Permit Application Supporting Documentation

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1. Introduction

The purpose of this report is to provide environmental documentation in support of a Section 404/Section 10 permit request made to the US Army Corps of Engineers (USACE) on February 20, 2013 by Shipyard Creek Associates, LLC. This request is for marine terminal development and navigation improvements at Shipyard Creek in North Charleston, South Carolina (USACE Action SAC#2013-00202-21R). A USACE response letter dated December 2, 2013 noted several issues requiring clarification before the permit could be issued.

This environmental report is intended to address those outstanding issues. A primary focus will be to ensure compliance with Section 404(b)(1) Guidelines (40 C.F.R 230) and to provide assurances that the most practicable alternative has been chosen for development of this planned facility. While it is understood that Department of Army permits are subject to requirements of the National Environmental Policy Act (NEPA) (42 U.S.C. § 4321 *et seq*), this document is not intended to be a formal NEPA submittal. As requested following discussion with the USACE, this document is being provided to address specific environmental or operational topics identified in the December 2, 2013 letter in order to assist in the decision making process.

2. Purpose and Need

2.1. Project Background

Shipyard Creek Associates, LLC (the Applicant) is seeking to rehabilitate the Shipyard Creek site located at 1800 Pittsburgh Avenue, Charleston, South Carolina (Figure 1). The site consists of approximately 74 acres of developable property fronting Shipyard Creek in an industrial and commercial section of the Charleston Peninsula. Shipyard Creek is a tributary of the Cooper River, which forms the eastern side of the Charleston Peninsula. A tidal creek and marsh along Shipyard Creek border the site to the north and east, industrial and commercial properties occur to the south, and a CSX rail yard defines the western boundary of the site (Figure 2).

Surrounding land use reflects the urban/industrialized nature of the area. Union Heights, a neighborhood with low-income and minority residents, is located to the west on the opposite side of the CSX rail yard well away from the Shipyard Creek site. Currently, a number of industrial businesses occupy the area south of the Shipyard Creek property. These businesses include the North Charleston Sewer District treatment facility, Kinder Morgan and Marinex Construction along with a number of truck stops, towing services and adult entertainment clubs. The Palmetto Railways proposes to construct and operate an Intermodal Container Transfer Facility (ICTF) at the former Charleston Naval Complex north of the site. The Navy Base Terminal and the proposed Charleston Port expansion (now owned by State Ports Authority) dominate the landscape east of Shipyard Creek. Land to the northeast above the turning basin is owned by the Federal government (law enforcement facility). West of the property is the CSX Cooper Yard and a Santee Cooper facility. All adjacent property owners were identified in the original permit submittal.

The site was used as a ferrochromium alloy smelting plant from 1941 until 1998. In 2000, the Environmental Protection Agency (EPA) placed the Shipyard Creek property on the National Priorities List (NPL) as a Superfund site because of contaminated ground water, sediment, and soil resulting from facility operations. The EPA, the South Carolina Department of Health and Environmental Control (SCDHEC) and the Potentially Responsible Party (PRP) Group, have investigated site conditions and taken steps to clean up the land in order to protect people and the environment from contamination. The United States Department of Defense was a member of the PRP Group and contributed more than $9 million for site remediation. The remediation required by EPA was completed in September 2006. In fact, the site was nationally recognized as being the 1,000th property on the NPL to reach the “construction complete” milestone. The success of this clean up action has been based on positive interaction by all involved parties, including community engagement and public outreach, to rehabilitate an economically viable property in a safe and environmentally effective manner. The Applicant purchased the property in March 2007 and was not responsible for any of the contamination.

Historically, the Upper Basin and Upper Channel portions of Shipyard Creek were periodically dredged by the USACE beginning in the mid-1950s until 1998 when operations ceased at the smelting plant. During the late 1960’s through the early 1970’s the Upper Basin was dredged to a depth of approximately -37 feet with the Upper Channel dredged to about -43 feet deep. Additional dredging occurred during the 1980s with the Upper Basin being deepened to approximately -41 feet, while the Upper Channel was dredged to a maximum of -39 feet. A primary component of the proposed project involves dredging the Upper Basin and Upper Channel to a depth of -38 feet, consistent with the depth that those areas were dredged and maintained from the 1960s through early 1990s.

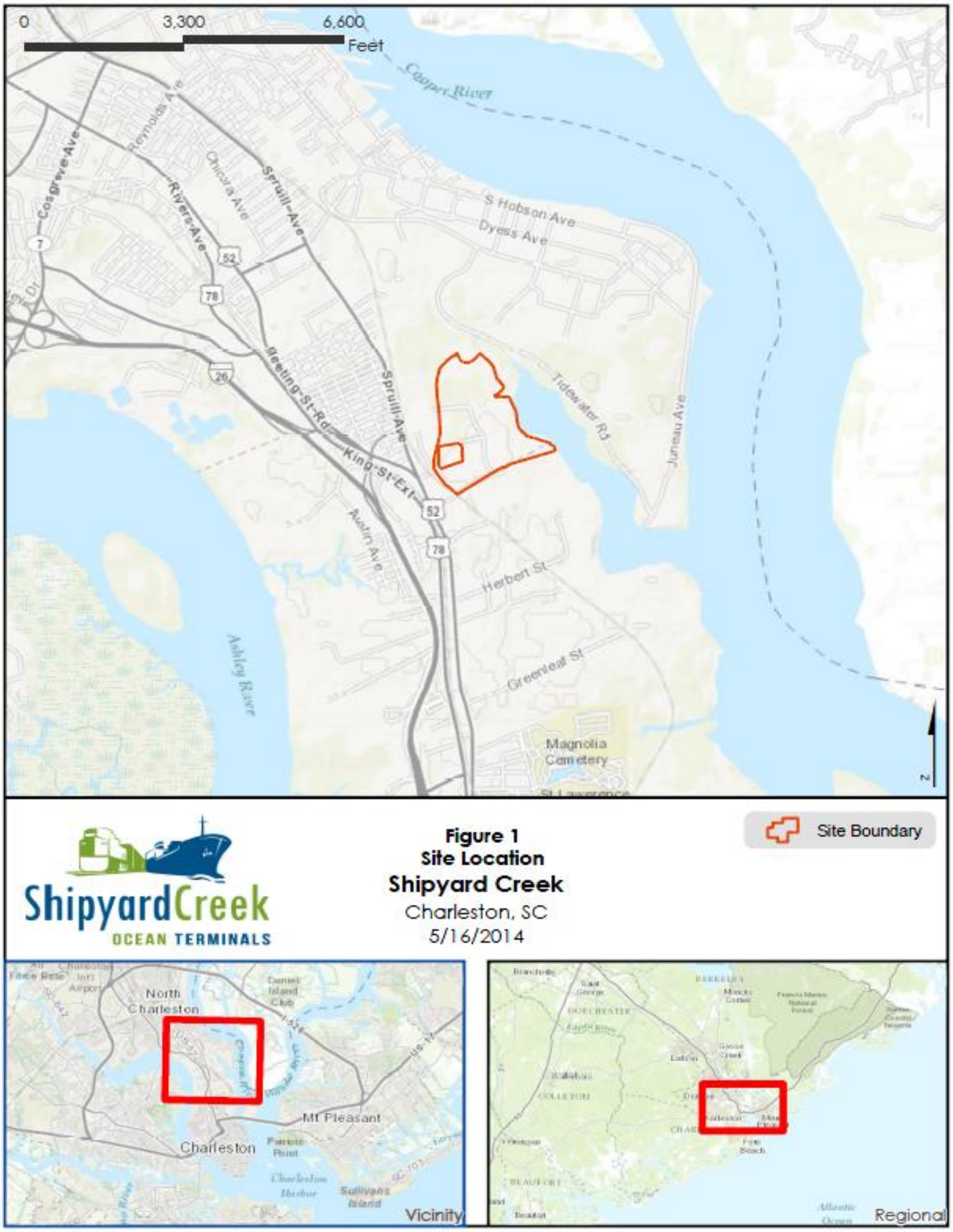


Figure 1: Site Location

Figure 2: Site Map

2.2. Project Description

The proposed action entails replacement and upgrade of the former marine terminal facility to permit larger vessels to safely navigate the Shipyard Creek channel, turning basin, and ship berths during all tidal stages. Specific actions proposed in the creek and along embankments include:

- Deepening and widening the existing authorized Upper Channel and Basin. The channel will be widened from 200 feet to 300 feet. Both the Upper Channel and Upper Basin will be deepened to -38 feet mean low level water (MLLW) with minus one foot of allowable over-dredge (consistent with the depths of historical dredging in these areas);
- Dredge a new mooring area adjacent to the channel (i.e., 130 feet wide at -12-foot MLLW and 65 feet wide at -7 feet MMLW);
- Construct a new 70-foot wide by 880-foot long concrete bulk handling wharf. The pile supported structure would have a steel sheetpile wall on the landward side. Armor stone is proposed for placement on the slope beneath the wharf and backfill placed behind the sheetpile wall;
- Construct a new 390-foot long steel retaining wall north of the proposed wharf;
- Construct a new 575-foot long steel sheetpile toe wall in front of an existing concrete wharf to allow for the proposed dredged deepening without endangering the structural stability of the existing wharf;
- Remove existing timber breasting dolphins along existing channel; and,
- Construct two 30-pile cluster timber dolphins and fourteen 19-pile cluster timber dolphins in the new mooring area outside of the proposed channel widening. This new mooring field will be available to Marinex Corporation (the company will also be granted the ability to place additional moorings in the northeast corner outside of the turning basin, if needed and with prior approval of the permitting agencies).

In addition, several improvements are contemplated for upland areas including:

- Terminal facilities capable of handling bulk, break-bulk and roll-on/roll-off (RO-RO) operations (no coal or liquid natural gas);
- An internal roadway system capable of handling truck traffic which will be generated by development of the Shipyard Creek site including necessary roadway and intersection improvements along Pittsburgh Avenue (the main Shipyard Creek site access roadway) and at the future port access road;
- An industrial rail siding will be incorporated into the site to take advantage of the site’s ability to connect to existing adjacent tracks and to reconstitute rail service which existed at the site from 1941 until closure of the smelting plant in 1998. The rail siding will consist of three, 650-ft tracks, to be located along the western edge of the property and allow the rail operation to accommodate transfer of rail cars and provide a bypass lane. This rail access would provide rail service for any on-site warehousing and allow the facility to receive items which are not easily transported via trucks (such as oversize/weight and out of dimension cargo) which is typical of goods shipped through a general cargo terminal.

The proposed facility is a general cargo terminal designed to handle a variety of materials – bulk (such as grain, wood pellets, or aggregate), break-bulk (lumber, rubber or palletized goods), RO/RO (vehicles) and out-of-dimension cargo. Since this is a general cargo facility, equipment needs will be tied directly to material type and volume. The hours of operation will likely be dependent upon vessel arrival and departure schedules and the type of commodity being handled; however, most yard activities are expected to occur during daytime hours.

Up to two vessel berthings are anticipated per week. When vessels arrive, material will be discharged or loaded via ships gear, or a mobile crane will be brought to the site when needed. Ships gear will be employed when possible to reduce the need for permanent shore-side equipment. For loading bulk materials, a portable ship loader may be utilized along with conveying equipment to move bulk material from the storage areas to the vessel or vice versa.

For import, material is transferred to shore-side before being loaded onto trucks or trains. This operation is reversed for export. Bulk materials such as aggregates will be stored on the ground while products such as wood pellets will be stored in enclosed facilities. Ground stored material will be handled by traditional means such as forklifts, front end loaders, and trucks. Warehousing for break bulk materials is expected to be configured to accommodate the facility and material being processed.

Material movement on and off the site will be facilitated by train and truck. As previously noted, the rail spur has three tracks to allow for storage, operation and bypass. Up to one train movement per week is anticipated accommodating approximately 12 rail cars. Trucks will accommodate more localized and regional material movement via I-26.

2.3. Project Purpose

The purpose of the proposed action is to rehabilitate a former brownfield (Superfund) site into an economically vibrant, Charleston-based marine terminal facility with access to existing federal shipping channels, major rail carriers, and the interstate highway system. The proposed project will allow the Shipyard Creek site to be re-developed as an operating marine terminal which will support businesses, help address the growing need for shipping capacity within the area, and provide a significant contribution to the City's tax base. When the Macalloy Corporation operated the plant from 1978 to 1998, the site had the second highest tax rate in North Charleston.

The proposed action will replace and upgrade the former Macalloy marine terminal facility to permit waterfront access to the site via deep draft Handymax sized vessels consistent with expected needs of the shipping industry. Land based improvements will result in bulk, break bulk, or RO-RO facilities with associated amenities (rail, roadway, and site improvements). Direct access into the site via rail and road is imperative. Proposed facilities will meet a growing need for shipping alternatives as business expansion occurs in South Carolina and throughout the region. The site will not be used to move goods to or from other state port terminals.

These proposed improvements are consistent with the formally recognized purpose and intent for this area to support water dependent port-based activities. This objective was documented in a Memorandum of Understanding (MOU) signed in 2002 between the City of North Charleston (the City) and the South Carolina State Ports Authority (SCSPA) recognizing the creation of a Port Overlay District (Figure 3) to encourage development of port related facilities in and around the Charleston Naval Complex (MOU, October 25, 2002). In 2011, the City rezoned the Shipyard Creek property to M-2 Heavy Industrial Zoning consistent with the intent of the 2002 MOU.

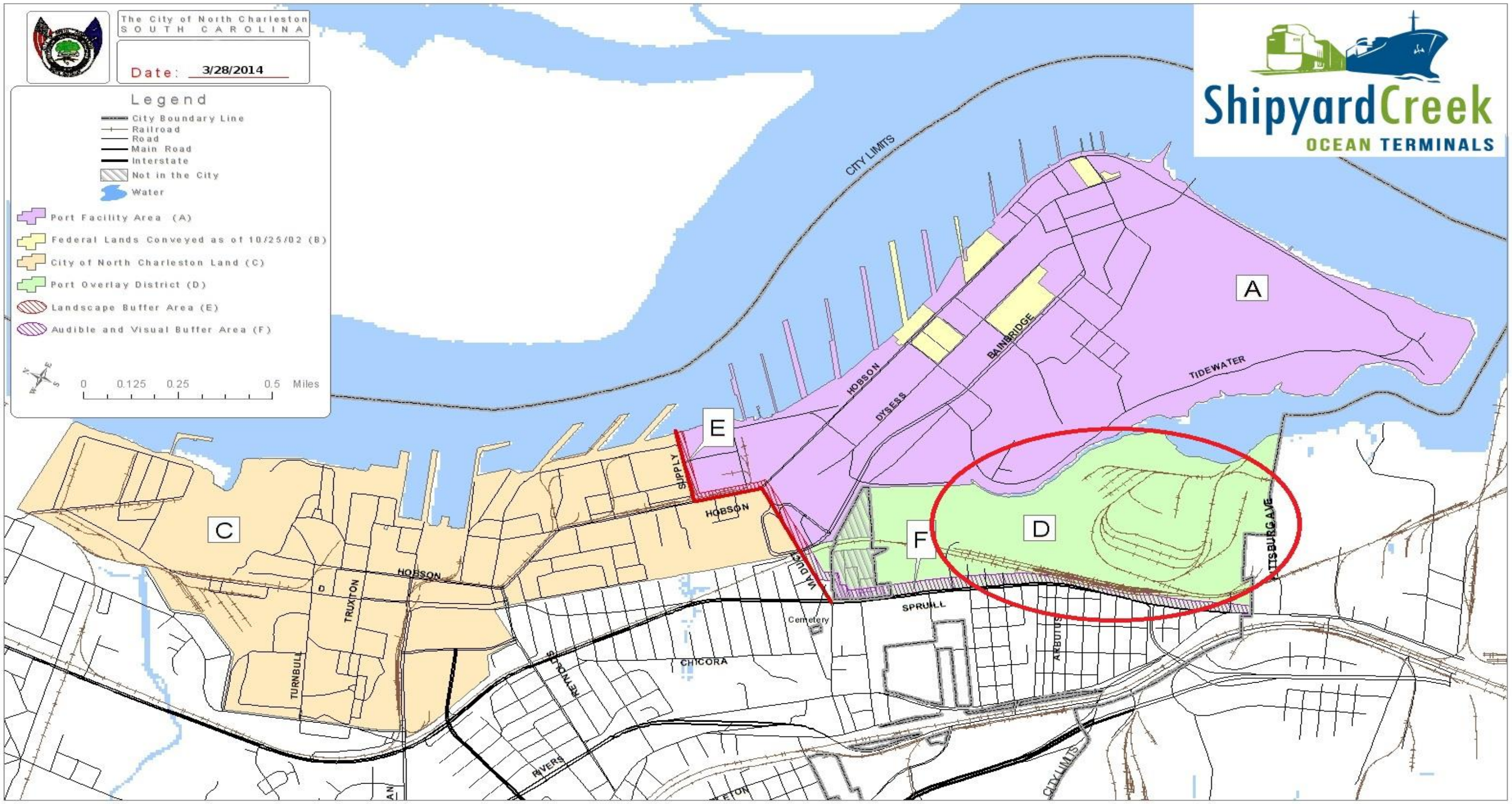


Figure 3
Port Overlay District

map source: city of north charleston

Figure 3: Port Overlay District

2.4. Project Need

2.4.1. Market Demand

The Port of Charleston is recognized worldwide as a significant and capable cargo port. The Charleston port district's ranking as a global trading port is consistently in the top ten nationally in cargo value and container volume. In 2009, the Charleston district was ranked ninth in cargo value and ninth in container volume (USACE 2010). The SCSPA has projected a more than doubling of containerized cargo into the port between 2004 and 2025 (1,650,000 twenty-foot equivalent units [TEUs] in 2004 to 4,000,000 TEUs in 2025), assuming a conservative 4.28 percent compound growth rate (USACE 2006). These numbers are focused on containerized shipping with an obvious need for general non-containerized facilities to handle bulk cargo demands.

More than 2,100 vessels from ports around the world called at the Port of Charleston in 2007 (USACE 2010). Although shipping traffic was down in 2009 and 2010, the port had one of its busiest months since May of 2008 in April 2014 (http://www.scspa.com/About/News/pressroom/pressroom.asp?PressRelease=416). The major commodities handled at the Port included agricultural products, consumer goods, machinery, metals, vehicles, chemicals, and clay products.

Area leaders recognize the importance of future growth at Shipyard Creek to Charleston. Break bulk tonnage increased substantially in 2012-2013 with nearly a 26 percent increase from the previous year (http://www.scspa.com/About/News/pressroom/pressroom.asp?PressRelease=370). The growth trend for shipping of bulk and break bulk items is expected to continue. To help deal with expected future demand, SCSPA has voiced support for the Shipyard Creek facility noting that "The development of additional marine terminal capacity along the Charleston Harbor enhances the attractiveness of our state as we enhance our efforts to attract manufacturing and distribution and encourage the growth of exports and imports" (SCSPA letter, May 9, 2013; Appendix A). The proposed project would help address the growing demand for additional maritime terminal capacity acknowledged by the SCSPA.

Support for additional private port expansion is even more imperative given that the SCSPA is facing a deficit of more than $1.5 billion to cover the cost of port expansion and needed infrastructural improvements. SCSPA President Jim Newsome has recognized the need for creative ways to help bridge this funding gap, including infusion of private capital. "There is long-term money, pensions, and other funds chasing infrastructure investments such as productive port terminals. We'd consider these approaches as appropriate" (Rob Brinson, Post and Courier, Apr 27, 2014).

2.4.2. Regional Need

The South Atlantic Region is one of the fastest growing parts of the country (USACE 2010). The South Atlantic states (North Carolina, South Carolina, Georgia, Alabama and Tennessee) and North Florida had a population of 34 million people in 2000 (over 12% of the total U.S. population), and it is expected to grow to over 57 million by 2050 (Georgia Institute of Technology 2006). As this region continues to grow faster than most other areas of the United States, the Port of Charleston is well positioned to support this additional growth. Marine transportation will become even more important to our economy as 95 percent of America's foreign trade is moved by ship (USACE 2010).

Port volumes at the Charleston Port increased during 2012, with container volumes increasing by more than nine percent compared to Savannah's growth of less than one percent (Charleston Metro Chamber of Commerce 2013). Subsequently, more demand will be placed on North Charleston, Wando, and the Naval Base terminals that currently handle most of the port's containerized needs. In order to meet future shipping demand, the South Carolina General Assembly authorized the SCSPA to begin plans for a new terminal facility along the west bank of the Cooper River and to convey a portion of the former Charleston Naval Base to the SCSCPA for expansion purposes.

In addition, harbor deepening will result in room for growth to accommodate larger Post-Panamax vessels. The port handled more than 1.5 million TEUs in calendar year 2012 and that trend is continuing (http://www.scspa.com/About/News/pressroom/pressroom.asp?PressRelease=370). While harbor deepening will help accommodate a significant increase in container traffic in Charleston, this increased demand will also result in an additional need to accommodate bulk, break bulk and RO-RO shipping. An analysis of shipping trends from 2003 through 2013 at the existing port shows that bulk and break bulk items such as wood and paper products account for 57 percent of the exports and 70 percent of the imports (US Census Bureau, Foreign Trade Division, December 13, 2013). The Charleston Port handled 723,420 tons of break bulk in fiscal year 2013 (SCSPA 2013). Since bulk and break bulk items are target markets for the Shipyard Creek project, additional capacity at the site will help meet these expected shipping needs. Most importantly, Shipyard Creek has direct rail access into the site, a situation which is rare for properties along the federal channel in Charleston and helps make this site an ideal location for the proposed project.

Recent announcements by BMW will also fuel the need for shipping facility expansion. The South Carolina automaker has indicated a commitment to invest more than $1 billion at its Greer South Carolina location creating 800 jobs and pushing production from 300,000 to 450,000 units annually (http://www.gsabusiness.com/news/50943-bmw-expanding-with-1b-investment-800-more-jobs). Many of these cars will be shipped from the Charleston Port, putting particular pressure on existing capacity at the Columbus Street Terminal. This increased demand will make the Shipyard Creek site even more attractive to handle specialized cargo that cannot be accommodated at other Charleston Port facilities.

2.4.3. Client Interest and Site Specific Needs

The Port of Charleston is a recognized name and location for customers seeking to ship cargo internationally which adds credibility to proposed expansion of port facilities at the Shipyard Creek site. Customers will benefit from all the synergies that currently exist in the Charleston port community including accessibility (two major railroads and highway access via I-26 to I-95, I-77, and I-85), a strong labor force, and support services for both vessels and cargo.

Based on the potential needs of targeted user groups for the Shipyard Creek site, various conceptual facility layouts have been prepared which would allow the site to act as a general cargo terminal. Product types for which clients have expressed an interest in shipping through this facility include:

- Wood chips and wood pellets
- Iron ore
- Grain and soybeans
- Steel modular components
- Machinery
- Various bulk raw materials

One thing all interested clients have in common: they are all bulk cargo shippers that need a bulk cargo terminal with complete access to and use of upland and waterfront facilities. While the proposed yard layout may change based on the commodity to be shipped or received, onsite impacts, as well as impacts associated with the dredging and wharf construction, will be the same regardless of the ultimate user. In other words, the actual type and distribution of the commodities coming into or leaving the site has not affected the overall analysis of environmental impacts. Also, as stated in the purpose and need, this project will serve principally as a bulk, break bulk, or RO-RO facility and will not involve coal or liquid natural gas. It is not the intent of the Applicant to deviate from this intended purpose such that the focus of the project or associated impacts could change.

To handle expected cargo needs, Handymax-sized bulk vessels would be required. Figures 4, 5 and 6 below present the overall lengths, beams and fully loaded drafts, respectively, of such vessels.

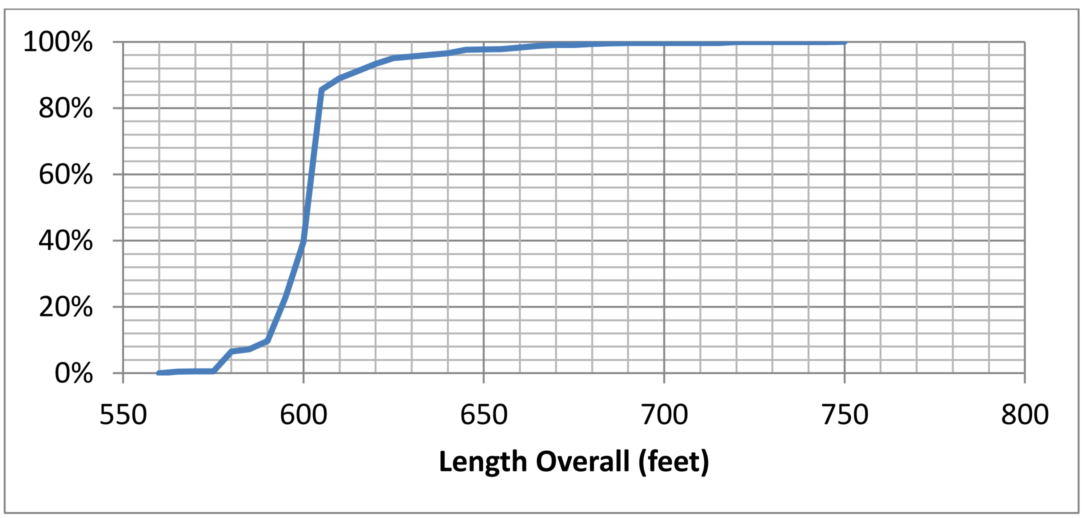


Figure 4: Handymax Vessel Overall Lengths (% less than)

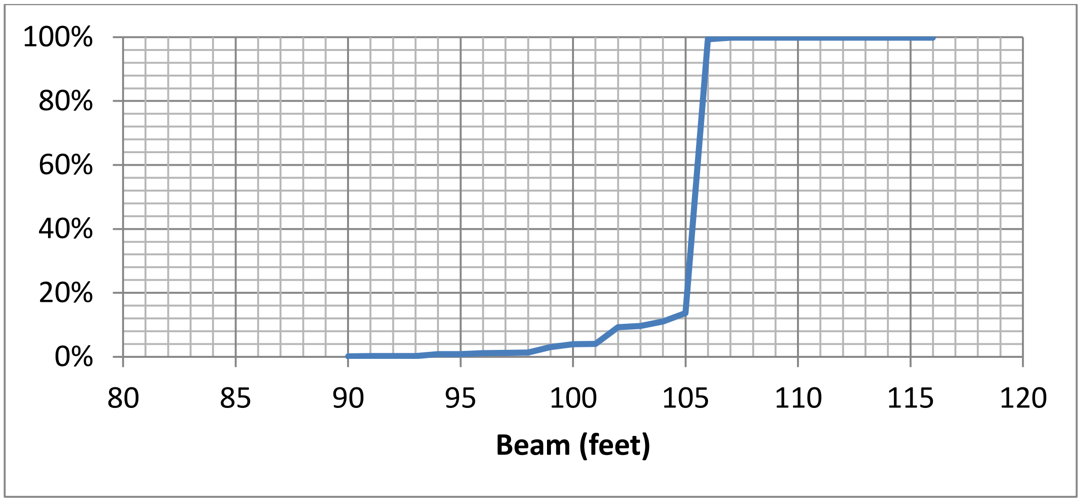


Figure 5: Handymax Vessel Beams (% less than)

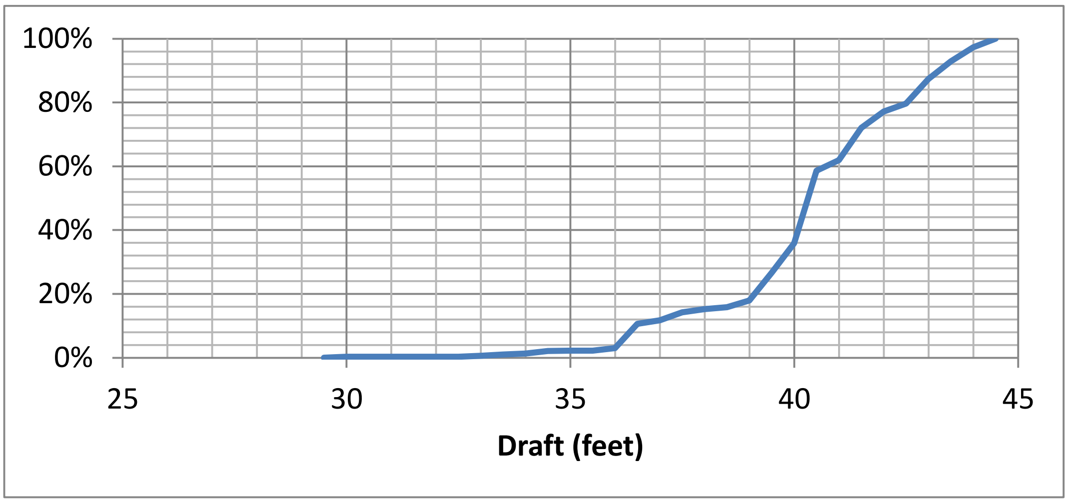


Figure 6: Handymax Vessel Fully Loaded Drafts (% less than)

Based on these data and communications with potential users, a typical Handymax vessel with an overall length of 623 feet; beam of 105 feet; and a loaded draft of 35.4 feet was selected for determining the required channel and turning basin dimensions in keeping with our preferred alternative for the Shipyard Creek project. This draft does not represent a fully loaded condition, but would serve as the minimum feasible draft for their operations. Deeper draft conditions would improve the terminal efficiency; however, the additional dredging depth required, and hence additional impacts due to the side slopes extending further into the critical areas, would outweigh the potential benefits at this time. In order to accommodate Handymax vessels of approximately 600 feet in length and drafts up to 35 feet, a channel width of 300 feet is proposed to allow for turning and maneuverability, and a dredged channel depth of -38 feet (plus one additional foot over dredge) was determined to be a targeted depth to meet vessel needs.

The proposed dredging within Shipyard Creek is very similar to a project that was extensively studied by the USACE in the 1970s and 1980s and recommended in connection with the plan to deepen Charleston Harbor to -40 feet. As a result of those studies and based on the recommendation of the

USACE, Congress passed the Water Resources Development Act of 1986, which specifically authorized the dredging of Shipyard Creek to a depth of -38 feet. Further, according to historical surveys conducted by the USACE, Shipyard Creek was routinely dredged to depths ranging from -36 to -40 feet deep during a period from the 1970s through early 1990s. Dredging within the Upper Basin and Upper Channel was ultimately discontinued for lack of need following the closure of the Macalloy plant. The proposed project would restore Shipyard Creek to a depth of -38 feet, the same depth at which it was historically authorized and maintained.

To this end, preliminary channel sizing was performed based on PIANC and USACE guidelines, along with desktop fast-time maneuvering modeling using the software package SHIPMA. To confirm these channel and turning basin dimensions, full mission bridge simulation studies were performed. These studies were conducted at the Maritime Institute of Technology and Graduate Studies (MITAGS) using two experienced Charleston Harbor pilots. The study validated the design of the approach channels, from a ship handling perspective, for utilization of Handymax Bulk Carriers. The harbor pilots also concluded that transiting the channel and performing berthing maneuvers could be performed safely under the proposed conditions (information previously provided with the permit application).

2.4.4. Jobs and Economic Benefits

The Port of Charleston is one of the most important ports in the United States and also serves as one of the most important economic drivers for the State of South Carolina. Today the Port handles between 20 and 26 million tons of cargo, including about 1.5 million TEUs, and is responsible for $45 billion in total economic output and over 260,000 jobs across the state (USACE 2010). An economic analysis done for the SCSPA by the Center for Economic Forecasting at Charleston Southern University (2006) measured the impact of the Port on the State economy. The analysis found that the SCSPA creates $9.4 billion in annual personal income and $2.5 billion in annual tax revenues.

Future projections show South Carolina growing from about 4.5 million people today to about 6.1 million in 2050. The Gross State Product for South Carolina has grown about 65 percent in the period from the previous study in 1996 until 2010 (USACE 2010). Roughly 25,000 new jobs are projected for the Charleston region in the next five years (http://www.charlestonbusiness.com/news/50736-industry-leaders-region-needs-degrees-to-match-jobs), many of which will be port related. More than 700 South Carolina companies from every county in the state regularly ship through the port, not including the hundreds of transportation companies that facilitate trade (SCSPA 2013). These numbers are expected to grow over time.

In short, the Shipyard Creek project will contribute economic synergy, jobs, and financial benefits to the Charleston area. This project is expected to be compatible with goals and expectations of the Port of Charleston to meet 21st century shipping needs with subsequent economic benefits to the area.

3. Alternatives Analysis

3.1. Off-Site Alternatives

3.1.1. Background

A total of seven regional alternative sites, including the preferred alternative, were considered for the project (Figure 7). All alternatives are Charleston-based and have varying attributes that warranted consideration as a port facility. This analysis also included sites evaluated for the marine container terminal facility at the Charleston Naval Complex (USACE 2006; Daniel and Clouter Islands). A description of each site is provided below.

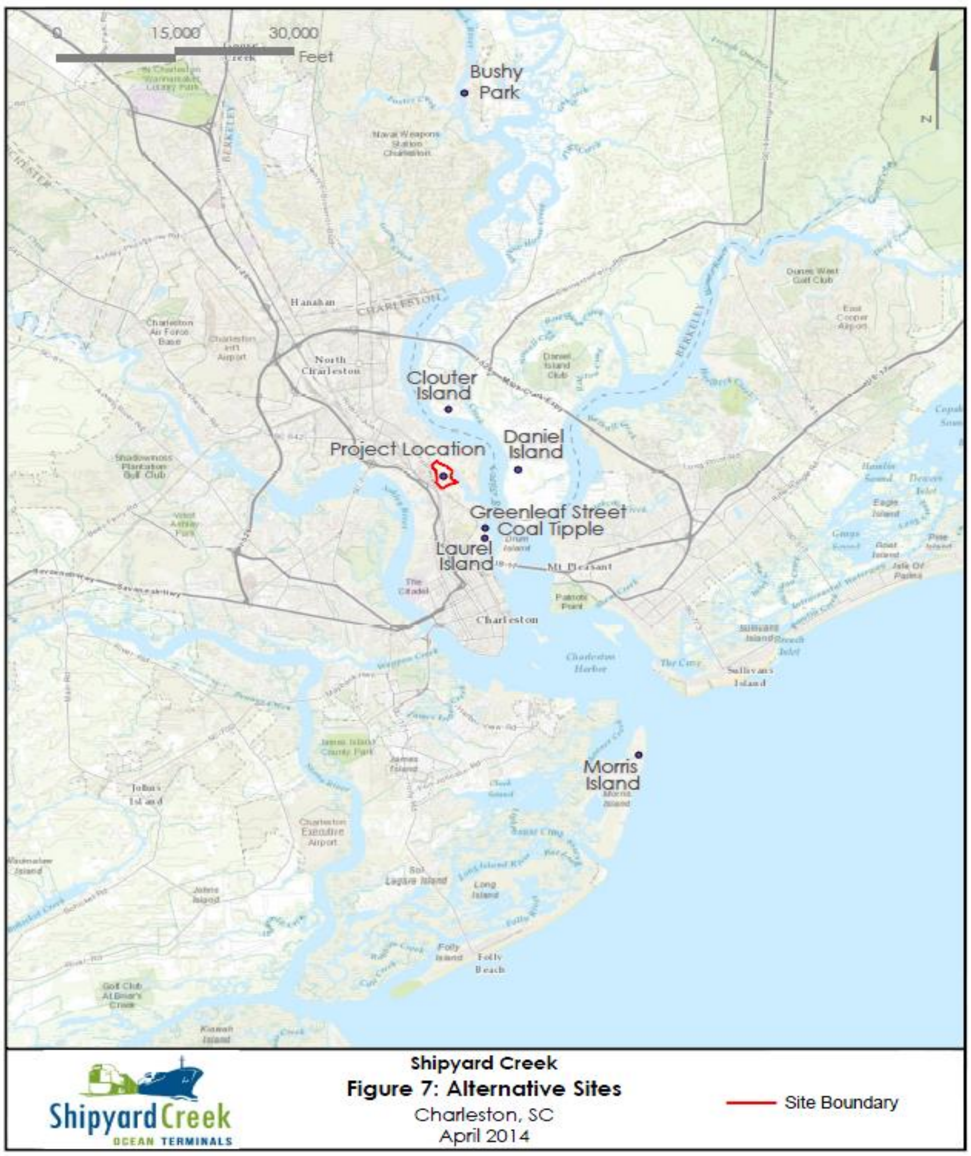


Figure 7: Alternative Sites

3.1.2. Alternative Site Descriptions

3.1.2.1. *Daniel Island*

The SCSPA owns 1,369 acres on the southern half of Daniel Island, SC. There is a 261-acre tract available for commercial development that was described in the analysis for the 2005 USACE Marine Container Terminal EIS at the Charleston Naval Complex (USACE 2006). The balance of the site is an active dredge disposal area. For this alternative, approximately 30 acres of estuarine wetlands would be impacted for port and access road development as well as impacts to freshwater wetlands. Extensive dredging would be needed to develop the site as a port as well as significant construction including fill for road and rail access which presently does not exist. The surrounding land use includes a large planned residential/commercial community which has been actively opposed to port development. In 2009, the South Carolina Legislature (SC ST SEC 54-3-119) declared that port uses cannot occur on the site and the land is to be transferred from the SCSPA to other (non-port) ownership. This site was eliminated from further consideration due to the fact that port related activities cannot be conducted on the property.

3.1.2.2. *Bushy Park Industrial Complex*

This site is a 1,600 acre industrial complex located on the upper reaches of the Cooper River near the town of Goose Creek. There is an active USACE application (P/N # SAC-2013-01331-2G; dated March 25, 2014) to construct a manufacturing facility, rail spur, and wharf on site as well as to conduct dredging in the adjacent channel. The proposal would require dredging approximately 955,600 cubic yards of river bottom (93 acres of surface area) to a depth of at least -39 feet from the existing depth of -30 to -35 feet within the channel; dredging to a depth of -42 feet is proposed at the dock and berth. Most of the dredging would be focused in previously undisturbed river bottom. In addition, about 100,000 cubic yards of annual dredging would be required. Since there are freshwater wetlands along the river frontage, impacts to an estimated 10.5 acres of these fringing wetlands would be required in order to develop port access. Finally, rail access to the site would need to be constructed which could result in potential additional wetland impact. Since the backlands are not immediately adjacent to the proposed berth, the site may not be acceptable for RO-RO shipping or receiving. This site did not receive further consideration since a development plan and permit request is already pending. Also, impacts associated with dredging, the lack of rail access, and site size limitations would restrict intended uses

3.1.2.3. *Clouter Island*

This site is located at the south end of Clouter Island along the Cooper River upstream from the Charleston Naval Complex site. There is a 275-acre tract available for commercial port development that was described as available in the USACE EIS for the Marine Container Terminal at the Charleston Naval Complex in 2005 (USACE 2006). As with the Daniel Island alternative, development of road and rail access would be needed to the property. For port development, there would be at least 15 acres of impact to estuarine wetlands which would occur along the shoreline, with some additional environmental impact from construction of an access road. The access road would impact existing residential, commercial and open space areas on the island. The existing confined dredge disposal system would have to be replaced elsewhere with likely additional impacts to wetlands as well. Again, extensive dredging would be needed to develop this site as a port. Clouter Island is an existing dredge disposal site that remains as a critical dredge material disposal area for SCSPA and USACE and cannot be reasonably obtained or utilized as an alternative development site. In addition, potential wetland and dredging impacts along with the need to construct an access road into the site resulted in this property being eliminated for further consideration.

3.1.2.4. *Laurel Island*

The Laurel Island site is along Town Creek across from the Drum Island Disposal site. There are approximately 159 acres which are potentially suitable for port development. A fringing estuarine marsh is present along the shoreline and impacts would be unavoidable in order to support berthing and adjacent land-based facilities. The surrounding land use is mostly industrial. Since the site is an old dredge spoil and landfill area, this previous disturbance suggests that cultural resources and on-site freshwater wetlands are not likely to be present. Additional dredging of the creek would be needed to develop portside facilities and accommodate shipping, but quantities are unknown at this time. Rail access exists but would need to be improved. Although interstate highway access is nearby, arterial roads into the site would need to be developed or improved to support efficient transport of goods and services. This action may require purchase of adjacent properties. Since this is an old dredge spoil and landfill area, soil modifications would be required in order to make the site suitable for bulk cargo. This site could be considered for future port expansion but potential delays associated with needed infrastructural improvements and potential need for additional land acquisition resulted in Laurel Island not being considered at this time.

3.1.2.5. *Morris Island*

This is an 840-acre uninhabited island famous for its role in the Civil War as the site where the African-American 54th Massachusetts Infantry led their ill-fated charge on Fort Sumter as portrayed in the movie Glory. In May 2008, the Trust for Public Land and partners, including the South Carolina Conservation Bank, the SCSPA, the Civil War Preservation Trust, and many private donors purchased the island on behalf of the City of Charleston. A portion of the island will be used by the SCSPA as a dredge spoil site, the balance will remain undeveloped. In order to develop the site for a port, impacts to the fringing salt marsh would be required along with extensive dredging in fairly shallow water. The historic nature of the site is a severe constraint to port development and is the primary reason Morris Island did not receive further consideration. In addition, road and rail access are not present and could only be constructed at great expense and with additional impacts to estuarine and freshwater wetlands.

3.1.2.6. *Greenleaf Street Coal Tipple*

The SCSPA owned 16 upland acres and 82 wetland acres on Town Creek near the Magnolia Cemetery on Greenleaf Street in Charleston. The upland portion of the tract was recently sold to an unidentified buyer for "water borne commerce" (http://www.port-of-charleston.com/About/News/pressroom/pressroom.asp?PressRelease=417). The land was formerly a coal tipple export facility constructed around 1915, which the SCSPA acquired in 1954. In the 1970s, a fire burned the rail trestle and the site has been vacant since that time. The site would likely require significant environmental remediation due to its past use as a coal export facility. The property is separated from

Town Creek by an extensive estuarine marsh which would require significant impacts in order to construct a wharf. Also, since there is such a small area of upland to support port related storage, additional estuarine wetland impacts would be needed to expand landside facilities and associated infrastructure. Significant dredging would undoubtedly be required to make this site a viable port. Because of the property configuration, it is difficult to construct the type of railroad trackage and connectability which is preferred. There is also limited storage capability. The limited size of the property, the need for significant infrastructural improvements, potential wetland impacts, and current ownership changes resulted in the elimination of the Greenleaf Street Coal Tipple from further consideration.

3.1.2.7. Preferred Alternative – Shipyard Creek

The preferred alternative is described in more detail elsewhere in this report. The site has approximately 74 acres of currently developable land along Shipyard Creek on a reclaimed former hazardous waste site. Immediate access to the Cooper River and Charleston shipping channels, rail access to the property, and a well-defined roadway and interstate network system servicing the property make the Shipyard Creek site ideal for storage and shipment of bulk, break bulk and RO-RO items. Efforts have been undertaken to minimize wetland impacts to approximately 0.38 acre of estuarine marsh or fringing areas below Mean High Water. Although the creek channel will need to be deepened to -38 feet to support Handymax vessels considered ideal for targeted shipping needs, every effort has been undertaken to reduce additional impacts to wetlands bordering the shipping channel. Deepening to -38 feet is in keeping with approved dredging of Shipyard Creek under the Water Resources Act of 1986 and with routine dredging to depths ranging from -36 to -40 feet deep during the 1970s through early 1990s. This property meets all the criteria defined in the project purpose and need.

3.2. On-site Alternatives

3.2.1. Background

Four on-site alternatives were examined in order to facilitate redevelopment of the Shipyard Creek property. As stipulated in the stated project purpose and need, the proposed action is to rehabilitate a former brownfield (Superfund) site into an economically vibrant, Charleston-based marine terminal facility with access to existing federal shipping channels, major rail carriers, and the interstate highway system; all on-site alternatives were considered within this context. The first alternative would be a no-build option where the existing property is allowed to remain in its present condition or be developed for alternative uses. The second alternative is to develop the site as a warehouse/storage/distribution center without the associated ocean terminal and associated dredging. The third alternative (applicant preferred) would be to develop the property as an ocean terminal with various extensive measures taken to minimize impacts. The fourth alternative is a variation of the preferred, but dredging activities have been modified to save costs resulting in associated additional wetland impacts (see Figures 8, 9, and 10).

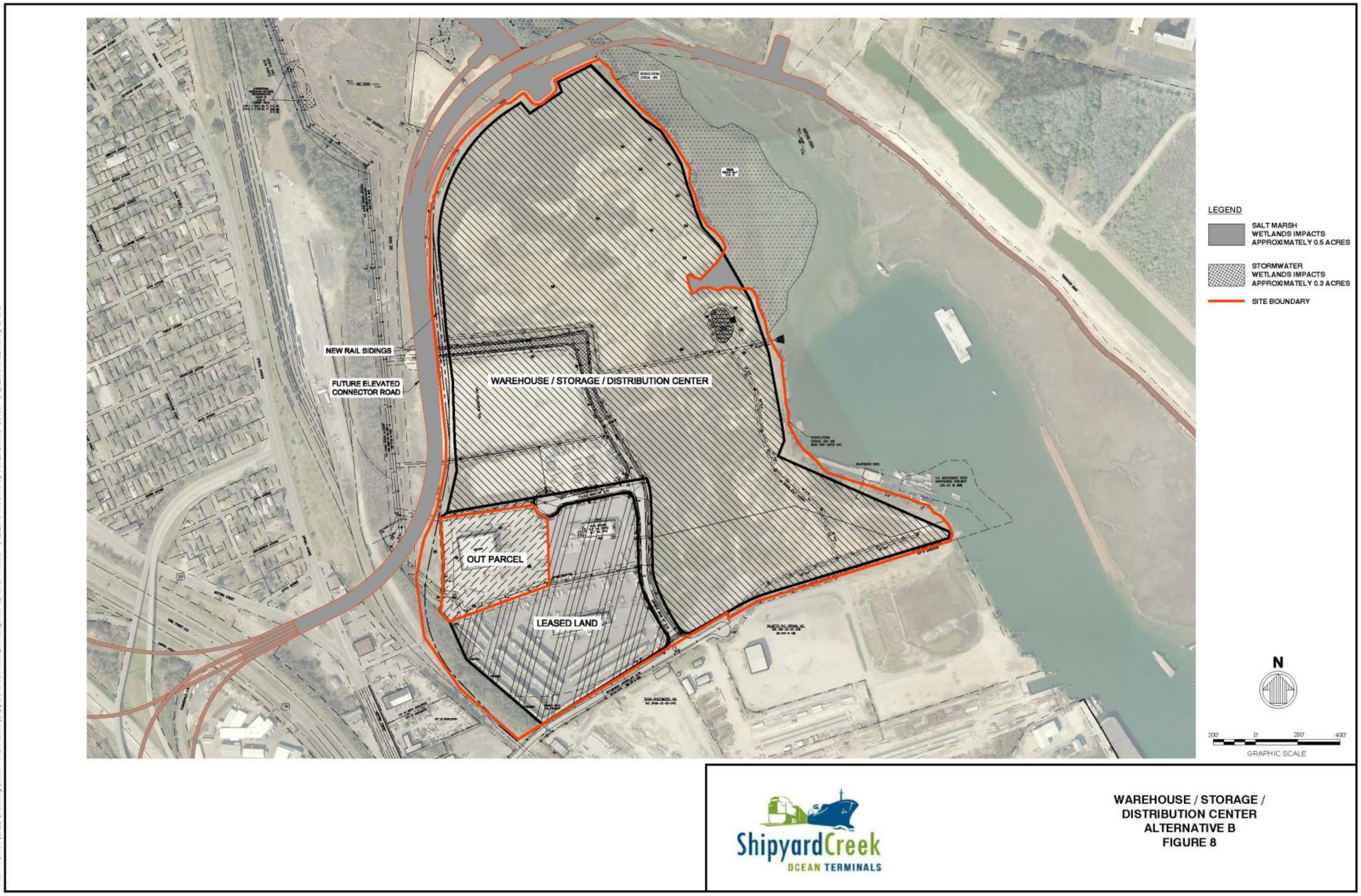


Figure 8: Alternative B

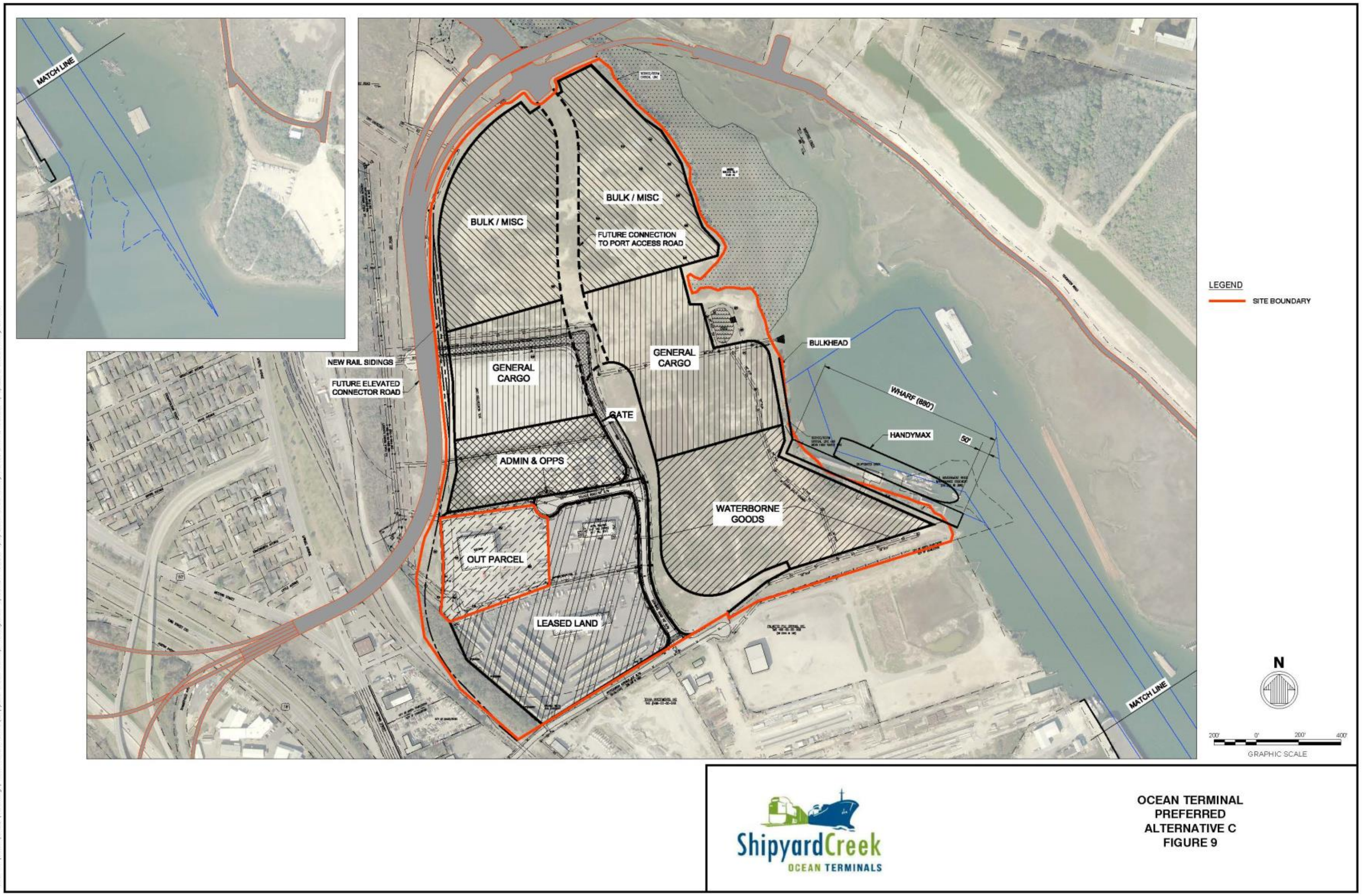


Figure 9: Alternative C

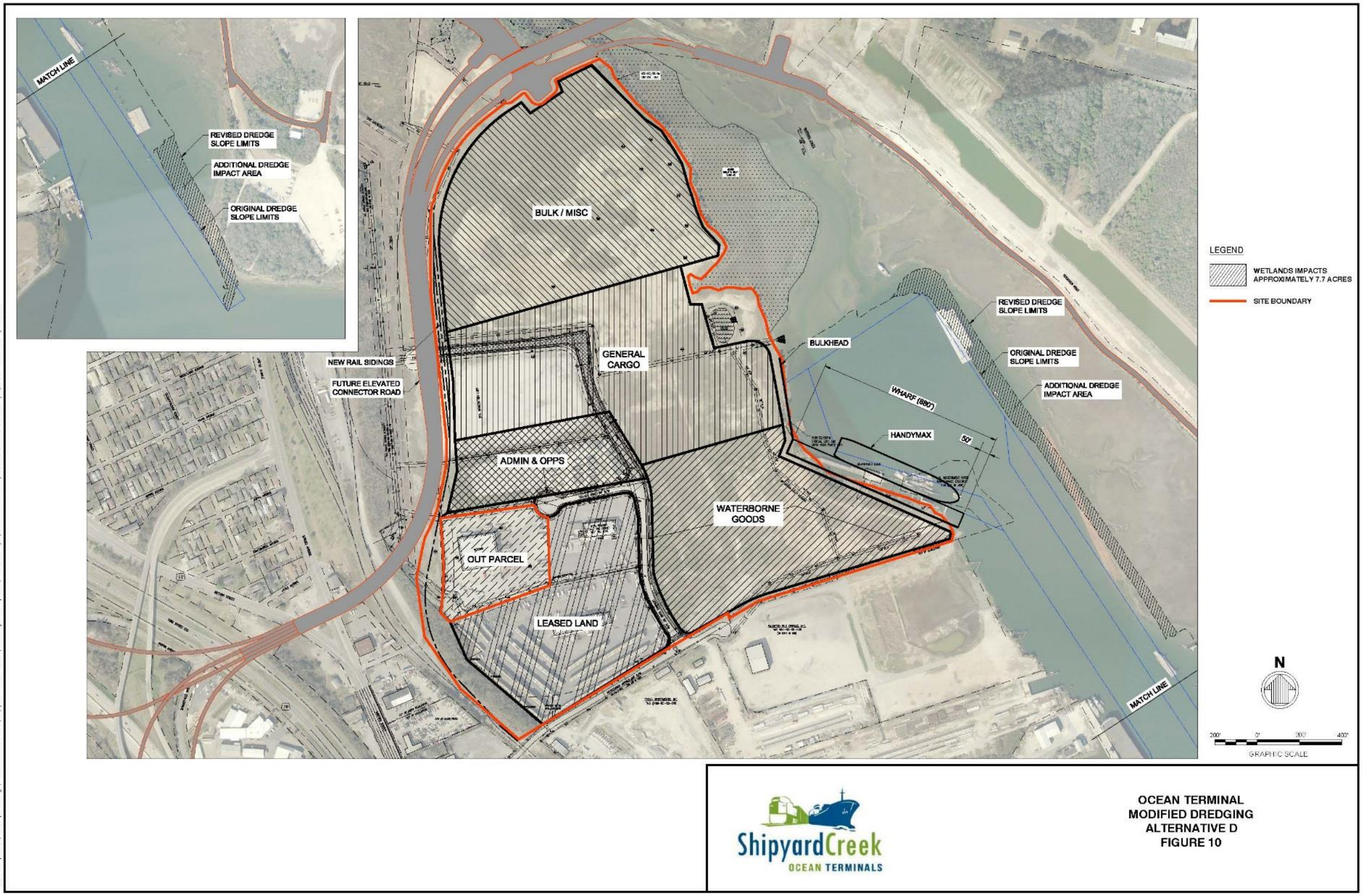


Figure 10: Alternative D

Use of the Shipyard Creek property as an ICTF is likely the highest and best use of the property. It should be noted that the Shipyard Creek property was considered as a potential site for the state-proposed ICTF. However, the current location of the Port Access Road across northern portions of the Shipyard Creek property (see Section 4.2.2) prohibited an ICTF from being further considered at this site. The South Carolina Public Railways decided to pursue construction of its ICTF at another location.

3.2.2. Compliance with 404(b)(1) Guidelines

When applying for a Section 404 permit from the USACE to impact “waters of the United States” (including wetlands), compliance with Section 404(b)(1) Guidelines is required. The Guidelines specifically state that "no discharge of dredged or fill material shall be permitted if there is a practicable alternative to the proposed discharge which would have less adverse impact on the aquatic ecosystem, so long as the alternative does not have other significant adverse environmental consequences" (40 CFR 230.10(a)). A consideration of avoidance and minimization measures is required during the evaluation of practicable alternatives.

The Shipyard Creek alternatives analysis has been conducted to be in compliance with the Guidelines. Regional site alternatives have been largely discounted for reasons previously addressed. Final site design and dredging protocols for the preferred alternative were predicated on efforts to avoid impacts to sensitive aquatic systems within the Shipyard Creek, sometimes at great expense. For example the Applicant intends to focus dredging within the center of the creek channel and build a toe wall along creek embankments (a $6 million cost) in order to reduce direct and secondary impacts to wetlands and other aquatic resources.

3.2.3. Alternative Site Descriptions

3.2.3.1. *Alternative A – No-Build*

This alternative would allow the property to remain in its present condition. With this alternative, the existing stormwater infrastructure would remain in place with no additional roadway or railroad improvements. There would be no wetland or open water impacts. Economic re-vitalization of the site would not occur. Alternatively, the site could be used for non-port related activities which may or may not require permit review. Either scenario is not in keeping with the intent of the City of North Charleston’s Port Overlay District to encourage port-related development or with the SCSPA’s focus to encourage additional port expansion opportunities in the area. If non-port related activities were to happen on the property, these activities may or may not contribute to the economic revitalization of this site or help meet the continuing need for additional shipping capabilities. This alternative does not meet specific criteria outlined in project purpose and need which is focused on redevelopment of a former Superfund site and meeting demands for additional port related facilities in the Charleston area.

3.2.3.2. *Alternative B – Warehouse/Storage/Distribution Center Without an Ocean Terminal*

This alternative would forego redevelopment of the site as an ocean terminal but would redevelop the site as a warehouse/storage/distribution center (Figure 8). No impacts to the shipping channel would occur since all activities would be land based with goods and services supplied via rail or through truck transport. As a result, this land based concept could potentially generate greater truck traffic and rail impacts than the preferred alternative. In addition, this alternative proposes to use the entire upland site along with the existing 0.3 acre stormwater storage system (which would need to be relocated elsewhere on the property) and about 0.5 acre of salt marsh that extends into the property from the fringing marsh denoted by the Critical Line survey.

The open water and marsh impacts from channel dredging could be eliminated as would marsh impacts from redevelopment of the wharf since all activities are land based under this alternative. However, since development under this proposed option would need to maximize use of the site for storage buildings and access, impacts to 0.5 acre of salt marsh wetlands as well as the loss of the 0.3 acre stormwater system may be necessary. This alternative also does not focus on developing a port related marine facility to accommodate growing regional and international shipping demands, and may result in additional wetland impacts. This alternative is not water dependent and under traditional NEPA protocols would not meet the project purpose, would not be considered reasonable and feasible, and would have to be discounted from further consideration.

3.2.3.3. *Alternative C (Preferred) – Ocean Terminal – Dredge Channel Centerline*

This alternative proposes development of the site to accommodate bulk, break bulk, and RO-RO commodities (Figure 9). The small stormwater basin at the northeast end of the property would remain available for treating runoff (additional treatment is also available off-site) but other site related impacts will remain largely outside of the Critical Line with very limited encroachment on marsh wetlands to accommodate water related activities.

Redevelopment of the site for an ocean terminal will require dredging of the channel and renovation of the waterfront where ships would dock. The channel itself was last dredged in 1991 and estimates suggest that about one million cubic yards of material will need to be removed in order to accommodate Handymax shipping vessels that are considered imperative to the success of the operation. The most efficient way to conduct that dredging will be to widen the existing channel and turning basin from the mouth of Shipyard Creek to the site following the center line of the existing channel.

This option will require construction of a toe wall along the western edge of the channel for about 600 linear feet in order to protect existing structures along the wharf front and to prevent additional loss of fringing waterfront habitat (Figure 9). This design will increase site development costs by about an additional $6 million. The Applicant is willing to incur these increased site development costs in order to minimize marsh impacts and provide greater shoreline stability, thereby reducing secondary impacts to fringing marsh resources. In addition, dredging at the southern end of the channel near the mouth of the Cooper River has been narrowed in order to reduce marsh impacts at the end of the southern-most peninsula at the future Navy Base Container Terminal site (see Figure 9). Efforts have also been made to reduce dredging in the upper northeast corner of the turning basin to avoid encroachment on area wetlands. Due to careful siting of shoreline facilities, and a commitment to reduce dredge-related adverse impacts, total unavoidable marsh impacts from this alternative have been limited to 0.38 acres of salt marsh in the vicinity of the proposed dock.

3.2.3.4. *Alternative D – Ocean Terminal – Modified Dredging.*

This option proposes to develop the site for bulk, break bulk, and RO-RO shipping similar to the Preferred Option. However, under this scenario, centerline of the shipping channel would be shifted 50 feet to the east with associated dredging shifted to the modified channel centerline (Figure 10). Significant financial savings could be realized by eliminating the toe wall. However, additional open water and salt marsh impacts would occur along eastern margins of the Shipyard Creek channel under this alternative as dredging of the bank slopes will encroach upon adjacent marsh land. Approximately 7.7 acres of these resources could be affected. Although this alternative meets project purpose and need and would reduce Applicant’s development costs, it may have greater environmental impacts than other alternatives.

3.3. Conclusion

The overall environmental impacts of the four on-site alternatives are summarized in Table 1 below. The Preferred Alternative (Alternative C) meets project purpose and need and will result in a minimization of impacts through careful dredging of the channel coupled with shoreline stabilization at a considerable expense to the applicant. The minimized impact from the preferred option meets the intent of 404(b)(1) guidelines as a practicable alternative.

Table 1: Comparison of Impacts for On-Site Alternatives

Alternative	Marsh Impacts (Ac)	Stormwater Pond Impacts (Ac)	Open Water Impacts (Ac)	Meet Purpose & Need?	Meet 404(b)(1) Guidelines
A: No Build	0	0	0	No	N/A
B: Warehouse/Storage/ Distribution Center	0.5	0.3	None	No	No
C: Ocean Terminal (Preferred)	0.38	0	42	Yes	Yes
D: Ocean Terminal – Modified Dredging	7.7	0	42	Yes	No

4. Affected Environment and Environmental Consequences

4.1. Natural Environment

The terrestrial portion of the project site is approximately 74 acres fronting Shipyard Creek in an industrial and commercial section of the Charleston Peninsula in addition to the reach of Shipyard Creek proposed for dredging. Because the site was an industrial plant from 1941-1998, a majority of the site has been cleared and now provides little habitat value. Nearby Shipyard Creek has historically been dredged and used for shipping resulting in an altered marine environment. The proposed project does not contemplate dredging to depths beyond the depths historically maintained in this area. A detailed assessment of environmental features on the site and in adjacent areas can be found in Appendix B.

4.1.1. Plant Communities

Most of the project area comprises cleared, previously used uplands on dredged material deposits and little un-cleared upland habitat exists on-site. Terrestrial vegetation on the project site is limited to old field vegetation and grasses (originally seeded to stabilize disturbed soils) over most of the reclaimed site. Because this site was previously developed as an industrial parcel, no vegetation over 15 years old resides on the site (except perhaps at the perimeter in areas not proposed for redevelopment by the Applicant). The plant community within the vast majority of the project site comprises a weedy herbaceous assemblage that is maintained by periodic mowing. There is no significant loss of habitat due to proposed action.

4.1.2. Wildlife and Fisheries – Terrestrial and Marine

Although the terrestrial environment has limited habitat value, the adjacent marshes and nearby marine ecosystems do provide opportunities for fish and wildlife. Estuarine emergent wetlands are important for many species. For example, the majority of estuarine shrimp are found in close proximity to such shallow wetland systems. These wetlands are also important as nursery areas for many species of snapper, grouper, flounder, and certain migratory pelagic species. However, most juvenile managed fish species found in the riparian salt/brackish marsh nurseries are spawned offshore and transported into the estuary through tidal inlets. Many commercial and managed species such as shrimp and summer flounder inhabit the tidal salt marsh edge, while adult spotted sea trout, flounder, and red drum forage the grass line for shrimp and other prey. Nursery areas, for species such as black drum, red drum, and spotted sea trout, can include soft bottom areas surrounded by salt/brackish marsh as well.

Some of the most ubiquitous residents (permanent or transitory) of wetlands and adjacent shorelines comprise migratory birds. Bitterns, oystercatchers, rail, herons, pelicans, terns, ibises, egrets, and gulls are a small sampling of typical coastal wetland avian species. Of course, wetlands comprise important habitat for many protected species or those of special concern as well, including the red knot, a bird species that is a candidate for listing under the Endangered Species Act.

Other typical inhabitants of estuarine wetlands include blue crab and eastern oyster. These species, along with shrimp and various life stages of the bird and fish species noted above, form part of a broad food-web that is necessary for supporting populations of consumers, such as bald eagles, ospreys, alligators, snakes, minks/weasels, bobcats, and other vertebrates, including humans.

Impacts to upland terrestrial areas are not expected to affect area wildlife except for common small mammals and reptiles. Birds that may forage in the area are anticipated to adjust feeding patterns, and any species that utilize area marshes will not be directly affected. Dredging may result in some short-term impacts to certain marine organisms. Impacts to fish populations will be limited because mobile species will seek other areas for foraging and spawning until construction is completed. No oyster reef, hard bottom, or submerged aquatic vegetation habitats will be removed for the proposed project. Following dredging, the benthic infaunal community associated with the soft/sand bottom substrate will recover quickly, generally within 6-12 months. Since this area has been historically used for industrial and marine shipping purposes (the dredging contemplated by the proposed project will not exceed the depth of dredging historically conducted in the area by the USACE), no new permanent direct, indirect, or cumulative adverse impacts on local wildlife are expected as a result of this project.

4.1.3. Threatened and Endangered Species

The Charleston Harbor area potentially supports a number of endangered and threatened species listed under the Endangered Species Act (ESA) of 1973 and the Marine Mammal Protection Act (MMPA) of 1972. Table 2 includes species listed under ESA in the Charleston area. None of the terrestrial species listed are known to occur in the proposed project area.

The recent public notice posted by USACE Charleston District stated the following regarding effects on species listed under ESA: "Pursuant to Section 7(c) of the Endangered Species Act of 1973 (as amended), the District Engineer has consulted the most recently available information and has determined that the project is not likely to adversely affect any federally endangered, threatened, or proposed habitat. This public notice serves as a request for written concurrence from the U.S. Fish and Wildlife Service and/or the National Marine Fisheries Service on this determination".

The USFWS did express concern regarding impacts to the West Indian manatee. The principal direct project-related threat to manatees would be the risk of vessel collisions during dredging operations. In the case of hopper dredging, the proposed environmental window would limit operations to colder periods when manatees are unlikely to be present. In the case of cutterhead dredging, operations could occur during warmer periods when manatees may be in the area. However, cutterhead dredges are relatively stationary, and would present a minimal collision risk to manatees. In addition, as requested by the USFWS in a letter dated 13 April 2013, dredging operations conducted between 15 May and 15 October would follow the USFWS Standard Manatee Guidelines. Therefore, direct impacts on manatees would not be expected under the proposed action. Shipyard Creek has limited or no foraging opportunities for manatees. Indirect effects on manatees via foraging habitat impacts would not be expected under the proposed action.

Table 2: Endangered and Threatened Species in Charleston (SC) Area

Common Name	Species	Federal Status	State Status
Mammals			
Blue whale	*Balaenoptera musculus*	E	E
Finback whale	*Balaenoptera physalus*	E	E
Humpback whale	*Megaptera novaeangliae*	E	E
North Atlantic right whale	*Eubalaena glacialis*	E	E
Sei whale	*Balaenoptera borealis*	E	E
Sperm whale	*Physeter macrocephalus*	E	E
West Indian manatee	*Trichechus manatus*	E	E
Rafinesque's big-eared bat	*Corynorhinus rafinesquii*	N/A	E
Birds			
Bald eagle	*Haliaeetus leucocephalus*	BGEPA	T
Wood stork	*Mycteria americana*	E	E
Red-cockaded woodpecker	*Picoides borealis*	E	E
Piping plover	*Charadrius melodus*	T	E
Wilson’s plover	*Charadrius wilsonia*	N/A	T
American swallow-tailed kite	*Elanoides forficatus*	SSC	E
Least tern	*Sterna antillarum*	N/A	T
Bachman’s warbler	*Vermivora bachmanii*	E (D/E)	E
Kirtland’s warbler	*Dendroica kirtlandii*	E	E
Red knot	*Calidris canutus rufa*	P	N/A
Reptiles			
Kemp's Ridley sea turtle	*Lepidochelys kempii*	E	E
Hawksbill sea turtle	*Eretmochelys imbracata*	E	E
Leatherback sea turtle	*Dermochelys coriacea*	E	E
Loggerhead sea turtle	*Caretta caretta*	T	T
Green sea turtle	*Chelonia mydas*	T	T
Spotted turtle	*Chlemmys guttata*	N/A	T
Gopher tortoise	*Gopherus polyphemus*	C	E
Amphibians			
Flatwoods salamander	*Ambystoma cingulatum*	T	E
Dwarf siren	*Pseudobranchus striatus*	N/A	T
Gopher frog	*Rana capito*	N/A	E
Fishes			
Shortnose sturgeon	*Acipenser brevirostrum*	E	E
Atlantic sturgeon	*Acipenser oxyrinchus oxyrinchus*	E	E
Smalltooth sawfish	*Pristis pectinata*	E	-
Plants			
Sea-beach amaranth	*Amaranthus pumilus*	T	N/A
Canby's dropwort	*Oxypolis canbyi*	E	N/A
Pondberry	*Lindera melissifolia*	E	N/A
American chaffseed	*Schwalbea americana*	E	N/A
T = Threatened; E = Endangered; S/A = Similarity of Appearance to a Threatened Taxon; SSP = Species of Special Concern; BGEPA = Bald and Golden Eagle Protection Act; C = Candidate for Listing; P = Proposed for Listing; D/E = May be delisted due to extinction			

Sources: Websites: http://www.dnr.sc.gov/species/index.html, http://www.nmfs.noaa.gov/pr/species/fish/, http://ecos.fws.gov/tess_public/countySearch!speciesByCountyReport.action?fips=45019; and J. Holling, SCDNR Heritage Trust Program, September 2012, pers com.

4.1.4. Geology and Sediments

According to US Geological Survey ("Charleston_quadrangle_geology_wgs84" ArcView layer downloaded from: http://geology.er.usgs.gov/eespteam/sergp/semaps.html), the geological unit underlying the west portion of the project site is the Wando Formation. Substrates in the east portion are classified as "artificial fill." These are typically of sand or clay origin and are 1-3 meters thick. Small marginal areas on the northeast and northwest of the site have substrates classified as "tidal marsh deposits." The Natural Resource Conservation Service classifies soils in the terrestrial portion of the project area as "urban."

The deposition of sediments into lower Shipyard Creek (i.e., the upper and lower turning basins, the channel connecting them, and adjacent unvegetated marine beds) results from flows from upper Shipyard Creek, overland runoff, and tides. Results from previous sample collection indicate that sediments typically comprised various types of silt (dark, light grey, brown, mixed with tan marble, soft, and/or firm) and firm clay. Atypical samples included one sample that contained organic material/unidentified vegetation. Impacts related to dredging are discussed in Section 5.

4.1.5. Wetlands

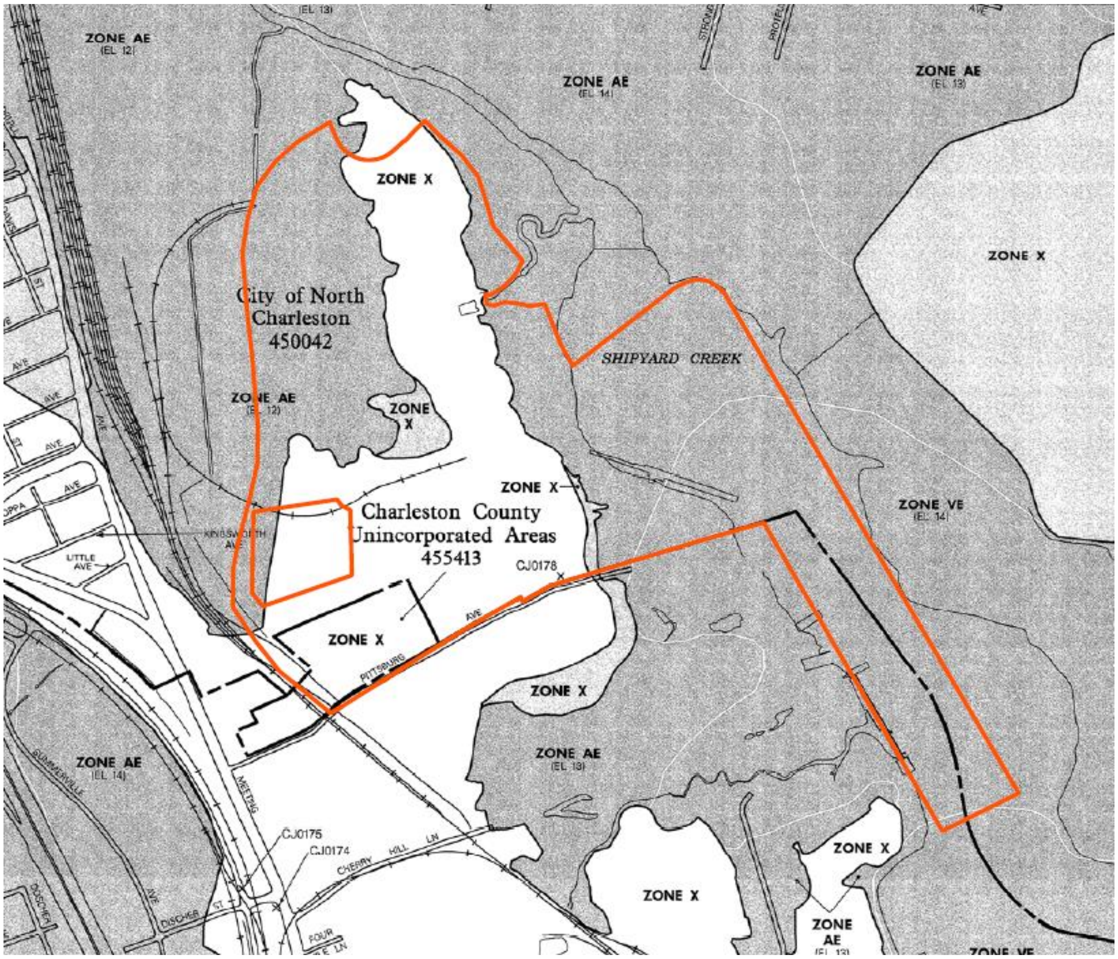
Estuarine emergent/shrub wetlands are the most dominant wetland type in the project area. Figures 3 and 4 in Appendix B illustrate the wetland areas. Wetlands boundaries are based jointly on federal (National Wetland Inventory) and state (SCDNR) GIS databases (accessed November 2013), 2013 aerial photography, and (for the area north of the project site) a 2006 wetland delineation by Davis and Floyd (portions of which were ground-truthed on 2 May 2014 and found to be accurate). An on-site investigation on 2 May 2014 confirmed that the South Carolina Department of Health and Environmental Control (SCDHEC) Ocean and Coastal Resource Management (OCRM) critical line (Figures 5 and 6 in Appendix B) coincided with the wetland jurisdictional boundary (for state as well as federal regulatory purposes) along the west bank of Shipyard Creek. However the OCRM line on the east bank was located farther uphill from the wetland boundary. The critical line demarcates the zone subject to South Carolina's Coastal Tidelands and Wetlands Act (CTWA), which has the goal of achieving balance between the appropriate use, development, and conservation of coastal resources in the best interest of all citizens of the state.

Approximately 0.28 acre of tidal herbaceous/ cordgrass marsh will be dredged and another 0.10 acre of estuarine emergent/shrub wetlands will be filled in order to construct the proposed project. The cordgrass impact area is located along the northeast shore of Shipyard Creek, approximately half the distance between the upper and lower basins. The impact was necessary and unavoidable due to the side-slope impact associated with channel widening/deepening. The shrub wetland areas that will be filled are along the shoreline west and southwest of the upper basin. These impacts are necessary in order to construct the wharf structures (two 0.04-acre areas) and the retaining wall (a 0.02-acre area), and could not be eliminated. Compensatory mitigation is being offered for unavoidable impacts (See Section 7). Indirect impacts to adjacent wetlands from activities such as ship movement and subsequent bank suction or scour/erosion are not anticipated since 1) dredging will be located in the central portions of the channel which will help reduce bank shore impacts; 2) toe walls have been constructed in the immediate project area to help stabilize the shoreline; and 3) ship speed will be reduced within the channel and berthing areas resulting in no-wake conditions. Additionally, bank suction is not expected to affect ships at berth in the lower channel because vessels entering and leaving the area will be operating at reduced speeds due to issues affecting maneuverability (channel width and depth) such that bank suction or the bank effect is not anticipated.

4.1.6. Floodplains and Stormwater

USEPA (2010) described the project site in the following way: "The topography of the Site is relatively flat with elevations ranging between 10 to 15 feet above mean sea level. Earthen ditches channel onsite storm water runoff to two engineered settling basins. Permitted discharge primarily occurs through one National Pollutant Discharge Elimination System (NPDES) outfall, with limited areas flowing directly to Shipyard Creek. Shallow groundwater beneath the Site generally flows from west to east and toward Shipyard Creek." In the northern portion of the site, overland runoff flows to the west, north, and east. In the southern portion of the site, overland runoff flows generally to the east.

Flood zones in the project site include Zones AE, X (shaded), and X (unshaded) and are shown in Figure 11. Zone AE areas are subject to inundation by the 1-percent-annual-chance flood event determined by detailed methods. Shaded Zone X areas are moderate risk areas within the 0.2-percent-annual-chance floodplain, areas of 1-percent-annual-chance flooding where average depths are less than one foot, areas of 1-percent-annual-chance flooding where the contributing drainage area is less than 1 square mile, and areas protected from the 1-percent-annual-chance flood by a levee. Unshaded Zone X areas are minimal risk areas outside the 1-percent and 0.2-percent-annual-chance floodplains.



Data Source: FEMA Flood Insurance Rate Map (FIRM), 2004

Figure 11: Approximate Flood Zone Map

The construction of the proposed project would require construction of up to 74 acres of impervious surface. This will increase storm flows to the receiving waters during extreme precipitation, but under typical conditions, flows will be released gradually. The existing 0.3 acre stormwater basin and the 8-acre stormwater system west of the site will be maintained and utilized. No construction will occur within flood zones areas that would be problematic for drainage (wetland areas excepted). There will be no loss of flood storage as a result of this project. The proposed project will comply with SCDHEC stormwater regulations and employ BMPs to mitigate the velocity of discharges and any risk of release of pollutants from the constructed facilities and surfaces. No indirect stormwater impacts are anticipated since current flow patterns and storage/treatment systems will not change

4.1.7. Hydrodynamics

The most recent hydrodynamic study of the lower Cooper River was completed in 2006 (ATM 2006). Discharges measured and calculated in the vicinity of Shipyard Creek (upstream of its confluence on the Cooper River), shows that modeled discharge on incoming and outgoing tides is nearly equivalent, but in different directions, as would be predicted only 7-8 miles from the ocean inlet.

These flows have likely been consistent since the Cooper River re-diversion (from the Santee River basin) project was completed in 1985.

The tidal range at the site between MHW and MLW is about 5.4 feet. Current velocities within Shipyard Creek were predicted to not exceed 0.10 m (4 inches)/s during the analyzed period (Moffatt & Nichol 2012).

4.1.8. Surface Water Quality

Surface waters in the project area comprise Shipyard Creek including the turning basin at its upper end, and the un-dredged, tidal reaches of the creek that form the site's eastern boundary and extend to the north and northwest, draining industrial, commercial, and residential areas of North Charleston. The adjacent drainage to the north is Noisette Creek.

The Cooper River and its tributaries, including Shipyard Creek, comprise SCDHEC Watershed 03050201-050. Surface water quality monitoring station MD-243 (sampled from 1999 through 2007 by the State of South Carolina) is located in Shipyard Creek between Marker #6 and the Macalloy Dock. SCDHEC noted that, "Aquatic life uses are fully supported. Significant decreasing trends in five-day biochemical oxygen demand, turbidity, total phosphorus and total nitrogen concentration, and a significant increasing trend in dissolved oxygen concentration suggest improving conditions for parameters." (http://www.scdhec.gov/HomeAndEnvironment/Docs/50201-050.pdf). The average DO for the sample period (43 samples total) was 7.0 mg/L, which is a level conducive to marine life.

SCDHEC developed TMDLs for both the Ashley River and for the Harbor/Cooper River/Wando basins. The contribution of upper Shipyard Creek's water quality to that of the Harbor/Cooper/Wando basin, with respect to DO, is insignificant due to the magnitude of their relative discharges. Even so, based on the above characterization, flows from upper Shipyard Creek may have resulted in a net benefit to DO levels in the immediate vicinity of the creek's juncture with the Cooper River. As stated in the *Total Maximum Daily Load Revision, Charleston Harbor, Cooper, Ashley, and Wando Rivers* (SDHEC 2013, Technical Document 0506-13), the revised DO TMDL for the wider, combined, Cooper, Ashley, and Wando Rivers and Harbor unit (Watershed 03050201) is a depression of not more than 0.1 mg/L.

Given (1) the historical characterization of Shipyard Creek's waters as fully supporting designated uses, as well as (2) proposed on-site methods for water treatment and (3) the relatively small proportion of contribution of discharges of Shipyard Creek to Watershed 03050201, the Applicant believes that there is little risk that operation of the facilities for this proposed project would result in DO demand that would jeopardize the TMDL requirement. As previously noted, local decreases in DO during construction could occur, particularly if undertaken when water temperatures are higher. However, reductions due to dredging would be localized and short term. Even when the warmest water temperature was recorded (31 deg C) at the TMDL sample site (MD-243), the corresponding DO was nearly 5.5 mg/L, which is still conducive to marine life.

No on site open water sources are anticipated that could breed mosquitoes except the small stormwater catchment system in the northeast corner of the site. The Applicant will work with the Charleston County Mosquito Control Program to develop a plan of action if mosquitoes become a nuisance. The Applicant will adhere to conditions presented by SCDHEC in the Clean Water Act Section 401 Water Quality Certification and no indirect adverse impacts to area water quality are anticipated.

4.1.9. Essential Fish Habitat (EFH)

The National Marine Fisheries Service (NMFS) and affiliates, the South Atlantic Fishery Management Council (SAFMC) and the Mid-Atlantic Fishery Management Council (MAFMC), oversee fish species and their habitats managed under rules implementing the Magnuson-Stevens Fishery Management Act and potentially found within the proposed project's footprint. A full Essential Fish Habitat (EFH) assessment describing habitats and managed fishery resources that are potentially present within the project footprint is provided in Appendix C.

In its letter dated 30 April 2013, NMFS identified the following EFH in the project area: estuarine emergent vegetation, marsh edge, tidal creek, softbottom, and intertidal mudflats. Estuarine water column is another EFH in the project area. Managed species that may utilize these habitats in the project area include shrimps, species of the snapper-grouper complex, certain coastal migratory pelagic species, bluefish, and summer flounder.

EFHs that could be affected by the project are the estuarine water column, estuarine emergent marsh, marsh edge, intertidal mudflats, softbottom, and the estuarine water column. However, the Applicant concurs with the statement in the USACE public notice (12 April 2013) that, "…the proposed action would not have a substantial individual or cumulative adverse impact on EFH or fisheries managed by the South Atlantic Fishery Management Council and the National Marine Fisheries Service (NMFS)."

4.2. Human Environment

4.2.1. Cultural Resources

An important component of preliminary resource studies at Shipyard Creek involved the identification of submerged hazards and potential cultural artifacts in the channel. A sonar survey of the project area was conducted on May 1, 2012. That survey identified a number of targets including logs, pipes, dock and docking structures, and the remains of three barges (Diversified Wilbanks, Inc. 2012). After review of the sonar survey findings, the State Historic Preservation Office (SHPO) recommended that a submerged cultural resources survey be conducted in the Area of Potential Effect (APE) for the proposed dredging, and that coordination be undertaken with the South Carolina Institute of Archaeology and Anthropology (SCIAA).

In order to comply with Section 106 of the National Historic Preservation Act (16 U.SC.470f) and SCIAA submerged cultural resource survey requirements, a magnetometer survey of the APE and a 50-foot buffer was undertaken on August 23, 2013 (Diversified Wilbanks, Inc 2013). The APE was defined as extending from the upper basin down to the east-west toe of the channel. Of particular interest were the remains of vessels and barges identified in the early sonar survey and two anomalies near the northern Shipyard Creek shoreline and west of its confluence with the Cooper River (Diversified Wilbanks, Inc. 2013).

Shipyard Creek has been extensively and repeatedly dredged since mid-20th century and all sonar targets are considered modern debris. The 1896 Coast and Geodetic Survey shows the channel was originally 13-15 feet deep. However, by 1959, NOAA chart 470 of Charleston Harbor shows the dredged footprint associated with commercial development that exists today along creek embankments.

A review of various NOAA charts and Google mapping provided insight into dating various artifacts identified in the study. Barges and vessels originally targeted for investigation appear to be modern based on hull configurations in the sonar images and the fact that none of the vessels appear on NOAA charts until 1972 or later and only seen in recent Google images. The two magnetic anomalies identified in earlier studies lie well outside of the APE and will not be impacted by proposed navigation improvements. There are remains of dock structures (mostly submerged) on the west side of the basin at the northern end of the navigation channel in Shipyard Creek that could be impacted by proposed activities. However, these structures are modern and of limited use; significant portions of these facilities have collapsed or show evidence of having been burned. In addition, as part of dredging operations, derelict vessels will be removed and the channel cleared of obstructions.

The report summary states:

> *Cartographic research confirms that historical depths in Shipyard Creek were significantly less than the depths to which the channel and basin have been dredged. That indicates that any cultural material within the toe of the channel and basin will be modern debris. As a consequence, no additional investigation is recommended in conjunction with the plan for navigation improvements as proposed. No National Register of Historic Places eligible submerged cultural resources will be impacted by the proposed project (Diversified Wilbanks, Inc. 2013).*

SHPO agrees. In a letter dated January 13, 2014 (Appendix D), they state: “Based on the description of the Area of Potential Effect (APE) and the identification of historic properties within the APE, our office, in consultation with James Spirek, the State Underwater Archaeologist, concurs with the assessment that no properties listed in or eligible for listing in the National Register of Historic Places will be affected by this project.” SHPO received final copies of the report effective August 26, 2014.

4.2.2. Roads / Traffic

4.2.2.1. *Existing Roadways*

The overwhelming majority of traffic accessing the Shipyard Creek site on existing roadways will arrive via Interstate 26 (I-26), using the Meeting Street / Spruill Avenue interchange. From there, traffic will access the site via Pittsburgh Avenue.

I-26 is the primary route for business travel from outside the Tri-County region and commuter traffic from the northwest parts of the Tri-County region to the greater Charleston area. I-26 is an eight-lane facility in the vicinity of the site. In 2012, SCDOT records list an estimated 84,000 average annual daily traffic near the Meeting Street Bridge.

Meeting Street is classified as a principal arterial with a posted speed limit of 40 mph. Its five-lane cross-section consists of two northbound lanes, two southbound lanes, and a center two-way left turn lane. Traffic counts performed in 2013 indicate 9,840 vehicles per day travel on Meeting Street in the vicinity of the site.

Spruill Avenue is a three-lane arterial that splits off North Meeting Street and continues north to its intersection and terminus at Montague Avenue in North Charleston. In the vicinity of the site, Spruill Avenue provides a connection to the eastbound lanes of I-26 as well as local road access to traffic exiting the I-26 westbound lanes and is classified as a minor arterial.

Pittsburgh Avenue is a two-lane facility linking Meeting Street and the waterfront along Shipyard Creek. The roadway is aligned in an east-west direction and, since there is not a posted speed limit, the statutory 30 mph speed limit applies.

The traffic study for this environmental document analyzed existing (2013), no-build (2018), and build (2018) conditions for egress and ingress traffic at the Shipyard Creek site. This current analysis was based on the 2005 study performed by SRS Engineering and the 2013 update performed by Davis & Floyd (D&F) targeted specifically at the Shipyard Creek site and its intended use as a bulk cargo facility. Future changes in traffic user patterns were derived from the USACE 2006 EIS for the Port Terminal Access Road. Both the SRS and D&F studies utilized average daily traffic numbers from the Berkeley-Charleston-Dorchester Council of Government (BCDCOG study). Subsequently, vehicle per day counts from the BCDCOG data were compared to site-specific traffic counts performed by SRS.

4.2.2.2. *Existing Traffic Volumes and LOS*

The 2013 traffic impact study in the vicinity of the Shipyard Creek site (Davis & Floyd, 2013) looked at a number of traffic movement factors. Table 4 shows the intersection control as well as the counted traffic of the Meeting Street at Pittsburgh Avenue intersection, which is the primary gateway into the site.

Table 3: Meeting Street at Pittsburgh Avenue Intersection Control and Counted Traffic Volumes

Scenario	**Northbound**			**Southbound**			**Westbound**		
Traffic Control	Uncontrolled			Uncontrolled			Stop-Controlled		
2012 (counted) AM Peak Hour Traffic Volumes (vph)	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
	N/A	207	7	82	533	N/A	24	N/A	28
2012 (counted) PM Peak Hour Traffic Volumes (vph)	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
	N/A	552	4	31	283	N/A	15	N/A	97

Since the 2013 study included only the intersection of Meeting Street at Pittsburgh Avenue, a capacity analysis for the intersections of Meeting Street at Spruill Avenue and Spruill Avenue at the I-26 ramps was performed by Moffatt & Nichol in 2014. This analysis used the same methodology as the previous traffic studies. Additionally, turning movement traffic counts were available at the intersection of Meeting Street and Spruill Avenue. Traffic volumes for the intersection of Spruill Avenue at I-26 ramps were surmised from these counts and regional patterns as well. Traffic signal plans were provided by SCDOT at the signalized intersections, however specific AM and PM peak hour timing data were not made available. Therefore, traffic signal timing for the two signalized intersections was developed using Synchro software (www.trafficware.com) in which traffic volumes and movement patterns generated a level of service at each intersection. The resultant capacity analysis was performed using methodologies outlined in the 2010 Highway Capacity Manual (TRB 2010).

Level of service (LOS) is a six-point scale and varies from letter grade A, representing almost free-flow conditions, to letter grade F, representing highly congested or "stop-and-go" conditions. LOS E represents at-capacity conditions and LOS D represents near-capacity conditions. Table 4 lists the LOS of the study intersections as they operated under existing traffic conditions.

Table 4: Existing (2013) Level of Service

Intersection	**Meeting Street at Pittsburgh Avenue**	**Meeting Street at Spruill Avenue**	**Spruill Avenue at I-26 Ramps***
Intersection Control	Stop-Controlled	Signalized	Signalized
AM Peak Hour LOS	C	B	A
PM Peak Hour LOS	D	B	B

*The eastbound right-turn at this intersection is a channelized right that operates under a yield sign and not the traffic signal at the intersection. To be conservative, this eastbound right-turn was removed from the intersection level of service calculation.

Intersection control refers to the mechanism for which traffic is regulated at the respective intersection. Meeting Street at Pittsburgh Avenue is controlled by a stop sign on Pittsburgh Avenue. The intersections of Meeting Street at Spruill Avenue and Spruill Avenue at the I-26 ramps are controlled by a traffic signal (i.e. signalized).

The 2013 study then projected (i.e. grew) traffic at a rate of 3.0 percent per year to the envisioned build-out year of 2018. This is often referred to as "background traffic" and attempts to determine operational characteristics in the build-out year without the proposed development. It should be noted that the 2013 study determined historical growth rates in the area to be 1.8 percent but grew the traffic at the aforementioned 3.0 per cent rate per year in order to account for the additional traffic expected from the initial phase of the Navy Base Container Terminal as well as all other unspecified background growth in traffic.

Table 5 lists the LOS of the study intersections as they operate under expected 2018 background traffic conditions.

Table 5: Background (2018) Level of Service

Intersection	Meeting Street at Pittsburgh Avenue	Meeting Street at Spruill Avenue	Spruill Avenue at I-26 Ramps*
Intersection Control	Stop-Controlled	Signalized	Signalized
AM Peak Hour LOS	D	B	B
PM Peak Hour LOS	D	B	B

*The eastbound right-turn at this intersection is a channelized right that operates under a yield sign and not the traffic signal at the intersection. To be conservative, this eastbound right-turn was removed from the intersection level of service calculation.

4.2.2.3. *Trip Generation and Impacts to LOS*

In the 2013 study, the developable area at the Shipyard Creek site was envisioned to be 88 acres. Based on preliminary planning, the site is envisioned to currently consist of 74 developable acres. The 2013 study generated traffic for the development based upon a projected number of 110 employees. The anticipated employment for the proposed project is projected to be within a reasonable range or less than the employees projected in the 2013 study. Table 6 lists the trip generation from the 2013 study. This includes both truck and personal vehicle (i.e. car) traffic.

Table 6 Trip Generation

Land Use	Weekday Daily			AM Peak Hour			PM Peak Hour		
	Total	Enter	Exit	Total	Enter	Exit	Total	Enter	Exit
Bulk Transfer Facility	650	325	325	150	102	48	155	50	105

For comparison purposes, the trip generation potential of the Shipyard Creek development was calculated using the Institute of Transportation Engineers (ITE) Trip Generation Manual (ITE, 9th edition). ITE generates trips based upon the acreage of the site that is attributed to ship berths, areas for transferring cargo, storage areas, and office space. Under these criteria, the area of the site generating traffic is estimated as 50 acres. The daily trip generation numbers using the ITE methodology resulted in fewer trips than what was presented in Table 6. To be conservative, the trip generation provided in Table 6 will be used in the operational analysis presented herein.

Without improvements, the 2013 study notes that site traffic causes the LOS at the intersection of Meeting Street and Pittsburgh Avenue to erode from LOS D (under background traffic) to LOS F (under build-out traffic) during both AM and PM peak hours. Those figures as well as the levels of service for the AM and PM peak hours for the intersections of Meeting Street at Spruill Avenue and Spruill Avenue at the I-26 ramps are listed in Table 7.

Table 7: Build Out (2018) Level of Service without Improvements

Intersection	Meeting Street at Pittsburgh Avenue	Meeting Street at Spruill Avenue	Spruill Avenue at I-26 Ramps*
Intersection Control	Stop-Controlled	Signalized	Signalized
AM Peak Hour LOS	F	B	B
PM Peak Hour LOS	F	B	B

*The eastbound right-turn at this intersection is a channelized right that operates under a yield sign and not the traffic signal at the intersection. To be conservative, this eastbound right-turn was removed from the intersection level of service calculation.

The 2013 study only included the intersection of Meeting Street at Pittsburgh Avenue as traffic volumes generated by the proposed development would constitute a small portion of the traffic on I-26. Specifically, average daily traffic counts collected in 2012 show traffic on I-26 in the vicinity of the development to be 83,300 vehicles per day. Traffic generated by Shipyard Creek would constitute an increase of less than one-percent on this section of I-26, assuming ALL project-related traffic utilized I-26. As such, no impacts to LOS on I-26 are foreseen as a result of this development.

As a result of the capacity analysis of existing laneage operating under full build-out traffic volumes, the study recommends installing a traffic signal at the intersection of Meeting Street and Pittsburgh Avenue (Figure 12). This was shown to improve the LOS at the intersection from LOS F to LOS C. The proposed project contemplates the installation of this recommended traffic signal. No improvements are recommended at the intersections of Meeting Street at Spruill Avenue and Spruill Avenue at the I-26 ramps. These intersections were found to operate at excellent levels of service across all analysis scenarios and the Shipyard Creek development traffic is not expected to impact the intersections in a manner that would warrant mitigation.

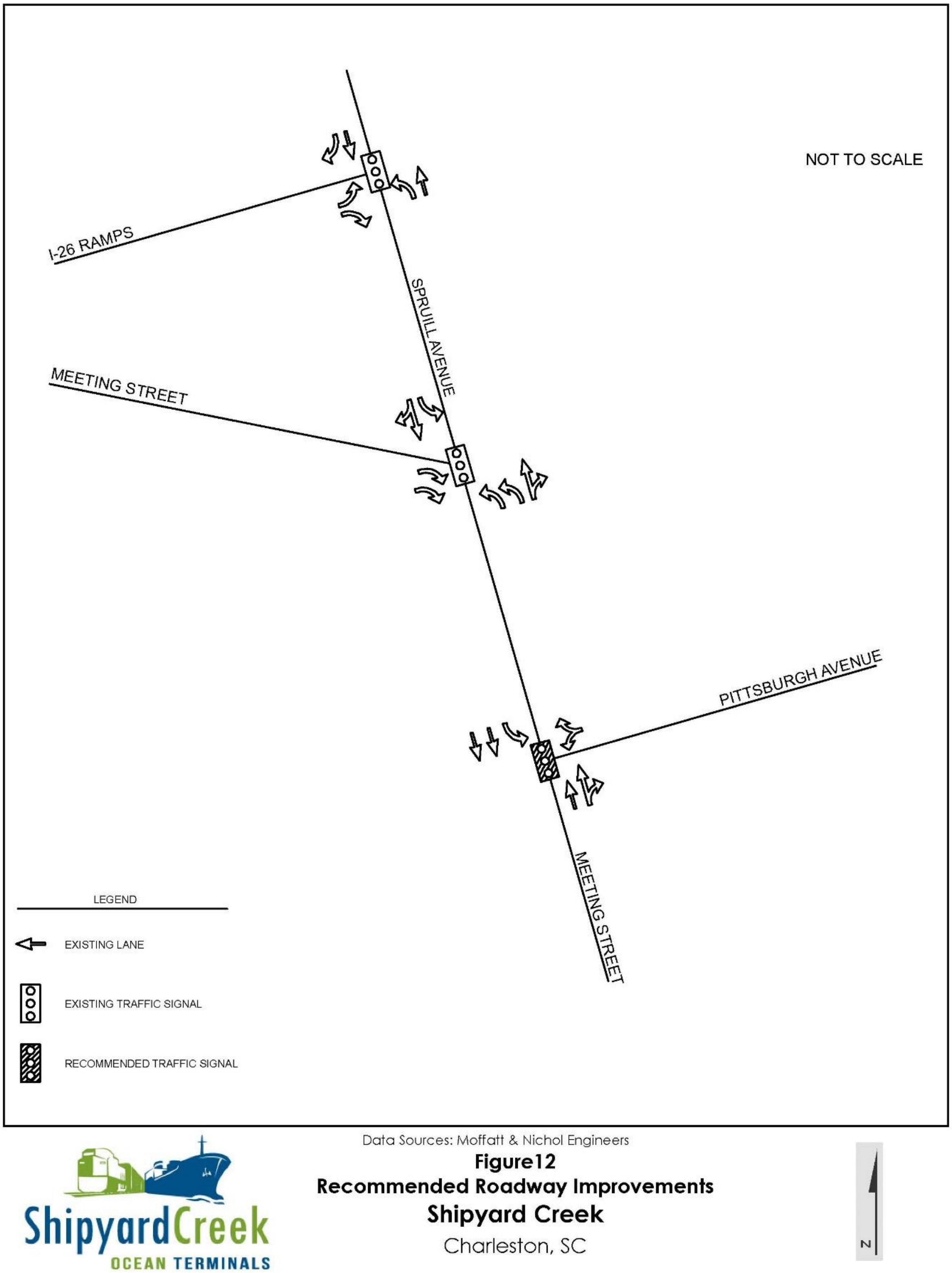


Figure 12: Recommended Roadway Improvements

4.2.2.4. *Future Traffic Changes*

In 2025, the Charleston Naval Complex is envisioned to begin operation. This 287-acre port facility will be located on the east side of Shipyard Creek. As part of this development, a full control of access facility connecting Interstate 26 and the Charleston Naval Complex Marine Container Terminal will be constructed. The facility will be entirely on new location, have a posted speed of 50 mph, and be classified as an urban freeway. This facility will potentially provide alternative access to the Shipyard Creek development. Figure 13 illustrates the new access road.

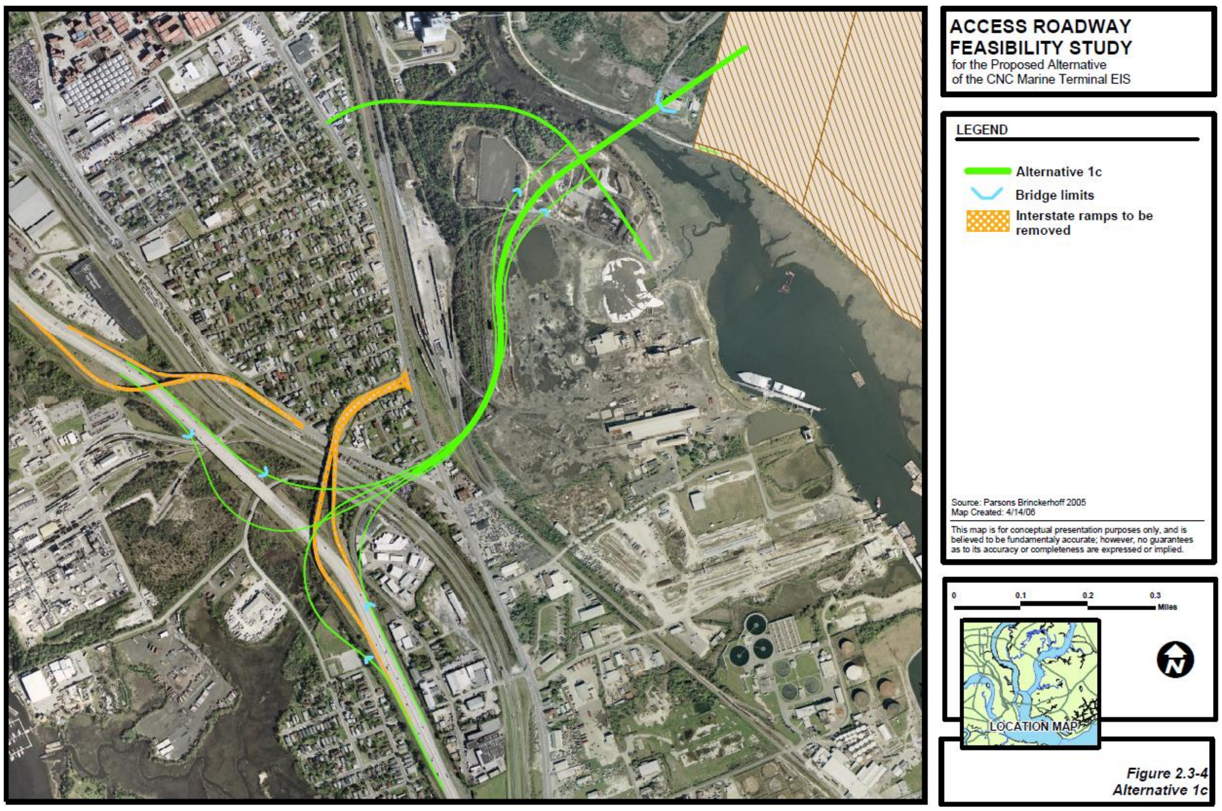


Figure 13: Charleston Naval Port Terminal Access Road

This design is expected to replace the existing interchange with Spruill Avenue. New access could be provided to the Shipyard Creek site via a proposed urban interchange and an east-west access road (see Figure 13). It can be postulated that the new urban freeway will have the following impacts to proposed development traffic and traffic patterns in the surrounding area:

- The elimination of the existing I-26 ramps on Spruill Avenue will decrease the amount of traffic on local roads near the site;
- Travel times to/from I-26 for development traffic will be shortened due to the new access road.
- Possible truck routes pre- and post- Port Terminal Access Road are shown on Figure 14 and Figure 15.

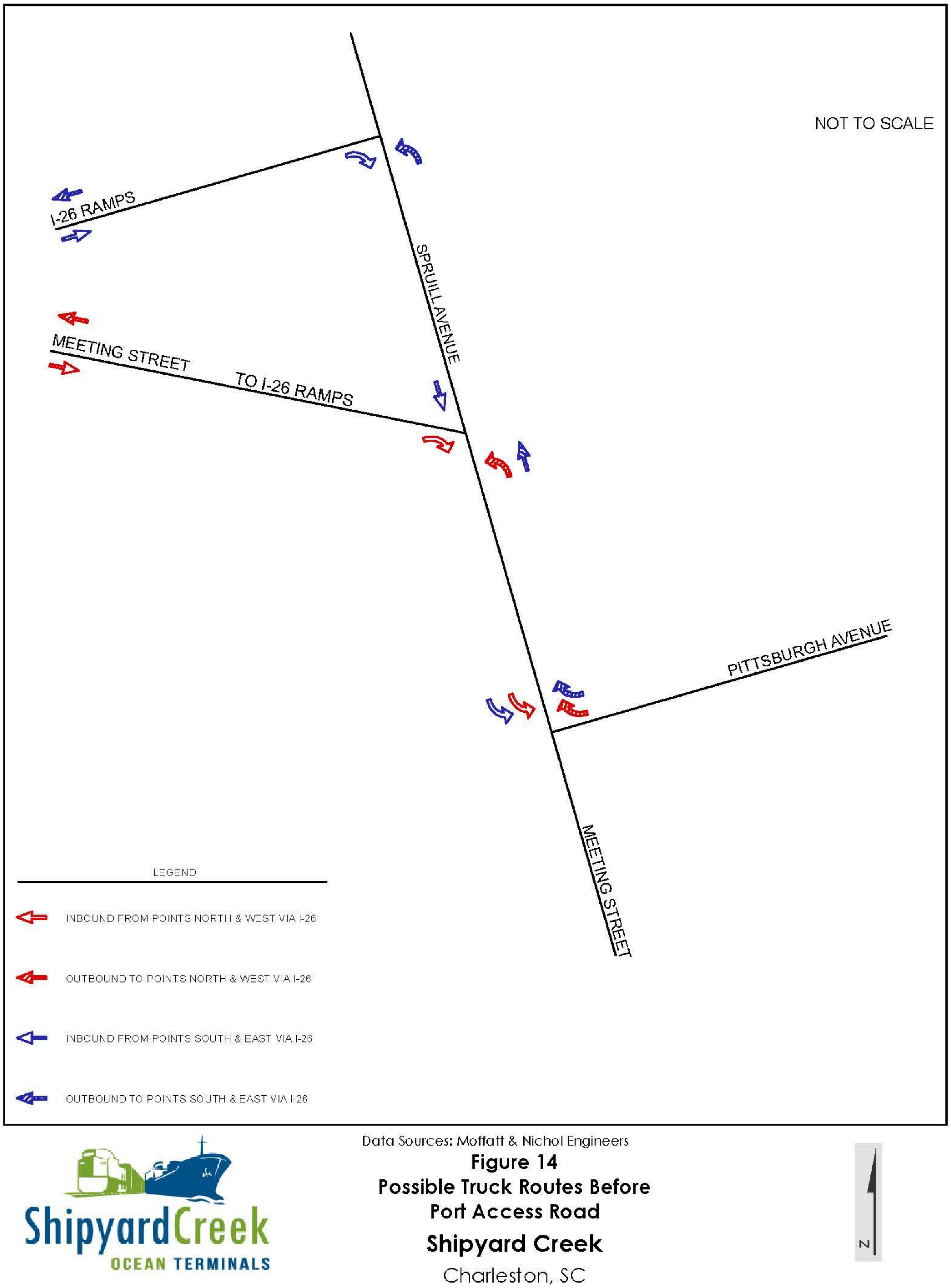


Figure 14: Possible Truck Routes Before Port Terminal Access Road

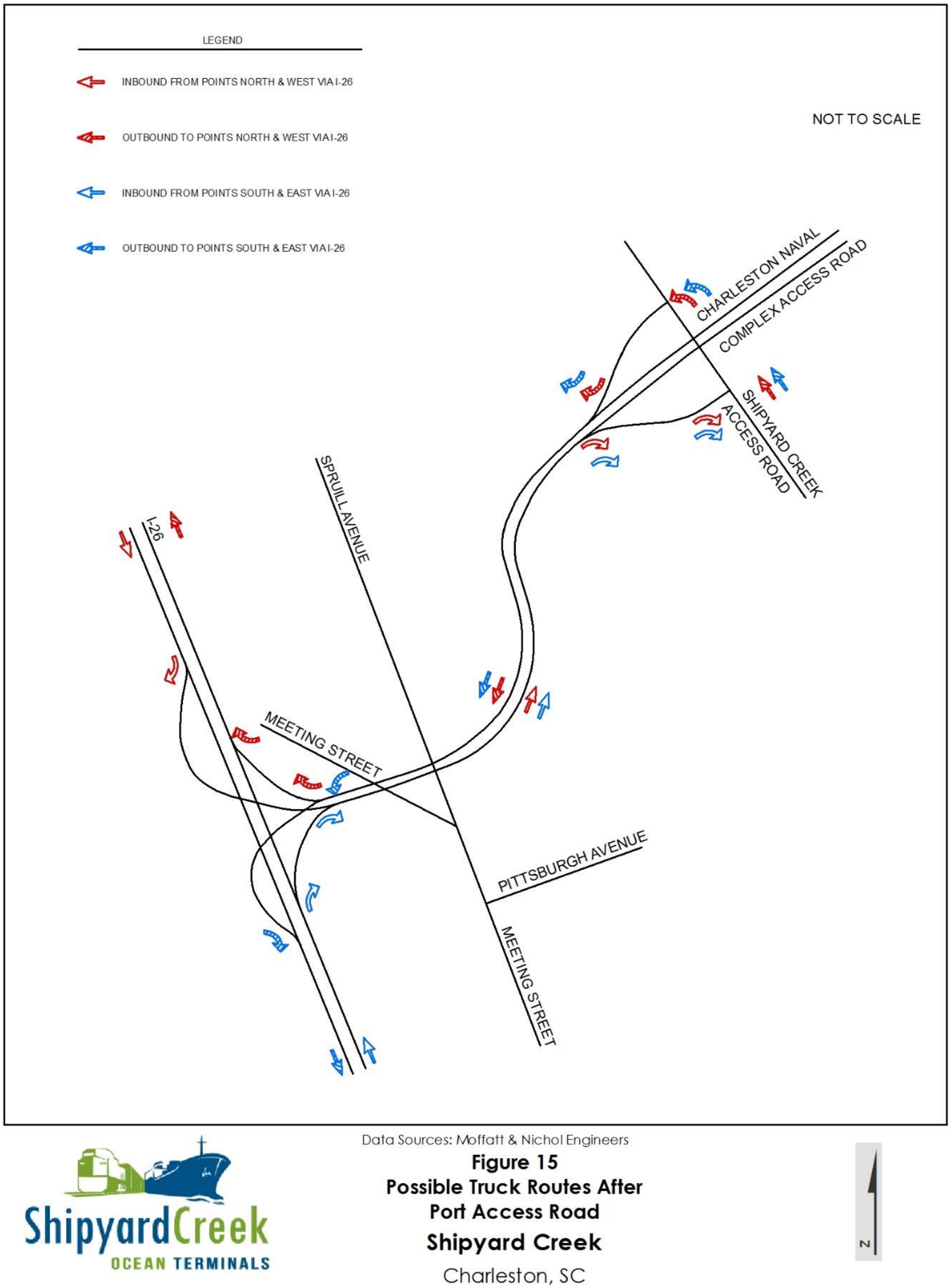


Figure 15: Possible Truck Routes After Port Terminal Access Road

The traffic feasibility study for the proposed port terminal access road (USACE 2006) used between 3,030 vehicles per hour (vph) and 4,780 vph per direction (depending on the section and time period) for the capacity analysis. Traffic generated by the Shipyard Creek development was included in the design of this proposed freeway. While the USACE 2006 study does not explicitly state the amount of traffic generated by the Shipyard Creek development, it appears that 205 vehicles per hour was anticipated from the project. This is greater than the trip generation numbers used for this current analysis.

Furthermore, the USACE 2006 study analyzed the new intersections of the proposed port terminal access road eastbound off-ramps at the local access road into the Shipyard Creek site. It was determined that this intersection could provide access to the urban freeway for the traffic generated from the Shipyard Creek project. The study found this intersection would operate at LOS C in the design year of 2025, which is more than adequate to handle traffic generated by the project.

Using these traffic volumes, the traffic generated by the proposed project would account for a maximum of approximately five percent of the total traffic on the new urban freeway. Therefore, it is anticipated that the Shipyard Creek development traffic will have a negligible impact to the planned port terminal access road.

The project will have some additional direct, indirect, and cumulative impacts on traffic in the area. Traffic patterns will not be changed as a result of the project and additional traffic volumes will be relatively minimal. As a result, the project will only represent a minor increase to the cumulative traffic in the Charleston area. I-26 will remain the primary route for business travel into the development and to the Charleston area in general. All regional studies and long-range transportation planning for I-26 have accounted for these anticipated traffic increases, inclusive of what will be generated by the Shipyard Creek development.

4.2.3. Railroads

4.2.3.1. *Existing Operations and Rail Traffic Volumes*

This rail study consisted of meeting with a CSX transportation officer at Bennett Yard, observation of the train operation at Bennett Yard, observation and spot inspections of the lead track from Bennett Yard to the industrial lead, and observation of other industries on the lead track including TransFlo, Kinder Morgan, and Chevron. This analysis also involved reviewing available public documents like CSX's website and timetables.

The Shipyard Creek site will be served by CSX on a section of track designated as the Macalloy lead. This track is classified as a light traffic density, low speed industrial lead track with no through trains and the speed is limited to 10 mph. The Macalloy lead meets Federal Railroad Administration's Class 1 track safety standards for tracks where speeds do not exceed 10 mph.

Currently, CSX's main business on this industrial track is Transflo (a bulk material handling service) and the chemical cars that serve both Chevron and Kinder Morgan. Cars come from CSX's Bennett Yard Monday through Friday beginning at 3:00 PM (second shift). When the cars arrive at the Kinder Morgan facility, they switch in the yard and cars are arranged to be delivered to Transflo. At the end of the second shift (00:00), a third shift switch crew is brought to the yard engine (still on the Macalloy lead), the industries on the lead are served, and the cars that are outbound are pulled back along another lead track which parallels King Street to access Bennett Yard. This is a two way trip (2 trips).

Due to proprietary business constraints CSX will not reveal exact counts of rail traffic. However, it is clear that no through trains or passenger trains operate on this lead. Five trains use this lead per week - one each day Monday through Friday. The maximum length of a CSX train is dependent on a variety of factors such as the number of cars to be shipped that day to service all facilities along the industrial lead, the length of the cars, the weight of the cars, and the tractive effort of the locomotive that CSX is using. Cars are added to or removed from the existing train on its industrial lead based on individual business needs.

4.2.3.2. *Rail Traffic Impacts Associated With the Proposed Facility*

Rail activities at the proposed Shipyard Creek terminal are designed to accommodate the large packages of freight that may be unloaded from or loaded onto vessels that will call at the terminal. The current design provides for shipment of a diverse group of commodities. From a land based transportation perspective, railroads are most efficient in handling large bulk commodities. The impact of rail service to the proposed terminal is to serve as a conduit to transport the bulk commodities via railcars to a location where they will be sorted and shipped to final locations. The general operating pattern of trains servicing the Shipyard Creek site is anticipated to remain essentially unchanged. The train will start at the Bennett Yard, travel in a southeast direction crossing Meeting Street, and enter into the Kinder Morgan site. After continuing on to the TransFlo facility, cars will again be switched and the train will head south to the Shipyard Creek site. The train will pull past the turnout and into the Shipyard Creek industrial rail siding where cargo will be unloaded, empty cars will be picked up, and the train will reverse route going through Kinder Morgan with eventual termination at Bennett Yard. Although rail logistics will fluctuate based on need and future traffic volume, the current design of trackage for the Shipyard Creek terminal prescribes that rail shipments will be handled as additional cars to the existing (current) train movements in the area. Generally, one trip per week is anticipated for pickup and delivery from the Shipyard Creek terminal.

The track capacity for the proposed preferred Shipyard Creek alternative does not have room for unit trains (unit trains refer to trains consisting of all one type of commodity). No additional trains will be required for this project. Instead, an additional industrial rail siding will be constructed on the site to accommodate site specific rail needs and essentially re-establish rail access to a property that had been served by rail since the 1940s (Figure 16). This siding will consist of three parallel tracks, with each track being 650 feet in length. No trains will be assembled on site. The practice will be for CSX crews to pull the cars that are to be shipped from the Shipyard Creek facility and place the cars on the industrial lead. CSX, due to workforce labor rules, will do all switching to assemble the train.

Although the site has a maximum capacity for up to 30 cars, this does not mean that 30 cars will be entering or leaving the Shipyard Creek site each day. Due to siding capacity, it is expected that, on average, 12 cars will enter the site and 12 cars will be picked up and attached to the train on the industrial siding. The existing train will therefore be lengthened by a maximum of 12 additional cars.

Figure 16: Existing and Proposed Site Rail Access

From the railway perspective the maximum number of rail cars needed to service any given site will be based on the service level and commodity. Commodities like wood pellets, grain, soybeans, will be handled in covered hopper cars. Commodities like iron ore will be handled in open top hoppers. Manufactured steel and machinery would be handled on flat cars.

By assuming the only limit to facility through-put is rail car capacity, the following analysis shown in Table 8 can predict the average annual rail car generation from Shipyard Creek. Rail capacity as the defining element of through-put is generally not practiced. Although one trip per week is expected for pickup and delivery from the site, this analysis assumes up to two trips per week to provide for unforeseen needs.

Table 8: Rail Car Generation

Siding Capacity								
The site will have three sidings with lengths of 650 feet each.								
However, one of the tracks must be used for loading and unloading of								
commodities and therefore should not be used to determine the maximum								
expected number of rail cars possible on an annual basis								
Covered Hopper Cars								
650 LF / siding	/	68 ft/car	=	9 cars/siding	x	1 siding	=	9 cars/trip
Open To Hopper Cars								
650 LF / siding	/	53 ft/car	=	12 cars/siding	x	1 siding	=	12 cars/trip
Flat Cars								
650 LF / siding	/	89 ft/car	=	7 cars/siding	x	1 siding	=	7 cars/trip
It is expected that CSX will service the site 1 or 2 times per week								
Conservatively:								
Covered Hopper Cars								
2 trips/ wk	x	52 weeks/yr	x	18 cars/trip	=	**1872 cars /yr**		
Open To Hopper Cars								
2 trips/ wk	x	52 weeks/yr	x	24 cars/trip	=	**2496 cars /yr**		
Flat Cars								
2 trips/ wk	x	52 weeks/yr	x	14 cars/trip	=	**1456 cars /yr**		

Additional impacts to area traffic movement as a result of restored rail service at Shipyard Creek will be relatively minor. The Pittsburgh Avenue grade crossing will potentially be blocked as the switcher enters and leaves the site. The switcher will only block this crossing by 30 seconds to one minute for up to two events per day. Other activities, such as stopping to align the turnouts for the terminal and coupling the locomotives to the railcars, could cause some additional blockage of the Pittsburgh Avenue grade crossing of up to 10 minutes; however, these events are expected to be rare. Since the railcars will be moved to CSX's Bennett Yard for classification, no other switching of the railcars is anticipated at the Shipyard Creek terminal.

There are nine road crossings along the circuitous rail route between Bennett Yard, Kinder Morgan, and TransFlo, before terminating again at Bennett Yard.

These crossings include:

- Cherry Hill Road
- Herbert Street
- Milford Street
- Greenleaf Road
- Pittsburgh Avenue
- Private Drive between King and Meeting Streets
- Misroon Street
- Accabee Road
- Dorchester Road

Other than the Pittsburgh Avenue crossing, there is no stoppage at any of the road crossings that is the result of this project (Figure 16); only an incremental increase in traffic delays (less than 30 seconds to one minute) will result from the additional 12 cars added to the existing train as a result of this project.

4.2.3.3. *Regional Effect of the Facility*

Bennett Yard is one of CSX's top flat yards in terms of performance (car placement, industrial switching, and dwell time). Railroads as an industry are recognized as the safest and most environmentally responsible modes of transportation. Therefore, among the modes of freight shipment that may leave the Shipyard Creek terminal, the rail component will have the least impacts. The additional rail shipments from the Shipyard Creek facility will not generate any additional trains into the yard. The existing schedule of trains by CSX can handle the small increase in rail car shipments generated by this proposed facility. CSX's Bennett Yard will only be impacted by additional rail cars to be sorted and placed on freight trains that depart and arrive at the yard. CSX confirmed they could handle the traffic flow for the Shipyard Creek facility as it is currently designed. Of course the capacity at Bennett Yard is subject to business levels and economic factors which cannot be forecast. However, since Bennett Yard handles rail traffic for much of the rail-served sites in Charleston, incremental or cumulative increases in rail traffic from the redeveloped Shipyard Creek site will be insignificant as currently designed.

4.2.4. Socio-Economics

As previously noted, the Shipyard Creek site is located in a heavily urban/industrialized area of North Charleston. The site is bordered on the south by industrial/commercial businesses; on the north by undeveloped land mostly slated to be developed as part of an improved Port Access Road network; on the east by Shipyard Creek (and by the Naval Base Container Terminal now under construction on the far side of the creek); and on the west by a rail yard, a wooded buffer area, and Spruill Avenue. To the west beyond Spruill Avenue is Union Heights, a low income, minority based residential neighborhood. Census information (Census Tract 43) shows this community is comprised mostly of

African-Americans (89.1 percent) with median incomes significantly lower than the county ($17,129 compared to $48,433 for the county) and with a higher portion of the population below the poverty level (47.3 percent compared to 16.5 percent for the county). Home occupancy and the median age are very similar to the county-wide rates but most homes are rented (77.8 percent compared to 39.7 percent for the county) rather than owned by the occupants. Overall, the census data show a relatively poor, working class neighborhood with housing stock in fairly good condition.

A smaller portion of the neighborhood population over the age of 16 is employed as compared to county numbers (45.7 percent vs. 66.5 percent). Many of the residents are employed in service industries (31.7 percent compared to 17.7 percent for the county) with a high percentage in the production, transportation, and material moving fields (21.5 percent compared to 9.6 percent for the county). This may be reflective of the proximity of various transportation-related industries to the neighborhood.

Development of the project will have no direct adverse impacts on the socio-economic character of the neighborhood. In fact, job opportunities likely to be offered at the Shipyard Creek facility are the type of employment class in which many of the residents have experience (transportation-related); expansion of potential employment opportunities would likely be welcomed by the Union Heights residents and by others in the North Charleston community.

In order to qualitatively evaluate potential impacts on job growth and economic benefits generated by the project, data from the SCSPA Economic Impact Study (Wilbur Smith Associates 2008) were examined and extrapolated to the Shipyard Creek facility. According to data in the SCSPA report, the Charleston Port is responsible for 6,800 jobs from direct port operations. This number does not include indirect employment (jobs from services and supplies to the port) or the induced employment (jobs created as money circulates through the economy). The average annual salary of these workers is about $58,400 which is higher than the average household income in the Charleston area of $48,433 and much higher than the average annual household income in Census Tract 43 of $17,129 (Table 9).

It can be assumed that the Shipyard Creek facility will generate additional employment opportunities at salaries that could be higher than the county average. Employment would be available during the construction phase as well as creation of full time positions once the facility is in operation. In general, Shipyard Creek is expected to have positive impacts on the local economy, both directly and indirectly through secondary job growth and induced spending. Finally, the project could have a positive effect on the social fabric of the Union Height neighborhood by providing options for nearby employment at salaries that could potentially increase the standard of living in the area.

Table 9: General Population Characteristics –
Charleston County to Census Track 43, City of Charleston

Sources of Data			**Charleston County**	**Census Tract 43**
A	Population		350,209	2,542
B	Median Age		35.9 years	38.0 years
C	Race	White	64.2%	7.1%
		African-American	29.8%	89.1%
		Hispanic	5.4%	4.3%
D	Housing Occupancy	Occupied	84.9%	80.6%
		Vacant	15.1%	19.4%
E	Housing Tenure	Owned	60.3%	22.2%
		Rented	39.7%	77.8%
F	Employment Status	Percent in labor force	66.5%	45.7%
G	Main Employment Class	Management, Business, Science and Arts	37.7%	12.8%
		Service	17.7%	31.7%
		Sales	25.5%	27.5%
		Natural Resources, Construction and Maintenance	9.5%	6.6%
		Production, Transportation and Material Moving	9.6%	21.5%
H	Median Household Income		$48,433	$17,129
I	Per capita income		$29,401	$9,853
J	Percent people at or below poverty rate		16.5%	47.4%

Sources of Data: A-E: 2010 US Census F-J: 2006-2010 Estimates from US Census

4.2.5. Environmental Justice

Executive Order 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*, requires that Environmental Justice be addressed during the NEPA process in order to evaluate "as appropriate, disproportionately high and adverse human health and environmental effects of its programs, policies and activities on minority populations and low-income populations in the United States." A minority neighborhood with a relatively low-income population has been identified west of the Shipyard Creek site (Census Tract 43). This neighborhood, known as Union Heights, consists mostly of single family homes separated from the project site by a rail yard, Spruill Avenue, a wooded buffer, and what will eventually be the proposed port access road.

As noted in the Charleston Harbor Final EIS (USACE 2006), the North Charleston Study Area (which incorporates the Shipyard Creek site and immediate vicinity) can be characterized as a minority community with respect to an environmental justice review since 83 percent of the population is minority, which is considerably higher than the present levels of 33% for Berkeley County or 39 percent for the Charleston County area as a whole. The percentage of persons living below the poverty level in the North Charleston study area was 45 percent in 2000, which is more than 10 percent higher than the poverty statistics for Charleston County (16 percent) and South Carolina (14 percent) (USACE 2006).

The socio-economic characteristics of Census Tract 43, when compared to Charleston County, show that the neighborhood is comprised primarily of African-Americans (89.1 percent compared to 29.8 percent for the County as a whole). Home occupancy and the median age are very similar to the county-wide rates but most homes are rented (77.8 percent compared to 39.7 percent for the county) rather than owned by the occupants. A smaller portion of the population over the age of 16 is employed (45.7 percent compared to 66.5 percent for the county) with a higher percentage of individuals employed in service industries (31.7 percent compared to 17.7 percent for the county) and in the production, transportation and material moving industries (21.5 percent compared to 9.6 percent for the county) which may reflect the proximity of various transportation-related industries to the neighborhood. The median income is lower than the county ($17,129 compared to $48,433) and a higher portion of the population is below the poverty level (47.3 percent compared to 16.5 percent for the county). This Census Tract meets environmental justice threshold requirements for minority status (50 percent or more of the population) and has a significant number of people of low income status. Overall, the census data show a fairly poor, working class neighborhood with housing stock in fairly good condition. Additional, nearby jobs in the type of employment class which many of the residents are experienced (transportation-related) would likely be welcomed by the residents as a potential source of employment.

With respect to community facilities, all of the known schools, churches, hospitals, child care facilities, libraries, nursing homes and parks in Census Tract 43 were located. A total of ten of these facilities (eight churches, one community center [Gethsemane Community Center] and one reported school that appears to be a vacant lot) are located in the residential portion of the Census Tract nearest the Shipyard Creek site. None of these facilities are within 900 feet of the proposed Shipyard Creek site and none will be directly impacted by the proposed marine terminal development.

Although the Union Heights neighborhood and Census Tract 43 meet the environmental justice standards for supporting a minority population, no adverse impacts are expected to occur as a result of this project that would contribute to that status. There may be some minor increases in local mobile air emissions from truck traffic to the port or small increases in noise and light levels as a result of cumulative growth in the area. However, any negative impacts would be minimal since the existing residential neighborhood is already separated and buffered from the Shipyard Creek site by distance as well as the presence of a rail yard, Spruill Avenue, a wooded buffer, and the future port access roadway. Impacts are expected to be positive in that nearby job opportunities would be available. In general, it appears that the proposed Shipyard Creek project would not adversely impact community stability, cohesion, or interaction and may provide a positive benefit to the local neighborhood in terms of local employment.

4.2.6. Hazardous Materials

The Shipyard Creek site functioned as a ferrochromium alloy smelting plant from 1941 until 1998. A number of owner operators have been involved in alloy production at the site during this time period including Pittsburgh Metallurgical Company (1941 to 1966); Airco (British Oxygen Corporation; 1966 to 1979); Macalloy Corporation (1979 to 1998); as well as the Department of Defense (since 1942) (http://www.epa.gov/region4/superfund/sites/npl/southcarolina/macalsc.html). Waste materials such as slag, wastewater, and particulate matter were stored in unlined and lined impoundments throughout the site during operational time periods (EPA 2010). The plant traditionally discharged process water off site to the Shipyard Creek and adjacent wetland areas.

The site was found to be in non-compliance under the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) and subsequently placed on the National Priority List as a Superfund site by the EPA in February 2000. Remedial actions were recommended upon completion of a Phase I and II Remedial Investigation and Feasibility Study and EPA published a Final Record of Decision on August 21, 2002 for the cleanup of contaminated soil, groundwater, storm water, and tidal sediments at the site. The EPA, the South Carolina Department of Health and Environmental Control (SCDHEC) and the Potentially Responsible Party (PRP) Group, investigated site conditions and took steps to clean up the land in order to protect people and the environment from contamination. The Department of Defense was one of the PRPs and contributed more than $9 million for site remediation. The following objectives were established for the cleanup (EPA 2010):

- Prevent future site worker exposure to unacceptable hazard levels in groundwater;
- Remediate shallow groundwater zones with the highest concentrations of hexavalent chromium to minimize long-term threats and limit hexavalent chromium migration into Shipyard Creek;
- Remediate soil that leaches hexavalent chromium to groundwater and surface water at concentrations hazardous to human health and the environment;
- Mitigate offsite hexavalent chromium discharges in storm water to Shipyard Creek through a combination of the aforementioned remediation measures and a comprehensive site-wide storm water management plan;

- Manage storm water discharges of toxic inorganic compounds in accordance with the comprehensive storm water management plan to protect ambient saltwater quality in Shipyard Creek;
- Remediate soil and debris that produce elevated levels of gamma radiation to mitigate current exposure pathways;
- Mitigate exposure of benthic organisms to contaminated sediments in the Tidal Creek [Shipyard Creek].

In 1998, short-term cleanup activities were initiated to reduce contaminants flowing into Shipyard Creek, including construction of structures to treat stormwater prior to discharge. In 1999 approximately 40,000 tons of contaminated dust was removed from an onsite reservoir and disposed of at an offsite landfill (http://www.epa.gov/region4/superfund/sites/npl/southcarolina/macalsc.html).

Remedial actions to implement remaining clean up remedies began in October 2004, with completion in September 2006. The following results were achieved (EPA 2010):

- Radiological debris and soil were removed from the site;
- Contaminated sediment in portions of Shipyard Creek was removed and a clean sand cap was constructed to isolate the minimal deeper contaminants;
- Concentrations of hexavalent chromium in soil were reduced below 23 milligrams per kilogram;
- A comprehensive storm water management system was constructed to mitigate offsite storm water discharges of toxic inorganic compounds;
- Institutional controls and restrictive covenants were executed for the Site that limit future use to commercial/industrial purposes, and prohibit the use of groundwater underlying the property.

The upper section of Shipyard Creek north of the turning basin was originally found to contain elevated levels of total chromium, nickel, and zinc in the immediate vicinity of the site. The volume of contaminated sediment was estimated to be 1,000 cubic yards to a depth of 18 inches (EPA 2010). Dredging 24 inches of sediment removed most of the contamination. After sediment removal, geotextile fabric was placed across the excavated area and clean sand backfill was placed over fabric bringing the target depth back to 18 inches. Restoration included planting 5,900 *Spartina alterniflora* in tidal marsh areas, along with 196 feet of shoreline restoration using shrub vegetation (*Baccharis halimifolia*).

Clean up of the site has been a success. Monitoring requirements have largely been reduced, although during the first five-year site inspection both state and federal agencies recommended that institutional controls be placed on the Site to restrict land and groundwater use. Current and future land use at the Site is limited to industrial and commercial purposes and groundwater may not be used for drinking or irrigation (EPA 2010). Removal of contaminated sediments and the use of sand caps in targeted areas of Shipyard Creek, along with replanting of marsh vegetation, have reduced contamination to acceptable levels. The first five year monitoring report recommended continued groundwater monitoring on the site semi-annually for the next two years and then annually for the following three years until the second five-year review is undertaken (due in July 2015) (EPA 2010).

No additional adverse impacts – either direct or indirect – are expected as a result of previous contamination. The proposed project is consistent with the uses allowed by EPA and with the goal of rehabilitating environmentally impacted property.

4.2.7. Noise, Air & Light

Site noise will be generated in two phases: during construction and later during operations. Noise levels are expected to decrease as distance from the source increases. Charleston Harbor currently generates noise typical of a busy harbor coming from vessel traffic and dockside activities. Interstate 26 and interior city streets extend in a north-south direction along western limits of the site, in addition to a rail line and an existing rail yard along the property boundaries. These facilities already generate constant source noise affecting the area. However, residential properties are located west of the Spruill Avenue and the existing rail yard at a distance of more than 900 feet from the proposed development site.

Although development of the preferred alternative will certainly increase noise levels, the incremental increases will be minimal and will not substantially impact residential neighborhoods to the west. There will be an increase in the ambient noise level during construction and dredging; however these activities will be temporary and sporadic (dredging) and will pose minimal additional noise impact to residential communities.

Ongoing operations will also result in relatively minor increases in noise levels. On site activities will be focused on transportation and storage of products (no manufacturing or ongoing production noise). Road and railroad noise due to increased traffic will also be relatively minimal in the context of the developed nature of this area with a wooded buffer between the site and the nearby neighborhood. Rail traffic will not increase from the existing one train trip per day and will only contribute incrementally and sporadically to existing background noise levels.

Air quality will also not be greatly impacted by the proposed project. Temporary and minor changes in air quality may occur from dredge, vessel, and vehicle traffic – both during and after construction. Emissions would be no more than what would occur as a result of the no build option due to the fact that SCSPA will continue maintenance dredging in Charleston Harbor and the Lower Basin of Shipyard Creek irrespective of this project, and growth will continue as ports-related projects expand in the general vicinity of the Shipyard Creek site. It is expected that air quality conditions in the state coastal counties will remain at or near current levels; this region is in attainment for standard pollutants in compliance with National Ambient Air Quality Standards (NAAQS).

There is no doubt that lighting of marine terminal facilities increases the ambient light levels of the surrounding area and may be viewed as a potential impact. However, there are no Federal regulatory standards regarding the environmental impacts resulting from the illumination of transportation facilities such as port terminals.

Lighting at Shipyard Creek is expected to be project focused without the need for extensive intrusion outside of project boundaries. Operationally, lighting needs will be primarily for security around storage areas and along the wharf. Offloading of ships is expected to generally be a daytime activity and what does occur at night would be focused along the waterfront. There will be no permanent structures or equipment, such as gantry cranes, that could require 24/7 illumination. Likewise, truck traffic to and from the port terminal is expected to primarily occur during daylight hours, so light impacts from vehicle headlights at night would likely be minimal. In addition, the site is separated from the Union Heights neighborhood to the west by Spruill Avenue, an existing rail yard, and a wooded buffer. Spruill Avenue already supports a number of commercial and industrial enterprises with lighting from area businesses and localized traffic.

Although the project is expected to contribute to nighttime sky glow, future lighting impacts is expected to be negligible.

5. Sediment Analysis and Dredging Impacts

5.1. Sediment Deposition

The deposition of sediments into lower Shipyard Creek (i.e., the upper and lower turning basins, the connecting channel, and adjacent unvegetated marine beds) is the result of flows from upper Shipyard Creek, overland runoff, and tides. Moffatt & Nichol (2013) summarized the dredging history of the project area and estimated sedimentation rates. They determined that the existing navigation project area (upper basin and channel, i.e., 960,000 square feet or approximately 22 acres) received about 35,000 yd^3/year of sediment annually since 1985. This resulted in the addition of approximately one foot of sediment into the upper basin and channel each year.

Sampling was conducted in the Shipyard Creek in June 2014. The area was divided into two dredging units for sample collection and analysis. These two areas were identified as SYC14-TB for the northern area that includes the turning basin, and SYC14-AC, which includes the access channel. Because of past testing and a former superfund site in the turning basin, SYC14-TB was further divided into two sub dredging units for elutriate chemistry, physical analysis, suspended particulate phase toxicology, and solid phase toxicology. As required by the *Southeast Regional Implementation Manual* (SERIM) (USEPA 2008), a representative sample from the offshore reference site was also collected and identified as SYC14-REF.

5.2. Sediment Sampling Analyses

Sediment and site water samples from the Shipyard Creek access channel and turning basin were collected in June 2014 to determine the suitability of the dredge material for offshore disposal. The samples were tested in accordance with the Quality Assurance Project Plan (QAPP) that was approved in May 2014 following offshore disposal guidelines provided by USACE-Charleston and USEPA Region 4.

5.2.1. Physical Analysis

Sediment samples from Shipyard Creek and the offshore reference site were tested for grain size, specific gravity, and Atterberg limits. The table below shows the sample results. For all project samples, the USCS classification is CH, indicating clay of high plasticity or fat clay. The reference site had a USCS classification of SM, indicating silty sand. The access channel had fines of approximately 76 percent, and the two turning basin samples had fines of 99 percent. The reference site was determined to have approximately 80 percent sand. The summary tables below show the grain sizes and other physical properties for each sample.

Table 10: Grain Size Distribution for Shipyard Creek Samples

Sample ID	Grain Size Distribution[2] (percent by weight)				USCS Soil Class
	Gravel	Total Sand	Silt	Clay	
SYC14-AC	0	24	32	44	CH
SYC14-TB1	0	1	37	61	CH
SYC14-TB2	0	1	37	62	CH
SYC14-REF	0	80	17	3	SM

Table 11: Total Solids, Specific Gravity, and Atterberg Limits for Shipyard Creek Samples

Sample ID	% Solids	Specific Gravity	Atterberg Limits		
			Plastic Limit	Liquid Limit	Plasticity Index
SYC14-AC	39.9	2.680	39	125	86
SYC14-TB1	28.3	2.504	58	212	154
SYC14-TB2	28.4	2.592	53	209	156
SYC14-REF	80.6	2.728	NP	NP	NP

5.2.2. Sediment Chemical Analysis

Sediment from Shipyard Creek and the reference site were tested for polynuclear aromatic hydrocarbons (PAHs), organotins, dioxins, polybrominated diphenyl ethers, oil and grease, ammonia, and total organic carbon (TOC). While analyses for metals, pesticides, and PCBs are typically performed, analyses for these compounds were done by GEL in 2013, and were therefore not required as part of the QAPP. Sediment analysis for a Section 103 evaluation is typically used to determine the tissue chemistry requirements stated in Section 6 of the SERIM. A discussion of each analyte group is shown below.

5.2.2.1. *PAHs*

Eighteen PAHs were tested as specified in Section 5 of the SERIM. Of these 18 PAHs, 16 were detected above the MRL in sample SYC14-AC, and 13 were detected above the MRL in sample SYC14-TB. All PAHs met the SERIM's target detection limits. As specified in the SERIM, the corresponding tissue samples produced from bioaccumulation from both sediment samples were recommended for PAH analysis. Sample SYC14-AC had concentrations of eight PAHs that exceeded either the TEL or ERL. Sample SYC14-T had concentrations of six PAHs that exceeded either the TEL or ERL. No concentration exceeded the ERM in either sample.

5.2.2.2. *Organotins*

Organotin analyses were performed for 3 congeners: n-butyltin, di-n-butyltin, and tri-n-butyltin. No concentration of any butyltin congener in sample SYC14-AC was found at or above the laboratory reporting limit. The concentration of each congener was greater than the laboratory reporting limit in sample SYC14-TB. All organotin congeners met the SERIM's target detection limits. As specified in the SERIM, the corresponding tissue samples produced from bioaccumulation in sediment sample SYC14-TB were recommended for organotin analysis. These analytes do not have TEL, ERL, or ERM screening criteria associated with them.

5.2.2.3. *Dioxins*

Dioxin and furan analyses were performed for the 17 congeners specified in Appendix M of the SERIM. The concentration for each congener was then normalized to 2, 3, 7, 8-TCDD using the toxicity equivalency factors from the World Health Organization (2005). The sum of each normalized value was calculated to yield a single toxicity equivalence (TEQ) for each sample. The laboratory MDL met the target detection limit for all congeners specified in the SERIM, while the laboratory reporting limit slightly exceeded the target detection limit for all congeners. Individual congeners do not have any corresponding screening criteria. Total TEQs have corresponding TEL and AET screening criteria. The total TEQ exceeded both the corresponding screening criteria, and the corresponding tissue samples produced from bioaccumulation from both sediment samples were recommended for dioxin and furan analysis.

5.2.2.4. *PBDEs*

Seventeen polybrominated diphenyl ether (PBDE) congeners were tested. PBDE concentrations were below the MDL for all congeners for both samples. Since no result exceeded the MDL, tissue analysis was not required for PBDE analyses and no summary exhibit is provided below.

5.2.2.5. *TOC, Total Petroleum Hydrocarbons, and Total Ammonia*

The sediment samples were analyzed for TOC, total petroleum hydrocarbons (TPH), and total ammonia to provide supplemental information about the sediment. These analytes do not have TEL, ERL, or ERM screening criteria associated with them. A summary of the results is shown in the table below.

Table 12: Summary of Sediment TOC, TPH, and Total Ammonia Results

Analyte	Concentration			
	SYC14-AC	SYC14-TB	SYC14-REF	Concentration Range (Dredge Area Samples Only)
TOC (%)	2.33	3.34	0.084	2.33 - 3.34
TPH	250	720	<130	250 - 720
Total Ammonia	300	763	4.63	300 - 763

"<" less-than symbol indicates the analyte was not detected at or above the MRL (value indicates the MRL).

5.2.3. Elutriate Analysis

Elutriate samples were prepared from the composited sediment samples SYC14-AC, SYC14-TB1, and SYC14-TB2. Chemistry analysis was then performed on the three elutriates and two background water samples, SYC14-SW and SYC14-ODMDS-SW. Analytical results were compared to the published water quality criteria criterion maximum concentration defined in Section 2.5.2. Analytical testing of the sediment samples was conducted in accordance with Tables 6-5, 10-3, and 13-2 of the QAPP.

5.2.3.1. *Ammonia*

Ammonia concentrations are provided in the table below.

Table 13: Summary of Elutriate and Site Water Ammonia Results

	Concentration (mg/L)						
Analyte	**SYC14-AC**	**SYC14-TB1**	**SYC14-TB2**	**SYC14-SW**	**SYC14-ODMDS-SW**	**Concentration Range (Dredge Area Samples Only)**	**CMC**
Total Ammonia	**28.6**	**44.8**	**43.1**	0.114	ND	28.6 - 44.8	11.6

Bolded values indicate the result is greater than the CMC.
ND indicates the analyte was not detected at or above the MDL.

The CMC is calculated using pH, temperature, and salinity values from Table 2 from Ambient Water Quality Criteria for Ammonia (Saltwater)-1989 (USEPA 1989) found at http://water.epa.gov/scitech/swguidance/standards/upload/2001_10_12_criteria_ambientwqc_ammoniasalt1989.pdf. Interpolation was used across all readings as part of the calculation.

5.2.3.2. *Metals*

Trace metals analyses were performed for the list of analytes shown in Table 13-3 of the QAPP. No metals concentrations for elutriate or site water samples were greater than the CMC. Beryllium, cadmium, mercury, selenium, silver, and thallium were not detected in concentrations greater than the MRL in any sample. All other metals analyzed were detected in concentrations greater than the MRL in at least one of the elutriate samples or the site water sample. All metals met the target detection limits specified in the SERIM, and no concentration for any metal exceeded its corresponding CMC, where applicable.

5.2.3.3. *Pesticides*

Chlorinated pesticides analyses were performed for the list shown in Table 13-3 of the QAPP. No pesticide concentration for elutriate or site water samples was greater than the CMC, and no pesticide concentration was greater than the MRL in any sample. With the exception of technical chlordane and toxaphene, all laboratory reporting limits met the target detection limits specified in the SERIM. For technical chlordane and toxaphene, the MDL is used for comparison to the CMC stated in Table 13-3.

5.2.4. Toxicology

5.2.4.1. *Suspended Particulate Phase Bioassay Data*

Suspended particulate phase bioassay was performed on project samples SYC14-TB1, SYC14-TB2, and SYC14-AC. Three species were used for this phase of testing: *Americamysis bahia*, *Menidia beryllina*, and *Mytilus edulis*. Ammonia levels in all test samples required ammonia-reduction procedures to demonstrate that the mortality and abnormal development were caused exclusively by ammonia. Upon completion of the ammonia-reduction procedures, the tests were set up with both ammonia-reduced and unreduced replicates.

Results for the three species found LC_{50}s and EC_{50}s ranging from 14% to 62%, depending on the sample and test species. Results also showed that all mortality and abnormal development was due to ammonia, allowing for a higher application factor for the ADDAMS modeling required for offshore disposal.

5.2.4.2. *Solid Phase Bioassay Data*

Solid phase bioassay was performed on the project samples SYC14-TB1, SYC14-TB2, and SYC14-AC and on the project reference sample SYC14-REF. Three species were used for this testing phase: *Leptocheirus plumulosus*, *Ampelisca abdita*, and *Neanthes arenaceodentata*. Testing for the amphipod *Leptocheirus plumulosus* showed that it did not meet the offshore disposal criteria as specified in the SERIM, but upon further investigation, the high levels of fine-grained material in the project samples was the likely cause of the high mortality. Testing was repeated using a different amphipod species, *Ampelisca abdita*. Results for both *Ampelisca abdita* and the polychaete *Neanthes arenaceodentata* show the sediment met the offshore disposal criteria.

5.2.4.3. *Bioaccumulation and Tissue Chemistry*

Bioaccumulation was performed on project samples SYC14-TB (composited from SYC14-TB1 and SYC14-TB2) and SYC14-AC and the project reference sample SYC14-REF. Two species were used for this phase of testing, *Neanthes virens* and *Macoma nasuta*. Survival for both species was acceptable across all samples. Once the bioaccumulation was completed, the tissues were collected from the sediment and sent to the chemistry laboratory for chemical analysis. The analytical requirements were based on sediment analytical results. Testing was performed for trace metals, PAHs, and dioxins for all project sample tissues, and for organotins for tissues prepared from sample SYC14-TB. Tissue chemistry results showed that no concentration in the tissue exceeded the FDA action limits for human health.

5.2.5. Reporting

A final sediment testing report following the format specified in Appendix D of the SERIM was submitted on September 29, 2014, to USACE and on September 30, 2014, to USEPA. The report summarizes all analytical findings and addresses all pertinent issues related to the offshore disposal of Shipyard Creek sediment, including a review of all elutriate chemistry, toxicology, and tissue chemistry results, including the results of the ADDAMS modeling.

5.3. Dredging Impacts

Dredging of a Federal channel by a private or municipal enterprise is addressed in 33 USC §565 and 33 USC §408. It is understood that dredging issues relevant to this project will be directed and managed by the Charleston USACE District.

Redevelopment of the site for an ocean terminal will require dredging of the channel. The upper basin and upper channel were last dredged in 1991 (128,445 yd^3 of material from 21.2 acres of channel bottom [Moffat & Nichol 2013]). These areas will be re-dredged to previously authorized depths (i.e., -38 feet for the channel reach) or re-dredged to slightly shallower than previously dredged depths (i.e., -38 feet in the upper/north turning basin that was previously -41 feet) using mechanical dredging techniques. Approximately one million cubic yards of material will need to be removed for construction of the preferred alternative. Construction will directly affect approximately 42 acres, which will comprise 21.2 acres of previously dredged bottom, 7.7 acres of not-previously dredged creek bed (bounded by the project toe-of-slope), and an additional 13.1 acres of not-previously dredged creek bed (required to accommodate the necessary 3:1 side-slopes for both previously and non-previously dredged bottom). The substrates are composed of mostly fine sands and clays.

5.4. Dredge Deposition

Material dredged from Shipyard Creek will be transported to the Charleston ocean dredged material disposal site (ODMDS), if suitable. Maintenance dredging will also be required. Moffat & Nichol (2013) found that approximately 49,000 yd3/year would need to be removed in the years following initial construction. It is expected that this spoil would be placed in either Clouter Creek Upland Disposal Area via pipeline or at the ODMDS. The study also determined that the proposed upper basin/channel deepening and widening would have negligible effects on maintenance dredging requirements for the lower basin and channel and have negligible effect on the proposed harbor deepening project.

6. Cumulative Impacts

6.1. Approach and Scope

Although this document is not intended as a NEPA submittal, a discussion of cumulative impacts is warranted to address how the actions at Shipyard Creek will affect resources in the Charleston area when taken into consideration with other changes and developments. The Council on Environmental Quality (CEQ) has defined cumulative impacts as "…the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions" (40 CFR part 1508.7). Cumulative impacts can result from individually minor, but collectively substantial, actions taking place over a period of time.

Direct and indirect impacts have previously been considered for issues related to the natural and human environment (see individual topics for discussion). Although Charleston supports a number of proposed projects (infrastructural, institutional, and private) now and in the immediate future, the focus of this cumulative impacts analysis is on port-related activities since the Applicant's proposed project is one of several similar actions occurring, or planned to occur, in the same geographic region (Charleston Harbor) and during the same general timeframe (next 5-10 years), and other activities in the area have similar effects on the same resources.

6.2. Relevant Past, Present and Future Actions

6.2.1. Past Actions

USACE has completed the deepening of the channels serving Charleston Harbor to a depth of -45 feet, including the widening of some reaches. This project involved the dredging and disposal of approximately 33 million cubic yards of material to deepen existing channels, and realign several channel components. Dredged material from maintenance of the Federal Navigation Project was placed at both the Charleston ODMDS and upland disposal areas.

Other past actions included the dredging of berths for use by the SCSPA (see maintenance dredging below) and for numerous other private harbor users.

6.2.2. Present Actions

A series of port related projects are currently underway in the Charleston area including:

- *Charleston Harbor Navigation Improvements (Post 45).* The Section 905(b) (WRDA 86) Analysis, Charleston Harbor Navigation Improvement Project (USACE Charleston District, July 2010) identified an interest in investigating potential improvements to the existing Federal navigation project in Charleston Harbor based on transportation cost savings associated with deepening the existing inner harbor to -48 feet and -50 feet (including 2 additional feet in the entrance channel). An ongoing study is considering a number of structural measures. Tentative recommendations will be identified in the draft report for the study which is expected to be released in the Fall of 2014 (personnel communication Brett Waters, Chief Planning, Charleston District, USACE).

- *Navy Base Container Terminal.* This action will consist of development across approximately 288 acres for support cargo marshaling, processing, and handling facilities. Among other navigation-related construction in the area is the Navy Base Container Terminal positioned between the Cooper River and Shipyard Creek in North Charleston, across from Daniel Island. The 2006 EIS for this project contained a cumulative impact assessment, which also discusses cumulative impacts of dredging (USACE 2006). That SCSPA facility will comprise the following: a) clearing and grubbing of 135 acres; b) dredging of over 4 million cubic yards of material to create three berths; c) placing 583,000 cubic yards of buttress and armor rock; d) construction of a 6,000-foot, two-lane roadway with 6,300 linear feet of ductile iron water main and 6,700 linear feet of sewer force main.

- *Maintenance of Federal Channels.* Maintenance dredging is ongoing in Charleston Harbor. Recent dredging permits for berths allow for some additional over dredge (-6 to -7 feet in order to compensate for the 5 to 6 foot tidal variance in the harbor) for advanced maintenance.

- *Port Berths.* Due to the Post 45 project, SCSPA is proposing to deepen berths at the North Charleston Terminal (NCT) and Wando Welch Terminal (WWT), where depths are currently -45 feet (total allowed/permitted are -51 and -52 feet, respectively). New depths have not yet been proposed, and depend to a large degree on the depths to which the Cooper and Wando Rivers will be dredged during Post 45.

6.2.3. Future/Anticipated Actions

The most likely subsequent, navigation-related actions to be implemented in Charleston Harbor following project construction are (1) dredging of berths (including non-SCSPA berths) associated with federal channels and (2) eventually, the regular maintenance of federal channels themselves. For non-entrance-channel reaches, maintenance dredging has historically occurred at a 12 to 18 month interval. Maintenance dredging is periodically required at all five SCSPA berths; this will continue in the future. Future anticipated actions concurrent with the above include the further use of the ODMDS and/or confined upland disposal sites.

There are numerous additional projects proposed or underway around Charleston Harbor which will or would have impacts to wetlands and waters of the U.S. These projects include, but are not limited to, the following:

- *Kinder Operating LP "C" Shipyard River Terminal*. USACE Charleston District received an application (#SAC-2005-5475-2G, fka 2005-2W-286) on September 19, 2014 from Kinder Morgan to modify an existing marine terminal facility near the confluence of Shipyard Creek and the Cooper River. Work will include additional dredging area (0.87 acre) adjacent to the proposed dock extension to the same permitted depth of -45' MLW plus allowable 2' over depth. Installation of a conveyor system will result in shading 0.51 acre of Waters of the U.S.

- *Maybank Mid-Stream Transfer Facility.* This project is comprised of two midstream berths located on Town Creek and on the Cooper River north of the Charleston Naval Complex.

6.3. Assessment of Cumulative Impacts of Proposed Action

Potential cumulative impacts on many resources (due to the proposed action) were considered. The majority of resources were determined to have little risk of being cumulatively impacted. Of those considered, only a few resources types were determined to have some potential of being impacted cumulatively or required further clarification/comment.

The proposed project is not anticipated to contribute to a long term decrease in DO levels (see Section 4.1.8). Construction and dredging of the deeper, expanded channel may result in some short term temporary decreases in DO but not to levels such that aquatic life would be adversely affected. Therefore, the project's contribution to a cumulative effect on Charleston Harbor DO is anticipated to minimal and temporary.

Wetland impacts have occurred in the Charleston area as far back as the 18th Century. For the proposed project, wetland impacts are extremely small (0.38 acre), and these losses will be mitigated resulting in no net loss of this resource. Because mechanical dredging techniques will be used for initial removal of sediments from the channel with immediate removal to the ODMDS for disposal, no secondary impacts to wetlands are anticipated (a decision on maintenance dredging is subject to future permitting). Therefore, with appropriate compensation, the project will have a minimal cumulative impact on wetlands.

Impacts to non-wetland Essential Fish Habitats due to the proposed project include the modification of approximately 13.1 acres of soft bottom benthic habitat and construction-related estuarine water column changes. Because the project may result in some small net loss of habitat, in combination with other navigation projects across the harbor, the loss of a few acres of such habitat could be considered to contribute to cumulative impacts.

As the project is not anticipated to have a permanent indirect or direct effect on fisheries, the proposed project will not likely have a cumulative effect on fisheries. Likewise, as detailed above, the project is not anticipated to have direct or indirect effects on species protected under ESA. Therefore no contributions to cumulative impacts are anticipated.

Infrastructural improvements to roads and railroads (with resultant effects on air and noise) will result in minor and incremental additional impacts. Although these additional impacts are minimal, they will contribute cumulatively to the Charleston environment. Other human environment issues (cultural resources, social and economic issues) are expected to be positively impacted by the project.

7. Mitigation

The Preferred Alternative will impact 0.38 acre of estuarine wetlands and areas below Mean High Water along the Shipyard Creek channel. An alternatives analysis, conducted both regionally and on site, has determined the Preferred Alternative is the most reasonable and feasible alternative available to meet the mandates of the stated Project Purpose and Need. Avoidance and minimization has also been considered in keeping with 404(b)(1) Guidelines. Compensatory mitigation is offered for unavoidable impacts due to project implementation.

Coordination on mitigation alternatives has previously been undertaken with USACE resulting in a determination that use of credits from the Congaree Carton Mitigation Bank in Charleston County is an appropriate option to mitigate for the 0.38 acre loss of wetlands. Using the Charleston District's Compensatory Mitigation Standard Operating Procedures, it has been calculated that 4.6 restoration/enhancement credits will be required to compensate for functional and spatial losses.

The Applicant is committed to using credits from the Congaree Carton Mitigation Bank. The Applicant has acquired 2.4 credits from the Bank with an option to purchase up to 3.0 additional credits as they become available to meet the total 4.6 mitigation credits that are needed for this project. The Congaree Carton Mitigation Bank remains viable and up to 6 salt marsh mitigation credits are anticipated from the bank as success criteria are met. The Bank Sponsor (09/02/14 email from The Earthworks Group) has indicated that agency approval is expected for release of an additional 3.6 tidal credits, which will more than adequately meet the needs of this project. It is understood that allowable construction related impacts in wetlands will be restricted based on credit availability. In the unlikely event of bank failure, the Applicant will negotiate in good faith with USACE to provide alternative mitigation for impacts that would exceed currently acquired bank mitigation credits before proceeding with expected impacts.

Mitigation for dredging impacts has focused on avoidance and minimization. As noted in the Alternatives Analysis, the Applicant has gone to great lengths to restrict dredging to the minimum amount necessary to accomplish project objectives and to limit dredging to depths previously authorized under federal law. Dredging will be concentrated within central portions of the channel with toe walls constructed to help stabilize channel embankments and prevent the loss of additional fringing wetlands. Use of best management practices will also be employed to help reduce direct and secondary impacts to water quality and benthic stability.

8. References

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9. Appendices

Appendix A: SCSPA Letter of Support, May 9, 2013

Appendix B: Assessment of Environmental Features – Existing Conditions and Impact Evaluation

Appendix C: Essential Fish Habitat Study

Appendix D: SPHO Letter, January 13, 2014

Appendix A:

SCSPA Letter of Support, May 9, 2013

South Carolina State **PORTS AUTHORITY**

James I. Newsome, III
President and Chief Executive Officer

P.O. Box 22287
Charleston, S.C. 29413-2287 USA
(843) 577-8600
Fax: (843) 577-8616

May 9, 2013

Mr. Robert L. Clement, III
President & Broker-In-Charge
CC&T Real Estate Services
2655 Evatt Lane, Suite 107
Charleston, SC 29405

Dear ~~Mr. Clement~~: Robert

The South Carolina Ports Authority supports your efforts to develop the former Macalloy property located on Shipyard Creek as a marine facility accommodating breakbulk, bulk and warehousing.

The development of additional marine terminal capacity along the Charleston Harbor enhances the attractiveness of our state as we enhance our efforts to attract manufacturing and distribution and encourage the growth of exports and imports.

Thank you for your investment.

Sincerely,

Jim Newsome

Appendix B:

Assessment of Environmental Features – Existing Conditions and Impact Evaluation

EXISTING CONDITIONS AND IMPACT EVALUATION

IN SUPPORT OF
GENERAL ENVIRONMENTAL ASSESSMENT
FOR USACE PERMIT ACTION SAC#2013-00202-21R

TERMINAL DEVELOPMENT AND
NAVIGATION IMPROVEMENTS
AT SHIPYARD CREEK

CHARLESTON, SOUTH CAROLINA

Original 14 June 2014

Revised 25 September 2014

DIAL CORDY
AND ASSOCIATES INC
Environmental Consultants

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1.0 AFFECTED ENVIRONMENT

1.1 Land Use

The terrestrial portion of the project site is approximately 74 acres fronting Shipyard Creek in an industrial and commercial section of the Charleston Peninsula in addition to the reach of Shipyard Creek proposed for dredging (Figure 1). A tidal creek and marsh along Shipyard Creek border the site to the north and east, industrial and commercial properties occur to the south, and a CSX rail line defines the western boundary of the site (Figure 2).

Current land use (as apparent in the aerial photo in Figure 2) shows formerly used industrial lands which have been cleared for the majority of the terrestrial project area. The southwest portion has already been redeveloped; that area comprises pavement on which three structures currently stand and various trailers, tractors, containers, and other equipment are staged/stored. Surrounding land use reflects the urban/industrial nature of the area. Union Heights, a residential neighborhood, is located just west of the site, beyond the CSX rail line.

1.2 Geology, Soils, and Sediments

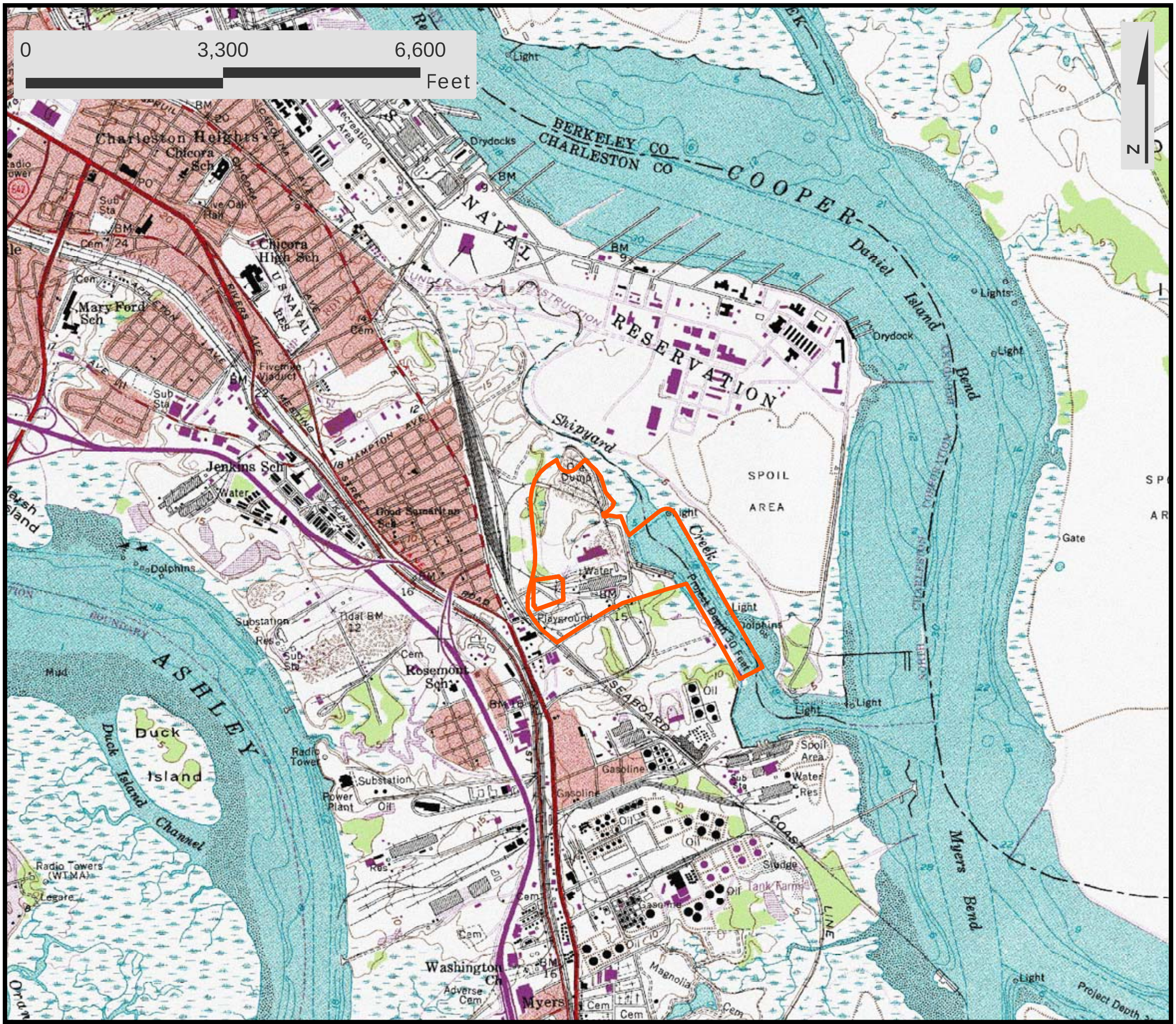
1.2.1 Terrestrial Project Site

According to US Geological Survey (“Charleston_quadrangle_geology_wgs84” ArcView layer downloaded from http://geology.er.usgs.gov/eespteam/sergp/semaps.html), the geological unit underlying the west portion of the project site is the Wando Formation. Substrates in the east portion are classified as “artificial fill.” These are typically of sand or clay origin and are 1-3 meters thick. Small marginal areas on the northeast and northwest of the site have substrates classified as “tidal marsh deposits.” The Natural Resource Conservation Service classifies soils in the terrestrial portion of the project area as “urban.”

1.2.2 Marine Sediments

The deposition of sediments into lower Shipyard Creek (i.e., the upper and lower turning basins, the channel connecting them, and adjacent unvegetated marine beds) results from flows from upper Shipyard Creek, overland runoff, and tides. Moffatt & Nichol (2013) summarized the dredging history of the project area and estimated sedimentation rates. They determined that the existing navigation project area (upper basin and channel, i.e., 960,000 square feet or approximately 22 acres) received approximately 35,000 yd^3/year of sediment annually since 1985. This resulted in the addition of approximately one foot of sediment into the upper basin and channel each year.

The Applicant conducted geological/sediment testing for both physical and chemical attributes in the area proposed for dredging. Results from chemical testing show some spatial variation, but contaminants in Shipyard Creek are generally low, and in most locations do not exceed state or national screening criteria. These results are being summarized and will be available under separate cover. Additional testing performed as part of a Section 103 evaluation will be used to determine the effects of waters and substances in contact with the dredge material on the environment, including on appropriate marine organisms and on human consumption of those species.

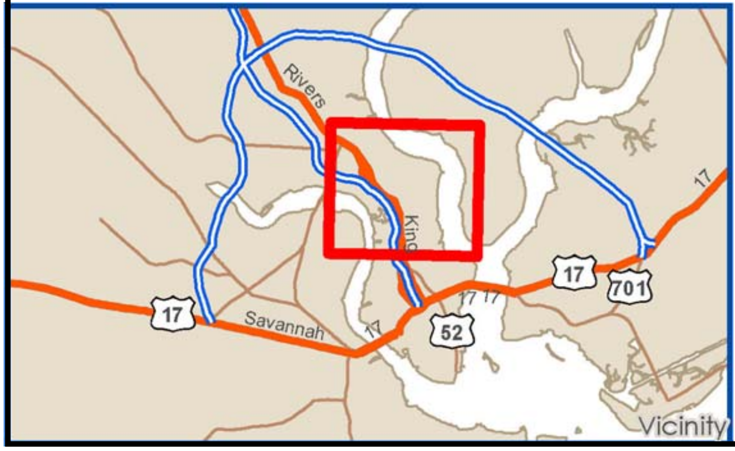


Data Source: USGS Charleston, SC 1:24000 Topographic Map

ShipyardCreek
OCEAN TERMINALS

Figure 1
Project Location
Shipyard Creek
Charleston, SC
5/13/2014

Approximate Project Limits



Data Source: Charleston County 2013 Orthophotography (NAIP)

Figure 2
Approximate Project Limits
Shipyard Creek
Charleston, SC
5/13/2014

Shipyard Creek OCEAN TERMINALS

Physical characterization of samples resulted from collecting material from eight locations two times (January and September 2013) in the channel and turning basin as well as proposed wharf area (exact locations detailed in GEL Engineering, LLC 2014). Some sampling cores were restricted from full penetration because they encountered resistant materials such as firm silt, firm clay/marl, firm silt/sand, or wood debris. Results from sample collection efforts indicated that sediments typically comprised various types of silt (dark, light grey, brown, mixed with tan marble, soft, and/or firm) and firm clay. Atypical samples included one sample that contained organic material/unidentified vegetation; it was taken from the sample site located approximately 1500 feet downstream from the north turning basin along the northeast side of the reach. Another sample contained shell; it was from the sample station approximately 700 feet southeast from the proposed turning basin on the northeast side of the reach.

1.3 Surface Water Quality

Surface waters in the project area comprise Shipyard Creek including the turning basin at its upper end, and the undredged, tidal reaches of the creek that form the site's eastern boundary and extend to the north and northwest, draining industrial, commercial, and residential areas of North Charleston. The adjacent drainage to the north is Noisette Creek.

The confluence of Shipyard Creek with the Cooper River is near the southern boundary of what is considered to be "Upper Harbor" of the Federal Charleston Harbor Navigation Project, maintained by the U.S. Army Corps of Engineers (USACE). Shipyard Creek provides an entrance channel 300 feet wide and 45 feet deep from deep water in the Cooper River to a lower turning basin, and then a 200-foot wide by 30-foot deep channel to an upper turning basin.

The Upper Basin and Upper Channel portions of Shipyard Creek were periodically dredged beginning in the mid-1950s until 1991. During the late 1960's through the early 1970's, the Upper Basin was dredged to a depth of approximately -37 feet with the Upper Channel dredged to about -43 feet deep. Additional dredging occurred during the 1980s with the Upper Basin being deepened to approximately -41 feet, while the Upper Channel was dredged to a maximum of -39 feet.

In general, Charleston Harbor (to which Shipyard Creek flows) is an intertidal and subtidal estuarine system, characterized by highly variable salinity and dissolved oxygen concentrations. Available information on these systems shows that dissolved oxygen (DO) concentrations frequently fall below the criteria established for such waters. These excursions are usually observed during high temperature periods whether or not there are anthropogenic sources of oxygen demand to the system (SCDHEC 2002). Water quality in Charleston Harbor is classified as SB, and is considered water-quality-limited for the purposes of wasteload allocation (WLA) development (SCDHEC 2002). (SB waters are tidal saltwaters designated for primary and secondary contact recreation, crabbing and fishing except for harvesting of clams, mussels or oysters for market purposes or human consumption, as well as for the survival and propagation of a balanced indigenous aquatic community of marine fauna and flora.) SCDHEC (2006) added, "The Charleston Harbor system is not considered to be impaired under criteria of Section 303(d) of the Clean Water Act except for an area 0.5 miles southeast from the mouth of Shem Creek. The impairment is for copper related to potential impacts on aquatic life." More recently, SCDHEC (2012) has determined that, "Currently available data and modeling indicate that regulated and unregulated stormwater and nonpoint sources do not contribute to the allowable DO depression on the mainstem segments including Charleston Harbor and the Cooper, Ashley, and Wando Rivers at existing conditions." Based on SDHEC (2012), it appears that all areas in Charleston Harbor are considered to "fully support" uses, albeit typical daily minimum DO averages are near

4 mg/L (vs. the desired 5 mg/L minimum used for other estuaries and upper reaches of rivers draining to Charleston Harbor).

Water samples collected by SCDHEC from 1999 to 2007 in the shallow water near shore (upper Shipyard Creek, southwest of the north turning basin, sample site number MD-243) appear to have DO levels in the range of 6.0 to 7.0 mg/L (unpublished data provided by W. Cantrell via email, SCDHEC, 12 May 2014). By the above standards, the area would appear to support designated uses. This is consistent with the data that showed that only 1 out of 27 samples during those years had a level of biochemical oxygen demand (BOD) above the quantification limit (May 2002). Average pH during that same sampling interval varied little from an average of 7.7 (+/- 0.3). However, as expected for a tidally influenced system only 7-8 miles from the coastal inlet and fed by runoff from the head of Shipyard Creek, salinity at that sampling station varied widely, i.e., from 7 to 23 ppt (mean = 18.6). Total suspended solids (TSS) varied widely, as rainfall/runoff may affect that parameter as it does salinity (mean = 6.9 mg/L). Average turbidity during the sampling interval was 4.4 NTU.

Data provided by SCDNR's Inshore Fisheries program staff (S. Arnott, via email 12 May 2014) were consistent with the above averages for salinity and DO (19.6 ppt and 6.4 mg/L, respectively) and was drawn from four locations in Shipyard Creek (the dredged portion).

The Cooper River and its tributaries, including Shipyard Creek, comprise SCDHEC Watershed 03050201-050. Surface water quality monitoring station MD-243 (sampled from 1999 through 2007 by the State of South Carolina) is located in Shipyard Creek between Marker #6 and the MacAlloy Dock. SCDHEC noted that, "Aquatic life uses are fully supported. Significant decreasing trends in five-day biochemical oxygen demand, turbidity, total phosphorus and total nitrogen concentration, and a significant increasing trend in dissolved oxygen concentration suggest improving conditions for parameters." (http://www.scdhec.gov/HomeAndEnvironment/Docs/50201-050.pdf)

The average DO for the sample period (43 samples total) was 7.0 mg/L, which is a level conducive to marine life.

SCDHEC developed TMDLs for both the Ashley River and for the Harbor/Cooper River/Wando basins. The contribution of upper Shipyard Creek's water quality to that of the Harbor/Cooper/Wando basin, with respect to DO, is insignificant due to the magnitude of their relative discharges. Even so, based on the above characterization, flows from upper Shipyard Creek may have resulted in a net benefit to DO levels in the immediate vicinity of the creek's juncture with the Cooper River. As stated in the *Total Maximum Daily Load Revision, Charleston Harbor, Cooper, Ashley, and Wando Rivers* (SDHEC 2013, Technical Document 0506-13), the revised DO TMDL for the wider, combined, Cooper, Ashley, and Wando Rivers and Harbor unit (Watershed 03050201) is a depression of not more than 0.1 mg/L.

1.4 Biotic Communities

1.4.1 Upland Habitat

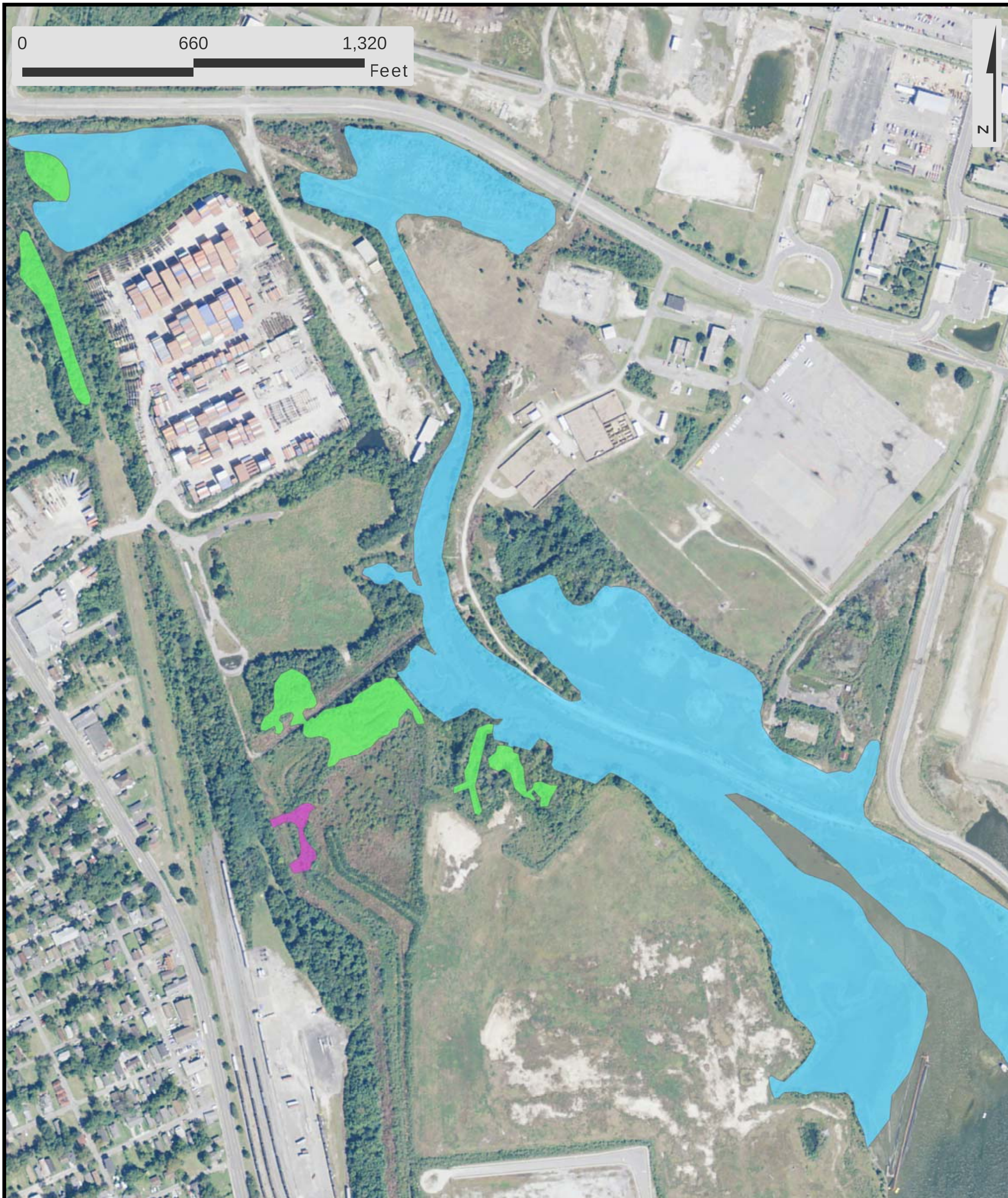
Most of the project area comprises cleared, previously used uplands on dredged material deposits. As shown in Figure 2, little uncleared upland habitat exists on-site. Terrestrial vegetation on the project site is limited to oldfield vegetation and grasses (originally seeded to stabilize disturbed soils) over most of the reclaimed site. Because this site was previously developed as an industrial parcel, no vegetation over 15 years old resides on the site (except perhaps at the perimeter in areas not proposed for redevelopment by the Applicant). The plant community within the vast majority of the project site comprises a weedy herbaceous assemblage that is maintained by periodic mowing. Common species include Bahia grass (*Paspalum notatum*) and other primarily non-native species such as yellow sweet-clover (*Melilotus officinalis*), crimson clover (*Trifolium incarnatum*), sericea lespedeza (*Lespedeza cuneata*), evening primrose (*Oenothera speciosa*), and narrow-leaf vetch (*Vicia sativa*), along with native vines such as grape (*Vitis sp.*), greenbriar (*Smilax sp.),* and Virginia creeper (*Parthenocissus quinquefolia*). Small areas of scrub-shrub vegetation occur on the dike bordering Shipyard Creek and at various other isolated locations within the project area. The scrub-shrub community is dominated by native and non-native trees, shrubs, and woody vines, including hackberry (*Celtis laevigata*), Chinese tallow (*Triadica sebifera*), black locust (*Robinia pseudoacacia*), sand laurel oak (*Quercus hemisphaerica*), Chinaberry (*Melia azedarach*), red mulberry (*Morus rubra*), black cherry (*Prunus serotina*), red cedar (*Juniperus virginiana* var. *silicicola*), wax myrtle (*Morella cerifera*), coffee tree (*Sesbania sp.*), dwarf palmetto (*Sabal minor*), Japanese privet (*Ligustrum japonicum*), Japanese honeysuckle (*Lonicera japonica*), peppervine (*Ampelopsis arborea*), trumpet vine (*Campsis radicans*), Virginia creeper, and grape.

1.4.2 Wetlands

Estuarine emergent/shrub wetlands are the most dominant wetland type in the project area. Figures 3 and 4 illustrate the wetland areas. Wetlands boundaries are based jointly on federal (National Wetland Inventory) and state (SCDNR) GIS databases (accessed November 2013), 2013 aerial photography, and (for the area north of the project site) a 2006 wetland delineation by Davis and Floyd (portions of which were ground-truthed on 2 May 2014 and found to be accurate). An on-site investigation on 2 May 2014 confirmed that the South Carolina Department of Health and Environmental Control (SCDHEC) Ocean and Coastal Resource Management (OCRM) critical line (Figures 5 and 6) coincided with the wetland jurisdictional boundary (for state as well as federal regulatory purposes) along the west bank of Shipyard Creek. However, the OCRM line on the east bank was located farther uphill from the wetland boundary. The critical line demarcates the zone subject to South Carolina's Coastal Tidelands and Wetlands Act (CTWA), which has the goal of achieving balance between the appropriate use, development, and conservation of coastal resources in the best interest of all citizens of the state.

Tidal wetlands along upper Shipyard Creek are dominated by cordgrass species (*Spartina alterniflora*) and black needlerush (*Juncus roemerianus*). Higher emergent marsh areas contain sea oxeye (*Borrichia frutescens*), and salt meadow hay (*Spartina patens*). Estuarine scrub shrub wetlands are dominated by wax myrtle (*Myrica cerifera*), salt marsh elder (*Iva frutescens*), and groundsel tree (*Baccharis halimifolia*). All of the species listed above were observed on site or near the project site (2 May 2014). Such wetlands are ecologically sensitive and important habitats. In addition to providing refuge for terrestrial wildlife, they are extremely important for certain fish species. In addition, they function to filter nutrients and sediments from upland sources, thereby improving downstream water quality. Also, these habitats buffer the adverse physical effects of stormwater flows. Another important function of these wetlands is to contribute detritus, which forms the basis of downstream (including tidal marsh) food chains (South Atlantic Fishery Management Council 1998).

Estuarine emergent wetlands are important for many wildlife species, including, but not limited to certain species managed under Essential Fish Habitat (EFH) provisions (see EFH section below). For example, the majority of estuarine shrimp are found in close proximity to such shallow wetland systems. These wetlands are also important as nursery areas for many species of snapper, grouper, flounder, and certain migratory pelagic species. However, most juvenile managed fish species found in the riparian salt/brackish marsh nurseries are spawned offshore and transported into the estuary through tidal inlets. Many commercial and managed species



Data Sources: Charleston County 2013 Orthophotography (NAIP), NWI, SCDNR Wetlands and ALTA Wetland Survey (2006)

Figure 3

Project Area Wetlands: North Area

Shipyard Creek

Charleston, SC

5/13/2014

ShipyardCreek OCEAN TERMINALS

Wetland Description

- Estuarine Emergent Wetland
- Palustrine Emergent Wetland
- Palustrine Forested Wetland

Data Sources: Charleston County 2013 Orthophotography (NAIP), NWI, SCDNR Wetlands and ALTA Wetland Survey (2006)

Figure 4
Project Area Wetlands: South Area
Shipyard Creek
Charleston, SC
5/13/2014

Wetland Description
- Estuarine Emergent Wetland
- Palustrine Emergent Wetland
- Palustrine Forested Wetland

ShipyardCreek OCEAN TERMINALS

Data Sources: Charleston County 2013 Orthophotography (NAIP),
OCRM Critical Line (GEL Engineering, 2012)

Figure 5

OCRM Critical Line: North Area

Shipyard Creek

Charleston, SC

5/13/2014

(orange outline)	Approximate Project Limits
(yellow line)	OCRM Critical Line (8-Aug12)

Shipyard Creek OCEAN TERMINALS

Data Sources: Charleston County 2013 Orthophotography (NAIP), OCRM Critical Line (GEL Engineering, 2012)

Figure 6

OCRM Critical Line: South Area

Shipyard Creek

Charleston, SC

5/13/2014

Approximate Project Limits

OCRM Critical Line (8-Aug12)

ShipyardCreek OCEAN TERMINALS

such as shrimp and summer flounder (*Paralichthys dentatus*) inhabit the tidal salt marsh edge, while adult spotted seatrout (*Cynoscion nebulosus*), flounder, and red drum (*Sciaenops ocellatus*) forage the grass line for shrimp and other prey. Nursery areas, for species such as black drum (*Pogonias cromis*), red drum, and spotted seatrout, can include soft bottom areas surrounded by salt/brackish marsh as well. Hence, the estuarine marshes are essential habitat to many managed species and serve multiple functions to various fish life-stages (Street et al. 2005).

Some of the most ubiquitous residents (permanent or transitory) of wetlands comprise migratory birds. Bitterns, oystercatchers, rail, herons, pelicans, terns, ibises, egrets, and gulls are a small sampling of typical coastal wetland avian species. Of course, wetlands comprise important habitat for many protected species or those of special concern as well, including the red knot, a bird species that is a candidate for listing under the Endangered Species Act.

Other typical inhabitants of estuarine wetlands include blue crab (*Callinectes sapidus* Rathburn) and eastern oyster (*Crassostrea virginica*). These species, along with shrimp and various life stages of the bird and fish species noted above, form part of a broad food-web that is necessary for supporting populations of consumers, such as bald eagles, ospreys, alligators, snakes, minks/weasels, bobcats, and other vertebrates, including humans.

Other wetland types (e.g., palustrine forested) may exist in the vicinity of the project area, but are outside the proposed project footprint. Their characteristics are not detailed here, but their locations are apparent on the figures above.

1.4.3 Marine Habitats

Marine habitats in the project area include previously dredged benthic softbottom habitat (in the channel and turning basins, estimated to comprise 21.2 acres) as well as undredged softbottom habitats, both of which comprise principally fine sands, silt, and clays. No hardbottom areas or oyster reefs (live or dead/wash) have been observed in the project area.

1.5 Essential Fish Habitats

The National Marine Fisheries Service (NMFS) and affiliates, the South Atlantic Fishery Management Council (SAFMC) and the Mid-Atlantic Fishery Management Council (MAFMC), oversee fish species and their habitats managed under rules implementing the Magnusen-Stevens Fishery Management Act and potentially found within the proposed project's footprint. A full Essential Fish Habitat (EFH) assessment describing habitats and managed fishery resources that are potentially present within the project footprint is provided under separate cover. That assessment provides information regarding the presence of EFH in the project area, the likely managed species in the area, and what potential impacts to those resources could occur if the proposed project is constructed and operated. Effects on EFH are summarized in Section 2.0 below.

In its letter dated 30 April 2013, NMFS identified the following EFH in the project area: estuarine emergent vegetation, marsh edge, tidal creek, softbottom, and intertidal mudflats. Estuarine water column is another EFH in the project area. Managed species that may utilize these habitats in the project area include shrimps, species of the snapper-grouper complex, certain coastal migratory pelagic species, bluefish, and summer flounder. For most of these species, the project area comprises habitats likely to be used by larval and juvenile life-history phases. Additional information is contained in the EFH Assessment.

1.6 Fishery Resources

In order to determine the character of the fish assemblage in the project area's waters and wetlands, the Applicant's consulting biologists queried several of the SCDNR's databases to search for the known local presence of various representative and important species. These included the following species:

- Southern flounder (*Paralichthys lethostigma*) and Summer flounder (*Paralichthys dentatus*), both benthic, non-migratory (but for inshore/offshore movements), recreationally fished species
- Red drum (*Sciaenops ocellatus*), a demersal, non-migratory, recreationally fished species
- Striped bass (*Morone saxatilis*), an anadromous, pelagic, recreationally fished species
- Gray snapper (*Lutjanus griseus*), a recreationally fished species using the estuary and offshore hardbottom for parts of its life-history
- Bluefish (*Pomatomus saltatrix*), a migratory pelagic species using the estuary for juvenile phase
- Blueback herring (*Alosa aestivalis*) , an anadromous, pelagic, recreationally and commercially fished, schooling species
- Two sturgeon species (discussed below), benthic-feeding anadromous species, protected by federal law
- In addition to the above fishes, white shrimp (*Litopenaeus setiferus*) data were collected.

Of the above species, only bluefish and white shrimp have been captured at the six sampling stations (unpublished data for two SCDNR sampling programs conducted during the past ten years) in Shipyard Creek (Figure 7). Typically, for these two species, it is the larval and juvenile life-history phases that may make use of project area estuarine habitats.

1.7 Federally Protected Species

1.7.1 Applicable Law

The Charleston Harbor area supports a number of endangered and threatened species listed under the Endangered Species Act (ESA) of 1973 and the Marine Mammal Protection Act (MMPA) of 1972. Table 1 includes species listed under ESA in the Charleston area. None of the terrestrial species listed are known to occur in the proposed project area.

Certain avian species may be federally protected by the Migratory Bird Treaty Act (MBTA) (16 U.S.C. 703–712). MBTA implements conventions between the U.S., Canada, Mexico, Japan and Russia for the protection of migratory birds. If migratory birds are known to be present on-site or use the area for breeding or foraging, additional considerations regarding site development may apply (see "Birds" section below). Species of the greatest concern to federal regulatory staff are addressed in detail below.

Data Sources: Charleston County 2013 Orthophotography (NAIP), SCECAP (2000), SCDNR (2002)

Figure 7

Fishery Resource Capture Locations

Shipyard Creek

Charleston, SC

5/13/2014

- SCECAP Station - White shrimp
- SCDNR Inshore Fisheries - Bluefish

Table 1: Endangered and threatened species in Charleston (SC) area

Common Name	Species	Federal Status	State Status
Mammals			
Blue whale	*Balaenoptera musculus*	E	E
Finback whale	*Balaenoptera physalus*	E	E
Humpback whale	*Megaptera novaeangliae*	E	E
North Atlantic right whale	*Eubalaena glacialis*	E	E
Sei whale	*Balaenoptera borealis*	E	E
Sperm whale	*Physeter macrocephalus*	E	E
West Indian manatee	*Trichechus manatus*	E	E
Rafinesque's big-eared bat	*Corynorhinus rafinesquii*	N/A	E
Birds			
Bald eagle	*Haliaeetus leucocephalus*	BGEPA	T
Wood stork	*Mycteria americana*	E	E
Red-cockaded woodpecker	*Picoides borealis*	E	E
Piping plover	*Charadrius melodus*	T	E
Wilson's plover	*Charadrius wilsonia*	N/A	T
American swallow-tailed kite	*Elanoides forficatus*	SSC	E
Least tern	*Sterna antillarum*	N/A	T
Bachman's warbler	*Vermivora bachmanii*	E (D/E)	E
Kirtland's warbler	*Dendroica kirtlandii*	E	E
Red knot	*Calidris canutus rufa*	P	N/A
Reptiles			
Kemp's Ridley sea turtle	*Lepidochelys kempii*	E	E
Hawksbill sea turtle	*Eretmochelys imbracata*	E	E
Leatherback sea turtle	*Dermochelys coriacea*	E	E
Loggerhead sea turtle	*Caretta caretta*	T	T
Green sea turtle	*Chelonia mydas*	T	T
Spotted turtle	*Chlemmys guttata*	N/A	T
Gopher tortoise	*Gopherus polyphemus*	C	E
Amphibians			
Flatwoods salamander	*Ambystoma cingulatum*	T	E
Dwarf siren	*Pseudobranchus striatus*	N/A	T
Gopher frog	*Rana capito*	N/A	E
Fishes			
Shortnose sturgeon	*Acipenser brevirostrum*	E	E
Atlantic sturgeon	*Acipenser oxyrinchus oxyrinchus*	E	E
Smalltooth sawfish	*Pristis pectinata*	E	-
Plants			
Sea-beach amaranth	*Amaranthus pumilus*	T	N/A
Canby's dropwort	*Oxypolis canbyi*	E	N/A
Pondberry	*Lindera melissifolia*	E	N/A
American chaffseed	*Schwalbea americana*	E	N/A

T = Threatened; E = Endangered; S/A = Similarity of Appearance to a Threatened Taxon; SSP = Species of Special Concern; BGEPA = Bald and Golden Eagle Protection Act; C = Candidate for Listing; P = Proposed for Listing; D/E = May be delisted due to extinction

Sources: Websites: http://www.dnr.sc.gov/species/index.html, http://www.nmfs.noaa.gov/pr/species/fish/, http://ecos.fws.gov/tess_public/countySearch!speciesByCountyReport.action?fips=45019; and J. Holling, SCDNR Heritage Trust Program, September 2012, pers com.

1.7.2 Fishes

The Atlantic Coast smalltooth sawfish (*Pristis pectinata*) population has a core distribution in the waters off Florida. Based on historical smalltooth sawfish occurrence records from waters as far north as New York, it is believed that members of the Florida core population regularly undertook seasonal migrations to more northern temperate waters (NMFS 2009). However, among recent records, the northernmost documented occurrence was an individual recorded seaward of the South Carolina-Georgia border in 2001 (International Sawfish Encounter Database/G. H. Burgess, unpublished data; as cited in Carlson et al. 2014). In a recent study of seasonal smalltooth sawfish movements, adults and subadults that were tagged in Florida remained in the general vicinity of the tagging area (Carlson et al. 2014). Records from South Carolina and Georgia are sparse; however, museum and newspaper records indicate that smalltooth sawfish were taken with some regularity in South Carolina waters until approximately 1938. The last documented sawfish encounter in South Carolina waters was reported in 1958 (Smalltooth Sawfish Status Review Team 2000).

The shortnose sturgeon (*Acipenser brevirostrum*) inhabits large Atlantic coast rivers from northeastern Florida to New Brunswick, Canada. Adults in southern rivers are estuarine anadromous, foraging at the saltwater-freshwater interface and moving upstream to spawn in the early spring. Spawning habitats include river channels with gravel, gravel/boulder, rubble/boulder, and gravel/sand/log substrates. Spawning in southern rivers begins in later winter or early spring and lasts from a few days to several weeks. Juveniles occupy the saltwater-freshwater interface, moving back and forth with the low salinity portion of the salt wedge during the summer. Juveniles typically move upstream during the spring and summer and move downstream during the winter, with movements occurring above the saltwater-freshwater interface. In southern rivers, both adults and juveniles are known to congregate in cool, deep thermal refugia during the summer. Shortnose sturgeons are benthic omnivores feeding on crustaceans, insect larvae, worms, and mollusks. Juveniles randomly vacuum the bottom and consume mostly insect larvae and small crustaceans. Adults are more selective feeders, feeding primarily on small mollusks (NMFS 1998). Several hundred adults are believed to inhabit the Cooper River and fertilized eggs have been collected below Pinopolis Dam; however, neither larvae nor juveniles have been collected and successful reproduction has not been confirmed (Cooke and Leach 2002, 2004). Consequently, the status and viability of shortnose sturgeon populations in the Cooper River remains poorly understood. The shortnose sturgeon has not been recorded in Shipyard Creek (unpublished data, Bill Post, SCDNR, via email dated 5 December 2013), but it is possible that it has or could occur.

Atlantic sturgeon (*Acipencer oxyrinchus*) spawn in freshwater but spend most of their adult life in the marine environment. Spawning adults generally migrate upriver in the spring/early summer, although a fall spawning migration may also occur in some southern rivers. Spawning is believed to occur in flowing water between the salt front and fall line of large rivers. Post-larval juvenile sturgeon move downstream into brackish waters and eventually move to estuarine waters where they reside for a period of months or years. Subadult and adult Atlantic sturgeon emigrate from rivers into coastal waters, where they may undertake long range migrations. Migratory subadult and adult sturgeon are typically found in shallow (40-70 ft) nearshore waters with gravel and sand substrates. Although extensive mixing occurs in coastal waters, Atlantic sturgeon return to their natal river to spawn. During the last two decades, Atlantic sturgeon have been observed in most South Carolina coastal rivers, although it is not known if all rivers support a spawning subpopulation [Collins and Smith 1997; Atlantic Sturgeon Status Review Team (ASSRT) 2007]. In 2003, three juvenile Atlantic sturgeon were captured in the Cooper River during winter shortnose sturgeon surveys (ASSRT 2007); however, SCDNR biologists are skeptical that these smaller sturgeon are residents of the Cooper River, as they may have been transported by flood waters from the Pee Dee or Waccamaw River via Winyah Bay and/or the Intracoastal Waterway (ICW) (McCord 2004). Several juvenile Atlantic sturgeon have also been captured during SCDNR shrimp trawl surveys; but no other records exist (ASSRT 2007).

1.7.3 Sea Turtles

The distribution of sea turtles along the South Carolina coast follows a seasonal pattern of inshore migration during the spring and offshore migration during the fall. Surveys of the Charleston Harbor entrance channel indicate that inshore and nearshore sea turtle occurrences are strongly correlated with bottom water temperatures ≥16° C (Van Dolah et al. 1992). Sea turtles were captured in the entrance channel from early April through early December; but were absent from early December through the end of March. Arendt et al. (2009) reported a similar strong correlation between the seasonal distribution of juvenile loggerheads and sea surface temperatures >17° C.

In South Carolina, nesting (occurring mid-May to mid-August) is most likely to be carried out by loggerhead sea turtles, as their largest nesting concentrations are found in Florida, Georgia, South Carolina, and North Carolina. However, 80% of their nesting occurs in six coastal Florida counties (USFWS 2012b). Green sea turtles may, though not frequently, nest in South Carolina, as they nest in small numbers in the U.S. Virgin Islands, Puerto Rico, Georgia, South Carolina, and North Carolina, but in larger numbers in Florida and Hawaii (USFWS 2012a). They nest from June through September. Leatherback nesting in South Carolina is rare.

The South Carolina “juvenile sea turtle guild” comprises Kemp’s Ridley sea turtle, green turtles, and hawksbill sea turtles. Individuals of these species may forage in both inshore and nearshore areas. These species, along with loggerhead sea turtles, are the species most likely to be affected by dredging operations in/near Charleston Harbor including Shipyard Creek.

Sea turtles that may be found in the project area are listed in Table 1. Nesting beaches include Sullivan’s Island, which is closest to the project site but has a relatively low nesting density, Folly Beach (a barrier island southwest of Morris Island Disposal Area), Isle of Palms (northeast of Sullivan’s Island), and the National Wildlife Refuge (NWR) northeast of the Isle of Palms (discussed below). The refuge conducts an intensive nest protection and relocation program for the loggerhead sea turtle. The turtles nesting on Cape Roman NWR are part of the northern sub-population of loggerhead sea turtle which encompasses the nesting area north of Amelia Island, Florida. Cape Island, the northern most barrier island of the refuge, receives the majority of nests laid, an average of 1,000 nests annually (USFWS 2009).

According to the USACE (2012) Sea Turtle Data Warehouse, over 20 years of sea turtle take data have been recorded for the Federal project area/Charleston Harbor Entrance Channel. Since 1991, 19 takes (Table 2) have been known to occur there; these affecting green sea turtles, loggerhead turtles, and Kemp’s Ridley sea turtles.

Table 2: Sea Turtle Take due to dredging at Federal Charleston Harbor Entrance Channel

Year	Dredge type	Dredged quantity (cy)	Number of takes	Number relocated
2012*	Maintenance	1,745,000	1(G)**	N/A
2004	Maintenance	1,449,234	3(L)***	7(L)
2000	New & Maintenance	5,627,386	5(L) 1(G)	2(L) 3(K)
1999	Maintenance	1,562,690	1(L)	N/A
1997	Maintenance	775,418	5(L)	2(L)
1991	New & Maintenance	376,425	3(L)	16(L) 1(K)

Key: G = green sea turtle; L = loggerhead sea turtle; K = Kemp's Ridley sea turtle
*unverified, potentially incomplete project records; **one Atlantic sturgeon taken also;
***two Atlantic sturgeon relocated; Source: USACE (2012)

1.7.4 Birds

Although South Carolina lies outside of the piping plover (*Charadrius melodus*) breeding range, the state's barrier islands provide important habitat for migrating and wintering plovers. Along the South Atlantic coast, wintering plovers are found at the accreting ends of barrier islands, along sandy peninsulas, and near coastal inlets. Preferred foraging habitats include sandflats adjacent to inlets or passes, sandy mudflats along prograding spits, and overwash areas. Roosting sites generally include inlet and adjacent ocean and estuarine shorelines and nearby exposed tidal flats (USFWS 1996). Critical habitat for the Atlantic Coast Wintering Population of piping plovers has been designated at a number of sites along the immediate coastline of South Carolina. The critical habitat unit nearest to the project area is the Cape Romain unit (Unit SC-7), located ~30 miles northeast of the mouth of the Cooper River. The project area is located ~8 miles inland of the coast, and does not contain suitable foraging habitat for the piping plover. Although intertidal flats occur in the undredged upper portion of Shipyard Creek, channel dredging and associated slumping of the adjacent intertidal sediments into the channel has essentially eliminated unvegetated intertidal flats within the lower portion of the creek, including the project area. Based on the inland location of the project area and the absence of suitable foraging habitat, the piping plover is not likely to occur within the project area.

The red knot (*Calidrus canutus rufa*) is a migratory shorebird that is currently proposed for listing under ESA. Although breeding does not occur in South Carolina, the state's barrier islands provide important habitat for migrating and wintering red knots. Along the South Atlantic coast, preferred foraging habitats include sandy beaches and tidal mud flats along the barrier islands. No critical habitat has been designated for this species. The potential for red knot occurrences in the project area is similar to that described above for the piping plover. Based on the inland location of the project area and the absence of suitable foraging habitat, the red knot is not likely to occur within the project area.

Endangered wood storks (*Mycteria americana*) are common, especially during the summer and fall months, at the Cape Romain NWR. Nesting sites typically contain patches of trees that are located in standing water or on small islands that are surrounded by open water. Storks forage almost entirely on small fish using a foraging technique known as tactilocation. Foraging storks wade through shallow-water habitats with their beaks immersed and partially open. Upon contacting prey, the beak is snapped shut and the prey is consumed. Foraging habitats include a wide variety of natural and man-made shallow-water wetlands. Optimal foraging conditions occur when prey are concentrated as a result of receding water levels (USFWS 2007a). Although the wood stork is an active breeder in Charleston County, no rookeries are located in the vicinity of the project area. The project area is a disturbed industrial site that does not contain suitable nesting or foraging habitat for the wood stork. Although potential shallow water foraging habitats occur in the undredged upper portion of Shipyard Creek, channel dredging and associated slumping of the adjacent sediments into the channel has essentially eliminated suitable shallow water foraging habitats within the lower portion of the creek. Therefore, the wood stork is not likely to occur within the project area.

Species protected under the MBTA that may utilize habitats in the project area are listed in Table 3. None were observed during the site visit on 2 May 2014, but these species may use the areas for occasional foraging and roosting/loafing.

1.7.5 Manatees and Dolphins

The West Indian manatee (*Trichechus manatus*) is federally protected under the MMPA as a depleted species and is listed throughout its range as an endangered species under the ESA (32 FR 4061). Manatees inhabit marine, brackish, and freshwater environments where they are found in seagrass beds, salt marshes, freshwater bottom areas, and a variety of other aquatic habitats. Manatees feed on a wide variety of submerged, floating, and emergent vegetation; however, seagrass beds are preferred foraging habitats, especially those with access to deep water. In areas of high tidal amplitude, manatees are known to feed on salt marsh vegetation (i.e., smooth cordgrass) which they access at high tide. Although manatees tolerate a wide range of salinities, they prefer areas where osmotic stress is minimal or areas that have a natural or artificial source of fresh water (USFWS 2001). Manatees are intolerant of cold water temperatures; and consequently, are generally restricted to inland and coastal waters of peninsular Florida during the winter. In the fall, as water temperatures fall below 68° F, manatees aggregate at natural thermal refugia in the southern two-thirds of Florida or take up residence at power plants, paper mills, or other warm water industrial outfalls in northern Florida. In the spring, as water temperatures reach 68°F, manatees disperse from winter aggregation sites. Some remain near their thermal refuges, while others undertake extensive movements along the coast and up rivers and canals. Warm weather sightings are most common in Florida and Georgia, whereas sightings drop off rapidly to the north (USFWS 2001). In South Carolina, manatees move freely between fresh, brackish, and marine habitats; commonly foraging on smooth cordgrass at high tide and switching to aquatic sea lettuce (*Ulva* sp.) beds at low tide. Manatees in South Carolina are known to move up rivers until their passage is blocked by either shallow water depths or dams. Although extensive stands of the introduced exotic plant *Hydrilla verticillata* are accessible to manatees in the upper Cooper River, the frequency of manatee sightings in the Cooper is generally low (Murphy and Griffin, undated SCDNR pamphlet). Manatees are infrequently sighted in the vicinity of Charleston Harbor during the warmer months. While there is no documented occurrence of manatees within Shipyard Creek, their presence, albeit rare, is a possibility and a concern to USFWS,

Although not protected under the ESA, the bottlenose dolphin (*Tursiops truncatus*) is federally protected under the MMPA. The Cooper River represents the geographic center of the Charleston Estuarine System (CES) bottlenose dolphin stock, a resident assemblage of dolphins that reside primarily in estuarine waters between the North Edisto River and Price Inlet. The CES stock may also use nearshore coastal waters to move between estuarine areas, but is distinct from coastal resident and transient dolphins. The number of dolphins observed in Charleston Harbor is substantially higher than the numbers observed in other South Carolina estuaries, indicating that the harbor is a high use area for the CSE stock (Speakman et al. 2006, as cited in NOAA 2009).

Table 3: Migratory birds likely to occur in the project area

Common Name	Scientific Name	Mud-flat	Salt Marsh
American bittern	*Botaurus lentiginosus*		X
American oystercatcher	*Haematopus palliatus*	X	X
Black rail	*Laterallus jamaicensis*		X
Black-backed gull	*Larus marinus*	X	
Black-bellied plover	*Pluvialis squatarola*	X	
Black-crowned night heron	*Nyticorax nycticorax*		X
Black-necked stilt	*Himantopus mexicanus*	X	
Brown pelican	*Pelecanus occidentalis*		X
Clapper rail	*Fallus longirostris*		X
Common tern	*Sterna hirundo*		X
Dunlin	*Calidris alpina*	X	
Foresters tern	*Sterna forsteri*		X
Glossy ibis	*Plegadis falcinellus*	X	X
Great blue heron	*Ardea herodias*		X
Great egret	*Ardea alba*		X
Greater yellowlegs	*Tringa melamoleuca*	X	X
King rail	*Rallus elegans*		X
Laughing gull	*Larus atricilla*	X	
Little blue heron	*Egretta caerulea*	X	
Short-billed dowitcher	*Limnodromus griseus*	X	
Piping plover	*Charadrius melodus*	X	
Red knot	*Calidris canutus*	X	X
Ring-billed gull	*Larus delawarensis*	X	X
Ruddy turnstone	*Arenaria interpres*	X	
Sanderling	*Calidris alba*	X	
Semipalmated plover	*Charadrius semipalmatus*	X	
Snowy egret	*Egretta thula*	X	
Sora	*Porzana carolina*		X
Spotted sandpiper	*Actitis macularia*	X	
Tricolored heron	*Egretta tricolor*		X
Virginia rail	*Rallus limicola*		X
Whimbrel	*Numenius phaeopus*	X	X
White ibis	*Eudocimus albus*	X	
Willet	*Catoptrophorus semipalmatus*	X	
Wilson's plover	*Charadrius wilsonia*	X	
Yellow rail	*Coturnicops noveboracensis*		X

*list is not exhaustive

1.8 Floodplains and Stormwater

USEPA (2010) described the project site in the following way: “The topography of the Site is relatively flat with elevations ranging between 10 to 15 feet above mean sea level. Earthen ditches channel onsite storm water runoff to two engineered settling basins. Permitted discharge primarily occurs through one National Pollutant Discharge Elimination System (NPDES) outfall, with limited areas flowing directly to Shipyard Creek. Shallow groundwater beneath the Site generally flows from west to east and toward Shipyard Creek.” In the northern portion of the site, overland runoff flows to the west, north, and east. In the southern portion of the site, overland runoff flows generally to the east.

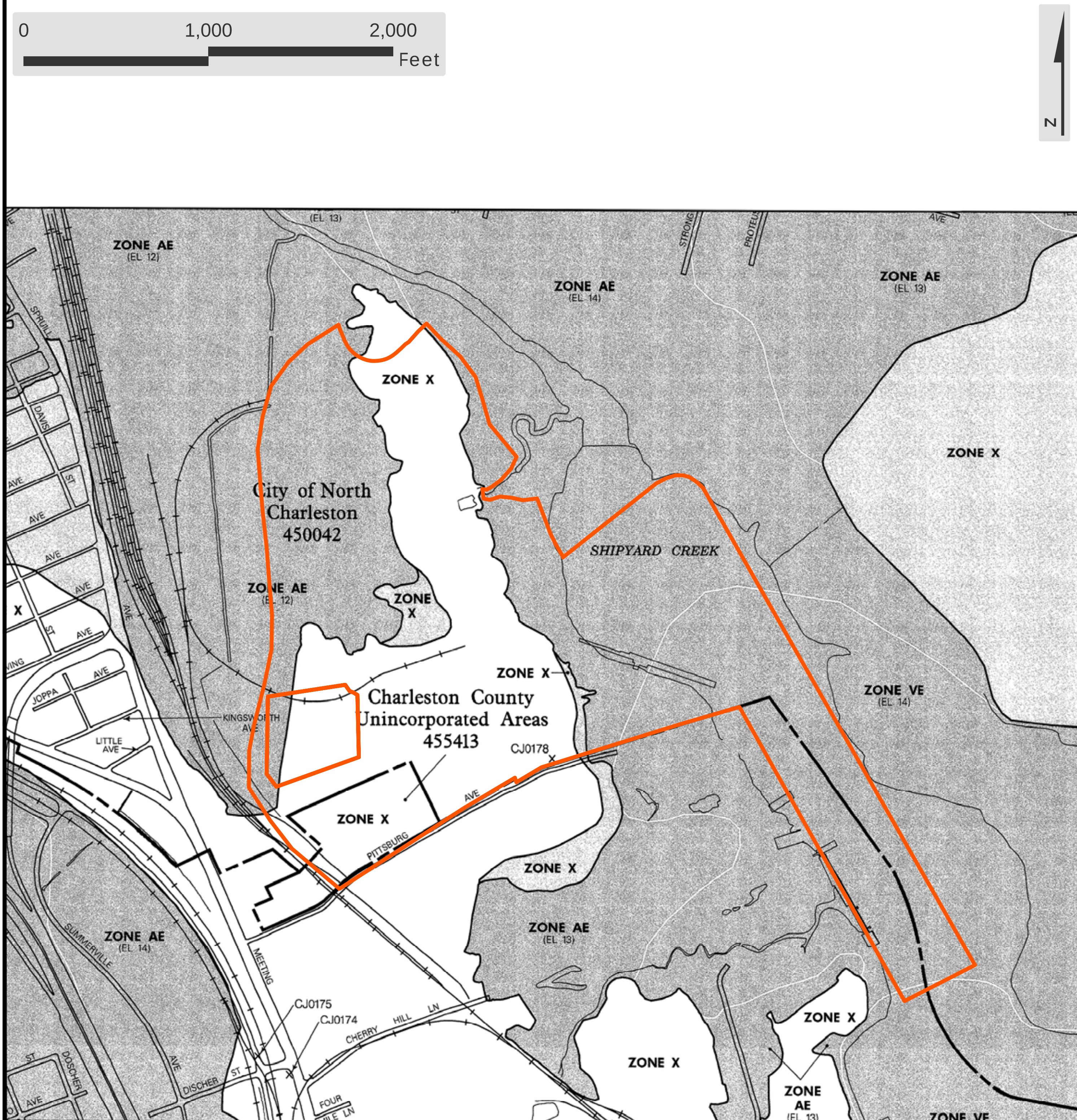
Flood zones in the project site include Zones AE, X (shaded), and X (unshaded) and are shown in Figure 8. Zone AE areas are subject to inundation by the 1-percent-annual-chance flood event determined by detailed methods. Shaded Zone X areas are moderate risk areas within the 0.2-percent-annual-chance floodplain, areas of 1-percent-annual-chance flooding where average depths are less than one foot, areas of 1-percent-annual-chance flooding where the contributing drainage area is less than 1 square mile, and areas protected from the 1-percent-annual-chance flood by a levee. Unshaded Zone X areas are minimal risk areas outside the 1-percent and .2-percent-annual-chance floodplains.

1.9 Tides, Currents, and Discharges

The most recent hydrodynamic study of the lower Cooper River was completed in 2006 in support of the Environmental Impact Statement (EIS) for the marine container terminal at the Charleston Naval Complex (CNC) in North Charleston (ATM 2006). Acoustic Doppler Current Profiler (ADCP) surveys were performed along transects at six stations in the lower Cooper River in January 20-21, 2005 (ATM 2006) (Figure 9). Discharges measured and calculated at Station ADCP-3, the transect closest to Shipyard Creek (upstream of its confluence on the Cooper River), are shown in Figure 10. The figure shows that modeled discharge on incoming and outgoing tides is nearly equivalent (albeit having slightly more, i.e., 200-300 m^3/s downstream discharge throughout the 24-hour tidal cycle), but in different directions, as would be predicted only 7-8 miles from the ocean inlet. These flows have likely been consistent since the Cooper River re-diversion (from the Santee River basin) project was completed in 1985. The re-diversion reduced the mean flow from the Santee-Cooper reservoirs to the Cooper River to approximately 127 m^3/s.

Average peak ebb currents in the Lower Cooper River near Daniel Island Bend are approximately 0.1 m^3/s, but can exceed 0.2 m^3/s during spring tide conditions. Current velocities for Shipyard Creek were predicted to not exceed 0.10 m/s during the analyzed period (Moffatt & Nichol 2012).

Current velocities and discharges were recorded during neap tide conditions at USGS gauges shown in Figure 11, including gauge 021720710, which is located on the Charleston peninsula downstream from Shipyard Creek. The average tidal range there was approximately 1.10 m and 1.17 m on January 20 and 21, 2005, respectively (ATM 2006) and 1.07 m to 1.16 m at the same location on January 2 and 3, 2012, respectively (Moffat & Nichol 2012).



Data Source: FEMA Flood Insurance Rate Map (FIRM), 2004

Figure 8
Approximate Flood Zone Map
Shipyard Creek
Charleston, SC
5/13/2014

Approximate Project Limits

ShipyardCreek
OCEAN TERMINALS

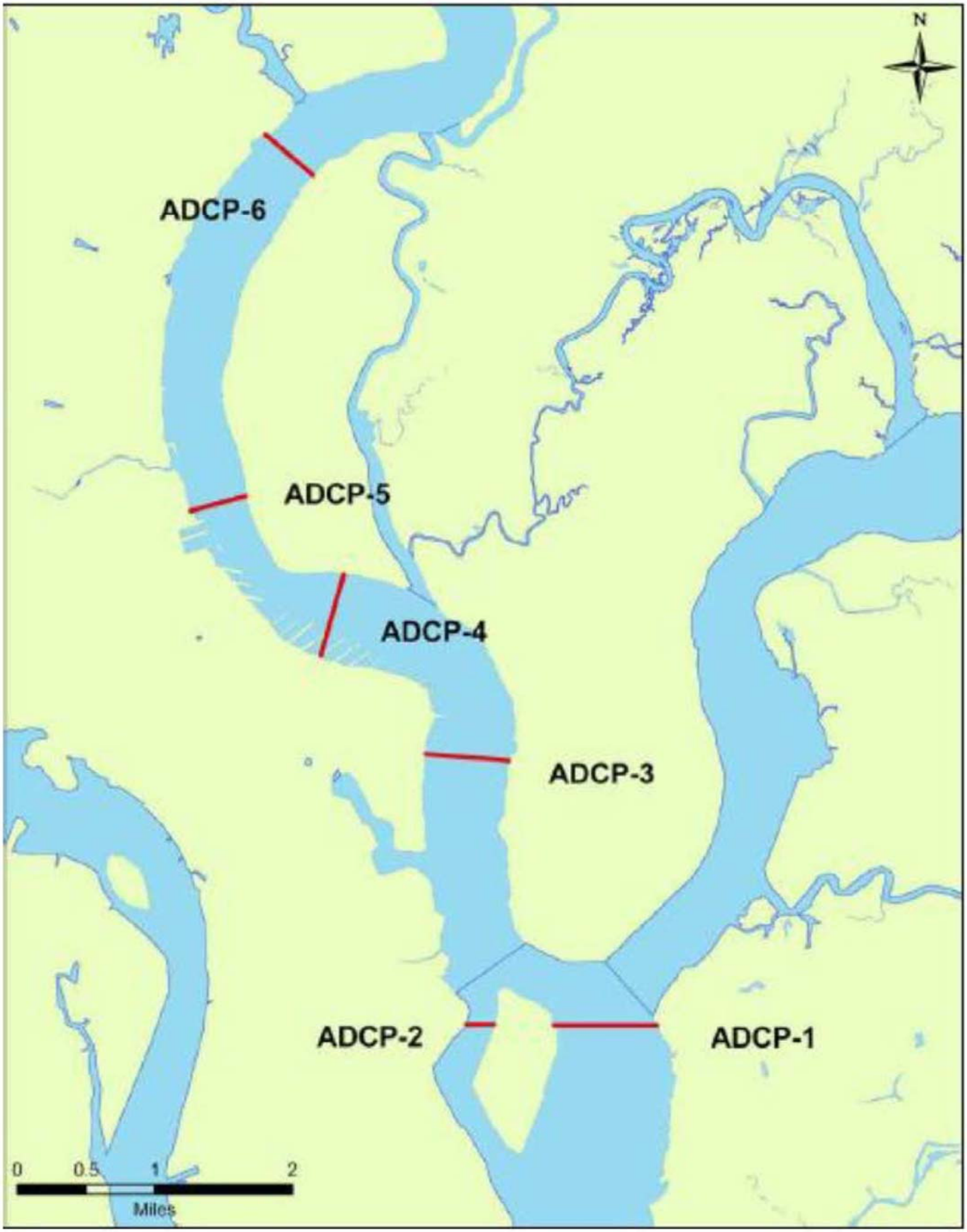


Figure 9
Positions of Acoustic Doppler Current Profiles
(20 and 21 January 2005)
Shipyard Creek
Charleston, SC
5/13/2014

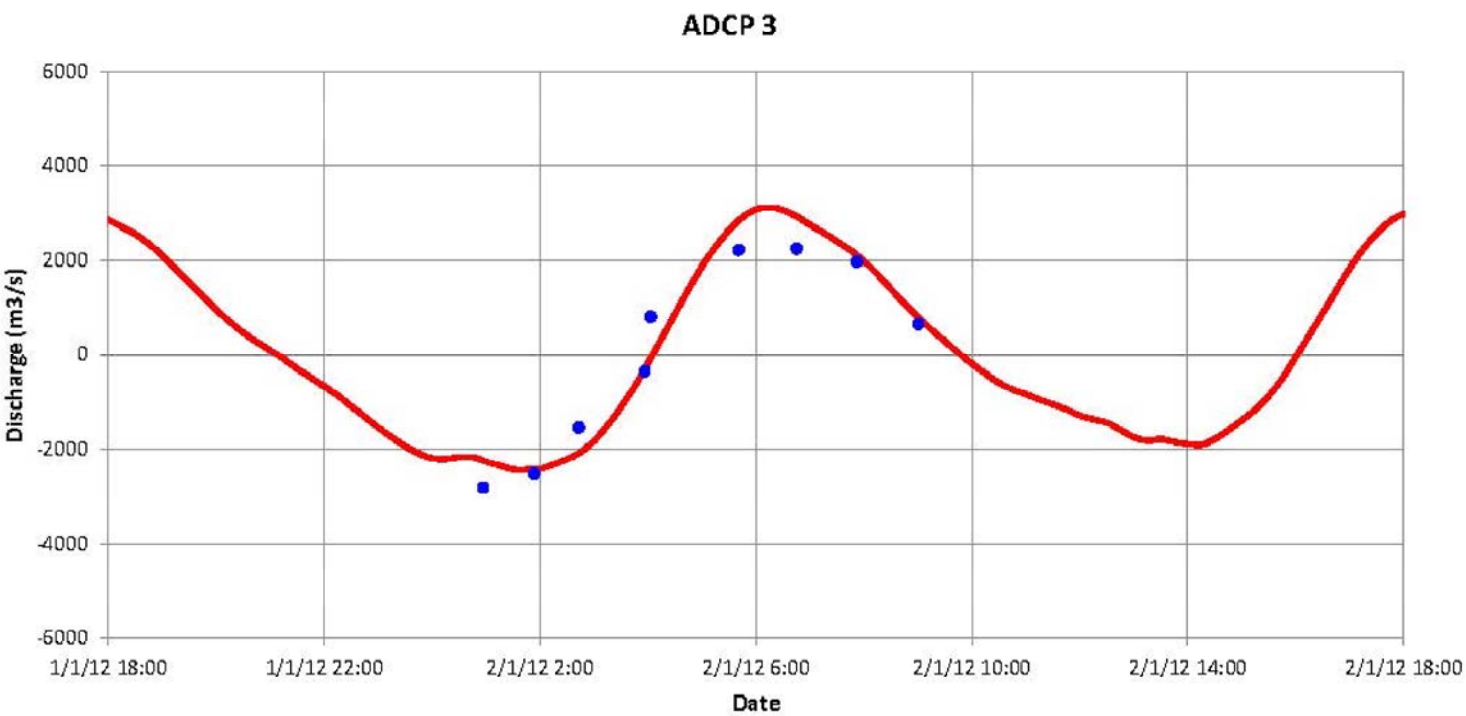


Figure 10
Calculated (red line) and Measured (blue dots)
Discharge on Cooper River at Transect ADCP-3

Shipyard Creek
Charleston, SC
5/13/2014

ShipyardCreek OCEAN TERMINALS

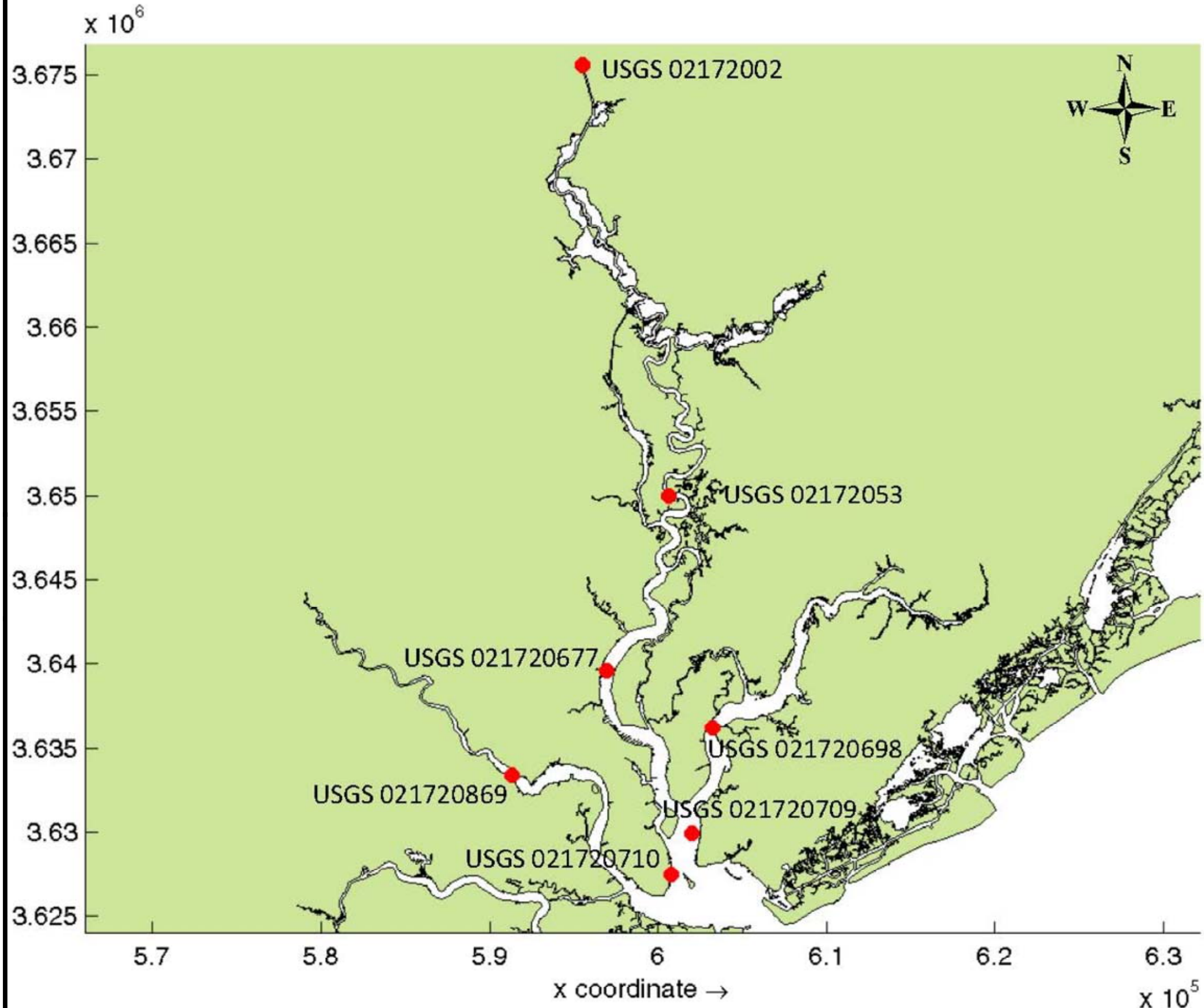


Figure 11
USGS Stations Used for Water Level Calibration and as Boundary Condition for Cooper River
Shipyard Creek
Charleston, SC
5/13/2014

2.0 EFFECTS OF THE PROPOSED PROJECT

2.1 Land Use

The entire 74-acre upland portion of the project area will be redeveloped (it formerly functioned as a ferrochromium alloy plant until 1998). The new land use will comprise navigation, transportation, and shipping functions. Specifically, development of the site will accommodate bulk, break bulk, and Ro-Ro commodities. The proposed land-use is consistent with the local zoning for industrial use and for the designated port industrial zone.

2.2 Marine Sediments

Redevelopment of the site for an ocean terminal will require dredging of the channel. The upper basin and upper channel were last dredged in 1991 (128,445 yd^3 of material from 21.2 acres of channel bottom, according to Moffat & Nichol 2013). Approximately one million cubic yards of material will need to be removed for construction of the Applicant's preferred option. Construction will directly affect approximately 42 acres, which will comprise 21.2 acres of previously dredged bottom, 7.7 acres of not-previously dredged creek bed (bounded by the project toe-of-slope), and an additional 13.1 acres of not-previously dredged creek bed (required to accommodate the necessary 3:1 side-slopes for both previously and non-previously dredged bottom). Material dredged from Shipyard Creek will be either placed in Clouter Creek Upland Disposal Area via pipeline or transported to the Charleston ocean dredged material disposal site if suitable. Material removed from the channel profile may slightly decrease tidal velocities through deepened portions of Shipyard Creek; this could increase shoaling rates in these areas during certain parts of the tidal cycle. Maintenance dredging will be required. Moffatt & Nichol (2013) found that approximately 49,000 yd^3/yr would need to be removed in the years following initial construction.

2.3 Surface Water Quality

Given (1) the historical characterization of Shipyard Creek's waters as fully supporting designated uses, as well as (2) proposed on-site methods for water treatment and (3) the relatively small proportion of contribution of discharges of Shipyard Creek to Watershed 03050201, the applicant believes that there is little risk that operation of the facilities for this proposed project would result in DO demand that would jeopardize the TMDL requirement. As previously noted, local decreases in DO during construction could occur, particularly if undertaken when water temperatures are higher. However, reductions due to dredging would be localized and short term. Even when the warmest water temperature was recorded (31 deg C) at the TMDL sample site (MD-243), the corresponding DO was nearly 5.5 mg/L, which is still conducive to marine life.

During construction, temporary increases in surface water turbidity, increases in TSS, and decreases in DO (increases in BOD) may occur, particularly in the vicinity of the dredging equipment. No changes in pH or salinity are expected. Long-term changes in these parameters are not anticipated. The Applicant will adhere to conditions presented by SCDHEC in the Clean Water Act Section 401 Water Quality Certification, which will ensure that temporary water quality effects will not adversely affect fish and wildlife outside the immediate dredging area.

2.4 Biotic Communities

2.4.1 Upland Habitat

Nearly all of the available upland habitat in the project boundaries that has developed since the former facility was closed in 1998 will be eliminated (74 acres). The site was formerly used for industrial purposes, and will be returned to such.

2.4.2 Wetlands

Approximately 0.28 acre of tidal herbaceous/cordgrass marsh will be dredged and another 0.10 acre of estuarine emergent/shrub wetlands will be filled in order to construct the proposed project. The cordgrass impact area is located along the northeast shore of Shipyard Creek, approximately half the distance between the upper and lower basins. The impact was necessary and unavoidable due to the side-slope impact associated with channel widening/deepening. The shrub wetland areas that will be filled are along the shoreline west and southwest of the upper basin. These impacts are necessary in order to construct the wharf structures (two 0.04-acre areas) and the retaining wall (a 0.02-acre area), and could not be avoided. To compensate for lost ecological functions of these areas, the Applicant proposes to purchase 4.6 credits of salt marsh enhancement/restoration from the Congaree Carton Mitigation Bank.

2.4.3 Marine Habitats

No oyster reef, hardbottom, or submerged aquatic vegetation habitats will be removed for the proposed project. Approximately half of the marine habitat to be affected by the proposed project (21.1 acres) will be previously dredged unconsolidated, softbottom, benthic habitats. These areas will be re-dredged to previously authorized depths (i.e., -39 feet for the channel reach) or re-dredged to slightly shallower than previously authorized depths (i.e., -39 feet in the upper/north turning basin that was previously -41 feet). Not previously dredged areas that will be dredged comprise 20.8 acres (7.7 acres of channel bottom and 13.1 acres for side-slope construction or bank repose) of softbottom habitat that include shallow (0 to -10 feet), medium-depth (10 to 20 feet), and deep (20+ feet) creek bed. The substrates are composed of mostly fine sands and clays. Following dredging, the benthic infaunal community associated with the soft/sand bottom substrate will recover quickly, generally within 6-12 months.

2.5 Essential Fish Habitats

Essential Fish Habitats that will be affected by the project are the estuarine water column, estuarine emergent marsh, marsh edge, intertidal mudflats, softbottom, and the estuarine water column. The Applicant concurs with the statement in the USACE public notice (12 April 2013) that, "…the proposed action would not have a substantial individual or cumulative adverse impact on EFH or fisheries managed by the South Atlantic Fishery Management Council and the National Marine Fisheries Service (NMFS)." NMFS subsequently assessed effects as comprising 42.38 acres including 42 acres of softbottom, 0.28 acre of emergent marsh/marsh edge, and 0.1 acre of intertidal mudflats (NMFS letter to Applicant dated 30 April 2013); all of which the Applicant has previously identified. Furthermore, NMFS stated, "Shoreline impacts from the sheetpile and armoring do not appear to include the 0.1 acres of fill shown on sheet 6 of 20. More importantly, impacts to finger creeks from sheetpile wall construction shown on sheet 4 of 20 are not assessed." Coordination regarding precise identification of these areas may be necessary in the future as the Applicant has not been able to find these locations of concern to NMFS. Finally, NMFS stated, "Lastly, the pipeline route between Shipyard Creek and the Clouter Creek Upland Disposal Area is not provided; verification that no new impacts to salt marsh would occur from the pipeline is needed." When dredging method and material transport methods are known, the Applicant will coordinate with relevant agencies to identify any additional impacts, minimize them if practicable, and provide compensatory mitigation. Mitigation proposed by the Applicant involves the purchase of 4.6 wetland mitigation credits, as noted above.

2.6 Fishery Resources

Although many important recreational and commercial fish species were not captured at SCDNR sample stations in Shipyard Creek, there is evidence that certain species use the area (white shrimp and bluefish). As such, it is likely that other species use the dredged and undredged portions of this tributary to the Cooper River as well. During construction, the following impacts to fish and shellfish could occur:

1. Direct mortality or injury of individual fishes (adults, subadults, juveniles, larvae, and/or eggs, depending on species, time of year, location, etc.) due to dredge equipment during construction and maintenance dredging (an effect temporary in duration).

2. Indirectly affecting foraging behavior and upstream/downstream movement of individuals through production of turbidity and decreased DO at (and down current of) construction/maintenance dredging sites (an effect temporary in duration)

These are not anticipated to significantly adversely and permanently affect fish populations, as motile species will seek other areas for foraging and spawning until construction is completed, and higher-than-normal mortality rates will return to normal as well. Where possible, the effects will be further mitigated by implementation of best management plans during construction and maintenance dredging.

2.7 Federally Protected Species

2.7.1 Fishes

Between 1990 and 2007, federal navigation dredging operations along the Atlantic Coast resulted in the take of 11 Atlantic sturgeons and 11 shortnose sturgeons (USACE 2008). All of the shortnose sturgeon takes occurred along the North Atlantic Coast, whereas all but one of the Atlantic sturgeon takes occurred along the South Atlantic Coast. Shortnose sturgeons were taken by hopper, cutterhead, and clamshell dredges; whereas Atlantic sturgeons were taken by hopper and clamshell dredges. Based on the lack of recorded individuals in the project area and the absence of reported dredge interactions along the South Atlantic Coast, direct impacts on shortnose sturgeon would not be expected under the proposed action. Cutterhead dredges are not known to entrain Atlantic sturgeon; and therefore, the use of a cutterhead dredge under the proposed action would not be expected to directly impact Atlantic sturgeon. Dredging operations under the proposed action could also employ hopper dredges, which are known to entrain Atlantic sturgeon. However, Atlantic sturgeon have not been reported from Shipyard Creek (unpublished data via Bill Post, SCDNR, 5 December 2013 email); and recent occurrence records in the vicinity of Charleston Harbor are limited to incidental captures of a few juveniles in the Cooper and Ashley Rivers (ASSRT 2007). Based on the limited occurrence records for Charleston Harbor, Atlantic sturgeon are not anticipated to be concentrated in Shipyard Creek; and therefore, the entrainment risk to Atlantic sturgeon would be low under the proposed action. Dredging operations would impact soft bottom habitats and associated benthic invertebrate communities in

Shipyard Creek, potentially affecting demersal fishes indirectly through losses of benthic infaunal prey. However, the dredged portion of Shipyard Creek is an industrial site with limited foraging opportunities for Atlantic sturgeon (NMFS 2006); and therefore, indirect impacts on Atlantic sturgeon would not be expected under the proposed action.

The only recent sawfish encounter in South Carolina was reported seaward of the South Carolina-Georgia border in 2001 (International Sawfish Encounter Database/G. H. Burgess, unpublished data; as cited in Carlson et al. 2014). Based on its apparent absence from South Carolina waters, the proposed action would not be expected to have any effect on the smalltooth sawfish.

2.7.2 Sea Turtles

The principal direct project-related threat to sea turtles would be the risk of entrainment during dredging operations. Cutterhead dredges are not known to entrain sea turtles; and therefore, in the case of cutterhead dredging under the proposed action, direct impacts on sea turtles would not be expected. Dredging operations under the proposed action could also employ hopper dredges, which are known to entrain sea turtles. Surveys of the Charleston Harbor entrance channel indicate that inshore and nearshore sea turtle occurrences are strongly correlated with bottom water temperatures ≥16° C (Van Dolah et al. 1992). Arendt et al. (2009) reported a similar strong correlation between seasonal occurrences of juvenile loggerheads in the entrance channel and sea surface temperatures >17° C. These studies indicate that sea turtles generally arrive in early April and depart by the end of November or early December. Based on this seasonal pattern, hopper dredging at Charleston Harbor is subject to an environmental dredging window of 1 December – 31 March. In addition, the use of turtle deflecting (rigid deflector) dragheads is required on hopper dredges year-round. The rigid deflector draghead creates a V-shaped sand ridge in front of the draghead as it is drawn along the seafloor, thus providing for the deflection of sea turtles while avoiding direct contact with draghead. Entrainment rates are dramatically reduced when rigid deflector dragheads are used and deployed correctly (Dickerson et al. 2004). Project-related hopper dredging operations would adhere to the same 1 December – 31 March environmental window and rigid deflector draghead requirements. Therefore, direct impacts on sea turtles would not be expected under the proposed action. Neither would indirect impacts be anticipated due to effects on sea turtle food resources. Shipyard Creek has limited foraging opportunities for sea turtles.

2.7.3 Birds

The project area does not contain any reasonable amount of suitable foraging habitat for either species. Although intertidal flats occur in the undredged upper portion of Shipyard Creek, they comprise an extremely small area. Furthermore, based on the inland location of the project area, no direct or indirect impacts on the piping plover or red knot would be expected under the proposed action. In a letter dated 13 April 2013, the USFWS concurred with a determination that the proposed action would not be likely to adversely affect either of these species or designated critical habitat for the piping plover.

Suitable nesting or foraging habitat for the wood stork does not exist within the project boundaries, although potential shallow water foraging habitats occur in the undredged upper portion of Shipyard Creek. No direct or indirect impacts on wood storks would be expected under the proposed action. In a letter dated 13 April 2013, the USFWS concurred with a determination that the proposed action would not be likely to adversely affect the wood stork.

2.7.4 Marine Mammals

The principal direct project-related threat to manatees would be the risk of vessel collisions during dredging operations. In the case of hopper dredging, the proposed environmental window would limit operations to colder periods when manatees are unlikely to be present in the vicinity of the project area. Therefore, hopper dredging under the proposed action would not be expected to directly impact manatees. In the case of cutterhead dredging, operations could occur during warmer periods when manatees may be present in the vicinity of the project area. However, cutterhead dredges are relatively stationary, and would present a minimal collision risk to manatees. In addition, as requested by the USFWS in a letter dated 13 April 2013, dredging operations conducted between 15 May and 15 October would follow the USFWS Standard Manatee Guidelines. Therefore, direct impacts on manatees would not be expected under the proposed action. Shipyard Creek has limited or no foraging opportunities for manatees. Therefore, indirect effects on manatees via foraging habitat impacts would not be expected under the proposed action.

Bottlenose dolphins are highly mobile and would be expected to avoid the project area during dredging operations. Therefore, no direct or indirect impacts on bottlenose dolphins would be expected under the proposed action.

2.7.5 Correspondence

The recent public notice posted by USACE Charleston District stated the following regarding effects on species listed under ESA: "Pursuant to Section 7(c) of the Endangered Species Act of 1973 (as amended), the District Engineer has consulted the most recently available information and has determined that the project is not likely to adversely affect any federally endangered, threatened, or proposed habitat. This public notice serves as a request for written concurrence from the U.S. Fish and Wildlife Service and/or the National Marine Fisheries Service on this determination"

2.8 Floodplains and Stormwater

Given the present and proposed final elevations of proposed structures of the terminal and associated infrastructure (see design drawings), no construction will occur within flood zones areas that would be problematic for drainage (wetland areas excepted). There will be no loss of flood storage as a result of this project.

Most of the stormwater from the project site will be piped to an 8-acre stormwater wetland west of the site and outside of project boundaries (apparently required as part of the EPA-authorized hazardous materials cleanup). The 0.3-acre stormwater pond on site is part (albeit small) of the stormwater treatment system. Stormwater runoff would be detained as required by the state and local regulations before being released into receiving waters. No direct discharge of stormwater into Shipyard Creek is anticipated.

The construction of the proposed project would require construction of up to 74 acres of impervious surface (likely to be less given the need for water treatment facilities). This will increase storm flows to the receiving waters during extreme precipitation, but under typical conditions, flows will be released gradually. The proposed project will comply with SCDHEC stormwater regulations and employ BMPs to mitigate the velocity of discharges and any risk of release of pollutants from the constructed facilities and surfaces.

2.9 Tides, Currents, and Discharges

Dredging of Shipyard Creek to its previously authorized depth of 38 ft. and the widening of the channel to 100 ft. are not predicted to alter current velocities and flows in the channel. Results of modeling analysis predicted that current velocities in the dredged portion of Shipyard Creek would not exceed 0.10 m/s following construction of the project. No other changes in the existing hydrodynamics of Shipyard Creek are expected as a result of construction and operation of the terminal and from proposed dredging and/or future maintenance dredging.

3.0 CUMULATIVE EFFECTS

3.1 Approach and Scope

The Council on Environmental Quality's (CEQ) regulations for implementing NEPA define cumulative impacts as "…the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions" (40 CFR part 1508.7). Cumulative impacts can result from individually minor, but collectively substantial, actions taking place over a period of time. Impacts can include both direct effects, which are caused by an action and occur at the same time and place as the action, and indirect effects which are caused by an action and occur later in time and are farther removed in distance, but can still be considered to be reasonably foreseeable.

Cumulative impact issues principally considered in this evaluation include water quality, wetlands, and protected species. Concerns with regard to these resources and ecological components were relevant in large part because (1) these components are especially vulnerable to potential incremental effects; (2) the Applicant's Proposed Project is one of several similar actions occurring, or planned to occur, in the same geographic region (Charleston Harbor) and during the same general timeframe (next 5-10 years); and (3) other activities in the area have similar effects on the same resources.

3.2 Relevant Past, Present, and Future Actions

3.2.1 Past Actions

USACE has completed the deepening of the channels serving Charleston Harbor to a depth of 45 feet, including the widening of some reaches. This project involved the dredging and disposal of approximately 33 million cubic yards of material to deepen existing channels, and realign several channel components. Dredged material from maintenance of the Federal Navigation Project was placed at both the Charleston ODMDS and upland disposal areas.

Other past actions include the dredging of berths for use by the SCSPA (see maintenance dredging below) and for numerous other private harbor users.

3.2.2 Present Actions

3.2.2.1 Charleston Harbor Post 45 Navigation Improvements

The Tentatively Selected Plan (TSP) for Post 45 contains the following navigation improvements for the Federal navigation project:

1. Deepen the existing entrance channel from a 47-foot project depth to a 52-foot depth over the existing 800-foot bottom width while maintaining the existing stepped or winged 1,000-foot width.

2. Extend the entrance channel seaward from the existing location to the 52-foot project depth contour.

3. Deepen the inner harbor from an existing depth of 45 feet to 50 feet to the container facility on the Wando River and the new container facility on the Cooper River and 48 feet for the reaches above that terminal to the container facility in North Charleston over varying expanded bottom widths ranging from 400 to 1800 feet (at the North Charleston Terminal turning basin.

4. Enlarge the existing turning basins at the Wando Welch and new SCSPA terminals to accommodate Post Panamax generation 2 and 3 container ships.

5. Enlarge the North Charleston Terminal turning basin to accommodate Post Panamax generation 2 container ships.

6. Place dredged material at the existing upland confined disposal facilities at Clouter Creek, Daniel Island, or Ocean Dredged Material Disposal Site for the upper harbor reaches and at the Ocean Dredged Material Disposal Site for material from the lower harbor.

3.2.2.2 Navy Base Container Terminal

Among other navigation-related construction in the area is the Navy Base Container Terminal positioned between the Cooper River and Shipyard Creek in North Charleston, across from Daniel Island. The 2006 EIS for this project contained a cumulative impact assessment, which also discusses cumulative impacts of dredging (USACE 2006). That SCSPA facility will comprise the following, according to the project contractor, Parsons Brinckerhoff (2014):

1. Clearing and grubbing of 135 acres;

2. Dredging of over 4 million cubic yards of material to create three berths;

3. Placing 583,000 cubic yards of buttress and armor rock;

4. Construction of a 6,000-foot, two-lane roadway with 6,300 linear feet of ductile iron water main and 6,700 linear feet of sewer force main.

The above will therefore consist of development across approximately 288 acres for support cargo marshaling, processing, and handling facilities (Parsons Brinckerhoff 2014).

3.2.2.3 Maintenance of Federal Channels

Maintenance dredging is ongoing in Charleston Harbor. Recent dredging permits for berths allow for some additional overdredge (6-7 feet in order to compensate for the 5 to 6 foot tidal variance in the harbor) for advanced maintenance.

3.2.2.4 Port Berths

Due to the Post 45 project, SCSPA is proposing to deepen berths at the North Charleston Terminal (NCT) and Wando Welch Terminal (WWT), where depths are currently 45 feet (total allowed/permitted are 51 and 52 feet, respectively). New depths have not yet been proposed, and depend to a large degree on the depths to which the Cooper and Wando Rivers will be dredged during Post 45. At NCT, the wharf structure was modified in 2008 to accommodate a total dredge depth of 60 feet. At WWT, the wharf structure will be improved during 2014-2016, but the total design dredge depth has not been determined. An analysis is currently underway to determine the cost differential between modifying the structure to accommodate depths of from 55 to 60 feet (Personal communication, P. Moore, SCSPA, email February 2014).

The existing/project and total allowable/permitted depths of the other three existing SCSPA terminals, where *no* additional dredging to increase depths are the following:

- Columbus Street Terminal (CST):
  Current Project Depth = -45'
  Current Total Allowable/Permit Depth = -51'

- Union Pier Terminal (UPT):
  Current Project Depth = -35'
  Current Total Allowable/Permit Depth = -45'

- Veterans Terminal (VT):
  Current Project Depth = -35'
  Current Total Allowable/Permit Depth = -42'

3.2.3 Future/Anticipated Actions

The most likely subsequent, navigation-related actions to be implemented in Charleston Harbor following project construction are (1) dredging (either for maintenance of permitted depths or for increased depths) of berths (including non-SCSPA berths) associated with federal channels and (2) eventually, the regular maintenance of federal channels themselves. For non-entrance-channel reaches, maintenance dredging has historically occurred at a 12 to 18 month interval. Maintenance dredging is periodically required at all five SCSPA berths; this will continue in the future. These include Wando Welch Terminal, North Charleston Terminal, Columbus Street Terminal, Union Pier, and Veterans Terminal. Of these, perhaps three may be dredged more deeply in the future if the Post 45 project is constructed. It is anticipated that, of the other (non-SCSPA) approximately 45 berths in the harbor, only one or two may be dredged more deeply. Future anticipated actions concurrent with the above include the further use of the ODMDS and/or confined upland disposal sites.

There are numerous additional projects proposed or underway around Charleston Harbor which will or would have impacts to wetlands and waters of the U.S. These projects include, but are not limited to, the following:

- Kinder Morgan Shipyard River Terminal, as proposed includes dredging, dock improvements, and additional vessel and rail traffic. "USACE Charleston District has received an application (#SAC-2005-5475-2G, fka 2005-2W-286) to modify an existing terminal by installing a new shipping conveyor system , transfer towers and a ship loader, extending a dock, relocating two mooring dolphins; and increasing the dredged area (by 0.87 acre) adjacent to the proposed dock extension in Shipyard Creek. The proposed depth for the expanded area is the same as the permitted depth of the remainder of the berthing areas, i.e., -45' MLW plus allowable 2' overdepth. It is estimated that up to 40,000 cubic yards of material will need to be dredged in order to achieve the proposed depth. The expansion would occur east towards the confluence of Shipyard Creek and the Cooper River. Dredged material would be disposed (via pipeline) to either the Clouter Island or Drum Island Confined Disposal Facility. Finally, installation of the conveyor system will result in shading 0.51 acre of Waters of the U.S." The public notice has recently been put out for public review.

- Maybank Mid-Stream Transfer Facilities located on Town Creek and on the Cooper River north of the Charleston Naval Complex.

3.3 ASSESSMENT OF CUMULATIVE EFFECTS OF THE PROPOSED ACTION

Potential cumulative effects on many resources (due to the proposed action) were considered. The majority of resources were determined to have little risk of being cumulatively impacted. Of those considered, only a few resources types were determined to have some potential of being impacted cumulatively or required further clarification/comment.

Water quality, and dissolved oxygen in particular, is a major concern for regulatory and resource agencies, and many users in the Charleston area. Charleston Harbor has naturally low DO levels, and modifications in water management in the Santee-Cooper River basins in conjunction with over 100 years of inlet, harbor, and river dredging may have resulted in additional locations and times when levels become critically low for certain less-tolerant marine species. The proposed project is not anticipated to contribute to a long term decrease in DO levels. Construction and dredging of the deeper, expanded channel may result in some short term temporary decreases in DO but not to levels such that aquatic life would be adversely affected. Therefore, the project's contribution to a cumulative effect on Charleston Harbor DO is anticipated to minimal and temporary.

Wetland impacts have occurred in the Charleston area as far back as the 18th Century. Prior to implementation of regulations and laws pursuant to the Clean Water Act of 1972 (and perhaps even for some time after), cumulative impacts to wetlands were significant. For the proposed project, wetland impacts are extremely small (0.38 acre), and these losses will be mitigated by restoration or enhancement projects. Therefore, with no net loss of wetlands in the basin, the project will not have a cumulative effect on wetlands.

Effects to non-wetland Essential Fish Habitats due to the proposed project include the modification of approximately 13.1 acres of softbottom benthic habitat and construction-related estuarine water column changes. Water column effects include temporary decreases in DO (discussed above) and temporary increases in turbidity. Since the increase in turbidity will be localized due to implementation of BMPs and precautions taken to ensure compliance with state water quality certification, the proposed project is not anticipated to cumulatively affect turbidity in the project vicinity. Softbottom impacts will involve the modification of 13.1 acres of benthic habitat. These areas comprise both the side-slope zones as well as the new toe-to-toe channel bottom (expansion area). Hence the existing softbottom that comprises shallow, medium-depth, and deeper areas will become deeper, albeit not all to the maximum depth of -39 as side-slopes will be included at a ratio of 3(horizontal):1(vertical). These side-slope areas will re-create transitional depths from the channel bottom to the nearshore areas. Because the project may result in some small net loss of shallower softbottom habitat, and as this process occurs in many other navigation projects across the harbor, the loss of a few acres of such habitat could be considered to contribute to cumulative effects.

As the project is not anticipated to have a permanent indirect or direct effect on fisheries, the proposed project will not likely have a cumulative effect on fisheries. Likewise, as detailed above, the project is not anticipated to have direct or indirect effects on species protected under ESA. Therefore, no contributions to cumulative effects are anticipated.

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APPENDIX A
SITE PHOTOGRAPHS

Photo 1 – Disturbed herbaceous community with evening primrose (*Oenothera speciosa*) and yellow sweet-clover (*Melilotus officinalis).*

Photo 2 – Disturbed herbaceous community with crimson clover (*Trifolium incarnatum*) and sericea lespedeza (*Lespedeza cuneata*).

Photo 3 – Scrub-shrub community with Japanese privet (*Ligustrum japonicum*) and grape (*Vitis* sp.).

Photo 4 – Hackberry (*Celtis laevigata*) along edge of scrub-shrub community.

Photo 5 – Hackberry (*Celtis laevigata*) along edge of scrub-shrub community.

Photo 6 – Black locust (*Robinia pseudoacacia*) along edge of scrub-shrub community.

Photo 7 – Japanese honeysuckle (*Lonicera japonica*) and trumpet vine (*Campsis radicans*).

Photo 8 – View from southwest of site to the east


Photo 8 -- Proposed wharf area (south portion) on Shipyard Creek


Photo 9 -- Proposed wharf area (north portion) on Shipyard Creek

Photo 10 – View to north showing salt marsh through which undredged headwaters of Shipyard Creek flow

Photo 11 -- Yellow rat snake (*Elaphe obsoleta*) foraging in typical groundcover on east-central portion of property approximately 75 feet from Shipyard Creek

Photo 12 – View from northeast corner of project area to the west

Photo 13 – View from west-central portion of the project area to the east

Appendix C:

Essential Fish Habitat Study

ESSENTIAL FISH HABITAT ASSESSMENT FOR SAC#2013-00202-21R

TERMINAL DEVELOPMENT AND NAVIGATION IMPROVEMENTS AT SHIPYARD CREEK

CHARLESTON, SOUTH CAROLINA

10 June 2014

Photo courtesy of SCDNR

Prepared for

moffatt & nichol

Creative People, Practical Solutions.

by

DIAL CORDY AND ASSOCIATES INC

Environmental Consultants

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1.0 INTRODUCTION

Shipyard Creek Associates, LLC is seeking to rehabilitate the Shipyard Creek site located at 1800 Pittsburgh Avenue, Charleston, South Carolina (Figure 1). The site comprises approximately 74 developable acres fronting Shipyard Creek in an industrial and commercial section of the Charleston Peninsula, Shipyard Creek is a tributary to the Cooper River, which forms the eastern side of the Charleston peninsula.. A tidal creek and marsh along Shipyard Creek border the site to the north and east, industrial and commercial properties occur to the south, and a CSX rail line defines the western boundary of the site (Figure 2).

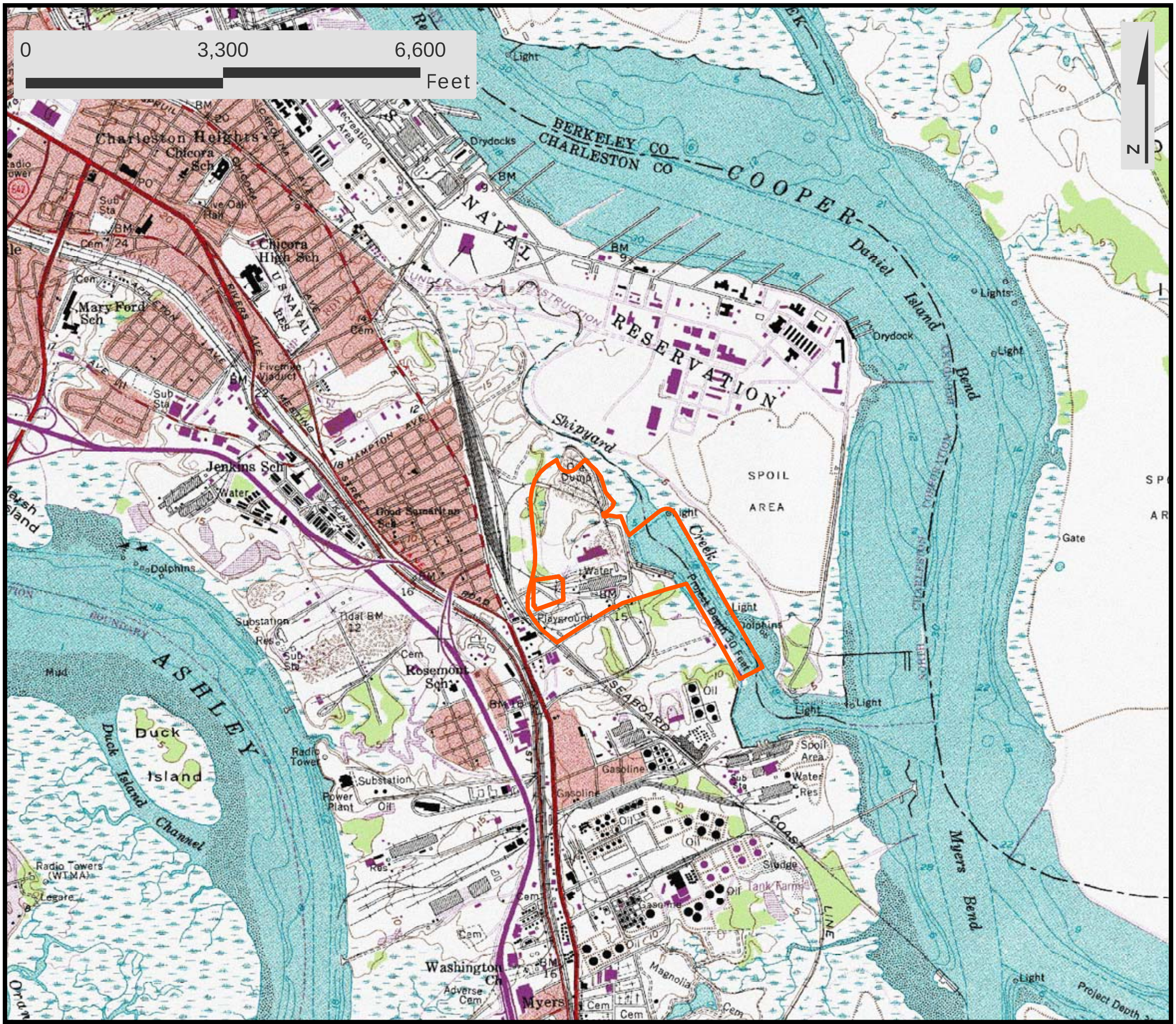
The Magnuson-Stevens Act's final rule, to manage fishery resources and their habitats, was released on January 17, 2002. The National Marine Fisheries Service (NMFS) and affiliates, the South Atlantic Fishery Management Council (SAFMC) and the Mid-Atlantic Fishery Management Council (MAFMC), oversee the managed species and their habitats potentially found within the proposed project's footprint [National Oceanic and Atmospheric Administration (NOAA) 2009a, NOAA 2009b]. In addition, the Atlantic States Marine Fisheries Commission (ASMFC) serves as a roundtable for cooperative discussion between 15 Atlantic states, coordinating the protection and administration of the states' shared near shore fishery resources. This Essential Fish Habitat (EFH) assessment describes the habitat(s) and managed fishery resource(s) that are potentially present within the project footprint.

The combination of fishery and habitat management with emphasis on healthy and diverse estuarine and marine ecosystems meets the EFH mandates of the Magnuson-Stevens Act. If a construction, permitting, funding, or other proposed action potentially affects EFH(s), then applicable federal permitting agencies must consult with the NMFS. The EFH consultation ensures the potential action considers the effects on important habitats and supports the management of sustainable marine fisheries (South Atlantic Region or "SAR" 2008a).

2.0 PROJECT DESCRIPTION

Historically, the Upper Basin and Upper Channel portions of Shipyard Creek were periodically dredged by USACE beginning in the mid-1950s until 1991 when operations ceased at the smelting plant. During the late 1960's through the early 1970's the Upper Basin was dredged to a depth of approximately -37 feet with the Upper Channel dredged to about -43 feet deep. Additional dredging occurred during the 1980s with the Upper Basin being deepened to approximately -41 feet, while the Upper Channel was dredged to a maximum of -39 feet. A primary component of the proposed project involves dredging the Upper Basin and Upper Channel to a depth of -38 feet, consistent with the depth that those areas were dredged and maintained from the 1960s through early 1990s.

The purpose of the proposed action is to rehabilitate a previously environmentally contaminated land tract into an economically vibrant property. The proposed action will replace and upgrade the former Shipyard Creek marine terminal facility to permit waterfront access to the site via deep draft vessels. Land based improvements will result in a bulk, break bulk, or RO/RO facilities with associated amenities (rail, roadway, and site improvements).

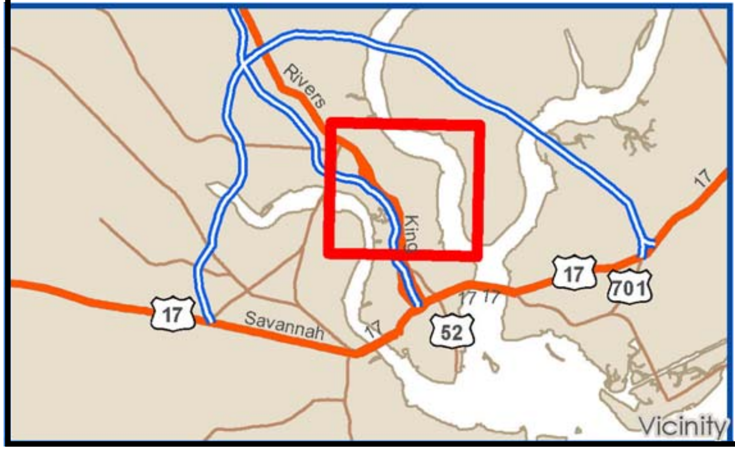


Data Source: USGS Charleston, SC 1:24000 Topographic Map

Approximate Project Limits

Figure 1
Project Location
Shipyard Creek
Charleston, SC
5/30/2014

ShipyardCreek OCEAN TERMINALS



Data Source: Charleston County 2013 Orthophotography (NAIP)

Figure 2
Approximate Project Limits
Shipyard Creek
Charleston, SC
5/30/2014

Approximate Project Limits

ShipyardCreek OCEAN TERMINALS

The proposed action entails replacement and upgrade of the former marine terminal facility to permit larger vessels to safely navigate the Shipyard Creek channel, turning basin, and ship berths during all tidal stages. Specific actions proposed in the creek and along embankments include the following:

- Deepening and widening the existing authorized Upper Channel and Basin. The channel would be widened from 200 feet to 300 feet. Both the Upper Channel and Upper Basin would be deepened to -38 feet mean low level water (MLLW) –with minus one foot of allowable over-dredge (consistent with the depths of historical dredging in these areas);

- Dredge a new mooring area adjacent to the channel (i.e., 130 feet wide at -12-foot MLLW and 65 feet wide at -7 feet MMLW);

- Construct a new 70-foot wide by 880-foot long concrete bulk handling wharf. The structure pile is supported with a steel sheetpile wall on the landward side. Armor stone is proposed for placement on the slope beneath the wharf and backfill placed behind the sheetpile wall;

- Construct a new 400-foot long steel retaining wall north of the proposed wharf;

- Construct a new 650-foot long steel sheetpile toe wall in front of an existing concrete wharf to allow for the proposed dredged deepening without endangering the structural stability of the existing wharf;

- Remove existing timber breasting dolphins along existing channel; and,

- Construct two 30-pile cluster timber dolphins and 14, 19-pile cluster timber dolphins in the new mooring area outside of the proposed channel widening. The new mooring field will be available to Marinex Corporation (the company will also be granted the ability to place additional moorings in the northeast corner outside of the turning basin, if needed.

In addition, several improvements are contemplated for upland areas including the following:

- Terminal facilities capable of handling bulk, break-bulk and roll-on/roll-off (ro-ro) operations;

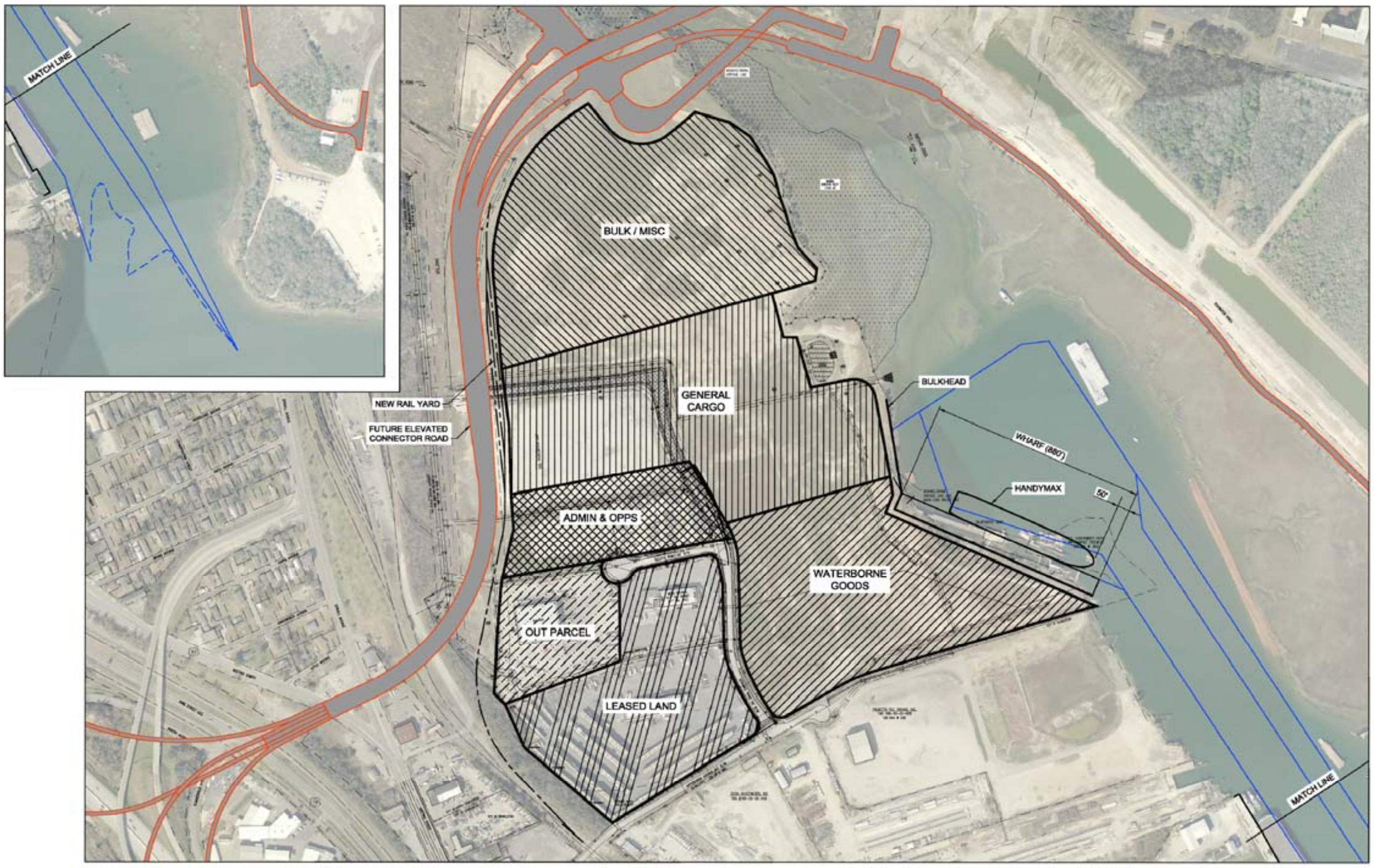
- A mobile harbor crane;

- An internal roadway system capable of handling the extent of truck traffic which will be generated by development of the Shipyard Creek site including necessary roadway and intersection improvements along Pittsburgh Avenue (the main Shipyard Creek site access roadway) and Cherry Hill Lane; and,

- A small rail yard to take advantage of the site's ability to connect to existing adjacent tracks. The rail would be located along the western edge of the property and allow the rail operation to accommodate additional rail storage and provide a bypass lane.

0 1,000 2,000
Feet

N



Data Source: Charleston County Orthophotography

Figure 3

Proposed Project - Shipyard Creek Concept

Shipyard Creek

Charleston, SC

5/30/2014

3.0 ESSENTIAL FISH HABITATS

Significance. Charleston Harbor supports significant fish and wildlife resources including many marine and estuarine species. The estuary supports large populations of penaeid shrimp and blue crabs which are economically important species. Demersal fish species include Atlantic croaker (*Micropogonias undulates*), bay anchovy (*Anchoa mitchilli*), Atlantic menhaden (*Brevoortia tyrannus*), spotted hake (*Urophycis regia*), weakfish (*Cynoscion regalis*), spot (*Leiostomus xanthurus*), blackcheek tonguefish (*Symphurus plagiusa*), white catfish (*Bagre marinus*), and silver perch (*Bairdiella chrysoura*). Other fish of commercial or recreational value are commonly found in Charleston Harbor, including southern flounder (*Paralichthys lethostigma*), red drum (*Sciaenops ocellatus*), spotted seatrout (*Cynoscion nebulosus*), bluefish (*Pomatomus saltatrix*), spot, and black drum (*Pogonias cromis*). Several anadromous species including two federally protected species, Atlantic sturgeon (*Acipenser oxyrinchus*) and shortnose sturgeon (*A. brevirostrum*), use Charleston Harbor.

All of Charleston Harbor's tidally influenced reaches and adjacent wetlands are considered EFH. The National Marine Fisheries Service (NMFS) recently sent notice to the U.S. Army Corps of Engineers (USACE) in a National Environmental Policy Act (NEPA) scoping letter (November 2, 2011) indicating that "Essential Fish Habitat (EFH) within the [Federal] project area includes estuarine and marine emergent vegetation, tidal freshwater wetlands, tidal creeks, oyster reefs, water column, intertidal and subtidal mudflats (unconsolidated bottom), coastal inlets, coral and artificial reefs, and hardbottom." Of these EFH types, within the proposed project area there are estuarine and marine emergent vegetation, tidal creeks, estuarine water column, and intertidal and subtidal mudflats (unconsolidated bottom). These four types are described below.

Estuarine and Marine Emergent Vegetation. NOAA defines estuarine emergent wetlands as "Deepwater tidal habitats and adjacent tidal wetlands that are usually semi-enclosed by land but have open, partly obstructed, or sporadic access to the ocean, with ocean-derived water at least occasionally diluted by freshwater runoff from the land. The upstream and landward limit is where ocean-derived salts measure less than 0.5 ppt during the period of average annual low flow. The seaward limit is (1) an imaginary line closing the mouth of a river, bay, or sound; and (2) the seaward limit of wetland emergents, shrubs, or trees when not included in (1)." These wetlands would be considered brackish and saltmarsh areas. Tidal wetlands in Charleston Harbor include emergent tidal marshes dominated by cordgrass species (*Spartina alterniflora*) and black rush (*Juncus roemerianus*). High marsh areas contain sea oxeye (*Borrichia frutescens*), salt grass (*Distichlis spicata*) and salt meadow hay (*Spartina patens*), and scrub shrub wetlands dominated by wax myrtle (*Myrica cerifera*), salt marsh elder (*Iva frutescens*), and groundsel tree (*Baccharis halimifolia*). Common reed (*Phragmites australis*) is also found along the fringe of the high marsh.

Tidal Creeks. Variable in size and water depth, coastal tidal creeks are nursery grounds for larvae and juvenile fish species. As an interface between estuarine habitats and the freshwater confluence of upstream flow, tidal creeks are characterized by their oyster bars, mud flats, and intertidal rivulets. At high tide when predators can access these creeks, juvenile fishes take advantage of the protection afforded by the marsh. As the tide ebbs and predators are forced to leave the shallow creeks, juveniles move off the marsh surface and concentrate in the creeks where their abundances can be quite high.

Estuarine Water Column. The estuarine water column is classified as essential fish habitat. It is located between the sediment-water interface and the surface of the water. The EFH estuarine water column provides both migrating and residential species of varying life stages the opportunity to survive in a productive, active, unpredictable, and at times strenuous environment. As the transport medium for nutrients and organisms between the ocean and inland freshwater systems, the estuarine water column is as essential a habitat as any marsh, seagrass bed, or reef (SAFMC 1998a).

Intertidal and Subtidal Mudflats (Unconsolidated Bottom). Intertidal flats are the unvegetated bottoms of estuaries and sounds that lie between the high and low tide lines. These flats occur along mainland or barrier island shorelines or can emerge in areas unconnected to dry land. Intertidal flats are most extensive where tidal range is greatest, such as near inlets and in the southern portion of the coast. Because the influence of lunar tides is minimal in the large sounds, true intertidal flats are not extensive, except for the area immediately adjacent to inlets (Peterson and Peterson 1979). Subtidal mudflats extend below mean low tide line and are unvegetated with benthic sediments comprising fine sand, silts, and clays.

4.0 HABITAT AREAS OF PARTICULAR CONCERN

Within areas designated as Essential Fish Habitat, there are habitats that provide certain important ecological functions called Habitat Areas of Particular Concern (HAPC). The Fisheries Management Councils may designate a specific habitat based on one or more of the following criteria: importance of the ecological function provided by the habitat; extent to which the habitat is sensitive to human-induced environmental degradation; whether, and to what extent, development activities are, or will be, stressing the habitat type; and rarity of the habitat type. The HAPC designation does not necessarily confer additional protection or restrictions upon an area, but helps prioritize and focus conservation efforts. Although these habitats are particularly important for healthy fish populations, other EFH areas that provide suitable habitat functions are also necessary to support and maintain sustainable fisheries and a healthy ecosystem. HAPC can be geographically grouped by managed species to better describe needs/uses of these sensitive habitats. These are noted below (project-area-specific HAPC are listed at the end of this section):

- **Shrimp**- All coastal inlets, all state-designated habitats of particular importance to shrimp, state-identified overwintering areas

- **Snapper Grouper Complex**- medium to high profile offshore hardbottoms where spawning normally occurs; localities of known or likely periodic spawning aggregations; nearshore hardbottom areas; The Charleston Bump (a deepwater, rocky, bottom feature approximately 90 miles southeast of Charleston, South Carolina); seagrass habitat; oyster/shell habitat; all coastal inlets; all state-designated nursery habitats of particular importance to snapper grouper; pelagic and benthic Sargassum; Hoyt Hills for wreckfish; the Oculina Bank HAPC; all hermatypic coral habitats and reefs; manganese outcroppings on the Blake Plateau; and Council-designated Artificial Reef Special Management Zones (SMZs). For **Black Sea Bass**, estuarine ebb and flows are critical to provide transport, refuge, and feeding/development areas for all life stages

- **Coastal Migratory Pelagics**- the Charleston Bump and Hurl Rocks (South Carolina); Pelagic Sargassum; and Atlantic coast estuaries with high numbers of Spanish mackerel and cobia (Broad River, SC)

- **Bluefish**- surf zone seaward of intertidal beaches and coastal inlets where ebb and flow currents are created by a bottleneck area of intense currents

- **Summer Flounder**- coastal inlets, estuarine systems for juvenile and adult development

Areas designated by NMFS and the FMCs affecting the South Atlantic area, and more specifically within South Carolina, include the Broad River, the Charleston Bump, and Hurl Rocks. Area-wide geographically defined HAPCs include Council-designated artificial reef special management zones, hermatypic coral habitat and reefs, hardbottoms, Hoyt Hills, *Sargassum* habitat, state-designated areas of importance to managed species, and submerged aquatic vegetation (SAV).

In the proposed project area, only shrimp and snapper-grouper HAPC occur, but habitats in the area also function as HAPC for summer flounder (though not officially categorized as HAPC in the on-line FMC GIS database).

5.0 MANAGED SPECIES

5.1 Penaeoid Shrimps

In the southeastern United States, the shrimp industry is based on the white shrimp (*Litopenaeus setiferus*), brown shrimp (*Farfantepenaeus aztecus*), pink shrimp (*Farfantepenaeus duorarum*), and the deeper water rock shrimp (*Sicyonia brevirostri*). For the above species, coastal inlets have been classified as HAPC. Within the project area, this includes the estuarine and marine water columns within the inlet which includes the navigation channel (see Figure 4). These areas are the connecting waterbodies between inshore estuarine nursery areas and offshore marine habitats used for spawning and growth to maturity.

Representative species profile: white shrimp. White shrimp are especially important in South Carolina. The species is subject to both recreational and commercial fisheries. The local agency responsible for management of white shrimp stocks within South Carolina waters is the SCDNR. Below are several important life-history, environmental, and resulting management considerations for the species (text relevant to the project area/proposed project excerpted and transcribed from Whitaker 2012):

> “The spawning season for white shrimp during spring is obvious by the large catches of mature shrimp by the commercial fleet. The exact timing of the spawning period seems to be set by water temperature during spring, but white shrimp typically spawn during May and early June with a few individuals spawning as late as July and early August…Post larval shrimp seem to settle out in the shallow waters in the upper ends of saltmarsh tidal creeks. Shrimp will remain in this “nursery habitat” about two or three months until they are about four inches in length. During high tide, juveniles move into the marsh grass to feed and escape predators. At low tide, when the water level is below the saltmarsh grass, shrimp concentrate in creek beds. The smallest shrimp remain near the creek bank while larger juveniles tend to be in deeper creek waters…Both brown and white shrimp seem to prefer muddy bottom...
>
> “As shrimp become larger, they leave the brackish waters and move gradually toward the higher salinity waters of the ocean…Shrimp usually begin moving into coastal rivers when they reach about 4 inches in length. Further growth occurs in the rivers until the shrimp are ready to move into the lower reaches of sounds, bays and river mouths. These lower reaches, termed “staging areas” by some biologists, serve to accumulate shrimp just prior to dispersal into the ocean. When white shrimp are in the staging areas, many will move into the shallow peripheral areas to feed at night…In years when shrimp are very abundant, they may migrate into the ocean at a size of about 4 to 5 inches in length. When not abundant, however, average size of shrimp may be 6 inches or more before they leave the estuaries. The difference in size between the years of high stock abundance and low abundance seems to be related to…density-dependent growth…Heavy rainfall, resulting in very low

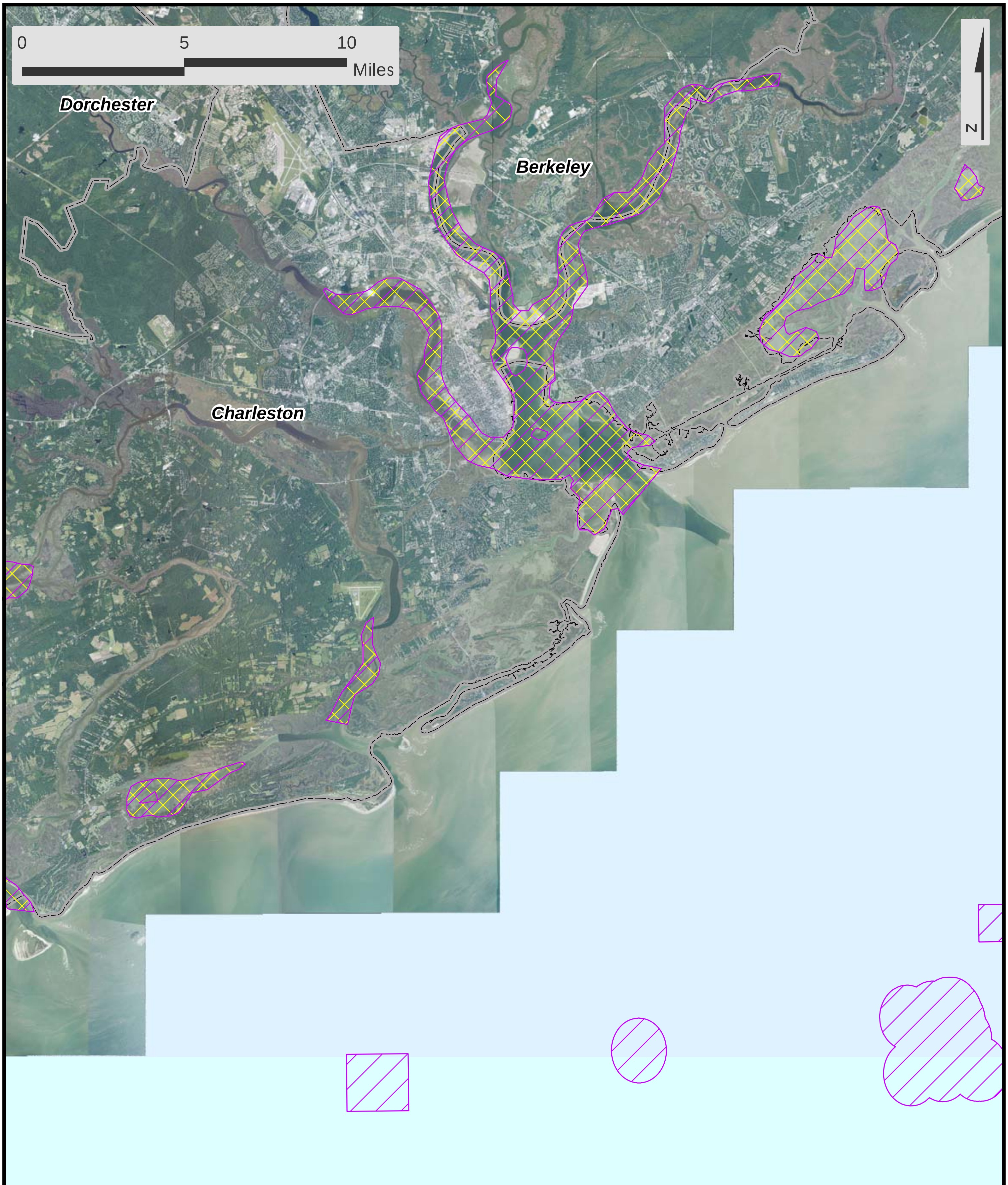
salinities, can force juvenile shrimp from nursery areas. When forced into the inhospitable open-water areas, growth and survival rates are poorer because of less available food and suitable habitat.

"Extreme environmental conditions such as droughts or unusually warm fall weather may result in delaying emigration of white shrimp into the ocean. Tagged white shrimp released into coastal waters of South Carolina in September have been observed to remain in the estuaries for two months or more before moving seaward. Heavy rainfall or river discharge along with the accompanying drops in water salinity (salt content of the water) have been known to cause shrimp to move into the ocean prematurely…In a wet year, the majority of the white shrimp may move into the ocean in August, about a month ahead of normal. The result would be a poor shrimp baiting season and poor harvest by commercial trawlers in October, normally one of the better months for shrimping. The areas typically most severely affected are Charleston Harbor and Winyah Bay, which receive relatively large amounts of upstate river discharge…Without significant rainfall and/or river discharge during fall, white shrimp appear to remain in the estuaries until water temperature falls to about 60-65˚F and then migration seems to occur primarily during the large tides associated with new and full moons..."

"White shrimp abundance fluctuates more than that of brown shrimp. The primary cause of these large fluctuations is the occasional near-total loss of spawning stocks. The white shrimp is a subtropical species and, being such, is susceptible to cold temperatures. During late fall, larger white shrimp that aren't caught by recreational or commercial fishermen migrate south as far as Cape Canaveral, Florida. This has been repeatedly documented by tagging studies. Unfortunately, most of these shrimp are caught before they have an opportunity to return north the next spring (assuming they would if allowed). Therefore, we in South Carolina are dependent upon the small white shrimp that overwinter in our estuaries to be our primary spawning stock. During winters in which water temperature falls to 46˚F or below for seven or more days, most of the overwintering brood stock are wiped out. In some years, cold-related mortalities have been noted as far south as the Georgia-Florida border. Following cold kills, the roe shrimp harvest is usually less than 50,000 pounds and often zero. Fall commercial landings also suffer, being less than 20 percent of the long-term average.

"If an adequate number of spawners is present, the next most important factor for white shrimp abundance seems to be water salinity in the nursery habitat in August and perhaps July. Low landings seem to be related to unusually dry summers resulting in higher than average salinity values. However, unusually wet summers can be detrimental also. Moderate rainfall and river discharge appear to create ideal conditions for white shrimp in most of the state's coastal marshes."

In addition to providing a generalized schematic for white shrimp life-history stages (Figure 5), Wenner (2004) discusses the state's fishery assessment program and the significance of the blend of environmental variables affecting white shrimp abundance in Charleston Harbor. Notably, he cites water temperatures as a critical parameter (see years 2001 and 2003 in Figure 6), one that is compounded when low salinities are present. He stated, "The poor survival in areas south of Charleston following cold winter temperatures is most likely due to the shallowness of rivers and less river flow" (Wenner 2004). Figure 7 shows where white shrimp have been captured in the Charleston Harbor estuary during SCECAP (South Carolina Estuarine and Coastal Assessment Program) and other inshore fisheries sampling efforts. Only approximately two-dozen sites produced samples with white shrimp. Figure 8 shows the subset of that dataset for only the proposed project area (Shipyard Creek). For white shrimp species summary, see the SCDNR website (https://www.dnr.sc.gov/marine/species/whiteshrimp.html).



Data Sources: Charleston County 2013 Orthophotography (NAIP), South Atlantic Fishery Management Council (2012)

Figure 4

EFH-SAFMC

Shipyard Creek

Charleston, SC

5/30/2014

Snapper Grouper EFH-HAPC*

Shrimp EFH-HAPC*

* South Atlantic Fishery Management Council (SAFMC) Essential Fish Habitat (EFH) - Habitat Areas of Particular Concern (HAPC), 2012.

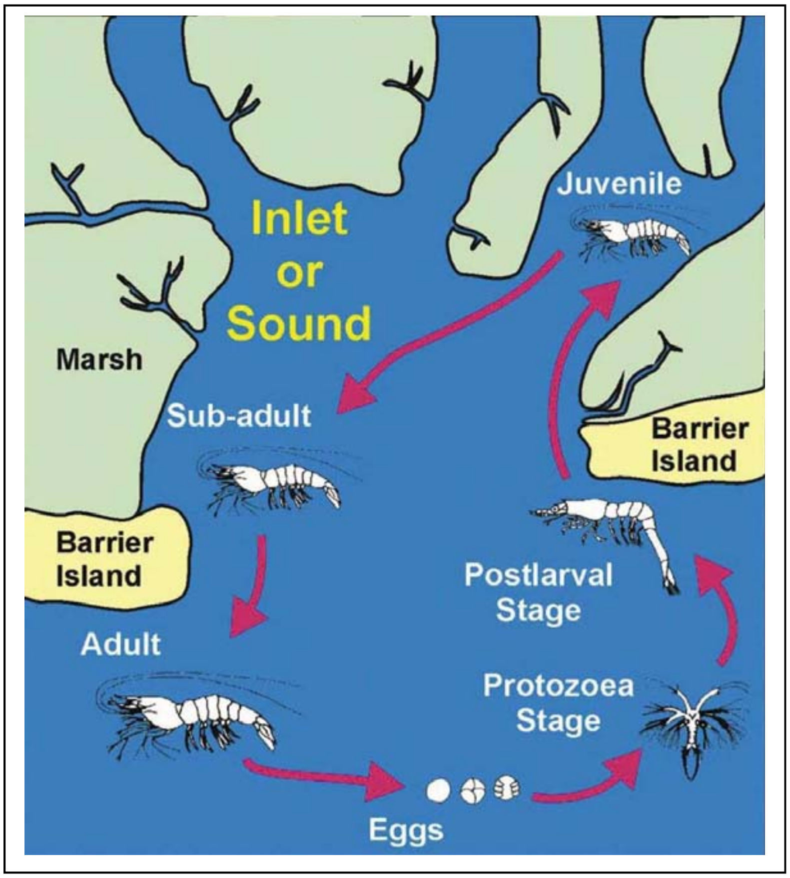


Figure 5 Schematic of white shrimp development

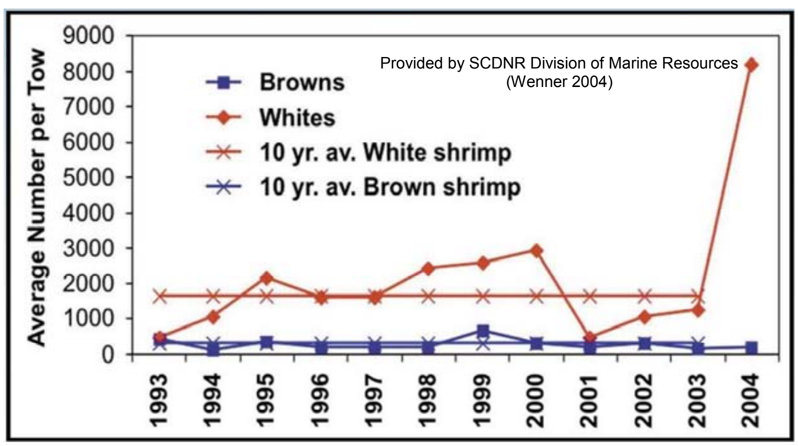
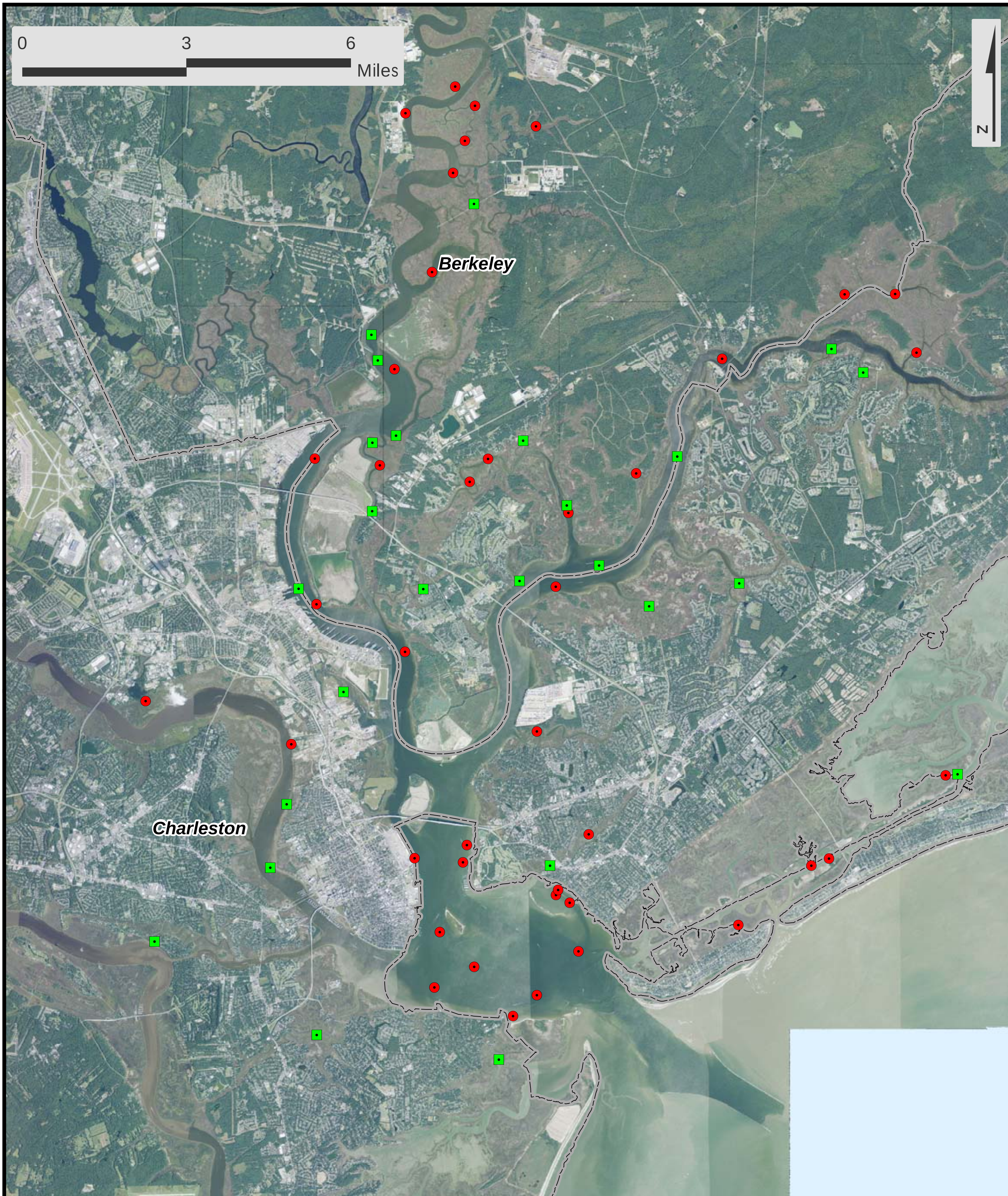


Figure 6 Catch (via trawl) of white shrimp in tidal creeks near Charleston, SC



Data Sources: Charleston County 2013 Orthophotography (NAIP),
South Carolina Estuarine and Coastal Assessment Program (1999-2009)

Figure 7

SCECAP - White Shrimp

Shipyard Creek

Charleston, SC

5/30/2014

SCECAP Stations

Positive for White shrimp

- NO
- YES

Data Sources: Charleston County 2013 Orthophotography (NAIP), SCECAP (2000), SCDNR (2002)

Figure 8

Fishery Resource Capture Locations

Shipyard Creek

Charleston, SC

5/30/2014

SCECAP Station - White shrimp

SCDNR Inshore Fisheries - Bluefish

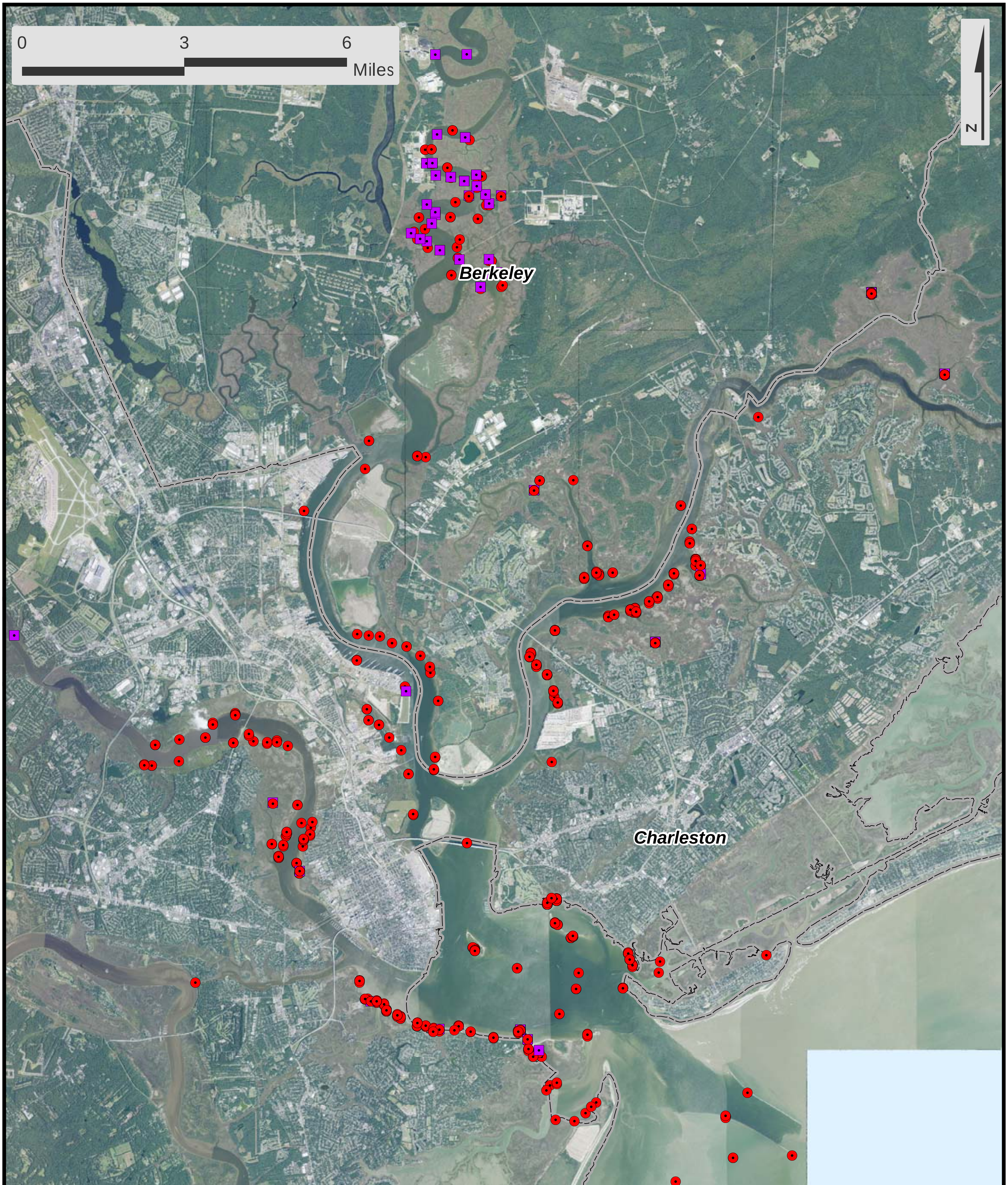
ShipyardCreek OCEAN TERMINALS

5.2 Snapper Grouper Complex

Ten families of fish containing 73 species are managed by the South Atlantic Fishery Management Council (SAFMC). These include balistids (triggerfishes), carangids (jacks), ephippids (spadefishes), haemulids (grunts), labrids (wrasses), lutjanids (snappers), serranids (groupers), sparids (porgies), and others. There is variation in specific life history patterns and habitat use among the snapper-grouper species complex. However, the vast majority of snapper-grouper species utilize both benthic and pelagic habitats during their life cycle. They live in the water column and feed on zooplankton during their planktonic larval stage, while juveniles and adults are demersal and usually associate with hard structures with high relief. EFH for these species in South Carolina includes estuarine emergent wetlands, estuarine scrub/shrub wetlands, and shellfish beds. Coastal inlets, including those waters of the Cooper River are considered Habitat Area of Particular Concern (HAPC). These areas are critical for spawning activity as well as feeding and daily movements.

Representative fish family: Lutjanidae. The EFH of snappers ranges from shallow estuarine areas (e.g., vegetated sand bottom, mangroves, jetties, pilings, bays, channels, mud bottom) to offshore areas (e.g., hard and live bottom, coral reefs, and rocky bottom) as deep as 400 m (Allen 1985; Bortone and Williams 1986). Like most snappers, these species participate in group spawning, which indicates either an offshore migration or a tendency for larger, mature individuals to take residency in deeper, offshore waters. Data suggest that adults tend to remain in one area. Both the eggs and larvae of these snappers are pelagic (Richards et al. 1994). After an unspecified period of time in the water column, the planktivorous larvae move inshore and become demersal juveniles. The diet of these newly settled juveniles consists of benthic crustaceans and fishes. Juveniles inhabit a variety of shallow, estuarine areas including vegetated sand bottom, bays, mangroves, finger coral, and seagrass beds. As adults, most are common to deeper offshore areas such as live and hardbottoms, coral reefs, and rock rubble. However, adult mutton, gray, and lane snapper also inhabit vegetated sand bottoms with gray snapper less frequently occurring in estuaries and mangroves (Bortone and Williams 1986). The diet of adult snappers includes a variety fishes, shrimps, crabs, gastropods, cephalopods, worms, and plankton. All species are of commercial and/or recreational importance. In particular, the mutton, gray, lane, and yellowtail snapper are targeted species.

Representative species profile: gray snapper. Gray snapper (*Lutjanus griseus*) is a popular gamefish, and one of many species that makes use of both inshore/estuary habitats as well as deeper, offshore habitats. In South Carolina waters, they are generally affiliated with reefs, oyster bars, rocky areas, and estuaries, particularly among seagrass beds if present as well as over soft and sand-bottom areas (Bester 2014). Spawning (broadcast, with demersal eggs) occurs April through November and peaks during summer in estuaries. When individuals reach approximately 8 cm, they move toward shallow rocky areas and coastal reefs (Bester 2014). As the fish approach 20 cm, they may have a preference for habitats with salinities between 9 and 23 ppt (Serrano et al. 2010). Figure 7 shows SCDNR inshore fisheries catch data for gray snapper. Approximately 8 to 10 miles upstream of Daniel Island in the Cooper River, there are important gray snapper nurseries. SCDNR data do not indicate captures of gray snapper in Shipyard Creek during their sampling programs (through 2007).



Data Sources: Charleston County 2013 Orthophotography (NAIP), South Carolina Department of Natural Resources (1984-2013)

Figure 9

SCDNR - Gray Snapper

Shipyard Creek

Charleston, SC

5/30/2014

5.3 Coastal Migratory Pelagics

King mackerel, Spanish mackerel, and cobia are coastal migratory pelagic species managed by the SAFMC. EFH for these species include the inlet and, in a more general sense, any high-salinity bays which may occur in the project vicinity. Many coastal pelagic prey species are estuarine-dependent in that they spend all or a portion of their lives in estuaries. Accordingly, the coastal pelagic species, by virtue of their food source, are to some degree also dependent upon estuaries and, therefore, can be expected to be detrimentally affected if the productive capabilities of estuaries are greatly degraded.

Representative species profile: king mackerel. King mackerel was selected as the representative species for further examination due to a marked decrease in landings since 1998 (see figure below). Conservation may be relatively more important for this species (than other similar species), and assessing if or how the proposed action may affect the species is therefore important. Below are several important life-history, environmental, and resulting management considerations for the species (excerpted and transcribed from SCDNR 2013b):

- <u>Habitat</u>. “King mackerel prefer warm, clear waters; all phases of development occur over continental shelf, including both nearshore and offshore habitats and live bottom…Older fish inhabit high salinity, green ocean waters, near the surface or at moderate depths. May move inshore on higher tides and during summer. Often associated with outer reefs, wrecks, towers, and buoys. Juveniles occur from mid-shelf to inshore waters and from the surface to moderate depths in water column. Individuals caught near fishing piers are typically older juveniles.

- <u>Spawning and Larvae</u>. “Spawning occurs between Gulf Stream and high turbidity zone in nearshore waters. In South Carolina, spawning occurs April – September. Larvae remain in high salinity waters throughout development. Larvae may be present across continental shelf, but are often most abundant in middle to outer shelf waters.

- <u>Distribution and Vulnerability</u>. “Distribution is governed by temperature and salinity. Annual migration from South Carolina waters to overwintering grounds in south Florida occurs during fall. Northward migration occurs during spring and early summer. Tendency to associate with hard structure such as fishing piers may increase fishing pressure. Potential for overfishing (especially in south Florida overwintering grounds); migratory nature increases management difficulty.”

SCDNR (2013a) explained recreational and commercial fishing trends for the past 35 years (see Figure 8):

- <u>Recreational Catch</u>. “The recreational catch, while variable year-to-year, has been on a declining trend since the mid 1980's. The relatively low recent 10 year average (compared to the entire time series) reflects the low total catch in the last ten years. The most recent 10 year average total catch (2002-2012) was one-third the average catch for the entire time series.

- <u>Commercial Landings</u>. “Commercial landings for king mackerel reflect a similar trend to the recreational landings with peak landings occurring in the 1980's and early 1990's. There has been a steady decline in commercial landings since 1990 with the latest 10 year average (2002-2012) landings at 23,400 lbs versus 115,873 lbs for the previous ten years (1991-2001).”

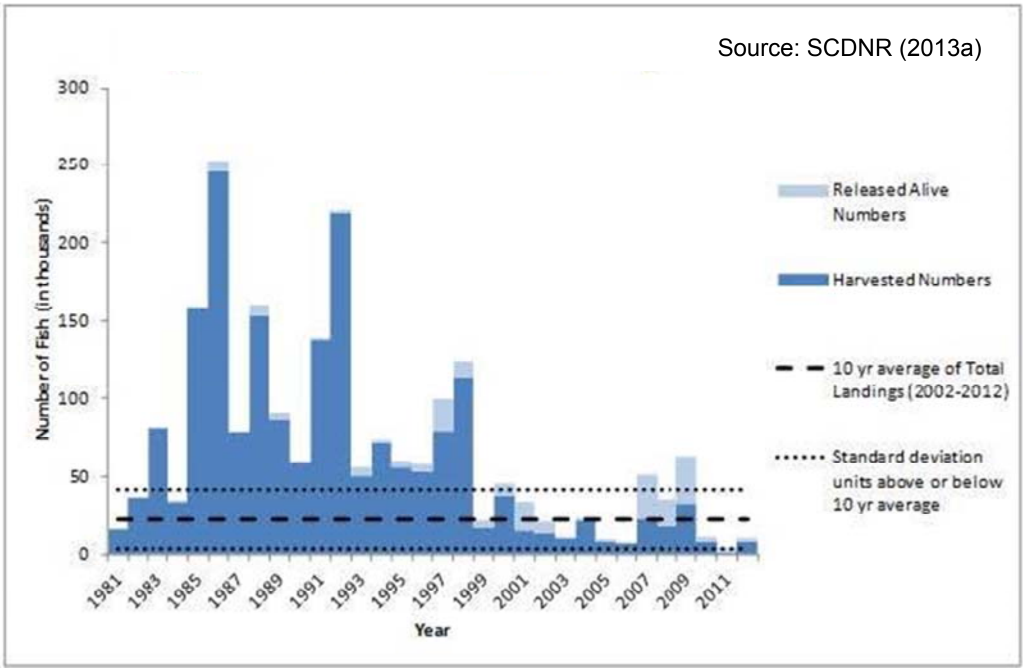


Figure 10 King mackerel recreational fishery catch in South Carolina (1981-2013)

Although SCDNR data do not indicate captures of king mackerel in Shipyard Creek during their sampling programs (through 2007), juveniles may be attracted to the piers and dolphins in the project area (both older dilapidated structure as well as those to be installed).

5.4 Bluefish

Bluefish are managed in the U.S. by the Mid-Atlantic Fishery Management Council. Bluefish are a migratory and pelagic species inhabiting most temperate coastal regions and are found along the entire east coast of the United States. Populations along the U.S. Atlantic Coast range from Maine to Florida with many wintering or spawning near the Mid-Atlantic Bight (Shepherd 2006). Bluefish can reach an age of 12 years and a size of over 100 cm standard length (SL). Adult populations head north from the Bight to winter while others migrate south to the Florida coast (NMFS 2006). By summer, bluefish move north into the Middle Atlantic Bight, although some medium size fish may remain off Florida (Shepherd 2006; Shepherd et al. 2006). A second spawning occurs in the offshore waters of the Mid-Atlantic Bight during summer. The result of these two spawning events is the appearance of two distinct size groups of juvenile bluefish during autumn; a spring spawned cohort with fish approximately 15-25 cm in length and a summer spawned cohort with fish approximately 4-14 cm in length (Able and Fahay 1998). Shepherds (2006) summarized that fish from the two spawning cohorts mix extensively during the year and constitute a single genetic stock (Graves et al. 1992). Bluefish are voracious predators and feed primarily on squid and fish (Buckel et al. 1999; Fahay et al. 1999).

EFH is identified for major estuaries between Penobscot Bay, Maine and the St. Johns River, Florida for juvenile and adult forms of bluefish (NMFS 2010a). Egg and larval forms of bluefish have designated EFH restricted to the pelagic waters over the continental shelf along Florida's coast. Inshore EFH has not been designated and; therefore, is not within the proposed project area. In general, juvenile bluefish occur in South Atlantic estuaries March through December and adults occur from May through January within the "mixing" and "seawater" zones (Shepherd 2006; Shepherd and Packer 2006). NMFS (1999) included a compendium of other authors' finding on environmental affiliations of life-history traits of the species. Minimum salinities listed for various stages were 26.2, 31, 35, and 33 ppt, for eggs, larvae, pelagic juveniles, and juveniles/older individuals, respectively. The same table indicated that individuals had been captured in DO levels as low as 4.5 mg/L (NMFS 1999).

NMFS (1999) noted that isolated, yet significant, spawning events for bluefish occurred during summer of 1976 and in April of 1979. Larvae were captured by Isaacs-Kidd midwater trawl. Juveniles were also captured in apparently high densities in South Carolina waters, but Clark (1973) believed this to be due to greater sampling effort (NMFS 1999). Juvenile bluefish may be encountered in the areas offshore of Charleston Harbor, while adult bluefish may be encountered year round in the vicinity of the proposed project area (Figure 11). Figure 8 above shows where the species has been captured in Shipyard Creek.

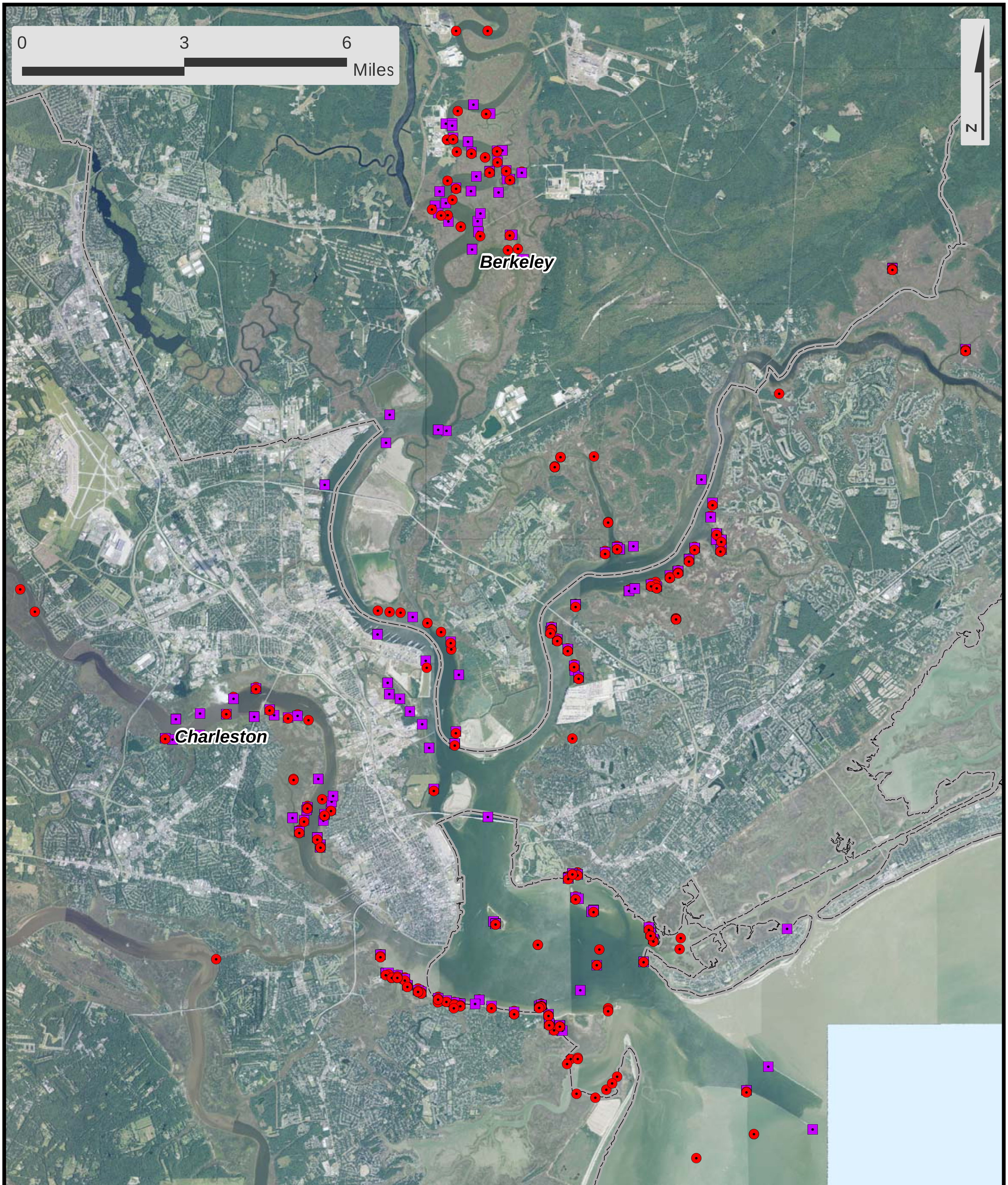
5.5 Summer Flounder

Summer flounder are managed in U.S. waters by the Mid Atlantic Fishery Management Council Species. Summer flounder generally occur in shallow coastal and estuarine waters during warmer months and occupy outer continental shelf areas in colder months. Their range has been shown to extend from Nova Scotia to Florida (Packer et al. 1999). All estuaries where summer flounder were identified as being present have been designated EFH for larvae, juveniles, and adults. HAPCs are designated within juvenile and adult EFH to include all species of macroalgae, seagrasses, and freshwater and tidal macrophytes in any size bed, as well as loose aggregations (NMFS 2010b).

Local representative species profile: summer flounder. Below are several important life-history, environmental, and resulting management considerations for the species (excerpted and transcribed from SCDNR 2013c):

- Habitat. "Adults inhabit lower to middle reaches of estuaries, coastal bays, and shallow nearshore shelf waters; typically burrow into sandy to slightly muddy bottoms; occupy a variety of estuarine habitats including tidal creeks and areas with submerged vegetation; also around inlets, jetties, beaches and nearshore reefs. Juveniles utilize bays, estuaries, tidal creeks, submerged vegetation and oyster reefs as nursery habitats. Larvae enter lower salinity waters in upper reaches of estuary whereas juveniles typically reside in moderate salinity waters.

- Spawning and larvae. "Spawning occurs "along continental shelf during seasonal migrations to offshore overwintering grounds; exact spawning locations unknown. In the South Atlantic Bight, spawning occurs November – February. Fish return to inshore habitats during spring. Young larvae develop offshore as plankton; older larvae utilize tidal currents and vertical migrations in water column to enter estuaries during winter and spring. Post-larvae complete metamorphosis to bottom-dwelling fish after settlement in the estuary.



Data Sources: Charleston County 2013 Orthophotography (NAIP),
South Carolina Department of Natural Resources (1984-2013)

Figure 11

SCDNR - Bluefish

Shipyard Creek

Charleston, SC

5/30/2014

SCDNR Inshore Fisheries

Positive for Bluefish

NO

YES

- Distribution and Vulnerability. “Less abundant in South Carolina waters than *P. lethostigma* (southern flounder)... In South Carolina, may overwinter in estuaries or deeper nearshore waters…Tolerate a wide salinity range; however, typical habitat is higher salinity than that of the southern flounder and growth is apparently optimal at intermediate (≥ 10 ppt) salinities. Adults generally prefer salinities ≥ 28 ppt. Conservation concerns: lack of knowledge regarding summer flounder biology and movements in South Carolina waters; degradation or loss of estuarine nursery habitat.”

SCDNR (2013d) explained recreational and commercial fishing trends for the past 35 years (see Figure 12):

- Recreational catch. “Recreational catch in South Carolina for summer flounder is highly cyclical due to South Carolina being at the southern end of their distribution range. Peak years occurred in 1984, 1991, and 2004-2006, with catch levels in most of the other years well below the most recent 10 year average (47,141 fish per year). Catches after 2006 dropped off and has stayed well below the 10 year average.

- Commercial landings. “Commercial flounder landings are not tracked by species, but combined as group to include all species of the genus *Paralichthys*. Total commercial landings for flounder in South Carolina have been steadily declining since the 1980's. The recent 10 year average (2001-2011) of 3,148 live pounds is significantly less than landings in the 1980's (52,972 live pounds) and the 1990's (12,108 live pounds). The primary gear targeting flounder in South Carolina in recent years include both trawls and gigs.

Summer flounder are a popular target for Charleston-area anglers. Figure 13 shows locations where they have been captured during SCECAP and other SCDNR inshore sampling efforts. The species appears to be distributed in the lower estuary and in the Wando Rivers. Their incidence of capture decreases farther upstream in the Ashley and Cooper rivers.

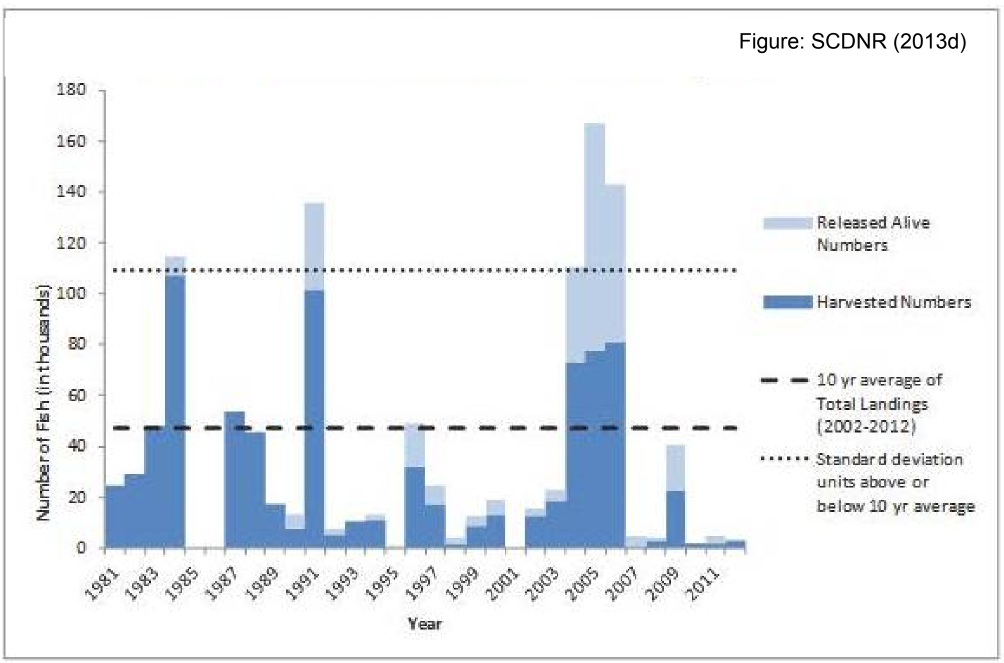
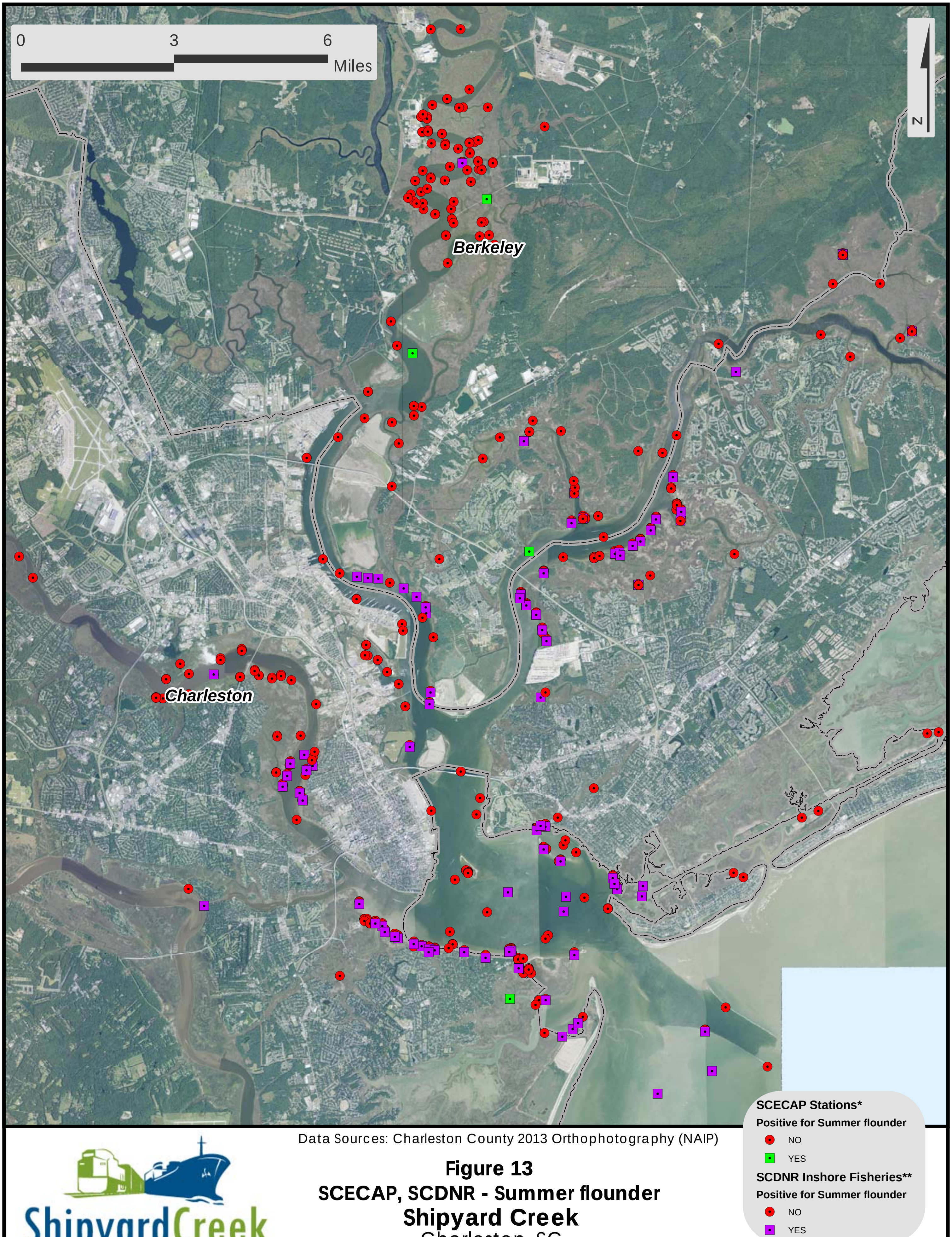


Figure 12   Southern flounder recreational fishery catch in South Carolina (1981-2013)



Data Sources: Charleston County 2013 Orthophotography (NAIP)

Figure 13
SCECAP, SCDNR - Summer flounder
Shipyard Creek
Charleston, SC
5/30/2014

* South Carolina Estuarine and Coastal Assessment Program (SCECAP, 2009)
** South Carolina Department of Natural Resources (SCDNR, 2013)

5.6 Black Sea Bass

Black sea bass (*Centropristis striata*) are members of the family Serranidae, which includes groupers (see snapper-grouper information above). Black sea bass are jointly managed under the Summer Flounder, Scup and Black Sea Bass Fishery Management Plan by the ASMFC and the MAFMC. The species is distributed from Nova Scotia to Florida and into the Gulf of Mexico, with Cape Hatteras serving as a geographic boundary between overlapping northern and southern stocks. The northern population migrates seasonally and spawns off New England, whereas the southern population migrates and spawns off the Chesapeake Bay area (ASMFC 2009b). Genetic analysis infers a single stock. However, they are managed independently as northern (Nova Scotia to Cape Hatteras, North Carolina), southern (south of Cape Hatteras to Florida), and Gulf of Mexico stocks (ASMFC 2009a).

Black sea bass, a temperate reef fish, prefer a habitat of structures such as oyster beds, wrecks, rock bottom piles, or reefs. Black sea bass spend summers inshore and as coastal water temperatures decline, they migrate and winter in offshore waters (ASMFC 2009a).

A process not yet fully understood, black sea bass (being protogynous hermaphroditic) will change their sex from female to male between the ages of two and five. Studies have determined that 38% of the northern population demonstrates sex reversal, which occurs between August and April following the spawn (ASMFC 2009b). Black sea bass spawn from February to May on the continental shelf; these ocean waters are EFH for black sea bass eggs and larvae (NOAA 2009f). Eggs are suspended in the water column until hatching a few days after fertilization. Young black sea bass will migrate into estuaries and bays, seeking shelter in various habitats such as oyster reefs, anthropogenic structures, and SAVs (ASMFC 2009b).

Estuarine habitats provide post-larvae and juveniles an environment suitable for development and growth. Rough shell/sandy bottoms, SAVs, and man-made structures are EFH for juvenile black sea bass (NOAA 2009f). With falling water temperatures, black sea bass migrate to the edge of the continental shelf and deeper offshore waters, returning to generally the same coastal region the following spring. Offshore structures, man-made or natural, are EFHs to offshore wintering black sea bass (NOAA 2009f). During summer periods, adults are normally associated with inshore structured habitats such as SAVs, oyster beds, hard bottoms, and anthropogenic structures such as piers, pilings, jetties, and wrecks (ASMFC 2009a). As opportunistic feeders, adult black sea bass will feed on a variety of crab, shrimp, fish, and clams (SAFMC 2009e, NEFSC 2009c).

Black sea bass life stages depend on the estuarine systems. Tidally influenced estuarine EFHs provide transport, refuge, and feeding/development areas for post-larval, juvenile, and adult black sea bass. All South Carolina coastal inlets and state designated primary/secondary nursery areas are considered HAPCs for many managed species (SAFMC 1998b). Species such as black sea bass, are dependent on the estuarine systems for post-larval, juvenile, and adult developmental success (SAR 2008a, SAR 2008c, and ASMFC 2009a). Black sea bass have not been captured at the SCDNR sample sites in Shipyard Creek, but they could be present in the vicinity, particularly as juveniles, which may be attracted to harbor structures.

5.7 Sharks

The Atlantic Highly Migratory Species Management Division of the National Marine Fisheries Service manages Atlantic highly migratory species (HMS) including tunas, sharks, swordfish and billfish. EFH for HMS principally comprises the marine and estuarine water column habitats that extend from the ocean to approximately two miles downstream of the confluence of Shipyard Creek with the Cooper River.

Seven species of sharks (all included in the federally implemented, i.e., not by fishery councils, HMS Fishery Management Plan) (NMFS 2006) are relatively common in the Charleston Harbor. Lemon sharks (*Negaprion brevirostris*) were captured by SCDNR sampling programs at only four sites in the harbor, including one site adjacent to Crab Bank, and sand tiger shark (*Carcharias taurus*) was captured at only one site (near the inlet). Unidentified sharks were mostly captured at the mouth of the harbor and at several sites in the Ashley River and along the shores of the harbor. No sharks were captured by SCDNR in Shipyard Creek or in the vicinity.

6.0 POTENTIAL EFFECTS TO ESSENTIAL FISH HABITAT

Scope. This assessment considers potential direct, indirect, permanent, and temporary impacts associated with construction (as well as operations due to maintenance activities), and assesses potential effects to EFH and resulting habitat uses (or loss thereof) by managed fish species. EFH impacts may occur either from disturbance or modification of habitat used by managed fish species, or from effects of activities that limit use of EFH by managed fishery species. The potential for adverse and substantial effects may be distinguished based on the following criteria guidance from NMFS (2004):

> “Adverse effect means any impact that reduces quality and/or quantity of EFH, including direct or indirect physical, chemical, or biological alterations of the waters or substrate and loss of, or injury to, benthic organisms, prey species and their habitat, and other ecosystem components, if such modifications reduce the quality and/or quantity of EFH. Adverse effects to EFH may result from actions occurring within EFH or outside of EFH and may include site-specific or habitat-wide impacts, including individual, cumulative, or synergistic consequences of actions (50 CFR 600.810(a)).
>
> “Substantial adverse effects are defined as effects that may pose a relatively serious threat to EFH and typically could not be alleviated through minor modifications to a proposed action; e.g., major harbor development with significant dredging and filling, channel realignments, or shoreline stabilization near EFH.”

The below assessment addresses EFHs specifically, and also representative species from among the various fishery management plans that use those EFHs in the project area.

Estuarine and Marine Emergent Vegetation. Approximately 0.28 acre of estuarine emergent vegetation (i.e., “emergent marsh,” or “marsh edge”) comprising cordgrass (along the northeast shore of Shipyard Creek, approximately half the distance between the upper and lower basins) is expected to be directly impacted by the proposed action, but none is anticipated to be impacted by subsequent operations and maintenance activities. Indirect impacts are not anticipated. The 0.28 impact was necessary and unavoidable due to the side-slope impact associated with channel widening/deepening. If any additional impacts due to dredge pipelines are discerned through the planning/engineering process, they will be identified to USACE/NMFS, minimized to the maximum extent practicable, and appropriate mitigation actions will be proposed and executed.

Tidal Creeks. Tidal creek habitats will not be directly or indirectly affected by the proposed action. Neither construction nor maintenance dredging due to the proposed action will occur in tidal creeks.

Estuarine Water Column. Temporary impacts to the estuarine water column are anticipated during construction and subsequent maintenance dredging for the proposed action. Turbidity levels near the dredge will be elevated. However, these effects will be monitored in order to ensure compliance with state water quality certification conditions.

Intertidal and Subtidal Mudflats (Unconsolidated Bottom). Approximately 0.10 acre of intertidal mudflats bordered by scrub/shrub wetlands (along the shoreline west and southwest of the upper basin) will be filled in order to construct the proposed project. These impacts are necessary in order to construct the wharf structures (two 0.04-acre areas) and the retaining wall (a 0.02-acre area), and could not be avoided. Future maintenance activities are not anticipated to impact any additional intertidal mudflats or along-shore shrub wetlands.

Direct removal of subtidal, unconsolidated benthic habitats (creek and channel bottom) will also occur due to channel and basin deepening and expansion. Approximately half of the marine habitat to be affected by the proposed project (21.1 acres) will be previously dredged unconsolidated, softbottom, benthic habitats. These areas will be re-dredged to previously authorized depths (i.e., -39 feet for the channel reach) or re-dredged to slightly shallower than previously dredged depths (i.e., -39 feet in the upper/north turning basin that was previously -41 feet). Not-previously-dredged areas that will be dredged comprise 20.8 acres (7.7 acres of channel bottom and 13.1 acres for side-slope construction or bank repose) of softbottom habitat that include shallow (0 to -10 feet), medium-depth (10 to 20 feet), and deep (20+ feet) creek bed.

Habitat Areas of Particular Concern. HAPC for snapper-grouper and shrimp species are shown above in Figure 4. The project area comprises HAPC for shrimp and snapper-grouper, and also function as HAPC for summer flounder (though not officially categorized as HAPC in the on-line FMC GIS database). These habitats will be affected by both filling (intertidal flats and shrub wetlands) and dredging (cordgrass wetlands and unvegetated bottoms).

7.0 POTENTIAL EFFECTS ON MANAGED SPECIES

7.1 Penaeoid Shrimps

The life history of white shrimp is typical of other penaeoid shrimp (these shrimps belong to eight phylogenetically distinct, yet ecologically similar, families). Effects to the species in and adjacent to Shipyard Creek due to the proposed project may be similar to those of other species; white shrimp are treated here as representative shrimp species in the project area. Direct impacts to white shrimp may include death due to dredging operations (temporary in duration, but to be repeated during maintenance operations). Indirect impacts to pelagic juvenile shrimp during dredging could include temporary changes in migratory behavior due to turbidity, and decreased planktonic forage due to reduction in water transparency within and adjacent to dredging and construction areas. Other indirect effects on shrimp may result from the loss of a very small amount of emergent marsh and intertidal habitat.

7.2 Snapper Grouper Complex Species

The life history of gray snapper is typical of other species in the snapper-grouper complex. Effects to the species in and adjacent to Shipyard Creek due to the proposed project may be similar to those of other species of the complex; gray snapper are treated here as representative species in the project area. Direct effects of dredging and maintenance activities include death or injury to gray snapper utilizing estuarine marsh and inshore structure. It is likely that effects will principally involve less motile life-history stages such as larvae and juveniles within the estuary. Indirect impacts to gray snapper during dredging could include reduced foraging efficiencies due to decreased water transparency within and adjacent to dredging and construction areas. Other indirect effects on snapper may result from the loss of a very small amount of emergent marsh and intertidal habitat.

7.3 Coastal Migratory Pelagic Complex Species

Effects to king mackerel in the project area may resemble those of other coastal migratory pelagic complex species. Direct effects of dredging and maintenance activities include death or injury to juvenile mackerel in the estuarine habitats of the project area. It is less likely that larger individuals would be impacted, as they can flee construction areas/disturbed waters, and adults are not likely to be present in the project area. Any decrease in foraging efficiency due to elevated turbidity at or near the construction/dredging areas would be temporary. Other indirect effects on mackerel may result from the loss of a very small amount of emergent marsh habitat.

7.4 Bluefish

Direct effects of dredging and maintenance activities include death or injury to juvenile bluefish in the project area. Mortality due to contact with dredge equipment is more likely for smaller individuals than for larger individuals, which can efficiently move away from disturbances, and are generally less likely to be in the project area (they prefer offshore waters). Dredging effects, including any decreases in foraging efficiency, will be temporary. Other temporary construction and maintenance dredging effects include interference with feeding due to sediment re-suspension; bluefish are visual feeders. Effects would be relatively minor as adult bluefish could seek forage where turbidity would not limit their movement. Other indirect effects on bluefish may result from the loss of a very small amount of emergent marsh habitat.

7.5 Summer Flounder

Direct effects of dredging and maintenance activities include death or injury to summer flounder in the estuary. Of the finfish species considered in this assessment, it may be least motile swimmer, and therefore, the most likely to suffer mortality from dredge equipment during construction and maintenance activities. This includes all life-history phases. Dredging and future maintenance dredging episodes will be temporary in duration. Other indirect effects on flounder may result from the loss of a very small amount of emergent marsh and intertidal habitat, but a loss of shallow- to medium-depth, subtidal, unconsolidated, benthic habitat that will be permanently deepened.

7.6 Black Sea Bass

Direct effects of dredging and maintenance activities include death or injury to black sea bass utilizing estuarine marsh and inshore structure. It is likely that effects will principally involve less motile life-history stages such as larvae and juveniles within the estuary. Indirect impacts to black sea bass during dredging could include reduced foraging efficiencies due to decreased water transparency within and adjacent to dredging and construction areas. Other indirect effects on black sea bass may result from the loss of a very small amount of emergent marsh and intertidal habitat.

7.7 Highly Migratory Species

Highly migratory species potentially using the project area include sharks. However their use of the area is less likely than areas closer to the inlet areas. Juveniles would be the most likely visitors. It is not likely that many individuals of these species will be taken by dredge equipment due to their high motility. Indirect effects due to temporary dredging operations are not likely to occur.

8.0 NON-MANAGED, ASSOCIATED FISHES AND INVERTEBRATES

Associated species consists of living resources that occur in conjunction with the managed species discussed above. These living resources would include the primary prey species and other fauna that occupy similar habitats.

Dredging would result in direct adverse effects on invertebrate species in the proposed project area. Initially, this will result in a significant but localized reduction in the abundance, diversity, and biomass of the immediate fauna. Species affected most are those that have limited capabilities or are incapable in avoiding the dredging activities. The fauna most affected would predominantly include invertebrates such as crustaceans, echinoderms, mollusks, polychaetes, and annelids. However, due to the relatively small area that will be impacted as viewed on a spatial scale, impacts to the benthic community will be minimal due to the relatively short period of recovery regarding infaunal communities following dredging activities (Culter and Mahadevan 1982; Saloman et al. 1982). Adjacent areas not impacted would most likely be the primary source of recruitment to the impacted area.

Zooplankton are primarily filter feeders and suspended inorganic particles can foul the fine structures associated with feeding appendages. Zooplankton that feed by ciliary action (e.g., echinoderm larvae) would also be susceptible to mechanical effects of suspended particles (Sullivan and Hancock 1977). Zooplankton mortality is assumed from the physical trauma associated with dredging activities (Reine and Clark 1998). The overall impact on the zooplankton community should be minimal due to the limited extent and transient nature of the sediment plume.

Associated fish species outside of those addressed in the scope of this EFH assessment may also be impacted. Larval feeding efficiency depends on many factors such as light intensity, temperature, prey evasiveness, food density, larva experience, and olfaction to mention a few (Gerking 1994). Larval fishes are visual feeders that depend on adequate light levels in the water column which reduces the reaction distance between larval fish and prey. Suspended sediment and dispersion due to dredging activities will temporarily increase turbidity levels in the proposed project area. This will reduce light levels within the water column which may have a short term negative effect regarding feeding efficiency. In addition, turbidity can affect light scattering which will impede fish predation (Benfield and Minello 1996). However, because the sediment plumes are transient and temporary, and the area to be impacted is relatively small when examined on a spatial scale, the overall impact to the larval fish population and consequently, the adult population should be minimal (Sale 1991). The majority of larval fish mortality will be attributed to the physical trauma associated with the dredging activities.

Similar to larval fishes, both juvenile and adult fishes are primarily visual feeders. Consequently, the visual effects of turbidity as described above will apply. Also, suspended sediment can impair feeding ability by clogging the interraker space of the gill rakers or the mucous layer of filter feeding species (Gerking 1994). However, because these fishes have the ability to migrate away from the dredging activities, the impact of the sediment plumes should be minimal. Few adult fishes have been entrained by dredging operations (McGraw and Armstrong 1988; Reine and Clark 1998); most juvenile and adult fishes have the ability to migrate away from the dredging activities. Consequently, dredging operations would have minimal effects on juvenile and adult fishes in the area. In addition, the reduction of benthic epifaunal and infaunal prey, and pelagic prey in the immediate area would have little effect on juvenile and adult fishes because they can migrate to adjacent areas that have not been impacted to feed.

9.0 CONCLUSIONS

The following list summarizes potential effects of the proposed action on EFH and managed species as detailed in the sections above:

1. Direct mortality or injury of individual fishes (adults, subadults, juveniles, larvae, and/or eggs, depending on species, time of year, location, etc.) due to dredge equipment during construction and maintenance dredging (an effect temporary in duration).

2. Indirectly affecting foraging behavior of individuals through production of turbidity at construction/maintenance dredging sites (an effect temporary in duration)

3. Indirectly affecting movements of individuals around/away from dredging sites due to construction equipment and related disturbed benthic habitats (an effect temporary in duration).

4. Indirectly affecting foraging by removal of habitat (i.e., wetland, subtidal softbottom; the former, a permanent effect, the latter a temporary effect due to recruitment of infauna in several months); wetland mitigation areas will compensate for functional losses for that habitat type.

Individually or in sum, the above are not anticipated to significantly adversely affect managed species or EFHs. Where possible, the above effects have been minimized via project design, and effects will be further mitigated by implementation of best management plans during construction and maintenance dredging. Where necessary impacts remain, the Applicant will provide compensatory mitigation for lost habitat function where practicable and necessary.

The Applicant concurs with the statement in the USACE public notice (12 April 2013) that, "…the proposed action would not have a substantial individual or cumulative adverse impact on EFH or fisheries managed by the South Atlantic Fishery Management Council and the National Marine Fisheries Service (NMFS)." However, the Applicant recognizes that further coordination with NMFS staff may be necessary to fully communicate the nature and location of impacts and necessary mitigation.

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APPENDIX D:

SPHO Letter, January 13, 1014

South Carolina Archives & History Center
History & Heritage For All Generations

January 13, 201

Jack T. Walker
GEL Engineering, LLC
2040 Savage Road
Charleston, SC 29407

Re: Shipyard Creek Dredging, Remote Sensing Survey Draft Report
Charleston County, South Carolina
SHPO Project Number: 12-JB0122

Dear Jack Walker:

Thank you for submitting the report entitled *Magnetic Remote-Sensing Survey of Shipyard Creek, North Charleston, Charleston County, South Carolina,* which we received on December 23, 2013. The State Historic Preservation Office is providing comments to the U.S. Army Corps of Engineers 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.

Based on the description of the Area of Potential Effect (APE) and the identification of historic properties within the APE, our office, in consultation with James Spirek, the State Underwater Archaeologist, concurs with the assessment that no properties listed in or eligible for listing in the National Register of Historic Places will be affected by this project. We do suggest, however, that in order for the report to follow a more logical order, the historic context/background section be moved so that it comes before the survey description.

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 immediately.

S. C. Department of Archives & History • 8301 Parklane Road • Columbia • South Carolina • 29223-4905 • (803) 896-6100 • www.state.sc.us/scdah

To complete the consultation process: We require one (1) bound and one (1) unbound hard copy on acid-free paper and two (2) digital copies in PDF format. Investigators should send all copies directly to SHPO. SHPO will distribute the appropriate copies to SCIAA. Please include a copy of our concurrence letter in the final report copies.

If you have any questions, please contact me at (803) 896-6181 or edale@scdah.state.sc.us.

Sincerely,

Emily Dale
Staff Archaeologist/GIS Coordinator
State Historic Preservation Office

cc: Keith Derting, SCIAA
Jim Spirek, SCIAA