Traffic Calming Study

JANUARY 2018

DELAWARE VALLEY
dvrpc
REGIONAL
PLANNING COMMISSION

The Delaware Valley Regional Planning Commission

is the federally designated Metropolitan Planning Organization for a diverse nine-county region in two states: Bucks, Chester, Delaware, Montgomery, and Philadelphia in Pennsylvania; and Burlington, Camden, Gloucester, and Mercer in New Jersey.

DELAWARE VALLEY dvrpc REGIONAL PLANNING COMMISSION

DVRPC's vision for the Greater Philadelphia Region is a prosperous, innovative, equitable, resilient, and sustainable region that increases mobility choices by investing in a safe and modern transportation system; that protects and preserves our natural resources while creating healthy communities; and that fosters greater opportunities for all.

DVRPC's mission is to achieve this vision by convening the widest array of partners to inform and facilitate data-driven decision-making. We are engaged across the region, and strive to be leaders and innovators, exploring new ideas and creating best practices.

FUNDING DISCLAIMER | *DVRPC is funded through a variety of funding sources including federal grants from the U.S. Department of Transportation's Federal Highway Administration (FHWA) and Federal Transit Administration (FTA), the Pennsylvania and New Jersey departments of transportation, as well as by DVRPC's state and local member governments. The authors, however, are solely responsible for the findings and conclusions herein, which may not represent the official views or policies of the funding agencies.*

TITLE VI COMPLIANCE | *DVRPC fully complies with Title VI of the Civil Rights Act of 1964, the Civil Rights Restoration Act of 1987, Executive Order 12898 on Environmental Justice, and related nondiscrimination statutes and regulations in all programs and activities. DVRPC's website, www.dvrpc.org, may be translated into multiple languages. Publications and other public documents can be made available in alternative languages and formats, if requested. DVRPC public meetings are always held in ADA-accessible facilities, and in transit-accessible locations when possible. Auxiliary services can be provided to individuals who submit a request at least seven days prior to a public meeting. Requests will be accommodated to the greatest extent possible. Any person who believes they have been aggrieved by an unlawful discriminatory practice by DVRPC under Title VI has a right to file a formal complaint. Any such complaint may be in writing and filed with DVRPC's Title VI Compliance Manager and/or the appropriate state or federal agency within 180 days of the alleged discriminatory occurrence.*
For more information on DVRPC's Title VI program or to obtain a Title VI Complaint Form, please visit: www.dvrpc.org/GetInvolved/TitleVI, call (215) 592-1800, or email public_affairs@dvrpc.org.

Acknowledgements

DVRPC would like to acknowledge the following individuals for their contributions to the study:

Kasim Ali, Philadelphia Streets Department
Ariel Ben-Amos, Philadelphia Water Department
Connie Bird, Philadelphia Water Department
Jeannette Brugger, Philadelphia Office of Transportation & Infrastructure Systems
Henry Davis, North Penn Community Action Council
Angela Dixon, Philadelphia Office of Transportation & Infrastructure Systems
Kisha Duckett, Philadelphia Streets Department
David Kanthor, Philadelphia City Planning Commission
Ian Litwin, Philadelphia City Planning Commission
Nicole Ozdemir, Philadelphia City Planning Commission
Nathan Powers, Philadelphia Streets Department
Christopher Puchalsky, Philadelphia Office of Transportation & Infrastructure Systems
Karen Thompson, Delaware River Waterfront Corporation
Michelle Webb, Philadelphia Streets Department
Kelley Yemen, Philadelphia Office of Transportation & Infrastructure Systems
Sarah Yeung, Philadelphia Chinatown Development Corporation

Table of Contents

Figures

Tables

Executive Summary

At the request of the City of Philadelphia, the Delaware Valley Regional Planning Commission (DVRPC) conducted a study to assess traffic calming and streetscape improvement strategies for a segment of the East Callowhill Street corridor.

Callowhill Street is an important westbound street dually-serving as a gateway to Center City Philadelphia, and a community-arterial for its adjacent Old City and Northern Liberties neighborhoods. The majority of Callowhill Street has two travel lanes. The segment between 2nd and 6th Streets is wider, with three to five travel lanes.

Recent zoning changes will encourage new mixed-use development to reinvigorate the area. To support the revitalization effort, this study of the East Callowhill Street corridor evaluated the existing condition of the transportation network, identified “Complete Streets” conceptual designs and green stormwater infrastructure opportunities for the network, and used traffic models to determine the impact of alternative lane configurations to road diet the network.

The study indicated that excessive capacity on East Callowhill Street creates unsafe conditions for all roadway users, and found that travel lanes can be eliminated with negligible impact on peak hour traffic operations.

In turn, the street-space could be reallocated to pedestrians for wider sidewalks and shorter intersection-crossing distances, to bicyclists for dedicated lanes, and/or to the environment for streetscape and green stormwater management improvements.

Four different road diet configurations were evaluated. Based on the results, two alternatives were identified. The first would reallocate space on the north side of the street from a vehicular lane and create a buffer between vehicular traffic and pedestrian traffic (**Figure 1**). A second would remove one lane on the south side of Callowhill Street, and this provides more opportunities for green stormwater infrastructure (**Figure 2**).

Specific features of the recommended plan include:

- Calming the traffic to improve safety for all roadway users;
- Reducing north-south crossing distance of Callowhill Street by 40 percent;
- Potentially creating a new bike lane; and
- Potentially managing stormwater and improving aesthetics through green stormwater infrastructure.

If the north side alternative is implemented, it will increase neighborhood livability, entice more development and redevelopment, serve all transportation users, and enhance East Callowhill Street as a gateway to Center City Philadelphia.

Figure 1: Proposed Callowhill Street Alternative 1

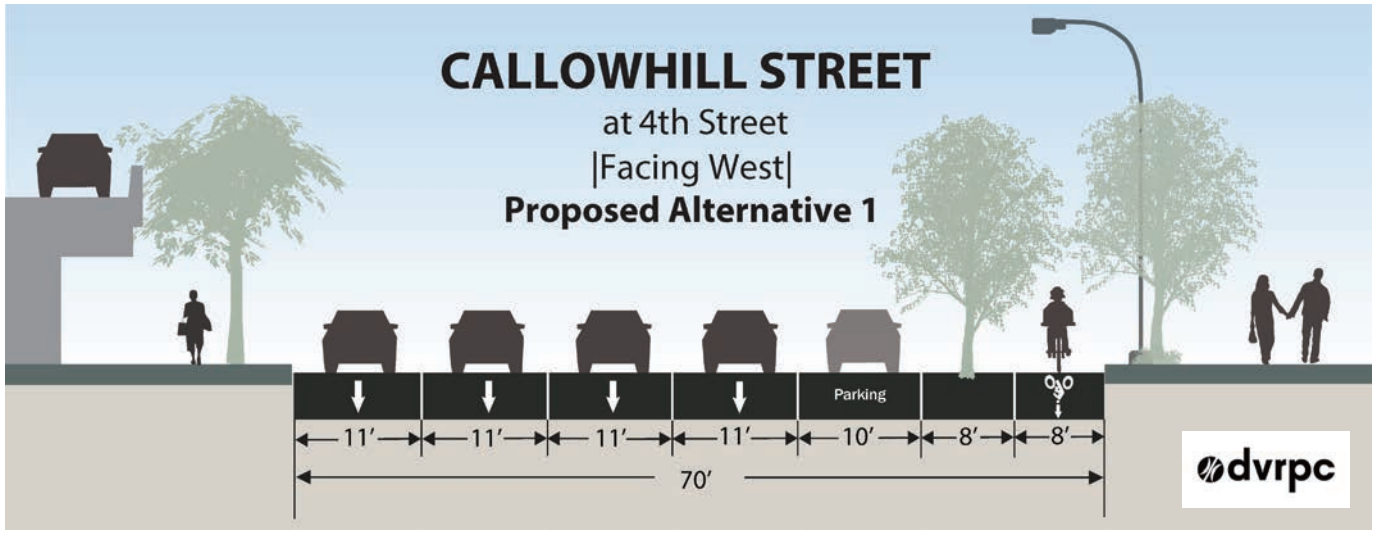
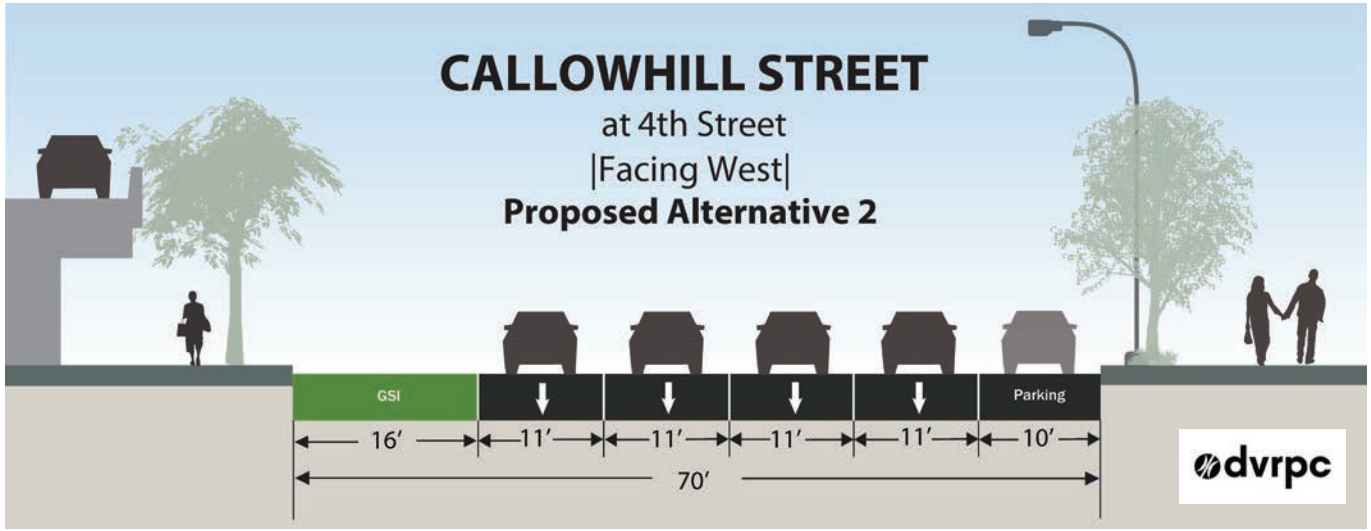


Figure 2: Proposed Callowhill Street Alternative 2



CHAPTER 1:

Purpose and Need

Callowhill Street is an important westbound street running from the Delaware River to 21st Street. It functions as a gateway to Center City Philadelphia and as a crosstown arterial for the Old City and Northern Liberties neighborhoods.

The majority of the route has two travel lanes. The study segment between 2nd and 6th Streets, however, expands to three to five lanes. Here, it operates more like the intersecting freeway ramps carrying I-95 traffic into Center City. The heavy vehicular volumes, high travel speeds, and relatively wide roadway design make traveling on foot or by bicycle in this segment less safe (**Figure 3**).

Figure 3: Formidable Pedestrian Crossing

Source: DVRPC, 2017

The city's comprehensive plan, Philadelphia 2035's Central District Plan (Philadelphia City Planning Commission, 2013) provides the guidance for development over the next decade. The study area is identified as "Superblocks," currently characterized by traditional industrial and warehousing uses. More recently, healthcare and residential development has occurred in the area, with more commercial and residential development proposed. To create a more vibrant community, the plan initiated zoning changes. Smaller block sizes with a mixture of more intensive land uses will result, in turn, requiring an improved walking and biking environment to foster a community feeling.

With underutilized spaces, low densities, and extensive surface parking lots, the area has much potential and space to grow. The Yards Brewing Company opened on the former Destination Maternity property and a medium-sized Target store is coming soon on the same property in 2018. There is also a proposed residential development. Two residential towers, with 24 and 27 stories, have been approved for construction on Callowhill Street between 3rd and 4th Streets. With growth in the offing, it is beneficial to consider transportation accessibility and safety in the area at this time.

Consequently, this project analyzed existing transportation conditions, and assessed road diet and other streetscaping techniques to complement the renewal and growth in the East Callowhill Street area. The study incorporated guidelines contained in the following references.

- Philadelphia 2035 Central District Plan
- Callowhill Chinatown North Strategic Plan
- Philadelphia Complete Streets Design Handbook
- Philadelphia Pedestrian and Bicycle Plan
- City of Philadelphia Green Streets and Design Manual
- Greenworks Philadelphia
- Green City, Clean Waters

CHAPTER 2:

Study Area Description

The study corridor of Callowhill Street is bounded by 2nd Street to the east, and 6th Street to the west as **Figure 4** shows. It is situated north of Center City Philadelphia and between the neighborhoods of Old City and Northern Liberties.

The area was originally zoned as Medium Industrial (I-2), which was created in the 1960s to encourage modern industrial development adjacent to the city's center. Characterized by warehousing and large surface parking lots, the area is underutilized compared to downtown and adjacent neighborhoods.

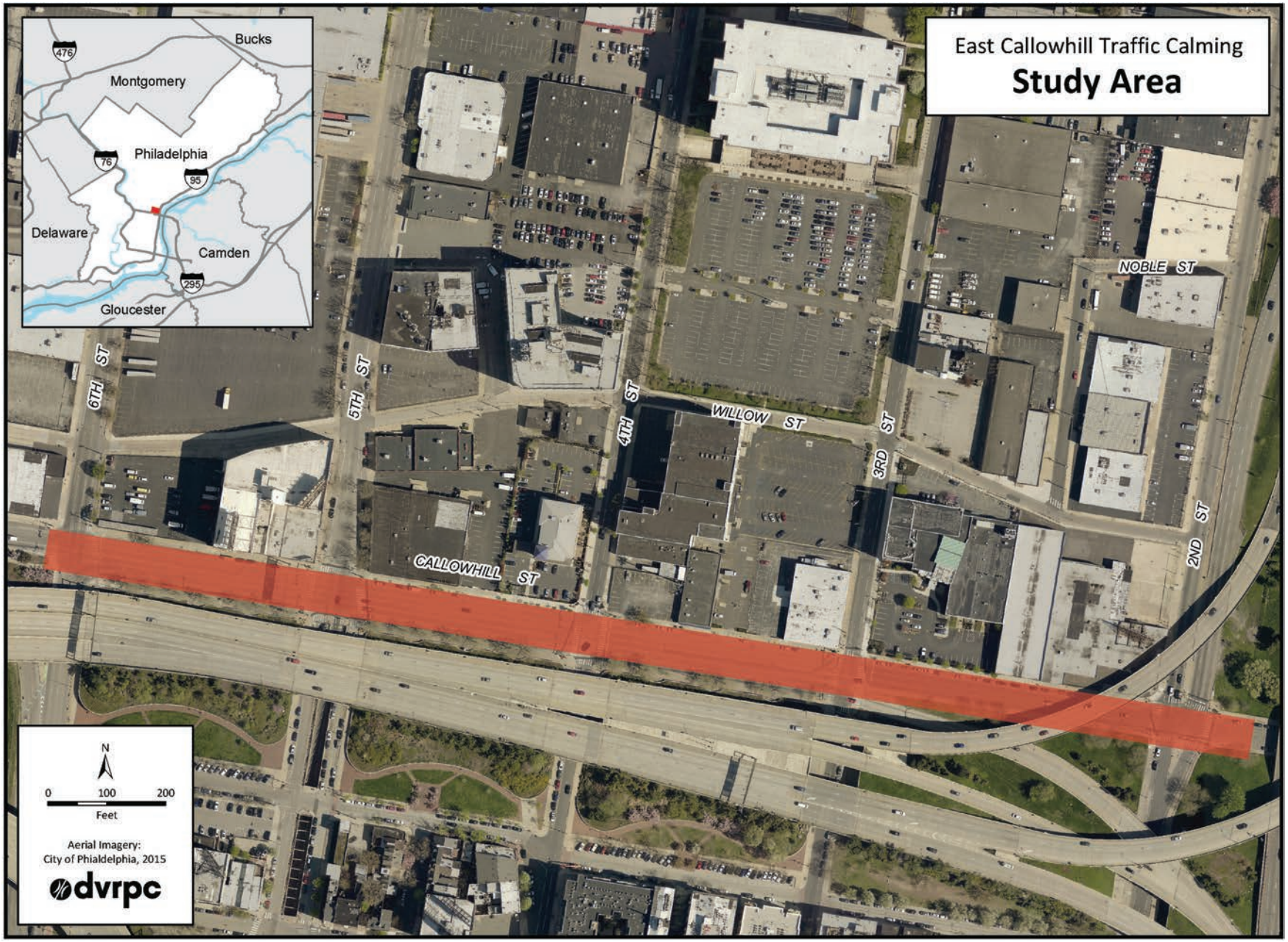
In 2013, the Philadelphia City Planning Commission (PCPC) completed the Philadelphia 2035 comprehensive plan. A new zoning vision was adopted to allow multi-use development of higher density, Community Commercial Mixed-Use (CMX-3). The new districts provide opportunities to revitalize the "Urban Void" and transform the area to a vibrant urban gateway to central Philadelphia.

Under the new zoning system, mixed-use projects are permitted in the previous industrial-only district. The Yards Brewing Company recently opened on the former Destination Maternity warehouse headquarters at Spring Garden and 5th Streets, taking 70,000-square-feet of space. Target Corporation is going to establish its central Philadelphia presence on the same property with a 47,000-square-foot store in July 2018.

A plan for two residential towers, containing 450 apartments over ground-level retail, known as "4 + Callowhill," was approved for construction between 3rd and 4th Streets. The development is maximizing all the available bonuses for incorporating the implementation of green stowmwater infrastructure on site.

Increased pedestrian and bicycle demand is foreseeable with the addition of the new mix of land use. Enhancing the area's ability to safely, efficiently, and attractively accommodate non-motorized and motorized travel demands will promote the area's future revitalization in return.

Figure 4: Study Area



CHAPTER 3:

Transportation Network

Street Network

The study area street network, federal highway functional classification, and recent traffic counts are shown in **Figure 5**.

Callowhill Street

Callowhill Street is a westbound principal arterial that runs from the Delaware River to 21st Street. The segment in the study area has three to five travel lanes to accommodate exiting traffic from I-95. Lane widths are 12-feet wide. On-street parking is permitted on the north side.

I-95

I-95 has two off-ramps that connect with Callowhill Street for access to Center City Philadelphia and other destinations.

Major Cross Streets

Within the project area, 2nd, 3rd, and 4th Streets are classified as major collectors, while 5th and 6th Streets are principal arterials. All are one-way streets. Even numbered streets are southbound; odd numbers are northbound. Typically, two travel lanes and at least one on-street parking lane occupy the cartways of each.

Transit Service

Market-Frankford Line

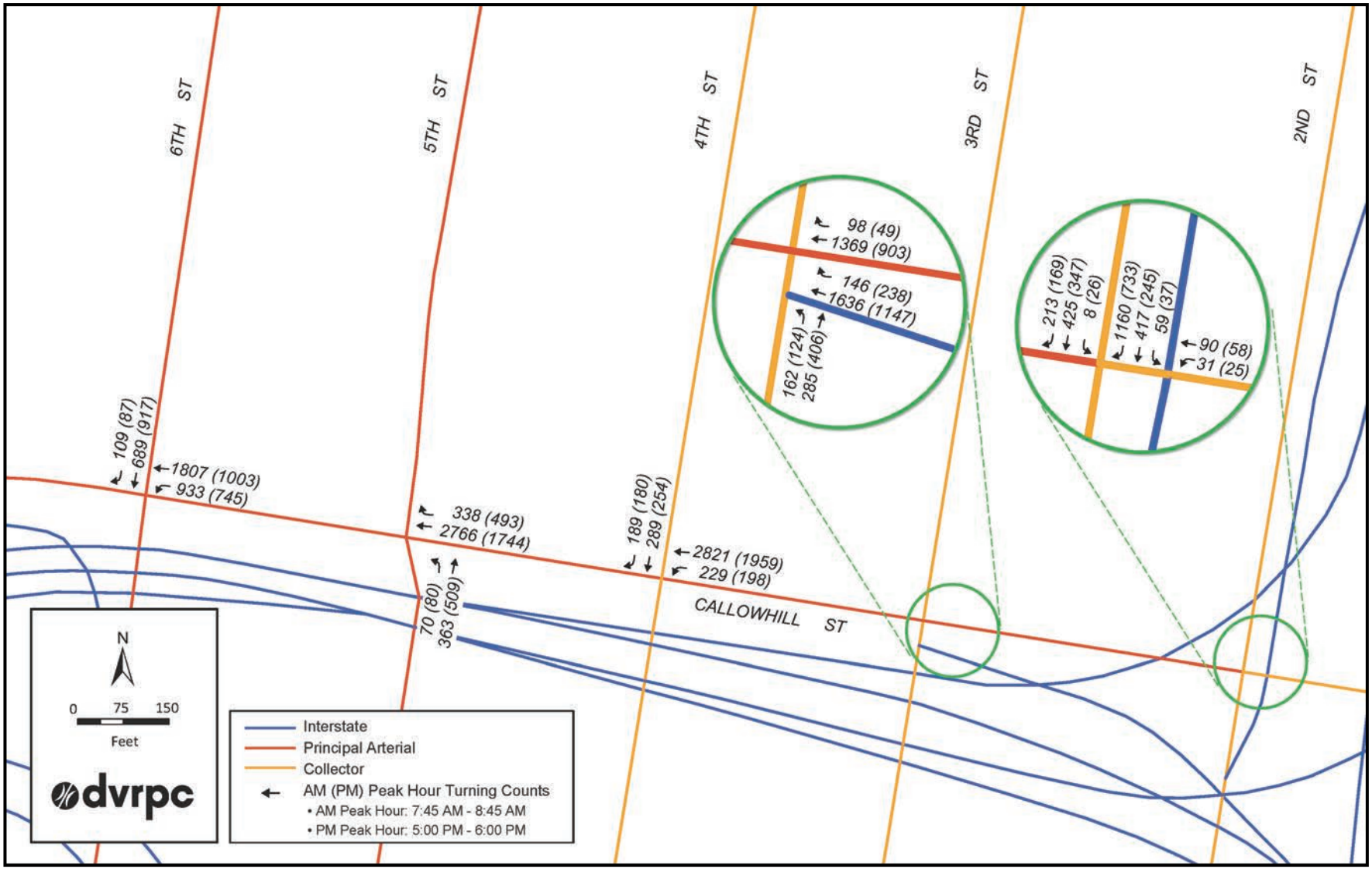
The Market-Frankford Line (MFL) is a rapid rail service operated by SEPTA between the 69th Street Transportation Center and the Frankford Transportation Center. The MFL's Spring Garden Station is located in the midst of the I-95 overpass at 2nd Street. The station serves 2,946 boarding passengers on a typical weekday.

Bus Services

The study area is conveniently served by two SEPTA bus routes seven days a week. North-south bus routes include Route 57 on 3rd and 4th Streets, and Route 5 on 2nd and 3rd Streets. As the supplemental service to the MFL, the Market Frankford NiteOwl bus route (MFO) operates Sunday through Thursday between the hours of 12:00 AM and 5:00 AM.

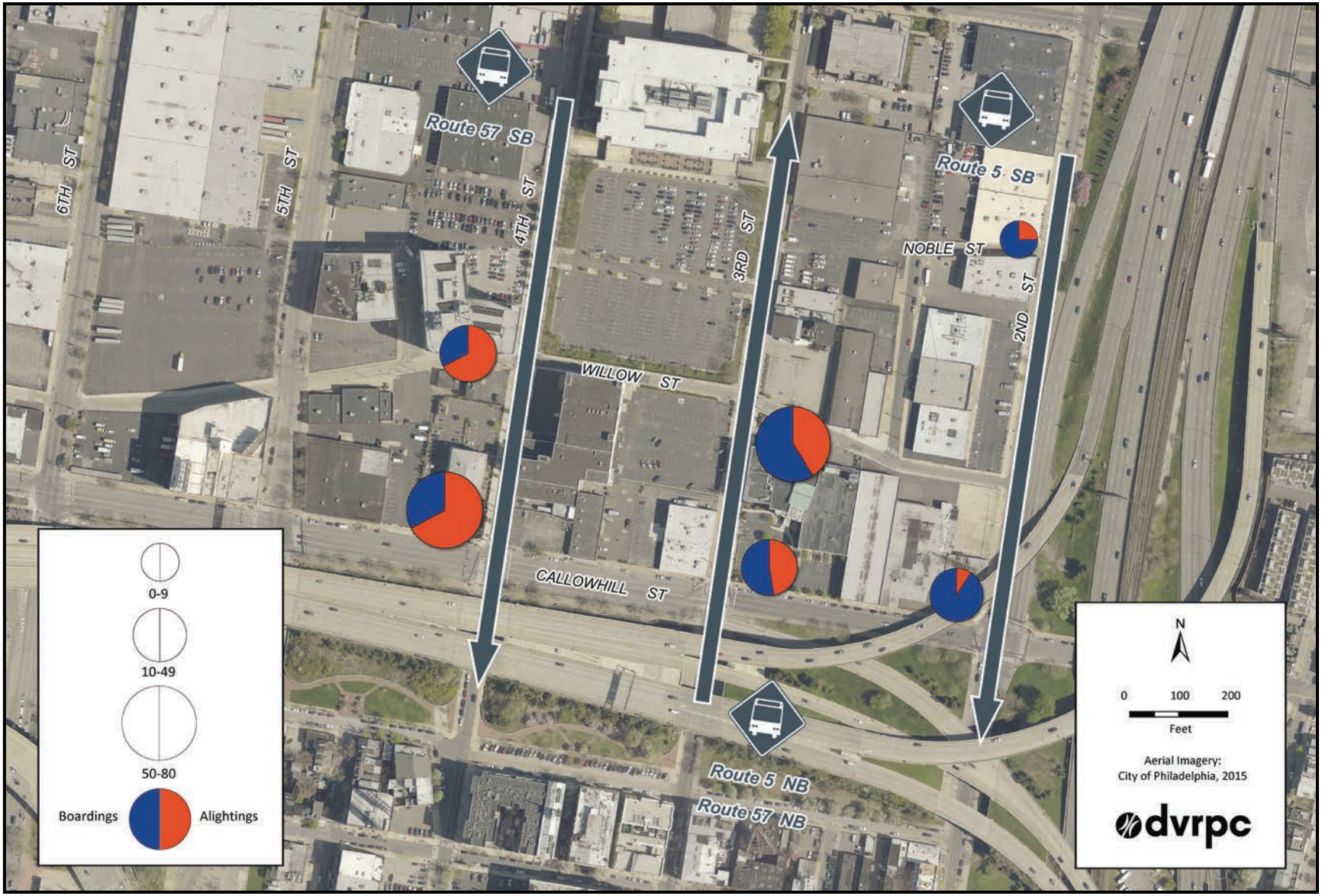
There are six bus stops in the study area. Ride checks conducted by SEPTA in 2015 indicated that there were a total of 114 bus boardings and 97 alightings during a typical weekday. **Figure 6** displays the count data.

Figure 5: Traffic Counts



Source: DVRPC, 2016

Figure 6: Daily Bus Boardings and Alightings (2015)



Source: DVRPC, 2015

Pedestrian Conditions

Sidewalks are provided throughout the study area. The widths of sidewalks on the north side of Callowhill Street range from 8 feet to 14 feet. Less inviting are the lengths of the crosswalks crossing East Callowhill Street. Here, the cross-section contains up to five travel lanes (plus a parking lane) to accommodate the exiting traffic volumes from I-95 to Center City. The excessive width creates a physical impediment for pedestrians (**Figure 7**).

Figure 7: Long Crossing Distance on Callowhill Street

Source: DVRPC, 2016

Green plants on the south side of Callowhill Street provide shade and reduce runoff. However, some of the trees are overgrown and compromise the visibility of the traffic and pedestrian-crossing signals as **Figure 8** shows.

Figure 8: Tree Branches Covering the Signal Heads

Source: DVRPC, 2016

The north side of Callowhill Street, in contrast, is relatively barren. The mural art between 2nd and 3rd Streets enhances the aesthetics of the existing streetscape, and some newly planted seedlings offer hope for the future.

Pedestrian counts were conducted by DVRPC staff using passive infrared technology. The annual average daily pedestrian volumes are shown in **Figure 9**. Overall, pedestrian activity is low. This is partially because there are a limited number of attractions in the study area. The hostile pedestrian environment is also a contributing factor. With new mixed-use development coming, especially the high-rise residential development, pedestrian volumes will increase significantly.

Figure 9: Daily Pedestrian Volumes (2016)

Bike Network

Bicycling is also an important component of the city's transportation system. Bike lanes are provided on 2nd (**Figure 10**), 5th (**Figure 11**), and 6th (**Figure 12**) Streets. The bike lane on 2nd Street was newly added during the 2016 paving season. On Callowhill Street, bicyclists share lanes with parked and moving vehicles. Although a "Share the Road" sign was presented at the curb side, the high vehicular speeds and the blurry pavement markings make it unpleasant for bicyclists (**Figure 13**).

Figure 10: Buffered Bike Lane on 2nd Street

Source: DVRPC, 2017

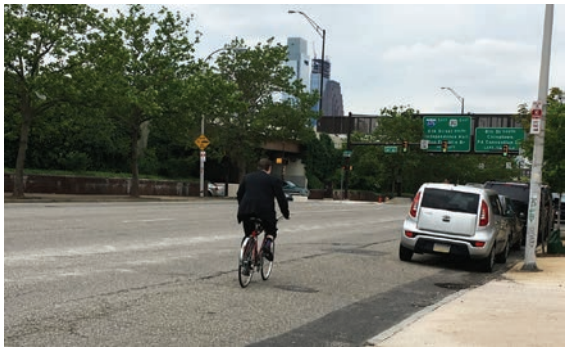
Figure 11: Conventional Bike Lane on 5th Street

Source: DVRPC, 2017

Figure 12: Conventional Bike Lane on 6th Street

Source: DVRPC, 2017

Figure 13: Bicycling on Callowhill Street



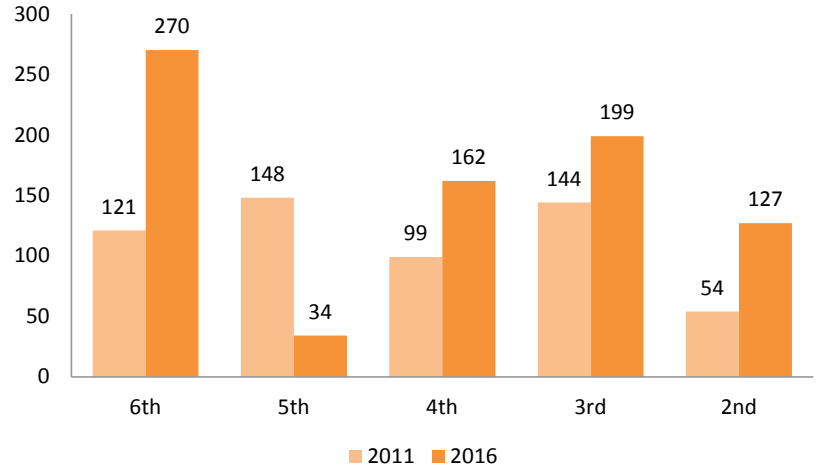
Source: DVRPC, 2017

Bicycle counts were conducted by taking videos for an entire week. Validation procedures were applied to account for seasonal and equipment variations. Annual average daily bicycle volumes are shown in **Figure 14**.

Figure 14: Daily Bike Volumes (2016)

By way of analysis, 6th Street has the highest bicycling activity. **Figure 15** compares the bike counts conducted in 2011 and 2016. Bicycle volumes have increased significantly on 2nd, 4th, and 6th Streets. Along 5th Street the number plummeted. This is because the tunnel carrying 5th Street under the Ben Franklin Bridge was closed for construction most of the year.

Figure 15: Bike Volumes Comparison between 2011 and 2016



Source: DVRPC, 2011 and 2016

It should be noted that a bike lane was added to Callowhill Street between 4th and 6th Streets during the summer paving season in 2017. A buffered bike lane is provided on the segment between 4th and 5th Streets (**Figure 16**), and a conventional bike lane is provided on the segment between 5th and 6th Streets at present (**Figure 17**).

Because the traffic study has already been completed by the time of the bike lane addition, ridership numbers are not available and the analysis in this report only reflects the condition without the new bike lane on Callowhill Street.

Figure 16: Buffered Bike Lane on Callowhill Street between 4th and 5th Streets

Source: DVRPC, 2017

Figure 17: Conventional Bike Lane on Callowhill Street between 5th and 6th Streets

Source: DVRPC, 2017

CHAPTER 4:

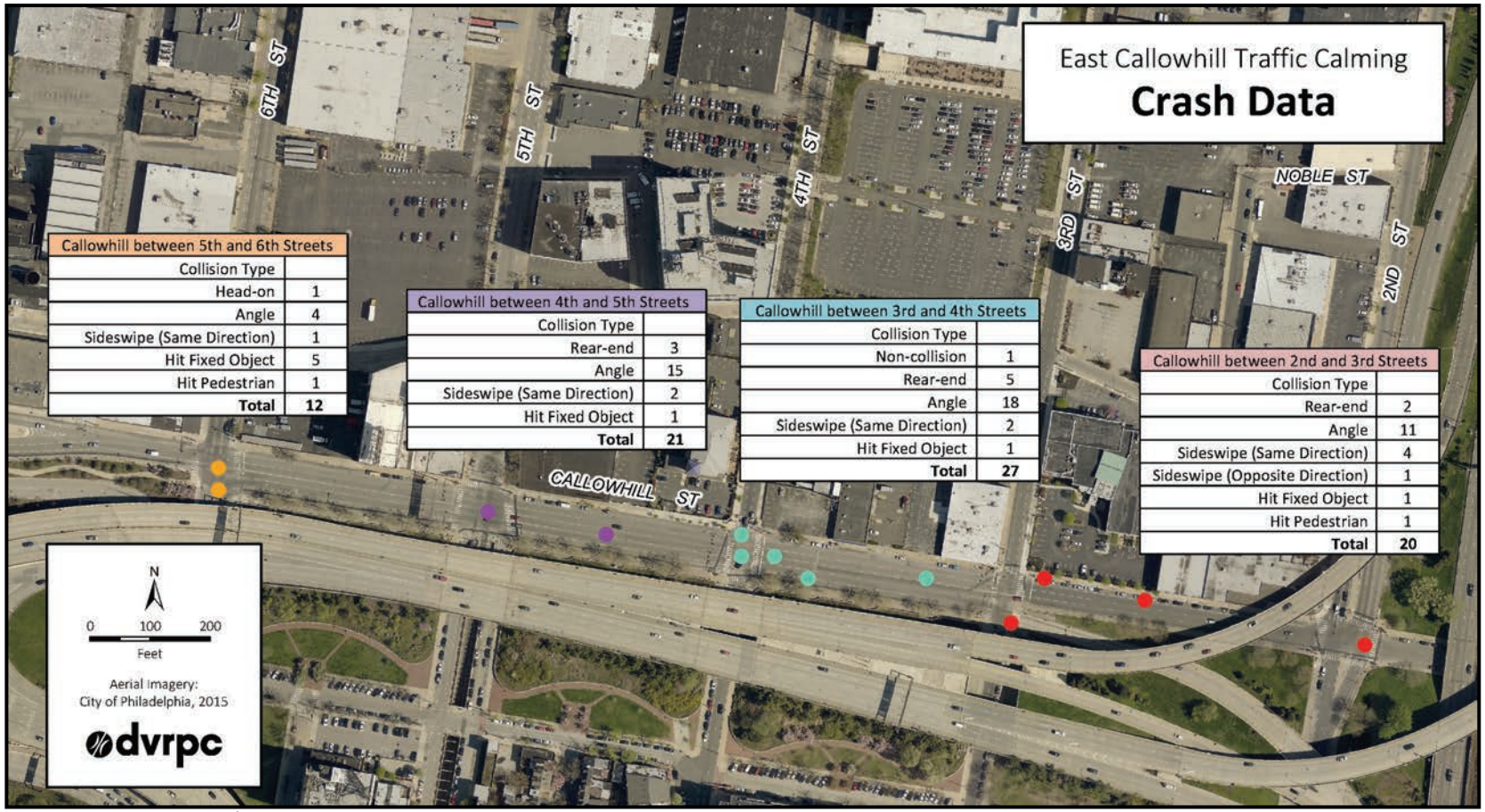
Safety Analysis

A comprehensive motor vehicle crash analysis was conducted for East Callowhill Street based on reportable traffic crash data from 2011 to 2016 as **Figure 18** shows.

There were a total of 80 crashes during the past five years, with angle crashes (48 crashes or 60 percent) occurring most frequently. **Figure 19** summarizes the crashes by collision type.

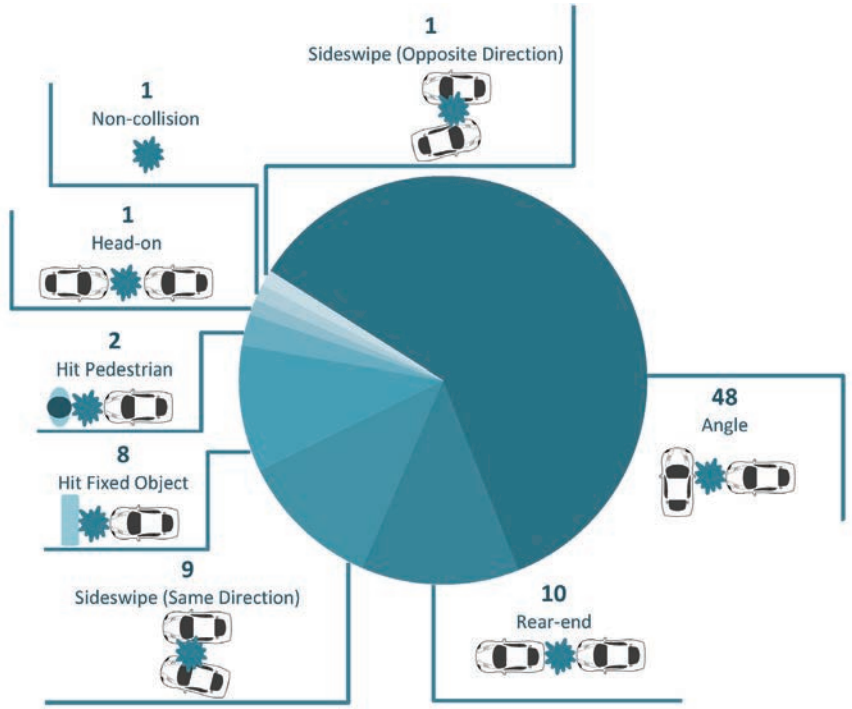
With 56 (70 percent) occurrences, most crashes involved minor to major injuries. No fatality was identified during the analysis years. **Figure 20** shows crash statistics by maximum severity level.

Figure 18: Crashes along Callowhill Street



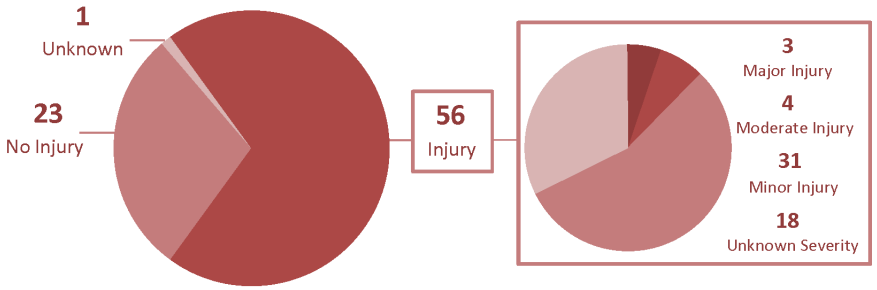
Source: PennDOT-Crashes, 2011-2016

Figure 19: Crashes by Type



Source: PennDOT-Crashes, 2011-2016

Figure 20: Crashes by Maximum Severity Level



Source: PennDOT-Crashes, 2011-2016

Among all the crashes, 72 crashes (90 percent) involved two or more people. A total of 220 people were involved in the past five years. About one-third of the people involved were injured (84 people, or 38 percent). Most of them experienced minor injuries. **Figure 21** shows the breakdown of the number of people injured by severity level. One bicyclist was involved during the analysis period, the injury of whom was unknown. Two pedestrians were involved, with major and minor injuries, respectively.

Figure 21: People Injured by Severity Level

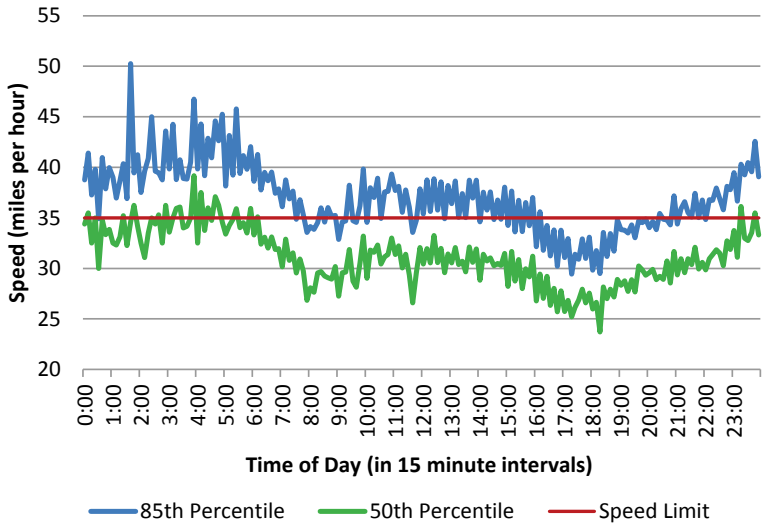
Source: PennDOT-Crashes, 2011-2016

CHAPTER 5:

Speed Analysis

The posted speed limit along East Callowhill Street is 35 miles per hour. Speed data was collected for a typical weekday using road tubes on the segment between 5th and 6th Streets to determine the actual speed of traffic. The aggregated 85th percentile speeds and median speeds by 15 minute intervals are shown in **Figure 22**. The 85th percentile speeds are mostly above 35 miles per hour and it can reach 45 miles per hour and above during the night.

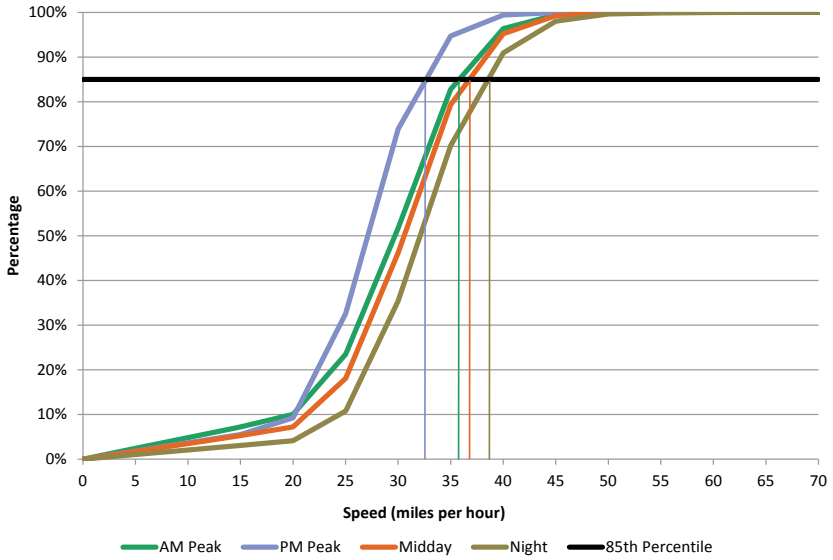
Figure 22: 15-Minute Speed Variation



Source: DVRPC, 2016

Speed data was grouped into four time periods and the cumulative distribution curves for each time span are shown in **Figure 23**. **Table 1** summarizes the median speeds and the 85th percentile speeds by four time periods of the day. The 85th percentile speeds are 36, 37, 33, and 39 miles per hour for the AM peak, midday, PM peak, and nighttime periods, respectively.

Figure 23: Cumulative Speed Distribution Curves



Source: DVRPC, 2016

Table 1: Speed Summary by Time Periods

Time Period	Median Speed (mph)	85th Percentile Speed (mph)
AM Peak (7:00 AM - 10:00 AM)	30	36
Midday (10:00 AM - 4:30 PM)	31	37
PM Peak (4:30 PM - 7:30 PM)	27	33
Night (7:30 PM - 7:00 AM)	32	39

Source: DVRPC, 2016

A similar data collection and analysis effort was made on the numbered cross streets between Spring Garden and Willow Streets. These streets have posted speed limits of 25 miles per hour. Speed data was aggregated to the entire day, and the median speeds and the 85th percentile speeds are summarized in **Table 2**.

Table 2: Speed Summary of Cross Streets

Street Name	Median Speed (mph)	85th Percentile Speed (mph)
6th Street	29	35
5th Street	27	32
4th Street	26	32
3rd Street	26	31

Source: DVRPC, 2016

The study team also used a speed gun and stop watch to measure the speeds of each segment along the Callowhill Street corridor during the midday off-peak hours. Although the sample size was smaller, the speed measured by this method matched with the speed collected by road tubes for the segment between 5th and 6th Streets. The speed summaries of the remaining segments are shown in **Table 3**.

Table 3: Speed Summary along Callowhill Street (Midday)

Callowhill Street Segment	Median Speed (mph)	85th Percentile Speed (mph)
Between 4th and 5th	34	37
Between 3rd and 4th	33	36
Between 2nd and 3rd	28	33

Source: DVRPC, 2016

Callowhill Street's cartway is wide between 3rd and 6th Streets, and higher traffic speeds follow. It operates as if it were an extension of I-95's off-ramps. Traffic calming strategies can be used to tame traffic's flow and change the East Callowhill Street streetscape to inform drivers they are now in the city.

CHAPTER 6:

Recommended Improvements

The proposed corridor design accommodates cars, buses, pedestrians, and bicyclists, and incorporates traffic calming strategies and streetscape enhancements. The main objectives are to increase safety for all roadway users, improve stormwater management, and enhance corridor aesthetics, without undermining overall traffic performance. Key elements of the proposed design are:

- Road diet on Callowhill
- Curb extensions to reduce pedestrian crossing distances
- Green stormwater infrastructure

Road Diet on Callowhill Street

The proposed corridor design changes the segment of Callowhill Street between 3rd and 6th Streets from a five-lane to four-lane configuration, and the lane width will be reduced to 11 feet. The on-street parking lane will be 10 feet wide on the north side of the street. It is wider than the standard requirement because of the heavy traffic volume. Depending on the implementation of Alternative 1 or 2, the extra space can be used for a sidewalk extension and a potential bike lane or green stormwater infrastructure (GSI).

The Callowhill Street crossing distance includes a parking lane and five travel lanes, which makes it formidable for pedestrians. A road diet on Callowhill Street will reduce the crossing distance effectively, and the extra space can be used for streetscape improvements to make it more appealing to pedestrians. Trees need routine trimming so that the branches will not obscure the pedestrian signal heads.

Curb Extensions

It is also recommended to install curb extensions, which will replace one lane of crossing distance to enhance street aesthetics and buffer on-street parking. The rendering is shown in **Figure 24**.

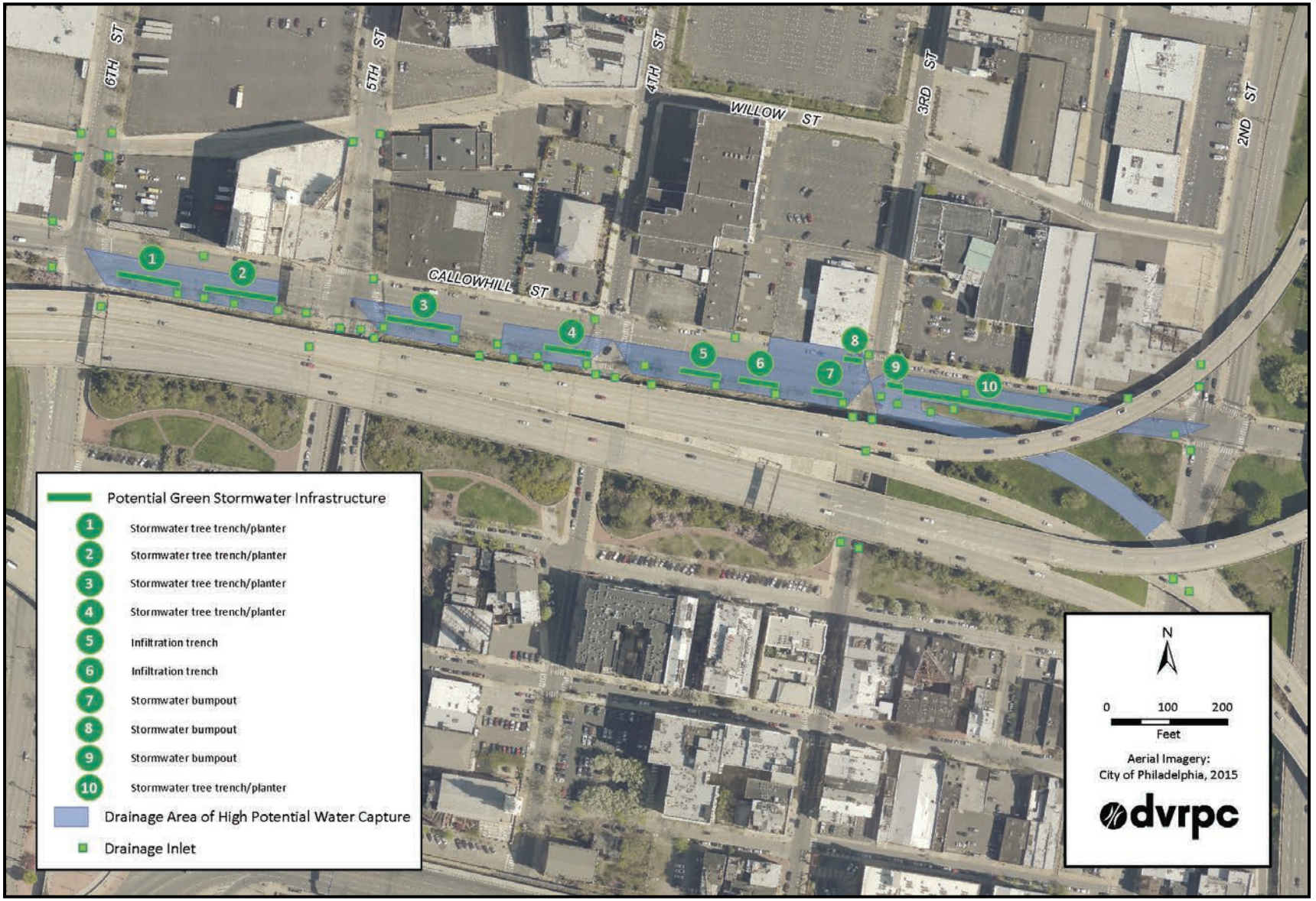
Figure 24: Curb Extension

Source: DVRPC, 2016

Green Stormwater Infrastructure

The Callowhill Street corridor would benefit from incorporating GSI. Doing so reduces stormwater runoff, enhances street aesthetics, and improves the pedestrian experience through the development of tree trench/planters, infiltration trenches, and stormwater bumpouts. **Figure 25** identifies potential GSI applications. On the north side, there is limited potential to implement GSI due to utility lines in the cartway or the footway. On the other hand, stormwater from Callowhill Street can be managed by the new development proposed at 4th and Callowhill due to the East Callowhill zoning overlay. If the sidewalk on the south side is expanded, it is possible to implement stormwater management practices.

Figure 25: Potential Green Stormwater Infrastructure



Source: Philadelphia Water Department, 2016

Cross-Section Design, Aerial View, and Rendering

Figures 26-32 visualize the conceptual design in cross-section, aerial view, and rendering of the proposed alternatives on Callowhill Street between 3rd and 6th Streets. The main objectives of the designs are potentially to calm traffic through road diet, to improve pedestrian experience through curb extension and streetscaping, to enhance bikeways through more visible and physically-separated bike lanes, and to strengthen stormwater management through GSI implementation.

Figure 26 is the existing Callowhill Street with a cross-section of five lanes. **Figures 27-29** are the cross-section, aerial view, and rendering of Alternative 1. This alternative removes one travel lane on the north side of Callowhill Street and creates a separated bike lane. **Figures 30-32** show the design of Alternative 2. It removes one lane on the south side and provides more opportunities for GSI. Both alternatives reduce the width of the travel lanes from 12 feet to 11 feet to calm the traffic.

Figure 26: Cross-Section of Existing Condition

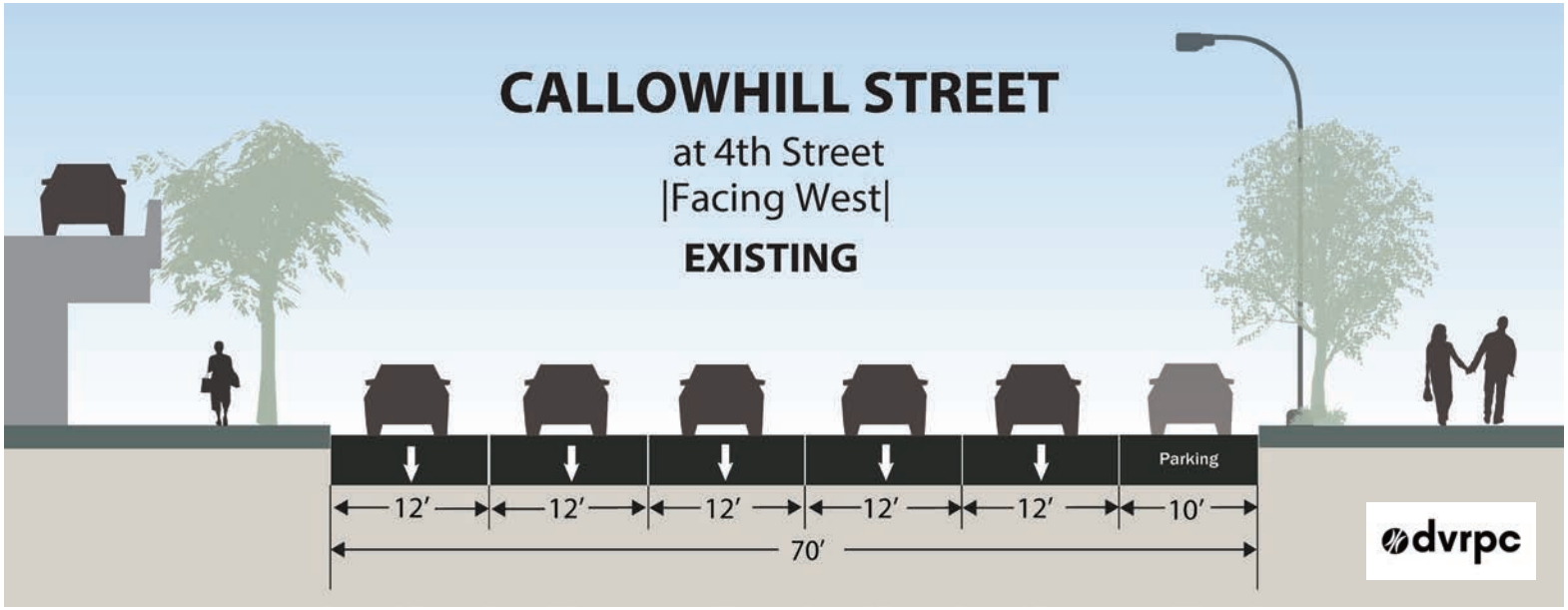


Figure 27: Cross-Section of Alternative 1

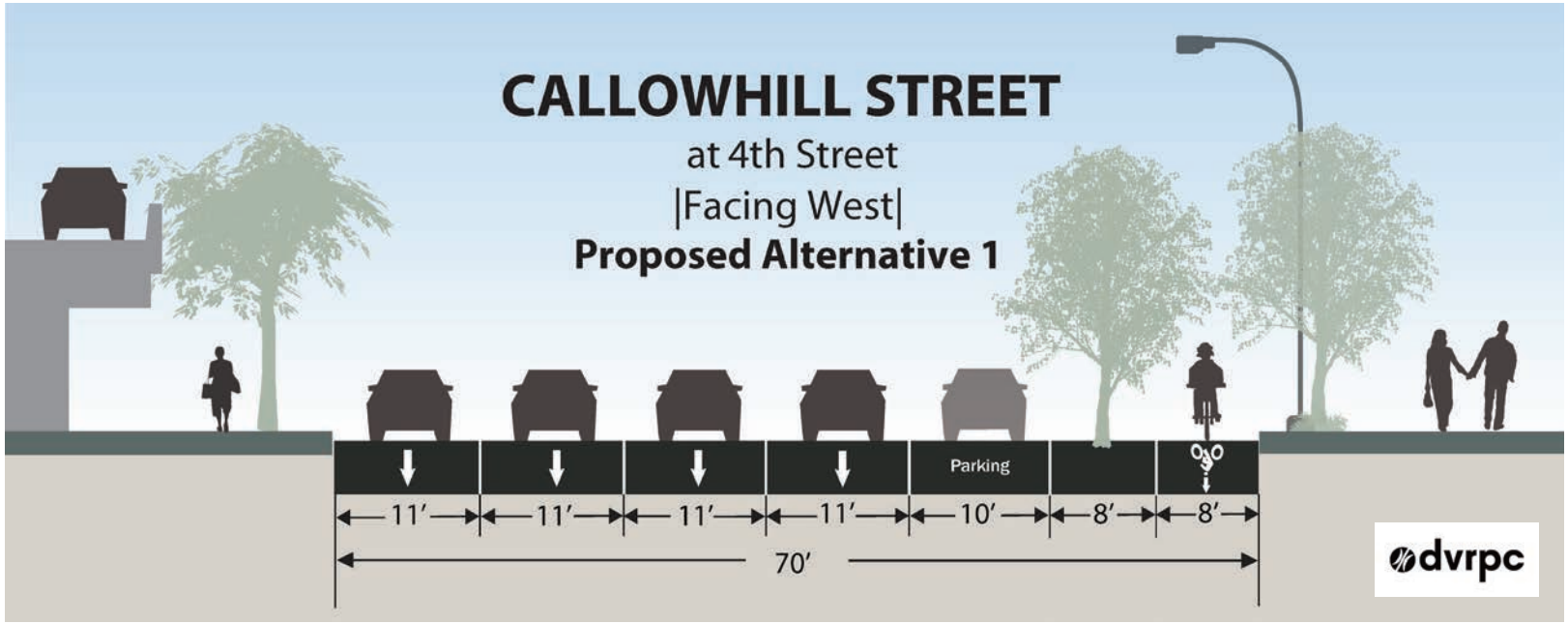


Figure 28: Aerial View of Alternative 1

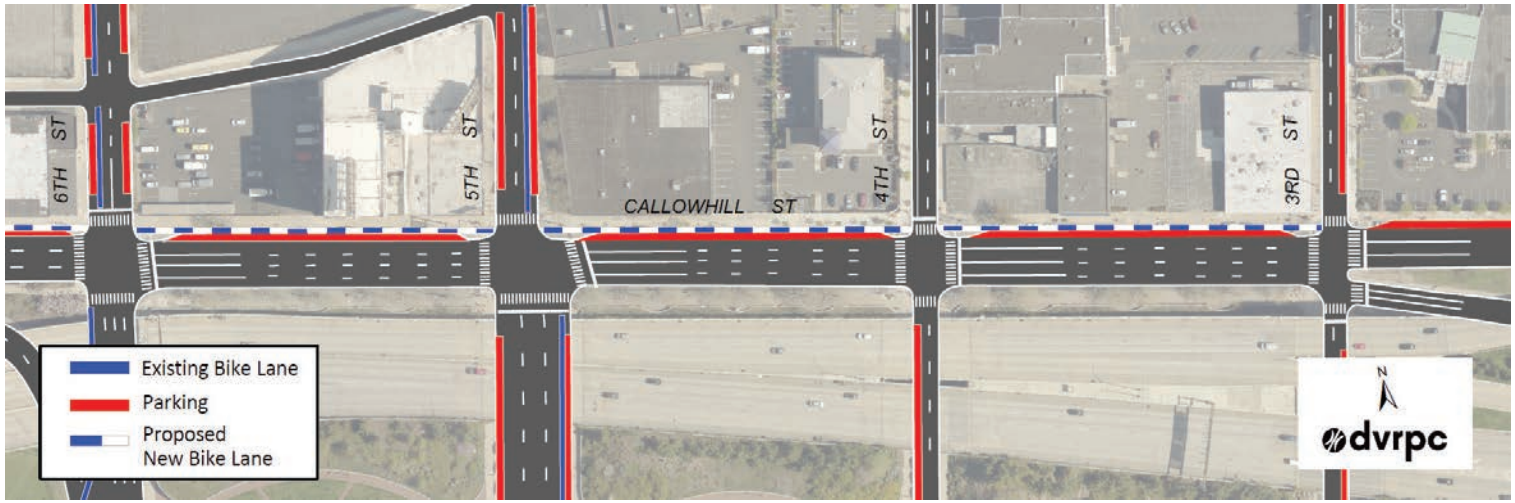


Figure 29: Rendering of Alternative 1

Source: DVRPC and PCPC, 2017

Figure 30: Cross-Section of Alternative 2

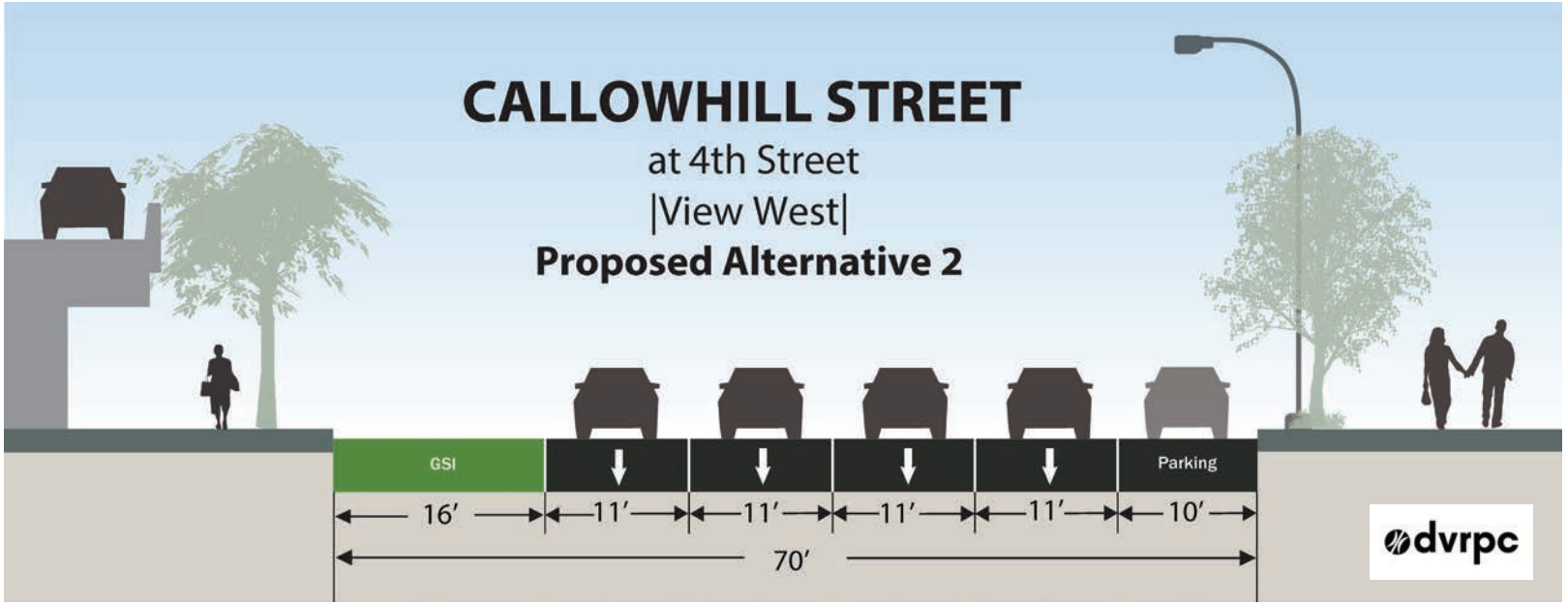


Figure 31: Aerial View of Alternative 2

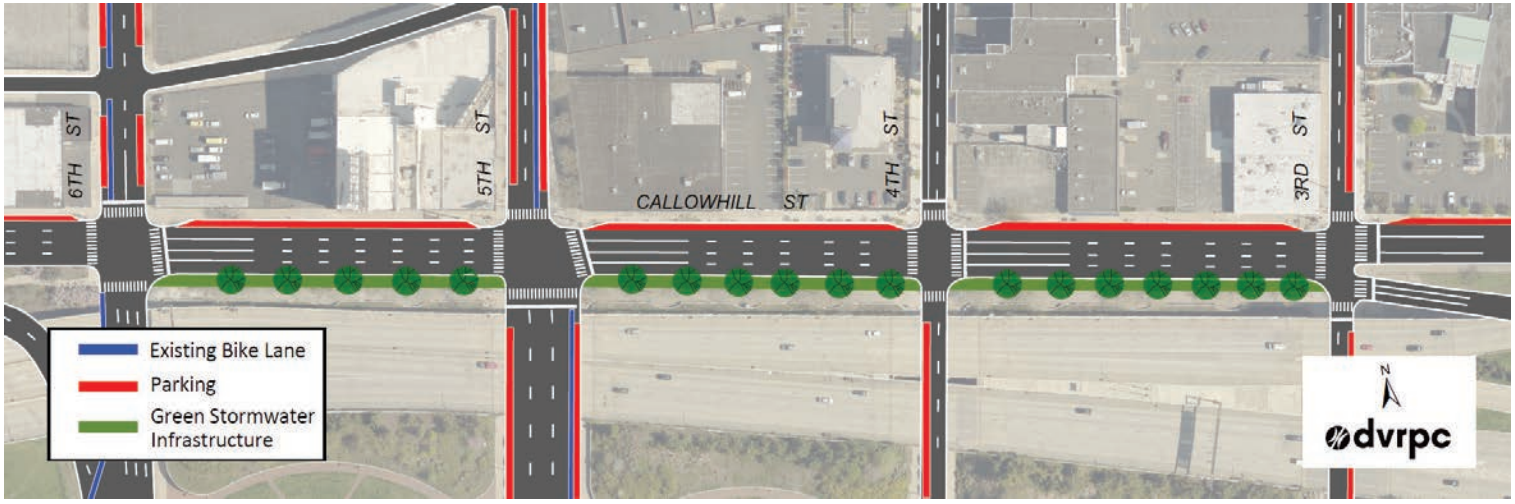


Figure 32: Rendering of Alternative 2

Source: DVRPC, 2016

CHAPTER 7:

Traffic Analysis

VISSIM traffic models were used to examine the impacts of alternate improvement proposals. Changes were recorded in terms of delay, level of service (LOS), queue length, and volume to capacity ratio (v/c). The following six scenarios were tested. Build scenarios assume a road diet configuration on Callowhill Street.

- Existing: Existing roadway configuration with recent traffic counts
- No Build: Existing roadway configuration with traffic volumes factored to 2025 levels to represent ongoing regional growth
- Build 1: Road diet on the north side of Callowhill Street between 3rd and 6th Streets
- Build 2: Road diet on the south side of Callowhill Street between 3rd and 6th Streets
- Build 3: Road diet on both sides of Callowhill Street between 5th and 6th Streets, and the north side of Callowhill Street between 3rd and 5th Streets
- Build 4: Road diet on both sides of Callowhill Street between 5th and 6th Streets, and the south side of Callowhill Street between 3rd and 5th Streets

DVRPC's regional travel demand model estimates an average annual growth factor of 0.17 percent per year for the study area. The growth factor is based on the DVRPC Board-adopted Long-Range Plan, which includes long-range forecasts and major regional transportation projects by county and federal functional classification. Therefore, the traffic volume is projected to grow by a total of 1.54 percent by the year 2025. **Table 4** is the LOS criteria used in this study. **Tables 5** through **8** summarize the VISSIM results. It should be noted that for all these Build scenarios, signal timings were adjusted to shift some of the north-south green time to westbound traffic.

Table 4: LOS Criteria for Signalized Intersections

LOS (v/c ≤ 1.0)	Control Delay (seconds per vehicle)	Qualitative Description of Traffic Operations
A	≤ 10	Stable and Predictable
B	> 10 - 20	
C	> 20 - 35	
D	> 35 - 55	Predictable, but Approaching Unstable
E	> 55 - 80	Unstable and Unpredictable
F	> 80	

Sources: Highway Capacity Manual, 2010, and DVRPC

It is observed that because of the large volumes of exiting traffic from I-95, the intersections at 2nd and 3rd Streets are the most congested with LOS C in the Existing and No Build conditions.

For Build 1 and Build 2, the road diet will increase the delay at each intersection. The LOS will degrade from A to B at the intersections of 5th and 6th Streets in the AM peak hour. The difference between road diet on the north side and the south side is negligible.

At the suggestion of the steering committee, road diet scenarios on both sides of Callowhill Street were tested as Build 3 and 4. Initially, it was attempted to remove lanes on both sides from 3rd Street to 6th Street; however, even with signal adjustments, through movements were significantly affected. The road diet on both sides is only practical on one segment between 5th and 6th Streets, where the volumes diminish. The model results of Build 3 and 4 show that queue lengths will increase at the 5th and 6th Streets intersections as expected. During the AM peak hour, most intersections will experience at least five seconds increase in delay. The 2nd Street intersection has the most significant delay increase and the LOS degrades to D. During the PM peak hour, the LOS mostly remains unchanged at LOS C.

Table 5: AM Peak Hour Delay (Seconds) and LOS Comparison (7:45 AM to 8:45 AM)

Intersection	Existing (AM)		No Build (AM)		Build 1 (AM)		Build 2 (AM)		Build 3 (AM)		Build 4 (AM)	
	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS
Callowhill & 6th	9.0	A	9.0	A	13.0	B	12.8	B	18.7	B	17.3	B
Callowhill & 5th	9.2	A	9.3	A	12.0	B	12.3	B	20.3	C	16.4	B
Callowhill & 4th	12.5	B	12.4	B	13.3	B	13.4	B	18.4	B	15.2	B
Callowhill & 3rd	21.0	C	22.4	C	27.6	C	27.6	C	31.8	C	26.4	C
Callowhill & 2nd	26.9	C	27.1	C	34.4	C	34.1	C	51.4	D	42.4	D

Source: DVRPC, 2017

Table 6: AM Peak Hour v/c Ratio and Queue (Feet) Comparison (7:45 AM to 8:45 AM)

Intersection	Street	Approach	Existing (AM)		No Build (AM)		Build 1 (AM)		Build 2 (AM)		Build 3 (AM)		Build 4 (AM)	
			v/c	Queue	v/c	Queue	v/c	Queue	v/c	Queue	v/c	Queue	v/c	Queue
Callowhill & 6th	Callowhill	WB	0.59	12	0.60	13	0.74	32	0.74	31	0.86	65	0.87	48
	6th	SB	0.67	62	0.68	63	0.68	63	0.68	63	0.96	91	0.96	93
Callowhill & 5th	Callowhill	WB	0.70	17	0.71	17	0.83	28	0.83	30	0.72	87	0.72	51
	5th	NB	0.29	30	0.30	30	0.30	30	0.30	30	0.37	37	0.37	37
Callowhill & 4th	Callowhill	WB	0.67	27	0.68	26	0.85	32	0.85	32	0.80	56	0.81	34
	4th	SB	0.59	58	0.60	58	0.60	61	0.60	62	0.68	72	0.68	72
Callowhill & 3rd	Callowhill	WB	0.78	51	0.79	53	0.75	148	0.75	145	0.72	183	0.73	148
	I-95 NB Off-Ramp	WB	0.82	88	0.83	102	0.82	85	0.82	86	0.80	114	0.80	76
	3rd	NB	0.49	38	0.50	39	0.52	41	0.52	41	0.54	43	0.54	43
Callowhill & 2nd	Callowhill	WB	0.50	19	0.51	19	0.51	17	0.51	17	0.51	18	0.51	18
	2nd	SB	0.89	87	0.90	90	0.91	170	0.91	166	0.91	194	0.91	168
	I-95 SB Off-Ramp	SB	0.68	70	0.69	70	0.69	72	0.69	71	0.68	228	0.69	148

Source: DVRPC, 2017

Table 7: PM Peak Hour Delay (Seconds) and LOS Comparison (5:00 PM to 6:00 PM)

Intersection	Existing (PM)		No Build (PM)		Build 1 (PM)		Build 2 (PM)		Build 3 (PM)		Build 4 (PM)	
	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS
Callowhill & 6th	10.3	B	10.3	B	11.4	B	11.4	B	13.6	B	15.6	B
Callowhill & 5th	11.8	B	13.3	B	14.2	B	14.2	B	16.5	B	20.5	C
Callowhill & 4th	12.1	B	12.2	B	13.1	B	13.1	B	13.1	B	15.8	B
Callowhill & 3rd	27.2	C	30.8	C	29.4	C	28.7	C	29.2	C	30.6	C
Callowhill & 2nd	23.2	C	23.7	C	24.9	C	25.1	C	25.2	C	25.1	C

Source: DVRPC, 2017

Table 8: PM Peak Hour v/c Ratio and Queue (Feet) Comparison (5:00 PM to 6:00 PM)

Intersection	Street	Approach	Existing (PM)		No Build (PM)		Build 1 (PM)		Build 2 (PM)		Build 3 (PM)		Build 4 (PM)	
			v/c	Queue	v/c	Queue	v/c	Queue	v/c	Queue	v/c	Queue	v/c	Queue
Callowhill & 6th	Callowhill	WB	0.37	5	0.37	4	0.46	6	0.46	6	0.62	20	0.62	35
	6th	SB	0.78	66	0.79	67	0.79	69	0.79	68	0.79	67	0.79	68
Callowhill & 5th	Callowhill	WB	0.62	42	0.63	59	0.76	57	0.76	57	0.72	66	0.73	89
	5th	NB	0.27	27	0.28	27	0.27	28	0.27	28	0.27	28	0.27	28
Callowhill & 4th	Callowhill	WB	0.47	23	0.48	23	0.59	26	0.59	26	0.59	24	0.59	36
	4th	SB	0.46	41	0.47	42	0.47	45	0.47	45	0.47	45	0.47	45
Callowhill & 3rd	Callowhill	WB	0.60	38	0.61	38	0.59	58	0.59	59	0.59	55	0.59	71
	I-95 NB Off-Ramp	WB	0.63	204	0.64	268	0.64	214	0.64	199	0.64	206	0.64	207
	3rd	NB	0.60	44	0.61	44	0.61	44	0.61	45	0.61	44	0.61	44
Callowhill & 2nd	Callowhill	WB	0.35	13	0.35	13	0.35	12	0.35	12	0.35	12	0.35	12
	2nd	SB	0.84	75	0.86	77	0.86	90	0.86	91	0.86	91	0.86	89
	I-95 SB Off-Ramp	SB	0.43	34	0.44	35	0.44	35	0.44	35	0.44	35	0.44	35

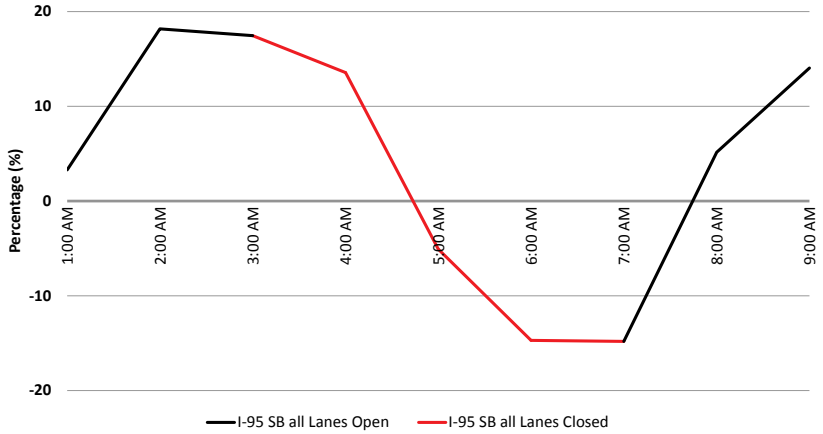
Source: DVRPC, 2017

I-95 Traffic Diversion and Stress Test

The steering committee also directed that the traffic study evaluate the overflow effect to Callowhill Street in the rare case of a lane closure on I-95. DVRPC staff was able to retrieve the incidence history on I-95. It is worth mentioning that a major crash occurred on southbound I-95 at 3:30 AM on Thursday, September 1st, 2016, which led to the closure of all southbound lanes from Exit 22 (I-676/Callowhill Street) to Exit 20 (Columbus Boulevard/Washington Avenue). The lanes were reopened just before 7:00 AM.

To examine the impact to Callowhill Street as a result of the closure, the average westbound speeds from 2nd Street to 6th Street during the crash day were compared to the average speeds on other Thursdays in the month of September in 2016. **Figure 33** shows the percentage difference in speeds on Callowhill Street before, during, and after the closure of I-95 southbound lanes.

Figure 33: Percentage Speed Difference for Callowhill Street on Incidence Day



Source: DVRPC, 2017

There is almost a 20 percent reduction in speeds during the closure hours which may be an indication of diverted traffic coming onto Callowhill Street. But it is important to note that effects of I-95 closure may vary significantly based on the type of the crash, direction of the lane closure, and season, time, and duration of the closure. Therefore, an in-depth study is required if stakeholders wish to examine the impact to Callowhill Street of the aforementioned factors.

A brief stress test was conducted with the VISSIM models by increasing I-95 northbound and southbound off-ramp volumes by 20 percent, respectively, to evaluate the impacts on the Build scenarios. **Tables 9** through **14** summarize the normal day and stress test results. The operations under stressed situations are generally worse during the AM peak hour than during the PM peak hour.

If the existing volumes from the northbound I-95 off-ramp are increased by 20 percent, long queues will form on the ramp, due to limited storage length for right turning vehicles. The congestion at the 3rd Street intersection affects the operation of the 2nd Street intersection as well, resulting in congestion on the southbound off-ramp and 2nd Street. The LOS drops from C to E at the 3rd Street intersection, and it drops from C to F at the 2nd Street intersection during the AM peak hour.

If the exiting volumes from southbound I-95 off-ramp are increased, the 2nd Street intersection will operate at LOS F and the 3rd Street intersection will also experience a delay increase. Overall, the traffic condition is less stressed compared to the test on the northbound off-ramp.

It should be noted that this is a relatively simplified stress test, which reflects a localized traffic condition. More detailed traffic analysis should include a larger area that considers regional travel origins and destinations.

Table 9: Normal Day Results (AM Peak Hour)

Intersection	Build 1 (AM)		Build 2 (AM)		Build 3 (AM)		Build 4 (AM)	
	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS
Callowhill & 6th	13.0	B	12.8	B	18.7	B	17.3	B
Callowhill & 5th	12.0	B	12.3	B	20.3	C	16.4	B
Callowhill & 4th	13.3	B	13.4	B	18.4	B	15.2	B
Callowhill & 3rd	27.6	C	27.6	C	31.8	C	26.4	C
Callowhill & 2nd	34.4	C	34.1	C	51.4	D	42.4	D

Source: DVRPC, 2017

Table 10: Stress Test on Northbound I-95 (AM Peak Hour)

Intersection	Build 1 (AM)		Build 2 (AM)		Build 3 (AM)		Build 4 (AM)	
	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS
Callowhill & 6th	17.6	B	17.6	B	20.7	C	22.0	C
Callowhill & 5th	20.5	C	21.2	C	28.8	C	32.0	C
Callowhill & 4th	19.2	B	19.6	B	26.0	C	29.0	C
Callowhill & 3rd	60.7	E	60.3	E	63.8	E	68.5	E
Callowhill & 2nd	110.7	F	90.1	F	120.7	F	132.3	F

Source: DVRPC, 2017

Table 11: Stress Test on Southbound I-95 (AM Peak Hour)

Intersection	Build 1 (AM)		Build 2 (AM)		Build 3 (AM)		Build 4 (AM)	
	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS
Callowhill & 6th	15.5	B	14.9	B	20.3	C	18.9	B
Callowhill & 5th	15.2	B	15.0	B	24.0	C	21.1	C
Callowhill & 4th	14.4	B	14.5	B	20.2	C	18.2	B
Callowhill & 3rd	34.4	C	35.0	C	38.5	D	33.6	C
Callowhill & 2nd	93.5	F	96.9	F	99.1	F	102.5	F

Source: DVRPC, 2017

Table 12: Normal Day Results (PM Peak Hour)

Intersection	Build 1 (PM)		Build 2 (PM)		Build 3 (PM)		Build 4 (PM)	
	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS
Callowhill & 6th	11.4	B	11.4	B	13.6	B	15.6	B
Callowhill & 5th	14.2	B	14.2	B	16.5	B	20.5	C
Callowhill & 4th	13.1	B	13.1	B	13.1	B	15.8	B
Callowhill & 3rd	29.4	C	28.7	C	29.2	C	30.6	C
Callowhill & 2nd	24.9	C	25.1	C	25.2	C	25.1	C

Source: DVRPC, 2017

Table 13: Stress Test on Northbound I-95 (PM Peak Hour)

Intersection	Build 1 (PM)		Build 2 (PM)		Build 3 (PM)		Build 4 (PM)	
	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS
Callowhill & 6th	11.4	B	11.0	B	16.5	B	15.7	B
Callowhill & 5th	23.0	C	22.5	C	35.9	D	30.2	C
Callowhill & 4th	17.7	B	17.1	B	27.9	C	21.9	C
Callowhill & 3rd	53.7	D	53.3	D	61.0	E	60.5	E
Callowhill & 2nd	30.4	C	26.0	C	36.6	D	33.3	C

Source: DVRPC, 2017

Table 14: Stress Test on Southbound I-95 (PM Peak Hour)

Intersection	Build 1 (PM)		Build 2 (PM)		Build 3 (PM)		Build 4 (PM)	
	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS
Callowhill & 6th	11.1	B	11.0	B	12.8	B	13.8	B
Callowhill & 5th	25.8	C	21.3	C	21.3	C	24.8	C
Callowhill & 4th	19.1	B	14.9	B	14.5	B	17.0	B
Callowhill & 3rd	39.2	D	34.6	C	32.0	C	33.1	C
Callowhill & 2nd	46.8	D	28.3	C	27.9	C	32.3	C

Source: DVRPC, 2017

CHAPTER 8:

Implementation

Among four scenarios simulated, road diet on the north side of Callowhill Street (Build 1, or Alternative 1) provides opportunity for a separated bike lane, while road diet on the south side (Build 2, or Alternative 2) provides opportunity for GSI.

Overall, a road diet is a cost-effective way to improve safety for all roadway users and change East Callowhill Street's roadway environment without compromising efficiency. **Table 15** contains the estimated construction cost for implementing a road diet on the north side of Callowhill Street (Alternative 1), which is the preferred alternative by the City's study advisory committee members at the present time. This is an order of magnitude cost estimate.

Next steps should include collaboration with Philadelphia City Planning Commission, Streets Department, Water Department, Center City District, developers, and community groups to finalize the conceptual design of the roadway and advance project elements as desired.

Table 15: Construction Cost Estimate (Rough)

Category	Quantity	Unit	Unit Cost	Total
Demolition				
Asphalt	2,000	Cubic Yards	$60	$120,000
Cleaning and Grubbing	1	Lump Sum	$30,000	$30,000
Installation				
Asphalt	7,800	Square Yards	$100	$780,000
ADA Curb Ramps	12	Each	$10,000	$120,000
Bumpout	180	Square Yards	$100	$18,000
Pedestrian Scale Lighting	36	Each	$5,000	$180,000
Sidewalk	1,050	Square Yards	$100	$105,000
Curbing	1,200	Linear Feet	$50	$60,000
Crosswalks (continental)	510	Linear Feet	$16	$8,160
Landscaping	1	Lump Sum	$30,000	$30,000
Sub-Total				**$1,451,160**
Additional Costs				
Maintenance of Traffic (10%)				$145,116
Mobilization (5%)				$72,558
Contingency (20%)				$290,232
Total Cost				**$1,959,066**

Source: DVRPC, 2017

East Callowhill Traffic Calming Study

Publication Number: 17008

Date Published: January 2018

Geographic Area Covered:
City of Philadelphia, Pennsylvania

Key Words:
Road Diet, Bicycle Lane, Accessibility, Roadway Cross-Section, Green Stormwater Infrastructure, Performance Measure, Philadelphia 2035, Zoning, Bus Shelter, Bumpout, Curb Extension

Abstract:
The study assessed Callowhill Street between 2nd and 6th Streets. A context sensitive design was recommended to calm traffic, reduce speeds, and improve safety, accessibility, and aesthetics. A road diet on East Callowhill Street enables improvement to pedestrian amenities and bike facilities, or green stormwater infrastructure. Aligned with recent zoning changes, the constructed project will complement study area revitalization efforts, and improve neighborhood quality of life.

Staff Contact:
Meijun Liu
Transportation Engineer
(215) 238-2856
mliu@dvrpc.org

DELAWARE VALLEY dvrpc REGIONAL PLANNING COMMISSION

190 N. Independence Mall West, 8th Floor
Philadelphia, PA 19106-1520
Phone: (215) 592-1800
Fax: (215) 592-9125
www.dvrpc.org

DELAWARE VALLEY
dvrpc
REGIONAL
PLANNING COMMISSION

DVRPC, 8TH FLOOR
190 N. INDEPENDENCE MALL WEST
PHILADELPHIA, PA 19106-1520
(215) 592-1800
WWW.DVRPC.ORG