APPENDIX A

Existing Federal and State Dredging Permits and Modifications (SAC-2009-00175-2IR)

OCT 17 2012

DHEC

PROMOTE PROTECT PROSPER

Catherine B. Templeton, Director

Promoting and protecting the health of the public and the environment

RECEIVED
OCT 10 2012

October 8, 2012

Anthony Magliacane, PE
628th Civil Engineer Squadron
Joint Base Charleston
2316 Red Bank Road
Goose Creek, SC 29445

Re: P/N 2009-00175-1R Naval Weapons station

Dear Mr.Magliacane,

We have reviewed your request for an extension of time for maintenance dredging at the Naval Weapons Station on the Cooper River and Goose Creek in Berkeley County. The conditions of the State Construction in Navigable Waters Permit and 401 Water Quality Certification is valid as long as the U.S. Army Corps permit is valid. All terms and conditions of the original permit are still in effect. This letter should be attached to and made part of the original permits.

If you have additional questions related to this extension, please call Erin Owen at 803-898-4243.

Sincerely,

Erin Owen

Erin Owen, Project Manager
Water Quality Certification and
Wetlands Program Section

Cc: U.S. Army Corps of Engineers,
Conway District Office

JUN 17 2011

DEPARTMENT OF THE ARMY
CHARLESTON DISTRICT, CORPS OF ENGINEERS
69-A Hagood Avenue
CHARLESTON, SOUTH CAROLINA 29403-5107

REPLY TO
ATTENTION OF

June 13, 2011

Regulatory Division

Naval Weapons Station Charleston
Attn: Cdr. Dennis E. Edwards
Facilities Management Division
Public Works Department, Bldg 5
2316 Red Bank Road
Goose Creek, South Carolina 29445

Dear Cdr. Edwards:

This is in response to correspondence received dated May 10, 2011, requesting that your permit SAC#2009-00175-2IR issued on March 30, 2010, be modified to reflect the changes on the attached drawings (Sheets 1 – 2 of 2 dated May 10, 2011). These changes include adding an additional 10,000 cubic yards of dredged material over a 1.06 acre area in front of Pier X-ray. This modification is needed to obtain the depths necessary for vessels to dock at the pier.

This is to inform you that your request for modification is granted. Please attach this letter with the modified drawings to the original permit. All of the conditions to which the work is made subject remain in full force and effect. In that this work appears subject to the jurisdiction of the South Carolina Department of Health and Environmental Control, Office of Ocean and Coastal Resource Management, it is highly recommended that you contact that agency to ascertain their requirements in this matter.

Sincerely,

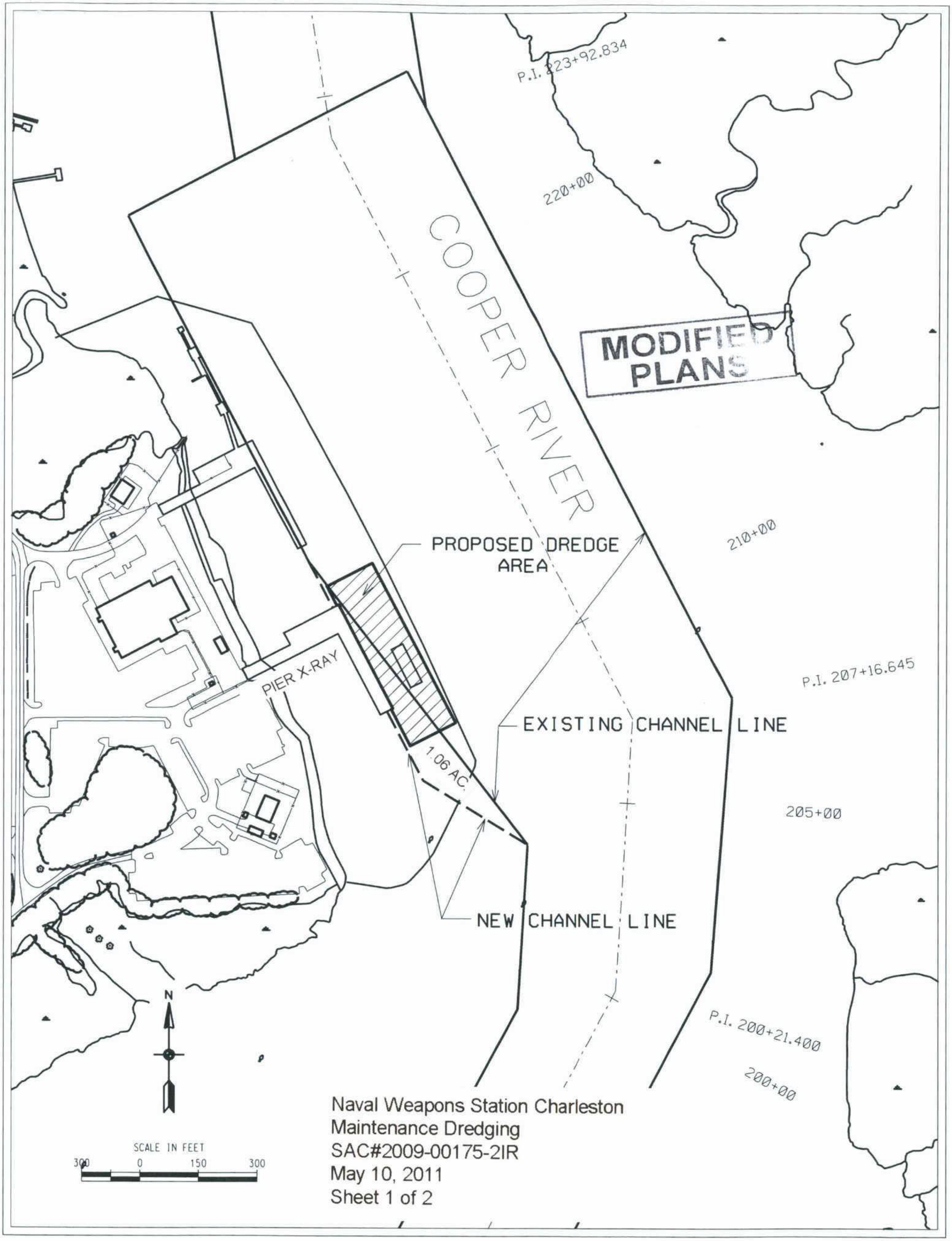
Tina B. Hadden
Chief, Regulatory Division

for: Jason A. Kirk, P.E.
Lieutenant Colonel, U.S. Army
Commander and District Engineer

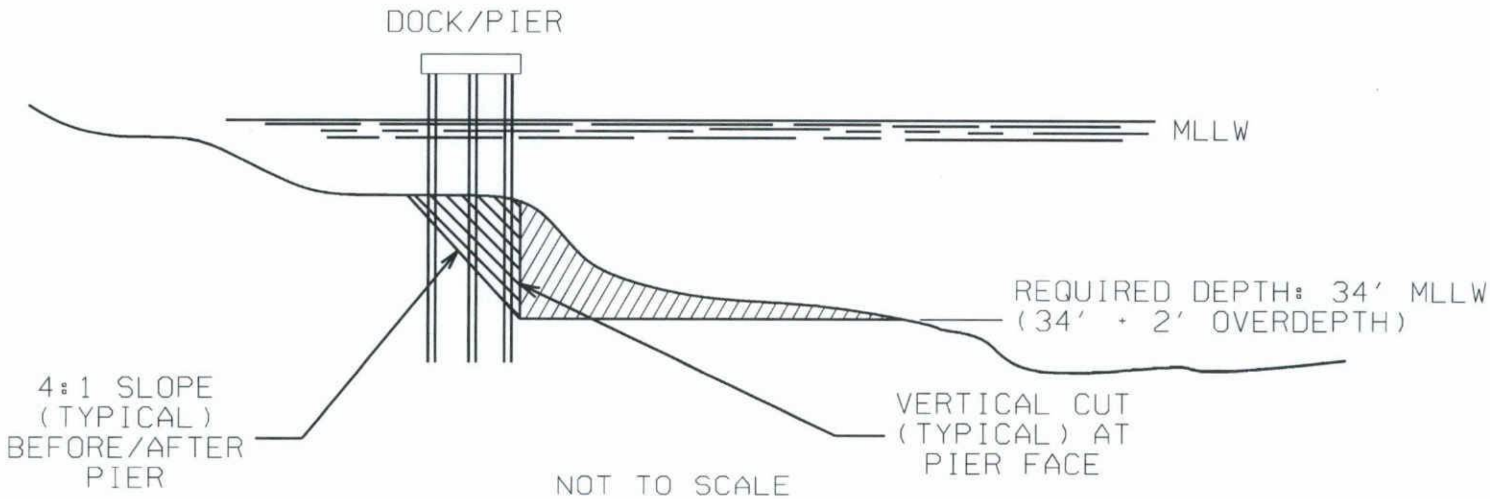
Enclosures

Copy furnished:
USACOE/Charleston District
ATTN: Mark Taylor, TS-ON
69A Hagood Avenue
Charleston, South Carolina 29403

Concur: cmm
SOCHA/RD-S
6/13/11
CROSBY/RD-S

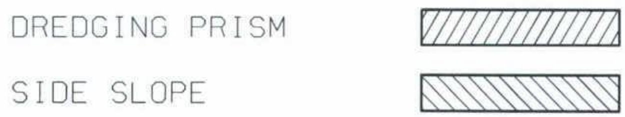


Naval Weapons Station Charleston
Maintenance Dredging
SAC#2009-00175-2IR
May 10, 2011
Sheet 1 of 2



NOT TO SCALE

NPTU DREDGING CROSS-SECTION



MODIFIED PLANS

Naval Weapons Station Charleston
Maintenance Dredging
SAC#2009-00175-2IR
May 10, 2011
Sheet 2 of 2

D H E C
PROMOTE PROTECT PROSPER

C. Earl Hunter, Commissioner
Promoting and protecting the health of the public and the environment

February 24, 2010

Naval Weapons Station Charleston
2316 Redbank Rd Ste 100
Goose Creek SC 29445

Re: Certification in Accordance with Section 401 of the Clean Water Act, as amended.
Permit in Accordance with R. 19-450 et. seq., 1976 SC Code of Laws,
Construction in Navigable Waters Permit,
Certification in Accordance with the Coastal Zone Management
Program (48-39-10 et. seq., and 15 CFR 93)

Naval Weapons Station Charleston
Maintenance dredging by hydraulic dredge
Cooper River & Goose Creek
Berkeley County
P/N 2009-00175-IR

DATE PERMIT ISSUED: February 24, 2010
CONSTRUCTION MUST BE COMPLETED BY: February 24, 2013

Dear Sir or Madam:

The South Carolina Department of Health & Environmental Control (SCHEC) and the Office of Ocean and Coastal Resource Management have reviewed plans for this project and determined that there is a reasonable assurance that the proposed project will be conducted in a manner consistent with the Certification requirements of Section 401of the Federal Clean Water Act, as amended, the Coastal Zone Management Program (48-39-10 et. seq., and 15 CFR 93) and the permitting requirements of R. 19-450 et. seq., 1976 SC Code of Laws.

In accordance with the provisions of Section 401, we certify that this project, subject to the indicated conditions, is consistent with applicable provisions of Section 303 of the Federal Clean Water Act, as amended. We also hereby certify that there are no applicable effluent limitations under Sections 301(b) and 302, and that there are no applicable standards under Sections 306 and 307.

1. The applicant must implement appropriate best management practices that will minimize erosion and migration of sediments on and off the project site during and after construction. These practices should include the use of appropriate grading and sloping techniques, mulches, silt fences, or other devices capable of preventing erosion, migration of sediments, and bank failure. All disturbed land surfaces and sloped areas affected by the project must be stabilized.

2. All necessary measures must be taken to prevent oil, tar, trash, debris and other pollutants from entering the adjacent waters or wetlands.

3. All efforts must be made to protect existing vegetation in and along shoreline areas.

4. Dredging must not occur during the months of March, April, May, or June, when possible, because of potential impacts to spawning fish.

5. All dredged material shall be placed in a contained upland area of adequate size in a manner, which ensures the material will not be re-deposited into the river or any other aquatic areas.

6. The dredge material must be capped or mixed with cleaner sediments or soils.

The SCDHEC reserves the right to impose additional conditions on this Certification to respond to unforeseen, specific problems that may arise and to take any enforcement action necessary to ensure compliance with State water quality standards.

Sincerely,

Heather Preston, Director
Division of Water Quality
Bureau of Water

cc: U.S. Army Corps of Engineers,
Charleston District Office
SC DHEC, Charleston EQC Office District Office
Region 6
OCRM

GENERAL CONDITIONS OF NAVIGABLE WATERS PERMITS

A. The authorization for activities or structures granted by this permit shall constitute a revocable license to use the lands or waters within the jurisdiction of the state.

B. The Department may require the permittee to modify or remove activities or structures authorized herein if it is determined by the Department that such modification or removal is consistent with the requirement of 450.9(A) [condition A above]. Modification or removal after the permit has been granted shall be ordered only after reasonable notice stating the reasons therefore and providing the permittee an opportunity to be heard.

C. All activities authorized by the permit shall be consistent with and limited by the terms and conditions of this permit; any unauthorized work or activity different from or inconsistent with the permit may result in the modification, suspension, or revocation of the permit in whole or in part, and the institution of such legal proceedings as the State of South Carolina may consider appropriate.

D. The construction authorized by this permit must be completed within three years of the date of issuance or such time as the Department may set for good cause shown. Extensions of time may be granted provided that the requests are submitted to the Department in writing prior to the expiration of the original time period, state whether there has been any change in the circumstances since the permit was approved and the reason for the extension of time.

E. No permit shall convey nor be interpreted as conveying expressly or implicitly, any property right in the land or water in which the permitted activity is located. No permit shall be construed or interpreted as alienating public property for private use, nor does it authorize the permittee to alienate, diminish, infringe upon or otherwise restrict the property rights of other persons or the public.

F. The grant, denial, modification, suspension, revocation of a permit or removal of a structure authorized under this permit, shall not be the basis for any claim for damages against the State of South Carolina. In no way shall the State be liable for any damage as the result of the erection of permitted works.

G. The permitted activities shall not block or obstruct navigation or the flow of any waters unless specifically authorized herein; no attempt shall be made by the permittee to prevent the full and free use by the public of all navigable waters at or adjacent to the work authorized by this permit; and, no spoil, dredged material, or any other fill material shall be placed below the mean high water or ordinary high water elevation, unless specifically authorized herein.

H. The permittee shall make every reasonable effort to perform the authorized work in a manner to minimize adverse impact on fish, wildlife, or water quality, and shall maintain any authorized structure in good condition in accordance with approved plans and specifications.

I. The permittee shall allow the Department or its authorized agents or representatives to make periodic inspections at any time deemed necessary to assure that the activity being performed is in accordance with the terms and conditions of this permit.

J. Permits are issued in the name of the applicant and may not be assigned to another without written permission of the Department and the written agreement of the transferee to abide by all the terms and conditions of the permit.

K. Permittee must notify the South Carolina Department of Archives and History (Ms. Rebekah Dobrasko, [803] 734-8577, Historic Preservation Division, Post Office Box 11669, Columbia, South Carolina 29211) if any archaeological materials are encountered during the course of the work. Archaeological materials consists of any items, fifty years or older, which were made or used by man. These items include, but are not limited to stone projectile points (arrowheads), ceramic sherds, bricks, worked wood, bone and stone, metal and glass objects, and human skeleton remains. These materials may be present on the ground surface and/or under the surface of the ground.

L. Permittee must notify the South Carolina Institute of Archaeology and Anthropology (Mr. Christopher Amer, [803] 777-8170) in accordance with South Carolina Underwater Antiquities Act of 1991 (Article 5, Chapter 7, Title 54 Code of Laws of South Carolina, 1976) in the event archaeological or paleontological remains are found during the course of work. Archaeological remains consist of any materials made or altered by man which remain from past historic or prehistoric times (i.e., older than 50 years). Examples include old pottery fragments, metal, wood, arrowheads, stone implements or tools, human burials, historic docks, structures or nonrecent (i.e., older than 100 years) vessel ruins. Paleontological remains consist of old animal remains, original or fossilized, such as teeth, tusks, bone, or entire skeletons.

DEPARTMENT OF THE ARMY
CHARLESTON DISTRICT, CORPS OF ENGINEERS
69A Hagood Avenue
CHARLESTON, SOUTH CAROLINA 29403-5107

REPLY TO
ATTENTION OF

MAR 30 2010

March 30, 2010

Regulatory Division

Naval Weapons Station Charleston
Attn: Cdr. Dennis E. Edwards
Facilities Management Division
Public Works Department, Bldg 5
2316 Red Bank Road
Goose Creek, South Carolina 29445

Dear Cdr. Edwards:

This is in response to your application requesting a Department of the Army permit.

Enclosed is your Department of the Army permit 2009-00175-2IR. It authorizes you to perform the work specified on the attached drawings. This permit is issued under the provisions of the Federal laws for the protection and preservation of the navigable waters of the United States.

Please notify this office promptly, in writing, when you start and complete the work. The enclosed cards may be used for that purpose. You should also be aware that a special condition has been included in this permit which requires that a copy of the permit and drawings must be available at the work site during the entire time of construction.

Respectfully,

Tina B. Hadden
Chief, Regulatory Division

Enclosures

Concur: cmm
SOCHA/RD-P
3/30/10
HADDEN/RD

DEPARTMENT OF THE ARMY PERMIT

Permittee: NAVAL WEAPONS STATION CHARLESTON
C/O CDR DENNIS E. EDWARDS
PUBLIC WORKS OFFICER

2316 REDBANK RD, BLDG 5
GOOSE CREEK, SC 29445

Permit No: 2009-00175-2IR

Issuing Office: CHARLESTON DISTRICT

NOTE: The term "you" and its derivatives, as used in this permit, means the permittee or any future transferee. The term "this office" refers to the appropriate district or division office of the Corps of Engineers having jurisdiction over the permitted activity or the appropriate official of that office acting under the authority of the commanding officer.

You are authorized to perform work in accordance with the terms and conditions specified below.

Project Description:
The work consists of maintenance dredging approximately 1 million cubic yards of material per year for a period of 10 years to maintain safe project depths for safe navigation for the Naval Weapons Station in accordance with the attached drawings entitled: Naval Weapons Station Charleston Maintenance Dredging. Sheets 1 thru 8 of 8 dated February 27, 2009.

Project Location:
This project is located on the Cooper River from a location in and near the mouth of Goose Creek to a point approximately 4.8 miles upstream, in Berkeley County, South Carolina.

Permit Conditions:

General Conditions:

1. The time limit for completing the work authorized ends on **31 March 2020.** If you find that you need more time to complete the authorized activity, submit your request for a time extension to this office for consideration at least one month before the above date is reached.

2. You must maintain the activity authorized by this permit in good condition and in conformance with the terms and conditions of this permit. You are not relieved of this requirement if you abandon the permitted activity, although you may make a good faith transfer to a third party in compliance with General Condition 4 below. Should you wish to cease to maintain the authorized activity or should you desire to abandon it without a good faith transfer, you must obtain a modification of this permit from this office, which may require restoration of the area.

3. If you discover any previously unknown historic or archeological remains while accomplishing the activity authorized by this permit, you must immediately notify this office of what you have found. We will initiate the Federal and state coordination required to determine if the remains warrant a recovery effort or if the site is eligible for listing in the National Register of Historic Places.

4. If you sell the property associated with this permit, you must obtain the signature of the new owner in the space provided and forward a copy of the permit to this office to validate the transfer of this authorization.

5. If a conditioned water quality certification has been issued for your project, you must comply with the conditions specified in the certification as special conditions to this permit. For your convenience, a copy of the certification is attached if it contains such conditions.

6. You must allow representatives from this office to inspect the authorized activity at any time deemed necessary to ensure that it is being or has been accomplished in accordance with the terms and conditions of your permit.

Special Conditions:

SEE PAGE 4.

Further Information:

1. Congressional Authorities: You have been authorized to undertake the activity described above pursuant to:

☒ Section 10 of the Rivers and Harbors Act of 1899 (33 U.S.C. 403).

☒ Section 404 of the Clean Water Act (33 U.S.C. 1344).

☐ Section 103 of the Marine Protection, Research and Sanctuaries Act of 1972 (33 U.S.C. 1413).

2. Limits of this authorization.

a. This permit does not obviate the need to obtain other Federal, state, or local authorizations required by law.

b. This permit does not grant any property rights or exclusive privileges.

c. This permit does not authorize any injury to the property or rights of others.

d. This permit does not authorize interference with any existing or proposed Federal project.

3. Limits of Federal Liability. In issuing this permit, the Federal Government does not assume any liability for the following:

a. Damages to the permitted project or uses thereof as a result of other permitted or unpermitted activities or from natural causes.

b. Damages to the permitted project or uses thereof as a result of current or future activities undertaken by or on behalf of the United States in the public interest.

c. Damages to persons, property, or to other permitted or unpermitted activities or structures caused by the activity authorized by this permit.

d. Design or construction deficiencies associated with the permitted work.

e. Damage claims associated with any future modification, suspension, or revocation of this permit.

4. Reliance on Applicant's Data: The determination of this office that issuance of this permit is not contrary to the public interest was made in reliance on the information you provided.

5. Reevaluation of Permit Decision. This office may reevaluate its decision on this permit at any time the circumstances warrant. Circumstances that could require a reevaluation include, but are not limited to, the following:

a. You fail to comply with the terms and conditions of this permit.

b. The information provided by you in support of your permit application proves to have been false, incomplete, or inaccurate (See 4 above).

c. Significant new information surfaces which this office did not consider in reaching the original public interest decision.

Such a reevaluation may result in a determination that it is appropriate to use the suspension, modification, and revocation procedures contained in 33 CFR 325.7 or enforcement procedures such as those contained in 33 CFR 326.4 and 326.5. The referenced enforcement procedures provide for the issuance of an administrative order requiring you to comply with the terms and conditions of your permit and for the initiation of legal action where appropriate. You will be required to pay for any corrective measures ordered by this office, and if you fail to comply with such directive, this office may in certain situations (such as those specified in 33 CFR 209.170) accomplish the corrective measures by contract or otherwise and bill you for the cost.

6. Extensions. General condition 1 establishes a time limit for the completion of the activity authorized by this permit. Unless there are circumstances requiring either a prompt completion of the authorized activity or a reevaluation of the public interest decision, the Corps will normally give favorable consideration to a request for an extension of this time limit.

Your signature below, as permittee, indicates that you accept and agree to comply with the terms and conditions of this permit.

Gary D. Martin — 26 MAR 2010

(PERMITTEE) — **(DATE)**

NAVAL WEAPONS STATION CHARLESTON

COMMANDING OFFICER
GARY D. MARTIN
CDR USN

GARY D. MARTIN

PRINT NAME

This permit becomes effective when the Federal official, designated to act for the Secretary of the Army, has signed below.

Tina B. Hadden — MAR 30 2010

(DISTRICT ENGINEER) — **(DATE)**

JASON A. KIRK, P.E.
or his Designee
Tina B. Hadden
Chief, Regulatory Division

When the structures or work authorized by this permit are still in existence at the time the property is transferred, the terms and conditions of this permit will continue to be binding on the new owner(s) of the property. To validate the transfer of this permit and the associated liabilities associated with compliance with its terms and conditions, have the transferee sign and date below.

(TRANSFEREE) — **(DATE)**

SPECIAL CONDITIONS FOR PERMIT #: 2009-00175-2IR

a. That the permittee agrees to provide all contractors associated with construction of the authorized activity a copy of the permit and drawings. A copy of the permit will be available at the construction site at all times.

b. That the permittee shall submit a signed compliance certification to the Corps within 60 days following completion of the authorized work and any required mitigation. The certification will include:
   1. A copy of this permit;
   2. A statement that the authorized work was done in accordance with the Corps authorization, including any general or specific conditions;
   3. A statement that any required mitigation was completed in accordance with the permit conditions;
   4. The signature of the permittee certifying the completion of the work and mitigation.

c. The permittee understands and agrees that, if future operations by the United States require the removal, relocation, or other alteration, of the structure or work herein authorized, or if, in the opinion of the Secretary of the Army or his authorized representative, said structure or work shall cause unreasonable obstruction to the free navigation of the navigable waters, the permittee will be required, upon due notice from the Corps of Engineers, to remove, relocate, or alter the structural work or obstructions caused thereby, without expense to the United States. No claim shall be made against the United States on account of any such removal or alteration.

d. It is recognized that this dredging is to be conducted on/or adjacent to an area subject to a prism and/or disposal easement held by the United States in perpetuity in conjunction with a Congressionally authorized project for the maintenance and improvement of the Charleston Harbor Federal Navigation
   Project. This permit does not convey any property rights either in real estate or material or any exclusive use privileges; nor does it relinquish any right the United States has for the use of its easement or the maintenance and future widening or deepening of the Charleston Harbor Federal Navigation Project pursuant to its easement rights.

e. Conveyance of this permit applies only to the dredging authorized and does not authorize the construction of any permanent structure or any structure suitable for habitation or any utility leading either to permanent structures suitable for habitation or to permanent structures within the bounds of areas on which the Corps of Engineers enjoys easement rights.

f. That permittee agrees that no permanent structures, beyond those authorized by this document, will be placed on the prism easement or on any adjacent disposal easement without written approval of the District Commander.

g. That the Secretary of the Army, representing the United States of America, hereby consents to the herein authorized dredging. The permittee shall not engage in any act which may interfere with or abridge the easement interests of the United States, except those specifically authorized herein.

h. That any Corps of Engineers Waterway Control Monument cannot be disturbed without first notifying this office 30 days in advance. After coordination with this office, a decision will be made as to the proper steps to be taken with regard to removing and relocating the monuments(s).

i. Approval of this permit will give Federal authorization for maintenance dredging for a period of ten years from the date of issuance provided all other special conditions are complied with.

j. That the permittee insures that the contractor is aware that it is the expectation of this office that environmentally responsible dredging take place at all times. It is noted that increased turbidity will occur with heavy overflow from the disposal area that contains high levels of Suspended Solids. Therefore, it is essential that care and diligence is taken to assure that the disposal area embankments are not breached, material overflow does not occur, and the spillway is properly and carefully maintained. The material should be pumped into the disposal area at such a rate as to allow settling at the spillway thereby minimizing suspended solids. The contractor is NOT allowed to pump into the disposal area whereby the effluent from the disposal area is mud or water with high levels of suspended solids. If this occurs the inspector should require that dredging operations halt immediately, take pictures immediately of the area in the immediate vicinity of the discharge pipe, and contact this office immediately.

k. That the permittee take both before- and after-dredging pictures of the area surrounding the spillway and provide them to this office within 30 days of completion of dredging.

l. That the permittee agrees that no placement or stockpiling of dredged material in Waters of the U.S. (double handling) will occur.

m. The permittee agrees that all efforts must be made to protect existing native riparian vegetation in and along shoreline areas.

n. The permittee understands and agrees to coordinate with the Corps and Charleston County to reimburse the fees required for mosquito control efforts including inspections and product application associated with the proposed disposal areas.

o. That the permittee agrees to conduct the work authorized herein in a manner that will not prevent or interfere with full and free use of the adjacent or nearby navigable waters of the United States by the boating public.

p. That the permittee must contact the United States Coast Guard to ascertain and assist in the issuance of a Notice to Mariners advising the boating public of the place and time that the dredging activity will be occurring.

q. That the permittee is responsible for properly installing and providing appropriate warning and marking devices to alert the boating public of any dangers (such as cables, anchors, buoys and other appurtenances) associated with the proposed dredging activity. All warning and marking devices must be marked and installed in accordance with United States Coast Guard standards.

r. That the permittee agrees to contact the Boating Division of the South Carolina Department of Natural Resources to advise them of the place and time that the dredging activity will be occurring. The permittee will solicit any information that the Department may have on local boating traffic patterns and activities in the project area. Such information will be used to facilitate dredging plant and appurtenances setup and operation to insure safe navigation through the area of work.

s. That three (3) months prior to the anticipated use of the disposal area, the permittee shall advise the

Chief, Project Management Division
U. S. Army Corps of Engineers
69A Hagood Avenue
Charleston, South Carolina 29403-5107

in writing, of the anticipated use of the area, the estimated yardage to be disposed of and a check or money order made payable to the Charleston District Finance and Accounting Officer for the amount necessary to cover the estimated yardage using the rate specified in the Consent Instrument prepared by the Real Estate Division, Savannah District and specifically referred to and defined in the paragraph below. The permittee's discharge shall not interfere with any on-going work, dredging, diking or dewatering within the proposed disposal area. Hence, the Government reserves the right to temporarily deny the use of the area, specify the location of the discharge line or whatever it deems necessary to protect the Government's interest.

t. That the permittee recognizes that this permit does not convey any real estate AND THAT PRIOR to further use of the disposal area authorized by this document a Consent Instrument addressing and defining the Governments interests in the disposal area must be executed with the Real Estate Division, Savannah District.

u. That the permittee acknowledges that failure to substantially comply with the provisions cited above will render this permit null and void.

v. In order to insure protection of West Indian Manatees that may enter the project area during dredging activities performed outside the winter months (November 1 thru February 15), the permittee will comply with the following:

    1. That the contractor will insure that all personnel associated with the project are made aware of the potential presence of manatees and the need to avoid collisions with them.

    2. That all construction personnel will be advised that there are civil and criminal penalties for harming, harassing, or killing manatees which are protected under the Marine Mammal Protection Act of 1972, the Endangered Species Act of 1973, and the Florida Manatee Sanctuaries Act of l978. The permittee is aware that it and/or contractor may be held responsible for any manatee harmed, harassed, or filled as a result of construction activities.

    3. That siltation barriers will be made of material in which manatees cannot become entangled, and properly secured, and are regularly monitored to avoid manatee entrapment. Barriers must not block manatee entry to or exit from essential habitat.

    4. That all vessels associated with the project will operate at "no wake/idle" speeds at all times while in water where the draft of the vessel provides less than four feet clearance from the bottom and that vessels will follow routes of deep water whenever possible.

    5. That if manatees are seen within 100 yards of the dredging area, all appropriate precautions shall be implemented to ensure protection of the manatees. These precautions shall include operating all equipment in such a manner that moving equipment does not come any closer than 50 feet of any manatee. Operation of any equipment closer than 50 feet to a manatee shall necessitate immediate shutdown of the equipment.

    6. That any collision with any/or injury of a manatee will be reported immediately to the S.C. Wildlife and Marine Resources department, Heritage Trust Section, (803) 844-2473.

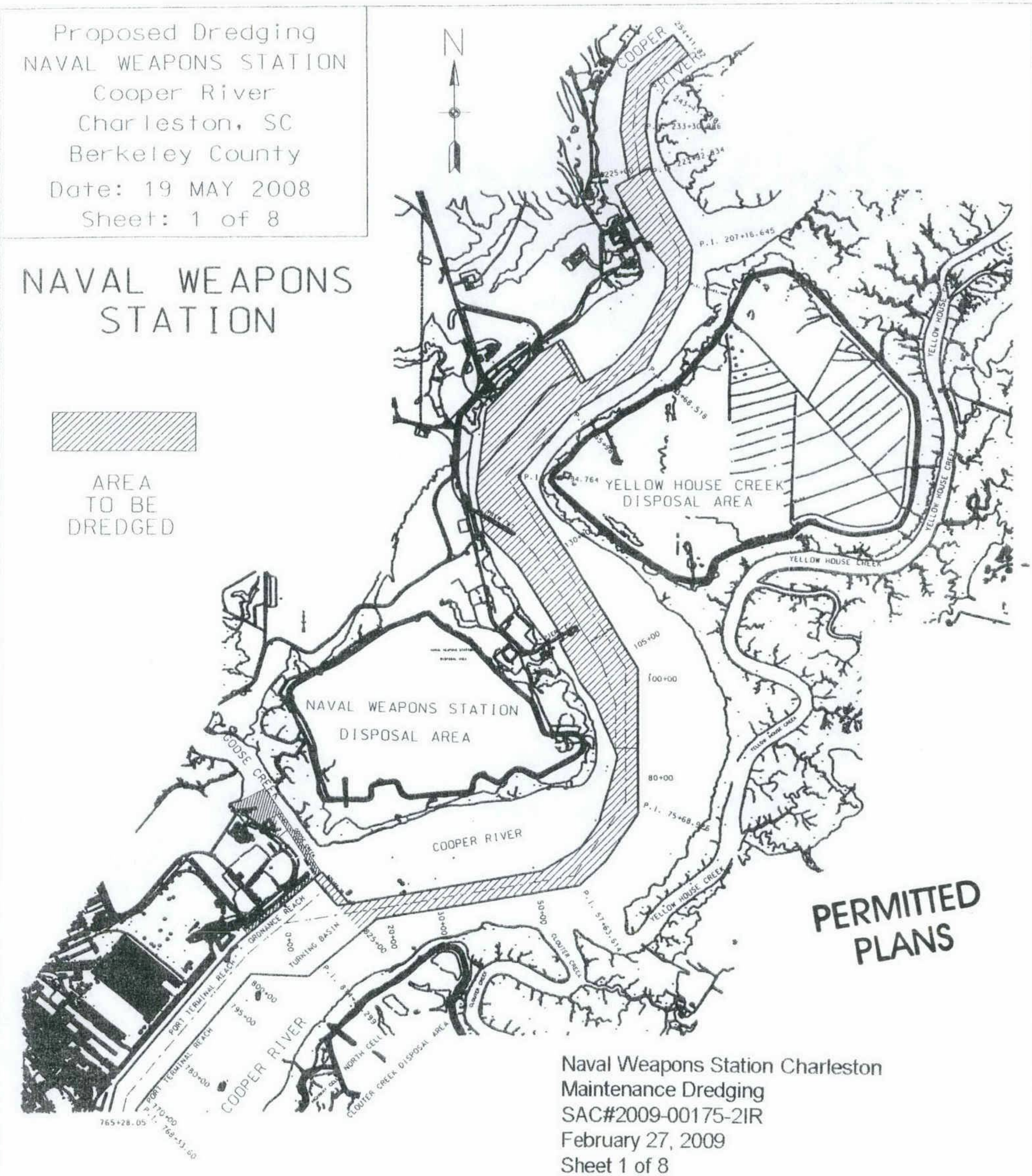
    7. That the contractor will maintain a log detailing sightings, collisions, or injuries to manatees should they occur during the contract period. Following project completion, a report summarizing incidents and sightings will be submitted to:

Mr. Barry Beasley
Heritage Trust Program Manager
S.C. Department of Natural Resource
1000 Assembly Street, Columbia, SC 29201-3117
P. O. Box 167, Columbia, SC 29202-0167

and

Ms. Nicole Adimey
U.S. Fish and Wildlife Service
North Florida Field Office
7915 Baymeadows Way, Suite 200
Jacksonville, FL 32256-7517

Proposed Dredging
NAVAL WEAPONS STATION
Cooper River
Charleston, SC
Berkeley County
Date: 19 MAY 2008
Sheet: 1 of 8



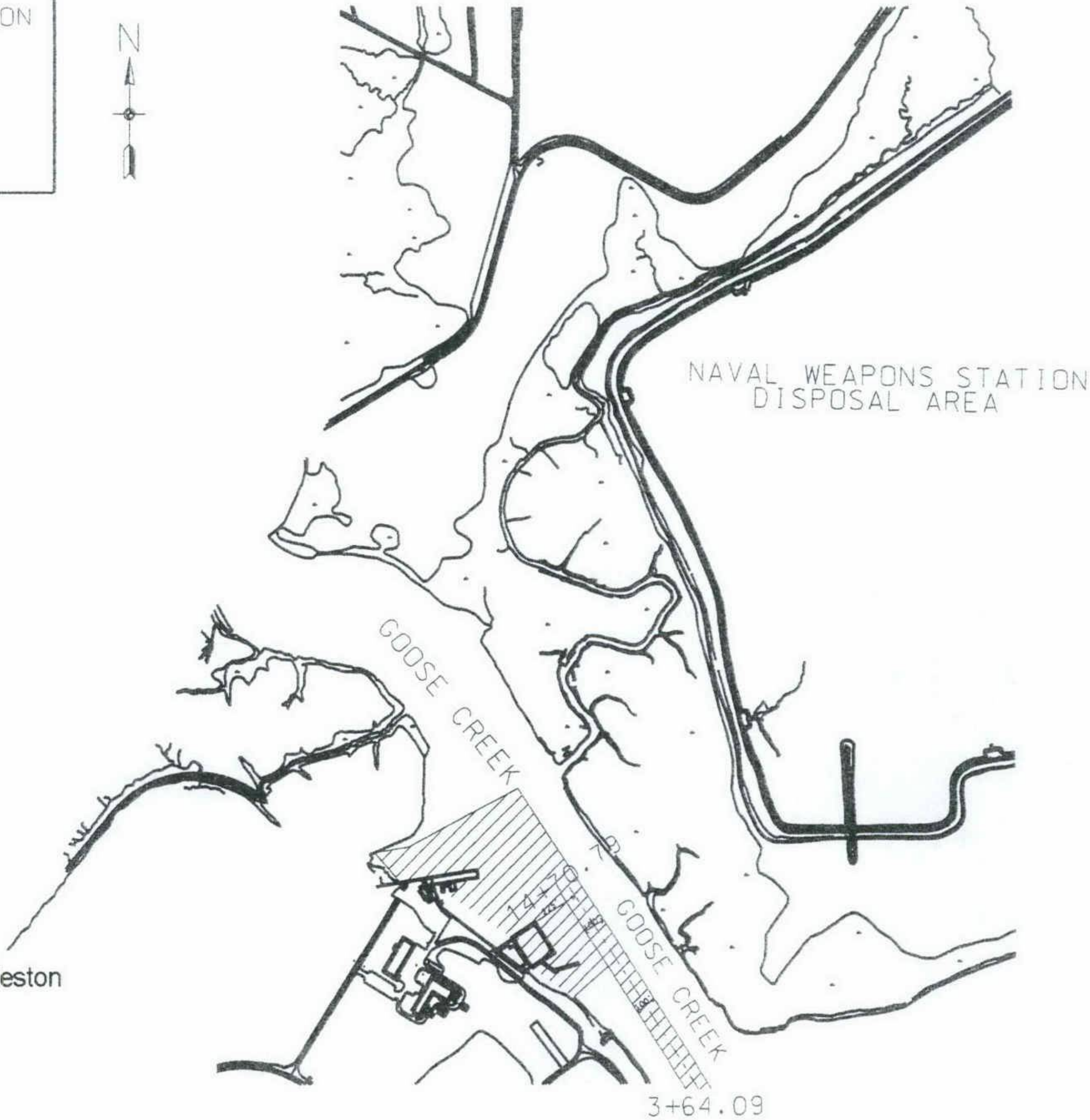
PERMITTED PLANS

Naval Weapons Station Charleston
Maintenance Dredging
SAC#2009-00175-2IR
February 27, 2009
Sheet 1 of 8

Proposed Dredging
NAVAL WEAPONS STATION
Cooper River
Charleston, SC
Berkeley County

Date: 19 MAY 2008
Sheet: 7 of 8

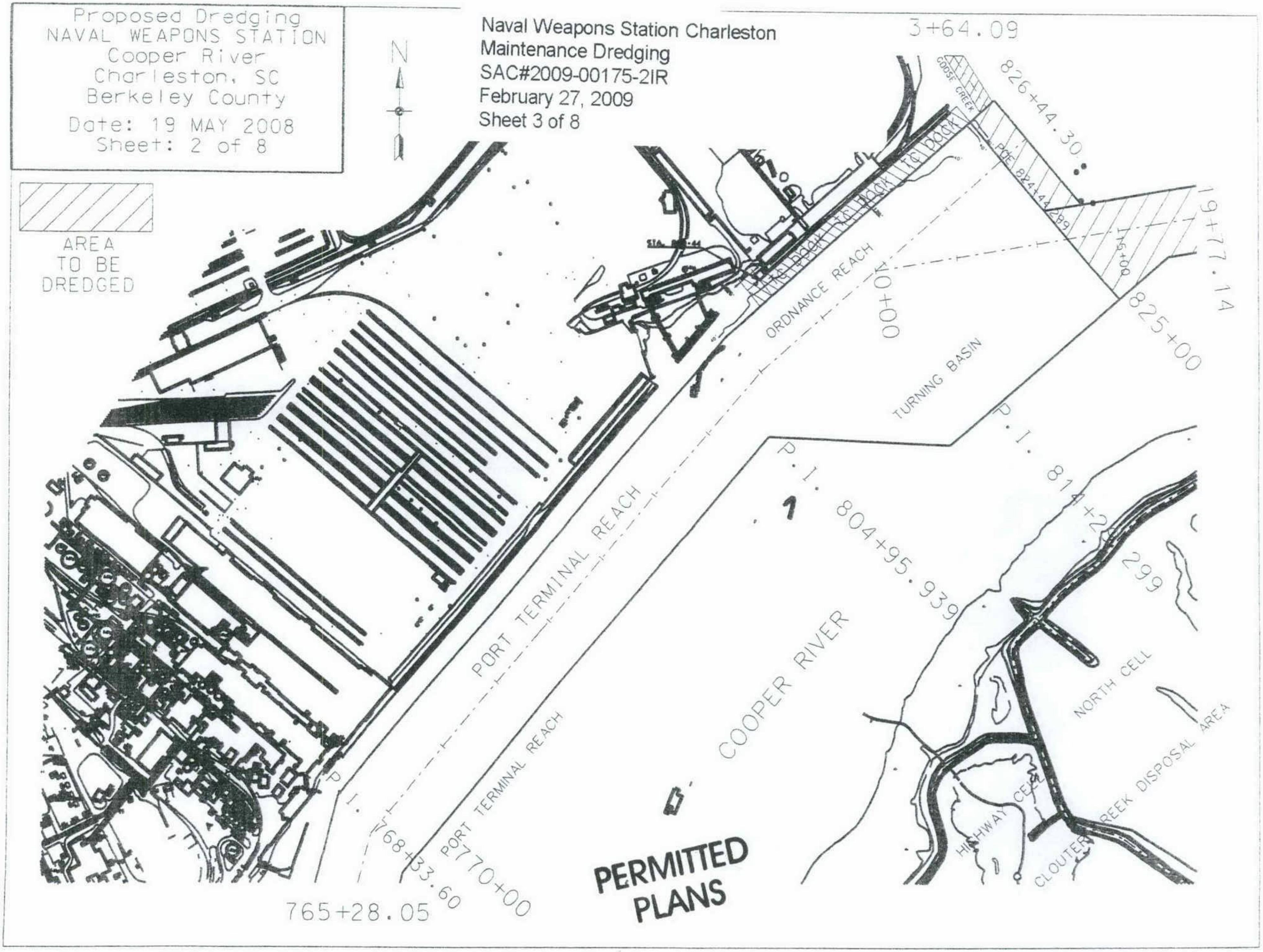
AREA
TO BE
DREDGED

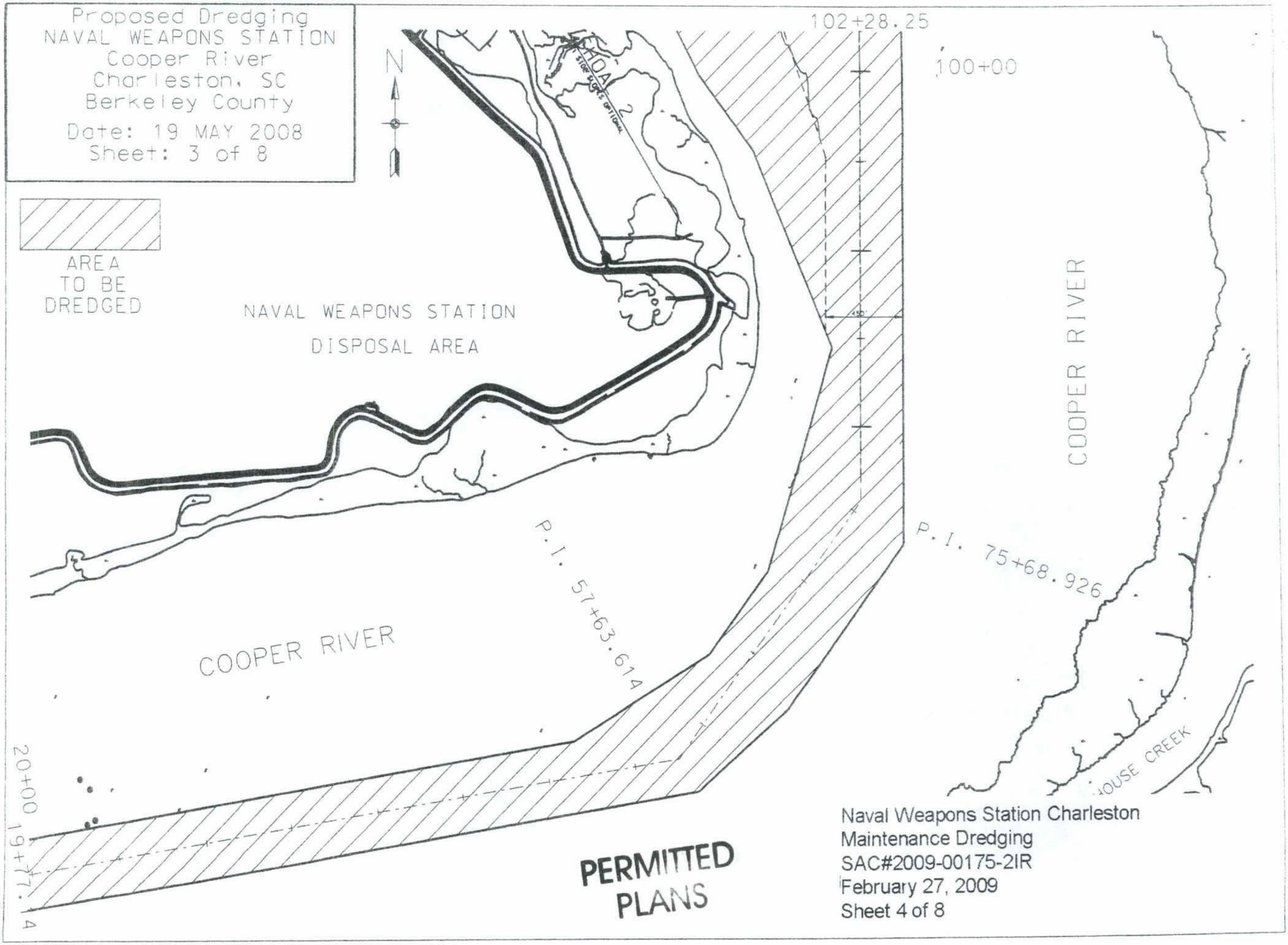


PERMITTED PLANS

Naval Weapons Station Charleston
Maintenance Dredging
SAC#2009-00175-2IR
February 27, 2009
Sheet 2 of 8

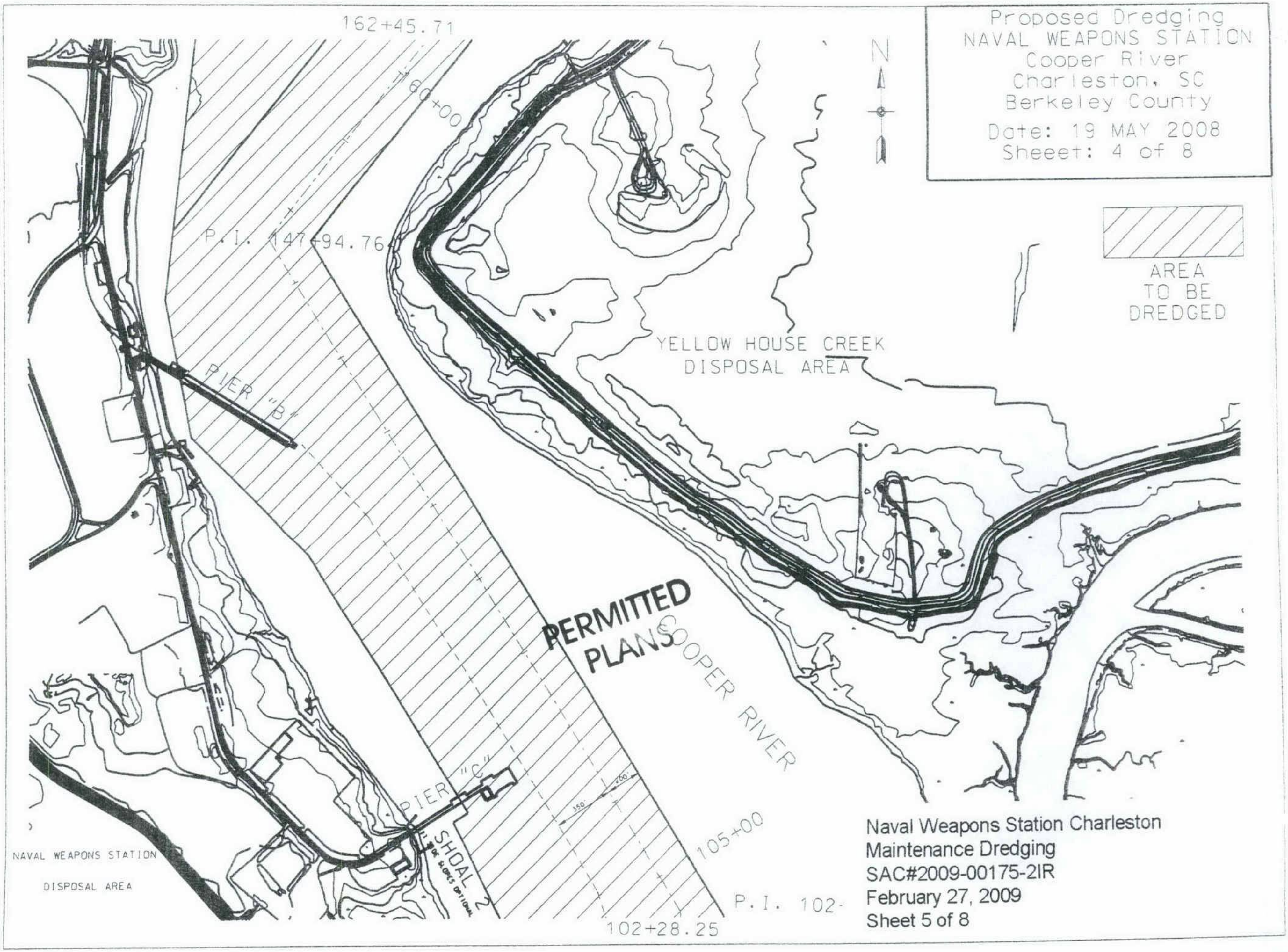
Naval Weapons Station Charleston
Maintenance Dredging
SAC#2009-00175-2IR
February 27, 2009
Sheet 3 of 8

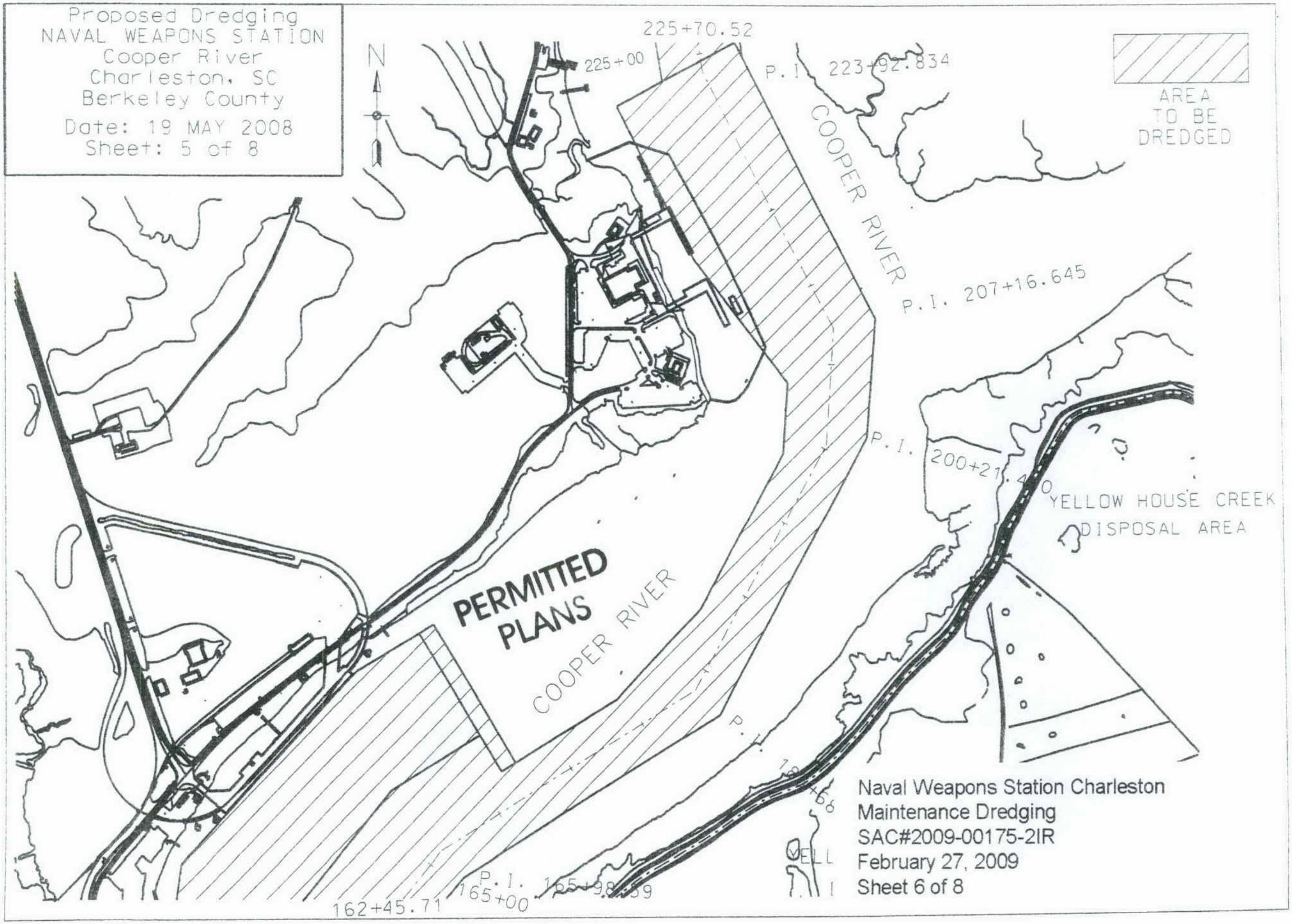




PERMITTED PLANS

Naval Weapons Station Charleston
Maintenance Dredging
SAC#2009-00175-2IR
February 27, 2009
Sheet 4 of 8

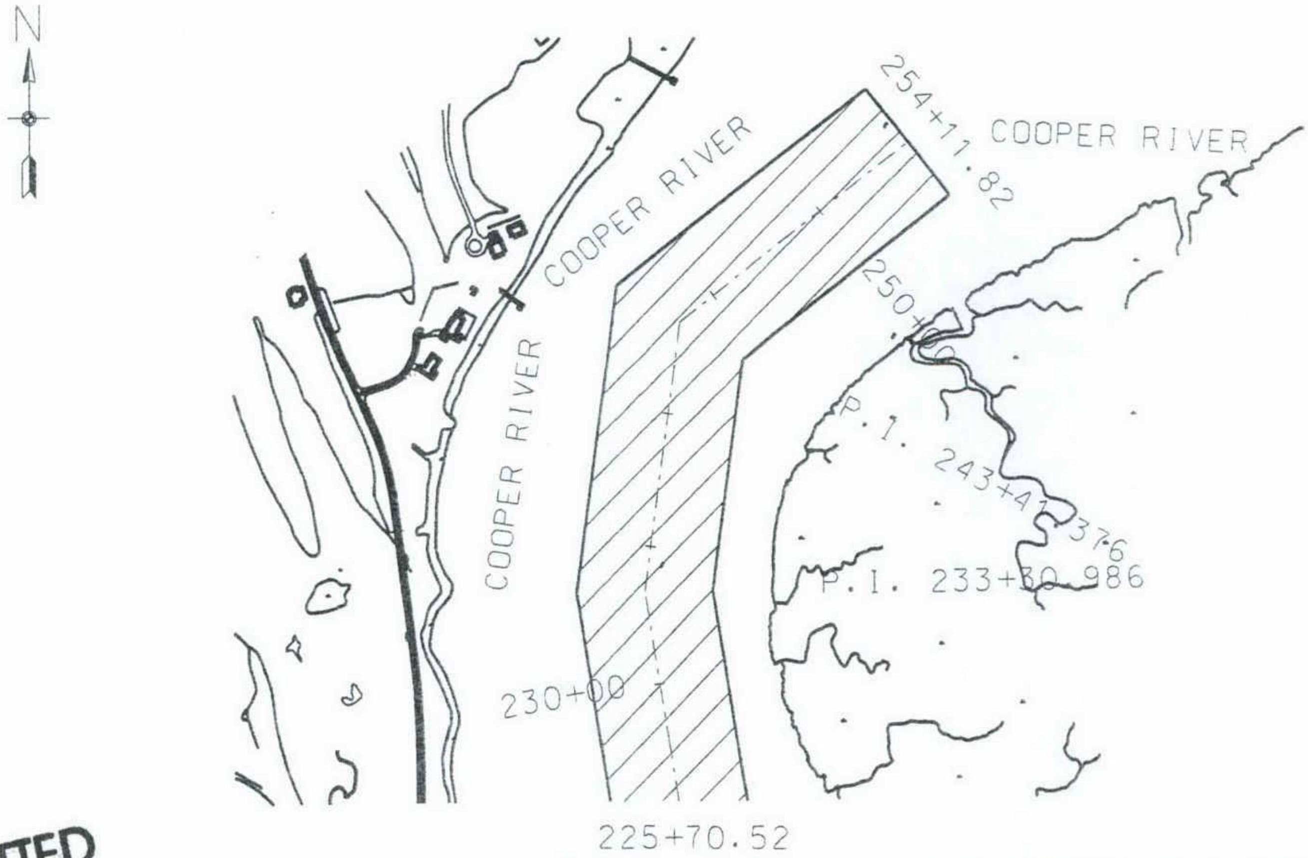

Proposed Dredging
NAVAL WEAPONS STATION
Cooper River
Charleston, SC
Berkeley County
Date: 19 MAY 2008
Sheeet: 4 of 8
N
AREA TO BE DREDGED
162+45.71
160+00
P.I. 147+94.76
PIER "B"
YELLOW HOUSE CREEK DISPOSAL AREA
PERMITTED PLANS
COOPER RIVER
PIER "C"
SHOAL 2
NAVAL WEAPONS STATION
DISPOSAL AREA
105+00
P.I. 102-
102+28.25
Naval Weapons Station Charleston
Maintenance Dredging
SAC#2009-00175-2IR
February 27, 2009
Sheet 5 of 8



Proposed Dredging
NAVAL WEAPONS STATION
Cooper River
Charleston, SC
Berkeley County
Date: 19 MAY 2008
Sheet: 5 of 8
N
225+70.52
225+00
P.I. 223+92.834
AREA TO BE DREDGED
COOPER RIVER
P.I. 207+16.645
P.I. 200+21.4
YELLOW HOUSE CREEK
DISPOSAL AREA
PERMITTED PLANS
COOPER RIVER
162+45.71
P.I.
165+00
Naval Weapons Station Charleston
Maintenance Dredging
SAC#2009-00175-2IR
February 27, 2009
Sheet 6 of 8

Proposed Dredging
NAVAL WEAPONS STATION
Cooper River
Charleston, SC
Berkeley County

Date: 19 MAY 2008
Sheet: 6 of 8



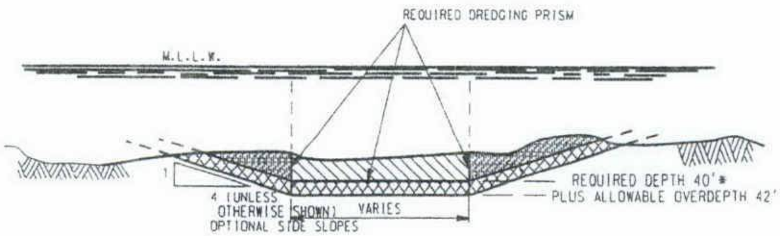
AREA
TO BE
DREDGED

Naval Weapons Station Charleston
Maintenance Dredging
SAC#2009-00175-2IR
February 27, 2009
Sheet 7 of 8

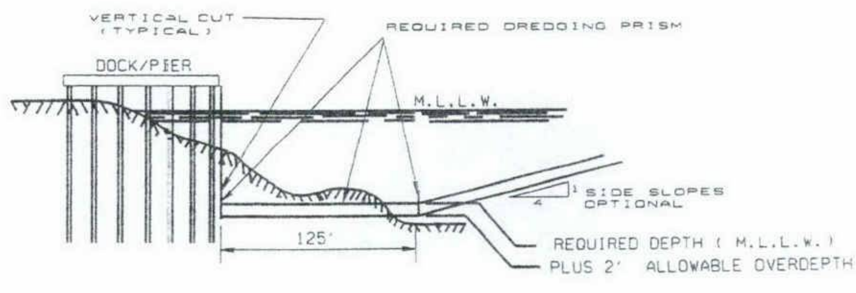
PERMITTED
PLANS

Proposed Dredging
NAVAL WEAPONS STATION
Cooper River
Charleston, SC
Berkeley County

Date: 19 MAY 2008
Sheet: 8 of 8



TYPICAL SECTION
NOT TO SCALE



NOT TO SCALE
TYPICAL SECTION
FOR DOCKS AND PIERS

REQUIRED DREDGING PRISM

ALLOWABLE OVERDEPTH

OPTIONAL SIDE SLOPE

* Exception:

Goose Creek Channel
Dredged to 25'

Naval Weapons Station Charleston
Maintenance Dredging
SAC#2009-00175-2IR
February 27, 2009
Sheet 8 of 8

PERMITTED
PLANS

APPENDIX B

Interagency/Intergovernmental Coordination
and Public Participation

SAMPLE SCOPING CORRESPONDENCE

-----Original Message-----
From: Ward, Bethney P CIV USARMY CESAC (US)
Sent: Friday, July 27, 2018 1:09 PM
To: Lorianne Riggin <RigginL@dnr.sc.gov>; Higgins, Jamie <Higgins.Jamie@epa.gov>; Preston, Heather <prestohs@dhec.sc.gov>; brownrj@dhec.sc.gov; Dan Burger (burgerdj@dhec.sc.gov) <burgerdj@dhec.sc.gov>; jcameron@charlestonpilots.com; justin.c.heck@uscg.mil; Hughes, Travis G CIV USARMY CESAC (US) <Travis.G.Hughes@usace.army.mil>; info@charlestonwaterkeeper.org; lori.dunn@sierraclub.org; Joy Brown <joy_brown@TNC.ORG>; Mark Messersmith (MMessersmith@scspa.com) <MMessersmith@scspa.com>; action@scccl.org; scwadw@ftc-i.net; ben@scwf.org
Cc: DavisS@dnr.sc.gov; militscher.chris@epa.gov; 'Stacie Crowe' <CroweS@dnr.sc.gov>; hightocw@dhec.sc.gov; Roberts, Nelson <robertln@dhec.sc.gov>; Chris Stout <stoutcm@dhec.sc.gov>; john.z.downing@uscg.mil; marianne.andrews2@BP.com; Coller-Socha, Robin D CIV USARMY CESAC (US) <Robin.C.Socha@usace.army.mil>; EPSTEIN, MARK A GS-12 USAF AMC 628 CES/CENP <mark.epstein@us.af.mil>; Perkins, Diane C CIV USARMY CESAC (US) <Diane.Perkins@usace.army.mil>
Subject: Joint Base Charleston Maintenance Dredging -- Scoping Phase (UNCLASSIFIED)

CLASSIFICATION: UNCLASSIFIED

Please see the attached request for input on scoping of the U.S. Air Force's project for Maintenance Dredging 2020-2030 at Joint Base Charleston in Berkeley County, South Carolina. A description of the proposed project is also attached. Your written input is appreciated by August 27, 2018.

Thank you,
Bethney Ward

Bethney Ward
Biologist; Planning and Environmental Branch U.S. Army Corps of Engineers, Charleston District 69A Hagood Avenue Charleston, SC 29403
(843) 329-8162
Bethney.P.Ward@usace.army.mil

DEPARTMENT OF THE ARMY
U.S. ARMY CORPS OF ENGINEERS, CHARLESTON DISTRICT
69 A HAGOOD AVENUE
CHARLESTON SC 29403-5107

July 26, 2018

SUBJECT: Joint Base Charleston Maintenance Dredging – Scoping Phase

To Whom It May Concern:

The U.S. Army Corps of Engineers (USACE) is preparing an Environmental Assessment for the U.S. Air Force (USAF), the action proponent, to conduct maintenance dredging of the Joint Base Charleston channels from 2020 to 2030. The permit issued by USACE that currently authorizes maintenance dredging expires on March 30, 2020. The purpose of this letter is to seek scoping comments to assist us in analyzing the action in accordance with the National Environmental Policy Act (NEPA) of 1969.

The Environmental Assessment will assess the potential environmental effects of the proposed action for maintenance dredging. Please find enclosed a description of the proposed action and of other action alternatives being considered. Maps showing the location of the action area are included. Based on the information enclosed, the USACE respectfully requests that your office identify any specific information, issues, or concerns that should be considered in the Environmental Assessment and the project scoping process. We would appreciate your comments by August 27, 2018.

If you have any questions about the proposed action, please contact Mr. Mark Epstein at (843) 963-1458 or via email at Mark.Epstein@us.af.mil.

Written comments or information to be considered should be sent to Ms. Bethney Ward at U.S. Army Corps of Engineers Charleston District, 69A Hagood Avenue, Charleston, SC 29403, or via email at Bethney.P.Ward@usace.army.mil. Your assistance in scoping of the project is greatly appreciated.

Sincerely,

Diane C. Perkins, AICP
Chief, Planning & Environmental Branch

Enclosure

SCOPING RESPONSES

-----Original Message-----
From: Coller-Socha, Robin D CIV USARMY CESAC (US)
Sent: Monday, July 30, 2018 10:42 AM
To: Ward, Bethney P CIV USARMY CESAC (US) <Bethney.P.Ward@usace.army.mil>
Subject: RE: Joint Base Charleston Maintenance Dredging -- Scoping Phase (UNCLASSIFIED)

Hey Bethany,
Appears to be standard dredging activity. Looks like there is a new area being proposed for dredging, an area that is being included that hasn't been dredged in over two decades, and areas that are going deeper than previously permitted. That being said, if sediment testing has not been conducted on the material proposed for dredging, it may be required prior to issuance of a new permit.

-Robin

-----Original Message-----
From: Heck, Justin LT [mailto:Justin.C.Heck@uscg.mil]
Sent: Monday, August 13, 2018 2:12 PM
To: Ward, Bethney P CIV USARMY CESAC (US) <Bethney.P.Ward@usace.army.mil>
Subject: RE: Joint Base Charleston Maintenance Dredging -- Scoping Phase (UNCLASSIFIED)

Ms. Ward,

Would it be possible for this action to cover any necessary movement of ATON that would be directly related to the project?

I hope doing this would benefit all parties by alleviating the Coast Guard from duplicating the NEPA process for areas covered under the Corps permit. Please advise.

Regards,

Justin Heck
Sector Charleston
Waterways Management Division
P: 843-740-3184
C: 843-323-7761

South Carolina Department of
Natural Resources

PO Box 12559
Charleston, SC 29422
843.953.9092 Office
843.953.9399 Fax
Crowes@dnr.sc.gov

Alvin A. Taylor
Director
Lorianne Riggin
Director, Office of
Environmental Programs

August 27, 2018

Ms. Bethney Ward
U.S. Army Corps of Engineers
Charleston District
69A Hagood Avenue
Charleston, SC 29403

RE: Joint Base Charleston Maintenance Dredging, Scoping Phase

Dear Ms. Ward:

The South Carolina Department of Natural Resources (SCDNR) has reviewed the Notice of Scoping for the proposed action referenced above and offers the following comments:

We understand that the U.S. Army Corps of Engineers is preparing an Environmental Assessment (EA) for the U.S. Air Force to conduct maintenance dredging of the Joint Base Charleston (JBC) from 2020 to 2030. The project involves maintenance dredging of up to 2,000,000 cubic yards (cy) of material per year using hydraulic cutterhead or mechanical clamshell dredging methods. Materials would be placed into one or more existing upland placement areas. The new request seeks authorization for maintenance dredging of the vessel navigation/berthing areas covered under the existing permit (permit no. 2001-00175-2IR) as well as new areas at Pier C and the inside/shoreside area of Pier X. The purpose for the action is to provide and sustain sufficient depth for navigation and berthing of military vessels that support JBC waterborne missions.

SCDNR commented on previous dredging projects in 1999 and 2009 (letters dated February 17, 1999 and April 2, 2009), and on associated Sediment Sampling and Analysis Reports. In these reviews, we expressed concerns regarding the results of bulk sediment testing, which showed exceedances of conservative ecological screening values for various metals as well as total dioxin/furan TEQ values. In light of these exceedances, the DNR recommended that appropriate precautions be taken to minimize the exposure of aquatic and terrestrial wildlife to the dredged materials. Such precautions might include placing a surface to bottom turbidity curtain around the dredging operation and mixing or covering the dredged material placed in the upland disposal areas with cleaner sediment to limit exposure.

SCDNR appreciates the opportunity to comment on the Notice of Scoping for this project and asks that the above concerns and recommendations regarding sediment contamination are taken into consideration in the preparation of an EA for this project. If you have any questions regarding these comments, please contact me by phone (843-953-9092) or by e-mail (crowes@dnr.sc.gov).

Sincerely,

Stacie Crowe
Office of Environmental Programs

SOUTH CAROLINA DEPARTMENT OF ARCHIVES & HISTORY

EST. 1905

February 6, 2019

Andrea Hughes
Biologist, Planning and Environmental Branch
U.S. Army Corps of Engineers, Charleston District
69A Hagood Ave
Charleston, SC 29403

Re: Joint Base Charleston Maintenance Dredging – Scoping Phase
Berkeley County, South Carolina
SHPO Project No. 19-KL0015

Dear Andrea Hughes:

Thank you for your email of January 23, 2019 regarding the above-referenced proposed undertaking. The State Historic Preservation Office (SHPO) is providing comments to the U.S. Army Corps of Engineers (Corps) pursuant to Section 106 of the National Historic Preservation Act and its implementing regulations, 36 CFR 800. Consultation with the SHPO is not a substitution for consultation with Tribal Historic Preservation Offices, other Native American tribes, local governments, or the public.

Our office defers to the expertise of the Office of the State Underwater Archaeologist for undertakings that may include submerged resources and would concur with their recommendation that no additional submerged cultural resources survey is needed in the project area.

Please contact Ryan Bradley at 803-576-6565 or rbradley@sc.edu or Jim Spirek at 803-576-6566 or spirek@sc.edu if you have any questions or require additional information about this recommendation.

If archaeological materials are encountered during construction, the procedures codified at 36 CFR 800.13(b) will apply. Archaeological materials consist of any items, fifty years old or older, which were made or used by man. These items include, but are not limited to, stone projectile points (arrowheads), ceramic sherds, bricks, worked wood, bone and stone, metal and glass objects, and human skeletal materials. The federal agency or the applicant receiving federal assistance should contact our office and the Office of the State Underwater Archaeologist immediately.

Please refer to SHPO Project Number 19-KL0015 in any future correspondence regarding this project. If you have any questions, please contact me at (803) 896-6181 or KLewis@scdah.sc.gov.

Sincerely,

Keely Lewis
Archaeologist
State Historic Preservation Office

cc: Ryan Bradley, MRD
Jim Spirek, MRD

-----Original Message-----
From: HUGHES, ANDREA W CIV USARMY CESAC (US)
Sent: Wednesday, February 6, 2019 2:21 PM
To: 'Lewis, Keely' <KLewis@scdah.sc.gov>
Subject: RE: Joint Base Charleston (UNCLASSIFIED)

Thanks Keely! I attached some of the original information that went out with the scoping letter in case it would be useful.

-----Original Message-----
From: Lewis, Keely [mailto:KLewis@scdah.sc.gov]
Sent: Wednesday, February 6, 2019 2:20 PM
To: HUGHES, ANDREA W CIV USARMY CESAC (US) <Andrea.W.Hughes@usace.army.mil>
Subject: [Non-DoD Source] RE: Joint Base Charleston (UNCLASSIFIED)

Hi Andrea,

Yes, I will have a letter over to you shortly.

Best,

Keely

-----Original Message-----
From: HUGHES, ANDREA W CIV USARMY CESAC (US) [mailto:Andrea.W.Hughes@usace.army.mil]
Sent: Tuesday, February 05, 2019 1:59 PM
To: Lewis, Keely <KLewis@scdah.sc.gov>
Subject: RE: Joint Base Charleston (UNCLASSIFIED)

HI Keely,

Thanks so much. I hate to add anything to your workload but JBC is asking for written concurrence from SHPO regarding the SCIAA recommendation that no additional submerged cultural resources survey is needed in the project area. Would you be able to provide me with a letter?

Thanks,

Andrea

Andrea W. Hughes
Biologist, Planning and Environmental Branch
U.S. Army Corps of Engineers, Charleston District
69-A Hagood Avenue Charleston, South Carolina 29403
843.329.8145

-----Original Message-----

From: HUGHES, ANDREA W CIV USARMY CESAC (US) [mailto:Andrea.W.Hughes@usace.army.mil]

Sent: Wednesday, January 23, 2019 9:43 AM

To: Lewis, Keely <KLewis@scdah.sc.gov>

Subject: RE: Joint Base Charleston (UNCLASSIFIED)

CLASSIFICATION: UNCLASSIFIED

Hi Keely,

I'm working on the environmental assessment for the JBC dredging project for the Planning Division. As mentioned below, the project involves maintenance dredging of the JBC navigational channels and berths and placement of the dredged material in established upland placement areas. There were no resources identified for the current permit that will expire in 2020 and the survey for the Pier X environmental assessment did not find evidence of any archaeological resources. Based on the information below, do you concur there would be no effect to resources? (JBC is coordinating with tribal interests.) Please let me know if you would like me to provide additional information or discuss via phone.

Thanks,

Andrea

Andrea W. Hughes

Biologist, Planning and Environmental Branch

U.S. Army Corps of Engineers, Charleston District

69-A Hagood Avenue Charleston, South Carolina 29403

843.329.8145

-----Original Message-----

From: BRADLEY, RYAN [mailto:RBRADLEY@sc.edu]

Sent: Thursday, January 17, 2019 9:07 AM

To: HUGHES, ANDREA W CIV USARMY CESAC (US) <Andrea.W.Hughes@usace.army.mil>

Cc: Lewis, Keely <KLewis@scdah.sc.gov>; SPIREK, JIM <SPIREKJ@mailbox.sc.edu>

Subject: [Non-DoD Source] RE: Joint Base Charleston - survey question (UNCLASSIFIED)

Ms. Hughes,

My name is Ryan Bradley underwater archaeologist with the South Carolina Institute of Archaeology and Anthropology's Maritime Research Division, and I am responsible for reviewing compliance reports as they pertain to submerged cultural resource surveys in accordance with Section 106. In response to your inquiry, we do not see the need for a survey of the proposed dredging sites as they are depicted on the map provided to us by your office. However, in the event that any project activities expose potential submerged cultural material, we ask that dredging activities cease operation in the immediate vicinity and contact is made with the South Carolina SHPO or our office concerning the content and nature of the site. Please direct future correspondence concerning review and compliance inquiries to this email.

Thank you,

Ryan Bradley

Underwater Archaeologist

Maritime Research Division

South Carolina Institute of Archaeology and Anthropology College of Arts and Sciences University of South Carolina

1321 Pendleton Street

Columbia SC 29208 USA

Phone: (803) 576-6565

Fax: (803) 254-1338

E-mail: rbradley@sc.edu

Maritime Research Division Website: BlockedBlockedBlockedBlockedhttp://artsandsciences.sc.edu/sciaa/mrd/

Follow MRD on Facebook: @MaritimeResearchDivision SCIAA Website: BlockedBlockedBlockedBlockedhttp://www.cas.sc.edu/sciaa/

Follow SCIAA on Facebook: @SCIAAOfficial

From:	HUGHES, ANDREA W CIV USARMY CESAC (US)
To:	"spirekj@mailbox.sc.edu"
Subject:	Joint Base Charleston - survey question (UNCLASSIFIED)
Date:	Tuesday, January 8, 2019 11:26:00 AM
Attachments:	JBC Dreding Locations.pdf

CLASSIFICATION: UNCLASSIFIED

Hi,

I am employed with the Corps of Engineers in the Charleston District and I am currently working on an Environmental Assessment (EA) for Joint Base Charleston. Alan Shirey recommended that I contact you to determine if a survey will be required for the project. The project involves maintenance dredging of the JBC navigation channels and associated berthing areas as well as a new area at Pier C and a new area inside/shoreside area of Pier X. Dredging of these areas is necessary to maintain current depths and meet new dredging requirements.

Background Information:

Joint Base Charleston in Berkeley County, South Carolina has performed routine dredging along approximately 4.8 miles of the Cooper River and along approximately 0.4 miles of Goose Creek from the confluence of the Cooper River since the 1940s. Dredging is performed to provide sufficient depth for navigation and berthing of Department of Navy, Military Sealift Command, Defense Fuels Supply Depot, Department of Army, Department of Air Force, and Department of Energy vessels that support JBC waterborne missions. The Naval Weapons Station Charleston (now known as Joint Base Charleston) currently holds a permit from the U.S. Army Corps of Engineers (USACE) and South Carolina Department of Health and Environmental Control (SCDHEC) to conduct maintenance dredging of the channels and several berthing areas.

The USACE, Charleston District issued permit no. 2009-00175-2IR for the existing maintenance dredging in March 2010. In 2011, the permit was modified to include dredging of a small area outside/riverside of Pier X to obtain the depths necessary for vessels to dock at this pier. Additionally, a Supplemental EA was prepared and a Finding of No Significant Impact was signed in 2018 for an approximate 2 acre area inside/shoreside of Pier X in need of dredging that was not covered in the existing dredging permit. The current permit will expire on 31 March 2020, and the action proponent, the U.S. Air Force on behalf of JBC, intends to apply for a new 10-year permit that will authorize maintenance dredging for another ten years.

I've attached a map depicting the proposed dredging locations. Please let me know if you need additional information to determine if a survey will be required or if you would like to discuss via a phone conference. I greatly appreciate your assistance in this matter.

Regards,

Andrea

Andrea W. Hughes
Biologist, Planning and Environmental Branch
U.S. Army Corps of Engineeers, Charleston District
69-A Hagood Avenue
Charleston, South Carolina 29403
843.329.8145

CLASSIFICATION: UNCLASSIFIED

APPENDIX C

Air Quality Analysis

AIR QUALITY ANALYSIS

Emission Sources

The marine emission sources such as dredges and the associated support equipment, was derived from EPA's extensive compilation of air emission factors for various types of equipment (Compilation of Air Emission Factors, AP-42, 5th Edition, USEPA 1995). The latest EPA technical report for developing load factors and emission factors for large compression-ignition marine diesel engines is given in the *Analysis of Commercial Marine Vessels Emissions and Fuel Consumption Data*; EPA 420-R-00-002, published February 2000. The technical report is a compilation of engine and fuel usage test data from various types of marine vessels, including bulk carriers, container ships, dredges, tankers, and tugboats. This report was employed in the determination of the load factors and emission factors for the various types of marine and construction support equipment that would be operational during construction of the proposed maintenance of the JCB Navigation Channel and Berthing Areas, as described within the recommended plan of this EA. The marine emission factors can be found in Table 1 below.

Equipment Use Parameters

This EA estimates air pollution emissions from construction operations for the recommended plan. In estimating the project's potential marine emissions, a marine equipment list including engine specifications [horsepower (hp)] was developed. The marine operations are comprised primarily of one hydraulic/cutter suction dredge or a mechanical/clamshell type dredge, up to 2,500 hp. Since upland disposal of dredged material is expected for the maintenance material, supporting construction equipment was also considered for potential air quality impacts. Bulldozers (436 hp), Excavators (524 hp) and tractors (193 hp) would be required to support the movement of material and maintenance of the upland disposal sites, associated with each dredging cycle. Emission rates for each applicable criteria pollutant CO, NO_x, $PM_{2.5}$, PM_{10}, SO_x, and VOCs were calculated in tons per hour. Each sources' (engine) emission rate was derived from the following formula:

*Emission Rate (tons/hr) = Engine Horsepower × Engine Load Factor × Emission Factor***

The marine equipment's engine load factors were estimated from the USEPA technical report *Analysis of Commercial Marine Vessels Emissions and Fuel Consumption Data* incorporating each source's suggested operating mode. A conservative time-averaged load factor of 75% of total power capacity was used during dredging operations. Dredging is expected to be completed over a 4-month period and necessary every 15 months, comprised of a 24-hr, 7-day per week operation. Additional construction and maintenance of the upland disposal sites would require approximately the following equipment hours per cycle:

- Dredging: 2,920 hours of dredging.
- JBC PA Ditching: 4,050 hours of long reach excavators and 1,350 hours of bulldozer support.
- JBC Dike Raising: 3,120 long reach excavator hours, 3,120 bulldozer support hours, and 3,120 tractor hours.
- YHC PA Ditching: 2,096 excavator hours and 1,350 bulldozer hours.
- YHC PA Dike Raising: 6,420 excavator hours, 3,120 bulldozer hours, and 3,120 tractor support hours.

** See Page 6 for emissions factors.

The annual hours of operation were developed for each piece of marine and construction equipment over the anticipated construction cycle. Potential criteria air pollutant quantities emitted were calculated based on the following formula:

Emission Amount (tons/year) = Emission Rate (tons/hour) × Working Hours (hours/year)

Table 1. Marine Emission Factors

Marine Engine Emission Factors		
Pollutant	Emission Rate (g/kW-hr)	lb/hp-hr
PM	0.272	0.0004
NOx	10.805	0.0175
NO2	16.058	0.0260
SO2	1.832	0.0030
CO	1.676	0.0027
VOC	0.189	0.0003

EPA, 2000

Emission Results

The criteria air pollutants emissions presented in Tables 2 - 6 below represent the estimated total of direct and indirect emissions that would occur during the Joint Base Charleston Recommended Plan construction cycle, determined for each project component.

Table 2. Estimated Emissions (tons) for Maintenance Dredging

Equipment	Capacity (hp)	Annual (hrs)	Pollutants (tons/yr)					
			CO	No_x	$PM_{2.5}$	PM_{10}	SO_x	VOC
Dredge	2,500	2,920	7.39	47.91	1.10	1.10	8.21	0.82
Bulldozer	436	487	0.68	0.04	0.06	0.06	0.12	0.12
Excavator	524	487	0.83	1.73	0.08	0.08	0.15	0.150
Total			8.90	49.68	1.23	1.23	8.49	1.09

Table 3. Estimated Emissions (tons) for JBC PA Ditching

Equipment	Capacity (hp)	Annual (hrs)	Pollutants (tons/yr)					
			CO	NO_x	$PM_{2.5}$	PM_{10}	SO_x	VOC
Excavators (3)	524	1,572	2.67	5.59	0.24	0.24	0.49	0.49
Bulldozer	436	1,350	1.88	3.93	0.17	0.17	0.34	0.34
Total			4.55	9.51	0.41	0.41	0.83	0.83

Table 4. Estimated Emissions (tons) for JBC Dike Raising

Equipment	Capacity (hp)	Annual (hrs)	Pollutants (tons/yr)					
			CO	NO_x	$PM_{2.5}$	PM_{10}	SO_x	VOC
Excavator	524	3,120	5.31	11.09	0.48	0.48	0.96	0.96
Bulldozers	436	3,120	4.34	9.07	0.39	0.39	0.79	0.79
Tractor	193	3,120	1.16	3.03	0.14	0.14	0.29	0.29
Total			10.80	23.20	1.02	1.02	2.04	2.04

Table 5. Estimated Emissions (tons) for YHC PA Ditching

Equipment	Capacity (hp)	Annual (hrs)	Pollutants (tons/yr)					
			CO	NO_x	$PM_{2.5}$	PM_{10}	SO_x	VOC
Excavators (4)	524	2,096	3.56	7.45	0.32	0.32	0.65	0.65
Bulldozer	436	1,350	1.88	3.93	0.17	0.17	0.34	0.34
Total			5.44	11.38	0.49	0.49	0.99	0.99

Table 6. Estimated Emissions (tons) for YHC PA Dike Raising

Equipment	Capacity (hp)	Annual (hrs)	Pollutants (tons/yr)					
			CO	NO_x	$PM_{2.5}$	PM_{10}	SO_x	VOC
Excavators	524	3,120	5.31	11.09	0.48	0.48	0.96	0.96
Excavators	524	3,120	5.31	11.09	0.48	0.48	0.96	0.96
Bulldozer	436	3,120	4.34	9.07	0.39	0.39	0.79	0.79
Tractor	193	3,120	1.16	3.03	0.14	0.14	0.29	0.43
Total			14.95	31.26	1.36	1.36	2.72	2.72

The criteria air pollutant emissions presented in Table 7 below represent the potential direct and indirect emission estimates occurring during the proposed Joint Base Charleston Recommended Plan.

Table 7. Total Estimated Emissions (tons) for All Project Components

Location	Approx. Duration (Months)	CO	No_x	$PM_{2.5}$	PM_{10}	SO_x	VOC
Dredging	4	8.90	49.68	1.23	1.23	8.49	1.09
JBC PA Ditching	4	4.55	9.51	0.41	0.41	0.83	0.83
JBC Dike Raising	12	10.80	23.20	1.02	1.02	2.04	2.04
YHC PA Ditching	4	5.44	11.38	0.49	0.49	0.99	0.99
YHC PA Dike Raising	12	14.95	31.26	1.36	1.36	2.72	2.72
Total		**44.64**	**125.03**	**4.52**	**4.52**	**15.06**	**7.67**

Carbon Dioxide Emissions

Carbon Dioxide emissions were calculated based on the Intergovernmental Panel on Climate Change (IPCC) guidelines for calculating emissions inventories. This requires that an oxidization factor be applied to the carbon content to account for a small portion of the fuel that is not oxidized into CO2. For all oil and oil products, the oxidation factor used is 0.99 (99 percent of the carbon in fuel is eventually oxidized, while 1 percent remains un-oxidized). Table 8 presents total emissions for all project components. Supporting data for CO2 emissions is provided on page 5.

Table 8. Carbon Dioxide (CO_2) Emissions for All Project Components

Project Activity	Fuel Consumption (gal)	Emissions CO_2 (lbs)
Dredging	376,391	8,355,880
JBC PA Ditching	37,568	834,010
JBC Dike Raising	124,410	2,761,902
YHC PA Ditching	43,790	972,138
YHC PA Dike Raising	161,460	3,584,412
Total	743,619	16,508,342

CO_2 emissions from a gallon of diesel = 2,778 grams x 0.99 x (44/12) = 10,084 grams = 10.1 kg/gallon = 22.2 pounds/gallon

Note: These calculations and the supporting data have associated variation and uncertainty. EPA may use other values in certain circumstances, and in some cases it may be appropriate to use a range of values.

CO2 Emissions Supporting Data

Green house gas emissions (C02) is 22.2 lb of CO2 per gallon of diesel burnt.
Hourly consumption estimated from Owning & Operating Costs, http://nheri.ucsd.edu/facilities/docs/Performance_Handbook_416C.pdf
The calculated fuel consumption taken to be 0.38 lb. of fuel per hour per applied horsepower.

22.2

Equipment	Horsepower	Annual Hrs	Ave. Fuel Consumption (gal/hr)	Total Fuel Consumption	CO2	CO2/Mo
Dozer	436	9,427	14	131,973	2,929,808	244,151
Tractor	193	6,240	14	87,360	1,939,392	161,616
Excavator	524	13,515	12	160,487	3,562,804	296,900
Dredges	2,500	2,920	129	376,391	8,355,875	696,323
Total				**756,211**	**16,787,879**	**1,398,990**

	gallons
Dredging	376,391
JBC PA Ditching	37,568
JBC Dike Raising	124,410
YHC PA Ditching	43,790
YHC PA Dike Raising	161,460

Equipment	Fuel Consumption (gal)	CO_2	Emissions CO_2/Mo
Dozer	131,973	2,929,808	244,151
Tractor	87,360	1,939,392	161,616
Excavator	136,040	3,020,088	251,674
Dredges	376,391	8,355,875	696,323
Total	**731,764**	**16,245,163**	**1,353,764**

Project Activity	Fuel Consumption (gal)	Emissions CO_2 (lbs)
Dredging	376,391	8,355,880
JBC PA Ditching	37,568	834,010
JBC Dike Raising	124,410	2,761,902
YHC PA Ditching	43,790	972,138
YHC PA Dike Raising	161,460	3,584,412
Total	743,619	16,508,342

CO_2 emissions from a gallon of diesel = 2,778 grams x 0.99 x (44/12) = 10,084 grams = 10.1 kg/gallon = 22.2 pounds/gallon

Note: These calculations and the supporting data have associated variation and uncertainty. EPA may use other values in certain circumstances, and in some cases it may be appropriate to use a range of values.

USEPA converter - Diesel fuel oil 7.37 lbs/gallon

Emissions Factors

Equipment	Horsepower	Load factor (percent)	CO (lb/bhp-hr)	VOC (lb/bhp-hr)	Nox lb/bhp-hr)	SOx (lb/bhp-hr)	PM10 (lb/bhp-hr)	CO (lb/hr)	VOC (lb/hr)	NOx (lb/hr)	SOx (lb/hr)	PM10 (lb/hr)
Air Compressor	37	48	0.011	0.002	0.018	0.002	0.001	0.195	0.036	0.32	0.036	0.018
Backhoe	79	46.5	0.015	0.003	0.022	0.002	0.001	0.551	0.11	0.808	0.073	0.037
Bedding Hopper/Conveyor system	55	46.5	0.02	0.003	0.024	0.002	0.0015	0.512	0.077	0.614	0.051	0.038
Compactor (sheep-foot)	99	57.5	0.007	0.002	0.02	0.002	0.001	0.398	0.114	1.139	0.114	0.057
Concrete Mixer	11	56	0.01	0.002	0.024	0.002	0.001	0.062	0.012	0.148	0.012	0.006
Crane	194	43	0.009	0.003	0.023	0.002	0.0015	0.751	0.25	1.919	0.167	0.125
Dozer	102.9	59	0.011	0.002	0.023	0.002	0.001	0.668	0.121	1.396	0.121	0.061
Forklift	83	30	0.013	0.003	0.031	0.002	0.0015	0.324	0.075	0.772	0.05	0.037
Front End Loader	147	46.5	0.011	0.002	0.023	0.002	0.001	0.752	0.137	1.572	0.137	0.068
Gas Welding Machine	19	51	0.479	0.054	0.002	0.0006	0.0003	14.332	0.523	0.019	0.006	0.002
Generator	22	74	0.011	0.002	0.018	0.002	0.001	0.179	0.033	0.293	0.033	0.016
Grader /tractor	156.6	57.5	0.008	0.003	0.021	0.002	0.001	0.72	0.27	1.891	0.18	0.09
Hand Held Vibrator plate	8	43	2.04	0.897	0.0006	0.0005	0.0085	7.018	3.086	0.002	0.002	0.029
Pile Hammer	161	62	0.02	0.003	0.024	0.002	0.0015	1.996	0.299	2.396	0.2	0.15
Roller	99	57.5	0.007	0.002	0.02	0.002	0.001	0.398	0.114	1.139	0.114	0.057
Rubber Tire Loader	147	54	0.011	0.002	0.023	0.002	0.0015	0.873	0.159	1.826	0.159	0.119
Scraper	266.79	66	0.011	0.001	0.019	0.002	0.0015	1.937	0.176	3.345	0.352	0.264
Tamping Spade	4	55	2.04	0.897	0.0006	0.0005	0.0085	4.488	1.973	0.001	0.001	0.019
Truck Mounted Vertical Auger Drill	209	75	0.02	0.003	0.024	0.002	0.0015	3.135	0.47	3.762	0.314	0.235
Vibrator Compactor	99	57.5	0.007	0.002	0.02	0.002	0.001	0.398	0.114	1.139	0.114	0.057
Well Driller	209	75	0.0200	0.0030	0.0240	0.0020	0.0015	3.135	0.470	3.762	0.314	0.235

Source: South Coast Air Quality Management District CEQA Air Quality Handbook, November 1993, Tables A9-8-B, A9-8-C and A9-8-D
Table EF-2, Construction Equipment Exhaust EF

(1) Default Horsepower from SCAQMD CEQA Air Quality Handbook, Table 9-8-C.

(2) Default load factors from SCAQMD CEQA Air Quality Handbook, Table 9-8-D.

(3) Emission factors from SCAQMD CEQA Air Quality Handbook, Table 9-8-B, unless otherwise noted.

(4) Emissions factors from SCAQMD CEQA Air Quality Handbook, Table 9-8-A. Units are in lbs/hr.

APPENDIX D

Sediment Sample Chemical Analysis Reports

Sediment Sampling and Analysis Joint Base Charleston Navigation Channel Charleston, South Carolina

Contract No. W912PM-15-D-0006

Submitted to:

U.S. Army Corps of Engineers
Charleston District
69 Hagood Avenue
Charleston, South Carolina 29412

Prepared and submitted by:

ANAMAR Environmental Consulting, Inc.
2106 NW 67th Place, Suite 5
Gainesville, Florida 32653

August 2019

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All appendices are provided in electronic format only and are included on the accompanying disc.

ACRONYMS, ABBREVIATIONS & INITIALISMS

AET	apparent effects threshold
ASTM	American Society for Testing and Materials
CFR	Code of Federal Regulations
CMC	criteria maximum concentration
CQAR	Chemical Quality Assurance Report
DQCR	Daily Quality Control Report
DU	dredging unit
ECD/ELCD	electron capture detectors/electrolytic conductivity detectors
EPA, USEPA	U.S. Environmental Protection Agency
ERL	effects range-low
GNSS	Global Navigation Satellite System
GPS	global positioning system
HMW	high molecular weight
ICP/MS	inductively coupled plasma/mass spectrometry
ITM	Inland Testing Manual
LMW	low molecular weight
MDL	method detection limit
MLLW	mean lower low water
MRL	method reporting limit
NELAC	National Environmental Laboratory Accreditation Conference
NOAA	National Oceanic and Atmospheric Administration
NTU	nephelometric turbidity unit
PAH	polynuclear aromatic hydrocarbon
PCB	polychlorinated biphenyl
ppt	parts per thousand
QA/QC	Quality Assurance/Quality Control
SAP/QAPP	Sampling and Analysis Plan/Quality Assurance Project Plan
SERIM	Southeast Regional Implementation Manual
TEF	toxic equivalency factor
TEL	threshold effects level
TEQ	toxicity equivalence
TOC	total organic carbon
TSS	total suspended solids
USACE	U.S. Army Corps of Engineers
USCS	Unified Soil Classification System

EXECUTIVE SUMMARY

This report details the field sampling, analysis, and results of a sediment testing study in support of the maintenance dredging of Joint Base Charleston (JBC), a 32.6-square-mile military facility in the cities of North Charleston and Goose Creek, South Carolina. JBC plans to perform maintenance dredging of the JBC Navigation Channel in the Cooper River and in associated Goose Creek. Project depths range from -48 feet mean lower low water (MLLW), at the TC Dock and at Shoals 4 and 4A north of Goose Creek, to as shallow as -15 feet MLLW at Pier C. This report details the analysis of physical and chemical parameters for upland disposal of the dredged material in the Yellow House Creek, Joint Base Charleston, or Clouter Creek placement areas. Field sampling took place June 18 through 21, 2018, and consisted of sediment and water sample collection for analysis of physical and chemical parameters.

Sampling Approach

Areas to be dredged have been divided into seven dredging units (DUs) representing defined areas within the dredging prism. Each DU was expected to have relatively consistent characteristics.

Two to seven sampling stations were selected from within each DU. Stations were selected by USACE based on current shoaling patterns and recent bathymetric survey data. The stations represent dredged material to be disposed of at upland placement areas.

All sediment samples were individually analyzed for physical parameters. The samples from each DU were also composited and homogenized to create one composite per DU. Composites JBC18-TC, JBC18-GC, JBC18-S1, JBC18-S2, JBC18-S3, JBC18-S4, and JBC18-PC underwent physical and chemical analysis.

Water for chemical analysis and for elutriate preparation was collected from the northern portion of Shoal 2A, northeast of the Pier C expansion area. This location was chosen to best represent the hydrochemical conditions for the JBC DUs.

Exhibit ES-1 is a summary table of analytical results for this project.

Sediment Physical Results

The seven composites were predominantly silt and clay (48.4% to 81.7% [silt and clay combined]) with sand (18.3% to 49.7%).

Sediment Chemistry Results

Metals and TOC

Eight of the 11 metals tested were detected in concentrations greater than the MRL in most sediment composites. Arsenic was the only metal detected in concentrations above the TEL and (or) ERL in six of the seven composites. JBC18-S3 contained maximum detected concentrations for 7 of the 8 metals detected above the MRL.

TOC concentrations ranged from 4540 to 112000 mg/kg and were highest in JBC18-S1.

Organotins

Tri-n-butyltin was not detected above the MRL in any composite.

Pesticides

None of the 28 pesticides tested were detected in concentrations above the MDL in any composite. The MRLs for chlordane; p,p' (4,4')-DDD; p,p' (4,4')-DDE; p,p' (4,4') DDT; dieldrin; γ-BHC (lindane); and toxaphene were greater than the respective TEL and (or) ERL. MDLs for chlordane and dieldrin in all seven composites also exceeded the TEL and (or) ERL. The laboratory reporting limits for chlordane, (4,4')-DDD, (4,4')-DDT, dieldrin, y-BHC (lindane), and toxaphene for all composites exceeded the TEL and (or) the ERL but did not exceed respective target detection limits specified in the SAP/QAPP (see Subsection 4.4.3 for more information).

PAHs

Six of the 19 PAH analytes tested were detected above the MDL in one or more composites. JBC18-TC and JBC18-S3 had detected concentrations of acenaphthene that exceeded the TEL and (or) ERL. In addition, MRLs for acenaphthene, acenaphthylene, and dibenzo(a,h)anthracene in one or more composites exceeded the respective TEL. However, the results for most of these composite and analyte combinations were not detected above the MDL (U qualified), and the respective MDLs were below the TEL and ERL. JBC18-S3 had the maximum detected concentrations for five of the six PAH analytes detected above the MDL, along with the maximum concentrations of total low-molecular-weight (LMW) PAHs, total high-molecular-weight (HMW) PAHs, and total PAHs.

PCBs

Twenty-four of the 26 PCB congeners tested were detected above the MDL in one or more composites each. None of the seven PCB Aroclors tested were detected above the MDL in any composite. Total EPA PCBs ranged from 0.0188 to 1.47 µg/kg. Total National Oceanic and Atmospheric Administration (NOAA) PCBs ranged from 0.0320 to 2.56 µg/kg. These total values were calculated from individual PCB congener results; MDLs were substituted for result values for non-detected (U-qualified) congeners.

Dioxins and Furans

All 17 individual dioxins and furans tested were detected above the MDL in one or more composites, although most results were at or below the MRL (J-qualified). All eight groups of total dioxins and furans were detected above the MDL in most composites, although only three of these groups were detected above the MRL in one or more composites. Six of the seven composites had total TEQ concentrations that exceeded the TEL.

Elutriate and Water Chemistry

Analytical results for the water sample JBC18-SW and elutriates generated from all seven sediment composites are summarized below. The results are compared to the CMC.

Metals, TSS and TOC

Seven of the 11 metals analyzed in water and elutriate samples were detected at or above the MDL in one or more samples. No metals were detected in concentrations greater than the CMC in any elutriate or water sample. The water sample had maximum detected concentrations of 4 (57%) of the 7 metals detected. TSS concentrations ranged from 1260 to 32,000 µg/L among elutriate and water samples. TOC concentrations ranged from 1,420 to 94,000 µg/L.

Organotins

Tri-n-butyltin was not detected above the MDL in any sample.

Pesticides and PAHs

None of the 28 pesticides tested were detected at or above the MDL in any elutriate or water sample. All seven elutriates and the water sample had MRLs for chlordane, endosulfan II, and toxaphene that exceeded the CMC; however, the results for these samples were not detected above the MDL.

Seven of the 19 PAHs tested were detected in concentrations above the MDL in one or more samples. Total PAHs ranged from 0.57 to 1.56 µg/L among the elutriates tested and 0.57 µg/L for the water sample. There are no CMCs for the PAHs tested.

PCB Congeners and Aroclors

Twenty-two of the 26 PCB congeners tested were detected at or above the MDL in one or more elutriate or water sample. PCB 52 was the only congener detected above the MRL, and only with samples JBC18-TC and JBC18-GC. Total EPA Region 4 PCBs ranged from 0.000086 to 0.000548 µg/L. Total NOAA PCBs ranged from 0.000125 to 0.000864 µg/L. None of the seven PCB Aroclors tested were detected above the MDL (U-qualified). There are no CMCs for the PCBs tested.

Dioxins and Furans

Five of the 17 dioxins and furans tested were detected at or above the MDL in one or more samples. However, all detected concentrations were below the MRL (J-qualified). Total TEQs ranged from 0.720 to 6.20 pg/L. Five of the eight total dioxin and furan groups were detected at or above the MDL in one or more samples, but all detected concentrations were below the MRL. There are no CMCs for the dioxins and furans tested.

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Exhibit ES-1. Summary of Analytical Results for Joint Base Charleston Sediments

			Sediment Physical				Sediment Chemistry								Elutriate Chemistry					
			Gravel	Sand	Silt & Clay	Solids	TOC	Metals	Tr-n-butyltin	Pesticides	PAHs	Total Region 4 PCBs	Total NOAA PCBs	Total TEQs	Metals	Pesticides	Total PAHs	Total Region 4 PCBs	Total NOAA PCBs	Total TEQs
Dredging Unit	Sample IDs	Composite ID	%	%	%	%	mg/kg	# of analytes > TEL or ERL	µg/kg	# of analytes > TEL or ERL	# of analytes > TEL or ERL	Results > TEL or ERL? (yes or no)	Results > TEL or ERL? (yes or no)	Results > TEL or ERL? (yes or no)	# of analytes > CMC	# of analytes > CMC	µg/L	µg/L	µg/L	pg/L
TC Dock	JBC18-TC-1A through -1C	JBC18-TC	0.0	23.0	77.0	38.9	38000	1 (arsenic)	<50	(none)	1 [A]	No	No	Yes (1.43 ng/kg)	(none)	(none)	1.56	0.000548	0.000864	0.000864
Goose Creek Channel	JBC18-GC-1A and -1B	JBC18-GC	0.0	47.9	52.1	60.2	4540	1 (arsenic)	<24	(none)	(none)	No	No	Yes (1.45 ng/kg)	(none)	(none)	0.87	0.000508	0.000807	0.000807
Shoal 1	JBC18-S1-1A through -1C	JBC18-S1	0.0	40.4	59.6	47.7	112000	1 (arsenic)	<43	(none)	(none)	No	No	Yes (0.856 ng/kg)	(none)	(none)	0.57	0.000121	0.000188	0.000188
Shoals 2 and 2A	JBC18-S2-1A through -1E	JBC18-S2	0.0	42.1	57.9	41.0	59400	1 (arsenic)	<48	(none)	(none)	No	No	Yes (3.15 ng/kg)	(none)	(none)	0.57	0.000171	0.000265	0.000265
Shoals 3 and 3A	JBC18-S3-1A through -1E	JBC18-S3	0.0	18.3	81.7	35.7	111000	1 (arsenic)	<51	(none)	1 [A]	No	No	Yes (1.28 ng/kg)	(none)	(none)	0.63	0.000139	0.000223	0.000223
Shoals 4, 4A, and 5	JBC18-S4-1A through -1G	JBC18-S4	1.9	49.7	48.4	45.6	52400	1 (arsenic)	<40	(none)	(none)	No	No	No	(none)	(none)	0.64	0.000235	0.000354	0.000354
Pier C Expansion	JBC18-PC-1A and -1B	JBC18-PC	0.0	45.0	55.0	57.9	8920	(none)	<30	(none)	(none)	No	No	Yes (1.73 ng/kg)	(none)	(none)	0.57	0.000089	0.000131	0.000131

[A] JBC18-TC and JBC18-S3 had detected concentrations of acenaphthene that exceeded the TEL and (or) ERL.

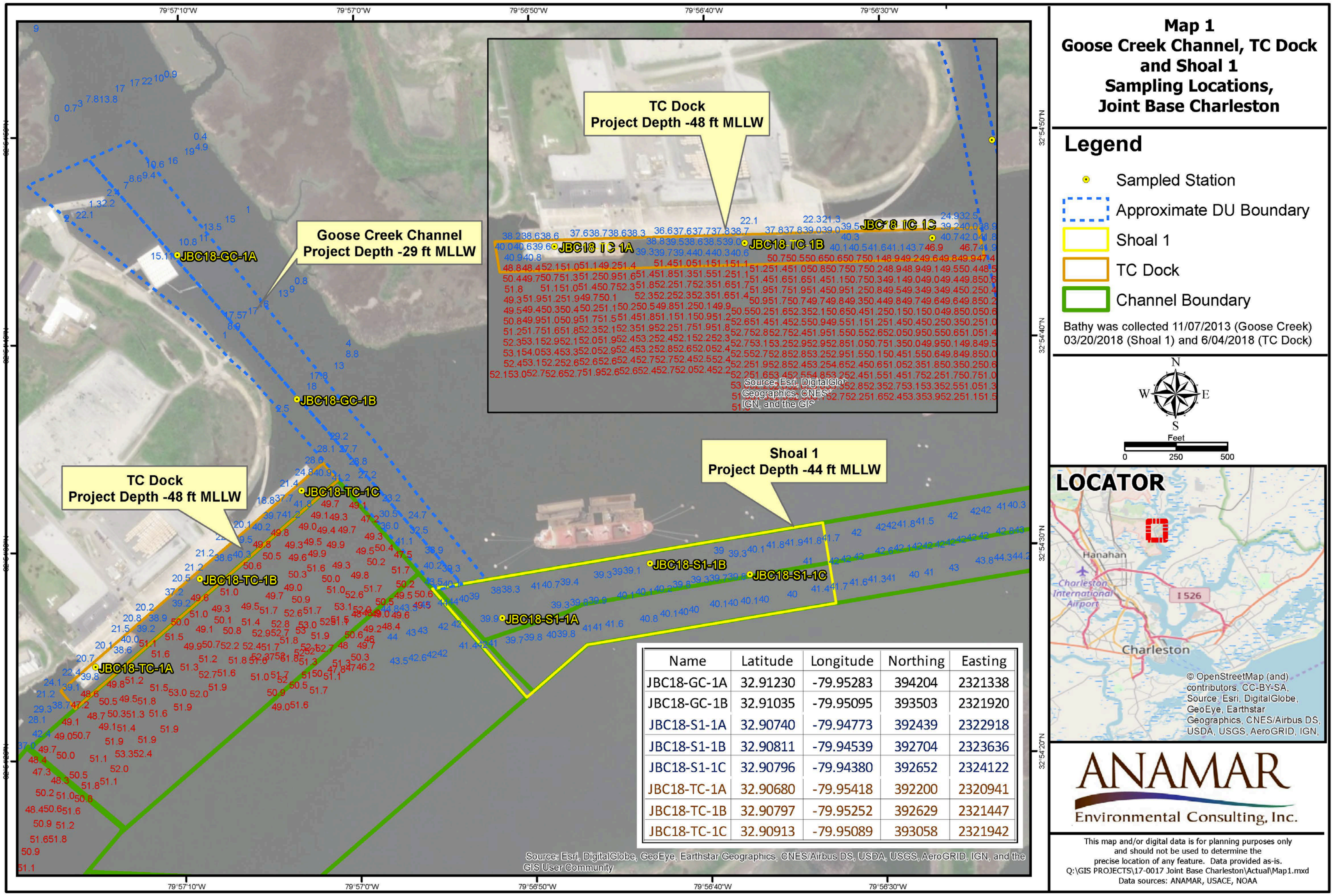
1 INTRODUCTION

1.1 Project Area Description

Joint Base Charleston (JBC) is a 32.6-square-mile military facility in the cities of North Charleston and Goose Creek, South Carolina. Under the jurisdiction of the U.S. Air Force, JBC serves as an Air Force base as well as a U.S. Navy support base. JBC plans to perform maintenance dredging of the JBC navigation channel in the Cooper River and in associated Goose Creek. Project depths range from -48 feet mean lower low water (MLLW), at the TC Dock and at Shoals 4 and 4A north of Goose Creek, to as shallow as -15 feet MLLW at Pier C (USACE 2017).

This report details the analysis of physical and chemical parameters for upland disposal of the dredged material in the Yellow House Creek, JBC, or Clouter Creek placement areas. The sampling and analysis of the dredged material is used to ensure that the proposed dredging will not have adverse effects on the environment (USACE 2017).

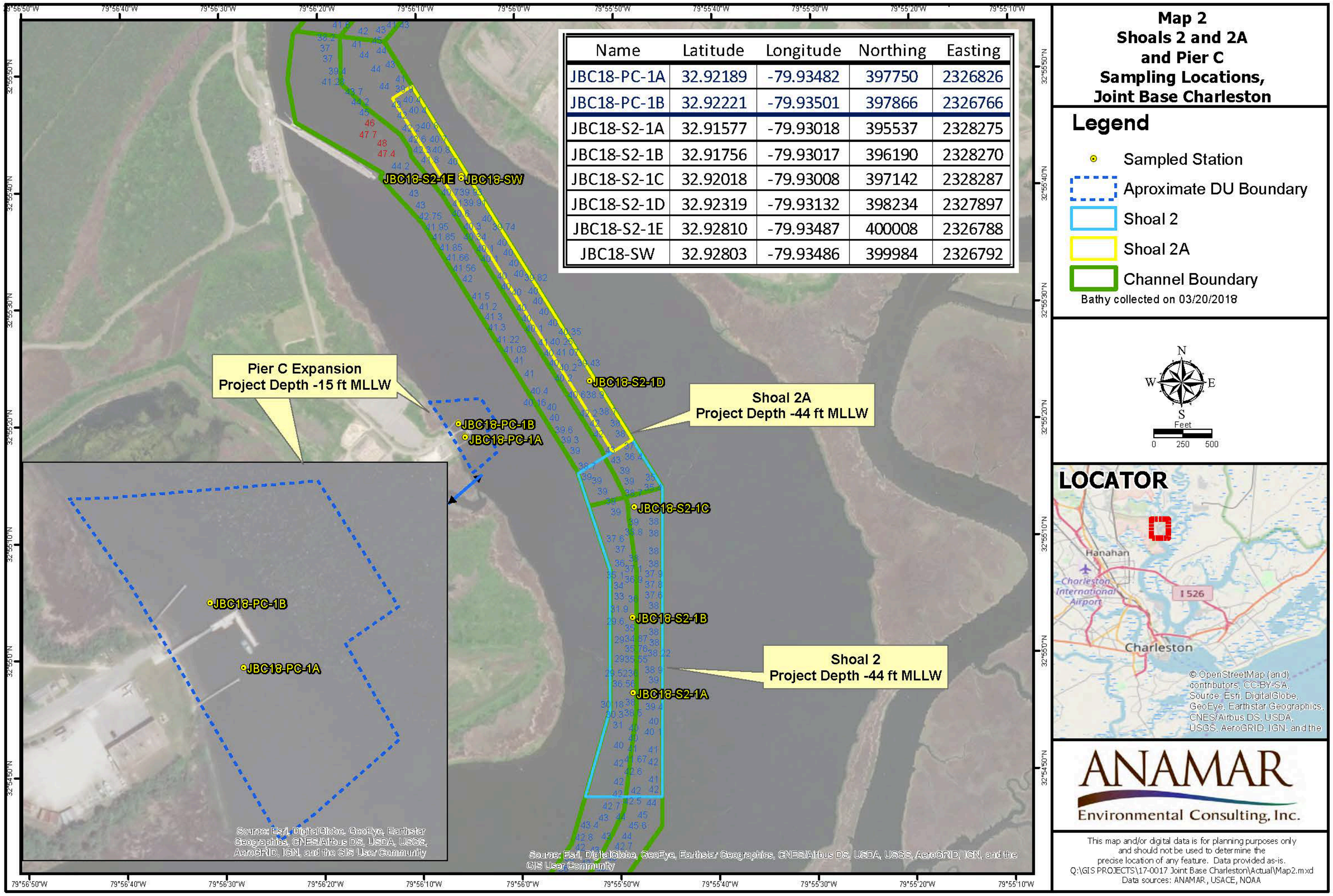
Overviews of the project area are shown in Exhibits 1-1 through 1-4.



Name	Latitude	Longitude	Northing	Easting
JBC18-GC-1A	32.91230	-79.95283	394204	2321338
JBC18-GC-1B	32.91035	-79.95095	393503	2321920
JBC18-S1-1A	32.90740	-79.94773	392439	2322918
JBC18-S1-1B	32.90811	-79.94539	392704	2323636
JBC18-S1-1C	32.90796	-79.94380	392652	2324122
JBC18-TC-1A	32.90680	-79.95418	392200	2320941
JBC18-TC-1B	32.90797	-79.95252	392629	2321447
JBC18-TC-1C	32.90913	-79.95089	393058	2321942

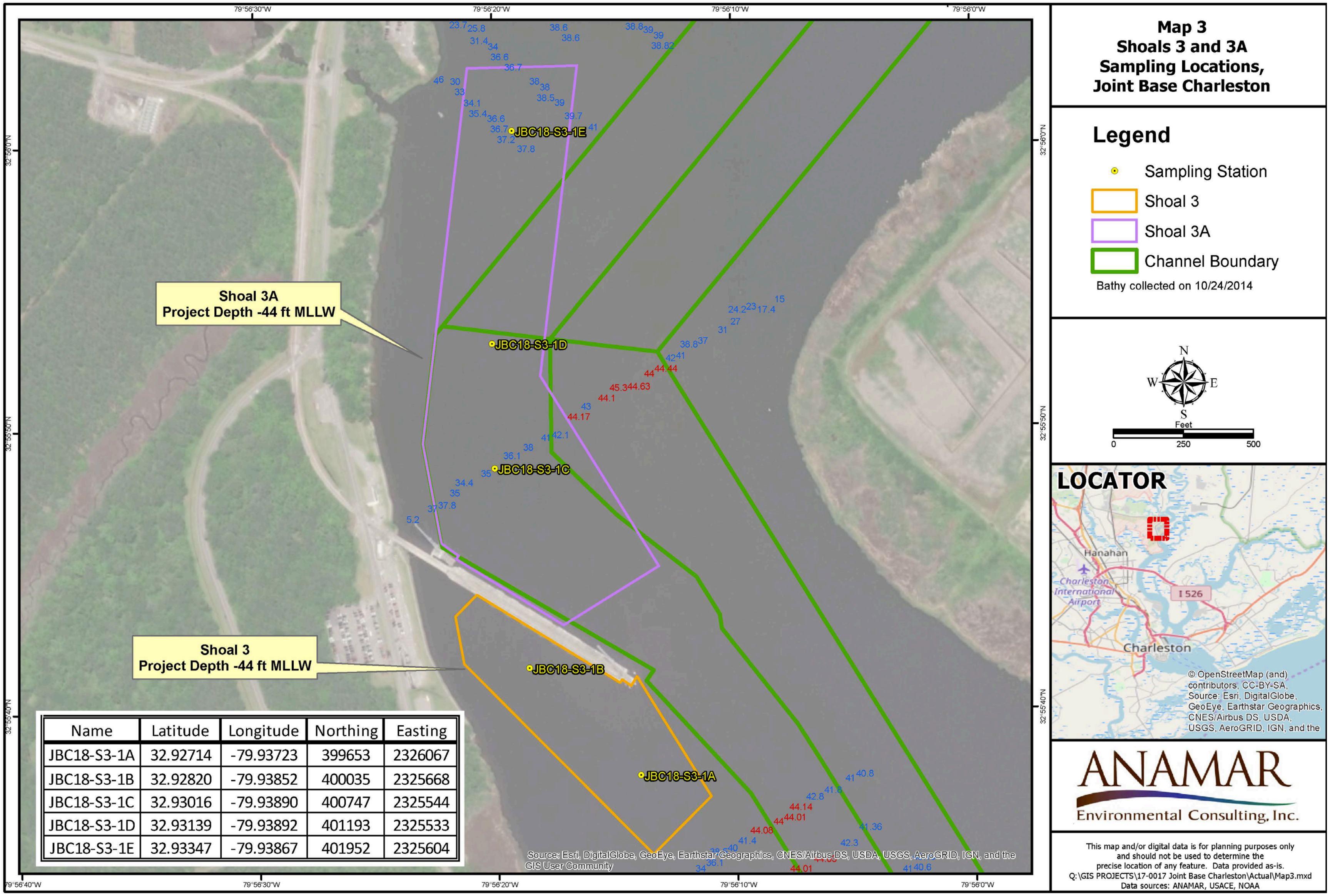
Exhibit 1-1. Overview of Goose Creek Channel, TC Dock, and Shoal 1 of Joint Base Charleston

ANAMAR Environmental Consulting, Inc.



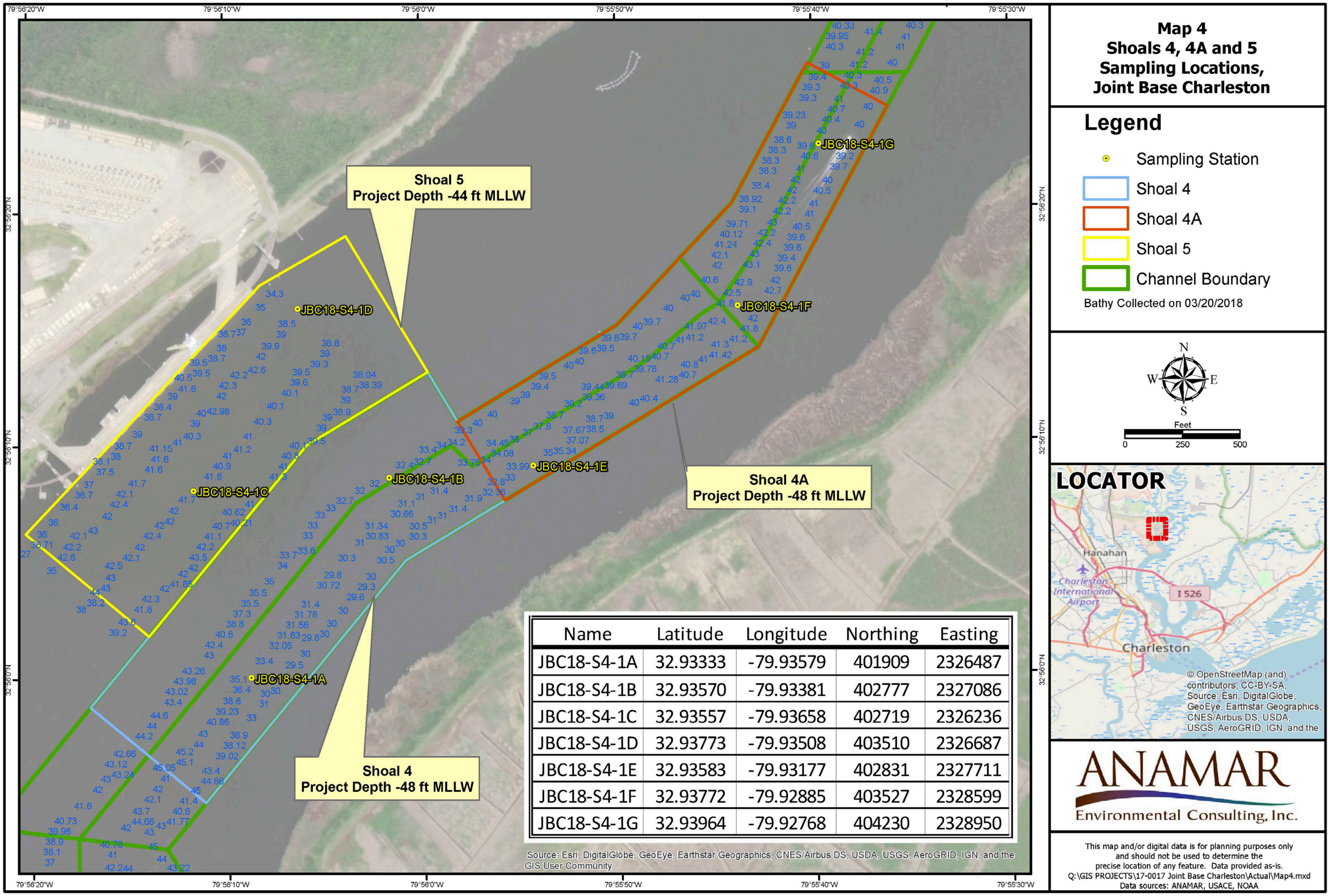
Name	Latitude	Longitude	Northing	Easting
JBC18-PC-1A	32.92189	-79.93482	397750	2326826
JBC18-PC-1B	32.92221	-79.93501	397866	2326766
JBC18-S2-1A	32.91577	-79.93018	395537	2328275
JBC18-S2-1B	32.91756	-79.93017	396190	2328270
JBC18-S2-1C	32.92018	-79.93008	397142	2328287
JBC18-S2-1D	32.92319	-79.93132	398234	2327897
JBC18-S2-1E	32.92810	-79.93487	400008	2326788
JBC18-SW	32.92803	-79.93486	399984	2326792

Exhibit 1-2. Overview of Shoals 2 and 2A and Pier C, Joint Base Charleston



Name	Latitude	Longitude	Northing	Easting
JBC18-S3-1A	32.92714	-79.93723	399653	2326067
JBC18-S3-1B	32.92820	-79.93852	400035	2325668
JBC18-S3-1C	32.93016	-79.93890	400747	2325544
JBC18-S3-1D	32.93139	-79.93892	401193	2325533
JBC18-S3-1E	32.93347	-79.93867	401952	2325604

Exhibit 1-3. Overview of Shoals 3 and 3A, Joint Base Charleston



Name	Latitude	Longitude	Northing	Easting
JBC18-S4-1A	32.93333	-79.93579	401909	2326487
JBC18-S4-1B	32.93570	-79.93381	402777	2327086
JBC18-S4-1C	32.93557	-79.93658	402719	2326236
JBC18-S4-1D	32.93773	-79.93508	403510	2326687
JBC18-S4-1E	32.93583	-79.93177	402831	2327711
JBC18-S4-1F	32.93772	-79.92885	403527	2328599
JBC18-S4-1G	32.93964	-79.92768	404230	2328950

Exhibit 1-4. Overview of Shoals 4, 4A, and 5, Joint Base Charleston

1.2 Description of the Testing Approach

1.2.1 Evaluation of Dredged Material for Disposal

Sediment and elutriate testing are required for potential upland disposal by the South Carolina Department of Health and Environmental Control and the Charleston District of the U.S. Army Corps of Engineers (USACE) to determine the suitability of the material to be dredged for disposal.

1.2.2 Objectives and Deliverables

The purpose of this sediment testing is to determine if dredged material from maintenance dredging of JBC is appropriate for disposal at upland placement areas and to help secure necessary state and federal permitting for this project.

USACE subcontracted ANAMAR to collect sediment and water samples, conduct required analyses, and present the results in a report. The field effort, laboratory methods, and this report are in accordance with the scope of work (USACE 2017) and the Sampling and Analysis Plan/Quality Assurance Project Plan (SAP/QAPP) (Appendix A).

Deliverables associated with this project include:

- Site-specific Health and Safety Plan/Accident Prevention Plan
- SAP/QAPP approved by USACE and EPA
- Daily Quality Control Reports (DQCRs)
- Laboratory electronic data deliverables and reports
- This sediment sampling and analysis report
- A Chemical Quality Assurance Report (CQAR)

ANAMAR coordinated and directed operations for this project and worked closely with USACE to develop sampling and analysis schemes, schedules, and deliverables. ANAMAR also reviewed all data and produced this report summarizing the results of the physical and chemical analysis of sediment, elutriate, and water of the dredged material collected from the project area. Exhibits 1-5 and 1-6 list the principal data users and subcontractors associated with this evaluation and their respective areas of responsibility.

Exhibit 1-5. Principal Data Users and Decision-Makers Associated with This Project

Agency or Company	Area(s) of Responsibility
U.S. Army Corps of Engineers, Charleston District (Charleston, South Carolina)	Permit and maintain the harbor with the dredge material to be disposed of at approved upland placement areas
South Carolina Department of Health and Environmental Control (Columbia, South Carolina)	Permit the upland disposal of dredged sediments at approved upland placement areas within the state

Exhibit 1- 6. Prime and Subcontractors and Responsibilities Associated with This Report

Company, Location, Website	Area(s) of Responsibility
ANAMAR Environmental Consulting, Inc. (Gainesville, Florida) www.anamarinc.com	Prime contractor. Prepare project deliverables, lead field sampling effort, lab coordination, project management
Athena Technologies, Inc. (McClellanville, South Carolina) www.athenatechnologies.com	Support for field collection of sediment samples requiring vibracore sampling equipment
Cape Fear Analytical, LLC (affiliated with GEL Laboratories [see below]) (Wilmington, North Carolina) http://www.gel.com/cape-fear-analytical/	Laboratory preparation and chemical analysis of sediment and elutriates (dioxins/furans, PCB congeners); sample holding and archiving
GEL Laboratories, LLC (Charleston, South Carolina) http://www.gel.com/laboratories	Laboratory preparation and chemical analysis of sediment and elutriates (metals, pesticides, PAHs, TOC, total suspended solids [TSS], elutriate preparation); sample holding and archiving
Terracon (Jacksonville, Florida) www.terracon.com	Laboratory preparation and physical analysis of sediment; sample holding and archiving
TestAmerica Seattle (Tacoma, Washington) www.testamericainc.com	Laboratory preparation and chemical analysis of sediment and elutriates (tri-n-butyltin); sample holding and archiving

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2 MATERIALS AND METHODS

2.1 Project Design and Rationale

A SAP/QAPP was prepared by ANAMAR and approved by USACE (Appendix A). The SAP/QAPP details the sampling design and rationale, analyses, and reporting requirements. Areas proposed to be dredged have been divided into seven dredging units (DUs) representing associated channel reaches or ranges (see Exhibit 2-1 below).

2.1.1 Sampling Locations and Dredging Unit Rankings

Sampling locations within each DU were selected by USACE based on current shoaling patterns and recent bathymetric survey data. Bathymetric surveys were conducted from March through June 2018 for most DUs, except for Goose Creek Channel and Shoals 3 and 3A, which were conducted in November 2013 and October 2014, respectively. The distribution and number of sampling locations provide adequate representation for each DU. Two to seven samples were collected from each DU and combined into a single composite per DU for analysis. Exhibit 2-1 shows the relationships between DUs in the project area and project depths. Coordinates of the sampled locations are provided in Table 1, and the locations of DUs and sampled stations are shown in Maps 1 through 4.

Summaries of field sampling materials and methods, analytes of interest, sampling compositing schemes, and sample nomenclature are provided in Exhibits 2-2 through 2-4, respectively.

Exhibit 2-1. Dredging Units, Project Depths and Composite IDs

Dredging Unit	Project Depth + Allowable Overdepth (ft, MLLW)	Sample IDs	Composite ID
TC Dock	-48	JBC18-TC-1A through -1C	JBC18-TC
Goose Creek Channel	-29	JBC18-GC-1A and -1B	JBC18-GC
Shoal 1	-44	JBC18-S1-1A through -1C	JBC18-S1
Shoals 2 and 2A	-44	JBC18-S2-1A through -1E	JBC18-S2
Shoals 3 and 3A	-44	JBC18-S3-1A through -1E	JBC18-S3
Shoals 4, 4A, and 5	-48 (Shoals 4 and 4A) -44 (Shoal 5)	JBC18-S4-1A through -1G	JBC18-S4
Pier C Expansion	-15	JBC18-PC-1A and -1B	JBC18-PC

Source: Table 2-1 of SAP/QAPP (ANAMAR 2018)

Exhibit 2-2. Summary of Field Sampling Materials and Methods

FIELD SAMPLE COLLECTION:
- 7 sediment composites (composed of 2 to 7 samples each)
- 1 water sample (from Shoal 2A) for water chemistry and elutriate preparation

SAMPLING GEAR:
- Sediment samples collected by vibracore
- Water collected with pneumatic stainless steel pump

VESSEL:
- R/V *Artemis* (30-foot pontoon barge)

PRESERVATION:
- Sediment chemistry samples kept at or below 4°C
- Water sample containerized in multiple containers with or without stabilizing agents and kept at or below 4°C
- Holding time requirements were analyte-specific and test-specific

IN SITU WATER COLUMN MEASUREMENTS:
- YSI multiprobe meter
- Hach 2100P turbidimeter

Exhibit 2-3. In Situ Water Column Data and Analytical Requirements for Physical and Chemical Testing

IN SITU WATER COLUMN DATA (water station only): Conductivity (mS/cm) pH Turbidity (NTU) Water temperature (°C)	Dissolved oxygen (mg/L and % saturation) Salinity (parts per thousand [ppt]) Tide cycle Water depth (feet)
SEDIMENT PHYSICAL AND TOC ANALYSES: • Grain size distribution • Hydrometer readings • Total solids • USCS* soil classification	• Specific gravity (composites only) • Atterberg limits (composites only) • Total organic carbon (TOC) (composites only)
SEDIMENT CHEMICAL ANALYSES (composites only): • Metals • Organotins • Organochlorine pesticides	• Dioxins and furans • Polynuclear aromatic hydrocarbons (PAHs) • Polychlorinated biphenyl (PCB) congeners and Aroclors
ELUTRIATE AND WATER ANALYSES: • Metals • Organotins • Dioxins and furans • Organochlorine pesticides	• PAHs • PCB congeners and Aroclors • Total suspended solids (TSS) and TOC

* USCS = Unified Soil Classification System

Exhibit 2-4. Dredging Units, Sample Identification, and Compositing Scheme

Dredging Unit	Sample ID	Project Depth (ft, MLLW)	Lowest Sampling Depth (ft, MLLW)	Approximate Volume Collected (gallons)	Sample Analysis	Composite ID and Analyses (see Exhibit 2-3 for more information)
TC Dock	JBC18-TC-1A	-48	-46.5	6.5	Physical	**JBC18-TC**: Physical, chemical (sediment & elutriate)
	JBC18-TC-1B	-48	-46.7	10	Physical	
	JBC18-TC-1C	-48	-46.4	10	Physical	
Goose Creek Channel	JBC18-GC-1A	-29	-27.5	7.5	Physical	**JBC18-GC**: Physical, chemical (sediment & elutriate)
	JBC18-GC-1B	-29	-27.1	7	Physical	
Shoal 1	JBC18-S1-1A	-44	-44.1	7	Physical	**JBC18-S1**: Physical, chemical (sediment & elutriate)
	JBC18-S1-1B	-44	-42.9	8	Physical	
	JBC18-S1-1C	-44	-43.4	6	Physical	
Shoals 2 and 2A	JBC18-S2-1A	-44	-45.0	3	Physical	**JBC18-S2**: Physical, chemical (sediment & elutriate)
	JBC18-S2-1B	-44	-44.3	4.5	Physical	
	JBC18-S2-1C	-44	-44.0	2.5	Physical	
	JBC18-S2-1D	-44	-44.0	7.5	Physical	
	JBC18-S2-1E	-44	-44.0	3	Physical	
Shoals 3 and 3A	JBC18-S3-1A	-44	-43.2	4.5	Physical	**JBC18-S3**: Physical, chemical (sediment & elutriate)
	JBC18-S3-1B	-44	-44.0	8	Physical	
	JBC18-S3-1C	-44	-44.0	5	Physical	
	JBC18-S3-1D	-44	-44.0	4	Physical	
	JBC18-S3-1E	-44	-44.0	4	Physical	

Dredging Unit	Sample ID	Project Depth (ft, MLLW)	Lowest Sampling Depth (ft, MLLW)	Approximate Volume Collected (gallons)	Sample Analysis	Composite ID and Analyses (see Exhibit 2-3 for more information)
Shoals 4, 4A, and 5	JBC18-S4-1A	-48	-48.0	9	Physical	**JBC18-S4**: Physical, chemical (sediment & elutriate)
	JBC18-S4-1B	-48	-48.1	8	Physical	
	JBC18-S4-1C	-44	-44.0	2	Physical	
	JBC18-S4-1D	-44	-44.0	4.5	Physical	
	JBC18-S4-1E	-48	-48.0	8	Physical	
	JBC18-S4-1F	-48	-48.0	5	Physical	
	JBC18-S4-1G	-48	-39.5 (met hard refusal)	0.5	Physical	
Pier C Expansion	JBC18-PC-1A	-15	-15.0	8	Physical	**JBC18-PC**: Physical, chemical (sediment & elutriate)
	JBC18-PC-1B	-15	-15.1	8	Physical	
Not applicable	JBC18-SW (water)	(not applicable)	3 ft off bottom	250 + water kit	Not applicable	See preceding table

2.2 Sample Collection Techniques

2.2.1 Field Effort

Sampling activities were conducted according to the SAP/QAPP (Appendix A) and guidance from USACE.

Field sampling took place June 18 through 21, 2018. Field personnel consisted of scientists from ANAMAR and Athena Technologies. The R/V *Artemis* departed from Daniel Island Marina in Charleston. Samples were stored in a refrigerated truck. Water sample JBC18-SW and sediment samples JBC18-GC-1A and 1B were picked up by laboratory staff on June 19 and driven to the GEL laboratory in Charleston. The remaining samples were delivered to the GEL laboratory on June 21 following completion of sampling. Compositing was conducted by GEL laboratory staff. Exhibit 2-5 is a summary of the field sampling efforts. For more details, refer to the DQCRs in Appendix B-3.

Exhibit 2-5. Field Sampling Activities

Date	General Activity
18-June-2018	• Calibrate equipment, load and launch vessel from Daniel Island Marina • Collect water sample JBC18-SW
19-June-2018	• Collect vibracore samples JBC18-GC-1A and -1B and arrange for lab pick-up of these samples along with water sample JBC18-SW • Collect vibracore samples JBC18-TC-1A through 1C and JBC18-S1-1A through 1C
20-June-2018	• Collect vibracore samples JBC18-S2-1A through 1E, JBC18-S3-1A through 1E, and JBC18-PC-1A and 1B
21-June-2018	• Collect vibracore samples JBC18-S4-1A through 1G • Deliver samples to GEL Laboratories in Charleston

2.2.2 Site Positioning

Sampling station locations were chosen to coincide with the dredging prism and were selected by USACE based on the most recent bathymetric survey data. The location of the water sampling station (JBC18-SW) at Shoal 2A was chosen to best represent the hydrochemical conditions within the seven DUs.

Target coordinates were uploaded to a Panasonic Toughbook computer and associated TKO Global Navigation Satellite System (GNSS) on the R/V *Artemis*. Coordinates were also loaded on a Garmin hand-held GPS (used as a backup unit). Uploaded coordinates in both GPS units were reviewed and compared with the original coordinates to verify them prior to field sampling. Sample position accuracy conformed to Subsection 2.2.2 of the SAP/QAPP. Navigation and positioning of the R/V *Artemis* was handled by a U.S. Coast Guard-certified captain under direction of the ANAMAR field team leader. Water depth data were collected at each station using a fathometer.

Coordinates of each station were recorded using GPS units in the field, and waypoints were recorded on field logs. Sampled locations are depicted in Maps 1 through 4. Table 1 contains spatial and temporal data along with field observations taken during vibracore sampling. Table 2 has these data associated with the water sample.

2.2.3 Decontamination Procedures

All equipment contacting sediment or water samples as cleaned and decontaminated as described below. Decontamination procedures followed those outlined in Florida Department of Environmental Protection standard operation procedures FC 1000. Work surfaces on the sampling vessel were cleaned before the sampling day began and before leaving each station. All equipment contacting sediment or water samples was decontaminated between sampling stations to prevent cross-contamination. Disposable nitrile gloves used at a given sampling station were replaced with new gloves prior to sampling at the next station.

Decontamination Procedures

- Wash and scrub using site water or tap water to remove gross contamination
- Wash/scrub with Liquinox detergent
- Rinse with site water
- Rinse with deionized water
- Rinse 2 times with pesticide-grade isopropanol
- Rinse 2 times with pesticide-grade hexane
- Rinse 3 times with deionized water
- Equipment not being used immediately was air-dried and stored wrapped in new, clean aluminum foil

Any derived waste was contained and disposed of in accordance with federal, state, and local laws.

2.2.4 Water Column Measurements

A YSI multiprobe meter and a Hach 2100P turbidimeter were used to measure water column parameters at the water sampling station (JBC18-SW, where the sediment sample JBC18-S2-1E was also collected [shown on Map 2]). Meters were calibrated prior to use per manufacturer's instructions. An end-of-day reading was also taken to document that each instrument remained calibrated within acceptance criteria. Water column measurements were recorded from 3 feet below surface, at mid-depth, and at 3 feet above the bottom. Measured water column parameters and associated data consisted of

- Time of reading
- Depth of measurement (feet)
- Water temperature (°C)
- pH (units)
- Salinity (ppt)
- Conductivity (mS/cm)
- Dissolved oxygen (mg/L and percent saturation)
- Turbidity (NTU, near-surface only)

Water depth measurements, tidal cycle, and weather observations were recorded on water sampling logs and are summarized in Table 2. Water column measurements (on a sampling log) and an instrument calibration log are in Appendices B-2 and B-4, respectively.

2.2.5 Sediment Sampling

Vibracore services were performed by Athena Technologies. An ANAMAR field team leader was on the sampling vessel at all times to direct operations, record field notes, containerize and label the samples, and take custody of the samples. All sediment cores were collected in decontaminated stainless steel core barrels. The primary GPS receiver (a Champion TKO GNSS) aboard the sampling vessel is capable of sub-meter horizontal accuracy and was used for navigation to the desired sampling station. A backup GPS unit capable of 10-meter accuracy was available and used in the event the primary GPS was nonfunctional. Once on station, the R/V *Artemis* was immobilized using a triple-point anchor system, and coordinates were marked with the GPS. Water depths during the sampling event were determined using a fathometer.

Athena's vibracore system was deployed from the deck of the vessel and consisted of a generator with a mechanical vibrator attached via cable. This vibrator was attached directly to a 4-inch-diameter stainless steel casing. The sampler was lowered to the substrate through a moon pool in the deck of the sampling platform by attaching lengths of drill stem. The vibracore apparatus was then activated and the sample barrel penetrated into the sediment until it reached target depth. After the core barrel was retrieved, the check valve was removed from the top of the core barrel and the length of material in the barrel was measured by inserting a tape measure covered with a nitrile glove into the top of the barrel until it contacted the sediment.

Core penetration required to reach project depth was calculated by determining the sediment surface elevation (top of core elevation) by subtracting water depth from the water surface elevation (as determined using the GNSS receiver) and then subtracting project depth (as a negative value) from the sediment surface elevation. Samples collected using a core device were reported as borings and data were recorded on boring logs. The ANAMAR team leader recorded the water surface elevation, depth of water, sediment surface elevation, total penetration of the boring, and length of material recovered in the core barrel. Borings at all stations were taken to full project depth including overdepth, or to refusal, whichever was encountered first. Additional cores were collected if needed to reach the volume of sediment required for analysis. The same number of cores were collected at each station within a given DU to provide a representative sample of the material based on depth of shoaling.

When sediment cores are collected with a vibracore system, the retrieved sample is subject to material compaction. For instance, a core sample taken from a penetration depth of 10 feet may result in a recovered core of only 8 to 9 feet in length, depending on the sediment composition.

Once all cores were collected at a given station, the sample material was photographed, transferred to labeled Teflon® bags, and placed immediately into ice-filled coolers. All containers were properly labeled, and sampling information for each station was recorded on individual project-specific field logs. At the end of each sampling day, iced sample coolers were transferred to a refrigerated truck for storage at or below 4°C. Table 1 provides additional information on vibracore sampling. Copies of the field logs for vibracoring are provided in Appendix B-1.

2.2.6 Water Sampling

The water sample for elutriate preparation was collected from station JBC18-SW, where the sediment sample JBC18-S2-1E was also collected) (shown on Map 2) within Shoal 2A using a stainless steel pneumatic pump attached to a Teflon® hose and powered by compressed air. All equipment contacting sampled water was decontaminated prior to use by methods outlined in Subsection 2.2.7. The suction hose was lowered through the water column. A stainless steel weight was attached to the end of the hose with stainless steel cable to allow the hose to hang approximately 3 feet above the sediment surface. Another section of Teflon® hose was attached to the discharge nozzle of the pump. Pressurized air was allowed to enter the pump, which drove a cylinder that pushed water through the Teflon® tubing. A pressure valve was used to adjust flow.

Two hundred and fifty gallons of water were collected from the water station. Water was containerized in low-density polyethylene 20-liter Cubitainers® for elutriate chemical analysis. The same pump was used to collect additional water for chemical analysis. The additional water collected was containerized in pre-cleaned, pre-preserved glass and plastic bottles (some with a preservative agent added) provided by GEL Laboratories.

The Cubitainers® and the additional containers of water were stored in ice-filled coolers for storage at or below 4°C. The water was then picked up by staff of GEL Laboratories on June 19, 2018 and transported to their Charleston laboratory for analysis. Water sampling date and time, station coordinates, and related information are included in Table 2. A copy of the water sampling field log is in Appendix B-2.

2.2.7 Sample Transport, Processing, and Custody

2.2.7.1 Transport to the Laboratories

Water sample JBC18-SW and sediment samples JBC18-GC-1A and 1B (all contained within ice-filled coolers) were picked up by staff of GEL Laboratories on June 19 and transported to their Charleston laboratory for analysis. The remaining samples were delivered by refrigerated truck to the GEL laboratory in Charleston by the ANAMAR team leader on June 21 following completion of sampling. The temperature inside the truck was monitored to ensure that samples met preservation criteria. A copy of the temperature log is provided in Appendix B-5.

2.2.7.2 Compositing and Homogenizing

Samples were homogenized and composited by GEL Laboratories at their Charleston laboratory as per Subsection 2.2.6 of the SAP/QAPP. Decontamination of equipment between composite samples followed methods described in Subsection 2.2.7.

2.2.7.3 Shipping to the Physical Laboratory

The 27 physical samples were shipped from the GEL Laboratories facility in Charleston to Terracon in Jacksonville, Florida, on June 24. GEL shipped the seven composites on June 29 and the water sample (for analysis of settling rates) on July 5. Terracon received the physical samples on June 29, the composites on July 2, and the water sample on July 6. Chain-of-custody forms accompanied the physical samples from GEL Laboratories and were completed to reflect the final sample names and to identify the analyses and analytical methods required. Copies of the final signed chain-of-custody forms are included in the laboratory reports (Appendices C and E).

2.3 Physical and Chemical Analytical Procedures

2.3.1 Physical Procedures

Terracon performed physical analyses of all sediment samples. ANAMAR performed quality assurance/quality control (QA/QC) on sediment physical data and presented the data in summary tables.

2.3.1.1 Grain Size Distribution

Gradation tests were performed by Terracon in general accordance with methods ASTM D-422 and ASTM D-1140. Each representative sample was air-dried and dry-prepped in accordance with method ASTM D-421, and results of the sieve analysis of material larger than a #10 sieve (2.00-mm mesh size) were determined. The minus #10 sieve material was then soaked in a dispersing agent. Following the soaking period, the sample was placed in a mechanical stirring apparatus and then in a sedimentation cylinder where hydrometer readings were taken over a 24-hour period. After the final hydrometer reading was taken, the sample was washed over a #200 sieve (0.075-mm mesh size), placed in an oven, and dried to a constant weight. After drying, the sample was sieved over a nest of sieves to determine the gradation of the material greater than #200 sieve size. Cumulative frequency percentages were graphed and presented by Terracon on USACE Form 2087 (Appendix C). ANAMAR tabulated and graphed the grain size distribution.

2.3.1.2 Percent Total Solids

Moisture content analyses were performed by Terracon in general accordance with method ASTM D-2216-80 and Plumb (1981). The sample weight was recorded and the sample was placed in an oven and dried to a constant mass at 110°C. Once a constant dry mass was obtained, the percent moisture was determined by subtracting the dry mass from the wet mass, then dividing the loss in mass due to drying (the mass of just moisture) by the wet mass. The percent total solids was reported on a 100% wet weight basis.

2.3.1.3 Atterberg Limits

Tests for liquid and plastic limits for the seven composited samples were performed by Terracon in general accordance with ASTM D-4318, wet method, as follows. The minus #40 sieved material was mixed with a small amount of water and placed in a liquid limit device. A groove was cut using a flat grooving tool and the liquid limit was determined by the number of drops of the cup. When the number of drops was in the desired range, a moisture sample was obtained and placed in a 230°C oven and dried to a constant weight. This was repeated until three determinations had been obtained, one between 15 and 25 blows, one between 20 and 30 blows, and one between 25 and 35 blows. The reported value is the intersecting value at 25 blows when all three were plotted.

The plastic limit was determined by slowly air-drying a small sample left over from the liquid limit determination. The sample was rolled and air-dried until the thread became crumbly and lacked cohesion. When this point was reached, the sample was placed in a tare and weighed, then placed in an oven and dried to a constant weight. The moisture content is the plastic limit.

2.3.1.4 Specific Gravity

Specific gravity was determined by Terracon for the composited samples in general accordance with method ASTM D-854. Each sample was placed in a mechanical stirring device and deionized water was added to form a slurry, which was then transferred to a pycnometer and de-aired by applying a vacuum. After vacuuming, the pycnometer with sample was allowed to reach thermal equilibrium. The water level was adjusted to a calibration mark and the pycnometer with sample was weighed. After the pycnometer with sample weight was recorded, the sample was emptied into a drying container and placed in an oven until a constant dry mass of sediment solids was obtained.

2.3.2 Chemical Analytical Procedures

GEL Laboratories performed most chemical analyses of sediment, water, and elutriate samples in accordance with published procedures. The only exceptions were dioxins/furans and PCB congeners, which where were analyzed by their affiliate, Cape Fear Analytical in Wilmington, North Carolina, and tri-n-butyltin, which was analyzed by TestAmerica Seattle in Tacoma, Washington. Analytical methods, preparation methods, target detection limits, and laboratory reporting limits for sediment, water, and elutriate analyses are provided in Subsection 2.3.2 of the SAP/QAPP (Appendix A). Elutriates were generated using methods described in Subsection 10.1.2.1 of the Green Book, equivalent to Subsection 10.1.2.1 of the *Inland Testing Manual* (ITM) (USEPA and USACE 1998). ANAMAR performed QA/QC on these data and presented the data in summary tables. Complete laboratory reports are provided in Appendix E. Exhibit 2-6 provides a summary of analytical methods used.

Exhibit 2-6. Summary of Methods and Equipment Used during Sediment, Water, and Elutriate Analysis

EPA Method	Instrument/ Procedure	Methodology Summary
200.8, 6010B, and 6020 (trace metals)	ICP and ICP/MS for trace metals	Inductively coupled plasma (ICP) with or without mass spectrometry (MS) is applicable to the determination of sub-µg/L concentrations of many elements in water samples and in waste extracts or digests. Acid digestion prior to filtration and analysis is required for aqueous samples and sediments for which total (acid-leachable) elements are required.
7470 (mercury in water)	Mercury Analyzer Cold Vapor Atomic Absorption (water)	Method 7470 is a cold-vapor atomic absorption procedure approved for determining the concentration of mercury in mobility-procedure extracts and aqueous wastes. All samples are subjected to an appropriate dissolution step before analysis.
7471 (mercury in sediment)	Mercury Analyzer Cold Vapor Atomic Absorption	Method 7471 is approved for measuring total mercury (organic and inorganic) in sediments and tissues. All samples are subjected to an appropriate dissolution step before analysis. If this dissolution procedure is not sufficient to dissolve a specific matrix type or sample, this method is not applicable for that matrix.
8081B (pesticides)	Gas Chromatograph	Method 8081B is used to determine the concentrations of various organochlorine pesticides in extracts from solid and liquid matrices using fused-silica, open-tubular capillary columns with electron capture detectors (ECD) or electrolytic conductivity detectors (ELCD). The compounds that can be run by this method may be determined by a single- or a dual-column analysis system.
8082A (PCB Aroclors)	Gas Chromatograph	Method 8082A is used to determine the concentrations of PCBs as individual PCB Aroclors in extracts from solid and aqueous matrices using open-tubular capillary columns with ECD or ELCD. The target compounds may be determined by a single- or dual-column analysis system.
8270 SIM (PAHs)	Gas Chromatograph/ Mass Spectrometer	This method is used to determine the concentration of semi-volatile/PAH organic compounds in extracts prepared from many types of solid matrices and water samples. Direct injection of a sample may be used in limited applications.
8290A and 1668 (congeners of dioxins, furans and PCBs)	High Resolution Mass Spectrometer	This method is used to determine the concentrations of dioxin and furan and PCB congeners in extracts prepared from many types of solid matrices and water samples.
9060 (modified*) (TOC)	Total Organic Carbon (TOC) Analyzer	Method 9060 is used to determine the concentration of organic carbon in sediment by catalytic combustion or wet chemical oxidation. The carbon dioxide formed from this procedure is measured and is proportional to the TOC in the sample.
Krone et al. (1989) (organotins)	Grignard Reaction/Gas Chromatograph/ Flame Photometric	This method refers to the Grignard reaction, gas chromatograph, and flame photometric detection of di-n-butyltin, n-butyltin, and tri-n-butyltin cations in sediment and elutriates. All samples are subjected to an extraction phase prior to analysis, and the concentration is determined using standard organic protocols.

* Minor modifications were made to Method 9060 that were approved by the National Environmental Laboratory Accreditation Conference (NELAC).

2.4 Data Reduction and Applicable Technical Quality Standards

Raw field and laboratory data were summarized, compiled into tables, and reviewed for errors. The CQAR is in Appendix D. Maps 1 through 4 are used to associate the results spatially with respect to sampling locations.

2.4.1 Sediment Chemistry

Results of laboratory analyses of sediment samples are compared to published sediment screening values as appropriate. These levels are the threshold effects level (TEL) and the effects range low (ERL). The TEL represents the concentration below which adverse effects are expected to occur only rarely. The ERL is the value at which toxicity may begin to be observed in sensitive species (Buchman 2008). These comparisons are for reference use only and are not intended for regulatory decision-making.

Dioxin-like compounds are written in widely used shorthand (Patnaik 1999) (example: 2,3,7,8-TCDD refers to the compound 2,3,7,8-tetrachlorodibenzo-p-dioxin). The dioxins and furans tested have total toxicity equivalence (TEQ) values calculated by multiplying the analytical results (or the method detection limit [MDL]) if the analyte was not detected at or above the MDL) with toxic equivalency factors (TEFs) for humans and other mammals from Van den Berg et al. (2006), which summarized a June 2005 re-evaluation of dioxin and dioxin-like compounds at the World Health Organization International Programme on Chemical Safety meeting in Geneva. These same TEFs are summarized in tables presented in USEPA (2010), representing an updated version of those discussed in Appendix M of the SERIM. The resultant TEQ was compared to the apparent effects threshold (AET) and the TEL. The comparisons made between sediment analytical results and the above-mentioned screening benchmarks (i.e., AET, ERL, TEL) are for reference use only, not for making regulatory decisions.

2.4.2 Elutriate and Water Chemistry

Analytical results for elutriate and water samples were compared to the latest published EPA water quality criteria of criteria maximum concentration (CMC [synonymous with ‘acute’]) established in USEPA (2006, 2015) and accepted by the State of South Carolina. The CMC is an estimate of the highest concentration of a pollutant in saltwater to which an aquatic community can be exposed briefly without resulting in an unacceptable effect (USEPA 2006, Buchman 2008). The South Carolina criteria are either equal to or slightly higher than the national criteria.

2.5 Reporting Limits

The sediment chemical concentration, MDL, and method reporting limit (MRL) were reported on a dry weight basis. The chemical concentration, MDL, and MRL for water and elutriates were reported on a wet weight basis. The MDL refers to the minimum concentration of a given analyte that can be measured and reported with a 99% confidence level that the analyte concentration is greater than zero (40 CFR Part 136 Appendix B). The MRL refers to the minimum concentration at which the laboratory will report analytical chemistry data with confidence in quantitative accuracy of a given datum. Common laboratory procedures for defining an MRL include assigning it to a fixed factor above the MDL or by using the lowest calibration standard. MRLs are often adjusted by the laboratory for sample-specific parameters such as sample weight, percent solids, or dilution.

3 RESULTS AND DISCUSSION

3.1 Field Sampling

Conditions during the June 18 through 21, 2018 field effort were acceptable for sampling. The sediment sampling efforts are summarized in Table 1 and the water sampling efforts are summarized in Table 2. All samples met acceptance criteria in Subsection 2.2.3 and 2.2.4 of the SAP/QAPP (see Subsection 4.1 [QA/QC Field Sampling] for further information). Water column parameters were recorded at the water sampling station and are included in Table 2.

3.2 Sediment Physical Results

Physical analyses were conducted for all sediment samples and composites. Individual samples and composites underwent grain size distribution analysis. Hydrometer readings, Atterberg limits, and specific gravity were also determined for the composites. Exhibit 3-1 summarizes and compares percent grain size distributions for composites. Exhibit 3-2 summarizes USCS classes, specific gravity, and Atterberg limits. Complete results of physical testing are presented in Tables 3 and 4 for samples and composites, respectively. The laboratory report of physical analytical results using USACE Form 2087 is provided in Appendix C.

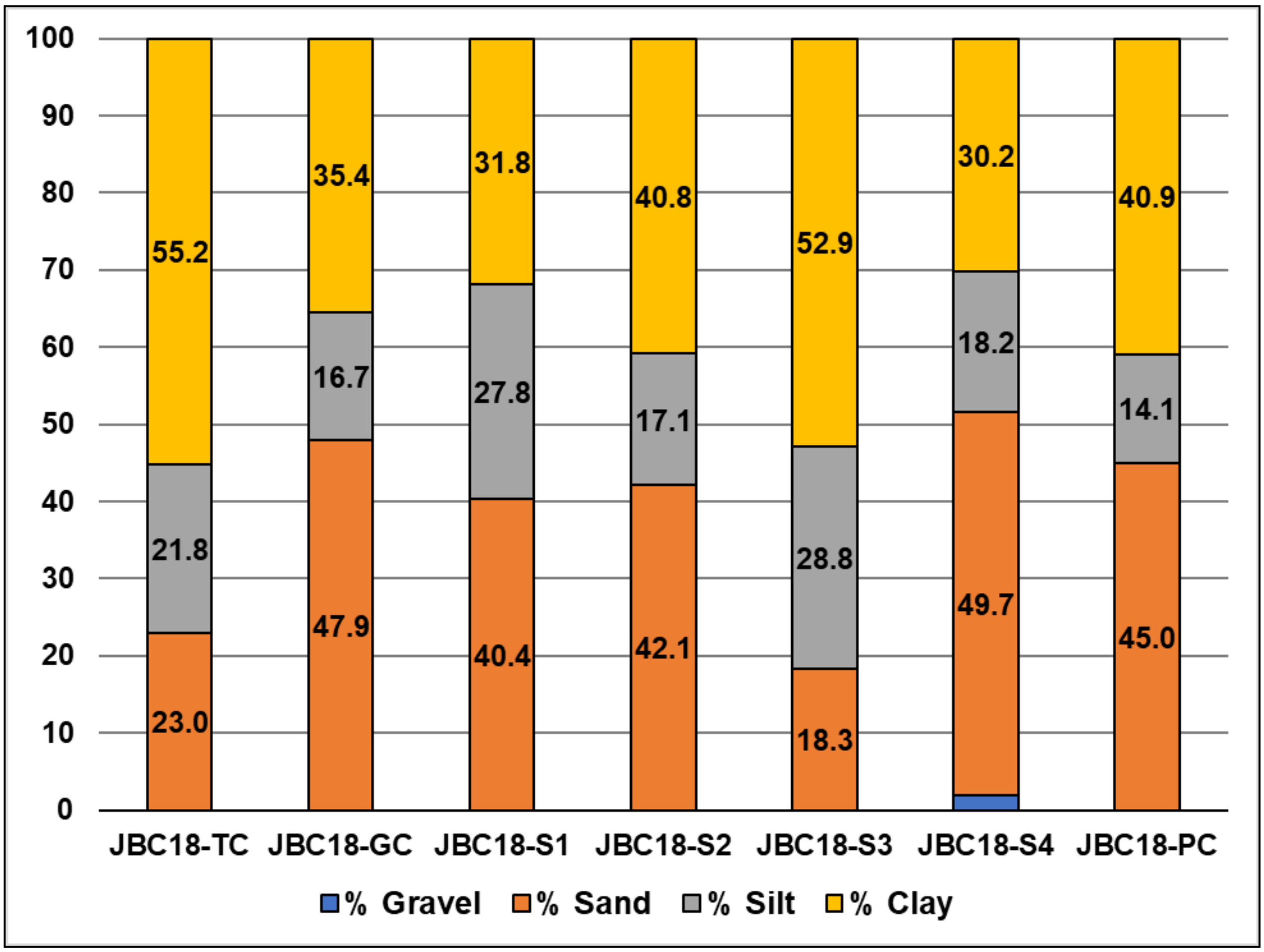

Exhibit 3-1. Percent Grain Size Distribution by Composite

Exhibit 3-2. USCS Soil Classes, Specific Gravity, and Atterberg Limits per Sediment Composite

Composite ID	USCS Soil Class[1]	Specific Gravity	Atterberg Limits		
			Plastic Limit	Liquid Limit	Plasticity Index
JBC18-TC	CH	2.602	42	126	84
JBC18-GC	CH	2.611	21	60	39
JBC18-S1	MH	2.673	39	88	49
JBC18-S2	CH	2.645	37	108	71
JBC18-S3	CH	2.631	51	142	91
JBC18-S4	SC	2.628	36	112	76
JBC18-PC	CH	2.620	27	63	36

[1] USCS classes defined: CH = clay of high plasticity; MH = silt of high plasticity, elastic silt; SC = clayey sand.
See Table 4 for complete physical analysis results for composites.

JBC18-TC (TC Dock)

Composite JBC18-TC is described as a fat clay with sand, little fine-grained quartz sand, little silt, trace medium to fine sand-size shell fragments, gray in color. The USCS classification is CH (clay of high plasticity). This composite is predominantly clay (55.2%) and sand (23.0%) with silt (21.8%).

JBC18-GC (Goose Creek Channel)

Composite JBC18-GC is described as a sandy fat clay, some fine-grained quartz sand, little silt, trace fine sand-size shell fragments, gray in color. The USCS classification is CH (clay of high plasticity). This composite is predominantly sand (47.9%) and clay (35.4%) with silt (16.7%).

JBC18-S1 (Shoal 1)

Composite JBC18-S1 is described as a sandy elastic silt, some fine-grained quartz sand, some clay, trace coarse to fine sand-size shell fragments, gray in color. The USCS classification is MH (silt of high plasticity). This composite is predominantly sand (40.4%) and clay (31.8%) with silt (27.8%).

JBC18-S2 (Shoals 2 and 2A)

Composite JBC18-S2 is described as a sandy fat clay, some fine-grained quartz sand, little silt, trace medium to fine sand-size shell fragments, gray in color. The USCS classification is CH (clay of high plasticity). This composite is predominantly sand (42.1%) and clay (40.8%) with silt (17.1%).

JBC18-S3 (Shoals 3 and 3A)

Composite JBC18-S3 is described as a fat clay with sand, little fine-grained quartz sand, little silt, gray in color. The USCS classification is CH (clay of high plasticity). This composite is predominantly clay (52.9%) and silt (28.8%) with sand (18.3%).

JBC18-S4 (Shoals 4, 4A, and 5)

Composite JBC18-S4 is described as a clayey sand, mostly fine-grained quartz, some clay, little silt, few coarse to fine sand-size shell fragments, trace fine gravel-size shell fragments, gray in color. The USCS classification is SC (clayey sand). This composite is predominantly sand (49.7%) and clay (30.2%) with silt (18.2%).

JBC18-PC (Pier C Expansion)

The JBC18-PC composite is described as sandy fat clay, some fine-grained quartz sand, little silt, trace medium to fine sand-size shell fragments, gray in color. The USCS classification is CH (clay of high plasticity). This composite is predominantly sand (45.0%) and clay (40.9%) with silt (14.1%).

3.3 Sediment Chemistry

Analytical results for sediment chemistry are presented in Tables 5 through 9. Sediment chemistry was performed on all sediment composites. Analyses consisted of metals, TOC, tri-n-butyltin, pesticides, PAHs, PCB congeners and Aroclors, and dioxins and furans. Analytical results were compared to published sediment screening criteria TEL, ERL, and AET; which are defined in Subsection 2.4.1.

3.3.1 Metals, TOC and Tri-n-butyltin

Eight of the 11 metals tested were detected in concentrations greater than the MDL in most sediment composites. Arsenic was the only metal detected in concentrations above the TEL and (or) ERL in six of the seven composites. JBC18-S3 contained maximum detected concentrations for seven of the eight metals detected above the MDL.

TOC concentrations ranged from 4,540 to 112,000 mg/kg and were highest in JBC18-S1. Tri-n-butyltin was not detected above the MDL in any composite. However, the MDLs and MRLs for tri-n-butyltin in sediment exceeded the target detection limit (5 µg/kg) and the laboratory reporting limit (1.8 µg/kg) in Table 2-6 of the SAP/QAPP. Exhibit 3-3 summarizes the analytical results for metals, TOC, and tri-n-butyltin in sediment compared to the TEL and ERL. Complete results are in Table 5.

Exhibit 3-3. Analytical Results for Metals, TOC, and Tri-n-butyltin in Sediment

	Concentration (mg/kg or as indicated below)								
	Composite ID (JBC18-)							TEL	ERL
Analyte	TC	GC	S1	S2	S3	S4	PC		
METALS									
Antimony	<0.798	<0.431	<0.664	<0.782	<0.912	<0.687	<0.531	x	x
Arsenic	***13.7***	**8.23**	**7.27**	**10.7**	***13.0***	**8.58**	5.54	7.24	8.2
Cadmium	<0.242	<0.131	<0.201	<0.237	<0.276	<0.208	<0.161	0.676	1.2
Chromium	24.6	11.7	27.3	23.0	29.6	16.4	14.8	52.3	81
Copper	10.5	2.57	10.0	11.5	15.7	7.32	2.89	18.7	34
Lead	11.2	5.61	6.51	10.7	12.6	8.07	7.24	30.24	46.7
Mercury	0.0313	0.011	0.0353	0.0379	0.0518	0.0265	0.0136	0.13	0.15
Nickel	8.53	2.92	10.9	7.56	11.5	5.18	2.86	15.9	20.9
Selenium	1.52	<0.653	1.48	1.50	2.82	<1.04	<0.804	x	x
Silver	<0.242	<0.131	<0.201	<0.237	<0.276	<0.208	<0.161	0.73	1
Zinc	45.0	14.3	38.9	41.9	56.8	30.2	13.4	124	150
OTHER									
TOC (mg/kg)	38000	4540	112000	59400	111000	52400	8920	x	x
Tri-n-butyltin (µg/kg)	<50	<24	<43	<48	<51	<40	<30	x	x

Less-than symbol (<) indicates the given analyte was not detected at or above the MDL (U-qualified) (value indicates the MDL).
x = No TEL or ERL published for that parameter.
Bolded values exceed the TEL and (or) ERL.
See Table 5 for complete results.

3.3.2 Pesticides

None of the 28 pesticides tested were detected in concentrations above the MDL in any composite. The MRLs for chlordane; p,p' (4,4')-DDD; p,p' (4,4')-DDE; p,p' (4,4')-DDT; dieldrin; γ-BHC (lindane); and toxaphene were greater than the respective TEL and (or) ERL. MDLs for chlordane and dieldrin in all seven composites also exceeded the TEL and (or) ERL. The laboratory reporting limits for chlordane, (4,4')-DDD, (4,4')-DDT, dieldrin, y-BHC (lindane), and toxaphene for all composites exceeded the TEL and (or) the ERL but did not exceed respective target detection limits specified in the SAP/QAPP (see Subsection 4.4.3 for more information). Complete results are in Table 6.

3.3.3 PAHs

Six of the 19 PAH analytes tested were detected above the MDL in one or more composites. JBC18-TC and JBC18-S3 had detected concentrations of acenaphthene that exceeded the TEL and (or) ERL. In addition, MRLs for acenaphthene, acenaphthylene, and dibenzo(a,h) anthracene in one or more composites exceeded the respective TEL. However, the results for most of these composite and analyte combinations were not detected above the MDL (U-qualified), and the respective MDLs were below the TEL and ERL. JBC18-S3 had the maximum detected concentrations for five of the six PAH analytes detected above the MDL, along with the maximum concentrations of total low-molecular-weight (LMW) PAHs, total high-molecular-weight (HMW) PAHs, and total PAHs. PAHs detected above the MDL in sediment are summarized in Exhibit 3-4. Complete results are in Table 7.

Exhibit 3-4. Sediment PAH Results Detected above the MDL

Analyte	Concentration (µg/kg)			
	Composite ID		TEL	ERL
	JBC18-TC	JBC18-S3		
Acenaphthene	***14.5***	***18.2***	6.71	16
Fluoranthene	12.1	12.5	113	600
Fluorene	8.07	12.5	21.2	19
Naphthalene	11.3	<3.16	34.6	160
Phenanthrene	12.1	20.1	86.7	240
Pyrene	8.07	10.5	153	665
Total LMW PAHs *	54.0	63.4	312	552
Total HMW PAHs *	30.8	35.6	655	1700
Total PAHs *	101	118	1684	4022

Bolded values exceed the TEL and (or) ERL.

Less-than symbol (<) indicates the given analyte was not detected at or above the MDL (U-qualified) (value indicates the MDL).

x = No TEL or ERL published for the given analyte.

* Total PAHs were calculated using the MDL for U-qualified results (non-qualified results use the value reported by the laboratory).

See Table 7 for complete results.

3.3.4 PCBs

Twenty-four of the 26 PCB congeners tested were detected above the MDL in one or more composites each. None of the seven PCB Aroclors tested were detected above the MDL in any composite. Total EPA PCBs ranged from 0.0188 to 1.47 µg/kg. Total National Oceanic and Atmospheric Administration (NOAA) PCBs ranged from 0.0320 to 2.56 µg/kg. These total values were calculated from individual PCB congener results; MDLs were substituted for result values for non-detected (U-qualified) congeners. Total PCBs are summarized in Exhibit 3-5. Complete results are provided in Table 8.

Exhibit 3-5. Sediment Total PCB Concentrations Calculated from PCB Congener Results

Analyte	Concentrations (µg/kg)								
	Composite ID (JBC18-)							TEL	ERL
	TC	GC	S1	S2	S3	S4	PC		
Total EPA Region 4 PCBs *	1.20	0.378	1.47	1.06	1.13	0.812	0.0188	21.6	22.7
Total NOAA PCBs *	2.09	0.645	2.56	1.82	1.94	1.41	0.0320	21.6	22.7

* Total PCBs were calculated using the MDL for U-qualified results. (J-qualified results use the value reported by the laboratory.)

See Table 8 for complete results.

3.3.5 Dioxins and Furans

All 17 individual dioxins and furans tested were detected above the MDL in one or more composites, although most results were at or below the MRL (J-qualified). All eight groups of total dioxins and furans were detected above the MDL in most composites, although only three of these groups were detected above the MRL in one or more composites. Six of the seven composites had total TEQ concentrations that exceeded the TEL. Dioxin and furan results greater than the MDL in one or more composites, along with the total TEQ results, are summarized in Exhibit 3-6. Complete results are provided in Table 9.

Exhibit 3-6. Sediment Total TEQs and Dioxin and Furan Group Results

Analyte	Concentrations (ng/kg)								
	Composite ID (JBC18-)							TEL	ERL
	TC	GC	S1	S2	S3	S4	PC		
Total TEQs *	**1.43**	**1.45**	**0.856**	**3.15**	**1.28**	0.698	**1.73**	0.85	3.6
TCDD, Total	9.37	44.4	3.49	12.0	6.07	7.09	94.5	x	x
PeCDD, Total	16.5	53.7	8.97	28.9	15.3	7.55	96.3	x	x
HxCDD, Total	88.2	260	52.7	162	81.2	43.8	444	x	x
HpCDD, Total	145	234	98.1	302	159	75.1	239	x	x
TCDF, Total	0.570	<0.203	0.657	2.14	0.928	0.593	0.249	x	x
PeCDF, Total	0.697	0.118	0.669	2.29	1.36	0.220	<0.0306	x	x
HxCDF, Total	1.56	1.02	1.47	4.37	2.90	0.617	0.193	x	x
HpCDF, Total	2.91	1.99	2.90	10.6	5.01	0.912	<0.0507	x	x

* Total TEQs were calculated by substituting (0.5 * MDL) multiplied by the TEF for U-qualified results. (J-qualified and non-qualified results use the value reported by the laboratory.)

Bolded values exceed the TEL.

x = No TEL or AET published for the given analyte.

Less-than symbol (<) indicates the given analyte was not detected at or above the MDL (U-qualified) (value indicates the MDL).

See Table 9 for complete results.

3.4 Elutriate and Water Chemistry

Analytical results for the water sample JBC18-SW and elutriates generated from all seven sediment composites are presented in Tables 10 through 14. Results of water samples and total (particulates and dissolved fractions) and dissolved fractions of elutriates are compared to the CMC, which is defined in Subsection 2.4.2. The water and elutriate chemistry laboratory case narrative and data are provided in Appendix E-2.

3.4.1 Metals, Organotins, TSS and TOC

Seven of the 11 metals analyzed in water and elutriate samples were detected at or above the MDL in one or more samples. No metals were detected in concentrations greater than the CMC in any elutriate or water sample. The water sample had maximum detected concentrations of four (57%) of the seven metals detected. Tri-n-butyltin was not detected above the MDL in any sample. TSS concentrations ranged from 1,260 to 32,000 µg/L among elutriate and water samples. TOC concentrations ranged from 1,420 to 94,000 µg/L. Metals, TSS, and TOC detected above the MDL in one or more samples are summarized in Exhibit 3-7. Complete results are presented in Table 10.

Exhibit 3-7. Summary of Results for Total Metals, TSS, and TOC in Elutriates and Water Samples

Analyte	Concentrations (µg/L)								
	Sample ID (JBC18-)								CMC
	TC	GC	S1	S2	S3	S4	PC	SW (water)	
METALS									
Antimony	<1.00	1.55	1.19	<1.00	<1.00	1.16	<1.00	<1.00	x
Arsenic	47.1	28.9	21.5	44.1	53.9	41.4	25.1	23.8	69
Copper	2.76	2.62	3.24	3.10	2.62	2.84	2.79	3.74	4.8
Lead	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	0.509	210
Nickel	7.28	7.13	7.42	7.82	6.76	7.40	7.33	7.68	74
Selenium	41.2	41.5	30.2	51.4	58.1	52.9	50.8	59.9	290
Zinc	5.43	9.18	7.52	5.44	5.37	8.20	5.07	10.3	90
OTHERS									
TSS	32000	8630	7410	5010	5030	5560	2890	1260	x
TOC	4470	1420	2890	40000	94000	31000	9430	35800	x

x = No CMC published for the given analyte.

Less-than symbol (<) indicates the given analyte was not detected at or above the MDL (U-qualified) (value indicates the MDL).

See Table 10 for complete results.

3.4.2 Pesticides and PAHs

None of the 28 pesticides tested were detected at or above the MDL in any elutriate or water sample. All seven elutriates and the water sample had MRLs for chlordane, endosulfan II, and toxaphene that exceeded the CMC; however, the results for these samples were not detected above the MDL. Complete results are provided in Table 11.

Seven of the 19 PAHs tested were detected in concentrations above the MDL in one or more samples. Total PAHs ranged from 0.57 to 1.56 µg/L among the elutriates tested and 0.57 µg/L for the water sample. There are no CMCs for the PAHs tested. Complete results are provided in Table 12.

3.4.3 PCB Congeners and Aroclors

Twenty-two of the 26 PCB congeners tested were detected at or above the MDL in one or more elutriate or water sample. PCB 52 was the only congener detected above the MRL, and only with samples JBC18-TC and JBC18-GC. Total EPA Region 4 PCBs ranged from 0.000086 to 0.000548 µg/L. Total NOAA PCBs ranged from 0.000125 to 0.000864 µg/L. None of the seven PCB Aroclors tested were detected above the MDL (U-qualified). There are no CMCs for the PCBs tested. Complete results are provided in Table 13.

3.4.4 Dioxins and Furans

Five of the 17 dioxins and furans tested were detected at or above the MDL in one or more samples. However, all detected concentrations were below the MRL (J-qualified). Total TEQs ranged from 0.720 to 6.20 pg/L. Five of the eight total dioxin and furan groups were detected at or above the MDL in one or more samples, but all detected concentrations were below the MRL. There are no CMCs for the dioxins and furans tested.

4 QUALITY ASSURANCE/QUALITY CONTROL

4.1 Field Sampling

Field sampling took place from June 18 through 21, 2018. Sample homogenization and elutriate preparation were performed over the following 2 weeks at GEL Laboratories. Sampling and compositing conformed to methods outlined in the SAP/QAPP.

Sampling in the JBC area complied with the protocols found in the SAP/QAPP.

4.2 Sample Receipt

4.2.1 Terracon

Composited sediment samples and the water sample (for settling rate analysis) were received at Terracon on June 29 and July 2, 2018. Several sediment samples were received in damaged containers, but the samples were still useable. All samples were analyzed in accordance with the criteria specified in the SAP/QAPP.

4.2.2 GEL Laboratories

Water sample JBC18-SW and sediment samples JBC18-GC-1A and 1B were picked up by the staff of GEL Laboratories and transported to their Charleston laboratory for analysis on June 19, 2018. The remaining samples were delivered by refrigerated truck to the GEL laboratory in Charleston by the ANAMAR team leader on June 21. All samples were received in good condition and consistent with the chain of custody prepared in the field. Once received, GEL composited the subsamples as described in the SAP/QAPP for sediment chemistry analysis and prepared the elutriate sample using the modified elutriate procedure. Once the samples were prepared, aliquots of the sediment and elutriate samples were sent to Cape Fear Analytical for dioxin and PCB congener analysis and to TestAmerica for organotin analysis. GEL performed all other tests shown in the SAP/QAPP.

4.2.3 Cape Fear Analytical

Sediment, elutriate, and water samples were received at Cape Fear Analytical from June 21 to June 28, 2018. All samples were received in good condition. Due to a laboratory issue, several elutriate samples were not delivered with the initial batch of samples. GEL arranged for shipping of the elutriate samples from TestAmerica, and the samples were delivered to Cape Fear Analytical on August 14, 2018. Based on standard analytical methodology, the samples were within holding time, and preservation was acceptable for analysis.

4.2.4 TestAmerica

Sediment, elutriate, and water samples were received at TestAmerica from June 21 to June 28, 2018. All samples were received in good condition. Due to a laboratory issue, several elutriate samples were not delivered to Cape Fear Analytical with the initial batch of samples. GEL arranged for shipping of the elutriate samples from TestAmerica, and the samples were delivered to Cape Fear Analytical on August 14, 2018. Based on standard analytical methodology, the samples were within holding time, and preservation was acceptable for analysis.

4.3 Physical Analysis

All physical analyses were performed by Terracon, and the results met the quality control criteria specified in the SAP/QAPP.

4.4 Sediment, Water and Elutriate Chemistry

4.4.1 Total Metals

4.4.1.1 Matrix Spike Recovery

Recoveries for zinc had three spikes outside control limits. The recoveries were consistent in the spike and spike duplicates, indicating a matrix interference in the sample. All other spikes were acceptable.

4.4.1.2 Method Blank

The method blank for chromium was detected at a level above the reporting limit for sediment samples. The results found in the sediment were at least 10 times the concentration found in the method blank, and the impact on the data quality should be minimal.

No additional anomalies associated with the analysis of these samples were observed.

4.4.2 Organotins by EPA Method 8270

4.4.2.1 Matrix Spike Recoveries

Spikes were not analyzed with the samples. Batch QC were within limits throughout the analytical testing, indicating that samples should be acceptable for evaluation. In addition, the results were reported as non-detects (U-qualified) throughout, with the elutriate levels well below the corresponding screening criteria.

4.4.2.2 Surrogates

Several sample surrogates were below the acceptance criteria specified in the SAP/QAPP but were acceptable using the laboratory acceptance limits.

4.4.2.3 Elevated Detection Limits

The laboratory detection limits were elevated above the levels specified in the SAP/QAPP for sediment, elutriate, and water samples. Sediment results do not have an applicable corresponding screening criterion. Elutriate detection limits were below the CMC. Therefore, the overall impact is low for both sediment and elutriate.

No other anomalies associated with the analysis of these samples were observed.

4.4.3 Organochlorine Pesticides by EPA Method 8081

4.4.3.1 Matrix Spike Recoveries

Several spikes were below 70% recovery for pesticides. Given the range of differences in the recoveries, the precision limit was not met for several pesticide compounds. The most likely explanation for the out-of-control recoveries and precision is matrix interference and sample heterogeneity.

4.4.3.2 Laboratory Control Sample

The laboratory control sample recovery was below 70% for several compounds, indicating a slightly low bias in the sample results. All results were non-detects, and the MDLs were below the target detection limits specified in the SAP/QAPP, indicating a low impact on the sample results.

No other anomalies associated with the analysis of these samples were observed.

4.4.4 PCB Aroclors by EPA Method 8082

4.4.4.1 Matrix Spike Recoveries

The spike recoveries for PCB Aroclors were below 70%, but the precision was acceptable, indicating a matrix interference in the samples and a slight low bias in the sample results.

4.4.4.2 Surrogates

Several surrogates for PCB Aroclors had recoveries in the range of 27% to 29%, which is below the limit specified in the SAP/QAPP, but within the lab acceptance limits. This indicates a slightly low bias in the samples but should have low impact on the results.

No other anomalies associated with the analysis of these samples were observed.

4.4.5 PCB Congeners by EPA Method 1668

Several surrogates for the congeners had low recoveries but, given the very low detection limits compared to the TDLs, the impact on the results should be minimal.

No anomalies associated with the analysis of these samples were observed.

4.4.6 PAHs by EPA Method 8270 SIM

The spike duplicate recoveries for several compounds were below 70% but were within the laboratory acceptance limits. This indicates a potential matrix interference and low bias in the samples.

No other anomalies associated with the analysis of these samples were observed.

4.4.7 Dioxins and Furans

4.4.7.1 Spike Recovery

No anomalies associated with the analysis of these samples were observed.

4.5 Target Detection Limit Exceedances

The following list shows the analytes for which the MDL provided by the laboratory exceeded the target detection limit or reporting limit as specified in the SAP/QAPP.

- For metals in sediment, several metals had MDLs or reporting limits that exceeded the target detection limits, but the concentration was detected in the sample. For these metals, there was no impact from the elevated detection limits. Cadmium had MDLs that exceeded the target detection limit with non-detected levels in the samples. The results were still below the corresponding screening levels, so this also should have low impact on the samples.

- For PAHs in sediment, sample JBC18-S4 had MDLs that exceeded the target detection limit. The elevated level is below all corresponding screening criteria and should have limited impact on the sample results.
- PCB Aroclors in sediment results from GEL exceeded the SAP/QAPP laboratory reporting limits. There are no corresponding screening criteria for these compounds except for Aroclor 1254. All MDLs for this compound were below the screening criteria, indicating a low impact on the results.
- Tributyltins in sediment had MDL results elevated above the target detection limits. There are no corresponding screening criteria, so the overall impact is low.
- In the elutriate and water analysis for trace metals, the achieved reporting limits matched the SAP/QAPP laboratory reporting limit, although several metals had MDLs above the target detection limit. In most cases, the results in which the MDL exceeded the target detection limit showed detectable concentrations in the samples.

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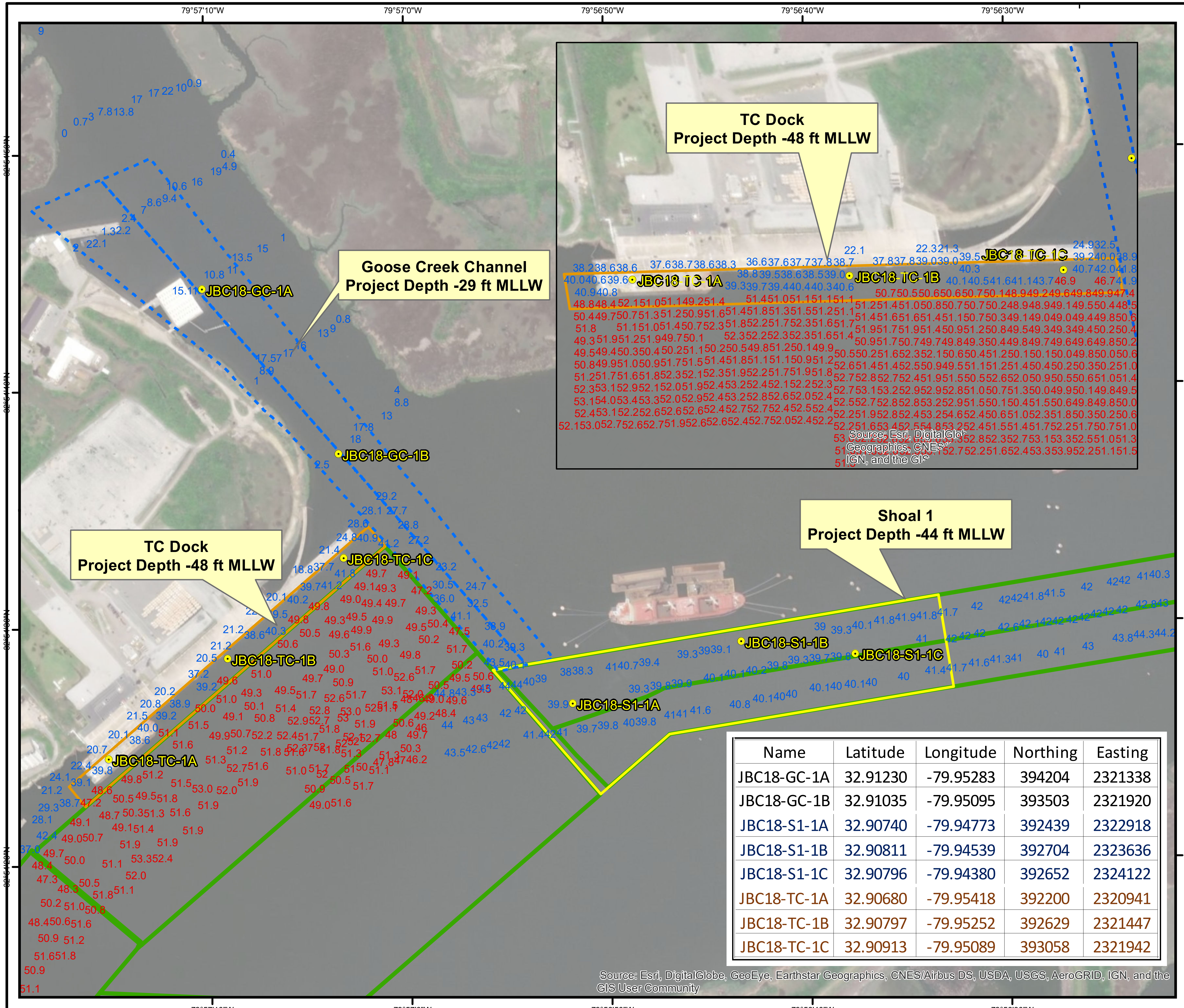
MAPS

MAPS



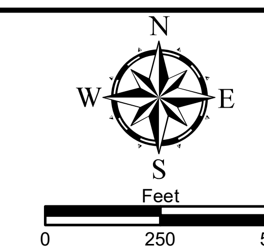
Name	Latitude	Longitude	Northing	Easting
JBC18-GC-1A	32.91230	-79.95283	394204	2321338
JBC18-GC-1B	32.91035	-79.95095	393503	2321920
JBC18-S1-1A	32.90740	-79.94773	392439	2322918
JBC18-S1-1B	32.90811	-79.94539	392704	2323636
JBC18-S1-1C	32.90796	-79.94380	392652	2324122
JBC18-TC-1A	32.90680	-79.95418	392200	2320941
JBC18-TC-1B	32.90797	-79.95252	392629	2321447
JBC18-TC-1C	32.90913	-79.95089	393058	2321942

Map 1
Goose Creek Channel, TC Dock and Shoal 1 Sampling Locations, Joint Base Charleston

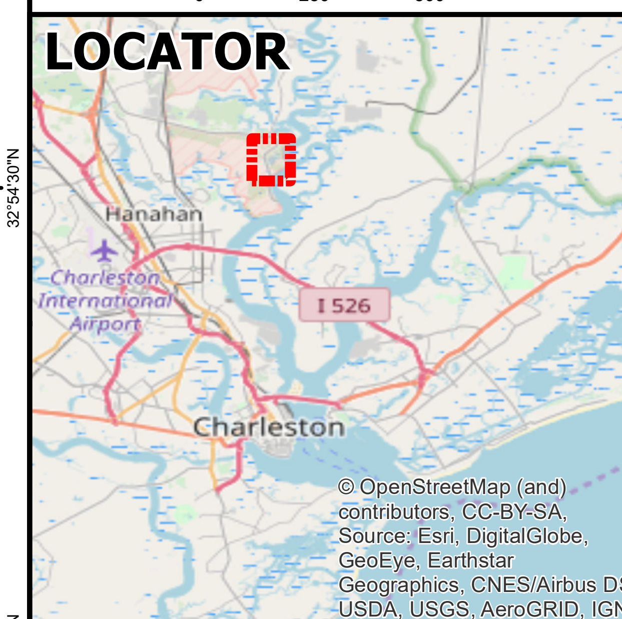
Legend

- Sampled Station
- Approximate DU Boundary
- Shoal 1
- TC Dock
- Channel Boundary

Bathy was collected 11/07/2013 (Goose Creek) 03/20/2018 (Shoal 1) and 6/04/2018 (TC Dock)



LOCATOR



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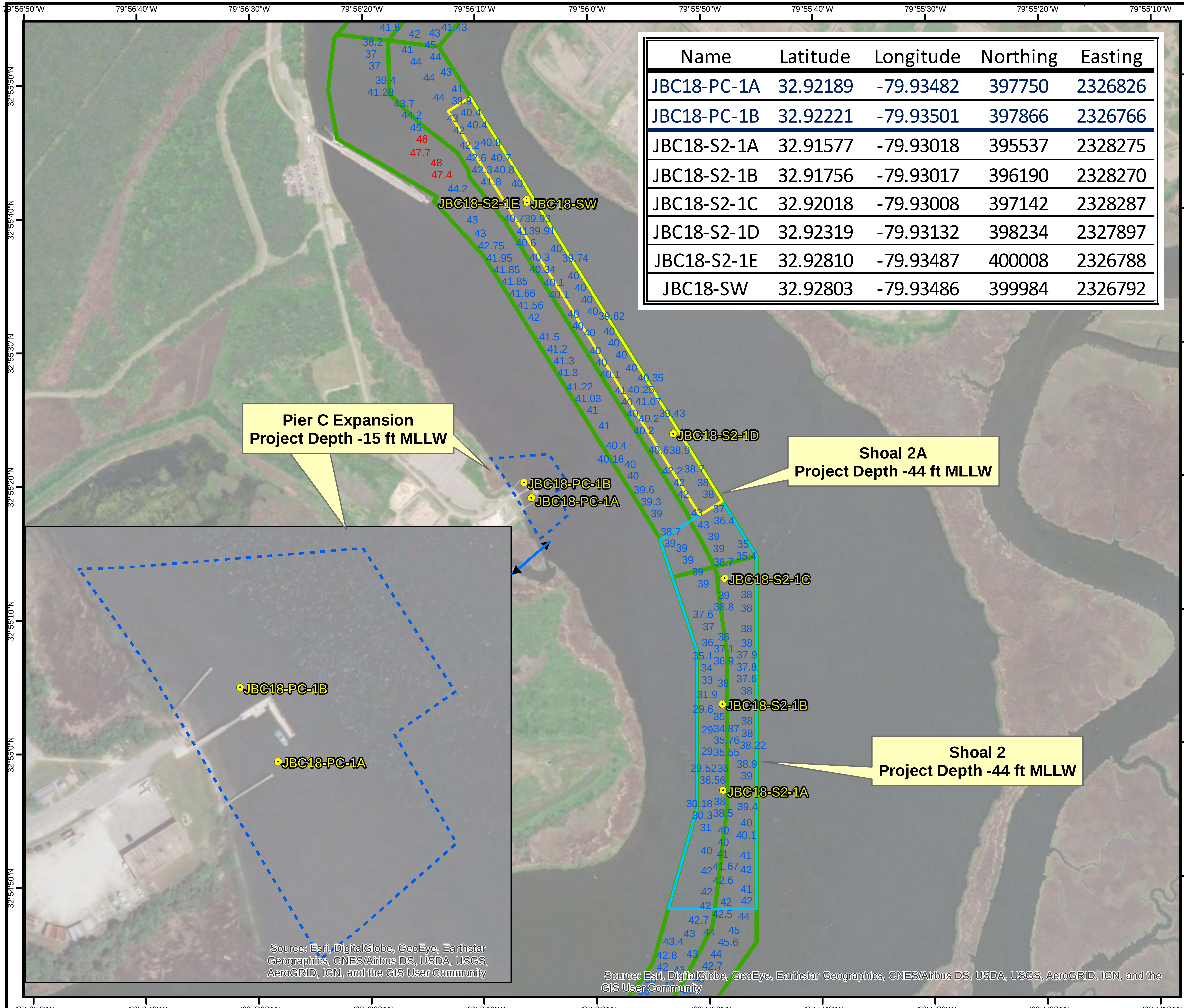
Q:\GIS PROJECTS\17-0017 Joint Base Charleston\Actual\Map1.mxd
Data sources: ANAMAR, USACE, NOAA

Map 2
Shoals 2 and 2A
and Pier C
Sampling Locations,
Joint Base Charleston

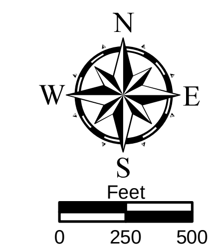


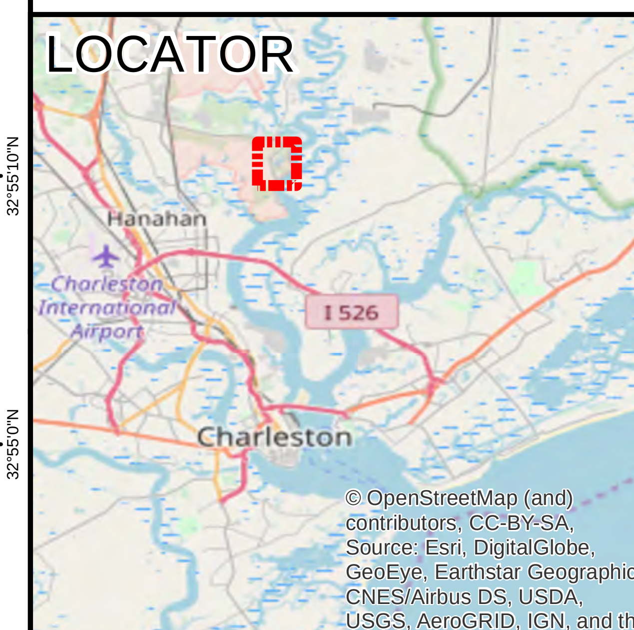
Name	Latitude	Longitude	Northing	Easting
JBC18-PC-1A	32.92189	-79.93482	397750	2326826
JBC18-PC-1B	32.92221	-79.93501	397866	2326766
JBC18-S2-1A	32.91577	-79.93018	395537	2328275
JBC18-S2-1B	32.91756	-79.93017	396190	2328270
JBC18-S2-1C	32.92018	-79.93008	397142	2328287
JBC18-S2-1D	32.92319	-79.93132	398234	2327897
JBC18-S2-1E	32.92810	-79.93487	400008	2326788
JBC18-SW	32.92803	-79.93486	399984	2326792

Legend

- Sampled Station
- Aproximate DU Boundary
- Shoal 2
- Shoal 2A
- Channel Boundary

Bathy collected on 03/20/2018





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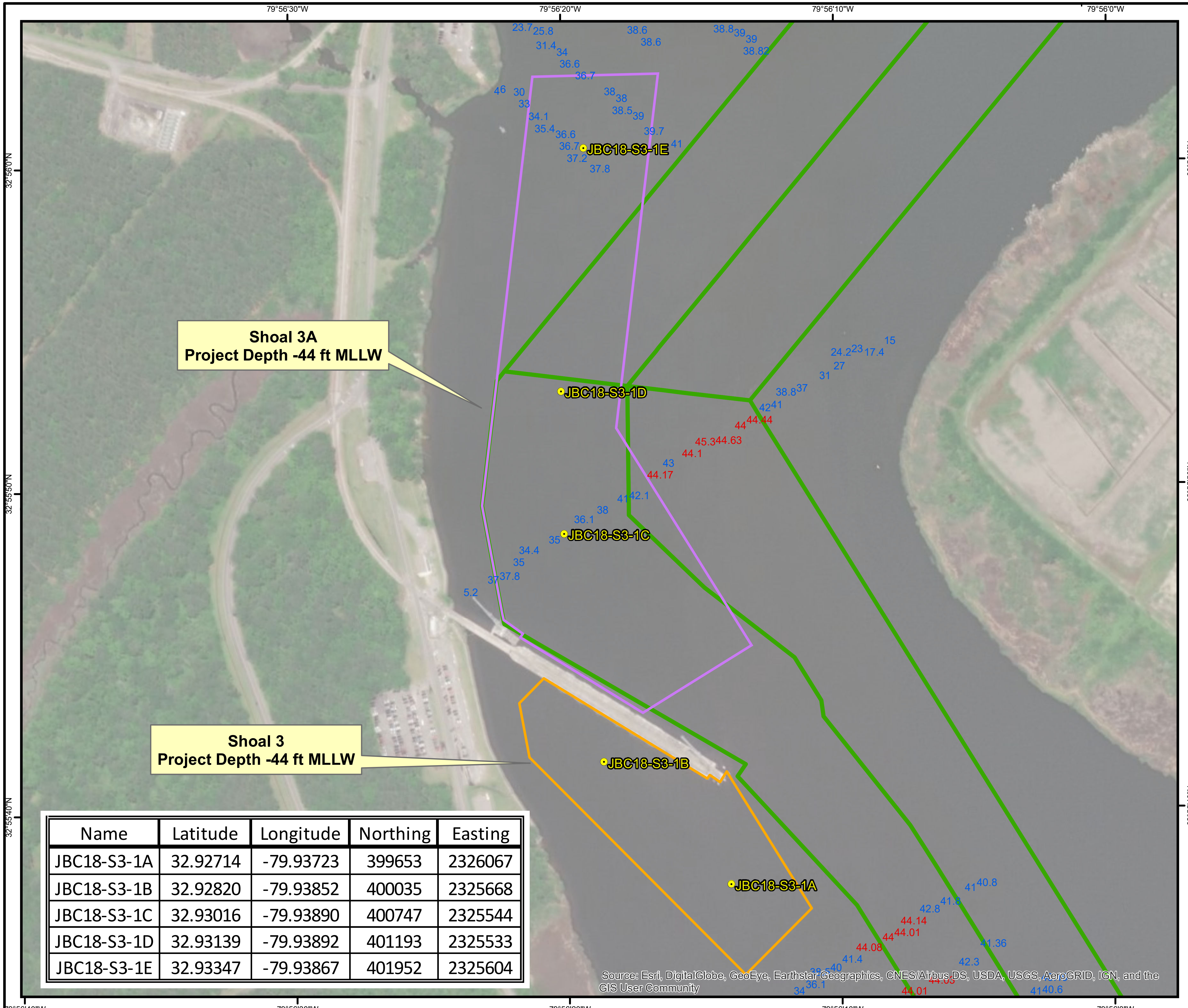
Data sources: ANAMAR, USACE, NOAA

Map 3
Shoals 3 and 3A Sampling Locations, Joint Base Charleston



Name	Latitude	Longitude	Northing	Easting
JBC18-S3-1A	32.92714	-79.93723	399653	2326067
JBC18-S3-1B	32.92820	-79.93852	400035	2325668
JBC18-S3-1C	32.93016	-79.93890	400747	2325544
JBC18-S3-1D	32.93139	-79.93892	401193	2325533
JBC18-S3-1E	32.93347	-79.93867	401952	2325604

Legend

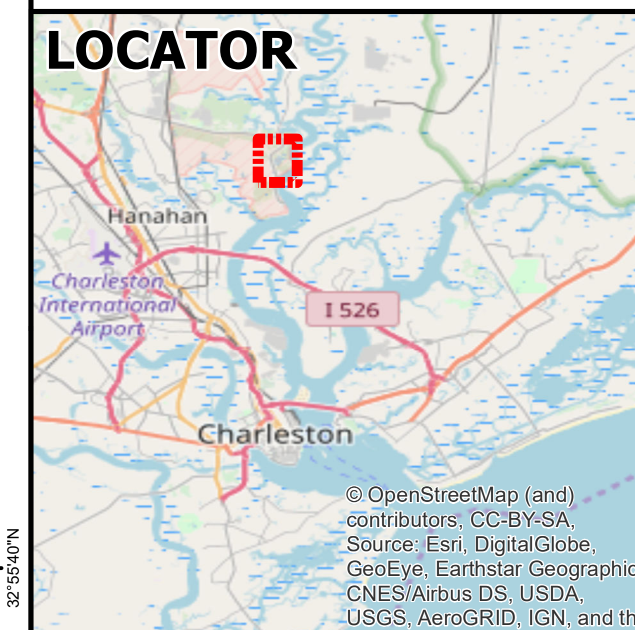
- Sampling Station
- Shoal 3
- Shoal 3A
- Channel Boundary

Bathy collected on 10/24/2014

N W E S

Feet
0 250 500

LOCATOR



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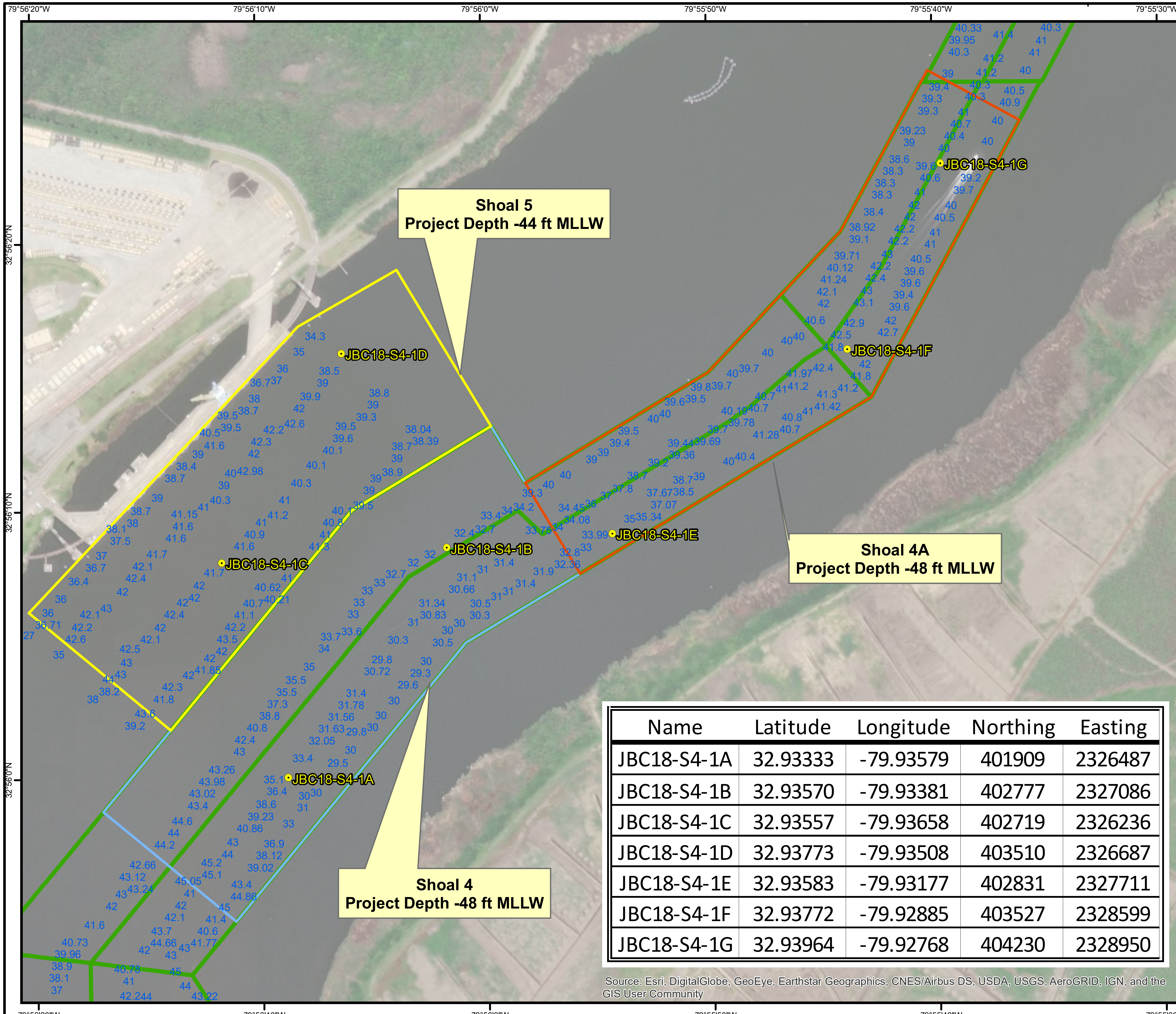
Q:\GIS PROJECTS\17-0017 Joint Base Charleston\Actual\Map3.mxd
Data sources: ANAMAR, USACE, NOAA



Name	Latitude	Longitude	Northing	Easting
JBC18-S4-1A	32.93333	-79.93579	401909	2326487
JBC18-S4-1B	32.93570	-79.93381	402777	2327086
JBC18-S4-1C	32.93557	-79.93658	402719	2326236
JBC18-S4-1D	32.93773	-79.93508	403510	2326687
JBC18-S4-1E	32.93583	-79.93177	402831	2327711
JBC18-S4-1F	32.93772	-79.92885	403527	2328599
JBC18-S4-1G	32.93964	-79.92768	404230	2328950

Map 4
Shoals 4, 4A and 5 Sampling Locations, Joint Base Charleston

Legend

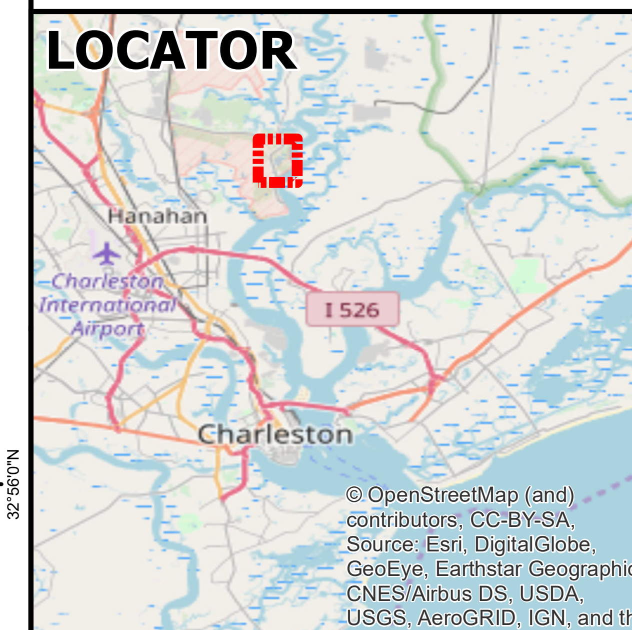
- Sampling Station
- Shoal 4
- Shoal 4A
- Shoal 5
- Channel Boundary

Bathy Collected on 03/20/2018

N W E S

Feet
0 250 500

LOCATOR



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Q:\GIS PROJECTS\17-0017 Joint Base Charleston\Actual\Map4.mxd
Data sources: ANAMAR, USACE, NOAA

TABLES

Acronyms and Qualifiers in Tables

Grain Size Definitions

Gravel	Particles ≥4.750 mm	Silt	Particles 0.005–0.074 mm
Sand	Particles 0.075–4.749 mm	Clay	Particles <0.005 mm

Unified Soil Classification System (USCS) classes

CH	Clay of high plasticity, elastic silt
SC	Clayey sand
MH	Silt of high plasticity, elastic silt

Metals Data Qualifiers

*	The result is an outlier. See Section 4 or the laboratory case narrative (Appendix D) for an explanation.
J	The result is an estimated value.
F	The matrix spike/matrix spike duplicate recovery is outside of acceptance limits.
N	The matrix spike sample recovery is not within control limits. See Section 4 or the laboratory case narrative for an explanation.
U	The analyte was analyzed but was not detected (ND) at or above the MDL.
i	The MRL/MDL is elevated due to a matrix interference.
X	See Section 4 or the laboratory case narrative (Appendix E) for an explanation.

Organics Data Qualifiers

*	The result is an outlier. See Section 4 or the laboratory case narrative (Appendix E) for an explanation.
B	The analyte was found in the associated method blank at a level that is significant relative to the sample result as defined by the DOD or NELAC standards.
C	Congener has coeluting congeners (when C qualifier refers to a congener).
D	The reported result is from a dilution.
H or h	Sample analysis performed out of holding time.
J	The result is an estimated value.
K	Estimated maximum possible concentration
P	The GC or HPLC confirmation criteria were exceeded. The relative percent difference is greater than 40% between the two analytical results.
Q	Quantitative interference; value is an estimate.
U	The analyte was analyzed for but was not detected (ND) at or above the MDL.
i	The MRL or MDL is elevated due to a matrix interference.
X	Sample analysis performed out of holding time.

Dioxin/Furan Data Qualifiers

J	The result is an estimated value for individual dioxin or furan analytes. For groups of total dioxin or furans, a J-qualifier indicates the total concentration present for a given number of chlorine atoms as part of the congeners. For those instances where one or more individual congener would be J-qualified as estimated, the total value is also qualified with a J. Note that this may include dioxin or furan congeners that are otherwise not reported.
K	This is an estimated maximum possible concentration for the associated compound. The ion abundance ratios associated with the associated compound are outside the QC limits.
U	The analyte was analyzed for but was not detected (ND) at or above the MDL.

Acronyms and Symbols Used in Tables

AET	apparent effects threshold
CMC	criteria maximum concentration
ERL	effects range-low
HMW	high molecular weight PAHs (NOAA 1989)
LC_{50}	lethal concentration affecting 50% of a population
LL	liquid limit
LMW	low molecular weight PAHs (NOAA 1989)
MDL	method detection limit
MLLW	mean lower low water
MRL	method reporting limit
NAD 83	North American Datum of 1983
ND	non-detect
NOAA	National Oceanic and Atmospheric Administration PCB congeners (see SERIM Table 5-6 for list)
NOEC	no observable effects concentration
PI	plasticity index
PL	plastic limit
TEF	toxicity equivalence factor
TEL	threshold effects level
TEQ	toxic equivalency quotient
x	no values published for the given parameter
–	no qualifier needed or no test conducted for that analyte or parameter

Acronyms and Symbols Used in the Sediment Chemistry Data Tables

Bolded values	Result is greater than or equal to the TEL and (or) ERL.
Italicized values	Indicate an associated MRL that exceeds the respective TEL and (or) ERL.

TABLE 1
Vibracore Sample Summary

Sample ID	Date	Time	Easting[1] (feet, NAD 83)	Northing[1] (feet, NAD 83)	Project Depth (feet, MLLW)	Metrics Per Core Sample: Water Depth (feet)	Water Surface Elevation[2] (feet, MLLW)	Top of Core Elevation[3] (feet, MLLW)	Core Number	Core Penetration (feet)	Recovery Length (feet)	Bottom of Core Elevation (feet, MLLW)	Recovery per Core (%)	Notes
JBC18-TC-1A	6/19/18	0905	2320941	392200	-48	39.5	-0.13	-39.6	1	6.9	4.5	-46.5	65	Two cores collected. First core encountered refusal at 6.9 feet and second core encountered refusal at 6.75 feet below the sediment surface.
		0920			-48	39.5	-0.13	-39.6	2	6.75	4.4	-46.4	65	
JBC18-TC-1B	6/19/18	0950	2321447	392629	-48	39.2	0.66	-38.5	1	8.2	8.0	-46.7	98	Two cores collected. Both cores encountered refusal at 8.2 feet below the sediment surface.
		1000			-48	39.2	0.66	-38.5	2	8.2	7.4	-46.7	90	
JBC18-TC-1C	6/19/18	1015	2321942	393058	-48	38.9	1.79	-37.1	1	9.25	8.25	-46.4	89	Two cores collected. Small sticks removed from samples. First core encountered refusal at 9.25 feet and second core encountered refusal at 9.3 feet below the sediment surface.
		1025			-48	38.9	1.79	-37.1	2	9.3	6.9	-46.4	74	
JBC18-GC-1A	6/19/18	0655	2321337	394204	-29	16.7	-0.29	-17.0	1	10.5	8.3	-27.5	79	Refusal encountered at 10.5 feet.
JBC18-GC-1B	6/19/18	0735	2321920	393503	-29.1	16.7	-0.75	-17.5	1	9.6	7.9	-27.1	82	Encountered hard, dry, medium grey clay at 6.5 through 9.6 feet below the sediment surface.
JBC18-S1-1A	6/19/18	1115	2322918	392439	-44	42.1	3.03	-39.1	1	5.0	3.5	-44.1	70	First two attempts unsuccessful due to encounters with Cooper marl-like material. Reached recovery on third attempt. First core encountered Cooper marl-like material at 4 to 5 ft below sediment surface, second core encountered similar material at 4 to 4.9 ft below sediment surface, third core encountered similar material at 4 to 4.9 ft below sediment surface.
		1200			-44	42.1	3.03	-39.1	2	4.9	3.0	-44.0	61	
		1220			-44	42.1	3.03	-39.1	3	4.9	3.0	-44.0	61	
JBC18-S1-1B	6/19/18	1255	2323636	392704	-44	43.4	4.74	-38.7	1	4.25	3.5	-42.9	82	First core encountered Cooper marl-like material at 3.5 to 4.25 ft, below sediment surface, second and third cores encountered similar material at 3.25 to 4 ft below sediment surface.
		1325			-44	43.4	4.74	-38.7	2	4.0	3.2	-42.7	80	
		1335			-44	43.4	4.74	-38.7	3	4.0	3.0	-42.7	75	
JBC18-S1-1C	6/19/18	1405	2324122	392632	-44	39.8	1.08	-38.7	1	4.7	2.8	-43.4	60	First core encountered Cooper marl-like material and refusal at 3.5 to 4.7 ft below sediment surface. Second core encountered similar material at 3.25 to 4.4 ft below sediment surface, third core encountered similar material at 3.5 to 4.4 ft below sediment surface.
		1430			-44	39.8	1.08	-38.7	2	4.4	2.7	-43.1	61	
		1445			-44	39.8	1.08	-38.7	3	4.4	2.25	-43.1	51	

TABLE 1 (*continued*)
Vibracore Sample Summary

Sample ID	Date	Time	Easting[1] (feet, NAD 83)	Northing[1] (feet, NAD 83)	Project Depth (feet, MLLW)	Metrics Per Core Sample: Water Depth (feet)	Water Surface Elevation[2] (feet, MLLW)	Top of Core Elevation[3] (feet, MLLW)	Core Number	Core Penetration (feet)	Recovery Length (feet)	Bottom of Core Elevation (feet, MLLW)	Recovery per Core (%)	Notes
JBC18-S2-1A	6/20/18	1305	23282275	375537	-44	38.5	4.34	-34.2	1	10.8	4.6	-45.0	43	Two attempts. first attempt < 50% recovery, discarded. Re-attempted and overpenetrated 1 ft to retain material in barrel.
JBC18-S2-1B	6/20/18	1215	2328270	396191	-44	36.4	2.90	-33.5	1	10.75	6.5	-44.3	60	Three attempts. First and second attempts < 50% recovery, discarded. Third attempt overpenetrated to 12 ft, still >50% recovery.
JBC18-S2-1C	6/20/18	1150	2328287	397142	-44	41.0	2.56	-38.4	1	5.6	3.5	-44.0	63	One core collected. Reached target penetration.
JBC18-S2-1D	6/20/18	1120	23278971	398234	-44	37.1	1.89	-35.2	1	8.8	8.7	-44.0	99	One core collected. Reached target penetration.
JBC18-S2-1E	6/20/18	1055	2326788	400008	-44	41.1	1.27	-39.8	1	4.2	3.3	-44.0	79	One core collected. Reached target penetration.
JBC18-S3-1A	6/20/18	0755	2326067	399653	-44	33.5	-0.11	-33.6	1	9.6	6.4	-43.2	67	Encountered Cooper marl-like material at 6.25 to 9.6 ft below sediment surface.
JBC18-S3-1B	6/20/18	0850	2325668	400035	-44	29.2	-0.58	-29.8	1	14.2	9.6	-44.0	68	Encountered Cooper marl-like material at 7.4 to 9.6 ft below the sediment surface.
JBC18-S3-1C	6/20/18	0925	2325544	400747	-44	30.6	-0.61	-31.2	1	12.8	8.0	-44.0	63	Traces of Cooper marl-like material in lower 6 inches of sample.
JBC18-S3-1D	6/20/18	0950	2325533	401193	-44	32.6	-0.29	-32.9	1	11.1	7.3	-44.0	65	One core collected. Reached target penetration.
JBC18-S3-1E	6/20/18	1020	2325604	401952	-44	36.7	0.42	-36.3	1	7.7	5.8	-44.0	75	One core collected. Reached target penetration.
JBC18-S4-1A	6/21/18	0915	2326490	401910	-48	32.2	-0.30	-32.5	1	15.5	11.7	-48.0	75	First attempt <50% recovery, discarded and recollected.
JBC18-S4-1B	6/21/18	1005	2327079	402782	-48	30.2	-0.45	-30.7	1	17.4	10.3	-48.1	59	1st attempt 53% recovery, discarded and recollected.
JBC18-S4-1C	6/21/18	1150	2326244	402715	-44	42.5	1.30	-41.2	1	2.8	2.1	-44.0	75	One core collected. Reached target penetration.
JBC18-S4-1D	6/21/18	0845	2326685	403517	-44	35	0.08	-34.9	1	9.1	6.7	-44.0	74	One core collected. Reached target penetration.
JBC18-S4-1E	6/21/18	1055	2327718	402830	-48	31.6	0.02	-31.6	1	16.4	10.4	-48.0	63	One core collected, reached target penetration. Unconsolidated material at sediment surface did not feed into barrel and resulted in low recovery.
JBC18-S4-1F	6/21/18	1120	2328602	403530	-48	41.5	0.44	-41.1	1	6.9	6.5	-48.0	94	One core collected. Reached target penetration.
JBC18-S4-1G	6/21/18	0800	2328950	404234	-48	39.9	0.98	-38.9	1	0.6	0.6	-39.5	100	Hard refusal 6 inches below sediment surface. Bottom is gravel with no fines.
JBC18-PC-1A	6/20/18	0700	2326826	397750	-15	8.75	0.67	-8.1	1	6.9	6.8	-15.0	99	Reached target penetration at 6.9 ft below sediment surface.
JBC18-PC-1B	6/20/18	0730	2326766	397866	-15	8.67	0.32	-8.4	1	6.7	6.5	-15.1	97	Reached target penetration at 6.7 ft below sediment surface.

[1] Datum NAD 83, South Carolina State Plane (Zone 3900) U.S. survey feet. Converted from latitude/longitude using the webpage www.earthpoint.us/StatePlain.aspx
[2] Water surface elevation is based on real-time tide height data obtained using a Champion TKO GNSS interfaced with the eGPS Real Time Network.
[3] Calculated as the sum of recorded water depth (- feet) and surveyed water surface elevation.

Source: ANAMAR Environmental Consulting, Inc.

ANAMAR Environmental Consulting, Inc.

TABLE 2
Water Sample Summary Including Water Column Measurements

Sample ID:	JBC18-SW (water)		
Date	6/18/18		
Sampling Start/End Times (EST)	1205-1315		
Depth of Water (ft)	44.5		
Time of Measurement (EST)	1155	1158	1202
Depth of Measurement (feet)	3.0	20	41
Water Temperature (°C)	29.2	28.8	28.5
pH (units)	7.24	7.52	7.66
Salinity (ppt)	7.34	12.34	20.14
Conductivity (µS/cm)	13896	27078	34869
Dissolved Oxygen (mg/L)	4.51	3.83	3.73
Dissolved Oxygen (%)	61.1	54.1	53.6
Turbidity (NTU)	5.55		
Easting[1] (feet, NAD 83)	2326792		
Northing[1] (feet, NAD 83)	399984		
Sampling Method	Pneumatic pump		
Field Description of Sample	Yellow, light tan in color; no suspended material or odor observed		
Weather/Tidal Cycle	Mid incoming tide with 0-5 knot winds from the NW, calm seas, clear skies		
General Conditions and Observations	Fifty 20-L Cubitainers (approx. 250 gal.) collected plus the water chemistry kit		

[1] Datum NAD 83, South Carolina State Plane (Zone 3900) U.S. survey feet. Converted from latitude/longitude using the webpage www.earthpoint.us/StatePlain.aspx.

Source: ANAMAR Environmental Consulting, Inc.

TABLE 3
Results of Physical Analyses for Sediment Samples

Analyte	Sample ID:	JBC18-TC-1A	JBC18-TC-1B	JBC18-TC-1C	JBC18-GC-1A	JBC18-GC-1B	JBC18-S1-1A	JBC18-S1-1B	JBC18-S1-1C	JBC18-S2-1A
Sediment Description		Fat clay, some silt, little fine-grained quartz sand, trace fine sand-size shell fragments, gray	Fat clay with sand, little fine-grained quartz sand, little silt, trace fine sand-size shell fragments, gray	Fat clay with sand, little fine-grained quartz sand, little silt, trace fine sand-size shell fragments, gray	Sandy fat clay, some fine-grained quartz sand, little silt, trace fine sand-size shell fragments, gray	Clayey sand, mostly medium to fine-grained quartz, some clay, few silt, gray	Sandy fat clay, some fine-grained quartz sand, little silt, trace fine sand-size shell fragments, gray	Sandy fat clay, some fine-grained quartz sand, little silt, trace medium to fine sand-size shell and rock fragments, gray	Sandy fat clay, some fine-grained quartz sand, little silt, trace medium to fine sand-size shell and rock fragments, gray	Fat clay, some silt, few fine-grained quartz sand, trace fine sand-size shell fragments, gray
% Gravel		0.0	0.0	0.6	0.0	0.0	0.0	1.2	0.0	0.0
% Coarse Sand		0.0	0.1	0.0	0.2	0.0	0.0	0.4	0.0	0.0
% Medium Sand		0.5	0.6	1.2	1.9	1.1	0.6	2.9	2.6	0.4
% Fine Sand		13.3	26.3	22.0	46.5	53.7	36.3	43.4	40.0	12.5
% Sand (total)		13.8	27.0	23.2	48.6	54.8	36.9	46.7	42.6	12.9
% Silt		30.1	21.2	26.5	20.7	11.4	27.3	23.8	25.8	32.3
% Clay		56.1	51.8	49.7	30.7	33.8	35.8	28.3	31.6	54.8
% Silt & Clay (combined)		86.2	73.0	76.2	51.4	45.2	63.1	52.1	57.4	87.1
% Solids		35.1	38.7	40.6	74.0	55.3	45.7	47.3	47.4	32.4
USCS Classification		CH	CH	CH	CH	SC	CH	CH	CH	CH
% Passing Sieve Size	**Equivalent (mm)**									
0.75 inch	**19.1**	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
0.375 inch	**9.5**	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
#4	**4.75**	100.0	100.0	99.4	100.0	100.0	100.0	98.8	100.0	100.0
#10	**2.00**	100.0	99.9	99.4	99.8	100.0	100.0	98.4	100.0	100.0
#20	**0.85**	99.9	99.7	98.9	99.4	99.7	99.8	97.7	99.6	99.9
#40	**0.425**	99.5	99.3	98.2	97.9	98.9	99.4	95.5	97.4	99.6
#60	**0.250**	97.6	95.5	96.9	92.5	93.1	97.1	87.3	92.9	98.5
#100	**0.149**	90.9	85.2	86.5	67.4	56.7	87.7	65.6	82.5	95.6
#200	**0.075**	86.2	73.0	76.2	51.4	45.2	63.1	52.1	57.4	87.1
Hydrometer Readings (% less than the following sizes)		85.3 @ 0.0417 mm	73.0 @ 0.0296 mm	69.1 @ 0.0296 mm	44.0 @ 0.0313 mm	45.1 @ 0.0303 mm	57.1 @ 0.0301 mm	45.2 @ 0.0313 mm	53.1 @ 0.0295 mm	82.2 @ 0.0296 mm
		76.5 @ 0.0303 mm	66.4 @ 0.0192 mm	62.9 @ 0.0192 mm	39.9 @ 0.0202 mm	42.1 @ 0.0195 mm	51.6 @ 0.0195 mm	41.8 @ 0.0201 mm	49.2 @ 0.0190 mm	77.3 @ 0.0190 mm
		71.5 @ 0.0113 mm	62.1 @ 0.0113 mm	58.8 @ 0.0113 mm	35.7 @ 0.0119 mm	39.2 @ 0.0114 mm	46.2 @ 0.0115 mm	38.4 @ 0.0118 mm	43.0 @ 0.0113 mm	70.0 @ 0.0113 mm
		66.5 @ 0.0081 mm	55.5 @ 0.0081 mm	52.6 @ 0.0081 mm	32.4 @ 0.0085 mm	36.2 @ 0.0082 mm	39.9 @ 0.0084 mm	33.2 @ 0.0085 mm	37.5 @ 0.0082 mm	63.8 @ 0.0081 mm
		59.0 @ 0.0058 mm	53.4 @ 0.0058 mm	50.6 @ 0.0058 mm	31.6 @ 0.0060 mm	34.7 @ 0.0058 mm	37.1 @ 0.0060 mm	29.8 @ 0.0061 mm	33.6 @ 0.0059 mm	57.7 @ 0.0058 mm
		50.2 @ 0.0029 mm	42.5 @ 0.0029 mm	44.4 @ 0.0029 mm	26.6 @ 0.0030 mm	29.6 @0.0029 mm	29.9 @ 0.0030 mm	24.7 @ 0.0030 mm	25.8 @ 0.0030 mm	45.4 @ 0.0030 mm
		41.4 @ 0.0013 mm	34.8 @ 0.0013 mm	36.1 @ 0.0013 mm	22.4 @ 0.0013 mm	26.6 @ 0.0012 mm	17.2 @ 0.0013 mm	17.9 @ 0.0013 mm	19.5 @ 0.0013 mm	31.9 @ 0.0013 mm

TABLE 3 (*continued*)
Results of Physical Analyses for Sediment Samples

Analyte Sample ID:		JBC18-S2-1B	JBC18-S2-1C	JBC18-S2-1D	JBC18-S2-1E	JBC18-S3-1A	JBC18-S3-1B	JBC18-S3-1C	JBC18-S3-1C Duplicate 1	JBC18-S3-1C Duplicate 2	JBC18-S3-1D
Sediment Description		Fat clay with sand, little fine-grained quartz sand, some silt, gray	Fat clay, little silt, few fine-grained quartz sand, gray	Clayey sand, mostly fine-grained quartz, some clay, little silt, gray	Clayey sand, mostly medium to fine-grained quartz, little clay, little silt, gray	Fat clay, some silt, few fine-grained quartz sand, trace fine sand-size shell fragments, gray	Fat clay with sand, little fine-grained quartz sand, some silt, trace fine sand-size shell fragments, gray	Fat clay, little silt, trace fine-grained quartz sand, gray	Fat clay, some silt, trace fine-grained quartz sand, gray	Fat clay, some silt, trace fine-grained quartz sand, gray	Fat clay with sand, some silt, little fine-grained quartz sand, gray
% Gravel		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
% Coarse Sand		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
% Medium Sand		2.1	0.3	0.8	2.6	0.3	0.7	0.1	0.1	0.1	0.4
% Fine Sand		24.8	5.5	56.1	62.4	11.1	18.3	2.9	2.6	4.0	14.6
% Sand (total)		26.9	5.8	56.9	65.0	11.4	19.0	3.0	2.7	4.1	15.0
% Silt		32.6	26.1	12.7	14.5	30.4	38.5	27.7	30.7	33.2	37.4
% Clay		40.5	68.1	30.4	20.5	58.2	42.5	69.3	66.6	62.7	47.6
% Silt & Clay (combined)		73.1	94.2	43.1	35.0	88.6	81.0	97.0	97.3	95.9	85.0
% Solids		42.3	26.6	47.8	50.1	32.5	32.5	25.8	26.5		39.5
USCS Classification		CH	CH	SC	SC	CH	CH	CH	CH	CH	CH
% Passing Sieve Size	**Equivalent (mm)**										
0.75 inch	**19.1**	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
0.375 inch	**9.5**	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
#4	**4.75**	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
#10	**2.00**	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
#20	**0.85**	99.8	99.9	99.8	99.4	100.0	99.8	100.0	100.0	100.0	99.9
#40	**0.425**	97.9	99.7	99.2	97.4	99.7	99.3	99.9	99.9	99.9	99.6
#60	**0.250**	90.6	99.3	97.9	86.2	99.2	98.4	99.9	99.9	99.9	98.9
#100	**0.149**	83.3	98.9	73.4	45.6	97.3	94.8	99.3	99.7	99.1	96.5
#200	**0.075**	73.1	94.2	43.1	35.0	88.6	81.0	97.0	97.3	95.9	85.0
Hydrometer Readings (% less than the following sizes)		58.5 @ 0.0308 mm	90.2 @ 0.0301 mm	39.7 @ 0.0316 mm	31.0 @ 0.0320 mm	79.4 @ 0.0306 mm	61.1 @ 0.0298 mm	93.4 @ 0.0308 mm	90.6 @ 0.0308 mm	88.8 @ 0.0308 mm	69.7 @ 0.0296 mm
		54.4 @ 0.0198 mm	84.5 @ 0.0193 mm	37.3 @ 0.0202 mm	28.3 @ 0.0205 mm	74.0 @ 0.0197 mm	55.5 @ 0.0193 mm	86.8 @ 0.0198 mm	84.2 @ 0.0198 mm	82.6 @ 0.0198 mm	61.6 @ 0.0193 mm
		50.3 @ 0.0116 mm	78.7 @ 0.0113 mm	35.0 @ 0.0118 mm	25.7 @ 0.0120 mm	68.6 @ 0.0115 mm	51.7 @ 0.0113 mm	81.9 @ 0.0116 mm	79.5 @ 0.0116 mm	76.3 @ 0.0116 mm	57.6 @ 0.0113 mm
		46.2 @ 0.0083 mm	73.0 @ 0.0081 mm	31.9 @ 0.0084 mm	24.4 @ 0.0086 mm	65.9 @ 0.0082 mm	47.9 @ 0.0081 mm	73.7 @ 0.0083 mm	71.5 @ 0.0083 mm	67.0 @ 0.0084 mm	53.5 @ 0.0081 mm
		42.1 @ 0.0060 mm	70.1 @ 0.0058 mm	31.1 @ 0.0060 mm	21.7 @ 0.0061 mm	60.6 @ 0.0059 mm	44.2 @ 0.0058 mm	70.5 @ 0.0059 mm	68.3 @ 0.0059 mm	63.9 @ 0.0060 mm	49.5 @ 0.0058 mm
		36.9 @ 0.0030 mm	57.3 @ 0.0029 mm	27.2 @ 0.0030 mm	19.1 @ 0.0030 mm	52.5 @ 0.0029 mm	36.7 @ 0.0029 mm	63.9 @ 0.0029 mm	58.8 @ 0.0030 mm	57.6 @ 0.0030 mm	40.4 @ 0.0030 mm
		27.7 @ 0.0013 mm	45.8 @ 0.0013 mm	25.7 @ 0.0013 mm	16.5 @ 0.0013 mm	41.7 @ 0.0013 mm	24.4 @ 0.0013 mm	52.4 @ 0.0013 mm	50.9 @ 0.0013 mm	49.8 @ 0.0013 mm	24.2 @ 0.0013 mm

TABLE 3 (*continued*)
Results of Physical Analyses for Sediment Samples

Analyte	Sample ID:	JBC18-S3-1E	JBC18-S4-1A	JBC18-S4-1B	JBC18-S4-1C	JBC18-S4-1D	JBC18-S4-1E	JBC18-S4-1F	JBC18-S4-1G	JBC18-PC-1A	JBC18-PC-1B
Sediment Description		Sandy fat clay, some fine-grained quartz sand, little silt, gray	Clayey sand, mostly fine-grained quartz, little clay, little silt, trace medium to fine sand-size shell fragments, gray	Fat clay with sand, some silt, little fine-grained quartz sand, trace coarse to fine sand-size shell fragments, gray	Fat clay, little silt, few fine-grained quartz sand, trace fine sand-size shell fragments, gray	Clayey sand, mostly fine-grained quartz, some clay, little silt, few medium to fine sand-size shell fragments, gray	Fat clay, little silt, few fine-grained quartz sand, gray	Sandy fat clay, some fine-grained quartz sand, little silt, trace medium to fine sand-size shell fragments, gray	Sandy elastic silt, some fine-grained quartz sand, little clay, trace coarse to fine sand-size shell and rock fragments, gray	Fat clay, little silt, few fine-grained quartz sand, gray	Sandy fat clay, some fine-grained quartz sand, little silt, gray
% Gravel		0.0	0.0	0.0	0.0	0.3	0.0	0.0	0.4	0.0	0.0
% Coarse Sand		0.0	1.0	3.4	0.0	0.4	0.0	0.0	0.6	0.0	0.0
% Medium Sand		0.4	11.1	6.7	0.3	15.2	0.3	1.5	1.7	0.2	2.2
% Fine Sand		39.5	40.6	22.0	5.4	36.0	6.2	33.4	43.3	9.9	47.4
% Sand (total)		39.9	52.7	32.1	5.7	51.6	6.5	34.9	45.6	10.1	49.6
% Silt		19.0	21.9	34.1	27.9	15.6	21.9	16.8	33.4	17.9	20.2
% Clay		41.1	25.4	33.8	66.4	32.5	71.6	48.3	20.6	72.0	30.2
% Silt & Clay (combined)		60.1	47.3	67.9	94.3	48.1	93.5	65.1	54.0	89.9	50.4
% Solids		39.5	57.1	48.7	26.8	42.6	39.5	37.6	73.5	40.6	74.5
USCS Classification		CH	SC	CH	CH	SC	CH	CH	MH	CH	CH
% Passing Sieve Size	**Equivalent (mm)**										
0.75 inch	**19.1**	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
0.375 inch	**9.5**	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
#4	**4.75**	100.0	100.0	100.0	100.0	99.7	100.0	100.0	99.6	100.0	100.0
#10	**2.00**	100.0	99.0	96.6	100.0	99.3	100.0	100.0	99.0	100.0	100.0
#20	**0.85**	99.9	94.9	92.3	99.9	94.6	99.7	99.6	98.5	99.9	99.6
#40	**0.425**	99.6	87.9	89.9	99.7	84.1	99.7	98.5	97.3	99.8	97.8
#60	**0.250**	98.6	82.9	88.0	99.5	75.3	99.4	94.4	94.6	99.7	95.4
#100	**0.149**	70.1	61.8	79.7	98.4	58.4	98.4	77.3	85.8	96.1	69.5
#200	**0.075**	60.1	47.3	67.9	94.3	48.1	93.5	65.1	54.0	89.9	50.4
Hydrometer Readings (% less than the following sizes)		55.7 @ 0.0308 mm	34.3 @ 0.0320 mm	43.0 @ 0.0316 mm	91.4 @ 0.0303 mm	45.1 @ 0.0320 mm	92.7 @ 0.0306 mm	61.6 @ 0.0316 mm	36.8 @ 0.0325 mm	88.2 @ 0.0290 mm	37.3 @ 0.0308 mm
		52.0 @ 0.0198 mm	32.9 @ 0.0204 mm	41.4 @ 0.0201 mm	85.6 @ 0.0195 mm	43.3 @ 0.0204 mm	92.7 @ 0.0193 mm	59.2 @ 0.0201 mm	33.5 @ 0.0208 mm	85.8 @ 0.0185 mm	36.0 @ 0.0196 mm
		48.2 @ 0.0116 mm	30.1 @ 0.0120 mm	38.2 @ 0.0118 mm	79.8 @ 0.0114 mm	39.6 @ 0.0120 mm	86.6 @ 0.0113 mm	54.6 @ 0.0118 mm	27.0 @ 0.0124 mm	81.0 @ 0.0109 mm	33.5 @ 0.0115 mm
		44.4 @ 0.0083 mm	28.7 @ 0.0085 mm	36.5 @ 0.0084 mm	76.9 @ 0.0081 mm	37.8 @ 0.0085 mm	80.6 @ 0.0081 mm	52.3 @ 0.0084 mm	23.7 @ 0.0089 mm	78.5 @ 0.0078 mm	32.2 @ 0.0082 mm
		42.5 @ 0.0059 mm	26.6 @ 0.0061 mm	34.9 @ 0.0060 mm	69.6 @ 0.0059 mm	34.1 @ 0.0061 mm	74.5 @ 0.0058 mm	50.0 @ 0.0060 mm	22.1 @ 0.0063 mm	73.7 @ 0.0056 mm	30.9 @ 0.0058 mm
		35.0 @ 0.0030 mm	23.1 @ 0.0030 mm	30.0 @ 0.0030 mm	59.5 @ 0.0029 mm	30.4 @ 0.0030 mm	62.3 @ 0.0029 mm	43.0 @ 0.0030 mm	17.2 @ 0.0031 mm	64.0 @ 0.0028 mm	27.2 @ 0.0029 mm
		29.3 @ 0.0013 mm	20.3 @ 0.0013 mm	24.4 @ 0.0013 mm	50.8 @ 0.0013 mm	23.0 @ 0.0013 mm	53.2 @ 0.0013 mm	38.3 @ 0.0013 mm	13.9 @ 0.0013 mm	56.8 @ 0.0012 mm	24.6 @ 0.0012 mm

See Appendix C for grain size distribution graphs.
Grain sizes and USCS classifications are defined at the front of the tables section.
Source: Terracon
Compiled by: ANAMAR Environmental Consulting, Inc.

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Environmental Consulting, Inc.

TABLE 4
Results of Physical Analyses for Composited Sediment Samples

Analyte	Composite ID:	JBC18-TC	JBC18-GC	JBC18-S1	JBC18-S2	JBC18-S3	JBC18-S3 (duplicate 1)	JBC18-S3 (duplicate 2)	JBC18-S4	JBC18-PC
Sediment Description		Fat clay with sand, little fine-grained quartz sand, little silt, trace medium to fine sand-size shell fragments, gray	Sandy fat clay, some fine-grained quartz sand, little silt, trace fine sand-size shell fragments, gray	Sandy elastic silt, some fine-grained quartz sand, some clay, trace coarse to fine sand-size shell fragments, gray	Sandy fat clay, some fine-grained quartz sand, little silt, trace medium to fine sand-size shell fragments, gray	Fat clay with sand, little fine-grained quartz sand, little silt, gray	Fat clay with sand, little silt, little fine-grained quartz sand, gray	Fat clay with sand, little silt, little fine-grained quartz sand, gray	Clayey sand, mostly fine-grained quartz, some clay, little silt, few coarse to fine sand-size shell fragments, trace fine gravel-size shell fragments, gray	Sandy fat clay, some fine-grained quartz sand, little silt, trace medium to fine sand-size shell fragments, gray
% Gravel		0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.9	0.0
% Coarse Sand		0.0	0.0	0.3	0.1	0.0	0.0	0.0	2.3	0.2
% Medium Sand		0.8	1.5	2.5	1.4	0.7	0.6	0.4	11.0	1.0
% Fine Sand		22.2	46.4	37.6	40.6	17.6	20.1	19.6	36.4	43.8
% Sand (total)		23.0	47.9	40.4	42.1	18.3	20.7	20.0	49.7	45.0
% Silt		21.8	16.7	27.8	17.1	28.8	26.5	26.2	18.2	14.1
% Clay		55.2	35.4	31.8	40.8	52.9	52.8	53.8	30.2	40.9
% Silt & Clay (combined)		77.0	52.1	59.6	57.9	81.7	79.3	80.0	48.4	55.0
% Solids		38.9	60.2	47.7	41.0	35.7	34.8		45.6	57.9
USCS Classification		CH	CH	MH	CH	CH	CH	CH	SC	CH
Specific Gravity		2.602	2.611	2.673	2.645	2.631			2.628	2.620
Settling Rate g/L		400	345	377	408	364			392	323 / 314 (Dup)
Atterberg Limits	**PL**	42	21	39	37	51			36	27
	LL	126	60	88	108	142			112	63
	PI	84	39	49	71	91			76	36
% Passing Sieve Size	**Metric Equivalent (mm)**									
0.75 inch	**19.1**	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
0.375 inch	**9.5**	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
#4	**4.75**	100.0	100.0	100.0	100.0	100.0	100.0	100.0	98.1	100.0
#10	**2.00**	100.0	100.0	99.7	99.9	100.0	100.0	100.0	95.8	99.8
#20	**0.85**	99.7	99.7	99.1	99.6	99.7	99.8	99.9	91.1	99.5
#40	**0.425**	99.2	98.5	97.2	98.5	99.3	99.4	99.6	84.8	98.8
#60	**0.250**	97.0	93.6	91.4	93.6	98.5	98.6	98.7	80.1	97.6
#100	**0.149**	86.5	67.7	76.5	74.9	91.9	91.8	91.8	63.2	72.5
#200	**0.075**	77.0	52.1	59.6	57.9	81.7	79.3	80.0	48.4	55.0
Hydrometer Readings (% less than the following sizes)		76.4 @ 0.0287 mm	50.1 @ 0.0299 mm	48.8 @ 0.0306 mm	53.6 @ 0.0314 mm	72.6 @ 0.0302 mm	76.1 @ 0.0302 mm	75.6 @ 0.0300 mm	43.5 @ 0.0317 mm	51.9 @ 0.0306 mm
		72.5 @ 0.0185 mm	49.4 @ 0.0190 mm	45.5 @ 0.0197 mm	97.7 @ 0.0201 mm	68.1 @ 0.0194 mm	71.4 @ 0.0194 mm	68.8 @ 0.0194 mm	41.8 @ 0.0202 mm	50.2 @ 0.0195 mm
		66.7 @ 0.0110 mm	44.3 @ 0.0113 mm	42.2 @ 0.0115 mm	47.8 @ 0.0117 mm	61.4 @ 0.0115 mm	64.4 @ 0.0115 mm	64.3 @ 0.0114 mm	38.4 @ 0.0118 mm	45.1 @ 0.0115 mm
		62.9 @ 0.0079 mm	40.7 @ 0.0081 mm	38.1 @ 0.0083 mm	43.9 @ 0.0084 mm	56.9 @ 0.0083 mm	59.7 @ 0.0083 mm	59.8 @ 0.0082 mm	35.0 @ 0.0085 mm	43.4 @ 0.0082 mm
		57.1 @ 0.0057 mm	37.0 @ 0.0059 mm	33.9 @ 0.0060 mm	41.9 @ 0.0060 mm	54.7 @ 0.0059 mm	55.0 @ 0.0059 mm	55.3 @ 0.0059 mm	31.5 @ 0.0061 mm	41.7 @ 0.0059 mm
		49.3 @ 0.0029 mm	31.2 @ 0.0029 mm	25.7 @ 0.0030 mm	36.1 @ 0.0030 mm	43.5 @ 0.0030 mm	45.6 @ 0.0030 mm	48.5 @ 0.0029 mm	28.1 @ 0.0031 mm	38.3 @ 0.0029 mm
		31.0 @ 0.0013 mm	26.9 @ 0.0013 mm	15.7 @ 0.0013 mm	28.3 @ 0.0013 mm	27.9 @ 0.0013 mm	29.3 @ 0.0013 mm	28.2 @ 0.0013 mm	23.0 @ 0.0013 mm	33.2 @ 0.0013 mm

See Appendix C for grain size distribution graphs and laboratory triplicate results.
Grain sizes and soil classifications are defined at the front of the tables section.

Source: Terracon Compiled by: ANAMAR Environmental Consulting, Inc.

TABLE 5
Analytical Results for Dry Weight Metals, Organotins and TOCs in Sediment Samples

			Sample ID:	JBC18-TC				JBC18-GC				JBC18-S1				JBC18-S2				JBC18-S3				JBC18-S3 (duplicate)				JBC18-S4				JBC18-PC			
Analyte	Maximum Conc. mg/kg	TEL mg/kg	ERL mg/kg	Result mg/kg	Qualifier	MDL	MRL	Result mg/kg	Qualifier	MDL	MRL	Result mg/kg	Qualifier	MDL	MRL	Result mg/kg	Qualifier	MDL	MRL	Result mg/kg	Qualifier	MDL	MRL	Result mg/kg	Qualifier	MDL	MRL	Result mg/kg	Qualifier	MDL	MRL	Result mg/kg	Qualifier	MDL	MRL
Metals																																			
Antimony	ND	x	x	ND	U	0.798	2.42	ND	U	0.431	1.31	ND	U	0.664	2.01	ND	U	0.782	2.37	ND	U	0.912	2.76					ND	U	0.687	2.08	ND	U	0.531	1.61
Arsenic	***13.7***	7.24	8.2	***13.7***	--	1.21	7.25	**8.23**	--	0.653	3.92	***7.27***	--	1.01	6.04	***10.7***	--	1.19	7.11	***13.0***	--	1.38	8.29					**8.58**	--	1.04	6.24	5.54	--	0.804	4.83
Cadmium	*ND*	0.676	1.2	*ND*	U	0.242	1.21	ND	U	0.131	0.653	*ND*	U	0.201	1.01	*ND*	U	0.237	1.19	*ND*	U	0.276	1.38					*ND*	U	0.208	1.04	*ND*	U	0.161	0.804
Chromium	29.6	52.3	81	24.6	--	0.363	1.21	11.7	--	0.196	0.653	27.3	--	0.302	1.01	23.0	--	0.356	1.19	29.6	--	0.414	1.38					16.4	--	0.312	1.04	14.8	--	0.241	0.804
Copper	15.7	18.7	34	10.5	--	0.725	2.42	2.57	--	0.392	1.31	10.0	--	0.604	2.01	11.5	--	0.711	2.37	15.7	--	0.829	2.76					7.32	--	0.624	2.08	2.89	--	0.483	1.61
Lead	12.6	30.24	46.7	11.2	--	0.798	2.42	5.61	--	0.431	1.31	6.51	--	0.664	2.01	10.7	--	0.782	2.37	12.6	--	0.912	2.76					8.07	--	0.687	2.08	7.24	--	0.531	1.61
Mercury	0.0518	0.13	0.15	0.0313	--	0.009	0.028	0.011	J	0.005	0.015	0.0353	--	0.008	0.023	0.0379	--	0.009	0.026	0.0518	--	0.012	0.035					0.0265	--	0.008	0.023	0.0136	J	0.006	0.018
Nickel	11.5	15.9	20.9	8.53	--	0.363	1.21	2.92	--	0.196	0.653	10.9	--	0.302	1.01	7.56	--	0.356	1.19	11.5	--	0.414	1.38					5.18	--	0.312	1.04	2.86	--	0.241	0.804
Selenium	2.82	x	x	1.52	J	1.21	7.25	ND	U	0.653	3.92	1.48	J	1.01	6.04	1.50	J	1.19	7.11	2.82	J	1.38	8.29					ND	U	1.04	6.24	ND	U	0.804	4.83
Silver	ND	0.73	1	*ND*	U	0.242	1.21	ND	U	0.131	0.653	*ND*	U	0.201	1.01	*ND*	U	0.237	1.19	*ND*	U	0.276	1.38					*ND*	U	0.208	1.04	*ND*	U	0.161	0.804
Zinc	56.8	124	150	45.0	--	0.967	2.42	14.3	--	0.506	1.26	38.9	--	0.805	2.01	41.9	--	0.948	2.37	56.8	--	1.11	2.76					30.2	--	0.833	2.08	13.4	--	0.644	1.61
Analyte	**Maximum Detected Conc. mg/kg**	**TEL mg/kg**	**ERL mg/kg**	**Result mg/kg**	**Qualifier**	**MDL**	**MRL**	**Result mg/kg**	**Qualifier**	**MDL**	**MRL**	**Result mg/kg**	**Qualifier**	**MDL**	**MRL**	**Result mg/kg**	**Qualifier**	**MDL**	**MRL**	**Result mg/kg**	**Qualifier**	**MDL**	**MRL**	**Result mg/kg**	**Qualifier**	**MDL**	**MRL**	**Result mg/kg**	**Qualifier**	**MDL**	**MRL**	**Result mg/kg**	**Qualifier**	**MDL**	**MRL**
Carbon, Total Organic	112000	x	x	38000	--	1330	3330	4540	--	200	500	112000	--	949	2370	59400	--	1000	2510	111000	--	951	2380	107000	--	951	2380	52400	--	897	2240	8920	--	985	2460
Analyte	**Maximum Detected Conc. µg/kg**	**TEL µg/kg**	**ERL µg/kg**	**Result µg/kg**	**Qualifier**	**MDL**	**MRL**	**Result µg/kg**	**Qualifier**	**MDL**	**MRL**	**Result µg/kg**	**Qualifier**	**MDL**	**MRL**	**Result µg/kg**	**Qualifier**	**MDL**	**MRL**	**Result µg/kg**	**Qualifier**	**MDL**	**MRL**	**Result µg/kg**	**Qualifier**	**MDL**	**MRL**	**Result µg/kg**	**Qualifier**	**MDL**	**MRL**	**Result µg/kg**	**Qualifier**	**MDL**	**MRL**
Tri-n-butyltin Cation	ND	x	x	ND	--	50	190	ND	--	24	94	ND	F1	43	160	ND	--	48	190	ND	--	51	200					ND	--	40	150	ND	--	30	110

Bolded values exceed the TEL and (or) ERL. *Italicized results* (or *ND*) indicate an associated MRL that is greater than the respective TEL and (or) ERL.
Acronyms and qualifiers are defined at the front of the tables section.

Sources: Most results from GEL Laboratories with the exception of tri-n-butyltin which came from TestAmerica; TEL and ERL values from Buchman (2008)
Compiled by: ANAMAR Environmental Consulting, Inc.

TABLE 6
Analytical Results for Dry Weight Pesticides in Sediment Samples

			Sample ID:	JBC18-TC				JBC18-TC (duplicate)				JBC18-GC				JBC18-S1				JBC18-S2				JBC18-S3				JBC18-S4				JBC18-PC			
Analyte	Maximum Conc. µg/kg	TEL µg/kg	ERL µg/kg	Result µg/kg	Qualifier	MDL	MRL	Result µg/kg	Qualifier	MDL	MRL	Result µg/kg	Qualifier	MDL	MRL	Result µg/kg	Qualifier	MDL	MRL	Result µg/kg	Qualifier	MDL	MRL	Result µg/kg	Qualifier	MDL	MRL	Result µg/kg	Qualifier	MDL	MRL	Result µg/kg	Qualifier	MDL	MRL
Aldrin	ND	x	x	ND	U	0.399	1.60	ND	U	0.401	1.61	ND	U	0.225	0.900	ND	U	0.349	1.39	ND	U	0.407	1.63	ND	U	0.485	1.94	ND	U	0.361	1.44	ND	U	0.293	1.17
Chlordane (technical)	*ND*	2.26	0.5	*ND*	U	3.99	20.0	*ND*	U	4.01	20.1	*ND*	U	2.25	11.2	*ND*	U	3.49	17.4	*ND*	U	4.07	20.3	*ND*	U	4.85	24.3	*ND*	U	3.61	18.0	*ND*	U	2.93	14.7
α (cis)-Chlordane	ND	x	x	ND	U	0.399	1.60	ND	U	0.401	1.61	ND	U	0.225	0.900	ND	U	0.349	1.39	ND	U	0.407	1.63	ND	U	0.485	1.94	ND	U	0.361	1.44	ND	U	0.293	1.17
γ (trans)-Chlordane	ND	x	x	ND	U	0.399	1.60	ND	U	0.401	1.61	ND	U	0.225	0.900	ND	U	0.349	1.39	ND	U	0.407	1.63	ND	U	0.485	1.94	ND	U	0.361	1.44	ND	U	0.293	1.17
Oxychlordane	ND	x	x	ND	U	0.399	1.60	ND	U	0.401	1.61	ND	U	0.225	0.900	ND	U	0.349	1.39	ND	U	0.407	1.63	ND	U	0.485	1.94	ND	U	0.361	1.44	ND	U	0.293	1.17
cis-Nonachlor	ND	x	x	ND	U	0.399	1.60	ND	U	0.401	1.61	ND	U	0.225	0.900	ND	U	0.349	1.39	ND	U	0.407	1.63	ND	U	0.485	1.94	ND	U	0.361	1.44	ND	U	0.293	1.17
trans-Nonachlor	ND	x	x	ND	U	0.399	1.60	ND	U	0.401	1.61	ND	U	0.225	0.900	ND	U	0.349	1.39	ND	U	0.407	1.63	ND	U	0.485	1.94	ND	U	0.361	1.44	ND	U	0.293	1.17
o,p' (2,4')-DDD	ND	x	x	ND	U	0.399	1.60	ND	U	0.401	1.61	ND	U	0.225	0.900	ND	U	0.349	1.39	ND	U	0.407	1.63	ND	U	0.485	1.94	ND	U	0.361	1.44	ND	U	0.293	1.17
p,p' (4,4')-DDD	*ND*	1.22	2	*ND*	U	0.798	3.19	*ND*	U	0.803	3.21	*ND*	U	0.450	1.80	*ND*	U	0.697	2.79	*ND*	U	0.813	3.25	*ND*	U	0.971	3.88	*ND*	U	0.721	2.89	*ND*	U	0.586	2.35
o,p' (2,4')-DDE	ND	x	x	ND	U	0.399	1.60	ND	U	0.401	1.61	ND	U	0.225	0.900	ND	U	0.349	1.39	ND	U	0.407	1.63	ND	U	0.485	1.94	ND	U	0.361	1.44	ND	U	0.293	1.17
p,p' (4,4')-DDE	*ND*	2.07	2.2	ND	U	0.798	3.19	*ND*	U	0.803	3.21	ND	U	0.450	1.80	*ND*	U	0.697	2.79	*ND*	U	0.813	3.25	*ND*	U	0.971	3.88	*ND*	U	0.721	2.89	*ND*	U	0.586	2.35
o,p' (2,4')-DDT	ND	x	x	ND	U	0.399	1.60	ND	U	0.401	1.61	ND	U	0.225	0.900	ND	U	0.349	1.39	ND	U	0.407	1.63	ND	U	0.485	1.94	ND	U	0.361	1.44	ND	U	0.293	1.17
p,p' (4,4')-DDT	*ND*	1.19	1	*ND*	U	0.798	3.19	*ND*	U	0.803	3.21	*ND*	U	0.450	1.80	*ND*	U	0.697	2.79	*ND*	U	0.813	3.25	*ND*	U	0.971	3.88	*ND*	U	0.721	2.89	*ND*	U	0.586	2.35
Dieldrin	*ND*	0.715	0.02	*ND*	U	0.798	3.19	*ND*	U	0.803	3.21	*ND*	U	0.450	1.80	*ND*	U	0.697	2.79	*ND*	U	0.813	3.25	*ND*	U	0.971	3.88	*ND*	U	0.721	2.89	*ND*	U	0.586	2.35
Endosulfan I	ND	x	x	ND	U	0.399	1.60	ND	U	0.401	1.61	ND	U	0.225	0.900	ND	U	0.349	1.39	ND	U	0.407	1.63	ND	U	0.485	1.94	ND	U	0.361	1.44	ND	U	0.293	1.17
Endosulfan II	ND	x	x	ND	U	0.798	3.19	ND	U	0.803	3.21	ND	U	0.450	1.80	ND	U	0.697	2.79	ND	U	0.813	3.25	ND	U	0.971	3.88	ND	U	0.721	2.89	ND	U	0.586	2.35
Endrin	ND	x	x	ND	U	0.798	3.19	ND	U	0.803	3.21	ND	U	0.450	1.80	ND	U	0.697	2.79	ND	U	0.813	3.25	ND	U	0.971	3.88	ND	U	0.721	2.89	ND	U	0.586	2.35
Endrin Aldehyde	ND	x	x	ND	U	0.798	3.19	ND	U	0.803	3.21	ND	U	0.450	1.80	ND	U	0.697	2.79	ND	U	0.813	3.25	ND	U	0.971	3.88	ND	U	0.721	2.89	ND	U	0.586	2.35
Endrin Ketone	ND	x	x	ND	U	0.798	3.19	ND	U	0.803	3.21	ND	U	0.450	1.80	ND	U	0.697	2.79	ND	U	0.813	3.25	ND	U	0.971	3.88	ND	U	0.721	2.89	ND	U	0.586	2.35
Heptachlor	ND	x	x	ND	U	0.399	1.60	ND	U	0.401	1.61	ND	U	0.225	0.900	ND	U	0.349	1.39	ND	U	0.407	1.63	ND	U	0.485	1.94	ND	U	0.361	1.44	ND	U	0.293	1.17
Heptachlor Epoxide	ND	x	x	ND	U	0.399	1.60	ND	U	0.401	1.61	ND	U	0.225	0.900	ND	U	0.349	1.39	ND	U	0.407	1.63	ND	U	0.485	1.94	0.775	J	0.361	1.44	ND	U	0.293	1.17
α-BHC	ND	x	x	ND	U	0.399	1.60	ND	U	0.401	1.61	ND	U	0.225	0.900	ND	U	0.349	1.39	ND	U	0.407	1.63	ND	U	0.485	1.94	ND	U	0.361	1.44	ND	U	0.293	1.17
β-BHC	ND	x	x	ND	U	0.399	1.60	ND	U	0.401	1.61	ND	U	0.225	0.900	ND	U	0.349	1.39	ND	U	0.407	1.63	ND	U	0.485	1.94	ND	U	0.361	1.44	ND	U	0.293	1.17
δ-BHC	ND	x	x	ND	U	0.399	1.60	ND	U	0.401	1.61	ND	U	0.225	0.900	ND	U	0.349	1.39	ND	U	0.407	1.63	ND	U	0.485	1.94	ND	U	0.361	1.44	ND	U	0.293	1.17
γ-BHC (Lindane)	*ND*	0.32	x	*ND*	U	0.399	1.60	*ND*	U	0.401	1.61	*ND*	U	0.225	0.900	*ND*	U	0.349	1.39	*ND*	U	0.407	1.63	*ND*	U	0.485	1.94	*ND*	U	0.361	1.44	*ND*	U	0.293	1.17
Methoxychlor	ND	x	x	ND	U	3.99	16.0	ND	U	4.01	16.1	ND	U	2.25	9.00	ND	U	3.49	13.9	ND	U	4.07	16.3	ND	U	4.85	19.4	ND	U	3.61	14.4	ND	U	2.93	11.7
Mirex®	ND	x	x	ND	U	0.399	1.60	ND	U	0.401	1.61	ND	U	0.225	0.900	ND	U	0.349	1.39	ND	U	0.407	1.63	ND	U	0.485	1.94	ND	U	0.361	1.44	ND	U	0.293	1.17
Toxaphene	*ND*	0.1	x	*ND*	U	13.3	39.9	*ND*	U	13.4	40.1	*ND*	U	7.49	22.5	*ND*	U	11.6	34.9	*ND*	U	13.5	40.7	*ND*	U	16.2	48.5	*ND*	U	12.0	36.1	*ND*	U	9.76	29.3
Chlorinated Pesticides, Total	ND	x	x	ND				ND				ND				ND				ND				ND				ND				ND			

Italicized results (or ND) indicate an associated MRL that exceeds the respective TEL and (or) ERL.
Acronyms and qualifiers are defined at the front of the tables section.

Sources: Results from GEL Laboratories; TEL and ERL values from Buchman (2008)
Compiled by: ANAMAR Environmental Consulting, Inc.

TABLE 7
Analytical Results for Dry Weight PAHs in Sediment Samples

			Sample ID:	JBC18-TC				JBC18-GC				JBC18-S1				JBC18-S2				JBC18-S3				JBC18-S4				JBC18-PC			
Analyte	Maximum Conc. µg/kg	TEL µg/kg	ERL µg/kg	Result µg/kg	Qualifier	MDL	MRL	Result µg/kg	Qualifier	MDL	MRL	Result µg/kg	Qualifier	MDL	MRL	Result µg/kg	Qualifier	MDL	MRL	Result µg/kg	Qualifier	MDL	MRL	Result µg/kg	Qualifier	MDL	MRL	Result µg/kg	Qualifier	MDL	MRL
1-Methylnaphthalene[LMW]	ND	x	x	ND	U	2.66	8.07	ND	U	1.49	4.53	ND	U	2.31	6.99	ND	U	2.68	8.13	ND	U	3.16	9.58	ND	U	4.73	14.3	ND	U	1.91	5.79
2- Chloronaphthalene	ND	x	x	ND	U	2.66	8.07	ND	U	1.49	4.53	ND	U	2.31	6.99	ND	U	2.68	8.13	ND	U	3.16	9.58	ND	U	4.73	14.3	ND	U	1.91	5.79
2-Methylnaphthalene[LMW]	ND	20.2	70	ND	U	2.66	8.07	ND	U	1.49	4.53	ND	U	2.31	6.99	ND	U	2.68	8.13	ND	U	3.16	9.58	ND	U	4.73	14.3	ND	U	1.91	5.79
Acenaphthene[LMW]	***18.2***	6.71	16	***14.5***	--	2.66	8.07	ND	U	1.49	4.53	*ND*	U	2.31	6.99	*ND*	U	2.68	8.13	***18.2***	--	3.16	9.58	*ND*	U	4.73	14.3	ND	U	1.91	5.79
Acenaphthylene	*ND*	5.87	44	*ND*	U	2.66	8.07	ND	U	1.49	4.53	*ND*	U	2.31	6.99	*ND*	U	2.68	8.13	*ND*	U	3.16	9.58	*ND*	U	4.73	14.3	ND	U	1.91	5.79
Anthracene[LMW]	ND	46.9	85.3	ND	U	2.66	8.07	ND	U	1.49	4.53	ND	U	2.31	6.99	ND	U	2.68	8.13	ND	U	3.16	9.58	ND	U	4.73	14.3	ND	U	1.91	5.79
Benzo(a)anthracene[HMW]	ND	74.8	261	ND	U	2.66	8.07	ND	U	1.49	4.53	ND	U	2.31	6.99	ND	U	2.68	8.13	ND	U	3.16	9.58	ND	U	4.73	14.3	ND	U	1.91	5.79
Benzo(a)pyrene[HMW]	ND	88.8	430	ND	U	2.66	8.07	ND	U	1.49	4.53	ND	U	2.31	6.99	ND	U	2.68	8.13	ND	U	3.16	9.58	ND	U	4.73	14.3	ND	U	1.91	5.79
Benzo(b)fluoranthene	ND	x	x	ND	U	2.66	8.07	ND	U	1.49	4.53	ND	U	2.31	6.99	ND	U	2.68	8.13	ND	U	3.16	9.58	ND	U	4.73	14.3	ND	U	1.91	5.79
Benzo(g,h,i)perylene	ND	x	x	ND	U	2.66	8.07	ND	U	1.49	4.53	ND	U	2.31	6.99	ND	U	2.68	8.13	ND	U	3.16	9.58	ND	U	4.73	14.3	ND	U	1.91	5.79
Benzo(k)fluoranthene	ND	x	x	ND	U	2.66	8.07	ND	U	1.49	4.53	ND	U	2.31	6.99	ND	U	2.68	8.13	ND	U	3.16	9.58	ND	U	4.73	14.3	ND	U	1.91	5.79
Chrysene[HMW]	ND	108	384	ND	U	2.66	8.07	ND	U	1.49	4.53	ND	U	2.31	6.99	ND	U	2.68	8.13	ND	U	3.16	9.58	ND	U	4.73	14.3	ND	U	1.91	5.79
Dibenzo(a,h)anthracene[HMW]	*ND*	6.22	63.4	*ND*	U	2.66	8.07	ND	U	1.49	4.53	*ND*	U	2.31	6.99	*ND*	U	2.68	8.13	*ND*	U	3.16	9.58	*ND*	U	4.73	14.3	ND	U	1.91	5.79
Fluoranthene[HMW]	12.5	113	600	12.1	--	2.66	8.07	ND	U	1.49	4.53	ND	U	2.31	6.99	ND	U	2.68	8.13	12.5	--	3.16	9.58	ND	U	4.73	14.3	ND	U	1.91	5.79
Fluorene[LMW]	12.5	21.2	19	8.07	--	2.66	8.07	ND	U	1.49	4.53	ND	U	2.31	6.99	ND	U	2.68	8.13	12.5	--	3.16	9.58	ND	U	4.73	14.3	ND	U	1.91	5.79
Indeno(1,2,3-cd)pyrene	ND	x	x	ND	U	2.66	8.07	ND	U	1.49	4.53	ND	U	2.31	6.99	ND	U	2.68	8.13	ND	U	3.16	9.58	ND	U	4.73	14.3	ND	U	1.91	5.79
Naphthalene[LMW]	11.3	34.6	160	11.3	--	2.66	8.07	ND	U	1.49	4.53	ND	U	2.31	6.99	ND	U	2.68	8.13	ND	U	3.16	9.58	ND	U	4.73	14.3	ND	U	1.91	5.79
Phenanthrene[LMW]	20.1	86.7	240	12.1	--	2.66	8.07	ND	U	1.49	4.53	ND	U	2.31	6.99	ND	U	2.68	8.13	20.1	--	3.16	9.58	ND	U	4.73	14.3	ND	U	1.91	5.79
Pyrene[HMW]	10.5	153	665	8.07	--	2.66	8.07	ND	U	1.49	4.53	ND	U	2.31	6.99	ND	U	2.68	8.13	10.5	--	3.16	9.58	ND	U	4.73	14.3	ND	U	1.91	5.79
Total LMW PAHs	63.4	312	552	54.0				10.4				16.2				18.8				63.4				33.1				13.4			
Total HMW PAHs	35.6	655	1700	30.8				8.94				13.9				16.1				35.6				28.4				11.5			
Total PAHs	118	1684	4022	101				28.3				43.9				50.9				118				89.9				36.3			

[LMW] Low Molecular Weight PAHs (NOAA 1989)

[HMW] High Molecular Weight PAHs (NOAA 1989)

For calculating total PAHs, U-qualified results use the MDL and J-qualified results use the value reported by the laboratory. Acronyms and qualifiers are defined at the front of the tables section.

Bolded values exceed the TEL and (or) ERL. *Italicized results* (or *ND*) indicate an associated MRL that is greater than the respective TEL and (or) ERL.

Sources: Results from GEL Laboratories; TEL and ERL values from Buchman (2008)

Compiled by: ANAMAR Environmental Consulting, Inc.

TABLE 8

Analytical Results for Dry Weight PCBs and Aroclors in Sediment Samples

Analyte			Sample ID:	JBC18-TC				JBC18-GC				JBC18-S1				JBC18-S2				JBC18-S3				JBC18-S4				JBC18-S4 (duplicate)				JBC18-PC			
Analyte	Maximum Conc. µg/kg	TEL µg/kg	ERL µg/kg	Result µg/kg	Qualifier	MDL	MRL	Result µg/kg	Qualifier	MDL	MRL	Result µg/kg	Qualifier	MDL	MRL	Result µg/kg	Qualifier	MDL	MRL	Result µg/kg	Qualifier	MDL	MRL	Result µg/kg	Qualifier	MDL	MRL	Result µg/kg	Qualifier	MDL	MRL	Result µg/kg	Qualifier	MDL	MRL
PCB 8[NOAA]	0.0267	x	x	0.0267	--	0.000631	0.0166	0.00517	J	0.000235	0.00996	0.0149	--	0.00151	0.0149	0.0203	--	0.000512	0.0158	0.0215	--	0.000727	0.0201	0.00848	J	0.000172	0.0151					0.000598	J	0.000129	0.0107
PCB 18[NOAA]	0.0325	x	x	0.0325	CJ	0.000425	0.0332	0.00501	CJ	0.000167	0.0199	0.0154	CJ	0.00116	0.0298	0.0218	CJ	0.000436	0.0316	0.023	CJ	0.000627	0.0402	0.0111	CJ	0.000154	0.0301					0.000541	CJ	0.000127	0.0214
PCB 20/28[NOAA]	0.0544	x	x	0.0544	C	0.000379	0.0332	0.00905	CJ	0.000149	0.0199	0.0282	CJ	0.00102	0.0298	0.0403	C	0.000389	0.0316	0.0454	C	0.000558	0.0402	0.0258	CJ	0.00013	0.0301					0.000905	CJ	0.000107	0.0214
PCB 44[NOAA]	0.130	x	x	0.0871	C	0.000196	0.0499	0.0202	CJ	0.000191	0.0299	0.0976	C	0.000686	0.0447	0.130	C	0.000455	0.0474	0.0709	C	0.000446	0.0603	0.0524	C	0.000133	0.0452					0.00113	CJ	0.000154	0.0322
PCB 49	0.0976	x	x	0.0789	C	0.000186	0.0332	0.0347	C	0.000181	0.0199	0.0976	C	0.000662	0.0298	0.0926	C	0.000433	0.0316	0.0824	C	0.000426	0.0402	0.054	C	0.00013	0.0301					0.000806	CJ	0.000152	0.0214
PCB 52[NOAA]	0.106	x	x	0.092	--	0.000213	0.0166	0.0434	--	0.000209	0.00996	0.106	--	0.00076	0.0149	0.0979	--	0.000499	0.0158	0.103	--	0.00049	0.0201	0.0583	--	0.000142	0.0151					0.00151	J	0.000165	0.0107
PCB 66[NOAA]	0.0482	x	x	0.0398	--	0.000253	0.0166	0.00977	J	0.000122	0.00996	0.0372	--	0.000519	0.0149	0.0372	--	0.000651	0.0158	0.0482	--	0.000333	0.0201	0.0296	--	0.000157	0.0151					0.000517	J	0.0000965	0.0107
PCB 77	0.00339	x	x	0.00339	J	0.000253	0.0166	ND	U	0.000418	0.00996	0.00262	J	0.000563	0.0149	0.00241	J	0.000983	0.0158	0.00306	J	0.000345	0.0201	0.00201	J	0.000169	0.0151					ND	U	0.000112	0.0107
PCB 86/87	0.0421	x	x	0.0367	CJ	0.000249	0.0997	0.0113	CJ	0.000126	0.0598	0.0421	CJ	0.000641	0.0894	0.0295	CJ	0.000344	0.0948	0.0374	CJ	0.000386	0.121	0.0279	CJ	0.000163	0.0904					0.000708	CJ	0.000116	0.0643
PCB 90/101[NOAA]	0.133	x	x	0.0918	C	0.000249	0.0499	0.0377	C	0.000126	0.0299	0.133	C	0.000644	0.0447	0.0785	C	0.000344	0.0474	0.0988	C	0.000386	0.0603	0.0763	C	0.000163	0.0452					0.00139	CJ	0.000118	0.0322
PCB 105[NOAA]	0.0166	x	x	0.0166	J	0.000316	0.0166	0.00181	J	0.000165	0.00996	0.0139	J	0.000772	0.0149	0.0109	J	0.000269	0.0158	0.0114	J	0.000474	0.0201	0.00845	J	0.000229	0.0151					0.000386	J	0.000122	0.0107
PCB 118[NOAA]	0.0657	x	x	0.0657	--	0.000276	0.0166	0.0116	--	0.000149	0.00996	0.0621	--	0.000695	0.0149	0.047	--	0.000231	0.0158	0.0633	--	0.000406	0.0201	0.0431	--	0.000208	0.0151					0.000909	J	0.000114	0.0107
PCB 126	ND	x	x	ND	U	0.000339	0.0166	ND	U	0.000183	0.00996	ND	U	0.000841	0.0149	ND	U	0.000307	0.0158	ND	U	0.000502	0.0201	ND	U	0.00025	0.0151					ND	U	0.000129	0.0107
PCB 128[NOAA]	0.0122	x	x	0.0122	CJ	0.000253	0.0332	0.00147	CJ	0.000134	0.0199	0.0109	CJ	0.00042	0.0298	0.00802	CJ	0.000278	0.0316	0.00894	CJ	0.00045	0.0402	0.00781	CJ	0.00016	0.0301					0.000204	CJ	0.000142	0.0214
PCB 129/138[NOAA]	0.129	x	x	0.114	C	0.000269	0.0499	0.0184	CJ	0.000143	0.0299	0.129	C	0.00045	0.0447	0.0835	C	0.000297	0.0474	0.090	C	0.000482	0.0603	0.0749	C	0.000169	0.0452					0.00174	CJ	0.000148	0.0322
PCB 153[NOAA]	0.203	x	x	0.158	C	0.000223	0.0332	0.0579	C	0.000118	0.0199	0.203	C	0.000388	0.0298	0.135	C	0.000246	0.0316	0.173	C	0.000398	0.0402	0.120	C	0.000136	0.0301					0.00193	CJ	0.000118	0.0214
PCB 156	0.0104	x	x	0.0103	CJ	0.000386	0.0332	0.00143	CJ	0.000151	0.0199	0.0104	CJ	0.000507	0.0298	0.00654	CJ	0.000319	0.0316	0.0074	CJ	0.00051	0.0402	0.00518	CJ	0.000232	0.0301					0.000305	CJ	0.000176	0.0214
PCB 169	ND	x	x	ND	U	0.000316	0.0166	ND	U	0.00012	0.00996	ND	U	0.000414	0.0149	ND	U	0.00025	0.0158	ND	U	0.000398	0.0201	ND	U	0.00019	0.0151					ND	U	0.000144	0.0107
PCB 170[NOAA]	0.0463	x	x	0.0342	--	0.000322	0.0166	0.00864	J	0.000189	0.00996	0.0463	--	0.000492	0.0149	0.0264	--	0.000294	0.0158	0.028	--	0.000522	0.0201	0.0245	--	0.000181	0.0151					0.000596	J	0.000176	0.0107
PCB 180[NOAA]	0.121	x	x	0.091	C	0.000259	0.0332	0.0253	C	0.000153	0.0199	0.121	C	0.0004	0.0298	0.073	C	0.000237	0.0316	0.0725	C	0.000422	0.0402	0.0638	C	0.000145	0.0301					0.0015	CJ	0.000139	0.0214
PCB 183	0.0366	x	x	0.0284	CJ	0.000269	0.0332	0.00773	CJ	0.000159	0.0199	0.0366	C	0.00042	0.0298	0.0233	CJ	0.000246	0.0316	0.0229	CJ	0.000438	0.0402	0.0194	CJ	0.000148	0.0301					0.000586	CJ	0.000144	0.0214
PCB 184	0.000157	x	x	ND	U	0.000279	0.0166	0.000157	J	0.0000618	0.00996	ND	U	0.000331	0.0149	0.00024	J	0.000107	0.0158	ND	U	0.000305	0.0201	ND	U	0.0000723	0.0151					ND	U	0.0000729	0.0107
PCB 187[NOAA]	0.0905	x	x	0.0683	--	0.000186	0.0166	0.0223	--	0.0000817	0.00996	0.0905	--	0.000423	0.0149	0.0561	--	0.000142	0.0158	0.0604	--	0.000257	0.0201	0.0611	--	0.0000965	0.0151					0.00116	J	0.0000965	0.0107
PCB 195[NOAA]	0.0114	x	x	0.00911	J	0.000306	0.0166	0.00318	J	0.000126	0.00996	0.0114	J	0.000471	0.0149	0.00804	J	0.000344	0.0158	0.009	J	0.000526	0.0201	0.00484	J	0.000142	0.0151					0.000135	J	0.000133	0.0107
PCB 206[NOAA]	0.0688	x	x	0.0295	Q	0.000382	0.0166	0.0189	Q	0.000157	0.00996	0.0688	--	0.000522	0.0149	0.0224	Q	0.000689	0.0158	0.0262	Q	0.00351	0.0201	0.0203	--	0.000187	0.0151					0.000444	J	0.000172	0.0107
PCB 209[NOAA]	0.0903	x	x	0.0201	--	0.000332	0.0166	0.0225	--	0.00012	0.00996	0.0903	--	0.000382	0.0149	0.0134	JQ	0.000367	0.0158	0.0175	JQ	0.000591	0.0201	0.0122	J	0.000102	0.0151					0.00039	JQ	0.000169	0.0107
Total EPA Region 4 PCBs	1.47	21.6	22.7	1.20				0.378				1.47				1.06				1.13				0.812								0.0188			
Total NOAA PCBs	2.56	21.6	22.7	2.09				0.645				2.56				1.82				1.94				1.41								0.0320			
Aroclor-1016	ND	x	x	ND	U	13.3	40.0	ND	U	1.49	4.48	ND	U	11.7	35.0	ND	U	13.6	40.8	ND	U	16.1	48.4	ND	U	12.0	36.1	ND	U	11.9	35.8	ND	U	1.96	5.88
Aroclor-1221	ND	x	x	ND	U	13.3	40.0	ND	U	1.49	4.48	ND	U	11.7	35.0	ND	U	13.6	40.8	ND	U	16.1	48.4	ND	U	12.0	36.1	ND	U	11.9	35.8	ND	U	1.96	5.88
Aroclor-1232	ND	x	x	ND	U	13.3	40.0	ND	U	1.49	4.48	ND	U	11.7	35.0	ND	U	13.6	40.8	ND	U	16.1	48.4	ND	U	12.0	36.1	ND	U	11.9	35.8	ND	U	1.96	5.88
Aroclor-1242	ND	x	x	ND	U	13.3	40.0	ND	U	1.49	4.48	ND	U	11.7	35.0	ND	U	13.6	40.8	ND	U	16.1	48.4	ND	U	12.0	36.1	ND	U	11.9	35.8	ND	U	1.96	5.88
Aroclor-1248	ND	x	x	ND	U	13.3	40.0	ND	U	1.49	4.48	ND	U	11.7	35.0	ND	U	13.6	40.8	ND	U	16.1	48.4	ND	U	12.0	36.1	ND	U	11.9	35.8	ND	U	1.96	5.88
Aroclor-1254	ND	63.3	x	ND	U	13.3	40.0	ND	U	1.49	4.48	ND	U	11.7	35.0	ND	U	13.6	40.8	ND	U	16.1	48.4	ND	U	12.0	36.1	ND	U	11.9	35.8	ND	U	1.96	5.88
Aroclor-1260	ND	x	x	ND	U	13.3	40.0	ND	U	1.49	4.48	ND	U	11.7	35.0	ND	U	13.6	40.8	ND	U	16.1	48.4	ND	U	12.0	36.1	ND	U	11.9	35.8	ND	U	1.96	5.88

[NOAA] National Oceanic and Atmospheric Administration PCB congeners (NOAA 1989, Table 5-6 of SERIM).

For calculating total EPA Region 4 PCBs and Total NOAA PCBs, U-qualified results use the MDL and J-qualified results use the value reported by the laboratory (See SERIM Section 7.3 for details).

Data qualifiers and acronyms are defined at the front of the tables section.

Source: Results from GEL Laboratories, and Cape Fear Laboratories; TEL and ERL values from Buchman (2008). Compiled by: ANAMAR Environmental Consulting, Inc.

TABLE 9
Analytical Results for Dry Weight Dioxins and Furans in Sediment Samples

				Sample ID:	JBC18-TC						JBC18-GC						JBC18-S1					
Analyte	Maximum Detected Conc. ng/kg	TEL ng/kg	AET ng/kg	TEF ng/kg	Result ng/kg	Qualifier	MDL	MRL	TEQ [1] (ND = 0)	TEQ [1] (ND = 0.5*MDL)	Result ng/kg	Qualifier	MDL	MRL	TEQ [1] (ND = 0)	TEQ [1] (ND = 0.5*MDL)	Result ng/kg	Qualifier	MDL	MRL	TEQ [1] (ND = 0)	TEQ [1] (ND = 0.5*MDL)
2,3,7,8-TCDD	0.299	x	x	1	ND	U	0.206	1.00	0	0.103	0.299	JK	0.269	0.996	0.299	0.299	ND	U	0.208	0.998	0	0.104
1,2,3,7,8-PeCDD	0.922	x	x	1	0.404	J	0.0733	5.00	0.404	0.404	0.486	JK	0.141	4.98	0.486	0.486	0.393	JK	0.107	4.99	0.393	0.393
1,2,3,4,7,8-HxCDD	1.50	x	x	0.1	0.621	J	0.250	5.00	0.0621	0.0621	0.749	J	0.231	4.98	0.0749	0.0749	0.557	J	0.181	4.99	0.0557	0.0557
1,2,3,6,7,8-HxCDD	3.12	x	x	0.1	1.03	J	0.224	5.00	0.103	0.103	1.46	J	0.209	4.98	0.146	0.146	0.920	J	0.163	4.99	0.092	0.092
1,2,3,7,8,9-HxCDD	4.94	x	x	0.1	2.10	J	0.240	5.00	0.21	0.21	3.82	J	0.223	4.98	0.382	0.382	1.63	J	0.174	4.99	0.163	0.163
1,2,3,4,6,7,8-HpCDD	76.0	x	x	0.01	31.9	--	0.362	5.00	0.319	0.319	40.2	--	0.464	4.98	0.402	0.402	23.4	--	0.325	4.99	0.234	0.234
OCDD	1110	x	x	0.0003	458	--	0.619	10.00	0.1374	0.137	623	--	0.680	9.96	0.1869	0.1869	322	--	0.513	9.98	0.0966	0.0966
2,3,7,8-TCDF	0.529	x	x	0.1	0.292	J	0.185	1.00	0.0292	0.0292	ND	U	0.203	0.996	0	0.01015	0.375	JK	0.160	0.998	0.0375	0.0375
1,2,3,7,8-PeCDF	0.148	x	x	0.03	0.110	J	0.0627	5.00	0.0033	0.0033	0.106	JK	0.0686	4.98	0.00318	0.00318	0.120	J	0.0581	4.99	0.0036	0.0036
2,3,4,7,8-PeCDF	0.198	x	x	0.3	0.0781	JK	0.056	5.00	0.02343	0.0234	ND	U	0.0612	4.98	0	0.00918	0.108	JK	0.0519	4.99	0.0324	0.0324
1,2,3,4,7,8-HxCDF	0.273	x	x	0.1	0.114	J	0.0657	5.00	0.0114	0.0114	0.0976	J	0.0725	4.98	0.00976	0.00976	0.122	JK	0.0655	4.99	0.0122	0.0122
1,2,3,6,7,8-HxCDF	0.240	x	x	0.1	0.118	JK	0.0607	5.00	0.0118	0.0118	0.0937	JK	0.067	4.98	0.00937	0.00937	0.126	JK	0.0605	4.99	0.0126	0.0126
2,3,4,6,7,8-HxCDF	0.277	x	x	0.1	0.162	J	0.0647	5.00	0.0162	0.0162	0.0996	JK	0.0713	4.98	0.00996	0.00996	0.162	J	0.0645	4.99	0.0162	0.0162
1,2,3,7,8,9-HxCDF	0.122	x	x	0.1	ND	U	0.0765	5.00	0	0.00383	ND	U	0.0845	4.98	0	0.00423	0.0918	JK	0.0762	4.99	0.00918	0.00918
1,2,3,4,6,7,8-HpCDF	3.35	x	x	0.01	1.03	J	0.0695	5.00	0.0103	0.0103	0.678	J	0.0811	4.98	0.00678	0.00678	1.06	J	0.0627	4.99	0.0106	0.0106
1,2,3,4,7,8,9-HpCDF	0.224	x	x	0.01	ND	U	0.0865	5.00	0	0.00043	ND	U	0.101	4.98	0	0.000505	0.132	JK	0.0778	4.99	0.00132	0.00132
OCDF	8.41	x	x	0.0003	2.81	J	0.191	10.00	0.000843	0.000843	1.43	J	0.197	9.96	0.000429	0.000429	2.64	J	0.166	9.98	0.000792	0.000792
Total TEQs [1] (ND = 0)	**3.03**	0.85	3.6	x						**1.31**						**1.21**						0.672
Total TEQs [1] (ND = 0.5*MDL)	**3.15**	0.85	3.6	x						**1.43**						**1.45**						**0.856**
TCDD, Total	94.5	x	x	x	9.37	--	0.206	1.00			44.4	J	0.269	0.996			3.49	--	0.208	0.998		
PeCDD, Total	96.3	x	x	x	16.5	J	0.0733	5.00			53.7	J	0.141	4.98			8.97	J	0.107	4.99		
HxCDD, Total	444	x	x	x	88.2	J	0.224	5.00			260	J	0.209	4.98			52.7	J	0.163	4.99		
HpCDD, Total	302	x	x	x	145	--	0.362	5.00			234	--	0.464	4.98			98.1	--	0.325	4.99		
TCDF, Total	2.14	x	x	x	0.570	J	0.185	1.00			ND	U	0.203	0.996			0.657	J	0.160	0.998		
PeCDF, Total	2.29	x	x	x	0.697	J	0.0362	5.00			0.118	J	0.047	4.98			0.669	J	0.0405	4.99		
HxCDF, Total	4.37	x	x	x	1.56	J	0.0607	5.00			1.02	J	0.067	4.98			1.47	J	0.0605	4.99		
HpCDF, Total	10.6	x	x	x	2.91	J	0.0695	5.00			1.99	J	0.0811	4.98			2.90	J	0.0627	4.99		

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TABLE 9 (*continued*)
Analytical Results for Dry Weight Dioxins and Furans in Sediment Samples

Analyte	JBC18-S2						JBC18-S3						JBC18-S4						JBC18-PC					
	Result ng/kg	Qualifier	MDL	MRL	TEQ [1] (ND = 0)	TEQ [1] (ND = 0.5*MDL)	Result ng/kg	Qualifier	MDL	MRL	TEQ [1] (ND = 0)	TEQ [1] (ND = 0.5*MDL)	Result ng/kg	Qualifier	MDL	MRL	TEQ [1] (ND = 0)	TEQ [1] (ND = 0.5*MDL)	Result ng/kg	Qualifier	MDL	MRL	TEQ [1] (ND = 0)	TEQ [1] (ND = 0.5*MDL)
2,3,7,8-TCDD	0.214	JK	0.182	0.998	0.214	0.214	ND	U	0.241	1.20	0	0.121	ND	U	0.220	1.00	0	0.110	ND	U	0.225	0.995	0	0.113
1,2,3,7,8-PeCDD	0.922	J	0.0962	4.99	0.922	0.922	0.511	JK	0.109	6.02	0.511	0.511	ND	U	0.125	5.01	0	0.0625	0.611	J	0.271	4.97	0.611	0.611
1,2,3,4,7,8-HxCDD	1.50	J	0.246	4.99	0.15	0.150	0.810	JK	0.246	6.02	0.081	0.081	0.407	J	0.273	5.01	0.0407	0.0407	1.04	JK	0.380	4.97	0.104	0.104
1,2,3,6,7,8-HxCDD	3.12	J	0.222	4.99	0.312	0.312	1.52	J	0.222	6.02	0.152	0.152	0.603	J	0.248	5.01	0.0603	0.0603	1.32	J	0.348	4.97	0.132	0.132
1,2,3,7,8,9-HxCDD	4.94	J	0.236	4.99	0.494	0.494	2.45	J	0.236	6.02	0.245	0.245	1.21	J	0.267	5.01	0.121	0.121	3.80	J	0.372	4.97	0.38	0.38
1,2,3,4,6,7,8-HpCDD	76.0	--	0.505	4.99	0.760	0.760	38.4	--	0.436	6.02	0.384	0.384	16.6	--	0.497	5.01	0.166	0.166	32.3	--	0.617	4.97	0.323	0.323
OCDD	1110	--	0.593	9.98	0.333	0.333	542	--	0.576	12.0	0.1626	0.1626	271	--	1.01	10.0	0.0813	0.0813	360	--	1.51	9.95	0.108	0.108
2,3,7,8-TCDF	0.529	JK	0.180	0.998	0.0529	0.0529	0.506	J	0.203	1.20	0.0506	0.0506	0.295	J	0.178	1.00	0.0295	0.0295	0.249	J	0.124	0.995	0.0249	0.0249
1,2,3,7,8-PeCDF	0.148	JK	0.0605	4.99	0.00444	0.00444	0.142	J	0.0819	6.02	0.00426	0.00426	ND	U	0.086	5.01	0	0.00129	ND	U	0.0633	4.97	0	0.0009495
2,3,4,7,8-PeCDF	0.198	JK	0.0539	4.99	0.0594	0.0594	ND	U	0.0733	6.02	0	0.0110	ND	U	0.0779	5.01	0	0.01169	ND	U	0.0573	4.97	0	0.00860
1,2,3,4,7,8-HxCDF	0.273	J	0.0605	4.99	0.0273	0.0273	0.169	J	0.0928	6.02	0.0169	0.0169	ND	U	0.0585	5.01	0	0.00293	ND	U	0.0533	4.97	0	0.00267
1,2,3,6,7,8-HxCDF	0.240	JK	0.0557	4.99	0.0240	0.0240	0.164	J	0.0858	6.02	0.0164	0.0164	ND	U	0.0539	5.01	0	0.00270	ND	U	0.0491	4.97	0	0.00246
2,3,4,6,7,8-HxCDF	0.277	JK	0.0595	4.99	0.0277	0.0277	0.229	J	0.0913	6.02	0.0229	0.0229	0.120	JK	0.0579	5.01	0.012	0.012	ND	U	0.0529	4.97	0	0.00265
1,2,3,7,8,9-HxCDF	0.122	JK	0.0705	4.99	0.0122	0.0122	ND	U	0.108	6.02	0	0.0054	ND	U	0.0683	5.01	0	0.00342	ND	U	0.0623	4.97	0	0.00312
1,2,3,4,6,7,8-HpCDF	3.35	J	0.084	4.99	0.0335	0.0335	1.64	J	0.0884	6.02	0.0164	0.0164	0.573	JK	0.0822	5.01	0.00573	0.00573	0.0617	JK	0.0507	4.97	0.000617	0.000617
1,2,3,4,7,8,9-HpCDF	0.224	JK	0.105	4.99	0.00224	0.00224	0.145	JK	0.110	6.02	0.00145	0.00145	ND	U	0.105	5.01	0	0.000525	ND	U	0.0648	4.97	0	0.000324
OCDF	8.41	J	0.153	9.98	0.00252	0.00252	3.97	J	0.192	12.0	0.001191	0.00119	1.33	J	0.208	10.0	0.000399	0.000399	ND	U	0.145	9.95	0	2.175E-05
Total TEQs [1] (ND = 0)						**3.03**						**1.07**						0.499						**1.58**
Total TEQs [1] (ND = 0.5*MDL)						**3.15**						**1.28**						0.698						**1.73**
TCDD, Total	12.0	J	0.182	0.998			6.07	--	0.241	1.20			7.09	--	0.220	1.00			94.5	--	0.225	0.995		
PeCDD, Total	28.9	J	0.0962	4.99			15.3	J	0.109	6.02			7.55	--	0.125	5.01			96.3	J	0.271	4.97		
HxCDD, Total	162	J	0.222	4.99			81.2	J	0.222	6.02			43.8	J	0.248	5.01			444	J	0.348	4.97		
HpCDD, Total	302	--	0.505	4.99			159	--	0.436	6.02			75.1	--	0.497	5.01			239	--	0.617	4.97		
TCDF, Total	2.14	J	0.180	0.998			0.928	J	0.203	1.20			0.593	J	0.178	1.00			0.249	J	0.124	0.995		
PeCDF, Total	2.29	J	0.0353	4.99			1.36	J	0.0501	6.02			0.220	J	0.0291	5.01			ND	U	0.0306	4.97		
HxCDF, Total	4.37	J	0.0557	4.99			2.90	J	0.0858	6.02			0.617	J	0.0539	5.01			0.193	J	0.0491	4.97		
HpCDF, Total	10.6	J	0.084	4.99			5.01	J	0.0884	6.02			0.912	J	0.0822	5.01			ND	U	0.0507	4.97		

[1] Total TEQs are calculated by substituting either 0, or (0.5 * MDL) multiplied by TEF, for non-detected (U-qualified) concentrations. J-qualified results use the value reported by the laboratory multiplied by the TEF for calculating total TEQs
Data qualifiers and acronyms are defined at the front of the tables section.
Bolded values exceed the AET and (or) TEL.

Sources: Results from Cape Fear Analytical Laboratories; TEL and AET values from Buchman (2008); TEF values from Van den Berg et al. (2006).
Compiled by: ANAMAR Environmental Consulting, Inc.

TABLE 10

Analytical Results for Metals, Tributyltin, Total Suspended Solids and TOC in Water and Elutriates Generated from Sediment

		Sample ID:	JBC18-SW (water)				JBC18-TC Total				JBC18-TC Dissolved				JBC18-GC Total				JBC18-GC Dissolved				JBC18-S1 Total				JBC18-S1 Dissolved			
Analyte	Maximum Conc. µg/L	CMC µg/L	Result µg/L	Qualifier	MDL	MRL	Result µg/L	Qualifier	MDL	MRL	Result µg/L	Qualifier	MDL	MRL	Result µg/L	Qualifier	MDL	MRL	Result µg/L	Qualifier	MDL	MRL	Result µg/L	Qualifier	MDL	MRL	Result µg/L	Qualifier	MDL	MRL
Antimony	1.55	x	ND	U	1.00	3.00	ND	U	1.00	3.00	ND	U	1.00	3.00	1.55	J	1.00	3.00	1.44	J	1.00	3.00	1.19	J	1.00	3.00	1.15	J	1.00	3.00
Arsenic	53.9	69	23.8	--	2.00	5.00	47.1	--	2.00	5.00	37.2	--	2.00	5.00	28.9	--	2.00	5.00	24.0	--	2.00	5.00	21.5	--	2.00	5.00	22.0	--	2.00	5.00
Cadmium	ND	40	ND	U	0.300	1.00	ND	U	0.300	1.00	ND	U	0.300	1.00	ND	U	0.300	1.00	ND	U	0.300	1.00	ND	U	0.300	1.00	ND	U	0.300	1.00
Chromium	ND	1100	ND	U	3.00	10.0	ND	U	3.00	10.0	ND	U	3.00	10.0	ND	U	3.00	10.0	ND	U	3.00	10.0	ND	U	3.00	10.0	ND	U	3.00	10.0
Copper	3.74	4.8	3.74	--	0.300	1.00	2.76	--	0.300	1.00	2.95	--	0.300	1.00	2.62	--	0.300	1.00	2.86	--	0.300	1.00	3.24	--	0.300	1.00	2.12	--	0.300	1.00
Lead	0.509	210	0.509	J	0.500	2.00	ND	U	0.500	2.00	ND	U	0.500	2.00	ND	U	0.500	2.00	ND	U	0.500	2.00	ND	U	0.500	2.00	ND	U	0.500	2.00
Mercury	ND	1.8	ND	U	0.067	0.200	ND	U	0.067	0.200	ND	U	0.067	0.200	ND	U	0.067	0.200	ND	U	0.067	0.200	ND	U	0.067	0.200	ND	U	0.067	0.200
Nickel	7.97	74	7.68	--	0.600	2.00	7.28	--	0.600	2.00	7.59	--	0.600	2.00	7.13	--	0.600	2.00	6.34	--	0.600	2.00	7.42	--	0.600	2.00	6.74	--	0.600	2.00
Selenium	59.9	290	59.9	--	2.00	5.00	41.2	--	2.00	5.00	42.2	--	2.00	5.00	41.5	--	2.00	5.00	40.9	--	2.00	5.00	30.2	--	2.00	5.00	46.1	--	2.00	5.00
Silver	ND	1.9	ND	U	0.300	1.00	ND	U	0.300	1.00	ND	U	0.300	1.00	ND	U	0.300	1.00	ND	U	0.300	1.00	ND	U	0.300	1.00	ND	U	0.300	1.00
Zinc	10.3	90	10.3	--	3.30	10.0	5.43	J	3.30	10.0	5.65	J	3.30	10.0	9.18	J	3.30	10.0	7.62	J	3.30	10.0	7.52	J	3.30	10.0	5.31	J	3.30	10.0
Analyte	**Maximum Conc. µg/L**	**CMC µg/L**	**Result µg/L**	**Qualifier**	**MDL**	**MRL**	**Result µg/L**	**Qualifier**	**MDL**	**MRL**	**Result µg/L**	**Qualifier**	**MDL**	**MRL**	**Result µg/L**	**Qualifier**	**MDL**	**MRL**	**Result µg/L**	**Qualifier**	**MDL**	**MRL**	**Result µg/L**	**Qualifier**	**MDL**	**MRL**	**Result µg/L**	**Qualifier**	**MDL**	**MRL**
Tri-n-butyltin Cation	ND	0.42	ND	U	0.077	0.31	ND	H	0.050	0.33	ND	H	0.050	0.33	ND	U	0.047	0.31	ND	U	0.046	0.30	ND	H	0.051	0.33	ND	H	0.050	0.33
Tri-n-butyltin Cation (duplicate sample)							ND	U	0.079	0.31	ND	U	0.084	0.34									ND	U	0.079	0.32	ND	U	0.078	0.31
Suspended Solids, Total	32000	x	1260	--	330	1000	32000	--	5700	25000	12200	--	1070	4690	8630	--	1120	4900	2080	J	1080	4720	7410	--	1060	4630	11600	--	1120	4900
Organic Carbon, Total	94000	x	35800	--	1140	5000	4470	--	330	1000	3860	--	330	1000	1420	--	330	1000	1690	--	330	1000	2890	--	330	1000	2620	--	330	1000

TABLE 10 (*continued*)

Analytical Results for Metals, Tributyltin, Total Suspended Solids and TOC in Water and Elutriates Generated from Sediment

	JBC18-S2 Total				JBC18-S2 Dissolved				JBC18-S3 Total				JBC18-S3 Dissolved				JBC18-S4 Total				JBC18-S4 Dissolved				JBC18-PC Total				JBC18-PC Dissolved			
Analyte	**Result µg/L**	**Qualifier**	**MDL**	**MRL**	**Result µg/L**	**Qualifier**	**MDL**	**MRL**	**Result µg/L**	**Qualifier**	**MDL**	**MRL**	**Result µg/L**	**Qualifier**	**MDL**	**MRL**	**Result µg/L**	**Qualifier**	**MDL**	**MRL**	**Result µg/L**	**Qualifier**	**MDL**	**MRL**	**Result µg/L**	**Qualifier**	**MDL**	**MRL**	**Result µg/L**	**Qualifier**	**MDL**	**MRL**
Antimony	ND	U	1.00	3.00	ND	U	1.00	3.00	ND	U	1.00	3.00	ND	U	1.00	3.00	1.16	J	1.00	3.00	1.19	J	1.00	3.00	ND	U	1.00	3.00	ND	U	1.00	3.00
Arsenic	44.1	--	2.00	5.00	30.1	--	2.00	5.00	53.9	--	2.00	5.00	41.2	--	2.00	5.00	41.4	--	2.00	5.00	29.3	--	2.00	5.00	25.1	--	2.00	5.00	22.3	--	2.00	5.00
Cadmium	ND	U	0.300	1.00	ND	U	0.300	1.00	ND	U	0.300	1.00	ND	U	0.300	1.00	ND	U	0.300	1.00	ND	U	0.300	1.00	ND	U	0.300	1.00	ND	U	0.300	1.00
Chromium	ND	U	3.00	10.0	ND	U	3.00	10.0	ND	U	3.00	10.0	ND	U	3.00	10.0	ND	U	3.00	10.0	ND	U	3.00	10.0	ND	U	3.00	10.0	ND	U	3.00	10.0
Copper	3.10	--	0.300	1.00	3.01	--	0.300	1.00	2.62	--	0.300	1.00	2.69	--	0.300	1.00	2.84	--	0.300	1.00	2.60	--	0.300	1.00	2.79	--	0.300	1.00	2.90	--	0.300	1.00
Lead	ND	.	0.500	2.00	ND	U	0.500	2.00	ND	U	0.500	2.00	ND	U	0.500	2.00	ND	U	0.500	2.00	ND	U	0.500	2.00	ND	U	0.500	2.00	ND	U	0.500	2.00
Mercury	ND	U	0.067	0.200	ND	U	0.067	0.200	ND	U	0.067	0.200	ND	U	0.067	0.200	ND	U	0.067	0.200	ND	U	0.067	0.200	ND	U	0.067	0.200	ND	U	0.067	0.200
Nickel	7.82	--	0.600	2.00	7.97	--	0.600	2.00	6.76	--	0.600	2.00	7.05	--	0.600	2.00	7.40	--	0.600	2.00	7.60	--	0.600	2.00	7.33	--	0.600	2.00	6.87	--	0.600	2.00
Selenium	51.4	--	2.00	5.00	57.2	--	2.00	5.00	58.1	--	2.00	5.00	45.7	--	2.00	5.00	52.9	--	2.00	5.00	53.8	--	2.00	5.00	50.8	--	2.00	5.00	39.1	--	2.00	5.00
Silver	ND	U	0.300	1.00	ND	U	0.300	1.00	ND	U	0.300	1.00	ND	U	0.300	1.00	ND	U	0.300	1.00	ND	U	0.300	1.00	ND	U	0.300	1.00	ND	U	0.300	1.00
Zinc	5.44	J	3.30	10.0	4.52	J	3.30	10.0	5.37	J	3.30	10.0	5.90	J	3.30	10.0	8.20	J	3.30	10.0	7.13	J	3.30	10.0	5.07	J	3.30	10.0	6.41	J	3.30	10.0
Analyte	**Result µg/L**	**Qualifier**	**MDL**	**MRL**	**Result µg/L**	**Qualifier**	**MDL**	**MRL**	**Result µg/L**	**Qualifier**	**MDL**	**MRL**	**Result µg/L**	**Qualifier**	**MDL**	**MRL**	**Result µg/L**	**Qualifier**	**MDL**	**MRL**	**Result µg/L**	**Qualifier**	**MDL**	**MRL**	**Result µg/L**	**Qualifier**	**MDL**	**MRL**	**Result µg/L**	**Qualifier**	**MDL**	**MRL**
Tri-n-butyltin Cation	ND	H	0.050	0.33	ND	H	0.048	0.31	ND	H	0.048	0.31	ND	H	0.048	0.31	ND	H	0.050	0.32	ND	H	0.048	0.31	ND	H	0.048	0.31	ND	H	0.050	0.33
Tri-n-butyltin Cation (duplicate sample)																																
Suspended Solids, Total	5010	--	330	1000	4320	--	330	1000	5030	--	330	1000	4730	--	330	1000	5560	--	330	1000	5070	--	330	1000	2890	--	330	1000	2880	--	330	1000
Organic Carbon, Total	40000	--	5700	25000	34000	--	1140	5000	94000	--	5700	25000	43000	--	5700	25000	31000	--	5700	25000	4810	--	1100	4810	9430	--	1080	4720	2500	J	1020	4460

Non-Detect (ND) results use the MDL for calculating total organotins. (J-qualified results use the value reported by the laboratory for calculating total organotins.)

Data qualifiers and acronyms are defined at the front of the tables section.

Sources: Results from GEL Laboratories with the exception of tri-n-butyltin which came from TestAmerica; CMC values taken from USEPA (2006).

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TABLE 11
Analytical Results for Pesticides in Water and Elutriates Generated from Sediment

		Sample ID:	JBC18-SW (water)				JBC18-TC Total				JBC18-TC Dissolved				JBC18-GC Total				JBC18-GC Dissolved			
Analyte	**Maximum Conc. µg/L**	**CMC µg/L**	**Result µg/L**	**Qualifier**	**MDL**	**MRL**	**Result µg/L**	**Qualifier**	**MDL**	**MRL**	**Result µg/L**	**Qualifier**	**MDL**	**MRL**	**Result µg/L**	**Qualifier**	**MDL**	**MRL**	**Result µg/L**	**Qualifier**	**MDL**	**MRL**
Aldrin	ND	1.3	ND	U	0.00665	0.020	ND	U	0.00665	0.020	ND	U	0.00665	0.020	ND	U	0.00665	0.020	ND	U	0.00665	0.020
Chlordane (technical)	*ND*	0.09	*ND*	U	0.0765	0.250	*ND*	U	0.0765	0.250	*ND*	U	0.0765	0.250	*ND*	U	0.0765	0.250	*ND*	U	0.0765	0.250
α (cis)-Chlordane	ND	x	ND	U	0.00665	0.020	ND	U	0.00665	0.020	ND	U	0.00665	0.020	ND	U	0.00665	0.020	ND	U	0.00665	0.020
γ (trans)-Chlordane	ND	x	ND	U	0.00665	0.020	ND	U	0.00665	0.020	ND	U	0.00665	0.020	ND	U	0.00665	0.020	ND	U	0.00665	0.020
Oxychlordane	ND	x	ND	U	0.005	0.020	ND	U	0.005	0.020	ND	U	0.005	0.020	ND	U	0.005	0.020	ND	U	0.005	0.020
cis-Nonachlor	ND	x	ND	U	0.0051	0.020	ND	U	0.0051	0.020	ND	U	0.0051	0.020	ND	U	0.0051	0.020	ND	U	0.0051	0.020
trans-Nonachlor	ND	x	ND	U	0.005	0.020	ND	U	0.005	0.020	ND	U	0.005	0.020	ND	U	0.005	0.020	ND	U	0.005	0.020
o,p' (2,4')-DDD	ND	x	ND	U	0.005	0.020	ND	U	0.005	0.020	ND	U	0.005	0.020	ND	U	0.005	0.020	ND	U	0.005	0.020
p,p' (4,4')-DDD	ND	x	ND	U	0.010	0.040	ND	U	0.010	0.040	ND	U	0.010	0.040	ND	U	0.010	0.040	ND	U	0.010	0.040
o,p' (2,4')-DDE	ND	x	ND	U	0.006	0.020	ND	U	0.006	0.020	ND	U	0.006	0.020	ND	U	0.006	0.020	ND	U	0.006	0.020
p,p' (4,4')-DDE	ND	x	ND	U	0.010	0.040	ND	U	0.010	0.040	ND	U	0.010	0.040	ND	U	0.010	0.040	ND	U	0.010	0.040
o,p' (2,4')-DDT	ND	x	ND	U	0.005	0.020	ND	U	0.005	0.020	ND	U	0.005	0.020	ND	U	0.005	0.020	ND	U	0.005	0.020
p,p' (4,4')-DDT	ND	0.13	ND	U	0.010	0.040	ND	U	0.010	0.040	ND	U	0.010	0.040	ND	U	0.010	0.040	ND	U	0.010	0.040
Dieldrin	ND	0.71	ND	U	0.010	0.040	ND	U	0.010	0.040	ND	U	0.010	0.040	ND	U	0.010	0.040	ND	U	0.010	0.040
Endosulfan I	ND	0.034	ND	U	0.00665	0.020	ND	U	0.00665	0.020	ND	U	0.00665	0.020	ND	U	0.00665	0.020	ND	U	0.00665	0.020
Endosulfan II	*ND*	0.034	*ND*	U	0.010	0.040	*ND*	U	0.010	0.040	*ND*	U	0.010	0.040	*ND*	U	0.010	0.040	*ND*	U	0.010	0.040
Endrin	*ND*	0.037	*ND*	U	0.010	0.040	*ND*	U	0.010	0.040	*ND*	U	0.010	0.040	*ND*	U	0.010	0.040	*ND*	U	0.010	0.040
Endrin Aldehyde	ND	x	ND	U	0.00665	0.040	ND	U	0.00665	0.040	ND	U	0.00665	0.040	ND	U	0.00665	0.040	ND	U	0.00665	0.040
Endrin Ketone	ND	x	ND	U	0.010	0.040	ND	U	0.010	0.040	ND	U	0.010	0.040	ND	U	0.010	0.040	ND	U	0.010	0.040
Heptachlor	ND	0.053	ND	U	0.00665	0.020	ND	U	0.00665	0.020	ND	U	0.00665	0.020	ND	U	0.00665	0.020	ND	U	0.00665	0.020
Heptachlor Epoxide	ND	0.053	ND	U	0.00665	0.020	ND	U	0.00665	0.020	ND	U	0.00665	0.020	ND	U	0.00665	0.020	ND	U	0.00665	0.020
α-BHC	ND	x	ND	U	0.00665	0.020	ND	U	0.00665	0.020	ND	U	0.00665	0.020	ND	U	0.00665	0.020	ND	U	0.00665	0.020
β-BHC	ND	x	ND	U	0.00665	0.020	ND	U	0.00665	0.020	ND	U	0.00665	0.020	ND	U	0.00665	0.020	ND	U	0.00665	0.020
δ-BHC	ND	x	ND	U	0.00665	0.020	ND	U	0.00665	0.020	ND	U	0.00665	0.020	ND	U	0.00665	0.020	ND	U	0.00665	0.020
γ-BHC (Lindane)	ND	0.16	ND	U	0.00665	0.020	ND	U	0.00665	0.020	ND	U	0.00665	0.020	ND	U	0.00665	0.020	ND	U	0.00665	0.020
Methoxychlor	ND	x	ND	U	0.050	0.200	ND	U	0.050	0.200	ND	U	0.050	0.200	ND	U	0.050	0.200	ND	U	0.050	0.200
Mirex®	ND	x	ND	U	0.00665	0.020	ND	U	0.00665	0.020	ND	U	0.00665	0.020	ND	U	0.00665	0.020	ND	U	0.00665	0.020
Toxaphene	*ND*	0.21	*ND*	U	0.150	0.500	*ND*	U	0.150	0.500	*ND*	U	0.150	0.500	*ND*	U	0.150	0.500	*ND*	U	0.150	0.500
Pesticides, Total Chlorinated	ND	x	ND				ND				ND				ND				ND			

TABLE 11 (*continued*)
Analytical Results for Pesticides in Water and Elutriates Generated from Sediment

Analyte	JBC18-S1 Total				JBC18-S1 Dissolved				JBC18-S2 Total				JBC18-S2 Dissolved				JBC18-S3 Total			
	Result µg/L	Qualifier	MDL	MRL	Result µg/L	Qualifier	MDL	MRL	Result µg/L	Qualifier	MDL	MRL	Result µg/L	Qualifier	MDL	MRL	Result µg/L	Qualifier	MDL	MRL
Aldrin	ND	U	0.00665	0.020	ND	U	0.00665	0.020	ND	U	0.00665	0.020	ND	U	0.00665	0.020	ND	U	0.00665	0.020
Chlordane (technical)	*ND*	U	0.0765	0.250	*ND*	U	0.0765	0.250	*ND*	U	0.0765	0.250	*ND*	U	0.0765	0.250	*ND*	U	0.0765	0.250
α (cis)-Chlordane	ND	U	0.00665	0.020	ND	U	0.00665	0.020	ND	U	0.00665	0.020	ND	U	0.00665	0.020	ND	U	0.00665	0.020
γ (trans)-Chlordane	ND	U	0.00665	0.020	ND	U	0.00665	0.020	ND	U	0.00665	0.020	ND	U	0.00665	0.020	ND	U	0.00665	0.020
Oxychlordane	ND	U	0.005	0.020	ND	U	0.005	0.020	ND	U	0.005	0.020	ND	U	0.005	0.020	ND	U	0.005	0.020
cis-Nonachlor	ND	U	0.0051	0.020	ND	U	0.0051	0.020	ND	U	0.0051	0.020	ND	U	0.0051	0.020	ND	U	0.0051	0.020
trans-Nonachlor	ND	U	0.005	0.020	ND	U	0.005	0.020	ND	U	0.005	0.020	ND	U	0.005	0.020	ND	U	0.005	0.020
o,p' (2,4')-DDD	ND	U	0.005	0.020	ND	U	0.005	0.020	ND	U	0.005	0.020	ND	U	0.005	0.020	ND	U	0.005	0.020
p,p' (4,4')-DDD	ND	U	0.010	0.040	ND	U	0.010	0.040	ND	U	0.010	0.040	ND	U	0.010	0.040	ND	U	0.010	0.040
o,p' (2,4')-DDE	ND	U	0.006	0.020	ND	U	0.006	0.020	ND	U	0.006	0.020	ND	U	0.006	0.020	ND	U	0.006	0.020
p,p' (4,4')-DDE	ND	U	0.010	0.040	ND	U	0.010	0.040	ND	U	0.010	0.040	ND	U	0.010	0.040	ND	U	0.010	0.040
o,p' (2,4')-DDT	ND	U	0.005	0.020	ND	U	0.005	0.020	ND	U	0.005	0.020	ND	U	0.005	0.020	ND	U	0.005	0.020
p,p' (4,4')-DDT	ND	U	0.010	0.040	ND	U	0.010	0.040	ND	U	0.010	0.040	ND	U	0.010	0.040	ND	U	0.010	0.040
Dieldrin	ND	U	0.010	0.040	ND	U	0.010	0.040	ND	U	0.010	0.040	ND	U	0.010	0.040	ND	U	0.010	0.040
Endosulfan I	ND	U	0.00665	0.020	ND	U	0.00665	0.020	ND	U	0.00665	0.020	ND	U	0.00665	0.020	ND	U	0.00665	0.020
Endosulfan II	*ND*	U	0.010	0.040	*ND*	U	0.010	0.040	*ND*	U	0.010	0.040	*ND*	U	0.010	0.040	*ND*	U	0.010	0.040
Endrin	*ND*	U	0.010	0.040	*ND*	U	0.010	0.040	*ND*	U	0.010	0.040	*ND*	U	0.010	0.040	*ND*	U	0.010	0.040
Endrin Aldehyde	ND	U	0.00665	0.040	ND	U	0.00665	0.040	ND	U	0.00665	0.040	ND	U	0.00665	0.040	ND	U	0.00665	0.040
Endrin Ketone	ND	U	0.010	0.040	ND	U	0.010	0.040	ND	U	0.010	0.040	ND	U	0.010	0.040	ND	U	0.010	0.040
Heptachlor	ND	U	0.00665	0.020	ND	U	0.00665	0.020	ND	U	0.00665	0.020	ND	U	0.00665	0.020	ND	U	0.00665	0.020
Heptachlor Epoxide	ND	U	0.00665	0.020	ND	U	0.00665	0.020	ND	U	0.00665	0.020	ND	U	0.00665	0.020	ND	U	0.00665	0.020
α-BHC	ND	U	0.00665	0.020	ND	U	0.00665	0.020	ND	U	0.00665	0.020	ND	U	0.00665	0.020	ND	U	0.00665	0.020
β-BHC	ND	U	0.00665	0.020	ND	U	0.00665	0.020	ND	U	0.00665	0.020	ND	U	0.00665	0.020	ND	U	0.00665	0.020
δ-BHC	ND	U	0.00665	0.020	ND	U	0.00665	0.020	ND	U	0.00665	0.020	ND	U	0.00665	0.020	ND	U	0.00665	0.020
γ-BHC (Lindane)	ND	U	0.00665	0.020	ND	U	0.00665	0.020	ND	U	0.00665	0.020	ND	U	0.00665	0.020	ND	U	0.00665	0.020
Methoxychlor	ND	U	0.050	0.200	ND	U	0.050	0.200	ND	U	0.050	0.200	ND	U	0.050	0.200	ND	U	0.050	0.200
Mirex®	ND	U	0.00665	0.020	ND	U	0.00665	0.020	ND	U	0.00665	0.020	ND	U	0.00665	0.020	ND	U	0.00665	0.020
Toxaphene	*ND*	U	0.150	0.500	*ND*	U	0.150	0.500	*ND*	U	0.150	0.500	*ND*	U	0.150	0.500	*ND*	U	0.150	0.500
Pesticides, Total Chlorinated	ND				ND				ND				ND				ND			

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TABLE 11 (*continued*)
Analytical Results for Pesticides in Water and Elutriates Generated from Sediment

Analyte	JBC18-S3 Dissolved				JBC18-S4 Total				JBC18-S4 Dissolved				JBC18-PC Total				JBC18-PC Dissolved			
	Result µg/L	Qualifier	MDL	MRL	Result µg/L	Qualifier	MDL	MRL	Result µg/L	Qualifier	MDL	MRL	Result µg/L	Qualifier	MDL	MRL	Result µg/L	Qualifier	MDL	MRL
Aldrin	ND	U	0.00665	0.020	ND	U	0.00665	0.020	ND	U	0.00665	0.020	ND	U	0.00665	0.020	ND	U	0.00665	0.020
Chlordane (technical)	*ND*	U	0.0765	0.250	*ND*	U	0.0765	0.250	*ND*	U	0.0765	0.250	*ND*	U	0.0765	0.250	*ND*	U	0.0765	0.250
α (cis)-Chlordane	ND	U	0.00665	0.020	ND	U	0.00665	0.020	ND	U	0.00665	0.020	ND	U	0.00665	0.020	ND	U	0.00665	0.020
γ (trans)-Chlordane	ND	U	0.00665	0.020	ND	U	0.00665	0.020	ND	U	0.00665	0.020	ND	U	0.00665	0.020	ND	U	0.00665	0.020
Oxychlordane	ND	U	0.005	0.020	ND	U	0.005	0.020	ND	U	0.005	0.020	ND	U	0.005	0.020	ND	U	0.005	0.020
cis-Nonachlor	ND	U	0.0051	0.020	ND	U	0.0051	0.020	ND	U	0.0051	0.020	ND	U	0.0051	0.020	ND	U	0.0051	0.020
trans-Nonachlor	ND	U	0.005	0.020	ND	U	0.005	0.020	ND	U	0.005	0.020	ND	U	0.005	0.020	ND	U	0.005	0.020
o,p' (2,4')-DDD	ND	U	0.005	0.020	ND	U	0.005	0.020	ND	U	0.005	0.020	ND	U	0.005	0.020	ND	U	0.005	0.020
p,p' (4,4')-DDD	ND	U	0.010	0.040	ND	U	0.010	0.040	ND	U	0.010	0.040	ND	U	0.010	0.040	ND	U	0.010	0.040
o,p' (2,4')-DDE	ND	U	0.006	0.020	ND	U	0.006	0.020	ND	U	0.006	0.020	ND	U	0.006	0.020	ND	U	0.006	0.020
p,p' (4,4')-DDE	ND	U	0.010	0.040	ND	U	0.010	0.040	ND	U	0.010	0.040	ND	U	0.010	0.040	ND	U	0.010	0.040
o,p' (2,4')-DDT	ND	U	0.005	0.020	ND	U	0.005	0.020	ND	U	0.005	0.020	ND	U	0.005	0.020	ND	U	0.005	0.020
p,p' (4,4')-DDT	ND	U	0.010	0.040	ND	U	0.010	0.040	ND	U	0.010	0.040	ND	U	0.010	0.040	ND	U	0.010	0.040
Dieldrin	ND	U	0.010	0.040	ND	U	0.010	0.040	ND	U	0.010	0.040	ND	U	0.010	0.040	ND	U	0.010	0.040
Endosulfan I	ND	U	0.00665	0.020	ND	U	0.00665	0.020	ND	U	0.00665	0.020	ND	U	0.00665	0.020	ND	U	0.00665	0.020
Endosulfan II	*ND*	U	0.010	0.040	*ND*	U	0.010	0.040	*ND*	U	0.010	0.040	*ND*	U	0.010	0.040	*ND*	U	0.010	0.040
Endrin	*ND*	U	0.010	0.040	*ND*	U	0.010	0.040	*ND*	U	0.010	0.040	*ND*	U	0.010	0.040	*ND*	U	0.010	0.040
Endrin Aldehyde	ND	U	0.00665	0.040	ND	U	0.00665	0.040	ND	U	0.00665	0.040	ND	U	0.00665	0.040	ND	U	0.00665	0.040
Endrin Ketone	ND	U	0.010	0.040	ND	U	0.010	0.040	ND	U	0.010	0.040	ND	U	0.010	0.040	ND	U	0.010	0.040
Heptachlor	ND	U	0.00665	0.020	ND	U	0.00665	0.020	ND	U	0.00665	0.020	ND	U	0.00665	0.020	ND	U	0.00665	0.020
Heptachlor Epoxide	ND	U	0.00665	0.020	ND	U	0.00665	0.020	ND	U	0.00665	0.020	ND	U	0.00665	0.020	ND	U	0.00665	0.020
α-BHC	ND	U	0.00665	0.020	ND	U	0.00665	0.020	ND	U	0.00665	0.020	ND	U	0.00665	0.020	ND	U	0.00665	0.020
β-BHC	ND	U	0.00665	0.020	ND	U	0.00665	0.020	ND	U	0.00665	0.020	ND	U	0.00665	0.020	ND	U	0.00665	0.020
δ-BHC	ND	U	0.00665	0.020	ND	U	0.00665	0.020	ND	U	0.00665	0.020	ND	U	0.00665	0.020	ND	U	0.00665	0.020
γ-BHC (Lindane)	ND	U	0.00665	0.020	ND	U	0.00665	0.020	ND	U	0.00665	0.020	ND	U	0.00665	0.020	ND	U	0.00665	0.020
Methoxychlor	ND	U	0.050	0.200	ND	U	0.050	0.200	ND	U	0.050	0.200	ND	U	0.050	0.200	ND	U	0.050	0.200
Mirex®	ND	U	0.00665	0.020	ND	U	0.00665	0.020	ND	U	0.00665	0.020	ND	U	0.00665	0.020	ND	U	0.00665	0.020
Toxaphene	*ND*	U	0.150	0.500	*ND*	U	0.150	0.500	*ND*	U	0.150	0.500	*ND*	U	0.150	0.500	*ND*	U	0.150	0.500
Pesticides, Total Chlorinated	ND				ND				ND				ND				ND			

Non-Detect (ND) results use the MDL for calculating total pesticides. *Italicized* results have an MRL>CMC.
Data qualifiers and acronyms are defined at the front of the tables section.
Sources: Results from GEL Laboratories; CMC values from USEPA (2006)
Compiled by: ANAMAR Environmental Consulting, Inc.

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TABLE 12
Analytical Results for PAHs in Water and Elutriates Generated from Sediment

	Sample ID:		JBC18-SW (water)				JBC18-TC Total				JBC18-TC Dissolved				JBC18-GC Total				JBC18-GC Dissolved				JBC18-S1 Total			
Analyte	**Maximum Conc. µg/L**	**CMC µg/L**	**Result µg/L**	**Qualifier**	**MDL**	**MRL**	**Result µg/L**	**Qualifier**	**MDL**	**MRL**	**Result µg/L**	**Qualifier**	**MDL**	**MRL**	**Result µg/L**	**Qualifier**	**MDL**	**MRL**	**Result µg/L**	**Qualifier**	**MDL**	**MRL**	**Result µg/L**	**Qualifier**	**MDL**	**MRL**
1-Methylnaphthalene[LMW]	0.090	x	ND	U	0.030	0.100	0.090	J	0.030	0.100	0.080	J	0.030	0.100	ND	U	0.030	0.100	ND	U	0.030	0.100	ND	U	0.030	0.100
2-Chloronaphthalene	ND	x	ND	U	0.030	0.100	ND	U	0.030	0.100	ND	U	0.030	0.100	ND	U	0.030	0.100	ND	U	0.030	0.100	ND	U	0.030	0.100
2-Methylnaphthalene[LMW]	0.080	x	ND	U	0.030	0.100	0.080	J	0.030	0.100	0.070	J	0.030	0.100	ND	U	0.030	0.100	ND	U	0.030	0.100	ND	U	0.030	0.100
Acenaphthene[LMW]	0.430	x	ND	U	0.030	0.100	0.430	--	0.030	0.100	0.350	--	0.030	0.100	0.280	--	0.030	0.100	0.250	--	0.030	0.100	ND	U	0.030	0.100
Acenaphthylene	ND	x	ND	U	0.030	0.100	ND	U	0.030	0.100	ND	U	0.030	0.100	ND	U	0.030	0.100	ND	U	0.030	0.100	ND	U	0.030	0.100
Anthracene[LMW]	ND	x	ND	U	0.030	0.100	ND	U	0.030	0.100	ND	U	0.030	0.100	ND	U	0.030	0.100	ND	U	0.030	0.100	ND	U	0.030	0.100
Benzo(a)anthracene[HMW]	ND	x	ND	U	0.030	0.100	ND	U	0.030	0.100	ND	U	0.030	0.100	ND	U	0.030	0.100	ND	U	0.030	0.100	ND	U	0.030	0.100
Benzo(a)pyrene[HMW]	ND	x	ND	U	0.030	0.100	ND	U	0.030	0.100	ND	U	0.030	0.100	ND	U	0.030	0.100	ND	U	0.030	0.100	ND	U	0.030	0.100
Benzo(b)fluoranthene	ND	x	ND	U	0.030	0.100	ND	U	0.030	0.100	ND	U	0.030	0.100	ND	U	0.030	0.100	ND	U	0.030	0.100	ND	U	0.030	0.100
Benzo(g,h,i)perylene	0.050	x	ND	U	0.030	0.100	ND	U	0.030	0.100	ND	U	0.030	0.100	ND	U	0.030	0.100	ND	U	0.030	0.100	ND	U	0.030	0.100
Benzo(k)fluoranthene	ND	x	ND	U	0.030	0.100	ND	U	0.030	0.100	ND	U	0.030	0.100	ND	U	0.030	0.100	ND	U	0.030	0.100	ND	U	0.030	0.100
Chrysene[HMW]	ND	x	ND	U	0.030	0.100	ND	U	0.030	0.100	ND	U	0.030	0.100	ND	U	0.030	0.100	ND	U	0.030	0.100	ND	U	0.030	0.100
Dibenzo(a,h)anthracene[HMW]	ND	x	ND	U	0.030	0.100	ND	U	0.030	0.100	ND	U	0.030	0.100	ND	U	0.030	0.100	ND	U	0.030	0.100	ND	U	0.030	0.100
Fluoranthene[HMW]	ND	x	ND	U	0.030	0.100	ND	U	0.030	0.100	ND	U	0.030	0.100	ND	U	0.030	0.100	ND	U	0.030	0.100	ND	U	0.030	0.100
Fluorene[LMW]	0.120	x	ND	U	0.030	0.100	0.120	--	0.030	0.100	0.090	J	0.030	0.100	0.050	J	0.030	0.100	ND	U	0.030	0.100	ND	U	0.030	0.100
Indeno(1,2,3-cd)pyrene	ND	x	ND	U	0.030	0.100	ND	U	0.030	0.100	ND	U	0.030	0.100	ND	U	0.030	0.100	ND	U	0.030	0.100	ND	U	0.030	0.100
Naphthalene[LMW]	0.390	x	ND	U	0.030	0.100	0.390	--	0.030	0.100	0.370	--	0.030	0.100	ND	U	0.030	0.100	ND	U	0.030	0.100	ND	U	0.030	0.100
Phenanthrene[LMW]	0.060	x	ND	U	0.030	0.100	0.060	J	0.030	0.100	ND	U	0.030	0.100	0.060	J	0.030	0.100	ND	U	0.030	0.100	ND	U	0.030	0.100
Pyrene[HMW]	ND	x	ND	U	0.030	0.100	ND	U	0.030	0.100	ND	U	0.030	0.100	ND	U	0.030	0.100	ND	U	0.030	0.100	ND	U	0.030	0.100
Total LMW PAHs	1.20	x	0.21				1.20				1.02				0.51				0.43				0.21			
Total HMW PAHs	0.18	x	0.18				0.18				0.18				0.18				0.18				0.18			
Total PAHs	1.56	x	0.57				1.56				1.38				0.87				0.79				0.57			

TABLE 12 (*continued*)
Analytical Results for PAHs in Water and Elutriates Generated from Sediment

Sample ID:	JBC18-S1 Dissolved				JBC18-S2 Total				JBC18-S2 Dissolved				JBC18-S3 Total				JBC18-S3 Dissolved				JBC18-S4 Total			
Analyte	Result µg/L	Qualifier	MDL	MRL	Result µg/L	Qualifier	MDL	MRL	Result µg/L	Qualifier	MDL	MRL	Result µg/L	Qualifier	MDL	MRL	Result µg/L	Qualifier	MDL	MRL	Result µg/L	Qualifier	MDL	MRL
1-Methylnaphthalene^{LMW}	ND	U	0.030	0.100	ND	U	0.030	0.100	ND	U	0.030	0.100	ND	U	0.030	0.100	ND	U	0.030	0.100	ND	UX	0.030	0.100
2-Chloronaphthalene	ND	U	0.030	0.100	ND	U	0.030	0.100	ND	U	0.030	0.100	ND	U	0.030	0.100	ND	U	0.030	0.100	ND	UX	0.030	0.100
2-Methylnaphthalene^{LMW}	ND	U	0.030	0.100	ND	U	0.030	0.100	ND	U	0.030	0.100	ND	U	0.030	0.100	ND	U	0.030	0.100	ND	UX	0.030	0.100
Acenaphthene^{LMW}	ND	U	0.030	0.100	ND	U	0.030	0.100	ND	U	0.030	0.100	0.090	J	0.030	0.100	0.070	J	0.030	0.100	0.060	JX	0.030	0.100
Acenaphthylene	ND	U	0.030	0.100	ND	U	0.030	0.100	ND	U	0.030	0.100	ND	U	0.030	0.100	ND	U	0.030	0.100	ND	UX	0.030	0.100
Anthracene^{LMW}	ND	U	0.030	0.100	ND	U	0.030	0.100	ND	U	0.030	0.100	ND	U	0.030	0.100	ND	U	0.030	0.100	ND	UX	0.030	0.100
Benzo(a)anthracene^{HMW}	ND	U	0.030	0.100	ND	U	0.030	0.100	ND	U	0.030	0.100	ND	U	0.030	0.100	ND	U	0.030	0.100	ND	UX	0.030	0.100
Benzo(a)pyrene^{HMW}	ND	U	0.030	0.100	ND	U	0.030	0.100	ND	U	0.030	0.100	ND	U	0.030	0.100	ND	U	0.030	0.100	ND	UX	0.030	0.100
Benzo(b)fluoranthene	ND	U	0.030	0.100	ND	U	0.030	0.100	ND	U	0.030	0.100	ND	U	0.030	0.100	ND	U	0.030	0.100	ND	UX	0.030	0.100
Benzo(g,h,i)perylene	ND	U	0.030	0.100	ND	U	0.030	0.100	ND	U	0.030	0.100	ND	U	0.030	0.100	ND	U	0.030	0.100	0.050	JX	0.030	0.100
Benzo(k)fluoranthene	ND	U	0.030	0.100	ND	U	0.030	0.100	ND	U	0.030	0.100	ND	U	0.030	0.100	ND	U	0.030	0.100	ND	UX	0.030	0.100
Chrysene^{HMW}	ND	U	0.030	0.100	ND	U	0.030	0.100	ND	U	0.030	0.100	ND	U	0.030	0.100	ND	U	0.030	0.100	ND	UX	0.030	0.100
Dibenzo(a,h)anthracene^{HMW}	ND	U	0.030	0.100	ND	U	0.030	0.100	ND	U	0.030	0.100	ND	U	0.030	0.100	ND	U	0.030	0.100	ND	UX	0.030	0.100
Fluoranthene^{HMW}	ND	U	0.030	0.100	ND	U	0.030	0.100	ND	U	0.030	0.100	ND	U	0.030	0.100	ND	U	0.030	0.100	ND	UX	0.030	0.100
Fluorene^{LMW}	ND	U	0.030	0.100	ND	U	0.030	0.100	ND	U	0.030	0.100	ND	U	0.030	0.100	ND	U	0.030	0.100	ND	UX	0.030	0.100
Indeno(1,2,3-cd)pyrene	ND	U	0.030	0.100	ND	U	0.030	0.100	ND	U	0.030	0.100	ND	U	0.030	0.100	ND	U	0.030	0.100	ND	UX	0.030	0.100
Naphthalene^{LMW}	ND	U	0.030	0.100	ND	U	0.030	0.100	0.080	J	0.030	0.100	ND	U	0.030	0.100	ND	U	0.030	0.100	0.050	JX	0.030	0.100
Phenanthrene^{LMW}	ND	U	0.030	0.100	ND	U	0.030	0.100	ND	U	0.030	0.100	ND	U	0.030	0.100	ND	U	0.030	0.100	ND	UX	0.030	0.100
Pyrene^{HMW}	ND	U	0.030	0.100	ND	U	0.030	0.100	ND	U	0.030	0.100	ND	U	0.030	0.100	ND	U	0.030	0.100	ND	UX	0.030	0.100
Total LMW PAHs	0.21				0.21				0.26				0.27				0.25				0.26			
Total HMW PAHs	0.18				0.18				0.18				0.18				0.18				0.18			
Total PAHs	0.57				0.57				0.62				0.63				0.61				0.64			

TABLE 12 (*continued*)
Analytical Results for PAHs in Water and Elutriates Generated from Sediment

Sample ID:	JBC18-S4 Dissolved				JBC18-S4 (duplicate) Total				JBC18-S4 (duplicate) Dissolved				JBC18-PC Total				JBC18-PC Dissolved				JBC18-PC (duplicate) Total				JBC18-PC (duplicate) Dissolved			
Analyte	Result µg/L	Qualifier	MDL	MRL	Result µg/L	Qualifier	MDL	MRL	Result µg/L	Qualifier	MDL	MRL	Result µg/L	Qualifier	MDL	MRL	Result µg/L	Qualifier	MDL	MRL	Result µg/L	Qualifier	MDL	MRL	Result µg/L	Qualifier	MDL	MRL
1-Methylnaphthalene[LMW]	ND	UX	0.030	0.100	ND	UX	0.030	0.100	ND	Uh	0.030	0.100	ND	UX	0.030	0.100	ND	UX	0.030	0.100	ND	Uh	0.030	0.100	ND	Uh	0.030	0.100
2-Chloronaphthalene	ND	UX	0.030	0.100	ND	Uh	0.030	0.100	ND	Uh	0.030	0.100	ND	UX	0.030	0.100	ND	UX	0.030	0.100	ND	Uh	0.030	0.100	ND	Uh	0.030	0.100
2-Methylnaphthalene[LMW]	ND	UX	0.030	0.100	ND	Uh	0.030	0.100	ND	Uh	0.030	0.100	ND	UX	0.030	0.100	ND	UX	0.030	0.100	ND	Uh	0.030	0.100	ND	Uh	0.030	0.100
Acenaphthene[LMW]	ND	UX	0.030	0.100	ND	Uh	0.030	0.100	ND	Uh	0.030	0.100	ND	UX	0.030	0.100	ND	UX	0.030	0.100	ND	Uh	0.030	0.100	ND	Uh	0.030	0.100
Acenaphthylene	ND	UX	0.030	0.100	ND	Uh	0.030	0.100	ND	Uh	0.030	0.100	ND	UX	0.030	0.100	ND	UX	0.030	0.100	ND	Uh	0.030	0.100	ND	Uh	0.030	0.100
Anthracene[LMW]	ND	UX	0.030	0.100	ND	Uh	0.030	0.100	ND	Uh	0.030	0.100	ND	UX	0.030	0.100	ND	UX	0.030	0.100	ND	Uh	0.030	0.100	ND	Uh	0.030	0.100
Benzo(a)anthracene[HMW]	ND	UX	0.030	0.100	ND	Uh	0.030	0.100	ND	Uh	0.030	0.100	ND	UX	0.030	0.100	ND	UX	0.030	0.100	ND	Uh	0.030	0.100	ND	Uh	0.030	0.100
Benzo(a)pyrene[HMW]	ND	UX	0.030	0.100	ND	Uh	0.030	0.100	ND	Uh	0.030	0.100	ND	UX	0.030	0.100	ND	UX	0.030	0.100	ND	Uh	0.030	0.100	ND	Uh	0.030	0.100
Benzo(b)fluoranthene	ND	UX	0.030	0.100	ND	Uh	0.030	0.100	ND	Uh	0.030	0.100	ND	UX	0.030	0.100	ND	UX	0.030	0.100	ND	Uh	0.030	0.100	ND	Uh	0.030	0.100
Benzo(g,h,i)perylene	ND	UX	0.030	0.100	ND	Uh	0.030	0.100	ND	Uh	0.030	0.100	ND	UX	0.030	0.100	ND	UX	0.030	0.100	ND	Uh	0.030	0.100	ND	Uh	0.030	0.100
Benzo(k)fluoranthene	ND	UX	0.030	0.100	ND	Uh	0.030	0.100	ND	Uh	0.030	0.100	ND	UX	0.030	0.100	ND	UX	0.030	0.100	ND	Uh	0.030	0.100	ND	Uh	0.030	0.100
Chrysene[HMW]	ND	UX	0.030	0.100	ND	Uh	0.030	0.100	ND	Uh	0.030	0.100	ND	UX	0.030	0.100	ND	UX	0.030	0.100	ND	Uh	0.030	0.100	ND	Uh	0.030	0.100
Dibenzo(a,h)anthracene[HMW]	ND	UX	0.030	0.100	ND	Uh	0.030	0.100	ND	Uh	0.030	0.100	ND	UX	0.030	0.100	ND	UX	0.030	0.100	ND	Uh	0.030	0.100	ND	Uh	0.030	0.100
Fluoranthene[HMW]	ND	UX	0.030	0.100	ND	Uh	0.030	0.100	ND	Uh	0.030	0.100	ND	UX	0.030	0.100	ND	UX	0.030	0.100	ND	Uh	0.030	0.100	ND	Uh	0.030	0.100
Fluorene[LMW]	ND	UX	0.030	0.100	ND	Uh	0.030	0.100	ND	Uh	0.030	0.100	ND	UX	0.030	0.100	ND	UX	0.030	0.100	ND	Uh	0.030	0.100	ND	Uh	0.030	0.100
Indeno(1,2,3-cd)pyrene	ND	UX	0.030	0.100	ND	Uh	0.030	0.100	ND	Uh	0.030	0.100	ND	UX	0.030	0.100	ND	UX	0.030	0.100	ND	Uh	0.030	0.100	ND	Uh	0.030	0.100
Naphthalene[LMW]	ND	UX	0.030	0.100	ND	Uh	0.030	0.100	ND	Uh	0.030	0.100	ND	UX	0.030	0.100	ND	UX	0.030	0.100	ND	Uh	0.030	0.100	ND	Uh	0.030	0.100
Phenanthrene[LMW]	ND	UX	0.030	0.100	ND	Uh	0.030	0.100	ND	Uh	0.030	0.100	ND	UX	0.030	0.100	ND	UX	0.030	0.100	ND	Uh	0.030	0.100	ND	Uh	0.030	0.100
Pyrene[HMW]	ND	UX	0.030	0.100	ND	Uh	0.030	0.100	ND	Uh	0.030	0.100	ND	UX	0.030	0.100	ND	UX	0.030	0.100	ND	Uh	0.030	0.100	ND	Uh	0.030	0.100
Total LMW PAHs	0.21				0.21				0.21				0.21				0.21				0.21				0.21			
Total HMW PAHs	0.18				0.18				0.18				0.18				0.18				0.18				0.18			
Total PAHs	0.57				0.57				0.57				0.57				0.57				0.57				0.57			

[LMW] Low Molecular Weight PAHs (NOAA 1989)
[HMW] High Molecular Weight PAHs (NOAA 1989)
Non-Detect (ND) results use the MDL for calculating the total PAHs. (J-qualified results use the value reported by the laboratory for calculating total PAHs.)
Data qualifiers and acronyms are defined at the front of the tables section.

Sources: Results from GEL Laboratories; CMC values from USEPA (2006).
Compiled by: ANAMAR Environmental Consulting, Inc.

TABLE 13
Analytical Results for PCBs and Aroclors in Water and Elutriates Generated from Sediment Samples

		Sample ID:	JBC18-SW (water)				JBC18-TC Total				JBC18-TC Dissolved				JBC18-GC Total				JBC18-GC Dissolved			
Analyte	Maximum Conc. µg/L	CMC µg/L	Result µg/L	Qualifier	MDL	MRL	Result µg/L	Qualifier	MDL	MRL	Result µg/L	Qualifier	MDL	MRL	Result µg/L	Qualifier	MDL	MRL	Result µg/L	Qualifier	MDL	MRL
PCB 8[NOAA]	0.0000423	x	ND	U	0.00000456	0.0000959	0.0000423	J	0.00000218	0.0000982	0.0000305	J	0.00000184	0.000095	0.0000369	J	0.00000275	0.0000954	0.0000304	J	0.00000261	0.0000951
PCB 18[NOAA]	0.0000357	x	0.0000042	CJ	0.00000121	0.0000767	0.0000354	CJ	0.000000805	0.0000786	0.0000242	CJ	0.000000608	0.000076	0.0000357	CJ	0.00000118	0.0000763	0.0000272	CJ	0.000000989	0.0000761
PCB 20/28[NOAA]	0.000023	x	0.0000061	CJ	0.00000102	0.0000767	0.000023	CJ	0.000000668	0.0000786	0.0000152	CJ	0.000000513	0.000076	0.0000229	CJ	0.00000103	0.0000763	0.0000171	CJ	0.000000875	0.0000761
PCB 44[NOAA]	0.0000451	x	0.00000756	CJ	0.000000959	0.000115	0.0000451	CJ	0.00000122	0.000118	0.0000315	CJ	0.00000141	0.000114	0.0000408	CJ	0.00000147	0.000114	0.000033	CJ	0.0000012	0.000114
PCB 49	0.0000901	x	0.00000621	CJ	0.00000094	0.0000767	0.0000901	C	0.0000012	0.0000786	0.0000634	CJ	0.00000137	0.000076	0.0000788	C	0.00000139	0.0000763	0.0000646	CJ	0.00000112	0.0000761
PCB 52[NOAA]	0.000122	x	0.00000974	J	0.000000997	0.0000384	0.000122	--	0.00000128	0.0000393	0.0000866	--	0.00000146	0.000038	0.000116	--	0.00000155	0.0000382	0.0000936	--	0.00000124	0.000038
PCB 66[NOAA]	0.0000085	x	0.00000263	J	0.000000537	0.0000384	0.0000085	J	0.000000687	0.0000393	0.0000065	J	0.000000608	0.000038	0.00000845	J	0.00000107	0.0000382	0.00000763	J	0.000000818	0.000038
PCB 77	ND	x	ND	U	0.00000069	0.0000384	ND	U	0.000000845	0.0000393	ND	U	0.00000076	0.000038	ND	U	0.00000126	0.0000382	ND	U	0.000000951	0.000038
PCB 86/87[NOAA]	0.0000161	x	0.00000416	CJ	0.00000094	0.00023	0.0000161	CJ	0.000000903	0.000236	0.0000117	CJ	0.000000741	0.000228	0.0000134	CJ	0.00000155	0.000229	0.0000114	CJ	0.000000951	0.000228
PCB 90/101[NOAA]	0.0000523	x	0.00000711	CJ	0.00000092	0.000115	0.0000523	CJ	0.000000903	0.000118	0.0000366	CJ	0.000000741	0.000114	0.0000413	CJ	0.00000155	0.000114	0.0000387	CJ	0.000000932	0.000114
PCB 105[NOAA]	0.00000384	x	0.00000159	J	0.000000786	0.0000384	0.00000171	J	0.000000825	0.0000393	0.00000127	J	0.000000969	0.000038	0.00000177	J	0.00000118	0.0000382	0.00000145	J	0.000000837	0.000038
PCB 118[NOAA]	0.0000131	x	0.00000497	J	0.000000729	0.0000384	0.00000811	J	0.000000746	0.0000393	0.00000673	J	0.000000893	0.000038	0.0000078	J	0.00000107	0.0000382	0.0000074	J	0.000000742	0.000038
PCB 126	ND	x	ND	U	0.000000882	0.0000384	ND	U	0.000000903	0.0000393	ND	U	0.00000104	0.000038	ND	U	0.00000134	0.0000382	ND	U	0.00000097	0.000038
PCB 128[NOAA]	0.00000269	x	ND	CU	0.00000092	0.0000767	ND	CU	0.000000982	0.0000786	ND	CU	0.000000874	0.000076	0.00000145	CJ	0.00000111	0.0000763	ND	CU	0.000000723	0.0000761
PCB 129/138[NOAA]	0.0000141	x	0.00000673	CJ	0.000000978	0.000115	0.0000121	CJ	0.00000104	0.000118	0.0000108	CJ	0.000000931	0.000114	0.0000111	CJ	0.00000114	0.000114	0.0000119	CJ	0.000000742	0.000114
PCB 153[NOAA]	0.0000485	x	0.00000861	CJ	0.000000825	0.0000767	0.0000485	CJ	0.000000884	0.0000786	0.0000424	CJ	0.000000798	0.000076	0.0000399	CJ	0.000000935	0.0000763	0.0000425	CJ	0.000000609	0.0000761
PCB 156	0.00000324	x	0.000000997	CJ	0.000000805	0.0000767	0.00000104	CJ	0.000000923	0.0000786	0.000000874	CJ	0.000000779	0.000076	0.00000153	CJ	0.000000858	0.0000763	ND	CU	0.00000146	0.0000761
PCB 169	ND	x	ND	U	0.000000633	0.0000384	ND	U	0.000000707	0.0000393	ND	U	0.000000627	0.000038	ND	U	0.000000706	0.0000382	ND	U	0.000000761	0.000038
PCB 170[NOAA]	0.0000059	x	0.00000196	J	0.00000107	0.0000384	0.00000579	J	0.00000122	0.0000393	0.00000564	J	0.00000103	0.000038	0.00000549	J	0.00000134	0.0000382	0.0000059	J	0.00000112	0.000038
PCB 180[NOAA]	0.0000146	x	ND	CU	0.000000882	0.0000767	ND	CU	0.000001	0.0000786	0.0000146	CJ	0.000000836	0.000076	0.0000136	CJ	0.00000107	0.0000763	0.0000138	CJ	0.000000913	0.0000761
PCB 183	0.00000509	x	0.00000157	CJ	0.00000092	0.0000767	0.00000477	CJ	0.00000106	0.0000786	0.00000509	CJ	0.000000893	0.000076	0.0000049	CJ	0.00000107	0.0000763	0.00000481	CJ	0.000000913	0.0000761
PCB 184	ND	x	ND	U	0.000000556	0.0000384	ND	U	0.000000628	0.0000393	ND	U	0.000000646	0.000038	ND	U	0.000000706	0.0000382	ND	U	0.00000059	0.000038
PCB 187[NOAA]	0.0000168	x	0.00000387	J	0.000000709	0.0000384	0.0000168	J	0.000000786	0.0000393	0.0000145	J	0.000000817	0.000038	0.0000123	J	0.000000916	0.0000382	0.0000133	J	0.000000761	0.000038
PCB 195[NOAA]	0.00000255	x	ND	U	0.000000748	0.0000384	0.00000228	J	0.000000962	0.0000393	0.00000228	J	0.000000874	0.000038	0.00000238	J	0.000000935	0.0000382	0.00000255	J	0.000000951	0.000038
PCB 206[NOAA]	0.00000496	x	ND	U	0.00000174	0.0000384	0.00000464	J	0.00000137	0.0000393	0.00000393	J	0.00000118	0.000038	0.00000496	J	0.00000113	0.0000382	0.00000474	J	0.00000124	0.000038
PCB 209[NOAA]	0.00000255	x	0.00000117	J	0.000000863	0.0000384	0.00000232	J	0.000000805	0.0000393	0.00000234	J	0.000000798	0.000038	0.00000227	J	0.000000954	0.0000382	0.00000255	J	0.000000875	0.000038
Total EPA Region 4 PCBs	0.000548	x	0.000091				0.000548				0.000421				0.000508				0.000440			
Total NOAA PCBs	0.000864	x	0.000148				0.000864				0.000671				0.000807				0.000707			
Aroclor-1016	ND	x	ND	U	0.0333	0.100	ND	U	0.0333	0.100	ND	U	0.0333	0.100	ND	U	0.0333	0.100	ND	U	0.0333	0.100
Aroclor-1221	ND	x	ND	U	0.0333	0.100	ND	U	0.0333	0.100	ND	U	0.0333	0.100	ND	U	0.0333	0.100	ND	U	0.0333	0.100
Aroclor-1232	ND	x	ND	U	0.0333	0.100	ND	U	0.0333	0.100	ND	U	0.0333	0.100	ND	U	0.0333	0.100	ND	U	0.0333	0.100
Aroclor-1242	ND	x	ND	U	0.0333	0.100	ND	U	0.0333	0.100	ND	U	0.0333	0.100	ND	U	0.0333	0.100	ND	U	0.0333	0.100
Aroclor-1248	ND	x	ND	U	0.0333	0.100	ND	U	0.0333	0.100	ND	U	0.0333	0.100	ND	U	0.0333	0.100	ND	U	0.0333	0.100
Aroclor-1254	ND	x	ND	U	0.0333	0.100	ND	U	0.0333	0.100	ND	U	0.0333	0.100	ND	U	0.0333	0.100	ND	U	0.0333	0.100
Aroclor-1260	ND	x	ND	U	0.0333	0.100	ND	U	0.0333	0.100	ND	U	0.0333	0.100	ND	U	0.0333	0.100	ND	U	0.0333	0.100

TABLE 13 (*continued*)
Analytical Results for PCBs and Aroclors in Water and Elutriates Generated from Sediment Samples

Sample ID:	JBC18-S1 Total				JBC18-S1 Dissolved				JBC18-S2 Total				JBC18-S2 Dissolved				JBC18-S3 Total			
Analyte	Result µg/L	Qualifier	MDL	MRL	Result µg/L	Qualifier	MDL	MRL	Result µg/L	Qualifier	MDL	MRL	Result µg/L	Qualifier	MDL	MRL	Result µg/L	Qualifier	MDL	MRL
PCB 8[NOAA]	ND	U	0.0000045	0.000179	ND	U	0.00000686	0.000176	ND	U	0.00000471	0.000174	ND	U	0.00000474	0.000174	ND	U	0.00000738	0.000175
PCB 18[NOAA]	0.00000793	CJ	0.00000218	0.000357	0.00000584	CJ	0.0000031	0.000352	0.00000865	CJ	0.00000269	0.000349	ND	CU	0.00000485	0.000349	0.00000805	CJ	0.00000168	0.00035
PCB 20/28[NOAA]	0.000006	CJ	0.00000189	0.000357	0.00000514	CJ	0.00000267	0.000352	0.00000746	CJ	0.00000234	0.000349	0.00000593	CJ	0.00000178	0.000349	0.00000787	CJ	0.00000143	0.00035
PCB 44[NOAA]	0.0000114	CJ	0.00000232	0.000536	0.0000107	CJ	0.00000267	0.000528	0.0000179	CJ	0.00000363	0.000523	ND	CU	0.0000121	0.000523	0.0000117	CJ	0.00000185	0.000525
PCB 49	0.0000079	CJ	0.00000225	0.000357	0.00000682	CJ	0.00000257	0.000352	0.0000116	CJ	0.00000349	0.000349	0.00000656	CJ	0.00000237	0.000349	0.0000103	CJ	0.00000178	0.00035
PCB 52[NOAA]	0.0000185	J	0.00000261	0.000179	0.0000164	J	0.00000299	0.000176	0.0000188	J	0.00000401	0.000174	0.0000156	J	0.00000262	0.000174	0.0000223	J	0.00000206	0.000175
PCB 66[NOAA]	ND	U	0.00000318	0.000179	ND	U	0.00000281	0.000176	0.00000436	J	0.00000237	0.000174	ND	U	0.00000373	0.000174	0.00000392	J	0.00000136	0.000175
PCB 77	ND	U	0.000002	0.000179	ND	U	0.00000229	0.000176	ND	U	0.00000303	0.000174	ND	U	0.0000022	0.000174	ND	U	0.00000182	0.000175
PCB 86/87[NOAA]	0.00000615	CJ	0.00000197	0.00107	ND	CU	0.00000675	0.00106	0.00000928	CJ	0.00000272	0.00105	0.00000649	CJ	0.0000022	0.00105	ND	CU	0.00000668	0.00105
PCB 90/101[NOAA]	0.00000729	CJ	0.00000197	0.000536	0.00000742	CJ	0.00000271	0.000528	0.0000123	CJ	0.00000276	0.000523	0.00000876	CJ	0.0000022	0.000523	0.0000111	CJ	0.00000164	0.000525
PCB 105[NOAA]	ND	U	0.00000314	0.000179	ND	U	0.00000313	0.000176	ND	U	0.00000296	0.000174	0.00000384	J	0.00000297	0.000174	ND	U	0.0000021	0.000175
PCB 118[NOAA]	ND	U	0.00000647	0.000179	0.00000454	J	0.00000299	0.000176	0.00000746	J	0.00000265	0.000174	0.00000851	J	0.00000276	0.000174	0.0000056	J	0.00000196	0.000175
PCB 126	ND	U	0.00000275	0.000179	ND	U	0.00000345	0.000176	ND	U	0.00000345	0.000174	ND	U	0.00000356	0.000174	ND	U	0.00000234	0.000175
PCB 128[NOAA]	ND	CU	0.00000189	0.000357	ND	CU	0.00000222	0.000352	ND	CU	0.00000255	0.000349	ND	CU	0.0000031	0.000349	ND	CU	0.00000133	0.00035
PCB 129/138[NOAA]	0.00000811	CJ	0.00000211	0.000536	0.00000767	CJ	0.00000246	0.000528	0.0000109	CJ	0.00000282	0.000523	0.00000914	CJ	0.00000324	0.000523	0.00000696	CJ	0.00000147	0.000525
PCB 153[NOAA]	0.00000661	CJ	0.00000182	0.000357	0.00000605	CJ	0.00000215	0.000352	0.0000139	CJ	0.00000244	0.000349	0.00000928	CJ	0.00000272	0.000349	0.0000111	CJ	0.00000129	0.00035
PCB 156	0.00000243	CJ	0.00000211	0.000357	0.0000025	CJ	0.00000225	0.000352	ND	CU	0.00000286	0.000349	0.00000324	CJ	0.00000251	0.000349	ND	CU	0.00000178	0.00035
PCB 169	ND	U	0.00000168	0.000179	ND	U	0.0000019	0.000176	ND	U	0.00000202	0.000174	ND	U	0.00000199	0.000174	ND	U	0.0000014	0.000175
PCB 170[NOAA]	ND	U	0.00000147	0.000179	ND	U	0.00000183	0.000176	ND	U	0.00000289	0.000174	0.00000258	J	0.00000202	0.000174	ND	U	0.00000126	0.000175
PCB 180[NOAA]	0.00000329	CJ	0.00000118	0.000357	0.00000303	CJ	0.00000151	0.000352	0.00000753	CJ	0.00000171	0.000349	ND	CU	0.0000053	0.000349	0.0000042	CJ	0.00000101	0.00035
PCB 183	0.00000175	CJ	0.00000125	0.000357	ND	CU	0.00000158	0.000352	0.00000248	CJ	0.00000178	0.000349	0.00000258	CJ	0.00000178	0.000349	ND	CU	0.00000171	0.00035
PCB 184	ND	U	0.000000715	0.000179	ND	U	0.00000095	0.000176	ND	U	0.00000105	0.000174	ND	U	0.00000101	0.000174	ND	U	0.000000735	0.000175
PCB 187[NOAA]	0.00000229	J	0.000000858	0.000179	ND	U	0.00000211	0.000176	ND	U	0.00000614	0.000174	0.00000408	J	0.00000136	0.000174	ND	U	0.00000399	0.000175
PCB 195[NOAA]	ND	U	0.00000118	0.000179	ND	U	0.00000165	0.000176	ND	U	0.00000164	0.000174	ND	U	0.00000192	0.000174	ND	U	0.00000112	0.000175
PCB 206[NOAA]	ND	U	0.00000168	0.000179	ND	U	0.00000208	0.000176	ND	U	0.00000303	0.000174	ND	U	0.00000216	0.000174	ND	U	0.00000182	0.000175
PCB 209[NOAA]	0.00000104	J	0.000000929	0.000179	ND	U	0.0000013	0.000176	0.00000209	J	0.00000133	0.000174	ND	U	0.00000133	0.000174	ND	U	0.000000875	0.000175
Total EPA Region 4 PCBs	0.000121				0.000117				0.000171				0.000135				0.000139			
Total NOAA PCBs	0.000188				0.000177				0.000265				0.000208				0.000223			
Aroclor-1016	ND	U	0.0333	0.100	ND	U	0.0333	0.100	ND	U	0.0333	0.100	ND	U	0.0333	0.100	ND	U	0.0333	0.100
Aroclor-1221	ND	U	0.0333	0.100	ND	U	0.0333	0.100	ND	U	0.0333	0.100	ND	U	0.0333	0.100	ND	U	0.0333	0.100
Aroclor-1232	ND	U	0.0333	0.100	ND	U	0.0333	0.100	ND	U	0.0333	0.100	ND	U	0.0333	0.100	ND	U	0.0333	0.100
Aroclor-1242	ND	U	0.0333	0.100	ND	U	0.0333	0.100	ND	U	0.0333	0.100	ND	U	0.0333	0.100	ND	U	0.0333	0.100
Aroclor-1248	ND	U	0.0333	0.100	ND	U	0.0333	0.100	ND	U	0.0333	0.100	ND	U	0.0333	0.100	ND	U	0.0333	0.100
Aroclor-1254	ND	U	0.0333	0.100	ND	U	0.0333	0.100	ND	U	0.0333	0.100	ND	U	0.0333	0.100	ND	U	0.0333	0.100
Aroclor-1260	ND	U	0.0333	0.100	ND	U	0.0333	0.100	ND	U	0.0333	0.100	ND	U	0.0333	0.100	ND	U	0.0333	0.100

TABLE 13 (*continued*)
Analytical Results for PCBs and Aroclors in Water and Elutriates Generated from Sediment Samples

Sample ID:	JBC18-S3 Dissolved				JBC18-S4 Total				JBC18-S4 Dissolved				JBC18-PC Total				JBC18-PC Dissolved			
Analyte	Result µg/L	Qualifier	MDL	MRL	Result µg/L	Qualifier	MDL	MRL	Result µg/L	Qualifier	MDL	MRL	Result µg/L	Qualifier	MDL	MRL	Result µg/L	Qualifier	MDL	MRL
PCB 8[NOAA]	ND	U	0.00000419	0.000173	ND	U	0.0000209	0.000172	ND	U	0.00000427	0.000172	ND	U	0.00000796	0.000175	ND	U	0.00000583	0.000176
PCB 18[NOAA]	0.0000079	CJ	0.00000211	0.000346	ND	CU	0.00000896	0.000343	0.0000061	CJ	0.00000265	0.000344	0.00000416	CJ	0.00000314	0.000349	0.0000033	CJ	0.00000285	0.000351
PCB 20/28[NOAA]	0.00000672	CJ	0.00000184	0.000346	ND	CU	0.00000947	0.000343	0.00000637	CJ	0.00000227	0.000344	0.00000475	CJ	0.00000272	0.000349	ND	CU	0.0000039	0.000351
PCB 44[NOAA]	0.0000122	CJ	0.00000201	0.00052	ND	CU	0.0000145	0.000515	0.0000126	CJ	0.00000248	0.000517	0.00000555	CJ	0.00000234	0.000524	0.00000555	CJ	0.00000264	0.000527
PCB 49	0.00000824	CJ	0.00000194	0.000346	0.0000124	CJ	0.00000673	0.000343	0.00000816	CJ	0.00000238	0.000344	0.00000269	CJ	0.00000223	0.000349	ND	CU	0.00000253	0.000351
PCB 52[NOAA]	0.0000191	J	0.00000222	0.000173	0.0000191	J	0.00000745	0.000172	0.0000168	J	0.00000265	0.000172	ND	U	0.00000932	0.000175	0.0000109	J	0.00000281	0.000176
PCB 66[NOAA]	0.00000374	J	0.00000149	0.000173	ND	U	0.00000573	0.000172	0.00000541	J	0.00000217	0.000172	ND	U	0.00000237	0.000175	ND	U	0.00000239	0.000176
PCB 77	ND	U	0.00000208	0.000173	ND	U	0.00000628	0.000172	ND	U	0.00000251	0.000172	ND	U	0.00000279	0.000175	ND	U	0.00000267	0.000176
PCB 86/87[NOAA]	0.00000817	CJ	0.00000201	0.00104	ND	CU	0.00000741	0.00103	ND	CU	0.0000104	0.00103	ND	CU	0.00000374	0.00105	ND	CU	0.00000344	0.00105
PCB 90/101[NOAA]	0.000011	CJ	0.00000204	0.00052	ND	CU	0.0000164	0.000515	0.0000131	CJ	0.00000307	0.000517	ND	CU	0.0000037	0.000524	ND	CU	0.00000341	0.000527
PCB 105[NOAA]	ND	U	0.00000346	0.000173	ND	U	0.0000101	0.000172	ND	U	0.00000365	0.000172	ND	U	0.00000409	0.000175	ND	U	0.00000482	0.000176
PCB 118[NOAA]	0.000007	J	0.00000201	0.000173	ND	U	0.00000975	0.000172	0.0000131	J	0.00000351	0.000172	ND	U	0.00000381	0.000175	ND	U	0.00000443	0.000176
PCB 126	ND	U	0.0000026	0.000173	ND	U	0.0000113	0.000172	ND	U	0.00000417	0.000172	ND	U	0.00000471	0.000175	ND	U	0.00000538	0.000176
PCB 128[NOAA]	0.0000018	CJ	0.00000159	0.000346	ND	CU	0.00000474	0.000343	0.00000269	CJ	0.00000224	0.000344	ND	CU	0.0000022	0.000349	ND	CU	0.00000176	0.000351
PCB 129/138[NOAA]	0.00000797	CJ	0.00000177	0.00052	0.0000107	CJ	0.00000498	0.000515	0.0000141	CJ	0.00000234	0.000517	0.00000447	CJ	0.0000023	0.000524	ND	CU	0.00000306	0.000527
PCB 153[NOAA]	0.0000107	CJ	0.00000156	0.000346	ND	CU	0.0000151	0.000343	0.0000151	CJ	0.00000196	0.000344	0.00000307	CJ	0.00000192	0.000349	0.0000032	CJ	0.00000155	0.000351
PCB 156	ND	CU	0.00000194	0.000346	ND	CU	0.00000426	0.000343	ND	CU	0.00000289	0.000344	ND	CU	0.00000203	0.000349	ND	CU	0.00000211	0.000351
PCB 169	ND	U	0.00000142	0.000173	ND	U	0.00000371	0.000172	ND	U	0.00000183	0.000172	ND	U	0.00000189	0.000175	ND	U	0.00000183	0.000176
PCB 170[NOAA]	0.00000197	J	0.00000132	0.000173	ND	U	0.00000601	0.000172	ND	U	0.0000042	0.000172	ND	U	0.00000234	0.000175	ND	U	0.00000239	0.000176
PCB 180[NOAA]	0.00000461	CJ	0.00000107	0.000346	ND	CU	0.00000927	0.000343	0.00000899	CJ	0.00000186	0.000344	ND	CU	0.00000297	0.000349	ND	CU	0.00000225	0.000351
PCB 183	ND	CU	0.00000201	0.000346	ND	CU	0.00000535	0.000343	ND	CU	0.00000424	0.000344	ND	CU	0.00000209	0.000349	ND	CU	0.00000211	0.000351
PCB 184	ND	U	0.000000797	0.000173	ND	U	0.00000288	0.000172	ND	U	0.00000114	0.000172	ND	U	0.00000115	0.000175	ND	U	0.0000013	0.000176
PCB 187[NOAA]	0.00000378	J	0.00000097	0.000173	ND	U	0.00000851	0.000172	ND	U	0.00000758	0.000172	ND	U	0.00000157	0.000175	ND	U	0.00000176	0.000176
PCB 195[NOAA]	ND	U	0.00000104	0.000173	ND	U	0.00000395	0.000172	ND	U	0.00000155	0.000172	ND	U	0.00000182	0.000175	ND	U	0.00000183	0.000176
PCB 206[NOAA]	ND	U	0.00000166	0.000173	ND	U	0.00000481	0.000172	0.00000372	J	0.00000189	0.000172	ND	U	0.00000213	0.000175	ND	U	0.00000221	0.000176
PCB 209[NOAA]	0.00000128	J	0.000000866	0.000173	ND	U	0.00000354	0.000172	0.00000203	J	0.00000127	0.000172	ND	U	0.00000122	0.000175	ND	U	0.00000134	0.000176
Total EPA Region 4 PCBs	0.000137				0.000235				0.000177				0.000089				0.000086			
Total NOAA PCBs	0.000217				0.000354				0.000277				0.000131				0.000125			
Aroclor-1016	ND	U	0.0333	0.100	ND	U	0.0333	0.100	ND	U	0.0333	0.100	ND	U	0.0333	0.100	ND	U	0.0333	0.100
Aroclor-1221	ND	U	0.0333	0.100	ND	U	0.0333	0.100	ND	U	0.0333	0.100	ND	U	0.0333	0.100	ND	U	0.0333	0.100
Aroclor-1232	ND	U	0.0333	0.100	ND	U	0.0333	0.100	ND	U	0.0333	0.100	ND	U	0.0333	0.100	ND	U	0.0333	0.100
Aroclor-1242	ND	U	0.0333	0.100	ND	U	0.0333	0.100	ND	U	0.0333	0.100	ND	U	0.0333	0.100	ND	U	0.0333	0.100
Aroclor-1248	ND	U	0.0333	0.100	ND	U	0.0333	0.100	ND	U	0.0333	0.100	ND	U	0.0333	0.100	ND	U	0.0333	0.100
Aroclor-1254	ND	U	0.0333	0.100	ND	U	0.0333	0.100	ND	U	0.0333	0.100	ND	U	0.0333	0.100	ND	U	0.0333	0.100
Aroclor-1260	ND	U	0.0333	0.100	ND	U	0.0333	0.100	ND	U	0.0333	0.100	ND	U	0.0333	0.100	ND	U	0.0333	0.100

Non-Detect (ND) results use the MDL for calculating total EPA Region 4 and total NOAA PCBs. (J-qualified results use the value reported by the laboratory for calculating total EPA Region 4 and total NOAA PCBs.)
[NOAA] National Oceanic and Atmospheric Administration PCB congeners (see SERIM Table 5-6 for list). PCBs 28, 87, 101, and 138 coelute with the PCBs shown in the table.
Data qualifiers and acronyms are defined at the front of the tables section.

Sources: Results from GEL Laboratories; CMC values from Buchman (2008).
Compiled by: ANAMAR Environmental Consulting, Inc.

TABLE 14

Analytical Results for Dioxins and Furans in Water and Elutriates Generated from Sediment Samples

Analyte	Maximum Conc. pg/L	CMC pg/L	TEF pg/L	Result pg/L	Qualifier	MDL	MRL	TEQ (ND=0)	TEQ (ND=0.5MDL)	Result pg/L	Qualifier	MDL	MRL	TEQ (ND=0)	TEQ (ND=0.5MDL)	Result pg/L	Qualifier	MDL	MRL	TEQ (ND=0)	TEQ (ND=0.5MDL)	Result pg/L	Qualifier	MDL	MRL	TEQ (ND=0)	TEQ (ND=0.5 MDL)	Result pg/L	Qualifier	MDL	MRL	TEQ (ND=0)	TEQ (ND=0.5 MDL)
			Sample ID:	JBC18-SW (water)						JBC18-TC Total						JBC18-TC Dissolved						JBC18-GC Total						JBC18-GC Dissolved					
2,3,7,8-TCDD	ND	x	1	ND	U	0.503	9.42	0	0.2515	ND	U	0.611	9.58	0	0.3055	ND	U	0.589	9.47	0	0.2945	ND	U	0.978	9.54	0	0.489	ND	U	1.02	9.57	0	0.510
1,2,3,7,8-PeCDD	ND	x	1	ND	U	0.422	47.1	0	0.211	ND	U	0.431	47.9	0	0.2155	ND	U	0.390	47.3	0	0.195	ND	U	1.01	47.7	0	0.505	ND	U	0.792	47.8	0	0.396
1,2,3,4,7,8-HxCDD	ND	x	0.1	ND	U	0.492	47.1	0	0.0246	ND	U	0.548	47.9	0	0.0274	ND	U	0.471	47.3	0	0.02355	ND	U	0.826	47.7	0	0.0413	ND	U	1.18	47.8	0	0.059
1,2,3,6,7,8-HxCDD	ND	x	0.1	ND	U	0.450	47.1	0	0.0225	ND	U	0.494	47.9	0	0.0247	ND	U	0.424	47.3	0	0.0212	ND	U	0.755	47.7	0	0.0378	ND	U	1.08	47.8	0	0.054
1,2,3,7,8,9-HxCDD	ND	x	0.1	ND	U	0.482	47.1	0	0.0241	ND	U	0.527	47.9	0	0.02635	ND	U	0.453	47.3	0	0.02265	ND	U	0.811	47.7	0	0.0406	ND	U	1.16	47.8	0	0.058
1,2,3,4,6,7,8-HpCDD	8.86	x	0.01	3.47	J	0.893	47.1	0.0347	0.0347	3.26	JK	0.763	47.9	0.0326	0.0326	2.8	J	0.655	47.3	0.028	0.028	2.99	J	1.30	47.7	0.0299	0.0299	2.07	J	0.861	47.8	0.0207	0.0207
OCDD	79.3	x	0.0003	38.9	J	1.03	94.2	0.01167	0.012	39.0	J	1.23	95.8	0.0117	0.012	29.4	J	1.19	94.7	0.00882	0.009	28.9	JK	1.57	95.4	0.00867	0.009	24.7	J	2.07	95.7	0.00741	0.007
2,3,7,8-TCDF	ND	x	0.1	ND	U	0.447	9.42	0	0.0224	ND	U	0.312	9.58	0	0.0156	ND	U	0.314	9.47	0	0.0157	ND	U	0.832	9.54	0	0.0416	ND	U	0.750	9.57	0	0.0375
1,2,3,7,8-PeCDF	0.452	x	0.03	0.452	JK	0.358	47.1	0.01356	0.0136	0.364	JK	0.249	47.9	0.01092	0.01092	0.322	J	0.239	47.3	0.00966	0.00966	ND	U	0.519	47.7	0	0.00779	ND	U	0.564	47.8	0	0.00846
2,3,4,7,8-PeCDF	ND	x	0.3	ND	U	0.324	47.1	0	0.0486	ND	U	0.222	47.9	0	0.0333	ND	U	0.214	47.3	0	0.0321	ND	U	0.469	47.7	0	0.0704	ND	U	0.511	47.8	0	0.0767
1,2,3,4,7,8-HxCDF	ND	x	0.1	ND	U	0.335	47.1	0	0.0168	ND	U	0.316	47.9	0	0.0158	ND	U	0.312	47.3	0	0.0156	ND	U	0.498	47.7	0	0.0249	ND	U	0.608	47.8	0	0.0304
1,2,3,6,7,8-HxCDF	ND	x	0.1	ND	U	0.307	47.1	0	0.0154	ND	U	0.291	47.9	0	0.01455	ND	U	0.288	47.3	0	0.0144	ND	U	0.458	47.7	0	0.0229	ND	U	0.559	47.8	0	0.0280
2,3,4,6,7,8-HxCDF	ND	x	0.1	ND	U	0.332	47.1	0	0.0166	ND	U	0.310	47.9	0	0.0155	ND	U	0.307	47.3	0	0.01535	ND	U	0.492	47.7	0	0.0246	ND	U	0.603	47.8	0	0.0302
1,2,3,7,8,9-HxCDF	ND	x	0.1	ND	U	0.390	47.1	0	0.0195	ND	U	0.368	47.9	0	0.0184	ND	U	0.365	47.3	0	0.0183	ND	U	0.58	47.7	0	0.0290	ND	U	0.708	47.8	0	0.0354
1,2,3,4,6,7,8-HpCDF	1.09	x	0.01	ND	U	1.49	47.1	0	0.00745	1.09	JK	0.45	47.9	0.0109	0.0109	0.663	JK	0.424	47.3	0.00663	0.00663	ND	U	0.599	47.7	0	0.003	ND	U	0.515	47.8	0	0.00258
1,2,3,4,7,8,9-HpCDF	ND	x	0.01	ND	U	1.90	47.1	0	0.00950	ND	U	0.561	47.9	0	0.00281	ND	U	0.526	47.3	0	0.00263	ND	U	0.767	47.7	0	0.00384	ND	U	0.658	47.8	0	0.00329
OCDF	2.32	x	0.0003	0.622	JK	0.592	94.2	0.00019	0.00019	2.32	J	0.784	95.8	0.0007	0.0007	1.27	JK	0.833	94.7	0.00038	0.00038	ND	U	1.45	95.4	0	0.00022	ND	U	1.44	95.7	0	0.00022
Total TEQs[1] (ND = 0)	0.0465	x	--						0.0463						0.0124						0.0465						0.0299						0.0281
Total TEQs[1] (ND = 0.5*MDL)	6.20	x	--						0.742						0.738						0.720						1.37						1.36
TCDD, Total	2.63	x	--	0.792	J	0.503	9.42			2.63	J	0.611	9.58			1.95	J	0.589	9.47			2.06	J	0.978	9.54			ND	U	1.02	9.57		
PeCDD, Total	1.88	x	--	ND	U	0.422	47.1			1.88	J	0.431	47.9			1.46	J	0.390	47.3			1.43	J	1.01	47.7			ND	U	0.792	47.8		
HxCDD, Total	10.3	x	--	5.67	J	0.450	47.1			8.14	J	0.494	47.9			8.79	J	0.424	47.3			7.49	J	0.755	47.7			7.88	J	1.08	47.8		
HpCDD, Total	20.1	x	--	11.7	J	0.893	47.1			8.43	J	0.763	47.9			9.98	J	0.655	47.3			10.3	J	1.30	47.7			9.78	J	0.861	47.8		
TCDF, Total	ND	x	--	ND	U	0.447	9.42			ND	U	0.312	9.58			ND	U	0.314	9.47			ND	U	0.832	9.54			ND	U	0.750	9.57		
PeCDF, Total	0.322	x	--	ND	U	0.171	47.1			ND	U	0.165	47.9			0.322	J	0.214	47.3			ND	U	0.469	47.7			ND	U	0.295	47.8		
HxCDF, Total	ND	x	--	ND	U	0.307	47.1			ND	U	0.291	47.9			ND	U	0.288	47.3			ND	U	0.458	47.7			ND	U	0.559	47.8		
HpCDF, Total	ND	x	--	ND	U	1.49	47.1			ND	U	0.450	47.9			ND	U	0.424	47.3			ND	U	0.599	47.7			ND	U	0.515	47.8		

TABLE 14 (*continued*)
Analytical Results for Dioxins and Furans in Water and Elutriates Generated from Sediment Samples

Sample ID:	JBC18-S1 Total					
Analyte	Result pg/L	Qualifier	MDL	MRL	TEQ (ND=0)	TEQ (ND=0.5 MDL)
2,3,7,8-TCDD	ND	U	3.61	9.98	0	1.81
1,2,3,7,8-PeCDD	ND	U	3.29	49.9	0	1.65
1,2,3,4,7,8-HxCDD	ND	U	4.23	49.9	0	0.212
1,2,3,6,7,8-HxCDD	ND	U	3.58	49.9	0	0.179
1,2,3,7,8,9-HxCDD	ND	U	4.03	49.9	0	0.202
1,2,3,4,6,7,8-HpCDD	ND	U	5.87	49.9	0	0.0294
OCDD	12.9	J	9.30	99.8	0.00387	0.004
2,3,7,8-TCDF	ND	U	6.35	9.98	0	0.318
1,2,3,7,8-PeCDF	ND	U	2.34	49.9	0	0.0351
2,3,4,7,8-PeCDF	ND	U	2.09	49.9	0	0.314
1,2,3,4,7,8-HxCDF	ND	U	3.53	49.9	0	0.177
1,2,3,6,7,8-HxCDF	ND	U	3.06	49.9	0	0.153
2,3,4,6,7,8-HxCDF	ND	U	3.43	49.9	0	0.172
1,2,3,7,8,9-HxCDF	ND	U	4.35	49.9	0	0.218
1,2,3,4,6,7,8-HpCDF	ND	U	3.08	49.9	0	0.0154
1,2,3,4,7,8,9-HpCDF	ND	U	4.15	49.9	0	0.0208
OCDF	ND	U	9.58	99.8	0	0.00144
Total TEQs[1] (ND = 0)						0.00388
Total TEQs[1] (ND = 0.5*MDL)						5.49
TCDD, Total	ND	U	3.61	9.98		
PeCDD, Total	ND	U	3.29	49.9		
HxCDD, Total	ND	U	3.58	49.9		
HpCDD, Total	ND	U	5.87	49.9		
TCDF, Total	ND	U	6.35	9.98		
PeCDF, Total	ND	U	2.09	49.9		
HxCDF, Total	ND	U	3.06	49.9		
HpCDF, Total	ND	U	3.08	49.9		

Sample ID:	JBC18-S1 Dissolved					
Analyte	Result pg/L	Qualifier	MDL	MRL	TEQ (ND=0)	TEQ (ND=0.5 MDL)
2,3,7,8-TCDD	ND	U	3.1	9.98	0	1.55
1,2,3,7,8-PeCDD	ND	U	2.33	49.9	0	1.165
1,2,3,4,7,8-HxCDD	ND	U	3.77	49.9	0	0.189
1,2,3,6,7,8-HxCDD	ND	U	3.18	49.9	0	0.159
1,2,3,7,8,9-HxCDD	ND	U	3.59	49.9	0	0.1795
1,2,3,4,6,7,8-HpCDD	ND	U	4.07	49.9	0	0.0204
OCDD	10.1	J	6.39	99.8	0.00303	0.003
2,3,7,8-TCDF	ND	U	5.03	9.98	0	0.252
1,2,3,7,8-PeCDF	ND	U	2.27	49.9	0	0.0341
2,3,4,7,8-PeCDF	ND	U	2.02	49.9	0	0.303
1,2,3,4,7,8-HxCDF	ND	U	2.62	49.9	0	0.131
1,2,3,6,7,8-HxCDF	ND	U	2.28	49.9	0	0.114
2,3,4,6,7,8-HxCDF	ND	U	2.54	49.9	0	0.127
1,2,3,7,8,9-HxCDF	ND	U	3.22	49.9	0	0.161
1,2,3,4,6,7,8-HpCDF	ND	U	2.26	49.9	0	0.0113
1,2,3,4,7,8,9-HpCDF	ND	U	3.05	49.9	0	0.0153
OCDF	ND	U	8.06	99.8	0	0.00121
Total TEQs[1] (ND = 0)						0.00302
Total TEQs[1] (ND = 0.5*MDL)						4.42
TCDD, Total	ND	U	3.1	9.98		
PeCDD, Total	ND	U	2.33	49.9		
HxCDD, Total	ND	U	3.18	49.9		
HpCDD, Total	ND	U	4.07	49.9		
TCDF, Total	ND	U	5.03	9.98		
PeCDF, Total	ND	U	1.65	49.9		
HxCDF, Total	ND	U	2.28	49.9		
HpCDF, Total	ND	U	2.26	49.9		

Sample ID:	JBC18-S2 Total					
Analyte	Result pg/L	Qualifier	MDL	MRL	TEQ (ND=0)	TEQ (ND=0.5 MDL)
2,3,7,8-TCDD	ND	U	2.81	9.98	0	1.41
1,2,3,7,8-PeCDD	ND	U	2.52	49.9	0	1.26
1,2,3,4,7,8-HxCDD	ND	U	3.72	49.9	0	0.186
1,2,3,6,7,8-HxCDD	ND	U	3.14	49.9	0	0.157
1,2,3,7,8,9-HxCDD	ND	U	3.54	49.9	0	0.177
1,2,3,4,6,7,8-HpCDD	ND	U	6.51	49.9	0	0.0326
OCDD	52.6	J	17.4	99.8	0.01578	0.016
2,3,7,8-TCDF	ND	U	4.43	9.98	0	0.222
1,2,3,7,8-PeCDF	ND	U	2.15	49.9	0	0.0323
2,3,4,7,8-PeCDF	ND	U	1.92	49.9	0	0.2880
1,2,3,4,7,8-HxCDF	ND	U	2.30	49.9	0	0.115
1,2,3,6,7,8-HxCDF	ND	U	2.00	49.9	0	0.100
2,3,4,6,7,8-HxCDF	ND	U	2.24	49.9	0	0.112
1,2,3,7,8,9-HxCDF	ND	U	2.83	49.9	0	0.142
1,2,3,4,6,7,8-HpCDF	ND	U	2.06	49.9	0	0.0103
1,2,3,4,7,8,9-HpCDF	ND	U	2.79	49.9	0	0.0140
OCDF	ND	U	7.74	99.8	0	0.00116
Total TEQs[1] (ND = 0)						0.0158
Total TEQs[1] (ND = 0.5*MDL)						4.27
TCDD, Total	ND	U	2.81	9.98		
PeCDD, Total	ND	U	2.52	49.9		
HxCDD, Total	7.03	J	3.14	49.9		
HpCDD, Total	ND	U	6.51	49.9		
TCDF, Total	ND	U	4.43	9.98		
PeCDF, Total	ND	U	1.64	49.9		
HxCDF, Total	ND	U	2.00	49.9		
HpCDF, Total	ND	U	2.06	49.9		

Sample ID:	JBC18-S2 Dissolved					
Analyte	Result pg/L	Qualifier	MDL	MRL	TEQ (ND=0)	TEQ (ND=0.5 MDL)
2,3,7,8-TCDD	ND	U	2.42	9.98	0	1.21
1,2,3,7,8-PeCDD	ND	U	2.08	49.9	0	1.04
1,2,3,4,7,8-HxCDD	ND	U	3.29	49.9	0	0.165
1,2,3,6,7,8-HxCDD	ND	U	2.78	49.9	0	0.139
1,2,3,7,8,9-HxCDD	ND	U	3.13	49.9	0	0.1565
1,2,3,4,6,7,8-HpCDD	ND	U	4.43	49.9	0	0.0222
OCDD	24.7	JK	15.2	99.8	0.00741	0.007
2,3,7,8-TCDF	ND	U	4.31	9.98	0	0.216
1,2,3,7,8-PeCDF	ND	U	2.23	49.9	0	0.0335
2,3,4,7,8-PeCDF	ND	U	1.99	49.9	0	0.299
1,2,3,4,7,8-HxCDF	ND	U	1.82	49.9	0	0.091
1,2,3,6,7,8-HxCDF	ND	U	1.58	49.9	0	0.079
2,3,4,6,7,8-HxCDF	ND	U	1.77	49.9	0	0.0885
1,2,3,7,8,9-HxCDF	ND	U	2.24	49.9	0	0.112
1,2,3,4,6,7,8-HpCDF	ND	U	1.68	49.9	0	0.0084
1,2,3,4,7,8,9-HpCDF	ND	U	2.27	49.9	0	0.0114
OCDF	ND	U	5.11	99.8	0	0.0007665
Total TEQs[1] (ND = 0)						--
Total TEQs[1] (ND = 0.5*MDL)						3.67
TCDD, Total	ND	U	2.42	9.98		
PeCDD, Total	ND	U	2.08	49.9		
HxCDD, Total	ND	U	2.78	49.9		
HpCDD, Total	6.23	J	4.43	49.9		
TCDF, Total	ND	U	4.31	9.98		
PeCDF, Total	ND	U	1.39	49.9		
HxCDF, Total	ND	U	1.58	49.9		
HpCDF, Total	ND	U	1.68	49.9		

Sample ID:	JBC18-S3 Total					
Analyte	Result pg/L	Qualifier	MDL	MRL	TEQ (ND=0)	TEQ (ND=0.5 MDL)
2,3,7,8-TCDD	ND	U	3.13	9.98	0	1.57
1,2,3,7,8-PeCDD	ND	U	2.43	49.9	0	1.22
1,2,3,4,7,8-HxCDD	ND	U	3.68	49.9	0	0.184
1,2,3,6,7,8-HxCDD	ND	U	3.11	49.9	0	0.156
1,2,3,7,8,9-HxCDD	ND	U	3.5	49.9	0	0.175
1,2,3,4,6,7,8-HpCDD	ND	U	5.11	49.9	0	0.026
OCDD	34.5	J	9.1	99.8	0.01035	0.010
2,3,7,8-TCDF	ND	U	6.03	9.98	0	0.302
1,2,3,7,8-PeCDF	ND	U	2.42	49.9	0	0.0363
2,3,4,7,8-PeCDF	ND	U	2.16	49.9	0	0.324
1,2,3,4,7,8-HxCDF	ND	U	2.24	49.9	0	0.112
1,2,3,6,7,8-HxCDF	ND	U	1.94	49.9	0	0.097
2,3,4,6,7,8-HxCDF	ND	U	2.17	49.9	0	0.109
1,2,3,7,8,9-HxCDF	ND	U	2.75	49.9	0	0.138
1,2,3,4,6,7,8-HpCDF	ND	U	2.26	49.9	0	0.0113
1,2,3,4,7,8,9-HpCDF	ND	U	3.06	49.9	0	0.0153
OCDF	ND	U	6.94	99.8	0	0.00104
Total TEQs[1] (ND = 0)						0.0104
Total TEQs[1] (ND = 0.5*MDL)						4.47
TCDD, Total	ND	U	3.13	9.98		
PeCDD, Total	ND	U	2.43	49.9		
HxCDD, Total	ND	U	3.11	49.9		
HpCDD, Total	ND	U	5.11	49.9		
TCDF, Total	ND	U	6.03	9.98		
PeCDF, Total	ND	U	1.72	49.9		
HxCDF, Total	ND	U	1.94	49.9		
HpCDF, Total	ND	U	2.26	49.9		

TABLE 14 (*continued*)

Analytical Results for Dioxins and Furans in Water and Elutriates Generated from Sediment Samples

Sample ID:	JBC18-S3 Dissolved					
Analyte	Result pg/L	Qualifier	MDL	MRL	TEQ (ND=0)	TEQ (ND=0.5 MDL)
2,3,7,8-TCDD	ND	U	3.54	9.98	0	1.77
1,2,3,7,8-PeCDD	ND	U	2.43	49.9	0	1.22
1,2,3,4,7,8-HxCDD	ND	U	3.83	49.9	0	0.192
1,2,3,6,7,8-HxCDD	ND	U	3.24	49.9	0	0.162
1,2,3,7,8,9-HxCDD	ND	U	3.65	49.9	0	0.1825
1,2,3,4,6,7,8-HpCDD	ND	U	5.11	49.9	0	0.0256
OCDD	40.1	J	10.9	99.8	0.01203	0.012
2,3,7,8-TCDF	ND	U	4.43	9.98	0	0.222
1,2,3,7,8-PeCDF	ND	U	2.35	49.9	0	0.0353
2,3,4,7,8-PeCDF	ND	U	2.09	49.9	0	0.314
1,2,3,4,7,8-HxCDF	ND	U	2.33	49.9	0	0.117
1,2,3,6,7,8-HxCDF	ND	U	2.03	49.9	0	0.1015
2,3,4,6,7,8-HxCDF	ND	U	2.26	49.9	0	0.113
1,2,3,7,8,9-HxCDF	ND	U	2.87	49.9	0	0.144
1,2,3,4,6,7,8-HpCDF	ND	U	2.42	49.9	0	0.0121
1,2,3,4,7,8,9-HpCDF	ND	U	3.28	49.9	0	0.0164
OCDF	ND	U	8.54	99.8	0	0.00128
Total TEQs[1] (ND = 0)						0.012
Total TEQs[1] (ND = 0.5*MDL)						4.63
TCDD, Total	ND	U	3.54	9.98		
PeCDD, Total	ND	U	2.43	49.9		
HxCDD, Total	ND	U	3.24	49.9		
HpCDD, Total	ND	U	5.11	49.9		
TCDF, Total	ND	U	4.43	9.98		
PeCDF, Total	ND	U	1.77	49.9		
HxCDF, Total	ND	U	2.03	49.9		
HpCDF, Total	ND	U	2.42	49.9		

Sample ID:	JBC18-S4 Total					
Analyte	Result pg/L	Qualifier	MDL	MRL	TEQ (ND=0)	TEQ (ND=0.5 MDL)
2,3,7,8-TCDD	ND	U	3.38	9.98	0	1.69
1,2,3,7,8-PeCDD	ND	U	2.91	49.9	0	1.46
1,2,3,4,7,8-HxCDD	ND	U	4.59	49.9	0	0.230
1,2,3,6,7,8-HxCDD	ND	U	3.86	49.9	0	0.193
1,2,3,7,8,9-HxCDD	ND	U	4.35	49.9	0	0.218
1,2,3,4,6,7,8-HpCDD	8.86	JK	5.95	49.9	0.0886	0.0886
OCDD	79.3	J	8.06	99.8	0.02379	0.024
2,3,7,8-TCDF	ND	U	4.43	9.98	0	0.2215
1,2,3,7,8-PeCDF	ND	U	2.89	49.9	0	0.0434
2,3,4,7,8-PeCDF	ND	U	2.58	49.9	0	0.387
1,2,3,4,7,8-HxCDF	ND	U	2.91	49.9	0	0.146
1,2,3,6,7,8-HxCDF	ND	U	2.53	49.9	0	0.127
2,3,4,6,7,8-HxCDF	ND	U	2.83	49.9	0	0.142
1,2,3,7,8,9-HxCDF	ND	U	3.58	49.9	0	0.179
1,2,3,4,6,7,8-HpCDF	ND	U	2.50	49.9	0	0.0125
1,2,3,4,7,8,9-HpCDF	ND	U	3.39	49.9	0	0.0170
OCDF	ND	U	7.78	99.8	0	0.00117
Total TEQs[1] (ND = 0)						0.0238
Total TEQs[1] (ND = 0.5*MDL)						5.11
TCDD, Total	ND	U	3.38	9.98		
PeCDD, Total	ND	U	2.91	49.9		
HxCDD, Total	ND	U	3.86	49.9		
HpCDD, Total	20.1	J	5.95	49.9		
TCDF, Total	ND	U	4.43	9.98		
PeCDF, Total	ND	U	2.00	49.9		
HxCDF, Total	ND	U	2.53	49.9		
HpCDF, Total	ND	U	2.50	49.9		

Sample ID:	JBC18-S4 Dissolved					
Analyte	Result pg/L	Qualifier	MDL	MRL	TEQ (ND=0)	TEQ (ND=0.5 MDL)
2,3,7,8-TCDD	ND	U	2.53	9.98	0	1.27
1,2,3,7,8-PeCDD	ND	U	2.17	49.9	0	1.09
1,2,3,4,7,8-HxCDD	ND	U	3.46	49.9	0	0.173
1,2,3,6,7,8-HxCDD	ND	U	2.92	49.9	0	0.146
1,2,3,7,8,9-HxCDD	ND	U	3.29	49.9	0	0.165
1,2,3,4,6,7,8-HpCDD	ND	U	5.59	49.9	0	0.0280
OCDD	73.1	J	12.1	99.8	0.02193	0.022
2,3,7,8-TCDF	ND	U	3.93	9.98	0	0.197
1,2,3,7,8-PeCDF	ND	U	1.76	49.9	0	0.0264
2,3,4,7,8-PeCDF	ND	U	1.58	49.9	0	0.237
1,2,3,4,7,8-HxCDF	ND	U	1.90	49.9	0	0.095
1,2,3,6,7,8-HxCDF	ND	U	1.65	49.9	0	0.0825
2,3,4,6,7,8-HxCDF	ND	U	1.85	49.9	0	0.0925
1,2,3,7,8,9-HxCDF	ND	U	2.34	49.9	0	0.117
1,2,3,4,6,7,8-HpCDF	ND	U	2.04	49.9	0	0.0102
1,2,3,4,7,8,9-HpCDF	ND	U	2.75	49.9	0	0.0138
OCDF	ND	U	7.23	99.8	0	0.00108
Total TEQs[1] (ND = 0)						0.0219
Total TEQs[1] (ND = 0.5*MDL)						3.75
TCDD, Total	ND	U	2.53	9.98		
PeCDD, Total	ND	U	2.17	49.9		
HxCDD, Total	ND	U	2.92	49.9		
HpCDD, Total	ND	U	5.59	49.9		
TCDF, Total	ND	U	3.93	9.98		
PeCDF, Total	ND	U	1.52	49.9		
HxCDF, Total	ND	U	1.65	49.9		
HpCDF, Total	ND	U	2.04	49.9		

Sample ID:	JBC18-PC Total					
Analyte	Result pg/L	Qualifier	MDL	MRL	TEQ (ND=0)	TEQ (ND=0.5 MDL)
2,3,7,8-TCDD	ND	U	2.86	9.98	0	1.43
1,2,3,7,8-PeCDD	ND	U	2.55	49.9	0	1.28
1,2,3,4,7,8-HxCDD	ND	U	2.99	49.9	0	0.150
1,2,3,6,7,8-HxCDD	ND	U	2.52	49.9	0	0.126
1,2,3,7,8,9-HxCDD	ND	U	2.84	49.9	0	0.142
1,2,3,4,6,7,8-HpCDD	ND	U	4.11	49.9	0	0.0206
OCDD	7.82	JK	5.23	99.8	0.00235	0.002
2,3,7,8-TCDF	ND	U	3.78	9.98	0	0.189
1,2,3,7,8-PeCDF	ND	U	2.07	49.9	0	0.0311
2,3,4,7,8-PeCDF	ND	U	1.84	49.9	0	0.276
1,2,3,4,7,8-HxCDF	ND	U	1.74	49.9	0	0.087
1,2,3,6,7,8-HxCDF	ND	U	1.51	49.9	0	0.0755
2,3,4,6,7,8-HxCDF	ND	U	1.69	49.9	0	0.0845
1,2,3,7,8,9-HxCDF	ND	U	2.14	49.9	0	0.107000
1,2,3,4,6,7,8-HpCDF	ND	U	2.48	49.9	0	0.0124
1,2,3,4,7,8,9-HpCDF	ND	U	3.35	49.9	0	0.0168
OCDF	ND	U	5.83	99.8	0	0.000875
Total TEQs[1] (ND = 0)						--
Total TEQs[1] (ND = 0.5*MDL)						4.02
TCDD, Total	ND	U	2.86	9.98		
PeCDD, Total	ND	U	2.55	49.9		
HxCDD, Total	10.3	J	2.52	49.9		
HpCDD, Total	ND	U	4.11	49.9		
TCDF, Total	ND	U	3.78	9.98		
PeCDF, Total	ND	U	1.50	49.9		
HxCDF, Total	ND	U	1.51	49.9		
HpCDF, Total	ND	U	2.48	49.9		

Sample ID:	JBC18-PC Dissolved					
Analyte	Result pg/L	Qualifier	MDL	MRL	TEQ (ND=0)	TEQ (ND=0.5 MDL)
2,3,7,8-TCDD	ND	U	4.31	9.98	0	2.16
1,2,3,7,8-PeCDD	ND	U	3.70	49.9	0	1.85
1,2,3,4,7,8-HxCDD	ND	U	5.51	49.9	0	0.276
1,2,3,6,7,8-HxCDD	ND	U	4.67	49.9	0	0.234
1,2,3,7,8,9-HxCDD	ND	U	5.23	49.9	0	0.262
1,2,3,4,6,7,8-HpCDD	ND	U	6.26	49.9	0	0.0313
OCDD	ND	U	10.5	99.8	0	0.002
2,3,7,8-TCDF	ND	U	6.74	9.98	0	0.337
1,2,3,7,8-PeCDF	ND	U	3.00	49.9	0	0.045
2,3,4,7,8-PeCDF	ND	U	2.68	49.9	0	0.402
1,2,3,4,7,8-HxCDF	ND	U	2.79	49.9	0	0.140
1,2,3,6,7,8-HxCDF	ND	U	2.42	49.9	0	0.121
2,3,4,6,7,8-HxCDF	ND	U	2.71	49.9	0	0.136
1,2,3,7,8,9-HxCDF	ND	U	3.42	49.9	0	0.171
1,2,3,4,6,7,8-HpCDF	ND	U	3.09	49.9	0	0.015
1,2,3,4,7,8,9-HpCDF	ND	U	4.19	49.9	0	0.021
OCDF	ND	U	10.5	99.8	0	0.002
Total TEQs[1] (ND = 0)						--
Total TEQs[1] (ND = 0.5*MDL)						6.20
TCDD, Total	ND	U	4.31	9.98		
PeCDD, Total	ND	U	3.70	49.9		
HxCDD, Total	ND	U	4.67	49.9		
HpCDD, Total	ND	U	6.26	49.9		
TCDF, Total	ND	U	6.74	9.98		
PeCDF, Total	ND	U	2.42	49.9		
HxCDF, Total	ND	U	2.42	49.9		
HpCDF, Total	ND	U	3.09	49.9		

[1] Total TEQs are calculated by substituting either 0, or (0.5 * MDL) multiplied by TEF, for non-detected (U-qualified) concentrations. J-qualified results use the value reported by the laboratory multiplied by the TEF for calculating total TEQs.
Data qualifiers and acronyms are defined at the front of the tables section.

Sources: Results from GEL Laboratories; TEF values from Van den Berg et al. (2006). (There are no federal CMC values for these dioxins and furans [USEPA 2006, Buchman 2008].)
Compiled by: ANAMAR Environmental Consulting, Inc.

NOTE:

All appendices are provided in
electronic format only and can be found on the accompanying disc.

APPENDICES

FINAL REPORT

SEDIMENT SAMPLING AND ANALYSIS
NNPTU PIER X-RAY
BERKELEY COUNTY, SOUTH CAROLINA

Contract No. W912PM-15-D-0006-DW02

Prepared for

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March 2016

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Appendices are provided in electronic format only and can be found on the accompanying disc.

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ACRONYMS AND ABBREVIATIONS

AES	atomic emission spectroscopy
AET	apparent effects threshold
CCC	criteria continuous concentration
CCV	continuing calibration verification
CDF	confined disposal facility
CFR	Code of Federal Regulations
CMC	criteria maximum concentration (synonymous with ‘acute’)
CQAR	Chemical Quality Assurance Report
DO	dissolved oxygen
ECD	electron capture detector
ELCD	electrolytic conductivity detector
EPA, USEPA	U.S. Environmental Protection Agency
ERL	effects range-low
FDEP	Florida Department of Environmental Protection
HSP	Health and Safety Plan
ICP/MS	inductively coupled plasma/mass spectrometry
JBC	Joint Base Charleston
LCS, DLCS	laboratory control sample, duplicate laboratory control sample
MB	method blank
MDL	method detection limit
MLLW	mean lower low water
MRL	method reporting limit
MS/MSD	matrix spike/matrix spike duplicate
NNPTU	Naval Nuclear Power Training Unit (NNPTU)
NOAA	National Oceanic and Atmospheric Administration
NTU	nephelometric turbidity unit
PAHs	polynuclear aromatic hydrocarbons
PBDE	polybrominated diphenyl ether
PCBs	polychlorinated biphenyls
PI	plasticity index
QA	quality assurance
QC	quality control
RTK	real-time kinematic (data)
SAP/QAPP	Sampling and Analysis Plan/Quality Assurance Project Plan
SOP	standard operating procedure
SPC	statistical process control
SRM	standard reference material
TEL	threshold effects level
TEQ	toxic equivalency
TOC	total organic carbon
USACE	U.S. Army Corps of Engineers
USCG	U.S. Coast Guard
USCS	U.S. Soil Classification Systems
WQ	water quality
WQC	water quality criteria

EXECUTIVE SUMMARY

This report details the field sampling, analysis, and results for the Naval Nuclear Power Training Unit (NNPTU) Pier X-Ray South Inboard Berthing Area sediment evaluations. The field sampling effort for this project consisted of sediment and water sampling in the vicinity of the pier and took place October 29, 2015.

To help with review and ease of finding information, this report is organized into main sections and subsections, figures, data tables, and appendices. Section 1 provides an introduction to the project, including the purpose and background, an overview of dredge material evaluation, and objectives. Section 2 describes the methods and materials for the field sampling effort, sample processing and custody, sediment testing procedures, and data reduction. Section 3 summarizes the field data; physical testing data; and sediment, elutriate, and site water chemistry data. Section 4 discusses the quality assurance review, including deviations from the Sampling and Analysis Plan/Quality Assurance Project Plan, data quality objectives, non-conformance issues, and corrective actions.

To facilitate data interpretation, raw field and laboratory data are summarized and compiled into tables. Analytical results are compared to applicable published screening values for reference.

Sampling Approach

Sampling for Pier X-Ray South Inboard Berthing Area consisted of two vibracore samples that were combined into a single composite. The sampling stations were selected by USACE based on review of bathymetry and assumed location of the IX-516 barge; the locations were positioned to best represent dredge material that will be taken to the confined disposal area. The composite sample is considered to be adequate to characterize the sediments within this area. Chemical and physical analyses were conducted for the composite sample. The analyses performed meet state and federal criteria for evaluating dredge material proposed for upland disposal. Sediment sampling was accomplished using a vibratory type core sampler. Pier X-Ray South Inboard Berthing Area core samples were collected to the depth of -25 feet MLLW to sample to project depth (-20 feet MLLW) plus 2 feet allowable overdepth and 3 feet disturbance area to -25 MLLW.

Sediment Physical Results (Table 3)

Composite sample NPTU15-1-COMP was described as fat clay, little silt, little fine quartz sand, gray. The sample consisted of 24.2% sand, 25.5% silt, and 50.3% clay. The USCS soil class is CH.

The plastic limit for sample NPTU15-1-COMP is 58.

Settling rate final concentration for NPTU15-1-COMP was 518 g/L. For this project, dredged material is expected to be placed in upland disposal areas by a hydraulic cutterhead dredge as a slurry (mixture of dredged solids and dredging site water). Settling refers to those processes in which the slurry is separated into supernatant water with a low concentration of solids and a more concentrated slurry and is affected by the salinity of the area, which ranged from 6.72 to 6.82 parts per thousand during sampling.

Sediment Chemistry Results (Tables 4-9)

Metals, TOC, and Organotins

Arsenic, copper, and zinc were detected in concentrations greater than the TEL. Arsenic and zinc concentrations also exceeded the ERL in this sample.

TOC was 75,300 mg/kg and total organotin was 8.5 µg/kg.

Pesticides

Pesticide concentrations in the sediment composite were less than the respective MDLs for all pesticides analyzed. However, the MDL values exceeded TEL and ERL values for six pesticides. See Subsection 4.4 for an explanation of the elevated detection levels. Total chlorinated pesticides for NPTU15-1-COMP was 444 µg/kg.

PAHs

No PAHs were detected in concentrations greater than the TEL or ERL in sample NPTU15-1-COMP; six of 18 PAHs analyzed were detected in concentrations greater than the MDL. However, MDL values for acenaphthene and acenophthylene exceed the respective TELs, and the results were non-detects. See Subsection 4.4 for an explanation of the elevated detection levels.

PCBs

Twenty-one of 26 PCB congeners were detected above the MDL in sample NPTU15-1-COMP. None of the seven Aroclors were detected above the respective MDL values. Total EPA Region 4 PCBs (2.35 µg/kg) and Total NOAA PCBs (2.07 µg/kg) did not exceed the TEL or ERL.

Dioxins and Furans

The total TEQ for sample NPTU15-1-COMP was 6.07 pg/g, which exceeds the TEL and AET. The TEQ was calculated using one-half the MDL when results are given as non-detects for individual dioxins.

Polybrominated Diphenyl Ethers

No PBDEs were detected in concentrations greater than the MRL in sample NPTU15-1-COMP.

Elutriate and Site Water Chemistry Results (Tables 4-9)

Metals, TOC, Total Suspended Solids, and Organotins

Arsenic, copper, mercury, nickel, selenium, and zinc were detected at concentrations greater than the MDL in both the total and dissolved fractions of NTPU15-1-COMP. Copper, lead, nickel, selenium, and zinc were detected in concentrations greater than the MDL in the site water sample. No analyte was detected at concentrations greater than the federal or state CMCs or CCCs.

TOC ranged from 3.79 to 13.2 mg/L.

Total suspended solids ranged from 32.4 mg/L in the site water chemistry sample to 56.4 mg/L in the total fraction from the modified elutriate prep.

No organotins were detected in concentrations greater than the MRL in the elutriates or site water sample. Total organotins were 0.028 µg/L for the total and dissolved fractions, as well as the site water sample.

Pesticides

No pesticides were detected in concentrations greater than the MDL in the elutriates or site water sample. Total chlorinated pesticides were 0.457 µg/L for the total and dissolved fractions and the site water.

PAHs

No PAHs were detected in concentrations greater than the MDL in the elutriates or site water sample. Total PAHs ranged from 1.36 to 1.45 µg/L.

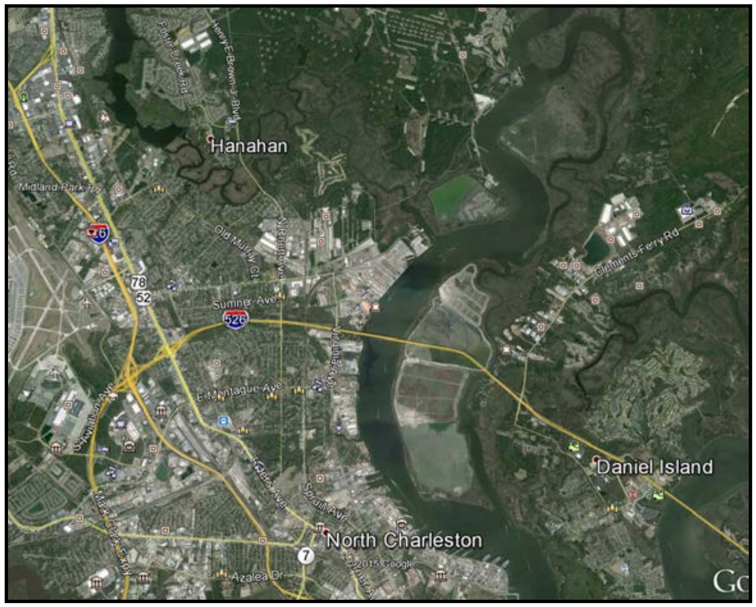
PCBs

No PCB congeners or Aroclors were detected in concentrations greater than the federal or state CMCs and CCCs in the elutriates or site water sample. Several PCB congeners were detected in concentrations above the MDL. Total EPA Region 4 PCBs ranged from 0.00020276 to 0.00030262 µg/L. Total NOAA PCBs ranged from 0.00016006 to 0.00025798 µg/L.

Dioxins and Furans

TEQs ranged from 1.43 to 10.8 pg/L for the elutriates and site water sample. The TEQ was calculated using one-half the MDL when results were given as non-detects for individual dioxins.

1 INTRODUCTION



The Naval Nuclear Power Training Unit (NNPTU) Pier X-Ray is on the Cooper River in North Charleston, South Carolina. The proposed dredging location was previously dredged one time in 1991 under a Department of the Army permit authorization. Dredging is proposed at the South Inboard Berthing Area at Pier X-Ray to provide adequate depth and berthing areas for vessels and work barges. Sampling and testing were conducted to determine if the proposed dredge material is acceptable for placement at a confined disposal facility (CDF). This report describes the sampling, analysis, and results of this effort.

1.1 Project Area Description

The purpose of the proposed dredging is to establish and maintain adequate depths to ensure safe and efficient use and navigation at facility berths in support of the NNPTU mission. The dredging area at Pier X-Ray South Inboard Berthing Area extends from the pier landward and to the security barrier and consists of estuarine river bottom. Dredged material from this project will be placed at Yellow House Creek, Clouter Creek Disposal Area, or the Joint Base Charleston Disposal Area.

The proposed project depth is -20 feet mean low lower water (MLLW) with 2 feet allowable overdepth. Pier X-Ray South Inboard Berthing Area is somewhat protected from severe open-water conditions. The proposed dredging for Pier X-Ray South Inboard Berthing Area is expected to be performed by a hydraulic cutterhead dredge. The sediment in this area is predominately fine-grained material. With soft sediments, a fair degree of accuracy in dredging depth can be expected. A bathymetric survey was provided by USACE and was used to estimate sample depths. The sampling team encountered bottom elevations ranging from -17.82 to -18.06 feet MLLW in the -22-foot MLLW project area. Map 1 shows bathymetry and sampling locations.

1.2 Dredging History

The area was dredged one time in 1991 under permit #90-4T-321. Map 2 shows the approximate area dredged in 1991.

1.3 Description of the Testing Approach

1.3.1 Evaluation of Dredge Materials for Disposal

The material to be dredged is expected to be comprised of predominately fine-grained sediment. Section 2.1 outlines sample nomenclature and the compositing scheme.

Sediment analytical results are compared to applicable published sediment screening values. Comparisons are provided for reference only, not for any regulatory decisions. The threshold effects level (TEL) represents the concentration below which adverse effects are expected to occur only rarely, and the effects range low (ERL) is the value at which toxicity may begin to be observed in sensitive species.

Dioxin results are used to calculate the toxic equivalency quotient (TEQ) using the toxicity equivalency factors adopted by the World Health Organization and published by Van den Berg et al. (2006). The TEQs for non-detect results were calculated using one-half of the method detection limit (MDL). The TEQs for each dioxin congener analyzed are added to determine a total TEQ value. The apparent effects threshold (AET) is the sediment concentration above which a particular adverse biological effect has always been found to be statistically significant relative to reference conditions.

Since the sediments dredged from Pier X-Ray South Inboard Berthing Area will be placed in a CDF, elutriate analyses were performed in accordance with "Interim Guidance Predicting Quality of Effluent Discharged from Confined Dredged Material Disposal Areas," Tech Note EEDP-4-2 and Appendix A of "Verification of Procedures for Designing Dredged Material Containment Areas for Solids Retention," Technical Report D-88-2.

Elutriate and site water results are compared to the federal water quality criteria (WQC) criteria maximum concentration (CMC) and criterion continuous concentration (CCC). The CMC is an estimate of the highest concentration of a contaminant in predominantly marine water to which an aquatic community can be exposed briefly without resulting in an unacceptable effect (USEPA 2006). The CCC is an estimate of the highest concentration of a contaminant in surface water to which an aquatic community can be exposed indefinitely without resulting in an unacceptable effect (USEPA 2006, Buchman 2008).

Elutriate and site water results were also compared to South Carolina water quality standards published by the South Carolina Department of Health and Environmental Control (SC DHEC) (2014). The water quality standard is a regulation that considers the designated use or uses of a water body, the numeric and narrative WQC that are necessary to protect the use or uses of that particular water body, and an anti-degradation statement. In most cases, the SC DHEC water quality standards are the same values as the federal CMC and CCC values.

The data collected support the application for a state water quality certification and an application for a Corps of Engineers permit pursuant to Section 401 and Section 404 of the Clean Water Act, which determines that the proposed discharge of dredge material will comply with the applicable provisions of Sections 301, 303, 306, and 307 of the Clean Water Act and relevant state laws.

1.3.2 Objectives and Deliverables

The objective of this sediment evaluation is to determine compliance with Sections 401 and 404 of the Clean Water Act for discharge of materials into waters of the United States. The sediment evaluation is required to plan for proper disposal of dredged material. Specific objectives are to:

- Collect the required number and volume of sediment samples from Pier X-Ray South Inboard Berthing Area to be representative of dredged materials from the facilities.
- Collect samples from specified locations within positioning accuracy appropriate for project objectives.
- Conduct sediment testing requirements set forth in the Inland Testing Manual (USEPA/USACE 1998).
- Provide sufficient information to document that the dredge materials are acceptable for proposed dredging and disposal activities.
- Provide a Sampling and Analysis/Quality Assurance Project Plan (SAP/QAPP) for approval before sampling and testing work begins. An effective quality assurance (QA) program ensures that the laboratory's test data are defensible and of sufficiently high quality to support the final decisions.
- Provide a Sediment Testing Report and supporting documentation to the Naval Nuclear Power Training Unit and to the U.S. Army Corps of Engineers-Charleston District (USACE) that describe all aspects of the study and present the results of field sampling and physical/chemical analysis of sediment, elutriates, and site water.

Deliverables for this work include:

- A SAP/QAPP approved by USACE prior to sampling and testing. QA is an integral component of dredge material sampling and analysis, and an effective QA program ensures that the laboratory's test data are defensible and of sufficiently high quality to support the final limiting permissible concentration evaluations. The SAP/QAPP addresses procedures for sampling and sample handling, storage, and analysis (Appendix A).
- A project-specific Health and Safety Plan–Accident Prevention Plan (HSP). This document addresses all safety issues related to the project.
- Preliminary sediment chemistry data tables. This information is sent to the client for review.
- Draft and final sediment testing reports and supporting documentation to USACE that describe all aspects of the study and present the results of field sampling and physical and chemical analysis of sediment and elutriate samples. The final report addresses comments provided by USACE, NPTU, and JBC. The reports provide the basis for a scientific recommendation regarding the acceptability of the proposed dredge material for upland disposal.
- Field paperwork, including the core logs, water quality field sheets, instrument calibration field sheets, daily quality control reports, and final chain of custody forms (Appendix B).
- A Chemical Quality Assurance Report (CQAR). The CQAR evaluates all representative data from the project field sampling and laboratory analyses and summarizes the overall usability of the data for the intended purposes (Appendix D).

ANAMAR coordinated and directed operations for this project and worked closely with USACE to develop sample collection and analysis schemes, schedules, and deliverables. ANAMAR also reviewed all data and produced this report summarizing results of the physical and chemical analysis of sediment, elutriate, and water samples collected within the project area. The following tables indicate the principal users of the data and the subcontractors associated with this evaluation and their respective areas of responsibility.

Principal Data Users and Decision Makers Associated with This Project	
Agency	**Area(s) of Responsibility**
Naval Nuclear Power Training Center (Charleston, South Carolina)	Operations and Maintenance of Pier X-Ray South Inboard Berthing Area
Joint Base Charleston	Permit applicant/owner
U.S. Army Corps of Engineers, Charleston District (Charleston, South Carolina)	Permitting dredging and dredged material disposal, potentially at upland CDF; management of dredging contract for permitted dredging often in conjunction with work in adjacent Charleston Harbor
South Carolina Department of Health and Environmental Control, Bureau of Water (Columbia, South Carolina)	Issuance of water quality certification of dredged sediment for upland disposal per Section 401 of the Clean Water Act

Subcontractors and Responsibilities	
Company, Location, Website	**Area(s) of Responsibility**
ALS Environmental Kelso, Washington www.ALSglobal.com	Laboratory preparation and chemical analysis of sediment and elutriates (organotins, PBDEs); sample holding and archiving
Athena Technologies, Inc. McClellanville, South Carolina www.athenatechnologies.com	Support for field collection of sediment samples requiring a vibracore.
Cape Fear Analytical Wilmington, North Carolina www.capefearanalytical.com	Laboratory preparation and chemical analysis of sediment and elutriates (dioxins, PCBs); sample holding and archiving
GEL Laboratories Charleston, South Carolina www.gel.com	Laboratory preparation and chemical analysis of sediment and elutriates (metals, pesticides, polynuclear aromatic hydrocarbons [PAHs], total organic carbon [TOC], total suspended solids (TSS), elutriate preparation); sample holding and archiving
Terracon Jacksonville, Florida www.terracon.com	Physical analysis of sediment; sample holding and archiving

2 MATERIALS AND METHODS

2.1 Project Design and Rationale

This section discusses the sampling scheme and rationale based on the USACE-approved scope of work and project objectives. Project-specific analytes, analytical methods, and target reporting limits are summarized in Section 2 of the QAPP (Appendix A). Sample locations are depicted in Maps 1 and 3, and coordinates from sediment and site water samples are listed in Table 1. Sediment samples were collected from locations and depths coinciding with the dredging prism.

Samples from two vibracore stations were composited into a single sample (NPTU15-1-COMP). Map 3 shows the locations of the two sampled stations. Station NPTU15-1A was located at the south end of the pier. Station NPTU15-1B was located near the western boundary of the dredging area near the dolphins. The sampling stations were selected by USACE based on review of bathymetry and predicted location of the IX-516 barge; the locations were positioned to best represent dredged material that will be taken to the confined disposal area. The composite sample is considered to be adequate to characterize the sediments within this area. Chemical and physical analyses were conducted for the composite sample. The analyses performed meet state and federal criteria for evaluating dredge material proposed for upland disposal.

Sampling Vessel Adjacent to Pier and Barge

Summaries of the field sampling and analysis scheme, sample nomenclature, and compositing scheme are provided below.

Summary of Field Sampling and Analysis Scheme	
FIELD SAMPLE COLLECTION – PIER X-RAY SOUTH INBOARD BERTHING AREA • 1 project sediment sample composite from two samples • Site water collected for elutriate preparation and water chemistry	
SAMPLE VESSELS: Athena's 30-foot pontoon boat, R/V *Artemis*	
PRESERVATION: Cool to 4ºC +/- 2ºC. Holding time requirements are analyte- and test-specific.	
IN SITU DATA:	
Water Temperature	Turbidity (NTUs)
pH	Tidal Cycle
Dissolved Oxygen (DO)	Conductivity
Water Depth	Sea State
Weather Conditions	Salinity
PHYSICAL ANALYSIS (SEDIMENTS): Grain Size with Hydrometer Specific Gravity Total Solids Settling Rates Atterberg Limits	
CHEMICAL ANALYSIS (SEDIMENTS, ELUTRIATES, AND SITE WATER): TOC Metals Organotins Pesticides Polynuclear aromatic hydrocarbons (PAHs) Polychlorinated biphenyl (PCB) congeners and Aroclors Dioxins and furans Polybrominated diphenyl ethers (PBDEs) Total suspended solids (elutriates only)	

NPTU Pier X-Ray South Inboard Berthing Area Sampling and Compositing Scheme and Sample Nomenclature

Subsample ID	# of Cores Collected Per Subsample	Volume Collected	Total Volume per Unit	Composite Sample ID/Analyses	Containers Used
NPTU15-1A	5	~18 gallons	~30 gallons	**NPTU15-1-COMP** Physicals Sediment Chemistry Elutriate Chemistry	7 Teflon® bags (~33 gallons)
NPTU15-1B	4	~15 gallons			
NPTU15-SW (site water)	N/A	~50 gallons + 2 WQ kits	N/A	Modified elutriate preparation, metals, pesticides, PCBs, PAHs, dioxins, TBT, PBDEs, total suspended solids	12 Teflon® bags lining 5-gallon Cubitainers® WQ kit containers provided by laboratories

2.2 Sample Collection Techniques

2.2.1 Project Field Effort

The field sampling was performed at Pier X-Ray South Inboard Berthing Area on October 29, 2015. The sampling team consisted of personnel from ANAMAR and Athena Technologies, Inc. Prior to sampling, sample volumes based on required analyses were calculated with assistance from the laboratories to ensure that sufficient sediment and water volumes were collected for all required analyses and elutriate generation. Below is a summary of the field sampling, compositing, and shipping schedule.

Date	General Activity
10-28-15	ANAMAR mobilized from Gainesville to North Charleston; Athena staged boat at Pier C. Security badges were obtained from JBC.
10-29-15	Collected all project sediment and water samples; composited sediment samples. Delivered sediment chemistry samples, site water kits, and elutriate water to GEL Laboratories in Charleston, SC (GEL homogenized the sediment and shipped samples to Cape Fear Analytical, ALS Environmental, and Terracon)

2.2.2 Site Positioning

Station locations were chosen to coincide with the dredging prism and were pre-established by USACE. These coordinates were provided to ANAMAR and loaded into the onboard Trimble DGPS (sub-meter accurate) interfaced with HYPACK for horizontal positioning. The vessel captain navigated to the desired coordinates using a helms map displayed on a Panasonic Toughbook computer screen. Once on station, the vessel was immobilized using the IX-516 barge's mooring lines, the dolphins adjacent to the barge, and the vessel's own power. Since there was some difficulty in accessing the target stations because of various obstacles (e.g, the dolphins, lines, containment boom, and the barge itself), USACE and the field team devised an approach to ensure that these obstacles did not preclude sampling within the dredging prism and that sampling took place as close to the target station as possible. A USACE representative coordinated with the facility's staff to ensure safe and secure operations and to coordinate the moving of the barge lines at the required time allowing access to sample within the dredging prism.

The site water station was co-located with station NPTU15-1B. Station coordinates were recorded in the field and are provided in Tables 1 and 2.

2.2.3 Decontamination Procedures

Equipment contacting sediment or water samples was cleaned and decontaminated prior to sampling. Decontamination procedures followed those outlined in Florida Department of Environmental Protection (FDEP) Standard Operation Procedures (SOP) FC1000. Personnel handling samples and decontaminating equipment wore disposable nitrile gloves, which were changed frequently to prevent cross-contamination.

Below is a summary of the decontamination process.

1) Wash and scrub with site water to remove gross contamination
2) Wash/scrub with Liquinox®

3) Rinse with site water
4) Rinse with de-ionized water
5) Rinse with pesticide-grade isopropanol
6) Rinse with de-ionized water
7) Rinse with pesticide-grade hexane (added for dioxin analysis; not in FDEP SOP FC1131)
8) Rinse with de-ionized water
9) Air dry

Upon drying, decontaminated equipment was wrapped in new (clean) aluminum foil or enclosed in a decontaminated stainless steel container (with stainless steel lid) until ready for use. For Pier X-Ray South Inboard Berthing Area sampling, all equipment was decontaminated prior to field work.

2.2.4 In situ Water Column Measurements

A YSI multiprobe meter and a Hach 2100P turbidimeter were used to measure water column parameters at the site water station. Turbidity was measured at the water's surface. All other measurements were collected from 3 feet below the surface, at mid-depth, and 3 feet from the bottom and consisted of

- Time of reading
- Water depth of reading (feet)
- Water temperature (°C)
- pH (units)
- Salinity (parts per thousand [ppt])
- Conductivity (mS/cm)
- Dissolved oxygen (mg/L and percent saturation)
- Turbidity (NTU, near-surface only)

Water measurements, tidal cycle, and weather observations were recorded on field sheets. The YSI meter and turbidimeters were calibrated before sampling. An end-of-day reading was also taken to document if the instrument remained calibrated within acceptance criteria. Water column measurements (on field sheets) and calibration logs are provided in Appendix B.

2.2.5 Sediment Sampling with Vibracore

All sediment samples were collected using a vibratory core sampler (vibracore). Vibracore services were performed by Athena Technologies. An ANAMAR team leader was on the sampling vessel at all times to direct operations, record field notes, and containerize and label samples. The core samples were collected from a 30-foot research vessel specifically outfitted for operating the vibracore equipment. This vessel carried all necessary sediment sampling equipment and had ample deck space for onboard sample processing and storage.

A sounding chain was used to determine water depth at the time of sampling. Tidal elevations were based on real-time kinematic (RTK) data. Bottom elevations at each station were calculated in the field based on water depths and tidal elevations. A datum conversion from NAVD88 to MLLW was used to ensure correct water surface elevation and required penetration depths. Bathymetric survey results were provided by USACE and were used in the field as a reference to confirm depths.

Extruding core sample into decontaminated Teflon® bag

Athena's vibracore system consisted of a generator with a mechanical vibrator attached via cable. This vibrator was attached directly to a 4-inch-diameter decontaminated, stainless steel core barrel. The sampler was lowered to the river bottom through a moonpool in the deck of the sampling platform by attaching lengths of drill stem. The vibracore machine was then turned on and the core barrel was allowed to penetrate until it reached target elevation of -25 feet MLLW, indicated by a mark made at the appropriate point on the drill stem. The sampler was then retrieved by use of an electric winch. Once the sample was on the deck, the length of the recovered core was determined using a measuring tape (covered with a nitrile glove to prevent contamination) inserted through the opening of the coring pipe until it contacted the sediment sample. The core was removed from the sampler into a Teflon® bag and processed by ANAMAR.

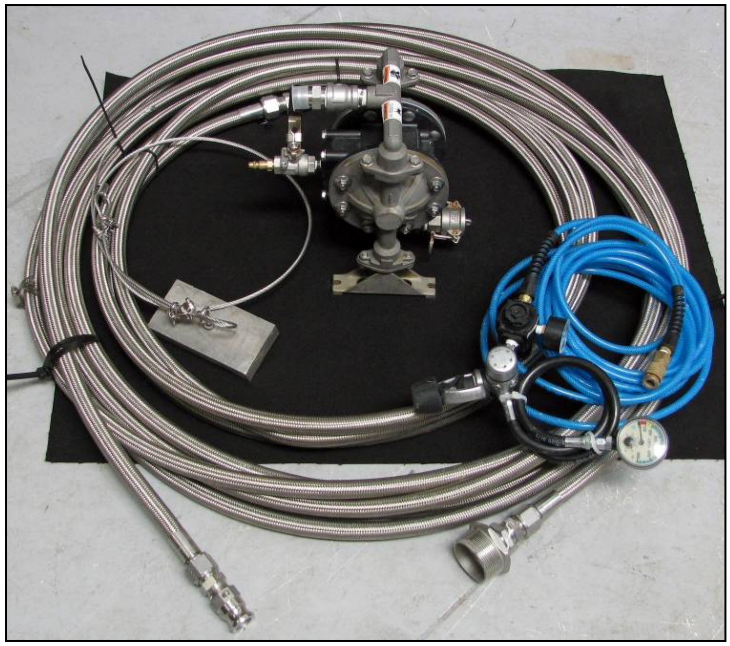
At each sampling site, detailed information regarding the sampling techniques and local conditions was recorded on individual field sheets and included station and sample ID, date and time, water depth, bottom elevation, penetration depth, weather, sea state, tidal cycle, coordinates, field team members, number and type of sample containers, sample physical description, core logs, and comments or observations. A field core log was completed for each core collected and the entire length of the core was characterized. The samples were containerized and labeled. Pictures of the field operations are provided in Appendix F. Field data are summarized in Table 1. Copies of field sheets and calibration sheets are in Appendix B.

To prevent cross-contamination, all sampling equipment was decontaminated prior to commencement of fieldwork (see Section 2.2.3 for decontamination procedures). The field team used new disposable laboratory gloves for each core.

The samples were containerized into Teflon® bags, labeled, and placed in coolers with ice. The coolers were transported back to the boat ramp upon completion of sampling, stored in a locked trailer, and delivered the same day to GEL's facility in Charleston, South Carolina. The ice was refreshed as necessary to maintain proper storage temperatures.

2.2.6 Water Sampling

Site water for elutriate preparation and background water chemistry (NPTU15-1-SW) was collected using a pneumatic pump with stainless steel and Teflon® wetted components attached to a Teflon®-lined hose. A compressed-air cylinder with a pressure regulator was used as a power source. All equipment contacting sampled water was decontaminated prior to use by methods outlined in Section 2.2.3. The pump and hose were flushed with approximately three volumes of site water before samples were collected. The suction hose was lowered through the water column. A stainless steel weight was attached to the distal end of the hose with stainless steel cable to allow the hose to be suspended approximately 3 feet above the sediment surface during sampling. Another segment of Teflon®-lined hose was attached to the pump discharge. Airflow to the pump was manually adjusted with a valve to control the flow rate from the pump.



Pneumatic water pump with regulator, weight, and stainless steel-encased Teflon® hose

Approximately 50 gallons of site water were collected in Teflon® bags lining 5-gallon Cubitainers®. The water chemistry sample was collected using pre-cleaned, pre-preserved containers provided by the laboratories. In addition, hydrographic measurements for water temperature, pH, water depth, DO, salinity, and conductivity were collected at 3 feet below the surface, at mid-depth, and 3 feet above the bottom. Turbidity was measured near the surface.

All water samples were labeled, iced in coolers, and stored in a locked trailer for delivery to GEL's facility. The ice was refreshed as necessary to maintain proper storage temperatures. The site water sampling location is depicted in Map 3. Station coordinates are included in Table 2. Copies of the water sampling field sheet are in Appendix B.

2.2.7 Sample Transport, Processing, and Custody

Following sampling at Pier X-Ray South Inboard Berthing Area, the sediment and water samples were transported in a locked trailer to GEL Laboratories in Charleston, South Carolina. The samples were checked in at GEL with the proper chain of custody detailing the sample names, date and time of collection, and analyses required. The sediment was homogenized and elutriate samples were extracted and prepared for analysis at GEL. A portion of the sediment, elutriate, and water sample volumes were shipped from GEL and received at ALS Environmental in Kelso, Washington on November 4 and 6, 2015 in good condition for chemical analysis of organotins and PBDEs in sediments, water, and elutriates (see the summary table in Section 2.1 for more details). A portion of the sample volume was also shipped to Cape Fear Analytical in Wilmington, North Carolina, for testing of dioxins and PCBs in sediment and elutriates. The sample was received in good condition on November 4, 2015. A portion of the sample volume was shipped to Terracon in Jacksonville, Florida, for sediment physical analysis. The sample was received in good condition on November 4, 2015. Complete chain of custody forms are provided in Appendix B and with the laboratory reports.

Chain-of-custody records were filled out to reflect the final sample names and to identify the analyses required and accompanied the samples during shipment. See Section 4 for more details on analyses performed by each laboratory.

2.3 Physical and Chemical Analytical Procedures

Terracon performed physical analysis of the sediment sample. ALS, GEL, and Cape Fear Laboratories performed sediment chemistry and elutriate analysis. ANAMAR performed quality assurance/quality control (QA/QC) on all analytical data and presented the data in summary tables. The laboratories' certifications can be found in Appendix E.

2.3.1 Physical Procedures

2.3.1.1 Grain Size Distribution

Gradation tests were performed by Terracon in general accordance with methods ASTM D-422 and ASTM D-1140. Each representative sample was air-dried and dry-prepped in accordance with method ASTM D-421, and results of the sieve analysis of material larger than a #10 sieve (2.00-mm mesh size) were determined. The minus #10 sieve material was then soaked in a dispersing agent. Following the soaking period, the sample was placed in a mechanical stirring apparatus and then in a sedimentation cylinder where hydrometer readings were taken over a 24-hour period. After the final hydrometer reading was taken, the sample was washed over a #200 sieve (0.075-mm mesh size), placed in an oven, and dried to a constant weight. After drying, the sample was sieved over a nest of sieves to determine the gradation of the material greater than #200 sieve size. Cumulative frequency percentages were graphed and presented by Terracon on USACE Form 2087 (Appendix C). ANAMAR tabulated and graphed the grain size distribution by sample and composite.

2.3.1.2 Moisture Content

Moisture content analyses were performed by Terracon in general accordance with method ASTM D-2216-80 and Plumb (1981). The sample weight was recorded and the sample was placed in an oven and dried to a constant mass at 110°C (383.2 kelvin). Once a constant dry mass was obtained, the percent moisture was determined by subtracting the dry mass from the wet mass, then dividing the loss in mass due to drying (the mass of just moisture) by the wet mass. The percent total solids was reported on a 100% wet weight basis.

2.3.1.3 Atterberg Limits

Tests for liquid and plastic limits for the two composites and the reference were performed by Terracon in general accordance with ASTM D-4318, wet method, as follows. The minus #40 sieved material was mixed with a small amount of water and placed in a liquid limit device. A groove was cut using a flat grooving tool and the liquid limit was determined by the number of drops of the cup. When the number of drops was in the desired range, a moisture sample was obtained and placed in a 230°C oven and dried to a constant weight. This was repeated until three determinations had been obtained, one between 15 and 25 blows, one between 20 and

30 blows, and one between 25 and 35 blows. The reported value is the intersecting value at 25 blows when all three are plotted.

The plastic limit was determined by slowly air-drying a small sample left over from the liquid limit determination. The sample was rolled and air-dried until the thread became crumbly and lacked cohesion. When this point was reached, the sample was placed in a tare and weighed, and then placed in an oven and dried to a constant weight. The moisture content is the plastic limit.

2.3.1.4 Specific Gravity

Specific gravity was determined by Terracon for the composite sample in general accordance with method ASTM D-854. Each sample was placed in a mechanical stirring device and de-ionized water was added to form a slurry. The slurry was then transferred to a pycnometer and de-aired by applying a vacuum. After vacuuming, the pycnometer with sample was allowed to reach thermal equilibrium. The water level was adjusted to a calibration mark and the pycnometer with sample was weighed. After the pycnometer with sample weight was recorded, the sample was emptied into a drying container and placed in an oven until a constant dry mass of sediment solids was obtained.

2.3.2 Chemical Analytical Procedures

Sediment and elutriate analyses were performed in accordance with published procedures. Analytical methods and detection limits for sediments and elutriates are provided in Section 2.3.2 of the QAPP (see Appendix A). Modified elutriate preparation was conducted using methods described in *Interim Guidance for Predicting Quality of Effluent Discharged from Confined Dredged Material Disposal Areas-General* (USACE 1985). Below is a brief description of the analytical methods used for sediment and elutriate analysis.

Method	Instrumentation	Brief Description of Methodology
6010	ICP for Trace Metals	Inductively coupled plasma-atomic emission spectrometry (ICP-AES) determines trace elements in solution. All aqueous and solid matrices require acid digestion prior to analysis.
6020 200.8	ICP/MS for Trace Metals	Inductively coupled plasma-mass spectrometry (ICP-MS) is applicable to the determination of sub-µg/L concentrations of a large number of elements in water samples and in waste extracts or digests. Acid digestion prior to filtration and analysis is required for aqueous samples, sediments, and tissues for which total (acid-leachable) elements are required.
7470	Mercury Analyzer (water)	Method 7470 is a cold-vapor atomic absorption procedure approved for determining the concentration of mercury in mobility-procedure extracts and aqueous wastes. All samples are subjected to an appropriate dissolution step before analysis.
7471A	Mercury Analyzer (sediment)	Method 7471 is approved for measuring total mercury (organic and inorganic) in sediments and tissues. All samples are subjected to an appropriate dissolution step before analysis. If this dissolution procedure is not sufficient to dissolve a specific matrix type or sample, this method is not applicable for that matrix.

Method	Instrumentation	Brief Description of Methodology
9060 (mod)	TOC Analyzer	Method 9060 is used to determine the concentration of organic carbon in sediment by catalytic combustion or wet chemical oxidation. The carbon dioxide formed from this procedure is measured and is proportional to the TOC in the sample.
8081a	Gas Chromatograph (GC)	This method may be used to determine the concentrations of various organochlorine pesticides in extracts from solid and liquid matrices using fused-silica, open-tubular, capillary columns with electron capture detectors (ECD) or electrolytic conductivity detectors (ELCD). The compounds that can be run by this method may be determined by either a single- or dual-column analysis system.
8082	Gas Chromatograph	This method is used to determine the concentrations of PCBs as individual PCB congeners in extracts from solid, tissue, and aqueous matrices using open-tubular, capillary columns with ECD or ELCD. Target compounds may be determined by either a single- or dual-column analysis system.
8270	Gas Chromatograph/ Mass Spectrometer	This method is used to determine the concentration of semi-volatile/PAH organic compounds in extracts prepared from many types of solid matrices and water samples. Direct injection of a sample may be used in limited applications.
8290	Gas Chromatograph/ Mass Spectrometer	This method is used to determine the concentration of dioxin and furan congeners in extracts prepared from many types of solid matrices and water samples.
Krone et al. 1989 (for butyltin)	Gas Chromatograph	Method Krone utilizes a flame photometric detector to determine the concentration of organotins in sediment, elutriates, and site water samples. The sample is extracted prior to analysis and injected into the GC for quantitative measurement.

2.4 Data Management

Raw field and laboratory data have been summarized and compiled into tables. The data were compared to applicable published criteria described in Section 1.3.

2.4.1 Reporting Limits

The sediment chemical concentration, MDL, and method reporting limit (MRL) were reported on a dry weight basis. The MDL refers to the minimum concentration of a given analyte that can be measured and reported with a 99% confidence level that the analyte concentration is greater than zero (40 CFR § 136 Appendix B). The MRL refers to the minimum concentration at which the laboratory will report analytical chemistry data with confidence in quantitative accuracy of a given data. Common laboratory procedures for defining an MRL include assigning it to a fixed factor above the MDL or by using the lowest calibration standard. MRLs are often adjusted by the laboratory for sample-specific parameters such as sample weight, percent solids, or dilution.

3 RESULTS AND DISCUSSION

3.1 Field Data and In Situ Measurements

3.1.1 Weather Conditions

Sampling occurred on October 29, 2015. Weather conditions during sampling were favorable with sunny to partly cloudy skies, light winds, and calm seas (Table 1). Currents were strong in the river and basin area of the pier; vibracoring operations were not affected by the currents since the sampling locations were out of the main channel and therefore not subject to the strongest currents in the river.

3.1.2 Water Column Data

Complete results of water column measurements and field observations for Pier X-Ray South Inboard Berthing Area are summarized in Table 2. Water column measurements were collected at the site water sampling location, which also coincided with Station NPTU15-1B. Readings were collected at 3 feet below the surface, at mid-depth, and 3 feet above the sediment surface. Turbidity was measured at the surface.

Water temperature ranged from 21.1° to 21.2°C, pH ranged from 6.98 to 7.02, salinity ranged from 6.72 to 6.82 ppt, conductivity ranged from 11.75 to 11.94 mS/cm, dissolved oxygen ranged from 78.8% to 95.2% and from 6.75 to 8.21 mg/L, and turbidity was 28 NTUs at the surface.

Copies of field sheets and field-generated paperwork are provided in Appendix B.

3.1.3 Sediment Sampling Observations

Field notes were taken during sediment sampling operations to document the stratigraphy of the core immediately after it was extracted from the coring tube. Overall, the cores collected from both stations were uniform in color and texture--predominantly dark gray (with some olive green) fine and medium sand, silt, and clay. The exceptions were at Station NPTU15-1B, where a distinct layer of consolidated clay was identified below approximately -24 feet MLLW in some of the cores. Some of the consolidated clay was gray in color, while the last core at this station had some tan clay as well. Vegetative material (black in color) was observed in all of the cores. Five cores were collected at Station NPTU15-1A and four cores were collected at Station NPTU15-1B to achieve adequate volume. The penetration depth and recovery length of each core were recorded on the field sheets, and a summary is provided below. Recovery ranged from 65% to 72% at NPTU15-1A and from 82% to 88% at NPTU15-1B. The complete vibracore log is included in Appendix B.

Sediment characterization during core extrusion

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Pier X-Ray South Inboard Berthing Area Vibracore Summary

Station ID	Water Depth (feet)	Tidal Elevation* (feet MLLW)	Top of Core Elevation (feet MLLW)	Bottom of Core Elevation (feet MLLW)	Penetration (feet)	Recovery (feet)	Recovery (%)	East (X) **	North (Y) **
NPTU15-1A	24.6	6.52	-18.1	-25.0	6.9 6.9 6.9 6.9 6.9	4.7 4.6 4.5 4.5 5.0	68% 68% 65% 65% 72%	2328733	405633
NPTU15-1B	23.3	5.43	-17.8	-25.0	7.2 7.2 7.2 7.2	6.2 5.9 5.5 5.9	86% 82% 76% 82%	2328654	405528

*= Elevation data collected using a Champion TKO System interfaced with the South Carolina VRS Network.

**= Coordinates were recorded in NAD83 State Plane, South Carolina (Zone 3900), US Survey feet.

3.2 Physical Testing Data

Physical analyses were run on the composited sample only. Hydrometer readings; Unified Soil Classification System (USCS) categories; and results of physical testing for grain size distribution, total solids, percent moisture, specific gravity, Atterberg Limits, and settling rates are presented in Table 3. The USCS is used to describe the texture and grain size of a soil/sediment. The complete laboratory report with grain size curves is provided in Appendix C.

3.2.1 Grain Size

NPTU15-1-COMP was described as fat clay, little silt, little fine quartz sand, gray. The sample consisted of 24.2% sand, 25.5% silt, and 50.3% clay. The USCS soil classification is CH.

Summary of Physical Analyses						
Sample	**Sand (%)**	**Silt/Clay (%)**	**Solids (%)**	**Moisture* (%)**	**Specific Gravity**	**USCS**
NPTU15-1-COMP	24.2	75.8	31.9	213.1	2.568	CH

*Percent moisture was calculated by the lab using the formula (100-(% solids))/% solids.
CH=clay of high plasticity, fat clay

3.2.2 Atterberg Limits

The plastic limit for sample NPTU15-1-COMP is 58 (Table 3).

Summary of Atterberg Limits			
Sample	**PL**	**LL**	**PI**
NPTU15-1-COMP	58	166	108

3.2.3 Settling Rates

The settling rate of a grain depends on its size, shape, and bulk density as well as on the viscosity of the fluid through which it is settling. Settling rate final concentration for NPTU15-1-COMP was 518 g/L (Table 3). The final concentration (g/L) is the amount of sediment that has settled out of an initial sediment slurry placed in a column and allowed to settle for a specific period of time.

Settling Rates	
Sample	**Final Concentration (g/L)**
NPTU15-1-COMP	518

For this project, dredged material is expected to be placed in upland disposal areas by a hydraulic cutterhead dredge as a slurry (mixture of dredged solids and dredging site water). Settling refers to those processes in which the slurry is separated into supernatant water with a low concentration of solids and a more concentrated slurry and is affected by the salinity of the area, which ranged from 6.72 to 6.82 ppt at the time of sampling.

3.3 Sediment Chemistry

Analytical results for sediment chemistry of composite NPTU15-1-COMP are presented in Tables 4 through 9. Analytical results were compared to published sediment screening criteria, including TEL and ERL. Definitions of these screening criteria are provided in Section 1.2. Complete sediment chemistry laboratory reports are provided in Appendix E.

3.3.1 Metals, TOC, and Organotins (Table 4)

Arsenic, copper, and zinc were detected in concentrations greater than the TEL. Arsenic and zinc concentrations also exceeded the ERL in this sample.

TOC was 75,300 mg/kg and total organotin was 8.5 µg/kg.

3.3.2 Pesticides (Table 5)

Pesticide concentrations in the sediment composite were less than the respective MDLs for all pesticides analyzed. However, the MDL values exceeded TEL and ERL values for six pesticides. See Subsection 4.4 for an explanation of the elevated detection levels. Total chlorinated pesticides for NPTU15-1-COMP was 444 µg/kg.

3.3.3 PAHs (Table 6)

No PAHs were detected in concentrations greater than the TEL or ERL in sample NPTU15-1-COMP; six of 18 PAHs analyzed were detected in concentrations greater than the MDL. However, MDL values for acenaphthene and acenophthylene exceed the respective TELs, and the results were non-detects. See Subsection 4.4 for an explanation of the elevated detection levels.

3.3.4 PCBs (Table 7)

Twenty-one of 26 PCB congeners were detected above the MDL in sample NPTU15-1-COMP. None of the seven Aroclors were detected above the respective MDL values. Total EPA Region 4 PCBs (2.35 µg/kg) and Total NOAA PCBs (2.07 µg/kg) did not exceed the TEL or ERL.

3.3.5 Dioxins and Furans (Table 8)

The total TEQ for sample NPTU15-1-COMP was 6.07 ng/kg, which exceeds the TEL and AET. The TEQ was calculated using one-half the MDL when results are given as non-detects for individual dioxins.

3.3.6 Polybrominated Diphenyl Ethers (PBDEs - Table 10)

No PBDEs were detected in concentrations greater than the MRL in sample NPTU15-1-COMP.

3.4 Elutriate Chemistry

Analytical results for elutriate samples generated from sediments collected from Pier X-Ray South Inboard Berthing Area and the site water sample are presented in Tables 4 through 9. Total and dissolved fractions are presented for each analyte. Results for elutriate and the site water sample are compared to federal and state WQC CMCs and CCCs. The definitions for CMC and CCC are provided in Section 1.2.

3.4.1 Metals, TOC, Total Suspended Solids, and Organotins (Table 4)

Arsenic, copper, mercury, nickel, selenium, and zinc were detected at concentrations greater than the MDL in both the total and dissolved fractions of NTPU15-1-COMP. Copper, lead, nickel, selenium, and zinc were detected in concentrations greater than the MDL in the site water sample. No analyte was detected at concentrations greater than the federal or state CMCs or CCCs.

TOC ranged from 3.79 to 13.2 mg/L.

Total suspended solids ranged from 32.4 mg/L in the site water chemistry sample to 56.4 mg/L in the total fraction from the modified elutriate prep.

No organotins were detected in concentrations greater than the MRL in the elutriates or site water sample. Total organotins were 0.028 µg/L for the total and dissolved fractions, as well as the site water sample.

3.4.2 Pesticides (Table 5)

No pesticides were detected in concentrations greater than the MDL in the elutriates or site water sample. Total chlorinated pesticides were 0.457 µg/L for the total and dissolved fractions and the site water.

3.4.3 PAHs (Table 6)

No PAHs were detected in concentrations greater than the MDL in the elutriates or site water sample. Total PAHs ranged from 1.36 to 1.45 µg/L.

3.4.4 PCBs (Table 7)

No PCB congeners or Aroclors were detected in concentrations greater than the federal or state CMCs and CCCs in the elutriates or site water sample. Several PCB congeners were detected in concentrations above the MDL. Total EPA Region 4 PCBs ranged from 0.00020276 to 0.00030262 µg/L. Total NOAA PCBs ranged from 0.00016006 to 0.00025798 µg/L.

3.4.5 Dioxins and Furans (Table 8)

TEQs ranged from 1.43 to 10.8 pg/L (0.00143 to 0.0108 ng/L) for the elutriates and site water sample. The TEQ was calculated using one-half the MDL when results were given as non-detects for individual dioxins.

3.4.6 PBDEs (Table 9)

2,2',4,4'-TetraBDE and 2,2',4,4',5-PentaBDE were detected at concentrations greater than the MDL (J-qualified) in the elutriates and site water sample.

4 QUALITY ASSURANCE/QUALITY CONTROL

Field sampling took place October 29, 2015. Sample homogenization was performed October 30, 2015, through November 2, 2015 at GEL Laboratories. Sampling and compositing conformed to methods outlined in the QAPP.

Sampling at Pier X-Ray South Inboard Berthing Area complied with the protocols found in the QAPP.

4.1 Sample Receipt

4.1.1 Terracon

Composited sediment samples and the site water (for settling rate analysis) were received at Terracon on November 4, 2015, in good condition and consistent with the chain-of-custody form.

4.1.2 GEL Laboratories

Sediment and site water samples were delivered to GEL on October 29, 2015. All samples were received in good condition and consistent with the chain of custody prepared in the field. Once received, GEL composited the two subsamples into a single sample for sediment chemistry analysis and prepared the elutriate sample using the modified elutriate procedure. Once the samples were prepared, aliquots of the sediment and elutriate samples were sent to Cape Fear Analytical for dioxin and PCB congener analysis, and to ALS Environmental for organotin and PBDE analysis. GEL performed all other tests shown in the QAPP.

4.1.3 Cape Fear Analytical

Sediment, elutriate, and site water samples were received at Cape Fear Analytical on November 4, 2015. All samples were received in good condition.

4.1.4 ALS Environmental

Sediment and site water samples were received at ALS on November 4, 2015. Due to a shipping issue originating at GEL, the elutriates were not delivered on November 4, 2015, but were received and logged-in in accordance with the chain of custody on November 6, 2015. All samples were received in good condition.

4.2 Sediment Chemistry

4.2.1 Total Metals

No anomalies associated with the analysis of these samples were observed.

4.2.2 Organotins by Krone et al. 1989

4.2.2.1 Matrix Spike Recovery

The matrix spike/matrix spike duplicate (MS/MSD) recoveries for n-butyltin were outside the control limit. All other spikes for organotins were within limits. The low spike recoveries indicate that the n-butyltin may have had a low bias in the sample.

4.2.2.2 Standard Reference Material

The lower advisory criteria (certified value and reference value) were exceeded for all analytes in the standard reference material (SRM). The recovery information reported is for advisory purposes only to provide additional information about the performance of these compounds in this matrix. The associated QA/QC results (laboratory control sample [LCS], matrix spike [MS], method blank [MB], calibration standards) indicated that the analysis was in control. No further corrective action was required.

No other anomalies associated with the analysis of these samples were observed.

4.2.3 Organochlorine Pesticides by EPA Method 8081

Several spikes were slightly below 70% recovery for pesticides. The spike duplicate was within control for all compounds except beta-BHC. Given the range of differences in the recoveries, the precision limit was not met for most pesticide compounds, although most spikes were within the acceptance limits.

4.2.4 PCB Aroclors by EPA Method 8082

No anomalies associated with the analysis of these samples were observed.

4.2.5 PCB Congeners by EPA Method 1668

No anomalies associated with the analysis of these samples were observed.

4.2.6 PAHs by EPA Method 8270D SIM

4.2.6.1 Surrogate Recovery

The surrogate recovery in the sediment sample was below the laboratory acceptance criteria on initial analysis. Upon re-analysis, the recovery was still low, indicating a potential matrix interference in the sediment. The data reported are from the initial analysis.

No other anomalies associated with the analysis of these samples were observed.

4.2.7 PBDE by EPA Method 8270D

Since the analysis for PBDEs was performed simultaneously with the sediment and water samples, the QC issues identified below apply to both matrices.

4.2.7.1 General Quality Control

QC acceptance limits have not been set for the analysis of PBDEs due to limited testing opportunities at ALS. The QC limits provided are temporary values until sufficient numbers of QC samples have been analyzed and statistical evaluation can be performed. In several cases, the QC analyzed exceeded the temporary values established by ALS.

4.2.7.2 Calibration Verification

Sample results were flagged as being outside the control criterion for the continuing calibration verification (CCV) sample for PBDE 206 and PBDE 209. In accordance with the EPA method, 80% or more of the CCV analytes must have passed within 20% of the true value. The remaining analytes are allowed a 40% difference as per the ALS SOP. The CCV met these criteria and no further corrective action was required.

4.2.7.3 Laboratory Control Sample

The recovery of PBDE 209 in the LCS was outside the control limits listed in the results summary. The limits are default values temporarily in use until sufficient data points are generated to calculate statistical control limits. Based on the method and historic data, the recovery observed was in the range expected for this procedure. No further corrective action was taken.

4.2.7.4 Matrix Spike Recovery

The recovery of many analytes in the replicate MS analyses for sample NTPU15-1 Comp were outside the control limits listed in the results summary. The limits are default values temporarily in use until sufficient data points are generated to calculate statistical control limits. Based on the method and historic data, the recoveries observed were in the range expected for this procedure. No further corrective action was taken.

The replicate MS recovery of PBDE 209 for sample NTPU15-1 Comp was outside control criteria. Recovery in the LCS was outside the lower advisory criterion listed in the results summary; recovery in the duplicate LCS (DLCS) was acceptable, which indicated that the analytical batch was in control. The MS outlier suggested a potential low bias in this matrix. No further corrective action was appropriate.

4.2.7.5 Elevated Detection Limits

The detection limits for the sample were elevated due to less-than-optimal sample mass extracted for analysis. The samples contained low percent solids, which prevented extraction of the sample mass necessary to achieve target detection limits.

No other anomalies associated with the analysis of these samples were observed.

4.2.8 Dioxins

No anomalies associated with the analysis of these samples were observed.

4.3 Site Water and Elutriate Chemistry

4.3.1 TOC by Method 9060

No anomalies associated with the analysis of these samples were observed.

4.3.2 Total Suspended Solids by Method SM2540D

The analysis of total suspended solids was performed out of holding time for the site water and elutriate sample due to a miscommunication with the laboratory. Since the material in the sample is composed of silt, clay, and sand, which are all insoluble in water, the overall impact on the results should be minimal to none.

4.3.3 Total and Dissolved Metals

The recoveries in the MS/MSD for zinc and nickel in the elutriate samples were outside the acceptance limit, which was likely due to the heterogeneity of the sediment sample.

The MS/MSD did not meet the recommended acceptance criteria for percent recoveries in mercury. The most likely cause was due to sample heterogeneity in the sediment.

No other anomalies associated with the analysis of these samples were observed.

4.3.4 Organotin Compounds

No anomalies associated with the analysis of these samples were observed.

4.3.5 Organochlorine Pesticides by EPA Method 8081

4.3.5.1 Matrix Spike Recovery Exceptions

The relative percent difference between the MS and MSD samples were outside the acceptance limits for several pesticide compounds, indicating a matrix interference in the samples.

4.3.5.2 Laboratory Control Sample Exceptions

The LCS/DLCS for endosulfan 2 and endrin did not meet the acceptance limits on one analytical column. The other column passed acceptance criteria. As target analytes were not detected in the associated sample, the results were reported.

No other anomalies associated with the analysis of these samples were observed.

4.3.6 PAHs by EPA Method 8270

No anomalies associated with the analysis of these samples were observed.

4.3.7 PCB Aroclors by EPA Method 8082

The LCS recoveries were below the South Carolina Department of Health and Environmental Control required acceptance limits of 70% to 130% but were within the laboratory statistical process control (SPC) limits. The project samples could not be re–extracted due to limited sample volume, and the data were reported.

No anomalies associated with the analysis of these samples were observed.

4.4 Target Detection Limit Exceedances

The following list shows the analytes for which the MDL provided by the laboratory exceeded the target detection limit or reporting limit as specified in the QAPP.

- For metals in sediment, several metals had MDLs that exceeded the reporting limit, but the concentration was detected in the sample. For these metals, there was no impact from the elevated detection limits.
- For PAHs in sediment, seven analytes had MDLs that exceeded the reporting limit. Acenaphthene and acenaphthylene were not detected in the sample and the MDL from the lab exceeded the TEL but not the ERL. The difference for PAHs appears to be due to the low solids content and matrix interferences in the sample.

- For pesticides in sediment, most of the MDLs exceeded the laboratory reporting limits in the QAPP. This appears to be from the low solids content and matrix interferences. The sample was analyzed from a 1:10 dilution, which is typical for matrix interferences and, along with the low solids content, was responsible for most of the exceedances above the reporting limit in the QAPP. For several pesticides, no concentration was detected in the sample and the MDL from the lab exceeded the TEL or ERL.
- PCB Aroclor results from GEL slightly exceeded the QAPP laboratory reporting limits, but the discrepancy was very small (3.3 in the QAPP to 3.4 from GEL). This was due to the low solids content.
- There were several small discrepancies in the PBDEs in sediment from ALS, but these were likely due to the solids content.
- In the elutriate/site water analysis, most achieved MDLs matched with the QAPP laboratory reporting limit, but two metals in the site water exceeded the laboratory reporting limit in the QAPP:
    - Antimony: 5 µg/L achieved vs. 3 µg/L in the QAPP
    - Arsenic: 8.5 µg/L achieved vs. 5 µg/L in the QAPP
- Several other metals had MDLs that slightly exceeded the QAPP laboratory reporting limits, but had detectable concentrations in the sample.

4.5 Total Concentrations Less than Dissolved Concentrations in the Elutriate Samples

Total Concentrations Less than Dissolved Concentrations in the Elutriate Samples
The analysis of copper, nickel, several PCB congeners, and two dioxin congeners had dissolved concentrations greater than the total. When performing the modified elutriate preparation, the sample is mixed, then allowed to settle, and then centrifuged. Following the centrifugation, the liquid phase is decanted, and a small portion of the sediment may be resuspended allowing for slightly higher levels in the dissolved fraction then the total. A relatively low amount of sediment that was resuspended would be sufficient to cause the discrepancy between the total and dissolved. For the analytes listed, the differences between the total and dissolved are relatively low, and with the exception of nickel are all below either the target detection limit or the laboratory reporting limit.

5 REFERENCES

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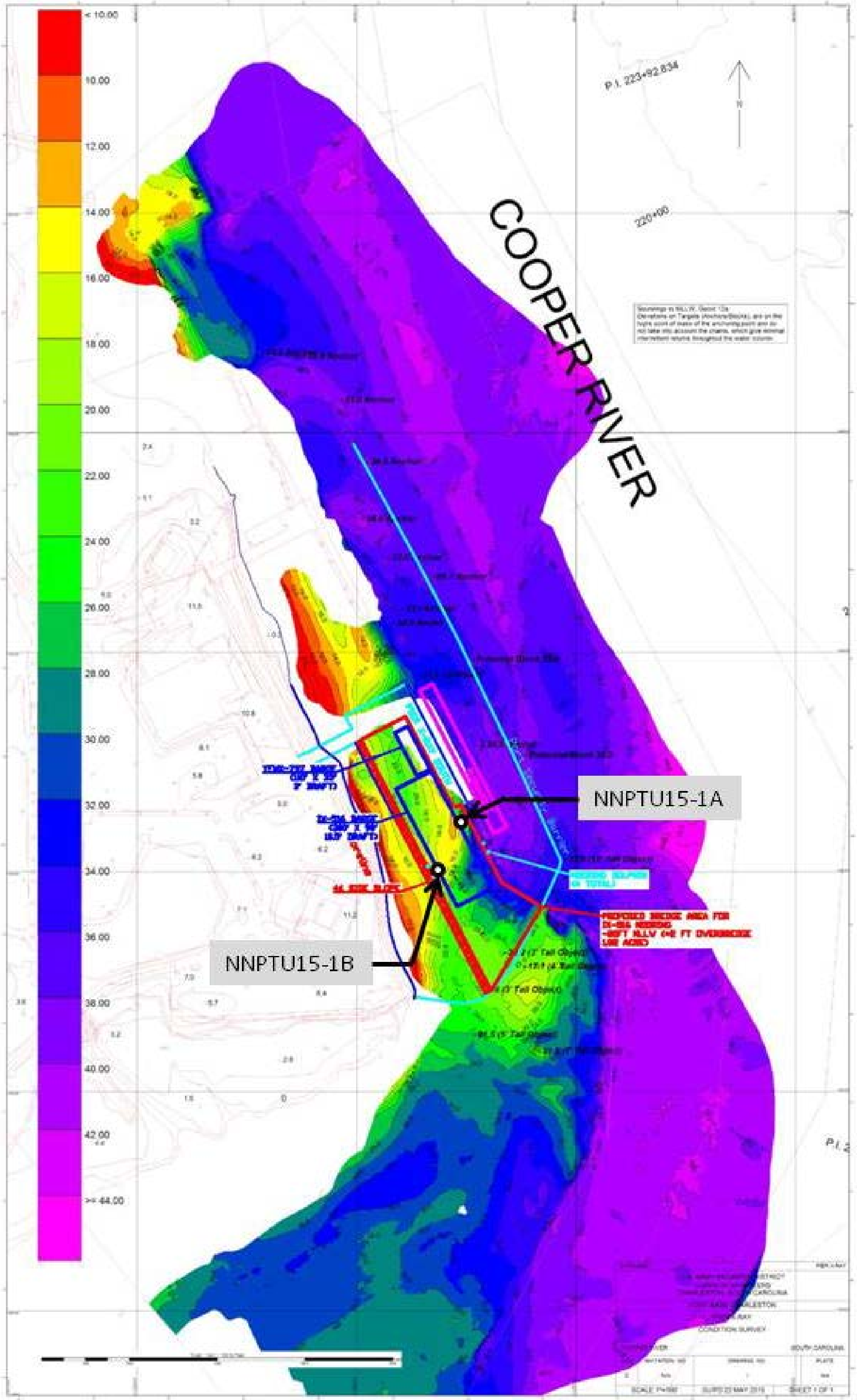
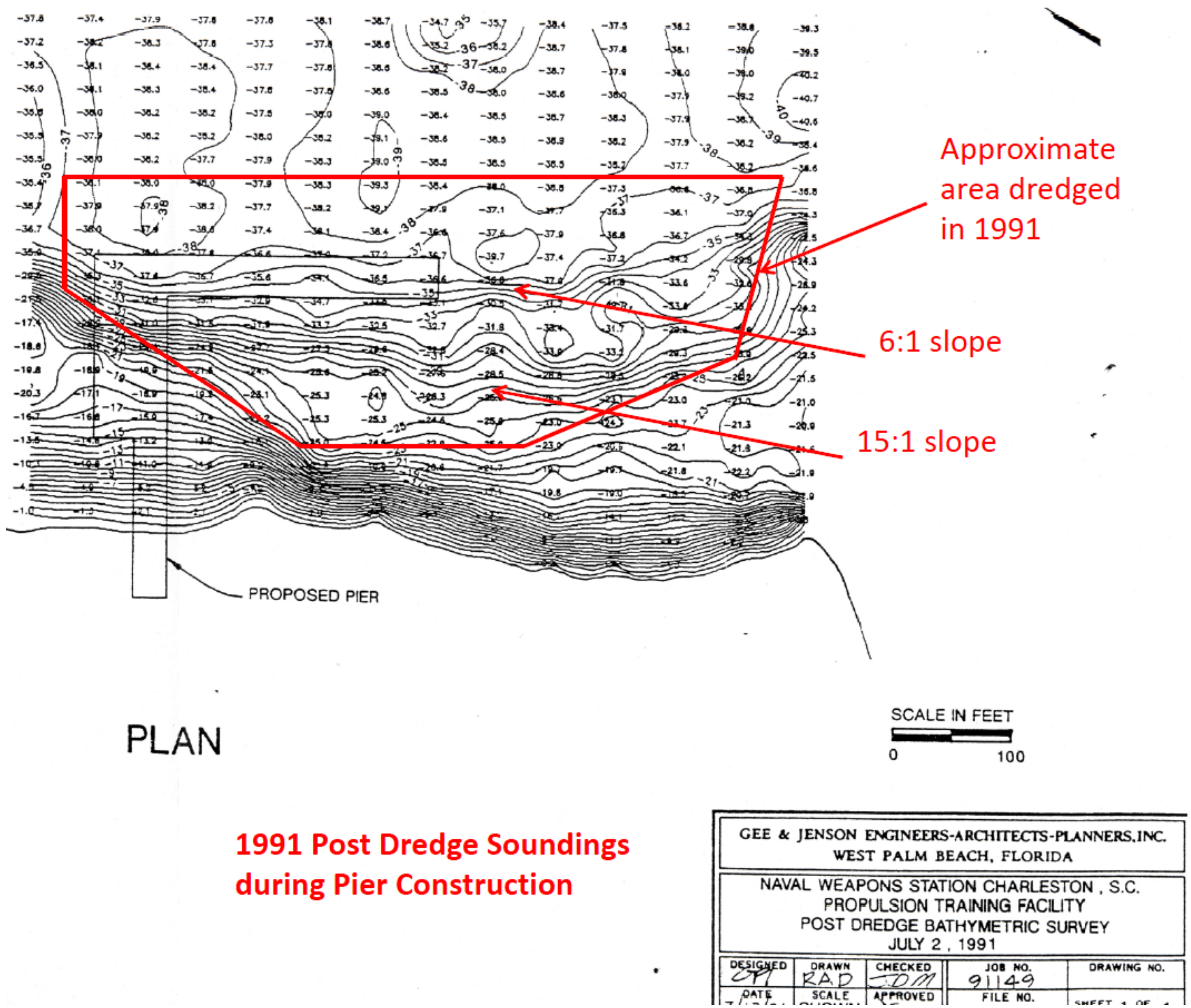
MAPS



Map 1 – Pier X-Ray South Inboard Berthing Area Sample Locations



Map 2 – Approximate Area of 1991 Dredging
Pier X-Ray South Inboard Berthing Area

Map 3
Pier X-Ray South Inboard Berthing Area Sample Locations (As Sampled)

Legend

Sampled Location

N
W E
S

Feet
0 100 200

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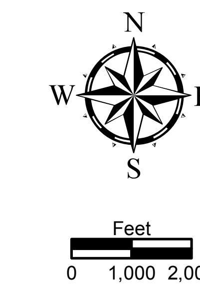
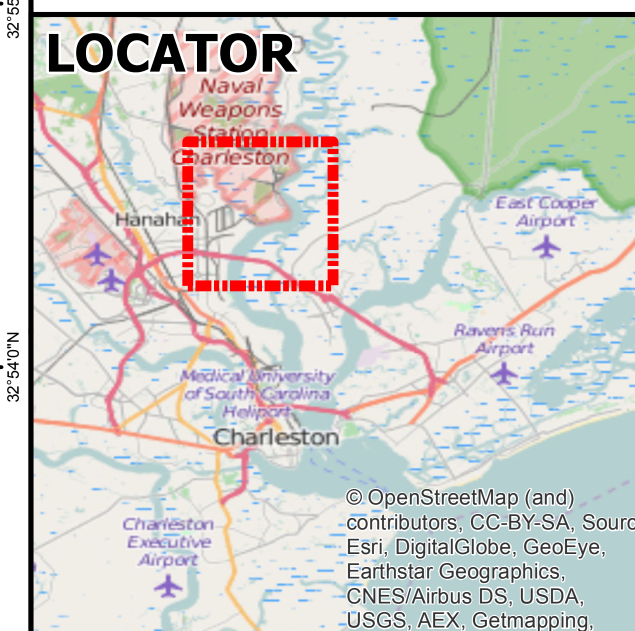
This map and/or digital data is for planning purposes only and should not be used to determine the precise location of any feature. Data provided as-is.
\15-0005_USACE Charleston_Pier XRay\
Actual Sampling Locations\Map2
Data sources: ANAMAR, USACE, NOAA

Map 4
Pier X-Ray Overview

Legend

Sampled Location





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\15-0005_USACE Charleston_Pier XRay\Actual Sampling Locations\Map1
Data sources: ANAMAR, USACE, NOAA

TABLES

Acronyms and Qualifiers in Tables

Grain Size Definitions

Gravel	Particles ≥4.750 mm	Silt	Particles 0.005–0.074 mm
Sand	Particles 0.075–4.749 mm	Clay	Particles <0.005 mm

Unified Soil Classification System (USCS) classes

CH Clay of high plasticity, elastic silt

Metals Data Qualifiers

J The result is an estimated value.

U The analyte was analyzed but was not detected (ND) at or above the MDL.

Organics Data Qualifiers

B The analyte was found in the associated method blank at a level that is significant relative to the sample result as defined by the DOD or NELAC standards.

C Congener has coeluters.

J The result is an estimated value.

P The GC or HPLC confirmation criteria were exceeded. The relative percent difference is greater than 40% between the two analytical results.

U The analyte was analyzed for but was not detected (ND) at or above the MDL.

Dioxin/Furan Data Qualifiers

J The result is an estimated value.

U The analyte was analyzed for but was not detected (ND) at or above the MDL.

Acronyms and Symbols Used in Tables

AET	apparent effects threshold
CCC	criterion continuous concentration
CMC	criteria maximum concentration
ERL	effects range-low
HMW	high molecular weight PAHs (NOAA 1989)
LL	liquid limit
LMW	low molecular weight PAHs (NOAA 1989)
MDL	method detection limit
MLLW	mean lower low water
MRL	method reporting limit
NAD 83	North American Datum of 1983
ND	non-detect
NOAA	National Oceanic and Atmospheric Administration PCB congeners (see SERIM Table 5-6 for list)
PI	plasticity index
PL	plastic limit
TEF	toxicity equivalence factor
TEL	threshold effects level
TEQ	toxic equivalency quotient
x	no values published for the given parameter
–	no qualifier needed or no test conducted for that analyte or parameter

Acronyms and Symbols Used in the Chemistry Data Tables

Bolded Values Result greater than or equal to the TEL and (or) ERL.

TABLE 1
Vibracore Sample Summary

	Sample ID	NPTU15-1A					NPTU15-1B			
Date		10/29/2015					10/29/2015			
Time		1030-1300					1330-1357			
Easting[1] (feet, NAD 83)		2328733					2328654			
Northing[1] (feet, NAD 83)		405633					405528			
Project Depth (feet, MLLW)		-25					-25			
Metrics Per Core Sample	Water Depth (feet)	24.6					23.3			
	Water Surface Elevation[2] (feet, MLLW)	6.52					5.43			
	Top of Core Elevation[3] (feet, MLLW)	-18.1					-17.8			
	Core Number	1	2	3	4	5	1	2	3	4
	Core Penetration (feet)	6.9	6.9	6.9	6.9	6.9	7.2	7.2	7.2	7.2
	Recovery Length (feet)	4.66	4.6	4.5	4.5	5	6.2	5.9	5.5	5.9
	Bottom of Core Elevation (feet, MLLW)	-25	-25	-25	-25	-25	-25	-25	-25	-25
	Recovery per Core (%)	68	67	65	65	72	86	82	76	82
Notes		5 cores collected. Total of 18 gallons were collected.					4 cores collected. Total of 15 gallons were collected.			

[1] Coordinates were recorded in NAD83 State Plane, South Carolina (Zone 3900), US Survey Feet.
[2] Water surface elevation data collected using a Champion TKO System interfaced with the South Carolina VRS
[3] Calculated as the sum of recorded water depth (- feet) and real-time tide height data from Champion TKO System interfaced with the South Carolina VRS Network.

Source: ANAMAR Environmental Consulting, Inc. and Athena Technologies

TABLE 2
Site Water Sample Summary Including Water Column Measurements

Sample ID:	NPTU15-1-SW (site water)		
Date	10/29/15		
Sampling Start/End Times (EST)	1440-1530		
Depth of Water (ft)	23		
Time of Measurement (EST)	1424	1425	1426
Depth of Measurement (feet)	3	13	20
Water Temperature (°C)	21.2	21.2	21.1
pH (units)	6.98	7.00	7.02
Salinity (ppt)	6.72	6.77	6.82
Conductivity (mS/cm)	11.75	11.84	11.94
Dissolved Oxygen (mg/L)	6.75	8.2	8.21
Dissolved Oxygen (%)	78.8	94.9	95.2
Turbidity (NTU)	28	-	-
Easting[1] (feet, NAD 83)	2328654		
Northing[1] (feet, NAD 83)	405528		
Sampling Method	Pneumatic pump		
Field Description of Sample	Clear brown tint in appearance with little vegetative debris, some suspended material, no odor present		
Weather/Tidal Cycle	Mid-outgoing tide, 0-5 knot winds from SW, calm seas, partly cloudy skies		
Volume Collected	Collected 50 gallons in addition to site water kit		

[1] Datum NAD 83, South Carolina (Zone 3900), US Survey Feet.
– = No reading taken

Source: ANAMAR Environmental Consulting, Inc.

TABLE 3

Results of Physical Analyses for the Composited Sediment Sample

	Sample ID:	**NTPU15-1-Comp**
Sediment Description		Fat clay, little silt, little fine quartz sand, gray
% Gravel		0.0
% Coarse Sand		0.0
% Medium Sand		0.9
% Fine Sand		23.3
% Sand (total)		24.2
% Silt		25.5
% Clay		50.3
% Silt & Clay (combined)		75.8
% Solids		31.9
% Moisture* (wet)		213.1
USCS Classification		CH
Specific Gravity		2.568
Atterberg Limits	**PL**	58
	LL	166
	PI	108
Settling Rates		
Final Concentration (g/L)		518
% Passing **Sieve Size**	**Metric Equivalent (mm)**	
0.75 inch	**19.1**	100.0
0.375 inch	**8.5**	100.0
#4	**4.75**	100.0
#10	**2.00**	100.0
#20	**0.85**	99.8
#40	**0.425**	99.1
#60	**0.250**	97.4
#100	**0.149**	91.5
#200	**0.075**	75.8
Hydrometer Readings **(% less than the following sizes)**		0.0308 mm @ 73.4
		0.0198 mm @ 68.0
		0.0116 mm @ 62.5
		0.0084 mm @ 54.4
		0.0060 mm @ 51.6
		0.0030 mm @ 43.5
		0.0013 mm @ 29.9

* % Moisture calculated by the lab using the formula (100-(% solids)) / % solids.

Grain sizes and soil classifications are defined at the front of the tables section.

Source: Terracon

Compiled by: ANAMAR Environmental Consulting, Inc.

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TABLE 4

Analytical Results for Metals, TOC, Total Suspended Solids, and Organotins in Sediment Samples, Site Water and Elutriates Generated from Sediment

	SEDIMENT																					
	Sample ID:		NPTU15-1-Comp								NPTU15-1-Comp (total)				NPTU15-1-Comp (dissolved)				NPTU15-1-SW (site water)			
Analyte	**TEL µg/kg**	**ERL µg/kg**	**Result µg/kg**	**Qualifier**	**MDL**	**MRL**	**CMC µg/L**	**CCC µg/L**	**SC CMC µg/L**	**SC CCC µg/L**	**Result µg/L**	**Qualifier**	**MDL**	**MRL**	**Result µg/L**	**Qualifier**	**MDL**	**MRL**	**Result µg/L**	**Qualifier**	**MDL**	**MRL**
Antimony	x	x	ND	U	1010	3050	x	x	x	x	ND	U	1.00	3.00	ND	U	1.00	3.00	ND	U	5.00	15.0
Arsenic	7240	8200	**14000**	--	1520	9140	69	36	69	36	25.1	--	1.70	5.00	20.6	--	1.70	5.00	ND	U	8.50	25.0
Cadmium	680	1200	568	J	305	1520	40	8.8	43	9.3	ND	U	0.110	1.00	ND	U	0.110	1.00	ND	U	0.110	1.00
Chromium	52300	81000	31100	--	457	1520	*1100	*50	1100	50	ND	U	2.00	10.0	ND	U	2.00	10.0	ND	U	10.0	50.0
Copper	18700	34000	**19700**	--	914	3050	4.8	3.1	5.8	3.7	0.394	J	0.350	1.00	0.725	J	0.350	1.00	2.97	J	1.75	5.00
Lead	30240	46700	15900	--	1010	3050	210	8.1	220	8.5	ND	U	0.500	2.00	ND	U	0.500	2.00	0.938	J	0.500	2.00
Mercury	130	150	69.5	--	12.2	36.6	1.8	0.94	2.1	1.1	0.076	J	0.067	0.200	0.077	J	0.067	0.200	ND	U	0.067	0.200
Nickel	15900	20900	10800	--	457	1520	74	8.2	75	8.3	8.80	--	0.500	2.00	12.5	--	0.500	2.00	6.42	J	2.50	10.0
Selenium	x	x	3170	J	1520	9140	290	71	290	71	2.96	J	1.50	5.00	1.65	J	1.50	5.00	12.4	J	7.50	25.0
Silver	730	1000	ND	U	305	1520	1.9	x	2.3	x	ND	U	0.100	1.00	ND	U	0.100	1.00	ND	U	0.100	1.00
Zinc	124000	150000	**685000**	--	1220	3050	90	81	95	86	36.3	--	3.50	10.0	31.0	--	3.50	10.0	23.7	--	3.50	10.0
Analyte	**TEL mg/kg**	**ERL mg/kg**	**Result mg/kg**	**Qualifier**	**MDL**	**MRL**	**CMC mg/L**	**CCC mg/L**	**SC CMC mg/L**	**SC CCC mg/L**	**Result mg/L**	**Qualifier**	**MDL**	**MRL**	**Result mg/L**	**Qualifier**	**MDL**	**MRL**	**Result mg/L**	**Qualifier**	**MDL**	**MRL**
Carbon, Total Organic	x	x	75300	--	561	1680	x	x	x	x	13.2	--	1.65	5.00	12.0	--	0.660	2.00	3.79	--	0.330	1.00
Total Suspended Solids							x	x	x	x	56.4	H	2.28	10.0	33.8	H	1.10	4.81	32.4	H	1.14	5.00
Analyte	**TEL µg/kg**	**ERL µg/kg**	**Result µg/kg**	**Qualifier**	**MDL**	**MRL**	**CMC µg/L**	**CCC µg/L**	**SC CMC µg/L**	**SC CCC µg/L**	**Result µg/L**	**Qualifier**	**MDL**	**MRL**	**Result µg/L**	**Qualifier**	**MDL**	**MRL**	**Result µg/L**	**Qualifier**	**MDL**	**MRL**
n-Butyltin Cation	x	x	4.5	--	0.81	3.2	x	x	x	x	ND	U	0.029	0.050	ND	U	0.029	0.050	ND	U	0.029	0.050
Di-n-butyltin Cation	x	x	4.0	--	0.59	3.2	x	x	x	x	ND	U	0.0073	0.050	ND	U	0.0073	0.050	ND	U	0.0073	0.050
Tri-n-butyltin Cation	x	x	8.4	--	1.4	3.2	0.42	0.0074	x	x	ND	U	0.012	0.050	ND	U	0.012	0.050	ND	U	0.012	0.050
Total Organotins (as tin)	x	x	8.5				x	x	x	x	0.028				0.028				0.028			

Bolded Values exceed the TEL and (or) ERL.

*Hexavalent chromium screening criteria were used for the elutriate sample, since total chromium screening criteria is not available for the National Water Quality criteria in saltwater samples.

Non-Detect (ND) results use the MDL for calculating total organotins. (J-qualified results use the value reported by the laboratory for calculating total organotins.)

Acronyms and qualifiers are defined at the front of the tables section.

Sources: Results from ALS Environmental and GEL Laboratories; TEL and ERL values from Buchman (2008) ; CMC and CCC values taken from USEPA (2006); SC CMC and CCC values from SC DHEC (2014).

Compiled by: ANAMAR Environmental Consulting, Inc.

TABLE 5

Analytical Results for Pesticides in Sediment Samples, Site Water and Elutriates Generated from Sediment

	SEDIMENT																					
	Sample ID:		NPTU15-1-Comp								NPTU15-1-Comp (total)				NPTU15-1-Comp (dissolved)				NPTU15-1-SW (site water)			
Analyte	TEL µg/kg	ERL µg/kg	Result µg/kg	Qualifier	MDL	MRL	CMC µg/L	CCC µg/L	SC CMC µg/L	SC CCC µg/L	Result µg/L	Qualifier	MDL	MRL	Result µg/L	Qualifier	MDL	MRL	Result µg/L	Qualifier	MDL	MRL
Aldrin	x	x	ND	U	5.14	20.6	1.3	x	1.3	x	ND	U	0.00665	0.020	ND	U	0.00665	0.020	ND	U	0.00665	0.020
Chlordane (technical)	2.26	0.5	ND	U	51.4	257	0.09	0.004	0.09	0.004	ND	U	0.0765	0.250	ND	U	0.0765	0.250	ND	U	0.0765	0.250
α (cis)-Chlordane	x	x	ND	U	5.14	20.6	x	x	x	x	ND	U	0.00665	0.020	ND	U	0.00665	0.020	ND	U	0.00665	0.020
γ (trans)-Chlordane	x	x	ND	U	5.14	20.6	x	x	x	x	ND	U	0.00665	0.020	ND	U	0.00665	0.020	ND	U	0.00665	0.020
Oxychlordane	x	x	ND	U	5.14	20.6	x	x	x	x	ND	U	0.005	0.020	ND	U	0.005	0.020	ND	U	0.005	0.020
cis-Nonachlor	x	x	ND	U	5.14	20.6	x	x	x	x	ND	U	0.0051	0.020	ND	U	0.0051	0.020	ND	U	0.0051	0.020
trans-Nonachlor	x	x	ND	U	5.14	20.6	x	x	x	x	ND	U	0.005	0.020	ND	U	0.005	0.020	ND	U	0.005	0.020
o,p' (2,4')-DDD	x	x	ND	U	5.14	20.6	x	x	x	x	ND	U	0.005	0.020	ND	U	0.005	0.020	ND	U	0.005	0.020
o,p' (2,4')-DDE	x	x	ND	U	5.14	20.6	x	x	x	x	ND	U	0.006	0.020	ND	U	0.006	0.020	ND	U	0.006	0.020
o,p' (2,4')-DDT	x	x	ND	U	5.14	20.6	x	x	x	x	ND	U	0.005	0.020	ND	U	0.005	0.020	ND	U	0.005	0.020
p,p' (4,4')-DDD	1.22	2	ND	U	10.3	41.1	x	x	x	x	ND	U	0.010	0.040	ND	U	0.010	0.040	ND	U	0.010	0.040
p,p' (4,4')-DDE	2.07	2.2	ND	U	10.3	41.1	x	x	x	x	ND	U	0.010	0.040	ND	U	0.010	0.040	ND	U	0.010	0.040
p,p' (4,4')-DDT	1.19	1	ND	U	10.3	41.1	0.13	0.001	0.13	0.001	ND	U	0.010	0.040	ND	U	0.010	0.040	ND	U	0.010	0.040
Dieldrin	0.72	0.02	ND	U	10.3	41.1	0.71	0.0019	0.71	0.0019	ND	U	0.010	0.040	ND	U	0.010	0.040	ND	U	0.010	0.040
Endosulfan I	x	x	ND	U	5.14	20.6	0.034	0.0087	0.34	0.0087	ND	U	0.00665	0.020	ND	U	0.00665	0.020	ND	U	0.00665	0.020
Endosulfan II	x	x	ND	U	10.3	41.1	0.034	0.0087	0.034	0.0087	ND	U	0.010	0.040	ND	U	0.010	0.040	ND	U	0.010	0.040
Endrin	x	x	ND	U	10.3	41.1	0.037	0.0023	0.037	0.0023	ND	U	0.010	0.040	ND	U	0.010	0.040	ND	U	0.010	0.040
Endrin Aldehyde	x	x	ND	U	10.3	41.1	x	x	x	x	ND	U	0.00665	0.040	ND	U	0.00665	0.040	ND	U	0.00665	0.040
Endrin Ketone	x	x	ND	U	10.3	41.1	x	x	x	x	ND	U	0.010	0.040	ND	U	0.010	0.040	ND	U	0.010	0.040
Heptachlor	x	x	ND	U	5.14	20.6	0.053	0.0036	0.053	0.0036	ND	U	0.00665	0.020	ND	U	0.00665	0.020	ND	U	0.00665	0.020
Heptachlor Epoxide	x	x	ND	U	5.14	20.6	0.053	0.0036	0.053	0.0036	ND	U	0.00665	0.020	ND	U	0.00665	0.020	ND	U	0.00665	0.020
α-BHC	x	x	ND	U	5.14	20.6	x	x	x	x	ND	U	0.00665	0.020	ND	U	0.00665	0.020	ND	U	0.00665	0.020
β-BHC	x	x	ND	U	5.14	20.6	x	x	x	x	ND	U	0.00665	0.020	ND	U	0.00665	0.020	ND	U	0.00665	0.020
δ-BHC	x	x	ND	U	5.14	20.6	x	x	x	x	ND	U	0.00665	0.020	ND	U	0.00665	0.020	ND	U	0.00665	0.020
γ-BHC (Lindane)	0.32	x	ND	U	5.14	20.6	0.16	x	0.16	x	ND	U	0.00665	0.020	ND	U	0.00665	0.020	ND	U	0.00665	0.020
Methoxychlor	x	x	ND	U	51.4	206	x	x	x	x	ND	U	0.050	0.200	ND	U	0.050	0.200	ND	U	0.050	0.200
Mirex®	x	x	ND	U	5.14	20.6	x	x	x	x	ND	U	0.00665	0.020	ND	U	0.00665	0.020	ND	U	0.00665	0.020
Toxaphene	0.1	x	ND	U	171	514	0.21	0.002	0.21	0.0002	ND	U	0.150	0.500	ND	U	0.150	0.500	ND	U	0.150	0.500
Chlorinated Pesticides, Total	x	x	444				x	x	x	x	0.457				0.457				0.457			

Non-Detect (ND) results use the MDL for calculating total pesticides. (J-qualified results use the value reported by the laboratory for calculating total pesticides.)
Acronyms and qualifiers are defined at the front of the tables section.

Sources: Results from GEL Laboratories; TEL and ERL values from Buchman (2008); CMC and CCC values from USEPA (2006); SC CMC and CCC values from SC DHEC (2014).
Compiled by: ANAMAR Environmental Consulting, Inc.

TABLE 6
Analytical Results for PAHs in Sediment Samples, Site Water and Elutriates Generated from Sediment

	SEDIMENT																								
	Sample ID:		NPTU15-1-Comp								NPTU15-1-Comp (total)				NPTU15-1-Comp (dissolved)				NPTU15-1-SW (site water)			
Analyte	TEL µg/kg	ERL µg/kg	Result µg/kg	Qualifier	MDL	MRL	CMC µg/L	CCC µg/L	SC CMC µg/L	SC CCC µg/L	Result µg/L	Qualifier	MDL	MRL	Result µg/L	Qualifier	MDL	MRL	Result µg/L	Qualifier	MDL	MRL
1-Methylnaphthalene[LMW]	x	x	ND	U	15.4	51.2	x	x	x	x	ND	U	0.204	0.467	ND	U	0.204	0.467	ND	U	0.218	0.500
2-Methylnaphthalene[LMW]	20.2	70	ND	U	15.4	51.2	x	x	x	x	ND	U	0.140	0.467	ND	U	0.140	0.467	ND	U	0.150	0.500
Acenaphthene[LMW]	6.71	16	ND	U	15.4	51.2	x	x	x	x	ND	U	0.140	0.467	ND	U	0.140	0.467	ND	U	0.150	0.500
Acenaphthylene	5.87	44	ND	U	15.4	51.2	x	x	x	x	ND	U	0.140	0.467	ND	U	0.140	0.467	ND	U	0.150	0.500
Anthracene[LMW]	46.9	85.3	ND	U	5.12	51.2	x	x	x	x	ND	U	0.140	0.467	ND	U	0.140	0.467	ND	U	0.150	0.500
Benzo(a)anthracene[HMW]	74.8	261	26.9	--	1.64	5.12	x	x	x	x	ND	U	0.015	0.0467	ND	U	0.015	0.0467	ND	U	0.016	0.050
Benzo(a)pyrene[HMW]	88.8	430	19.5	--	1.64	5.12	x	x	x	x	ND	U	0.015	0.0467	ND	U	0.015	0.0467	ND	U	0.016	0.050
Benzo(b)fluoranthene	x	x	27.5	--	1.64	5.12	x	x	x	x	ND	U	0.015	0.0467	ND	U	0.015	0.0467	ND	U	0.016	0.050
Benzo(g,h,i)perylene	x	x	ND	U	1.64	5.12	x	x	x	x	ND	U	0.015	0.0467	ND	U	0.015	0.0467	ND	U	0.016	0.050
Benzo(k)fluoranthene	x	x	ND	U	0.820	2.56	x	x	x	x	ND	U	0.00748	0.0234	ND	U	0.00748	0.0234	ND	U	0.008	0.025
Chrysene[HMW]	108	384	30.9	P	1.64	5.12	x	x	x	x	ND	U	0.015	0.0467	ND	U	0.015	0.0467	ND	U	0.016	0.050
Dibenzo(a,h)anthracene[HMW]	6.22	63.4	ND	U	1.64	5.12	x	x	x	x	ND	U	0.015	0.0467	ND	U	0.015	0.0467	ND	U	0.016	0.050
Fluoranthene[HMW]	113	600	59.3	--	1.64	5.12	x	x	x	x	ND	U	0.015	0.0467	ND	U	0.015	0.0467	ND	U	0.016	0.050
Fluorene[LMW]	21.2	19	ND	U	15.4	51.2	x	x	x	x	ND	U	0.140	0.467	ND	U	0.140	0.467	ND	U	0.150	0.500
Indeno(1,2,3-cd)pyrene	x	x	ND	U	1.64	5.12	x	x	x	x	ND	U	0.015	0.0467	ND	U	0.015	0.0467	ND	U	0.016	0.050
Naphthalene[LMW]	34.6	160	ND	U	15.4	51.2	x	x	x	x	ND	U	0.140	0.467	ND	U	0.140	0.467	ND	U	0.150	0.500
Phenanthrene[LMW]	86.7	240	ND	U	15.4	51.2	x	x	x	x	ND	U	0.170	0.467	ND	U	0.170	0.467	ND	U	0.182	0.500
Pyrene[HMW]	153	665	40.9	--	1.64	5.12	x	x	x	x	ND	U	0.015	0.0467	ND	U	0.015	0.0467	ND	U	0.016	0.050
Total LMW PAHs	312	552	97.5				x	x	x	x	1.07				1.07				1.15			
Total HMW PAHs	655	1700	179				x	x	x	x	0.090				0.090				0.096			
Total PAHs	1684	4022	324				x	x	x	x	1.36				1.36				1.45			

[LMW] Low Molecular Weight PAHs (NOAA 1989)
[HMW] High Molecular Weight PAHs (NOAA 1989)
Non-Detect (ND) results use the MDL for calculating total PAHs. (J-qualified results use the value reported by the laboratory for calculating total PAHs.)
Acronyms and qualifiers are defined at the front of the tables section.

Sources: Results from GEL Laboratories; TEL and ERL values from Buchman (2008). (There are no federal or state CMC or CCC values for these PAHs [USEPA 2006, Buchman 2008, SC DHEC 2014].)
Compiled by: ANAMAR Environmental Consulting, Inc.

ANAMAR Environmental Consulting, Inc.

TABLE 7

Analytical Results for PCBs and Aroclors in Sediment Samples, Site Water and Elutriates Generated from Sediment Samples

	SEDIMENT						ELUTRIATES															
	Sample ID:		NPTU15-1-Comp								NPTU15-1-Comp (total)				NPTU15-1-Comp (dissolved)				NPTU15-1-SW (site water)			
Analyte	TEL µg/kg	ERL µg/kg	Result µg/kg	Qualifier	MDL	MRL	CMC µg/L	CCC µg/L	SC CMC µg/L	SC CCC µg/L	Result µg/L	Qualifier	MDL	MRL	Result µg/L	Qualifier	MDL	MRL	Result µg/L	Qualifier	MDL	MRL
PCB 8[NOAA]	x	x	ND	U	0.0155	0.0122	x	x	x	x	ND	U	0.0000175	0.0000204	ND	U	0.0000138	0.0000206	ND	U	0.0000133	0.0000201
PCB 18*[NOAA]	x	x	0.0359	C	0.0182	0.0244	x	x	x	x	ND	CU	0.00000902	0.0000408	ND	CU	0.00000716	0.0000411	ND	CU	0.00000607	0.0000402
PCB 28*[NOAA]	x	x	0.056	C	0.0134	0.0244	x	x	x	x	ND	CU	0.0000127	0.0000408	ND	CU	0.00000843	0.0000411	0.00000903	CJ	0.00000515	0.0000402
PCB 44*[NOAA]	x	x	0.111	C	0.00937	0.0366	x	x	x	x	0.0000176	CJ	0.0000103	0.0000612	0.000015	CJ	0.00000942	0.0000617	0.0000157	CJ	0.00000714	0.0000603
PCB 49*	x	x	0.0991	C	0.00894	0.0244	x	x	x	x	ND	CU	0.00000972	0.0000408	ND	CU	0.00000887	0.0000411	ND	CU	0.00000977	0.0000402
PCB 52[NOAA]	x	x	0.156	--	0.0101	0.0122	x	x	x	x	0.0000131	J	0.0000101	0.0000204	0.0000128	J	0.00000919	0.0000206	0.00000955	J	0.00000696	0.0000201
PCB 66[NOAA]	x	x	0.0687	--	0.00625	0.0122	x	x	x	x	0.0000101	J	0.00000578	0.0000204	ND	U	0.00000611	0.0000206	0.00000826	J	0.0000045	0.0000201
PCB 77	x	x	ND	U	0.00603	0.0122	x	x	x	x	ND	U	0.00000768	0.0000204	ND	U	0.00000693	0.0000206	ND	U	0.00000595	0.0000201
PCB 87*	x	x	0.151	C	0.00979	0.0733	x	x	x	x	0.0000139	CJ	0.00000596	0.000122	ND	CU	0.00000621	0.000123	0.00000842	CJ	0.00000537	0.000121
PCB 101*[NOAA]	x	x	0.266	C	0.0102	0.0366	x	x	x	x	0.0000172	CJ	0.00000592	0.0000612	0.0000172	CJ	0.00000619	0.0000617	0.0000149	CJ	0.00000535	0.0000603
PCB 105[NOAA]	x	x	0.0734	--	0.00403	0.0122	x	x	x	x	ND	U	0.00000888	0.0000204	0.00000559	J	0.00000438	0.0000206	ND	U	0.00000537	0.0000201
PCB 118[NOAA]	x	x	0.211	--	0.00387	0.0122	x	x	x	x	0.0000107	J	0.0000048	0.0000204	ND	U	0.000012	0.0000206	0.0000117	J	0.00000426	0.0000201
PCB 126	x	x	ND	U	0.00453	0.0122	x	x	x	x	ND	U	0.00000708	0.0000204	ND	U	0.00000537	0.0000206	ND	U	0.00000545	0.0000201
PCB 128*[NOAA]	x	x	0.0411	C	0.0097	0.0244	x	x	x	x	ND	CU	0.00000653	0.0000408	ND	CU	0.00000516	0.0000411	ND	CU	0.0000044	0.0000402
PCB 138*[NOAA]	x	x	0.264	C	0.0108	0.0366	x	x	x	x	0.0000132	CJ	0.000007	0.0000612	0.0000365	CJ	0.00000551	0.0000617	0.000015	CJ	0.00000473	0.0000603
PCB 153*[NOAA]	x	x	0.296	C	0.00924	0.0244	x	x	x	x	ND	CU	0.0000148	0.0000408	0.0000309	CJ	0.00000471	0.0000411	0.0000176	CJ	0.00000404	0.0000402
PCB 156*	x	x	0.0376	C	0.0032	0.0244	x	x	x	x	ND	CU	0.00000437	0.0000408	0.00000434	CJ	0.00000372	0.0000411	ND	CU	0.00000356	0.0000402
PCB 169	x	x	ND	U	0.00244	0.0122	x	x	x	x	ND	U	0.00000429	0.0000204	ND	U	0.00000354	0.0000206	ND	U	0.00000328	0.0000201
PCB 170[NOAA]	x	x	0.0435	--	0.00575	0.0122	x	x	x	x	ND	U	0.00000457	0.0000204	0.0000186	J	0.00000603	0.0000206	ND	U	0.00000348	0.0000201
PCB 180*[NOAA]	x	x	0.0978	C	0.0049	0.0244	x	x	x	x	0.00000684	CJ	0.00000382	0.0000408	0.0000413	C	0.00000502	0.0000411	0.00000955	CJ	0.0000029	0.0000402
PCB 183*	x	x	0.0338	C	0.00565	0.0244	x	x	x	x	0.00000425	CJ	0.00000414	0.0000408	0.00000656	CJ	0.00000543	0.0000411	ND	CU	0.00000372	0.0000402
PCB 184	x	x	ND	U	0.00186	0.0122	x	x	x	x	ND	U	0.00000282	0.0000204	ND	U	0.00000282	0.0000206	ND	U	0.00000255	0.0000201
PCB 187[NOAA]	x	x	0.0879	--	0.00227	0.0122	x	x	x	x	0.00000747	J	0.00000382	0.0000204	0.0000137	J	0.00000383	0.0000206	0.00000865	J	0.00000348	0.0000201
PCB 195[NOAA]	x	x	0.00857	J	0.00344	0.0122	x	x	x	x	ND	U	0.00000382	0.0000204	ND	U	0.00000463	0.0000206	ND	U	0.00000213	0.0000201
PCB 206[NOAA]	x	x	0.0422	--	0.00488	0.0122	x	x	x	x	ND	U	0.00000465	0.0000204	0.00000562	J	0.00000422	0.0000206	ND	U	0.0000029	0.0000201
PCB 209[NOAA]	x	x	0.138	--	0.00286	0.0122	x	x	x	x	ND	U	0.00000361	0.0000204	ND	U	0.00000348	0.0000206	ND	U	0.00000247	0.0000201
Total EPA Region 4 PCBs	21.6	22.7	2.35				0.033	0.03	x	0.03	0.00023640				0.00030262				0.00020276			
Total NOAA PCBs	21.6	22.7	2.07				0.033	0.03	x	0.03	0.00018229				0.00025798				0.00016006			
Aroclor-1016	x	x	ND	U	3.43	10.3	x	x	x	x	ND	U	0.0333	0.100	ND	U	0.0317	0.0952	ND	U	0.0333	0.100
Aroclor-1221	x	x	ND	U	3.43	10.3	x	x	x	x	ND	U	0.0333	0.100	ND	U	0.0317	0.0952	ND	U	0.0333	0.100
Aroclor-1232	x	x	ND	U	3.43	10.3	x	x	x	x	ND	U	0.0333	0.100	ND	U	0.0317	0.0952	ND	U	0.0333	0.100
Aroclor-1242	x	x	ND	U	3.43	10.3	x	x	x	x	ND	U	0.0333	0.100	ND	U	0.0317	0.0952	ND	U	0.0333	0.100
Aroclor-1248	x	x	ND	U	3.43	10.3	x	x	x	x	ND	U	0.0333	0.100	ND	U	0.0317	0.0952	ND	U	0.0333	0.100
Aroclor-1254	63.3	x	ND	U	3.43	10.3	x	x	x	x	ND	U	0.0333	0.100	ND	U	0.0317	0.0952	ND	U	0.0333	0.100
Aroclor-1260	x	x	ND	U	3.43	10.3	x	x	x	x	ND	U	0.0333	0.100	ND	U	0.0317	0.0952	ND	U	0.0333	0.100

[NOAA] National Oceanic and Atmospheric Administration PCB congeners (NOAA 1989, Table 5-6 of SERIM).

* Indicates congener that coelutes with one or more PCB congener (see Sections 3 and 4 of this report for details).

Non-Detect (ND) results use the MDL for calculating total EPA Region 4 PCBs and total NOAA PCBs (See SERIM Section 7.3 for details). (J-qualified results use the value reported by the laboratory for calculating total EPA Region 4 PCBs and total NOAA PCBs.)

Data qualifiers and acronyms are defined at the front of the tables section.

Sources: Cape Fear Analytical and GEL Laboratories; TEL, ERL, CMC and CCC values from Buchman (2008). South Carolina CMC and CCC from SC DHEC (2014).

Compiled by: ANAMAR Environmental Consulting, Inc.

TABLE 8

Analytical Results for Dioxins and Furans in Sediment Samples, Site Water and Elutriates Generated from Sediment Samples

	SEDIMENT																											
	Sample ID:			NPTU15-Comp										NPTU15-1-Comp (total)					NPTU15-1-Comp (dissolved)					NPTU15-1-SW (site water)				
Analyte	TEL ng/kg	AET ng/kg	TEF ng/kg	Result ng/kg	Qualifier	MDL	MRL	TEQ	CMC pg/L	CCC pg/L	SC CMC pg/L	SC CCC pg/L	TEF pg/L	Result pg/L	Qualifier	MDL	MRL	TEQ	Result pg/L	Qualifier	MDL	MRL	TEQ	Result pg/L	Qualifier	MDL	MRL	TEQ
2,3,7,8-TCDD	x	x	1	0.401	J	0.156	0.997	0.401	x	x	x	x	1	ND	U	0.972	10.3	0.486	ND	U	1.25	11	0.304	ND	U	1.03	9.99	0.156
1,2,3,7,8-PeCDD	x	x	1	1.68	J	0.303	4.98	1.68	x	x	x	x	1	ND	U	1.52	51.5	0.760	ND	U	1.44	55	0.547	ND	U	1.64	50.0	0.449
1,2,3,4,7,8-HxCDD	x	x	0.1	2.56	J	0.484	4.98	0.256	x	x	x	x	0.1	ND	U	1.7	51.5	0.0840	ND	U	1.48	55	0.0622	ND	U	2.14	50.0	0.0665
1,2,3,6,7,8-HxCDD	x	x	0.1	4.40	J	0.484	4.98	0.440	x	x	x	x	0.1	ND	U	1.61	51.5	0.0805	ND	U	1.45	55	0.0584	ND	U	2.02	50.0	0.0589
1,2,3,7,8,9-HxCDD	x	x	0.1	7.74	--	0.514	4.98	0.774	x	x	x	x	0.1	ND	U	1.68	51.5	0.0840	ND	U	1.5	55	0.0630	ND	U	2.12	50.0	0.0668
1,2,3,4,6,7,8-HpCDD	x	x	0.01	140	--	0.939	4.98	1.40	x	x	x	x	0.01	ND	U	2.33	51.5	0.0117	2.75	J	2.46	55	0.0320	6.27	J	2.54	50.0	0.201
OCDD	x	x	0.0003	2020	--	1.36	9.97	0.606	x	x	x	x	0.0003	17.0	J	3.95	103	0.00510	29.7	J	8.42	110	0.151	64.3	J	2.96	99.9	9.74
2,3,7,8-TCDF	x	x	0.1	0.971	J	0.132	0.997	0.0971	x	x	x	x	0.1	ND	U	1.27	10.3	0.0635	ND	U	1.22	11	0.0387	ND	U	1.20	9.99	0.0232
1,2,3,7,8-PeCDF	x	x	0.03	0.526	J	0.147	4.98	0.0158	x	x	x	x	0.03	ND	U	0.857	51.5	0.0129	ND	U	0.939	55	0.00604	ND	U	0.847	50.0	0.00256
2,3,4,7,8-PeCDF	x	x	0.3	0.568	J	0.143	4.98	0.170	x	x	x	x	0.3	ND	U	0.873	51.5	0.131	ND	U	1	55	0.0655	ND	U	0.845	50.0	0.0277
1,2,3,4,7,8-HxCDF	x	x	0.1	ND	U	0.570	4.98	0.0285	x	x	x	x	0.1	ND	U	0.857	51.5	0.0429	ND	U	0.919	55	0.0197	ND	U	0.747	50.0	0.00735
1,2,3,6,7,8-HxCDF	x	x	0.1	ND	U	0.538	4.98	0.0269	x	x	x	x	0.1	ND	U	0.855	51.5	0.0428	ND	U	0.904	55	0.0193	ND	U	0.767	50.0	0.00741
1,2,3,7,8,9-HxCDF	x	x	0.1	0.502	J	0.229	4.98	0.0502	x	x	x	x	0.1	ND	U	1.18	51.5	0.0590	ND	U	1.15	55	0.0339	ND	U	1.03	50.0	0.0175
2,3,4,6,7,8-HxCDF	x	x	0.1	0.696	J	0.166	4.98	0.0696	x	x	x	x	0.1	ND	U	0.906	51.5	0.0453	ND	U	0.886	55	0.0201	ND	U	0.761	50.0	0.00764
1,2,3,4,6,7,8-HpCDF	x	x	0.01	4.76	J	0.147	4.98	0.0476	x	x	x	x	0.01	ND	U	0.791	51.5	0.00396	ND	U	1.34	55	0.00265	ND	U	1.39	50.0	0.00184
1,2,3,4,7,8,9-HpCDF	x	x	0.01	0.568	J	0.227	4.98	0.00568	x	x	x	x	0.01	ND	U	1.24	51.5	0.00620	ND	U	2.03	55	0.00629	ND	U	2.00	50.0	0.00629
OCDF	x	x	0.0003	11.9	--	0.640	9.97	0.00357	x	x	x	x	0.0003	ND	U	3.19	103	0.000479	ND	U	3.61	110	0.000864	ND	U	2.88	99.9	0.00124
Total TEQs[1]	0.85	3.6	x					**6.07**	x	x	x	x	--					1.92					1.43					10.8
TCDD, Total	x	x	x	39.6	--	0.156	0.997	--	x	x	x	x	--	ND	U	0.972	10.3	--	ND	U	1.25	11.0	--	ND	U	1.03	9.99	--
PeCDD, Total	x	x	x	52.9	--	0.303	4.98	--	x	x	x	x	--	ND	U	1.52	51.5	--	ND	U	1.44	55.0	--	ND	U	1.64	50.0	--
HxCDD, Total	x	x	x	287	--	0.484	4.98	--	x	x	x	x	--	2.43	J	1.61	51.5	--	1.76	J	1.45	55.0	--	6.79	J	2.02	50.0	--
HpCDD, Total	x	x	x	601	--	0.939	4.98	--	x	x	x	x	--	4.57	J	2.22	51.5	--	10.4	J	2.46	55.0	--	21.1	J	2.54	50.0	--
TCDF, Total	x	x	x	5.06	--	0.132	0.997	--	x	x	x	x	--	ND	U	1.27	10.3	--	ND	U	1.22	11.0	--	ND	U	1.20	9.99	--
PeCDF, Total	x	x	x	4.73	J	0.100	4.98	--	x	x	x	x	--	ND	U	0.709	51.5	--	ND	U	0.629	55.0	--	ND	U	0.604	50.0	--
HxCDF, Total	x	x	x	6.73	--	0.149	4.98	--	x	x	x	x	--	ND	U	0.855	51.5	--	ND	U	0.886	55.0	--	ND	U	0.747	50.0	--
HpCDF, Total	x	x	x	13.8	--	0.147	4.98	--	x	x	x	x	--	ND	U	0.791	51.5	--	ND	U	1.34	55.0	--	ND	U	1.39	50.0	--

Bolded Values exceed the TEL and (or) ERL.

[1] Total TEQs are calculated using one-half the MDL when the result is given as ND (non-detect). (J-qualified results use the value reported by the laboratory for calculating total TEQs.) These values are mul

Data qualifiers and acronyms are defined at the front of the tables section.

Sources: Results from Cape Fear Analytical and GEL Laboratories; TEL and AET values from Buchman (2008); TEF values from Van den Berg et al. (2006). (There are no federal or state CMC or CCC values for these dioxins and furans [USEPA 2006, Buchman 2008, SC DI

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TABLE 9

Analytical Results for Polybrominated Diphenyl Ethers (PBDEs) in Sediment Samples, Site Water and Elutriates Generated from Sediment Samples

Analyte	Congener #	SEDIMENT Sample ID: TEL µg/kg	AET µg/kg	NPTU15-Comp Result µg/kg	Qualifier	MDL	MRL	CMC ng/L	CCC ng/L	SC CMC ng/L	SC CCC ng/L	NPTU15-1-Comp (total) Result ng/L	Qualifier	MDL	MRL	NPTU15-1-Comp (dissolved) Result ng/L	Qualifier	MDL	MRL	NPTU15-1-SW (site water) Result ng/L	Qualifier	MDL	MRL
2,2',4-TriBDE	17	x	x	ND	U	0.036	0.16	x	x	x	x	ND	U	0.18	0.99	ND	U	0.18	0.98	ND	U	0.18	0.99
2,4,4'-TriBDE	28	x	x	ND	U	0.037	0.16	x	x	x	x	ND	U	0.26	0.99	ND	U	0.26	0.98	ND	U	0.26	0.99
2,2',4,4'-TetraBDE	47	x	x	ND	U	0.045	0.16	x	x	x	x	0.71	J	0.15	0.99	0.50	J	0.15	0.98	0.47	J	0.15	0.99
2,3',4,4'-TetraBDE	66	x	x	ND	U	0.030	0.16	x	x	x	x	ND	U	0.20	0.99	ND	U	0.20	0.98	ND	U	0.20	0.99
2,3',4',6-TetraBDE	71	x	x	ND	U	0.024	0.16	x	x	x	x	ND	U	0.16	0.99	ND	U	0.16	0.98	ND	U	0.16	0.99
2,2',3,4,4'-PentaBDE	85	x	x	ND	U	0.062	0.16	x	x	x	x	ND	U	0.35	0.99	ND	U	0.35	0.98	ND	U	0.35	0.99
2,2',4,4',5-PentaBDE	99	x	x	ND	U	0.047	0.16	x	x	x	x	1.3	--	0.32	0.99	0.93	J	0.32	0.98	0.88	J	0.32	0.99
2,2',4,4',6-PentaBDE	100	x	x	ND	U	0.022	0.16	x	x	x	x	ND	U	0.10	0.99	ND	U	0.10	0.98	ND	U	0.10	0.99
2,2',3,3',4,4'-HexaBDE	128	x	x	ND	U	0.016	0.16	x	x	x	x	ND	U	0.13	0.99	ND	U	0.13	0.98	ND	U	0.13	0.99
2,2',3,4,4',5'-HexaBDE	138	x	x	ND	U	0.025	0.16	x	x	x	x	ND	U	0.11	0.99	ND	U	0.11	0.98	ND	U	0.11	0.99
2,2',4,4',5,5'-HexaBDE	153	x	x	ND	U	0.014	0.16	x	x	x	x	ND	U	0.093	0.99	ND	U	0.093	0.98	ND	U	0.093	0.99
2,2',4,4',5,6'-HexaBDE	154	x	x	ND	U	0.012	0.16	x	x	x	x	ND	U	0.14	0.99	ND	U	0.14	0.98	ND	U	0.14	0.99
2,2',3,4,4',5',6-HeptaBDE	183	x	x	ND	U	0.020	0.16	x	x	x	x	ND	U	0.10	0.99	ND	U	0.10	0.98	ND	U	0.10	0.99
2,3,3',4,4',5,6-HeptaBDE	190	x	x	ND	U	0.031	0.16	x	x	x	x	ND	U	0.36	0.99	ND	U	0.36	0.98	ND	U	0.36	0.99
2,2',3,4,4',5,5',6-OctaBDE	203	x	x	ND	U	0.045	0.16	x	x	x	x	ND	U	0.35	0.99	ND	U	0.35	0.98	ND	U	0.35	0.99
2,2',3,3',4,4',5,5',6-NonaBDE	206	x	x	ND	U	0.048	1.6	x	x	x	x	ND	U	0.25	9.9	ND	U	0.25	9.8	ND	U	0.25	9.9
DecaBDE	209	x	x	ND	U	0.040	1.6	x	x	x	x	ND	U	0.79	9.9	ND	U	0.79	9.8	ND	U	0.79	9.9

Data qualifiers and acronyms are defined at the front of the tables section.

Source: Results from ALS Environmental. (There are no TEL, AET, CMC or CCC values for these PBDEs [USEPA 2006, Buchman 2008, SC DHEC 2014].)
Compiled by: ANAMAR Environmental Consulting, Inc.

NOTE:

Appendices are provided in electronic format only
and may be found on the accompanying CD.

APPENDIX E

Notice of Availability

DEPARTMENT OF DEFENSE
DEPARTMENT OF THE AIR FORCE

NOTICE OF AVAILABILITY OF A DRAFT ENVIRONMENTAL ASSESSMENT AND PROPOSED FINDING OF NO SIGNIFICANT IMPACT FOR MAINTENANCE DREDGING 2020 – 2030 AT JOINT BASE CHARLESTON, SOUTH CAROLINA

A draft environmental assessment has been prepared to analyze the impacts of conducting routine maintenance dredging of the navigation channels and berthing areas, including new and existing dredging units at Joint Base Charleston in South Carolina. The purpose is to provide and sustain sufficient depth for navigation and berthing of military vessels that support JBC waterborne missions. Dredging of the JBC navigation channels and associated berthing areas is necessary to maintain current depths and meet new dredging requirements.

The draft EA was prepared in accordance with the National Environmental Policy Act, Council on Environmental Quality regulations, and Air Force instructions implementing NEPA and evaluates potential impacts of the alternative actions on the environment including the no-action alternative. Based on this analysis, the Air Force has prepared a proposed Finding of No Significant Impact.

The Air Force invites the public to review and comment on this draft EA and proposed FONSI for 30 days ending October 2, 2019. The draft EA and proposed FONSI, dated August 2019, are available for review at the following locations: Otranto Rd Regional Library, 2261 Otranto Road, Charleston, SC 29406; Hanahan Library; 1216 Old Murray Drive, Hanahan, SC 29410; and JBC-Weapons Station Library, Bldg 732, 2316 Red Bank Road, Goose Creek, SC 29445.

Electronic copies of the documents can also be found on the United States Army Corps of Engineers, Charleston District website at: https://www.sac.usace.army.mil/Missions/Civil-Works/NEPA-Documents
Comments should be provided in writing to andrea.w.hughes@usace.army.mil or Andrea W. Hughes, Planning and Environmental Branch, U.S. Army Corps of Engineers, Charleston District, 69-A Hagood Avenue, Charleston, South Carolina 29403.

PRIVACY ADVISORY NOTICE

Public comments on this draft EA are requested pursuant to NEPA, 42 United States Code 4321, et seq. All written comments received during the comment period will be considered during the final EA preparation. Providing private address information with your comment is voluntary and such personal information will be kept confidential unless release is required by law. However, address information will be used to compile the project mailing list and failure to provide it will result in your name not being included on the mailing list.

APPENDIX F

Section 7(a)(2) Consultation
for U.S. Fish and Wildlife Service

United States Department of the Interior

FISH AND WILDLIFE SERVICE
176 Croghan Spur Road, Suite 200
Charleston, South Carolina 29407

October 18, 2018

Ms. Diane C. Perkins
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U.S. Army Corps of Engineers
69A Hagood Avenue
Charleston, S.C. 29403-5107

Attn: Bethany Ward

Re: REVISED - Joint Base Charleston, Maintenance Dredging, Cooper River and Goose Creek, Berkeley County, South Carolina, FWS Log No. 2018-I-1277

Dear Ms. Perkins:

The U.S. Fish and Wildlife Service (Service) received the U.S. Army Corps of Engineers-Charleston District's (USACE) letter of September 24, 2018, regarding dredging in Berkeley County, South Carolina. The U.S. Air Force, on behalf of Joint Base Charleston (JBC), will be performing maintenance dredging in the Cooper River and Goose Creek to improve navigation and vessel berthing areas. The USACE evaluated the proposed action pursuant to section 7 of the Endangered Species Act of 1973 (ESA) and is now seeking our concurrence with the determination of impact upon threatened and endangered (T&E) species.

As described, the proposed dredging is to maintain JBC vessel navigation and berthing areas through dredging of up to 2 million cubic yards of material per year. Dredging depth in the Cooper River will be 40 feet below mean lower low water (MLLW) with a 2-foot over depth allowance. Depths in the Goose Creek will be 25 feet MLLW with a 2-foot over depth allowance. All dredged material will be placed in existing Yellow House Creek, Joint Base Charleston, and Clouter Creek disposal areas adjacent to the Cooper River. Dredging will be conducted using either a hydraulic cutter head or via mechanical clamshell. No timeframe for the dredging operations was provided.

Potential impacts to threatened and endangered species were evaluated by the USACE. Although multiple species were evaluated, only one, the West Indian manatee (*Trichechus manatus)*, has the potential to occur in the project area. After review, the USACE concluded the proposed surveys may affect, but are not likely to adversely affect the West Indian manatee. The Service concurs with your determination. A conclusion of "no effect" was made for the remainder of threatened and endangered species managed by the Service. Consultation under section 7 of the ESA is not required for no effect determinations. Please contact the National Oceanic and Atmospheric Administration for consultation requirements regarding the Atlantic and shortnose sturgeon.

Please note that obligations under the ESA must be reconsidered if: (1) new information reveals impacts of this identified action may affect any federally listed species or critical habitat in a manner not previously considered; (2) this action is subsequently modified in a manner, which was not considered in this assessment; or (3) a new species is listed or critical habitat is designated that may be affected by the identified action. Further we recommend that the standard manatee protections guidelines are followed during all dredging operations.

The Service also recommends the USACE consider the potential presence and project impacts to At-Risk-Species (ARS) that may be in the project area. Although no federal protections are afforded to ARS, we recommend the USACE consider the potential impacts of this project in your evaluation of the dredging project. We have included a list of the ARS that may occur in Berkeley County, South Carolina. Incorporating proactive measures to avoid or minimize harm to ARS may improve their status and assist with precluding the need to list these species. Additional information on ARS can be found at:

http://www.fws.gov/southeast/candidateconservation

Thank you for the opportunity to provide these comments in the early stages of the restoration project. If you should need further clarification regarding the Service's recommendations, please contact Mr. Mark Caldwell at (843) 727-4707 ext. 215, and reference FWS Log No. 2018-I-1277.

Sincerely,

Thomas D. McCoy
Field Supervisor

TDM/MAC

South Carolina List of At-Risk, Candidate, Endangered, and Threatened Species - Berkeley County

CATEGORY	COMMON NAME/STATUS	SCIENTIFIC NAME	SURVEY WINDOW/ TIME PERIOD	COMMENTS
Amphibian	Frosted flatwoods salamander (T, CH)	*Ambystoma cingulatum*	January 1-April 30	Larvae present in breeding ponds
	Gopher frog (ARS)	*Lithobates capito*	Breeding: October-March	Call survey: February-April
Bird	American wood stork (T)	*Mycteria americana*	February 15-September 1	Nesting season
	Bald eagle (BGEPA)	*Haliaeetus leucocephalus*	October 1-May 15	Nesting season
	MacGillivray's seaside sparrow (ARS)	*Ammodramus maritimus macgillivraii*	May-June	
	Red-cockaded woodpecker (E)	*Picoides borealis*	April 1-July 31	Nesting season
	Saltmarsh sparrow (ARS)	*Ammospiza caudacuta*	Fall/winter	Fall/winter surveys
Crustacean	None Found			
Fish	Atlantic sturgeon* (E)	*Acipenser oxyrinchus**	February 1-April 30	Spawning migration
	Blueback herring* (ARS)	*Alosa aestivalis**	Mid-January-mid May	Peak: March-April
	Shortnose sturgeon* (E)	*Acipenser brevirostrum**	February 1-April 30	Spawning migration
Insect	Frosted elfin (ARS)	*Callophrys irus*	March - June	
	Monarch butterfly (ARS)	*Danaus plexippus*	August-December	Overwinter population departs: March-April
Mammal	Northern long-eared bat (T)	*Myotis septentrionalis*	Year round	Winter surveys not as successful
	Tri-colored bat (ARS)	*Perimyotis subflavus*	Year round	Found in mines and caves in the winter
	West Indian manatee (T)	*Trichechus manatus*	May 15-October 15	In coastal waters
Mollusk	None Found			
Plant	American chaffseed (E)	*Schwalbea americana*	May-August	1-2 months after a fire
	Boykin's lobelia (ARS)	*Lobelia boykinii*	May-July/August	
	Bog asphodel (ARS*)	*Narthecium americanum*	June-July	
	Canby's dropwort (E)	*Oxypolis canbyi*	Mid-July-September	
	Carolina-birds-in-a-nest (ARS)	*Macbridea caroliniana*	July-November	
	Ciliate-leaf tickseed (ARS)	*Coreopsis integrifolia*	August-November	
	Pondberry (E)	*Lindera melissifolia*	February-March	
	Raven's seedbox (ARS)	*Ludwigia ravenii*	June-October	
	Sun-facing coneflower (ARS)	*Rudbeckia heliopsidis*	July-September	
Reptile	Eastern diamondback rattlesnake (ARS)	*Crotalus adamanteus*	Most of the year	Peak: April-November
	Southern hognose snake (ARS)	*Heterodon simus*	Most of the year	
	Spotted turtle (ARS)	*Clemmys guttata*	February-mid April	

DEPARTMENT OF THE ARMY
U.S. ARMY CORPS OF ENGINEERS, CHARLESTON DISTRICT
69 A HAGOOD AVENUE
CHARLESTON SC 29403-5107

September 24, 2018

Mr. Tom McCoy
Field Supervisor
U.S. Fish and Wildlife Service
176 Croghan Spur Road, Suite 200
Charleston, SC 29407

Dear Mr. McCoy:

The U.S. Air Force, on behalf of Joint Base Charleston (JBC), is proposing to conduct routine maintenance dredging of the of the JBC navigation channel and associated vessel berthing areas of the Cooper River and Goose Creek, over a 10-year period from 2020 to 2030. The U.S. Army Corps of Engineers, Charleston District (USACE) is assisting the U.S. Air Force in complying with the National Environmental Policy Act and other environmental laws and regulations.

The USACE, on behalf of the U.S. Air Force, is seeking a letter of concurrence under Section 7(a)(2) of the Endangered Species Act of 1973 (as amended) for consultation #04ES1000-2018-SLI-1208, Joint Base Charleston Maintenance Dredging 2020-2030. A Section 7(a)(2) evaluation has been prepared and is enclosed for your consideration. Through the process of the Section 7(a)(2) evaluation, the USACE has determined that the proposed Federal action will have no effect, or is not likely to adversely affect, threatened and endangered species under the jurisdiction of the USFWS. The USACE kindly requests expedited concurrence with this determination since the evaluation concludes that no adverse impacts will result from the proposed action.

If you have any questions about the proposed federal action or Section 7(a)(2) evaluation being submitted, please contact Ms. Bethney Ward at (843)329-8162 or by email at Bethney.P.Ward@usace.army.mil.

Sincerely,

Diane C. Perkins, AICP
Chief, Planning and Environmental Branch

Enclosure

Section 7(a)(2) Evaluation for

Joint Base Charleston Maintenance Dredging 2020-2030

Submitted to the US Fish and Wildlife Service by the U.S. Army Corps of Engineers, on behalf of the U.S. Air Force

September 2018

In accordance with Sections 7(a)(2) of the Endangered Species Act (ESA), the U.S. Army Corps of Engineers, Charleston District (USACE) provides the following evaluation to the U.S. Fish and Wildlife Service (USFWS) in support of consultation 04ES1000-2018-SLI-1208 for the proposed action "Joint Base Charleston Maintenance Dredging 2020-2030." This evaluation presents the information considered by the Federal Action Agency (the U.S. Air Force) for determining potential impacts to threatened and endangered species under the jurisdiction of the USFWS, in accordance with the Endangered Species Act of 1973, as amended.

BACKGROUND

Joint Base Charleston (JBC) in Berkeley County, South Carolina has performed routine dredging along approximately 4.8 miles of the Cooper River and along approximately 0.4 miles of Goose Creek from the confluence of the Cooper River since the 1940s. Dredging is performed to provide sufficient depth for navigation and berthing of Department of Navy, Military Sealift Command, Defense Fuels Supply Depot, Department of Army, Department of Air Force, and Department of Energy vessels that support JBC waterborne missions. The Naval Weapons Station Charleston, now known as Joint Base Charleston, currently holds a permit from the USACE and South Carolina Department of Health and Environmental Control (SCDHEC) to conduct maintenance dredging of the channels and several berthing areas. The current permit will expire on 31 March 2020, and the action proponent, the U.S. Air Force on behalf of JBC, intends to apply for a new 10-year permit that will authorize maintenance dredging for another ten years. Since this is a Federal action, an Environmental Assessment (EA) is being prepared to evaluate the potential environmental impacts of the proposed action, in compliance with the National Environmental Policy Act of 1969 (NEPA). The proposed action is not a new activity, but the project was initially Categorically Excluded from NEPA in accordance with Navy regulations. The USACE is assisting the U.S. Air Force (USAF) with preparation of the EA and their compliance with other environmental laws and regulations.

PROPOSED ACTION

A detailed description of the proposed action and alternatives being considered by the Federal Action Agency can be found in **Attachment 1**. In summary, the proposed action is to maintain JBC vessel navigation/berthing areas through routine dredging of up to 2,000,000 cubic yards (cy) of material per year (see Figure 1). The dredging depth within the JBC Channel is 40' required depth, plus 2' allowable overdepth Mean Lower Low Water (MLLW). The depth within the Goose Creek Channel is 25' required depth, plus 2' allowable overdepth MLLW. The piers and docks have varying depth requirements depending on their purpose, as do shoals. Advanced maintenance dredging of 4' is proposed for three of the dredging areas – Shoal 4, Shoal 4A, and TC Dock – where accelerated shoaling has been experienced over the past ten years. The width of shoals within the JBC Channel and Goose Creek Channel vary;

however, the required width for piers and docks is 125'. The dredging requirements for the entire proposed action can be found in Attachment 1.

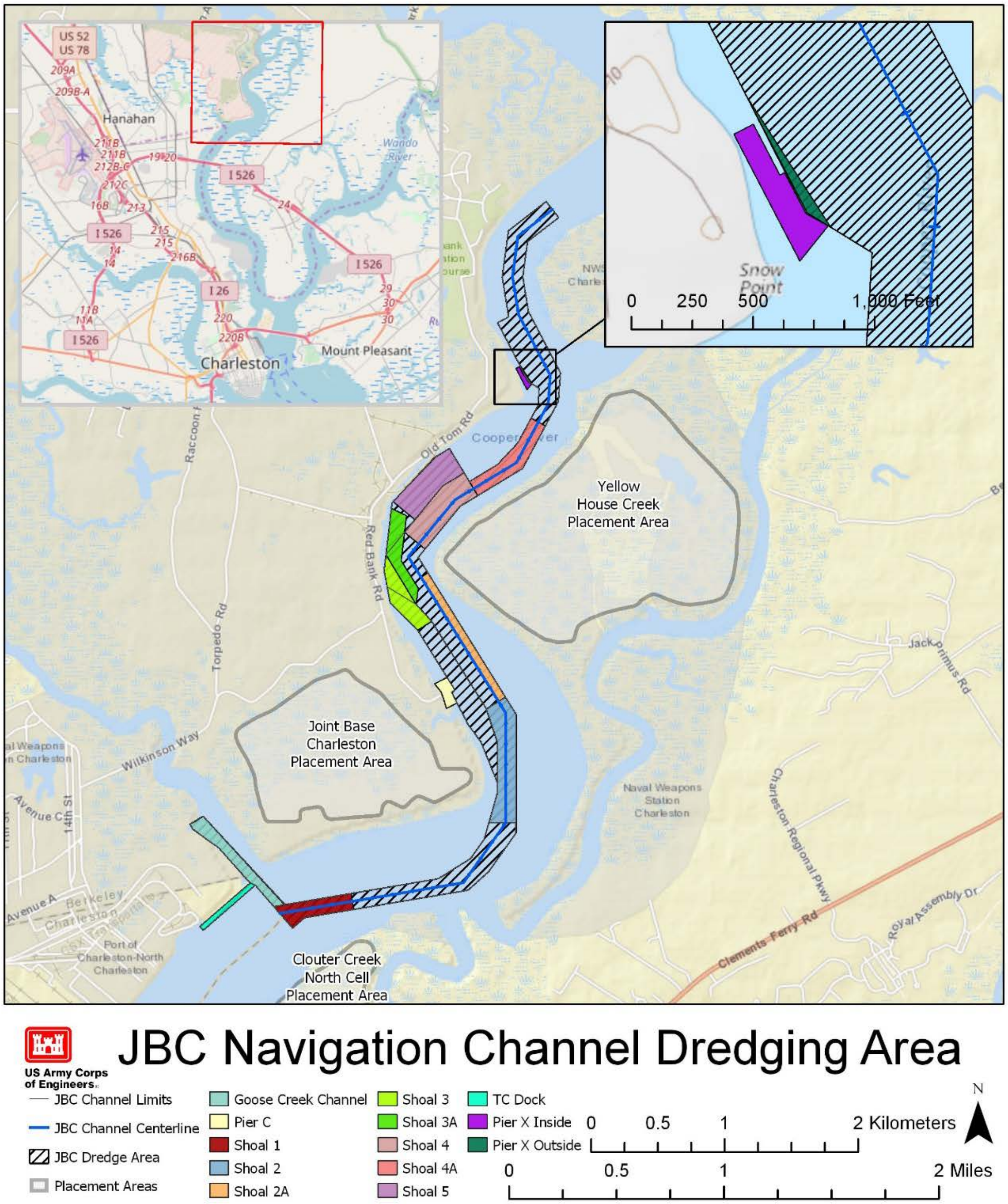


Figure 1. Location of Joint Base Charleston Dredging Area

To maintain current project depths, routine maintenance dredging is required on a 15-20 month rotating cycle, with the exception of the TC Dock area which is dredged approximately every nine months. To meet new dredging needs, a small area at Pier X South will be dredged and maintained that was not included in the original permit but was assessed in a recent Supplemental EA (US Department of the Navy and US Department of the Air Force, 2018). A second new, but small, area at Pier C also needs to be dredged and maintained. The pier structure no longer exists, but a floating dock is present.

Dredging would be conducted via hydraulic cutterhead or mechanical clamshell dredging methods, as appropriate, and the dredged material would be placed into one or more existing upland placement areas. The existing, confined, upland placement areas that would be used for disposal include the Yellow House Creek, Joint Base Charleston, and Clouter Creek Placement Areas.

SPECIES EVALUATIONS AND DETERMINATIONS

An official species list for the proposed action area was generated by the USFWS' Information for Planning and Consultation (IPaC) online system on September 4, 2018 (Consultation Code 04ES1000-2018-E-02307) can be found in **Attachment 2**. The species list revealed that eight threatened or endangered species managed by the USFWS may be in the vicinity of the proposed action area, including the West Indian manatee, the Northern long-eared bat, the red-cockaded woodpecker, the American wood stork, the frosted flatwoods salamander, and three plants – American chaffseed, Canby's dropwort, and pondberry. There is no critical habitat in the project action area. Additionally, 23 migratory birds protected under the Migratory Bird Act of 1918 or the Bald and Golden Eagle Protection Act of 1940 were identified.

Some of the species are that are on this list are the same as those evaluated in the Integrated Feasibility Study/Environmental Impact Statement (IFR/EIS) and the Biological Assessment (Appendix F1) for the Charleston Harbor Deepening and Widening Project – Post 45 (USACE 2015). That project includes dredging activities in the Federal navigation channel of the Cooper River, just downriver from the proposed action area. Similar dredging methods and upland placement areas will be utilized for the proposed action as to those evaluated for impacts to species on the Cooper River for the Post 45 Project. Therefore, similar rationale is used for this evaluation, but not repeated in detail here.

<u>Wood Stork</u>

Wood storks are wading birds found in brackish and freshwater wetlands in most coastal counties of South Carolina. They feed primarily on small estuarine fishes, such as sunfish. Habitat loss or alterations are cited as a major threat for wood storks, but the number of nesting pairs and nesting colonies in South Carolina has been increasing, and the nesting range along the South Atlantic coast is growing. Wood storks were upgraded from "endangered" to "threatened" under the Endangered Species Act in 2014. There are no known nesting colonies in the vicinity of the JBC navigation channel.

Substantial information on the American wood stork, including its life history, distribution, population status and threats as they relate to the Charleston Harbor system, can be found in the "Biological Assessment of Threatened and Endangered Species for Charleston Harbor Post 45 Project" (USACE 2015, Appendix F1). The Biological Assessment also included an evaluation of the potential for impacts to wood storks from the dredging activities.

The USFWS concurred with the Biological Assessment prepared for the Post 45 project that the dredging activity will not affect the American wood stork "as no suitable habitat for [this] species will be directly impacted" (USACE 2015, Appendix Q). Due to the proximity and similarity of the proposed action on the

Cooper River, the USACE concludes on behalf of the USAF that the proposed action will have no effect on the American wood stork.

Manatee

Manatees are most common in the warm waters of peninsular Florida, but some migrate along the South Carolina coast during the summer months. Manatees can inhabit shallow (5-20 feet) salt and fresh waters. Because of the high tidal amplitude in South Carolina, manatees feed on abundant salt marsh grasses at high tide and submerged algae beds at low tide. Manatees have occasionally been observed in the Cooper River. Most recently in 2016, a male manatee was rescued from cold stress in the Cooper River.

An extensive description of the West Indian manatee, including its life history, distribution, population status and threats as they relate to the Charleston Harbor system can be found in the "Biological Assessment of Threatened and Endangered Species" for Charleston Harbor Post 45 Project (USACE 2015, Appendix F1). A thorough evaluation of the impacts of dredging, including the types of activities to take place in the Cooper River, was also prepared for that Biological Assessment.

The USFWS acknowledged in response to the Biological Assessment and IFR/EIS for Post 45 (USACE 2015, Appendix Q) that with implementation of the USFWS' standard protection guidelines designed to avoid impacts to the West Indian manatee from vessel collisions with any dredging equipment, the Post 45 Project is not likely to adversely affect the West Indian manatee. These same conservation measures will be implemented for the proposed action. Therefore, the USACE concludes on behalf of the USAF that the proposed action may affect, but will not adversely affect, the West Indian manatee.

Terrestrial Species

None of the terrestrial species identified in the USFWS IPaC Species Report for the proposed action area (presumably in relation to the upland placement areas), were considered species of concern for the Post 45 Project for consultation under the ESA. The actual occurrence of these species in the proposed action area depends on the availability of suitable habitat, the season of the year relative to the species' temperature tolerance, migratory habitats, and other factors. Long-eared bats roost in cavities or crevices of both live and dead trees in the summertime. The preferred habitat of frosted flatwoods salamanders is open longleaf pine forests, pine flatwoods, or savannas with wiregrass. The red-cockaded woodpecker can be found in mature pine forests, preferably longleaf pines.

Due to the existing disturbed nature and active use of upland dredged material placement areas, suitable habitat for these species does not exist there. There is also no suitable habitat for American chaffseed, Canby's dropwort, and pondberry. Therefore, the USACE concludes on behalf of the USAF that the proposed action will have no effect on the Northern long-eared bat, red-cockaded woodpecker, frosted flatwoods salamander, American chaffseed, Canby's dropwort, and pondberry.

Migratory Birds

As stated previously, there are 23 species of migratory birds that could be present in the proposed action area. Given the relatively short duration (four to six months) of the periodic dredging activities, and limited habitat suitability for birds at the upland placement areas as discussed above, long term impacts to migratory birds are unlikely. However, common conservation practices used for other dredging projects can be considered. The USFWS recommended for the Post 45 Project that all lighting from dredge equipment, barges, and support vessels be directed downward toward the work area, and no skyward pointed lights be utilized in order to minimize the effects of nighttime dredging activities on migratory birds. This same conservation recommendation will be incorporated into the proposed action.

CONCLUSION OF SECTION 7(a)(2) EVALUATION

The USACE, on behalf of the USAF, has determined that the propped action will have no effect on the Northern long-eared bat, red-cockaded woodpecker, wood stork, frosted flatwoods salamander, American chaffseed, Canby's dropwort, and pondberry; and may affect, but not adversely affect, the West Indian manatee. The USAF is committed to implementing the USFWS' standard protection guidelines for manatees for the proposed action, and for controlling nighttime lighting for protection of migratory birds as described above.

REFERENCES

US Department of the Navy and US Department of the Air Force. 2018. *Final Supplemental Environmental Assessment for Additional Dredging for Facilities Expansion at the Navy Nuclear Power Training Unit Charleston, Joint Base Charleston, South Carolina*. March 2018.

US Army Corps of Engineers (USACE). 2015a. *Biological Assessment of Threatened and Endangered Species for Charleston Harbor Post 45 (Final),* Charleston, South Carolina. USACE Charleston District. May 2015.

US Army Corps of Engineers (USACE). 2015b*. Final Integrated Feasibility Report and Environmental Impact Statement for Charleston Harbor Post 45, Charleston, South Carolina.* USACE Charleston District. June 2015.

ATTACHMENT 1

Description of Proposed Action and Alternatives

For

Maintenance Dredging 2020-2030 at Joint Base Charleston, Berkeley County, South Carolina

June 2018

DESCRIPTION OF PROPOSED ACTION AND ALTERNATIVES

FOR

Maintenance Dredging 2020-2030 at Joint Base Charleston, Berkeley County, South Carolina

PRPARED FOR:

Department of the Air Force

July 2018

Letters or other written comments provided may be published in the Final Environmental Assessment (EA). As required by law, substantive comments will be addressed in the Final EA and made available to the public. Any personal information provided will be kept confidential. Private addresses will be compiled to develop a mailing list for those requesting copies of the Final EA. However, only the names of the individuals making comments and their specific comments will be disclosed. Personal home addresses and phone numbers will not be published in the Final EA.

1.0 PURPOSE OF AND NEED FOR ACTION

1.1 INTRODUCTION

Joint Base Charleston (JBC) in Berkeley County, South Carolina has performed routine dredging along approximately 4.8 miles of the Cooper River and along approximately 0.4 miles of Goose Creek from the confluence of the Cooper River since the 1940s (Figure 1). Dredging is performed to provide sufficient depth for navigation and berthing of Department of Navy, Military Sealift Command, Defense Fuels Supply Depot, Department of Army, Department of Air Force, and Department of Energy vessels that support JBC waterborne missions. The Naval Weapons Station Charleston (now known as Joint Base Charleston) currently holds a permit from the U.S. Army Corps of Engineers (USACE) and South Carolina Department of Health and Environmental Control (SCDHEC) to conduct maintenance dredging of the channels and several berthing areas.

The USACE, Charleston District issued permit no. 2009-00175-2IR for the existing maintenance dredging in March 2010. The project was Categorically Excluded in accordance with Navy regulations at the time, so an Environmental Assessment (EA) was not prepared. As part of the permit, a Certification in accordance with Section 401 of the Clean Water Act and a Certification in accordance with the Coastal Zone Management Act (15 CFR Part 923) were obtained from the SCDHEC. In 2011, the permit was modified to include dredging of a small area outside/riverside of Pier X to obtain the depths necessary for vessels to dock at this pier (see Figure 1, inset map). Additionally, a Supplemental EA was prepared and a Finding of No Significant Impact was signed in 2018 for an approximate 2 acre area inside/shoreside of Pier X in need of dredging that was not covered in the existing dredging permit.

The current permit will expire on 31 March 2020, and the action proponent, the U.S. Air Force on behalf of JBC, intends to apply for a new 10-year permit that will authorize maintenance dredging for another ten years. Since this is a Federal project, an Environmental Assessment (EA) will be prepared to evaluate the potential environmental impacts of the proposed action in compliance with the National Environmental Policy Act of 1969 (NEPA) (42 United States Code [USC] 4331 et seq.), the regulations of the President's Council on Environmental Quality (CEQ) that implement NEPA procedures (40 CFR 1500-1508), the Air Force Environmental Impact Assessment Process Regulations at 32 CFR Part 989, and Air Force Instruction 32-7061. The information presented in the Final EA will serve as the basis for deciding whether the proposed action would result in a significant impact to the environment, requiring the preparation of an Environmental Impact Statement (EIS), or whether no significant impacts would occur, in which case a Finding of No Significant Impact (FONSI) would be appropriate.

1.2 PURPOSE OF AND NEED FOR THE ACTION

The purpose for the action is to provide and sustain sufficient depth for navigation and berthing of military vessels that support JBC waterborne missions. Dredging of the JBC navigation channels and associated berthing areas is needed to maintain current depths and meet new dredging requirements. The permit issued by the USACE and SCDHEC that currently authorizes maintenance dredging of the vessel navigation/berthing areas will expire on 31 March 2020. The U.S. Air Force on behalf of JBC is seeking to obtain a new permit that will authorize maintenance dredging for another ten years. Additionally, a new area at Pier C will need to be dredged and maintained that was not in the original permit, and the newly proposed inside/shoreside area of Pier X that was not part of the original permit but already assessed, will be included in the new permit request for future maintenance dredging. JBC will not be able to perform dredging and implement their waterborne missions without a new permit.

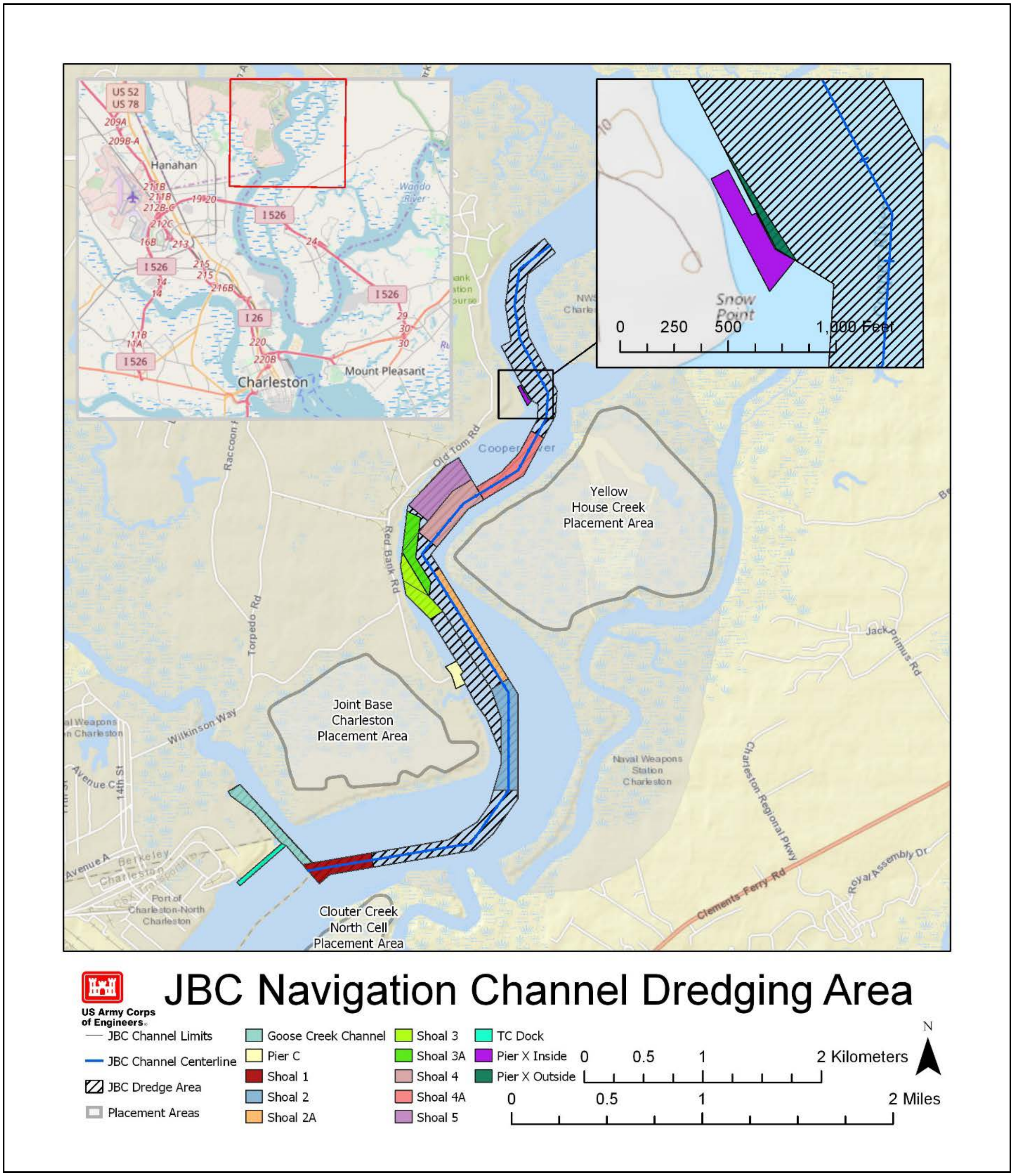


Figure 1. Location of Joint Base Charleston Dredging Area and Units.

1.3 DECISION TO BE MADE

The decision to be made is the selection of an alternative by the U.S. Air Force to support future maintenance dredging of the JBC channels and associated vessel berthing areas. The decision options are to:

- Discontinue routine maintenance dredging when the current dredging permit expires (the No Action Alternative);
- Select an action alternative for maintenance and/or new dredging, and prepare a Finding of No Significant Impact (FONSI); or
- Prepare an Environmental Impact Statement (EIS) if the alternatives will result in significant environmental impacts.

1.4 INTERGOVERNMENTAL COORDINATION

1.4.1 Interagency and Intergovernmental Coordination and Consultation

Scoping is an early and open process for developing the breadth of issues to be addressed in the EA, and for identifying significant concerns related to a proposed action. Per requirements of the Intergovernmental Cooperation Act of 1968 (42 U.S.C. 4231(a)) and Executive Order 12372, Federal, state, and local agencies with jurisdiction that could be affected by the proposed action will be notified during the development of the EA. This will include agencies with legal authorities under Section 7 of the Endangered Species Act, the Magnuson-Stevens Fishery Conservation and Management Act, the Clean Water Act, the Clean Air Act, the Coastal Zone Management Act, and the National Historic Preservation Act. The agencies consulted regarding the proposed action will be presented in the EA, along with copies of correspondence.

1.4.2 Government to Government Consultations

Executive Order 13175, Consultation and Coordination with Indian Tribal Governments (6 November 2000), directs Federal agencies to coordinate and consult with Native American tribal governments whose interests might be directly or substantially affected by activities in federally administered areas. Consistent with that executive order, DoDI 4710.02, *Interactions with Federally-Recognized Tribes*, and AFI 90-2002, *Air Force Interaction with Federally-recognized Tribes*, federally recognized tribes that are affiliated historically with the JBC geographic area will be invited to consult on the proposed action for the potential to affect resources of cultural, historical, or religious significance to the tribes. The tribal consultation process is distinct from NEPA consultation or the interagency coordination process, and it requires separate notification of all relevant tribes. The timelines for tribal consultation are also distinct from those of other consultations. The Native American tribal governments that will be coordinated with regarding the proposed action, their comments, and the U.S. Air Force’s responses will be summarized in the EA.

1.5 PUBLIC AND AGENCY REVIEW

Regulations from the CEQ (40 CFR 1506.6) direct Federal agencies to involve the public in preparing and implementing their NEPA documents. Comments from the public and agencies will be sought, through the scoping phase and on the Draft EA. A Notice of Availability (NOA) of the Draft EA and FONSI will be published in the local newspaper, *The Post & Courier*, announcing the availability of the draft EA and inviting the public to review and comment on the Draft EA. Copies of the Draft EA and FONSI may also be made available for review at public locations. The NOA, the public and agency comments, and the U.S. Air Force's responses will be summarized in the Final EA.

2.0 DESCRIPTION OF THE PROPOSED ACTION AND ALTERNATIVES

2.1 PROPOSED ACTION

The proposed action is to maintain JBC vessel navigation/berthing areas through routine dredging of up to 2,000,000 cubic yards (cy) of material per year. Maintenance dredging of the JBC channels and berthing areas is managed by dredging units identified by shoals, piers and docks (see Figure 1). The dredging depth within the JBC Channel is 40' required depth, plus 2' allowable overdepth Mean Lower Low Water (MLLW). The depth within the Goose Creek Channel is 25' required depth, plus 2' allowable overdepth MLLW. Allowable overdepth is to assure the action is constructed to the authorized depth. The piers and docks have varying depth requirements (see Section 2.4) depending on their purpose. Advanced maintenance dredging of 4' is proposed for three of the dredging units – Shoal 4, Shoal 4A, and TC Dock – where accelerated shoaling has been experienced over the past ten years. Advanced maintenance is conducted to enable the action to maintain the authorized depth for a longer period of time, potentially reducing the need to dredge more often. The width of shoals within the JBC Cannel and Goose Creek Channel vary; however, the required width for piers and docks is 125'.

To maintain current project depths, routine maintenance dredging is required on a 15-20 month rotating cycle, with the exception of the TC Dock area every nine months. To meet new dredging needs, a small area at Pier X South will be dredged and maintained that was not included in the original permit but was assessed in a recent Supplemental EA (US Department of the Navy and US Department of the Air Force, 2018). A second new area at Pier C also needs to be dredged and maintained (see Section 2.4). The pier structure no longer exists, but a floating dock is present.

Dredging wouldl be conducted via hydraulic cutterhead or mechanical clamshell dredging methods, as appropriate, and the dredged material would be placed into one or more existing upland placement areas. The existing, confined, upland placement areas that would be used include the Yellow House Creek, Joint Base Charleston, and Clouter Creek Placement Areas (Figure 2). The Clouter Creek Placement Area is currently used for material from the TC Dock dredging unit.

2.2 SELECTION STANDARDS

NEPA and the CEQ regulations mandate the consideration of reasonable alternatives for the proposed action. "Reasonable alternatives" are those that also could be utilized to meet the purpose of and need for the proposed action. Per the requirements of the Air Force Environmental Impact Analysis Process regulations (32 CFR Part 989), selection standards are used to identify alternatives for meeting the purpose of and need for the proposed action.

Figure 2. Locations of Placement Areas for Joint Base Charleston Maintenance Dredging.

In addition to supporting the Purpose of and Need for the Action, the proposed action must meet the following dredging method selection standards:

- Minimum depth of 42’ in the Cooper River navigation channel and major berths, 25’ in the Goose Creek navigation channel and berths, and 10’ to and at Pier C in order to maintain safe operations
- Establish dredge cycles (schedules) and depths for the dredging units that minimize frequency of dredging
- Utilize the most effective and efficient dredging methods and equipment based on cost, timing, availability and accessibility of placement areas, and environmental considerations
  - The decision to use one type of dredging method or another is based on a variety of factors, including environmental considerations, cost, timing, and the suitability of material placement areas. Flexibility is even more important for smaller dredging projects because the mobilization of dredging equipment is a greater percentage of the overall cost. Traditionally, both hydraulic cutterhead and mechanical clamshell dredges have been used to maintain the Federal navigation channel in the Cooper River below the JBC channel limits. Hopper dredges do not need to be considered because the capacity provided by these dredges is not needed in this part of the Cooper River; likewise hopper dredges pose greater risks to fish and sea turtles and operate within restricted seasonal windows.
  - Utilization of material placement areas other than those currently being used does not need to be considered. The three containment areas proposed are owned and/or managed by Joint Base Charleston or the US Army Corps of Engineers, specifically for the purpose of supporting the navigable waters that JBC or USACE has jurisdiction for. They are currently being used for material disposal under the existing permit, and capacity in the placement areas is actively monitored. Using other placement areas is not considered practicable because it would result in additional costs and enhanced environmental risks associated with transporting the material greater distances through busy waterways.
- Minimize impacts to US waters, human health, habitat, and threatened and endangered species
- Do not impact cultural or historical resources.

2.3 DETAILED DESCRIPTION AND SCREENING OF THE ALTERNATIVES

As described Section 2.2, reasonable alternatives to the proposed action must be considered. “Reasonable alternatives” are those that also could be utilized to meet the purpose of and need for the proposed action. The selection standards presented in Section 2.2 were applied to the following alternatives to determine which could serve the purpose of and need for the action.

2.3.1 Alternative 1 (Preferred Alternative): New and Existing Maintenance Dredging

This is the preferred action alternative, and entails conducting routine maintenance dredging of the JBC navigation channel and berthing areas, including new and existing dredging units. The specifications for the dredging units (depth, slope, etc.) over a 10-year period are presented in Table 1. The locations of the dredging units are shown in Figure 1. Dredging would be conducted by hydraulic cutterhead or mechanical clamshell methods, as appropriate, on a 15-20 month rotating cycle (or 9 months for TC Dock, as needed) as determined by routine depth soundings. Depths are measured at MLLW. The dredged material would be placed, as appropriate, into one or more of the designated upland placement areas which includes Yellow House Creek, Joint Base Charleston, and Clouter Creek. This alternative meets all of the selection standards.

TABLE 1. Dredging Units for Joint Base Charleston Navigation Channels and Berthing Areas

Dredging Unit	Status	Proposed Depth and Slope
JBC Channel Shoal 1 JBC Channel Shoal 2 JBC Channel Shoal 2A JBC Channel Shoal 3 JBC Channel Shoal 3A JBC Channel Shoal 5 JBC Channel Shoal 6	Previously permitted and dredged to 42' MLLW (40' +2' overdepth; 1:4 side slopes)	40' MLLW required depth + 2' allowable overdepth; 1:4 side slopes
JBC Channel Shoal 4 JBC Channel Shoal 4A	Previously permitted and dredged to 42' MLLW (40' +2' overdepth; 1:4 side slopes)	40' MLLW required depth + 4' advanced maintenance + 2' allowable overdepth; 1:4 side slopes
TC Dock	Previously permitted and dredged to 42' MLLW (40' +2' overdepth; 1:4 side slopes)	40' MLLW required depth + 4' advanced maintenance + 2' allowable overdepth; 1:4 side slopes
Pier X South, 1.06 acre area riverside/outside berth	Previously permitted [existing permit modified in 2011] and dredged to 36' MLLW (34' +2' overdepth; 1:4 side slopes)	40' MLLW required depth + 2' allowable overdepth; 1:4 side slopes
Pier X South, 2.2 acre area barge shoreside/inside berths	Partially dredged once in 1991 during pier construction; not part of current maintenance dredging permit	20' MLLW required depth + 2' allowable overdepth; 1:4 side slopes
Pier C Security Boat Dock	Newly proposed	10' MLLW required depth + 2' allowable overdepth; 1:4 side slopes
Goose Creek Channel	Previously permitted and dredged to 27'MLLW (25' + 2' overdepth; 1:4 side slopes)	25' MLLW required depth + 2' allowable overdepth; 1:4 side slopes

2.3.2 Alternative 2: Existing Maintenance Dredging

This alternative is the same as the preferred action alternative (Alternative 1), with the elimination of new dredging requirements for the Pier C access channel and berth to 10' MLLW plus 2' overdepth and 4:1 side slopes. With current depths at Pier C, JBC missions can still function but will be subject to operational constraints and navigation hazards at low tide. This alternative meets most of the selection standards, but only partially meets the first selection standard in Section 2.2 for minimum navigation depths needed for safe navigation.

2.3.3 Alternative 3: No Action Alternative

Under the No Action Alternative, the proposed action would not be met. This alternative entails not conducting routine maintenance dredging of the JBC vessel navigation/berthing areas and the dredging units presented in Table 1 over a 10-year period after the current permit expires. As a result of no action, sediments will accumulate along the sides and bottom of the channels and in berthing areas, resulting in shoaling that will limit clearance/access for vessels to reach JBC to execute their operational mission. A grounded vessel poses a risk to safe navigation, results in vessel damage, and reduces mission capabilities.

The No Action Alternative cannot be considered reasonable, as it fails to address the purpose of and need for the action. However, it will be carried forward for further analysis, consistent with the CEQ regulations, and to provide a baseline against which the impacts of the other alternatives can be assessed.

2.4 ALTERNATIVES ELIMINATED FROM FURTHER CONSIDERATION

Although Alternative 2 for Existing Maintenance Dredging, which excludes new 10’ (+2’) dredging at Pier C, does not meet all of the selection standards, it will be carried forward for further consideration in the EA. The NEPA process is intended to support flexible, informed decision-making. The environmental impact analysis that will be conducted for the Draft EA and feedback from the public and other agencies will inform decisions to be made about whether, when and how to execute the proposed action.

3.0 Reference

US Department of the Navy and US Department of the Air Force. 2018. Final Supplemental Environmental Assessment for Additional Dredging for Facilities Expansion at the Navy Nuclear Power Training Unit Charleston, Joint Base Charleston, South Carolina. March 2018.

ATTACHMENT 2

USFWS Official Species List

Generated by IPaC for

Joint Base Charleston Maintenance Dredging 2020-2030

September 4, 2018

United States Department of the Interior

FISH AND WILDLIFE SERVICE
South Carolina Ecological Services
176 Croghan Spur Road, Suite 200
Charleston, SC 29407-7558
Phone: (843) 727-4707 Fax: (843) 727-4218
http://www.fws.gov/charleston/

In Reply Refer To: September 04, 2018
Consultation Code: 04ES1000-2018-SLI-1208
Event Code: 04ES1000-2018-E-02307
Project Name: Joint Base Charleston Maintenance Dredging 2020-2030

Subject: List of threatened and endangered species that may occur in your proposed project location, and/or may be affected by your proposed project

To Whom It May Concern:

The enclosed species list identifies threatened, endangered, proposed and candidate species, as well as proposed and final designated critical habitat, that may occur within the boundary of your proposed project and/or may be affected by your proposed project. The species list fulfills the requirements of the U.S. Fish and Wildlife Service (Service) under section 7(c) of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 *et seq.*).

New information based on updated surveys, changes in the abundance and distribution of species, changed habitat conditions, or other factors could change this list. Please feel free to contact us if you need more current information or assistance regarding the potential impacts to federally proposed, listed, and candidate species and federally designated and proposed critical habitat. Please note that under 50 CFR 402.12(e) of the regulations implementing section 7 of the Act, the accuracy of this species list should be verified after 90 days. This verification can be completed formally or informally as desired. The Service recommends that verification be completed by visiting the ECOS-IPaC website at regular intervals during project planning and implementation for updates to species lists and information. An updated list may be requested through the ECOS-IPaC system by completing the same process used to receive the enclosed list.

The purpose of the Act is to provide a means whereby threatened and endangered species and the ecosystems upon which they depend may be conserved. Under sections 7(a)(1) and 7(a)(2) of the Act and its implementing regulations (50 CFR 402 *et seq.*), Federal agencies are required to utilize their authorities to carry out programs for the conservation of threatened and endangered species and to determine whether projects may affect threatened and endangered species and/or designated critical habitat.

A Biological Assessment is required for construction projects (or other undertakings having similar physical impacts) that are major Federal actions significantly affecting the quality of the human environment as defined in the National Environmental Policy Act (42 U.S.C. 4332(2)(c)). For projects other than major construction activities, the Service suggests that a biological evaluation similar to a Biological Assessment be prepared to determine whether the project may affect listed or proposed species and/or designated or proposed critical habitat. Recommended contents of a Biological Assessment are described at 50 CFR 402.12.

If a Federal agency determines, based on the Biological Assessment or biological evaluation, that listed species and/or designated critical habitat may be affected by the proposed project, the agency is required to consult with the Service pursuant to 50 CFR 402. In addition, the Service recommends that candidate species, proposed species and proposed critical habitat be addressed within the consultation. More information on the regulations and procedures for section 7 consultation, including the role of permit or license applicants, can be found in the "Endangered Species Consultation Handbook" at:

http://www.fws.gov/endangered/esa-library/pdf/TOC-GLOS.PDF

Please be aware that bald and golden eagles are protected under the Bald and Golden Eagle Protection Act (16 U.S.C. 668 *et seq.*), and projects affecting these species may require development of an eagle conservation plan (http://www.fws.gov/windenergy/eagle_guidance.html). Additionally, wind energy projects should follow the wind energy guidelines (http://www.fws.gov/windenergy/) for minimizing impacts to migratory birds and bats.

Guidance for minimizing impacts to migratory birds for projects including communications towers (e.g., cellular, digital television, radio, and emergency broadcast) can be found at: http://www.fws.gov/migratorybirds/CurrentBirdIssues/Hazards/towers/towers.htm; http://www.towerkill.com; and http://www.fws.gov/migratorybirds/CurrentBirdIssues/Hazards/towers/comtow.html.

We appreciate your concern for threatened and endangered species. The Service encourages Federal agencies to include conservation of threatened and endangered species into their project planning to further the purposes of the Act. Please include the Consultation Tracking Number in the header of this letter with any request for consultation or correspondence about your project that you submit to our office.

Attachment(s):

- Official Species List
- USFWS National Wildlife Refuges and Fish Hatcheries
- Migratory Birds

Official Species List

This list is provided pursuant to Section 7 of the Endangered Species Act, and fulfills the requirement for Federal agencies to "request of the Secretary of the Interior information whether any species which is listed or proposed to be listed may be present in the area of a proposed action".

This species list is provided by:

South Carolina Ecological Services
176 Croghan Spur Road, Suite 200
Charleston, SC 29407-7558
(843) 727-4707

Project Summary

Consultation Code: 04ES1000-2018-SLI-1208

Event Code: 04ES1000-2018-E-02307

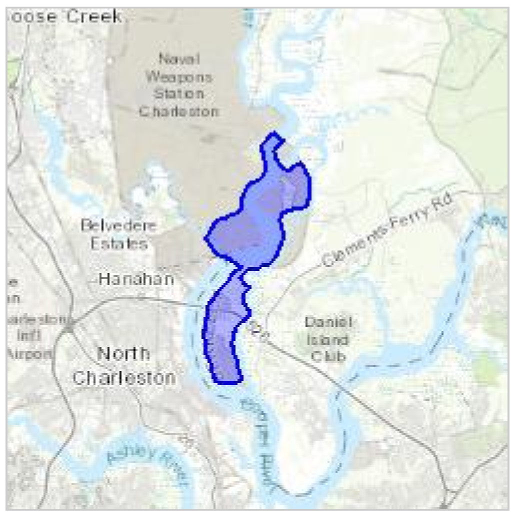
Project Name: Joint Base Charleston Maintenance Dredging 2020-2030

Project Type: DREDGE / EXCAVATION

Project Description: Conduct routine, maintenance dredging of the JBC navigation channel over next 10 years, utilizing existing upland placement areas for disposal.

Project Location:

Approximate location of the project can be viewed in Google Maps: https://www.google.com/maps/place/32.909108496470765N79.93718208928647W



Counties: Berkeley, SC

Endangered Species Act Species

There is a total of 8 threatened, endangered, or candidate species on this species list.

Species on this list should be considered in an effects analysis for your project and could include species that exist in another geographic area. For example, certain fish may appear on the species list because a project could affect downstream species.

IPaC does not display listed species or critical habitats under the sole jurisdiction of NOAA Fisheries[1], as USFWS does not have the authority to speak on behalf of NOAA and the Department of Commerce.

See the "Critical habitats" section below for those critical habitats that lie wholly or partially within your project area under this office's jurisdiction. Please contact the designated FWS office if you have questions.

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1. NOAA Fisheries, also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

Mammals

NAME	STATUS
Northern Long-eared Bat *Myotis septentrionalis* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/9045	Threatened
West Indian Manatee *Trichechus manatus* There is **final** critical habitat for this species. Your location is outside the critical habitat. ***This species is also protected by the Marine Mammal Protection Act, and may have additional consultation requirements.*** Species profile: https://ecos.fws.gov/ecp/species/4469	Threatened

Birds

NAME	STATUS
Red-cockaded Woodpecker *Picoides borealis* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/7614	Endangered
Wood Stork *Mycteria americana* Population: AL, FL, GA, MS, NC, SC No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/8477	Threatened

Amphibians

NAME	STATUS
Frosted Flatwoods Salamander *Ambystoma cingulatum* There is **final** critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/4981	Threatened

Flowering Plants

NAME	STATUS
American Chaffseed *Schwalbea americana* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/1286	Endangered
Canby's Dropwort *Oxypolis canbyi* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/7738	Endangered
Pondberry *Lindera melissifolia* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/1279	Endangered

Critical habitats

THERE ARE NO CRITICAL HABITATS WITHIN YOUR PROJECT AREA UNDER THIS OFFICE'S JURISDICTION.

USFWS National Wildlife Refuge Lands And Fish Hatcheries

Any activity proposed on lands managed by the National Wildlife Refuge system must undergo a 'Compatibility Determination' conducted by the Refuge. Please contact the individual Refuges to discuss any questions or concerns.

REFUGE INFORMATION WAS NOT AVAILABLE WHEN THIS SPECIES LIST WAS GENERATED. PLEASE CONTACT THE FIELD OFFICE FOR FURTHER INFORMATION.

Migratory Birds

Certain birds are protected under the Migratory Bird Treaty Act[1] and the Bald and Golden Eagle Protection Act[2].

Any person or organization who plans or conducts activities that may result in impacts to migratory birds, eagles, and their habitats should follow appropriate regulations and consider implementing appropriate conservation measures, as described below.

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1. The Migratory Birds Treaty Act of 1918.
2. The Bald and Golden Eagle Protection Act of 1940.
3. 50 C.F.R. Sec. 10.12 and 16 U.S.C. Sec. 668(a)

The birds listed below are birds of particular concern either because they occur on the USFWS Birds of Conservation Concern (BCC) list or warrant special attention in your project location. To learn more about the levels of concern for birds on your list and how this list is generated, see the FAQ below. This is not a list of every bird you may find in this location, nor a guarantee that every bird on this list will be found in your project area. To see exact locations of where birders and the general public have sighted birds in and around your project area, visit the E-bird data mapping tool (Tip: enter your location, desired date range and a species on your list). For projects that occur off the Atlantic Coast, additional maps and models detailing the relative occurrence and abundance of bird species on your list are available. Links to additional information about Atlantic Coast birds, and other important information about your migratory bird list, including how to properly interpret and use your migratory bird report, can be found below.

For guidance on when to schedule activities or implement avoidance and minimization measures to reduce impacts to migratory birds on your list, click on the PROBABILITY OF PRESENCE SUMMARY at the top of your list to see when these birds are most likely to be present and breeding in your project area.

NAME	BREEDING SEASON
American Kestrel *Falco sparverius paulus* This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA	Breeds Apr 1 to Aug 31
American Oystercatcher *Haematopus palliatus* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/8935	Breeds Apr 15 to Aug 31

NAME	BREEDING SEASON
Bald Eagle *Haliaeetus leucocephalus* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities. https://ecos.fws.gov/ecp/species/1626	Breeds Sep 1 to Jul 31
Black Skimmer *Rynchops niger* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/5234	Breeds May 20 to Sep 15
Clapper Rail *Rallus crepitans* This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA	Breeds Apr 10 to Oct 31
Dunlin *Calidris alpina arcticola* This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA	Breeds elsewhere
Eastern Whip-poor-will *Antrostomus vociferus* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds May 1 to Aug 20
Gull-billed Tern *Gelochelidon nilotica* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9501	Breeds May 1 to Jul 31
King Rail *Rallus elegans* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/8936	Breeds May 1 to Sep 5
Least Tern *Sterna antillarum* This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA	Breeds Apr 20 to Sep 10
Lesser Yellowlegs *Tringa flavipes* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9679	Breeds elsewhere
Marbled Godwit *Limosa fedoa* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9481	Breeds elsewhere

NAME	BREEDING SEASON
Nelson's Sparrow *Ammodramus nelsoni* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds elsewhere
Prairie Warbler *Dendroica discolor* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds May 1 to Jul 31
Prothonotary Warbler *Protonotaria citrea* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds Apr 1 to Jul 31
Red-headed Woodpecker *Melanerpes erythrocephalus* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds May 10 to Sep 10
Red-throated Loon *Gavia stellata* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds elsewhere
Ruddy Turnstone *Arenaria interpres morinella* This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA	Breeds elsewhere
Rusty Blackbird *Euphagus carolinus* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds elsewhere
Seaside Sparrow *Ammodramus maritimus* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds May 10 to Aug 20
Semipalmated Sandpiper *Calidris pusilla* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds elsewhere
Short-billed Dowitcher *Limnodromus griseus* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9480	Breeds elsewhere
Willet *Tringa semipalmata* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds Apr 20 to Aug 5

Probability Of Presence Summary

The graphs below provide our best understanding of when birds of concern are most likely to be present in your project area. This information can be used to tailor and schedule your project activities to avoid or minimize impacts to birds. Please make sure you read and understand the FAQ "Proper Interpretation and Use of Your Migratory Bird Report" before using or attempting to interpret this report.

Probability of Presence (■)

Each green bar represents the bird's relative probability of presence in the 10km grid cell(s) your project overlaps during a particular week of the year. (A year is represented as 12 4-week months.) A taller bar indicates a higher probability of species presence. The survey effort (see below) can be used to establish a level of confidence in the presence score. One can have higher confidence in the presence score if the corresponding survey effort is also high.

How is the probability of presence score calculated? The calculation is done in three steps:

1. The probability of presence for each week is calculated as the number of survey events in the week where the species was detected divided by the total number of survey events for that week. For example, if in week 12 there were 20 survey events and the Spotted Towhee was found in 5 of them, the probability of presence of the Spotted Towhee in week 12 is 0.25.
2. To properly present the pattern of presence across the year, the relative probability of presence is calculated. This is the probability of presence divided by the maximum probability of presence across all weeks. For example, imagine the probability of presence in week 20 for the Spotted Towhee is 0.05, and that the probability of presence at week 12 (0.25) is the maximum of any week of the year. The relative probability of presence on week 12 is 0.25/0.25 = 1; at week 20 it is 0.05/0.25 = 0.2.
3. The relative probability of presence calculated in the previous step undergoes a statistical conversion so that all possible values fall between 0 and 10, inclusive. This is the probability of presence score.

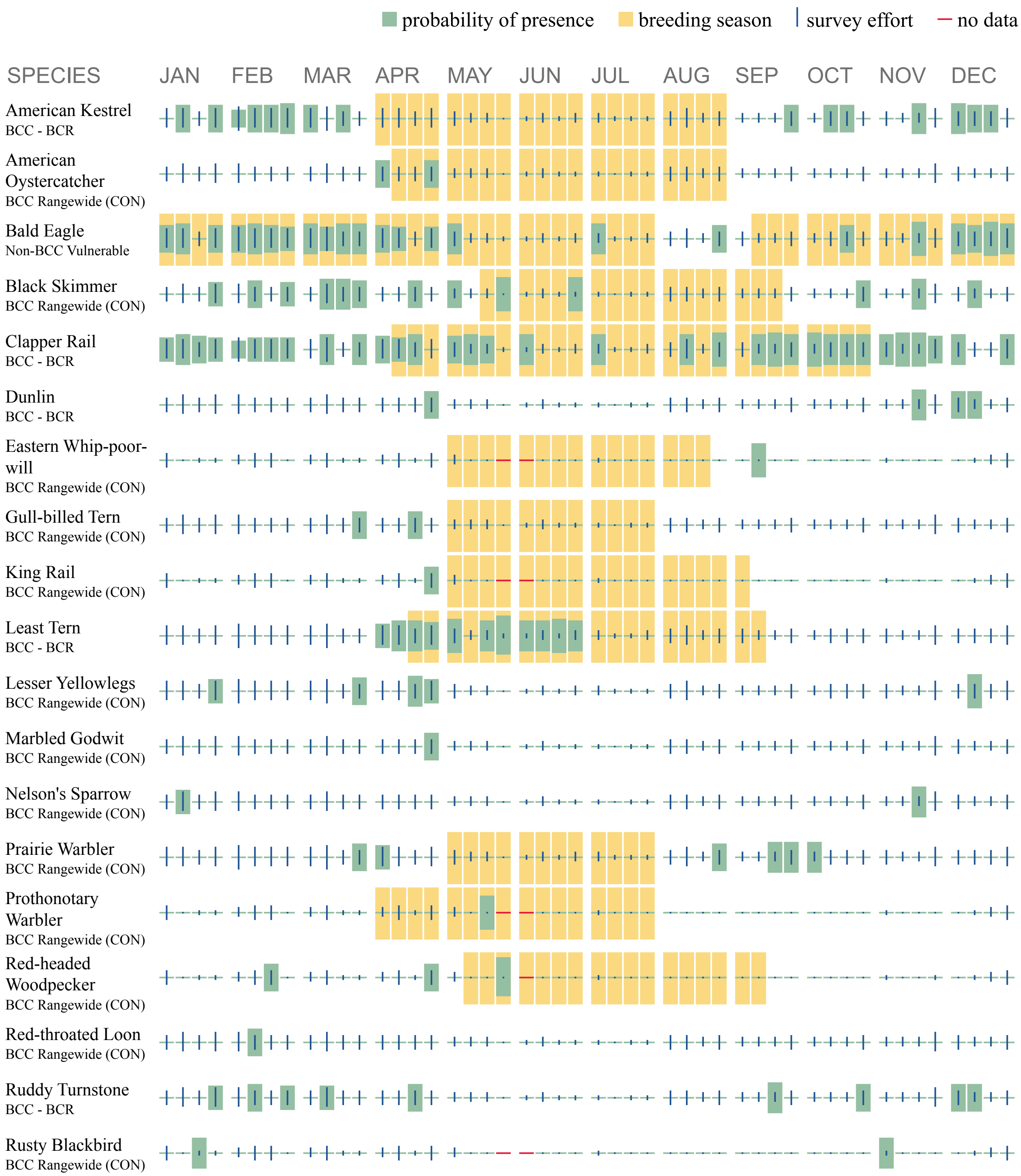
Breeding Season (■)
Yellow bars denote a very liberal estimate of the time-frame inside which the bird breeds across its entire range. If there are no yellow bars shown for a bird, it does not breed in your project area.

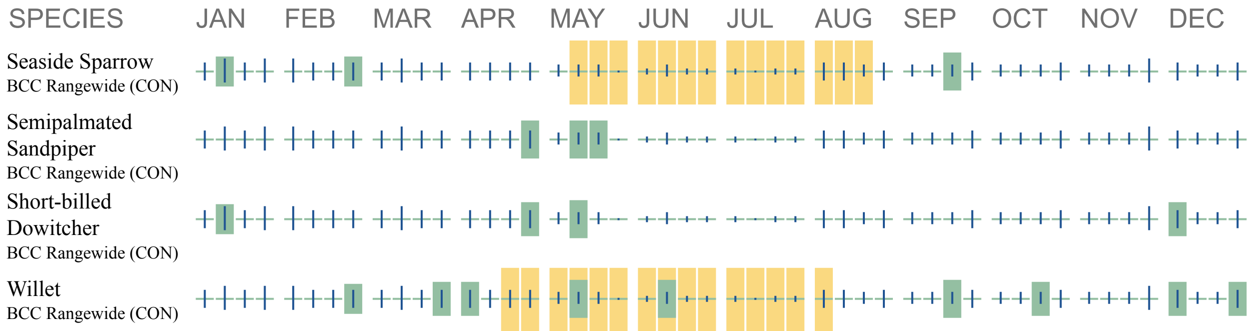
Survey Effort (|)
Vertical black lines superimposed on probability of presence bars indicate the number of surveys performed for that species in the 10km grid cell(s) your project area overlaps. The number of surveys is expressed as a range, for example, 33 to 64 surveys.

No Data (–)
A week is marked as having no data if there were no survey events for that week.

Survey Timeframe

Surveys from only the last 10 years are used in order to ensure delivery of currently relevant information. The exception to this is areas off the Atlantic coast, where bird returns are based on all years of available data, since data in these areas is currently much more sparse.





Additional information can be found using the following links:

- Birds of Conservation Concern http://www.fws.gov/birds/management/managed-species/birds-of-conservation-concern.php
- Measures for avoiding and minimizing impacts to birds http://www.fws.gov/birds/management/project-assessment-tools-and-guidance/conservation-measures.php
- Nationwide conservation measures for birds http://www.fws.gov/migratorybirds/pdf/management/nationwidestandardconservationmeasures.pdf

Migratory Birds FAQ

Tell me more about conservation measures I can implement to avoid or minimize impacts to migratory birds.

Nationwide Conservation Measures describes measures that can help avoid and minimize impacts to all birds at any location year round. Implementation of these measures is particularly important when birds are most likely to occur in the project area. When birds may be breeding in the area, identifying the locations of any active nests and avoiding their destruction is a very helpful impact minimization measure. To see when birds are most likely to occur and be breeding in your project area, view the Probability of Presence Summary. Additional measures and/or permits may be advisable depending on the type of activity you are conducting and the type of infrastructure or bird species present on your project site.

What does IPaC use to generate the migratory birds potentially occurring in my specified location?

The Migratory Bird Resource List is comprised of USFWS Birds of Conservation Concern (BCC) and other species that may warrant special attention in your project location.

The migratory bird list generated for your project is derived from data provided by the Avian Knowledge Network (AKN). The AKN data is based on a growing collection of survey, banding, and citizen science datasets and is queried and filtered to return a list of those birds reported as occurring in the 10km grid cell(s) which your project intersects, and that have been identified as warranting special attention because they are a BCC species in that area, an eagle (Eagle Act requirements may apply), or a species that has a particular vulnerability to offshore activities or development.

Again, the Migratory Bird Resource list includes only a subset of birds that may occur in your project area. It is not representative of all birds that may occur in your project area. To get a list of all birds potentially present in your project area, please visit the E-bird Explore Data Tool.

What does IPaC use to generate the probability of presence graphs for the migratory birds potentially occurring in my specified location?
The probability of presence graphs associated with your migratory bird list are based on data provided by the Avian Knowledge Network (AKN). This data is derived from a growing collection of survey, banding, and citizen science datasets .

Probability of presence data is continuously being updated as new and better information becomes available. To learn more about how the probability of presence graphs are produced and how to interpret them, go the Probability of Presence Summary and then click on the "Tell me about these graphs" link.

How do I know if a bird is breeding, wintering, migrating or present year-round in my project area?
To see what part of a particular bird's range your project area falls within (i.e. breeding, wintering, migrating or year-round), you may refer to the following resources: The Cornell Lab of Ornithology All About Birds Bird Guide, or (if you are unsuccessful in locating the bird of interest there), the Cornell Lab of Ornithology Neotropical Birds guide. If a bird on your migratory bird species list has a breeding season associated with it, if that bird does occur in your project area, there may be nests present at some point within the timeframe specified. If "Breeds elsewhere" is indicated, then the bird likely does not breed in your project area.

What are the levels of concern for migratory birds?
Migratory birds delivered through IPaC fall into the following distinct categories of concern:

1. "BCC Rangewide" birds are Birds of Conservation Concern (BCC) that are of concern throughout their range anywhere within the USA (including Hawaii, the Pacific Islands, Puerto Rico, and the Virgin Islands);
2. "BCC - BCR" birds are BCCs that are of concern only in particular Bird Conservation Regions (BCRs) in the continental USA; and
3. "Non-BCC - Vulnerable" birds are not BCC species in your project area, but appear on your list either because of the Eagle Act requirements (for eagles) or (for non-eagles) potential susceptibilities in offshore areas from certain types of development or activities (e.g. offshore energy development or longline fishing).

Although it is important to try to avoid and minimize impacts to all birds, efforts should be made, in particular, to avoid and minimize impacts to the birds on this list, especially eagles and BCC species of rangewide concern. For more information on conservation measures you can implement to help avoid and minimize migratory bird impacts and requirements for eagles, please see the FAQs for these topics.

Details about birds that are potentially affected by offshore projects
For additional details about the relative occurrence and abundance of both individual bird species and groups of bird species within your project area off the Atlantic Coast, please visit the Northeast Ocean Data Portal. The Portal also offers data and information about other taxa besides birds that may be helpful to you in your project review. Alternately, you may download the bird model results files underlying the portal maps through the NOAA NCCOS Integrative Statistical Modeling and Predictive Mapping of Marine Bird Distributions and Abundance on the Atlantic Outer Continental Shelf project webpage.

Bird tracking data can also provide additional details about occurrence and habitat use throughout the year, including migration. Models relying on survey data may not include this information. For additional information on marine bird tracking data, see the Diving Bird Study and the nanotag studies or contact Caleb Spiegel or Pam Loring.

What if I have eagles on my list?
If your project has the potential to disturb or kill eagles, you may need to obtain a permit to avoid violating the Eagle Act should such impacts occur.

Proper Interpretation and Use of Your Migratory Bird Report
The migratory bird list generated is not a list of all birds in your project area, only a subset of birds of priority concern. To learn more about how your list is generated, and see options for identifying what other birds may be in your project area, please see the FAQ "What does IPaC use to generate the migratory birds potentially occurring in my specified location". Please be aware this report provides the "probability of presence" of birds within the 10 km grid cell(s) that overlap your project; not your exact project footprint. On the graphs provided, please also look carefully at the survey effort (indicated by the black vertical bar) and for the existence of the "no data" indicator (a red horizontal bar). A high survey effort is the key component. If the survey effort is high, then the probability of presence score can be viewed as more dependable. In contrast, a low survey effort bar or no data bar means a lack of data and, therefore, a lack of certainty about presence of the species. This list is not perfect; it is simply a starting point for identifying what birds of concern have the potential to be in your project area, when they might be there, and if they might be breeding (which means nests might be present). The list helps you know what to look for to confirm presence, and helps guide you in knowing when to implement conservation measures to avoid or minimize potential impacts from your project activities, should presence be confirmed. To learn more about conservation measures, visit the FAQ "Tell me about conservation measures I can implement to avoid or minimize impacts to migratory birds" at the bottom of your migratory bird trust resources page.

APPENDIX G

Essential Fish Habitat Assessment

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Southeast Regional Office
263 13th Avenue South
St. Petersburg, Florida 33701-5505
http://sero.nmfs.noaa.gov

November 30, 2018 F/SER47:CC/pw

(Sent via Electronic Mail)

Lt. Col. Jeffrey Palazzini
Charleston District, Corps of Engineers
69A Hagood Avenue
Charleston, South Carolina 29403-5107

Attention: Bethney Ward

Dear Lt. Colonel Palazzini:

NOAA's National Marine Fisheries Service (NMFS) reviewed *Essential Fish Habitat Assessment for Joint Base Charleston Maintenance Dredging 2020-2030* dated October 2018 and the District's corresponding letter dated October 9, 2018. The EFH Assessment describes maintenance dredging of the Joint Base Charleston (JBC) navigation channels and associated berthing areas in the Cooper River in Berkeley County. Since the 1940s, JBC has performed routine dredging along approximately 4.8 miles of the Cooper River and along approximately 0.4 miles of Goose Creek from the confluence of the Cooper River. The existing 10-year permit (2009-00175-2IR) will expire on March 31, 2020. The U.S. Army Corps of Engineers, on behalf of the U.S. Air Force, has determined that any new impacts to EFH resulting from the proposed action would be no more than negligible individually and cumulatively. As the nation's federal trustee for the conservation and management of marine, estuarine, and anadromous fishery resources, the NMFS provides the following comments and recommendations pursuant to authorities of the Fish and Wildlife Coordination Act and the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act).

The purpose of the proposed project is to provide sufficient depth for navigation and berthing vessels that support JBC waterborne missions. JBC would use a hydraulic cutterhead or mechanical clamshell for the dredging, and the dredged material would be placed into one or more existing upland placement areas (Yellow House Creek, Joint Base Charleston, and Clouter Creek Placement Areas). The project proposal indicated two primary changes from previously permitted dredging activities – an increase in advanced maintenance dredging depths in three shoaling areas (Shoal 4, Shoal 4A, and TC Dock), and one new area to be impacted (Pier C). Based on the information provided and the long history of maintenance dredging along this stretch of the Cooper River, the NMFS offers no EFH conservation recommendations regarding the proposed maintenance dredging activities.

The NMFS appreciates the opportunity to provide these comments. Please direct related correspondence to the attention of Cindy Cooksey at our Charleston Area Office. She may be reached at (843) 460-9922 or by e-mail at Cynthia.Cooksey@noaa.gov.

Sincerely,

/ for

Virginia M. Fay
Assistant Regional Administrator
Habitat Conservation Division

cc: COE, Bethney.P.Ward@usace.army.mil
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SCDNR, DavisS@dnr.sc.gov
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DEPARTMENT OF THE ARMY
U.S. ARMY CORPS OF ENGINEERS, CHARLESTON DISTRICT
69 A HAGOOD AVENUE
CHARLESTON SC 29403-5107

October 9, 2018

Dr. Pace Wilber
Habitat Conservation Division
NOAA National Marine Fisheries Service
219 Fort Johnson Road
Charleston, South Carolina 29412-9110

Dear Dr. Wilber:

The U.S. Air Force is proposing to conduct routine maintenance dredging of the Joint Base Charleston (JBC) navigation channels and associated vessel berthing areas of the Cooper River and Goose Creek, over a 10-year period from 2020 to 2030. The U.S. Army Corps of Engineers, Charleston District (USACE) is assisting the U.S. Air Force in complying with the National Environmental Policy Act and other environmental laws and regulations.

The USACE, on behalf of the U.S. Air Force, has prepared and enclosed an Essential Fish Habitat Assessment for your consideration under the Magnuson-Stevens Fishery Conservation and Management Act. Since this is not a new action, the USACE has concluded that no new significant or long-term impacts will occur to designated EFH in the proposed action area. The USACE requests your review of the EFH Assessment for Joint Base Charleston Maintenance Dredging 2020-2030, and looks forward to your response.

If you have any questions about the proposed Federal action or the EFH Assessment, please contact Ms. Bethney Ward at (843)329-8162 or by email at Bethney.P.Ward@usace.army.mil.

Sincerely,

Diane C. Perkins, AICP
Chief, Planning and Environmental Branch

Enclosure

Essential Fish Habitat Assessment for

Joint Base Charleston Maintenance Dredging 2020-2030

Prepared October 2018

Background

The objective of this Essential Fish Habitat (EFH) Assessment is to describe how the proposed Federal action for maintenance dredging of the Joint Bases Charleston navigation channels and associated berthing areas (see below) potentially influences the quality and/or quantity of habitat. EFH is designated by the NOAA Fisheries and the South Atlantic Fisheries Management Council (SAFMC), as required by the Magnuson-Stevens Fishery Conservation and Management Act of 1976, reauthorized in 2006. EFH is defined in the Act as "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity." The definition of EFH may include habitat for an individual species, or an assemblage of species. Habitats used at any time during a species' life cycle must be accounted for when assessing EFH.

Proposed Action

Joint Base Charleston (JBC) in Berkeley County, South Carolina has performed routine dredging along approximately 4.8 miles of the Cooper River and along approximately 0.4 miles of Goose Creek from the confluence of the Cooper River since the 1940s. Dredging is performed to provide sufficient depth for navigation and berthing vessels that support JBC waterborne missions. The Naval Weapons Station Charleston, now known as Joint Base Charleston, currently holds a permit from the U.S. Army Corps of Engineers (USACE) and South Carolina Department of Health and Environmental Control (SCDHEC) to conduct maintenance dredging of the channels and the berthing areas. The current permit will expire on 31 March 2020, and the action proponent, the U.S. Air Force (USAF), intends to apply for a new 10-year permit that will authorize maintenance dredging for another ten years. Since this is a Federal action, an Environmental Assessment (EA) is being prepared to evaluate the potential environmental impacts of the proposed action, in compliance with the National Environmental Policy Act of 1969 (NEPA), as amended. The proposed action is not a new activity, but the project was initially Categorically Excluded from NEPA in accordance with Navy regulations. The USACE is assisting the U.S. Air Force in preparing the EA and complying with other environmental laws and regulations.

A detailed description of the proposed action and alternatives being considered by the USAF is attached (**Attachment 1**). In summary, the proposed action is to maintain JBC vessel navigation/berthing areas through routine dredging of up to 2,000,000 cubic yards (cy) of material per year (see Figure 1). The dredging depth within the JBC Channel is 40' required depth, plus 2' allowable overdepth Mean Lower Low Water (MLLW). The depth within the Goose Creek Channel is 25' required depth, plus 2' allowable overdepth MLLW. The piers and docks have varying depth requirements depending on their purpose. Some of the shoals necessitate different dredging requirements. Advanced maintenance dredging of 4' is proposed for three of the dredging units – Shoal 4, Shoal 4A, and TC Dock – where accelerated shoaling has been experienced over the past ten years. The width of shoals within the JBC Channel and Goose Creek Channel vary; however, the required width for piers and docks is 125'.

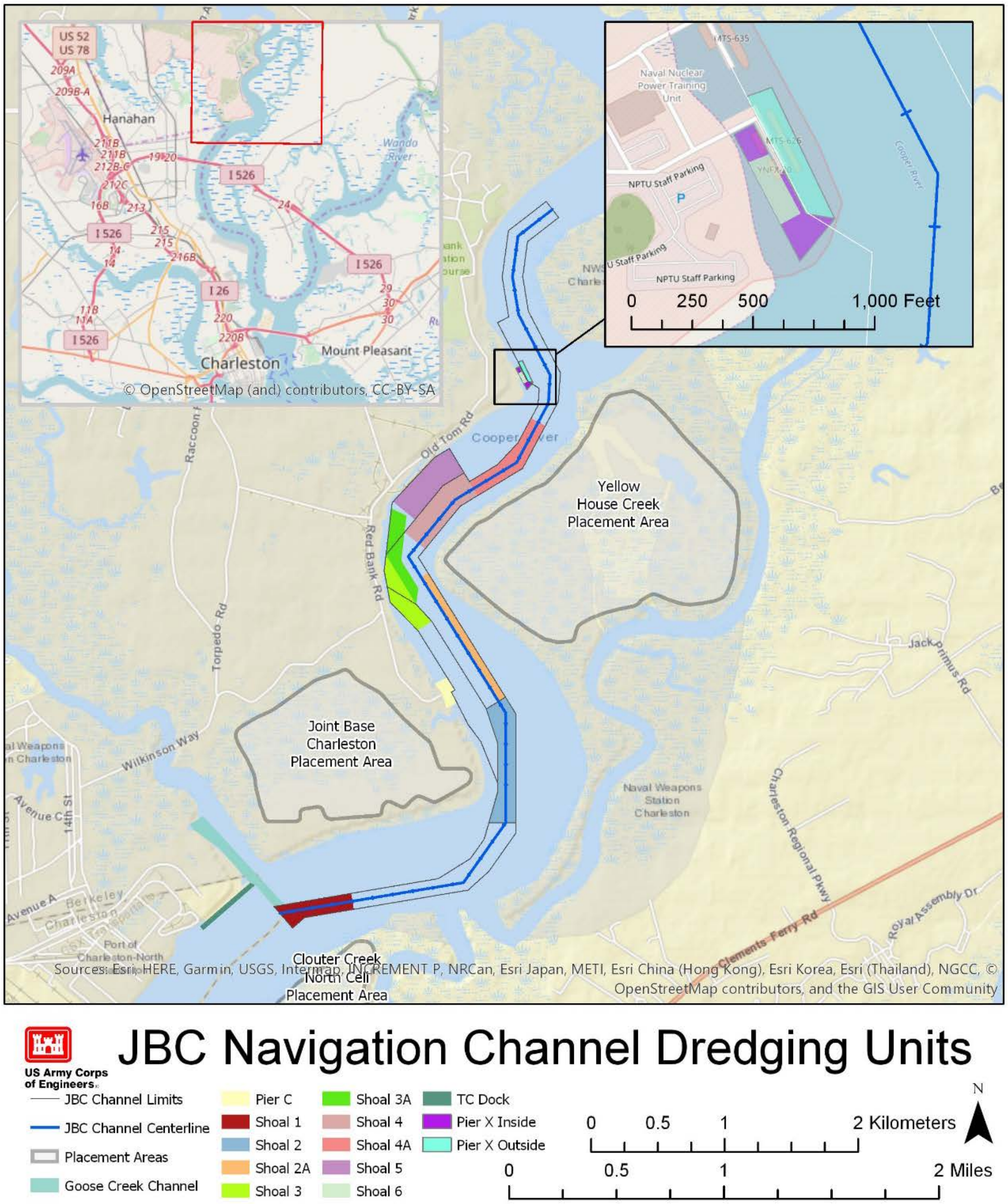

Figure 1. Location of Joint Base Charleston Dredging Area

To maintain current project depths, routine maintenance dredging is required on a 15-20 month rotating cycle, with the exception of the TC Dock area every nine months. To meet new dredging needs, a small area at Pier X South will be dredged and maintained that was not included in the original permit but was assessed in a recent Supplemental EA. The EFH

Assessment for that effort resulted in NOAA Fisheries having "no objection to the proposed expansion of the footprint of the maintenance dredging at…..the Pier X-Ray South Lagoon area" (US Department of the Navy and US Department of the Air Force, 2018). A second new area of approximately 4.5 acres at Pier C also needs to be dredged and maintained. The pier structure no longer exists, but a floating dock is present.

Dredging would be conducted via hydraulic cutterhead or mechanical clamshell dredging methods, as appropriate, and the dredged material would be placed into one or more existing upland placement areas. The existing confined, upland placement areas that would be used for disposal include the Yellow House Creek, Joint Base Charleston, and Clouter Creek Placement Areas.

<u>Essential Fish Habitat Present</u>

NOAA Fisheries' EFH Mapper identified that the proposed action area, including the estuarine water column, is designated as EFH for snapper-grouper and three species of sharks (NMFS 2018). Estuarine areas of the Charleston Harbor are also considered EFH for penaeid shrimp.

EFH that serves as nursery grounds for estuarine dependent species in the snapper-grouper complex includes estuarine emergent vegetated wetlands (salt and brackish marshes) and tidal creeks like those found along the lower Cooper River, and unconsolidated bottom (soft sediments) that occur in the navigation channel. Species may include Atlantic spadefish, bank sea bass, gray snapper, rock sea bass, and sheepshead.

Although a number of sharks can be found in South Carolina waters, only a few species of highly migratory sharks utilize estuarine areas. Tiger sharks (*Galeocerdo cuvier*), spinner sharks (*Carcharhinus brevipinna*), and Atlantic blacktip sharks (*Carcharhinus limbatus*) have designated EFH in the proposed action area on the Cooper River. Tiger sharks enter estuaries to find prey, where they usually feed at night. Spinner sharks move inshore to reproduce, and pups move into shallow estuarine waters for food and protection. Blacktip shark pups are born in shallow nursery grounds, then juveniles remain in the estuary for the first years of their lives.

White shrimp (*Litopenaeus setiferus*), brown shrimp (*Farfantepenaeus aztecus*), and blue crabs (*Callinectes sapidus*) are also economically important fisheries that are common in the Charleston Harbor and South Carolina waters. Emergent vegetated wetlands, tidal creeks, unconsolidated bottom, and oyster reefs provide essential nursery habitat for juvenile development.

<u>Assessment of Impacts</u>

An extensive description of NOAA Fisheries managed species found in the Charleston Harbor system and their EFH requirements has already been prepared by the USACE in the Essential Fish Habitat Assessment for the Charleston Harbor Post 45 Deepening Project (USACE 2015, Appendix H). The assessment covered penaeid shrimp, the snapper-grouper complex, and sharks, as well as additional species found in the Charleston Harbor system but not in the area around JBC. Potential effects to EFH from the Charleston Harbor Post 45 Deepening Project were also thoroughly assessed. No estuarine or marine emergent vegetation, tidal creeks, or oyster reefs were determined to be directly impacted by the Post 45 deepening, including subsequent operations and maintenance activities. Likewise, the same absence of impacts is expected for dredging of the JBC navigation channels/berthing areas.

Dissolved oxygen (DO) in the water column, which is important to the survival of fish and other aquatic organisms, was modeled for the Charleston Harbor Post 45 Deepening Project based on different deepening scenarios, and only a minor reduction (average of 0.03 mg/L) was predicted in the Charleston Harbor system. Changes in salinity, which influence marsh vegetation, species distributions, DO and other factors, was also modeled for the Cooper River all the way to the Bushy Park Reservoir (upriver of the action area), as well as other nearby rivers. Results showed a slight alteration in salinity distribution in various portions of the Charleston Harbor system, but not in the area along the JBC navigation channel.

For the proposed action, short term and localized impacts to the estuarine water column and sub-bottom habitat that are typical of dredging projects are expected, such as increased turbidity, reduced dissolved oxygen, and loss of benthic communities in the dredged areas. The JBC navigation channels represent only a fraction of the available estuarine habitat on the Cooper River, and the planned activities do not restrict access to those habitats.

Since maintenance dredging of the JBC channels and berthing areas is already occurring, no significant new impacts to EFH are anticipated. Dredging methods and depths will mostly remain consistent with current activities so that no new habitat will be impacted. Salinity concentrations and other water chemistry regimes will not be permanently altered since new deepening of the JBC navigation channel is not proposed. The one exception to changes in methods includes the small increased depth of 4’ advanced maintenance dredging proposed for Shoals 4 and 4A and at TC Dock, as described above. This should have a negligible impact on EFH. By conducting the advanced maintenance dredging, there is less potential to impact fisheries and associated habitats by reducing the need to dredge as frequently. There would also be less frequent disturbance to benthic communities.

Only one new area will be impacted (Pier C) that is not currently being dredged. Due to the relatively small size of the area (approximately 4.5 acres, see Figure 1) and the limited dredging depth of 10’ plus 2’ overdepth, no substantial new threat to EFH is expected. The sediment at Pier C will be tested prior to dredging, and turbidity curtains will be used to control sediment distribution if elevated levels of contaminants are detected.

Conclusion

The USACE, on behalf of the USAF, has determined that no or negligible new impacts to EFH for NOAA Fisheries managed species will result from the proposed action, either individually or cumulatively. The JBC navigation channels and berthing areas are already periodically disturbed due to current dredging. Current effects from the maintenance dredging are considered short-term and localized. The new area to be dredged at Pier C is relatively small, and new depth requirements are in limited areas compared to the entire proposed action area and to available habitat. Conducting advanced maintenance dredging in rapid shoaling areas should reduce the frequency of dredging activities and thus potential to impact fisheries and their habitats. Turbidity curtains will be used around the dredge to the extent practicable, if sediment contamination is detected.

References

National Marine Fisheries Service (NMFS) 2018. Essential Fish Habitat Mapper. Last updated April 12, 2018; accessed September 11, 2018. www.fisheries.noaa.gov/resource/map/essential-fish-habitat-mapper

US Army Corps of Engineers (USACE) 2015. *Final Integrated Feasibility Report and Environmental Impact Statement for Charleston Harbor Post 45, Charleston, South Carolina*. USACE Charleston District. June 2015.

US Department of the Navy and US Department of the Air Force. 2018. *Final Supplemental Environmental Assessment for Additional Dredging for Facilities Expansion at the Navy Nuclear Power Training Unit Charleston, Joint Base Charleston, South Carolina*. March 2018.

ATTACHMENT 1

Description of Proposed Action and Alternatives

For

Maintenance Dredging 2020-2030 at Joint Base Charleston, Berkeley County, South Carolina

June 2018

DESCRIPTION OF PROPOSED ACTION AND ALTERNATIVES

FOR

Maintenance Dredging 2020-2030 at Joint Base Charleston, Berkeley County, South Carolina

PRPARED FOR:

Department of the Air Force

July 2018

Letters or other written comments provided may be published in the Final Environmental Assessment (EA). As required by law, substantive comments will be addressed in the Final EA and made available to the public. Any personal information provided will be kept confidential. Private addresses will be compiled to develop a mailing list for those requesting copies of the Final EA. However, only the names of the individuals making comments and their specific comments will be disclosed. Personal home addresses and phone numbers will not be published in the Final EA.

1.0 PURPOSE OF AND NEED FOR ACTION

1.1 INTRODUCTION

Joint Base Charleston (JBC) in Berkeley County, South Carolina has performed routine dredging along approximately 4.8 miles of the Cooper River and along approximately 0.4 miles of Goose Creek from the confluence of the Cooper River since the 1940s (Figure 1). Dredging is performed to provide sufficient depth for navigation and berthing of Department of Navy, Military Sealift Command, Defense Fuels Supply Depot, Department of Army, Department of Air Force, and Department of Energy vessels that support JBC waterborne missions. The Naval Weapons Station Charleston (now known as Joint Base Charleston) currently holds a permit from the U.S. Army Corps of Engineers (USACE) and South Carolina Department of Health and Environmental Control (SCDHEC) to conduct maintenance dredging of the channels and several berthing areas.

The USACE, Charleston District issued permit no. 2009-00175-2IR for the existing maintenance dredging in March 2010. The project was Categorically Excluded in accordance with Navy regulations at the time, so an Environmental Assessment (EA) was not prepared. As part of the permit, a Certification in accordance with Section 401 of the Clean Water Act and a Certification in accordance with the Coastal Zone Management Act (15 CFR Part 923) were obtained from the SCDHEC. In 2011, the permit was modified to include dredging of a small area outside/riverside of Pier X to obtain the depths necessary for vessels to dock at this pier (see Figure 1, inset map). Additionally, a Supplemental EA was prepared and a Finding of No Significant Impact was signed in 2018 for an approximate 2 acre area inside/shoreside of Pier X in need of dredging that was not covered in the existing dredging permit.

The current permit will expire on 31 March 2020, and the action proponent, the U.S. Air Force on behalf of JBC, intends to apply for a new 10-year permit that will authorize maintenance dredging for another ten years. Since this is a Federal project, an Environmental Assessment (EA) will be prepared to evaluate the potential environmental impacts of the proposed action in compliance with the National Environmental Policy Act of 1969 (NEPA) (42 United States Code [USC] 4331 et seq.), the regulations of the President's Council on Environmental Quality (CEQ) that implement NEPA procedures (40 CFR 1500-1508), the Air Force Environmental Impact Assessment Process Regulations at 32 CFR Part 989, and Air Force Instruction 32-7061. The information presented in the Final EA will serve as the basis for deciding whether the proposed action would result in a significant impact to the environment, requiring the preparation of an Environmental Impact Statement (EIS), or whether no significant impacts would occur, in which case a Finding of No Significant Impact (FONSI) would be appropriate.

1.2 PURPOSE OF AND NEED FOR THE ACTION

The purpose for the action is to provide and sustain sufficient depth for navigation and berthing of military vessels that support JBC waterborne missions. Dredging of the JBC navigation channels and associated berthing areas is needed to maintain current depths and meet new dredging requirements. The permit issued by the USACE and SCDHEC that currently authorizes maintenance dredging of the vessel navigation/berthing areas will expire on 31 March 2020. The U.S. Air Force on behalf of JBC is seeking to obtain a new permit that will authorize maintenance dredging for another ten years. Additionally, a new area at Pier C will need to be dredged and maintained that was not in the original permit, and the newly proposed inside/shoreside area of Pier X that was not part of the original permit but already assessed, will be included in the new permit request for future maintenance dredging. JBC will not be able to perform dredging and implement their waterborne missions without a new permit.

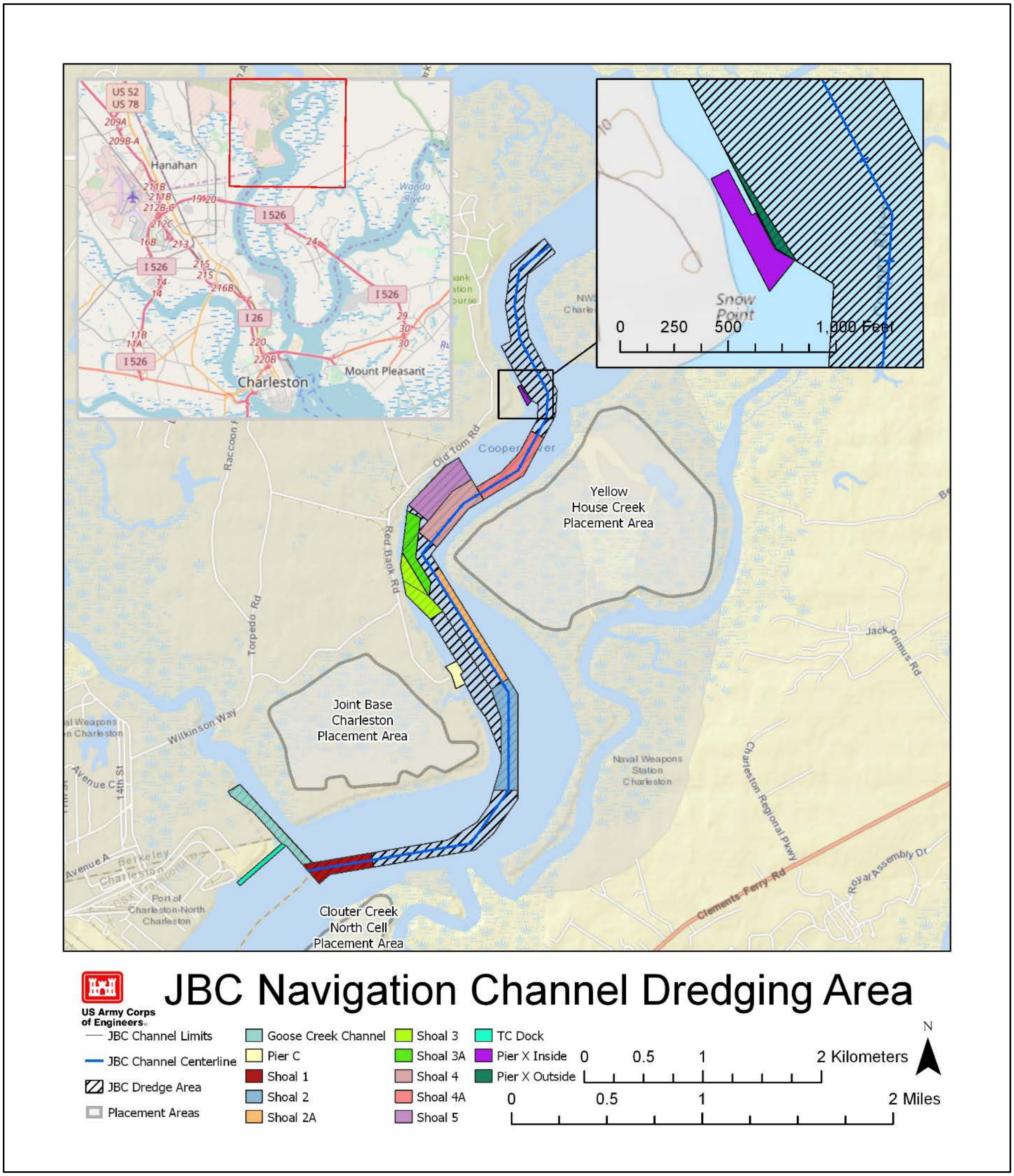

Figure 1. Location of Joint Base Charleston Dredging Area and Units.

1.3 DECISION TO BE MADE

The decision to be made is the selection of an alternative by the U.S. Air Force to support future maintenance dredging of the JBC channels and associated vessel berthing areas. The decision options are to:

- Discontinue routine maintenance dredging when the current dredging permit expires (the No Action Alternative);
- Select an action alternative for maintenance and/or new dredging, and prepare a Finding of No Significant Impact (FONSI); or
- Prepare an Environmental Impact Statement (EIS) if the alternatives will result in significant environmental impacts.

1.4 INTERGOVERNMENTAL COORDINATION

1.4.1 Interagency and Intergovernmental Coordination and Consultation

Scoping is an early and open process for developing the breadth of issues to be addressed in the EA, and for identifying significant concerns related to a proposed action. Per requirements of the Intergovernmental Cooperation Act of 1968 (42 U.S.C. 4231(a)) and Executive Order 12372, Federal, state, and local agencies with jurisdiction that could be affected by the proposed action will be notified during the development of the EA. This will include agencies with legal authorities under Section 7 of the Endangered Species Act, the Magnuson-Stevens Fishery Conservation and Management Act, the Clean Water Act, the Clean Air Act, the Coastal Zone Management Act, and the National Historic Preservation Act. The agencies consulted regarding the proposed action will be presented in the EA, along with copies of correspondence.

1.4.2 Government to Government Consultations

Executive Order 13175, Consultation and Coordination with Indian Tribal Governments (6 November 2000), directs Federal agencies to coordinate and consult with Native American tribal governments whose interests might be directly or substantially affected by activities in federally administered areas. Consistent with that executive order, DoDI 4710.02, *Interactions with Federally-Recognized Tribes*, and AFI 90-2002, *Air Force Interaction with Federally-recognized Tribes*, federally recognized tribes that are affiliated historically with the JBC geographic area will be invited to consult on the proposed action for the potential to affect resources of cultural, historic, or religious significance to the tribes. The tribal consultation process is distinct from NEPA consultation or the interagency coordination process, and it requires separate notification of all relevant tribes. The timelines for tribal consultation are also distinct from those of other consultations. The Native American tribal governments that will be coordinated with regarding the proposed action, their comments, and the U.S. Air Force's responses will be summarized in the EA.

1.5 PUBLIC AND AGENCY REVIEW

Regulations from the CEQ (40 CFR 1506.6) direct Federal agencies to involve the public in preparing and implementing their NEPA documents. Comments from the public and agencies will be sought, through the scoping phase and on the Draft EA. A Notice of Availability (NOA) of the Draft EA and FONSI will be published in the local newspaper, *The Post & Courier*, announcing the availability of the draft EA and inviting the public to review and comment on the Draft EA. Copies of the Draft EA and FONSI may also be made available for review at public locations. The NOA, the public and agency comments, and the U.S. Air Force's responses will be summarized in the Final EA.

2.0 DESCRIPTION OF THE PROPOSED ACTION AND ALTERNATIVES

2.1 PROPOSED ACTION

The proposed action is to maintain JBC vessel navigation/berthing areas through routine dredging of up to 2,000,000 cubic yards (cy) of material per year. Maintenance dredging of the JBC channels and berthing areas is managed by dredging units identified by shoals, piers and docks (see Figure 1). The dredging depth within the JBC Channel is 40' required depth, plus 2' allowable overdepth Mean Lower Low Water (MLLW). The depth within the Goose Creek Channel is 25' required depth, plus 2' allowable overdepth MLLW. Allowable overdepth is to assure the action is constructed to the authorized depth. The piers and docks have varying depth requirements (see Section 2.4) depending on their purpose. Advanced maintenance dredging of 4' is proposed for three of the dredging units – Shoal 4, Shoal 4A, and TC Dock – where accelerated shoaling has been experienced over the past ten years. Advanced maintenance is conducted to enable the action to maintain the authorized depth for a longer period of time, potentially reducing the need to dredge more often. The width of shoals within the JBC Channel and Goose Creek Channel vary; however, the required width for piers and docks is 125'.

To maintain current project depths, routine maintenance dredging is required on a 15-20 month rotating cycle, with the exception of the TC Dock area every nine months. To meet new dredging needs, a small area at Pier X South will be dredged and maintained that was not included in the original permit but was assessed in a recent Supplemental EA (US Department of the Navy and US Department of the Air Force, 2018). A second new area at Pier C also needs to be dredged and maintained (see Section 2.4). The pier structure no longer exists, but a floating dock is present.

Dredging would be conducted via hydraulic cutterhead or mechanical clamshell dredging methods, as appropriate, and the dredged material would be placed into one or more existing upland placement areas. The existing, confined, upland placement areas that would be used include the Yellow House Creek, Joint Base Charleston, and Clouter Creek Placement Areas (Figure 2). The Clouter Creek Placement Area is currently used for material from the TC Dock dredging unit.

2.2 SELECTION STANDARDS

NEPA and the CEQ regulations mandate the consideration of reasonable alternatives for the proposed action. "Reasonable alternatives" are those that also could be utilized to meet the purpose of and need for the proposed action. Per the requirements of the Air Force Environmental Impact Analysis Process regulations (32 CFR Part 989), selection standards are used to identify alternatives for meeting the purpose of and need for the proposed action.

Figure 2. Locations of Placement Areas for Joint Base Charleston Maintenance Dredging.

In addition to supporting the Purpose of and Need for the Action, the proposed action must meet the following dredging method selection standards:

- Minimum depth of 42’ in the Cooper River navigation channel and major berths, 25’ in the Goose Creek navigation channel and berths, and 10’ to and at Pier C in order to maintain safe operations
- Establish dredge cycles (schedules) and depths for the dredging units that minimize frequency of dredging
- Utilize the most effective and efficient dredging methods and equipment based on cost, timing, availability and accessibility of placement areas, and environmental considerations
    - The decision to use one type of dredging method or another is based on a variety of factors, including environmental considerations, cost, timing, and the suitability of material placement areas. Flexibility is even more important for smaller dredging projects because the mobilization of dredging equipment is a greater percentage of the overall cost. Traditionally, both hydraulic cutterhead and mechanical clamshell dredges have been used to maintain the Federal navigation channel in the Cooper River below the JBC channel limits. Hopper dredges do not need to be considered because the capacity provided by these dredges is not needed in this part of the Cooper River; likewise hopper dredges pose greater risks to fish and sea turtles and operate within restricted seasonal windows.
    - Utilization of material placement areas other than those currently being used does not need to be considered. The three containment areas proposed are owned and/or managed by Joint Base Charleston or the US Army Corps of Engineers, specifically for the purpose of supporting the navigable waters that JBC or USACE has jurisdiction for. They are currently being used for material disposal under the existing permit, and capacity in the placement areas is actively monitored. Using other placement areas is not considered practicable because it would result in additional costs and enhanced environmental risks associated with transporting the material greater distances through busy waterways.
- Minimize impacts to US waters, human health, habitat, and threatened and endangered species
- Do not impact cultural or historic resources.

2.3 DETAILED DESCRIPTION AND SCREENING OF THE ALTERNATIVES

As described Section 2.2, reasonable alternatives to the proposed action must be considered. “Reasonable alternatives” are those that also could be utilized to meet the purpose of and need for the proposed action. The selection standards presented in Section 2.2 were applied to the following alternatives to determine which could serve the purpose of and need for the action.

2.3.1 Alternative 1 (Preferred Alternative): New and Existing Maintenance Dredging

This is the preferred action alternative, and entails conducting routine maintenance dredging of the JBC navigation channel and berthing areas, including new and existing dredging units. The specifications for the dredging units (depth, slope, etc.) over a 10-year period are presented in Table 1. The locations of the dredging units are shown in Figure 1. Dredging would be conducted by hydraulic cutterhead or mechanical clamshell methods, as appropriate, on a 15-20 month rotating cycle (or 9 months for TC Dock, as needed) as determined by routine depth soundings. Depths are measured at MLLW. The dredged material would be placed, as appropriate, into one or more of the designated upland placement areas which includes Yellow House Creek, Joint Base Charleston, and Clouter Creek. This alternative meets all of the selection standards.

TABLE 1. Dredging Units for Joint Base Charleston Navigation Channels and Berthing Areas

Dredging Unit	Status	Proposed Depth and Slope
JBC Channel Shoal 1 JBC Channel Shoal 2 JBC Channel Shoal 2A JBC Channel Shoal 3 JBC Channel Shoal 3A JBC Channel Shoal 5 JBC Channel Shoal 6	Previously permitted and dredged to 42’ MLLW (40’ +2’ overdepth; 1:4 side slopes)	40’ MLLW required depth + 2’ allowable overdepth; 1:4 side slopes
JBC Channel Shoal 4 JBC Channel Shoal 4A	Previously permitted and dredged to 42’ MLLW (40’ +2’ overdepth; 1:4 side slopes)	40’ MLLW required depth + 4’ advanced maintenance + 2’ allowable overdepth; 1:4 side slopes
TC Dock	Previously permitted and dredged to 42’ MLLW (40’ +2’ overdepth; 1:4 side slopes)	40’ MLLW required depth + 4’ advanced maintenance + 2’ allowable overdepth; 1:4 side slopes
Pier X South, 1.06 acre area riverside/outside berth	Previously permitted [existing permit modified in 2011] and dredged to 36’ MLLW (34’ +2’ overdepth; 1:4 side slopes)	40’ MLLW required depth + 2’ allowable overdepth; 1:4 side slopes
Pier X South, 2.2 acre area barge shoreside/inside berths	Partially dredged once in 1991 during pier construction; not part of current maintenance dredging permit	20’ MLLW required depth + 2’ allowable overdepth; 1:4 side slopes
Pier C Security Boat Dock	Newly proposed	10’ MLLW required depth + 2’ allowable overdepth; 1:4 side slopes
Goose Creek Channel	Previously permitted and dredged to 27’MLLW (25’ + 2’ overdepth; 1:4 side slopes)	25’ MLLW required depth + 2’ allowable overdepth; 1:4 side slopes

2.3.2 Alternative 2: Existing Maintenance Dredging

This alternative is the same as the preferred action alternative (Alternative 1), with the elimination of new dredging requirements for the Pier C access channel and berth to 10’ MLLW plus 2’ overdepth and 4:1 side slopes. With current depths at Pier C, JBC missions can still function but will be subject to operational constraints and navigation hazards at low tide. This alternative meets most of the selection standards, but only partially meets the first selection standard in Section 2.2 for minimum navigation depths needed for safe navigation.

2.3.3 Alternative 3: No Action Alternative

Under the No Action Alternative, the proposed action would not be met. This alternative entails not conducting routine maintenance dredging of the JBC vessel navigation/berthing areas and the dredging units presented in Table 1 over a 10-year period after the current permit expires. As a result of no action, sediments will accumulate along the sides and bottom of the channels and in berthing areas, resulting in shoaling that will limit clearance/access for vessels to reach JBC to execute their operational mission. A grounded vessel poses a risk to safe navigation, results in vessel damage, and reduces mission capabilities.

The No Action Alternative cannot be considered reasonable, as it fails to address the purpose of and need for the action. However, it will be carried forward for further analysis, consistent with the CEQ regulations, and to provide a baseline against which the impacts of the other alternatives can be assessed.

2.4 ALTERNATIVES ELIMINATED FROM FURTHER CONSIDERATION

Although Alternative 2 for Existing Maintenance Dredging, which excludes new 10’ (+2’) dredging at Pier C, does not meet all of the selection standards, it will be carried forward for further consideration in the EA. The NEPA process is intended to support flexible, informed decision-making. The environmental impact analysis that will be conducted for the Draft EA and feedback from the public and other agencies will inform decisions to be made about whether, when and how to execute the proposed action.

3.0 Reference

US Department of the Navy and US Department of the Air Force. 2018. Final Supplemental Environmental Assessment for Additional Dredging for Facilities Expansion at the Navy Nuclear Power Training Unit Charleston, Joint Base Charleston, South Carolina. March 2018.

APPENDIX H

Coastal Zone Consistency Determination

Joint Base Charleston Maintenance Dredging Project

Charleston and Berkeley Counties, South Carolina

Federal Coastal Consistency Request Documentation

Background/Need: Joint Base Charleston (JBC) in Berkeley County, South Carolina has performed routine dredging along approximately 4.8 miles of the Cooper River and along approximately 0.4 miles of Goose Creek from the confluence of the Cooper River since the 1940s (Figure 1 left inset map). Dredging is performed to provide sufficient depth for navigation and berthing of Department of Navy, Military Sealift Command, Defense Fuels Supply Depot, Department of Army, Department of Air Force, and Department of Energy vessels that support JBC waterborne missions. The Naval Weapons Station Charleston (now known as Joint Base Charleston) currently holds a permit from the U.S. Army Corps of Engineers (USACE) and South Carolina Department of Health and Environmental Control (SCDHEC) to conduct maintenance dredging of the channels and several berthing areas.

The USACE, Charleston District issued permit no. 2009-00175-2IR for the existing maintenance dredging in March 2010. The project was Categorically Excluded in accordance with Navy regulations at the time, so an Environmental Assessment (EA) was not prepared. As part of the 2010 permit, a Certification in accordance with Section 401 of the Clean Water Act and a Certification in accordance with the Coastal Zone Management Act (15 CFR Part 923) were obtained from the SCDHEC. In 2011, the permit was modified to include dredging of a small area outside/riverside of Pier X to obtain the depths necessary for vessels to dock at this pier (see Figure 1, right inset map). Additionally, a Supplemental EA was prepared and a Finding of No Significant Impact (FONSI) was signed in 2018 for an approximate 2 acre area inside/shoreside of Pier X in need of dredging that was not covered in the existing dredging permit.

The current permit will expire on 31 March 2020, and the action proponent, the U.S. Air Force (USAF) on behalf of JBC, intends to apply for a new 10-year permit that will authorize maintenance dredging for another ten years. Since this is a Federal project, we are requesting on behalf of the U.S. Air Force, concurrence that the project meets the Certification requirements of the Coastal Zone Management Act, as well as Section 401 of the Federal Clean Water Act and the permitting requirements of R. 19-450 et Seq., 1976 SC Code of Laws.

Description of Existing Project: The proposed project is to routinely dredge up to 2,000,000 cubic yards (CY) of material per year from the Joint Base Charleston navigation channels and berthing areas along 4.8 miles of the Cooper River and 0.4 mile of the Goose Creek Channel. Maintenance dredging of the JBC navigation channels (Cooper River and Goose Creek) and berthing areas (Goose Creek boathouse/pier, Wharf A [included with Shoal 5], Pier B [included with Shoal 3], TC Dock, Pier C, and Pier X) is managed by dredging units identified by shoals, piers and docks (see Figure 1). The dredging depth within the JBC Channel (Cooper River) is 40' required depth, plus 2' allowable overdepth Mean Lower Low Water (MLLW). The depth within the Goose Creek Channel is 25' required depth, plus 2' allowable overdepth MLLW. Allowable overdepth is to assure the action is constructed to the authorized depth. The piers and docks have varying depth requirements (see Table 1) depending on their purpose. Advanced maintenance dredging of up to 4' is proposed for three of the dredging units, Shoal 4, Shoal 4A, and TC Dock, where accelerated shoaling has been experienced over the past ten years. Advanced maintenance dredging is conducted to enable the action to maintain the authorized depth for a longer period of time, potentially reducing the need to dredge more often. The width of shoals within the JBC Channel and Goose Creek Channel vary; however, the required width for piers and docks is 125'.

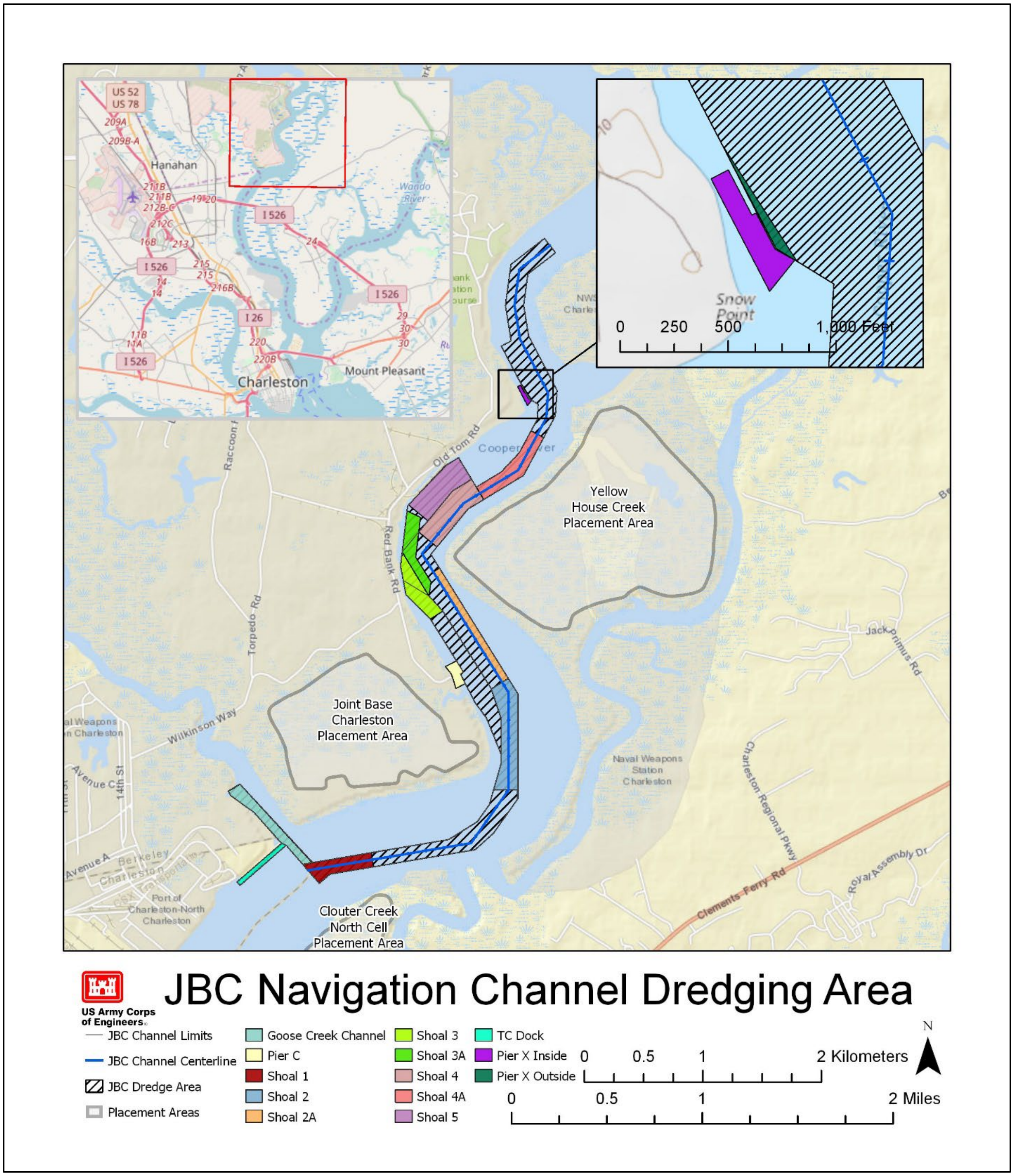

Figure 1. Location of Joint Base Charleston Dredging Area and Units.

To maintain current project depths, routine maintenance dredging is required on a 15-20 month rotating cycle, with the exception of the TC Dock area (every nine months). To meet new dredging needs, a small area inside Pier X South will be dredged and maintained that was not included in the previous permit but was assessed in a recent Supplemental EA (US Department of the Navy and US Department of the Air Force, 2018). A second new area at Pier C also needs to be dredged and maintained. The original fixed pier structure no longer exists at Pier C, but a floating dock is now present.

TABLE 1. Dredging Units for Joint Base Charleston Navigation Channels and Berthing Areas

Dredging Unit	Status	Proposed Depth and Slope	Change from Previous Permit
JBC Channel Shoal 1 JBC Channel Shoal 2 JBC Channel Shoal 2A JBC Channel Shoal 3 JBC Channel Shoal 3A JBC Channel Shoal 5 JBC Channel Shoal 6	Previously permitted and dredged to 42' MLLW (40' +2' overdepth; 1:4 side slopes)	40' MLLW required depth + 2' allowable overdepth; 1:4 side slopes	None
JBC Channel Shoal 4 JBC Channel Shoal 4A	Previously permitted and dredged to 42' MLLW (40' +2' overdepth; 1:4 side slopes)	40' MLLW required depth + 4' advanced maintenance + 2' allowable overdepth; 1:4 side slopes	+4' advanced maintenance
TC Dock	Previously permitted and dredged to 42' MLLW (40' +2' overdepth; 1:4 side slopes)	40' MLLW required depth + 4' advanced maintenance + 2' allowable overdepth; 1:4 side slopes	+4' advanced maintenance
Pier X South, 1.06 acre area riverside/outside berth	Previously permitted [existing permit modified in 2011] and dredged to 36' MLLW (34' +2' overdepth; 1:4 side slopes)	40' MLLW required depth + 2' allowable overdepth; 1:4 side slopes	+ 6' required depth
Pier X South, 2.2 acre area barge shoreside/inside berths	Partially dredged once in 1991 during pier construction; not part of current maintenance dredging permit	20' MLLW required depth + 2' allowable overdepth; 1:4 side slopes	+20" required and 2" overdepth
Pier C Security Boat Dock	Newly proposed	10' MLLW required depth + 2' allowable overdepth; 1:4 side slopes	+10' required and 2' overdepth
Goose Creek Channel	Previously permitted and dredged to 27' MLLW (25' + 2' overdepth; 1:4 side slopes)	25' MLLW required depth + 2' allowable overdepth; 1:4 side slopes	No change

Dredging methods are largely influenced by site conditions and the dredging contractor and would include cutter suction dredge (CSD) or mechanical clamshell. The dredged material would be placed into one or more existing upland placement areas. The existing, confined, upland placement areas that would be used include Clouter Creek (the Clouter Creek

Placement is divided into 4 cells: North Cell, Highway Cell, Middle Cell, and South Cell), Joint Base Charleston, and Yellow House Creek Placement Areas (Figure 2). The Clouter Creek Placement Area is currently used for material from the TC Dock dredging unit.

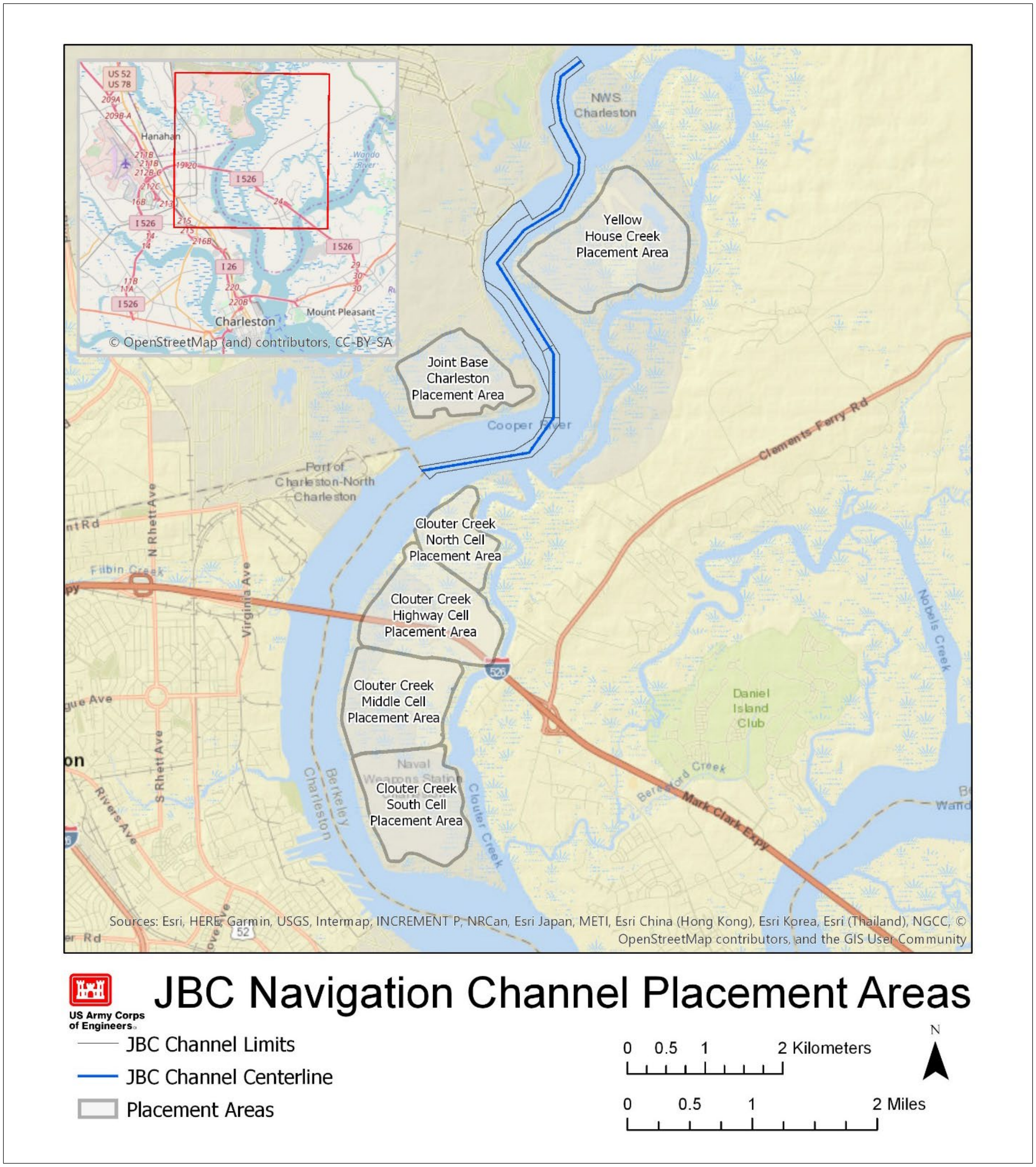

Figure 2. Locations of Placement Areas for Joint Base Charleston Maintenance Dredging

Sediment: In 2016, 2 sediment composites (composed of 4 to 5 samples each) were collected at the Naval Nuclear Power Training Unit Pier X-Ray South Inboard Berthing Area. In June 2018, seven sediment composites (composed of 2 to 7 samples each) were collected at the TC Dock, Goose Creek channel, Pier C, and Shoals 1, 2, 2A, 3, 3A, 4, 4A, and 5. (Sediment Sample Chemical Analysis Reports are available in the draft EA or can be provided upon request.)

Table 2 provides a summary of the 2016 and 2018 sediment composite results. The 2016 results demonstrate that 21 PCB congeners, 6 PAH analytes, and 6 metals were detected in composite samples. Copper was detected in concentrations greater than the TEL. Arsenic and zinc exceeded the TEL and ERL.

Table 2. Summary of 2016 and 2018 Sediment Testing Results

PARAMETER	2016 Pier X South	2018 TC DOCK	2018 GOOSE CR CHANNEL	2018 SHOAL 1	2018 SHOALS 2/2A	2018 SHOALS 3/3a	2018 SHOALS 4/4A/5	2018 PIER C	Marine Sediment Screening Criteria		
									TEL+	ERL+	ERM
Tri-n-butyltin (ug/kg)	< TEL/ERL	< TEL/ERL	< TEL/ERL	< TEL/ERL	< TEL/ERL	< TEL/ERL	< TEL/ERL	< TEL/ERL	x	x	x
PESTICIDES (ug/kg)											
All pesticides	< TEL/ERL	< TEL/ERL	< TEL/ERL	< TEL/ERL	< TEL/ERL	< TEL/ERL	< TEL/ERL	< TEL/ERL	varies		
METALS											
Arsenic	14.0	13.7	8.23	7.27	10.7	13	8.58	5.54	7.24	8.2	70
Zinc	685.0	< TEL/ERL	< TEL/ERL	< TEL/ERL	< TEL/ERL	< TEL/ERL	< TEL/ERL	< TEL/ERL	124.0	150.0	x
Copper	19.7	< TEL/ERL	< TEL/ERL	< TEL/ERL	< TEL/ERL	< TEL/ERL	< TEL/ERL	< TEL/ERL	18.7	34.0	x
All other metals	< TEL/ERL	< TEL/ERL	< TEL/ERL	< TEL/ERL	< TEL/ERL	< TEL/ERL	< TEL/ERL	< TEL/ERL	varies		
DIOXINS /FURANS											
Total TEQs*	< TEL/ERL	1.43	1.45	0.856	3.15	1.28	0.698	1.73	0.85	3.6	x
PCB AROCLORS (ug/kg)											
All PCB Aroclors	< TEL/ERL	< TEL/ERL	< TEL/ERL	< TEL/ERL	< TEL/ERL	< TEL/ERL	< TEL/ERL	< TEL/ERL	varies		
PCB CONGENERS (ug/kg)											
All PCB congeners	< TEL/ERL	< TEL/ERL	< TEL/ERL	< TEL/ERL	< TEL/ERL	< TEL/ERL	< TEL/ERL	< TEL/ERL	varies		
PAH ANALYTES											
Acenaphthene	< TEL/ERL	14.5	< TEL/ERL	< TEL/ERL	< TEL/ERL	18.2	< TEL/ERL	< TEL/ERL	6.71	16	500
All other PAH	< TEL/ERL	< TEL/ERL	< TEL/ERL	< TEL/ERL	< TEL/ERL	< TEL/ERL	< TEL/ERL	< TEL/ERL	varies		
Total PAHs	< TEL/ERL	< TEL/ERL	< TEL/ERL	< TEL/ERL	< TEL/ERL	< TEL/ERL	< TEL/ERL	< TEL/ERL	1684	4022	x

The 2018 results demonstrate that 24 PCB congeners, 6 PAH analytes, and 8 metals were detected in composite samples. However, only arsenic (metal) was detected in concentrations above the TEL and/or ERL.

The arsenic concentrations were: 13.7 mg/kg at TC Dock, 8.23 mg/kg at Goose Creek, 7.27 mg/kg at Shoal 1, 10.7 mg/kg at Shoal 2, 13.0 mg/kg at Shoal 3, and 8.58 mg/kg at Shoal 4. The average concentration was 10.3 mg/kg. Five of the seven sites exceeded the ERL of 8.2 mg/kg and six of the seven sites exceeded the EPA screening value of 7.24 mg/kg, but all are well below the ERM of 70.0 mg/kg.

Arsenic samples are naturally occurring in S.C. and according to the NOAA report entitled "Chemical Contaminant Levels in Estuarine Sediment of the Ashepoo-Combahee-Edisto River Basin National Estuarine Research Reserve and Sanctuary Site", (Scott et al. 1998) found the level of sediment contamination in the ACE Basin National Estuarine Research Reserve (NERR) to be low. While the overall level of sediment contamination in the ACE Basin study area was found to be low with very little potential for adverse biological effects, sediment testing at NERR has detected arsenic levels that exceed the ERL. However, arsenic concentrations are naturally high in the southeastern United States based on several studies conducted in pristine systems (Scott et al. 1994, Long et al. 1998, Sanger 1998). These naturally high levels are due to the high arsenic concentrations in the basement rock within the region. Therefore, these findings generally indicate that trace metal concentrations in the ACE Basin are indicative of that which one would expect from the natural weathering of basement rock within the region (Scott et al. 1998). However, in order to limit wildlife exposure to potential soil contaminants JBC will implement recommendations regarding placement of a turbidity curtain around the dredge area to the maximum extent practicable, and mixing or covering of contaminated dredged material with clean dredged material prior to disposal.

Water Quality: USAF identified that the proposed project area, including the estuarine water column, is designated as EFH for snapper-grouper and three species of sharks including the tiger shark, the black-tipped shark, and the spinner shark. No estuarine or marine emergent vegetation, tidal creeks, or oyster reefs will be directly or indirectly impacted by the dredging project. Maintenance dredging would result in short-term, localized impacts to the water column and sub-bottom habitat such as increased turbidity, reduced dissolved oxygen, and loss of benthic communities in the dredged areas. However, these areas would return to normal once dredging activities cease. In addition, best management practices, including measures to prevent pollutants from entering the water or migration of sediments, would be implemented as appropriate. Any impacts to water chemistry, such as dissolved oxygen or salinity concentrations would be short-term and insignificant, as new advanced maintenance dredging requirements are minor and new dredging at Pier C is relatively small in size (~1 acre) and of limited depth (10 feet). By correspondence dated November 30, 2018, the National Marine Fisheries Service offered no EFH conservation recommendations regarding the proposed maintenance dredging activities.

Cultural Resources: Maintenance dredging of the JBC and Goose Creek navigational channels, the TC dock, and the riverside berthing areas of Pier X south were previously authorized under Corps permit number SAC-2009-00175-2IR. The shoreside/inside berth area of Pier X south was previously dredged in 1991 and was reviewed under the 2018 EA associated with the NPTU facilities expansion. The only new areas proposed for dredging include the Pier C Security Boat Dock; advanced dredging depths of up to 4' in two shoal areas and the TC dock; and an additional 6' of depth to riverside Pier X South. In response to agency coordination for this proposal, the underwater archaeologist with the South Carolina Institute of Archaeology and Anthropology's Maritime Research Division (SCIAA) determined that no submerged cultural resource survey would be required for the proposed dredging activities. In a letter dated February 6, 2019, the State Historic Preservation Office (SHPO) concurred with the SCIAA recommendation that no submerged cultural resources survey is needed for the proposed project. However, in the event that project activities expose potential submerged cultural material, dredging activities would cease operation in the immediate vicinity and contact would be made with the SHPO and SCIAA concerning the content and nature of the site.

Threatened and Endangered Species: By letter dated October 18, 2018, the USFWS concurred with the USAF determination that dredging operations may affect, but are not likely to adversely affect, the West Indian manatee. A conclusion of "no effect" was made for the remainder of threatened and endangered species managed by the Service. Likewise, no state listed species would be affected by the dredging operations. In addition, the USAF determined that dredging activities would have no effect to sea turtle species and may affect but are not likely to adversely affect the Atlantic or shortnose sturgeon species. An expedited request for concurrence was submitted to NMFS on February 22, 2019. During a phone conference with NMFS, USACE, and JBC on July 15, 2019, NMFS indicated the project would be covered under the proposed South Atlantic Regional Biological Assessment and existing South Atlantic Regional Biological Opinion (SARBA/O). At JBC's request, USACE is currently coordinating with NMFS to obtain written concurrence.

Wetlands: The proposed action is intended to increase depths to navigational waterways and will not involve impacts to the shoreline habitats or marshes located adjacent to the channels. Therefore, wetlands will not be directly or indirectly affected by the dredging project.

Conclusion: The environmental impacts of the proposed maintenance dredging were evaluated and documented in a 2019 draft EA. A public notice for the draft EA will be published in September 2019. The draft EA determined that maintenance dredging of the JBC channels and berthing areas would not cause or contribute to violations of any known applicable state water quality standard which would result in permanent damage to the ecosystem. The project would not violate the Endangered Species Act of 1973, or impact any state listed species. The life states of aquatic life and other wildlife would not be adversely affected and significant adverse effects on aquatic ecosystem diversity, productivity, and stability would not occur. The project would provide sufficient depth for navigation and berthing of Department of Navy, Military Sealift Command, Defense Fuels Supply Depot, Department of Army, Department of Air Force, and Department of Energy vessels that support JBC waterborne missions. Therefore the beneficial permanent effects outweigh the negative temporary effects associated with the dredging activities.

The USAF has determined that the federal project is consistent to the maximum extent practicable with the requirements of the Coastal Zone Management Act related to Dredging and Areas of Special Resource Significance, as well as Section 401 of the Federal Clean Water Act and the permitting requirements of R. 19-450 et Seq., 1976 SC Code of Laws. Therefore, we are requesting written concurrence of Federal Coastal Consistency.

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APPENDIX I

Section 7 Consultation for

National Marine Fisheries Service

DEPARTMENT OF THE ARMY
CHARLESTON DISTRICT CORPS OF ENGINEERS
69A HAGOOD AVENUE
CHARLESTON, SOUTH CAROLINA 29403

February 22, 2019

Project Name: Maintenance Dredging of the Joint Base Charleston Navigation Channels and Berthing Areas for 2020 to 2030, Charleston and Berkeley Counties, South Carolina

Mr. David Bernhart
Assistant Regional Administrator
Protected Resources Division
National Marine Fisheries Service
Southeast Regional Office
263 13th Avenue South
St. Petersburg, Florida 33701

Dear Mr. Bernhart,

The United States Air Force (USAF) is proposing to conduct routine maintenance dredging of the Joint Base Charleston (JBC) navigation channels and associated vessel berthing areas, over a 10-year period from 2020 to 2030. The U.S. Army Corps of Engineers (USACE), Charleston District (Corps) is assisting the USAF in complying with the National Environmental Policy Act and other environmental laws and regulations.

The Corps has determined that the proposed project may affect, but is not likely to adversely affect (NLAA) federally-listed species and their designated critical habitat, as described below, and is therefore requesting concurrence with our determinations pursuant to Section 7 of the Endangered Species Act (ESA) of 1973, as amended (16 U.S.C. § 1536), and the consultation procedures at 50 C.F.R. Part 402.

Pursuant to our request for expedited concurrence, the Corps is providing the following information:

- A description of the proposed action to be considered;

- A description of the affected area;

- A description of any listed species or designated critical habitat (DCH) that may be affected by the action; and

- An analysis of the potential effects on any listed species or DCH.

1. PROPOSED ACTION

a. Description of the proposed action: The proposed action is to routinely dredge up to 2,000,000 cubic yards (CY) of material per year from the Joint Base Charleston navigation channels and berthing areas along 4.8 miles of the Cooper River and 0.4 mile of the Goose Creek Channel. The USACE, Charleston District issued permit no. 2009-00175-2IR for the existing maintenance dredging in March 2010. The current permit will expire on 31 March 2020, and the action proponent, the U.S. Air Force on behalf of JBC, intends to apply for a new 10-year permit that will authorize maintenance dredging for another ten years.

Maintenance dredging of the JBC navigation channels and berthing areas is managed by dredging units identified by shoals, piers and docks (see Figure 1). The dredging depth within the JBC Channel is 40' required depth, plus 2' allowable overdepth Mean Lower Low Water (MLLW). The depth within the Goose Creek Channel is 25' required depth, plus 2' allowable overdepth MLLW. Allowable overdepth is to assure the action is constructed to the authorized depth. The piers and docks have varying depth requirements (see Table 1) depending on their purpose. Advanced maintenance dredging of up to 4' is proposed for three of the dredging units, Shoal 4, Shoal 4A, and TC Dock, where accelerated shoaling has been experienced over the past ten years. Advanced maintenance is conducted to enable the action to maintain the authorized depth for a longer period of time, potentially reducing the need to dredge more often. The width of shoals within the JBC Channel and Goose Creek Channel vary; however, the required width for piers and docks is 125'.

To maintain current project depths, routine maintenance dredging is required on a 15-20 month rotating cycle, with the exception of the TC Dock area (every nine months). To meet new dredging needs, a small area at Pier X South will be dredged and maintained that was not included in the original permit but was assessed in a recent Supplemental EA (US Department of the Navy and US Department of the Air Force, 2018). Previous consultation for the dredging at Pier X South, pursuant to Section 7 of the ESA of 1973, as amended (16 U.S.C. § 1536), and the consultation procedures at 50 C.F.R. Part 402, was concluded with your agency on September 6, 2018. A second new area at Pier C also needs to be dredged and maintained (see Table 1). The pier structure no longer exists, but a floating dock is present. No new structures are proposed.

Maintenance dredging would be conducted via hydraulic cutterhead or mechanical clamshell dredging methods, as appropriate, during an average period of 3 weeks per event for the TC Dock and an average period of 4 months per event for the remaining areas. The dredged material would be appropriately placed into one or more existing upland placement areas. The existing, confined upland placement areas that would be used include the Yellow House Creek, Joint Base Charleston, and Clouter Creek Placement Areas (see Figure 2). The Clouter Creek Placement Area is currently used for material from the TC Dock dredging unit.

Three types of barges, a flat-top barge, a split hull barge, or a bottom dump barge, are generally used to transport dredged material to the disposal sites. A tugboat typically transports barges to the disposal site at a speed of no more than 13 knots.

TABLE 1. Dredging Units for JBC Navigation Channels and Berthing Areas

Dredging Unit	Status	Proposed Depth and Slope
JBC Channel Shoal 1 JBC Channel Shoal 2 JBC Channel Shoal 2A JBC Channel Shoal 3 JBC Channel Shoal 3A JBC Channel Shoal 5 JBC Channel Shoal 6	Previously permitted and dredged to 42’ MLLW (40’ +2’ overdepth; 1:4 side slopes)	40’ MLLW required depth + 2’ allowable overdepth; 1:4 side slopes
JBC Channel Shoal 4 JBC Channel Shoal 4A	Previously permitted and dredged to 42’ MLLW (40’ +2’ overdepth; 1:4 side slopes)	40’ MLLW required depth + 4’ advanced maintenance + 2’ allowable overdepth; 1:4 side slopes
TC Dock	Previously permitted and dredged to 42’ MLLW (40’ +2’ overdepth; 1:4 side slopes)	40’ MLLW required depth + 4’ advanced maintenance + 2’ allowable overdepth; 1:4 side slopes
Pier X South, 1.06 acre area riverside/outside berth	Previously permitted [existing permit modified in 2011] and dredged to 36’ MLLW (34’ +2’ overdepth; 1:4 side slopes)	40’ MLLW required depth + 2’ allowable overdepth; 1:4 side slopes
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Pier C Security Boat Dock	Newly proposed	10’ MLLW required depth + 2’ allowable overdepth; 1:4 side slopes
Goose Creek Channel	Previously permitted and dredged to 27’MLLW (25’ + 2’ overdepth; 1:4 side slopes)	25’ MLLW required depth + 2’ allowable overdepth; 1:4 side slopes

In June 2018, seven sediment composites (composed of 2 to 7 samples each) were collected at the TC Dock, Goose Creek channel, Pier C, and Shoals 1, 2, 2A, 3, 3A, 4, 4A, and 5. The sediment analysis revealed arsenic concentrations that exceeded the threshold effects level (TEL) and the effects range low (ERL) but were well below the effects range medium (ERM). Arsenic samples are naturally occurring in S.C. A NOAA report entitled “Chemical Contaminant Levels in Estuarine Sediment of the Ashepoo-Combahee-Edisto River Basin National Estuarine Research Reserve and Sanctuary Site”, (Scott et al. 1998) found that approximately 30% of the sediment samples from the ACE Basin, which is a predominantly undeveloped watershed, exceeded the ERL value for arsenic with a maximum concentration of 21.22 mg/kg. JBC sediments, with an average concentration of 10.3 mg/kg of arsenic, are actually lower in concentrations than those samples from the ACE Basin and would not be expected to result in unacceptable adverse impacts to aquatic, mammalian, or avian wildlife. Other studies in pristine systems have also found high arsenic concentrations in the southeastern United States (Scott et al. 1994, Long et al. 1998, Sanger 1998). These naturally high levels are due to the high arsenic concentrations in the basement rock within the region. Therefore, these findings generally indicate that trace metal concentrations in the ACE Basin are indicative of that which one would expect from the natural weathering of basement rock within the region (Scott et al. 1998).

Previous sediment testing in 2016 for the shoreside/inside Pier X South dredging revealed elevated levels of zinc that exceeded the probable effects level (PEL) and the ERM (US Department of the Navy and US Department of the Air Force. 2018). In order to limit exposure to aquatic organisms from potential contaminants during dredging activities, JBC will implement SCDNR recommendations including placement of a turbidity curtain around the dredge area to the maximum extent practicable, or mixing or covering of contaminated dredged material with clean dredged material prior to disposal.

b. Description of the project purpose: The purpose for the Proposed Action is to provide and sustain sufficient depth for navigation and berthing of military vessels that support JBC waterborne missions. Dredging of the JBC navigation channels and associated berthing areas is necessary to maintain current depths and meet new dredging requirements. The permit issued by USACE and South Carolina Department of Health and Environmental Control (SCDHEC) that currently authorizes maintenance dredging of the vessel navigation/berthing areas will expire on 31 March 2020. The U.S. Air Force on behalf of JBC is seeking to obtain a new permit that will authorize maintenance dredging for another ten years. Additionally, a new area at Pier C will need to be dredged and maintained that was not in the original permit, and the newly proposed inside/shoreside area of Pier X that was not part of the original permit but already assessed, will be included in the new permit request for future maintenance dredging. JBC will not be able to perform dredging and implement their waterborne missions without a new permit.

c. Description of minimization measures: A turbidity curtain will be placed around the dredge area to localize sedimentation, to the maximum extent practicable.

- Turbidity curtains will be properly secured, regularly monitored and constructed of materials that reduce the risk of species entrapment.

- The turbidity curtains will be removed once dredging activities are completed and water quality conditions have returned to background conditions.

Dredging contracts will specify implementation of best management practices to reduce the risk of spills and minimize impacts to water quality. Typical measures include compliance with the spill, prevention, control, and countermeasure plan (SPCC), equipment inspection and monitoring for leaks, secondary containment of fuel tanks, spill response containment, and appropriate removal of all supplies from the dredge vessel.

All vessels associated with dredging activities limit speeds to no more than 13 knots.

Sea turtle species have only been observed in the Cooper River as far north as Riverfront Park, which is approximately 2.7 miles south of the downstream end of the JBC channel. However, as a precautionary measure, JBC will adhere to the NMFS *Sea Turtle and Smalltooth Sawfish Construction Conditions* dated March 23, 2006.

2. ACTION AREA

Pursuant to 50 C.F.R. § 402.02, the term *action area* is defined as "all areas to be affected directly or indirectly by the federal action and not merely the immediate area involved in the action." Accordingly, the action area typically includes the affected jurisdictional waters and other areas affected by the authorized work or structures within a reasonable distance. The ESA regulations recognize that, in some circumstances, the action area may extend beyond the limits of the Corps' regulatory jurisdiction.

For the purposes of this consultation, the action area is the aquatic environment within the JBC navigation channel limits and the upland environments of the Yellow House Creek Placement Area, Joint Base Charleston Placement Area, and Clouter Creek Placement Area. The action area begins at the TC Dock located approximately 10.3 river miles from the Charleston Harbor, and extends along approximately 4.8 miles of the JBC navigation channel and berthing areas and 0.4 mile of the Goose Creek Channel from its intersection with the Cooper River (see Figure 1). The Yellow House Creek contained disposal area is located on the east side of the Cooper River near River Mile (RM) 13.0; the Clouter Creek contained disposal site is located on the east side of the Cooper River between RM 7.0 and RM 10.5; and the Joint Base Charleston disposal site is located on the west side of the Cooper River at approximately RM 11.0 between the Yellow House Creek and Clouter Creek placement sites (see Figure 2).

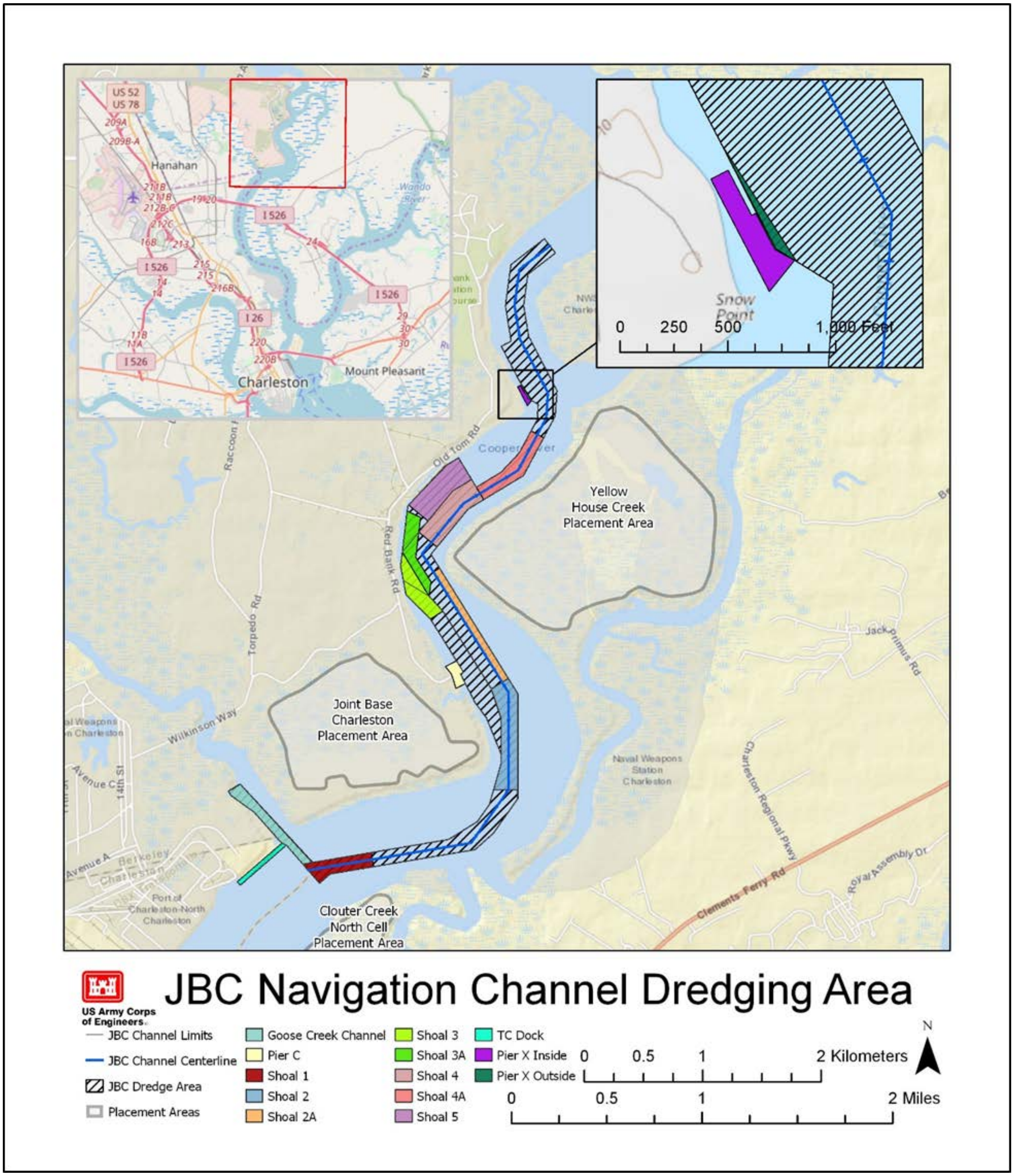

Figure 1. Location of JBC Dredging Area and Units.

Figure 2. Locations of Placement Areas for JBC Maintenance Dredging.

3. AFFECTED SPECIES/HABITAT

Project activities have the potential to affect the listed species as shown in Table 2 below. Table 3 provides the potential species use of the action area.

Table 2: Species in the action area

Species	ESA Listing Status	Listing Rule/Date	Most Recent recovery plan date	USACE Effect Determination (Species)
Atlantic sturgeon (South Atlantic DPS)	E	77 FR 5913/ February 6, 2012	N/A	NLAA
Shortnose sturgeon	E	32 FR 4001/ March 11, 1967	December 1998	NLAA
Kemp's ridley sea turtle	E	35 FR 18319/ December 2, 1970	September 2011	No effect
Leatherback sea turtle	E	35 FR 8491/ June 3, 1970	January 1992	No effect
Loggerhead sea turtle	T	76 FR 58868/ September 22, 2011	January 2009	No effect
Green sea turtle	T	81 FR 20057/ April 6, 2016	October 1991	No effect

Table 3: Potential Species Use of the Action Area

Species	Use of the Action Area
Atlantic sturgeon	Atlantic sturgeon inhabit major estuaries and coastal rivers from Canada to Florida. Atlantic sturgeon are bottom feeders and forage for mollusks, crabs and other crustaceans, worms, and bottom dwelling fish. Threats to their existence include habitat loss and degradation, water quality degradation, fisheries interactions, and habitat impediments such as locks and dams. Atlantic sturgeon spend the majority of their lives in nearshore marine waters, returning to their natal rivers to spawn (Wirgin et al. 2002). Young sturgeon may spend the first few years of life in their natal river estuary before moving out to sea (Wirgin et al. 2002). In the South, spawning adult Atlantic sturgeon generally migrate upriver in February and March (Bain 1997; Caron et al. 2002; Murawski et al. 1977; Smith 1985; Smith and Clugston 1997). Atlantic sturgeon spawning occurs in fast-flowing water between the salt front and fall line of large rivers (Bain et al. 2000; Borodin 1925;

	Crance 1987; Leland 1968; Scott and Crossman 1973) over hard substrate to which the highly adhesive sturgeon eggs adhere (Gilbert 1989; Smith and Clugston 1997). After hatching, larvae assume a bottom dwelling existence (Smith et al. 1980) and move downstream to rearing grounds (Kynard and Horgan 2002). Juvenile sturgeon continue to move further downstream into brackish waters, and eventually become residents in estuarine waters for months or years. According to Mr. Bill Post, South Carolina Department of Natural Resources (SCDNR) Diadromous Finfish Manager, the State documented “spawning behavior” by a few Atlantic sturgeon in the Cooper River during fall of 2015 and 2016. However, the area was impacted by the 1,000-year rainfall event in October 2015 and by Hurricane Matthew in 2016 before any additional data could be collected. As a result, neither spawning nor false spawning in the Cooper River could be verified. Additionally, any potential spawning, if it were to occur, would be well upstream of any habitat impacts from the proposed action. Recent research carried out by Post et al. (2014) observed 7 Atlantic sturgeon in the Cooper River during the 3-year project period, indicating upstream migration of sturgeon. The project is not located in Atlantic sturgeon DCH.
Shortnose sturgeon	Shortnose sturgeon inhabit large coastal rivers of eastern North America from Canada to Florida and typically move between freshwater and saltwater during some part of their life cycle, but not necessarily for spawning. Their foraging habitat includes the sandy and muddy bottoms of rivers where they feed on insects, worm, mollusks, crabs and other crustaceans. Commercial fisheries by-catch, habitat degradation from dredging, pollution, saltwater intrusion, and habitat impediments such as locks and dams are threats that continue to affect recovery efforts. Southern populations of Shortnose sturgeon usually spawn at least 125 miles upriver (Kynard 1997) or throughout the fall line zone, if they are able to reach it. Shortnose sturgeon that may be found in the action area are unable to access the fall line zone because of dams located along the river. The dam located nearest the action area is the Pinopolis Dam at River Mile (RM) 48. The population of Shortnose sturgeon downstream of Pinopolis have been documented in the tailrace area immediately below the dam since 1997 (Cooke and Leach 1999). Fertilized Shortnose sturgeon

	eggs collected in the Pinopolis Dam tailrace verified spawning despite nontraditional spawning habitat (i.e., barren hard bottom with scattered pockets of clam shell and marl pieces) (Cooke and Leach 2004; Duncan et al. 2004). This spawning in the tailrace in atypical habitat supports the hypothesis that a blockage in spawning migration can force new spawning areas (Kynard et al. 1999). However, no larvae have been found downstream of the Pinopolis Dam (B. Post, SCDNR, pers. comm. to K. Reece, NMFS, April 14, 2015). Any eggs that made it to the larval stage would not be viable because of exposure to salinity downstream of the dam. Larvae would not have enough time to mature to a stage that was tolerant of increased estuarine salinities. Typical spawning occurs further upriver allowing sufficient time for larvae to develop increased salinity tolerances. No known collections of early life-stage Shortnose sturgeon, other than fertilized in the tailrace, have been documented, although survey efforts are limited. The absence of early life stage Shortnose sturgeon indicates that recruitment failure is occurring as smaller fish are not present to grow and replace the reproducing adults. This finding led Cooke and Leach (2004) to determine that the Cooper River subpopulation of Shortnose sturgeon is recruitment-limited. Recent research conducted from 2011-2014 documented 40 Shortnose sturgeon detected in the Cooper River as far upstream as the Pinopolis Dam (RM 48) and as far downstream as RM 0 (Post et al. 2014). Prior research carried out by Palmer (2001) found that Shortnose sturgeon migrated seasonally within a 25.4-mile stretch of the river between the Pinopolis Dam at RM 48 and RM 22.6 (Palmer 2001). In the winter, Shortnose sturgeon aggregate around RM 27; this structurally diverse area is thought to be a productive foraging site and to provide shelter to the fish from high river flows (Palmer 2001). Shortnose sturgeon do not typically utilize the lower 22 miles (approximate) of the Cooper River (Palmer 2001). Therefore, the Shortnose sturgeon in the Cooper River exist in an abbreviated ecosystem: available habitat is restricted within the upper 26 miles of the Cooper River between Pinopolis Dam at RM 48 and about RM 22. Sturgeon were tagged and tracked by Palmer (2001) in the Cooper River by season and RM. The study found that sturgeon occupy RM 25.5 to RM 48 in the spring, RM 30.6 to RM 48.0 in the summer, RM 27.2 to RM 48 in the fall, and RM 22.6 to RM 48.0 in the

	winter. All of these areas are upstream of the action area, however sturgeon may be expected to migrate into it.
Kemp’s ridley sea turtle	The Kemp’s ridley sea turtles inhabit nearshore and inshore habitats of the Atlantic and Gulf coasts. They are shallow water, benthic feeders and prefer muddy or sandy bottom habitats where they forage primarily for crabs. Death or injury from commercial fishing trawls is a primary threat to their existence. Sea turtles have not been documented to occur within the action area and there is no potential nesting habitat present in the action area, as there are no beaches that would be impacted. The project is not located in Kemp’s ridley sea turtle DCH.
Leatherback sea turtle	The Leatherback sea turtles is a pelagic species that inhabits the Indian, Atlantic, and Pacific oceans. They primarily feed on jellyfish but will also feed on fish, mollusks, crabs and other crustaceans, as well as seaweed and algae. Death or injury from commercial fishing trawls, loss of nesting and foraging habitat, and marine pollution are some of the factors threatening their existence. Sea turtles have not been documented to occur within the action area and there is no potential nesting habitat present in the action area, as there are no beaches that would be impacted. The project is not located in Leatherback sea turtle DCH.
Loggerhead sea turtle	The loggerhead sea turtle inhabits the continental shelf and estuarine environments throughout temperate and tropical regions of the Atlantic, Pacific, and Indian Oceans (Dodd 1988). Nesting within the Northwest Atlantic DPS generally occurs from North Carolina to Florida and along the Gulf Coast of Florida. Loggerhead sea turtles are primarily found in coastal waters and feed on mollusks, shrimp, crabs, and lobsters in hard bottom habitats. Juveniles forage on crabs, mollusks, jellyfish, and vegetation at or near the surface (Dodd 1988). Death or injury from commercial fishing vessels, loss of nesting and foraging habitat, and marine pollution are some of the factors threatening their existence. Sea turtles have not been documented to occur within the action area and there is no potential nesting habitat present in the action area, as there are no beaches that would be impacted. The project is not located in loggerhead sea turtle DCH.

Green sea turtle	Green sea turtles inhabit shallow waters of reefs, bays, and inlets. They can be found in tropical and temperate waters worldwide, where adult sea turtles feed on marine grasses and sea algae. Young sea turtles feed on aquatic insects, young crabs and other crustaceans, as well as seagrasses and algae. The Green sea turtle is prone to Fibropapillomatosis, a disease involving multiple skin and internal tumors. This disease, as well as loss of nesting and foraging habitat, death or injury from dredging and fishing operations, and marine pollution, are factors in the sea turtle's decline. Sea turtles have not been documented to occur within the action area and there is no potential nesting habitat present in the action area, as there are no beaches that would be impacted. The project is not located in green sea turtle DCH

4. ROUTE(S) OF EFFECT TO SPECIES:

Sea Turtle Species

Sea turtles face numerous natural and man-made threats that affect their status and ability to recover including impacts caused by fisheries operations, construction and maintenance of federal navigation channels, coastal development, and vessel strikes. Incidental by-catch in commercial fisheries is identified as a major contributor to past declines, and a threat to future recovery for all of the sea turtle species (NMFS and USFWS 1991; NMFS and USFWS 1992a; NMFS and USFWS 1992b; NMFS and USFWS 2008; NMFS et al. 2011). Domestic fisheries are also responsible for the capture, injury and death of sea turtles at various life stages. Structural impacts to nesting habitat include the construction of buildings and pilings, beach armoring and re-nourishment, sand extraction, and artificial lighting.

According to Michelle Pate with the SCDNR, sea turtles have only been observed in the Cooper River as far north as Riverfront Park. Riverfront Park is located approximately 2.7 miles south of the downstream end of the JBC channel. Sea turtles are not listed as a federally endangered or threatened species for Berkeley County, where the majority of the action area is located. Only the TC Dock is located in Charleston County and the channel adjacent to the TC Dock is routinely dredged for use as a turning basin associated with Charleston Harbor dredging activities.

Sturgeon Species

Physical effects: Potential physical impacts associated with dredging that may adversely impact sturgeon species (Atlantic and shortnose) include entrainment and/or capture of adults, juveniles, larvae, and eggs by dredging activities or injury due to strikes from dredging equipment and/or vessels. However, the chance of injury or death to Atlantic or shortnose sturgeon from interactions with clamshell and hydraulic dredging equipment is unlikely since these species are highly mobile and are likely to avoid the areas during dredging activities.

Habitat effects: Modeling conducted for the Charleston Harbor Post 45 Project (Post 45 2015) indicates that the tailrace canal of the Cooper River (outside of the proposed action area) contains suitable habitat for spawning based on velocity, temperature, substrate and salinity, but not for egg and larval life stages. This is because the modeled outputs for temperature within the timeframe for egg and larval habitat was below the threshold necessary for development. Successful spawning and recruitment within the Cooper River has not been documented. However, tagging and tracking by the South Carolina Department of Natural Resources of Atlantic and shortnose sturgeon show movement in the Cooper River. The highest usage of the Cooper River by shortnose sturgeon occurs roughly between RM 22 and 27, which is approximately where the freshwater-to-saltwater interface occurs (outside of the proposed action area). Disruption of migratory pathways is not anticipated since dredging activities, which would be localized at any particular time and would not span the length and width of the entire channel, will not prevent or significantly reduce adequate areas for passage.

Water quality effects: Sturgeon species may be affected by impacts to water quality including increased turbidity, and changes to salinity and dissolved oxygen associated with dredging activities. However, the impacts would be discountable due to the temporary nature of the activities.

While sediment testing conducted in June 2018 (ANAMAR 2018) indicates elevated levels of arsenic, this is not anticipated to adversely affect sturgeon species since studies have demonstrated that arsenic is naturally occurring in this region due to high concentrations found in basement rock.

Vessel strikes: The project may affect sturgeon species by injury or death as a result of interactions with equipment or materials used during dredging. However, the chance of injury or death from interactions with clamshell and/or hydraulic dredging equipment is discountable as these species are highly mobile and are likely to avoid the areas during construction. Additionally, vessels associated with dredging activities will typically move at speeds of less than 13 knots.

5. ROUTES OF EFFECT TO CRITICAL HABITAT

The project is not located in designated critical habitat, and there are no potential routes of effect to any designated critical habitat. The NOAA Fisheries' August 17, 2017 Final Rule designated critical habitat for the Distinct Population Segments (DPS) of Atlantic sturgeon (82 FR 39160). Under the Rule, the Cooper River up to the confluence of the East and West branches is designated as part of the Santee-Cooper Critical Habitat Unit (C7) of the Carolina DPS. However, pursuant to 33 CFR 424.12 (h), NMFS determined that the Joint Base Charleston Integrated Natural Resource Management Plan (INRMP) demonstrates an applicable conservation benefit to the Atlantic sturgeon species, and therefore, NMFS did not designate the section of the Cooper River adjacent to JBC properties, which includes the Action Area, as critical habitat. The Corps, on behalf of the USAF, has determined that the Proposed Action will have no effect on designated Atlantic sturgeon critical habitat.

6. DETERMINATION:

The Corps has reviewed the proposed project for its impacts to federally listed species and their DCH. The Corps has concluded the project will have no effect to any sea turtle species and may affect, but is not likely to adversely affect, the Atlantic and shortnose sturgeon species. The project will not affect any DCH. This analysis was prepared based on the best scientific and commercial data available.

The Corps, on behalf of the USAF, is requesting NMFS written concurrence with these determinations. The Corps appreciates your cooperation in completing this informal Section 7 consultation by concurring with the Corps' effect determination(s) in a timely manner. If NMFS disagrees with the Corps' effect determination(s) and requests formal Section 7 consultation, please contact the below referenced Project Manager to discuss suggested modifications to the action to avoid potential adverse effects and NMFS' additional information needs. The Corps will continue to coordinate with NMFS office via email to provide the requested information and, if warranted, a revised effects determination.

If you have questions, please contact Andrea Hughes of our Planning and Environmental Branch at (843) 329-8145 or andrea.w.hughes@usace.army.mil.

Sincerely,

Nancy Parrish
Acting Chief,
Planning and Environmental Branch

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APPENDIX J

Best Management Practices

Best Management Practices

1. Appropriate best management practices that will minimize erosion and migration of sediments on and off the project site during and after construction should be implemented. These practices should include the use of appropriate grading and sloping techniques, mulches, silt fences, or other devices capable of preventing erosion, migration of sediments, and bank failure.

2. All disturbed land surfaces and sloped areas affected by the project must be stabilized.

3. All necessary measures must be taken to prevent oil, tar, trash, debris and other pollutants from entering the adjacent waters or wetlands.

4. All efforts must be made to protect existing vegetation in and along shoreline areas.

5. Dredging must not occur during the months of March, April, May, or June, when possible, to avoid potential impacts to spawning fish.

6. All dredged material should be placed in a contained upland area of adequate size in a manner which ensures the material will not be re-deposited into the river or any other aquatic areas.

7. The dredge material must be capped or mixed with cleaner sediments or soils, when practicable.