MEMORANDUM

To: Emily Dalphy
District Department of Transportation (DDOT)

From: Daniel Markham, P.E.
Tracy Lower, P.E.
Kimley-Horn and Associates, Inc.

Date: September 7, 2017

Subject: High Crash Site Review Summary Memo
9th Street NW and Florida Avenue NW/U Street NW
9th Street NW and Florida Avenue NW/V Street NW

DDOT has identified several high-crash locations in the District for a safety evaluation to identify potential improvements to mitigate observed crash patterns. Short-term improvements will be identified that can be implemented in the next calendar year and may include signing and marking enhancements or signal timing adjustments. Long-term recommendations will also be identified that could be incorporated as part of planned capital improvement projects, such as intersection modification or streetscape projects.

This memorandum provides a summary of the review of crash data, projects that could impact the intersection, the outcome of the field review meeting, and recommendations for the intersection of 9th Street NW at Florida Avenue NW/U Street NW and 9th Street NW at Florida Avenue/V Street NW. A total of 103 crashes were provided to Kimley-Horn for review at the location mentioned above. A review of the police report crash descriptions was conducted, and it was determined that 18 (17%) should be removed from the analysis. **Table 1** below, describes the reason for removal and the number of crashes removed for the intersection.

Table 1: Summary of Removed Crashes (2013-2015)

Reason for Removal	Number of Crashes
Conflicting accounts that accident occurred	2
Crash description not provided	2
Crash location could not be determined	2
Greater than 500 feet from study intersection	7
Occurred on private property	3
Suspected intentional hit	2
TOTAL	**18**

Background

The two intersections being evaluated along 9th Street NW are located at the eastern end of the U Street Corridor. The posted speed limit along the intersecting roadways is 25 mph. U Street NW is a four-lane, two-way principal arterial roadway that carries more than 20,000 vpd according to 2014 traffic data published by DDOT. East of 9th Street NW, U Street NW becomes Florida Avenue NW and carries a similar volume of traffic as U Street NW. 9th Street NW is a four-lane, two-way minor arterial roadway that carries roughly 10,000 vpd south of U Street NW. To the north, 9th Street NW splits at V Street NW, continuing north-south as 9th Street NW and as Florida Avenue NW to the northwest of V Street NW. The section that becomes Florida Avenue NW maintains a four-lane cross section for approximately 700 feet north of V Street NW, where it transitions to a two-lane roadway northwest of Sherman Avenue NW. 9th Street NW and V Street NW to the north of U Street NW are two-lane, two-way local streets.

At the signalized intersection of 9th Street NW and U Street NW/Florida Avenue NW, left-turn movements are prohibited from U Street NW/Florida Avenue NW. An approximately 150-foot left-turn lane is marked for the southbound left-turn movement, which operates with a protected-permissive left-turn signal. Left-turn movements in the northbound direction are permitted, but turning vehicles must yield to opposing southbound traffic on 9th Street NW. A WMATA bus stop is located on the southwest corner of the intersection that serves the 90, 92, 96, and X3 bus routes. Marked crosswalks are provided across all legs of the intersection.

At the unsignalized intersection of 9th Street NW and V Street NW/Florida Avenue NW, there are no turning restrictions for vehicles. The southbound approach of 9th Street NW and the westbound approach of V Street NW are both stop controlled, with the other approaches operating free-flow. Bike lanes are provided in both directions along V Street NW. Marked crosswalks are provided across all legs of the intersection with the exception of the southbound approach along Florida Avenue NW. The unsignalized crosswalk across the southern leg of the intersection spans a distance of approximately 75 feet and is signed with a pedestrian warning sign for vehicles approaching from the south. The pedestrian warning sign is missing along the southbound approach to the crosswalk.

The Eastern Downtown Protected Bike Lane Study was completed in February 2017 and looked at alternatives for bike lanes north-south between Pennsylvania Avenue NW and Florida Avenue NW. The study recommended two alternatives for protected bike lane accommodations:

1. Two-way cycle track on the east side of 6th Street NW
2. Two-way cycle track on the east side of 9th Street NW

The second alternative, referred to as Alternative 4 in the study, would have an impact to operations at the intersection of 9th Street NW and U Street NW/Florida Avenue NW. The protected-permissive left-turn signal would be replaced with a protected only signal for the southbound left-turn movement. In addition, the capacity of the northbound approach would be reduced to a single lane, widening to two lanes approximately 100 feet prior to the signal to provide an exclusive left-turn lane and a shared through and right-turn lane.

90% streetscape design drawings have been prepared for the 9th Street NW/Florida Avenue NW corridor between U Street NW and Barry Place NW. These plans include improved pedestrian crosswalks, on-street bicycle lanes along much of the corridor, and lane reconfigurations that reduce the number of travel lanes to two north of V Street NW. In addition, a traffic signal is proposed at the intersection of Florida Avenue NW/9th Street NW/V Street NW. The streetscape improvements north of W Street NW will be implemented as part of a private development project

currently underway. The streetscape improvements south of W Street NW will be implemented by DDOT. The 90% design plan sheet reflecting improvements to be implemented by DDOT are included in **Attachment A**.

A crash evaluation was conducted for each of the two 9th Street intersections and site visits were conducted by DDOT staff, community members, and Kimley-Horn and Associates, Inc. on June 29, 2017. Field observations were reviewed in conjunction with the crash evaluations in order to develop short and long-term recommendations for the two intersections. The following sections summarize the crash evaluations and recommendations for each intersection.

Crash Evaluation and Site Field Review

A total of 85 crashes occurred at the intersections of 9th Street NW and Florida Avenue NW/U Street NW and 9th Street NW and Florida Avenue NW/V Street NW between 2013 and 2015. There were 59 (69%) documented as PDO crashes, 15 (18%) involving at least one reported injury, and 11 (13%) unreported or unknown crash severity. There were no fatal crashes recorded at the two intersections. The predominant crash type was rear end collisions, accounting for 23 (27%) of the crashes. Other common crash types include angle, side swipe, and fixed object collisions. Four crashes involved a pedestrian, and four crashes involved bicycles. **Figure 1** summarizes the crash locations and corresponding crash statistics. From the crash data, some of the key issues identified include:

- On-street parking maneuvers near the intersection resulted in 12 (14%) of the crashes at the two intersections
- Left-turns are not allowed onto 9th Street from the Florida Avenue and U Street approaches, and violations account for two (10%) of the 19 angle collisions
- Less than 10% of crashes occurred with a weather event such as rain or snow
- Off peak period crashes were the accounted for the highest number of crashes (75%), and a similar number of crashes occurred in the AM peak period (12%) and PM peak period (13%), defined as 6:00-10:00 AM and 3:00-7:00 PM, respectively

Figure 2 further identifies some key crash types and indicates other field observations noted during the site visit that relate to safety issues at this intersection.

9th Street NW and Florida Avenue NW/U Street NW

Field observations indicated that there is a lot of speeding in the northbound and southbound directions at this intersection. This speeding likely contributed to the ten angle crashes that occurred along 9th Street. Field observations also indicated faded pavement markings on the north side of this intersection, which could have contributed to the nine northbound and southbound sideswipe crashes at the intersection. It was also noted after field observations that there was a heavy volume of southbound lefts from 9th Street NW onto Florida Avenue NW, which not only caused some illegal passing in the northbound lanes (i.e. crossing the solid double yellow centerline), but also conflicted with pedestrians in the crosswalk on the east side of the intersection. There was one southbound left-turn pedestrian crash recorded at this intersection. The observed passing maneuvers could also contribute to the sideswipe crashes on the southbound approach.

Other field observations noted for the intersection of 9th Street NW and Florida Avenue NW/U Street NW included:

- Lane shifts on U Street NW/Florida Avenue NW cause many drivers to cross the double yellow lines
- There is a lack of pedestrian queuing space on corners during peak times
- Westbound Florida Avenue NW is marked for through traffic only, but right turns are permitted

9th Street NW and Florida Avenue NW/V Street NW

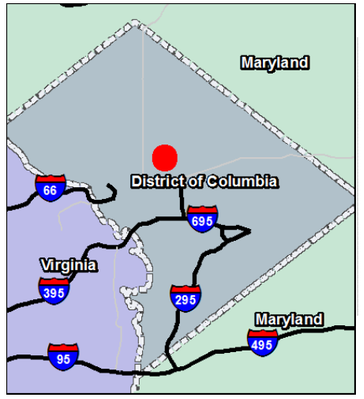
At the intersection of 9th Street NW and Florida Avenue NW/V Street NW, it was noted that there is a significant sight distance issue along the westbound V Street NW approach due to the parking garage on the southeast corner. V Street NW drivers are forced to pull far into the intersection in order to see northbound traffic on 9th Street NW. There were two recorded angle crashes at this location that could be attributed to sight distance issues. Additionally, field notes indicated that there was a need for a ladder crosswalk crossing V Street NW, where one pedestrian crash was reported based on the crash data.

Other field observations noted for the intersection of 9th Street NW and Florida Avenue NW/V Street NW included:

- The crosswalk on the south leg of the intersection is approximately 70 feet and is unsignalized, making it hazardous for pedestrians (the pedestrian warning sign is also missing)
- There is no crossing on the north leg of the intersection
- There are many left turning bicycles attempting to get from the V Street NW bike lanes to the T Street NW bike lanes two blocks south of the intersection, or other points south, but there are no marked bike facilities
- Parking north of U Street NW is not visible to southbound vehicles on Florida Avenue NW due to the curvature in the roadway approaching U Street NW

Table 1 provides a summary of the field observations noted during the site visit along with the crash types that might be attributed to the observed issue. Also indicated in the table with each observation are recommendations for further evaluation where additional considerations may be necessary prior to implementing any short or long-term recommendations.

Figure 1: Crash Analysis Summary Figure – 9th Street NW and Florida Avenue NW/U Street & 9th Street NW and Florida Avenue NW/V Street



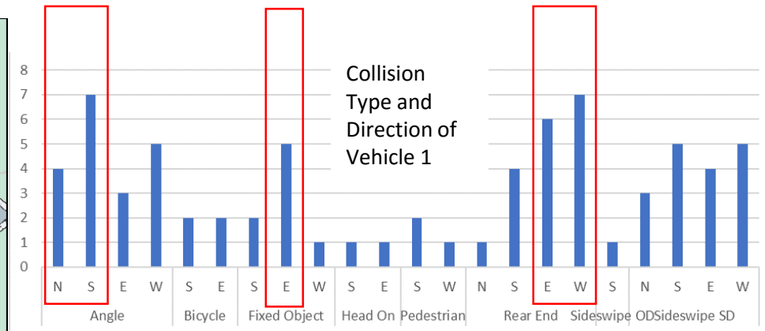
Legend

Intersection Study Area

Collision Type

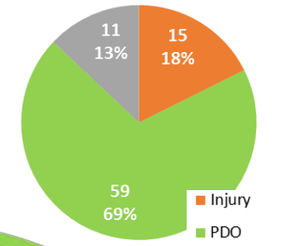
- Angle
- Fixed Object
- Head On
- Pedestrian
- Rear End
- Sideswipe OD*
- Sideswipe SD**
- Bicycle
- Parking

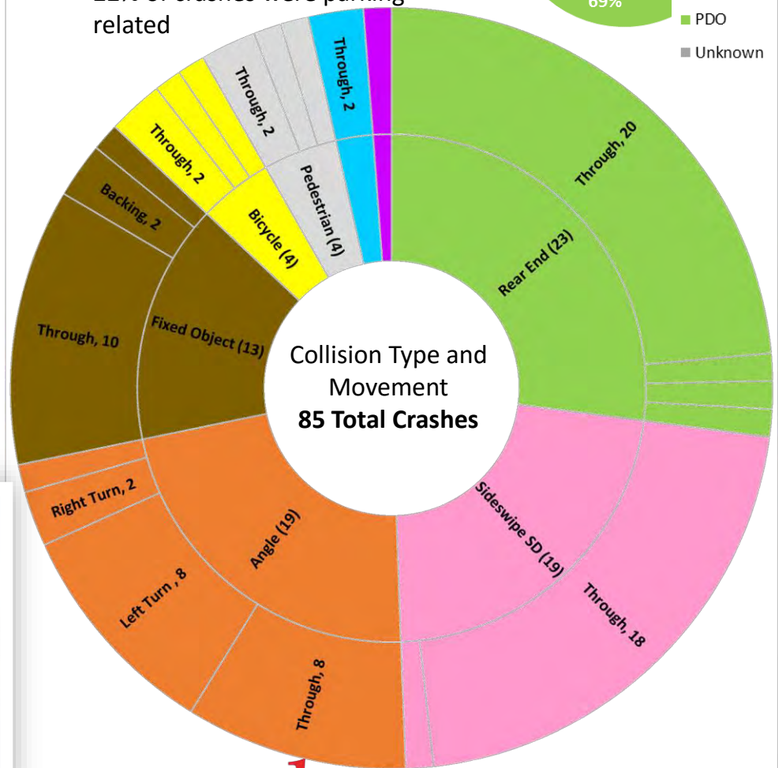
*Opposite Direction **Same Direction

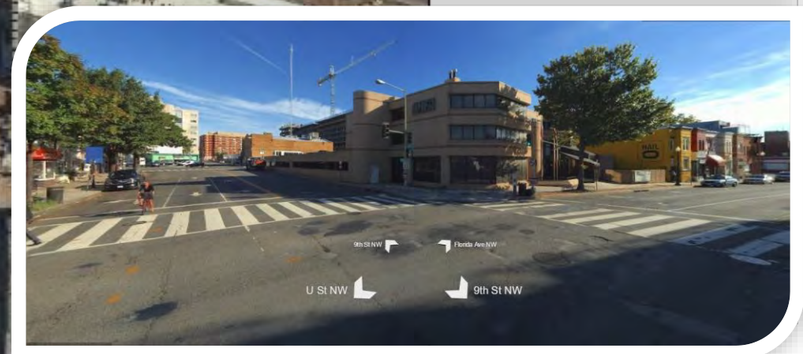


Crash Summary

- Rear end and fixed object crashes were concentrated on Florida Avenue NW/U Street NW
- Angle crashes were concentrated on 9th Street NW
- 22% of crashes were parking-related







District Department of Transportation

Kimley»Horn

Figure 2: Summary of Field Observations and Associated Crash Types – 9th Street NW and Florida Avenue NW/U Street & 9th Street NW and Florida Avenue NW/V Street

District Department of Transportation

Kimley»Horn

Crash Analysis 2013-2015
85 total crashes

1 Pedestrian Crash attributed to lack of high-visibility crosswalk

2 Left-Turn Angle Crashes attributed to blind left turn from V St

9 NB/SB Sideswipe Crashes that could be attributed to faded lane markings

1 Pedestrian Crash

10 NB/SB Angle Crashes Which could be attributed to excessive speeding in these directions

Florida Ave NW

V St NW

9th St NW

U St NW

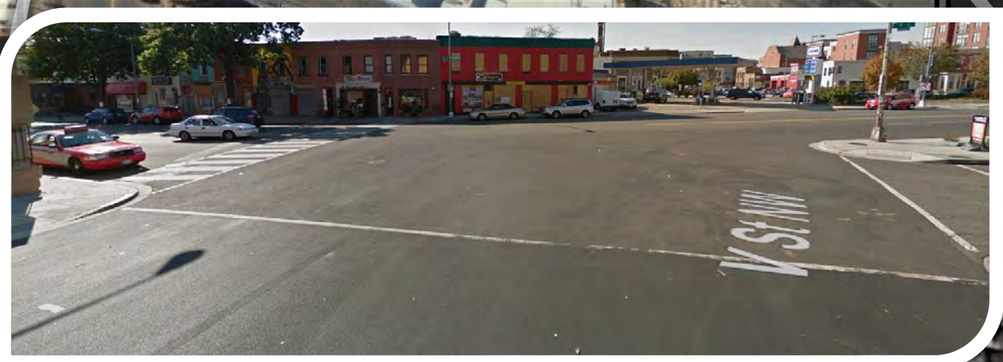
Florida Ave NW

8th St NW

Legend

- Rear-End Collision
- Side Swipe Same Direction
- Side Swipe Opposite Direction
- Right Angle Collision
- Pedestrian
- On-Street Parking

N
NOT TO SCALE



Other Staff Observations During Site Field Review on 6/29/2017

- Significant speeding on Florida Ave and 9th St NB/SB
- Double parking on 9th St South of U St and on V St

Observations at Intersection of 9th St/V St/Florida Ave

- Dangerous turns from V Street because vehicles must pull out into the intersection to see oncoming traffic on 9th St
- Crosswalk on south leg of intersection is very long and Unsignalized
- No crosswalk on the north leg of the intersection to cross Florida Avenue
- There are no marked bicycle facilities connecting bike lanes on V St to bike lanes on T St (south) but there are many left turning bicycles

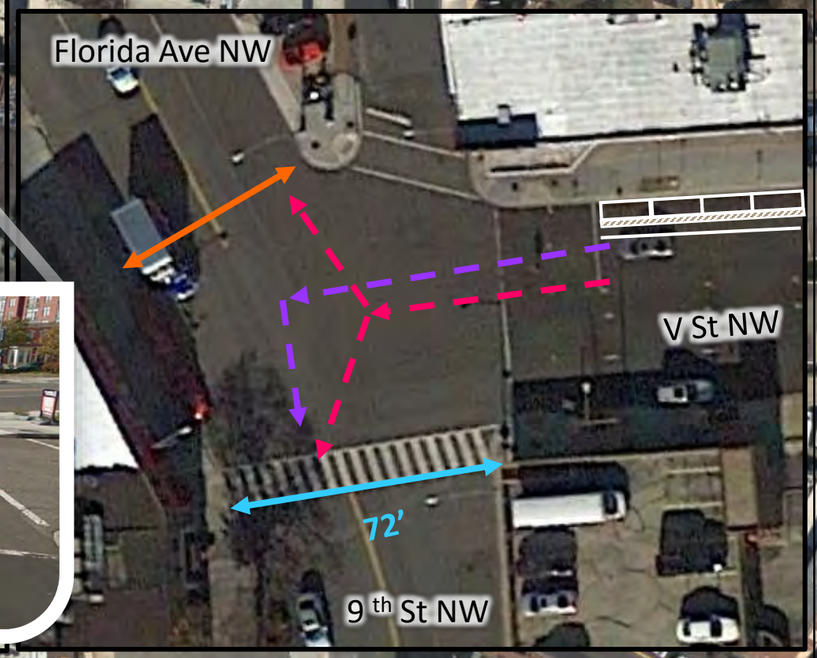


Table 2: Summary of Field Review Notes and Related Crash Types – 9th Street NW and Florida Avenue NW/U Street NW and 9th Street NW and Florida Avenue NW/V Street NW

Site Visit Notes *(provided by DDOT staff, community members, and Kimley-Horn)*	Location	Related Crash Types							Further Analysis
		Sideswipe	Rear End	Parking	Bicycle	Left Turn	Right Turn	Pedestrian	
9th St and Florida Ave speeding issues (both directions, primarily SB).	9th St/Florida Ave (NB/SB)		X						
Potential curb extensions at 9th St/U St/Florida Ave.	9th St/Florida Ave/U St							X	
Faded/non-existent lane markings, especially north of U St on Florida Ave.	9th St/Florida Ave (NB/SB)	X							
North of U St, off-peak parking isn't visible from SB Florida Ave north of V St.	B/w U St and V St	X		X					
Sidewalk on east side of 9th Street north of U St too narrow.	East Side Sidewalk b/w U St and V St								
Double parking all around, particularly 9th St south of U St and on V St.	South of U St and on V St	X		X					
Lane shifts on Florida/U due to curve in Street and N/S on 9th/Florida. Vehicles are crossing double yellow lines in both eastbound and westbound directions.	Florida/U and 9th/Florida	X							
Lots of left-turning bikes with little information about how to queue.					X	X			
Signage SB – missing pedestrian warning sign (only arrow is present).									
Need for high-visibility crosswalk on east side of 9th St/Florida Ave crossing V St.								X	
Florida Ave WB is marked for Thru Only, but the right turn is permitted.	Florida Ave WB		X				X		
Leftmost signal head for WB Florida Ave has green ball but should have thru arrow since left turns are not permitted.	Florida Ave WB					X			
Investigate RTOR restriction.							X	X	X
Investigate lagging left or protected-only left for southbound 9th St to mitigate pedestrian/left-turn conflict.	9th Street SB					X		X	X
Extremely long unsignalized crosswalk across 9th St at V St is dangerous for pedestrians.	9th St Crosswalk South of V St							X	
Bike lanes for V St could be moved to the curb side instead of providing curbside parking.	V Street	X			X				
Crosswalk should be added across Florida Avenue on the north side of V St.	Florida Ave Crosswalk North of V Street							X	
Sight distance for the westbound left turn from V St is very poor. Heavy turn conflicts and aggressive turn maneuvers at 9th St and V St.	9th St and V St					X			
Heavy SBL volume (some observed making double left or crossing over center line to bypass drivers waiting to turn). Conflicts with peds and bikes in east side crosswalk.		X				X		X	
Lack of lane designations in NB receiving lanes on north side of intersection.	Between U St and V St	X	X						
Lack of ped queuing space on corners during peak times (weekends/night).								X	
Walk phase on north-south crossings seems short given ped demand and width of intersection.								X	
Perform analyses of signal warrants and other traffic control devices at intersection of 9th St/Florida Ave and V St.									

Short-Term Recommendations

Figure 3 illustrates the short-term recommendations improvements for the intersection. A brief description of some of the recommendations is provided below.

9th Street NW and Florida Avenue NW/U Street NW

Westbound Florida Ave NW lanes are marked for through movements when right turns are permitted. Recommended installing through/right markings in right lane

At the intersection of 9th Street NW and Florida Avenue NW/U Street NW, it is recommended that the northbound left-turn and southbound left-turn phasing be adjusted. Aggressive southbound left-turn movements during the permissive phase often disregard pedestrian activity within the crosswalk on the east side of the intersection. In addition, northbound left-turn movements were observed to consistently pass through the intersection on red at the end of the signal cycle. It is recommended that DDOT consider changing the southbound left-turn movement to a protected-only vehicle phase and implement a lagging protected northbound left-turn phase. This will help to reduce southbound left-turn conflicts with pedestrians in the crosswalk and will allow northbound left-turning vehicles to clear at the end of the cycle and reduce red light running. In the interim, a "Turning Vehicles Yield to Pedestrians" (left-turn orientation) sign should be installed to reinforce the yield condition for left-turning vehicles. Additionally, it is recommended that the left-most westbound signal for Florida Avenue NW be replaced with a through-arrow signal to reduce illegal left-turns. Another suggestion made by staff was consideration for right turn on red restrictions. It is also recommended that the through-only pavement markings on the westbound approach be replaced by through/right-turn pavement markings since the right turn is permitted. Lastly, it is recommended that pavement markings be refreshed and installed to guide eastbound and westbound movements through the intersection and to guide northbound movements into the proper receiving lanes.

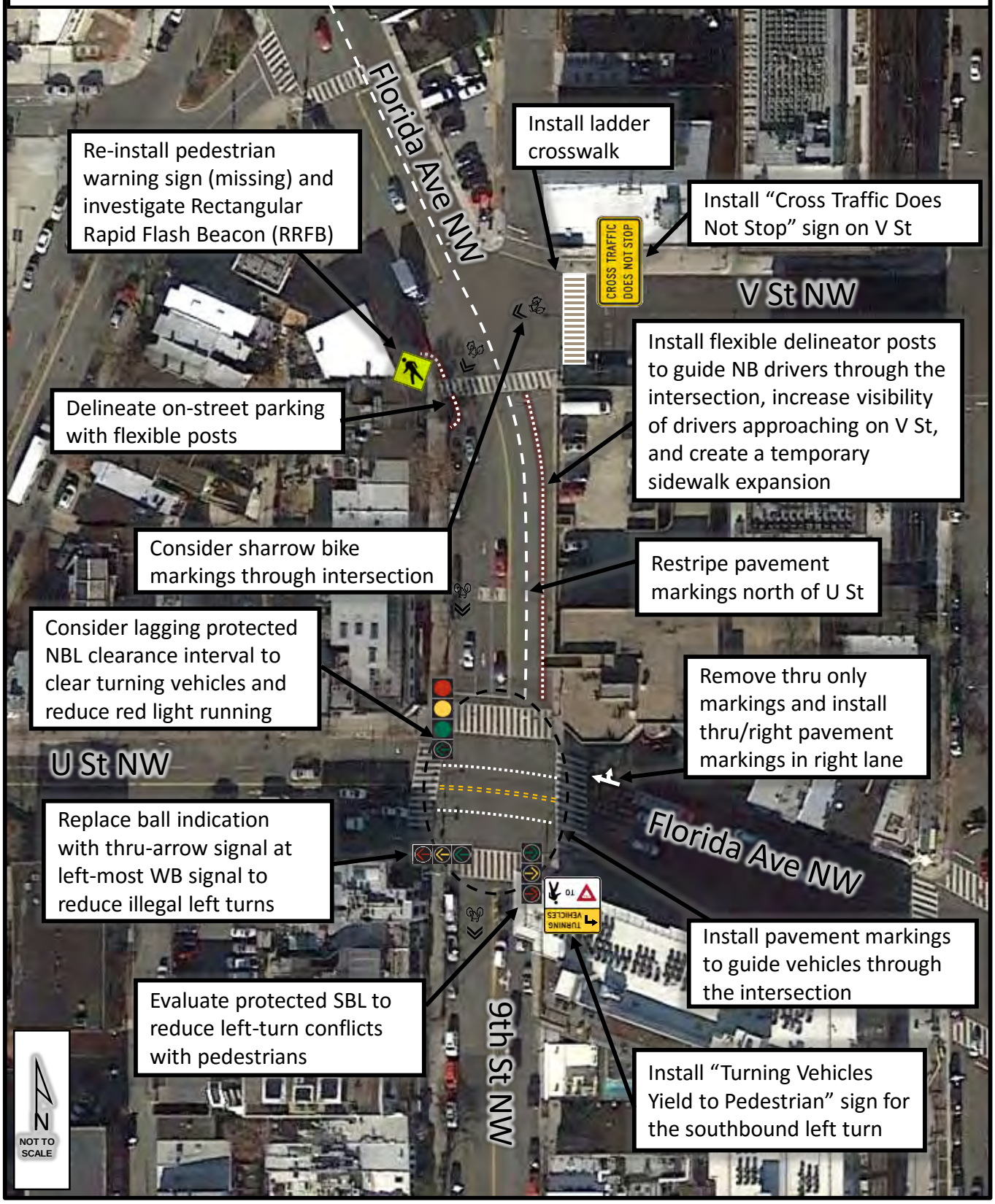
During the field review, it was noted that the width of the sidewalk along the east side of 9th Street NW is narrow (less than 5 feet wide). Given the number of pedestrian generators in the area, a wider sidewalk would be a benefit to pedestrian mobility. DDOT has implemented sidewalk expansions in Georgetown in recent years, repurposing on-street parking lanes as a pedestrian walkway. Barrier fences are used to separate pedestrians from the adjacent travel lanes. DDOT could explore a similar treatment to improve the pedestrian facilities along 9th Street NW between U Street NW and V Street NW. The width of the northbound departure lanes is approximately 25 feet. Reducing the travel lane widths to 10 feet and installing a 1-foot barrier (e.g. flexposts), a 4-foot sidewalk expansion could be created. It is not recommended that a sidewalk expansion of less than four feet be considered. If the expansion proves to be an effective treatment, DDOT should prioritize the implementation of a permanent sidewalk. The sidewalk expansion could result in pedestrian injuries due to the trip hazard present as pedestrians travel between the roadway and raised sidewalk surfaces.

9th Street NW and Florida Avenue NW/V Street NW

Missing pedestrian warning sign at 9th Street NW crosswalk

Many recommendations are proposed to address sight distance issues at the intersection of 9th Street NW and Florida Avenue NW/V Street NW. First, to address sight distance issues for westbound vehicles on V Street NW, it is recommended that flexible delineator posts be installed on 9th Street NW just south of the intersection to reduce the turning radius for northbound vehicles and provide a protected space for drivers on V Street NW to move past the stop bar to identify potential conflicts. Additionally, it is recommended that a "Cross Traffic Does Not Stop" sign be installed at the V Street NW approach to alert drivers to free-flow crossing traffic as they attempt to enter the intersection. Second, to address pedestrian sight distance at the two crosswalks, it is recommended that the crosswalk on the east side of the intersection be replaced with a ladder crosswalk and that the missing pedestrian warning sign on the west side of the intersection be reinstalled. To reduce the crossing distance across 9th Street NW and improve visibility of pedestrians to drivers, it is recommended that flexible delineator posts be installed on the west side of the crosswalk. This will also delineate the off-peak curbside parking lane. Furthermore, it is recommended that rectangular rapid flash beacons (RRFB) be investigated for the crosswalk across 9th Street NW enhance driver awareness of crossing pedestrians. Lastly, to guide left-turning bicycles from the V Street NW bike lanes to the T Street NW bike lanes, it is recommended that sharrow bike markings be installed through the intersection.

Figure 3: Short-Term Recommendations
9th Street NW and Florida Ave NW/U St NW
9th Street NW and Florida Ave NW/V St NW



Long-Term Recommendations

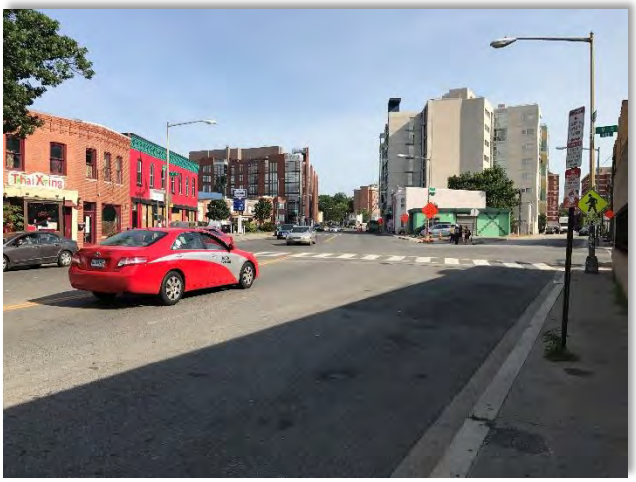
Figure 4 illustrates long-term recommendations for the intersection. A brief description of some of the recommendations is provided below.

9th Street NW and Florida Avenue NW/U Street NW

To address the lack of pedestrian queueing space at each corner of the intersection, it is recommended that curb extensions be installed. It is recommended that the sidewalk on the east side of 9th Street NW north of the intersection be widened to better accommodate pedestrians.

9th Street NW and Florida Avenue NW/V Street NW

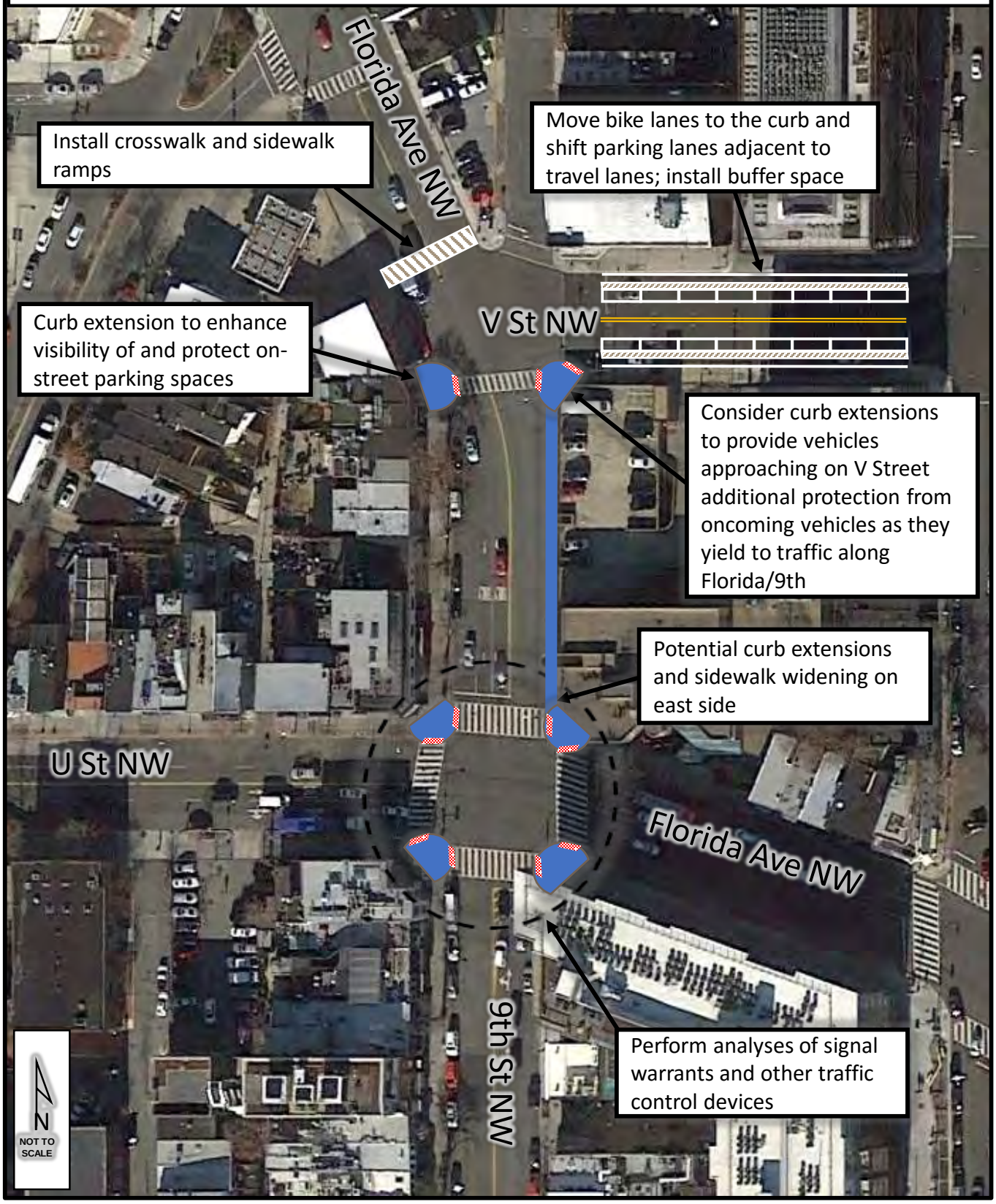
Based upon recommendations from field observations, it is recommended that an analysis of signal warrants and other traffic control devices be conducted for the intersection of 9th Street NW and Florida Avenue NW/U Street NW. To more permanently delineate on-street parking on 9th Street NW to southbound drivers and to shorten the crosswalk distance, it is recommended that curb extensions also be installed on either side of the 9th Street NW crosswalk. This will provide additional protection to westbound V Street NW drivers by providing more space to pull out into the intersection. Based on field observations, it is recommended that a new crosswalk be installed on the north side of the intersection crossing Florida Avenue NW. Lastly, shifting the bike lanes to the curb should be considered as the on-street parking will provide a buffer for bicyclists.



V St NW has blind corner and existing crosswalk is very long and uncontrolled. Recommended curb extensions and sidewalk widening to enhance pedestrian accommodations.

Prior to implementing any of the physical improvements outlined above, the latest version of the streetscape design plans should be reviewed to be sure the improvements are consistent with the current design plans for this intersection. The current version of the streetscape plans has identified a traffic signal installation at this intersection and a reduction of the number of travel lanes on Florida Avenue NW to one lane.

Figure 4: Long-Term Recommendations
9th Street NW and Florida Ave NW/U St NW
9th Street NW and Florida Ave NW/V St NW



Implementation

As outlined above, short and long-term recommendations and considerations have been identified for the intersections of 9th Street NW at Florida Avenue NW/U Street NW and 9th Street NW at Florida Avenue NW/V Street NW. While some of these may only require the installation of standard signs and pavement markings, others will require further evaluation or perhaps engineering drawings to account for changes in geometry, impacts on drainage, or signal modifications. Below is an outline of a preliminary guide to carry forward the implementation of recommended improvements. A general timeframe for implementation is provided; however, this will be influenced by the scale of the recommendation, cost, and available funding. As streetscape and other roadway infrastructure projects arise in the vicinity of these intersections, opportunities to incorporate these recommendations into the design of these projects should be considered.

Short-Term Recommendations

9th Street NW and Florida Avenue NW/U Street NW

- Through arrow signals
- Pavement markings
- Turning Vehicles Yield to Pedestrians
- Right turn on red restrictions

9th Street NW and Florida Avenue NW/V Street NW

- Flexible delineators
- Pedestrian and cross-traffic signage and crosswalk
- Sharrow lane markings
- Consider temporary sidewalk expansion on 9th Street NW

Improvements to Evaluate Prior to Implementation

9th Street NW and Florida Avenue NW/U Street NW

- Left-turn signal phasing
- Signal analysis and right turn on red restrictions

9th Street NW and Florida Avenue NW/V Street NW

- Rectangular rapid flash beacons

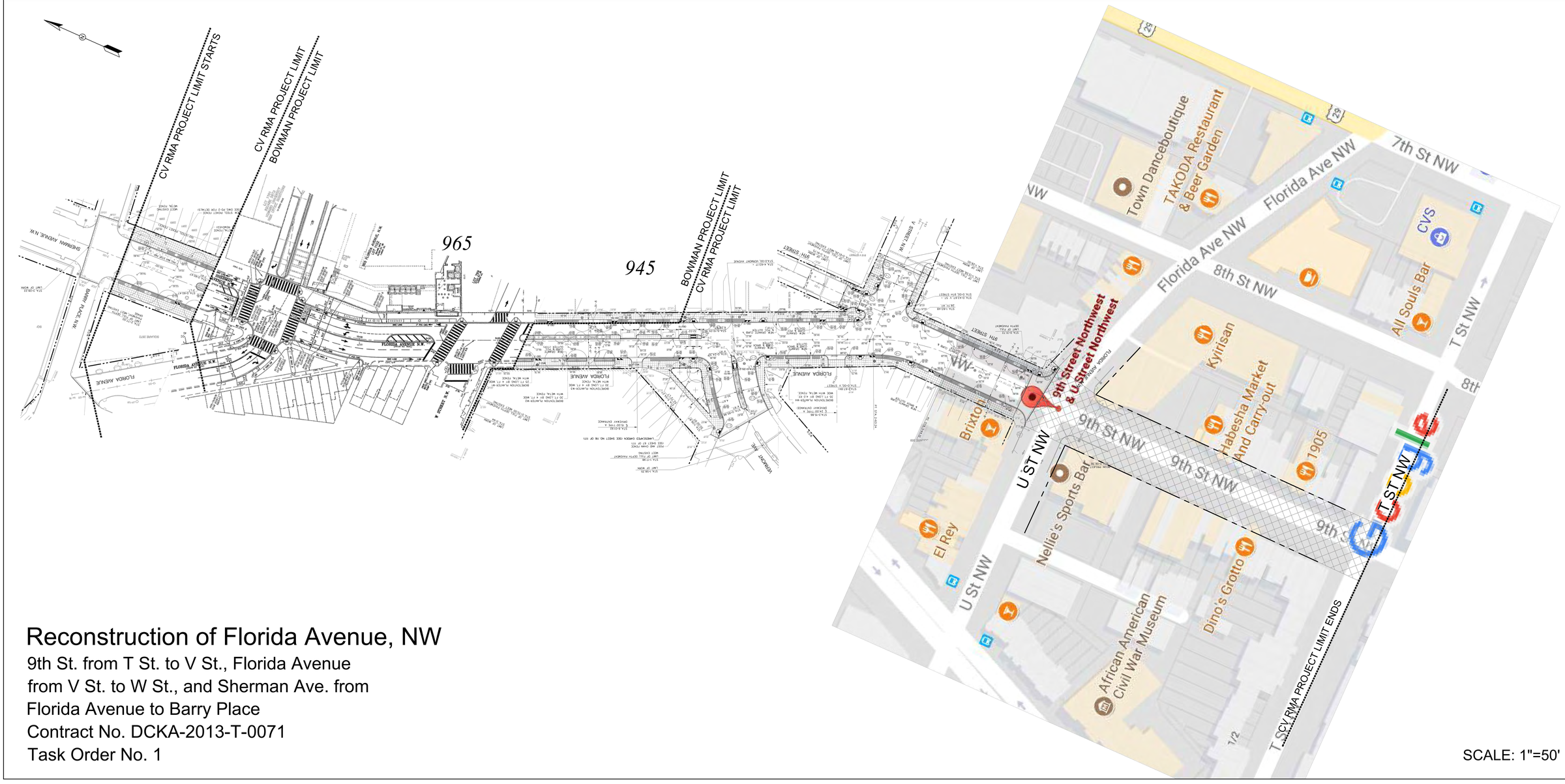
Long-Term Recommendations

9th Street NW and Florida Avenue NW/U Street NW

- Curb extensions and sidewalk expansion

9th Street NW and Florida Avenue NW/V Street NW

- Curb extensions
- North side crosswalk
- V St NW Bike lane adjustment
- Analysis of traffic control devices (e.g. traffic signal warrant)



Reconstruction of Florida Avenue, NW

9th St. from T St. to V St., Florida Avenue
from V St. to W St., and Sherman Ave. from
Florida Avenue to Barry Place
Contract No. DCKA-2013-T-0071
Task Order No. 1

SCALE: 1"=50'