3.0 AFFECTED ENVIRONMENT

3.1 Natural Resources

3.1.1 Soils

Given the development history of the Study Area, most of the Study Area is expected to represent completely or partially disturbed soil sequences. The current use of land is roadway, sidewalk, and dry, grassed open space. The soil types in this area have only fair potential for landscaping because of droughtiness. Soils occurring in the Study Area include Urban land-Galestown complex, Keyport-Urban land complex, Sassafras-Urban land complex and Christiana-Urban land complex. The Urban land-Galestown complex is the most common soil, which is found in the western, central, and part of the northern sections of the Study Area.[32] The northern and eastern edges of the Study Area are reported as Keyport-Urban land complex. Small segments of Sassafras-Urban land complex and Christiana-Urban land complex are found along the southern edge of the Study Area. See **Figure 3-1** for an overview of the Study Area soils.

- **Urban land- Galestown complex (UmB).** Urban land- Galestown complex represents areas where roughly 70 percent of the soil surface is covered with impervious surfaces, with smaller areas of graded and reworked Galestown series soils exposed. The 1976 District soil survey notes that roughly 5 percent of Urban land-Galestown mapping units are relatively undisturbed Galestown soils. Galestown soils developed out of old marine deposits of sand and found on uplands and terraces along the Coastal Plain. They are generally deep and somewhat excessively drained. The typical profile includes a thick two-layer A Horizon of loamy sand over a very thick, coarse loamy sand B Horizon. The substratum is generally more than three feet below the surface.

- **Christiana-Urban land complex (CfC).** Christiana series soils are deep, well drained soils formed in silty material deposited over older clay deposits.[33] They are generally found on well-dissected uplands, and within the Study Area are reported as part of the Christiana-Urban land complex, where roughly 40 percent of the area is covered with impervious surfaces, 20 percent consists of reworked or graded Christiana series soils, and 20 percent consists of relatively undisturbed Christiana series soils. The remaining 20 percent includes a mixture of associated soil series and areas of eroded Christian series soils where the clayey subsoil is exposed. The typical profile for Christiana series soils includes a thin silt loam A Horizon over a two-layer subsoil. In its upper layer, the subsoil is a heavy yellowish brown silt loam, but changes to a red silty clay within a foot of the surface.

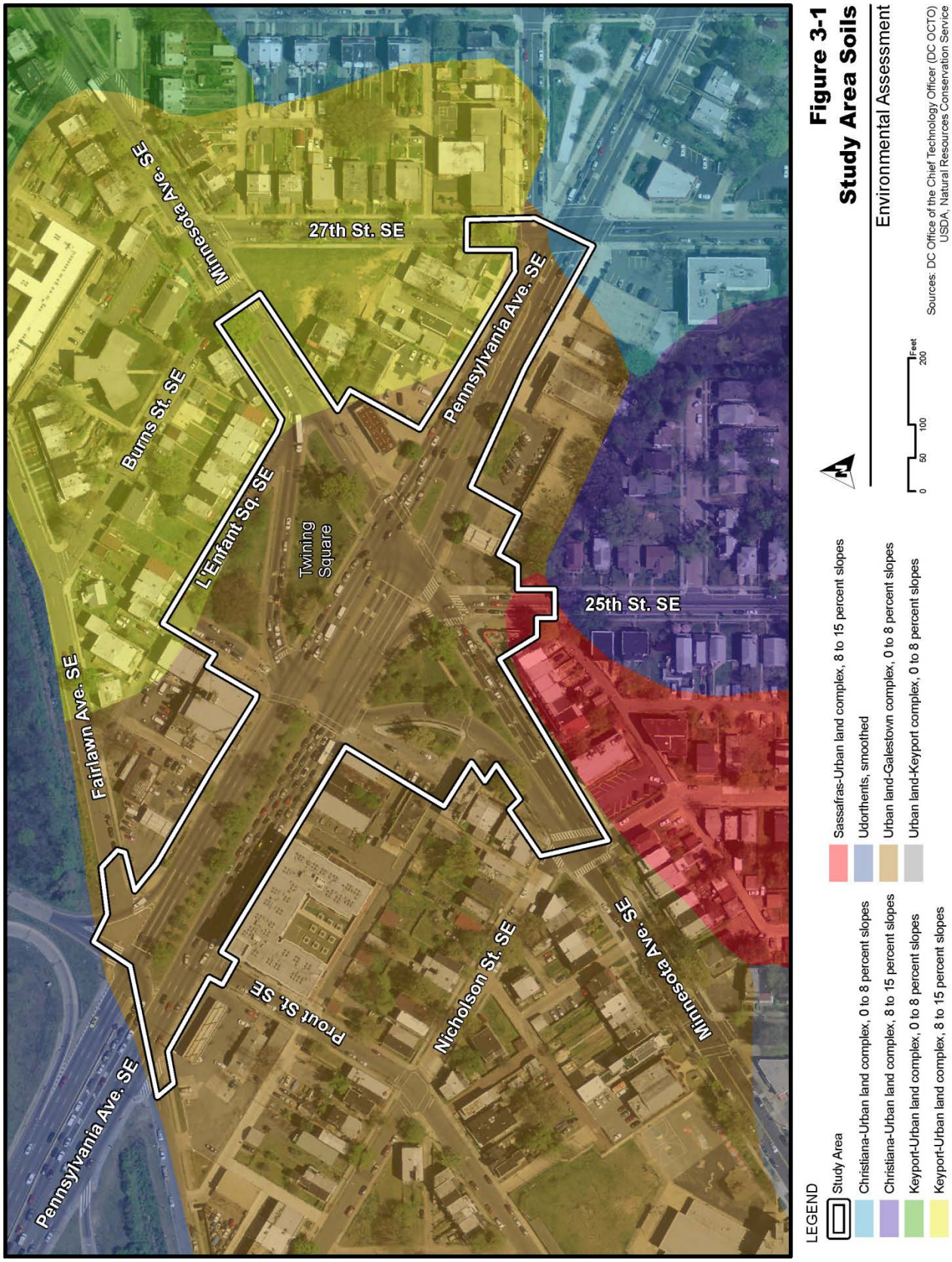


Figure 3-1
Study Area Soils
Environmental Assessment

- **Keyport-Urban land complex (KmC).** Keyport soils are generally deep, moderately well drained soil developed in silty material over older clay deposits. They are typical found in lower settings in the Coastal Uplands. Areas in the Study Area which are reported as Keyport- Urban land complex consists of strongly slopes areas where roughly 40 percent of the area is covered with impervious surfaces, 20 percent consists of reworked or graded Keyport series soils, and 20 percent consists of relatively undisturbed Keyport series soils. The remaining 20 percent includes a mixture of associated soil series and areas of severely eroded Keyport series soils where the grey clayey subsoil is exposed. The typical soil profile for Keyport series soils includes a thin silt loam A Horizon, and a thick, multi-layered subsoil which is dominated by clay within a foot of the surface due to erosion deflation.

- **Sassafras-Urban land complex (SgC).** Sassafras series soils are deep, well drained soils formed in marine sediments, and found on side slopes and ridges tops in upland settings.[34] Sassafras series soils reported within the Study Area are included in Sassafras- Urban land complex mapping units where roughly 40 percent of the mapping unit is impervious surfaces, 20 percent is disturbed Sassafras series soils, 20 percent is undisturbed Sassafras series soils, and 20 percent consists of associated soils types. Typical soil profiles in strongly sloped areas of Sassafras soils consists of a sandy loam A Horizon less than a foot thick, over a multi-layer subsoil which approached two feet in thickness. Subsoil grades from sandy loam to sandy clay loam and back.

3.1.2 Water Resources

Groundwater

Groundwater in the vicinity of Pennsylvania and Minnesota Avenues, SE occurs within poorly consolidated sand and gravel aquifers of the Coastal Plan Physiographic Province. The Coastal Plain is characterized by unconsolidated interleaved deposits of gravel, sand, silt, and clay, with the surface soils in the vicinity of the Study Area formed in reworked river terrace deposits from the Pliocene and Pleistocene, as well as Potomac Group soils from the Cretaceous.[35] The Potomac Group is the oldest layer of the Coastal Plain deposits and consists of mostly silty clays with interbedded sand and gravel.[36] The Coastal Plain can be divided into six regional aquifers which are separated by four regional confining units that slow the vertical flow of groundwater. Groundwater in the District is not used as a potable water source.

Water Quality

While there are no surface waters within the Study Area, stormwater runoff from the Study Area ultimately enters tributaries which flow into the nearby Anacostia River. Due to its urbanized character, the Anacostia River has become highly degraded and thus the focus of restoration efforts by the District.

The 1972 Federal Water Pollution Control Act, as amended by the Clean Water Act of 1977, is a national policy to restore and maintain the chemical, physical, and biological integrity of the nation's waters; enhance the quality of water resources; and to prevent, control, and abate water pollution. Based on review of 2010 EPA water quality assessments, the Anacostia River is impaired for Protection of Human Health related to Consumption of Fish and Shellfish and for Secondary Contact Recreation and Aesthetic Enjoyment, both upstream and downstream of the project Study Area. These impairments are likely

caused by oxygen depletion in the water, as well as the presence of trash and other debris. A probable source contributing to impairment is urban-related stormwater runoff which brings oil and grease into the Anacostia River.

3.1.3 Wildlife

The Endangered Species Act of 1973 (ESA) provides for the conservation of species which are listed as endangered or threatened. The ESA is implemented by the U.S. Fish and Wildlife Service (FWS), who manages land and freshwater species, and by the National Oceanic and Atmospheric Administration's (NOAA) National Marine Fisheries Service (NMFS), who manages marine species.

Terrestrial Organisms

The District provides habitat to a variety of wildlife species which are accustomed to urban conditions and frequent human disturbances. Common wildlife in the District include deer, raccoons, squirrels, chipmunks, frogs, salamanders, turtles, snakes, bats, ducks and a range of bird species.

Migratory Birds

The Study Area is located within the Atlantic Flyway, an important pathway for migratory birds traveling along the Atlantic coast and through parts of the Washington, D.C. area. Migratory bird species are known to utilize the Chesapeake Bay during their migration to feed, rest, winter and breed during the spring. Ospreys are a common migratory bird found in the Anacostia River watershed. They are known to nest high on trees or on lower platforms, such as the concrete pilings beneath the South Capitol Street Bridge.[37] In 2011, ospreys caused a stop-work order, as the birds had built a nest atop a construction crane being used on the Anacostia Riverwalk Trail.[38] The Study Area is within the Anacostia River watershed. However, it does provide any habitat for migratory birds, such as mature forests, wetlands or immediate proximity to the river corridor. The Study Area likely supports a limited population of birds, small mammals, reptiles and amphibians. Wildlife found in the Study Area are those that are able to adapt to the urban landscape.

3.1.4 Vegetation

The Study Area includes the 25th Street, SE intersection with Minnesota Avenue, the green space area designated as Twining Square, and two small cut-through/side streets designated as L'Enfant Square, SE. The primary vegetative areas within the Study Area are roadside and urban lawn, with low growing plants and trees. The NPS park land at the intersection, U.S. Reservation 487, is divided into four reservations totaling approximately 1.2 acres of grassed park property with interspersed trees throughout. The NPS medians in the Study Area are also grassed with interspersed street trees (approximately 0.24 acres). Based on an engineering survey of Pennsylvania Avenue, SE, there are approximately 15 trees in the northern reservation (north of Pennsylvania Avenue) and approximately 18 trees in the southern reservation (south of Pennsylvania Avenue). According to the D.C. Street Trees Map by Casey Trees®, Willow oak trees and Thornless honeylocust trees are both found in the vicinity of the Pennsylvania and Minnesota Avenues, SE intersection.[39]

Twining Square does not function as green space or as a visitor destination; the intersection is urban in nature, and is primarily used by commuters and residents as a through-way, rather than as a destination.

3.2 Cultural Resources

3.2.1 Historical Context

The following present a narrative of the development history of the Study Area, based on historic maps that were available for review. See *Appendix E, Section 106 Consultation and Cultural Resources Information (Cultural Resources)* for additional information, details and historic maps.

Based on a reconstruction of early land grants prepared as part of an archival study prepared for adjacent Anacostia Park, the present Study Area appears to have been primarily within "Green's Purchase," acquired by Luke Green in 1668.[40] Green's Purchase was likely subdivided into smaller tenancies and periodically transferred, and subsequently sold off as smaller parcels in the late eighteenth and early nineteenth centuries.

The first available cartographic source which depicted detail on the south side of the Anacostia River is Boschke's 1861 topographic map of Washington, DC. Based on the features indicated on this map, the Study Area was largely surrounded by undeveloped or rural land at that time. Although, there is what appears to be a small structure and orchard present in the southern section of the Study Area, while a second structure was present outside the northwest Study Area extension.

Anacostia Road, a precursor to present day Minnesota Avenue, was clearly well established by 1861. The less detailed picture provided by the 1879 Hopkins *Atlas of 15 Miles Around Washington* suggests that the orchard property belonged to Elizabeth Howard, while the structure off the northwestern Study Area extension belonged to Henry Naylor, one of eight structures that he is depicted as owning in the Study Area vicinity. One of those eight is the additional structure, built along the Anacostia-Bladensburg Road between 1861 and 1879, now visible within the southern portion of the Study Area. Another important development in the vicinity of the Study Area was the establishment of the Alexandria Branch of the B&O Railroad alignment passing to the west of the Study Area.

Additional detailed information available on the 1888 USCGS topographic sheets for the District indicates that both mid-nineteenth century structures within the Study Area, and the Howard orchard, survived into the last part of the nineteenth century. This highly detailed and accurate map also indicates that the present Study Area included a deeply incised stream valley filled with marsh, and bordered by a sand dune or possibly elevated fill along the subsequent alignment of the Pennsylvania Avenue extension. During this period a new Pennsylvania Avenue bridge was under construction, and plans were underway to develop the area south of the proposed Pennsylvania Avenue extension as Twining City. Overall, the topographic sheets indicated that the immediate Study Area vicinity remained rural, with large segments of woodland to the east.

Many of the avenues and streets east of the Anacostia River, including Pennsylvania Avenue did not exist as of 1901 but were proposed. By 1903 the Study Area vicinity was actively being developed as a suburb of the District, fully subdivided but only partially developed. The 1903 Baist *Real Estate Atlas of Surveys of Washington* indicated that neither of the mid-nineteenth century structures survived the extension of Pennsylvania Avenue and the development of the Twining City subdevelopment. Several modern elements within the Study Area are present on this source. The most significant is the depiction of L'Enfant Circle, although it is indicated as a perfect square reservation with a circular road exchange

within it, a configuration which is not supported by any other cartographic source reviewed during this historical context research. Most of the present lot configuration is also present on this source. However, very few structures had been constructed prior to 1903, and the handful of primarily wooden structures was restricted to the area south and west of the Study Area. Only one structure, in Lot 1 of Square 5560, appears to fall within the Study Area, and that may be an artifact of the georeferencing distortion.

Based on the sequence of Baist Real Estate Atlases, subsequent development of the Study Area vicinity was relatively slow but consistent. Prior to 1913, development was only present south of Pennsylvania Avenue. In 1913, a single structure was present along the north of Pennsylvania Avenue, and a small handful of frame structures had been completed along the south side of Burns Street on lots backing onto the square. See *Appendix E, Cultural Resources* to view the complete Historic Context Report with historic maps.

Review of the Baist series indicated that the park land reservation was established early in the twentieth century as an irregular rectangle which remained stable into the 1940s.

In the 1920s and early 1930s, Twining Square was known as L'Enfant Square. In 1929, the Office of Public Buildings and Public Parks of the National Capital assumed jurisdiction over Reservations 487 A, B, C and D (Twining Square and the adjacent medians) at the intersection of Pennsylvania and Minnesota Avenues, SE via the March 29, 1929 request of the Commissioners of the District. In 1933, in accordance with the recommendation of the National Capital Park and Planning Commissions, U.S. Reservation 487 officially became "Twining Square" instead of "L'Enfant Square." The name Twining Square was selected to honor the first military member of the District Commissioners, Major William Johnson Twining who served from 1878-1882.

Fewer mid-twentieth century cartographic resources were identified during the archival research. Aerial photographs from 1949, 1951, 1957, and 1963 were examined but provided little useful information about the interior of the Study Area beyond documenting the construction of access lanes within the reservation. Land transfer to and from the DC Commissioners modified the reservation space in 1938 (along the outer edges, Land Order 487), and again prior to 1949 to construct the internal access lanes (recorded in 1951, Land Order 463). A 1954 Baist map suggests that redevelopment was underway in the Study Area vicinity at that time, as the three early twentieth century frame structures on the south side of Burns Street had been removed to make room for a row of brick rowhouses. The structures previously present on either side of Pennsylvania Avenue east of Minnesota Avenue were also demolished in the mid-twentieth century, and service stations were constructed in their place.

Subsequent disturbance from the 1970s to present is more difficult to track, as few archival sources were readily available for review and most late twentieth century maps do not identify specific building footprints. Aerial photographs suggest redevelopment of the northeastern corner of Fairlawn and Pennsylvania Avenue between 1957 and 1963, the northeast corner of the Pennsylvania Avenue and Minnesota Avenue sometime between 1963 and 1980, and the northeastern corner of Fairlawn and Pennsylvania Avenue was again redeveloped between 1963 and 1980. The northeastern corner of Fairlawn and Pennsylvania Avenue is outside but adjacent to the Study Area, but the redeveloped lot on the northeastern corner of Pennsylvania and Minnesota extends into the Study Area.

**It is important to note that Build Alternative 1 – Revised Square Alternative is often referred to as the "Modified Square Alternative" in the cultural resources reports and correspondence.*

Area of Potential Effects (APE)

Direct and an Indirect Areas of Potential Effect (APE) were developed using a composite of the Build Alternatives considered for this project. Both the alternatives carried forward and the alternatives dismissed from further consideration were included in the development of the APE. **Figure 3-2** delineates the APE-Direct, which is equivalent to the Study Area. The APE-Direct was approved by the DC State Historic Preservation Office (SHPO) in April of 2011. The archaeological APE is restricted to the APE-Direct due to proposed ground disturbing activities.

The APE-Direct presently consists of a sloped streetscape, with the northern and southern extensions up Minnesota Avenue, SE and the eastern extension up Pennsylvania Avenue, SE rising in elevation, while the western extension has a very gentle slope down. Development is primarily commercial along Pennsylvania Avenue and the southern portion of Minnesota Avenue, while the northern extension of Minnesota Avenue and the other cross streets consist of residential development.

The historic architectural and history APE, also known as the APE-Indirect is based upon a site visit and line-of-sight survey. The Architectural APE-Indirect, illustrated in **Figure 3-3**, was delineated to include the full parcel of all structures adjacent to the APE-Direct, and includes one building beyond the APE-Direct (Pennsylvania Avenue, Minnesota Avenue, and 25th Street, and Pennsylvania Avenue and Fairlawn Avenue). A detailed description and photographs of the current visual conditions within the APE-Indirect are provided in *Appendix E.* The APE-Indirect was approved by the DC SHPO in April of 2011.

3.2.2 Historic Structures

Through research and coordination with the DC SHPO, it was determined that three buildings are eligible for the National Register of Historic Places (NRHP) for purposes of compliance with Section 106 of the National Historic Preservation Act (NHPA) for this project. These properties include the Morton's Department Store Building at 2324 Pennsylvania Avenue, SE; the Highland Theater Building at 2523 Pennsylvania Avenue, SE; and the Little Tavern Building at 2537 Pennsylvania Avenue, SE. The Little Tavern Building was demolished in 2012 and there are currently no buildings or structures that occupy the lot. **Figure 3-4** provides the locations of these structures within the APE-Indirect. See *Appendix E* for a description and photographs of the historic structures.

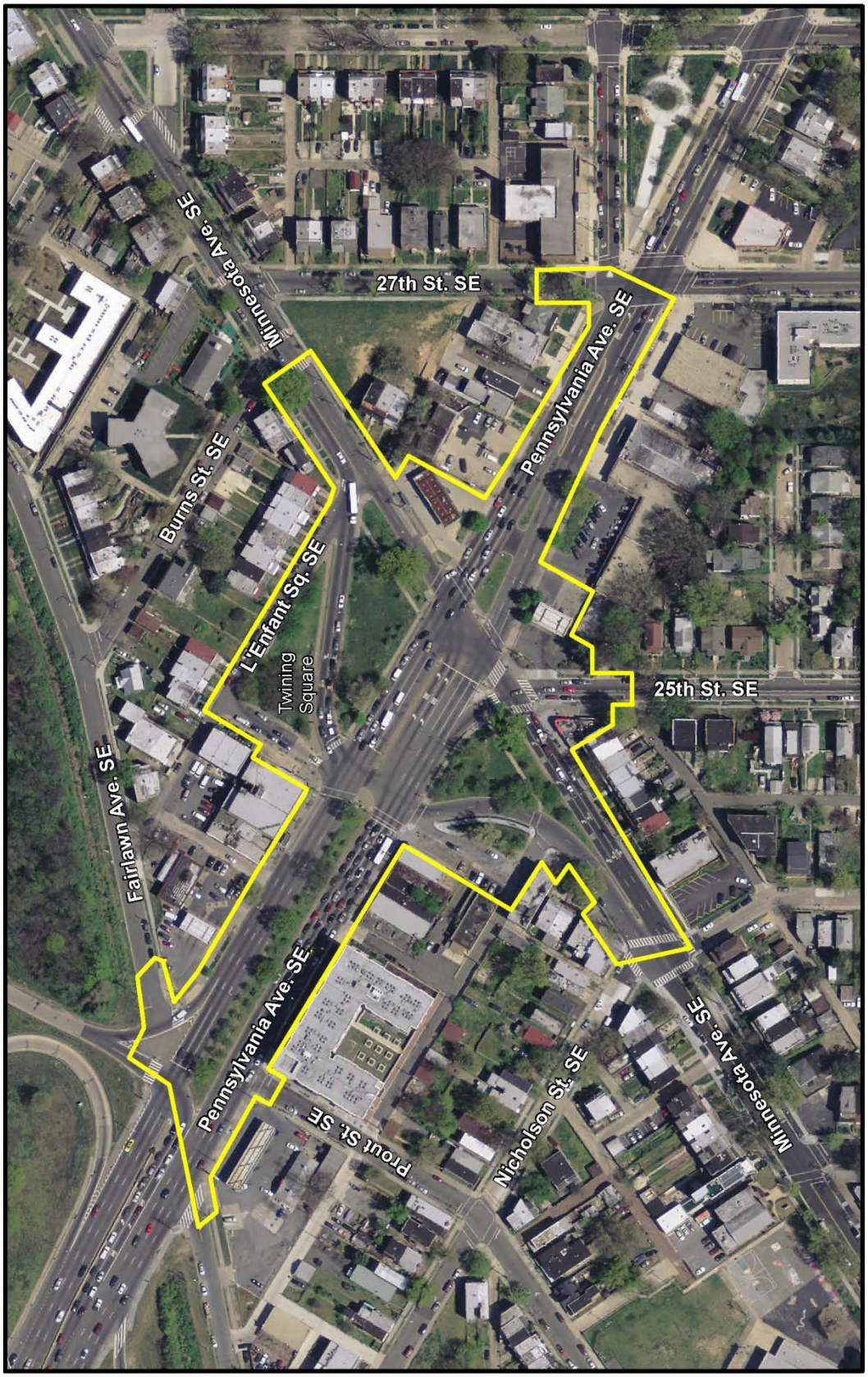


Figure 3-2
Direct APE
Environmental Assessment

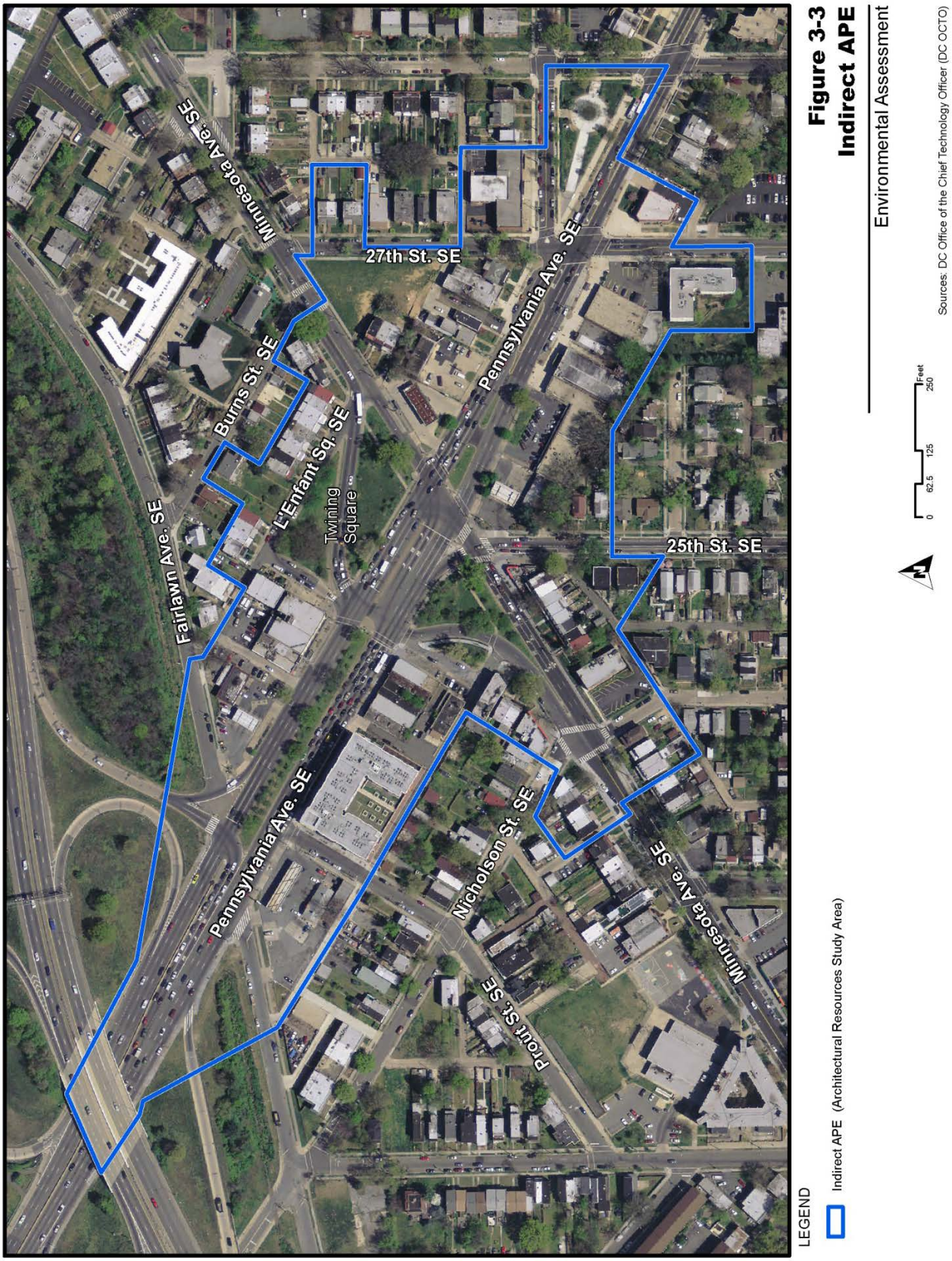


Figure 3-3
Indirect APE
Environmental Assessment

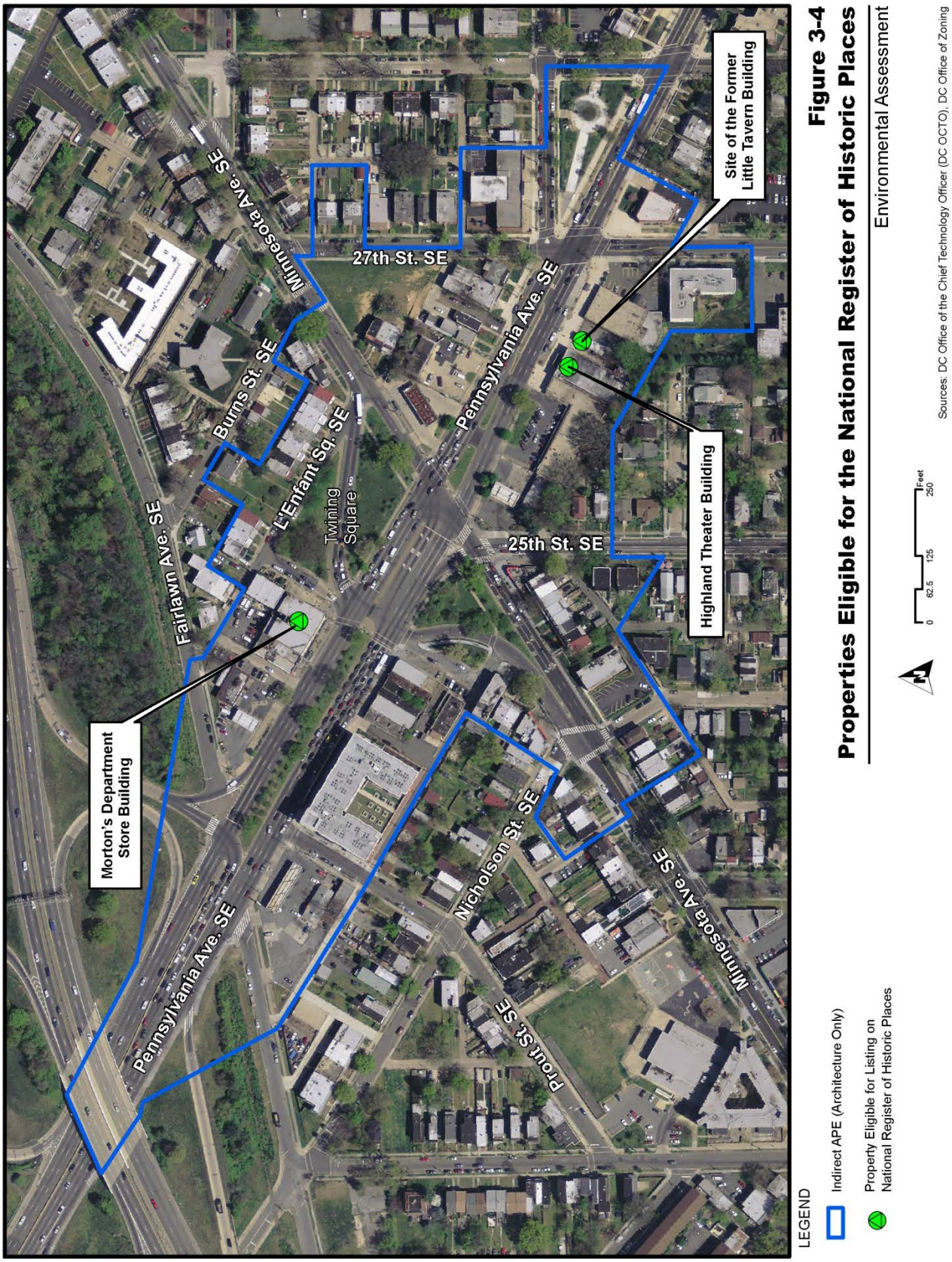


Figure 3-4
Properties Eligible for the National Register of Historic Places
Environmental Assessment

3.2.3 Cultural Landscapes

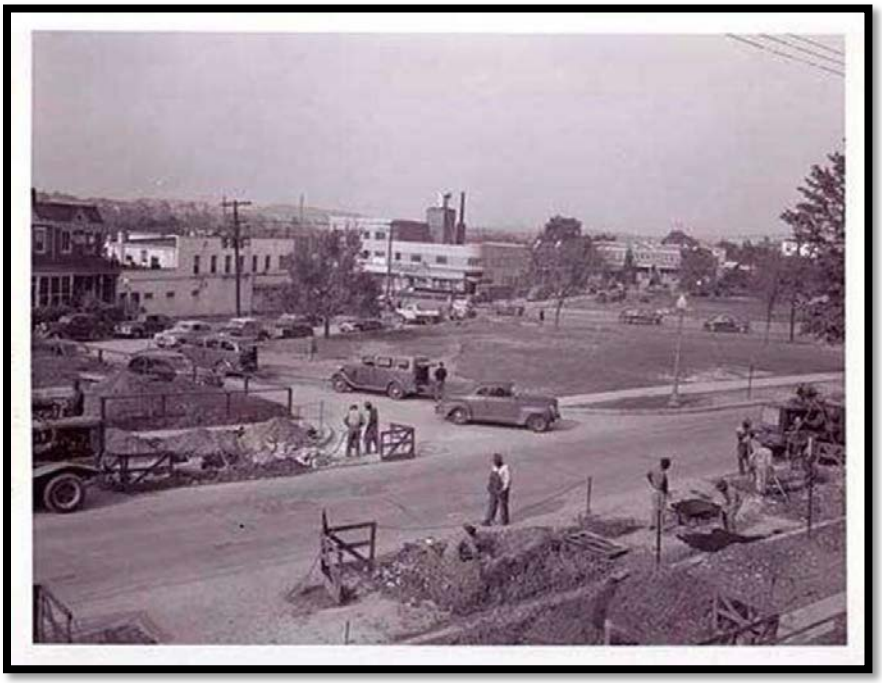
Cultural landscapes reflect the relationship between what is natural and what is man-made. According to *The Secretary of the Interior's Standards for the Treatment of Historic Properties with Guidelines for the Treatment of Cultural Landscapes*, a cultural landscape is "a geographic area (including both cultural and natural resources and the wildlife or domestic animals therein) associated with a historic event, activity, or person or exhibiting other cultural or aesthetic values."[41]

DDOT and NPS provided historic landscape photographs for review of cultural landscapes in the Study Area. The NPS photographs were associated with the 1938 Land Order transferring the outer north and western portions of the reservation to the District Commissioners. These included copies of three photographs, two dated 1929, taken looking from Pennsylvania Avenue across each portion of the reservation. Although the photographs were blurred, it was possible to get a sense of open space to the north of the reservation and wooded area to the south of the reservation.

Three photographs from the mid-1940s are shown below. The oldest, dated 1945, captures the southern reservation, looking northwest from a point on Minnesota Avenue near the Nicholson Street intersection (**Photo 1**). Both portions of the reservation appear to be essentially devoid of trees. The other two photographs, dated 1947 shows views east and west along Pennsylvania Avenue. **Photo 2** is the view looking west along Pennsylvania Avenue, presumably from the roof or upper floors of a multi-story structure, looking across a tree-less reservation and commercial development on Pennsylvania Avenue. The front entrances of both Minnesota Avenue service stations are visible. **Photo 3** is the corresponding view looking east along Pennsylvania Avenue from a point west of the Fairlawn intersection, again documenting the essentially commercial nature of development in this area. Neither portion of the reservation is visible in this photograph.

Photo 1

1945 Photograph looking northwest across the southern portion of Reservation 487



Photograph courtesy of DDOT.

Photo 2

1947 Photograph looking along Pennsylvania Avenue

Photograph courtesy of DDOT.

Photo 3

1947 View looking east along Pennsylvania Avenue

Photograph courtesy of DDOT.

3.2.4 Archaeology

Thorough assessments of potential for both prehistoric and historic archaeological resources are included in the *Archaeological Assessment of Potential for the Proposed Pennsylvania Avenue and Minnesota Avenue Land Exchange and Intersection Improvements Project* in *Appendix E*. Below is a summary of findings.

The APE lends itself to four primary divisions based on the character of current conditions, further discussed below: the northern reservation (green space north of Pennsylvania Avenue); the southern reservation (bifurcated green space south of Pennsylvania Avenue); the area of new ROW acquisition (only applied to alternatives dismissed from further consideration); and areas under existing roadbed. Because the Build Alternatives carried forward (Build Alternatives 1 and 2) would not require any new ROW acquisition, that part of the discussion is not discussed further. However, the area of new ROW acquisition is included in the *Archaeological Assessment of Effects Report* in *Appendix E*.

Based on archival research and coordination with the DC SHPO City Archaeologist, it was determined that an archaeological investigation was needed for the Proposed Action. Geoarchaeological coring was conducted in November 2012 to assess the soils and landscapes available to prehistoric populations, as well as the extent of historic impacts accrued since the initiation of European settlement over 300 years ago. Investigations were directed toward examinations and analyses of soil and geomorphic features for indications of landscape stability, buried surface levels, deposit types, and environmental conditions relating to human utilization of a landscape. The Geoprobe borings were made at selected locations determined on the basis of historic mapping showing a wetland northeast of Pennsylvania Avenue and apparent uplands to the southwest. Three borings were made on each side of Pennsylvania Avenue, and approximate locations of the borings are shown in **Figure 3-5**. The associated report, *Geoarchaeological Interpretations in the Vicinity of the Intersection of Pennsylvania and Minnesota Avenues in the Anacostia Section of Washington, D.C.* and the findings of the investigation are included in *Appendix E, Cultural Resources*.

The Northern Reservation

Overall, the northern reservation appeared to have little potential for archaeological resources. Based on the most accurate detailed map available (the 1888/1892 topographic plate), the area north of Pennsylvania Avenue consisted primarily of marsh prior to infilling for the late nineteenth-early twentieth century development of the Twining City subdivision. Based on the 1888 topographic sheet, this stream valley was deeply cut suggesting removal of considerable amounts of soil and reflected a deep erosion environment prior to inundation. Once flooded, there was little likelihood of human occupation. As such, no further cultural resources consideration in this area appears warranted.

Geoarchaeological coring confirmed that the northern reservation is too poorly drained for occupation; the wetland north of Pennsylvania Avenue would likely have been an attractive draw throughout the Holocene era. Probably altered by a century or more of agricultural run-off and then intentionally filled, the wetland identified on a historic map is still present, but now lies as much as 15 feet below the modern surface.

Figure 3-5
Boring Locations and Study Area Superimposed on 1892 Map

Source: EAC/Archaeology, Inc., 2011.

The Southern Reservation

The southern reservation was considered a zone of high potential for prehistoric resources, as well as historic resources associated with nineteenth century residences. Subsequent establishment of the right turn lane which bisects the reservation represents a substantial source of disturbance, but does not appear to have affected the entire reservation. Utility disturbance in this area appears to have been restricted to the early twentieth century, and consisted of one or at most two alignments established prior to 1913, when excavation would have consisted of less destructive manual labor. By 1921, maps indicate a marked preference for utility placement under the adjacent street beds, which may have minimized subsequent disturbance in this area.

Geoarchaeological coring found that, as would be expected in such an urban setting, the upland south of Pennsylvania Avenue has been variably disturbed. Consequently, although this ancient landscape would have been well suited for occupation, it has only very limited prospects for early cultural resources.

Areas under Existing Roadbeds

This area includes the Pennsylvania and Minnesota Avenue roadbeds, and small connecting segments of 25th and 27th Streets, as well as the Twining Square access roads (both internal and external). Most of these pass over areas of high potential, but archival documentation indicates that the Pennsylvania Avenue, Minnesota Avenue, and 25th Street roadbeds had all been substantially disturbed by the mid and late twentieth century preference for placing utilities under them. Three of the four Twining Square access roads pass exclusively over areas considered to have little potential for intact resources due to prior stream scrubbing and erosion, and the final southern internal access road was tested with the southern reservation area. No information about prior disturbance under 27th Street was found during the archival research, but as project impacts in this area would appear to be largely cosmetic changes to blend into the proposed new Pennsylvania Avenue configuration, no testing was warranted at this location.

3.3 Socioeconomic Resources

3.3.1 Land Use

Land use designations within the Study Area were determined using the *District of Columbia Generalized Land Use Layer*. Land use within the Study Area is designated as commercial, parks and open space and low- and medium- density residential. Commercial land uses line Pennsylvania Avenue, SE on both sides of the street within the Study Area and at all of the intersection corners. Low density residential land use is found on Minnesota Avenue, SE and to the north of L'Enfant Square, SE (north of Twining Square). The parks and open space land use consists of Twining Square and the center medians on Pennsylvania Avenue. Public/Institutional/Federal land uses are interspersed throughout the area. See **Figure 3-6** for land use designations within the Study Area.

Neighborhoods in the vicinity of the project Study Area include Hillcrest, Randle Heights, Anacostia, and Fort DuPont Park. Retail pockets are auto-oriented in character, and offer limited services. The corridor has several major parks (Fort Davis, Fort DuPont and Fort Stanton) and smaller pocket parks; however pedestrian access to the parks is hindered or restricted due to the heavily traveled, automobile-oriented Pennsylvania Avenue, SE.

3.3.2 Zoning

The District of Columbia Office of Zoning *District of Columbia Zoning Map*[42] identifies the subject intersection and its immediate surroundings to the east and west along Pennsylvania Avenue and to the south on Minnesota Avenue as Zone C-2-A, which permits low density development, including office employment centers, shopping centers, medium-bulk mixed use centers, and housing. The residences just north of the square, lining L'Enfant Square, SE (street) are zoned R-4, which permits matter-of-right development of single-family residential uses (including detached, semi-detached, row dwellings, and flats), churches and public schools with minimum lot widths, etc.[43] Commercial, parks and open space, and low density residential are predominant in the Study Area. 2300 Pennsylvania Avenue, a block west of the intersection, is zoned as a C-2-A active Planned Unit Development (PUD). Zoning classifications are shown on Figure 3-6.

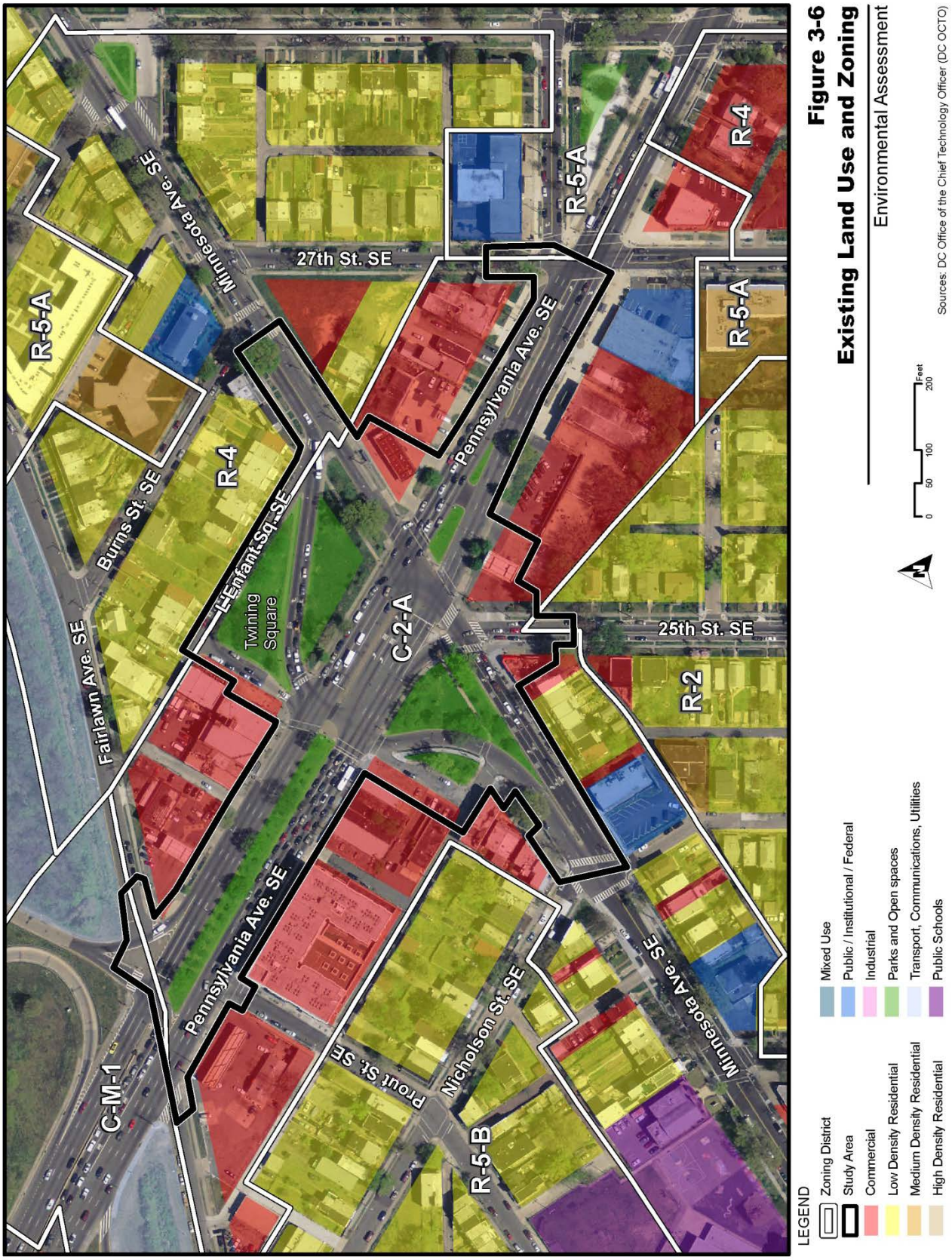


Figure 3-6
Existing Land Use and Zoning
Environmental Assessment

3.3.3 Demography

The Study Area is adjacent to or located within three Census tracts (CTs): 77.09, 76.01 and 76.04, shown in **Figure 3-7**. These CTs are bordered to the northwest by the Anacostia River, to the west by Fort DuPont and Pope Branch Park, and to the south by Good Hope Rd SE and Alabama Ave SE. Census data was gathered for the three CTs and for the District. Figure 3-7 also illustrates the relevant Census block groups. Employment and income information is only available at the CT level; therefore block group information is only referenced for population and race.

Table 3.1 provides the population in the Study Area by CT, including population change from 1980 to 2010 as compared to population trends in the average CT in the District. Population in the Study Area has declined in the last three decades, but much less so between 2000 and 2010 than the previous decades. The average District CT declined in population in the 1980s and 1990s, but reversed this trend between 2000 and 2010 with a 5 percent increase in population.

Based on 2010 U.S. Census Bureau data, the predominant race within the Study Area is Black or African American. **Table 3.2** shows the demography for the CTs and the District. The CTs within the Study Area have over 96% minority populations, as compared to the District which has a 65% minority population. As shown on **Table 3.3**, the block groups range from 96 to 99% minority.

Based on 2010 Demographic Profile Data, the median age of the population of the District is 33.8 years. The median age of the populations in the CTs adjacent to the Study Area is between 40 and 44 years. Percent of the population in the Study Area receiving a high school diploma has improved in the last few decades, as shown by the drop in percent of persons without a high school degree, shown in **Table 3.4**. This trend is consistent with the average District CTs.

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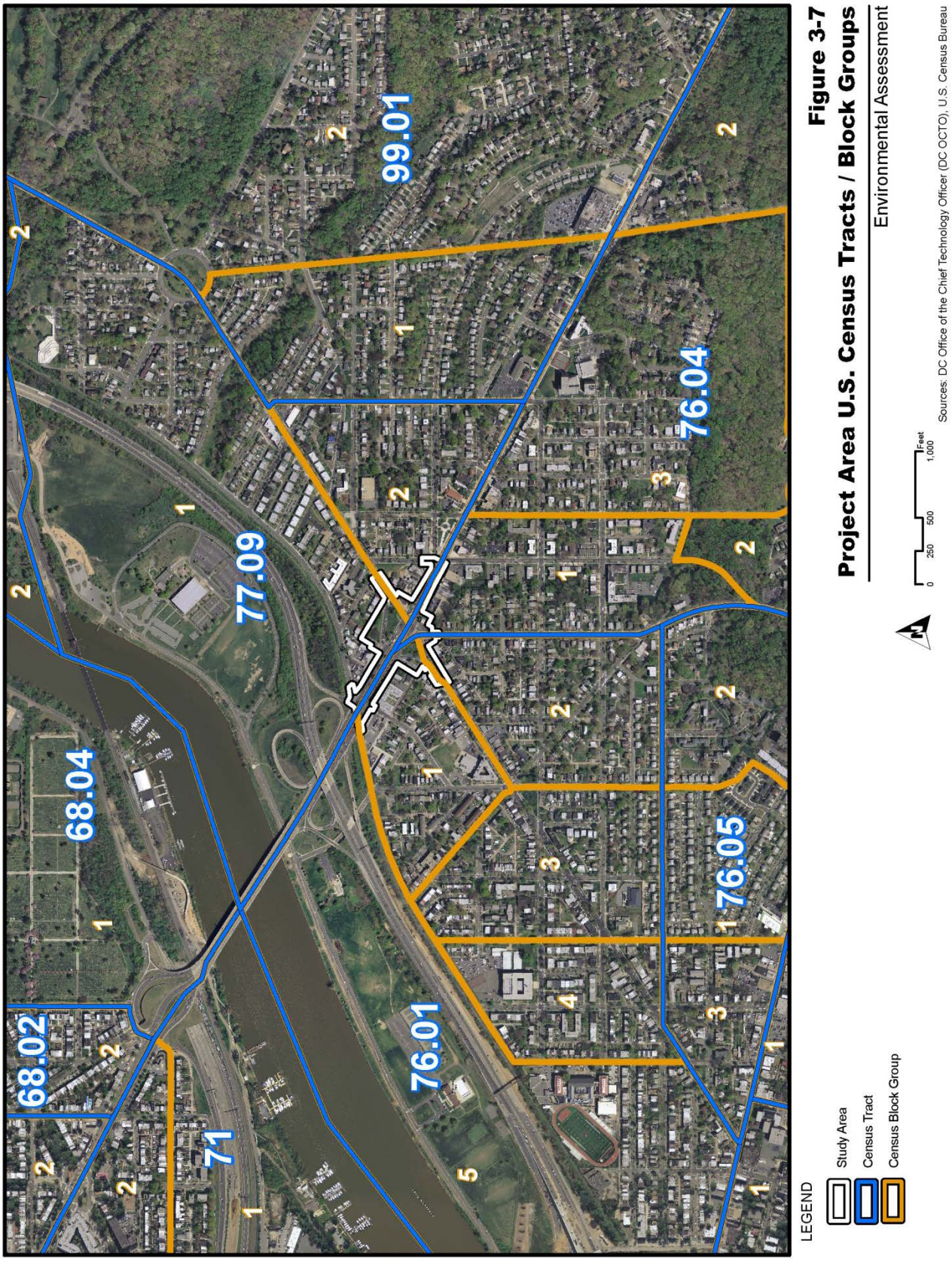


Figure 3-7
Project Area U.S. Census Tracts / Block Groups
Environmental Assessment

Table 3.1
Change in Population in the Study Area (1980-2010)

	1980	1990	2000	2010	% Change ('80-'90)	% Change ('90-'00)	% Change ('00-'10)
CT 77.09	2,594	2,367	2,031	2,007	-8.8%	-14%	-1.2%
CT 76.01	5,893	5,226	4,572	4,355	-11%	-13%	-4.7%
CT 76.04	4,642	4,410	3,764	3,644	-5%	-15%	-3.2%
Avg all CTs in District	3,566	3,391	3,196	3,362	-4.9%	-5.7%	5.2%

Source: Neighborhood Info DC (U.S. Census 2010), 2012.

Table 3.2
Study Area Demography by Census Tract

Subject		CT 77.09		CT 76.01		CT 76.04		District of Columbia	
		Estimate	%	Estimate	%	Estimate	%	Estimate	%
Total Population		2,007	100	4,355	100	3,644	100	601,723	100
Not Hispanic or Latino	White	29	1.9	124	3.2	127	4.1	209,464	38.5
	Black or African American	1,884	94.5	4,075	94.4	3,387	93.6	301,053	50.7
	American Indian & Alaska Native	7	0.4	6	0.2	9	0.3	1,322	0.3
	Asian	3	0.1	21	0.5	10	0.3	20,818	3.5
	Native Hawaiian and Other Pacific Islander	0	0	0	0	1	0	216	0.1
	Other Race	8	1.3	4	0.2	4	0.4	1,451	4.1
	Two or More Races	29	1.7	64	1.6	47	1.4	12,650	2.9
Hispanic or Latino		47	2.3	61	1.4	59	1.6	54,749	9.1
Total Minority		1,978	98.6	4,231	97.2	3,517	96.5	392,259	65.2

Source: U.S. Census Bureau, 2010.

Table 3.3
Study Area Demography by Block Group

Subject		CT 77.09				CT 76.01				CT 76.04	
		BG 1		BG 2		BG 1		BG 2		BG 1	
		Estimate	%	Estimate	%	Estimate	%	Estimate	%	Estimate	%
Total Population		1,239	100	768	100	645	100	665	100	1,058	100
Not Hispanic or Latino	White	16	1.3	13	1.7	24	3.7	25	3.8	20	1.9
	Black or African American	1,161	93.7	723	94.1	586	90.9	630	94.7	1,004	94.9
	American Indian & Alaska Native	4	0.3	3	0.4	2	0.3%	2	0.3	3	0.3
	Asian	3	0.2	0	0	3	0.5	2	0.3	1	0.1
	Native Hawaiian and Other Pacific Islander	0	0	0	0	0	0	0	0	0	0
	Other Race	2	0	6	0.8	0	0	0	0.0	0	0
	Two or More Races	22	1.8	7	0.9	16	2.5	4	0.6	16	1.5
Hispanic or Latino		31	2.5	16	2.1	14	2.2	2	0.3	14	1.3
Total Minority		1,223	98.7	755	98.3	621	96.3	640	96.2	1,038	98.1

Source: U.S. Census Bureau, 2010.

Table 3.4
Persons without a High School Diploma in the Study Area (1980-2010)

	Number				As a percent of population			
	1980	1990	2000	2005-2009	1980	1990	2000	2005-2009
CT 77.09	43	38	30	25	1.7%	1.6%	1.5%	1.2%
CT 76.01	42	33	32	18	0.7%	0.6%	0.7%	0.4%
CT 76.04	31	20	17	12	0.7%	0.5%	0.5%	0.3%
Avg all CTs in District	33	27	22	15	0.9%	0.8%	0.7%	0.4%

Source: Neighborhood Info DC (U.S. Census 2010), 2012.

3.3.4 Environmental Justice

Executive Order 12898, "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations" directs agencies to address environmental and human health conditions in minority and low-income communities so as to avoid the disproportionate placement of any adverse effects from federal policies and actions on these populations. In order to identify potential disproportionate impacts associated with the proposed action, the following steps must be taken:

1. Identify the potentially affected population within the Study Area.
2. Characterize the Study Area population with respect to minorities and low-income populations.
3. Determine potentially significant adverse impacts of the alternatives.
4. Evaluate the potential for disproportionately high and adverse impacts on minority or low-income populations in the Study Area.

EO 12898 does not define the terms "minority" or "low-income." However, guidance provided by the CEQ describes these terms in the context of an Environmental Justice (EJ) analysis. The following definitions taken from the CEQ guidance are unique to EJ analysis and were used to identify minority and low-income populations living near the LOD:

Minority Individual. A Minority Individual is classified by the U.S. Census Bureau as belonging to one of the following groups: American Indian or Alaskan Native, Asian or Pacific Islander, Black (not of Hispanic Origin), and Hispanic. Minority Populations – According to the CEQ guidelines, should be identified where either (a) the minority population of the affected area exceeds 50 percent or (b) the minority population percentage of the affected area is meaningfully greater than the minority population percentage in the general population or other appropriate unit of geographic analysis.

Low-income Population. Low-income populations are identified where individuals have incomes below the U.S. Department of Health and Human Services poverty guidelines. A low-income population is either a group of low-income individuals living in proximity to one another or a set of individuals who share common conditions of environmental exposure or effect.

Adapted from CEQ's *Environmental Justice Under the National Environmental Policy Act*, the threshold for further analysis is met in either of the following cases:

- Census block groups where the minority or low-income population in the Census block group equals or exceeds 50 percent of the population in that Census block group.
- Census block groups where the percentage of the minority or low-income population is at least 10 percent higher than the minority or low-income population percentage for the District of Columbia.
- Impacts to Census block groups meeting the EJ threshold have the potential to be disproportionately borne by minority or low-income populations. The EJ analysis performed for this project focuses on these areas. No further EJ impact analysis is performed on the areas not meeting the EJ threshold.

Based on the demographics of the surrounding Census tracts (CTs) and block groups, there are minority populations within the Study Area. The minority population exceeds 50 percent of the population of the Census block groups. The Census block group and CT populations in the Study Area range from 96 to 99 percent minority. These minority populations are 10+ percent higher than the minority population of the District (approx. 65%). Specifically, the Black or African American population in the Study Area CTs and block groups is significantly higher in proportion to the total population of Black or African Americans in the District.

The percent of population with low income is not available at the Census block level, however the economic data by CT is provided in *Section 3.3.5, Economics and Development*. Families and individuals below the poverty line do not exceed 50 percent of the population total in any of the adjacent CTs. Families and individuals below the poverty line are lower than the District average for CTs 76.01 and 76.04 and is less than 10 percent higher than the District average in CT 77.09. Although no CTs were found to meet the threshold for low-income populations, this does not rule out the possibility of Census blocks meeting this threshold.

3.3.5 Economics and Development

The median household income in the District is $61,835.[44] The median household incomes for the CTs surrounding the project Study Area are all below the median for the District. CT 77.09 has a median household income which is less than half that of the District. With regard to the poverty rate, the District has a median of 18.2 percent of individuals below the poverty line. Percentages for the CTs around the project Study Area are similar, with CT 76.01 and 76.04 slightly lower at 17.2 and 17.3 percent, respectively, and CT 77.09 slightly higher at 18.9 percent. **Table 3.5** shows the economic data for the CTs and the District.

Table 3.5
Study Area Economic Data

Subject	CT 77.09	CT 76.01	CT 76.04	District
Median Household Income ($)	28,490	40,681	51,074	61,835
Families below the poverty line (%)	0.0[1]	7.1	11.0	13.9
Individuals below the poverty line (%)	18.9	17.2	17.3	18.2

Notes: [1] Unavailable. Census data also provides a margin of error for each statistic. CT 77.09 has 0.0 +- 12.7% of families below the poverty line.

Source: 2011 ACS Demographic and Housing Estimates (2007-2011) 5 Year Estimates.

DMPED has plans to facilitate development along the 2300 block of Pennsylvania Avenue, SE. This block is within the project Study Area and is located immediately west of Twining Square. The District aims to help implement the goals of the Great Streets Initiative by redeveloping this key corridor to eliminate blight, provide quality neighborhood-serving retail and potential job creation. DMPED has already acquired 2337 Pennsylvania Avenue, SE. The next steps in development will be to negotiate with private land owners on the 2300 block in order to develop the properties. [45]

3.3.6 Aesthetics and Visual Quality

Visibility of a proposed action to viewers from public places determines the visual influence a project may have on its surroundings. The viewshed of a project depends on the scale of the project, its proposed location and the topography of the area. Resources that may have a greater sensitivity within any Study Area include land at higher topography.

The Study Area includes the 25th Street, SE intersection with Minnesota Avenue, the green space area designated as Twining Square, and two small cut-through/side streets designated as L'Enfant Square, SE. The Study Area is currently a mixture of residential rowhouses and 1- to 2-story commercial structures, and includes businesses such as gas stations and walk-up eateries. Roadway, traffic signals, underutilized properties and auto-oriented commercial uses currently dominate the intersection. "Twining Square" does not function as green space or as a visitor destination and is not visually appealing as it exists today. The intersection is urban in nature, and is primarily used by commuters and residents as a through-way, rather than as a destination.

There are no views toward any of the District's significant monuments or vistas from the Study Area. Line of sight is truncated in the northwest portion of the Study Area by the artificial berms constructed to carry I-295 over Pennsylvania Avenue. From this overpass, the visual boundary runs southeast towards Fairlawn Avenue, passing over the elevated CSX tracks, and crossing Fairlawn Avenue at its intersection with the western extension of the L'Enfant Square, SE roadway. Beyond this point on Fairlawn Avenue, line of sight is either interrupted or occluded by other structures fronting Pennsylvania Avenue and Fairlawn Avenue.

3.3.7 Health and Safety

The primary concerns with health and safety in the Study Area are related to vehicular and pedestrian safety due to traffic operations. Although air quality is a regional issue, it is not of concern to human health and safety at the intersection. Congested urban roads tend to be the principal cause of carbon monoxide (CO) pollution at intersections such as Pennsylvania Avenue and Minnesota Avenue. Air quality modeling for a CO -hot spot analysis in the Study Area shows that the 1-hour and 8-hour CO concentrations do not exceed either the 1-hour (35 ppm) or 8-hour (9 ppm) National Ambient Air Quality Standards (NAAQS). See *Section 3.5, Air Quality* for a full discussion of air quality in the Study Area. Additionally, there are no known hazardous wastes, contamination sites, or leaking underground storage tank sites or landfills in the Study Area impacting human health and safety.

The safety issues at the Pennsylvania and Minnesota Avenues, SE intersection are related to traffic operations. The intersection is a safety hazard for pedestrians, bicyclists and motorists. The unsafe conditions are a result of the existing intersection configuration, which lead to unsafe traffic and pedestrian movements. Traffic congestion, poor design and visibility, insufficient storage area for vehicles, frequent bus stops, and multiple intersection connections all make this intersection confusing to navigate and generate unsafe conditions for vehicles and pedestrians. Compounding the safety issues at this intersection is the fact that motorists cut through the neighborhood streets in the communities surrounding this intersection in order to bypass the traffic congestion.

Vehicular Safety

The Pennsylvania and Minnesota Avenues, SE intersection has a high volume of accidents and injuries, as discussed in *Section 1.2.1* of the Purpose and Need. A total of 123 reported crashes and 60 reported injuries occurred at this intersection during the most recent 3-year reporting period (2009 to 2011).

Along Pennsylvania Avenue, SE, crash data collected between 2009 to 2011 indicate that side swipes (31%), right-angle (20%), and rear-end collisions (18%) are the prevalent accident types at this intersection.[46] As indicated from the accident summaries, the number of accidents can largely be attributed to the congestion of the roadway in the weekday-evening hours. In addition, the rear-end accidents are also a result of stop-and-go conditions. The side-swipe accidents can be attributed to vehicles changing lanes and aggressive driving, while the right-angle accidents largely occur due to congestion and frustration resulting in motorists taking chances to clear the intersection.[47]

Existing intersection geometries and signal phasing are factors contributing to crash occurrences at the intersection. Congested conditions during peak periods and excessively high vehicle speeds during off-peak periods are also contributing factors.[48] Additionally, problems at the intersection are exacerbated by the lack of an interchange movement for motorists traveling from the Anacostia Freeway (I-295) southbound to Pennsylvania Avenue, SE westbound. This causes motorists to make frequent illegal traffic movements at this intersection. In order to reach Pennsylvania Avenue, SE westbound, motorists make illegal U-turns, or make a left turn on Minnesota Avenue, SE northbound followed by a left turn onto Minnesota Avenue southbound.[49]

Pedestrian Safety

The intersection is heavily used by pedestrians commuting to and from work or using the bus stops at the intersection. Many of the existing crosswalks at the intersection are inconvenient to use due to placement and long crossing length. This discourages pedestrian use, and instead of using the signalized crosswalks provided, pedestrians crossing to and from bus stops and commercial properties choose unmarked, more direct routes across the medians and busy lanes of traffic. The intersection has a large number of pedestrian and vehicle "conflict points" under the existing configuration. Pedestrians frequently jaywalk at this intersection and cross Pennsylvania Avenue, SE without waiting for a Walk indication in order to get to bus stops across the street. A review of the police crash records indicated that five pedestrians were injured at this intersection in the past three years (2010 to 2012). However, during field observations of a one-hour AM peak period in March of 2013, three minor pedestrian/vehicle incidents were observed and dismissed without being reporting to the police.

3.3.8 Community Resources

Figure 3-8 illustrates community resources, including nearby emergency response centers, places of worship and schools.

Emergency Response

The Study Area is within the District's Sixth Police District. The Sixth Police District substation is located at 2701 Pennsylvania Avenue, SE, one block east on Pennsylvania Avenue from the intersection with Minnesota Avenue, SE. The annual rate of reported crime in the Sixth District has remained steady

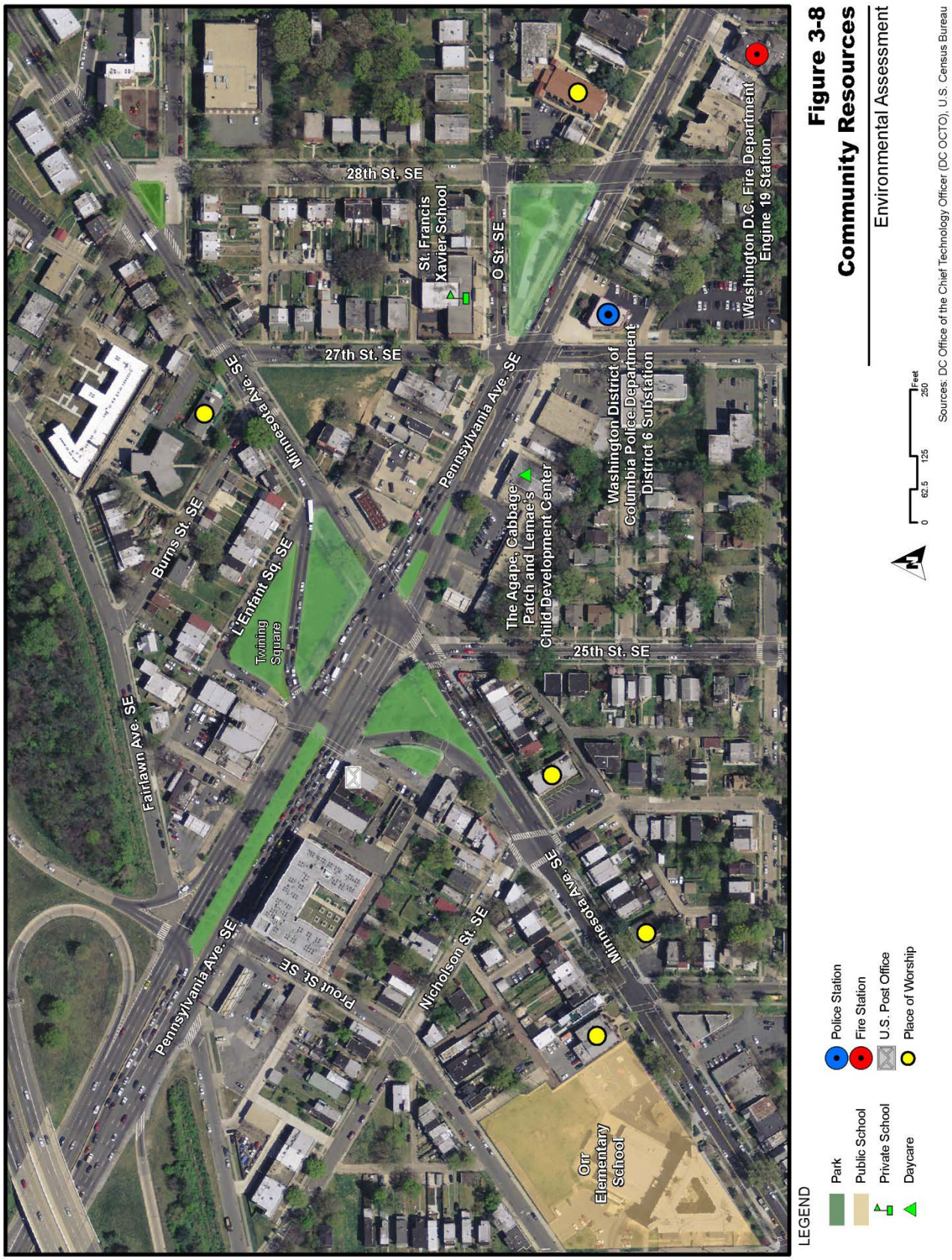


Figure 3-8
Community Resources
Environmental Assessment

over the past five years, with 4,627 crimes in 2007 and 4,684 crimes in 2011. These trends are consistent with the steady crime rates throughout the District in the 2007 to 2011 timeframe.[50]

Fire and rescue services for the Study Area are provided by the District Fire and Emergency Medical Services Department. The closest emergency medical station is located at 2813 Pennsylvania Avenue, SE, and houses the Engine Company 19.[51]

Schools

Schools closest to the Study Area include Orr Elementary School and St. Francis Xavier Catholic School. Orr Elementary School is located at 2200 Minnesota Avenue, SE, approximately 0.2 miles south of the Study Area. St. Francis Xavier is located at 2700 O Street SE, approximately two blocks from the Study Area. Additional schools within the vicinity of the Study Area include Randle Highlands Elementary School and Howard Road Academy, both located east on Pennsylvania Avenue, SE.

The Agape, Cabbage Patch and Lemae's Child Development Center daycare is located less than a block from the project intersection at 2533 Pennsylvania Avenue, SE.

Places of Worship

There are several places of worship located within the vicinity of the Study Area. The places of worship closest to the Study Area include Grace Memorial Baptist Church and Emmanuel Church of God-Christ. Grace Memorial Baptist Church is located at 2407 Minnesota Ave, S.E., less than 0.1 miles south of the intersection with Pennsylvania Ave, S.E. Emmanuel Church of God-Christ is located at 2600 Minnesota Ave, S.E., approximately 0.1 miles north of the intersection with Pennsylvania Ave, S.E. Additional places of worship within the vicinity of the Study Area include: Galilee Baptist Church, Second St. James Baptist Church and St. Francis Xavier Church.

Parks and Recreation Areas

Twining Square is located in the Study Area and is integral to the project intersection of Pennsylvania and Minnesota Avenues, SE. Twining Square is one of the Capitol Hill Parks, a collection of 59 triangles and squares owned by the NPS. "Twining Park" is the name given to the small parks owned by the NPS along Pennsylvania Avenue, SE, between Minnesota Avenue and 28th Street. As noted previously, Twining Square at this intersection is U.S. Reservation 487. U.S. Reservation 336A is also known as "Twining Square" by some and lies a few blocks east of the project intersection on Pennsylvania Avenue between 27th and 28th Streets SE. For more history of Twining Square, see *Section 1.3.2, Description of Study Area.*

The existing NPS-owned land in the Study Area does not operate as a park or recreation area and is not actively managed, with the exception of periodic mowing. NPS currently maintains the median of Pennsylvania Avenue at this intersection, as well as the park land at the intersection. The park land is fragmented by roadway, which results in the park land being used primarily as traffic islands for pedestrians crossing the streets.

Additional Resources

A U.S. Post Office is located at 2341 Pennsylvania Avenue, SE, at the southern corner of the intersection with L'Enfant Square, SE.

3.3.9 Utilities and Infrastructure

Most of the utilities at the intersection are located under the existing roadbeds of Pennsylvania and Minnesota Avenues SE, and the presence of a 72" sewer cutting northwest to southeast through the northern reservation suggests at least one major utility runs underneath the Twining Square park area as well. Archival research shows that extensive utility placement occurred around this intersection during the early 20th century. **Figure 3-9** provides an illustration of utilities in the Study Area, including electric, storm/water, gas, telephone and sewer lines.

District of Columbia Water and Sewer Authority (DC Water)

DC Water maintains and operates the water and sewer system throughout the District. Water distributed to the District is treated to meet or exceed all water quality standards at the USACE Washington Aqueduct treatment plant. The plant treats water from Great Falls on the Potomac River, which is then sold to DC Water for distribution. The DC Water system includes 1,300 miles of water pipelines where water is conveyed to the homes and businesses in the District.[52]

The existing storm and sanitary sewer system is a combined sewer system (CSS) in one-third of the District and is a municipal separate storm sewer system (MS4) in two-thirds of the District, including the project Study Area.[53] An MS4 includes two independent systems: one system to convey sanitary sewage from homes and businesses and one system to convey storm water. In the Study Area, the storm water runoff enters the storm water system and discharges into the Anacostia River. Sewage enters the sanitary sewer system, is treated at the Blue Plains Wastewater Treatment Plant and the treated wastewater is then discharged into the Potomac River. The Anacostia River is under tidal influence and therefore, the DDOE does not require water quantity control. Storm and sewer lines exist throughout the project intersection and run mostly parallel to the street network. As previously indicated, there is a 72" sewer main that runs west along Pennsylvania Avenue up to the Minnesota Avenue intersection, and then cuts northwest to southeast through the northern reservation.

Washington Gas

Washington Gas provides natural gas to customers in the District, Maryland and Virginia. Underground gas utility lines are located in the Study Area. The gas lines appear to run primarily beneath roadway along the major streets in the Study Area with connections to most residences and businesses.

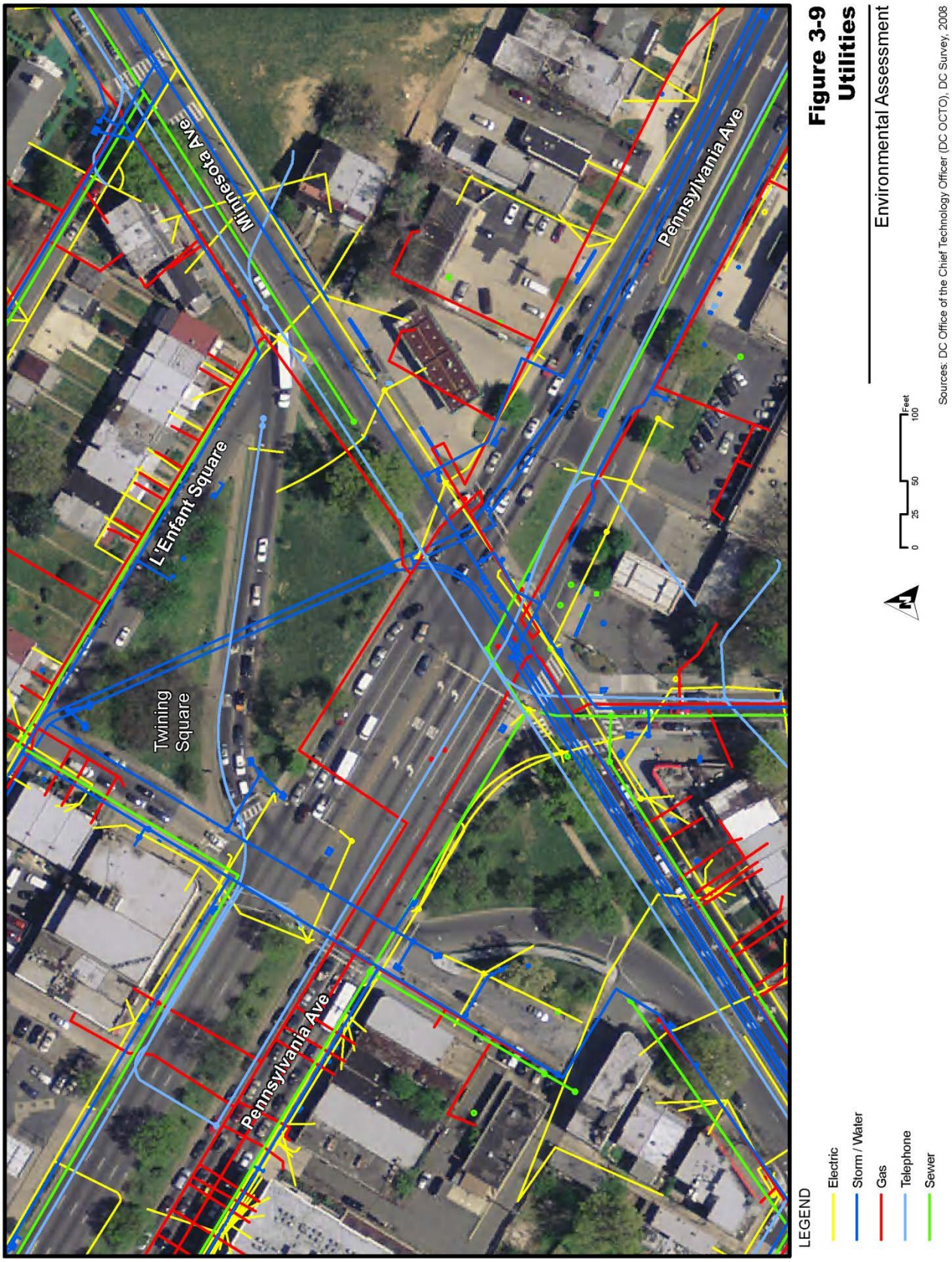


Figure 3-9
Utilities
Environmental Assessment

Sources: DC Office of the Chief Technology Officer (DC OCTO), DC Survey, 2008

WMATA

Typically, WMATA utilities are present in the right-of-way because of the Metro rail stations. Although, WMATA operates several Metrobus routes along Pennsylvania Avenue, SE, there are no Metro rail stations within the Study Area. The closest Metro station is the Potomac Avenue Metro Station, which is approximately 1.3 miles north of the Study Area at the intersection of Pennsylvania and Potomac Avenues, SE. Other nearby Metro stations are approximately two miles away (Anacostia Metro and Congress Heights on the green line and Benning Road on the blue line). ***There are no bus shelters in the study area associated with WMATA operations. WMATA bus stop poles, which are considered WMATA infrastructure, are located at each bus stop with information attached for bus users.*** During the interagency meeting on September 6, 2012, WMATA noted that the project intersection is often used as a "lay-by area" where buses pull over and wait when they are running ahead of schedule. Transit operations are discussed in *Section 3.4.3, Transit*.

PEPCO

Potomac Electric Power Company (PEPCO) provides electric service to the District, including the Study Area. Power lines and utility poles connect to each of the buildings in the Study Area and run along Pennsylvania Avenue, SE on both sides of the street. Utility poles do not run through Twining Square parkland; however, they do border much of the park area. Traffic lights are also served by electricity in the Study Area.

3.4 Transportation

3.4.1 Pedestrian and Bicycle Network

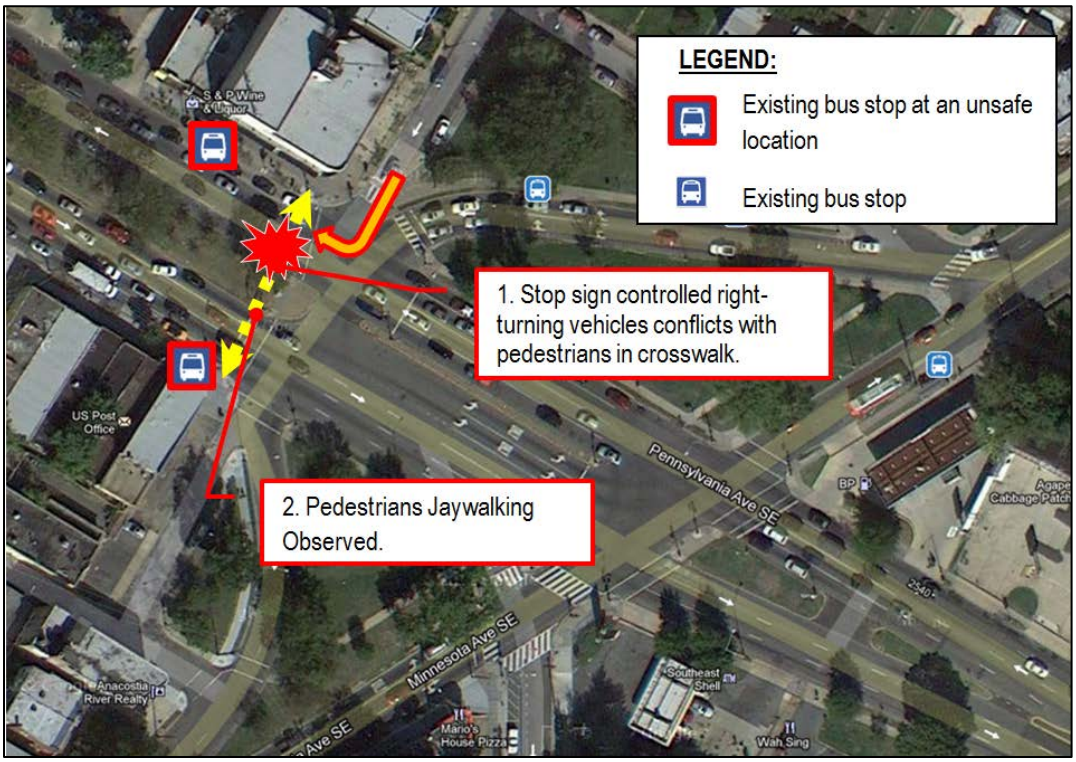
Pedestrian Network

As shown in **Figure 3-10**, there are two heavily used bus stops on Pennsylvania Avenue, SE just west of the square. During mid-week field observations January 8th through 10th, 2013, over 150 pedestrians were observed crossing Pennsylvania Avenue, SE. The pedestrians were observed using the west side crosswalk alone to access two heavily used bus stops on Pennsylvania Avenue, SE just west of Twining Square during both the AM and PM peak hours. The numbers below correspond to Figure 3-10 to identify two of the primary dangerous behaviors associated with the pedestrians crossing at this location during field observation:

1. Although an Exclusive Pedestrian Phase is provided in the signal timing to stop all vehicles and only allow pedestrians to cross Pennsylvania Avenue, the vehicles from the unsignalized local driveway still attempt to make abrupt right turns between gaps of pedestrians; any vehicle failing to finish the turn must suddenly stop, forcing vehicles behind to stop suddenly as well. Field observations found that in a one-hour period during the morning peak hour, three minor scratches involving pedestrians were seen and dismissed without reporting to the police.
2. It was observed that some pedestrians jaywalked to cross Pennsylvania Avenue, SE without waiting for a Walk indication, in order to get to the bus stop across the street. A review of the police crash records indicated that five pedestrians were injured at this intersection in the past three years (2011 to 2013).

Figure 3-10

Existing Safety Concerns for Pedestrians



Source: Google Maps and HNTB, 2013.

Bicycle Network

For bicyclists, field observations were conducted and safety records were reviewed. The following observations were noted:

1. The majority of cyclists currently use the sidewalks and crosswalks on the south side of Pennsylvania Avenue, SE, for two main reasons:
   a. The vehicular traffic is heavy during peak hours and bicyclists feel more comfortable riding on sidewalks rather than in the roadway[54];
   b. Although sidewalks and crosswalks are present on both sides of Pennsylvania Avenue near Minnesota Avenue, SE, bicyclists prefer to ride on the south side because continuous sidewalk and curb-cuts on the north side at the area west of the northbound I-295 on-ramp are not available.
2. No major bicyclist safety concerns were identified in the field observation or from the accident history.

3.4.2 Roadway Network

The study intersection is located on a major commuter route, Pennsylvania Avenue, SE, in an urban environment at its crossing with the local travel route of Minnesota Avenue, SE. To assess the traffic impacts to the surrounding area, the adjacent intersections to the subject intersection were also included in the traffic analysis. For detailed methodology, data collection methods, traffic volume development, and traffic simulation model calibration techniques, refer to ***Appendix F, Traffic Analysis Report***.

The streets included in the Study Area are described as follows:

- Pennsylvania Avenue, SE is a median-separated Principle Arterial according to the DDOT Roadway Functional Classification and presently with an average annual daily traffic (AADT) of 42,500 vehicles per day. It is one of the few major gateways used by motorists to reach Downtown Washington, DC from Southeast DC east of the Anacostia River and Maryland.
- Minnesota Avenue, SE is as a Minor Arterial with AADT of 10,200 vehicles per day.
- 25th Street, SE is a Minor Arterial with AADT of 5,800 vehicles per day. It is a one-way street going southbound within the Study Area.

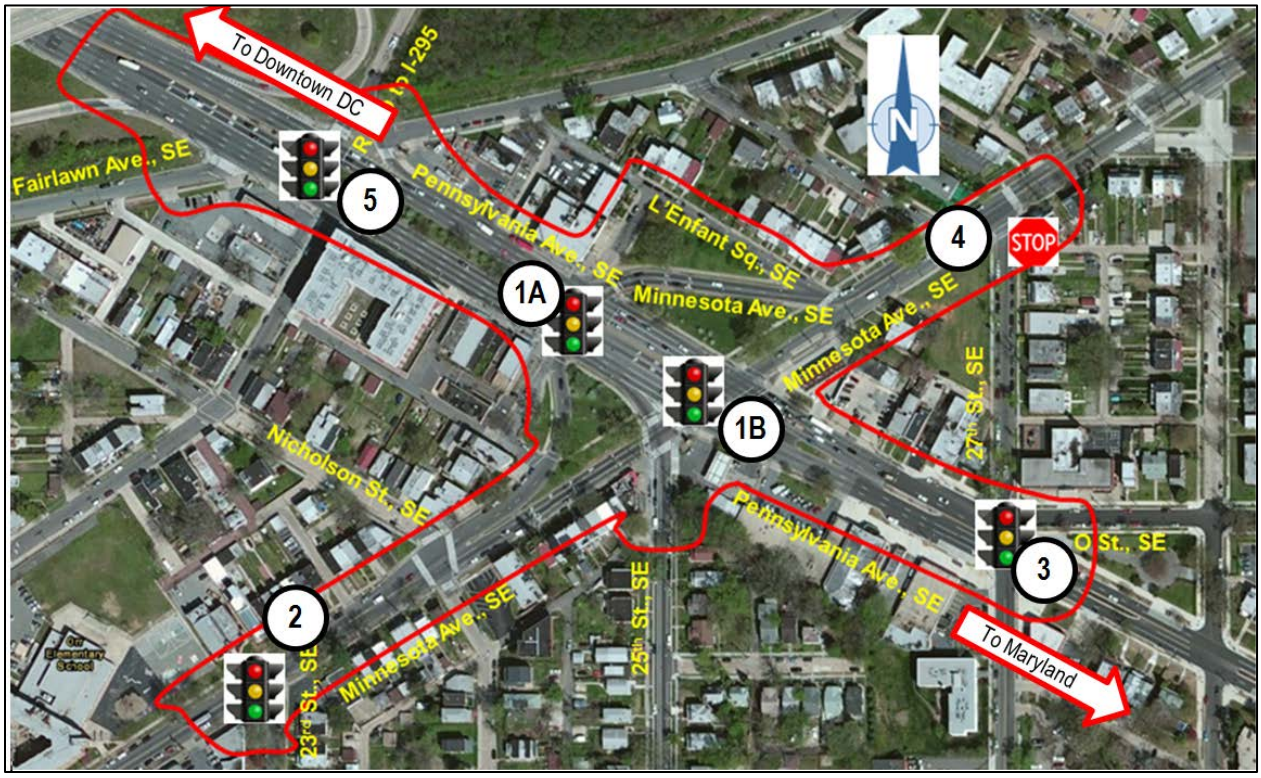
The intersections in the Study Area are provided in **Table 3.6** and shown in **Figure 3-11.** Note that Intersection Numbers 2 through 5 in the table are intersections adjacent to the subject intersection (1A and 1B) that would not be modified by any of the Build Alternatives; however, nearby impacts to these adjacent intersections due to each of the Build Alternatives are considered in this EA.

Table 3.6
List of Intersections in the Study Area

ID	Intersection	Traffic Control
1A	Pennsylvania Ave. and Minnesota Ave., SE West	Signalized
1B	Pennsylvania Ave. and Minnesota Ave., SE East	Signalized
2	Minnesota Ave. and 23rd St., SE	Signalized
3	Pennsylvania Ave., 27th St. and O St., SE	Signalized
4	Minnesota Ave. and 27th St., SE	Un-signalized
5	Pennsylvania Ave., I-295 N.B. On Ramp and Fairlawn Ave., SE	Signalized

Figure 3-11

Study Area for Traffic Impact Analysis

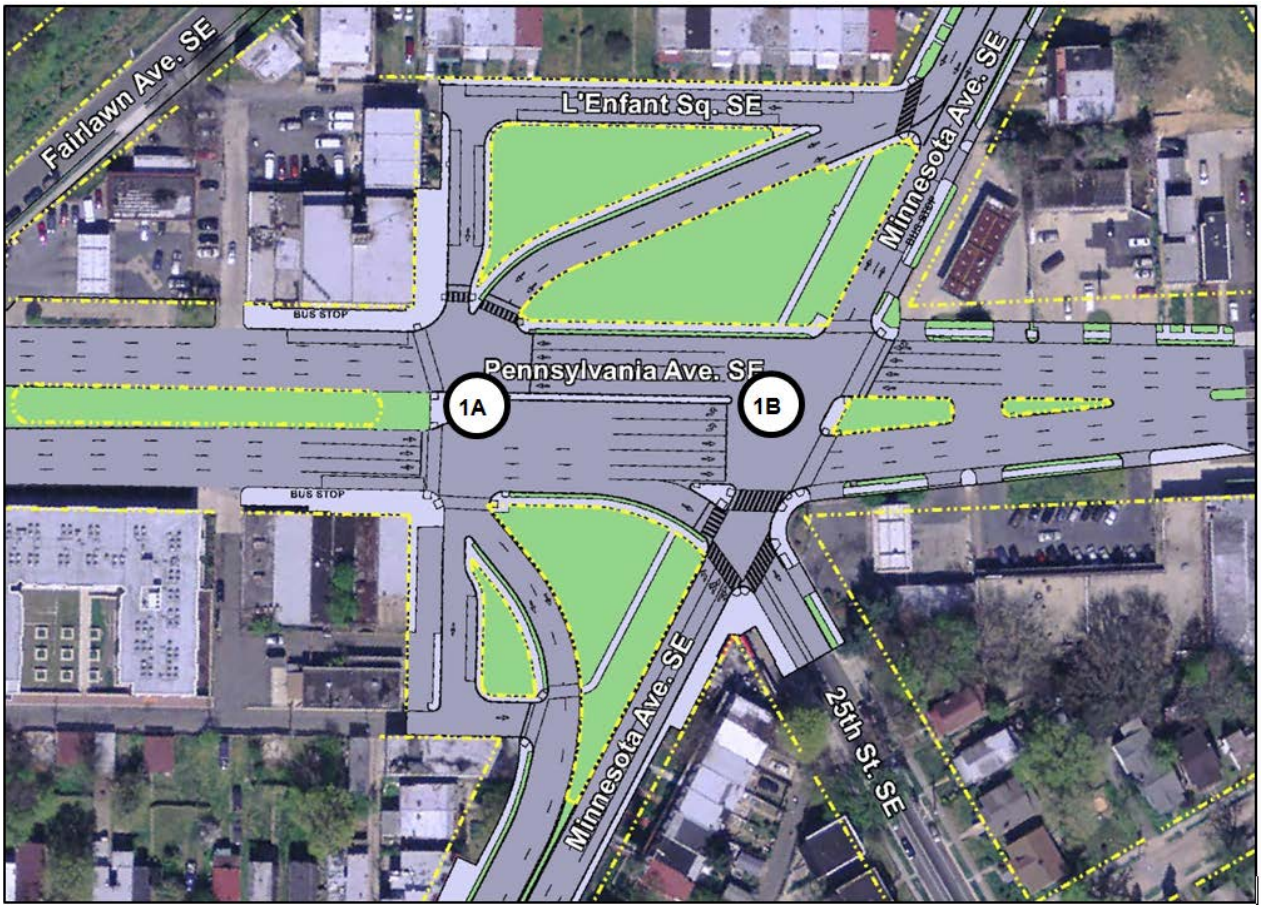


Source: Background aerial image from ESRI.

In the existing configuration, shown in **Figure 3-12**, Pennsylvania Avenue, SE is a two-way street with a concrete median; it has three or four travel lanes in each direction with two added lanes at the left turn onto northbound Minnesota Avenue. Minnesota Avenue is a two-way undivided street south of Nicholson Street and north of L'Enfant Square, SE. Within the Study Area, the NPS-owned park area separates Minnesota Avenue, SE into two one-way streets and this forms two signalized intersections on Pennsylvania Avenue, SE (1A and 1B). L'Enfant Square, SE is a one-lane, one-way street with on-street parking on both sides, providing access to the local residences and shops; it joins the west Pennsylvania Avenue, SE and Minnesota Avenue, SE intersection (1A), however it is not controlled by any traffic signals – only right turns are allowed and they are controlled by a Stop sign.

Figure 3-12

Existing Roadway Configuration



Source: HNTB, 2014.

Existing Condition Traffic Analysis

Delays and LOS

A key metric used in assessing traffic operations is Level of Service (LOS). LOS is an estimate of the performance efficiency and quality of an intersection or roadway as established by the *Highway Capacity Manual (HCM)*[55] methodology. The HCM methodology measures the degree of delay at intersections using a letter scale from A to F, "A" being the free flow condition and "F" being the total gridlock. LOS D or better is desirable for urban corridors.

For signalized intersections, **Table 3.7** provides the LOS scales and their descriptions.

Table 3.7
Level of Service Definitions

LOS	Vehicular Delay	Description
A	< 10 sec/veh	Desirable - free flow
B	10 – 20 sec/veh	Desirable - nearly free flow
C	20 - 35 sec/veh	Desirable - stable traffic flow
D	35 – 55 sec/veh	Acceptable - unstable traffic flow
E	55 – 80 sec/veh	Congestion - operation at capacity
F	> 80 sec/veh	Gridlock - over capacity

Source: Transportation Research Board, *Highway Capacity Manual*, 2000.

The traffic delay and LOS results are presented in **Tables 3.8** and **3.9** and discussed in this section.

In the existing year, all intersections operate at an acceptable level of service during the AM peak hour, except the Pennsylvania Avenue and 27th Street intersection (Intersection ID 3) operates at LOS E, slightly below the threshold of LOS D (55.0 sec/veh). The peak travel direction, northwest Pennsylvania Avenue towards Downtown DC operates at LOS B, except at 27th Street.

Table 3.8
Traffic Delay and LOS Results – Existing AM

ID	INTERSECTION	APPROACH	EXISTING			
			APPROACH		INTERSECTION	
			DELAY	LOS	DELAY	LOS
1A	L'Enfant Sq & Pennsylvania Ave	SWB	287.5	F	39.5	D
		SWR (L'Enfant Sq.)	0.4	A		
		SEB	12.6	B		
		NWB	12.4	B		
1B	Pennsylvania Ave & Minnesota Ave	SEB	18.4	B	18.4	B
		NWB	19.5	B		
		NEB	14.1	B		
		SWB	-			
1C*	L'Enfant Sq South & Minnesota Ave NB	NET	-		-	
		SEL				
2	Minnesota Ave & 23rd St	EB	4.5	A	10.8	B
		WB	4.0	A		
		NB	29.3	C		
3	Pennsylvania Ave & 27th St	WB	101.1	F	59.4	E
		NB	108.1	F		
		SEB	14.4	B		
		NWB	57.1	E		
4	Minnesota Ave & 27th St	NB	10.4	B	0.9	A
		NEB	0.0	A		
		SWB	0.0	A		
5	Pennsylvania Ave & NB 295 Ramp	SEB	24.9	C	23.4	C
		NWB	23.0	C		

Note: * Intersection 1C only exists in the Revised Square Alternative.
Source: HNTB, 2013.

In the existing year, all intersections in the Study Area operate at a LOS D or better during the PM peak hour. The southwest bound approach at Intersection 1A experiences heavy delay and operates at an LOS F during both AM and PM conditions. The peak travel direction during the PM rush hour is southeast on Pennsylvania Avenue, and operates at LOS C or better.

Table 3.9
Traffic Delay and LOS Results – Existing PM

ID	INTERSECTION	APPROACH	EXISTING			
			APPROACH		INTERSECTION	
			DELAY	LOS	DELAY	LOS
1A	L'Enfant Sq & Pennsylvania Ave	SWB	186.2	F	35.2	D
		SWR (L'Enfant Sq.)	0.2	A		
		SEB	27.9	C		
		NWB	4.2	A		
1B	Pennsylvania Ave & Minnesota Ave	SEB	3.6	A	24.8	C
		NWB	73.0	E		
		NEB	49.3	D		
		SWB	-			
1C*	L'Enfant Sq South & Minnesota Ave NB	NET	-		-	
		SEL				
2	Minnesota Ave & 23rd St	EB	4.7	A	8.1	A
		WB	4.4	A		
		NB	29.0	C		
3	Pennsylvania Ave & 27th St	WB	57.1	E	17.3	B
		NB	51.8	D		
		SEB	10.8	B		
		NWB	19.9	B		
4	Minnesota Ave & 27th St	NB	14.7	B	1.1	A
		NEB	0.0	A		
		SWB	0.0	A		
5	Pennsylvania Ave & NB 295 Ramp	SEB	5.8	A	7.3	A
		NWB	11.9	B		

Note: * Intersection 1C only exists in the Revised Square Alternative.
Source: HNTB, 2013.

Queues

Table 3.10 provides the queuing analysis results on key movements at the intersections for the existing condition in the AM peak hour at the Pennsylvania and Minnesota Avenues, SE intersection.

Table 3.11 provides the queuing analysis results on key movements at the intersections for the existing condition in the PM peak hour. In the PM peak hour, similar queue results were found.

Table 3.10
Queuing Analysis Results (in Feet) – Existing AM

ID	Intersection	Direction	Existing
1A	**L'Enfant Sq & Pennsylvania Ave**	SWT	~333
		SET	165
		NWT	619
1B	**Pennsylvania Ave & Minnesota Ave**	SEL	136
		SET	5
		NWL	-
		NWT	338
		NEL	~102
		NET	0
		SWL	-
		SWT	-

Note: ~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

Source: HNTB, 2013.

Table 3.11
Queuing Analysis Results (in Feet) – Existing PM

ID	Intersection	Direction	Existing
1A	**L'Enfant Sq & Pennsylvania Ave**	SWT	~314
		SET	775
		NWT	79
1B	**Pennsylvania Ave & Minnesota Ave**	SEL	179
		SET	12
		NWL	-
		NWT	250
		NEL	172
		NET	170
		SWL	-
		SWT	-

Note: ~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

Source: HNTB, 2013.

Travel Times

Travel time, the amount of time it takes for a motorist to travel from point A to point B, is a direct reflection of motorist experience. Existing travel times are shown in **Tables 3.12** and **3.13.**

Table 3.12
Existing Travel Times (in Minutes) – AM

From	To	Movement	Existing
Penn Ave/295NB Ramp	Minn Ave/27th St	EBL	2.6
Penn Ave/295NB Ramp	Penn Ave/27th St	EBT	1.8
Penn Ave/295NB Ramp	Minn Ave/23rd St	EBR	2.3
Penn Ave/295NB Ramp	Minn Ave/25th St	EBR	1.8
Penn Ave/27th St	Penn Ave/295NB Ramp	WBT	1.3
Penn Ave/27th St	Minn Ave/23rd St	WBR	1.0
Minn Ave/23rd St	Penn Ave/295NB Ramp	NBL	6.1
Minn Ave/23rd St	Minn Ave/27th St	NBT	3.8
Minn Ave/23rd St	Penn Ave/27th St	NBR	4.3
Minn Ave/23rd St	Minn Ave/25th St	NBR	3.7
Minn Ave/27th St	Minn Ave/25th St	SBL	4.4
Minn Ave/27th St	Minn Ave/23rd St	SBT	4.5
Minn Ave/27th St	Penn Ave/295NB Ramp	SBR	4.9

Source: HNTB, 2013.

Table 3.13
Existing Travel Times (in Minutes) – PM

From	To	Movement	Existing
Penn Ave/295NB Ramp	Minn Ave/27th St	EBL	3.4
Penn Ave/295NB Ramp	Penn Ave/27th St	EBT	3.4
Penn Ave/295NB Ramp	Minn Ave/23rd St	EBR	4.2
Penn Ave/295NB Ramp	Minn Ave/25th St	EBR	4.1
Penn Ave/27th St	Penn Ave/295NB Ramp	WBT	2.2
Penn Ave/27th St	Minn Ave/23rd St	WBR	1.8
Minn Ave/23rd St	Penn Ave/295NB Ramp	NBL	2.3
Minn Ave/23rd St	Minn Ave/27th St	NBT	2.4
Minn Ave/23rd St	Penn Ave/27th St	NBR	3.2
Minn Ave/23rd St	Minn Ave/25th St	NBR	2.4
Minn Ave/27th St	Minn Ave/25th St	SBL	3.0
Minn Ave/27th St	Minn Ave/23rd St	SBT	3.0
Minn Ave/27th St	Penn Ave/295NB Ramp	SBR	1.8

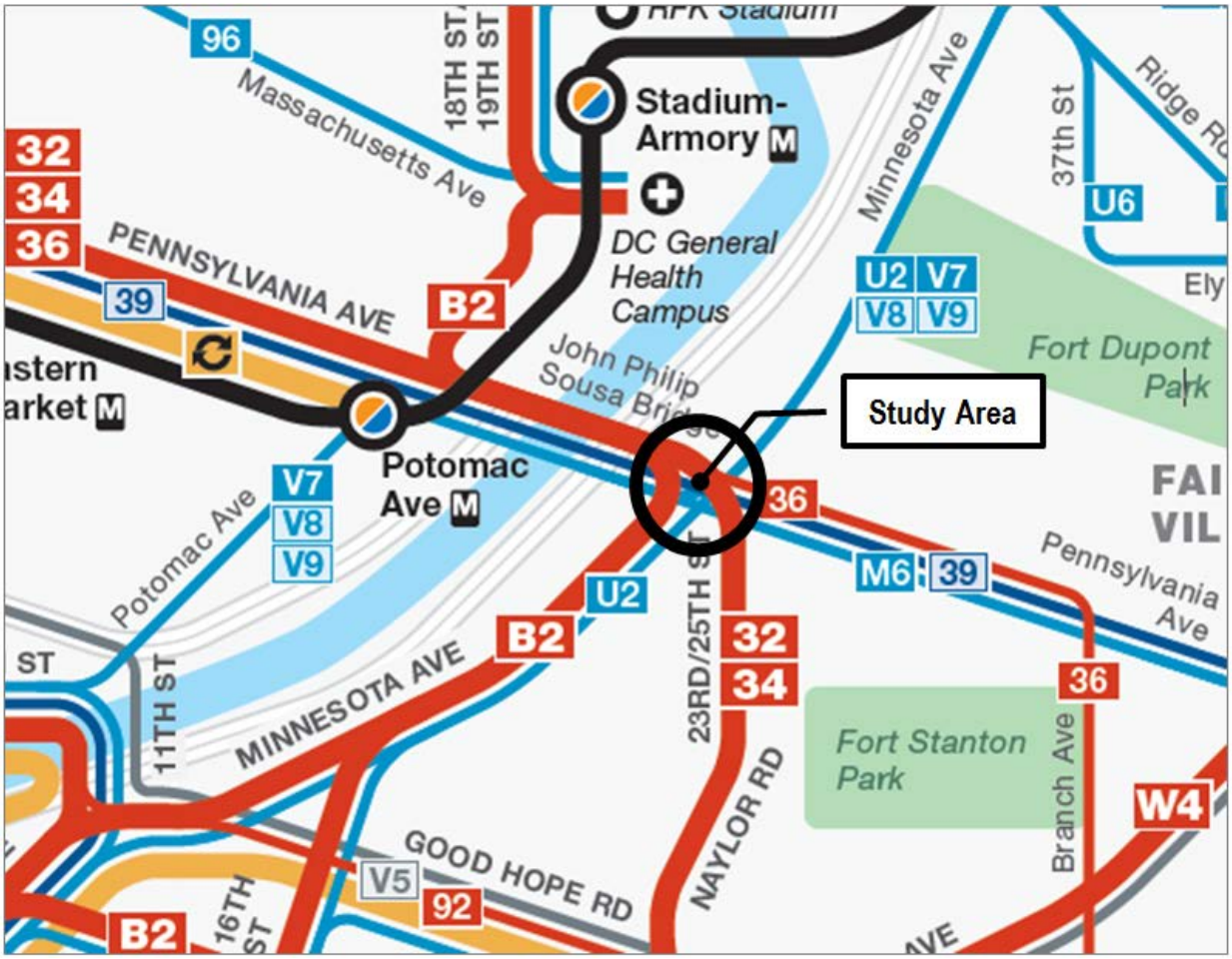
Source: HNTB, 2013.

3.4.3 Transit

Currently there are twelve bus routes (32, 34, 36, 39, A11, B2, J13, K11, M6, V7, V8 and V9) using Pennsylvania Avenue, five routes (B2, U2, V7, V8 and V9) on Minnesota Avenue and two (32 and 34) on 25th Street in the Study Area, as shown in **Figure 3-13**. While not shown on Figure 3-13, bus route 39 is an express bus route that runs along Pennsylvania Avenue. The nearest Metro station is the Potomac Avenue Station which is located one mile to the west of the Study Area.

Figure 3-13

Bus Routes within the Study Area and the Vicinity

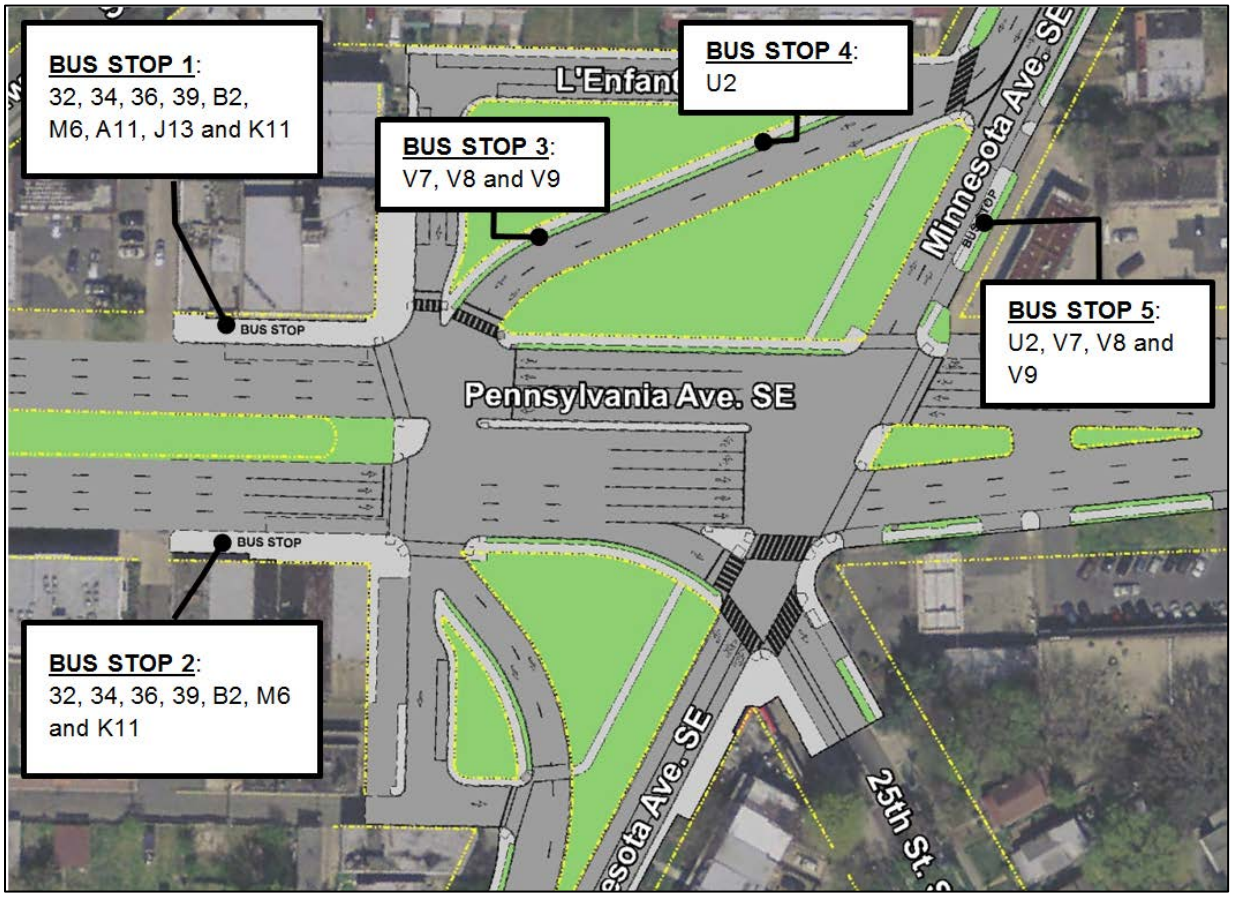


Source: Washington Metropolitan Area Transit Authority website www.wmata.com, 2013.

Figure 3-14 shows the five existing bus stops within the Study Area. Bus Stops 1 and 2 are located on Pennsylvania Avenue, SE west of L'Enfant Square, SE; Bus Stops 3 and 4 are on southbound Minnesota Avenue, SE between the two NPS-owned park spaces north of Pennsylvania Avenue, SE; and Bus Stop 5 is on northbound Minnesota Avenue, SE north of Pennsylvania Avenue, SE. ***The existing bus shelters in District right-of-way belong to Clear Channel, under a franchise agreement. WMATA bus stop poles are located at each bus stop with information attached for bus users.***

Figure 3-14

Bus Stops in the Existing Condition



Source: HNTB, 2014.

3.5 Air Quality

3.5.1 Criteria Pollutants

The Federal Clean Air Act of 1970 established the National Ambient Air Quality Standards (NAAQS) (**Table 3.14**). These standards were established by the United States Environmental Protection Agency (EPA) to protect public health, safety, and welfare from known or anticipated effects of sulfur dioxide (SO_2), particulate matter (PM_{10}, 10-micron in diameter and smaller along with $PM_{2.5}$, 2.5 micron in diameter and smaller), carbon monoxide (CO), nitrogen dioxide (NO_2), ozone (O_3), and lead (Pb). EPA refers to these pollutants as the "criteria" pollutants.

Table 3.14
National Ambient Air Quality Standards (NAAQS)

Pollutant	Primary/ Secondary	Averaging Time	Level	Form
Carbon Monoxide (CO)	Primary	8 – Hour	9 ppm	Not to be exceeded more than once per year
		1 – Hour	35 ppm	
Lead (Pb)	Primary and secondary	Rolling 3-Month Average	0.15 µg/m^3 (1)	Not to be exceeded
Nitrogen Dioxide (NO_2)	Primary	1 – Hour	100 ppb 5)	98th percentile, averaged over 3 years
	Primary and secondary	Annual Mean	53 ppb (2)	Annual Mean
Ozone (O_3)	Primary and secondary	8 – Hour	0.075 ppm (3)	Annual fourth-highest daily maximum 8-hr concentration, averaged over 3 years
Particulate Matter ($PM_{2.5}$)	Primary	Annual	12 µg/m^3	annual mean, averaged over 3 years
	Secondary	Annual	15 µg/m^3	annual mean, averaged over 3 years
	Primary and secondary	24-hour	35 µg/m^3	98th percentile, averaged over 3 years
Particulate Matter (PM_{10})	Primary and secondary	24-hour	150 µg/m^3	Not to be exceeded more than once per year on average over 3 years
Sulfur Dioxides (SO_2)	Primary	1-hour	75 ppb (4)	99th percentile of 1-hour daily maximum concentrations, averaged over 3 years
	Secondary	3-hour	0.5 ppm	Not to be exceeded more than once per year

(1) Final rule signed October 15, 2008. The 1978 lead standard (1.5 µg/m3 as a quarterly average) remains in effect until one year after an area is designated for the 2008 standard, except that in areas designated nonattainment for the 1978, the 1978 standard remains in effect until implementation plans to attain or maintain the 2008 standard are approved.

(2) The official level of the annual NO2 standard is 0.053 ppm, equal to 53 ppb, which is shown here for the purpose of clearer comparison to the 1-hour standard.

(3) Final rule signed March 12, 2008. The 1997 ozone standard (0.08 ppm, annual fourth-highest daily maximum 8-hour concentration, averaged over 3 years) and related implementation rules remain in place. In 1997, EPA revoked the 1-hour ozone standard (0.12 ppm, not to be exceeded more than once per year) in all areas, although some areas have continued obligations under that standard ("anti-backsliding"). The 1-hour ozone standard is attained when the expected number of days per calendar year with maximum hourly average concentrations above 0.12 ppm is less than or equal to 1.

(4) Final rule signed June 2, 2010. The 1971 annual and 24-hour SO2 standards were revoked in that same rulemaking. However, these standards remain in effect until one year after an area is designated for the 2010 standard, except in areas designated nonattainment for the 1971 standards, where the 1971 standards remain in effect until implementation plans to attain or maintain the 2010 standard are approved.

Source: http://www.epa.gov/air/criteria.html, accessed May 29, 2013.

The primary pollutants from motor vehicles are unburned hydrocarbons, NO_x, CO, and particulates. Hydrocarbons (HC) and nitrogen oxides (NO_x) can combine in a complex series of reactions catalyzed by sunlight to produce photochemical oxidants such as ozone and NO_2. Because these reactions take place over a period of several hours, maximum concentrations of photochemical oxidants are often found far downwind of the precursor sources. Ozone and NO_2 are regional problems.

Carbon monoxide is a colorless and odorless gas which is the product of incomplete combustion, and is the major pollutant from gasoline fueled motor vehicles. CO is a localized air quality issue.

Particulate matter includes both airborne solid particles and liquid droplets. These liquid particles come in a wide range of sizes. PM_{10} particulates are coarse particles, such as windblown dust from fields and unpaved roads. $PM_{2.5}$ particulates are fine particles generally emitted from activities such as industrial and residential combustion and from vehicle exhaust. Particulates from transportation can be a localized issue when a project is determined to be a project of air quality concern for either PM_{10} or $PM_{2.5}$ emissions.

An exceedance of the NAAQS pollutant level does not necessarily constitute a violation of the standard. Some of the criteria pollutants (including CO) are allowed one exceedance of the maximum level per year, while for other pollutants criteria levels cannot be exceeded. Violation criteria for other pollutants are based on past recorded exceedances. Table 3.14 lists the allowable exceedances for the EPA criteria pollutants.

3.5.2 Attainment Designations

The Clean Air Act Amendments (CAAA) of 1977 and 1990 required all states to submit to the EPA a list identifying those air quality regions, or portions thereof, which meet or exceed the NAAQS or cannot be classified because of insufficient data. Portions of air quality control regions which are shown by monitored data or air quality modeling to exceed the NAAQS for any criteria pollutant are designated "nonattainment" areas for that pollutant. The CAAA also established time schedules for the states to attain the NAAQS.

States that have nonattainment areas are required to prepare State Implementation Plans (SIP) that lay out a plan to show how the state will improve the air quality to attain the NAAQS. Both new and improvement highway projects must be contained in the area's Long-Range Plan (LRP) and Transportation Improvement Program (TIP). The Metropolitan Washington Council of Governments (MWCOG) along with the District of Columbia and the states of Maryland and Virginia are responsible for preparing the LRP and TIPs. Once the Metropolitan Planning Organizations (MPO) has completed the LRP and TIP, they are submitted to the FHWA for review and approval according to the requirements of the CAAA and related implementation regulations.

The Study Area is located within the National Capital Interstate Air Quality Control Region (AQCR #47). This AQCR includes the District of Columbia, Maryland, and Virginia Intrastate Air Quality Control Region. The District of Columbia is currently in attainment status for 4 of the 7 criteria pollutants (Pb, NO_2, PM_{10} and SO_2,); re-classified from nonattainment to maintenance for CO; and has been classified as being in nonattainment for the 1997 and 2008 8-hour ozone, and the 1997 $PM_{2.5}$ standards.

3.5.3 Existing Conditions

The results of the CO microscale air quality modeling for existing conditions were analyzed as part of the air quality analysis conducted for the EA. The maximum 1-hour CO concentrations in the existing condition (2012) are 4.8 ppm, and the maximum 8-hour CO concentrations are 3.8 ppm. The 1-hour concentrations include a background concentration of 2.9 ppm and the 8-hour concentrations include a background concentration of 2.5 ppm. These concentrations do not exceed either the 1-hour (35 ppm) or 8-hour (9 ppm) NAAQS.

Refer to ***Appendix G, Air Quality Report*** for detailed air quality analysis and results.

3.6 Noise

3.6.1 Noise Model and Analysis

The FHWA's Procedures for Abatement of Highway Traffic Noise and Construction Noise is presented in the Code of Federal Regulations, Title 23 Part 772 (23 CFR 772). This regulation, plus other guidance documents written to explain the regulation, sets forth the process for performing a traffic noise analysis. The process includes the following:

- Identify existing and proposed land uses in the Study Area;
- Determine existing noise levels either:
  - through modeling, or
  - noise measurements with concurrent classification counts of vehicles passing the noise monitoring site;
- Validate predicted noise levels through comparison between measured and predicted levels;
- Model future design year traffic noise levels which will yield the worst hourly traffic noise on a regular basis (PM peak hour noise levels);
- Identify locations that would be exposed to a noise impact based upon the Noise Abatement Criteria (NAC) as presented in **Table 3.15**;
- Model noise abatement measures to mitigate the predicted design year traffic noise impacts; and
- Modeling must be performed with FHWA’s most recent version of the Traffic Noise Model® (TNM).

DDOT’s Noise Policy is the District’s tool for implementing 23 CFR 772. The NAC, which is presented in 23 CFR 772, establishes the noise abatement criteria for various land uses. The noise level descriptor used is the equivalent sound level, L_{eq}, defined as the steady state sound level which, in a stated time period (usually one hour), contains the same sound energy as the actual time-varying sound.

Table 3.15
Noise Abatement Criteria (NAC) – Hourly A-Weighted Sound Level-Decibels (dBA)

Activity Category	Activity Criteria $L_{eq}(h)$	Evaluation Location	Activity Description
A	57	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	Residential
C	67	Exterior	Active sport areas, amphitheaters, auditoriums, campgrounds, cemeteries, daycare centers, hospitals, libraries, medical facilities, parks, picnic areas, places of worship, playgrounds, public meeting rooms, public or nonprofit institutional structures, radio studios, recording studios, recreation areas, Section 4(f) sites, schools, television studios, trails, and trail crossings.
D	52	Interior	Auditoriums, daycare centers, hospitals, libraries, medical facilities, places of worship, public meeting rooms, public or nonprofit institutional structures, radio studios, recording studios, schools, and television studios.
E	72	Exterior	Hotels, motels, offices, restaurants/bars, and other developed lands, properties or activities not included in A-D or F.
F	N/A	N/A	Agriculture, airports, bus yards, emergency services, industrial, logging, maintenance facilities, manufacturing, mining, rail yards, retail facilities, shipyards, utilities (water resources, water treatment, electrical), and warehousing.
G	N/A	N/A	Undeveloped lands that are not permitted.

Source: **"**District of Columbia Department of Transportation Noise Policy," District Department of Transportation, July 11, 2011.

Noise abatement measures are considered when the predicted noise levels approach or exceed those values shown for the appropriate activity category in Table 3.15, or when the predicted traffic noise levels substantially exceed the existing noise levels. DDOT has defined the approach value as being 1 dBA less than the noise levels shown in Table 3.11. DDOT has defined an increase over existing noise levels of 10 decibels or more as being substantial.

TNM® is FHWA's "computer program for highway traffic noise prediction and analysis."[56] The following parameters are used in this model to calculate an hourly $L_{eq}(h)$ at a specific receiver location:

- Distance between roadway and receiver;
- Relative elevations of roadway and receiver;
- Hourly traffic volume in light-duty (two axles, four tires), medium-duty (two axles, six tires), and heavy-duty (three or more axles) vehicles;
- Vehicle speed;
- Ground absorption; and
- Topographic features, including retaining walls and berms.

The Pennsylvania Avenue/Minnesota Avenue Study Area consists of medium-density residential, retail, and recreational areas. The criteria stated in Table 3.15 will help to determine whether or not the Proposed Action will impact uses throughout the corridor.

3.6.2 Noise Measurements

Existing noise level measurements were conducted on March 21, 2013 at four representative sites in the Study Area. A 20-minute measurement was taken at each site. The measurements were made in accordance with FHWA and DDOT guidelines using an integrating sound level analyzer meeting ANSI and IEC Type 1 specifications. Traffic counts were taken at each site, concurrent with the noise measurements. Traffic data were obtained at all the field sites. **Table 3.16** contains observed traffic data, a site description, date, start time and duration of the noise measurements. The measurement locations were selected adjacent to the proposed alignments. The noise measurement sites and modeled noise receiver locations are shown on **Figure 3-15** and **Figure 3-16**. The field data sheets are presented in ***Appendix H, Noise Technical Report***.

Table 3.16

Measured Existing Noise Levels

Field Site #	Site Description	Date	Start Time	Duration (minutes)	Traffic[1] Roadway	A[a]	MT[b]	HT[c]	Buses[d]	Speed (mph)	Noise Level, dBA $L_{eq}(h)$
FS-1	Vacant lot on north side of L'Enfant Square SE between 2404 and 2420 L'Enfant Square SE.	3/21/2013	8:00 AM	20	L'Enfant Square WB	84	0	0	0	5 to 15	61.5
FS-2	Twining Square, 27 ft. north to L'Enfant Square. 29 ft. south to WB Pennsylvania Avenue, 109 ft. west to 54 ft. to SB Minnesota Avenue.	3/21/2013	8:30 AM	20	Pennsylvania Avenue (EB and WB); Minnesota Avenue (SB)	1,330	17	25	23	15 to 40	73.1
FS-3	Terrace next to sidewalk. 30 ft. to EB Pennsylvania Avenue. 76 ft. to north corner of 2529 Pennsylvania Avenue.	3/21/2013	9:00 AM	20	Pennsylvania Avenue (EB and WB)	931	21	14	6	25 to 35	71.1
FS-4	NPS reservation area. Surrounded by L'Enfant Square SE and SB Minnesota Avenue, south of Pennsylvania Avenue. 16 ft. east of L'Enfant Square SE, 38 ft. west of SB Minnesota Avenue.	3/21/2013	9:30 AM	20	Pennsylvania Avenue (EB); Minnesota Avenue (NB and SB); L'Enfant Square SB	629	18	22	17	20 to 35	69.7

Note: (1) Vehicle counts classified as follows:

a. Autos (A) defined as vehicles with 2-axles and 4-tires.

b. Medium trucks (MT) defined as vehicles with 2-axles and 6-tires.

c. Heavy trucks (HT) defined as vehicles with 3 or more axles.

d. Buses defined as vehicles carrying more than 9 passengers.

Source: HNTB Corporation, March 2013.

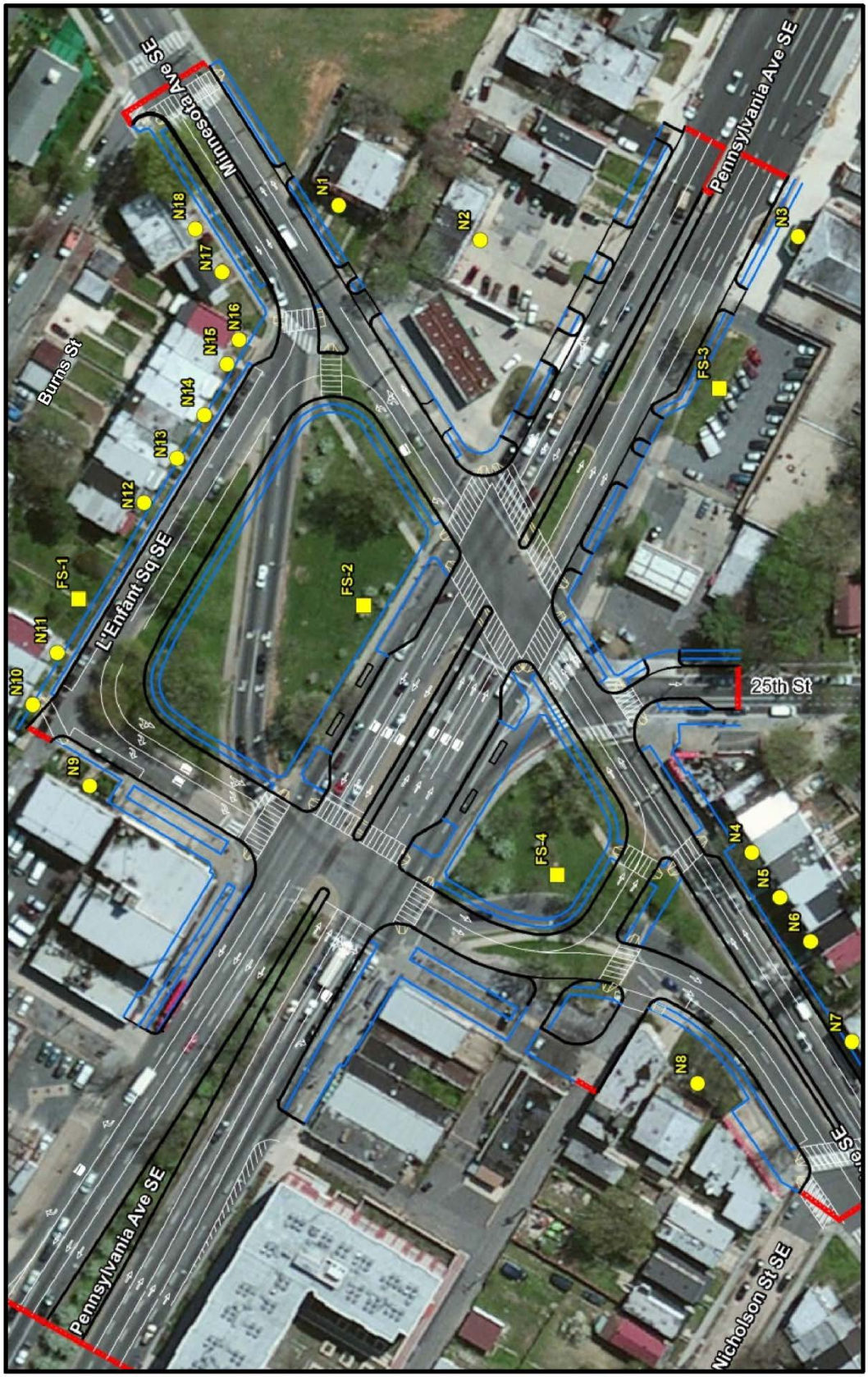


Figure 3-15
Noise Receiver Map - Revised Square Alternative
Environmental Assessment

Source: HNTB Corporation, 2013

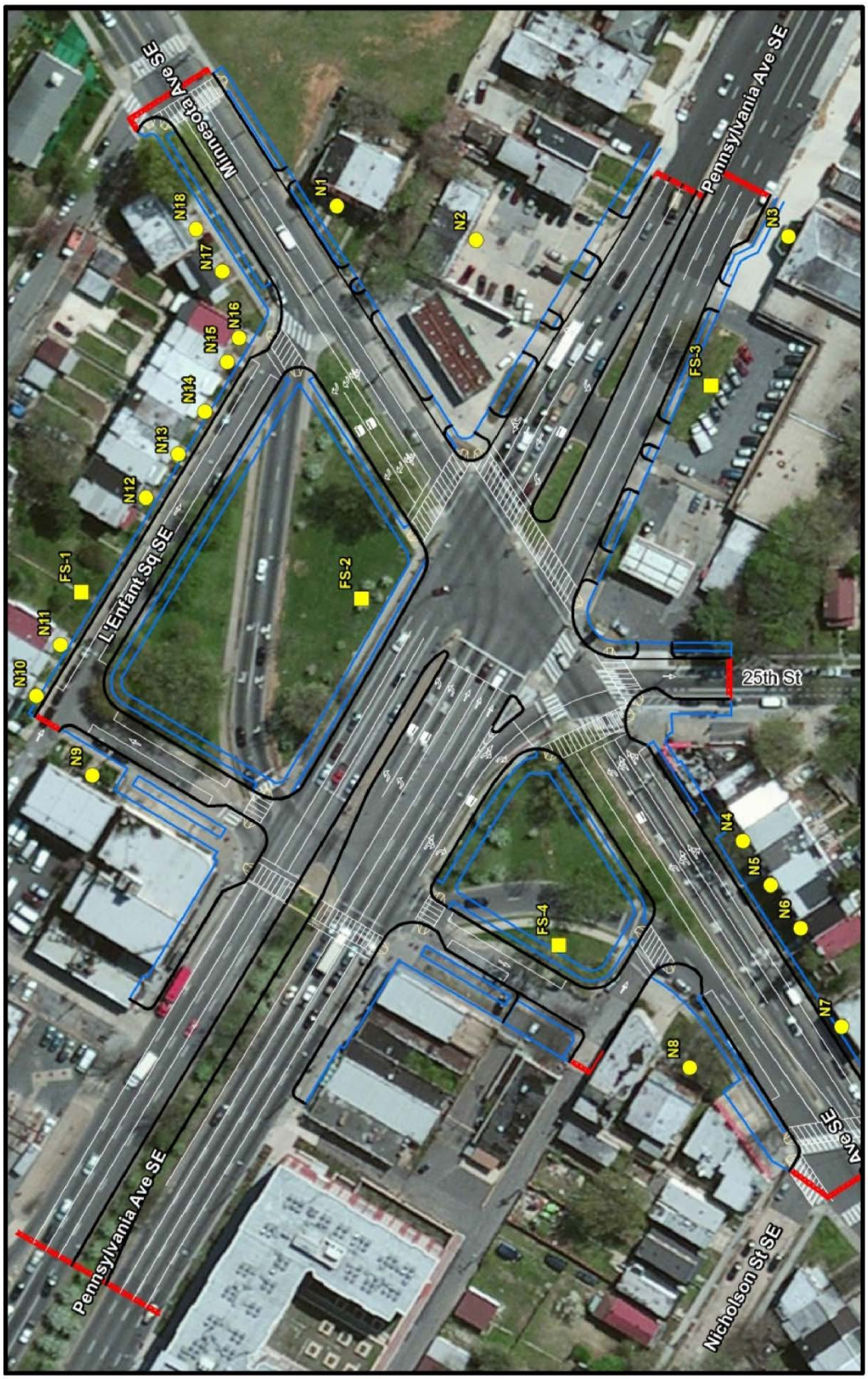


Figure 3-16
Noise Receiver Map - Conventional Intersection Alternative
Environmental Assessment

Source: HNTB Corporation, 2013

Measured vs. Modeled

TNM® 2.5 was used to validate the predicted noise levels through comparison with the measured and predicted noise levels. Traffic was counted and classified concurrently with each noise measurement by vehicle type: cars, medium trucks, heavy trucks, and buses. Traffic counts, concurrent with the noise measurements, were taken at four measurement sites. The traffic data from the four sites were used in the model. The site by site comparison is presented in **Table 3.17**. All four field site modeled data compared within 0-3 dB of the measured noise levels. This represents reasonable correlation since the human ear can barely distinguish a 3 dBA change in the $L_{eq}(h)$ noise level in the urban environment.

Table 3.17
Comparison of Measured and Modeled Noise Levels

Field Site	Noise Level, dBA $L_{eq}(h)$		Difference in Noise Level, dBA $L_{eq}(h)$ (Modeled Minus Measured)
	Measured	Modeled	
FS-1	61.5	63.8	2.3
FS-2	73.1	72.2	-0.9
FS-3	71.1	68.1	-3.0
FS-4	69.7	69.0	-0.7

Source: HNTB Corporation, March 2013.

Modeled Existing PM Peak Hour Noise Levels

Existing (2012) PM peak hour noise levels at the 16 residential locations, which represents 35 dwelling units, would range from 63.8 to 69.0 dBA $L_{eq}(h)$. The noise levels at the category C locations would range from 67.4 to 71.1 dBA $L_{eq}(h)$. The interior noise level at the category D location, N7, would be 41.1 dBA. As shown in Table 4.12, the noise levels at 25 of the 35 dwelling units are presently approaching or exceeding 67 dBA, as are the noise levels in the park and at the daycare.