

**Table III-8: Potential Prehistoric and Historic Archaeological Resources in the APE**

Parcel Designation	Project APE (Acre)	Archaeological Resource Potential	
		Prehistoric	Historic
1	11.9	L	M to H
2	27.3	M	M to H
3 and 4	9.7	L	M
5	3.3	L	M to H
6	2.8	M	M to H
7	4.9	H	H
8	5.0	H	L
9	5.0	H	L
10	1.1	L	H
11	0.4	L	L
12	7.4	H	H
13	3.4	L	L
14	3.0	H	L
15	5.8	L	L
16	1.7	H	L
17	4.3	L	L
18	63.8	H	H
19	1.4	H	H
20	2.6	H	H
21	6.0	H	H
22	6.0	H	L
23	2.0	L	H
24	1.2	L	M to H
25	8.0	H	H
26	11.5	H	L

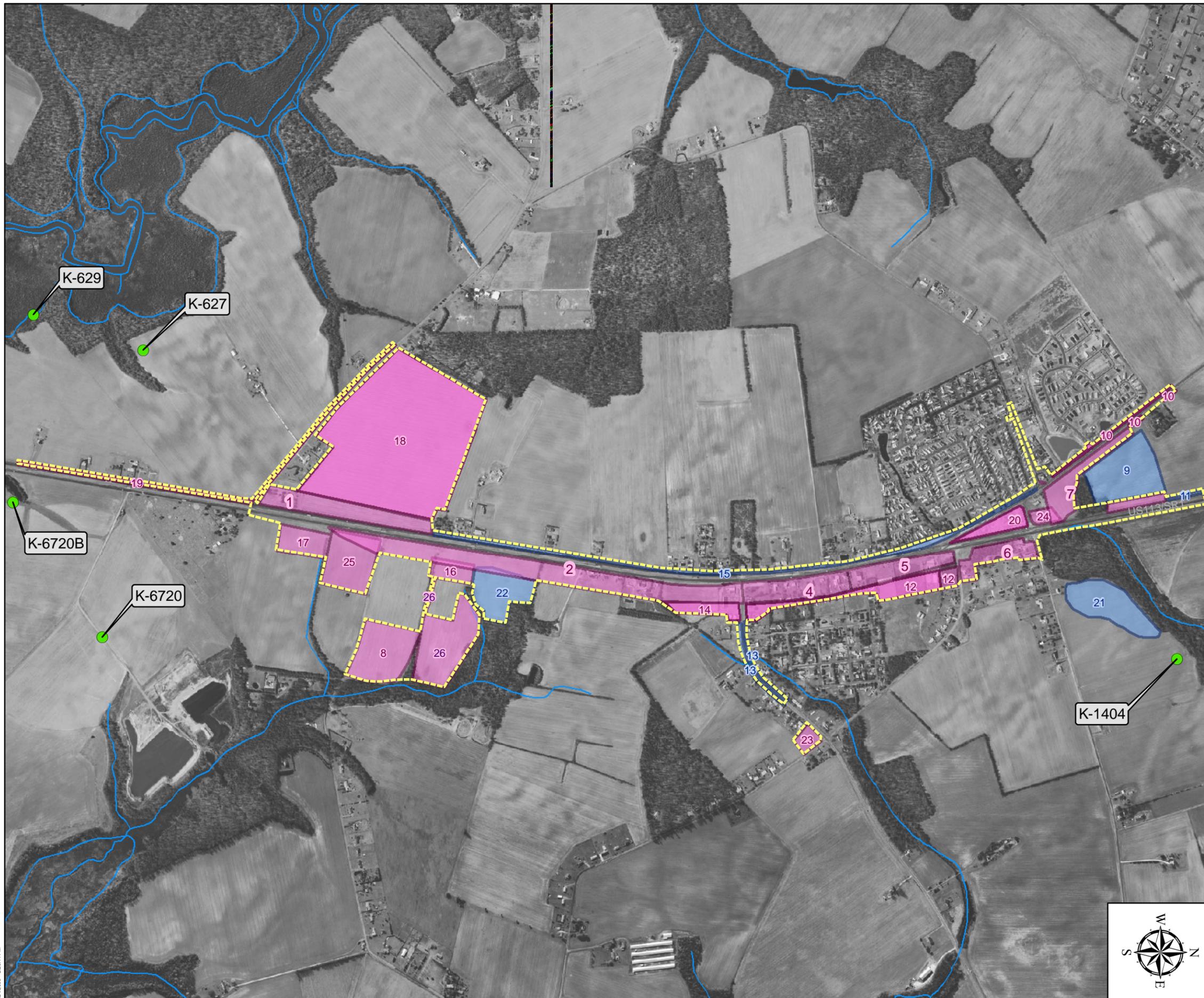
Test Intervals: (M) Medium - 75.0 feet, (H) High - 50.0 feet.

**Table III-9: Key to CRS Numbers for Archaeological Resources in APE and Surrounding Project Area**

CRS #	Resource Name; Street Address or Location	Resource Type	Age (approximate)	Comments
<b>West Side</b>				
K-627	Sipple Farm #2 Site 7K-F-54	Precontact site	Unknown	--
K-629	Robbins Farm #2 Site 7K-F-44	Precontact site	Woodland	--
<b>East Side</b>				
K-1404	7K-F-92	Precontact site	Unknown	--
K-6720	Southeast of Barratt's Chapel, east side SR 1, near Frederica	Precontact/Historic site	Unknown	"prehistoric / historic scatters"
K-6720B	South of Barratt's Chapel, east side of SR 1	Precontact/Historic site	Unknown	"prehistoric / historic scatters"

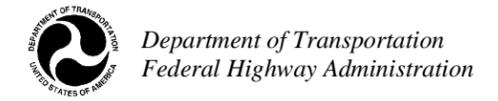
Source: CRS files and Photographic Identification Cards; on file at DE SHPO, Dover, Delaware.

**SR 1, Little Heaven  
Grade Separated Intersection  
Environmental Assessment**



- Archeological Site
- Area of Potential Effect (APE)
- Agreed Not Tested
- Tested Area
- Stream

**Figure III-9  
Archeological Areas  
of Potential Effect (APE)**



Map Document: (X:\Projects\SR1\_CCP\mappings\73 EA\_Document\June2008\Revisions\FigIII-09ArcheoAPE.mxd) 2/2/2008 12:20:14 PM

### 3. Historic Architectural Resources

Within the defined APE, historic architectural resource surveys were first conducted in 2003 and continued until 2008. They included examination of all buildings within the APE. Historic maps were used to determine approximate dates of construction for resources and properties previously evaluated for National Register eligibility.

As part of the historic identification for architectural resources, all properties dated through 1960 on the east side of SR 1, and properties primarily dating through 1954 on the west side of SR 1 were surveyed for the National Register of Historic Places.

In all, a series of separate reports or supplements (see links below) were generated to help identify historic properties. Results of eligibility assessments and other boundary clarifications were all confirmed by the DE SHPO and DelDOT in a series of stages or different volumes.

- [http://www.deldot.gov/archaeology/little\\_heaven/architectural/index.shtml](http://www.deldot.gov/archaeology/little_heaven/architectural/index.shtml)
- [http://www.deldot.gov/archaeology/little\\_heaven/vol2/index.shtml](http://www.deldot.gov/archaeology/little_heaven/vol2/index.shtml)
- [http://www.deldot.gov/archaeology/little\\_heaven/architectural/addendum\\_2007/index.shtml](http://www.deldot.gov/archaeology/little_heaven/architectural/addendum_2007/index.shtml)
- [http://www.deldot.gov/archaeology/little\\_heaven/bowers\\_beach\\_rd/index.shtml](http://www.deldot.gov/archaeology/little_heaven/bowers_beach_rd/index.shtml)
- [http://www.deldot.gov/archaeology/historic\\_pres/north\\_frederica/index.shtml](http://www.deldot.gov/archaeology/historic_pres/north_frederica/index.shtml)
- [http://www.deldot.gov/archaeology/barratts\\_chapel\\_rd/index.shtml](http://www.deldot.gov/archaeology/barratts_chapel_rd/index.shtml)

Based on background research efforts and coordination with the DE SHPO, five (5) individual cultural resources with properties listed in or eligible for the NRHP were confirmed, as shown on **Table III-10** and **Figure III-10**. Please see the Section IV of this EA for a detailed description and evaluation of impacts to these resources.

**Table III-10: Surveyed Historic Architectural Resources in the APE**

CRS No.	Resource Name/Address/Location	Resource Type	Age (approximate)	National Register Status
K-137	Jehu Reed House, 7585 Bay Rd.	Residence/mansion; former farmstead	circa 1770	Listed (Criteria A & C)
K-103	Barratt's Chapel and Cemetery, 6416 Bay Rd.	Church and Cemetery	circa 1780	Listed (Criteria A & C)
K-2686	Thomas James House, 628 Clapham Rd.	Residence; former farmstead	circa 1845	Eligible (Criterion C)
K-2685	Mt. Olive Colored School, 288 Clapham Rd.	African American School	circa 1923	Eligible (Criteria A & C)
K-01689	W. C. Fountain Agricultural Complex 4988 Barratt's Chapel Road	Residence; former farmstead	circa 1730	Eligible (Criteria C & D)

#### *a. Impacts to Historic Resources*

A Determination of Effects Report has been prepared for Section 106 compliance and is included on DelDOT's Archaeology/Historic Preservation Website:  
[http://www.deldot.gov/archaeology/little\\_heaven/dae/index.shtml](http://www.deldot.gov/archaeology/little_heaven/dae/index.shtml).

The project would have an adverse effect on the following resources:

- Jehu Reed House (CRS No. K-137)
- Mt. Olive Colored School (CRS No. K-2685)

The Section 4(f) Evaluation chapter of this Environmental Assessment discusses the avoidance, minimization and mitigation of these properties in detail. The project as an undertaking would experience some adverse effects and therefore a Memorandum of Agreement (See **Appendix A**) between FHWA, DelDOT and the DE SHPO was developed to resolve any adverse effects that may occur as a result of implementing the project.



**LEGEND**

-  Area of Potential Effect (APE)
-  Property Lines
-  Tax Parcel of Historic Property (NRHP-Listed/Eligible)

Aerial Photo: 2007  
 Note: Map does not depict archaeological sites due to privacy reasons and further efforts are needed to confirm National Register status.

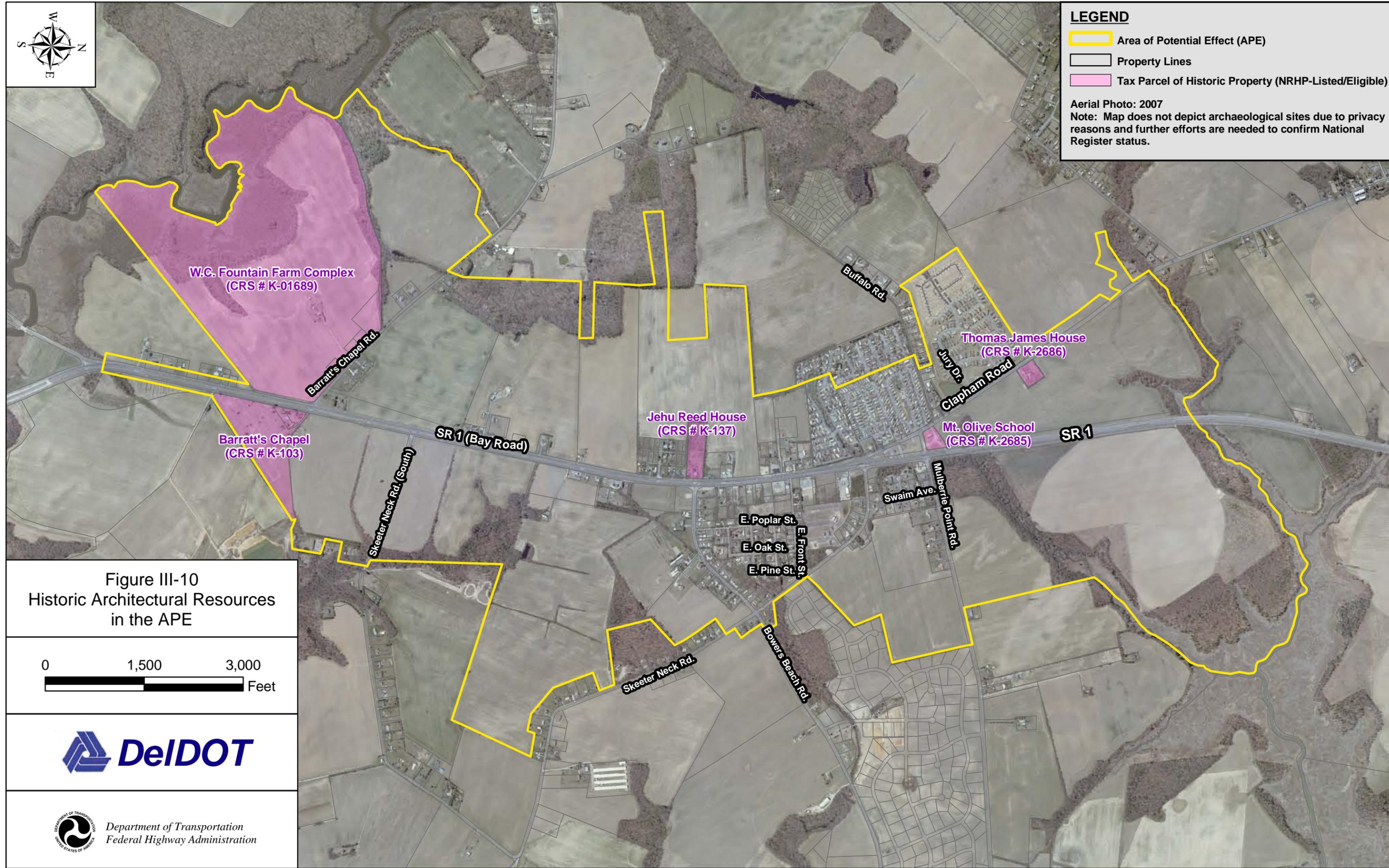
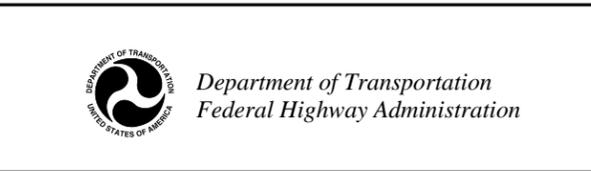
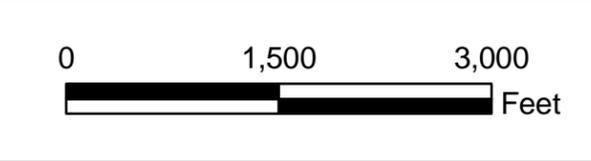


Figure III-10  
 Historic Architectural Resources  
 in the APE



## C. Natural Environment

### 1. Open Waters and Wetlands: USACE and DNREC Jurisdictional Resources

A brief description of the open waters and wetlands follows and a summary of their functions and values are summarized in **Table III-13** and their locations shown on **Figure III-11**. A summary of the history of the wetland and waterway delineation, started in 2004 and revised in 2008 and 2009, follows. A detailed discussion of the five jurisdictional wetlands and eight waterways identified in the Project Area is provided under a separate cover in a report entitled SR 1, Little Heaven Grade Separated Intersection Project *Waters of the U.S Identification and Delineation Report (February 2004, Revised December 2008, Addendum September 2009)*.

This Identification and Delineation of Waters of the U.S. Report is based on readily available secondary source information as well as detailed field reconnaissance. The Routine On-Site Determination Method in accordance with the Corps of Engineers Wetlands Delineation Manual (USACE, 1987) was used to identify and delineate the wetlands within the Project Area. The presence of hydric soil, hydrophytic vegetation, and wetland hydrology was documented for each area determined to be a wetland. Federal and state permits will be necessary prior to initiating any fill or encroachment (e.g. filling, draining, crossing, etc.) activities in the identified wetlands.

#### a. History of Project-level Open Water and Wetland Delineation

Surface water and wetland inventories, field investigations and delineations were conducted in the Project Area in 2003/2004 and 2008. The inventories included a review of the U.S. Fish and Wildlife Service's National Wetland Inventory (NWI) Mapping, the Natural Resource Conservation Service of the United States Department of Agriculture Soil Survey of Kent County, Delaware Natural Resources and Environmental Control's (DNREC) System-Wide Monitoring Program (SWMP) wetland mapping (Frederica, DE) and field reconnaissance surveys.

Field investigations and delineations of water and wetland resources were conducted throughout the Project Area to satisfy the requirements of the U.S. Army Corps of Engineers (USACE), which has jurisdictional authority over the Waters of the U.S., including wetlands, under the purview of Section 404 of the Clean Water and the requirements of DNREC under the purview of Chapter 72 Subaqueous Lands Act of Title 7. These field delineations, completed on October 29, November 3 and 17, December 17, 2003 and June 9, 2004, determined that six wetland areas exist within the project study area. Following the November 2004 USACE Jurisdictional Field view, two of the six wetlands areas were determined to not meet jurisdictional determination criteria and were removed from the plan, leaving four jurisdictional wetland areas (Wetland 1, 3, 5 and 6) and three waterways (WA 1, WA 2 and WA 3) located in the Project Area.

The project was placed on-hold until 2007 due to budgetary constraints. In September 2007, the Project Area was re-evaluated for compliance with new waterways guidance. In addition, new areas associated with an expanded project study limit were surveyed in January 2008 for additional wetlands and waterways as shown on **Figure III-11**. This survey did not identify any additional wetland areas and eight waterway areas, bringing the total wetlands identified to four and the total waterways identified to eleven. However, during a USACE Jurisdictional Field Review of the resources in the expanded Project Area conducted in July 2008, one previously identified wetland (Wetland 5) was determined to not meet the three wetland criteria; therefore there are only three Jurisdictional wetlands within the Project Area, those consisting of Wetlands 1, 2 and 6.

## 2. Jurisdictional Open Waters

The field delineations of the Project Area identified eight additional waterways, three along Barratt’s Chapel Road (WA 6, 7 and 8), four waterways associated with the extended portion of WA 2 (WA 9, 10, 11 and 12) and a waterway located adjacent to the Skeeter Neck Road/Bower’s Beach intersections (WA 13). Combined with the previous survey results, there were 11 waterways identified in the Project Area, including the previously identified WA 1, WA 2 and WA 3. Seven of these are relatively permanent waterways (RPW), which are defined as waterways that have relatively permanent waters at least three months of the year. All seven RPW waterways were reviewed in the field by USACE on July 31, 2008 and determined to be jurisdictional, including WA 2, 3, 9, 10, 11, 12, 13 from the 2004 delineation.

WA 1, a previously identified waterway, and the three non-RPW waterways, as well as a portion of WA 3 were identified as non-jurisdictional by the USACE representative and are depicted as non-jurisdictional wetlands and waterways on **Figure III-11**. These waterways have been removed from the following discussion. The seven jurisdictional waterways within the Project Area are WA 2, 3, 9, 10, 11, 12 and 13.

A final identification and delineation of “Waters of the U.S.” was conducted for this project on April 16, 2009 for the area in the vicinity of the wetland mitigation site (See **Figure III-11**). There were not any non-jurisdictional ditches were identified on the site, beyond the portion of the farm field ditch, identified by the USACE, during a previous field visit. The field reconnaissance identified two palustrine wetlands (WL and WM) and two open water channels potentially regulated by Section 404 of the Clean Water Act.

### a. Impacts and Avoidance/Minimization Efforts

Throughout the project development process measures to avoid and minimize waterway impacts were pursued; however, it would be necessary to encroach on approximately 782 linear feet of waterway (**Table III-11**).

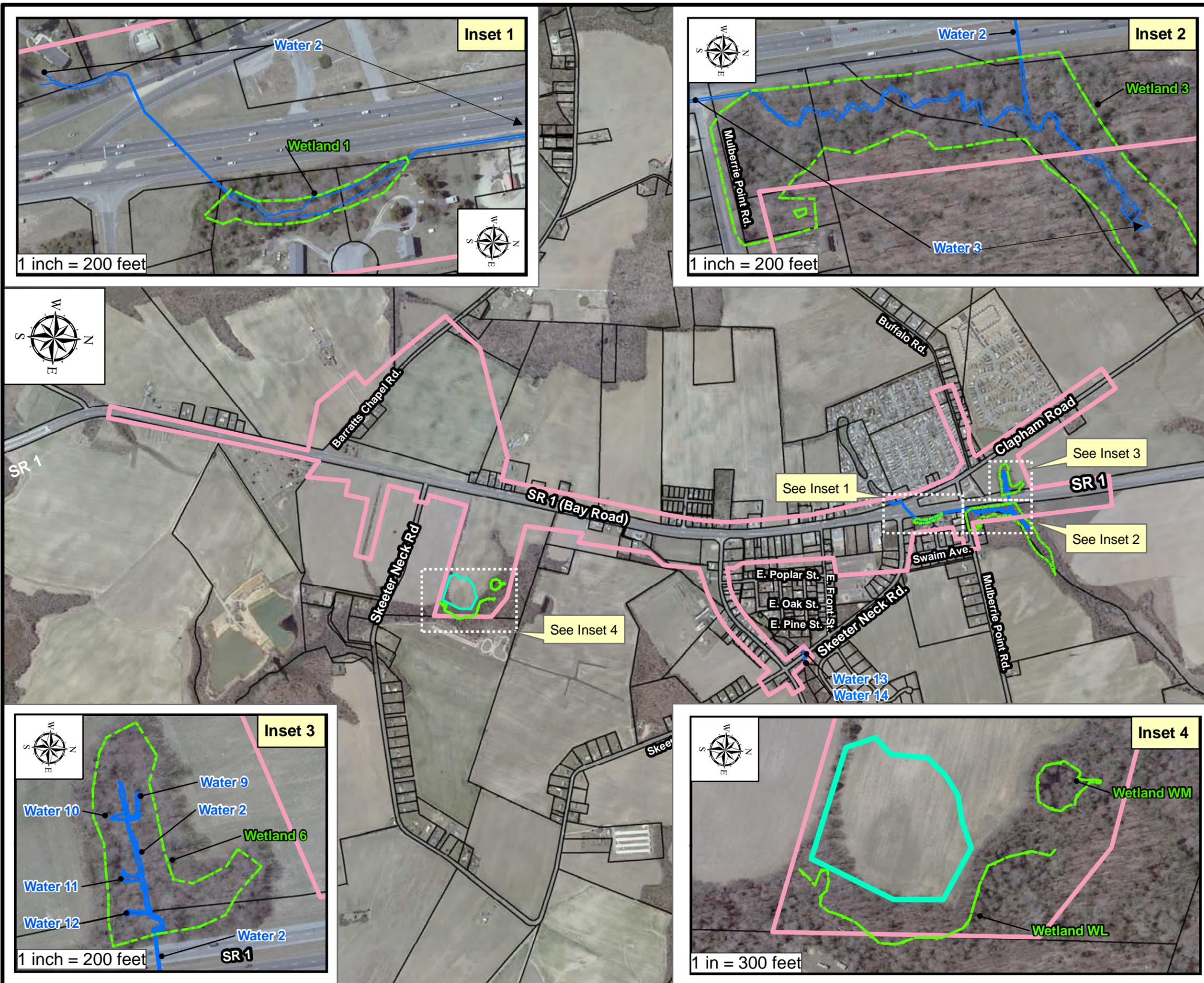
**Table III-11: Impacts to Jurisdictional Open Waters in Linear Feet (LF)**

Alternatives	Jurisdictional Waters								
	WA 2	WA 3	WA 9	WA 10	WA 11	WA 12	WA 13	WA 14	Total
A	115	624	--	--	--	--	--	--	739
B	115	644	--	--	--	--	--	--	759
*C	146	624	--	--	--	--	12	--	782
D	--	344	--	--	--	--	--	--	344
E	--	624	--	--	--	--	--	--	624
F	--	344	--	--	--	--	--	--	344

**Note:** \*Alternative C is the Preferred Alternative

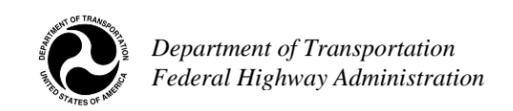
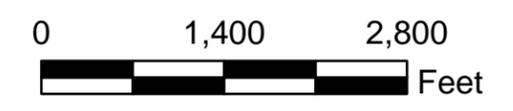
Additional measures to minimize impacts would continue through final design as grading and stormwater management needs are finalized. Potential water quality impacts associated with construction activities would be managed with erosion and sediment control practices, such as sediment traps, silt fences and biofiltration swales to prevent water quality problems. Sedimentation impacts should be minimal and would not have an adverse effect on the wetlands so long as strict adherence to the project’s erosion and sediment control plan is carried out. Roadway pollutant impacts would also be minimized through proposed stormwater management facilities.

**SR 1, Little Heaven  
Grade Separated Intersection  
Environmental Assessment**



- Wetland Study Area Boundary
- Delineated Wetlands (Jurisdictional)
- Jurisdictional Waters (Jurisdictional)
- Wetland Mitigation Site

Figure III-11  
Jurisdictional Waters and Wetlands



### 3. Jurisdictional Wetlands

There are five jurisdictional wetlands located within the project study area: Wetland 1, 3, 6, WL and WM. **Table III-12** provides a summary of the jurisdictional wetlands classification and functions.

**Table III-12: Summary of Wetland Characteristics**

Wetland ID	Cowardin Classification System	Dominant Vegetation	Primary Functions
Wetland 1	PFO	black gum, spicebush, royal fern, arrowwood viburnum, red maple	GWD, S/TR, NR/T, WD /A
Wetland 3	PFO	ostrich fern, American holly, summersweet, sensitive fern, greenbriar, white oak, persimmon	GWD, S/TR, NR/T, WD/A R, VQ/A, U
Wetland 6	PFO	red maple, sensitive fern, greenbriar, Japanese honeysuckle, arrowwood	GWD, S/TR, NR/T, WD /A
Wetland WL	PFO	red maple, skunk cabbage, willow oak	FA, S/TR, NR/T, WD/A
Wetland WM	PFO	red maple, silver maple	GWD, FA, S/TR, WD/A
<b>Notes:</b> PEM=Palustrine Emergent; PFO=Palustrine Forested; GWD=Groundwater Discharge; S/TR=Sediment & Toxicant Retention; FA=Floodflow Alteration; N R/T=Nutrient Removal & Transformation; W D/A=Wildlife Diversity & Abundance; R=Recreation; U=Uniqueness;V Q/A=Visual Quality & Aesthetics			

**Wetland 1** – A PFO classified wetland located along the eastern edge of SR 1 between Mulberrie Point Road and Skeeter Neck Road. A perennial waterway bisects the wetland and continues under Mulberrie Point Road into Wetland 3. Functions and values for Wetland 1 are groundwater discharge, sediment/toxicant retention, nutrient removal and wildlife habitat.

**Wetland 3** – A PFO classified wetland located in a heavily wooded area along the eastern edge of SR 1, north of Mulberrie Point Road. The wetland extends beyond the Project Area boundary to the northwest. The same perennial stream bisecting Wetland 1 traverses through Wetland 3 and is hydrologically connected to Wetland 6 via a drainage pipe under SR 1. Functions and values for Wetland 3 are groundwater discharge, sediment/toxicant retention, nutrient removal, wildlife habitat, recreation, uniqueness and visual quality/aesthetics.

**Wetland 6** – A PFO classified wetland located in a wooded area along the northern edge of the Project Area between Clapham Road and SR 1. It is hydrologically connected via a pipe under SR 1 to Wetland 3. Functions and values are groundwater discharge, sediment/toxicant retention, nutrient removal and wildlife habitat.

**Wetland WL** – A PFO classified wetland that is seasonally flooded by the unnamed tributary that flows through the system. The wetland system is located on the outer limits of the project study area both along the east and north edge of the site. Wetland WL is hydrologically connected to the stream that flows through the system.

**Wetland WM** – A PFO classified wetland that is a seasonally inundated system, with strong vegetative morphological adaptations of the tree species and sparse ground cover. Wetland WM is a broadleaf deciduous forested wetland (PFO1C) that is seasonally flooded and is hydrologically connected to the unnamed tributary flowing through Wetland WL via a single outlet to the channel.

**a. Impacts and Avoidance/Minimization Efforts**

The following is a discussion of the wetland impacts resulting from the alternatives analysis as well as avoidance and minimization efforts taken to reduce impacts to the Project Area wetlands and waterways. **Table III-13** shows the wetland impacts associated with each build alternative.

**Table III-13: Individual Wetlands: Impacts in Acres (ac.)**

Alternative	Wetland Number/Existing Wetland Size within Project Area (Acre)					
	W1	W3	W6	WL	WM	Total
A	0.14	3.57	0.20	0.00	0.00	3.91
B	0.18	3.49	0.20	0.00	0.00	3.87
*C	0.276	0.472	0.241	0.00	0.00	0.989
D	0.01	0.21	0.00	0.00	0.00	0.22
E	0.276	0.21	0.00	0.00	0.00	0.486
F	0.01	0.21	0.00	0.00	0.00	0.22

\*Note: Alternative C is the Preferred Alternative

*(1) No-build*

Implementation of the No-Build Alternative would have no effect on the wetlands or streams in the project study area.

*(2) Alternative Analysis*

Alternatives A and B were evaluated for impacts to wetlands during the initial alternatives analysis as shown in **Table III-13**. Alternative A would impact approximately 3.91 acres of wetland in the Project Area, including 0.14 acres of Wetland 1, 3.57 acres of Wetland 3 and 0.20 acre of Wetland 6. Alternative B would impact 3.87 acres of wetland including 0.18 acres of Wetland 1, 3.49 acres of Wetland 3 and 0.20 acres of Wetland 6. In both cases, the alternatives would result in impacts to approximately half of Wetland 1, severely affecting the functions it provides.

In response to the significant wetland impacts associated with Alternatives A and B, these alternatives were no longer pursued and Alternatives C through F were further developed and analyzed. Their design and impact on wetlands were evaluated and presented in public workshops. The following describes these alternatives.

The Preferred Alternative, Alternative C, was originally modified in 2007 to include a portion of Barratt’s Chapel Road and extensions of the Project Area along Mulberrie Point Road and Bower’s Beach Road. The Preferred Alternative has been refined since the initial impact evaluation as the project was carried forward through the project development process. Modifications include the widening of the median within the northern portion of SR 1 as it approaches the intersection of Skeeter Neck at Buffalo Road and the addition of deceleration lane in the northbound lane of SR 1. These modifications result in additional wetland impacts, including 0.241 acres of Wetland 6 and an increase (0.21 acres to 0.472 acres) of impacts to Wetland 3. The entire Wetland 1 area would be eliminated by the proposed project. Overall wetland impacts increased from 0.486 to 1.026 acres.

Alternative D would involve locating the proposed bridge over SR 1 to the south in order to avoid over 3.36 acres of impacts to Wetland 3. Alternative D proposes a cul-de-sac at Skeeter Neck Road and a right-in/right-out at Mulberrie Point Road where it intersects with SR 1. This modification separates the community along Mulberrie Point Road and the Tara subdivision. Feedback obtained at a public workshop indicated that the local community was opposed to Alternative D, due to the lack of connectivity between the community and the roadway system. Additionally, Alternative D does not meet the project needs for improved transportation safety

and does not completely address the overall SR 1 Corridor Capacity Preservation Program (CCPP) initiatives. Alternative D results in 0.22 acres of wetland impacts, including 0.01 acres of Wetland 1 and 0.21 acres of Wetland 3.

Alternative E is similar to Alternative C; however, Alternative E does not provide Mulberrie Point Road with either a connection to SR 1 or the east service road. Based on feedback obtained at a public workshop, the local community stated they were opposed to Alternative E due to the lack of connectivity between the community and the roadway system. Additionally, Alternative E does not meet the project needs for improved transportation safety and does not completely address the overall SR 1 CCPP initiatives. Alternative E results in 0.486 acres of wetland impacts, including 0.276 acres from Wetland 1 and 0.21 acres from Wetland 3.

Alternative F is similar in design to Alternative C. The SR 1 overpass would be relocated to the south of the existing Bower's Beach Intersection, avoiding over 3 acres of wetland impacts to Wetland 3. Feedback obtained at a public workshop indicated that the local community was opposed to Alternative F, due to the lack of connectivity between the community and the roadway system. Additionally, Alternative F does not meet the project needs of improved transportation safety and does not completely address the overall SR 1 CCPP initiatives. Alternative F results in 0.22 acre of wetland impacts, including 0.01 acres from Wetland 1 and 0.21 acres from Wetland 3.

Although Alternatives D and F result in fewer impacts, Alternative C is proposed for further study as the Preferred Alternative because it offers a design that provides interconnectedness of the roadways, separates local and regional traffic, provides adequate access for emergency response vehicles and is the best alternative for addressing safety concerns and community cohesiveness. In addition, Alternative C was the preferred alternative design of the local community.

As noted above, the implementation of the Preferred Alternative C would result in the direct loss of approximately 1.03 acres of wetlands. As shown in **Table III-13**, the impacts would occur to three of the five wetlands within the Project Area.

Throughout the project development process, measures to avoid and minimize wetland impacts were pursued. Based on the current preliminary design it would be necessary to encroach on approximately 0.276 acres from Wetland 1, 0.472 acres from Wetland 3 and 0.241 acres from Wetland 6. Additional measures to minimize impacts would continue through final design, including the use of increased slopes or retaining walls, wherever practical.

The potential water quality impacts associated with construction activities would be managed with current construction practices, such as sediment traps and silt fencing, to prevent water quality problems. All of the alternatives have the potential to adversely impact water quality caused by sedimentation during construction. Prior to construction, project activities would obtain the necessary construction authorizations: sediment and erosion control, stormwater management and water quality certification. To manage the water quality impacts, DelDOT would follow standard procedures contained in the most recent *Delaware Erosion and Sediment Control Handbook* (1989), the *Delaware Sediment and Stormwater Regulations* (1991) and *DelDOT's Standard Erosion Control Details and Specifications* (2001). These procedures may include stream diversion and temporary water crossings, if necessary. For the Preferred Alternative, a detailed sequence of construction, along with an extensive erosion and sediment control plan would be developed. This erosion and sediment control plan would be included in the project documentation and approved by the Department's Stormwater Engineer.

The proposed project also has the potential for indirect impacts that could affect wetlands in the Project Area. Because the project would alter existing topography and most of the wetlands rely on surface water to provide at least some hydrologic support, there is the potential for altering the hydrologic support for the wetlands. There is also the potential of wetland impacts occurring as a result of sedimentation deposition during construction and the release of roadway pollutants (i.e. automotive oils, road-deicing agents) once the new roads are opened to travel. The extensive exposure of soil during construction activities could create sedimentation deposition in adjacent wetlands.

**b. Wetland Mitigation**

Throughout the project development process, measures to avoid and minimize wetland impacts were pursued; however, based on the current preliminary design, it will be necessary to encroach on 0.989 acres of wetlands. Additional measures to minimize impacts will continue through final design, including use of increased slopes and/or retaining walls where necessary. In addition, the potential water quality impacts associated with construction activities will be managed with routine construction practices, such as sediment traps and silt fences, to prevent water quality problems.

As part of the USACE permitting process, the acreage and function of the impacted wetlands will require mitigation. Wetland replacement requirements are based on the area of wetlands lost, the type of wetlands lost, and the functions and values of the wetlands and other aquatic resources impacted by the proposed project. The overall design goal for the replacement of impacted wetlands would be to replace the functions lost and the total wetland area impacted.

Three mitigation sites were identified, evaluated and later discussed with the USACE at the July 31, 2008 Jurisdictional Determination Field Review. Ultimately a preferred site was selected at a location on the east side of SR 1 in an agricultural field located between Skeeter Neck Road and a forested windbreak/drainage ditch. The site is located in the Murderkill River watershed upstream from the area of tidal influence. Existing conditions at the proposed site consists of active agricultural fields adjacent to a drainage ditch and woodland. A PFO wetland and associated perennial stream system is located on the east and southeast edge of the proposed mitigation area. Soils at the proposed mitigation site include Hammonton-Fallsington-Mullica Complex soils (HoA), zero to two percent slopes, Hammonton Sandy loam (HnA), zero to two percent slopes, Ingleside loamy sand (IeA), zero to two percent, and Fallsington loam (FgA), zero to two percent slopes. The mitigation site soils are Ingleside series, a well drained soil with a seasonal high water table at a depth of 48 to 72 inches from January to May. The Fallsington soils, located in the adjacent wetland, have a seasonal high water table within six inches of the soil surface. More detailed evaluations will be performed to determine whether site conditions are conducive for wetland replacement at Site #1. These evaluations may include the installation of groundwater monitoring wells, on-site soil testing and preparation of water budgets.

The proposed wetland mitigation may be combined with other mitigation strategies for the project, such as required mitigation for tree impacts under Delaware's *Senate Bill #324*. Coordination with the regulatory agencies in selecting the most appropriate mitigation strategies for the project will continue through Final Design. If adequate mitigation cannot be achieved with a 1:1 replacement ratio, the 1:1 wetland replacement design can be combined with a mitigation package potentially including stream restoration, wetland enhancement, riparian buffer enhancement or mitigation at a higher ratio.

### **c. Wetland Permits**

No permits would be required for the No-Build Alternative. Approximately 0.989 acres of wetlands and 782 feet of waterways would be encroached upon as a result of implementing Preferred Alternative C. These impacts would require the following permits: Coastal Zone Management (CZM) consistency determination, an individual Section 404 Permit from the USACE, a Subaqueous Lands Permit from DNREC if impacts are within an area greater than 800 acres and a Section 401 Water Quality Certification.

## **4. Floodplains**

There are no one-hundred-year floodplains that occur in the Project Area, therefore resulting in no impacts under any of the build alternatives. The closest one-hundred-year floodplains are located outside of the Project Area along an unnamed tributary of Trunk Ditch, northeast of the Project Area and along a tributary of Murderkill River, approximately 1,600 feet east of the SR 1/Bower's Beach Road intersection on Bower's Beach Road, east of the Project Area; and 3) along a tributary of Double Run, approximately 1,800 feet west of the SR 1/Bower's Beach Road, west of the Project Area, as shown on **Figure III-12** on page III-33.

## **5. Threatened and Endangered Species**

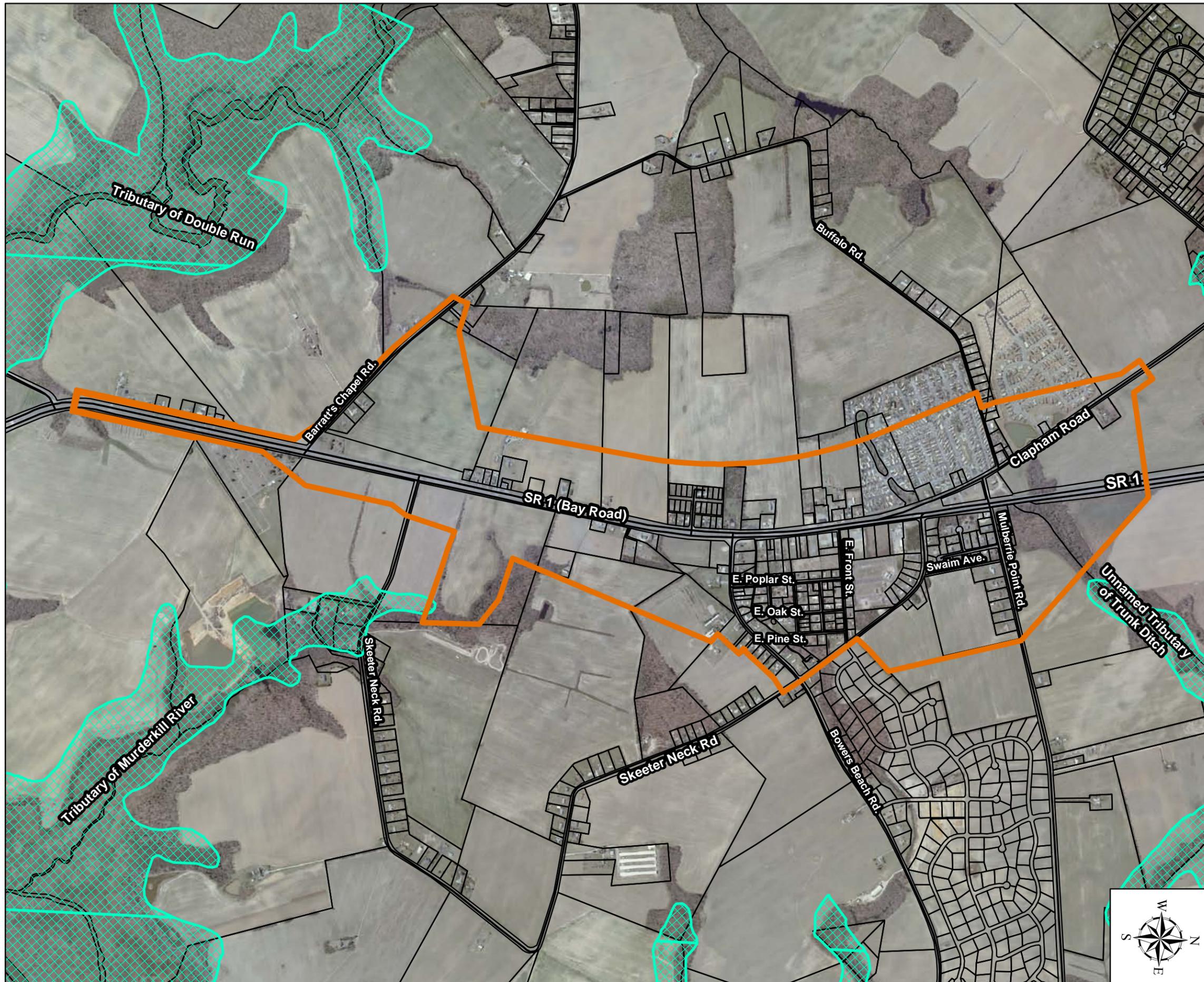
The DNREC, United States Fish and Wildlife Service (USFWS) and the National Marine Fisheries Service (NMFS) have been contacted regarding the presence of threatened and endangered species located in the Project Area. Responses have been received from all three of the regulatory agencies. According to the agencies, except for occasional transient species, there are no known threatened or endangered species that would be affected by the project (**Appendix B**).

## **6. Air Quality**

The SR 1 Little Heaven Grade Separated Intersection is located within the United States Environmental Protection Agency (USEPA)-designated Kent County, Delaware Non-attainment Area for Ozone. This project is a safety project and the proposed construction parameters of this project will not add any vehicle miles traveled in the Project Area. This project was deemed "Not Regionally significant" by the Delaware Interagency Transportation Conformity Consultation Workgroup and therefore would not trigger a new regional analysis under the rules for transportation conformity. In concurrence with the USEPA and the DNREC, FHWA and FTA have determined that the Air Quality Conformity Determination - Kent County Portion of the 2008-2013 Delaware Capital Transportation Program for the Kent County, Delaware Ozone Non-attainment Area adequately address and meet the requirements as specified in the November 1993 Federal Conformity Rule and its subsequent amendments. The existing Air Quality Conformity determination for Kent County, Delaware will stay in effect until Jan 9, 2010 or until such time as a new regional analysis is deemed necessary.

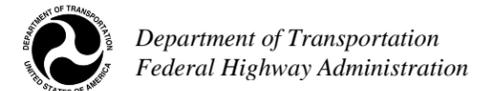
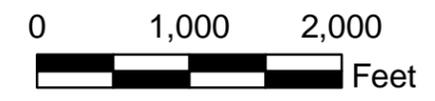
At a project level, there will be no meaningful changes in traffic volumes, vehicular mix, location of the existing facility or any other factor that would cause an increase in emissions or impacts relative to the no-build alternative. As such, this project will generate minimal air quality impacts for the Clean Air Act criteria pollutants and has not been linked with any special Mobile Source Air Toxics (MSAT) concerns. Consequently, this project is exempt from an analysis for MSATs.

SR 1, Little Heaven  
Grade Separated Intersection  
Environmental Assessment



 Project Area  
 100 Year Floodplain

Figure III-12  
Floodplains



### ***a. Air Quality Impacts***

The project is located within the USEPA designated Kent County, Delaware Non-attainment Area for Ozone. Due to the relatively small area the proposed project covers, it is unlikely the roadway improvements will have a stand-alone effect on statewide air quality. Because a grade separated intersection lane will eliminate traffic idling, vehicle emissions concentrations in the vicinity of the project study area will be decreased and therefore the overall air quality will be improved.

Therefore, at a project level, there will be no meaningful changes in traffic volumes, vehicular mix, location of the existing facility or any other factor that would cause an increase in emissions impacts relative to the no-build alternative. As such, this project will generate minimal air quality for the Clean Air Act criteria pollutants and has not been linked with any special Mobile Source Air Toxics (MSAT) concerns. Consequently, this project is exempt from an analysis for MSATs.

Some temporary degradation of air quality may result from construction activities. This condition will be remedied at the completion of the project.

## **7. Noise**

### ***a. Noise Fundamentals***

The descriptor selected for analysis of existing and potential noise impacts on the Project Area is the Hourly Equivalent Sound Level ( $L_{eq1h}$ ).  $L_{eq}$  is defined as the equivalent steady state sound level, which in a designated time period (normally one hour) would contain the same acoustic energy as the time-varying sound level during the same period. The unit of measure for  $L_{eq}$  is the decibel (dB) measured on the "A" scale, commonly referred to as dBA. The dBA scale is the accepted standard measure used in assessing community noise exposure because this scale closely approximates the frequency level of the human ear.

### ***b. Noise Abatement Criteria***

Noise Abatement Criteria (NAC) for various land uses have been established by the FHWA in Title 23 of the Code of Federal Regulations, Part 772 (23 CFR, Part 772), Procedures for Abatement of Highway Traffic Noise and Construction Noise. These categories and criteria are presented in **Table III-14**. The NAC for land uses occurring in the project are included within Activity Category B.

According to the procedures described in 23 CFR, Part 772, noise impacts occur when predicted traffic noise levels for the design year approach or exceed the NAC prescribed for a particular land use category, or when the predicted noise levels are substantially higher than the existing ambient noise levels. Noise levels are considered to be approaching the NAC when they are within one dBA, which would equate to 66-dBA for Category B land uses.

**TABLE III-14: Noise Abatement Criteria (NAC), 23 CFR, Part 772  
 Hourly A-Weighted Sound Level in Decibels (dBA)\***

Activity Category	L <sub>eq</sub> (h)	L <sub>10</sub> (h)	Description of Activity Category
A	57 (Exterior)	60 (Exterior)	Lands on which serenity and quiet are of extraordinary significance and serve an important public need and where the preservation of those qualities is essential if the area is to continue to serve its intended purpose.
B	67 (Exterior)	70 (Exterior)	Picnic areas, recreation areas, playgrounds, active sports areas, parks, residences, motels, hotels, schools, churches, libraries and hospitals.
C	72 (Exterior)	75 (Exterior)	Developed lands, properties or activities not included in Categories A or B above
D	--	--	Undeveloped lands
E	52 (Interior)	55 (Interior)	Residences, motels, hotels, public meeting rooms, schools, churches, libraries, hospitals and auditoriums.
* Either L <sub>eq</sub> (h) or L <sub>10</sub> (h) (but not both) may be used on a project. Note: These sound levels are only to be used to determine <u>impact</u> . These are the absolute levels where abatement must be considered. Noise abatement should be designed to achieve a substantial noise reduction - not the noise abatement criteria.			

**c. Data Collection**

Noise monitoring for this project was conducted in 2004. Field measurements of ambient noise levels were performed for use in determining existing and future noise levels via FHWA’s Traffic Noise Model (TNM) Version 2.5. Ambient noise describes the current existing noise environment. Noise measurements were performed using Metrosonics dB 308 and Metrosonics dB 3080 Noise Monitors, which recorded noise levels at one-minute intervals during a 20-minute session. Classified traffic counts and vehicle speeds were recorded during the same periods.

Noise Sensitive Areas (NSA), as defined as picnic areas, recreation areas, playgrounds, active sports areas, parks, residences, motels, hotels, schools, churches, libraries and hospitals were identified in the Project Area. Receptors were selected within the NSAs to represent the overall noise environment and to determine locations where residences may be impacted by traffic noise. Seven NSAs and thirty-four receptor locations were identified in the Project Area (see **Figure III-13** on page III-37). A description of each NSA is provided below. The receptor locations along with the measured noise levels are shown in **Table III-15**.

**NSA 1** consists of manufactured homes within the High Point subdivision, located west of Clapham Road in the northwest quadrant of the Project Area. NSA 1 is represented by Receptors 1, 2, 3, 4, 11 and 14.

**NSA 2** consists of single-family residences, located east of SR 1 along Mulberrie Point Road and Skeeter Neck Road in the Bower’s Landing Community, in the northeast quadrant of the Project Area. NSA 2 is represented by Receptors 5, 6, 7, 8, 9, 10, 12 and 13.

**NSA 3** consists of single-family residences and businesses, located within the town of Little Heaven, west of SR 1. NSA 3 is represented by Receptors 16, 19 and 26. Receptor 19 was located at the National Register-listed Jehu Reed House, on SR 1 across from the intersection of SR 1 and Bower’s Beach Road.

**NSA 4** consists of single family residences located east of SR 1 in the Bakers Choice Community. NSA 4 is represented by Receptors 17, 18, 20, 21, 22, 23, 24 and 25.

**NSA 5** consists of single family residences located west of SR 1, south of the intersection of SR 1 and Bower’s Beach Road. NSA 5 is represented by Receptors 28 and 30.

**NSA 6** consists of single family residences along Barratt’s Chapel Road, west of SR 1. NSA 6 is represented by Receptor 33, located at the intersection of Barratt’s Chapel Road and SR 1.

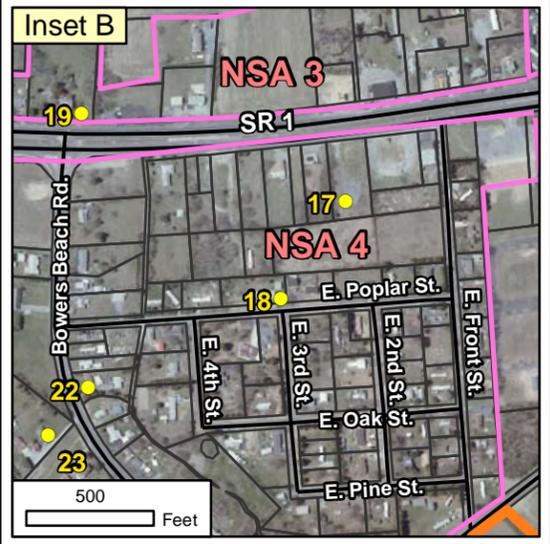
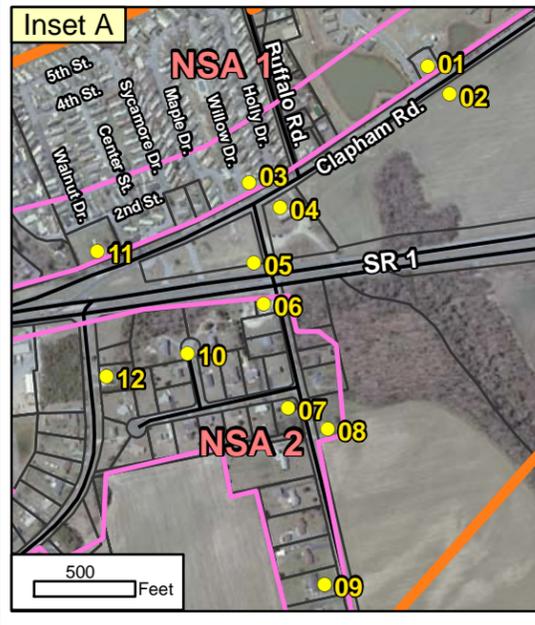
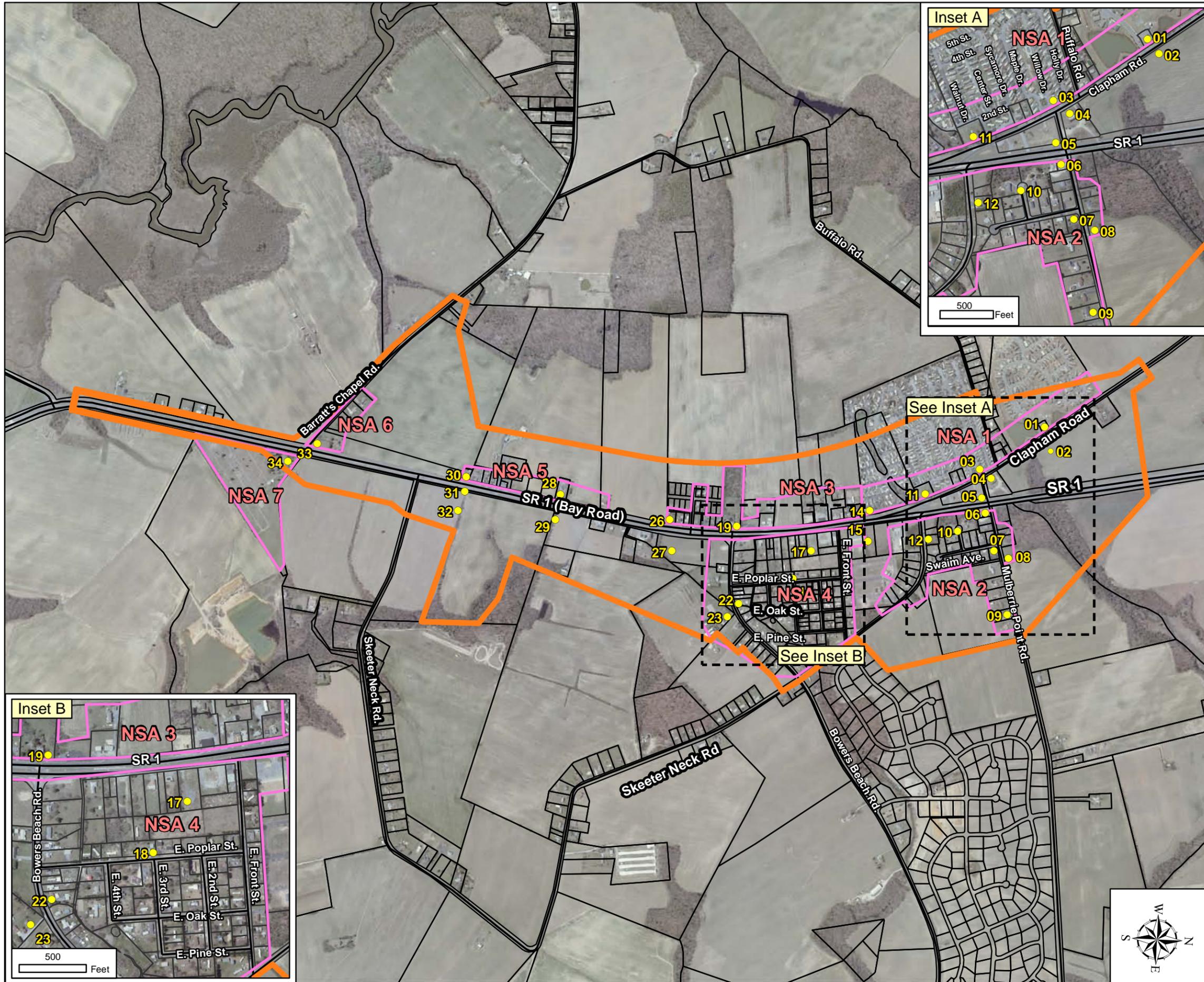
**NSA 7** consists of the National Register-listed Barratt’s Chapel and cemetery, located at the intersection of Barratt’s Chapel Road and SR 1, east of SR 1. NSA 7 is represented by Receptor 34. Receptors 15, 27, 29, 31 and 32 were used to determine the 66-dBA noise impact contours.

**Table III-15: Field Measured Noise ( $L_{eq}$ ) in the Project Area**

NSA	Receptor #	Location	Field Measured Noise $L_{eq}$ 20 minutes
1	1	Clapham Road @ Jury Drive	64
1	2	Clapham Road	68
1	3	145 Willow Drive	62
1	4	Clapham Road @ Mulberrie Point Rd.	64
1	11	117 Clapham Rd.	67
1	14	195 Lake Shore Drive	66
2	5	SR 1 @ Mulberrie Pt. Rd.	72
2	6	SR 1 @ Mulberrie Pt. Rd. (Pump Station)	70
2	7	17 Swaim Ave.	54
2	8	223 Mulberrie Pt. Rd.	49
2	9	380 Mulberrie Pt. Rd.	49
2	10	55 Swaim Ave.	59
2	12	3040 Skeeter Neck Rd.	60
3	16	Flea Market on southbound SR 1	74
3	19	Jehu Reed House	68
3	26	7421 SR 1 (Bay Road)	72
4	17	Abandoned lot (adjacent to SR 1)	57
4	22	171 Bower’s Beach Rd.	61
4	23	226 Bower’s Beach Rd.	55
4	24	299 Bower’s Beach Rd.	58
4	25	264 Bower’s Beach Rd.	60
5	28	7137 SR 1 (Bay Road)	72
5	30	Residence along southbound SR 1 (Bay Rd.)	72
6	33	Corner of SR 1 @ Barratt’s Chapel Road	73
7	15	Abandoned lot (adjacent to SR 1)	62
7	27	Abandoned lot (opposite Receptor # 26)	63
7	29	Abandoned lot (opposite Receptor # 28)	65
7	31	Agricultural Field across from Receptor # 30)	67
7	32	Agricultural Field across from Receptor # 30)	62
7	34	Barratt’s Chapel	65

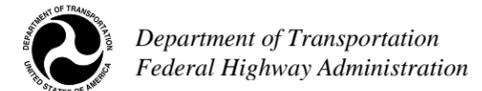
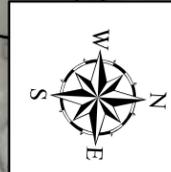
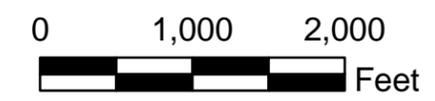
**Note:** Receptor numbers 13, 20 and 21 are not listed in the table due to recording equipment errors during data collection.

SR 1, Little Heaven  
Grade Separated Intersection  
Environmental Assessment



-  Project Area
-  Noise Sensitive Area (NSA) Boundary
-  Field Receptor

Figure III-13  
Noise Sensitive Areas



**d. Model Calibration**

A noise prediction model was created using FHWA's computer modeling software TNM Version 2.5. The model was calibrated using the locations of the field receptors, along with traffic volumes and traffic speeds measured concurrently with the noise measurements were all entered into the model. A calibrated model is expected to produce reasonably accurate noise levels anywhere within the study area under whatever traffic conditions are entered into it. A control or No-build model was developed along with models for existing noise levels and the design year 2030 no-build and build scenarios utilizing the Preferred Alternative.

**e. Existing Noise Levels**

To represent the existing noise environment within the entire Project Area, baseline peak noise hour conditions, statistically derived traffic volumes obtained from DelDOT were entered into the model, replacing the field-counted data. Theoretical or "virtual" receptor sites were then placed within the model in a grid pattern that included the entire study area. The model was run and noise levels were obtained for all virtual receptors. From interpolation of the model-predicted noise levels at these receptors, the 66-dBA impact contour was determined and drawn on a map of the study area. **Figure III-14** shows the 66-dBA impact contours predicted for the baseline 2004.

**f. Design Year 2030 Noise Environment**

The traffic data used for analysis of Design Year 2030 noise impacts were from statistical projections provided by DelDOT. Using the Summer Peak Annual Average Daily Traffic (AADT) predicted in that report for 2030, the Summer Peak Average Hourly Traffic was derived and entered into the model as the 2030 Design Year Volume (DHV), replacing the field-counted data. Since the traffic projections were only directionally distributed and not categorized by vehicle type or by its distribution across individual lanes, the traffic was assumed to have the same distribution proportions as the field-counted traffic. After adjusting the statistical traffic volumes to take into account that distribution, the traffic data was entered into the model.

Using the 2030 Peak Hour traffic volumes discussed above, the model was run and noise levels were obtained for all receptors for the No-build and Preferred Alternative models. From interpolation of the model-predicted noise levels at these receptors, the 66-dBA impact contours were determined for both sides of SR 1. **Figure III-14** shows the no-build and build conditions' 66-dBA impact contours predicted for the Design Year 2030, compared to the 66-dBA impact contours for Baseline Year 2004.

**g. Impact Assessment and Mitigation**

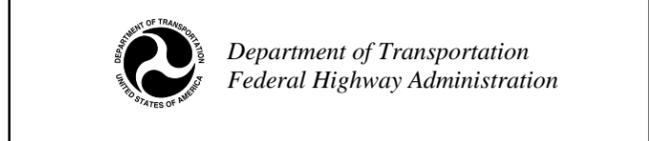
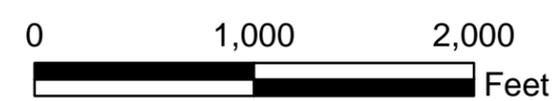
Based upon the TNM Model results, the Project Area can expect to experience a one to three dBA increase in traffic noise as a result of constructing Alternative C, the Preferred Alternative. **Figure III-14** shows the two 66-dBA impact contours as predicted for Design Year 2030, compared to the 66-dBA impact contours for Baseline Year 2004. The 66-dBA contours for 2004 and 2030 No-build are almost identical, indicating that, even with an expected increase in traffic volume, the noise environment would not change for the Project Area under No-build conditions. The 66-dBA contour for the 2030 Build generally follows the other contours; however the northbound SR 1 service road is shifted about 185 feet to the east of the existing SR 1. Since the alignment of SR 1 is shifted farther east, it is expected to have a decrease in noise levels at NSAs 3 and 5. Due to the shifting alignment, NSA's 2 and 4 will have an



**SR 1, Little Heaven  
Grade Separated Intersection  
Environmental Assessment**

- 2004 67 dBA Contour (No-Build)
- 2030 67 dBA Contour (No-Build)
- 2030 67 dBA Contour (Build - Preferred Alternative)
- Noise Sensitive Area (NSA) Boundary
- Alternative C (Preferred Alternative)
- Proposed Right-of-way

**Figure III-14  
Noise Impacts for 2004 No-Build  
and 2030 No-Build and Build**



increase in decibels. NSAs 1, 6 and 7 will remain about the same regardless of whether the Preferred Alternative is constructed.

The 2030 Build 66-dBA contour extends further east into the Bakers Choice Community (NSA 4) and (NSA 2); however, all of the properties within the 66-dBA contour that front existing northbound SR 1 are being relocated due to the need to acquire them for right-of-way in which to construct the relocated northbound SR 1 lanes.

NSA's 1 and 6 would exceed the 66-dBA under the existing and future build and no-build conditions; however, the 2030 Build condition's 66-dBA noise contour would recede slightly to the east due to the shift in the alignment of SR 1. Noise mitigation in the form of constructing structural walls or earthen berms would not be possible due to the numerous driveways entering onto the new west service road, nor would using them effectively reduce noise due to the number of drive-way breaks that would be needed to maintain access to the properties. Furthermore, the access provided by these driveways is essential for community mobility and, therefore, must be retained.

NSA 7, the Barratt's Chapel and Cemetery property, would experience a year 2030 Build 66-dBA noise contour that is nearly identical to its existing No-Build condition location. Mitigation will be provided to this property in the form of landscaping and tree plantings along the property's frontage.

#### *h. Construction Noise*

Temporary increases in noise levels may be attributed to construction activities. This condition would be remedied at the completion of the project. Several mitigation procedures can be followed to assist in minimizing the temporary impacts of construction noise. Adjustments to the equipment, the provision of temporary noise barriers, varying the construction activity areas to redistribute noise events, public involvement and financial incentives to contractors are alternates to decrease temporary noise impacts. These mitigation measures will be considered during final design to minimize public exposure to short-term noise impacts.

### **8. Hazardous Materials**

To identify properties with environmental issues regarding compliance with state and federal solid and hazardous waste and underground storage tank regulations, an Environmental Site Assessment (ESA) was conducted for the Project Area, completed in April 2003. The ESA consisted of the following: a review of historical aerial photographs; a thorough inspection of the properties located within the Project Area; an examination of records of relevant federal, state and local environmental agencies; and a review of the DNREC UST Branch's project files for active LUST sites located within the project limits.

A screening of properties in the Project Area revealed that seven LUST sites were present within the Project Area. Three of the sites, Shore Stop #245 (DNREC Facility ID #1-000209), Del Gas (DNREC Facility ID #1-000154) and the William Roop Property (DNREC Facility ID #1-000490) were identified as active facilities, indicating that they are still undergoing investigation or remediation. The four other facilities, Kamar Bus Service (DNREC Facility ID #1-000283), Appel's Marine Incorporated (DNREC Facility ID #1-000321), Cain's Furniture (DNREC Facility ID #1-000475) and the Little Heaven Pump Station (DNREC Facility ID #1-000619), have been issued "No Further Action" letters from DNREC indicating that all investigative and remedial activities at these properties have been completed. A low concentration, residually contaminated soil may still be present in the subsurface at the Cain's Furniture Property, at the

Appel's Marine Property, at the Del Gas Property and at the Shore Stop #245 Property. No additional investigative or remedial work has been performed on the Roop Property since 1994; therefore, it is likely that residually contaminated soil still exists in the subsurface at the site.

The following are potential environmental conditions present within the Project Area:

Numerous properties located along the northbound side of SR 1 use individual residential water supply wells located on the individual properties for their drinking water. According to Delaware Water Well regulations, the wells would need to be properly abandoned by a Delaware-licensed well driller during any property development activities. The properties on the northbound side of SR 1 use on-site septic fields for their sewage waste disposal.

The Del Gas (Tax Parcel #SM-00-122.00-02-37.01), Conley (Tax Parcel #SM-00-122.00-02-21.00), Roop (Tax Parcel #SM-00-122.15-01-05.00) and Appel's Marine (Tax Parcel #SM-00-122.15-01-11.00) properties potentially have residually contaminated soil and groundwater related to the former presence of leaking underground storage tanks, which may be encountered during construction activities. The potential that contaminated soil or groundwater would be encountered increases with the depth of disturbance required to construct the new roadway with its associated utilities.

At the Little Heaven Towing property (Tax Parcel #SM-00-122.11-01-09.00), auto salvage material was observed on the eastern portion of the site. This is an environmental concern because oil and lubricating oils could have leaked from the salvaged cars into the subsurface at the property.

At Tax Parcel #SM-00-122.11-01-19.00, two vent pipes associated with UST's were observed on the north side of the building. On the DelDOT 1973 photo-log, the property had been a Mobil gas station. The property is not listed on DNREC's databases for UST or LUST sites. Therefore, it is likely that the property was formerly an old retail gas station that went out of business prior to 1989 when the current UST regulations were enacted. It is also likely that at least two UST's are still present in the subsurface at the site and the potential exists that soil and groundwater at the site have been contaminated as a result of releases from them.

At Tax Parcel #SM-00-122.15-01-12.00, the footprint of a former gasoline dispenser island was observed. This observation is consistent with the observation of active gasoline dispensers on the property on the DelDOT 1973 photo-log. The property is not listed on DNREC's databases for UST or LUST sites. Therefore, it is possible that the property was formerly an old retail gas station that went out of business prior to 1989. It is also possible that UST's from the former gasoline station are still present at the property.

Based on these findings, there is increased potential for encountering petroleum contaminated soil and/or groundwater, or buried solid waste during the installation of underground utilities and installation of building footers. The recommended contract item and specifications to remove and dispose of any contamination has been added to the contract in accordance with all Occupational Safety and Health Administration (OSHA), USEPA, and DNREC requirements.