3.3 WATER QUALITY

3.3.1 Introduction

This section characterizes the water quality for existing surface and groundwater resources within the study area, including the surface waters of Noisette Creek and Shipyard Creek, the Cooper River between Filbin Creek and US 17, and the underlying groundwater resources (Figure 3.3-1). This study area allows for the evaluation of tidal surface waters of both Noisette Creek and Shipyard Creek, and accommodates the evaluation of any potential contamination from on-site activities that could be transported upstream during incoming tide or downstream to the Cooper River. Inclusion of water quality data for Filbin Creek allows for an estimate of existing conditions in the region, in the absence of sampling stations on Noisette Creek. Filbin Creek is located in the same watershed as the Proposed Project site, is approximately 2 miles from Noisette Creek, and has a similar ratio of developed to undeveloped land as the Noisette Creek watershed. The southern boundary of the study area also allows for an assessment of potential contamination from the nearby Superfund Site on the Macalloy Site, which could be transported down Shipyard Creek to the Cooper River.

3.3.2 Surface Water Quality

Stormwater runoff in the study area is primarily transported via overland flow and underground storm sewers to Noisette Creek or Shipyard Creek, and then to the Cooper River. Runoff in the undeveloped portions of the study area moves by sheet flow to various swales, waterways, culverts, and outfalls. There are no stormwater treatment ponds within the study area, except for two stormwater ponds at the corner of McMillan and Spruill Avenue and those associated with new development (e.g., Hunley Waters Subdivision). A high percentage (25 percent) of the study area is classified as "industrial," followed by residential land uses (19 percent) (see Section 3.9 – Land Use). Runoff from these land uses typically has higher pollutant loads for constituents such as oil, grease, metals, fecal coliforms, and nutrients.

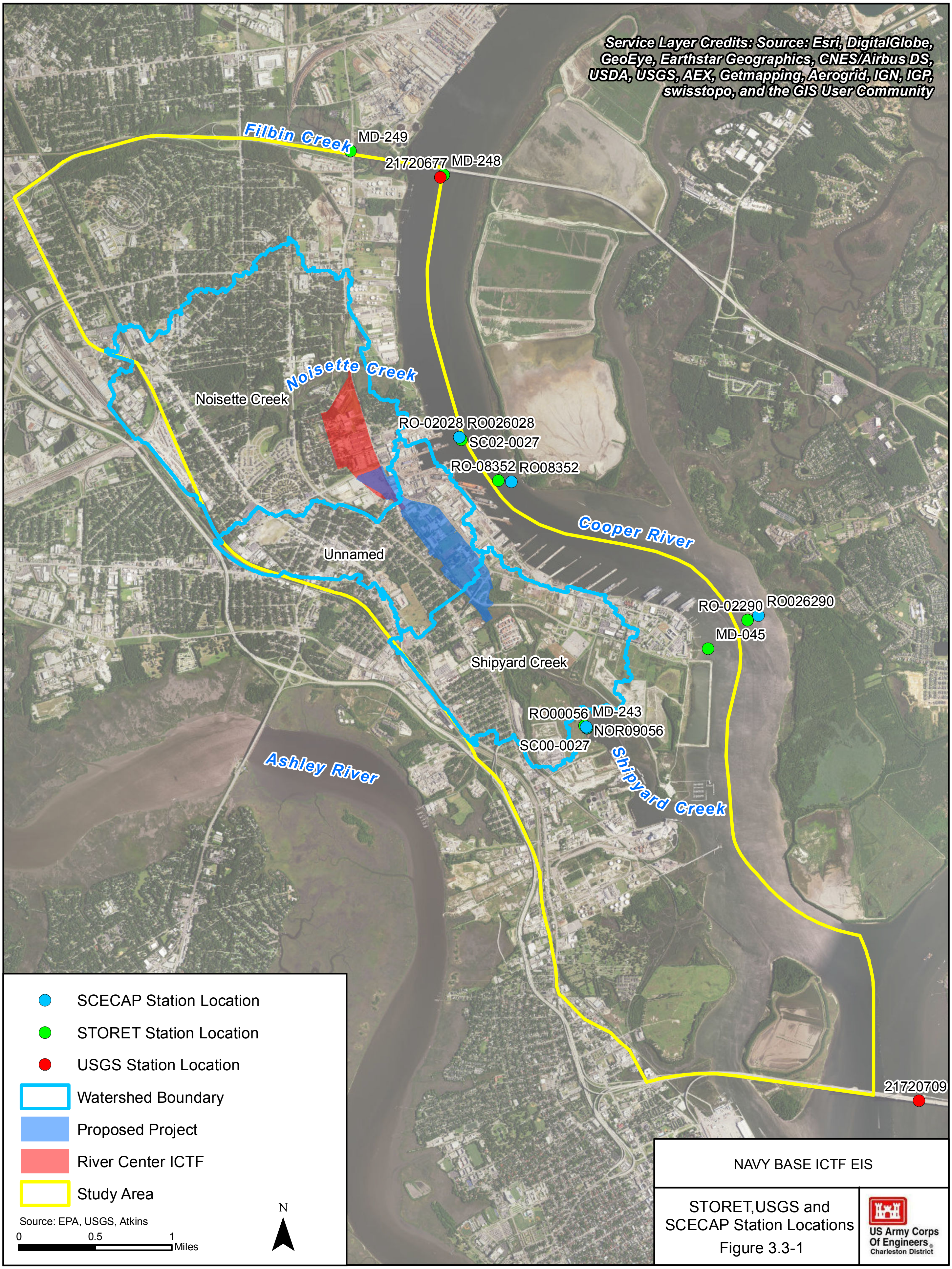
3.3.2.1 Surface Water Quality Monitoring Stations

Surface water quality data collected from the Cooper River Sub-Basin (12-digit HUC 030502010707) were used to assess current water quality characteristics within the study area. These data were obtained from the EPA Storage and Retrieval (STORET) Data Warehouse (EPA 2014a) and the USGS (2013) (Figure 3.3-1). Within the STORET database, two stations were sampled by the EPA National Aquatic Resources Survey and the Environmental Monitoring and Assessment Program and eight stations were sampled by the South Carolina Department of Health and Environmental Control (SCDHEC); however, data from one station (RO-11308) were discarded as per STORET instructions and replaced with data from Station MD-045 (Table 3.3-1). All data analyzed from the STORET database were collected between 1999 and 2013; data analyzed from the one USGS station were collected between 2007 and 2013.

Table 3.3-1
Existing STORET and USGS Water Quality Stations Within the Study Area

Station	Location	Organization Name
Shipyard Creek		
SC00-0027	Shipyard Creek	EPA National Aquatic Resources Survey and the Environmental Monitoring and Assessment Program
MD-243	Shipyard Creek between Marker #6 and Macalloy Dock	SCDHEC
Filbin Creek		
MD-249	Filbin Creek at Virginia Avenue	SCDHEC
Cooper River		
SC02-0027	Cooper River, 2,300 feet downstream of Noisette Creek mouth	EPA National Aquatic Resources Survey and the Environmental Monitoring and Assessment Program
MD-045	Cooper River above mouth of Shipyard Creek at Channel Buoy 49	SCDHEC
MD-248	Cooper River at Mark Clark Bridge (I-526)	SCDHEC
RO-02028	Cooper River within Navy Yard Reach	SCDHEC
RO-02290	Cooper River (1.4 miles northeast of Shipyard Creek mouth)	SCDHEC
RO-08352	Cooper River (1 mile downstream from Noisette Creek in the Navy Yard Reach)	SCDHEC
RO-11308	Cooper River above mouth of Shipyard Creek at Channel Buoy 49 (Use MD-045)	SCDHEC
021720677	Cooper River at Filbin Creek	USGS

Source: EPA 2014A, USGS 2013.


Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community
Filbin Creek
MD-249
21720677
MD-248
Noisette Creek
Noisette Creek
RO-02028
RO026028
SC02-0027
RO-08352
RO08352
Cooper River
Unnamed
RO-02290
RO026290
MD-045
Shipyard Creek
RO00056
MD-243
NOR09056
SC00-0027
Ashley River
Shipyard Creek
21720709
SCECAP Station Location
STORET Station Location
USGS Station Location
Watershed Boundary
Proposed Project
River Center ICTF
Study Area
Source: EPA, USGS, Atkins
0
0.5
1
Miles
N
NAVY BASE ICTF EIS
STORET,USGS and SCECAP Station Locations
Figure 3.3-1
US Army Corps Of Engineers
Charleston District

In addition, water quality data collected between 1999 and 2010 by the South Carolina Department of Natural Resources (SCDNR) and SCDHEC through a collaborative coastal monitoring program entitled the "South Carolina Estuarine and Coastal Assessment Program" (SCECAP) also were summarized. Although this sampling effort included different sampling locations selected each year throughout the state's coastal waters, only data collected from the five stations within the study area are discussed (Table 3.3-2, and Figure 3.3-1). All stations were sampled once during the summer months (mid-June through August). Results for dissolved oxygen (DO), total nitrogen (TN), phosphorus (P), and fecal coliform concentrations are included below. Additional findings from the series of technical reports generated through this program and the data obtained from those surveys can be obtained from the SCECAP website (SCECAP 2014).

Table 3.3-2
SCECAP Water Quality Stations

Survey Year	Station	Station Depth (m)	Location
1999–2000	RO00056	6.4	Cooper River in the turning basin of Shipyard Creek
2001–2002	RO026290	8.2	Cooper River across from NOAA Pier Romeo
2001–2002	RO026028	13.4	Cooper River near old Navy Base
2007–2008	RO08352	9.8	Cooper River at the southwest tip of the Clouter Creek disposal area
2009–2010	NOR09056	5.8	Cooper River in the turning basin of Shipyard Creek

Source: SCECAP 2014.

3.3.2.2 Waterbody Classifications

The portion of the Cooper River extending approximately 30 miles upstream from the junction of the Ashley and Cooper rivers is classified as "SB" (saltwaters) (SCDHEC 2012a). Noisette Creek, Shipyard Creek, and Filbin Creek have not been classified directly by the State of South Carolina; as such, their classification (also "SB") is based on the downstream waters of which they are a tributary (the Cooper River) (SCDHEC 2012a, SCDNR 2009) (see Section 4.3 – Water Quality).

Pursuant to Section 303(d) of the CWA and Federal Regulation 40 C.F.R. 130.7, SCDHEC developed a priority list of waterbodies that do not meet state water quality standards after the required controls for point and nonpoint source pollutants have been applied. Table 3.3-3 provides the most recent (2012) Section 303(d) list of impaired waters in the Cooper River watershed and the study area being evaluated in this EIS (SCDHEC 2012b). Water-bodies are reassessed every 2 years for compliance with state water quality standards. The 2012 list of impaired waters includes the Cooper River

(1 mile downstream from Noisette Creek in the Navy Yard Reach) and Filbin Creek. Both sites are listed for impairments to recreational uses as a result of elevated fecal coliform concentrations. The locations of both sites are shown in Figure 3.3-1.

Table 3.3-3
303(d) List of Impaired Waters in the Cooper River Watershed (12 digit HUC 30502010707) in 2012

12 Digit HUC	Location	Station	Use	Cause
030502010707	Cooper River (1 mile downstream from Noisette Creek in the Navy Yard Reach)	RO-08352	Recreational	Fecal Coliform
030502010707	Filbin Creek at Virginia Avenue, North Charleston	MD-249	Recreational	Fecal Coliform

Source: SCDHEC 2012b.

3.3.2.3 Surface Water Quality Standards

Total Maximum Daily Loads

Section 303 of the CWA and EPA's Water Quality Planning and Management Regulations (40 C.F.R. Part 13) requires that states develop Total Maximum Daily Loads (TMDLs) for water bodies included on the Section 303(d) list of impaired waters as a means of reducing water pollution. All TMDLs include reductions from existing pollution loads needed to meet water quality standards as well as a margin of safety (MOS).

A TMDL for DO was established for the Charleston Harbor, Cooper River, Ashley River, and Wando River in 2013 (SCDHEC 2013a). This TMDL revises and combines the existing 2002 Cooper River-Wando River-Charleston Harbor TMDL (SCDHEC 2002) and the 2003 Ashley River TMDL (SCDHEC 2003). Among other reasons for the revision is a revised DO standard as amended in the South Carolina Pollution Control Act of 2010 (adoption in South Carolina Regulation 61-68 pending) (SCDHEC 2013a). Ambient monitoring stations designated in the TMDL as not supporting aquatic life use due to low DO are located outside of the study area.

The wasteload allocation (WLA) defined in the TMDL is for continuous non-storm water dischargers. Modeling efforts indicate that regulated and unregulated stormwater and non-point sources do not contribute to the allowable DO depression on the mainstem segments; however, if additional loading of oxygen demand from Municipal Separate Storm Sewer Systems (MS4s) or other regulated stormwater sources to the TMDL segments is indicated, the TMDL may be revised (SCDHEC 2013a).

A phased approach to achieving the reduction in discharge of oxygen-demanding substances to the system was allowed in the previous TMDLs. The Cooper River TMDL required a reduction from pre-TMDL permitted ultimate oxygen demand (UOD) of 58 percent in Phase I and a final reduction of

69 percent in Phase 2. The revised TMDL is equivalent to an additional 2 percent reduction below the Phase I level for the Cooper River (SCDHEC 2013a).

Fish Consumption Advisories

Fish consumption advisories are issued in areas where fish contaminated with mercury have been identified. This contamination does not make the water unsafe for swimming or boating. Fish consumption advisories were issued throughout the Cooper River watershed in 2014, including the East Fork of the Cooper River, the West Fork of the Cooper River, and the "T" to Bushy Park; there are no restrictions downstream of Bushy Park where the study area is located (SCDHEC 2014a).

3.3.2.4 Summary of Surface Water Quality Variables

The surface water quality for the variables of concern in the Cooper River watershed is described below. The variables of concern include DO, salinity, total suspended solids (TSS), turbidity, nutrients, bacteria, and heavy metals. Sample depths ranged from 0.2 to 0.3 meter at all sites except Station 021720677, which is the one USGS station included in the dataset. USGS samples at this one station were collected from depths of 1.41 to 4.73 meters. Data for other contaminants of concern in surface waters—including volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), chlorinated pesticides/polychlorinated biphenyls (PCBs), polycyclic aromatic hydrocarbons (PAHs), and dioxins—were not available for the study area.

3.3.2.4.1 Dissolved Oxygen

The amount of oxygen dissolved in water is crucial for the survival of aquatic organisms and is an important indicator of any water body's health. Many of the waters in and around Charleston Harbor have DO levels below the established criteria due to both natural conditions (e.g., organic loading and reduced oxygen levels from wetlands and marshes) and anthropogenic activities (e.g., wastewater dischargers). State standards indicate that DO should not fall below 4.0 milligrams per liter (mg/L) (SCDHEC 2012c). Waters in South Carolina that do not meet this numeric criterion due to natural conditions are covered by antidegradation requirements in South Carolina R.61-68, Section D.4 (SCDHEC 2012c), allowing for an additional lowering of DO by no more than 0.1 mg/L due to point sources and other activities.

The STORET dataset contained 361 DO readings from seven stations collected by the SCDNR (see Figure 3.3-1 for station locations). In addition, the USGS collected 124,206 samples at one station, for a total of 124,567 DO samples within the study area. DO values ranged between 2.4 and 11.31 mg/L at all STORET stations and ranged from 2.5 to 11.5 mg/L at Station 021720677 (see Table 3.3-4) (EPA 2014a, USGS 2013). The mean DO level was 6.1 mg/L at all STORET stations and 6.8 mg/L at Station 021720677.

All samples collected in the study area were instantaneous. Seven of the 367 DO samples included in the STORET database fell below 4.0 mg/L and were confined to Stations MD-248 and MD-249 (EPA 2014a). Levels dropped below 4.0 mg/L to 3.84 mg/L only once at Station MD-248 (August 2011). Aquatic life was partially supported at Station MD-249 due to low DO levels (SCDNR 2009, SCDHEC 2005a); however, DO values have remained above 4.0 mg/L since 2007 (EPA 2014a). These results indicate insufficient DO levels in 2 percent of the total samples analyzed between 0.2 and 0.3 meter throughout the study area. One percent of the DO samples collected at Station 021720677 (or 1,389 samples) also demonstrated insufficient DO levels between 1.41 and 4.73 meters water depth.

All samples collected through the SCECAP were categorized as "good," meaning they were within state water quality standards (SCECAP 2014).

3.3.2.4.2 Salinity

Large variations in salinity over short time periods can result in stressful conditions for invertebrate and fish species. The STORET dataset includes 369 salinity readings at seven stations (see Figure 3.3-1 for station locations); salinity was not measured at Station 021720677. Salinity values ranged from 0 to 28 parts per thousand (ppt), with an average of 15.4 ppt (see Table 3.3-4) (EPA 2014a). All samples were collected from between 0.2 and 0.3 meter, so the potential for a vertical salinity gradient could not be identified.

Surface salinity values at stations collected through SCECAP ranged from 13.5 to 19.1 ppt; bottom salinities at the same stations ranged from 15.7 to 26.4 ppt (SCECAP 2014). The largest variation between surface and bottom salinities at any station was 8.8 ppt at Station RO026290 in 2002.

3.3.2.4.3 Total Suspended Solids and Turbidity

TSS refers to the weight of organic and inorganic material suspended in the water column. TSS differs from turbidity, which is an optical property that measures the light transmittance through the water column. Sources of particulates within the study area primarily include stormwater runoff from urban land uses and transportation features (i.e., roads, parking lots). Increased impervious features also may cause higher flows, which in turn may result in increased river bank erosion and elevated TSS and turbidity. Long-term elevation in TSS and turbidity can adversely impact the health of a water ecosystem (EPA 2006a).

The STORET dataset includes 31 TSS samples collected from four sites; 28 of the samples were collected from Station MD-243; TSS was not sampled at Station 021720677. TSS values ranged between 1.6 and 27 mg/L with an average value of 11.1 mg/L (see Table 3.3-4) (EPA 2014a). There are no explicit state standards for TSS (SCDHEC 2012c). SCDHEC monitoring data from Station MD-243 in Shipyard Creek shows a slight increasing trend in TSS.

Data from 385 turbidity samples, collected from seven stations, were included in the STORET dataset; approximately 74 percent of samples were collected from Stations MD-045 and MD-248. Turbidity values ranged between 1.4 and 76 nephelometric turbidity units (NTUs) with an average value of 5.5 NTUs (see Table 3.3-4) (EPA 2014a). State standards for turbidity establish a limit of 25 NTUs, provided existing uses are maintained (SCDHEC 2012c). Turbidity levels exceeded 25 NTUs twice at Station MD-045 (in 1999 and 2000) and five times at Station MD-249 (once after 2002). Turbidity was not sampled at Station 021720677.

3.3.2.4.4 Nutrients

Increases in nutrient concentrations (including nitrogen and phosphorus constituents) can lead to algal blooms, reduced water clarity, low DO levels, and potential fish kills (Bricker et al. 2007). Primary sources of nutrient pollution in the study area include point source dischargers, such as the Felix C. Davis wastewater treatment plant (WWTP); and various sources of stormwater runoff containing pollutants such as fertilizers. Although SCDHEC has not established specific water quality standards for nitrogen or phosphorus, loading of nutrients will be addressed on an individual basis as necessary to ensure compliance with the narrative and numeric criteria (SCDHEC 2012c).

Evaluation of existing nutrient conditions within the study area focus on total nitrogen (TN) and total phosphorus (TP) data. The STORET dataset includes 206 samples from eight stations (see Figure 3.3-1 for station locations) within the study area for TN; approximately 82 percent of the samples were collected from Stations MD-045 and MD-248. TN concentrations ranged from 0.14 mg/L to 2.76 mg/L and averaged 0.44 mg/L (see Table 3.3-4) (EPA 2014a). For TP, the STORET dataset includes 274 samples from nine stations within the study area; approximately 80 percent of these were collected from Stations MD-045 and MD-248. TP concentrations ranged from 0.02 mg/L to 0.46 mg/L, with an average value of 0.04 mg/L (see Table 3.3-4) (EPA 2014a). Nutrients were not monitored at Station 021720677.

STORET monitoring data show a decreasing (i.e., improving) trend in TN concentration at Station MD-045 ($R^2 = 0.20$; $p < 0.0001$) and increasing TP concentrations over time ($R^2 = 0.06$; $p < 0.05$) (EPA 2014a). Both TN and TP concentrations demonstrated relatively little change over time at Station MD-248 ($R^2 = 0.005$; $p = 0.521$ and $R^2 = 0.0003$; $p > 0.05$, respectively) (EPA 2014a).

All TN and TP samples collected through the SCECAP were categorized as “good,” meaning they represent normal values relative to SCDHEC historical data (SCECAP 2014).

3.3.2.4.5 Bacteria

Microbiological indicators of fecal contamination (e.g., fecal coliforms, enterococci, *Escherichia coli*) found in the gastrointestinal tracts of humans and other warm-blooded animals are used to indicate the presence of pathogens in surface waters. Micro-organisms from fecal sources that enter surface waters used by humans can pose a human health risk.

Water quality standards developed by SCDHEC are based on the ability to safely use surface waters (e.g., for drinking water, shellfish harvesting, or recreation) for their designated use. Epidemiological studies conducted by the EPA have demonstrated that enterococci are the most appropriate indicators predicting the presence of pathogens that cause illness in marine waters (EPA 2002). SCDHEC uses enterococci for regulating water quality for recreational use. State standards for enterococci dictate that the geometric mean of at least four samples collected over a 30-day period at one site should not exceed 35 most probable number (MPN)/100 mL, with a maximum single sample limit of 501 MPN/100 mL (SCDHEC 2012c). A fecal coliform criterion not to exceed a geometric mean of 14 MPN/100 mL, with a maximum single sample limit of 43 MPN/100 mL is used for shellfish harvesting waters (SFH) with uses listed in Class SB (SCDHEC 2012c).

The STORET dataset includes 26 enterococci samples from three sites (see Figure 3.3-1 for site locations) within the study area, ranging from 10 colony forming units/milliliter (CFU/mL) to 156 CFU/mL, with an average value of 55 CFU/mL (see Table 3.3-4) (EPA 2014a). Enterococci were not monitored at Station 021720677.

Seven stations (see Figure 3.3-1 for station locations) also were sampled for fecal coliform. At these stations, samples collected ranged from 2 CFU/100 mL to 1,600 CFU/mL, with an average value of 138 CFU/100 mL (see Table 3.3-4) (EPA 2014a). Fecal coliforms were not monitored at Station 021720677.

Fecal coliform samples collected through the SCECAP from Stations RO00056, RO08352, and NOR09056 were categorized as "good," meaning samples had ≤43 colonies/100 mL; fecal coliform samples collected from Stations RO026290 and RO026028 had marginal results (44–400 colonies/100 mL), potentially not supporting shellfish harvesting (SCECAP 2014).

3.3.2.4.6 Heavy Metals

SCDHEC measured concentrations of cadmium, chromium, copper, and zinc at stations within the study area to compare to state standards intended to protect aquatic life and human health (Table 3.3-4; SCDHEC 2012c); lead, mercury, and nickel were not measured. These metals are naturally occurring in the environment and many are necessary for plants and animals in trace concentrations. Elevated levels of heavy metals may enter surface waters from industrial or agricultural land uses as well as atmospheric inputs via rainfall.

Each of the six samples (three samples taken at Station MD-045, two samples at Station MD-249, and one sample at Station MD-248) analyzed for copper exceeded the state standard. One of 18 samples collected at Station MD-045 exceeded the standard for zinc. The monitoring station in Shipyard Creek (MD-243) did not show any standard exceedances for these metals.

Table 3.3-4
Summary of Concentrations, Water Quality Criteria, and Compliance for Parameters of Interest
(data presented are from STORET stations only)

Parameter	Unit	Minimum	Maximum	Average	Criteria	Section 303(d) List?
Dissolved Oxygen (instantaneous)	mg/L	2.4	11.31	6.1	4.0	**No**
Salinity	ppt	0	28	15.4	No criteria	
Total Suspended Solids	mg/L	1.6	27	11.1	No criteria	
Total Nitrogen	mg/L	0.14	2.76	0.44	No criteria	
Total Phosphorus	mg/L	0.02	0.46	0.04	No criteria	
Enterococci (single sample maximum)	CFU/mL	10	156	55	501	**No**
Fecal Coliforms (single sample maximum)	CFU/mL	2	1,600	138	43	**Yes**
Cadmium (criterion maximum concen-tration [CMC])	µg/L	0.14	0.96	0.42	43	**No**
Chromium (CMC)	µg/L	10	17	13.5	1,100	**No**
Copper (CMC)	µg/L	10	10	10	5.8	**No**
Zinc (CMC)	µg/L	10	160	19.7	95	**No**

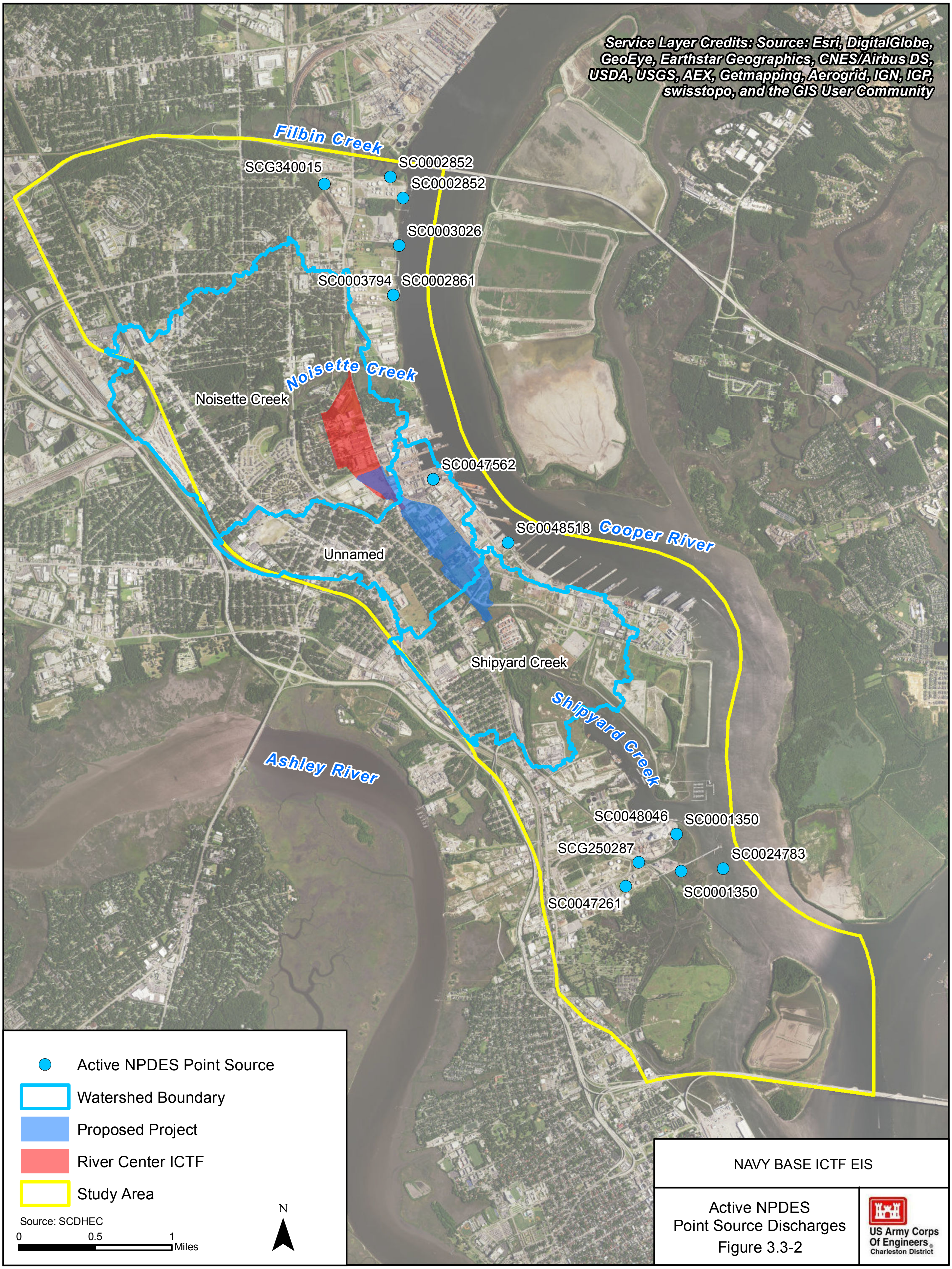
Source: EPA 2014a.

3.3.2.5 Point Source and Non-Point Source Surface Water Pollution

Various sources of pollution from point source discharges (e.g., industrial and wastewater treatment plants) and non-point sources (e.g., stormwater, atmospheric deposition) can affect the surface water quality of the Lower Cooper River.

3.3.2.5.1 Point Source Discharges

The NPDES Stormwater Program regulates stormwater point source discharges for MS4s, construction activities, and industrial activities. Table 3.3-5 represents all locations with active NPDES permits within the study area. Locations are depicted on Figure 3.3-2.



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Active NPDES
Point Source Discharges
Figure 3.3-2

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Table 3.3-5
Active NPDES Permits Within the Study Area

NPDES Permit #	NPDES PIPE #	Permittee	Facility Type	Location Description
SC0001350	SC0001350-001	Kinder Morgan-Shipyard River Terminal	Industrial	Petroleum Bulk Stations and Terminals
SC0001350	SC0001350-002	Kinder Morgan-Shipyard River Terminal	Industrial	Petroleum Bulk Stations and Terminals
SC0002852	SC0002852-001	Amerada Hess/Virginia Av North	Industrial	Petroleum Bulk Stations and Terminals
SC0002861	SC0002861-002	Amerada Hess/Virginia Av South	Industrial	Petroleum Bulk Stations and Terminals
SC0002861	SC0002861-001	Amerada Hess/Virginia Av South	Industrial	Petroleum Bulk Stations and Terminals
SC0002852	SC0002852-002	Amerada Hess/Virginia Av North	Industrial	Petroleum Bulk Stations and Terminals
SC0003026	SC0003026-004	Chevron USA Inc.	Industrial	Lubricating Oils and Greases
SC0024783	SC0024783-001	NCSD/Felix C Davis WWTP	Municipal	Sewerage Systems
SC0047261	SC0047261-001	Petroliance LLC/Charleston	Industrial	Petroleum Bulk Stations and Terminals
SC0047562	SC0047562-001	Detyens Shipyard/Main Yard	Industrial	Ship Building and Repairing
SC0047562	SC0047562-01A	Detyens Shipyard/Main Yard	Industrial	Ship Building and Repairing
SC0047562	SC0047562-01B	Detyens Shipyard/Main Yard	Industrial	Ship Building and Repairing
SC0048518	SC0048518-001	Seacrest Marine Holdings LLC	Industrial	Ship Building and Repairing
SCG250287	Not available	Kinder Morgan Operating LPC Shipyard River Terminal	Industrial	Special Warehousing and Storage
SCG340015	SCG340015-001	Kinder Morgan Bulk Term North	Industrial	Petroleum Bulk Stations and Terminals

Source: SCDHEC 2014b.

3.3.2.5.2 Non-Point Sources of Pollution

Non-point sources of pollution (both natural and anthropogenic) generally have a larger impact on water quality than point source discharges. Stormwater runoff contributes a large percentage of surface water pollution and can contain pollutants such as sediment, fertilizers, herbicides, insecticides, oil, grease, toxic chemicals, salt, bacteria, and nutrients (EPA 2012). Natural sources of nutrients and detritus from marshes in the system can produce oxygen demands and effect overall water quality in the study area.

3.3.3 Sediment Quality

In addition to monitoring potentially contaminated sites, as discussed in Section 3.15 (Hazardous, Toxic, and Radioactive Waste), sediment quality data collected between 1999 and 2010 through the SCECAP are summarized for levels of contaminants and toxicity. Although this sampling effort included different sampling locations selected each year throughout the state's coastal waters, only data collected from the five stations (see Figure 3.3-1 for station locations) within the study area are discussed (see Table 3.3-2). Several replicate grab samples were collected from all stations sampled once during the summer months (mid-June through August). Contaminants measured included metals, PAHs, PCBs, polybrominated diphenyl ethers (PBDEs), and pesticides. Toxicity levels at each site, measured using the results of three bioassays employed as indicators of contaminant bioavailability and evidence of probable contaminant effects on benthic species, also are summarized. Findings from the series of technical reports generated through this program and the data obtained from those surveys can be obtained from the SCECAP website (SCECAP 2014).

3.3.3.1 Contaminants

In 2000, Station RO00056, located in the turning basin of Shipyard Creek, was rated as poor due to elevated levels of arsenic, copper, and chromium, plus eight PAHs, which exceeded the concentration of a contaminant that resulted in adverse bioeffects in 10 percent of the studies examined (defined as the Effects Range-Low or ER-L levels) (Long et al. 1998). Stations RO026290, RO026028, RO08352, and NOR09056 were rated as marginal due to moderately elevated contaminant concentrations.

3.3.3.2 Toxicity

Bioassays were used by SCECAP to provide useful evidence of probable contaminant effects in sediments on benthic species. Given the variability in the results from the three bioassays used, a weight of evidence approach was used to define sediment toxicity. No positive tests indicated non-toxic sediments, while only one positive test indicated possible evidence of toxic sediments. Two or more positive tests indicated a high probability of toxic sediments; however, after evaluating six years of data, it was determined that the amphipod assay does not perform well in the region and therefore was removed from the methodology. As a result, in 2005, only two assays were used; a positive test result in both assays indicated a high probability of toxic sediments, positive results in only one of the assays indicated possible evidence of toxic sediments, and no positive results indicated non-toxic sediments.

Stations RO00056 (1999–2000 survey period) and NOR09056 (2009–2010 survey period) demonstrated results indicating toxic sediments. Station RO026028 (2001–2002 survey period) suggested possible toxic sediments and Stations RO026290 (2001–2002 survey period) and RO08352 (2007–2008 survey period) showed non-toxic sediments.

3.3.4 Groundwater Quality

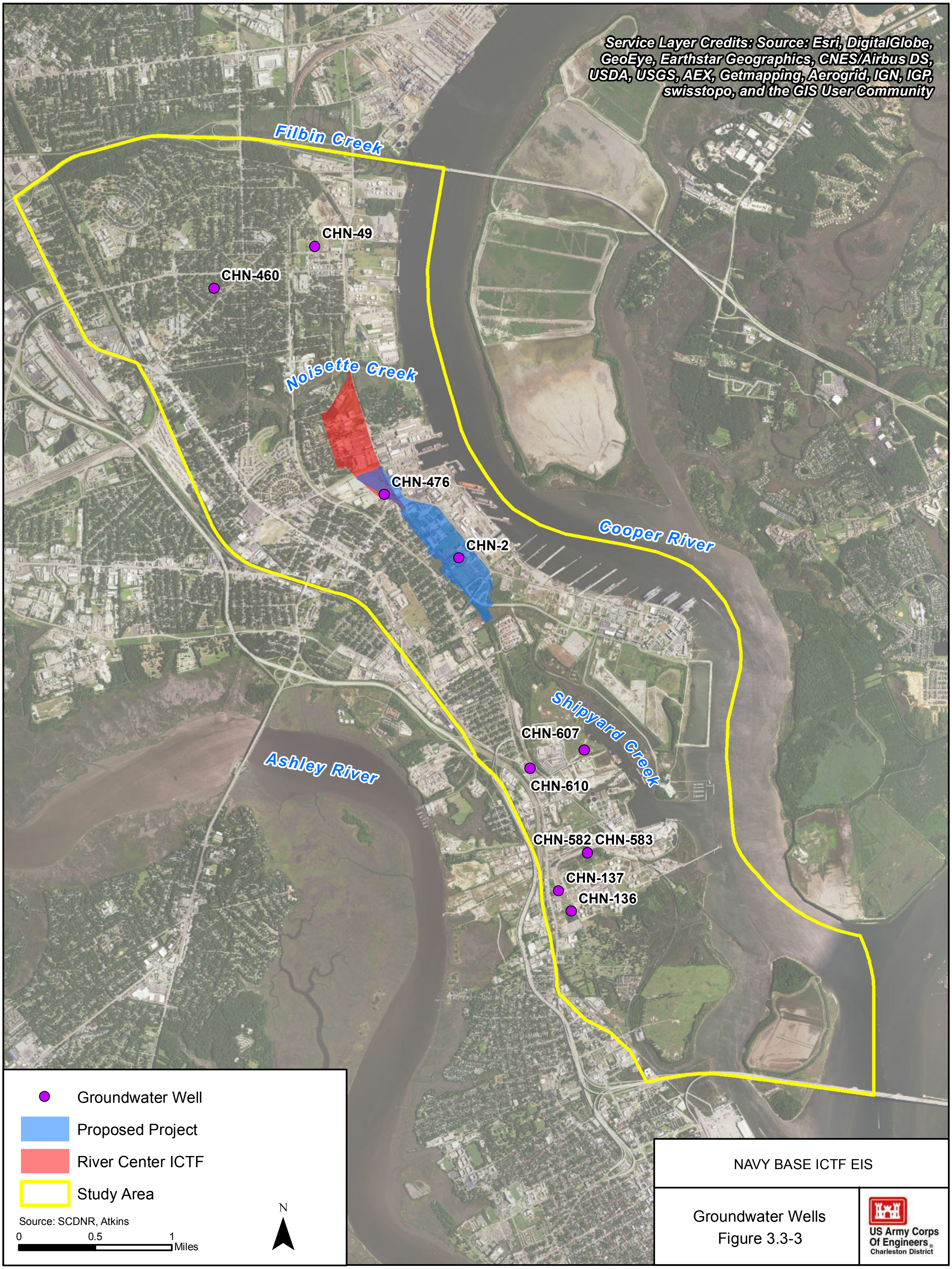
The Cooper River sub-basin overlays the Coastal Plain aquifers. Regionally, the Middendorf aquifer is the principal public supply groundwater source in the vicinity of the study area while the Tertiary sand and Floridan aquifers are the most commonly used groundwater sources, especially in areas south and west of Charleston (SCDNR 2009).

Mt. Pleasant is the largest municipal supply user, withdrawing 1,783 million gallons in 2006. Significant cones of depression have developed in both the Middendorf and Floridan aquifers due to the long-term and ever-increasing use of groundwater in this sub-basin (SCDNR 2009). SCDHEC has designated Berkley, Charleston, and Dorchester counties as the Trident Capacity Use Area. Because the study area is located in Charleston County, any production water wells or well fields withdrawing more than three million gallons per day (gpd) must be permitted through SCDHEC.

The SCDNR maintains a record of coastal plain water wells. There are ten wells in the study area (Table 3.3-6; Figure 3.3-3) and two of these are located in the Project site. The two wells that are located within the Project site, CHN-2 (18CC-r1) and CHN-476 (18CC-q1), are assigned for industrial use and unused, respectively (SCDNR 2007).

Municipal water supplies for the City of North Charleston, where the Project site is located, are served by the Charleston Water System. This utility gets their water primarily from Bushy Park Reservoir and secondarily from the Edisto River. The Charleston Water System has no operating groundwater wells in the study area (personal communication, Jane Byrne, Charleston Water System, September 30, 2014).

The Middendorf aquifer is characterized by alkaline, very soft water of a generally sodium bicarbonate type with high levels of total dissolved solids (TDS) and fluoride levels above recommended drinking water limits (SCDNR 2009, Park 1985). Although water quality in the Tertiary sand aquifer is generally good in northern Berkeley and Charleston counties, it becomes increasingly mineralized to the southeast and with depth. The Tertiary sand aquifer varies from a sodium bicarbonate type in Berkeley County to a sodium chloride type in south-coastal Charleston County (SCDNR 2009). Floridan aquifer groundwater tends to be less mineralized than that from the Tertiary sand aquifer, though interaquifer contamination is common in the sub-basin.



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Groundwater Wells
Figure 3.3-3

US Army Corps Of Engineers
Charleston District

Table 3.3-6
SCDNR Coastal Plain Water Well Records in the Study Area

Well Number	Elevation (ft)	Owner	Use	Depth (ft)	Year Drilled
CHN-2	12	Charleston Naval Shipyard	Industrial	2026	1943
CHN-49	30	Raybestos-Manhattan	Industrial	440	1951
CHN-136	15	Exxon Co.	Unused	504	1960
CHN-137	15	Exxon Co.	Abandoned	510	1961
CHN-460	30	J. T. Bunn	Unused	325	1965
CHN-476	20	U. S. Naval Shipyard	Unused	315	0
CHN-582	0	W. R. Grace Co.	Industrial	240	0
CHN-583	0	W. R. Grace Co.	Industrial	220	0
CHN-607	12	Macalloy Corp.	Industrial	394	1987
CHN-610	10	Macalloy Corp.	Industrial	399	1987

Source: SCDNR 2007. Disclaimer: The SCDNR does not guarantee the accuracy of this well information. In many cases, our well information comes from old records, and as a result, some of the information, such as the well owner or the well use, may no longer be accurate. This is in no way a complete inventory of all the water wells in the South Carolina Coastal Plain.

Groundwater quality within the shallow aquifer is vulnerable to contamination throughout most of the Santee Basin and varies greatly in the sub-basin. Contaminants from fertilizers, pesticides, and spills or leaks at or near the land surface can move quickly to the water table, especially in areas where sandy soils offer little opportunity for filtration or degradation of pollutants. Under the Project site, groundwater quality within the surficial aquifer has been affected by contaminants associated with anthropogenic activities in the area (see Section 3.15 – Hazardous, Toxic, and Radioactive Waste); however, protection of deeper aquifers is provided by the Cooper Formation, a geological formation that functions as an effective confining unit, inhibiting downward movement of groundwater (Park 1985).

Statewide ambient groundwater monitoring activities are currently suspended (SCDHEC 2013b, 2014c, 2015a); however, site-specific groundwater monitoring is ongoing at potentially contaminated sites. These efforts are addressed in more detail in Section 4.15 (Hazardous, Toxic, and Radioactive Waste).

3.4 VEGETATION AND WILDLIFE

3.4.1 Introduction

The affected environment for vegetation and wildlife includes numerous aquatic and terrestrial land cover classes, vegetation communities, and wildlife species. Species listed as threatened, endangered,