

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.⁵¹

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 19.⁵²

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.⁵³

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.⁵⁴ 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.



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). Additionally, there are no bus shelters in the study area; therefore no WMATA infrastructure is present in the area. 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 Corporation, 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, 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 roadway⁵⁵;
 - 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 Road 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.

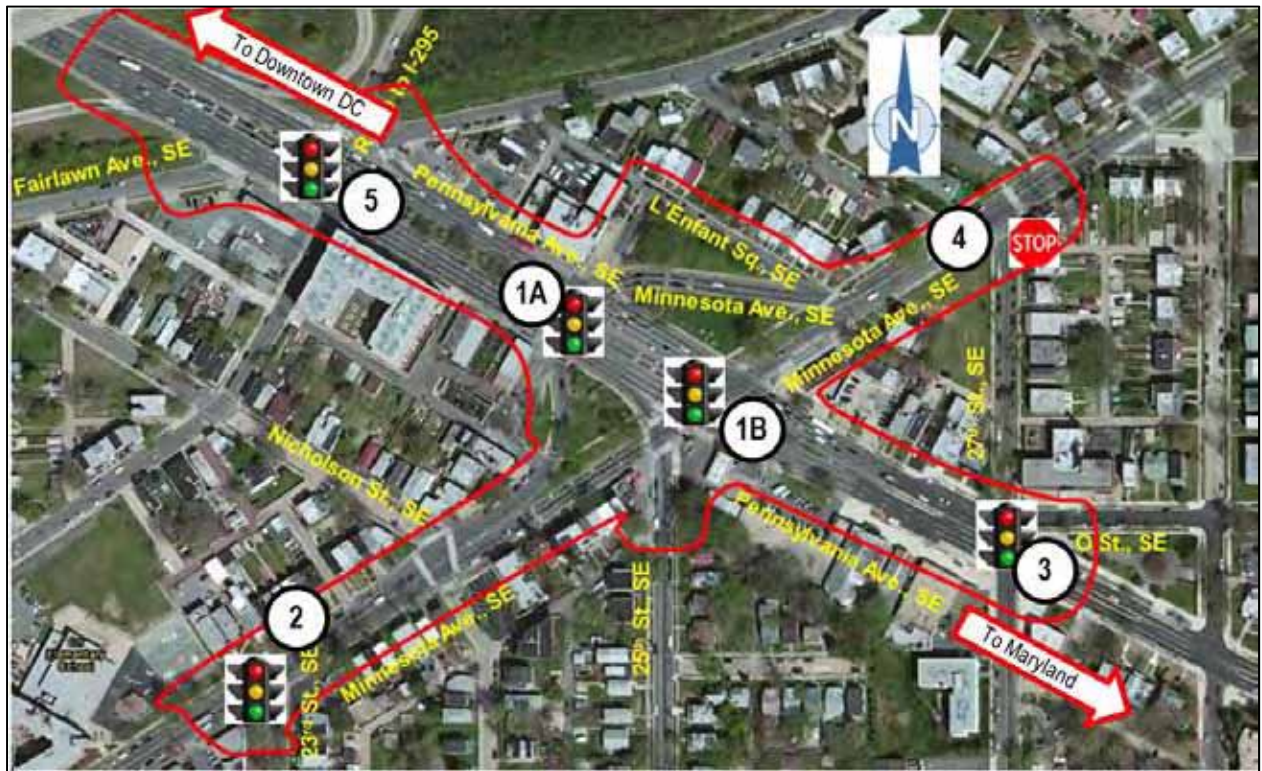
The intersections in the Study Area are provided in **Table 3.6** and shown in **Figure 3-11**. Note that Intersection Numbers 2 through 5 in the table are intersections adjacent to the subject intersection (1A and 1B) that would not be modified by any of the Build Alternatives; however, nearby impacts 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 Corporation, 2013.

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)*⁵⁶ 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 Corporation, 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 Corporation, 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 Corporation, 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 Corporation, 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 Corporation, 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

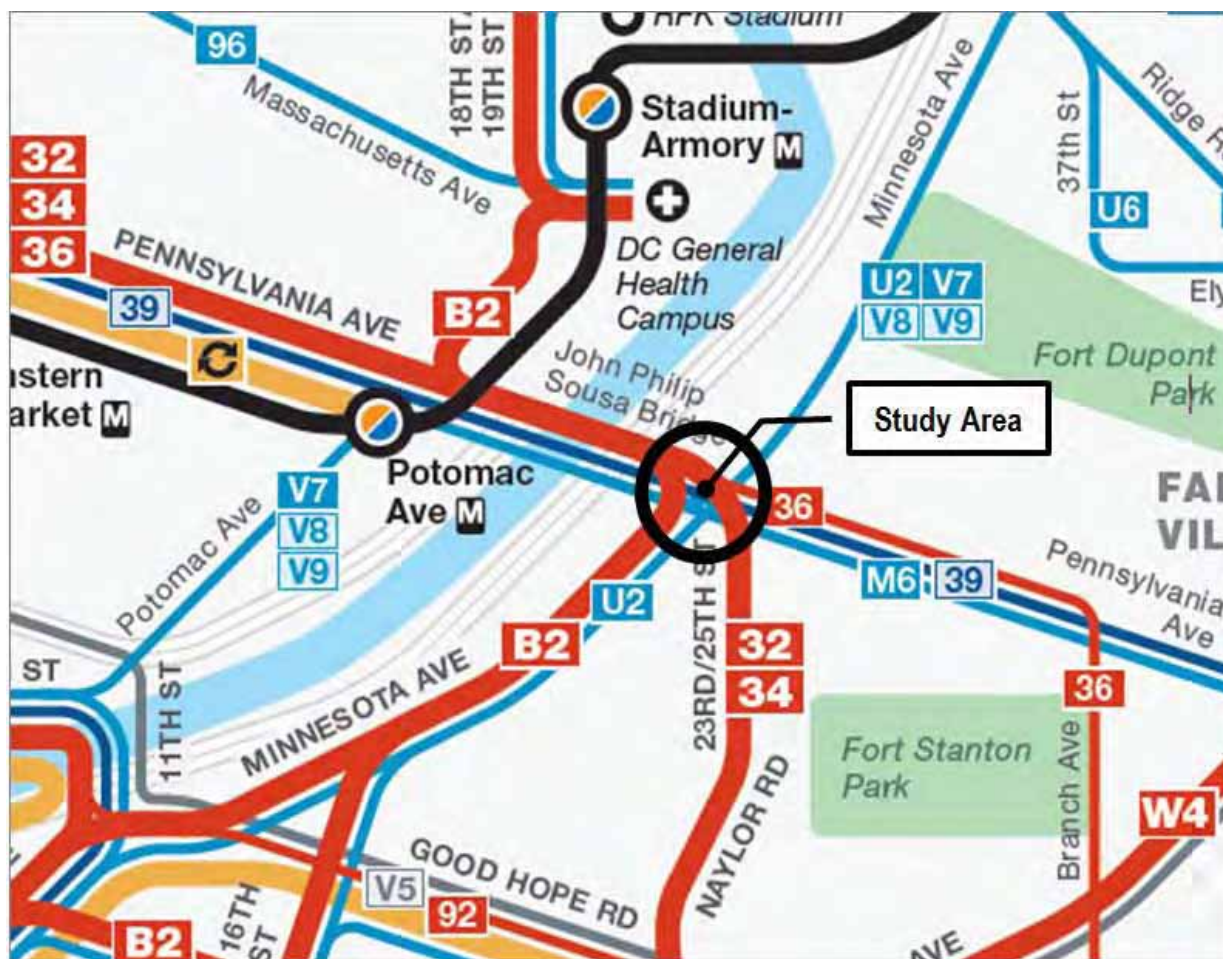
Source: HNTB Corporation, 2013.

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, 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

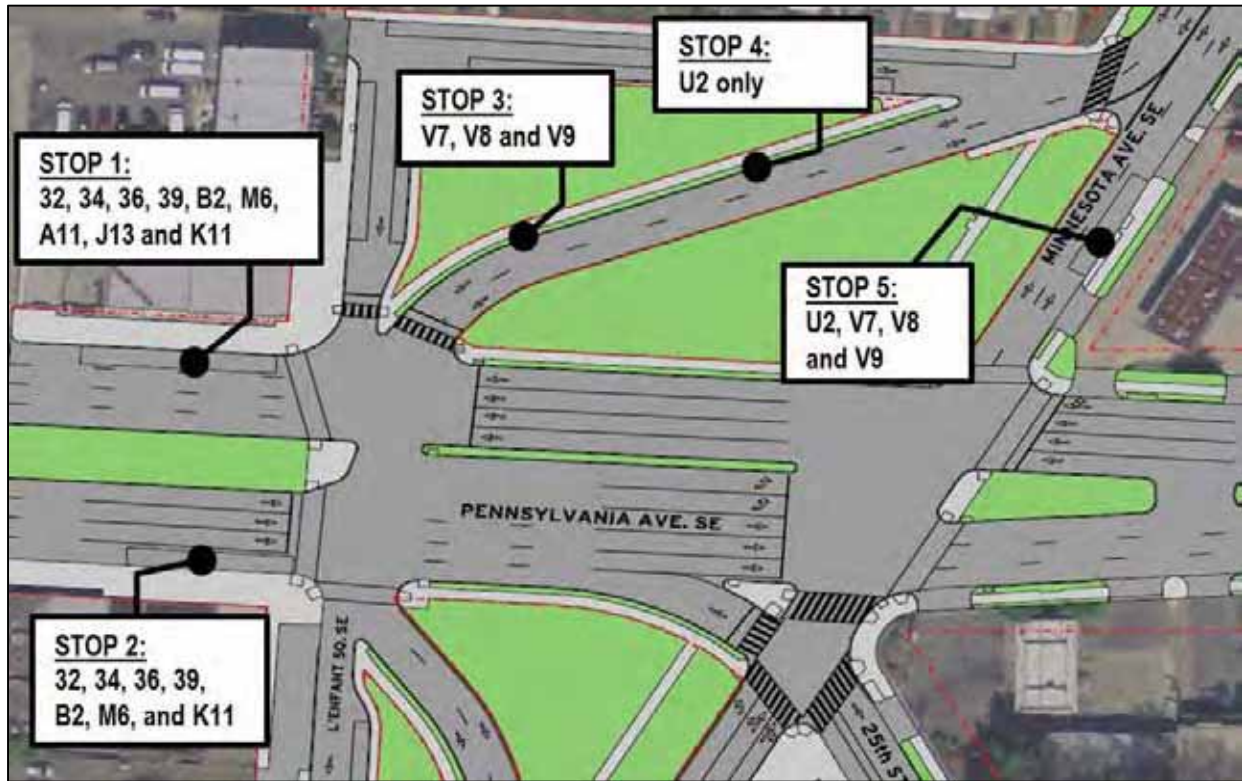
Bus Routes within the Study Area and the Vicinity



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

Figure 3-14 shows the five existing bus stops within the Study Area. Stops 1 and 2 are located on Pennsylvania Avenue west of L'Enfant Square; Stops 3 and 4 are on southbound Minnesota Avenue between the two NPS-owned park spaces north of Pennsylvania Avenue; and Stop 5 is on northbound Minnesota Avenue north of Pennsylvania Avenue.

Figure 3-14

Bus Stops in the Existing Condition

Source: HNTB Corporation, 2013.

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 (SO₂), particulate matter (PM₁₀, 10-micron in diameter and smaller along with PM_{2.5}, 2.5 micron in diameter and smaller), carbon monoxide (CO), nitrogen dioxide (NO₂), ozone (O₃), 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 NO₂. 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 NO₂ 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. PM₁₀ 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 PM₁₀ 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, NO₂, PM₁₀ and SO₂); 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, amphitheatres, 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.”⁵⁷ 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⁾					Noise Level, dB A Leq(h)	
					Roadway	A ^a	MT ^b	HT ^c	Buses ^d		Speed (mph)
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-axes and 4-tires.
b. Medium trucks (MT) defined as vehicles with 2-axes 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.



LEGEND

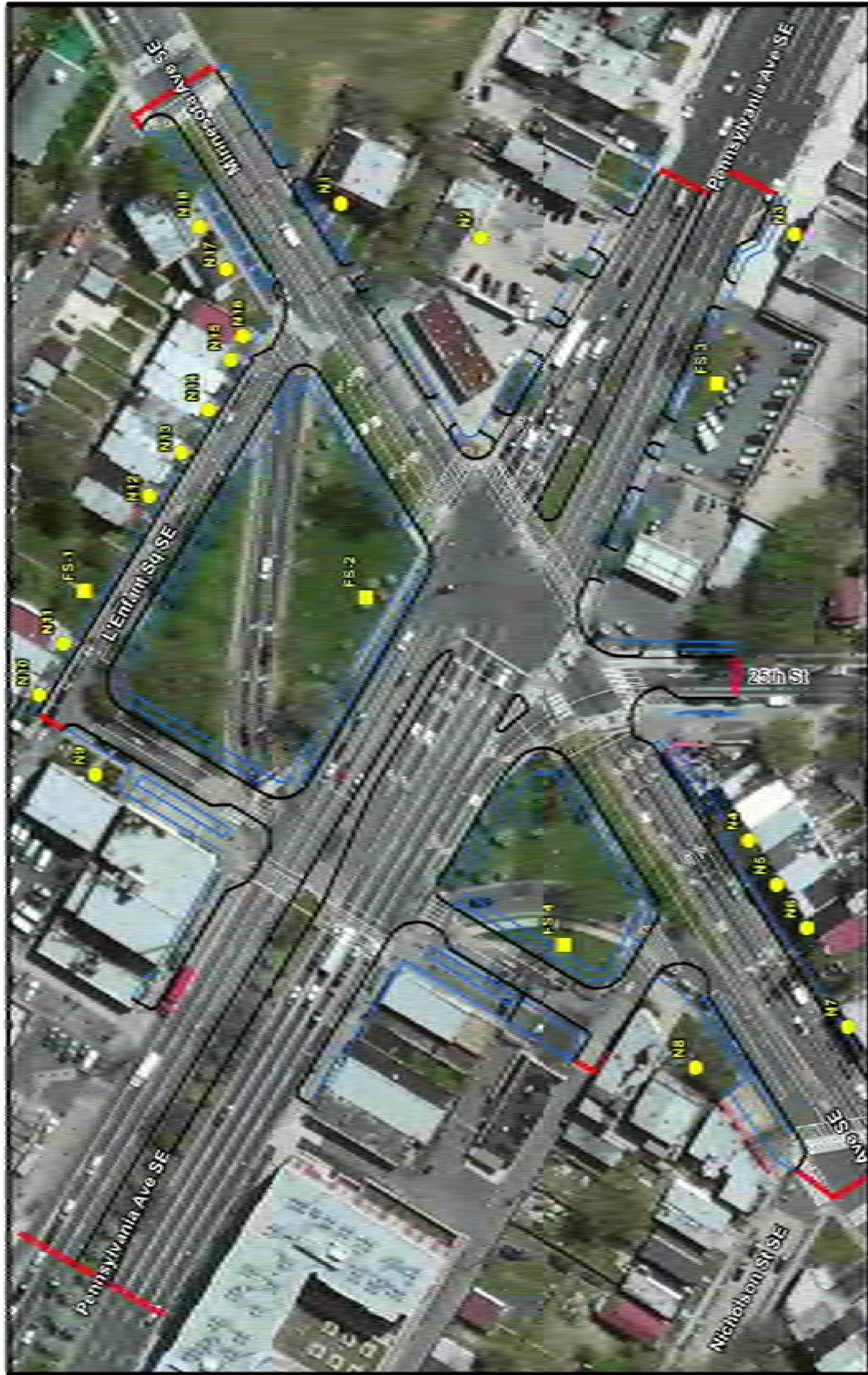
- Field Measurement Site
- Noise Monitoring Site

Figure 3-15
Noise Receiver Map - Revised Square Alternative

Environmental Assessment



Source: HNTB Corporation, 2013



LEGEND
Field Measurement Site
Noise Modeling Site

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.