Compared to other CBAs and the No-Build, CBA 1 would result in the greatest probable effects to biodiversity of the study area, although the difference with CBA 3 is negligible. By contrast, CBA 2 would result in the least probable effects to biodiversity of the study area.

#### 4.12.3.2 Mitigation

A riparian ecosystem consists not only of the stream channel and banks, but also the adjacent floodplain and transitional upland fringe (USDA, NRCS, 1998). Mitigation of adverse effects upon regional biodiversity through riparian corridor restoration would have limited long-term effectiveness unless chronic land uses can be restricted or regulated within the entire watershed and unless *all* key elements of the riparian ecosystem (including headwaters) are afforded protection under the restoration plan (USDA, NRCS, 1998). Considering the fact that the vast majority of lands comprising the various watersheds within the study area are privately owned and, considering the infeasibility of VDOT being able to acquire expanses of land large and contiguous enough to render stream restoration effective, this option is not considered viable through direct implementation by VDOT. Should a CBA be selected, payment in-lieu into a comprehensive landscape management program administered by a local Soil and Water Conservation District, the Natural Resources Conservation Service, the Virginia Department of Conservation and Recreation, or The Nature Conservancy would instead be pursued as a form of mitigation which would benefit regional biodiversity. Preferred areas for mitigation efforts involving riparian corridor restoration and/or preservation are the Antioch Swamp SCU (located just upstream and downstream of Route 460 on the Blackwater River), the Hickaneck Swamp Conservation Site (located just upstream of Route 460 on the Blackwater River), and the Zuni Pine Barrens Conservation Site (located just downstream of Route 460 on the Blackwater River). These areas are characterized by relatively high species richness, support populations of several state-listed species, and contain stream segments that are impaired due to high fecal coliform counts and sedimentation resulting largely from agricultural runoff. Restoration and/or preservation would also be consistent with the "Resource Protection" mission goal of the *Blueprint for the Future of Migratory Birds: Migratory Bird Program: Strategic Plan 2004-2014* (U.S. Dept. of the Interior, Fish and Wildlife Service, 2004).

## 4.13 WATERS OF THE U.S., INCLUDING WETLANDS

Within the study area, "waters of the U.S." include waterways (perennial streams, intermittent streams, and certain ephemeral streams), water bodies (reservoirs and certain ponds), wetlands, and deepwater habitat (those portions of waterways and water bodies deeper than 6.6 feet). More-detailed discussion of waters of the U.S. is found in the *Natural Resource Technical Report* (VDOT, 2005).

To reduce impacts at major stream crossings, a number of bridges have been proposed. Estimating bridge locations and spans lengths during preliminary engineering is difficult, lacking detailed hydraulic and survey data. However, an approach was used that involved estimating bridge locations and minimum hydraulic openings to accommodate estimated 100-year storm flows. At the bridges identified, locations of seasonally flooded wetlands were reviewed and bridge lengths increased accordingly to further reduce impacts . These prospective bridge locations are presented in Table 4.13-1.

**TABLE 4.13-1**
**PROSPECTIVE BRIDGE LOCATIONS**

| # | Jurisdiction | Stream Name | Bridge Length (ft.) |
|---|---|---|---|
| **CBA 1** | | | |
| 1 | Prince George | Second Swamp | 870 |
| 2 | Sussex | Warwick Swamp | 1,105 |
| 3 | Sussex | Coppahaunk Swamp | 1,000 |
| 4 | Southampton | Seacock Swamp | 650 |
| 5 | Isle of Wight, Southampton | Blackwater River | 3,515 |
| 6 | Isle of Wight | Antioch Swamp | 1,200 |
| 7 | Isle of Wight | Antioch Swamp | 880 |
| **CBA 2** | | | |
| 1 | Prince George | Second Swamp | 940 |
| 2 | Prince George | Second Swamp | 2,955 |
| 3 | Sussex | Warwick Swamp | 1,970 |
| 4 | Sussex | Coppahaunk Swamp | 1,500 |
| 5 | Isle of Wight, Southampton | Blackwater River | 4,160 |
| 6 | Isle of Wight | Burnt Mills Swamp | 480 |
| 7 | Isle of Wight | Ennis Pond | 620 |
| 8 | Isle of Wight | Ennis Pond | 1,695 |
| **CBA 3** | | | |
| 1 | Prince George | Blackwater Swamp | 3,175 |
| 2 | Surry, Sussex | Blackwater River | 3,920 |
| 3 | Sussex | Coppahaunk Swamp | 2,440 |
| 4 | Isle of Wight, Southampton | Blackwater River, Warwick Branch | 3,050 |
| 5 | Isle of Wight | Pope Swamp | 820 |
| 6 | Isle of Wight | Ennis Pond | 620 |
| 7 | Isle of Wight | Ennis Pond | 1,695 |

### 4.13.1 Navigable Waters of the U.S. (Section 10 Waters)

Navigable waters of the U.S. within the study area (as determined by the Norfolk District COE) consist of the Blackwater River, the Pagan River, the Western Branch Reservoir, Lake Prince, Lake Cohoon, and Lake Meade (Norfolk District COE, 1988). All three of the CBAs entail crossings of the Blackwater River. A new bridge would be constructed should one of the three CBAs be selected as the preferred alternative. Bridges would be designed to accommodate boat traffic of the type currently using the river (small recreational craft) and a permit from the U.S. Army Corps of Engineers under Section 10 of the Rivers and Harbors Act of 1899 would be obtained prior to construction.

### 4.13.2 Waterways, Water Bodies, and Associated Deepwater Habitat

The study area contains a large number of named and unnamed perennial and intermittent streams. Of these, the Blackwater River is the most prominent and longest stream course. The major surface water impoundments of Western Branch Reservoir, Lake Prince, Lake Cahoon, and Lake Meade are located in

the easternmost portion of the study area. In addition, the study area contains numerous small ponds – most of which are man-made.

#### 4.13.2.1 Effects

No estuarine or lacustrine deepwater habitat will be affected by any of the CBAs. Table 4.13-2 presents effects to perennial and intermittent streams within the Planning Corridor for each of the three CBAs. Table 4.13-3 presents effects to perennial and intermittent streams within the Design Corridor for each of the three CBAs. Preliminary project designs minimized and avoided impacts to streams by incorporating bridges at certain major stream crossings (see Table 2.1-1). Because they would be spanned on structure, the following direct impacts do not include stream segments that would be spanned via one of the bridges presented in Table 2.1-1.

**TABLE 4.13-2**
**SUMMARY OF EFFECTS TO STREAMS (PLANNING CORRIDOR)**

| Alternative | Effects to Perennial Streams (feet) | Effects to Intermittent Streams (feet) | Total Stream Effects (feet) |
|---|---|---|---|
| CBA 1 | 20,406 | 53,634 | 74,040 |
| CBA 2 | 27,406 | 22,216 | 49,622 |
| CBA 3 | 19,016 | 56,069 | 75,085 |

**TABLE 4.13-3**
**SUMMARY OF EFFECTS TO STREAMS (DESIGN CORRIDOR)**

| Alternative | Effects to Perennial Streams (feet) | Effects to Intermittent Streams (feet) | Total Stream Effects (feet) |
|---|---|---|---|
| CBA 1 | 11,529 | 21,336 | 32,865 |
| CBA 2 | 10,661 | 13,401 | 24,062 |
| CBA 3 | 11,001 | 26,360 | 37,361 |

The severity of stream effects within the Planning Corridor with respect to the total length of perennial and intermittent streams within the study area are provided Table 4.13-5. The severity of stream effects within the Design Corridor with respect to the total length of perennial and intermittent streams within the study area are provided Table 4.13-5. Within the Planning Corridor and the Design Corridor, CBA 3 would result in the greatest severity of effects to streams by affecting 1.65 percent and 0.82 percent, respectively, of the study area total.

**TABLE 4.13-4**
**SEVERITY OF EFFECTS TO STREAMS - CBA PLANNING CORRIDOR**

| Wetland Type | Total Feet of Streams Within Study Area | CBA 1 | | CBA 2 | | CBA 3 | |
|---|---|---|---|---|---|---|---|
| | | Effects (ft) | % of Total | Effects (ft) | % of Total | Effects (ft) | % of Total |
| Perennial Streams | 3,391,401 | 20,406 | 0.60 | 27,406 | 0.81 | 19,016 | 0.56 |
| Intermittent Streams | 1,446,954 | 53,634 | 3.71 | 22,216 | 1.54 | 56,069 | 3.87 |
| Total Feet Affected | 4,538,355 | 74,040 | 1.63 | 49,622 | 1.09 | 75,085 | 1.65 |

[1] Source: USGS National Hydrography Dataset (NHD) 2004.

**TABLE 4.13-5**
**SEVERITY OF EFFECTS TO STREAMS - CBA DESIGN CORRIDOR**

| Wetland Type | Total Feet of Streams Within Study Area | CBA 1 | | CBA 2 | | CBA 3 | |
|---|---|---|---|---|---|---|---|
| | | Effects (ft) | % of Total | Effects (ft) | % of Total | Effects (ft) | % of Total |
| Perennial Streams | 3,391,401 | 11,529 | 0.34 | 10,661 | 0.31 | 11,001 | 0.32 |
| Intermittent Streams | 1,446,954 | 21,336 | 1.47 | 13,401 | 0.93 | 26,360 | 1.82 |
| Total Feet Affected | 4,538,355 | 32,865 | 0.72 | 24,062 | 0.53 | 37,361 | 0.82 |

[1] Source: USGS National Hydrography Dataset (NHD) 2004.

### 4.13.2.2 Mitigation

Impacts to streams within the project study area will be avoided and minimized to the greatest extent practicable. Compensation will then be provided for any unavoidable impacts.

During the preliminary design process, impacts to streams will be avoided to the extent practicable based on the following general guiding principles:

- Attempt to avoid longitudinal impacts to perennial streams and riparian forests;
- Attempt to avoid transverse crossings of perennial streams in order to minimize the length of culverts and pipes.

Avoidance and minimization measures to be developed during this preliminary design process include adjustments to the location of the alignment (horizontal alignment) and the width of the construction limits (vertical alignment) where practicable. The horizontal and vertical alignments will be adjusted to avoid and/or minimize the number and length of relocations and enclosures; however, the adjustments may be constrained by the presence of other sensitive resources (e.g. adjacent streams, wetlands, known cultural resources, residences). Where practicable, the vertical alignment will be modified to reduce the width of the construction limits in order to avoid stream encroachments. Increasing the steepness of fill slopes also narrowed construction limits.

Specific avoidance and minimization measures will be evaluated and incorporated into the selected alternative following evaluation of surface water resource quality. The following sections summarize specific avoidance and mitigation measures that could reduce the physical and ecological impacts of the proposed project on surface waters within the immediate vicinity of the proposed facility.

*Bridges*

Tentative bridge locations for each of the CBAs are described in Table 4.13-1. Bridges, when compared to stream enclosures, avoid physical and ecological impacts to surface waters (e.g. alteration in hydrology and sedimentation, reduction in forested buffer strips, interference with movement of aquatic organisms). Bridges do, however, affect streams with respect to shading and localized sources of stormwater runoff. Because bridges cost substantially more to construct and maintain than do enclosures, the use of bridges for all stream crossings is neither cost effective nor practicable.

*Enclosures*

Should a CBA be selected, additional alignment-specific field reviews will focus on minimizing the length of physical impacts to surface water resources. This could include minor alignment shifts and reductions in construction limits, which, as a whole, will reduce the length of stream enclosures.

*Relocations*

Stream relocations can be minimized by shifting alignments, increasing slope angles, and use of retaining walls. For this project, all reasonable efforts will be made to limit relocations to smaller first and second order headwater streams. Should a CBA be selected, measures to minimize stream relocations will be identified, evaluated, and incorporated into the design of the facility.

General and specific design measures and construction techniques that will be considered for this project include fencing, stream channel enhancements, and stream access. In addition, other mitigation measures may include:

- The implementation of an Erosion and Sediment Control Plan.
- The use of properly sized and engineered culverts for stream crossings to minimize impacts attributed to flood height and flood duration.
- Construction of detention treatment facilities.
- The use of culverted stream crossings which are properly sized and engineered to provide unobstructed, continuous flow for fish and macroinvertebrates.
- Perpendicular stream crossings.
- Stream enhancement techniques which would include creation of pool and riffle zones, planting stream-shading vegetation, constructing low flow channels and pools, and to compensate for unavoidable stream relocations.
- Enhancement of disturbed first- and second-order stream systems as a result of loss of intermittent and perennial headwater stream habitat.

Prospective stream restoration and/or riparian zone restoration sites were identified which could serve as mitigation for unavoidable CBA stream encroachments (Figure 4.13-1). Large wetland systems and preserves are prevalent throughout the study area. A review of comprehensive plans indicates the majority of the study will remain rural, agricultural, or open space. The majority of study area farmland traverses streams with little riparian buffer area - leaving streams exposed to high soil and nutrient runoff during rain and storm events. In landscapes such as this, restoration strategies should evaluate potential mitigation sites which will help reduce soil and nutrient runoff to streams.

Prospective stream and/or riparian zone mitigation sites were identified within which riparian reforestation or the establishment of vegetated corridors between blocks of agricultural land and open space could provide for the reduction of soil and nutrients to aid in improved stream quality (Figure 4.13-1). In addition, due to the close proximity of these areas to existing streams and their generally low elevation, these areas could also serve as potential wetland mitigation sites, thereby also assisting in the reduction of soil and nutrients to stream systems.

Prospective stream restoration sites identified as part of the study are listed below and are shown in Figure 4.13-1. Prospective stream mitigation sites have been located within areas that would be consistent with long term land uses set forth in local comprehensive plans.

SITE 1. Unnamed tributary of an unnamed tributary to Lake Kilby. Located approximately one mile northwest of the Little Tabernacle Church on US Route 58 in Suffolk.

SITE 2. Unnamed tributary to Cahoon Creek. Located approximately 500 feet northwest of the intersection of SR 607 and 632 in Suffolk.

SITE 3. Unnamed tributary to Cahoon Creek in Suffolk. Located just north of the intersection of SR 608 and 632.

SITE 4. Unnamed tributary to Nuby Run in Isle of Wight County. Located approximately one mile southeast of the intersection of Route 258 and SR 605.

SITE 5. Unnamed tributary to Courthouse Millpond in Isle of Wight County. Located approximately one mile east of Central Hill along SR 637.

SITE 6. Unnamed tributary to Pope Swamp in Isle of Wight County. Located approximately one mile south of Central Hill along SR 647.

SITE 7. Unnamed tributary to Antioch Swamp in Isle of Wight County. Located between SR 646 and US Route 460.

SITE 8. Unnamed tributary to Hunters Swamp in Isle of Wight County. Located approximately ¾ mile west of the intersection of SR 643 and 603.

SITE 9. Unnamed tributary to Round Hill Swamp in Southampton County. Located ½ mile southwest of Seacock Corner along SR 614.

SITE 10. Unnamed tributary to Seacock Swamp in Southampton County. Located ¾ mile southwest of Camp Corner along SR 616.

SITE 11. Unnamed tributary to Brantley Swamp in Southampton County. Located just west of Saddlers Crossroads (intersection of SR 600 and 618).

SITE 12. Unnamed tributary to Coppahaunk Swamp in Sussex County. Located ¼ mile north of the intersection of SR 604 and 615.

Mitigation strategy for stream impacts will include detailed watershed analysis, stream classification, and stream channel stability assessment.

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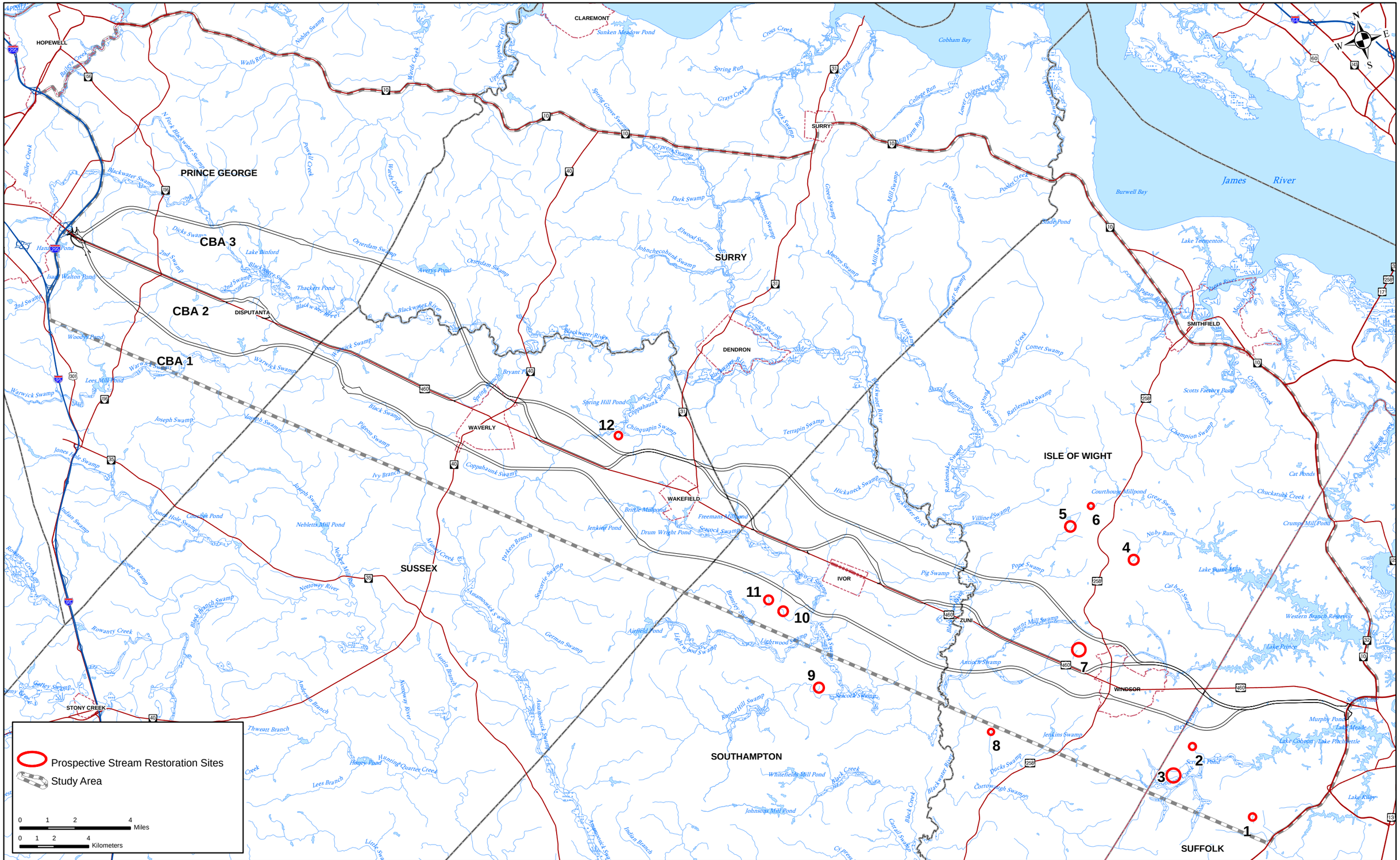


FIGURE 4.13-1
PROSPECTIVE STREAM RESTORATION SITES

### 4.13.3 Wetlands

#### 4.13.3.1 Effects

Acres of wetlands affected within each of the three CBAs (sorted by wetland type) are presented for the Planning Corridor in Table 4.13-6. Affected wetlands are shown in Figure 4.13-2.

Table 4-13-7 presents acres of wetlands potentially affected within the 230-foot-wide Design Corridor associated with CBA 1 and CBA 3 along with the 140-foot-wide Design Corridor associated with CBA 2. The effect of shifting the Design Corridor within the wider Planning Corridor is also presented in Table 4-13-7.

For the Planning Corridor, the severity of effects to wetlands relative to the total acreage of wetlands currently occurring within the study area are presented for each of the CBAs in Table 4.13-8. For the Design Corridor, the severity of effects to wetlands relative to the total acreage of wetlands currently occurring within the study area are presented for each of the CBAs in Table 4.13-9. Assuming use of bridges at major wetland crossings, use of the narrower Design Corridor, and use of applicable alignment shifts, the percent of total study area wetlands that would be affected is 0.21 percent for CBA 1, 0.17 percent for CBA 2, and 0.21 percent for CBA 3 (Table 4-13-9).

Each of the CBAs extend across three major watersheds or Hydrologic Unit Codes (HUCs): the Nansemond River (HUC 02080208), the Blackwater River (HUC 03010202), and the Nottoway River (HUC 03010201). Acres of wetlands affected within the Planning Corridor associated with each of the three CBAs are presented in Table 4.13-10 for each watershed (HUC).

#### 4.13.3.2 Mitigation

Executive Order 11990 (Protection of Wetlands) states that wetland Impacts must be avoided and minimized to the maximum extent practicable. To address avoidance and minimization, three measures were incorporated into the planning effort. The first effort was to locate the CBAs such that the corridors crossed the major wetland systems at a narrow location. The second measure was to incorporate bridges over FEMA-designated floodplains. Executive Order 11988 ( Floodplain Management) states that floodplain impacts must be avoided wherever there is a practicable alternative. Incorporation of the bridges, reduced the impacts by 46.81 acres for CBA 1, 87.90 acres for CBA 2 and 91.40 acres for CBA 3. A distribution of the impact reductions by wetland habitat type is presented in Table 4.13-4 for each CBA. The third measure was to shift the Design Corridor for CBAs 1 and 3 north or south within the Planning Corridor to avoid additional wetland areas. These shifts for CBA 1 and 3 would result in the avoidance of 13.4 acres of wetlands and 10.5 acres of wetlands, respectively. The types of wetlands comprising these areas is presented in Table 4.13-7. CBA 2 is centered on the existing roadway alignment for the entire length of the corridor; therefore, it was not possible to minimize effects to wetlands by shifting the centerline of this CBA.

Once wetland impacts have been avoided and minimized to the maximum extent practicable, compensation must be provided to mitigate for the remaining unavoidable impacts. Compensation typically takes the form of wetland replacement through the restoration of wetlands where a parameter has been removed or the creation of wetlands from non-wetland areas. Compensation requirements were calculated by utilizing the standard ratios of 2:1 for forested, 1.5:1 for scrub shrub, 1:1 for emergent, and 1:1 for unconsolidated bottom. See Table 4.13-10 for a summary of the compensation requirements. The project impacts were sorted by Hydrologic Unit Code (HUC) to determine compensation requirements within each of the three watersheds; Nansemond River, Blackwater River, and Nottoway River (Table 4.13-11).

**TABLE 4.13-6**
**WETLANDS AFFECTED AND IMPACT MINIMIZATION (DUE TO BRIDGES) WITHIN CBA PLANNING CORRIDORS**

| Wetland Type | Area Affected (acres) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | CBA 1 | | | CBA 2 | | | CBA 3 | | |
| | Effects without Bridge | Effects with Bridge | Net Reduction | Effects without Bridge | Effects with Bridge | Net Reduction | Effects without Bridge | Effects with Bridge | Net Reduction |
| Palustrine Forested Seasonally Inundated | 177.42 | 133.44 | 43.98 | 196.86 | 117.68 | 79.18 | 172.76 | 87.32 | 85.44 |
| Palustrine Forested Seasonally Saturated | 106.64 | 106.09 | 0.55 | 82.38 | 81.52 | 0.86 | 116.35 | 114.86 | 1.49 |
| Palustrine Scrub Shrub | 18.6 | 16.32 | 2.28 | 30.05 | 26.46 | 3.59 | 33.4 | 29.82 | 3.58 |
| Palustrine Emergent | 20.25 | 20.25 | 0 | 13.63 | 9.36 | 4.27 | 11.8 | 11.13 | 0.67 |
| Palustrine Unconsolidated Bottom/Shore | 13.36 | 13.36 | 0 | 19.87 | 19.87 | 0 | 27.55 | 27.33 | 0.22 |
| Total Acreage Affected | 336.27 | 289.46 | 46.81 | 342.79 | 254.89 | 87.9 | 361.86 | 270.46 | 91.4 |

**TABLE 4.13-7**
**WETLANDS AFFECTED WITHIN DESIGN CORRIDORS**
**ALONG WITH MINIMIZATION ATTRIBUTED TO ALIGNMENT SHIFTS WITHIN THE PLANNING CORRIDORS [1]**

| Wetland Type | Area Affected (acres) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | CBA 1 (230 ft) | | | CBA 2 (140 ft) | | | CBA 3 (230 ft) | | |
| | Effects without alignment shift | Effects with alignment shift | Net reduction | Effects without alignment shift | Effects with alignment shift | Net reduction | Effects without alignment shift | Effects with alignment shift | Net reduction |
| Palustrine Forested Seasonally Inundated | 68.52 | 60.02 | 8.50 | 46.15 | N/A | N/A | 48.75 | 38.75 | 10.00 |
| Palustrine Forested Seasonally Saturated | 55.05 | 51.45 | 3.60 | 33.55 | N/A | N/A | 59.95 | 59.95 | 0 |
| Palustrine Scrub Shrub | 9.77 | 8.47 | 1.30 | 12.84 | N/A | N/A | 13.57 | 13.57 | 0 |
| Palustrine Emergent | 10.75 | 10.75 | 0 | 6.86 | N/A | N/A | 7.48 | 7.48 | 0 |
| Palustrine Unconsolidated Bottom/Shore | 7.70 | 7.70 | 0 | 10.52 | N/A | N/A | 16.01 | 15.51 | 0.50 |
| Total Acreage Affected | 151.79 | 138.39 | 13.40 | 109.92 | N/A | N/A | 145.76 | 135.26 | 10.5 |

[1] Data also includes bridges.

## TABLE 4.13-8
## SEVERITY OF EFFECTS TO WETLANDS - CBA PLANNING CORRIDOR

| Wetland Type | Total Acreage Within Study Area | CBA 1 | | | | CBA 2 | | | | CBA 3 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Effects without Bridge | % of Total | Effects with Bridge | % of Total | Effects without Bridge | % of Total | Effects with Bridge | % of Total | Effects without Bridge | % of Total | Effects with Bridge | % of Total |
| Palustrine Forested Seasonally Inundated | 33,640.17 | 177.42 | 0.53 | 133.44 | 0.4 | 196.86 | 0.59 | 117.68 | 0.35 | 172.76 | 0.51 | 87.32 | 0.26 |
| Palustrine Forested Seasonally Saturated | 20,962.36 | 106.64 | 0.51 | 106.09 | 0.51 | 82.38 | 0.39 | 81.52 | 0.39 | 116.35 | 0.56 | 114.86 | 0.55 |
| Palustrine Scrub Shrub | 5,773.82 | 18.6 | 0.32 | 16.32 | 0.28 | 30.05 | 0.52 | 26.46 | 0.46 | 33.4 | 0.58 | 29.82 | 0.52 |
| Palustrine Emergent | 2,323.32 | 20.25 | 0.87 | 20.25 | 0.87 | 13.63 | 0.59 | 9.36 | 0.41 | 11.8 | 0.51 | 11.13 | 0.48 |
| Palustrine Unconsolidated Bottom/Shore | 2,580.74 | 13.36 | 0.51 | 13.36 | 0.51 | 19.87 | 0.77 | 19.87 | 0.77 | 27.55 | 1.07 | 27.33 | 1.06 |
| Total Acreage Affected | 65,280.41 | 336.27 | 0.51 | 289.46 | 0.44 | 342.79 | 0.53 | 254.89 | 0.39 | 361.86 | 0.55 | 270.46 | 0.41 |

## TABLE 4.13-9
## SEVERITY OF EFFECTS TO WETLANDS - CBA DESIGN CORRIDOR [1]

| Wetland Type | Total Acreage Within Study Area | CBA 1 | | | | CBA 2 | | | | CBA 3 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Effects without Alignment Shift | % of Total | Effects with Alignment Shift | % of Total | Effects without Alignment Shift | % of Total | Effects with Alignment Shift | % of Total | Effects without Alignment Shift | % of Total | Effects with Alignment Shift | % of Total |
| Palustrine Forested Seasonally Inundated | 33,640.17 | 68.52 | 0.20 | 60.02 | 0.18 | 46.15 | 0.14 | N/A | N/A | 48.75 | 0.14 | 38.75 | 0.12 |
| Palustrine Forested Seasonally Saturated | 20,962.36 | 55.05 | 0.26 | 51.45 | 0.24 | 33.55 | 0.16 | N/A | N/A | 59.95 | 0.29 | 59.95 | 0.29 |
| Palustrine Scrub Shrub | 5,773.82 | 9.77 | 0.17 | 8.47 | 0.15 | 12.84 | 0.22 | N/A | N/A | 13.57 | 0.26 | 13.57 | 0.26 |
| Palustrine Emergent | 2,323.32 | 10.75 | 0.46 | 10.75 | 0.46 | 6.86 | 0.29 | N/A | N/A | 7.48 | 0.32 | 7.48 | 0.32 |
| Palustrine Unconsolidated Bottom/Shore | 2,580.74 | 7.70 | 0.30 | 7.70 | 0.30 | 10.52 | 0.41 | N/A | N/A | 16.01 | 0.62 | 15.51 | 0.60 |
| Total Acreage Affected | 65,280.41 | 151.79 | 0.23 | 138.39 | 0.21 | 109.92 | 0.17 | N/A | N/A | 145.76 | 0.22 | 135.26 | 0.21 |

[1] Data also includes bridges.

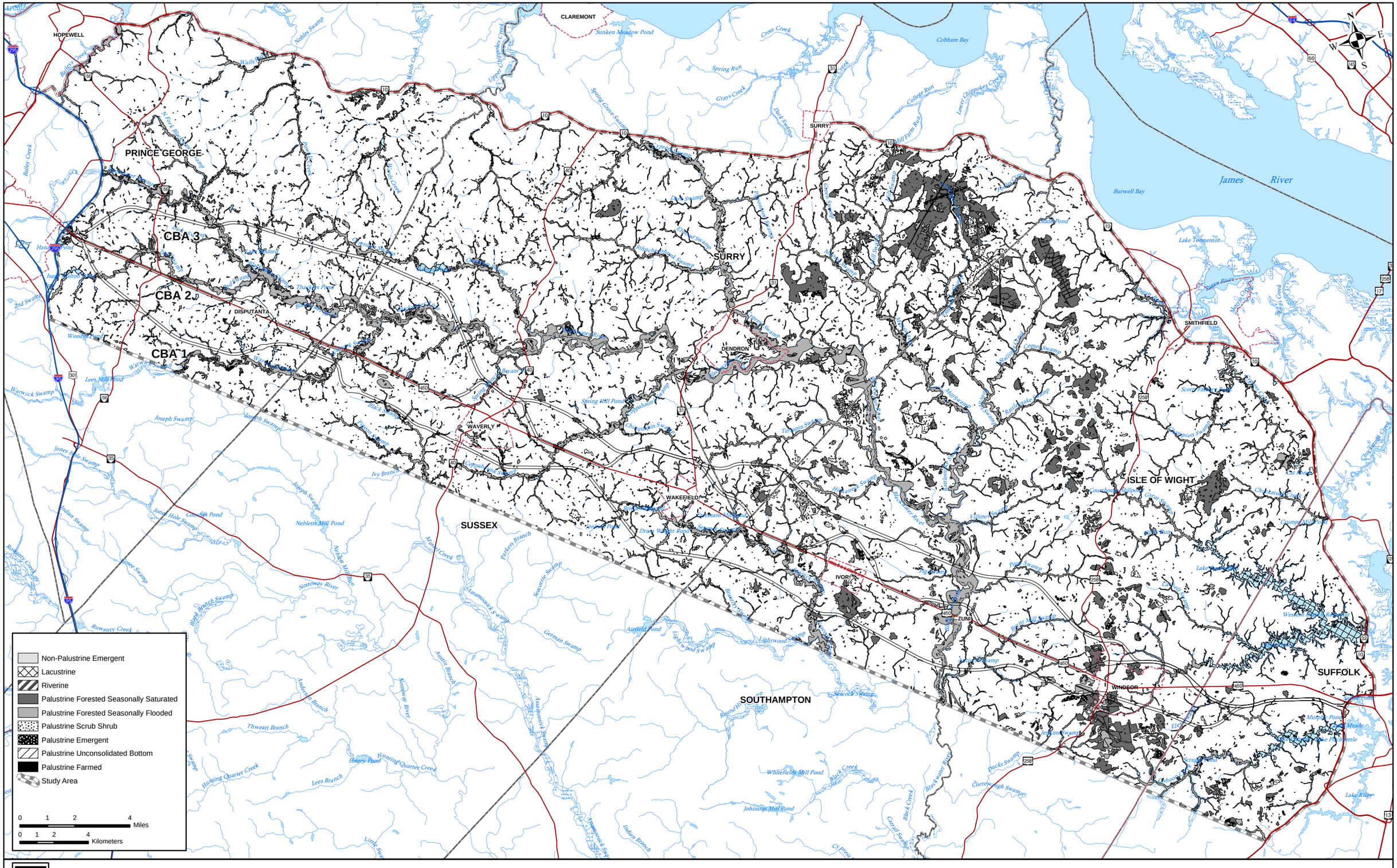


FIGURE 4.13-2
WATERS OF THE U.S., INCLUDING WETLANDS

**Table 4.13-10**
**ESTIMATED COMPENSATION REQUIREMENTS (DESIGN CORRIDOR)**

| Wetland Habitat Type | CBA 1 (230 ft) | | CBA 2 (140 Ft) | | CBA 3 (230 ft) | |
|---|---|---|---|---|---|---|
| | Effects (acres) | Mitigation Required (acres) | Effects (acres) | Mitigation Required (acres) | Effects (acres) | Mitigation Required (acres) |
| Palustrine Forested Seasonally Inundated | 60.02 | 120.04 | 46.15 | 92.30 | 38.75 | 77.50 |
| Palustrine Forested Seasonally Saturated | 51.45 | 102.90 | 33.55 | 67.10 | 59.95 | 119.90 |
| Palustrine Scrub/Shrub | 8.47 | 12.71 | 12.84 | 19.26 | 13.57 | 20.36 |
| Palustrine Emergent | 10.75 | 10.75 | 6.86 | 6.86 | 7.48 | 7.48 |
| Palustrine Unconsolidated Bottom/Shore | 7.70 | 7.70 | 10.52 | 10.52 | 15.51 | 15.51 |
| Total | 138.39 | 254.1 | 109.92 | 196.04 | 135.26 | 240.75 |

Compensation strategies would be determined during project permitting; however, four conceptual alternatives were evaluated at this stage of the study:

1. On-site and Off-site Wetland Restoration/Creation Opportunities. A site search was conducted. (The results are provided in following sections).
2. Applicable VDOT Mitigation Banks. VDOT has two banks servicing the study area, the Goose Creek Bank, has a small number of credits, less than 30-acres available for use and the Benjamin Nottoway River Mitigation bank with less than 3 credits available.
3. Commercial Wetland Mitigation Banks. There are six commercial mitigation banks servicing HUC 02080208, Nansemond River. There are no commercial banks servicing HUC Codes 03010202, Blackwater River and 03010201, Nottoway River currently providing credits, however there is one large bank (just approved) with the potential for 100-125 credits.
4. Contributions to the Nature Conservancy Virginia Wetland Restoration Trust Fund. Should it not be feasible to mitigate all project impacts through compensation items 1 through 3, above, the balance would be provided through payment in to the Trust Fund

Each site evaluated was assigned a numeric value (1 to 3) to each of the nine compensation site search criteria, based upon the presence, nature and relative quality of the factors described above. The most a site could score is 27 points. Scores of 20 points and above would be considered for further evaluation. Thirty sites scored 20 or higher - 12 in the Nansemond River watershed, ten in the Blackwater River watershed, and eight in the Nottoway River watershed. The numeric results for the sites evaluated in this study are provided in Appendix D.

The 12 sites in the Nansemond River watershed that scored 20 or higher have an approximate acreage of 196. The ten sites that scored 20 or higher in the Blackwater River watershed have an approximate acreage of 301. The eight sites that scored 20 or higher in the Nottoway River watershed has an approximate acreage of 2,432. The total approximate acreage from the three watersheds in the study area is 2929. See Table 4.13-11 for a comparison of mitigation requirements and potential mitigation identified by CBA and watershed. There will be a temporal loss of wetland functions and values while the wetland compensation sites develop to maturity; however with the compensation ratios of 2:1 for forested, 1.5:1 for scrub shrub, 1:1 for emergent, and 1:1 for unconsolidated bottom should provide additional functions and values as the overall wetland acreage in each watershed increases.

**TABLE 4.13-11**
**MITIGATION REQUIREMENTS AND AVAILABLE MITIGATION ACRES BY WATERSHED**

| Watershed | Mitigation Required (acres) | | | Potential Mitigation Available (acres) |
|---|---|---|---|---|
| | CBA 1 | CBA 2 | CBA 3 | |
| Nansemond | 90.12 | 59.50 | 28.36 | 196 |
| Blackwater | 144.51 | 136.58 | 212.39 | 301 |
| Nottoway | 20.30 | 0 | 0 | 2,432 |
| Totals | 254.10 | 196.04 | 240.75 | 2,929 |

Sufficient mitigation was identified in the Nansemond and Nottoway Rivers to compensate for proposed impacts. The search within the Blackwater River watershed was deficient by 32 to 60 acres depending on which CBA was selected. The Blackwater River watershed mitigation deficit can be resolved by providing the balance of mitigation in adjacent watersheds (especially the Nottoway River watershed which, like the Blackwater, is a tributary to the Chowan River).

With total mitigation requirements within the Design Corridor of 254.10 acres for CBA 1, 196.04 acres for CBA 2, and 240.75 acres for CBA 3, sufficient restoration and creation acreage to compensate for unavoidable wetland impacts has been identified within study area watersheds. In addition, the following options can also provide compensation: 1) VDOT mitigation bank credits, 2) commercial banks, and 3) contributions to the Virginia Wetland Restoration Trust Fund. Payment in-lieu to the Trust Fund would be made only after a determination had been made that it is not feasible to provide all necessary mitigation through restoration or creation. Should it be determined at a later phase of project design that wetland impacts will be greater that estimates given herein for Design Corridor CBA concepts, the wetlands mitigation site search conducted as part of this study verifies that adequate acreage of suitable mitigation sites exists within study area watersheds (see Table 4.13-11).

## 4.14 FLOODWAYS & 100 YEAR FLOODPLAINS

See Figure 4.14-1 for locations of floodways and 100-year floodplains. A more-detailed discussion of floodplains and associated floodways is presented the *Natural Resources Technical Report* (VDOT, 2005).

### 4.14.1 Effects

Each CBA would span floodways and encroach upon 100-year floodplains at multiple locations. Four regulated floodways would be crossed under CBA 1, four under CBA 2, and three under CBA 3. Table 4.14-1 presents floodway crossings by CBA, stream, and watershed. Floodway crossings are depicted in Figure 4.14-1. Without construction of those bridges presented in Table 4.13-1, 72.55 acres of floodplain would be affected under CBA 1, 71.78 acres under CBA 2, and 99.53 acres under CBA 3 within the Design Corridor. With construction of those bridges presented in Table 4.13-1, 58.19 acres of floodplain would be affected under CBA 1 (a 20 percent reduction in floodplain encroachment), 63.42 acres under CBA 2 (a 12 percent reduction in floodplain encroachment), and 84.75 acres under CBA 3 (a 15 percent reduction in floodplain encroachment) within the Design Corridor. Table 4.14-1 presents floodplain encroachment estimates by CBA, stream, and watershed. Floodplain encroachments are depicted in Figure 4.14-1.

With CBAs being centered within the Planning Corridor, three near-parallel floodplain encroachments would result from development of CBA 1, five from CBA 2, and six from CBA 3. If, during later design