

KNOXVILLE SOUTH WATERFRONT, TENNESSEE

PUBLIC IMPROVEMENTS



Existing Natural Resources and Ecological Evaluation Report



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DRAFT
MAY 2008

SOUTH KNOXVILLE WATERFRONT
EXISTING NATURAL RESOURCES
AND
ECOLOGICAL EVALUATION REPORT
DRAFT

MAY 2008

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Background: Project Development & Planning Focus

Evolving out of an extensive community envisioning process, the Knoxville South Waterfront Vision and Action Plan was adopted by City of Knoxville Council in 2006. The 20 year goal of the plan is to transform the south side of the downtown riverfront with a careful balance of development, preservation and enhancement. The Plan proposes to transform the predominantly under-valued industrial properties and revitalize them to improve the riverfront's recreational, cultural resource, civic, and economic values. Other implementation steps have been taken, including the City's establishment of a Redevelopment District and the adoption of Form-based Development Codes for the South Waterfront.

The City is now shifting from a long-term planning focus to that of a short-term project design and implementation focus. The Action Plan identified and budgeted several public improvement projects that would assist in achieving the City's goals in the next 5 years. These public projects were selected based on their ability to:

- improve roads and open space hand-in-hand with development by property owners;
- be separable in case funding is not available or the market changes;
- geographically distribute equitably between neighborhoods; and
- set benchmark standards for years to come.

The initial Knoxville South Waterfront proposes 12 individual projects to choose from depending on priorities, funding, and land owner consent. If implemented together the projects include:

- over 7 acres of new roads and road improvements;
- over 16 acres of new waterfront open space created from private land that will connect to other trails and greenways;
- over 10 acres of improvements to existing public land;
- over 23 acres of private development potential unlocked in the short-term;
- an "urban wild" full of diversity and surprise; and
- an everyday getaway for residents, citizens and visitors to enjoy waterfront living.

**South Knoxville Waterfront
Existing Natural Resources and Ecological Evaluation Report**

1.0 Report Purpose, Scope, and Limitations

The purpose of this report is to present a description of the current existing natural resources and provide an ecological evaluation of sites proposed to be developed for the South Knoxville Waterfront Project in Knoxville, Tennessee. The report was prepared by Environmental Consulting and Training Services, Inc. (ECATS) at the request of Hargreaves Associates.

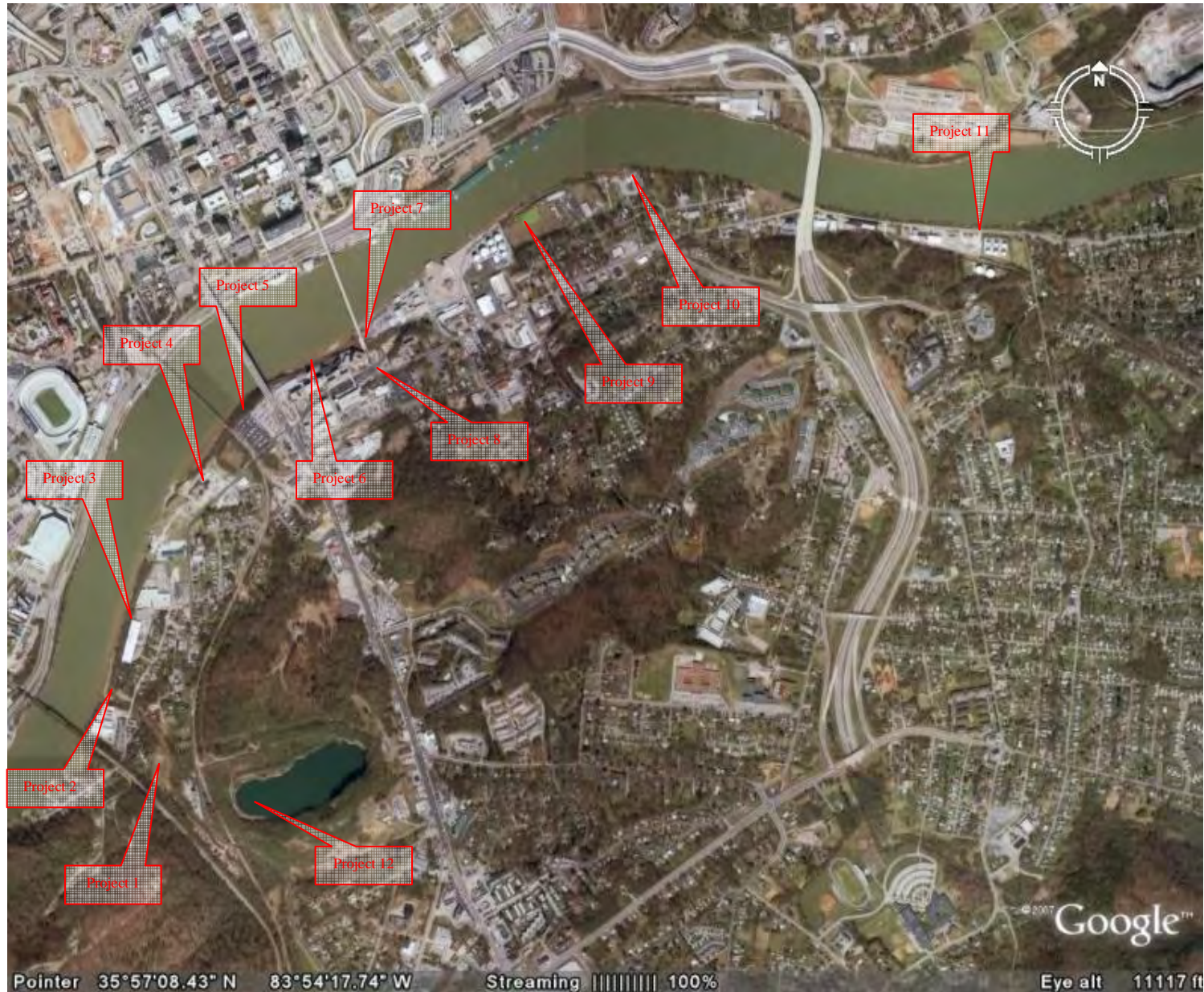
The evaluation of the existing natural and ecological resources in this report is limited to the visual observations of field biologists and ecologists. No sampling was conducted during the course of this report. No wetlands delineations were conducted during the course of this report. This report is limited to identifying potential “Areas of Concern” (AOC) located within the proposed project area. This report makes no determinations regarding surface water and/or groundwater quality, soil contamination, hazardous and/or toxic substances releases, air quality, environmental justice issues, and/or cultural resources as these parameters lie outside the Scope of Work (SOW) for this report.

2.0 Project Location

The South Knoxville Waterfront Project is located in Knoxville, Tennessee, along the southern bank of the Tennessee River (Fort Loudoun Reservoir). Figure 1 presents the general location of this project. The Project is divided into 12 different Project Locations:

- (1) Project 1 – Cherokee Trail Connector
- (2) Project 2 – Goose Creek Landing
- (3) Project 3 – Pedestrian Bridge
- (4) Project 4 – City View Condominiums and Marina
- (5) Project 5 – Henley Gateway
- (6) Project 6 – Shoals Riverwalk
- (7) Project 7 – Gay Street Stairway
- (8) Project 8 – Sevier Avenue/Council Place Enhancements
- (9) Project 9 – River Road and River Plain Park
- (10) Project 10 – Lincoln Street Landing
- (11) Project 11 – Baker Street Landing
- (12) Project 12 – Springs Water Center (Fort Dickerson Quarry Lake)

Figure 1. General view of the South Knoxville Waterfront Project. Source: GoogleEarth 2008.



3.0 General Physiography of the Knoxville Area

According to the U.S. Geological Survey (USGS), the Knoxville area is located in the Appalachian Valley and Ridge Province between the Smoky Mountains (Unaka Mountains) and Cumberland Plateau. The Appalachian Valley and Ridge Province is a relatively low-lying region which came into being as a result of extreme folding and faulting events. The roughly parallel ridges and valleys of this province vary in width, height, and geologic material. Rocks found in the area include limestone, dolomite, shale, siltstone, sandstone, chert, claystone, and marble. Numerous springs, sinkholes, and caves are also found in this province.

According to the U.S. Environmental Protection Agency (EPA), the Level III Ecoregion where Knoxville is located is the “Ridge and Valley” or “The Great Valley of East Tennessee”. The extensive drainage system of the Great Valley includes many streams and rivers that converge to form the Tennessee River. Present-day forests in this ecoregion cover approximately 50% of the region. The aquatic habitat diversity in this ecoregion is extraordinary and supports numerous fish and aquatic invertebrate species.

According to EPA, the Level IV Ecoregion of the Great Valley where Knoxville lies is identified as the “Southern Limestone/Dolomite Valleys and Low Rolling Hills” marked by mostly low rolling ridges and valleys. Landcover in this ecoregion includes intensive agriculture, urban and industrial areas, and thickly forested areas. The common forest types in this ecoregion are Appalachian oak forests (mixed oaks, hickory, pine, poplar, birch, maple), bottomland oak forests, bottomland mesophytic forests, and sycamore-ash-elm riparian forests; other vegetated areas interspersed between the forested areas include grassland barrens intermixed with cedar-pine glades and cedar barrens.

Eight Projects are located on the shores of the Tennessee River (Fort Loudoun Reservoir); four sites are not. The general topographies of Projects 2, 3, 8, 9, 10, and 11 are generally flat and range from approximately 830 feet (ft) above mean sea level (msl) to 810 ft msl. Projects 5, 6, and 7 each contain a bluff feature with steep rocky slopes and elevations up to 890 ft msl. Project 1 ranges in elevation from 810 ft msl up to 880 ft msl, and Project 12 contains an old quarry feature with steep topography ranging from 900 ft msl down to 630 ft msl. See Section 8.0 for more details concerning the physiography of each project site.

4.0 General Geology and Soils of the Knoxville Area

When Africa and North America collided during the Allegheny Orogeny (mountain forming event) approximately 350 million years ago, parallel layers of Paleozoic sandstones, conglomerates, shales, and limestones were folded and faulted. These folded and faulted rocks were left between the Smoky (Unaka) Mountains and Cumberland Plateau as North America and Africa later drifted apart during the Jurassic Period of the Mesozoic Era (opening up the area presently containing the Atlantic Ocean). Erosion of softer rock such as limestone and shale formed valleys, and left the harder sandstones and

conglomerates which formed ridges. Streams followed the areas where softer rocks were exposed during thrust faulting and eroded the softer rocks and forming streambeds. Streams running perpendicular to the orientation of rock fractures eventually eroded through the fractures and became underground streams. One of the resulting geologic features from this process is the 900 mile-long area of alternating ridges and valleys known as the Appalachian Valley and Ridge Province. This geologic province runs from the northeast to southwest (from New York to Alabama) as shown in Figure 2 to the right.

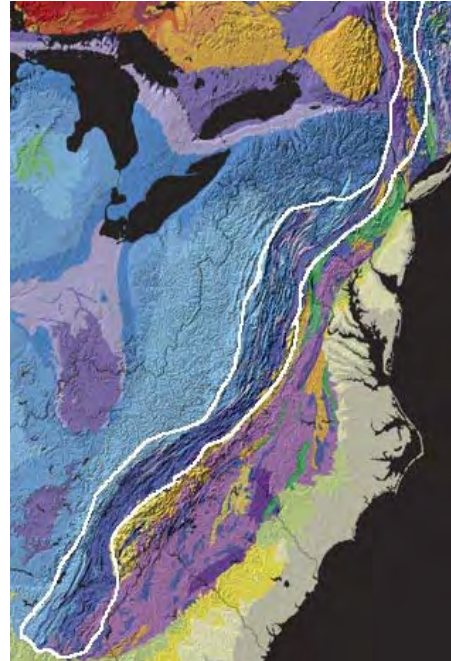


Figure 2. The Appalachian Valley and Ridge Province (highlighted in white) Source: USGS 2008.

According to the USGS, the geology of the Knoxville area is dominated by Ordovician limestone and dolomite which are easily eroded by water. Since the Cambrian Period, underground water enlarged breaks and crevices in the limestone and formed connected cave systems, termed “karst systems” by geologists. Due to karst geology, numerous connected underground streams, springs, sinkholes, and caves exist in the Knoxville area.

Knoxville is located in the Southern Limestone/Dolomite Valley and Low Rolling Hill Region within the Great Valley. This region forms a heterogeneous area composed predominantly of a bedrock of Ordovician limestone and cherty dolomite with some shale, siltstone, sandstone, claystone, and marble. Knoxville’s surficial geology is composed of a Quaternary cherty clay solution residuum. The topography consists of valleys, low rolling ridges with rounded hills, some steep ridges north of Knoxville, caves, and springs. The streams within this region are moderate to low gradient with bedrock, cobble, gravel, and sandy substrates.

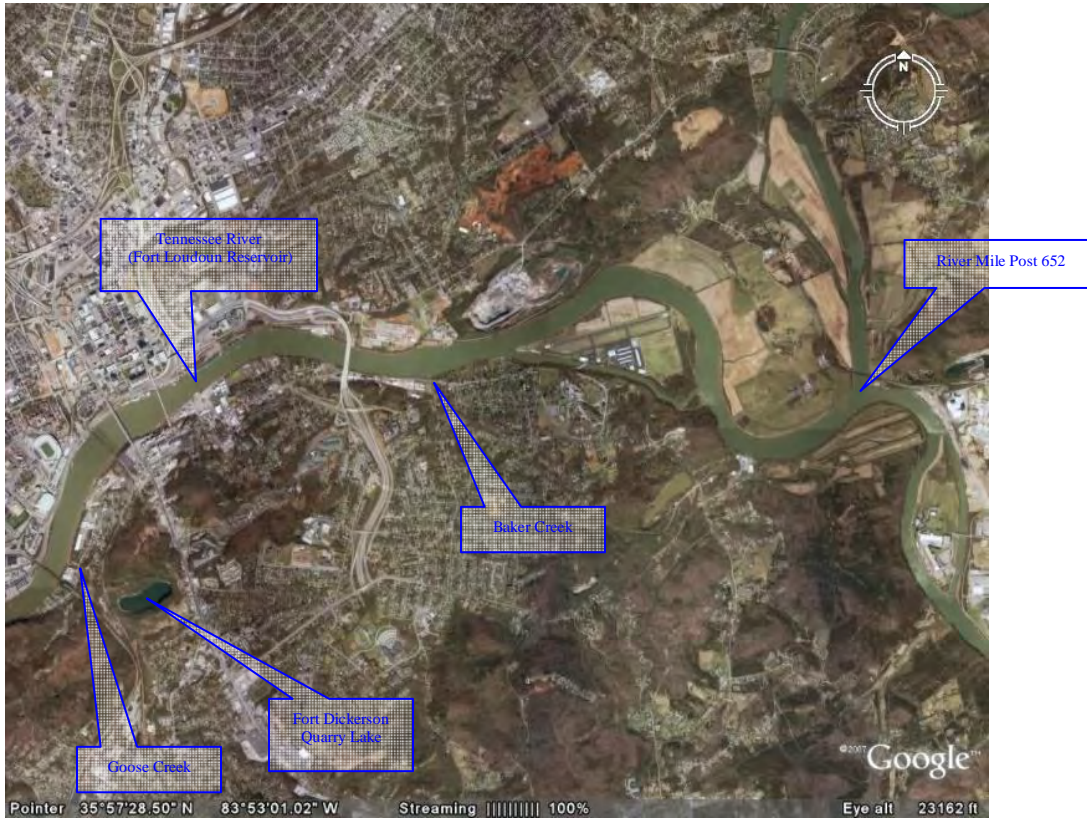
One of the typical soil orders found in the Southern Limestone/Dolomite Valley and Low Rolling Hill Region are the Ultisols (Paleudults). Common soil series found in this ecoregion include Fullerton, Dewey, Decatur, Bodine, and Waynesboro. See Section 8.0 for more site specific information on soils.

5.0 Main Surface Waters in the South Knoxville Area

The City of Knoxville originated on the banks of the Tennessee River. From the 1930s to 1950s, the Tennessee Valley Authority (TVA) impounded the Tennessee River and other rivers in the area to control flooding and produce hydroelectric power. These impoundments resulted in the formation of lakes and reservoirs. The portion of the Tennessee River flowing through Knoxville became known as the Fort Loudoun Reservoir. The Tennessee River originates upstream from Knoxville at the confluence of the Holston and French Broad Rivers east of Knoxville (river mile post 652). From this

point of origin, the Tennessee River flows in a westerly to southwesterly direction as it meanders through the Knoxville area (see Figure 3 below).

Figure 3. Surface waters located within the South Knoxville Waterfront area. Source: GoogleEarth 2008.



The Tennessee River (Fort Loudoun Reservoir) is a navigable body of water. It is considered a water of the United States (U.S.) and a water of the State of Tennessee and as such is protected from degradation. Other surface waters considered waters of the U.S. and State of Tennessee that are found in the area of the South Knoxville Waterfront include Goose Creek (Projects 1 and 2) and Baker Creek (Project 11).

According to the Tennessee Department of Environment and Conservation (TDEC) Division of Water Pollution Control (WPC), Fort Loudoun Reservoir, Baker Creek, and Goose Creek are impaired waters and listed on the state's Clean Water Act (CWA) §303(d) list. This list is a compilation of those surface waters that are "water quality limited" and need additional pollution controls. These waters are not fully meeting their designated uses. The three surface waters in the South Knoxville Waterfront area are listed for the following reasons:

- Fort Loudoun Reservoir:
 - sediment contaminated with polychlorinated biphenyls (PCBs);
 - fishing advisory posted due to PCBs; and

- listed as a Category 5 surface water (one or more uses are not being met) with required total maximum daily loads (TMDLs) for known pollutants.
- Baker Creek:
 - discharges from Municipal Separate Storm Sewer System (MS4) areas and collection system failures have lead to contamination with nitrates and *Escherichia coli*;
 - other anthropogenic habitat alterations have degraded this creek;
 - listed as a Category 5 surface water; and
 - EPA has approved pathogen and habitat alteration TMDLs to address known pollutants.
- Goose Creek:
 - discharges from MS4 areas, collection system failures, and Resource Conservation and Recovery Act (RCRA) Hazardous Waste sites have lead to contamination with PCBs, *Escherichia coli*, and RCRA hazardous wastes;
 - other anthropogenic habitat alterations have degraded this creek;
 - listed as a Category 5 surface water; water advisory due to pathogens and RCRA hazardous waste;
 - contamination from Witherspoon Superfund site; and
 - EPA has approved siltation, pathogen, and habitat alteration TMDLs to address known pollutants.

Agencies having jurisdiction over these surface waters include:

- TDEC, which would require aquatic resource alteration permits (ARAPs);
- TVA, which would require permits under TVA Act §26a if the shoreline is altered;
- U.S. Army Corps of Engineers (USACE), which regulates activities in the waters of the U.S. (especially dredging activities and bridging over surface waters) and jurisdictional wetlands under CWA §404; and
- EPA which requires National Pollutant Discharge Elimination System (NPDES) permits for construction and general stormwater discharges under the CWA and continued compliance with TMDLs it has set for these surface waters.

5.1 Wetlands

Wetlands are currently defined by USACE Wetland Delineation Manual as “those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted to life in saturated soil conditions”.

Jurisdictional wetlands are considered waters of the U.S. and are protected under CWA §404. A jurisdictional wetland meets the definition of wetland and is located with a connection to or is adjacent to waters of the U.S. The USACE enforces regulations protecting jurisdictional wetlands. Consultation with the USACE is required if

jurisdictional wetlands are present on a site and a permit to construct in or near these wetlands is required from USACE.

To meet the definition of a wetland under the USACE Wetland Delineation Manual, there are three requirements which must be met.

1. Hydrophytic vegetation:
“The prevalent vegetation consists of macrophytes that are typically adapted to areas having hydrologic [water] and [hydric] soil conditions. Hydrophytic species, due to morphological, physiological, and/or reproductive adaptation(s), have the ability to grow, effectively compete, reproduce, and/or persist in anaerobic soil conditions.”
2. Hydric soils
“Soils are present and have been classified as hydric, or they possess characteristics that are associated with reducing soil conditions.”
3. Hydrology
“The area is inundated either permanently or periodically at mean water depths \leq 6.6 ft, or the soil is saturated to the surface at some time during the growing season of the prevalent vegetation.”

Any wetlands located on sites located with shoreline on the Tennessee River, Baker Creek, and/or Goose Creek are jurisdictional wetlands. Agencies (e.g., USACE, TVA) issuing permits for construction activities in wetlands must comply with Executive Order 11990 “Protection of Wetlands.” See Section 8.0 for more site specific information on wetlands.

5.2 Floodplains

According the most recent Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps (FIRMs) for the South Knoxville Waterfront, the majority of the sites have areas lying within the 100-year and 500-year floodplains of the Tennessee River, Goose Creek, and/or Baker Creek. Agencies (e.g., USACE, TVA) issuing permits for construction activities in floodplains must comply with Executive Order 11988 “Floodplain Management”. See Section 8.0 for more site specific information on floodplains.

6.0 Typical Vegetation in the Knoxville Area

The dominant terrestrial plant association in the Knoxville area is oak-hickory forest that is most widely distributed on ridges and dry slopes. The most common understory trees are red maple (*Acer rubrum*), blackgum (*Nyssa sylvatica*), and sourwood (*Oxydendrum arboreum*). Along the river, sycamore (*Platanus occidentalis*) and black walnut (*Juglans nigra*) can be found. Fescue grasses (*Festuca, spp.*) and broom sage (*Andropogon virginicus*) are typical grasses found in the area.

Aquatic vegetation typically includes various species of algae, duckweed (*Lemna spp.* and *Spirodela spp.*), and pondweed (*Potamogeton spp.*).

7.0 Typical Wildlife in the Knoxville Area

The Knoxville area contains a diversity of mammals, birds, reptiles, amphibians, fish, and invertebrates. East Tennessee has the largest diversity of salamanders in the world ranging from the large hellbender (*Cryptobranchus alleganiensis*) to the secretive Tennessee cave salamander (*Gyrinophilus palleucus*). South Knoxville contains one of the largest known populations of the Berry cave salamander (*Gyrinophilus gulolineatus*). East Tennessee is also known for the diversity of bird species which migrate through the region and those species which are permanent residents. Waterfowl, songbirds, and raptors follow the Appalachian Mountains during their migrations and frequent East Tennessee's rivers and lakes. Peregrine falcons (*Falco peregrinus*) have taken up residence on the ledges of high rise buildings in downtown Knoxville. Common bird species observed in the Knoxville area include: Carolina chickadee (*Poecile carolinensis*), mallard duck (*Anas platyrhynchos*), common coot (*Fulica atra*), great blue heron (*Ardea herodias*), cardinal (*Cardinalis cardinalis*), tufted titmouse (*Baeolophus bicolor*), red-tailed hawk (*Buteo jamaicensis*), barred-owl (*Strix varia*), wild turkey (*Meleagris gallopavo*), Canada goose (*Branta canadensis*), and American crow (*Corvus brachyrhynchos*). Mammal species commonly known to the Knoxville area include: Virginia opossum (*Didelphis virginiana*), raccoon (*Procyon lotor*), striped skunk (*Mephitis mephitis*), Eastern cottontail (*Sylvilagus floridanus*), Eastern gray squirrel (*Sciurus carolinensis*), groundhog (*Marmota monax*), American beaver (*Castor canadensis*), gray fox (*Urocyon cinereoargenteus*), red fox (*Vulpes vulpes*), little brown bat (*Myotis lucifugus*), and white-tailed deer (*Odocoileus virginianus*). Occasionally, an American black bear (*Ursus americanus*) may wander through southern Knox County.

The Tennessee River basin is one of the most diverse habitats in North America for freshwater fish and mollusks. It supports over 240 fish species and 60 mollusks species according to the USGS National Water Quality Assessment Program. Numerous fish species inhabit the Tennessee River and its tributaries such as large-mouth bass, small-mouth bass, bluegill, sunfish, pumpkinseed, shiners, stonerollers, chubs, gars, and catfish. Native mussels and river snails have been on the decline in the Tennessee River. Many native species are protected by federal and state law. Competition with invasive species, habitat destruction, siltation, and pollution has greatly reduced native mussel and river snail populations. Of these approximately 60 mollusk species, 30 species are federally protected and 52 species are state protected.

7.1 Invasive Animal Species

Invasive introduced animal species known in the Knoxville area include the common pigeon (*Columba livia*), European starling (*Sturnus vulgaris*), Asian clam (*Corbicula fluminea*), zebra mussel (*Dreissena polymorpha*), and common carp (*Cyprinus carpio*). Feral domestic dogs (*Canis lupus familiaris*) and cats (*Felis catus*) also damage native wildlife populations in the area. Coyotes (*Canis latrans*) have migrated into the area as well and compete with foxes.

7.2 Protected Animal Species

According to the TDEC Division of Natural Areas (DNA) Natural Heritage Inventory, the federal- and state-listed protected animal species for the Upper Tennessee River in Knox County include the following listed in Table 2 below.

Table 2. Protected Animal Species in the Knox County/Upper Tennessee River Area.

Protected Animal Species in the Knox County/Upper Tennessee River Area			
Common Name	Scientific Name	Federal Status	State Status
Anthony's river snail	<i>Athearnia anthonyi</i>	LE, XN	E
Dromedary pearl mussel	<i>Dromus dromas</i>	LE	E
Spiny river snail	<i>Io fluvialis</i>	—	G2, S2
Orange-foot pimpleback	<i>Plethobasus cooperianus</i>	LE	E
Yellowfin madtom	<i>Noturus flavipinnis</i>	LT, XN	E
Tennessee cave salamander	<i>Gyrinophilus palleucus</i>	—	T
Hellbender	<i>Cryptobranchus alleganiensis</i>	—	D
Peregrine falcon	<i>Falco peregrinus</i>	—	E
Least bittern	<i>Ixobrychus exilis</i>	—	D
Common barn owl	<i>Tyto alba</i>	—	D
Southeastern shrew	<i>Sorex longirostris</i>	—	D
Gray bat	<i>Myotis grisescens</i>		
Heron rookery*	<i>n/a</i>	—	—

Key: LE = federal-listed endangered LT = federal-listed endangered — = not listed
 E = state-listed endangered T = state-listed threatened
 G2 = globally imperiled S2 = state imperiled
 D = state-listed species deemed in need of management
 *heron rookeries protected under state law from disturbance

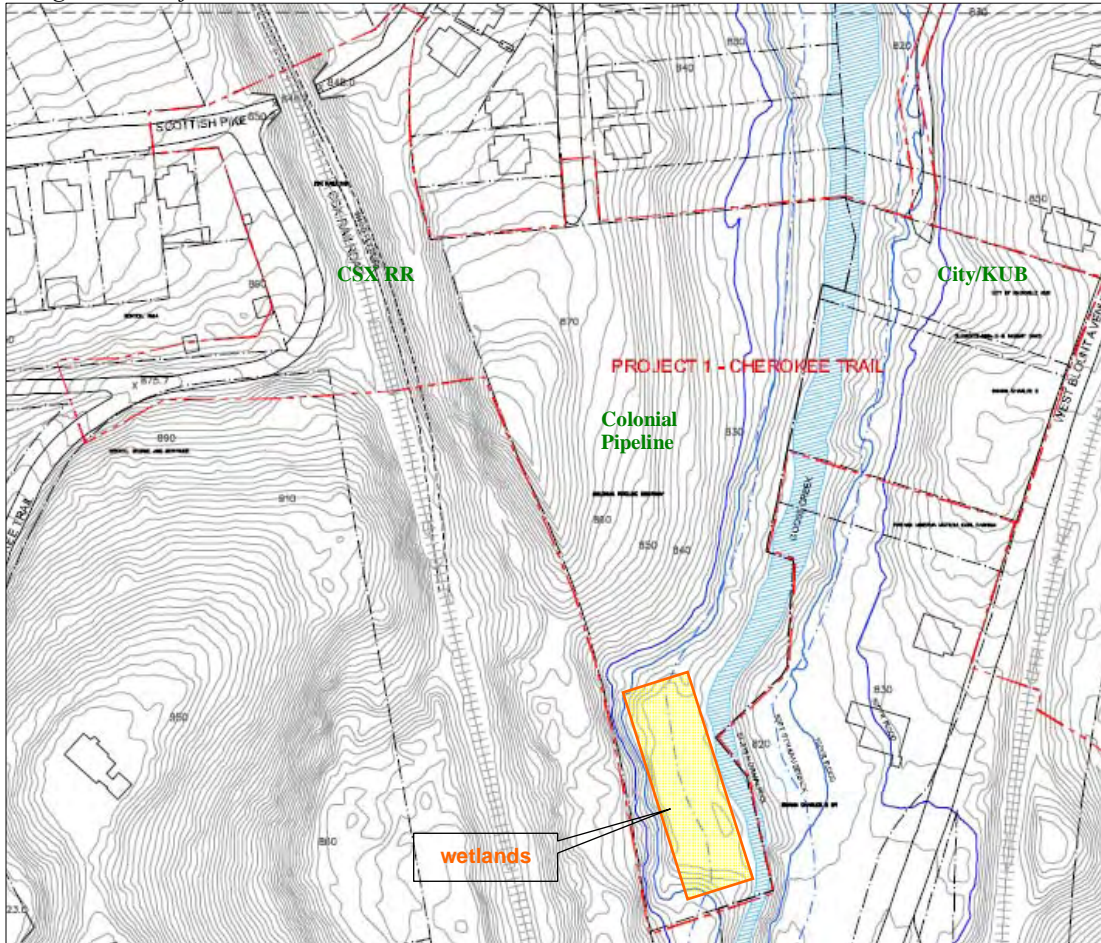
8.0 Project Descriptions and Ecological Evaluations

The following sections (8.1 through 8.12) detail the existing natural conditions and evaluate the ecological conditions found during the site visits to each project site. Projects 1, 10, 11, and 12 were visited on 11 March 2008 during which time a pedestrian survey to observe current terrestrial conditions was conducted (see photographs in Appendix A). Projects 5, 6, 7, 8, and 9 were visited on 12 March 2008 during which time a pedestrian survey to observe current terrestrial conditions was conducted (see photographs in Appendix B). Projects 2, 3, 5, 6, 7, 9, 10, and 11 were visited on 02 April 2008 by boat during which time observations from the boat of the existing shoreline and shoal conditions were made (see photographs in Appendix C). No pedestrian survey to observe the terrestrial conditions on Project 2 was conducted as no right-of-entry was granted to enter this property. Please note the other limitations to the surveys conducted as stated previously in Section 1.0.

8.1 Project 1 – Cherokee Trail Connector

This site can be divided into three sections: the CSX Railroad underpass, Colonial Pipeline property, and City of Knoxville/KUB property. See Figure 4 below. Photographs of this site are located in Appendix A. The orange outlined area in Figure 4 is the approximate location of the wetlands on this project site.

Figure 4. Project 1 area – Cherokee Trail Connector.



8.1.1 Topography

The CSX Railroad underpass contains steep grades rising from the intersection of Cherokee Trail and Scottish Pike at approximately 850 ft msl to the intersection of Cherokee Trail and Carls Lane at 870 ft msl. The CSX Railroad tracks are at an elevation of approximately 880 ft msl.

The Colonial Pipeline property is roughly triangular in shape and is located along the west bank of Goose Creek. The northwestern portion of the property contains the highest elevation at approximately 870 ft msl. The property then slopes downward towards

Goose Creek towards the east and southeast where the lowest elevation is found at approximately 810 ft msl. The southern-most portion of the property next to Goose Creek is relatively flat and has an elevation of approximately 815 ft msl.

The City of Knoxville/KUB property on the east bank of Goose Creek towards Blount Avenue rises gradually from approximately 810 ft msl at Goose Creek to approximately 860 ft msl along Blount Avenue.

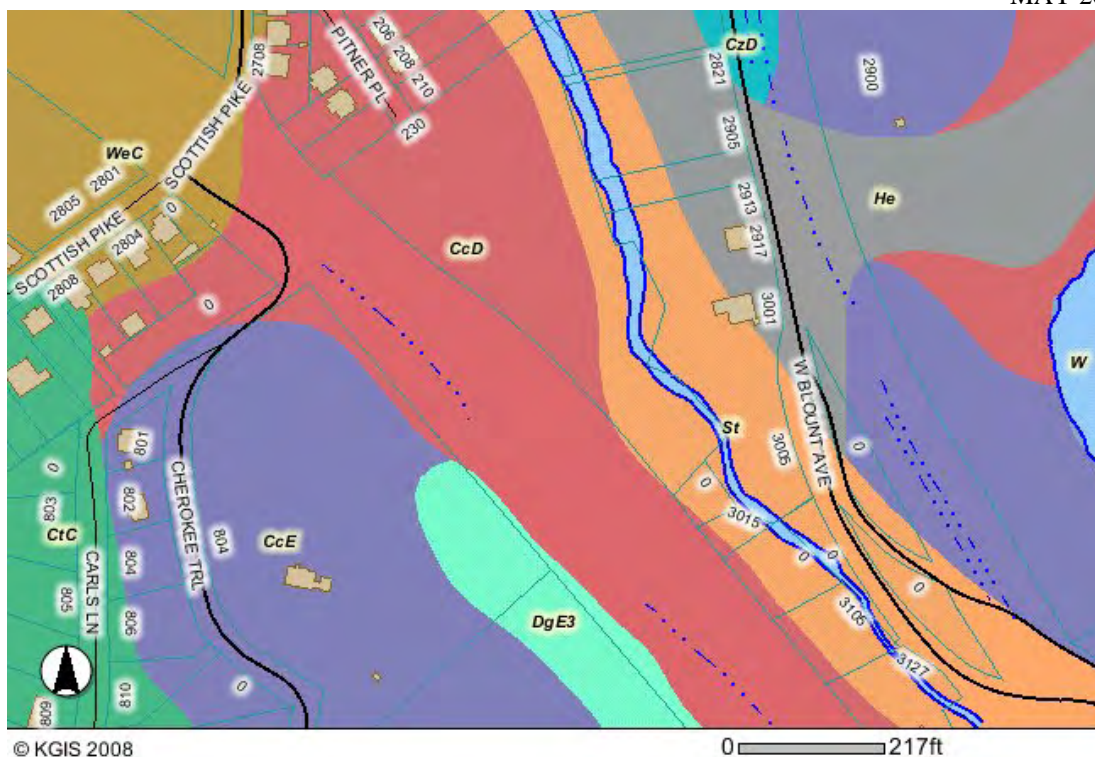
8.1.2 Geology/Soils

Table 3 and Figure 5 below are derived from the Knoxville Knox County KUB Geographic Information Service (KGIS) map (© 2008) of U.S. Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) data from the NRCS 2004 soil survey for Knox County. Table 3 and Figure 5 show the types of soils located on the Project 1 site.

Table 3. Soils located in the Project 1 area (NRCS 2004).

Project 1 – Cherokee Trail Connector		
Soil Description	Map Symbol	Listed by NRCS as Hydric Soil?
Waynesboro Loam, 5-12 % slopes	WeC	no
Coghill-Corryton Complex, 5-12 % slopes	CcD	no
Coghill-Corryton Complex, 25-65 % slopes, rocky	CcE	no
Steadman Silt Loam, 0-3 % slopes, occasionally flooded	St	yes
Heiskell Silt Loam, 0-2 % slopes, occasionally flooded	He	yes
Corryton-Udorthents-Urban Land Complex, 12-25% slopes	CzD	no

Figure 5. Soil map of the Project 1 area (NRCS 2004).



8.1.3 Surface Waters, Wetlands, and Floodplains

Goose Creek runs through the eastern portion of the Colonial Pipeline part of this site and the western portion of the City of Knoxville/KUB part of this site. These areas along Goose Creek also lie within the 100-year and 500-year floodplains of the creek. A wetland area exists in the southern portion of the Colonial Pipeline part of this site (see Figure 4 above). The wetland is entirely located within the 100-year floodplain of Goose Creek.

The Colonial Pipeline section is a sloping, vegetated field leading towards Goose Creek (photo 1-14). This slow moving creek flows along the eastern border of much of the site (photo 1-18). Goose Creek has been evaluated by TDEC and determined to be a Category 5 stream and was placed on the CWA §303(d) list for not meeting one or more water quality standards. TDEC has documented that Goose Creek is contaminated with PCBs, *Escherichia coli*, and other known pollutants from the Witherspoon Superfund site. A loss of biological integrity has been attributed to a combination of heavy siltation, pollution, and other anthropogenic habitat alterations (see photos 1-21, 1-23, 1-24, and 1-26). The creek is contaminated to the extent that TDEC recommends no body contact with the creek waters.

General site and creek conditions were observed during the 11 March 2008 site visit using a visual habitat assessment for low gradient streams. Goose Creek empties into the Tennessee River. The river was at draw-down levels at the time of the site visit. Therefore, at the time of the site visit, Goose Creek was only about 10 feet wide and five

or six inches deep for much of its length. The water of the creek exhibited a slight turbidity at the time of the site visit. Evidence of higher water levels for the creek was observed along the banks and overhang areas. The stream bottom was covered in a thick layer of silt and mud with sand and gravel substrate available only in small, isolated areas. (See photos 1-23, 1-24, and 1-26). Several large items of trash were observed embedded in the stream including: a 55-gallon drum, several tires, plastic patio chairs, and two old washing machines along with general trash and debris (see photos 1-20, 1-22 and 1-27).

Channel alterations have decreased biological integrity of the stream and increased the silt load to the creek. Evidence of aquatic animal life observed only included the presence of empty shells of an invasive Asiatic clam species (*Corbicula fluminea*) and raccoon tracks found along the stream banks. No fish or aquatic invertebrates were observed in the creek at the time of the site visit. Algae masses covered much of the central flow area of the stream in zones where there was sun exposure (up to 80% of the bottom in places). Old evidence of beaver activity along the banks in the southern portion of the Colonial Pipeline property is estimated to be approximately 10-15 years old. No current indicators of beaver activity were evident on the site.

The creek bank at the northern section of the property (the downstream section of the creek) showed signs of erosion with low sloped, exposed muddy banks mostly along the left bank (see photo 1-21). The riparian zone of the left bank was covered with grasses, woody vegetation, and small trees (see photo 1-14). The larger trees and vegetation along the right bank provided a little more bank stability and about 30% canopy cover for the stream.

In contrast, the upstream area, in the southern two-thirds of the site, had an estimated 75-80% canopy cover. Trees, shrubs and woody vegetation also provided good bank stability. The creek substrate varied slightly from the downstream site with a few leaf packs, and stick jams providing riffle-like flow. There was also a small artificial “gravel-bar” created by the dumping of limestone gravel in the creek.

A small wetland area was observed in the southern most end of the site. The area, located within the 100-year floodplain, was evidenced by the presence of facultative plants such as horse-tail (*Equisitum, spp.*). The total area of the wetlands is estimated at 0.125 acres.

8.1.4 Plant Species

Protected plant species: No threatened or endangered plant species were observed on this project site on the day of the site visit and none is known to exist at this project site.

Common plant species: The CSX Railroad section contains some oak, maple, and poplar trees along side of the road and railroad. Woody shrubs, blackberry, and kudzu is also present. From the eastern base of the railroad embankment to Goose Creek in the Colonial Pipeline area, the site a field of fescue grass and broom sage undergoing old field succession with invasion by woody plants. Bordering the Colonial Pipeline section

is a thick border of native oak trees. Along the creek, sycamore, black walnut, and sumac are present. In the wetland area, facultative wetland species such as *Equisitum spp.*, *Spartina spp.*, and *Juncus spp.* are present. The City of Knoxville/KUB section is a grassy field which is regularly mowed.

Invasive plant species: Terrestrial invasive plant species dominate the types of plants observed on the site and include: Japanese honeysuckle, mimosa, creeping Euonymus, privet, Amur honeysuckle, Himalayan blackberry, and callery pear.

8.1.5 Animal Species

Protected animal species: No threatened or endangered animal species were observed on this project site on the day of the site visit and none is known to exist at this project site.

Common animal species: Various common songbird species such as cardinals, mockingbirds, and field sparrows were observed during the site visit. Evidence of raccoon activity (tracks) along the creek was also observed. Scat from Eastern cottontails was also evident. Past beaver activity from 10-15 years ago was evident in the southern portion of the project site, but no evidence of current activity was observed.

Invasive animal species: Shells from the invasive Asian clam (*Corbicula fluminea*) were observed in Goose Creek but no live specimens were evident.

8.1.6 Habitat Ecology

Critical habitat for protected species: No evidence for or favorable habitat for state or federally listed species was observed during the site visit. No critical habitats designated by USFWS exist within the project area.

Habitat descriptions: The CSX Railroad part of the project area is urban residential and urban industrial. From the eastern base of the CSX Railroad embankment to Goose Creek the area is less disturbed, and includes a grassy field that is being invaded by woody plants and a thick border of a less disturbed area of natural forest dominated by native oak species. Near the southern extremity of the site along Goose Creek, there is a wetland area located within the 100-year floodplain. Also in the southern area of the site, there is evidence of beaver activity estimated to be 10-15 years old, but no current beaver activity was noted. The section east of Goose Creek with the power line only contains a grassy field which is mowed routinely.

8.1.7 Area(s) of Concern Identified

Areas of Concern for environmental impairment from the proposed road improvement project:

- crosses Goose Creek and alters stream banks;
- will occur within the 100-year and 500-year floodplains of Goose Creek;
- may potentially increase sediment loading into Goose Creek; and
- may adversely affect the wetlands area located on the Colonial Pipeline property.

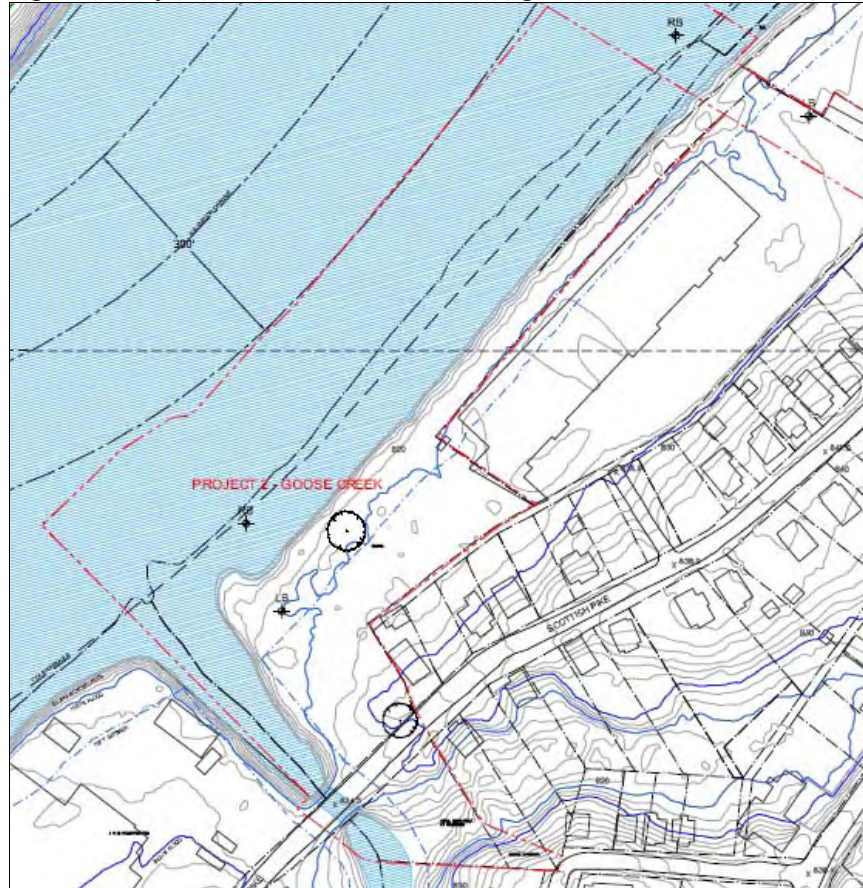
Items for consideration:

- Proposed activities at this site involve a stream crossing at Goose Creek which will require an ARAP permit from TDEC WPC. An individual (rather than general) ARAP permit may be required due known RCRA contamination in the sediments of Goose Creek from the Witherspoon Superfund site upstream and TMDLs set for Goose Creek by EPA. The need for additional bank stabilization may cause sediment loading and potential release of contaminants into Goose Creek. Individual ARAP permits generally require more documentation and time to acquire than a general ARAP permit.
- Construction in, and disturbance of, the noted wetland area in the southern portion of the site should be avoided if at all possible. If deemed necessary to disturb or impact this wetland area, an ARAP and consultation with TDEC will be required and mitigation measures will need to be implemented.
- A NPDES Storm Water Construction Permit is required if more than one acre of land will be disturbed by clearing, grading, or excavation. In addition, any time the ground is cleared, graded, or excavated, standard erosion control practices, such as silt fences, staked hay bales, or coffer dams, should be employed to prevent sediment from entering the creek during construction phases. Consultation with TDEC to apply for this permit will be required.

8.2 Project 2 – Goose Creek Landing

This area is located on the south side of the Tennessee River at the mouth of Goose Creek and runs parallel to the Tennessee River towards the east. See Figure 6 below. Photographs for this site are located in Appendix C.

Figure 6. Project 2 area – Goose Creek Landing.



8.2.1 Topography

Elevation from the shoreline at approximately 810 ft msl rises gradually to approximately 820 ft msl. This property is relatively flat.

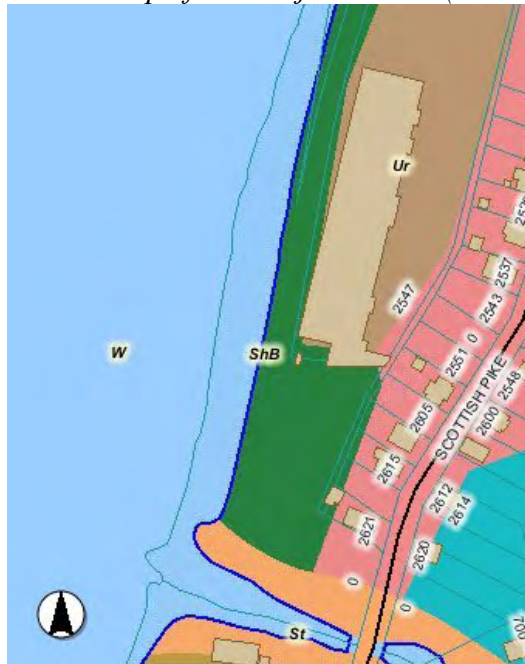
8.2.2 Geology and Soils

Table 4 and Figure 7 below (sources: KGIS map © 2008 of NRCS data from 2004 Knox County Soil Survey) lists the types of soils located on the Project 2 site.

Table 4. Soils located in the Project 2 area (NRCS 2004).

Project 2 – Goose Creek Landing		
Soil Description	Map Symbol	Listed by NRCS as Hydric Soil?
Steadman Silt Loam, 0-3 % slopes, occasionally flooded	St	yes
Shady Loam, 2-5 % slopes	ShB	no
Urban Land	Ur	no
Dewey-Udorthents-Urban Land Complex, 2 to 12 % slopes	DyC	no

Figure 7. Soil map of the Project 2 area (NRCS 2004).



8.2.3 Surface Waters, Wetlands, and Floodplains

Goose Creek flows through the western portion of this site and empties into the Tennessee River. From the mouth of Goose Creek eastward, the property contains shoreline on the Tennessee River. The western portion of the property lies within the 100-year floodplain of Goose Creek. The portion of the property along the Tennessee River lies with the 100-year floodplain. All of the property lies within the 500-year floodplain of the Tennessee River.

It is unknown if any wetlands are located on this project site since no right-of-entry was granted by the current property owner to permit a pedestrian survey of the site. It is possible wetlands exist on the site since it is within the 100-year floodplain, adjacent to two surface waters, and contains hydric soils.

This site was viewed, via boat, from the Tennessee River (land access was not available at the time of the study). Shallow-water shoals, approximately 1.5 to 2 feet deep at low pool, extended the entire length of the property. The river banks were steep but only 3 to

4 feet high and stabilized with large rip rap boulders and vegetation. Several large trees overhanging the water along with semi-submerged old tree stumps and logs provided good habitat for fish and other aquatic organisms.

Goose Creek enters the Tennessee River at the western edge of the property. The footers for an old bridge cross Goose Creek just 40 – 50 feet upstream of the mouth. A gas pipeline crossing extends out from the point on the left bank of Goose Creek into the Tennessee River. An NPDES permitted outfall for industrial stormwater discharged into the river (TNR050584) is located on the JBM Metals property adjacent to and south of the southern portion of Project 2.

Goose Creek has been evaluated by TDEC and was determined to be a Category 5 stream. Category 5 creeks are ones that are known to be polluted and have water quality that fails to meet state Water Quality Standards. Additionally, Goose Creek was placed on the CWA §303(d) list for not meeting one or more water quality standards. TDEC has documented that the creek is contaminated with PCBs, *Escherichia coli* and other known pollutants from the Witherspoon Superfund site. A loss of biological integrity has been attributed to a combination of heavy siltation, pollution, and other anthropogenic habitat alterations. The creek is contaminated to the extent that TDEC recommends no body contact with the creek waters.

8.2.4 Plant Species

Protected plant species: No threatened or endangered plant species were observed on this project site on the day of the site visit and none is known to exist at this project site.

Common plant species: Along the riverbanks, large riparian trees such as sycamore and slippery elm are present with the tree canopy giving cover to the riverbank and shoal area. Numerous partially submerged logs and stumps covered with mosses line the river bank. Algae and species of submerged aquatic plants were observed in shallow river bottom areas where sunlight was more prevalent through the tree canopy along the banks.

8.2.5 Animal Species

Protected animal species: No threatened or endangered animal species were observed on this project site on the day of the site visit and none is known to exist at this project site.

Common animal species: Animals observed in the shoals areas and along the river banks during the site visit included: a great blue heron wading in the shoals, mallard ducks and Canada geese feeding underneath the tree canopy along the riverbank in the shoals area, and raccoon tracks on the shore of the shoal area. Fish observed included species of sunfish/bluegills and large-mouth bass. Smaller minnows and shiners were also observed in the areas with logs and stumps.

Invasive animal species: *Corbicula* invasive clam species were observed in the shoal area.

8.2.6 Habitat Ecology

Critical habitat for protected species: No evidence for or favorable habitat for state or federally listed species was observed during the site visit. No critical habitats designated by USFWS exist within the project area.

Habitat descriptions: This site contains shallow-water shoals which extend the entire length of the property. The river banks have been stabilized with large rip rap boulders and established riparian vegetation. Large riparian tree species provide cover over the riverbank and shoals. Semi-submerged tree stumps and logs provide habitat for fish and aquatic invertebrates. The combination of the shoals area and stumps/logs/tree roots attract fish and aquatic invertebrates by providing areas for feeding, spawning, and nursery habitat. Shade offered by the tree canopy along the riverbank is important to these aquatic species during the warmer months of the year.

8.2.7 Area(s) of Concern Identified

Areas of Concern for environmental impairment from the proposed riverbank stabilization, small craft docks, landing, and boardwalk:

- will occur within the 100-year and 500-year floodplain of both the Tennessee River and Goose Creek;
- may potentially increase sediment loading and release contaminants into both the Tennessee River and Goose Creek;
- will alter the bank and shoreline of both the Tennessee River and Goose Creek; and
- may adversely impact the shoal areas, large overhanging riparian trees, stumps, logs, and established large rip rap currently used by fish and aquatic invertebrates for feeding, spawning, and nurseries.

Items for consideration:

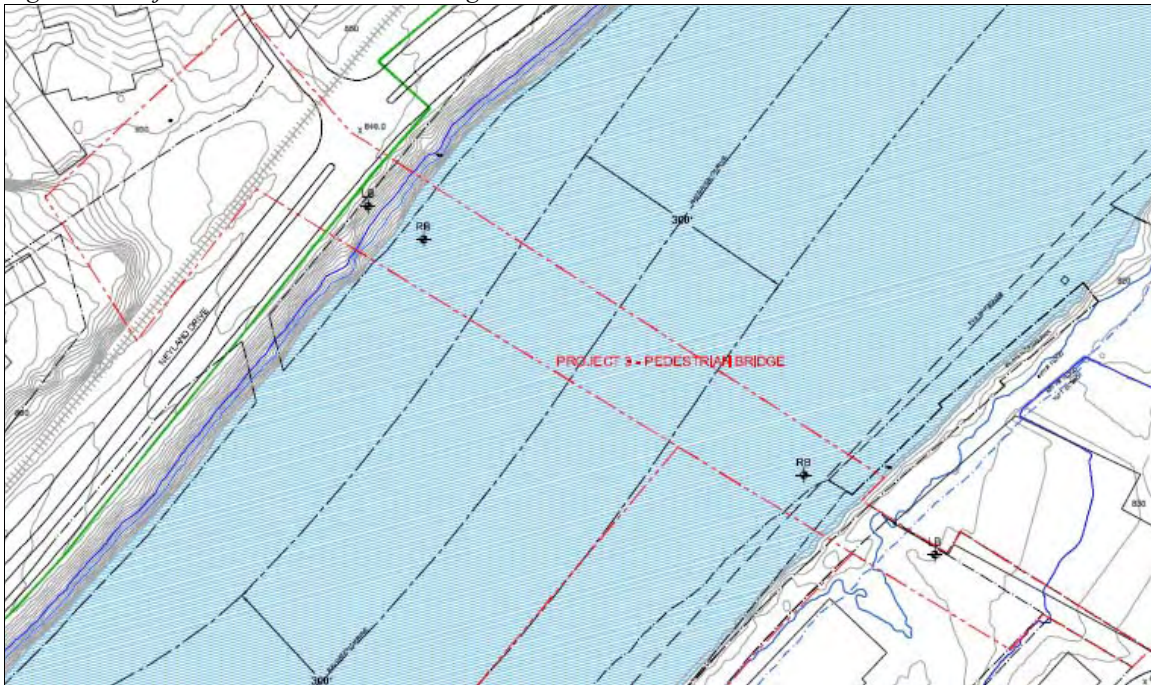
- Proposed activities at this site may involve removing the old bridge footers from Goose Creek and alteration of its banks, which will require an ARAP permit from TDEC WPC. An individual (rather than general) ARAP permit may be required due known RCRA contamination in the sediments of Goose Creek from the Witherspoon Superfund site located upstream and TMDLs set for Goose Creek by EPA. Individual ARAP permits generally require more documentation and time to acquire than a general ARAP permit.
- It is recommended that the project be done in a manner that will minimize the loss of shoal areas, large overhanging riparian trees, stumps, logs, and established large rip rap along all of the project's shoreline so as not to reduce habitat loss for aquatic species. If it is deemed necessary to disturb or impact these areas, mitigation measures should be taken to enhance or add shoal areas and riparian vegetation elsewhere. Consultation with TDEC and TWRA would be required.

- If it is deemed necessary to alter the shoreline in anyway, all proposed riverfront stabilizations, alterations, and enhancements will require Shoreline Construction permits from TVA. Section 26a of the TVA Act requires that TVA approval be obtained before any construction activities can be carried out that affect navigation, flood control, or public lands along the shoreline of the TVA reservoirs or in the Tennessee River or its tributaries. The permit process is divided into two categories: minor projects and major projects. Portions of the proposed Project 2 may fall into the “major projects” category. According to TVA, “major projects and facilities” include: commercial marinas, community docks, barge terminals and mooring cells, utility crossings, bridges, culverts, roads, wastewater discharges, water intakes and sewage outfalls, dredging, placement of fill, and others.
- The need for additional bank stabilization may cause sediment loading and potential release of contaminants into the Tennessee River and Goose Creek. Consultation with TDEC may be required.
- A NPDES Storm Water Construction Permit is required if more than one acre of land will be disturbed by clearing, grading, or excavation. In addition, any time the ground is cleared, graded, or excavated, standard erosion control practices, such as silt fences, staked hay bales, or coffer dams, should be employed to prevent sediment from entering the creek and river during construction phases. Consultation with TDEC to apply for this permit will be required.

8.3 Project 3 – Pedestrian Bridge

This site can be divided into two sections: south bank of the Tennessee River near Specialty Metals and the north bank on the campus of the University of Tennessee (UT). See Figure 8 below. Photographs for this project site are located in Appendix C.

Figure 8. Project 3 area – Pedestrian Bridge.



8.3.1 Topography

The south-side is relatively flat with elevation ranging from 810 to 820 ft msl. The north-side is steeper. The property rises from 820 to 860 ft msl from the river over Neyland Drive to the UT parking lot area.

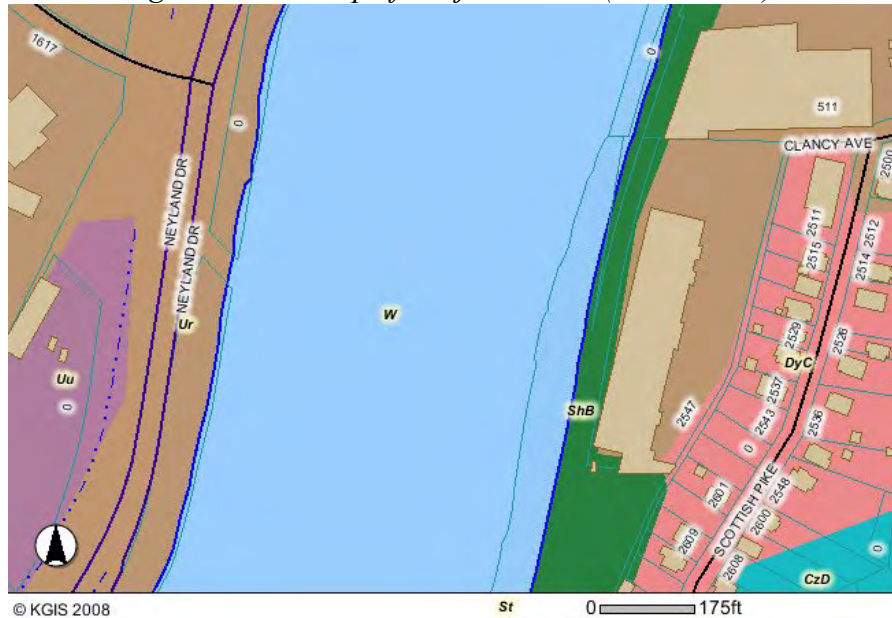
8.3.2 Geology and Soils

Table 5 and Figure 9 below (sources: KGIS map © 2008 of NRCS data from 2004 Knox County Soil Survey) lists the types of soils located on the Project 3 site.

Table 5. Soils located in the Project 3 area (NRCS 2004).

Project 3 – Pedestrian Bridge		
Soil Description	Map Symbol	Listed by NRCS as Hydric Soil?
Shady Loam, 2 - 5 % slopes	ShB	no
Urban Land	Ur	no
Urban Land-Udorthents Complex	Uu	no

Figure 9. Soil map of Project 3 area (NRCS 2004).



8.3.3 Surface Waters, Wetlands, and Floodplains

This project crosses the Tennessee River. Proposed bridge footings on the south bank would be located within the 100-year and 500-year floodplain of the Tennessee River. Proposed bridge footings on the north bank are not located in a floodplain. There are no wetlands located on this project site.

8.3.4 Plant Species

Protected plant species: No threatened or endangered plant species were observed on this project site on the day of the site visit and none is known to exist at this project site.

Common plant species: Along the southern riverbank, large riparian trees such as sycamore and slippery elm are present with the tree canopy giving cover to the riverbank and shoal area. Numerous partially submerged logs and stumps covered with mosses line the river bank. Algae and species of submerged aquatic plants were observed in shallow river bottom areas where sunlight was more prevalent through the tree canopy along the banks. The UT parking lot area and Neyland Drive on the northern bank are urban environments. Oaks, maples, and grasses sparsely populate the western end of the parking lot area where the proposed bridge footing would be placed.

8.3.5 Animal Species

Protected animal species: No threatened or endangered animal species were observed on this project site on the day of the site visit and none is known to exist at this project site.

Common animal species: Animals observed along the southern river bank during the site visit included Canada geese swimming along the riverbank and sunfish/bluegills. Smaller minnows and shiners were also observed in the areas with logs and stumps. American crows were observed on the north side of this project (UT parking lot).

Invasive animal species: *Corbicula* invasive clam species were observed in the shoal area. House sparrows and pigeons were observed in the UT parking lot (north side of this project).

8.3.6 Habitat Ecology

Critical habitat for protected species: No evidence for or favorable habitat for state or federally listed species was observed during the site visit. No critical habitats designated by USFWS exist within the project area.

Habitat descriptions for the south side of the project:

- Tennessee River 100-year and 500-year floodplain
- Large riparian trees along the south bank, tree roots, stumps, and logs offer shade as well as feeding, spawning, and nursery areas to aquatic species
- Shoals on the south bank offer feeding and spawning areas
- Established rip rap offer feeding, spawning, and nursery areas

Habitat descriptions for the north side of the project:

- Urban/Industrial with roads, parking lot, and buildings offer no habitat
- Sparsely vegetated area offer limited habitat

8.3.7 Area(s) of Concern Identified

Areas of Concern for environmental impairment from the proposed pedestrian bridge and riverbank stabilization:

- will cross the Tennessee River;
- will occur within the 100-year and 500-year floodplain of the Tennessee River on the south bank;
- may potentially increase sediment loading and release contaminants into the Tennessee River;
- will alter the banks and shoreline of the Tennessee River;
- may adversely impact the south bank which has a shoal area, large overhanging riparian trees, stumps, logs, and established large rip rap currently used by fish and aquatic invertebrates for feeding, spawning, and nurseries.

Items for consideration:

- The proposed bridge will cross over the Tennessee River and require permitting from the U.S. Coast Guard (USCG), USACE, and TVA.

- It is recommended that the project be done in a manner that will minimize the loss of shoal areas, large overhanging riparian trees, stumps, logs, and established large rip rap along all of the project's shoreline so as not to reduce habitat loss for aquatic species. If it is deemed necessary to disturb or impact these areas, mitigation measures should be taken to enhance or add shoal areas and riparian vegetation elsewhere. Consultation with TDEC and TWRA would be required.

- If it is deemed necessary to alter the shoreline in any way all proposed riverfront stabilizations, alterations, and enhancements will require Shoreline Construction permits from TVA. Section 26a of the TVA Act requires that TVA approval be obtained before any construction activities can be carried out that affect navigation, flood control, or public lands along the shoreline of the TVA reservoirs or in the Tennessee River or its tributaries. The permit process is divided into two categories: minor projects and major projects. Portions of proposed Project 3 may fall into the "major projects" category. "Major projects and facilities" include: commercial marinas, community docks, barge terminals and mooring cells, utility crossings, bridges, culverts, roads, wastewater discharges, water intakes and sewage outfalls, dredging, placement of fill, and others.

- The need for additional bank stabilization may cause sediment loading and potential release of contaminants into the Tennessee River. Consultation with TDEC may be required.

- A NPDES Storm Water Construction Permit is required if more than one acre of land will be disturbed by clearing, grading, or excavation. In addition, any time the ground is cleared, graded, or excavated, standard erosion control practices, such as silt fences, staked hay bales, or coffer dams, should be employed to prevent sediment from entering the river during construction phases. Consultation with TDEC to apply for this permit will be required.

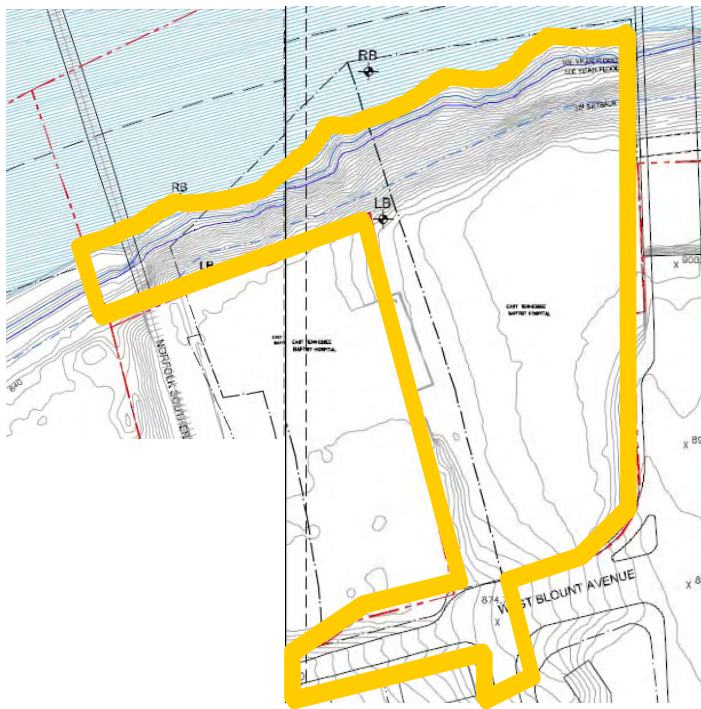
8.4 Project 4 – City View Condominiums

This site was not evaluated. A Final Environmental Assessment (EA) dated 29 September 2006 and Finding on No Significant Impact (FONSI) dated 8 November 2006 have already been issued for this site.

8.5 Project 5 – Henley Gateway

This site is comprised of a small portion of land along the Tennessee River located between the City View Condominiums (Project 4) and the Henley Street Bridge, north of West Blount Avenue. This site contains a forested limestone bluff and shoal area along the river. The lower portion of the employee parking lot for Baptist Hospital is also contained in this site. See Figure 10 below. Photographs for this project area are located in Appendix B.

Figure 10. Project 5 – Henley Gateway (approximate area outlined in yellow).



8.5.1 Topography

This site contains a steep limestone bluff, shallow shoal area, and a relatively flat area. The limestone bluff has a nearly vertical slope in some places. At the top of the bluff the elevation is approximately 860 ft msl. The elevation of the shoal area below is approximately 815 ft msl. The elevation on the eastern side of the flat area next to the Norfolk Southern Railroad tracks is approximately 830 ft msl. The small portion west of the railroad tracks is also approximately 830 ft msl.

8.5.2 Geology and Soils

Table 6 and Figure 11 below (source: source: KGIS map © 2008 of NRCS data from 2004 Knox Soil Survey) lists the types of soils located on the Project 5 site.

Table 6. Soils located in the Project 5 area (NRCS 2004).

Project 5 – Henley Gateway		
Soil Description	Map Symbol	Listed by NRCS as Hydric Soil?
Marbledale-Etowah Complex, 12-25% slopes	MeD	no
Urban Land	Ur	no
Loyston-Talbott-Rock Outcrop Complex, 15-50% slopes	LtD	no
Etowah Loam, 2-5 % slopes	EtB	no

Figure 11. Map of soils in the Project 5 area (NRCS 2004).



8.5.3 Surface Waters, Wetlands, and Floodplains

This site contains shoreline along the Tennessee River for its entire length. There are no wetlands on this site. The shoal areas of this site lie completely within the 100-year floodplain of the Tennessee River. Some of the limestone bluff areas adjacent to the river also lie within the 100-year and 500-year floodplains. The water depth ranges from approximately 5-15 feet deep along this bluff and shoal line.

8.5.4 Plant Species

Protected plant species: No threatened or endangered plant species were observed on this project site on the day of the site visit and none is known to exist at this project site.

Common plant species: The forested limestone bluff west of the Henley Street Bridge is vegetated with shrubs, trees, and herbaceous plants that provide a stretch of natural shade and beauty at the rivers' edge (see photos BT-39 through BT-42). Overhanging trees, stumps and logs provide fish habitat. The forested area includes a mix of native and invasive species of trees and woody shrubs. Mosses cover the limestone bluff area here. The forested area is dominated by native Shumard red oak (*Quercus shumardii*). The vegetation located in the western portion near the railroad tracks contains a mix of oaks and maples which line either side of the bottom of the railroad embankment.

Invasive plant species: The invasive species found in the area includes: mimosa, princess tree, tree of heaven, Amur honeysuckle, Japanese honeysuckle, English ivy, and trailing euonymus.

8.5.5 Animal Species

Protected animal species: No threatened or endangered animal species were observed on this project site on the day of the site visit and none is known to exist at this project site.

Common animal species: Various common songbirds such as cardinals and mockingbirds were observed in the forested bluff area. The vegetation and crevices in the rock face offer habitat for small rodents, reptiles, and amphibians as well. The shoal area underneath the bluff is shaded by the overhanging tree canopy and offers habitat for fish and aquatic invertebrates.

Invasive animal species: House sparrows, pigeons, and feral cats were observed in the forested bluff area. The invasive clam species *Corbicula* was observed in the shoal area.

8.5.6 Habitat Ecology

Critical habitat for protected species: No evidence for or favorable habitat for state or federally listed species was observed during the site visit. No critical habitats designated by USFWS exist within the project area.

Habitat Descriptions:

- Forested limestone bluff offers vegetative habitat and rock crevices
- Shoals area offers feeding and spawning areas for aquatic wildlife
- Urban/industrial areas (parking lot and railroad) offer no habitat
- Borders of trees along railroad tracks offer limited vegetative habitat

The forested limestone bluff offers vegetative cover to birds, small mammals, reptiles, insects, and amphibians. The crevices in the rock face offer habitat for these animals as well. The shoal area underneath the bluff is shaded by the overhanging tree canopy. The trees, submerged stumps, and logs provide aquatic habitat. The riverbank has been stabilized with large rip rap for much of the length of the project. Sandy/mud shoals are present in areas where rip rap has not been placed that provide habitat, food, and spawning areas for fish and other aquatic organisms when the water levels are raised.

8.5.7 Area(s) of Concern Identified

Areas of Concern for environmental impairment from the proposed pier and stairway to the floating riverwalk:

- will occur on the Tennessee River;
- will occur within the 100-year and 500-year floodplain of the Tennessee River;
- may potentially increase sediment loading and release contaminants into the Tennessee River;
- may adversely affect forested limestone bluff;
- will alter the banks and shoreline of the Tennessee River; and
- may adversely impact the riverbank which has a forested limestone bluff, shoal area, large overhanging riparian trees, stumps, logs, and established large rip rap currently used by terrestrial and aquatic wildlife.

Items for consideration:

- The aesthetic value and habit availability of the forested limestone bluff area between the Henley Street Bridge and the railroad bridge is unique in the south waterfront area and adverse impacts to this forested area should be reduced as much as possible. Construction of the pier and access to the floating stairway should be conducted with the goal of providing waterfront access and maintaining as much of the forested limestone bluff area as possible.
- It is recommended that the project construction be conducted in a manner that will minimize the loss or degradation of the following features so as to reduce habitat loss for wildlife species:
 - trees in the forested limestone bluff area,
 - the face of limestone bluff,
 - shoal area,
 - large overhanging riparian tree branches, stumps, logs, and
 - established large rip rap along the project's shoreline.

If it is deemed necessary to disturb or impact these areas, mitigation measures should be taken to enhance or add shoal areas and riparian vegetation elsewhere to minimize habitat loss. Consultation with TDEC and TWRA would be required.

- If it is deemed necessary to alter the shoreline in any way all proposed riverfront stabilizations, alterations, and enhancements will require Shoreline Construction permits from TVA. Section 26a of the TVA Act requires that TVA approval be obtained before any construction activities can be carried out that affect navigation, flood control, or public lands along the shoreline of the TVA reservoirs or in the Tennessee River or its tributaries. The permit process is divided into two categories: minor projects and major projects. Portions of proposed Project 3 may fall into the "major projects" category. "Major projects and facilities" include: commercial marinas, community docks, barge terminals and mooring cells, utility crossings, bridges, culverts, roads, wastewater

discharges, water intakes and sewage outfalls, dredging, placement of fill, and others.

- The need for additional bank stabilization may cause sediment loading and potential release of contaminants into the Tennessee River. Consultation with TDEC may be required.
- A NPDES Storm Water Construction Permit is required if more than one acre of land will be disturbed by clearing, grading, or excavation. In addition, any time the ground is cleared, graded, or excavated, standard erosion control practices, such as silt fences, staked hay bales, or coffer dams, should be employed to prevent sediment from entering the river during construction phases. Consultation with TDEC to apply for this permit will be required.

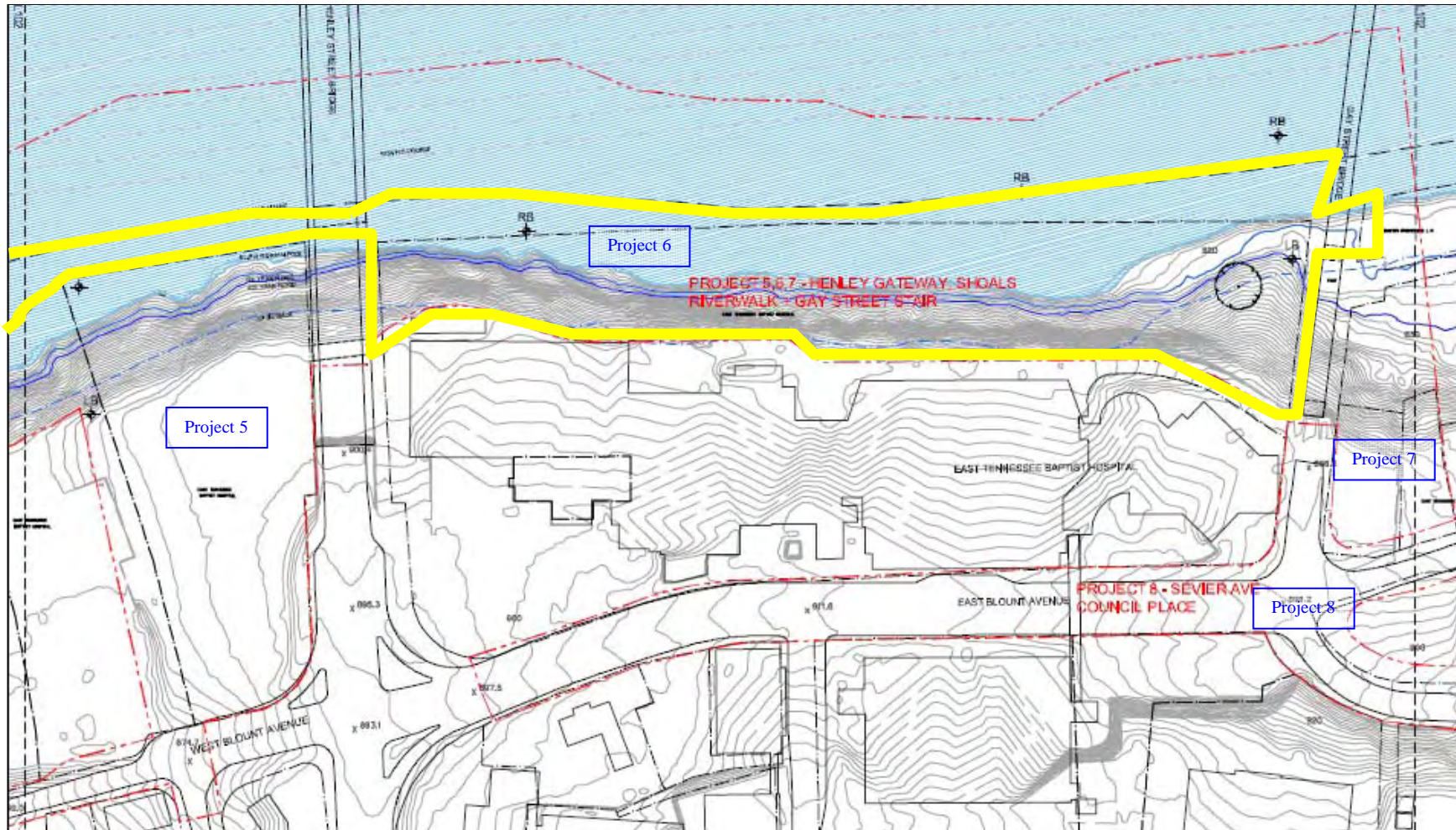
8.6 Project 6 – Shoals Riverwalk

This site contains limestone bluffs and shoals. The western portion of Project 6 is located in the portion of the Tennessee River directly offshore from Project 5 between the Norfolk Southern Railroad and Henley Street Bridges. The eastern portion of Project 6 contains the kudzu covered limestone bluff and shoal area and the portion of the Tennessee River directly offshore from it. This eastern portion is located north of Baptist Hospital in between the Henley Street Bridge and just east of the Gay Street Bridges. Figure 12 shows the Project 6 area. Photographs of Project 6 are located in Appendices B and C.

8.6.1 Topography

There are two main topographical features characterizing this site: a steep limestone bluff and shallow shoal area. The topography of the land on top of the bluff is relatively flat and the average elevation is approximately 880 ft msl. On top of the bluff, there is a gentle downward slope from east to west (from the Gay Street Bridge towards the Norfolk Southern Railroad Bridge) ranging in elevation from approximately 890 ft msl to 860 ft msl. The slope of the limestone bluff is nearly vertical in some places. Elevation of the bluff area ranges from approximately 815 ft msl at the river's edge to approximately 890 ft msl at the entrance to the Gay Street Bridge. The shallow shoal area at the bottom of the bluff is relatively flat and averages 815 ft msl in elevation.

Figure 12. Project 6 – Shoals Riverwalk (approximate boundary highlighted in yellow).



8.6.2 Geology and Soils

Table 7 and Figure 13 below (source: KGIS map © 2008 of NRCS data from 2004 Knox Soil Survey) lists the types of soils located on the Project 6 site.

Table 7. Soils located in the Project 6 area (NRCS 2004).

Project 6 – Shoals Riverwalk		
Soil Description	Map Symbol	Listed by NRCS as Hydric Soil?
Loyston-Talbott-Rock Outcrop Complex, 15-50 % slopes	LtD	no
Urban Land	Ur	no
Corryton-Udorthents-Urban Land Complex, 12-25% slopes	CzD	no

Figure 13. Soil map of Project 6 area (NRCS 2004).



8.6.3 Surface Waters, Wetlands, and Floodplains

This site contains shoreline along the Tennessee River for its entire length. There are no wetlands on this site. The shoal areas of this site lie completely within the 100-year floodplain of the Tennessee River. Some of the limestone bluff areas adjacent to the river also lie within the 100-year and 500-year floodplains.

The western portion of Project 6 is located in the Tennessee River. The water depth in this area ranges from approximately 5-15 feet deep. Overhanging trees and submerged stumps and logs in the Project 5 area provide fish habitat in the Project 6 area (see photos BT-39 through BT-42). The riverbank has been stabilized with large rip rap in some areas of the project. Sandy/mud shoals are present in areas where rip rap has not been placed that provide habitat, food, and spawning areas for fish and other aquatic organisms when the water levels are raised.

The kudzu-covered limestone bluff and shoal area to the east of the Henley Street Bridge offers no vegetative cover or submerged stumps/logs. A sandy/mud shoal area is present in the eastern portion of Project 6 and has no rip rap in place. When the water levels are raised in the summer months, this offers a feeding and spawning area for fish and aquatic invertebrates. During the site visit, water depth in this area ranged from 1 to 10 feet.

8.6.4 Plant Species

Protected plant species: No threatened or endangered plant species were observed on this project site on the day of the site visit and none is known to exist at this project site.

Common plant species: The Tennessee River at Project 6 is surrounded by commercial and industrial properties. The river bank in front of Baptist Hospital (east of the Henley Street Bridge) is a limestone bluff leading approximately 50 vertical feet up from the river to the hospital access road (see photos BT-29 through BT-36). Kudzu covers all of the bluff face in this area of the project and no other terrestrial vegetation is present.

Invasive plant species: Kudzu is an invasive vine species that aggressively has taken over the entire face of the limestone bluff.

8.6.5 Animal Species

Protected animal species: No threatened or endangered animal species were observed on this project site on the day of the site visit and none is known to exist at this project site.

Common animal species: Groundhogs have an extensive burrow system in the kudzu limestone bluff east of the Henley Street Bridge. Mallard ducks, Canada geese, common coots, and a great blue heron were observed in the river, under the bridges, and in the shoal area.

Invasive animal species: The invasive Asian clam *Corbicula* is present in the shoal area. Pigeons were observed roosting under the bridges.

8.6.6 Habitat Ecology

Critical habitat for protected species: No evidence for or favorable habitat for state or federally listed species was observed during the site visit. No critical habitats designated by USFWS exist within the project area.

Habitat descriptions:

- Tennessee River provides aquatic habitat
- Shoals offer feeding and spawning areas to aquatic wildlife
- Kudzu-covered limestone bluffs offers limited habitat
- Urban/industrial area, hospital, and parking areas offer no habitat

There is a very high proportion of hardscape in the Project 6 area which is characterized as urban/industrial. The bluff habitat is steep and covered by the highly invasive vine

species kudzu and has signs of erosion. Groundhog activity on the bluff has also increased degradation of the bluff. Below the bluff is a shallow shoal area offering feeding and spawning areas to fish and aquatic invertebrates. A small area of low ground abuts the river on the east end of the property just under the Gay Street Bridge but does not offer much habitat since it is urbanized.

8.6.7 Area(s) of Concern Identified

Areas of Concern for environmental impairment from the proposed riverwalk and overlook:

- will occur on the Tennessee River;
- will occur within the 100-year and 500-year floodplain of the Tennessee River;
- may potentially increase sediment loading and release contaminants into the Tennessee River;
- may require stabilization measures to prevent further erosion from the already degraded limestone bluff in front of Baptist Hospital;
- will alter the banks and shoreline of the Tennessee River;
- may adversely impact the shoal area currently used by terrestrial and aquatic wildlife; and
- will require control measures to eradicate or reduce the presence of the existing aggressive terrestrial invasive vine species kudzu.

Items for consideration:

- If it is deemed necessary to disturb or alter the shoreline, TVA Shoreline Construction permits will be required for the proposed walkways and bridges. Section 26a of the TVA Act requires that TVA approval be obtained before any construction activities can be carried out that affect navigation, flood control, or public lands along the shoreline of the TVA reservoirs or in the Tennessee River or its tributaries. The permit process is divided into two categories, minor projects and major projects. Portions of proposed Project 6 may fall into the “major projects” category. “Major projects and facilities” include: commercial marinas, community docks, barge terminals and mooring cells, utility crossings, bridges, culverts, roads, wastewater discharges, water intakes and sewage outfalls, dredging, placement of fill, and others.
- The need for additional bank stabilization may cause sediment loading and potential release of contaminants into the Tennessee River. Consultation with TDEC may be required.
- It is recommended that the project construction be conducted in a manner that will minimize the loss or degradation of the shoal areas in Projects 5 and 6 and the forested limestone bluff located in Project 5. Measures should be taken to protect these areas as the floating walkway is constructed to reduce sediment loading and erosion. If it is deemed necessary to disturb or impact these areas, mitigation

measures should be taken to enhance or add shoal areas and riparian vegetation elsewhere to minimize habitat loss.

- TWRA and/or USFWS should be contacted concerning potential impacts to aquatic wildlife which may exist once the floating walkway is in place such as alterations to habitats, available light, temperatures in shallow areas, and water flow patterns.
- A NPDES Storm Water Construction Permit is required if more than one acre of land will be disturbed by clearing, grading, or excavation. In addition, any time the ground is cleared, graded, or excavated, standard erosion control practices, such as silt fences, staked hay bales, or coffer dams, should be employed to prevent sediment from entering the river during construction phases. Consultation with TDEC to apply for this permit will be required.

8.7 Project 7 – Gay Street Stairway

This small site is the small area located on the east side of the Gay Street Bridge and south towards Council Place. It includes a parking area for Baptist Hospital. See Figure 14 below. Photographs for Project 7 are located in Appendices B and C.

Figure 14. Project 7 – Gay Street Stairway (approximate area highlighted in yellow).



8.7.1 Topography

The site elevation at the northern end of the project is approximately 825 ft msl. From north to south, there is a steep limestone bluff area. The elevation on top of the bluff is approximately 885 ft msl. On top of the bluff, the land is relatively flat.

8.7.2 Geology and Soils

Table 8 and Figure 15 below (source: KGIS map © 2008 of NRCS data from 2004 Knox Soil Survey) lists the types of soils located on the Project 7 site.

Table 8. Soils located in the Project 7 area (NRCS 2004).

Project 7 – Gay Street Stairway		
Soil Description	Map Symbol	Listed by NRCS as Hydric Soil?
Loyston-Talbott-Rock Outcrop Complex, 15-50 % slopes	LtD	no
Urban Land	Ur	no
Corryton-Udorthents-Urban Land Complex, 12-25% slopes	CzD	no

Figure 15. Soil map of the Project 7 area (NRCS 2004).



8.7.3 Surface Waters, Wetlands, and Floodplains

This site is located approximately 100 feet south of the Tennessee River. There are no wetlands on this site. The northeastern corner of this property lies within the 500-year floodplain of the Tennessee River.

8.7.4 Plant Species

Protected plant species: No threatened or endangered plant species were observed on this project site on the day of the site visit and none is known to exist at this project site.

Common plant species: Kudzu, maintained grass lawns, and few sparsely located trees (poplar, princess tree) are the only vegetation on this site.

Invasive plant species: Kudzu has covered the limestone bluff. Princess tree is present on the site.

8.7.5 Animal Species

Protected animal species: No threatened or endangered animal species were observed on this project site on the day of the site visit and none is known to exist at this project site.

Common animal species: Groundhogs have an extensive burrow system in the kudzu covered limestone bluff.

Invasive animal species: Pigeons were observed in the parking lot on this site.

8.7.6 Habitat Ecology

Critical habitat for protected species: No evidence for or favorable habitat for state or federally listed species was observed during the site visit. No critical habitats designated by USFWS exist within the project area.

Habitat descriptions: There is a kudzu covered limestone bluff; the remainder of the project site is urban/industrial hardscape.

8.7.7 Area(s) of Concern Identified

Areas of Concern for environmental impairment from the proposed stairway:

- will occur within the 500-year floodplain of the Tennessee River;
- may potentially increase sediment loading into the Tennessee River;
- may require stabilization measures to prevent further erosion from the already degraded limestone bluff; and
- will require control measures to eradicate or reduce the presence of the existing aggressive terrestrial invasive vine species kudzu.

Items for consideration:

- A NPDES Storm Water Construction Permit is required if more than one acre of land will be disturbed by clearing, grading, or excavation. In addition, any time the ground is cleared, graded, or excavated, standard erosion control practices, such as silt fences, staked hay bales, or coffer dams, should be employed to prevent sediment from entering the river during construction phases. Consultation with TDEC to apply for this permit will be required.

8.8 Project 8 – Sevier Avenue/Council Place Enhancement

Project 8 involves roads near Baptist Hospital and the Gay Street Bridge. Proposed improvements to East Blount Avenue (Figure 16) and its intersection with Gay Street, Sevier Avenue, and Council Place (Figure 17) involve areas surrounded by buildings. Photographs of this project site are located in Appendix B.

Figure 16. Project 8 – Sevier Avenue and Council Place Enhancement (western section).

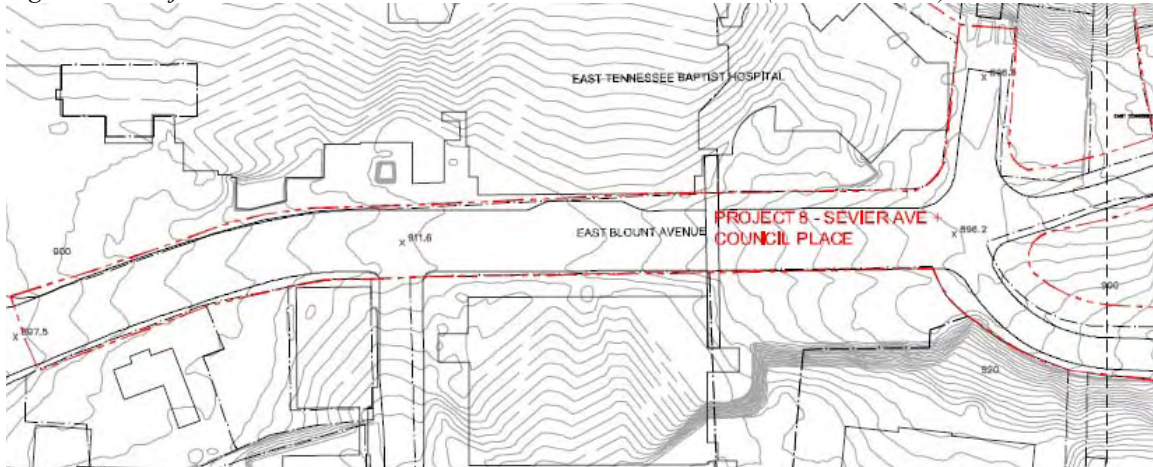


Figure 17. Project 8 – Sevier Avenue and Council Place Enhancement (eastern section).



8.8.1 Topography

This area is relatively flat. The average elevation is 885 ft msl.

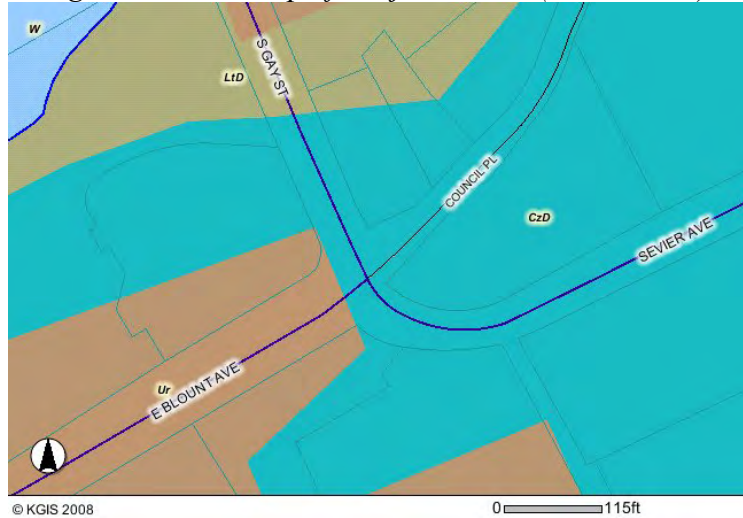
8.8.2 Geology and Soils

Table 9 and Figure 18 below (source: KGIS map © 2008 of NRCS data from 2004 Knox County Soil Survey) lists the types of soils located on the Project 8 site.

Table 9. Soils located in the Project 8 area (NRCS 2004).

Project 8 – Sevier Avenue & Council Place Enhancement		
Soil Description	Map Symbol	Listed by NRCS as Hydric Soil?
Urban Land	Ur	no
Corryton-Udorthents-Urban Land Complex, 12-25% slopes	CzD	no

Figure 18. Soil map of Project 8 area (NRCS 2004).



8.8.3 Surface Waters, Wetlands, and Floodplains

There are no surface waters, wetlands, or floodplains on this project site. However, the site lies approximately 200 feet from the Tennessee River.

8.8.4 Plant Species

Protected plant species: No threatened or endangered plant species were observed on this project site on the day of the site visit and none is known to exist at this project site.

This site is not vegetated.

8.8.5 Animal Species

Protected animal species: No threatened or endangered animal species were observed on this project site on the day of the site visit and none is known to exist at this project site.

No animals were observed on this site at the time of the site visit.

8.8.6 Habitat Ecology

Critical habitat for protected species: No evidence for or favorable habitat for state or federally listed species was observed during the site visit. No critical habitats designated by USFWS exist within the project area.

There is no habitat offered to wildlife at this project site.

8.8.7 Area(s) of Concern Identified

Areas of Concern for environmental impairment from the proposed road improvements:

- may potentially increase sediment loading into the Tennessee River.

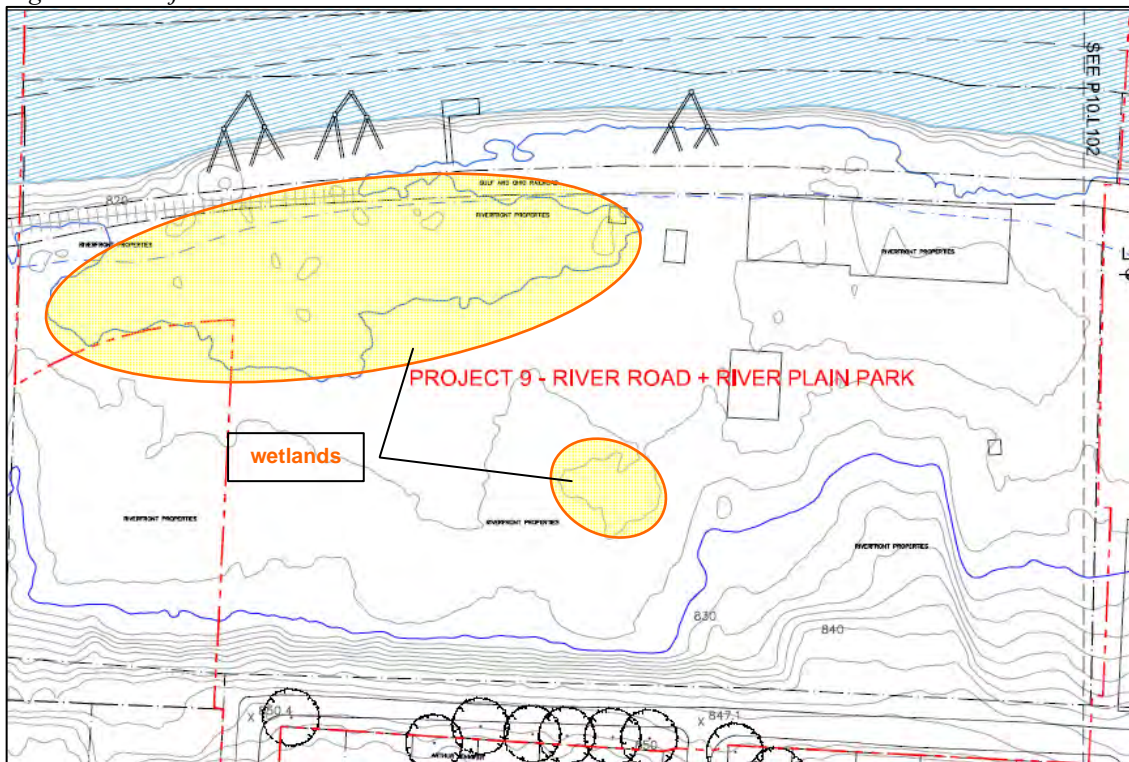
Items for consideration:

- A NPDES Storm Water Construction Permit is required if more than one acre of land will be disturbed by clearing, grading, or excavation. In addition, any time the ground is cleared, graded, or excavated, standard erosion control practices, such as silt fences, staked hay bales, or coffer dams, should be employed to prevent sediment from entering the river during construction phases. Consultation with TDEC to apply for this permit will be required.

8.9 Project 9 – River Road and River Plain Park

This site is located between the Tennessee River and Langford Avenue from Barber Street to Dixie Street. The site was formerly a fueling station run by Star Enterprises (Texaco). The Gulf and Ohio Railroad owns the railroad tracks located in the northern portion of the project site. Three metal barge docks and one wooden dock exist in the northern portion of the property on the Tennessee River. Two wetlands areas are located on this project site and are indicated by the orange outlined areas in Figure 19 below. Photographs for this project are located in Appendices B and C.

Figure 19. Project 9 area – River Road and River Plain Park.



8.9.1 Topography

This site contains a shoal area along its northern border with the Tennessee River. The shoal area is at approximately 815 ft msl. The site slopes up from the shoal to the railroad tracks which are at approximately 820 ft msl. Traveling from the railroad tracks north, the site is relatively flat and then slopes up towards Langford Road (from 825 ft msl to 845 ft msl). The average elevation throughout the main part of the project site is approximately 830 ft msl. The eastern portion of the property is paved and contains various buildings including a former fueling station. The western portion of the property has been filled in areas and contains several abandoned groundwater monitoring wells. Railroad tracks are located in the northern portion of the site.

8.9.2 Geology and Soils

Table 10 and Figure 20 below (source: KGIS map © 2008 of NRCS data from 2004 Knox County Soil Survey) lists the types of soils located on the Project 9 site. Although the survey does not list hydric soils on the property, the wetland areas should be investigated as possible hydric soils have developed in these areas since the soil survey.

Table 10. Soils located in the Project 9 area (NRCS 2004).

Project 9 – River Road and River Plain Park		
Soil Description	Map Symbol	Listed by NRCS as Hydric Soil?
Urban Land	Ur	no
Dewey-Udorthents-Urban Land Complex, 2-12% slopes	DyC	no

Figure 20. Soil map of the Project 9 area (NRCS 2004).



8.9.3 Surface Waters, Wetlands, and Floodplains

The northern portion of this site contains shoal areas and lies along the Tennessee River. There are two wetlands areas located on the site (see Figure 19). The larger wetland site is approximately 1.5 acres while the smaller one is approximately 0.125 acres. The project site lies within the 100-year and 500-year floodplain of the Tennessee River.

The property of Project 9 that is sited to become the River Plain Park sits on a former industrial site with evidence of past groundwater monitoring activities and filling of areas with gravel. The major existing structures remaining on the property include: a large one-story building with garages and loading docks; a storage shed; and a covered cement

area surrounded by French drains that were most likely a former fueling area. Stains of residual oils on the concrete driveway in front of the storage shed and on the concrete floor of the shed was observed during the site visit. There are several railroad tanker cars and box cars parked on the Gulf and Ohio railroad tracks at the north side of the property adjacent to the river. Three large, metal, barge-docking structures and a wooden pier reach out into the Tennessee River from the riverbank. Water levels near the shore of the river ranged from approximately 5 feet deep at the eastern portion of the property to approximately 14 feet in front of the barge-docking structures (photo BT-21) and then tapering to a shallow 4 feet deep off a small shoal area at the western edge of the property.

Aquatic ecological features on the site include a small mud flat approximately 60 feet in length at the north west corner of the property leading out to the shoal area in the river (see photo BT-24). Invasive Asiatic clams (*Corbicula fluminea*) were found here along with a single relic of a pink papershell heelsplitter mussel (*Potamilus oniensis*) (see photo 9-59). *Potamilus oniensis* live in silt, mud or sand in medium to large rivers and are listed as “sporadically occurring” in the Tennessee River. *Potamilus oniensis* has a “secure” conservation status, meaning that it is not threatened or vulnerable to extinction at this time. Several raccoon and great blue heron tracks were seen along the bank line as well. Large, boulder-size rip rap cover the eastern portion of the shoreline from east of the metal barge docks to the property edge.

Two wetlands are located on the main property. The larger of the two is found within the 100-year flood plain on the northwest side of property. Stands of willows and hard pan soils covered the west section of the wetland. Standing water was present in this wetland at the time of the site visit on 12 March 2008 (see photos 9-17 through 9-22). The second smaller wetland is located within the 500-year floodplain, just south west of the middle of the property. Standing water was also present in this wetland (see photo 9-37). Rainfall had not occurred within a 48-hour period prior to the site visit.

An outfall for the former Star Enterprise’s Industrial Stormwater discharges exists on the property. According to EPA, NPDES permit # TN0067156 at river mile (RM) 648.2 was last active on this site in 2003. The adjacent Marathon Oil property has an active NPDES permit for discharges (TN0067181) at RM 648.0.

8.9.4 Plant Species

Protected plant species: No threatened or endangered plant species were observed on this project site on the day of the site visit and none is known to exist at this project site.

Common plant species: Facultative wetland plants such as *Spartina spp.* and *Juncus spp.* are present in both wetlands areas. The hardpan soil portion of the larger wetlands contains willows. Sumac is also sporadically present throughout the larger wetland area.

The area between Langford Avenue and the railroad includes some hardscape, but most of the project site is a fescue field undergoing old field succession that is now being

invaded by woody plants and other herbaceous plants. The steep road bank between Langford Avenue and the former fescue field is occupied by hardwood forest which includes mostly native species of oak, hickory, and maple. The narrow strip of land between the railroad and the reservoir shore is covered by a mixture of exotic and native weedy plants, especially blackberry and honeysuckle.

Invasive plant species: Amur honeysuckle, Japanese honeysuckle, Himalayan blackberry, callery pear, *Sericea lespedeza*, and red-tip photinia.

8.9.5 Animal Species

Protected animal species: No threatened or endangered animal species were observed on this project site on the day of the site visit and none is known to exist at this project site.

Common animal species: During the site visit, the following animals or evidence of their use of the property was observed: Eastern cottontails, field sparrows, red-winged blackbirds, mockingbirds, American crows, great blue herons, mallard ducks, Canada geese, common coots, papershell heelsplitter mussel, box turtles, land snails, gray foxes, raccoons, and Southeastern chorus frogs (*Pseudacris feriarum*).

Invasive animal species: The invasive Asian clam (*Corbicula spp.*) was observed in the shoal area. Evidence of feral dogs was noted throughout the site.

8.9.6 Habitat Ecology

Critical habitat for protected species: No evidence for or favorable habitat for state or federally listed species was observed during the site visit. No critical habitats designated by USFWS exist within the project area.

Habitat descriptions: The property is urban/industrial with ongoing old field succession of a former fescue field bordered by a mix of hardwood trees. Two wetlands areas (one 1.5 acres and one 0.125 acres) are present in the floodplain areas. A shoal area exists along the northern portion of the property. The non-industrial part of the site is currently used by common species of birds, small mammals, amphibians, and reptiles. The shoal area offers aquatic feeding and spawning habitat for fish and invertebrates. Waterfowl also make use of the shoal area for feeding.

8.9.7 Area(s) of Concern Identified

Areas of concerns for environmental impairment for the proposed road improvements and riverside park:

- may adversely impact the two wetlands areas;
- will occur on the Tennessee River;
- will occur within the 100-year and 500-year floodplain of the Tennessee River;
- may potentially increase sediment loading and contaminant release into the Tennessee River;
- will alter the bank and shoreline of the Tennessee River; and

- may adversely impact the shoal area currently used by fish and aquatic invertebrates for feeding and spawning.

Items for consideration:

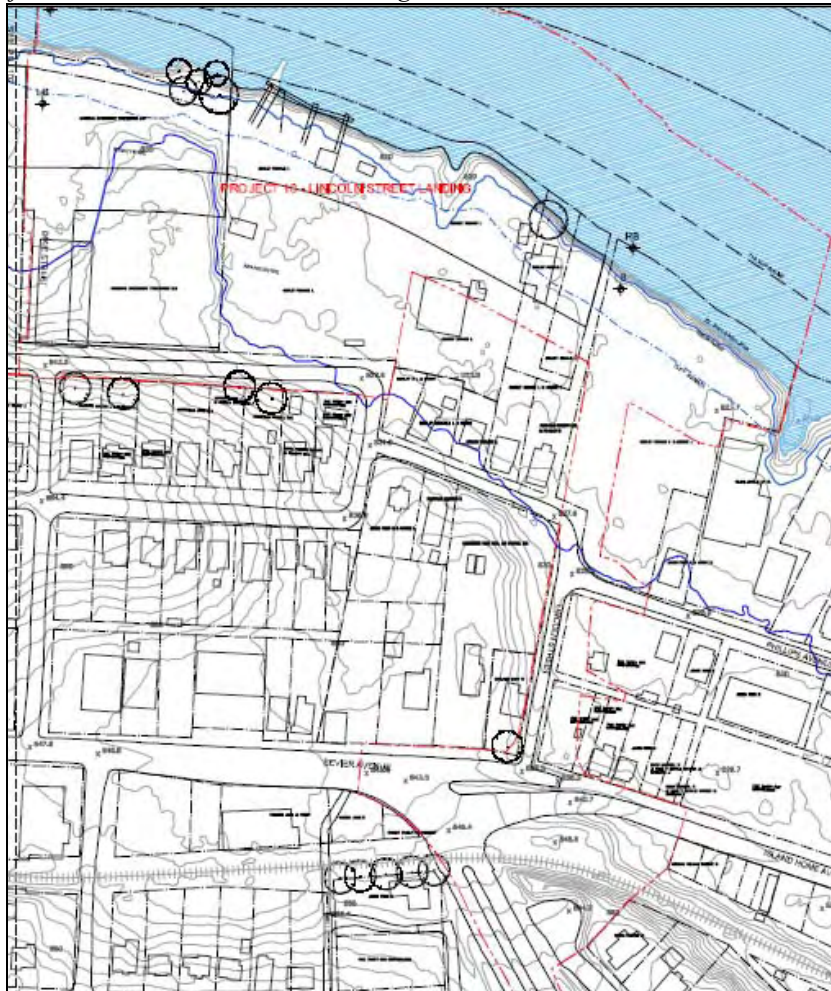
- Construction in, and disturbance of, the two noted wetland areas on the site should be avoided if at all possible. If deemed necessary to disturb or impact these wetland areas, an ARAP and consultation with TDEC will be required and mitigation measures will need to be implemented. USACE will require a permit for the alteration, filling, or construction in wetlands over 1 acre.
- It is recommended that the project be done in a manner that will minimize the loss of shoal areas along all of the project's shoreline so as not to reduce habitat loss for aquatic species. If it is deemed necessary to disturb or impact these areas, mitigation measures should be taken to enhance or add shoal areas and riparian vegetation elsewhere. Consultation with TDEC and TWRA would be required.
- Riverfront stabilizations, alterations, and enhancements will require Shoreline Construction permits from TVA. Section 26a of the TVA Act requires that TVA approval be obtained before any construction activities can be carried out that affect navigation, flood control, or public lands along the shoreline of the TVA reservoirs or in the Tennessee River or its tributaries. The permit process is divided into two categories, minor projects and major projects. Portions of proposed Project 9 may fall into the "major projects" category. "Major projects and facilities" include: commercial marinas, community docks, barge terminals and mooring cells, utility crossings, bridges, culverts, roads, wastewater discharges, water intakes and sewage outfalls, dredging, placement of fill, and others
- The need for additional bank stabilization may cause sediment loading and potential release of contaminants into the Tennessee River. Consultation with TDEC may be required.
- A NPDES Storm Water Construction Permit is required if more than one acre of land will be disturbed by clearing, grading, or excavation. In addition, any time the ground is cleared, graded or excavated, standard erosion control practices, such as silt fences, staked hay bales, or coffer dams, should be employed to prevent sediment from entering the river during construction phases. Consultation with TDEC would be required.

8.10 Project 10 – Lincoln Street Landing

This project site is located at the eastern end of Langford Avenue where it intersects with Phillips Avenue. It is located in a residential and industrial setting along the Tennessee River. A metal barge dock and a floating dock are located in the northwestern portion of the property. A boat ramp is located in the northern middle section of the site. The northeastern portion of the property contains a grassy area with large trees. The southern portion of the property contains property along Lincoln Street and the intersection of Lincoln Street, Sevier Avenue, and Island Home Avenue. See Figure 21 below. Photographs of this project site are located in Appendices A and C.

Project 10 would be constructed on property currently used for light industry. Numerous storage structures and open storage areas are on site storing metal, equipment, boats, and construction materials. A metal barge dock and pier extend out into the river on the western portion of the property (photo BT-13). An old concrete boat ramp leads down to the river (photo BT-11).

Figure 21. Project 10 area – Lincoln Street Landing.



8.10.1 Topography

This site is relatively flat and gently slopes down to the Tennessee River. From the shoal area along its northern border with the Tennessee River at approximately 815 ft msl towards Langford Avenue and Phillips Avenue, the site slopes up to 835 ft msl. The average elevation throughout the main part of the project site is approximately 830 ft msl. Traveling south from the intersection of Phillips Avenue with Lincoln Street towards Sevier Avenue and Island Home Avenue, the elevation changes from approximately 835 ft msl to 845 ft msl.

8.10.2 Geology and Soils

Table 11 and Figure 22 below (source: KGIS map © 2008 of NRCS data from 2004) lists the types of soils located on the Project 10 site.

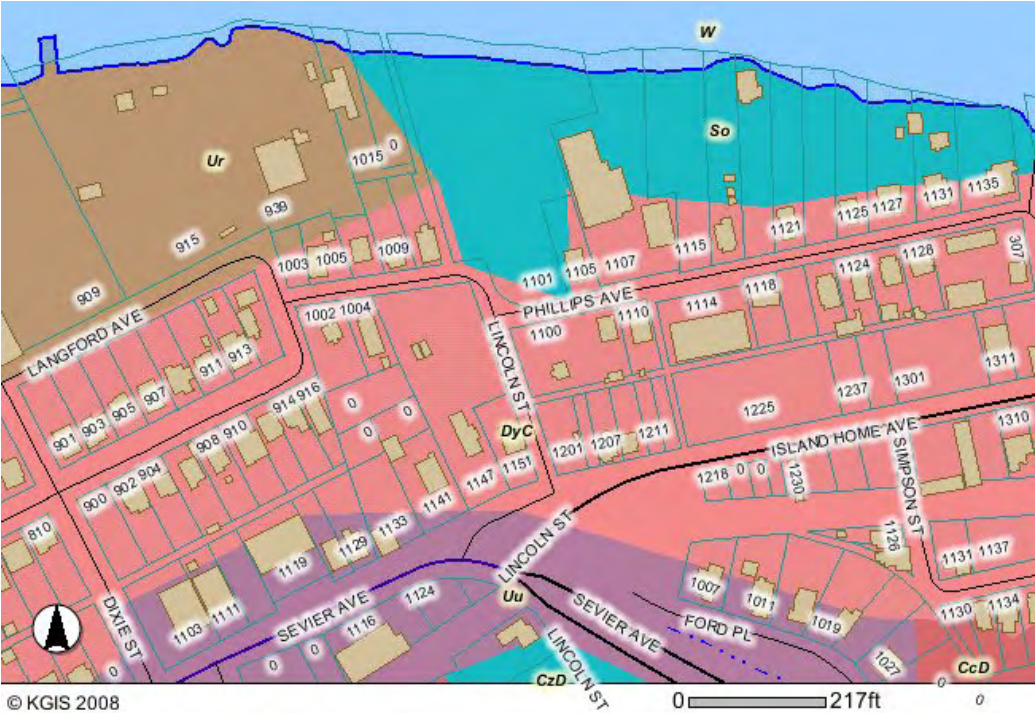
Table 11. Soils located on Project 10 area (NRCS 2004).

Project 10 – Lincoln Street Landing		
Soil Description	Map Symbol	Listed by NRCS as Hydric Soil?
Urban Land	Ur	no
Dewey-Udorthents-Urban Land Complex, 2 to 12 % slopes	DyC	no
Shady-Whitwell Complex, 0 to 3 % slopes, rarely flooded	So	no
Urban Land-Udorthents Complex	Uu	no

Figure 22. Soil map of Project 10 area (NRCS 2004).

South Knoxville Waterfront
Existing Natural Resources and Ecological Evaluation Report

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MAY 2008



8.10.3 Surface Waters, Wetlands, and Floodplains

Project 10 is located on the Tennessee River and is within its 100-year and 500-year floodplains. There are no wetlands located on this project site.

The eastern portion of the riverbank is predominately covered with large rip rap installed for bank stabilization. In the western portion of the shoreline, there are small areas of mud and low gradient banks leading out to shallow shoal areas under the barge dock and adjacent to the pier (photos BT 12 through BT 15). Water depths along the shore ranged from approximately 6 feet near the boat ramp to 12 feet deep off of the barge dock. The average depth is around 9 feet deep.

A wet-weather conveyance on the eastern third of the property (just east of the house) drains to the river (photo BT-8). Although wet-weather conveyances are not considered “waters of the state”, preventive measures should be taken to prevent construction runoff from discharging into this conveyance since the conveyance directly discharges into the river.

Adjacent property to the east, Union Printers, discharges industrial stormwater into the Tennessee River under NDPS permit # TNR054544.

8.10.4 Plant Species

Protected plant species: No threatened or endangered plant species were observed on this project site on the day of the site visit and none is known to exist at this project site.

Common plant species: Urbanized species of plants are prevalent on this project site. Mowed/maintained grass lawns and sparsely placed hardwood trees exist in the eastern and southern portions of the property. Some of these trees are large mature oaks and hickories which offer habitat to songbirds and squirrels as well as shade. Along the riverbanks, sycamores and black walnut are present.

Invasive plant species: Except for a few native trees on the shore and at the extreme eastern section of the project area, virtually all of the plants were terrestrial invasive species. They included Japanese honeysuckle, mimosa, Amur honeysuckle, English ivy, and Himalayan blackberry.

8.10.5 Animal Species

Protected animal species: No threatened or endangered animal species were observed on this project site on the day of the site visit and none is known to exist at this project site.

Common animal species: Terrestrial animal species observed included songbirds, gray squirrels, and domestic dogs and cats. Aquatic species observed included the invasive Asian clam *Corbicula*, waterfowl, and sunfish/bluegill species of fish.

Invasive animal species: The invasive Asian clam *Corbicula* was observed in the shoal area.

8.10.6 Habitat Ecology

Critical habitat for protected species: No evidence for or favorable habitat for state or federally listed species was observed during the site visit. No critical habitats designated by USFWS exist within the project area.

Habitat description: This site is located in an urban/industrial setting with streets, buildings, and a railroad. Maintained lawns and a few large hardwood trees typical of an urban setting are located on the site. The shoal area in the northern portion of the property offers feeding and spawning habitat for fish and aquatic invertebrates.

8.10.7 Area(s) of Concern Identified

Areas of concerns for environmental impairment for the proposed road improvements, docks, and riverfront landing:

- will occur on the Tennessee River;
- will occur within the 100-year and 500-year floodplain of the Tennessee River;
- may potentially increase sediment loading and release contaminants into the Tennessee River;
- will alter the bank and shoreline of the Tennessee River; and
- may adversely impact the shoal area currently used by fish and aquatic invertebrates for feeding and spawning.

Items for consideration:

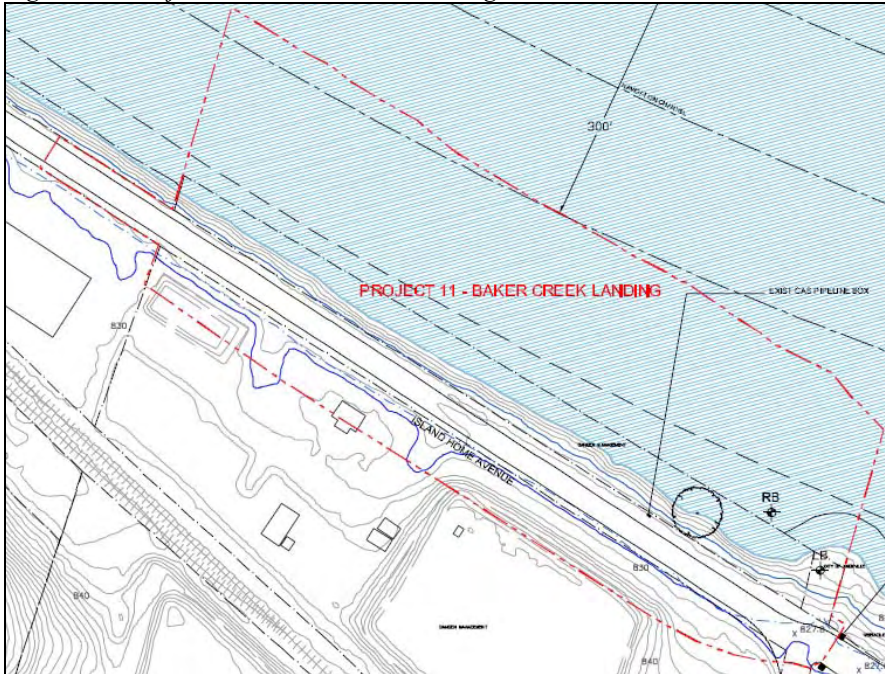
- It is recommended that the project be done in a manner that will minimize the loss of shoal areas along the project's shoreline so as not to reduce habitat loss for aquatic species. If it is deemed necessary to disturb or impact these areas, mitigation measures should be taken to enhance or add shoal areas and riparian vegetation elsewhere. Consultation with TDEC and TWRA would be required.
- Riverfront stabilizations, alterations, and enhancements will require Shoreline Construction permits from TVA. Section 26a of the TVA Act requires that TVA approval be obtained before any construction activities can be carried out that affect navigation, flood control, or public lands along the shoreline of the TVA reservoirs or in the Tennessee River or its tributaries. The permit process is divided into two categories, minor projects and major projects. Portions of proposed Project 9 may fall into the "major projects" category. "Major projects and facilities" include: commercial marinas, community docks, barge terminals and mooring cells, utility crossings, bridges, culverts, roads, wastewater discharges, water intakes and sewage outfalls, dredging, placement of fill, and others.

- The need for additional bank stabilization may cause sediment loading and potential release of contaminants into the Tennessee River. Consultation with TDEC may be required.
- A NPDES Storm Water Construction Permit is required if more than one acre of land will be disturbed by clearing, grading, or excavation. In addition, any time the ground is cleared, graded or excavated, standard erosion control practices, such as silt fences, staked hay bales, or coffer dams, should be employed to prevent sediment from entering the river during construction phases. Consultation with TDEC may be required.

8.11 Project 11 – Baker Creek Landing

This project site is located along Island Home Avenue just west of Baker Creek and the intersection of Island Home Avenue and Maplewood Drive. The former TransMontaigne Fuel tank farm is located in this vicinity. See Figure 23 below. Photographs for this project site are located in Appendices A and C.

Figure 23. Project 11 – Baker Creek Landing.



8.11.1 Topography

This site is relatively flat along the road and averages 822 ft msl in elevation. It slopes down from the road to the Tennessee River (from 822 ft msl to 813 ft msl). A small low lying area (815 ft msl) and shoal (813 ft msl) is located in the extreme eastern portion of this site.

8.11.2 Geology and Soils

Table 12 and Figure 24 below (source: KGIS map © 2008 of NRCS data from 2004 Knox County Soil Survey) lists the types of soils located on the Project 11 site.

Table 12. Soils located in the Project 11 area (NRCS 2004).

Project 11 – Baker Street Landing		
Soil Description	Map Symbol	Listed by NRCS as Hydric Soil?
Urban Land	Ur	no
Bloomingsdale Silt Loam, 0-2 % slopes, occasionally flooded	Bd	yes

Figure 24. Soil map of the Project 11 area (NRCS 2004).



8.11.3 Surface Waters, Wetlands, and Floodplains

The project is located along the Tennessee River and lies partially within its 100-year floodplain and entirely within its 500-year floodplain. There are no wetlands on the site.

The project is located at the easternmost edge of the Knoxville Waterfront Improvements project on 1.3 acres of riverbank, existing road, and adjacent industrial land. Current site conditions along the riverbank include a narrow band of riparian vegetation between Island Home Avenue and the Tennessee River. Baker Creek empties into the river, approximately 150 feet upstream of the eastern extent of the project site. The nearly vertical bank leading to the river is approximately four feet high and has been stabilized with large rip rap and concrete pieces along the majority of the bank of the study site. Just offshore, the water was approximately 3-8 feet deep at the eastern end of the property and approximately 10 –13 feet deep on the western portion during low pool conditions.

An industrial storm water discharge point (NPDES permit #0022535) assigned to the former TransMontaigne fuel tank site is located on the project site (see photo BT-4). According to EPA records, this NPDES permit has been inactive since 2003.

A small shoal area is located within the extreme eastern portion of the property.

Nearby Baker Creek is listed as a Category 5 impaired water (see Section 5.0 for details).

8.11.4 Plant Species

Protected plant species: No threatened or endangered plant species were observed on this project site on the day of the site visit and none is known to exist at this project site.

Common plant species: The bank of the river is vegetated with blackberry bushes and other woody/weedy shrubs. Grass lines the areas adjacent to Island Home Avenue, the former TransMontaigne property, and low lying area in the eastern part of the property.

Invasive plant species: Himalayan blackberry common on riverbank, along with mimosa, tree of heaven, catalpa, and Japanese and Amur honeysuckles.

8.11.5 Animal Species

Protected animal species: No threatened or endangered animal species were observed on this project site on the day of the site visit and none is known to exist at this project site.

Common animal species: Waterfowl and sunfish/bluegills were observed in the river near this property.

Invasive animal species: *Corbicula*, an invasive Asian clam species, was observed in the eastern shoal area of the property.

8.11.6 Habitat Ecology

Critical habitat for protected species: No evidence for or favorable habitat for state or federally listed species was observed during the site visit. No critical habitats designated by USFWS exist within the project area.

Habitat description: There is a minimal amount of habitat between Island Home Avenue and the rivershore. A shoal area exists at eastern end of site which would be used by fish and aquatic invertebrates.

8.11.7 Area(s) of Concern Identified

Areas of concerns for environmental impairment for the proposed bank stabilization and marina:

- will occur on the Tennessee River;
- will occur within the 100-year and 500-year floodplain of the Tennessee River;
- may potentially increase sediment loading and release contaminants into the Tennessee River;
- will alter the bank and shoreline of the Tennessee River; and
- may adversely impact the shoal area currently used by fish and aquatic invertebrates for feeding and spawning.

Items for consideration:

- It is recommended that the project be done in a manner that will minimize the loss of shoal areas along the project's eastern shoreline so as not to reduce habitat loss for aquatic species. If it is deemed necessary to disturb or impact these areas, mitigation measures should be taken to enhance or add shoal areas and riparian vegetation elsewhere. Consultation with TDEC and TWRA would be required.

- Riverfront stabilizations, alterations, and enhancements will require Shoreline Construction permits from TVA. Section 26a of the TVA Act requires that TVA approval be obtained before any construction activities can be carried out that affect navigation, flood control, or public lands along the shoreline of the TVA reservoirs or in the Tennessee River or its tributaries. The permit process is divided into two categories, minor projects and major projects. Portions of proposed Project 9 may fall into the "major projects" category. "Major projects and facilities" include: commercial marinas, community docks, barge terminals and mooring cells, utility crossings, bridges, culverts, roads, wastewater discharges, water intakes and sewage outfalls, dredging, placement of fill, and others.

- The need for additional bank stabilization may cause sediment loading and potential release of contaminants into the Tennessee River. Consultation with TDEC may be required.

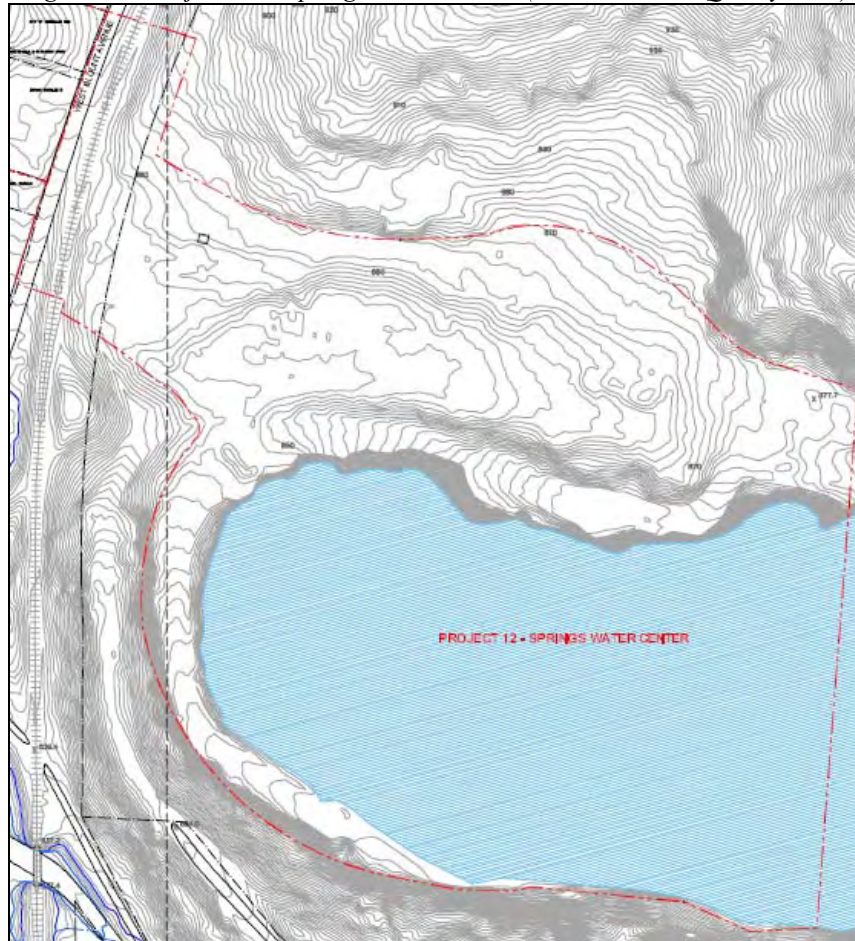
- A NPDES Storm Water Construction Permit is required if more than one acre of land will be disturbed by clearing, grading, or excavation. In addition, any time the ground is cleared, graded or excavated, standard erosion control practices, such as silt fences, staked hay bales, or coffer dams, should be employed to prevent sediment from entering the river during construction phases. Consultation with TDEC may be required.

- If any supporting structures for the proposed Baker Creek landing/overlook involve work within Baker Creek, an ARAP will be required from TDEC. Structures would include, but are not limited to: pilings, culverts, bridges, rip rap etc. Erosion control measures should also be put in place along the creek bank prior to construction to prevent construction runoff from entering the creek and river.

8.12 Project 12 – Springs Water Center (Fort Dickerson Quarry Lake)

This project area is located at the site of a former limestone quarry which was abandoned when it collapsed and filled with water approximately 30 years ago. The quarry lake is located between Fort Dickerson Civil War Park and West Blount Avenue. See Figure 25 below. The photographs for this project site are located in Appendix A.

Figure 25. Project 12 – Springs Water Center (Fort Dickerson Quarry Lake)



8.12.1 Topography

This site is characterized by steep vertical limestone walls which are remnants of an abandoned quarry. The highest elevation from the southern rim of the quarry is approximately 925 ft msl; the highest elevation from the northern rim of the quarry is 900 ft msl. The lowest elevation at the bottom of the quarry is approximately 625 ft msl. The trail leading from West Blount Avenue begins at an elevation of approximately 850 ft msl and climbs to approximately 880 ft msl before descending down to the western rim at 820 ft msl. The trail drops down around the southwestern rim to 650 ft msl where the trail meets the water's edge.

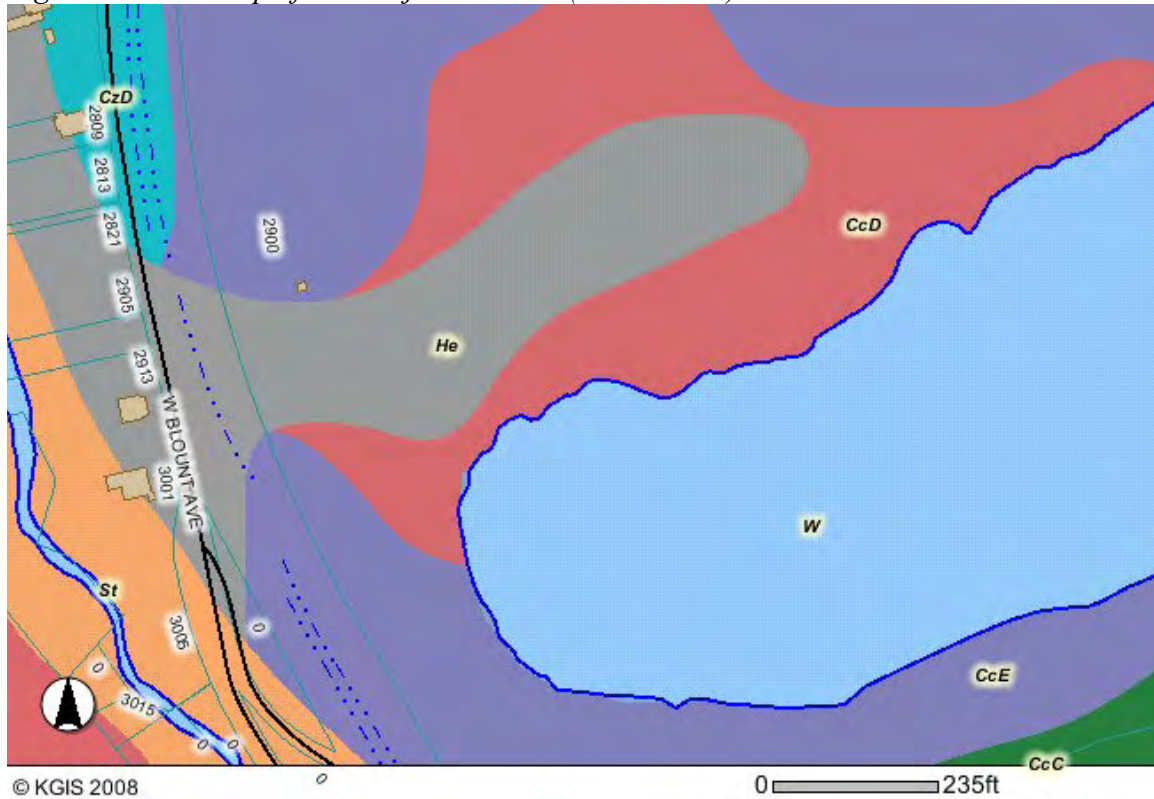
8.12.2 Geology and Soils

Table 13 and Figure 26 below (source: KGIS map © 2008 of NRCS data from 2004 Knox County soil survey) lists the types of soils located on the Project 12 site.

Table 13. Soils located within the Project 12 area (NRCS 2004).

Project 12 – Springs Water Center (Fort Dickerson Quarry Lake)		
Soil Description	Map Symbol	Listed by NRCS as Hydric Soil?
Corryton-Udorthents-Urban Land Complex, 12-25% slopes	CzD	no
Coghill-Corryton Complex, 5-12 % slopes	CcD	no
Coghill-Corryton Complex, 25-65 % slopes, rocky	CcE	no
Heiskell Silt Loam, 0-2 % slopes, occasionally flooded	He	yes

Figure 26. Soil map of the Project 12 area (NRCS 2004).



8.12.3 Surface Waters, Wetlands, and Floodplains

The quarry lake is located approximately 500 feet east of Goose Creek and 1,800 feet south of the Tennessee River. None of Project 12 is located within a floodplain. There is a wetland area located on the project site and is approximately 0.5 acres in size.

The quarry walls collapsed and the quarry flooded approximately 30 years ago. Most of the mining equipment was pulled out; however, some was not removed and remains at the bottom of the quarry lake. The blue color of the water is due to the nature of the

limestone rock quarried at the site. Calcium and magnesium (and possibly copper) leachate from the limestone rock give the water in the quarry its blue hue.

The quarry lake is supplied underground by spring water and is reportedly 200 feet deep in some places. When the former quarry collapsed and flooded in 1970s, a lake was created and surrounded by nearly vertical, limestone walls on three sides (photos 12-24, 12-25, and 12-26).

A trail, starting near the entrance of the quarry site, follows the northern rim of the quarry and leads down to the shallow section of the lake on the southwest edge. There are open meadow areas and a small wetland (0.5 acres in size) just north of the trail on northwest of the lake. The wetland is in a low area of the meadow and had standing water at the time of the field visit (photo 12-18). Rainfall had not occurred within a 48-hour period before the site visit.

The lake reportedly supports aquatic life including fish, benthic aquatic organisms, and alga (photo 12-31). The water in the lake at times looks bright blue from dissolved minerals leached from the limestone rock, primarily calcium and magnesium (photo 12-13). The water is also very clear allowing one to see the bottom of the quarry in the shallower sections (see photo 12-29). Although the lake supports aquatic life and is connected to the groundwater system, this body of water is not considered “waters of the state” by TDEC for the following reasons: (1) there is no surface water connection to the lake, (2) the lake is completely contained within the boundaries of the property, and (3) the lake was created as a direct result of mining operations. This exemption is found in the Tennessee Water Quality Control Act (TWQCA), as stated in the following section from the Tennessee Code Annotated (T.C.A.).

T.C.A. § 69-3-103 (22):

“The permitting requirements of the TWQCA and the prohibition against issuing permits for activities that will cause a condition of pollution either individually or in combination with others apply broadly to all waters of the state defined as: any and all water, public or private, on or beneath the surface of the ground, which are contained within, flow through, or border upon Tennessee or any portion thereof except those bodies of water confined to or retained within the limits of private property in single ownership which do not combine or effect a junction with natural surface or underground waters.”

8.12.4 Plant Species

Protected plant species: No threatened or endangered plant species were observed on this project site on the day of the site visit and none is known to exist at this project site.

Common plant species: The area north of the quarry lake is and along the trail is forested with deciduous hardwoods. It is a mixture of native and introduced species. Facultative wetland species of plants occur in the wetland area northwest of the quarry lake.

Invasive plant species: Amur honeysuckle, mimosa, Japanese honeysuckle, fragrant honeysuckle, Callery pear, Nandina, princess tree, tree of heaven, and multiflora rose were observed.

8.12.5 Animal Species

Protected animal species: No threatened or endangered animal species were observed on this project site on the day of the site visit and none is known to exist at this project site.

Common animal species: On the day of the site visit, the following animals or evidence of their use of the property was observed: Eastern cottontails, field sparrows, song sparrows, red-winged blackbirds, mockingbirds, tufted titmice, Carolina chickadees, cardinals, American crows, mallard ducks, Canada geese, box turtles, land snails, Virginia opossums, raccoons, and Southeastern chorus frogs (*Pseudacris feriarum*). The chorus frogs were entirely found in the wetlands area and were quite numerous. No fish were observed in the quarry lake on the day of the site visit.

Dr. Ben Fitzpatrick at UT and Matthew Niemiller (doctoral-candidate) at UT have conducted studies on rare salamander populations (the Berry cave salamander *Gyrinophilus gulolineatus* and Tennessee cave salamander *Gyrinophilus palleucus*) in the South Knoxville area in former quarry sites and caves (e.g., Meads Quarry and Cruze Cave approximately 2 miles east of the Project 12 site). It is unknown if there is any connection between the Project 12 quarry lake and Meads Quarry. [See 28 January 2008 article in the *Knoxville News-Sentinel* (<http://www.knoxnews.com/news/2008/jan/28/0128cavefish/>)].

Invasive animal species: The invasive Asian clam (*Corbicula spp.*) was observed in the shallow areas of the quarry lake. Feral dogs and cats were also observed on the site. It is possible that any fish species and the invasive *Corbicula* which inhabit the quarry lake are present due to persons stocking the quarry lake with fish from other lakes in the area.

8.12.6 Habitat Ecology

Critical habitat for protected species: No evidence for or favorable habitat for state or federally listed species was observed during the site visit. However, the existing small wetland could conceivably be habitat for rare amphibians. Seeps in the quarry walls could possibly have been re-occupied by rare salamanders. The karst system may connect this quarry lake to other caves and quarry lakes in the South Knoxville region. No critical habitats designated by USFWS exist within the project area.

Habitat descriptions: Virtually all of the project area was severely disturbed by quarrying and associated activities thirty years ago. Natural re-vegetation has occurred, including the establishment of a small wetland. Habitat for small mammals, reptiles, and amphibians are present in the crevices in the quarry walls. Other habitat on the site includes the quarry lake, forested areas, and wetlands.

8.12.7 Area(s) of Concern Identified

Areas of Concern for environmental impairment for the proposed aquatic recreation center:

- may adversely impact water quality in the quarry lake; and
- may adversely impact the wetland area on the site currently utilized by amphibians as a breeding ground.

Items for consideration:

- It is advisable to submit a request to TDEC to receive written documentation from the state agency stating the exclusion under T.C.A. § 69-3-103 (22) applies to the quarry lake and it is not “waters of the State”. Such written documentation would be prudent for the project’s permanent record.
- Construction in, and disturbance of, the noted wetland area in the southern portion of the site should be avoided if at all possible. If deemed necessary to disturb or impact this wetland area, an ARAP and consultation with TDEC will be required and mitigation measures will need to be implemented.
- The quarry lake appears to be either a closed drainage basin or to be drained sub-surface. If the water turnover rate is very slow or zero, increased human activity in, on, and around the lake has the potential to degrade water quality unless on-site waste water treatment facilities are provided.
- Contact UT regarding the possibility of rare salamander species in the area of the project. Matt Niemiller (doctoral student) and Ben Fitzpatrick (assistant professor) of the UT Department of Ecology and Evolutionary Biology have been conducting studies in South Knoxville on populations of rare salamanders (the Berry Cave Salamander and Tennessee Cave Salamander), in a cave system located at Meads Quarry at Ijam’s Nature Center. Meads Quarry is approximately 2 miles east of the Fort Dickerson Quarry Lake. The Berry Cave Salamander is a subterranean obligate (can only live in caves). The largest known population of this salamander is found at Meads Quarry. UT researchers should be contacted to evaluate any potential rare salamander habitat and/or possible groundwater connection to the Meads Quarry cave with the Fort Dickerson Quarry Lake.
- Currently, there are some solid waste issues for this site. There is ongoing unauthorized human use of the project site as an illegal garbage dump and illegal camping site which has led to some habitat and vegetation degradation. Also, some mining equipment was left in the bottom of the quarry when it flooded thirty years ago.

9.0 Conclusions

Protected Species and Critical Habitats

USFWS and TDEC Division of Natural Areas (DNA) listings of protected plant and animal species for Knox County and the Upper Tennessee River were consulted prior to the site visits and boat trip observations of each project site (see Tables 1 and 2 in Sections 6.0 and 7.0, respectively). No federal- or state-listed threatened or endangered species were observed on any of the project sites during the site visits and none are known to exist at any of the project sites.

The USFWS list of designated critical habitats was also consulted; no critical habitats are designated in any of the project areas or areas adjacent to the project sites. None of the habitats observed at the project sites during the site visits present favorable habitat for those protected species listed by USFWS and TDEC DNA.

Native Freshwater Mussel Species

A limited survey (observation only by walking the shoreline and from a boat; no sampling or underwater observation) for native mussels was conducted for those project sites along the Tennessee River, Goose Creek, and Baker Creek. The relic of one common freshwater mussel species, pink papershell heelsplitter (*Potamilus ohioensis*), was observed (see photo # 9-59 in Appendix B). No evidence of any other native freshwater mussel species was observed on the project sites during the site visits.

Invasive Species

During the site visits, the invasive Asian clam (*Corbicula fluminea*) was observed populating all the freshwater aquatic habitats (Tennessee River, Goose Creek, Baker Creek, and Fort Dickerson Quarry Lake). The aggressive invasive vine kudzu (*Pueraria montana*) has taken over the limestone bluff located in Projects 6 and 7. Other invasive and exotic plant species not as aggressive as kudzu were observed at each project site and are listed in the plant species description for each project.

Wetlands

During the site visit, areas which appear to be jurisdictional wetlands were observed on Projects 1, 9, and 12. However, no wetlands delineation was conducted as part of this report. The estimated size of the wetland on Project 1 is 0.125 acres. Project 9 contains two wetlands: one approximately 1.5 acres in size and one approximately 0.125 acres in size. Project 12 contains one wetland estimated to be 0.5 acres in size.

Permits from Federal and State Agencies

Table 14 below summarizes the types of required permits and actions from federal and state agencies for each project. The Areas of Concern for each project area are also highlighted in the table.

Table 14. Required Permits and Actions.

Project #	Project Title	Permits/Actions Required	Areas of Concern
1	Cherokee Trail Connector	<ul style="list-style-type: none"> • TDEC – ARAP • TDEC – NPDES SW General Construction • TDEC – consult for wetlands mitigation 	<ul style="list-style-type: none"> • Goose Creek wetlands • floodplain
2	Goose Creek Landing	<ul style="list-style-type: none"> • TDEC – ARAP • TDEC – NPDES SW General Construction • TVA – §26a Shoreline Construction • TDEC/TWRA – consult for shoals mitigation 	<ul style="list-style-type: none"> • Goose Creek • Tennessee River floodplain • shoals
3	Pedestrian Bridge	<ul style="list-style-type: none"> • TDEC – NPDES SW General Construction • TVA – §26a Shoreline Construction • USCG/USACE – bridge construction • TDEC/TWRA – consult for shoals mitigation 	<ul style="list-style-type: none"> • Tennessee River floodplain • shoals
4	City View Condominiums and Marina	N/A	N/A – permits for this project have already been approved
5	Henley Gateway	<ul style="list-style-type: none"> • TDEC – NPDES SW General Construction • TVA – §26a Shoreline Construction • TDEC/TWRA – consult for shoals and vegetation mitigation 	<ul style="list-style-type: none"> • Tennessee River floodplain • shoals • riparian vegetation

Project #	Project Title	Permits/Actions Required	Areas of Concern
6	Shoals Riverwalk	<ul style="list-style-type: none"> • TDEC – NPDES SW General Construction • TVA – §26a Shoreline Construction • TDEC/TWRA – consult for shoals and vegetation mitigation and kudzu control 	<ul style="list-style-type: none"> • Tennessee River • floodplain • shoals • riparian vegetation • kudzu control
7	Gay Street Stairway	<ul style="list-style-type: none"> • TDEC – NPDES SW General Construction • TDEC/TWRA – consult for kudzu control 	<ul style="list-style-type: none"> • floodplain • kudzu control
8	Sevier Avenue / Council Place Enhancements	<ul style="list-style-type: none"> • TDEC – NPDES SW General Construction 	none
9	River Road and River Plain Park	<ul style="list-style-type: none"> • TDEC – ARAP • TDEC – NPDES SW General Construction • TVA – §26a Shoreline Construction • TDEC/TWRA – consult for shoals and wetlands mitigation • USACE – §404 CWA for alteration, filling, or construction in wetlands > 1 acre 	<ul style="list-style-type: none"> • Tennessee River • wetlands • floodplain • shoals
10	Lincoln Street Landing	<ul style="list-style-type: none"> • TDEC – NPDES SW General Construction • TVA – §26a Shoreline Construction • TDEC/TWRA – consult for shoals mitigation 	<ul style="list-style-type: none"> • Tennessee River • floodplain • shoals

Project #	Project Title	Permits/Actions Required	Areas of Concern
11	Baker Street Landing	<ul style="list-style-type: none"> • TDEC – NPDES SW General Construction • TVA – §26a Shoreline Construction • TDEC/TWRA – consult for shoals mitigation • [TDEC – ARAP only if project will involve work in Baker Creek] 	<ul style="list-style-type: none"> • Tennessee River • floodplain • shoals • Baker Creek
12	Springs Water Center (Fort Dickerson Quarry Lake)	<ul style="list-style-type: none"> • TDEC – ARAP • TDEC – NPDES SW General Construction • TDEC – consult for wetlands mitigation • TDEC – request documentation stating quarry lake is not “waters of the State” 	<ul style="list-style-type: none"> • wetlands • quarry lake

10.0 Recommendations

Overall Recommendations

Construction in the waterfront area should be coordinated by using multi-agency meetings and notifications to ensure all federal and state agencies involved in the permitting process are informed and kept up-to-date of each projects’ progress. Mitigation measures should to be taken to reduce the amount of habitat loss (e.g., wetlands, shoals, riparian vegetation), reduce sediment loading, and prevent contaminant release. Enhancements to the existing natural conditions to create new habitats and resolve current degradation and erosion problems should also be part of each project. The mitigation measures and enhancements together should provide a net gain of wildlife habitat and improvements to water quality.

In addition to the required permits and actions listed in Table 14 above, the following recommendations following Best Management Practices (BMPs) for each project site are made.

Project 1

Construction in and adversely affecting the wetland in this area should be avoided if possible. If it is not possible, then mitigation measures should be implemented as approved by TDEC. Construction in Goose Creek and stabilization of its banks has a high potential for the release of contaminants into Goose Creek and the Tennessee River.

Consultation with TDEC on the BMPs to be implemented to reduce contaminant release will be required as part of the individual ARAP permit process.

Project 2

Construction in Goose Creek and stabilization of its banks has a high potential for the release of contaminants into Goose Creek and the Tennessee River. Consultation with TDEC on the BMPs to be implemented to reduce contaminant release will be required as part of the individual ARAP permit process.

It is recommended that the project be done in a manner that will minimize the loss of shoal areas, large overhanging riparian trees, stumps, logs, and established large rip rap along all of the project's shoreline so as not to reduce habitat loss for aquatic species. If it is deemed necessary to disturb or impact these areas, mitigation measures should be taken to enhance or add shoal areas and riparian vegetation elsewhere. Consultation with TDEC and TWRA would be required.

Project 3

It is recommended that the project be done in a manner that will minimize the loss of shoal areas, large overhanging riparian trees, stumps, logs, and established large rip rap along all of the project's shoreline so as not to reduce habitat loss for aquatic species. If it is deemed necessary to disturb or impact these areas, mitigation measures should be taken to enhance or add shoal areas and riparian vegetation elsewhere. Consultation with TDEC and TWRA would be required.

Project 5

It is recommended that the construction of the pier and access to the floating stairway be conducted with the goal of providing waterfront access and maintaining as much of the forested limestone bluff area as possible. It is also recommended that the project construction be conducted in a manner that will minimize the loss or degradation of the following features so as to reduce habitat loss for wildlife species:

- trees in the forested limestone bluff area,
- the face of limestone bluff,
- shoal area,
- large overhanging riparian tree branches, stumps, logs, and
- established large rip rap along the project's shoreline.

If it is deemed necessary to disturb or impact these areas, mitigation measures should be taken to enhance or add shoal areas and riparian vegetation elsewhere to minimize habitat loss. Consultation with TDEC and TWRA would be required.

Project 6

It is recommended that the floating walkway construction be conducted in a manner that will minimize the loss or degradation of the shoal areas in Projects 5 and 6 and the forested limestone bluff located in Project 5. Measures should be taken to protect these areas as the floating walkway is constructed to reduce sediment loading and erosion. If it

is deemed necessary to disturb or impact these areas, mitigation measures should be taken to enhance or add shoal areas and riparian vegetation elsewhere to minimize habitat loss.

TWRA and/or USFWS should be contacted concerning potential impacts to aquatic wildlife which may exist once the floating walkway is in place such as alterations to habitats, available light, temperatures in shallow areas, and water flow patterns.

Project 9

Construction in and adversely affecting the two wetlands in this area should be avoided if possible. If it is not possible, then mitigation measures should be implemented as approved by TDEC.

It is recommended that the project be done in a manner that will minimize the loss of shoal areas, large overhanging riparian trees, stumps, logs, and established large rip rap along all of the project's shoreline so as not to reduce habitat loss for aquatic species. If it is deemed necessary to disturb or impact these areas, mitigation measures should be taken to enhance or add shoal areas and riparian vegetation elsewhere. Consultation with TDEC and TWRA would be required.

Project 10

It is recommended that the project be done in a manner that will minimize the loss of shoal areas, large overhanging riparian trees, stumps, logs, and established large rip rap along all of the project's shoreline so as not to reduce habitat loss for aquatic species. If it is deemed necessary to disturb or impact these areas, mitigation measures should be taken to enhance or add shoal areas and riparian vegetation elsewhere. Consultation with TDEC and TWRA would be required.

Project 11

It is recommended that the project be done in a manner that will minimize the loss of shoal areas, large overhanging riparian trees, stumps, logs, and established large rip rap along all of the project's shoreline so as not to reduce habitat loss for aquatic species. If it is deemed necessary to disturb or impact these areas, mitigation measures should be taken to enhance or add shoal areas and riparian vegetation elsewhere. Consultation with TDEC and TWRA would be required.

Project 12

Construction in, and disturbance of, the noted wetland area in the southern portion of the site should be avoided if at all possible. If deemed necessary to disturb or impact this wetland area, an ARAP and consultation with TDEC will be required and mitigation measures will need to be implemented.

The quarry lake appears to be either a closed drainage basin or to be drained sub-surface. If the water turnover rate is very slow or zero, increased human activity in, on, and around the lake has the potential to degrade water quality unless on-site waste water treatment facilities are provided.

Contact Matt Niemiller (doctoral student) and Ben Fitzpatrick (assistant professor) at University of Tennessee, Department of Ecology and Evolutionary Biology, regarding the possibility of rare salamander species in the area of the project. Mr. Niemiller and Dr. Fitzpatrick have been conducting studies in South Knoxville on populations of the Berry cave salamander (*Gyrinophilus gulolineatus*) and Tennessee cave salamander (*Gyrinophilus palleucus*) in Meads Quarry (approximately 2 miles east of the Fort Dickerson Quarry Lake). They should be contacted to evaluate any potential rare salamander habitat and/or possible groundwater connection to the Meads Quarry cave with the Fort Dickerson Quarry Lake.

APPENDIX A

**South Knoxville Waterfront
Project 1 – Cherokee Trail Connector
Photographs Taken 11 March 2008**



Photograph 1-1. View to east. West side of railroad underpass at Scottish Pike/Cherokee Trail intersection.



Photograph 1-2. View to northeast. West side of railroad and vegetation adjacent to Scottish Pike River Park.



Photograph 1-3. View to east. West side of underpass at Scottish Pike/Cherokee Trail intersection.



Photograph 1-4. View to east. West side of railroad at Scottish Pike/Cherokee Trail intersection



Photograph 1-5. View to south. West side of railroad running parallel to Cherokee Trail.



Photograph 1-6. View to north. West side of railroad running parallel to Cherokee Trail and intersection with Scottish Pike.



Photograph 1-7. View to southeast. Cherokee Trail area approximately 150 feet before its intersection with Scottish Pike.



Photograph 1-8. View to northeast. Cherokee Trail area approximately 250 feet before its intersection with Scottish Pike



Photograph 1-9. View to west. East side of underpass at Scottish Pike/Cherokee Trail intersection.



Photograph 1-10. View to southwest. East side of railroad area towards Colonial Pipeline property.



Photograph 1-11. View to northwest. East side of railroad area towards Fort Loudoun Reservoir.



Photograph 1-12. View to southwest. East side of underpass and railroad.



Photograph 1-13. View to west. Colonial Pipeline property adjacent to Pitner Place towards border with railroad.



Photograph 1-14. View to east. Colonial Pipeline Property adjacent to Pitner Place towards Goose Creek and City of Knoxville KUB property with electrical utility tower.



Photograph 1-15. View to southeast. Colonial Pipeline property adjacent to Pitner Place towards Goose Creek upstream.



Photograph 1-16. View to north. Colonial pipeline property towards Pitner Place terminus.



Photograph 1-17. View to south. Colonial Pipeline property adjacent to east side of railroad tracks.



Photograph 1-18. View to southeast. Colonial Pipeline property west side of Goose Creek, above 100-year floodplain.



Photograph 1-19. View to south. Goose Creek looking upstream.



Photograph 1-20. View to the east of the east bank of Goose Creek and western portion of the City of Knoxville KUB property.



Photograph 1-21. View to north. Goose Creek downstream.



Photograph 1-22. View to southeast of the east bank of Goose Creek.



Photograph 1-23. Typical silty substrate and algal growth in Goose Creek.



Photograph 1-24. Typical bank slope and structure of Goose Creek.



Photograph 1-25. Asian clam, *Corbicula fluminea*, is an invasive species and was found in Goose Creek during the site visit (see lower right corner of photograph).



Photograph 1-26. Raccoon (*Procyon lotor*) activity was apparent along the banks of Goose Creek.



Photograph 1-27. Example of typical woody debris found in Goose Creek approximately 1,000 feet upstream from its mouth.



Photograph 1-28. View to west. Vegetative cover along southern portion of Colonial Pipeline property adjacent to Goose Creek.



Photograph 1-29. View to north. Wetland area in southern portion of Colonial Pipeline property along the west bank of Goose Creek.



Photograph 1-30. View to south. Wetland area in southern portion of Colonial Pipeline property along the west bank of Goose Creek.



Photograph 1-31. View to west. City of Knoxville KUB property located between West Blount Avenue and the east bank of Goose Creek.

APPENDIX A

**South Knoxville Waterfront
Project 10 – Lincoln Street Landing
Photographs Taken March 11, 2008**



Photograph 10-1. View to east from road to boat ramp.



Photograph 10-2. View to southeast from road to boat ramp.



Photograph 10-3. View to south from road to boat ramp.



Photograph 10-4. View to west from road to boat ramp.



Photograph 10-5. View to northwest from road to boat ramp.



Photograph 10-6. View to north from road to boat ramp.



Photograph 10-7. View to northwest from boat ramp.



Photograph 10-8. View to southeast from boat ramp.



Photograph 10-9. View to north of shoreline and Fort Loudoun Reservoir from boat ramp.



Photograph 10-10. View to south from end of boat ramp and shoreline.



Photograph 10-11. View to northwest of shoreline and Fort Loudoun Reservoir from end of boat ramp.



Photograph 10-12. View to southeast of shoreline and Fort Loudoun Reservoir from end of boat ramp.



Photograph 10-13. View to northwest. End of railroad tracks located between northern portion of property and Fort Loudoun Reservoir.



Photograph 10-14. View to northeast from end of railroad tracks. Northern portion of property between fence and Fort Loudoun Reservoir.



Photograph 10-15. View to north. Metal barge pier.



Photograph 10-16. View to northeast. Dock adjacent to metal barge pier.



Photograph 10-17. View to southeast from dock of shoreline and metal barge pier.



Photograph 10-18. View to north from dock.



Photograph 10-19. View to west from dock of shoreline and its typical vegetation.



Photograph 10-20. View to west from dock of shoreline and Fort Loudoun Reservoir.



Photograph 10-21. View to west of storage building located south of metal barge pier. Note outside storage of equipment, drums, and gas cylinders.



Photograph 10-22. View to east of storage building located south of metal barge pier in northwestern portion of property.



Photograph 10-23. View to southeast of northwestern portion of property just south of storage building in Photographs 10-21 & 10-22.



Photograph 10-24. View to south from northwestern portion of property.



Photograph 10-25. View to southwest from northwestern portion of property.



Photograph 10-26. View to west from northwestern portion of property.



Photograph 10-27. View to southwest of workshop and AST storage located along the western border of the property.



Photograph 10-28. View to west of western portion of property. Note outside storage of equipment and drums.



Photograph 10-29. View to southeast towards wooden dock and wet weather conveyance.



Photograph 10-30. View to northwest towards wooden dock and wet weather conveyance.



Photograph 10-31. View to south of eastern portion of property from shoreline towards Phillips Avenue and Lincoln Street.



Photograph 10-32. View to north of eastern portion of property.



Photograph 10-33. View to east of eastern portion of property.



Photograph 10-34. View to northeast of eastern portion of property.



Photograph 10-35. View to east from Lincoln Street.



Photograph 10-36. View to southeast from Lincoln Street.

APPENDIX A

**South Knoxville Waterfront
Project 11 – Baker Creek Landing
Photographs Taken March 11, 2008**



Photograph 11-1. View to northwest. Island Home Avenue towards South Knoxville Bridge.



Photograph 11-2. View to southeast. Island Home Avenue towards Island Home Neighborhood and Baker Creek.



Photograph 11-3. View to southwest of NPDES permitted outfall at former Transmontaigne tank farm site on Island Home Avenue.



Photograph 11-4. View to south of former Transmontaigne site and Toyota parts garage on Island Home Avenue.



Photograph 11-5. View to south. Former Transmontaigne site on Island Home Avenue.



Photograph 11-6. View to southeast. Shoreline along Island Home Avenue.



Photograph 11-7. View to north. Typical riprap and shoreline vegetation.



Photograph 11-8. View to north. Typical riprap and shoreline vegetation.



Photograph 11-9. View to southwest. Former Transmontaigne tank farm site along Island Home Avenue.



Photograph 11-10. View to south. Former Transmontaigne tank farm site along Island Home Avenue.



Photograph 11-11. View to southeast. Former Transmontaigne tank farm site along Island Home Avenue.



Photograph 11-12. View to northwest. Gas pipeline crossing Island Home Avenue and Fort Loudoun Reservoir.



Photograph 11-13. View to northwest. Shoreline along Island Home Avenue from entrance to Island Home Neighborhood towards South Knoxville Bridge.



Photograph 11-14. View to southeast. Mouth of Baker Creek near entrance to Island Home Neighborhood.

APPENDIX B

**South Knoxville Waterfront
Project 5 – Henley Gateway
Photographs Taken March 12, 2008**



Photograph 5-1. View to south from employee parking lot towards W. Blount Avenue.



Photograph 5-2. View to west from employee parking lot towards railroad tracks.



Photograph 5-3. View to southwest. Western border of parking lot adjacent to Norfolk Southern Railroad tracks.



Photograph 5-4. View to northwest. Western border of parking lot adjacent to Norfolk Southern Railroad tracks.



Photograph 5-5. View to east. Employee parking lot and Baptist Hospital. Intersection of W. Blount Avenue and Chapman Highway.



Photograph 5-6. View to south towards intersection of W. Blount Avenue and St. Paul Street. Western end of employee parking lot proposed for extension of St. Paul Street.

APPENDIX B

**South Knoxville Waterfront
Project 6 – Shoals Riverwalk
Photographs Taken March 12, 2008**



Photograph 6-1. View to south. Baptist Hospital bluff from downtown Knoxville.



Photograph 6-2. View to west from Gay Street Bridge. Bluff and shoals area.



Photograph 6-3. View to northwest from Baptist Hospital of Henley Street Bridge.



Photograph 6-4. View to northeast from Baptist Hospital. Bluff area covered with kudzu (*Pueraria montana*), an invasive species. Shallow shoal area.



Photograph 6-5. View to northeast from Baptist Hospital of Gay Street Bridge.



Photograph 6-6. View to east. Bluff area and Gay Street Bridge.



Photograph 6-7. View to north of Baptist Hospital bluff and shallow shoal areas.



Photograph 6-8. View to northwest. Bluff and shoal area; Henley Street Bridge.



Photograph 6-9. View to east. Access road between Baptist Hospital and bluff area.



Photograph 6-10. View to west. Parking garage area between Baptist Hospital and Henley Street Bridge.



Photograph 6-11. View to northwest of bluff area near parking garage. Evidence of groundhog (*Marmota monax*) activity. Presence of invasive vegetative species kudzu.



Photograph 6-12. Typical groundhog hole found in bluff area.



Photograph 6-13. View to east towards Gay Street Bridge of bluff area.



Photograph 6-14. View to north of bluff, shoals, and Fort Loudoun Reservoir.



Photograph 6-15. View to northeast of bluff area and Henley Street bridge.



Photograph 6-16. View to west underneath Henley Street Bridge.



Photograph 6-17. View to northwest underneath Henley Street Bridge.



Photograph 6-18. View to northeast underneath Henley Street Bridge.



Photograph 6-19. View to northeast of Henley Street Bridge from parking lot.



Photograph 6-20. View to northwest from employee parking lot.



Photograph 6-21. View to northwest from employee parking lot towards Norfolk Southern Railroad bridge.

APPENDIX B

**South Knoxville Waterfront
Project 7 – Gay Street Stairway
Photographs Taken March 12, 2008**



Photograph 7-1. View to southeast. Parking area at Gay Street and Council Place.



Photograph 7-2. View to southeast. Parking area at Gay Street and Council Place.



Photograph 7-3. View to northeast from parking area at Gay Street and Council Place.



Photograph 7-4. View to east towards Council Place.

APPENDIX B

**South Knoxville Waterfront
Project 8 – Sevier Avenue/Council Place Enhancement
Photograph Taken March 12, 2008**



Photograph 8-1. View to south from Baptist Hospital access road towards intersection of Gay St, Blount Avenue, Sevier Avenue, and Council Place.

**South Knoxville Waterfront
Project 9
River Road and River Plain Park
Photographs Taken March 12, 2008**



Photograph 9-1. View to southeast towards Langford Avenue of property entrance.



Photograph 9-2. View to east. Eastern property border and adjacent property.



Photograph 9-3. View to north from property entrance of eastern portion of property and former Star Enterprise main building.



Photograph 9-4. View to north of eastern end of property.



Photograph 9-5. View to west. Eastern end of main building.



Photograph 9-6. View to northwest. Main building and garage area.



Photograph 9-7. View to northwest. Garage area west of main building.



Photograph 9-8. View to west from propane tank towards Marathon Petroleum tanks.



Photograph 9-9. View to southwest. Former Star Enterprise fueling station.



Photograph 9-10. View to southwest; adjacent to southwest corner of old fueling station.



Photograph 9-11. View to northwest. Area adjacent to and behind garage.



Photograph 9-12. View to south from garage area towards Langford Avenue.



Photograph 9-13. View to south-southwest from garage area towards Langford Avenue.



Photograph 9-14. View to southwest from garage area towards Marathon Petroleum.



Photograph 9-15. View to west from behind garage area towards Marathon Petroleum.



Photograph 9-16. View to north from behind garage area towards shed and railroad.



Photograph 9-17. View to northwest. Wetland area in northwestern portion of property.



Photograph 9-18. View to northeast towards shed and railroad. Wetlands area.



Photograph 9-19. View to east towards main building. Wetlands area.



Photograph 9-20. View to north towards railroad. Hardpan wetlands area.



Photograph 9-21. View to northeast towards railroad of hardpan wetlands.



Photograph 9-22. View to north towards railroad and northwest gate. Wetlands area.



Photograph 9-23. View to west from northwestern gate towards Marathon Petroleum.



Photograph 9-24. View to northwest. Typical vegetation in far northwestern corner of the property.



Photograph 9-25. View to southeast; south of old fueling station to property entrance.



Photograph 9-26. View to south towards Langford Avenue; south of old fueling station.



Photograph 9-27. View to north-northwest to old fueling station from property entrance.



Photograph 9-28. View to northwest; west of entrance and south of old fueling station.



Photograph 9-29. View to west; west of entrance and parallel to Langford Avenue.



Photograph 9-30. View to west; southern area of property parallel to Langford Avenue.



Photograph 9-31. View to northwest; southern area of property towards railroad tracks.



Photograph 9-32. View to south. Typical vegetation and slope from southern edge of property up to Langford Avenue.



Photograph 9-33. View to northwest; southern area of property. Fill area in foreground.



Photograph 9-34. View to southwest towards Langford Avenue from fill area.



Photograph 9-35. View to northwest from fill area in southern portion of the property.



Photograph 9-36. View to south; empty AST in southern area near Langford Avenue.



Photograph 9- 37. View to northeast; wetlands area southwest of old fueling area.



Photograph 9-38. View to north. Former groundwater monitoring well site.



Photograph 9-39. View to northwest; typical vegetation in southwestern area of property.



Photograph 9-40. View to west. Former groundwater monitoring well site in southwestern area of property.



Photograph 9-41. View to south. Southwestern area of property towards intersection of Langford Avenue and Barber Street.



Photograph 9-42. View to east. Northern portion of property along Fort Loudoun Reservoir and Gulf & Ohio Railroad.



Photograph 9-43. View to west. Northern portion of property along Fort Loudoun Reservoir and Gulf & Ohio Railroad.



Photograph 9-44. View to northwest. Shoreline by eastern metal barge pier.



Photograph 9-45. View to northwest. Shoreline by wooden pier.



Photograph 9-46. Typical steep slope and riprap along shoreline.



Photograph 9-47. View to northwest. Shoreline by wooden pier, middle metal pier, and western metal pier.



Photograph 9-48. Dock and pump house associated with wooden pier.



Photograph 9-49. View to west towards Marathon Petroleum. Western end of railroad tracks.



Photograph 9-50. View to east from western end of railroad tracks.



Photograph 9-51. View to north from railroad tracks looking down to shoal area in northwestern corner of property.



Photograph 9-52. View to south from river shore. Typical slope and vegetation.



Photograph 9-53.
View to south from shoreline and
shoal area looking up slope
towards railroad tracks.



Photograph 9-54. View to northwest. Western end of shoreline and shoal area.



Photograph 9-55. Evidence of raccoon (*Procyon lotor*) activity on shoal area.



Photograph 9-56. View to east from shoal area towards metal piers.



Photograph 9-57.. View to north. Shallow shoal area extends out to Fort Loudoun Reservoir. Asian clam (*Corbicula fluminea*), an invasive species, found in shoal area.



Photograph 9-58. View to east. Eastern end of shoal area near metal piers.



Photograph 9-59. The Pink Papershell or Fragile Heelsplitter (*Potamilus ohiensis*) is a common freshwater mussel native to Tennessee and was found during the assessment in the shoal area.

APPENDIX A

**South Knoxville Waterfront
Project 12 – Springs Water Center
(Fort Dickerson Quarry Lake)
Photographs Taken March 11, 2008**



Photograph 12-1. View to northwest. Entrance to Fort Dickerson Quarry Lake area looking towards West Blount Avenue.



Photograph 12-2. View to southwest. Entrance area to quarry. Old guard shack.



Photograph 12-3. View to northeast. Entrance area to quarry.



Photograph 12-4. View to north. Northeastern border area of quarry property.



Photograph 12-5. View to north. Exposed limestone along northern edge of quarry.



Photograph 12-6. View to east. Access road to northern rim of quarry.



Photograph 12-7. View to south. Wooded area between access road and northern quarry rim.



Photograph 12-8. View to northeast. Area between access road and Fort Dickerson Civil War Park.



Photograph 12-9. View to northeast of northeastern corner of quarry property adjacent to Fort Dickerson Civil War Park.



Photograph 12-10. View to east from bend in access road on northern rim of quarry towards observation deck at Fort Dickerson Civil War Park.



Photograph 12-11. View to due south from northern rim of Quarry Lake.



Photograph 12-12. View to southeast from northern rim of Quarry Lake.

Photograph 12-13. View to south from north quarry rim.



Photograph 12-14. View to east of north quarry rim trail.



Photograph 12-15. View to north of vegetative cover between north rim trail and quarry access road.



Photograph 12-16. View to southwest from north rim trail of the western quarry rim.



Photograph 12-17. View to north of vegetative cover between north rim trail and quarry access road.



Photograph 12-18. View to northeast. Wetlands located approximately 50 feet north of the northwestern rim curve of the quarry.



Photograph 12-19. View to northeast. Wetland area located between north rim trail and quarry access road.



Photograph 12-20. View to northeast. Wetland area located between north rim trail and quarry access road.



Photograph 12-21. View to northeast. Wetland area located between north rim trail and quarry access road.



Photograph 12-22. View to west. Exposed limestone along western border of quarry area adjacent to railroad tracks and West Blount Avenue.



Photograph 12-23. View to northwest of western quarry rim.



Photograph 12-24. View to north of northern quarry rim.



Photograph 12-25. View to northeast of northern quarry rim.



Photograph 12-26. View to east of eastern quarry rim.



Photograph 12-27. View to southeast of southern quarry rim.



Photograph 12-28. View to north from southern rim shallow edge area.



Photograph 12-29. View to north from southern quarry rim shallow edge area.



Photograph 12-30. View to north from southern quarry rim shallow edge area.



Photograph 12-31. View to south from southern quarry rim shallow area. Area of algal cover.



Photograph 12-32. Southern quarry rim shallow area. Evidence of Asian clam, *Corbicula fluminea*, an invasive species.

APPENDIX C

**“Boat Trip (BT) Photographs”
Site Visit of Shoreline and Riverfront Projects by Boat
(starting at the eastern end of Project 11 and going west to Project 2)
Photographs Taken 02 April 2008**



Photograph #BT-1. View to southwest of Project 11 shoreline and shoals.



Photograph #BT-2. View to south of eastern end of Project 11 adjacent to Baker Creek and shoal area.



Photograph #BT-3. View to southeast. Shoal area adjacent to eastern end of Project 11.



Photograph #BT-4. Outfall for Industrial Stormwater NPDES permit TN0022535 from former TransMontaigne Fuel Tank Farm property on Island Home Avenue. Outfall located in western end of Project 11 in rip rap area.



Photograph #BT-5. View to south of eastern end of Project 10; shoal area.



Photograph #BT-6. View to southwest of eastern portion of Project 10; shoal area.



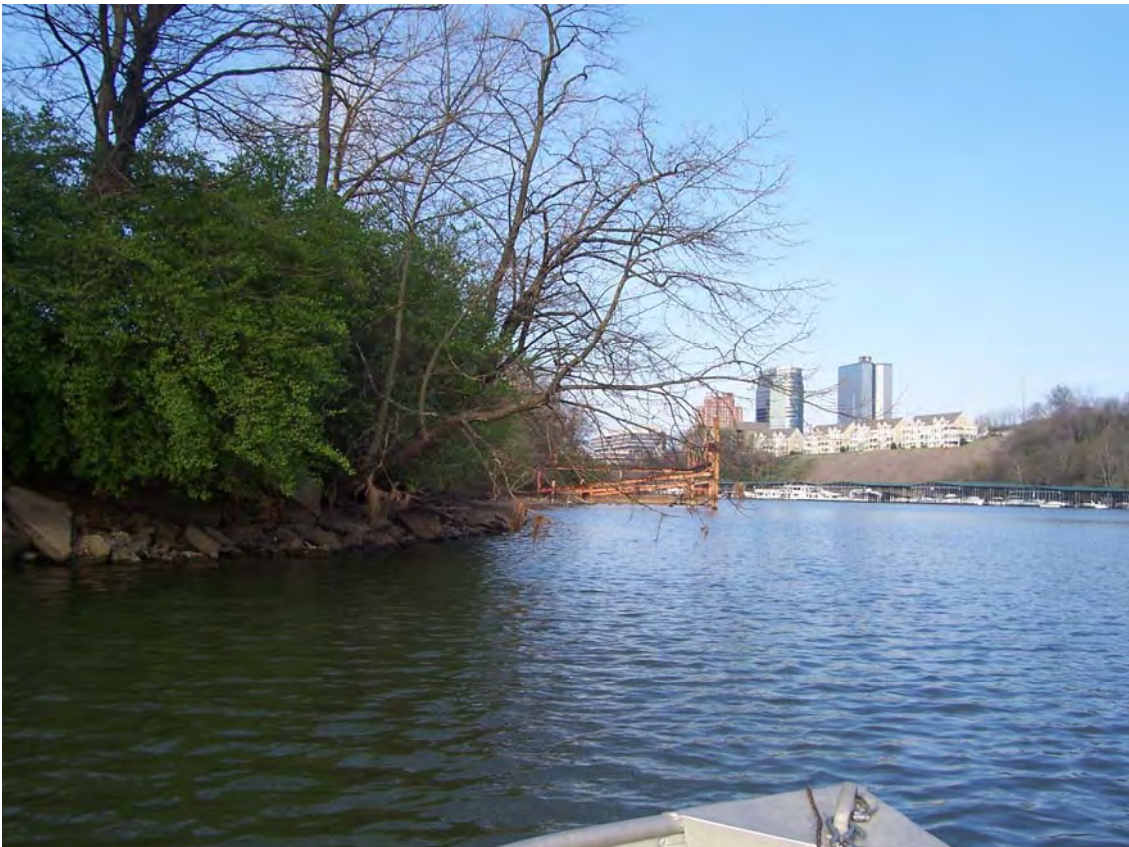
Photograph #BT-7. View to southwest of eastern portion of Project 10; shoal area.



Photograph #BT-8. View to southwest of eastern portion of Project 10 adjacent to wet weather conveyance; shoal area.



Photograph #BT-9. View to southwest of Project 10 west of the wet weather conveyance towards metal barge piers.



Photograph #BT-10. View to west of metal barge piers on Project 10 site.



Photograph #BT-11. View to south. Boat ramp located on Project 10 site.



Photograph #BT-12. View to south of Project 10. Shoal area located between boat ramp and metal barge pier.



Photograph #BT-13. View to southwest of Project 10. Shoal area located between metal barge pier and floating dock.



Photograph #BT-14. View to south of shoal area located under metal barge pier on Project 10 site. Mallard ducks (*Anas platyrhynchos*) observed in shoal area.



Photograph #BT-15. View to southwest of metal barge pier and floating dock on Project 10 site. Shoal area continues under floating dock.



Photograph #BT-16. View to south of western end of Project 10 site and shoal area.



Photograph #BT-17. View to south of eastern end of Project 9 and smaller shoal area.



Photograph #BT-18. View to southwest of eastern portion of Project 9 and smaller shoal area.



Photograph #BT-19. View to southwest of eastern rip rap portion of Project 9 located west of smaller shoal area.



Photograph #BT-20. View to south of outfall for general site stormwater drainage from the Project 9 site. Outfall located east of metal barge piers and near the eastern portion of the large building on the Project 9 site.



Photograph #BT-21. View to west of metal barge piers and wooden dock on Project 9 site.



Photograph #BT-22. View to south of outfall for Industrial Stormwater NPDES permit TN0067156 for the former Star Enterprises fueling area on the Project 9 site.



Photograph #BT-23. View to southwest of wooden dock on the Project 9 site.



Photograph #BT-24. View to south of large shoal area located on western portion of Project 9. Shoal extends from the western side of the wooden dock to the adjacent Marathon Petroleum property.



Photograph #BT-25. View to west of Gay Street and Henley Street Bridges. Bluff and shoal area located on Project 6 property shown on the left side of the photograph.



Photograph #BT-26. View to southwest of Gay Street Bridge and Project 7 area.



Photograph #BT-27. View to south of Project 7 area and Gay Street Bridge. Stormwater outfall from Holston Gas property.



Photograph #BT-28. View to south underneath Gay Street Bridge of Project 7 site.



Photograph #BT-29. View to south of Project 6 area. Kudzu (*Pueraria montana*), an invasive species, covers the limestone bluff in front of Baptist Hospital. A large shoal area is located in this project area between the Gay Street and Henley Street Bridges.



Photograph #BT-30. View to southwest of Project 6 area; limestone bluffs and shoals.



Photograph #BT-31. View to southwest. General stormwater drainage from Baptist Hospital onto bluffs. Continuous drainage has created habitat for mosses to grow on the limestone outcropping (area of dark colored rocks). Shoal area evident in foreground of photograph.



Photograph #BT-32. View to southwest of Project 6 limestone bluffs and shoal area.



Photograph #BT-33. View to south of extensive kudzu coverage of limestone bluff in Project 6 area. Stormwater outfall from Baptist Hospital located in center of photograph.



Photograph #BT-34. View to southwest of general stormwater drainage from Baptist Hospital onto bluffs. Continuous drainage has eroded limestone and permitted growth of mosses (just left of photograph's center). Shoal area evident in foreground.



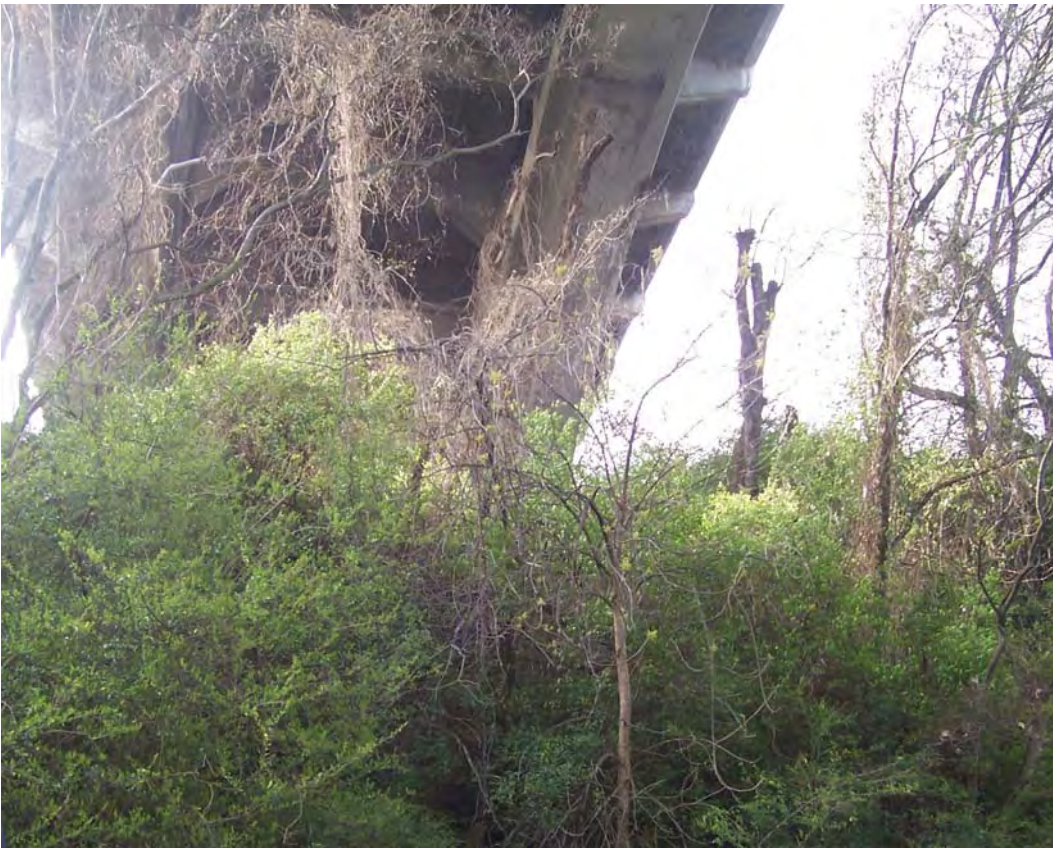
Photograph #BT-35. View to south. Project 6 bluff area and shoals. General stormwater drainage from Baptist Hospital onto limestone bluffs (area dark colored rocks) permits growth of mosses.



Photograph #BT-36. View to southwest towards Henley Street Bridge. Bluff and shoals area.



Photograph #BT-37. View to south of western end of Project 6 area adjacent to Henley Street Bridge. Bluff and shoal area.



Photograph #BT-38. View to south underneath Henley Street Bridge of bluff area in area of Project 6. Shoal area extends underneath Henley Street Bridge.



Photograph #BT-39. View to southwest of limestone bluff, trees, and shoal area located between the Henley Street Bridge and Norfolk Southern Railroad Bridge in the Project 6 area.



Photograph #BT-40. View to southwest of vegetated bluff and shoal area located between the Henley Street Bridge and Norfolk Southern Railroad Bridge in the Project 6 area. No kudzu is present in this bluff area.



Photograph #BT-41. View to southwest of shady limestone bluff and shoals located between the Henley Street Bridge and Norfolk Southern Railroad Bridge in the Project 6 area.



Photograph #BT-42. View to west of limestone bluff and shoals located between the Henley Street Bridge and Norfolk Southern Railroad Bridge in the Project 6 area.



Photograph #BT-43. View to south of limestone bluff and trees in the Project 6 area located between the Henley Street Bridge and Norfolk Southern Railroad Bridge.



Photograph #BT-44. View to south of limestone bluff, trees, and shoals in the Project 6 area located between the Henley Street Bridge and Norfolk Southern Railroad Bridge.



Photograph #BT-45. View to west of limestone bluff and shoals located between the Henley Street Bridge and Norfolk Southern Railroad Bridge in the Project 6 area.



Photograph #BT-46. View to south of shoal area in Project 6 just east of the Norfolk Southern Railroad Bridge.



Photograph #BT-47. View to southeast of shoal area in Project 6 and Norfolk Southern Railroad Bridge.



Photograph #BT-48. View to west. Shoal area extends from Project 6 area and underneath Norfolk Southern Railroad Bridge towards the Project 4 area.



Photograph #BT-49. View to south of Project 3 area and shallow shoal area.



Photograph #BT-50. View to south of eastern end of Project 2 area and shallow shoals.



Photograph #BT-51. View to southwest of eastern portion of Project 2 area and shallow shoals.



Photograph #BT-52. View to southwest towards Goose Creek of Project 2 shoreline and shoal area.



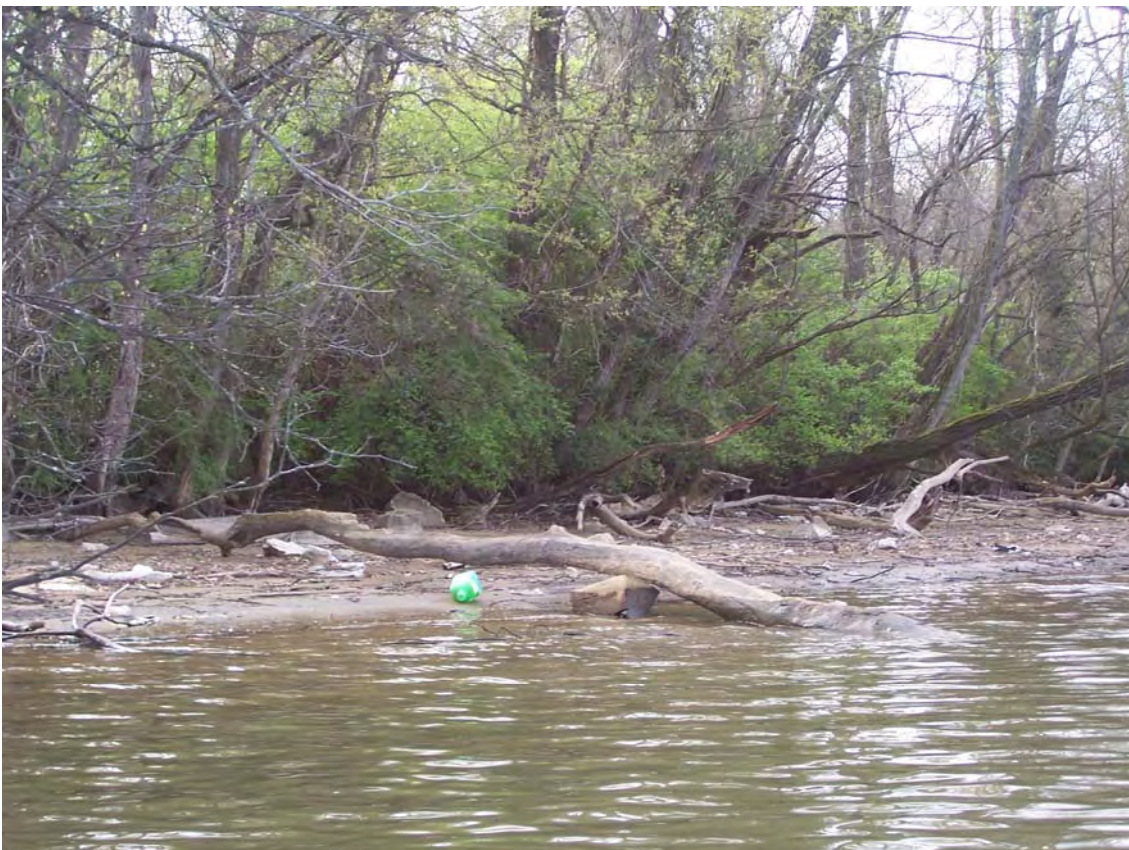
Photograph #BT-53. View to south of Project 2 shoreline and shoal area.



Photograph #BT-54. View to southwest of Project 2 shoreline and shoal area.



Photograph #BT-55. View to south of shallow shoal area in Project 2.



Photograph #BT-56. View to south of western portion of Project 2 shoreline and shoals.



Photograph #BT-57. View to southwest of western portion of Project 2 shoreline and shoals.



Photograph #BT-58. View to southwest of western portion of Project 2 shoreline and shoals.



Photograph #BT-59. View to southwest. Western portion of Project 2 shoreline and shoals.



Photograph #BT-60. View to southwest of western portion of Project 2 shoreline and shoals and mouth of Goose Creek. Great blue heron (*Ardea herodias*) observed at western shoal point at creek's mouth.



Photograph #BT-61. View to south. Mouth of Goose Creek in the Project 2 area.



Photograph #BT-62. View to east of pipeline crossing and east bank of Goose Creek at its mouth.



Photograph #BT-63. View to southeast of the eastern bank of Goose Creek at its mouth.



Photograph #BT-64. View to south of the mouth of Goose Creek.