police will establish a security zone around the vessel at its sinking site before the Adirondack's arrival and continue until after she is on the bottom and initial inspection dives are complete.

Communications

Communications between the USCG, State Police, Tug Miss Piggy and the small support vessels will be by VHF marine radio. Communications between crew members on board will be by hand held portable radios. All evolutions will be called by the sinking supervisor.

Whistle signals will be blown by the Tug Miss Piggy for the public's benefit:

- 3 short blasts- Time until sea valves are opened (TBA)
- 2 short blasts- Time until sea valves are opened (TBA)
- 1 long blast- Sea valves open

There will be a meeting of all personnel involved with the sinking procedure early the day before. Procedures will be gone through from start to finish and any remaining issues worked out and all questions answered. The weather forecast will be monitored. The day of sinking must have light wind and calm seas. The event may have to be delayed to the next calm day if the weather is not acceptable. The go-no go decision will be made by 0600 the planned day of sinking by the sinking supervisor in conjunction with the USCG and State Police. This decision will be released to the media at this time.

Sinking

Pre-cut flooding holes 21" wide x 21" high, 1 foot above the waterline a day or two before the sinking. This must be done after ballasting (see "Vessel Preparation"). There will be up to 9 on each side of the engine room, every other frame space, close to the midpoint. Soft patches of ¾ inch plywood will be installed over the holes as they are cut with soft rubber gaskets. Pre-cut an opening low in each peak bulkhead approximately 4 ft x 4 feet on centerline leaving multiple 2" tabs uncut. The cuts will be caulked with silicone.

Preposition all 6 anchors with tug, barge and crane the day before. The anchors will be 3500 lb concrete blocks and will be attached to anchor lines consisting of approx. 50 feet of 7/8 inch chain shackled to 250 feet of 1 ½" nylon line. Each line will have a buoy attached to the bitter end. The anchor coordinates will be pre-determined and located by GPS.

The Adirondack will be towed from her berth at the Burlington Ferry Dock and moved into position with LCT Co.'s tug Miss Piggy (42' push boat). This trip is about 2 miles long. She will be attached to the bow anchor line then backed into

position. The other 5 lines will be shuttled to the Adi by small work boats. These lines will be secured to rope falls (4 part $\frac{3}{4}$ inch). The anchor lines will be led around the bulwark end posts at main deck level about 3 feet above the water line. The vessel will be moved as close as possible to the sinking location (N 44 degrees 28.819', W 73 degrees 14.868') using the rope falls. The lines will then be secured and the falls removed. The vessel's position will be determined by GPS located on the uppermost deck.

Once the Adirondack is in the correct position and the weather looks good, the openings in both peak bulkheads will be cut free and tack welded to the vessel. The engine room/void doors will be opened gaskets removed and welded open. The soft patches on the hull flooding openings will then be removed and passed over to the tug. When all is ready and all non-essential personnel are off the boat, the 5 sea valves will be opened using reach rods through the main deck. The remaining crew will leave the Adirondack and board the tug which will back away to a safe distance.

When the vessel is on the bottom and the silt has settled, inspection dives will be made. The anchors and their lines will be recovered as will any flotsam.

Comments- Sinking Procedure

The reason for repositioning the anchors is that we only have one tug available to us. If we use the tug to hold the Adi on station, we will not have another to deploy the anchors.

We propose using nylon with chain leaders instead of all chain or cable because of ease of handling. Our crews know how to use the rope falls as this is how we position vessels on our drydock.

The lines will lead off the main deck instead of to pad eyes on the lower hull because of difficult access. The hull of the Adi slopes down about 30 degrees from the horizontal, so attaching the lines to the hull below the main deck will be difficult at best. Leading the lines over the main deck also leaves plenty of room to run the rope falls. The main deck is only about 4 ft above the water line and will only be about 3 feet above the waterline when ballasted to max load draft, so the increase in height over the hull mounted pad eyes is small.

I did some rough calculations and think that 9 openings on each side of the engine room would bring the boat from the 3-foot freeboard to sinking in about 2 minutes. It would take some time to get from the 4-foot to the 3-foot freeboard using the sea cocks. I was not going to put any openings in the voids as if one end starts down sooner, that end would really accelerate as the flooding holes submerged further. Also, the small freeboard will not allow placing higher any flooding holes that would be cut in the void or peak hull. There would be ample openings in the watertight bulkheads to allow the water to flow into the voids and peaks.

DIVE



Historic
LAKE CHAMPLAIN



dive.lcmm.org

LAKE CHAMPLAIN UNDERWATER HISTORIC PRESERVE



State of Vermont • Division for Historic Preservation
HistoricSites.Vermont.gov

WHAT IS AN UNDERWATER HISTORIC PRESERVE?

All underwater historic sites in Lake Champlain belong in public trust to the people of the respective states in whose water they lie. The States of Vermont and New York have established the Lake Champlain Underwater Historic Preserve to provide public access for divers to some of the lake's historic shipwrecks. The system is designed to protect these irreplaceable historic resources from anchor damage and artifact collecting. With the cooperation of the recreational diving community, these wrecks will be available for generations of divers to enjoy.

Lake Champlain's Historic Preserve system works and succeeds only with your cooperation. Protection of historic shipwrecks and safety of other divers is your responsibility.

Divers who witness violations of the preserve diving guidelines are asked to voluntarily report them to the Vermont State Police Marine Division (802) 655-3435 and the New York State Police (518) 962-8235.

For more information about the Lake Champlain Underwater Historic Preserve, or to make comments or suggestions, contact:

Vermont Division for Historic Preservation

National Life Building
One National Life Drive, 6th Floor
Montpelier, Vermont 05620-1201
(802) 828-3051

HistoricSites.Vermont.gov/html/underwater.html

Lake Champlain Maritime Museum

4472 Basin Harbor Road
Vergennes, Vermont 05491
(802) 475-2022
www.lcmm.org

New York Department of Environmental Conservation

Route 86, P.O. Box 296
Raybrook, New York 12977-0296
(518) 897-1200

REGISTRATION PROCESS

Seasonal registration is required for every diver prior to using the Preserve System.

Registration and information can be obtained from the locations listed below or through most local dive facilities and charter operators. Registration need only be done once during the season. We ask for your cooperation in this effort.

Register Online at
dive.lcmm.org

or by calling:

Lake Champlain Maritime Museum
Vergennes, Vermont (802) 475-2022

The Vermont sites in the Lake Champlain Underwater Historic Preserve and the production and distribution of this booklet are supported by the Vermont Division for Historic Preservation: HistoricSites.Vermont.gov.

DIVING RECOMMENDATIONS

FLY THE FLAG



(left) International Alpha Flag
(right) Diver Down Flag

Law and common sense dictate the use of these flags. Remember to take down the flag when diving operations are finished.

PRESERVE RULES

REMOVAL OF ARTIFACTS IS FORBIDDEN BY LAW

Artifact removal or damage to the site is a violation of trust as well as law, and violators will be prosecuted. Violators also jeopardize the continuing existence of the Preserve system. Take nothing but photos and memories.

PENETRATION OF WRECKS IS NOT PERMITTED

Penetration greatly increases the risk of a diving accident and also damages the fragile wooden vessels. Soft silt in the hull can quickly turn the visibility from clear to zero. Exhausted air bubbles can lift and damage fragile deck planking.

AVOID CONTACT

Practice good buoyancy control. Even casual contact, such as brushes with fin tips, leaves scrape marks on these wooden shipwrecks. Give fragile elements generous clearance. Secure all dangling equipment, such as gauges.

HOW TO DIVE A SITE

- Descend down the mooring system to the concrete mooring pad.
- Follow the guideline to the wreck.
- Keep the wreck in sight at all times to avoid becoming disoriented.
- Maintain good buoyancy control, avoiding any contact with the wreck.
- With wrecks that have multiple mooring systems always return to the same mooring system from which you descended.
- Always descend and ascend on the mooring system. Avoid free ascents from the bottom.

DIVING SUGGESTIONS

- All persons using the Underwater Historic Preserve System must be certified divers and register annually. Make sure your experience and skills will allow you to **MAKE THE DIVE SAFELY. WHEN IN DOUBT, DO NOT MAKE THE DIVE.**
- All dives should be no-decompression dives. Monitor your depth and bottom time. Include a safety stop as part of your dive.
- Lake Champlain contains cold fresh water. Divers need to be familiar with the challenging environmental conditions of the Lake including cold temperatures and dark conditions. Watch your thermal comfort.
- Monitor your air. It is recommended that you exit the water with a minimum of 500 psi.
- Always build in a safety margin. Caution and good diving practices should prevail at all times.
- Only certified divers with appropriate experience should consider diving the Underwater Preserves. Each diver recognizes that diving is an inherently dangerous activity, and each diver must assess all conditions and use their best judgment in planning and executing the dive. Divers assume responsibility for their actions while diving on the UHP sites and assume the risk of injury.

STOP THE SPREAD OF INVASIVE SPECIES



Aquatic invasive species (AIS) are non-native aquatic plants, animals, and pathogens that cause harm to the environment, economy or human health. Once established, AIS can pose a serious threat to indigenous fish, wildlife and native plant populations. Species can travel in a variety of ways, most commonly through interconnected waterways, **but also can hitchhike in your boat trailer, bilge water, or dive gear. It is illegal to transport all aquatic plants, zebra and quagga mussels in Vermont.**

WHAT CAN I DO?

Check your gear, boat, trailer (or pet) for any hitchhikers and remove.

Clean your equipment; submerge all equipment in hot tap water (110 °F or hotter) for at least 10 minutes. Run hot water through your boat motor and bilge.

Dry equipment and boat thoroughly.

Zebra Mussel

This small black and white striped mussel clusters on hard surfaces throughout Lake Champlain, including shipwrecks. Their veligers are microscopic, and can be transported in only a teaspoon of water.

Asian Clam

Colonies of this small bivalve have been found in Lake George and in the Champlain Canal, but to date have not been found in Lake Champlain.

Didymo (or “rock snot”)

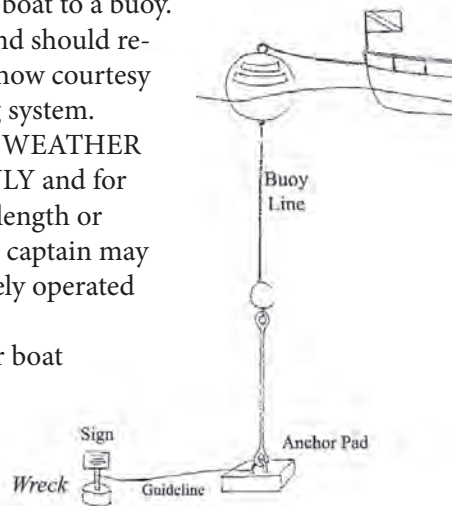
This tan clumpy algae has a cottony texture, and has been found in many Vermont rivers. Felt-soled wading boots are prohibited in Vermont waters.

Vermont Department of Environmental Conservation
www.anr.state.vt.us/dec/dec.htm • (802) 241-3777

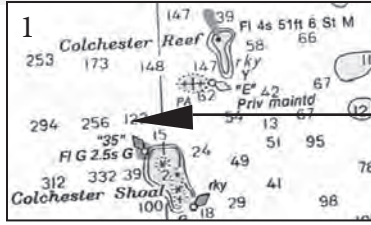
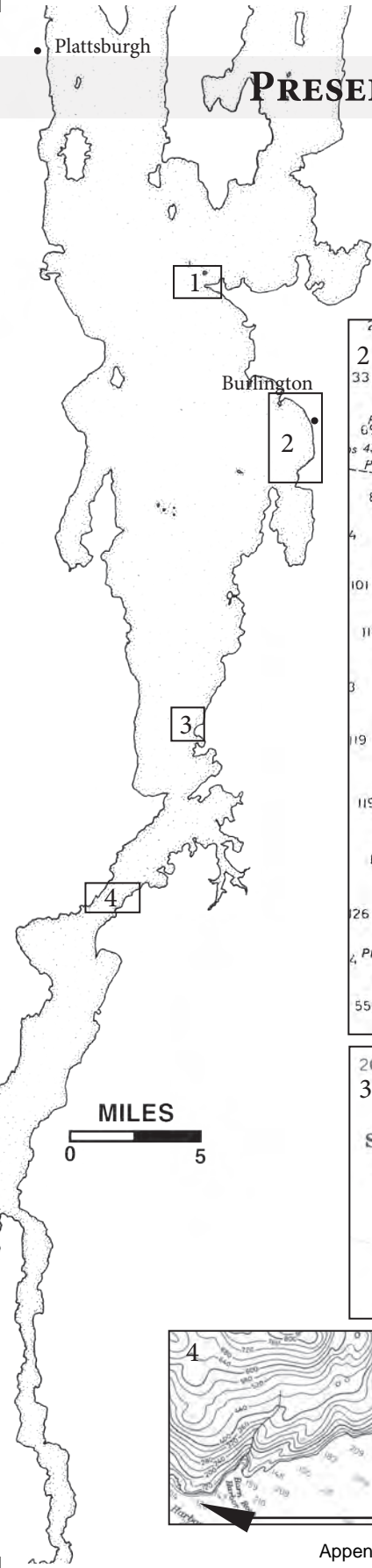
Lake Champlain Basin Program
www.lcbp.org • (800) 468-5227

MOORING

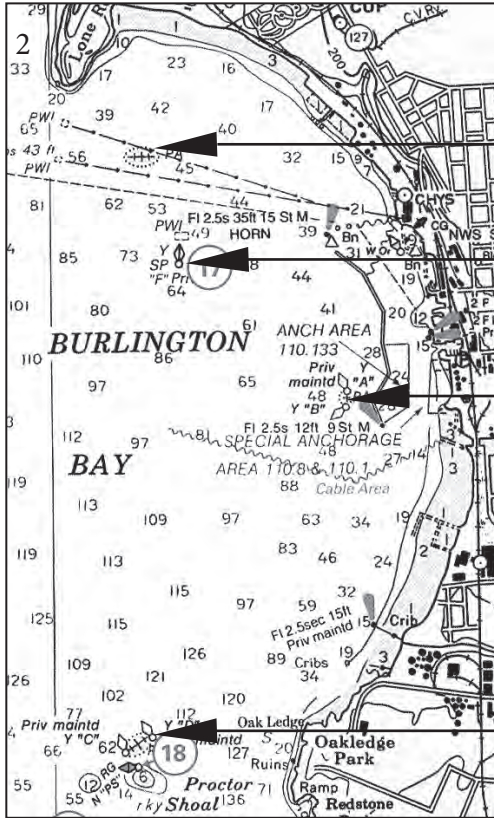
- Yellow buoys marked "Underwater Historic Preserve" identify the preserve sites.
- By law, no anchoring is permitted within 200 feet of a buoy.
- Anyone diving at these sites must tie his or her boat to a buoy. Only one boat at a time can be tied to a buoy and should remain only for the duration of the dive. Please show courtesy and cooperation in rotating use of the mooring system.
- The buoy systems are designed for use in FAIR WEATHER AND MODERATE WIND CONDITIONS ONLY and for vessels less than 35 feet long. Vessels 50 feet in length or less and piloted by a U.S. Coast Guard-licensed captain may secure to a buoy only for the purpose of remotely operated vehicle (ROV) operations.
- Divers must fly a "Divers Down" flag from their boat for the duration of the dive.
- Use the mooring line as a reference to control your ascent and decent.



PRESERVE SITE LOCATIONS



Phoenix
page 6

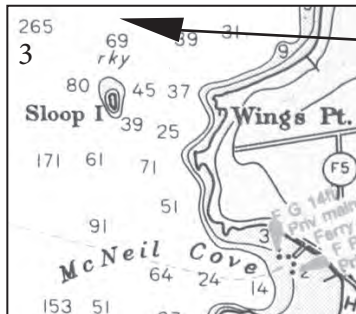


Horse Ferry
page 7

O.J. Walker
page 8

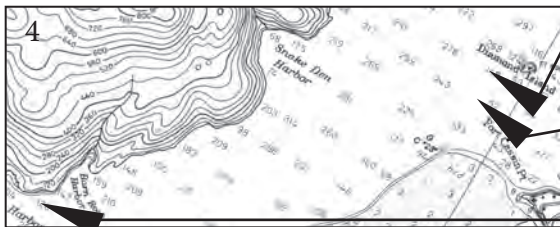
General Butler
page 9

A.R. Noyes
page 10



Sloop Island Canal Boat
page 11

Diamond Island
Stone Boat
page 12

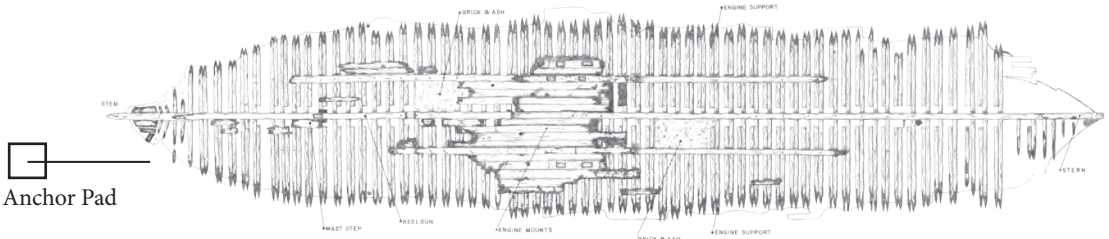


Water Witch
page 13

Champlain II
page 14



PHOENIX



Phoenix, built by the Lake Champlain Steamboat Company and launched in 1815, was the second commercial steamboat on Lake Champlain. The steamer, commanded by Captain Jehaziel Sherman, maintained a regular schedule between Whitehall, NY and St. Johns, Quebec, with stops at other Lake ports along the route.

At 11:00 P.M. on September 4, 1819, *Phoenix* left Burlington for Plattsburgh, NY, with 46 passengers and crew, under the command of Captain Sherman's son, Richard. An unusual glow in the midships galley provided the first warning that a fire had broken out on board, but the discovery was made too late to save the *Phoenix*. The passengers were roused from their cabins and loaded into two small boats. Unfortunately, in the confusion, a dozen people (including the captain) were left to fend for themselves on the burning ship. Sherman and several others were rescued from the Lake in the morning but six others were not so lucky and perished in the Lake's cold, dark waters. The cause of the fire was said to have been a candle carelessly left burning in the pantry; however, circumstantial evidence suggests that the fire may have been intentionally set by competing lake sailing interests.

FEATURES OF INTEREST

Size of wreck: 146' long, 27' wide.

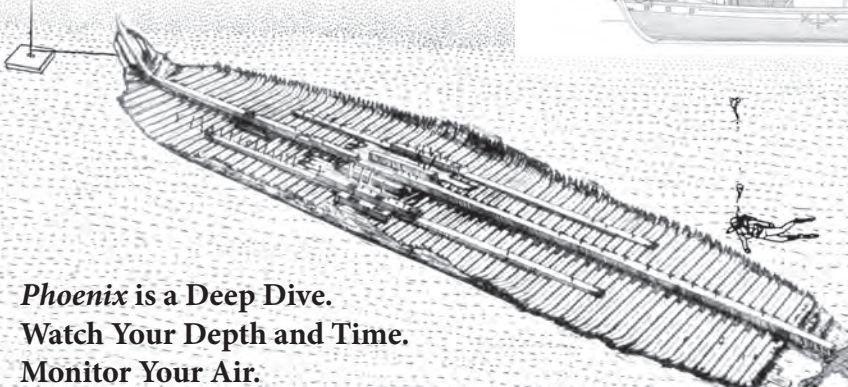
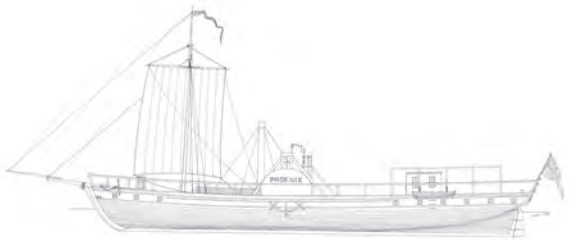
The fire-charred framing ends and massive hull are clearly visible. The bow is prominent, jutting 15' off the bottom. The rudder hardware is visible at the stern. The iron rods which held the engines and boilers are visible.

DIVING INFORMATION

- Experience level: Advanced.
- Depth of water: 60' (bow)–110' (stern).
- The anchor pad to the preserve buoy rests at approximately 50' depth.
- The depth and location on the open lake requires serious dive planning.
- Monitor your depth and air and watch for changing weather.
- Underwater lights are necessary.
- Steep angle of the wreck can be disorienting.

LOCATION: 44° 32.98N, 73° 20.11W

On the northern face of Colchester Shoal reef.



***Phoenix* is a Deep Dive.
Watch Your Depth and Time.
Monitor Your Air.**

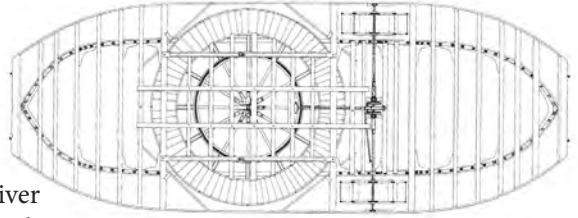
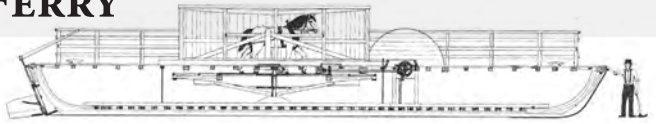
HORSE FERRY

The very fragile horse-powered ferry in Burlington Bay is the only archaeologically studied example of a turntable "team-boat," a once common North American vessel type. Animal powered vessels were introduced into North America in 1814. They became a popular form of transportation for short-distance river and lake crossing, until the middle of the 19th century, when they were surpassed by the increasing use of steam power.

Lake Champlain's long, narrow shape created the need for many ferry crossings between Vermont and New York, crossings that were ideally suited to horse ferries. The use of horse ferries on the Lake appears to have peaked in the 1830s and 1840s.

The Burlington Bay Horse Ferry was discovered in the fall of 1983 during a side-scan sonar survey. The identity and date of construction have not yet been determined. Continued study of this unique vessel may provide more clues to her name and date of sinking.

A working 1/2-size model of this vessel's horse-power system is located at the Lake Champlain Maritime Museum. More information about this wreck can be found in the 1998 publication *When Horses Walked on Water*, by Kevin Crisman.



FEATURES OF INTEREST

Size of wreck: 63' long, 23' wide

The horizontal flywheel and gear shaft are visible amidships.

The two paddle wheels are perhaps her most spectacular feature. The iron hubs and oak spokes are deteriorated but intact; the paddle blades are missing. The paddle wheels are easily damaged—please avoid touching them.

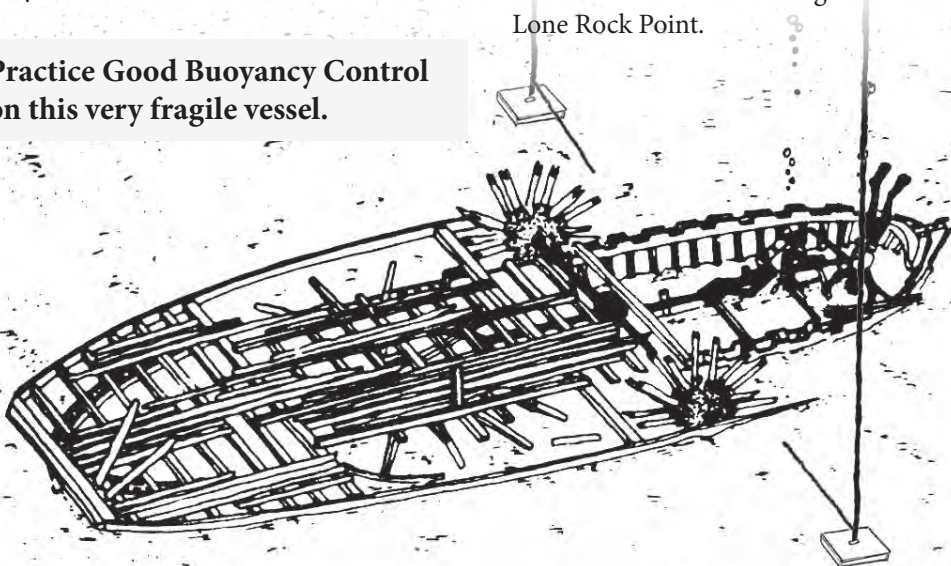
DIVING INFORMATION

- Experience level: Intermediate
- Depth of water: 50'
- This vessel is weak and easily damaged. Control your buoyancy. Do not use any part of the vessel to support your weight.
- Stay off the bottom to avoid low visibility conditions. Avoid contact with the fragile shipwreck.

LOCATION: 44° 29.12N, 73° 14.58W

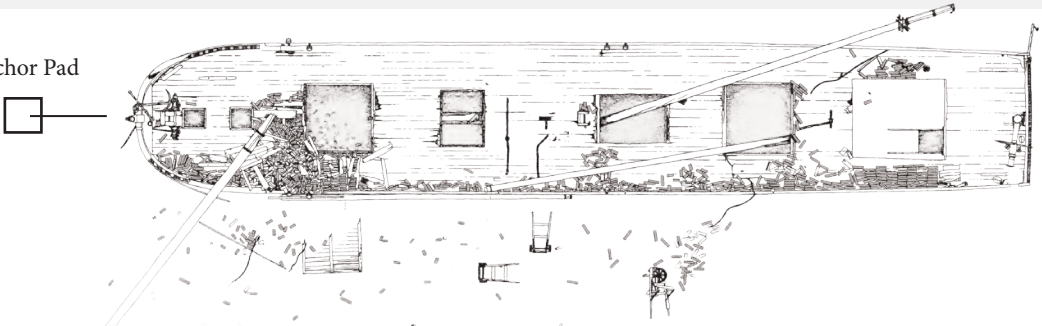
Approximately 2/3 of the way northwest from the north end of the Burlington breakwater to Lone Rock Point.

Practice Good Buoyancy Control on this very fragile vessel.



O.J. WALKER

Anchor Pad



O.J. Walker was built in 1862 in Burlington, Vermont, and was named after one of the region's leading merchants, Obadiah Johnson Walker. The vessel was a cousin to the *General Butler*; both were schooner-rigged sailing canal boats.

O.J. Walker had a working career of 33 years and was employed hauling heavy cargoes. Like so many other canal vessels, it had the dual purpose of a work boat and family living quarters. One of its owners, Captain Weatherwax, lived on board with his family for over 9 years.

The boat's last owners operated the Mallett's Bay Brick and Tile Yard and hired various lake captains to use *O.J. Walker* to transport their products. Captain Shell Parkhurst, who died while sailing, was at the time the "oldest boatman" on the lake at age 75. His daughter, Mrs. Rock, took over the vessel and became the only woman Captain of a canal boat plying between New York and Burlington.

O.J. Walker's final voyage came on May 11, 1895. A severe wind storm caught the crew off guard. The boat began leaking severely, and, as the crew disembarked into a small rowboat, *O.J. Walker* tipped, spilling much of its cargo. It righted itself briefly before sinking.

FEATURES OF INTEREST

Size of wreck: 86' long, 14' wide.

The ship's wheel and aft cabin hatch cover are in place and are extremely fragile; please avoid contact. The masts, boom, anchors, and most rigging parts can be seen around the vessel. Many bricks and tiles still lie on deck and scattered off the port side along with the hand carts for moving them.

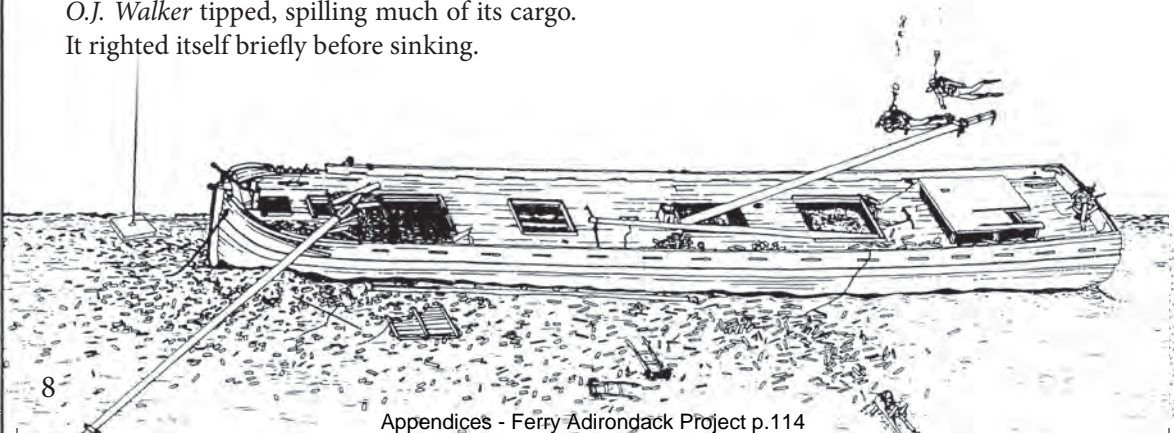
DIVING INFORMATION

- Experience Level: Intermediate-Experienced.
- Depth of water: 65'
- Control your buoyancy. Stay off the bottom to avoid low visibility conditions. Avoid contact with the fragile shipwreck.

LOCATION: 44° 28.72 N, 73° 14.44 W

Approximately 3/4 of a mile west of the north end of the Burlington breakwater. Between the Horse Ferry and *General Butler*.

**Do Not Penetrate the Wreck!
Removal of Artifacts (including bricks) is Illegal.**



GENERAL BUTLER



General Butler was built in 1862 in Essex, New York. The schooner-rigged *Butler* is an example of a Lake Champlain sailing canal boat designed to sail on the lake and, with masts removed and centerboard raised, travel through the Champlain Canal.



field and his son, who rowed out in a 14' lighthouse boat and took all five to safety. The *Butler* was declared a total loss. Artifacts from *General Butler* are on display at the Lake Champlain Maritime Museum.

On her last voyage she was under the command of her third owner, Captain William Montgomery of Isle La Motte. While sailing up the lake on December 9, 1876 a powerful winter gale struck and upon approaching Burlington, *Butler's* steering mechanism broke. The captain jury-rigged a tiller bar to the steering post and attempted to maneuver his craft around the breakwater. The attempt was unsuccessful and the schooner crashed headlong into the breakwater. The force of the water was so great that the vessel was repeatedly lifted on top of the ice-covered stones. One by one each of the ship's company made the perilous jump onto the breakwater. The captain was the last to leave the ship which immediately sank into the 40' of water where she now rests.

Having narrowly escaped death by drowning, *Butler's* survivors now risked freezing to death on the breakwater. All surely would have perished had it not been for the heroic intervention of Burlington ship chandler James Wake-

FEATURES OF INTEREST

Size of wreck: 88' long, 14' wide

The vessel rests on her keel, bow towards the breakwater. There are five hatches in the deck. Note the dead-eyes, windlass and cleats used for sailing. The masts were stepped on deck in three sided "tabernacles" and held in place with iron pins.

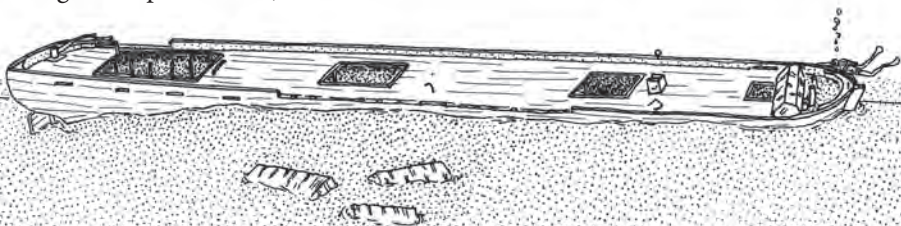
DIVING INFORMATION

- Experience level: Beginner
- Depth of water: 40'
- Buoyancy should be carefully controlled to avoid damaging this fragile and remarkably intact wreck.
- Exercise special care at the stern to avoid damaging the extremely fragile rudder.

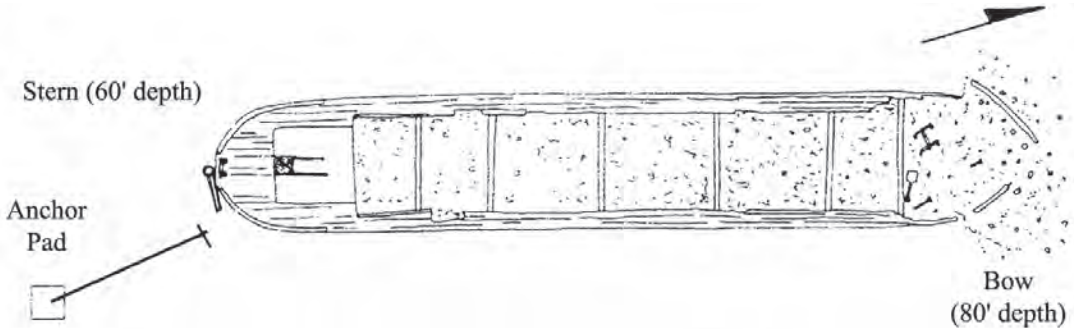
LOCATION: 44°28.23N, 73°13.70W

Approximately 75 yards west of the southern end of the Burlington breakwater. Note: *General Butler* is located 300' north of the City of Burlington's waste water discharge pipeline.

Do Not Penetrate the Wreck!



A.R. NOYES



A.R. Noyes represents perhaps the most common type of commercial vessel that operated on Lake Champlain and its related canal systems. The standard canal boat first appeared in 1823 with the opening of the Champlain Canal. These craft rapidly increased in numbers throughout the nineteenth century and operated on the Lake into the early 1900s. Standard canal boats had no independent means of propulsion. On lakes and rivers, they had to be towed by steam vessels and on canals they were moved by horse and mule. Canal boats frequently were the homes of families of "canalers" who lived on the boats and traveled from place to place to earn a living. Long trains of canal boats could still be seen on the Lake at the beginning of the 20th century, but disappeared due to competition from railroads and overland transportation.

A.R. Noyes is believed to have sunk on October 17, 1884, when a number of canal boats broke loose from the steam tug *Tisdale* which was towing them on their way to Burlington. *A.R. Noyes* was the only one reported lost.

FEATURES OF INTEREST

Size of wreck: 90' long; 14' wide

The rudder and rudder post are visible on the stern, facing up the slope towards Proctor Shoal. In the cargo area, there are remnants of a mule towing apparatus crushed and partially buried by the impact of the shifting cargo of coal.

DIVING INFORMATION

- Experience level: Advanced
- Depth of water : 60' (stern) - 80' (bow)
- The vessel rests on a gradual slope and extremely silty bottom. Control your buoyancy. Stay off the bottom to avoid low visibility conditions.
- Underwater lights are necessary.
- This wreck is extremely fragile, all effort should be made to avoid contact.

LOCATION: 44° 27.26N, 73° 14.76W

Just north of the Coast Guard's navigational buoy on Proctor Shoal.

**Do Not Penetrate the Wreck!
Extremely Silty Bottom.**



A standard canal boat like William Higgins from Ticonderoga (pictured here at St. John's, Quebec on the Chambly Canal circa 1910), was often a family-run enterprise. Courtesy the Canal Society of New York State.

SLOOP ISLAND CANAL BOAT



Anchor
Pad

The Sloop Island Canal Boat is a standard canal boat from the last generation of canal boats on Lake Champlain. The Champlain Canal locks expanded over time, and with them the size of canal boats. At 97 feet long and 17½ feet wide, the Sloop Island Canal Boat was built after the 1873 canal expansion. Standard canal boats had no independent means of propulsion, and were towed by mules or horses in the canal and by a steamboat or tug on Lake Champlain.

The name and exact details of the sinking of the Sloop Island Canal Boat are unknown. An archaeological study in 2002-2003 indicated that the boat sank in distress around 1915. The entire artifact collection from the cabin was recovered and conserved, and a selection placed on exhibit at the Lake Champlain Maritime Museum. The artifacts suggest that a family consisting of a man, woman and at least one child lived on board. An entire household of goods is represented: glassware, dishes, silverware, a woolen coat, and woodworking tools. The cargo hold is filled with bituminous coal mined in western Pennsylvania. Timbers removed from the cabin are stored in the hold below the walkways; please do not disturb.

*Canal boats under tow on Lake Champlain, circa 1900.
Courtesy the Lake Champlain Maritime Museum.*

FEATURES OF INTEREST

Wreck is 97' long, 17 ½' wide
Bow still contains a windlass, anchor and deck lights. Wheel and steering mechanism amidships; these are extremely fragile - please do not disturb. Cable is still wrapped around the port side cleats. The cabin roof lies off the boat's starboard side.

DIVING INFORMATION

- Experience level: Very-Experienced
- Depth of water: 90'
- Underwater lights are necessary
- Buoyancy should be carefully controlled to avoid damaging this intact shipwreck

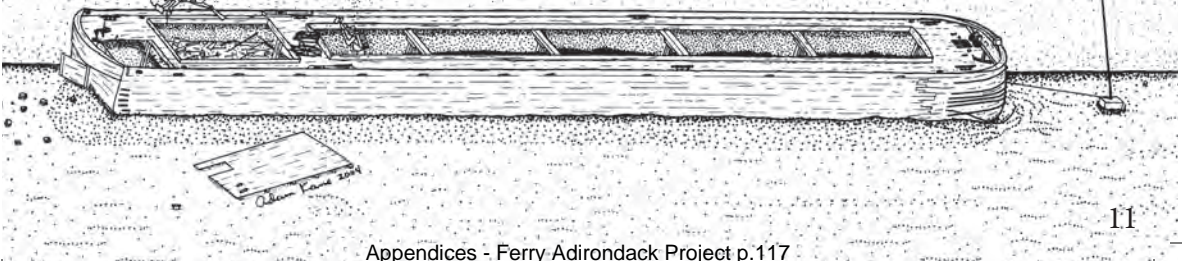
LOCATION: 44° 18.780N, 73° 18.492W

The wreck lies approximately ¼ mile north of Sloop Island.



In Tow Down Lake Champlain

**Potentially Strong Currents.
Do Not Penetrate the Wreck!
Removal of Artifacts is Illegal.**



DIAMOND ISLAND STONE BOAT

The Diamond Island Stone Boat was one of hundreds of wooden canal boats that transported cargo throughout the lake and Champlain Canal. The name of this boat, who owned her, and when she navigated the lake have not yet been determined. Similar in size and construction to the coal barge *A.R. Noyes*, the Stone Boat is a flat-bottomed, vertically-sided vessel. There is no evidence of an engine, nor of masts and sails, indication that she had no independent means of propulsion. She was instead towed from port to port by a tugboat, or by mules on the canal.

On her last voyage the boat carried a load of quarried stone that filled her hold from stem to stern. The circumstances of her sinking are unknown, but most likely she was separated from her tow, leaving her to drift onto the rocky shore of Diamond Island; or, the immense weight of stone in her hold may have stressed the hull, opening seams in the planking and forcing her owners to attempt to save the cargo and hull by running her ashore. Efforts to save the vessel were obviously unsuccessful.

FEATURES OF INTEREST

Size of wreck: 93' long; 14' wide

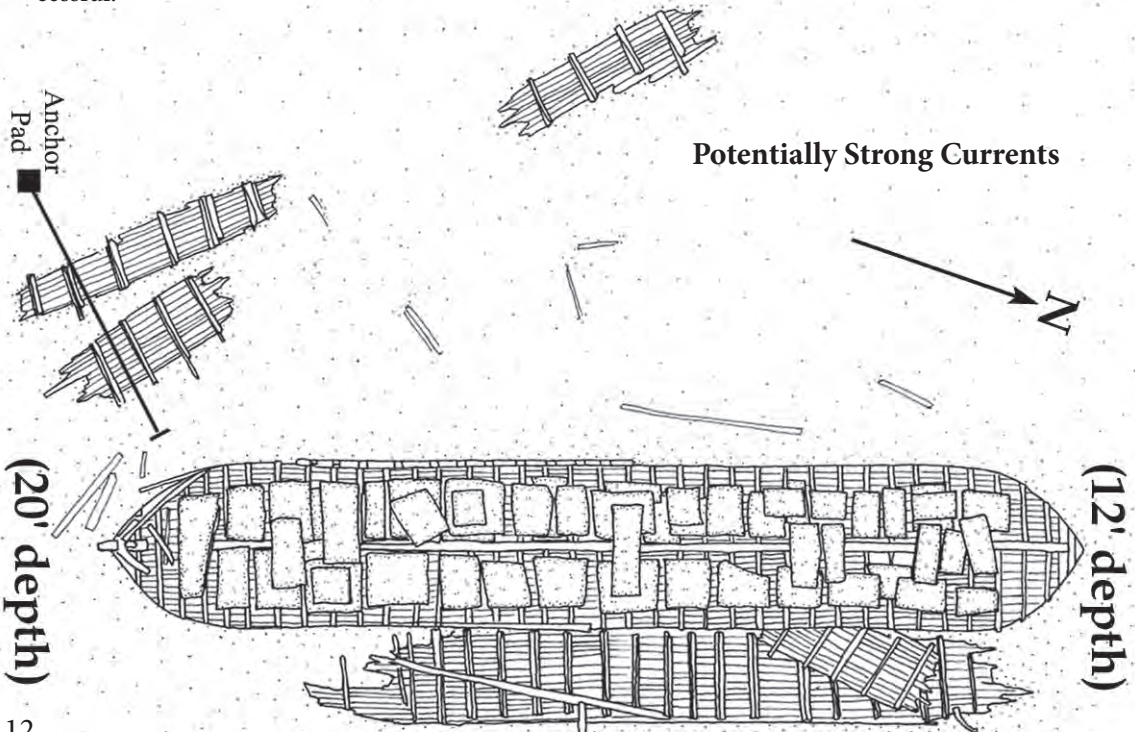
The stem extends 8' above the bottom and is reinforced by several heavy timbers. The cargo of stone blocks lies stacked upon the frames over the length of the wreck. The hull's frame timbers and keelson are visible between the blocks. In the decades since the boat sank, her sides have been broken down by decay and winter ice, and now lie on the bottom on both sides of the wreck.

DIVING INFORMATION

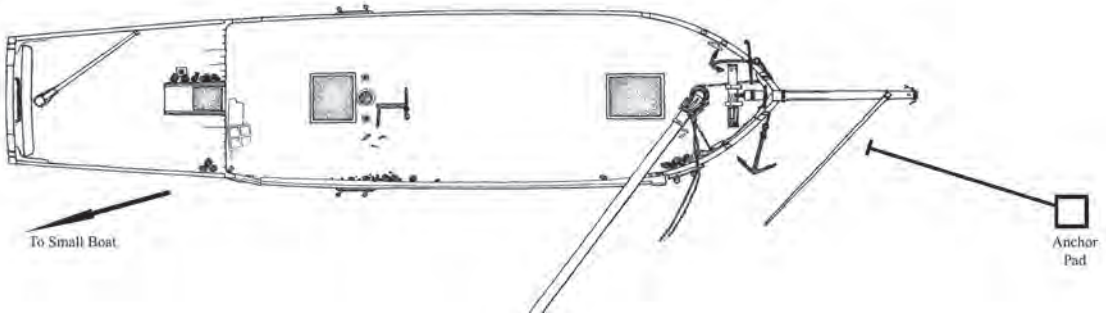
- Experience level: Beginner (Note: currents can be very strong here making this an Advanced dive - use caution)
- Depth of water: 12'–20'
- Never leave your boat unattended. If you are swept off the wreck someone in your boat must be prepared to pick you up.
- This is a popular fishing site. Watch for fishing line and carry a knife.

LOCATION: 44° 14.10N 73° 20.04W

Immediately off the southeast side of Diamond Island.



WATER WITCH



Water Witch was constructed as a steamboat at the mouth of Otter Creek in 1832. Between 1832 and 1834 she plied Lake Champlain, however, in 1835 the Champlain Transportation Co. bought her to solidify their position as the lake's dominant steamboating company.

Water Witch's days as a steamer were over. Her machinery was removed and she was converted into a schooner. Little is known of her life as a work-a-day craft propelled by wind, but we know that it was long. In 1866, she began her thirty-fourth season. She was captained by Thomas Mock, who had on board his wife and three children. On April 26 the schooner met its end when it foundered in a gale while carrying a load of iron ore. The Mock's infant, Roa, was in the cabin, and was lost.

Water Witch was discovered in 1977, and was later studied archaeologically. This vessel is unique for both its construction and history.

Do Not Penetrate the Wreck!
Removal of Artifacts is Illegal.
This is a Gravesite;
Please Use Respect.

FEATURES OF INTEREST

Wreck is 83' long, 18' wide.

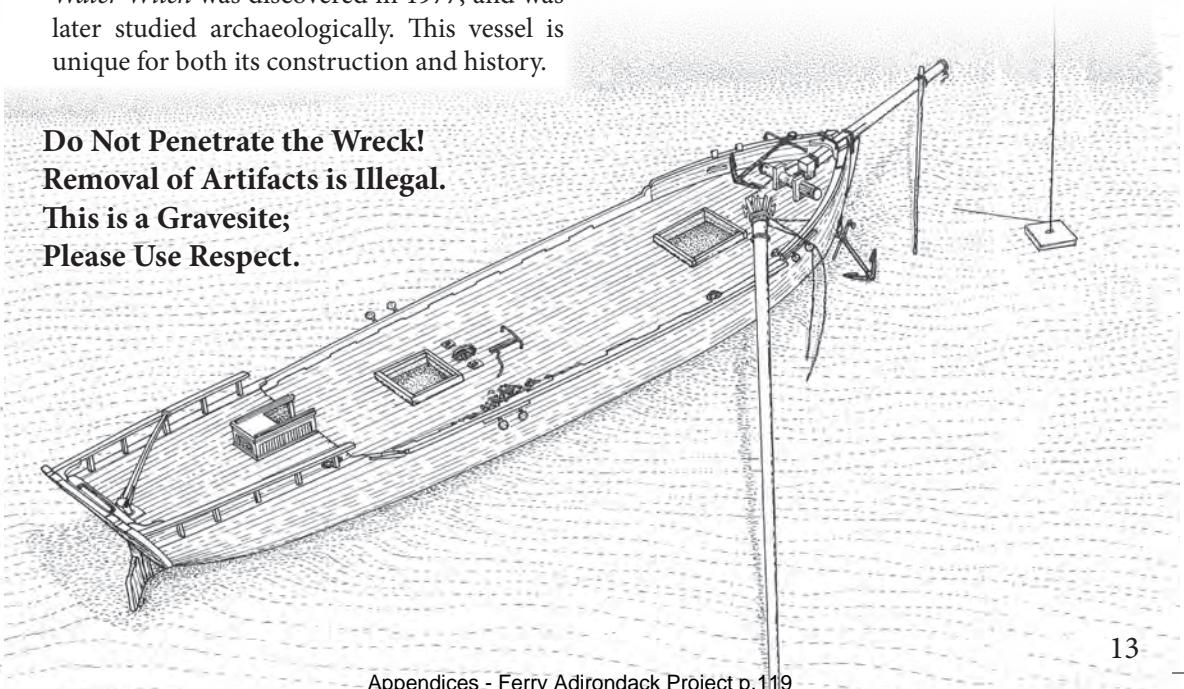
There is a graceful 12' long tiller bar and intact bowsprit. The foremast lies draped over the hull. A small boat is located off the stern.

DIVING INFORMATION

- Experience level: Very Experienced.
- Control your buoyancy. Avoid ANY contact with the fragile shipwreck.
- Lights necessary
- Depth of water: 90'
- Runoff from Otter Creek can cause zero visibility conditions after a heavy rain.

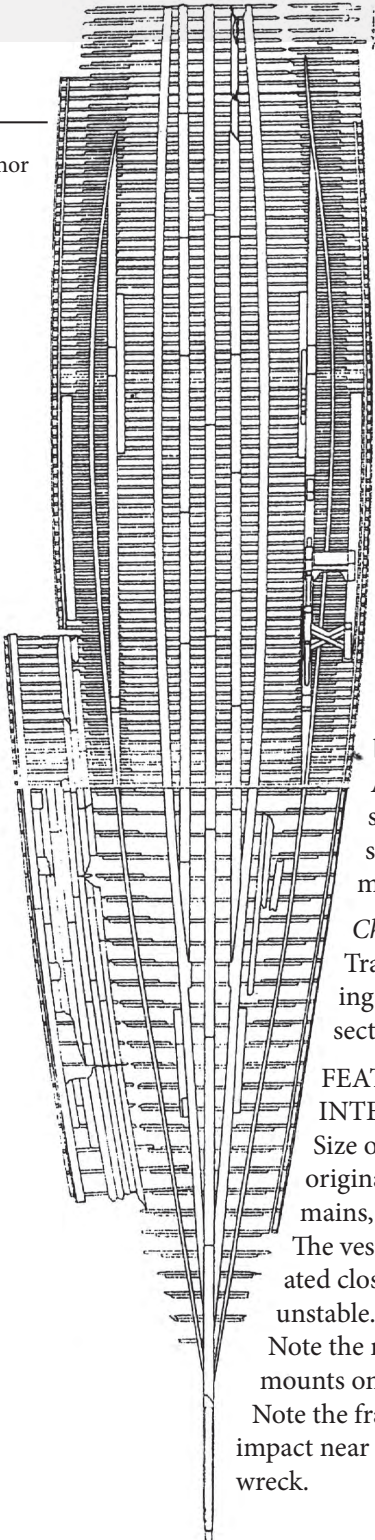
LOCATION: 44° 14.00N 73° 20.08W

The wreck lies approximately ¼ mile south of Diamond Island.



CHAMPLAIN II

Anchor
Pad



Champlain II was originally named the *Oakes Ames* when it was launched in Burlington in 1868. It was built to ferry railroad cars from Burlington to Plattsburgh. In 1874, the Champlain Transportation Co. converted *Oakes Ames* into one of the line vessels for passenger transport and renamed it *Champlain II*.

Champlain II's career ended on the night of July 16, 1875. While at dock in Westport, NY, the pilots changed shifts with John Eldredge taking over the wheel from Ell Rockwell. Rockwell would later recount that John Eldredge had "appeared glum." *Champlain II* headed north out of Westport, and a short time later the enormous steamer ran aground near Barn Rock.

Rockwell immediately returned to the pilot-house to see what was amiss. Eldredge turned to Rockwell and asked, "Can you account for my being on the mountain?"

All persons on board were safely disembarked on *Champlain II* aground on the NY shore. An investigation found that Eldredge had been taking morphine to relieve the symptoms of a disorder called gout.

Champlain II was only insured against fire. The Champlain Transportation Co. tried to recoup some of its losses by salvaging the engines and superstructure, but the submerged stern section was allowed to remain.



FEATURES OF INTEREST

Size of wreck: 163' of the original 244' long hull remains, 34' wide.

The vessel's sternpost is situated closest to shore and is unstable. Avoid contact.

Note the massive engine mounts on either side.

Note the frames broken from impact near the deeper end of the wreck.

DIVING INFORMATION

- Experience level: Beginner.
- Depth of water: 15' - 35'
- The bottom is silty. Stay off the bottom to avoid limited visibility.
- The vessel is infested with zebra mussels. Gloves are recommended to avoid cuts.
- Beware of overhanging sections of the vessel. Watch for fishing line. Carry a knife.

LOCATION: 44°12.36N, 73° 22.58W

The wreck lies close to the New York shore between Barn Rock and Rock Harbor, north of Westport, NY, across from Basin Harbor, VT.

The Shoreline is Private; Do Not Trespass.

A LEGACY OF SHIPWRECKS

Lake Champlain contains more than 300 historic shipwrecks in her depths, a testament not only to the preservation qualities of a cold freshwater lake, but to the rich history of the region. This legacy begins with 10,000 years of Native American occupation; early European explorers of the seventeenth century; a violent military period punctuated by lake battles in the French and Indian War, the American Revolution, and the War of 1812; a prosperous commercial period in the 1800s; and today a time of recreation and stewardship.

The nine sites in the UHP were selected based upon their archaeological sensitivity and their appropriateness for diving. The period of lake commerce in the 1800s and early 1900s saw the most boat traffic on Lake Champlain, and so it's no coincidence that all the UHP sites date from this robust time.

The Champlain Valley's abundant natural resources of timber, iron ore, stone and agricultural products were in demand throughout the region. Initially, goods were shipped aboard traditional sailing vessels - lake sloops or schooners.

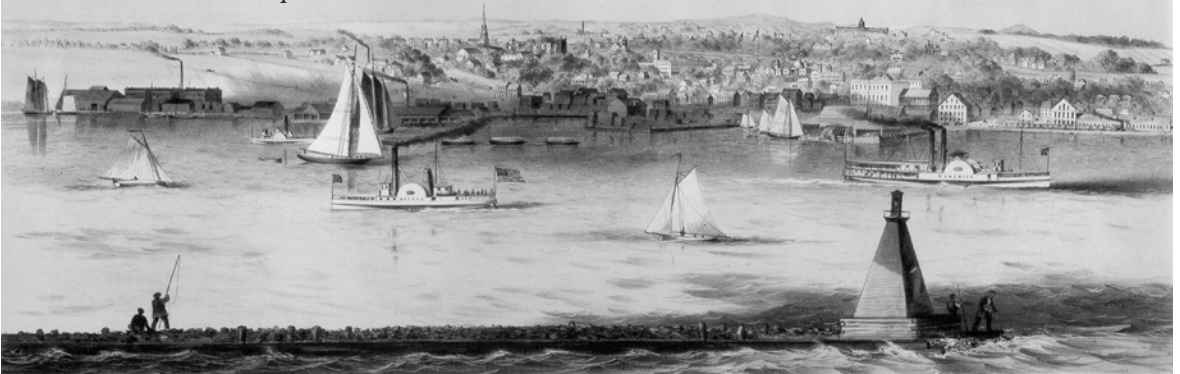
Steamboats added a new dimension to lake commerce with their early arrival in 1809. *Phoenix* is an opportunity to view the oldest archaeologically studied steamboat hull in existence. Steamboating continued with 29 sidewheelers plying the lake for the next 150 years. Their size and grandeur is evident in the remains of *Champlain II*.

Crossing the lake at numerous points, ferries were powered by oar, sail, steam, and even horses. A unique view into the mechanism of a horse-powered ferry is offered to divers in Burlington Harbor.

Arguably, the single biggest event influencing the economics of the lake region was the opening of the Champlain Canal in 1823. By the 1840s, goods could travel south through the Champlain Canal to the Hudson River, westbound to the Great Lakes via the Erie Canal, and north to the St. Lawrence River via the Chambly Canal.

Canal boats were custom-built for these canals, and designed to maximize cargo capacity and still fit in the canal locks. Each enlargement of the locks meant a new class of vessel. Standard canal boats had no independent propulsion, towed by mules in the canal, and by steamers in the lake. *A.R. Noyes*, the Sloop Island Canal Boat, and the Diamond Island Stone Boat are all examples of this once plentiful vessel. To avoid delays and towing fees some entrepreneurs rigged canal boats for sail on Lake Champlain. *General Butler* and *O.J. Walker* are both examples of 1862-class canal schooners.

Historians now estimate that over 3,000 canal boats were built and used on the lake during the nineteenth and early twentieth centuries - truly the "tractor trailers" of the day.



BURLINGTON, VT. 1858.

RETURN ADDRESS:

EMERGENCY INFORMATION

**U.S. Coast Guard, Burlington Station
Marine Band Channel 16
Cell Phone *CG**

911

Non-emergency:
Marine Band 21; (802) 864-6791

Identify your call as a SCUBA diving related accident and be prepared to give your location.

Note: there is NO local recompression chamber. Injured diver will be transported to a local medical facility where the attending physician should call the

**Divers Alert Network (DAN)
(919) 684-9111**

MAILING ADDRESS:

**LAKE CHAMPLAIN
UNDERWATER HISTORIC PRESERVE**

*To Mail this Piece:
Be sure to include adequate postage and accurate mailing and return addresses.*

Lake Champlain Basin Program Invasive Species Update

What Can I Do:

- **Clean** off visible hitchhikers and mud from your dive gear, boat, trailer (or pet) and dispose of properly before entering and leaving Lake Champlain.
- **Drain** and treat dive equipment used in the lake in 3.5% salt solution (1/2 cup/gallon) for 30 minutes. Rinse gear, boat motor, and bilge with hot water.
- **Dry** all equipment and boat completely before next use to prevent the spread of aquatic invasive species.

The federal guidelines support 120F for flushing motors though I have not found cited information about temperature and duration for soaking dive gear specifically. Do you know where you found 110F for 10 minutes? Other research suggests 45C (113F) for watersports equipment for 15 minutes. That is close to the numbers you had and is supported in the literature but not recommended in federal guidelines at this time.

Please also **remove the Didymo section**. After more research didymo has been found in sediment core records across North America and is considered a native nuisance species. VT has also rolled back its regulations on felt soled waders so this is out of date. I would recommend replacing that species with:

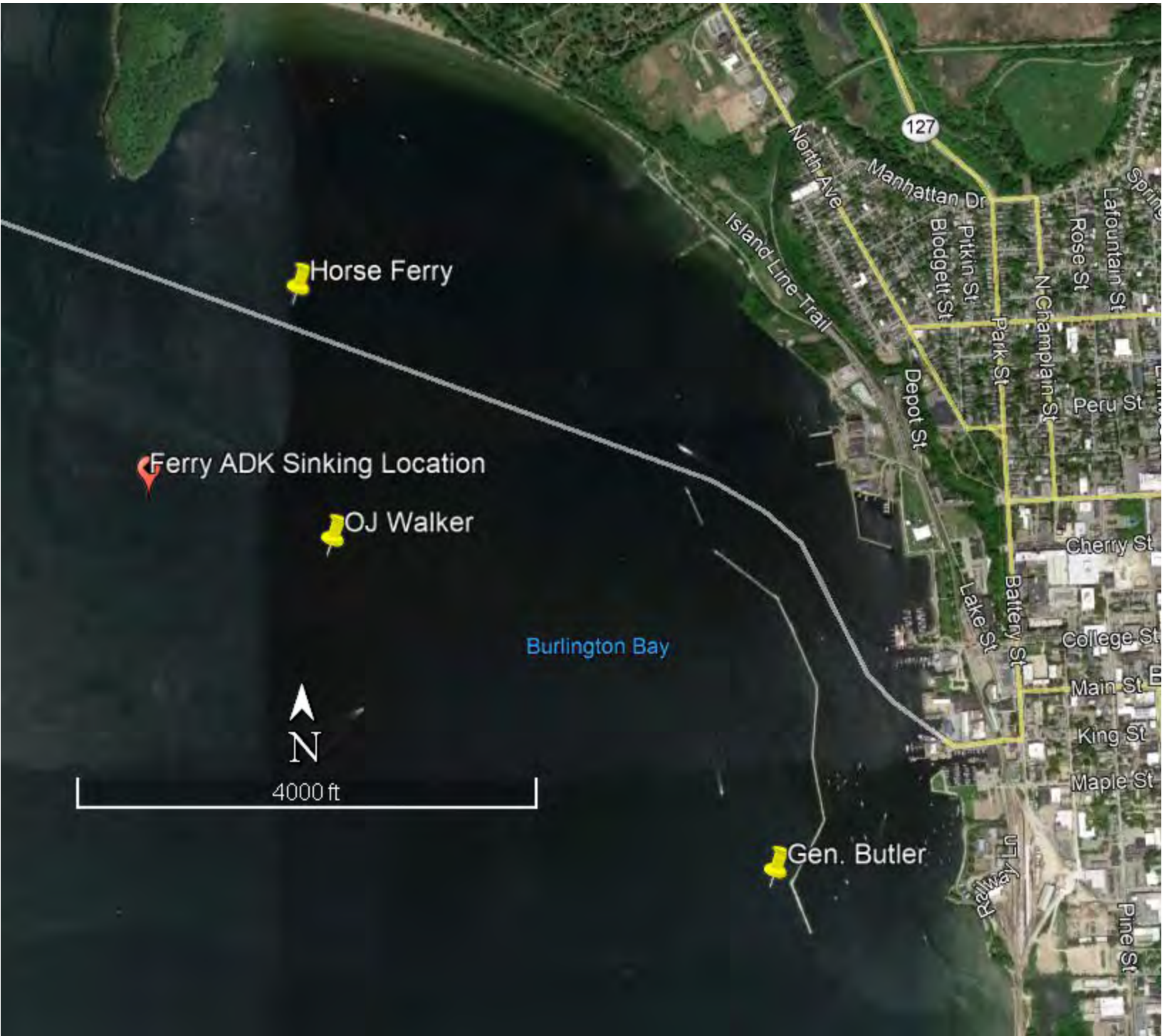
Spiny Water Flea – These fleas are invasive crustaceans that outcompete native zooplankton which could cause disruptions in the food chain. Their tail spines hook on fishing lines and downriggers fouling angler's gear.

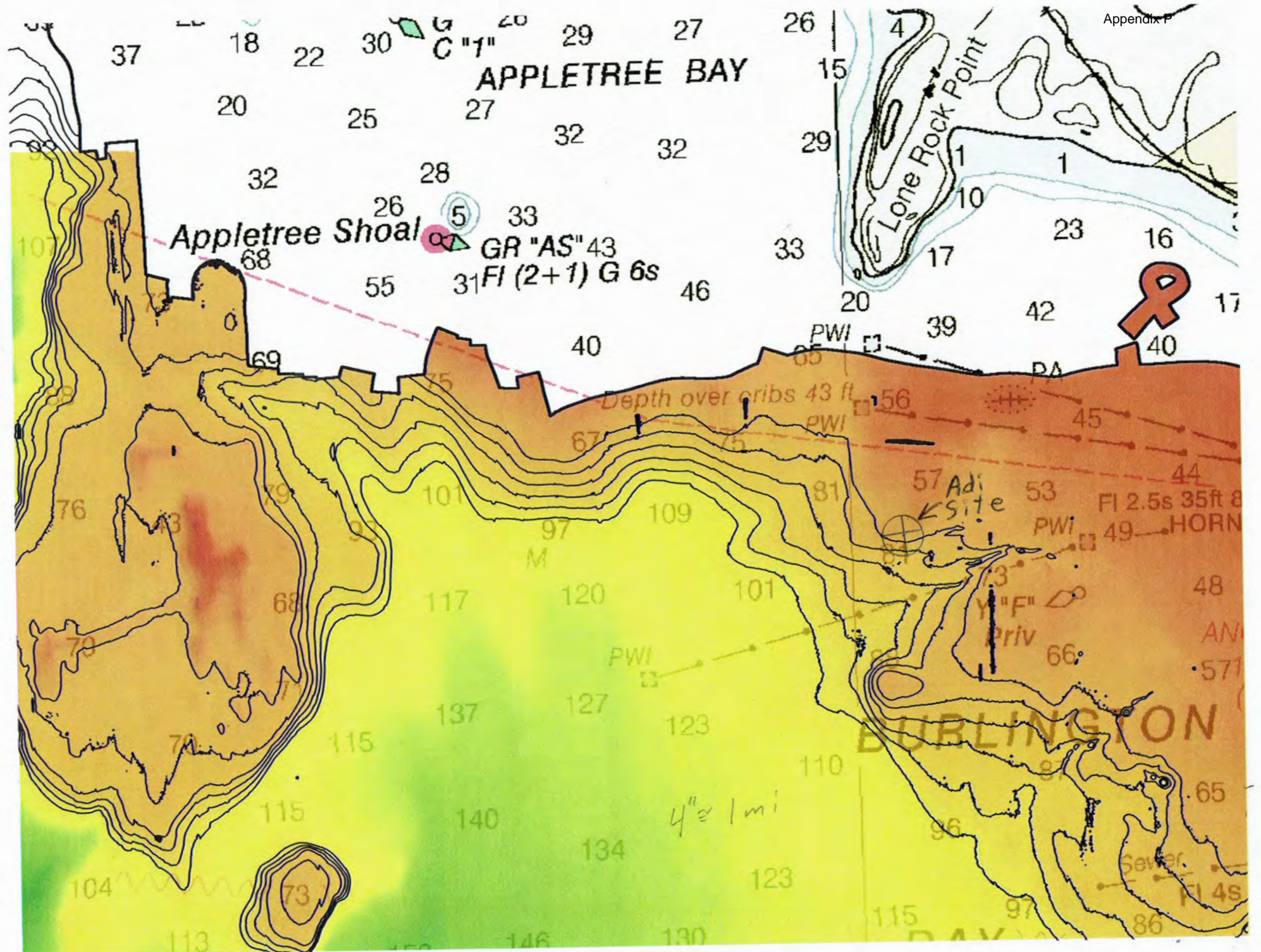
You may also want to consider replacing zebra mussel with quagga mussel or adding quagga mussel to the zebra mussel though space is limited. It would also be fine to leave this the way it is. I would think that the greatest risk to historic ship wrecks currently preserved in deep water – below depths that zebra mussels prefer – would be the quagga mussel which has not yet been found in LC but would certainly colonize deep shipwrecks.

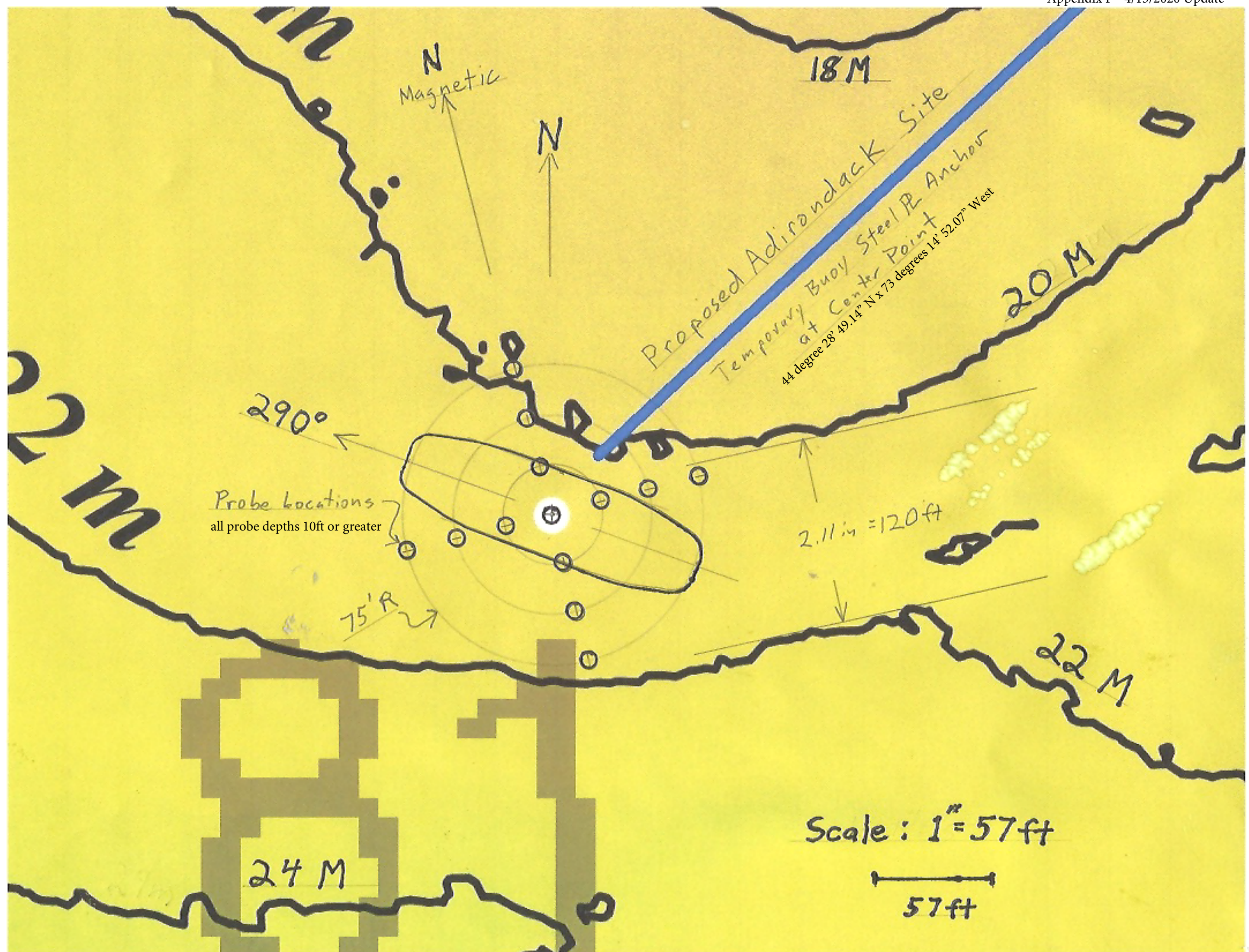
The **Asian Clam** section is accurate but the species is now also found in Lake Bomoseen, VT and it is not found in Lake Champlain yet (still).

Please let me know if you have any questions, would like further info, or further review.

Thanks!







N
Magnetic

N

18 M

Proposed Adirondack Site

Temporary Buoy Steel P Anchor
at Center Point
44 degree 28' 49.14" N x 73 degrees 14' 52.07" West

20 M

290°

Probe locations
all probe depths 10ft or greater

75' R

2.11 m = 120 ft

22 M

Scale: 1" = 57 ft

57 ft

24 M

Notes on Bathymetric Map of Proposed Adirondack Reefing Site

On September 6, 2019, Lake Champlain Transportation Co. (LCT Co.) deployed a temporary lighted buoy at the proposed site (44 degree 28' 49.14" N x 73 degrees 14' 52.07" West). A permit had been obtained from the Coast Guard for this temporary buoy. A steel Plate anchor and synthetic anchor line was used to secure the buoy. It was left in place for one week to get feedback from the ferry boat captains and other mariners as to any hazard or inconvenience a permanent buoy at this location would cause. There was no negative feedback. The buoy was retrieved on Sept.13, 2019, leaving the anchor and line on the bottom.

On Sept. 17, 2019 the first of two inspection dives was made by John Paul and his son Taylor Paul, both employees of LCT Co. We set a dive flag using GPS, then descended to the bottom only 4 feet from the buoy anchor set previously. We Probed the bottom with a ½ inch diameter x 10 ft long steel rod straight down adjacent to the anchor. The Rod went all the way down by hand force alone. Taylor stayed at the anchor (the center of our pattern) holding the end of the tape measure and I reeled out 25 ft of it moving due magnetic north. At this new location I probed the bottom again with the same results. I then swam an arc with 25 ft radius to the next cardinal point east scanning the bottom for any objects or anomalies. Taylor was the gauge for direction, using his compass and communicating that to me via wireless coms. I probed the bottom again with exactly the same results. This was repeated through all 4 cardinal points and then the radius was increased to 50 feet and repeated the same series of steps. It was finally increased to 75 feet and the process was repeated. All 13 Probes went right to the end of the rod indicating that the silt was at least 10 ft deep. The only objects seen on this survey was the frame of what looked like a milk crate and a few small clumps of weed. The bottom was all silt. The visibility was about 15 feet so virtually all the bottom was observed to a radius of about 90 feet.

The second inspection dive was made by the same 2 divers. The dive flag anchor was dropped within 2 feet of the plate anchor this time using GPS. This time we measured the anchor plate to help determine the ability of the silt to support the Adirondack. We also used a ½ inch diameter x 12 foot long aluminum rod to probe the center location and several of the 25 ft radius locations. The rod could be pushed into the bottom all 12 ft by hand at all locations.

The center of the white dot on the bathymetric map is the center of the proposed site and is the current location of the temporary anchor buoy. The small circles along the radius lines indicate the points where the sediment was probed. The positions of these were corrected for magnetic variation.

Respectfully submitted,

John C Paul,

4-13-20



April 22, 2019

Mr. John Paul
Port Engineer
Lake Champlain Transportation Company
1 King Street, Dock
Burlington, Vermont 05401-5293

RE: ARI/CRB Project No.; ARI 1309-30; Ferry Adirondack Evaluation Report

Dear Mr. Paul;

The Ferry *Adirondack* Project (initially the Ferry *Champlain* Project) came to the attention of Artificial Reefs International/CRB Geological and Environmental Services (ARI/CRB) in late summer 2018 from a news journalist at NBC 5 in Burlington, with whom we had done award-winning work several years ago in Lee County, Florida. The local NBC affiliate in Fort Myers had won an Edward R. Murrow Award in 2014 after working with our team on a piece entitled “*Mohawk Masterpieces*”, an after-sinking underwater art project conducted on the *USS Mohawk* Veterans Memorial Reef which we had deployed in 2012. The Project successfully aimed at multiplying the public good already being experienced by the local Lee County (Fort Myers) community. After hearing of the Ferry *Adirondack* Project, we contacted Mr. Jonathan Eddy from Waterfront Diving Center and were briefed on the proposed effort. Mr. Eddy subsequently met with Mr. Joe Weatherby at the Diving Equipment and Marketing Association (DEMA) Trade Show in November 2018 where Mr. Weatherby has represented the industry’s “Ships 2 Reefs” artificial reefing initiative for many years. They discussed the proposed project in more detail. Subsequent to that meeting, a conference call was held which included Mr. Eddy, from Waterfront Diving, Ms. Heather Stewart and Mr. John Paul from Lake Champlain Transportation Company (LCTC), and Mr. Weatherby from ARI/CRB. The Project was discussed, and it was determined that the Ferry *Adirondack* Project could benefit from ARI/CRB’s reefing experience. An evaluation trip was planned and took place at the LCTC facility and *Adirondack* lay berth from March 24-27, 2019. Following is the evaluation report.

Adirondack Evaluation Report

Ship Evaluation of Ferry Boat *M/V Adirondack* (*Adirondack*) conducted by Mr. Weatherby, Senior Project Manager, ARI/CRB March 24-27, 2019.

Project Description

The *Adirondack* Artificial Reef Project is the plan to sink the ferryboat *Adirondack* which will be cleaned to the standards set forth in the USEPA’s Best Management Practices: *Guidelines for Preparing Vessels as Artificial Reefs* (BMPs), on a permitted site in Lake Champlain. This Project is being undertaken in order to provide benefits that are good for the people of Burlington and Vermont and the environment of Lake Champlain.

Project Goals: Benefits to the Public Good

Statement of Public Good: Ferry *Adirondack*'s conversion to Historic Dive Preserve Site, by Chris Sabick, Lake Champlain Maritime Museum (edited to reflect *Adirondack* as the selected reefing candidate vessel instead of the original *Champlain*.)

The use of the ferry *Adirondack* as new a dive site within Vermont's Underwater Historic Preserve (UHP) system will benefit the local community in a number of different ways including: the long term preservation of this historic vessel, the increased of diver awareness of submerged cultural resources in Lake Champlain and their management, and the structure will act as an artificial reef and freshwater habitat while providing the ability to use this site as a test model in the effectiveness of artificial reefs in freshwater bodies of water.

Historic Preservation

Though it seems counter intuitive, the purposeful sinking of the Ferry *Adirondack* for inclusion within the Underwater Historic Preserve system (UHP) will effectively preserve the vessel for many years to come. The alternative fate of this ferry is a trip to the scrapping yard where it would have been cut up for scrap and disposed of. Lake Champlain is a superb preservative environment which will keep this vessel in a condition in which it can be appreciated and interpreted for generations to come. In its new setting it can be appreciated by, and interpreted to, the dive community (both local and visiting), and to non-divers through the use of Remote Operated Vehicles (ROVs). Preserving *Adirondack* on the bottom of Lake Champlain is also much more cost effective than the constant maintenance and upkeep that would be required to preserve this vessel on dry land, assuming that a display venue could be found that would be willing to house such a massive vessel.

Artificial Reef

The historic wooden vessels already included in UHPS now act as artificial reefs which attract large numbers of fish and provide habitat for other organisms ranging from crayfish to freshwater sponges. The addition of *Adirondack* to the Preserve system would allow for the creation of another artificial reef on the lake bottom which would also form habitat for all manner of life on the lake bottom. As the *Adirondack* is a steel hulled vessel it also offers an interesting opportunity to measure and study how rapidly and thoroughly this new habitat is exploited by lake organisms in comparison to the more well understood wooden vessels. This added knowledge could then be shared with other freshwater administrators and researchers who are considering adding artificial reefs of this type to their systems.

Diver Awareness

The addition of this large and impressive vessel to Vermont's Underwater Historic Preserve System (and the publicity around its sinking) will provide a significant increase in the awareness of Lake Champlain as a dive destination. This fact should attract a significant number of divers from outside of the area to visit Lake Champlain and experience the new dive site, while learning about the colorful history of the Champlain region. The inclusion of the *Adirondack* in the UHP system will also give the local dive community a new site to explore. At this point there are nine sites in the Vermont UHP, and the dive community has been asking for additional sites to be added to the system for some time. The increased exposure to the preserve sites contained within Lake Champlain will also allow divers to learn more about the importance of proper management and access to these non-renewable cultural resources and instill a sense of

stewardship for them within the dive community.

The following points are taken from John Paul’s written comments on Public Good:

The long service of the ferry boat *Adirondack* on Lake Champlain makes her an icon recognizable to Vermonters and visitors alike. Many people could not stomach the thought of scrapping her. The sport of scuba diving has grown immensely. There are many thousands of scuba divers in Vermont alone. The proximity of the artificial reef created by sinking the *Adirondack* in Lake Champlain will be very convenient and easy to enjoy for Vermonters and New Englanders alike. Similarly, sinking the *Adirondack* so that the top of the ship is in 30-40’ of depth will make it so that all skill levels of scuba diver, beginner to advanced can share and enjoy this experience. Fishermen also will enjoy fishing on the *Adirondack*.

While Public Good is the main driver of the Ferry *Adirondack* Project, the positive economic impacts from projects of this type are very well documented, even in cold water communities like Burlington. Permanent job growth, increased sales tax revenue and increased commerce throughout all sectors of the community predictably successful artificial reef projects and surely contribute to the Public Good. Examples of this are the *Wolfe Island* in Kingston, Ontario and the *Straits of Mackinac* in Chicago.

Adirondack is a historically significant vessel. As the oldest operating double-ended ferry operating in America she is unique. As a static above water display, she would require prohibitively expensive maintenance and require it forever. Displayed underwater she would be well preserved as evidenced by the other historic all-wooden vessels in the lake. Underwater she would have no ongoing maintenance cost other than moorings, which is minimal.

Thoughts on “Public Good” for the Ferry *Adirondack* Project by ARI/CRB

While the foregoing commentary on the Public Good aspects of the Ferry *Adirondack* Project ARI/CRB offers in addition: Jonathan Eddy reports that Professor Ellen Marsden of the University of Vermont has expressed interest in creating educational programs around the new reef if possible. Among the types of studies that have been discussed are fisheries studies. The data generated from this work, along with the training of local divers in scientific diving techniques are also valuable. Another meeting to this end is scheduled in the very near future. This can in fact be done successfully. The *General Hoyt S. Vandenberg* Artificial Reef Project in the Florida Keys National Marine Sanctuary is a good example. There are underwater classroom activities regularly conducted on and around the ship by the Florida Keys Community College. Numerous studies are and have been conducted there utilizing the ship as an open water research laboratory. This is possible on the *Adirondack* as well. Inviting local public safety and military organizations to train on the *Adirondack* was also discussed with LCTC leadership as an added public benefit. It can be reasonable expected that the Ferry *Adirondack* Project will be a benefit to fishermen and boaters in the lake. Structure on lake bottoms has long been used worldwide to enhance fisheries. It is possible that the *Adirondack*, as complex habitat, could enhance spawning activity for certain fish species as well.

Plans now suggest that the deployment site for the *Adirondack* will be proximal to the wreck of the historic Burlington Bay Horse Ferry, probably the only place in the world where two (2) vessels of this type, from different eras, can be viewed underwater in the same day. As the *Adirondack* is constructed of both wood and steel, the progression of the freshwater colonization

of these materials can be studied easily and together from an established baseline. ARI/CRB has enjoyed award-winning success with our projects in the area of positive media and public relations. As discussed with LCTC during the ship evaluation, the deployment of the *Adirondack* represents an unprecedented media opportunity for Burlington and Vermont. The appetite of the media for this project will be huge. The opportunity to positively showcase the Burlington destination and all the charms offered by the community is likely a once-in-a-lifetime. ARI/CRB can work with local and regional tourism experts to maximize this, if desired.

Assumptions:

LCTC personnel have read and understand the United States Environmental Protection Agency's *Best Management Practices: Guidelines for Preparing Vessels as Artificial Reefs* and understand its contents. LCTC personnel have identified and properly tested materials used in the construction of the *Adirondack*. LCTC has/will have determined to the State of Vermont's satisfaction that any and all regulated Materials of Concern identified aboard *Adirondack* are either non-existent or have been removed prior to sinking. It is also understood that due to *Adirondack's* age, date of construction and use it can be expected that very little or no Materials of Concern (save hydrocarbons and wiring) would/will be present aboard prior to cleaning. LCTC understands that the relevant regulators should be advised of LCTC's desire to reef the *Adirondack* in Lake Champlain early in the permitting process and have taken proper steps to this end. LCTC understands that reefing, while common in many places, is an uncommon activity in Vermont and could require extra time and effort to secure the necessary permits/permissions. LCTC personnel have experience with the geological characteristics of the bottom of Lake Champlain generally through long personal experience of scuba diving in the lake. Once the specific site to deploy the *Adirondack* is selected a thorough evaluation of the lake bottom will be conducted. As stated by LCTC during meetings conducted during the ship evaluation, public support of this Project is required for it to be successful. The regional community is, and properly so, acutely sensitive to proper treatment of the Lake Champlain environment. This sensitivity, coupled with the historic lack of reefing activity within the lake, will likely require an outreach effort by Project supporters to the public to educate and answer questions about the considerable environmental and social benefits to be generated by the *Ferry Adirondack* Project.

Strategic Relationships/Stakeholders

- LCTC has undertaken to develop many of the strategic relationships that will be necessary to ensure the success of the Project. They Include:
- Heather Stewart, John Paul, Lake Champlain Transportation Company
- Jonathan Eddy, Waterfront Diving Center
- Fred Baddour, Joe Weatherby ARI/CRB
- Erin Moreau, Burlington Harbor Master
- Misha Center, Permit Analyst, State of Vermont Department of Environmental Conservation
- Mike Adams Senior Project Manager, US Army Corps of Engineers, New England District
- Ed Green, Marine Inspector, US Coast Guard Station Burlington
- Scott Dillon, Survey Archeologist, Vermont Division for Historic Preservation
- Chris Sabick, Lake Champlain Maritime Museum

- Arthur Cohn, Spitfire Management Project
- Ellen Marsden, Professor, University of Vermont Rubenstein School of Environment and Natural Resources
- Tom Manley, Assistant Professor of Geology, Middlebury College
- Pierre LaRocque, Owner, Champlain Divers International

Ship Description/Condition

M/V Adirondack is a 130' x 40' x 42' car ferry built in Jacksonville, Florida in 1913. The vessel is 130-feet long between perpendiculars, and 152-feet long overall. She is the oldest in-service double ended American ferryboat of all time. She has a carrying capacity of thirty-four (34) cars. She is powered by two (2) Caterpillar 3412 Diesel engines. She is equipped with two (2) diesel generators, and carries 5,000-gallons of diesel fuel in two (2) tanks that are not integral to the hull. Her summer route has been from Burlington, Vermont to Port Kent, New York since 1954. Her hull plating is 5/16 inch and her superstructure framing is wood. Her hull is built of quarter-inch (1/4") steel plate and is painted and free from blooms or visible rot in the steel of her hull plating, rivets, framing and scantlings.

Her car deck is steel diamond plate, is painted and well maintained. Her superstructure is wood over a framework made of quarter-inch (1/4") steel angle iron.

Adirondack is a US Coast Guard inspected multi-passenger carrying vessel and as such is regularly inspected by the US Coast Guard. The *Adirondack* presents as an extremely well-maintained vessel, especially considering her advanced age and steady career of commercial use.

Personnel

LCTC Leadership has indicated that personnel to execute the cleaning, environmental preparation and to liaise with ARI/CRB on the deployment of the *Adirondack* as an artificial reef in Lake Champlain are to be led by LCTC Port Engineer and 43-year employee of LCTC, John Paul. After touring the *Adirondack* with John Paul his complete understanding of the ship, her systems and the capabilities of the LCTC crew and facilities are clear. John Paul presents not only as an expert on the *Adirondack*, but also as an environmentalist with years of scuba diving experience in Lake Champlain.

Yard/Equipment

The LCTC facility where the *Adirondack* is currently moored, at 1 King Street Dock in Burlington, Vermont 05401, is fully equipped and entirely suitable to accomplish the work necessary to safely prepare *M/V Adirondack* to be properly reefed in Lake Champlain. The yard is large with good access to the vessel for workers and equipment. LCTC has the proper well-maintained equipment on hand to safely accomplish the scope(s) necessary to prepare *Adirondack* for sinking. Workers in the yard appear in proper PPE and safety consciousness is in evidence. LCTC possess the tug boat(s) and towing assets to safely tow the *Adirondack* to the selected deployment sit and get her properly anchored.

Corporate Citizenry

Introductions to many of the corporate leaders at LCTC were arranged while the evaluation was being conducted. Corporate officers were curious and enthusiastic about the Project. Most had questions about what was possible and about the benefits to be expected. All exhibited concern

for the Lake Environment and knowledge of the history of the region. LCTC figures prominently in that history. LCTC has been a good corporate citizen on the lake. One of the best examples of this is LCTC collaboration on the schooner *Lois McClure*.

Site Selection

The Project's stated goal is to sink the *M/V Adirondack* on a permitted site within 3-4 miles of downtown Burlington, Vermont, in 70'-75' depth of water.

The exact location of the permitted site for the deployment of the *Adirondack* had not been finalized at the time of this evaluation but Project leadership was actively engaged with stakeholders gathering input to select a site. Discussions with stakeholders as well as regulators with jurisdiction had begun well prior to the SARI/CRB ship evaluation visit in March 2019. All in attendance at the meeting conducted in LCTC offices.

John Paul of LCTC and Jonathan Eddy, owner of Waterfront Diving Center, both Project leaders and scuba divers, demonstrate long experience and considerable expertise with the lake, its bottom composition and prevailing conditions. Discussions included proper consideration of factors impacting site selection such as but not limited to prevailing wind, visibility, current, Lake Bottom geology, and normal boat traffic, proximity to other submerged cultural resources, proximity to infrastructure (marinas, boat ramps, hotels etc.) and buoys.

History

As described above, ferry boats have long been a part of Lake Champlain history since before the American Revolution. According to the people encountered in Burlington during this evaluation, it is right and appropriate that the *Adirondack* be deployed in the lake as historically representative of commerce and traditional transportation on and around Lake Champlain. It also seems natural that it is a LCTC vessel as the most successful ferry company ever to work the lake.

Permit/Regulatory

LCTC has demonstrated an appreciation for the complexity of the permitting process for the regulators involved. This exists anywhere in the United States where artificial reefing takes place. The regulators with whom we met with during the ship evaluation presented as at least open-minded and curious and likely supportive. They expressed their unfamiliarity with reefing permits and openly willing to accept help.

Recommendations

The scopes remaining for the Ferry *Adirondack* Project to succeed are: Successfully permitting the Project. To accomplish this in a timely fashion will require that the permitting process be supported. Rationale with precedent as well as properly filled out applications will save much time and money. An example is the "404" which we believe is unnecessary for this project. If so, this will save tens of thousands of dollars in permit fees. In other places even small mistakes in filling out applications can result in months-long delays.

As discussed, and if desired, ARI/CRB will present a proposal to support this process.

Generating public support. Under this scope of work, ARI/CRB will create presentation material for project organizers to use to seek written support (on letterhead) from politicians, civic organizations and NGOs. Written letters of support early in this process from the University of

Vermont, UVM Office of Sustainability, Lake Champlain Maritime Museum, the Chamber of Commerce, Vermont Department of Tourism and Marketing, Vermont Attractions Association and any and all groups whom can support the Project.

ARI/CRB can also support these efforts in person if desired.

- Clean the *Adirondack* to USEPA specifications. Discussed above.
- Decide if the *Adirondack* is to be deployed using explosive cutting charges (recommended) or by slow-fill.
- Properly ballasting and cutting the hull to prepare the *Adirondack* for sinking.
- Tow the *Adirondack* to the permitted site. Securely anchor her over the site in a predetermined anchor spread.
- Sink the *Adirondack!*
- Conduct clearance dives.
- Open for recreational activity.

Security Considerations

Once it is determined and publicly announced that the project will move forward, it is recommended that all through-hull valves below the waterline aboard *Adirondack* are closed, chained, and locked. All fire-suppression systems should be charged and ready for use. Excess fuel should be removed from the vessel. Access to the vessel should be limited and security should be monitored. Just precautionary.

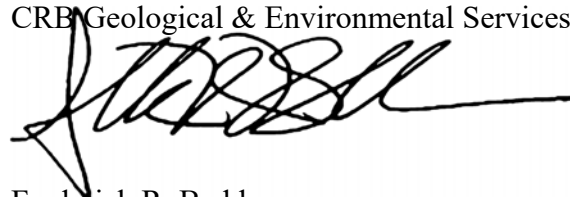
Community Support

It is our opinion that community support is the single most important factor that will determine the success of the Ferry *Adirondack* Project. We think that this Project is quite unique and the potential community benefits (Public Good) that are possible here are outsized. We encourage casting a wide net when seeking letters of community support. No Rotary meeting or church group should be too small to be addressed. This is a good Project and LCTC has assembled an impressive team. LCTC has a proud history on the lake.

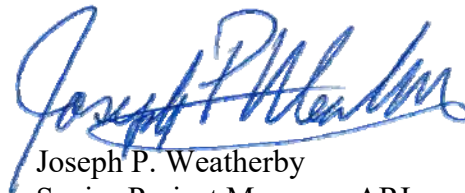
ARI/CRB is excited to be a part of it.

Sincerely,

Artificial Reefs International and
CRB Geological & Environmental Services, Inc.



Frederick R. Baddour
President, CRB



Joseph P. Weatherby
Senior Project Manager, ARI



June 21, 2019

Mr. John Paul
Operations Manager
Lake Champlain Transportation Company
Burlington, Vermont 05401

Mr. Jonathan Eddy
CEO
Waterfront Diving Center
Burlington, Vermont 05401

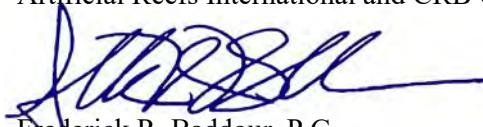
Re: ARI/CRB Project No. ARI 1309-30: Proposal to Sink the *M/V Adirondack*, Burlington, Vermont

Dear Sirs;

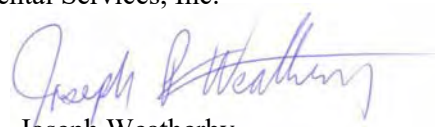
Artificial Reefs International and CRB Geological & Environmental Services, Inc. (ARI/CRB) are pleased to provide you with this proposal for the sinking the *M/V Adirondack*. Upon receiving your electronic acceptance, this letter and attachments will confirm your engagement of ARI/CRB. A detailed scope of services and cost is presented in Attachments A and B. The Terms and Conditions of this contract are included in Attachment C.

Please indicate your acceptance of our terms by returning a signed copy of the attachments along with the required retainer. If you have any questions or require any additional information please let us know. We look forward to working with you on this important project.

Sincerely,
Artificial Reefs International and CRB Geological & Environmental Services, Inc.



Frederick R. Baddour, P.G.
President, CRB



Joseph Weatherby
Senior Project Manager
Artificial Reefs International

ATTACHMENT A

SCOPE OF SERVICES BURLINGTON, VERMONT

SCOPE of the “sinking evolution” (the duration ARI/CRB personnel are in Burlington, Vermont, to complete the scuttling of Adirondack) phase of the Ferry Adirondack Project:

- ARI/CRB personnel will mobilize to the Site to complete ‘sinking evolution’ phase of Ferry Adirondack Project, scope defined below. Eight (8) days with technician and supervisor; \$28,000 estimated, cost and scope subject to change.
- Sink date tentatively Thursday, May 14, 2020.

This scope includes:

1. Work with Lake Champlain Transportation Company (LCTC) staff directing bulking up superstructure, ballasting, preparing flooding and venting holes, anchoring and sinking the Ferry Adirondack by slow flooding method. Explosive deployment by any other entity not included. As previously agreed with LCTC, ARI/CRB is still engaged in gathering options and pricing for explosive deployment.
 2. Monthly phone consultation on vessel prep until our arrival in Vermont.
 3. LCTC can cite ARI/CRB involvement and track record in communications with regulators, stakeholders, sponsors, the general public and media. ARI/CRB will be available monthly (more often by appointment in writing as requested).
 4. ARI/CRB will produce a detailed Sink Plan to be shared with and understood in sinking evolution of the Ferry Adirondack Project.
 5. Goal is to sink the vessel in an upright, keel-down orientation with superstructure intact.
 6. ARI/CRB personnel will be available for meetings while on the ground in Burlington, Vermont.
 7. Marketing support available upon request of LCTC.
- Terms 50% payment at contract, (secures dates and pricing), 40% upon commencement of sinking evolution, 10% upon sinking vessel.
 - Travel, lodging and per diem paid separately by LCTC.

LCTC agrees to:

1. Bear all responsibility and all liability for adhering to and complying with United States Environmental Protection Agency’s Guidelines: Best Management Practices for Preparing Vessels as Artificial Reefs, all costs associated with compliance, ship preparation, inspection and requirements pursuant to.
2. Maintain records of closely approximated weights of all materials removed from Adirondack to

be used in stability analysis.

3. Produce at LCTC's expense after ship cleaning and preparation a stability analysis by a qualified Naval Architect (as discussed and agreed during the initial ship evaluation aboard Adirondack) to be submitted to ARI/CRB at least 30 days prior to commencement of sinking evolution.
 4. Maintain all through-hull fittings in an unencumbered, workable, closed and locked condition.
 5. Maintain Adirondack's bilges in a clean and dry condition.
 6. Provide labor and equipment to cut holes through decks. Provide labor to remove all debris. Dispose of all debris.
 7. Make no attempt to secure any fixed ballast to Adirondack without prior discussion and agreement with ARI/CRB.
 8. Will make only cuts in the weather (car) deck of Adirondack so as to accommodate necessary removal of equipment or ship cleaning activities. Cut-out holes in deck should be tack-welded or affixed in place until final sink plan is determined.
 9. Cut no holes in Adirondack's hull below the car deck level.
- Terms 50% payment at contract, (secures dates and pricing), 40% upon commencement of sinking evolution, 10% upon sinking vessel.
 - Travel, lodging and per diem of \$50 per day per CRB employee paid separately by LCTC.

Attachment B



CRB Geological & Environmental Services, Inc.
d/b/a Artificial Reefs International
8744 S.W. 133rd Street, Miami, Florida 33176



Project Work Order

Date: 6/21/19 **CRB Client Number:** ARI 1309-30

Client: Mr. John Paul Operations Manager Lake Champlain Transportation Company Burlington, Vermont 05401
Mr. Jonathan Eddy CEO Waterfront Diving Center Burlington, Vermont 05401

Project: Burlington, Vermont; Site Visit for M/V Adirondack Project

Authorized Scope: See Attachment A

Authorized fees: \$28,000.00 Estimated - Cost & scope subject to change.

Retainer: Terms 50% payment at contract (secures dates and pricing), 40% upon commencement of sinking evolution, 10% upon sinking vessel.

Schedule: To be determined.

Compensation/Billing:

- Time & Materials
- Not-to-exceed
- Lump Sum Fee (All inclusive)
- Lump Sum Fee (Labor) Plus Expenses

Terms & Conditions:

- Attachment C
- Existing Contract Dated:

Authorization to Proceed

Proposed by: CRB Geological & Environmental Services, Inc., and Artificial Reefs International **Accepted by:** _____

Signature: _____ Signature: _____
Name: Frederick R. Baddour, P.G. Name: _____
Title: President ARI/CRB Title: _____
Date: June 21, 2019 Date: _____

ATTACHMENT C
STATEMENT OF TERMS AND CONDITIONS

- A. **EXCLUSIVE USE:** Client agrees that services provided by CRB Geological & Environmental Services, Inc. (CRB) hereunder are for the Client for the purposes set forth in the Proposal. Reports will be prepared for the exclusive benefit of and use by Client, under the Terms and Conditions of this Contract.
- B. **COMPENSATION AND PAYMENT TERMS:** The attached proposal is valid for thirty (30) days from date of receipt by Client. Payment is due for services performed and materials and equipment provided, and other costs incurred, with payment in full due upon completion of the agreed scope of services and receipt of final invoice. In the event Client fails to pay any invoice due, CRB may, without waiving any other claim or right, and without liability whatsoever to the Client, terminate its performance hereunder. Client shall reimburse CRB for all reasonable attorney fees and court costs related to the collection of overdue invoices. An interest charge of one and one-half percent (1.5%) per month (the "Default Rate") or the maximum rate of interest permitted under applicable law, if the Default Rate is not permitted under applicable law, shall automatically accrue and be payable by Client, on any balance that remains unpaid thirty (30) days after the date of the invoice.
- C. **RIGHT-OF-ENTRY:** Client grants to CRB the right, exercisable by CRB as it deems necessary in the performance of its services hereunder, of entry to the property upon which the agreed scope of services is to be performed, (the "Site") by CRB, its agents, employees, contractors and subcontractors, for the purpose of performing services hereunder; including without limitation, the making of surveys, maintenance of equipment and other services described in the Proposal. Should the Client not own the Site, the Client warrants and represents, by acceptance of this Proposal, that it has authority and permission of the owner(s) and occupant(s) of the Site and any such properties, to grant CRB this right of entry.
- D. **INSURANCE:** CRB shall maintain workers compensation, professional liability, and commercial liability insurance policies. Refer to Exhibit I for limits and coverage. Certificates of insurance evidencing these coverages will be provided to the Client prior to executing the contract. CRB shall not be responsible for any loss, damage, cost, or expense beyond the amounts, limits, exclusions, and conditions of such insurance.
- E. **LIABILITY:** Client agrees that the liability of CRB to Client and all other claimants for any and all claims, losses, expenses or damages arising out of, or in any way, related to this Contract or the services provided hereunder shall be limited to an aggregate sum not to exceed the total fee for CRB's services or \$50,000.00, whichever amount is greater.
- F. **SEVERABILITY:** The provisions of these terms and conditions are severable. The invalidity of any part of these Terms and Conditions or any portion thereof shall not invalidate the remainder of these Terms and Conditions nor the remainder of any portion hereof.
- G. **TERMINATION:** Either the Client or CRB may terminate this Contract by giving thirty (30) days written notice to the other party. In the event that the Client terminates this Contract, for cause or without cause, the Client shall pay CRB the costs that CRB has paid, incurred or become obligated for prior to the effective date of termination, including any obligations, commitments and unsettled claims, plus any amounts due and owed by the Client as of the date of termination to include reasonable termination expenses.
- H. **FORCE MAJEURE:** CRB will not have any liability for any failure to perform, or delay in performance, due to any circumstances beyond its reasonable control, including but not limited to, strikes, riots, wars, fire, flood, explosion, acts of nature, acts of government, acts of utilities, labor disputes, delays in transportation or inability to obtain material or equipment. In the event of any failure to perform or delay in performance, due to any such circumstances, the time for performance shall be extended by a period of time reasonably necessary to overcome the effect of such circumstances or such delay, and the Client will not be entitled to refuse performance or otherwise be relieved of any obligations hereunder.
- I. **CLAIMS:** Client agrees that it shall bring any and all claims against CRB no later than the earlier of (i) Thirty (30) days of the completion of services to be provided hereunder or (ii) one (1) year after the date of this Contract. The Client waives all such claims if not brought in accordance with this Paragraph. In the event that the Client makes a

claim against CRB and the Client fails to prevail on such claim upon final adjudication, the Client shall pay all costs incurred by CRB in defending itself against the claim, including without limitation court costs, attorneys' fees and costs, and expenses for experts.

- J. HAZARDOUS MATERIALS INDEMNIFICATION: The Client agrees that CRB has not caused or contributed to the presence of any Hazardous Materials that may exist or be discovered at or about the Site, and that CRB does not assume any liability for such Hazardous Materials. Client hereby releases and agrees to defend, indemnify and hold harmless CRB, its subcontractors, its agents, officers, directors, and employees from and against all claims, damages, costs, liability, losses, and expenses, including without limitation reasonable attorneys' fees and costs, arising out of or in any way connected with (i) the failure or alleged failure to detect any Hazardous Materials at or about the Site and (ii) the actual, alleged, or threatened discharge, dispersal, release, or escape of any Hazardous Materials.
- K. DOCUMENTS: All reports, field data and notes, laboratory test data, calculations, estimates and other documents which CRB prepares as instruments of service shall be utilized by the Client solely for the project for which the study was made. CRB will retain all pertinent records relating to the services performed hereunder by CRB for a period of two (2) years following the performance of such services. Records will be reproduced at the Client's expense.
- L. LIMITATIONS: Services provided by CRB hereunder shall be performed in accordance with generally accepted practices of environmental The Teams providing similar services at the same time, in the same geographical area, and under similar circumstances and conditions as the services provided hereunder. CRB's findings and conclusions shall be considered not as scientific certainties, but rather as professional opinions based upon, and concerning the significance of, the limited data gathered during the course of this Project. No other warranty, expressed or implied, is made. CRB does not and cannot represent that the Site does not contain any Hazardous Materials, or any other latent conditions beyond that observed by CRB during the course of this Project.

M/V Adirondack Proposal for Reefing FAQ



M/V Adirondack approaching the dock in Port Kent. Mid 1950's

Introduction

The Lake Champlain Transportation Company is offering to donate the soon to be retired Ferry *Adirondack* for the creation of a new Lake Champlain Underwater Historic Preserve dive site. The *Adirondack*, built in 1913, is the oldest continuously operating double ended ferry in the U.S. The Ferry has been a fixture on the Lake Champlain Transportation Company's Burlington to Port Kent crossing for 65 years, since having started service here in 1954. During this time *Adirondack* has transported thousands of passengers and vehicles across one of the Champlain Valley's most scenic lake crossings.

The Ferry *Adirondack* Project is an opportunity to preserve this piece of Lake Champlain history by sinking the vessel in the Lake and adding it, as a site, to the existing Lake Champlain Underwater Historic Preserve (UHP). The Underwater Historic Preserve system was created in 1985 and currently includes ten historic vessels. It is one of the first and best regarded preserve systems in the country and is overseen by the Vermont Division for Historic Preservation. The M/V *Adirondack* would be the eleventh vessel in the Preserve and ownership would transfer from the Lake Champlain Transportation Company to the State of Vermont upon sinking. The UHP System benefits the public by protecting historic vessels while providing public access for both recreational divers and the general public through the use of Remotely Operated Vehicles (ROVs). It may seem counterintuitive to preserve a vessel by sinking it, but Lake Champlain's cold fresh water will preserve the vessel's structure for many years so that it can continue to be

interpreted and appreciated in the Champlain Valley. In addition to preserving history, the Ferry *Adirondack* Project will help provide an economic stimulus to the Champlain Valley through increased diver visitation to the UHP from around the country. By adding the Ferry *Adirondack* to the Lake Champlain Underwater Historic Preserve, this significant piece of maritime history will be preserved, protected and enjoyed by the public for many years to come.

FAQ

Below are a series of frequently asked questions and answers that will provide further information about this project.

Q. *What is the reasoning behind this proposed project?*

A. Ferry ridership at the Burlington/Port Kent Ferry has been decreasing in recent years and three boats are no longer needed at this crossing. In addition, with re-alignment of the docks at LCT due to the marina expansion project, there is no longer a space to keep the third boat. The inclusion of *Adirondack* in the UHP system will prevent the vessel from being sent to the scrapyard and retain it in the Champlain Valley where it has served since 1954.

Q. *What other options are available for the Adirondack?*

A. Several other options have been considered including:

- **Removing the vessel from the water and creating a static use for it**, such as a museum, or converting it into a restaurant. This method of preservation was done by the Shelburne Museum with the Steamer Ticonderoga in 1955. LCT feels that this option is not viable because of the cost associated with such a project today. LCT received an estimate of \$1.3 million from CCS Construction, Inc. of Morrisville, VT. to simply remove the vessel from the water using two 600-ton crawler cranes and placing it on land. This estimate did not include site preparation, assuming a site could be found, to lift such a large vessel. The estimate also did not take into consideration land acquisition or the substantial conversion cost associated with creating a new long-term use. In either case the hull and superstructure of *Adirondack* would need to be maintained to keep her weather tight. This is an expensive venture as well. One needs only to consider the Steamer Ticonderoga. She went through a \$1.5 million restoration project in the mid-1990s
- **Leaving the vessel in the water and creating a static use.** The costs of creating an in-water static display would vary greatly depending on the location selected and the use of the vessel. A major consideration would be where to berth the *Adirondack*. She is 152' long and draws 8 ½' of water. There are very few slips in the Burlington area that could accommodate her. After May of 2020 LCT will have no space for her, which is the reason driving this project. One of the few comparable slips of adequate size is currently being used by the Spirit of Ethan Allen III. The annual rental of this slip will be \$105,000.00 in 2020. Obviously, this slip is not available, but a new dock lease would be a similar cost. If a suitable location could be found, in addition to the dock lease, there would be additional expenses associated with creating a slip. This would involve driving up to 40 pilings in groups to keep her stable and creating a gangway. LCT estimates the cost to do this to be approximately \$75,000.00, plus some shore-side improvements.

Even if an entity could raise the money for the slip and improvements, maintenance costs would then need to be taken into consideration. Since 2004 the *Adirondack* has been undergoing the re-plating of her hull. That process is now 2/3s complete. The next section would need to be done in the next 4-5 years at an estimated cost of \$200,000.00. Two more sections would need to be completed in the years ahead. Leaving the vessel in the water and not completing the repairs needed would be very risky indeed. There have been several examples of static display/restaurant vessels that have sunk at the dock due to lack of maintenance/oversight. The salvage and clean-up of these events is tremendously expensive and usually involves dealing with petroleum products, either from the bilges or heating systems. This would not be the case if the *Adirondack* were purposely sunk as an artificial reef due to the stringent cleaning requirements which are listed in the M/V *Adirondack* Reefing Preparation Project Guidelines.

- **Selling the vessel off the Lake.** Finding a buyer for the *Adirondack* would be very difficult. Although she has been well maintained, she is still over 100 years old. In order to move her to a different location, her upper deck house would have to be removed in order to transit the Champlain Barge Canal. The deck house (pilot houses, passenger cabin, and stack) would have to be moved separately by barge. This would give clearance for the many bridges on the canal as well as reducing the vessel's draft. The control depth of the canal is only 7.5 feet, about 1 foot less than *Adirondack* draws now. The cost associated with the disassembly and transport is estimated to be \$73,240.00. Once the *Adirondack* and barge with her super-structure arrived in Albany, she would need to be re-assembled. Scarano Boat Building in Albany has provided an estimate of \$85,000.00 for this work. That makes the total cost of the project \$158,240.00 NOT including the acquisition cost of the vessel. These figures make it very unlikely that the vessel would sell.
- **Scrapping the *Adirondack*.** This would be by far the least expensive option for LCT. It would involve removing the entire super-structure, the engines and all other machinery. This would be done at LCT for an estimated cost of \$47,120.00. The vessel would then be towed to Donjon Recyclers of Staten Island at an estimated cost of \$27,200.00. Donjon would take the *Adirondack* at no cost to LCT and cut her up. Depending upon scrap value, LCT may receive up to 2.5 cents per pound totaling about \$10,000.00. The net cost to LCT for this option would be \$64,320.00. Obviously, this option would involve the total destruction of the *Adirondack* and the loss of her legacy as a historic vessel here on Lake Champlain.

Q. *If it is decided that sinking Adirondack is the best option, what precautions will be taken to ensure that sinking the vessel will not pollute the Lake which we are trying so hard to clean up?*

A. Preparation of the vessel for this project is a long, expensive, and laborious process which involves a thorough cleaning of the vessel to remove any contaminants that might be found on board. This process is guided by the U.S. Environmental Protection Agency and the U.S. Maritime Administration, which adopted a set of standards in 2006 called the "National Guidance: Best Management Practices for Preparing Vessels Intended to Create Artificial Reefs"

(BMPs). In the 75-page BMP document very specific steps needed to environmentally clean a vessel are spelled out. Since its adoption these BMPs have been utilized in dozens of projects in both freshwater and saltwater locations with great success. Please see the BMP guidance here: <https://www.epa.gov/sites/production/files/2015-09/documents/artificialreefguidance.pdf>

In summary the BMPs require that all petroleum lubricated devices be removed from the vessel. This includes the engines, compressors, and generators. The fuel tanks and wastewater tanks will be removed. All voids in the boat will be thoroughly cleaned. All electrical conduit will be removed as well as any sources of PCBs and asbestos. Environmental testing recently conducted on *Adirondack* shows very little of these contaminants on board currently. Any loose or flaking paint will be removed. The rubber roof of the hurricane deck will be removed prior to sinking. The cleaning standards require that no sheen is visible on the water when she sinks and that no danger to the environment exists.

To ensure that this process is done properly LCT has hired a firm, Artificial Reefs International (ARI), to act as consultants for the project. In addition to assisting with the cleaning of the vessel ARI will be responsible for the actual sinking of *Adirondack*. ARI has been involved in the sinking of dozens of vessels and has had no environment mishaps.

Q. Has sinking a large vessel as a dive site in cold fresh water been done before?

A. There are at least 3 examples of comparable sized vessel sunk as dive sites/ artificial reefs in fresh water in North America:

- 1) ***Wolff Islander II***: Sunk 3 miles east of Kingston, Ontario on September 21, 1985 by the Comet Foundation. She was a 164 ft long steel ferry that ran between Kingston and Wolf Island from 1946 to 1975. Her location is just off the North side of Wolf Island in about 80 feet of water. She is still a very popular dive site 35 years later.
- 2) ***Straits of Mackinac***: Sunk off Chicago on April 10, 2003 in Lake Michigan. She was also a steel ferry, 203 ft long that operated across the Straits of Mackinac from 1928 to 1957. Her location is about 10 miles off Chicago in 75 feet of water. This is also a very popular dive site today.
- 3) ***Buccaneer***: Sunk off Chicago June 18, 2010 in Lake Michigan. She was originally a WWII coastal patrol boat and was converted to a tour/excursion boat that operated out of the Chicago area. She is 98 ft long and rests in 72 ft of water. As with the examples above, remains a very popular dive site.

Q. Is LCT choosing to sink Adirondack because it is the least expensive option for them?

A. No - quite the contrary. The estimated cost of cleaning *Adirondack* to the standards outlined in the BMPs is \$106,000.00. Other costs, such as waste disposal, concrete for ballasting, consulting fees to ARI and sinking her, total approximately \$69,000.00, making the total cost of this project \$175,000.00. The vessel is being donated by LCT. The estimated cost of scrapping the *Adirondack*, per the methods described earlier, is approximately \$64,320.00. LCT is investing in this project because they believe in preserving the legacy of the *Adirondack*.

Q. What considerations went into the decision of where to sink Adirondack?

A. One of the major considerations that went into this was the proximity to a population base and support services such as dockage, marina services and dive shops. This made the greater Burlington area a logical choice. These considerations were for not only the diving public, but also to the non-diving public who may want to visit the site using ROV charters. Another consideration was proximity to other shipwrecks of the Underwater Historic Preserve making dive excursions convenient for visiting divers. (See attached maps) Other considerations were to avoid areas of heavy boating traffic such as the mouth of Shelburne Bay, near the Burlington breakwater, or the busier boating routes such as between Juniper Island and the end of Shelburne Point. A safe depth for scuba diving was also a consideration. Having a safe depth on the top of the vessel in approximately 25' of water for novice divers and deeper depths of approximately 70' at the bottom for more advanced divers will enhance the desire to dive this location. Obviously sinking the vessel at a depth that does not pose a hazard to navigation is important and is a US Coast Guard requirement. Choosing a location which provided some protection from prevailing north and south winds was also a consideration. We feel the site chosen, approximately ½ mile south west of Lone Rock Point, (N 44° 28'49.1", W 73° 14'52.1") met these selection criteria best (see attached map).

Q. *Will public funds be used to complete this project?*

A. No. LCT is donating the vessel to the State and LCT is paying all costs associated with environmental mitigation and the sinking of the vessel. LCT is also paying all costs associated with Artificial Reefs International participation in the project. The only State funds needed will be to purchase a buoy to mark the site and limited funds for public interpretation of the site. The ongoing maintenance of the site, of which there is very little, will be handled through the already existing appropriation to the Lake Champlain Underwater Historic Preserve program.

Cost figures used to arrive at the estimates presented above are available for review upon request.

For more information, please visit the information page at the Vermont State Historic Sites Underwater Preserves here:

<https://historicsites.vermont.gov/underwater-preserves/adirondack-reefing>

We welcome your comments and questions as your feedback is very important to us as the proposed project is reviewed. Visit the survey here:

<https://www.surveymonkey.com/r/AdirondackFerry>

