February 2025

Terrace and De Soto Streets Pedestrian Safety and Traffic Study

Final Report

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EXECUTIVE SUMMARY

The University of Pittsburgh encompasses and is adjacent to many academic, research, and medical facilities. The history of crashes and incidents along with increasing development activity along Terrace Street and De Soto Street have heightened concerns regarding the safety and usability of these streets, particularly for pedestrians and cyclists, collectively known as vulnerable road users.

This study evaluated current safety conditions and proposed a range of recommendations to improve the overall functionality and accessibility of the streets. The final report summarizes these recommendations, developed with stakeholder input, to address existing challenges and proactively prevent future issues.

Existing Conditions

The study area considered is shown in **Figure 1** and includes five intersections along De Soto Street and Terrace Street, between Fifth Avenue and Darragh Street. From 2019 to 2023, the area experienced 28 crashes, 7 involving pedestrians, two of which resulted in fatalities. Near-miss incidents, which often go unreported, are frequent.

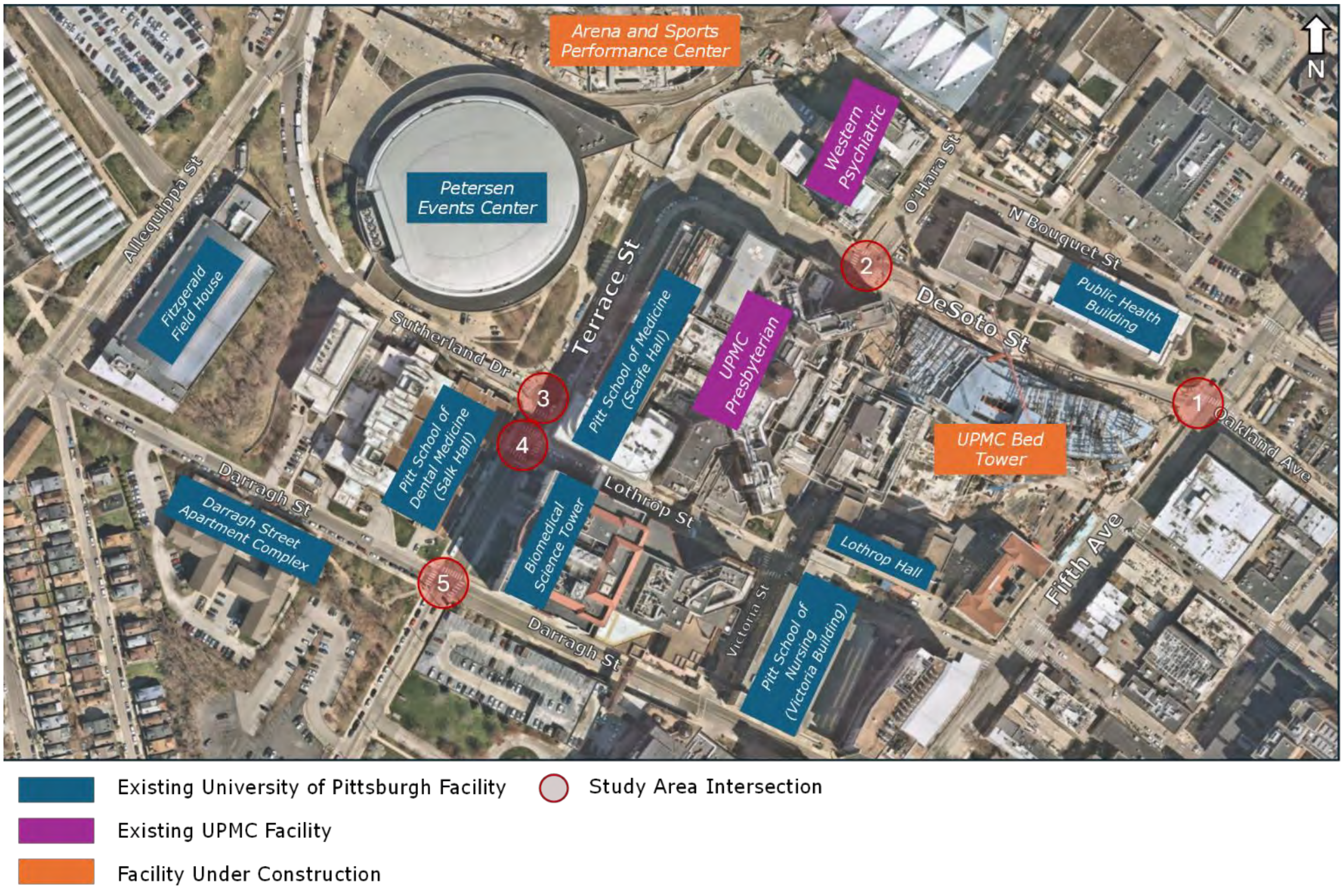

Figure 1: Study Area

The study identified several issues contributing to pedestrian and vehicular safety concerns:

- **Confusing signage and limited visibility:** Numerous outdated or missing signs obstruct sightlines, causing confusion for both drivers and pedestrians.
- **Insufficient lighting:** Many streetlights and pedestrian walkway lights are non-functional or insufficient, reducing visibility at night.
- **Aging infrastructure:** Outdated signal equipment lacks modern features that improve visibility and accessibility like retroreflective backplates and accessible pedestrian push buttons.
- **On-going construction:** Construction activities can create a less predictable and potentially confusing environment for street users.
- **Jaywalking:** Pedestrians frequently ignore crosswalks, traffic control, and signage for more direct routes.
- **User mix**: The study area experiences a mix of travel modes—personal vehicles, commercial freight, pedestrians, cyclists, e-scooters, shuttles, and more—and a mix of user familiarity with the streets (e.g., hospital and special event visitors).

Stakeholder Feedback

Walkshop

The project team conveyed a group of representatives from the University to walk the study area and discuss proposed improvements on September 17th, 2024. The goal was to observe the existing conditions of the corridor as experienced by pedestrians, drivers, and other users. The intersections of De Soto Street and O'Hara Street, Terrace Street and Lothrop Street/Sutherland Drive, and the Terrace Street midblock crosswalk were identified as specific locations of concern because of their heavy pedestrian movements and a lack of compliance with traffic control. Several corridor wide issues, including poor visibility of pedestrians and confusing traffic control were noted. A corridor-wide increase in the use of e-scooters and e-bikes was also documented.

Stakeholder Feedback

A stakeholder group that included representatives from various University departments, including planning, capital projects, space management, parking and transportation, and public safety convened throughout the study. During these meetings, the project team captured the University's perspective on current operations along the study area corridor, priority areas, and potential solutions. The University also emphasized the need for short-term improvements that can be implemented very quickly as well as mid- and long-term improvements that can accommodate future development.

Additional conversations were held with the City of Pittsburgh Department of Mobility and Infrastructure (DOMI) to align recommendations with citywide plans, to discuss implementation strategy, and to investigate potential City support for the proposed interventions. The team and DOMI reviewed existing and planned City initiatives that could impact the study area and discussed feasible pedestrian safety enhancement that the City could support. DOMI reiterated the importance of integrating recommendations into future plans for the study area.

A stakeholder meeting was also held with UPMC, which has a prominent presence on the corridor. This project team discussed current and future developments on the study area, safety challenges in the corridor, and the specific needs and challenges faced by UPMC. UPMC representatives identified key conflict points, like patient drop-off areas, and outlined steps the organization is taking to improve pedestrian safety around its campus. The project team ensured that recommendations were developed to limit negative impacts on hospital operations, especially emergency services.

University of Pittsburgh shuttle operators also weighed in on the study, indicating the Terrace Street/De Soto Street bend and illegal parking impede visibility.

Recommendations

Short-, mid- and long-term recommendations were developed for each study area location and several corridor-wide improvements were identified. Location-specific recommendations are discussed in the report.

Corridor-wide improvements include:

- **Signage and Sight Distance:** Update and install clear, unambiguous signage to guide both pedestrians and drivers. Remove or relocate obstructive signs to enhance overall visibility, particularly at intersections.
- **Lighting:** Ensure consistent and adequate illumination, including updating to LED fixtures, across the corridor to increase visibility during nighttime, particularly at crosswalks and key intersections.
- **Signal Infrastructure:** Modernize traffic signals with features like retroreflective backplates to increase signal visibility, install pedestrian countdown timers and accessible push buttons at all signalized intersections, and ensure they are ADA-compliant.
- **Pedestrian Safety Enhancements:** Implement leading pedestrian intervals (LPIs) at intersections to give pedestrians a head start in crossing before vehicles can move. Install Rectangular Rapid Flashing Beacons (RRFBs) at unsignalized crosswalks to alert drivers when pedestrians are crossing.
- **Traffic Calming Measures:** Introduce curb extensions or bump-outs to reduce pedestrian crossing distances and slow down vehicular speeds. Apply pavement markings, such as high-visibility crosswalks and speed reduction indicators, to guide and control traffic movements.
- **Crosswalk Enhancements:** Implement a raised crosswalk/speed table at the Terrace Street midblock crosswalks to make pedestrians more visible and encourage vehicles to slow down.
- **Multimodal Infrastructure:** Develop designated travel areas for cyclists and e-scooter users to reduce conflicts with vehicles and pedestrians. Install a bicycle climbing lane on steep sections of the corridor to safely accommodate cyclist movements.
- **Daylighting:** Reduce parking near crosswalks and intersections to improve the visibility of pedestrians and ensure that parking restrictions are clearly marked and enforced.

The feasibility of recommendations was assessed based on location, implementation timeline, and potential complexity. The goal was to prioritize actions that can be effectively implemented while considering practicality, stakeholder needs, and cost efficiency. The implementation timeline prioritizes the recommendations based on:

- **Location:** Identifying specific intersections or street segments for targeted improvements.
- **Implementation Timeline:** Dividing recommendations into short-term (within 1 year), mid-term (within 2-3 years), and long-term (beyond 3 years) timeframes to spread out resource allocation.
- **Complexity:** Considering the practicality and ease of implementation to ensure recommendations can be executed effectively with available resources and coordination among stakeholders.

A multi-tiered approach enables the allocation of resources and efforts effectively over time:

- **Short-Term Improvements:** Address immediate safety concerns through small-scale, easily implemented measures such as LPIs, improved signage, and better lighting.
- **Mid-Term Improvements:** Focus on moderate interventions like installing midblock RRFBs, updating signal infrastructure, and adding curb bump outs.
- **Long-Term Improvements:** Undertake more extensive projects, such as bike lane expansions, structural changes to intersections to address visibility and accessibility, and improvements dependent on completion of other ongoing projects in the study area.

Improvements that were implemented during the study are indicated on the timeline with a checkmark. An opinion of probable costs was developed for each short-, mid-, and long-term recommendation scenario and are outlined in more detail in the report.

Location	Recommendation	Short-Term	Mid-Term		Long-Term
		2025	2026	2027	2028+
De Soto Street and Fifth Avenue	Implement Leading Pedestrian Intervals (LPIs).				
	Install No Turn on Red Signs for all hours.				
	Consider expanding the existing curb space using curb bump outs.				
	Support the implementation of future BRT and cycle track infrastructure by coordinating with the City and PRT.				
De Soto Street Driveways	Add concrete stickers to alert pedestrians that they are entering an active driveway.				
	Install pedestrian detectable warning surfaces on both side of the driveways.				
	Install audio/visual alert systems to alert pedestrians of an oncoming parking garage vehicle.				
De Soto Street and O'Hara Street	Retime signals to change pedestrian walk phasing, add LPIs, and shorten the cycle length.				
	Consider a lagging left-turn to minimize pedestrian-vehicle conflicts.				
	Restripe high-visibility crosswalk markings.				
	Install No Turn on Red signs for all hours.	✓			
	Relocate UPMC Shuttle stop to the corner of O'Hara Street and North Bouquet Street.				
	Install fencing along the bend extending until UPMC Presbyterian loading docks.				
	Update signal equipment to include retroreflective backplates, new signal heads, pedestrian walk timers, and accessible pedestrian push buttons.				
	Consider installing left turn hardening infrastructure to slow down drivers and to move the driver's field of vision to the crosswalk.				
	Reinstall bike lanes on both sides of O'Hara Street.				
	Consider installing a bicycle climbing lane on De Soto Street to connect to bike lanes on O'Hara Street.				
	Install permanent curb bump outs past the new bike lane to increase the landing area for pedestrians.				
Terrace Street Bend	Improve lighting on Terrace St, particularly at bend.				
	Add concrete stickers at driveway entrances to alert pedestrians to potential vehicle conflicts.				
	Repaint curbs in restricted parking area and improve No Parking signage.	✓			
	Install fencing along the University of Pittsburgh Medical School, extending from the end of the parking zone on Terrace St to the UPMC Presbyterian loading dock on De Soto St.				
	Install transverse pavement markings to alert drivers to slow down as they approach the curve.				
	Consider installing a bicycle climbing lane on De Soto Street to connect to bike lanes on O'Hara Street.				
Terrace St Midblock Crosswalk	Install flexible delineators to reinforce parking and act as an interim curb bump out.				
	Maintain high visibility crosswalk striping.				
	Install a Rectangular Rapid Flashing Beacons (RRFBs) and passive pedestrian detection.				
	Update parking signage along Terrace St to minimize sight distance impacts.				
	Option A - Install a speed table to create a raised crosswalk to increase pedestrian visibility and to slow down speeds along the corridor.				
	Option B – Install permanent concrete curb bump outs and median.				
Terrace Street, Lothrop Street and Sutherland Drive	Install flexible delineators for temporary curb bump outs to increase pedestrian space and decrease crossing length.				
	Install high visibility crosswalk striping at the Sutherland Dr crossing.				
	Eliminate Terrace St crossing at Sutherland Dr				
	Move Stop sign to Lothrop St to reduce driver confusion and improve visibility.				
	Add Stop bar and supplemental cross traffic sign on Sutherland Dr.				
	Install a fully ADA-compliant curb ramp at the northern Terrace St crossing.				
	Install RRFBs at both Terrace St crossings.				
	Install LED lighting.				
	Install permanent curb bump outs.				
Terrace Street and Darragh Street	Implement LPIs.	✓			
	Improve LED lighting.				
	Restripe yellow paint at curbs and extend restricted parking zone.	✓			
	Enforce parking restrictions to increase sight distance				
	Remove redundant signage. And reduce excess visual clutter.				
	Install No Turn on Red Signage at all approaches.				
	Relocate Pitt Shuttle stop to the loading dock driveway of Salk Hall.				
	Update signal equipment to include retroreflective backplates, new signal heads, pedestrian walk timers, and accessible pedestrian push buttons.				
	Relocate existing UPMC wayfinding signage on the southern corner of the intersection to improve visibility.				
	Consider relocating mast arms and utility poles to increase landing pad space for curb ramps.				
	Install fully ADA-compliant curb ramps and landings at crossings.				

Next Steps

The safety recommendations for the Terrace Street and De Soto Street corridor both address immediate concerns and plan for future development and growth. By working with project partners to implement these changes, the University of Pittsburgh aims to create a safer, more accessible environment for all road users, including pedestrians, cyclists, and drivers.

Upon the completion of this study, it is recommended that the University provide this study to the City of Pittsburgh and work with project partners to secure funding for design and implementation. The following are the suggested next steps:

1. **Prioritize Short-Term Actions**: Focus on the immediate implementation of low-cost, high-impact interventions such as LPIs, improved signage, and lighting upgrades. These changes will quickly enhance safety and set the stage for more extensive mid- and long-term projects.
2. **Secure Funding and Resources**: Engage with potential project partners, including the City of Pittsburgh, UPMC, and other stakeholders, to secure the necessary funding. This collaborative effort will help distribute the financial burden and ensure the timely implementation of the recommended improvements.
3. **Begin Design and Engineering Phases**: For the short-term recommendations, initiate the detailed design and engineering phases. This includes finalizing the specifications for signal timings, RRFBs, curb bump-outs, and improved signage and lighting.
4. **Coordinate with Stakeholders**: Establish coordination meetings with all key stakeholders, including city officials, UPMC, and the University’s internal departments. Effective communication ensures alignment on project goals, schedules, and potential disruptions during construction.
5. **Community Engagement**: Continue involving the community through public meetings and feedback sessions. Transparent communication regarding project progress, timelines, and benefits will foster community support and ensure that the interventions meet the needs and expectations of road users.
6. **Monitor and Evaluate**: After implementing the improvements, monitor their effectiveness and gather data on safety performance and user behavior. This evaluation will help refine future stages of the project and ensure continuous improvement.

INTRODUCTION

The University of Pittsburgh (the University) is located in the Oakland neighborhood of the City of Pittsburgh and is a major hub for academic, research, and medical activity. Within the Oakland neighborhood and specifically along Terrace Street and De Soto Street, there are several planned developments including a large hospital addition and on-going University construction. These projects impact the safety and use of the surrounding streets, particularly for vulnerable road users (VRU), such as pedestrians and bicyclists. As a result, the University of Pittsburgh is looking to partner with other stakeholders and the City of Pittsburgh to address existing safety challenges while enhancing the overall functionality and accessibility of the area for the future. ***This study will assess the safety conditions and provides recommendations, ranging from low impact, easily implemented safety measures to larger-scale projects, aimed at addressing safety challenges and improving the functionality along the Terrace/De Soto Streets corridor.***

This final report provides an overview of the recommendations identified to address the existing safety challenges located on the Terrace Street/De Soto Street corridor. Throughout the development of these recommendations, project stakeholders were engaged to gather feedback on their feasibility. These feasibility factors included implementation costs, schedule, potential crash reduction, and effectiveness in addressing concerns and proactively reducing future crashes and conflicts. Additionally, impacts to roadway widths, particularly around intersections, were analyzed to confirm that recommended improvements would not adversely impact emergency vehicle and delivery truck movement along the corridor.

This final report includes all recommendations, including those that were implemented or were in the process of implementation during the study. Upon the completion of this study, it is recommended that the University provide this study to the City of Pittsburgh and work with project partners to secure funding for design and implementation.

EXISTING CONDITIONS SUMMARY

The project study area encompasses five intersections along the Terrace Street/De Soto Street corridor, as shown in **Figure 2** on the next page. All streets in the study area are owned by the City of Pittsburgh, with the exception of Sutherland Drive, which is privately-owned by the University. It begins with the intersection of Fifth Avenue and De Soto Street and continues until the intersection of Terrace Street and Darragh Street. Throughout this report, the direction of De Soto Street will be referred to as “north-south” and the direction of Terrace Street will be considered “east-west”.

Figure 2: Project Site Area and Study Intersections

This study evaluated the existing conditions along the Terrace Street and De Soto Street corridor to understand the safety challenges as they relate to vulnerable road users. This corridor has a history of pedestrian and vehicular challenges due to:

- Confusing signage and limited visibility
- Insufficient lighting
- Aging infrastructure
- On-going construction creating a confusing environment
- Jaywalking
- A mix of travel modes and unfamiliar users

Data Collection

Previous Plan Review

Previous studies and plans related to the developments along the corridor and other plans for the Oakland neighborhood were reviewed to identify documented safety concerns, assess potential changes in mobility within the corridor, and determine if any improvements have been proposed. This review identified several safety concerns at the intersection of Terrace Street and Lothrop St/Sutherland Dr as well as recommended improvements to bicycle and pedestrian facilities as identified in the Oakland Plan. A summary of the reviewed plans can be found in the Existing and Future Conditions Assessment report in the **Appendix**.

Traffic Data

Weekday and event traffic data was collected to understand existing travel behaviors along the corridor. For weekday data collection, turning movement counts, including vehicular volumes, bicycle volumes, and pedestrian volumes, were collected on Tuesday, September 17th, 2024 during the morning (6:00 a.m. to 9:00 a.m.) and afternoon (3:00 p.m. to 6:00 p.m.) peak periods. Counts were conducted at the following intersections:

- De Soto Street and O'Hara Street
- Terrace Street and Lothrop Street/Sutherland Drive
- Terrace Street and UPMC Building C Driveway
- Terrace Street and Darragh Street

Counts were not collected at the intersection of Fifth Avenue and De Soto Street due to construction which created a long-term closure of southbound De Soto Street.

Additional pedestrian counts were collected at mid-block crossings and known crossing locations on Tuesday, September 17th, 2024 during the morning (6:00 a.m. to 9:00 a.m.) and afternoon (3:00 p.m. to 6:00 p.m.) peak periods. These locations included the crossing areas across Terrace Street between Scaife Hall, the Petersen Events Center, and the bend. Continuous 72-hour automated traffic recorder data, including traffic volumes, speeds, and vehicle classifications, was collected between Tuesday, September 17th, 2024 and Thursday, September 19th, 2024. This data was collected along Terrace Street west of the bend and along De Soto Street south of the bend.

For event data collection, turning movement counts, including vehicular volumes, bicycle volumes, and pedestrian volumes, were collected on Friday, October 25th, 2024 during a Women's Volleyball game played at the Petersen Events Center from 5:30 p.m. to 10:30 p.m. Counts were conducted at the following intersections:

- De Soto Street and Fifth Avenue
- De Soto Street and O'Hara Street
- Terrace Street and Lothrop Street/Sutherland Drive
- Terrace Street and Darragh Street

Intersection Capacity Analysis

Intersection capacity analyses were performed for existing 2024 conditions during the AM, PM, and Event peak hours at the following intersections:

- De Soto Street and Fifth Avenue (Event only)
- De Soto Street and O'Hara Street
- Terrace Street and Lothrop Street/Sutherland Drive
- Terrace Street and UPMC Building C Driveway (AM and PM only)
- Terrace Street & Darragh Street

The results of this analysis highlighted the operational effectiveness of the intersections along the corridor. While the results of this analysis are considered acceptable performance, poor operations at specific intersections due to ongoing construction have created operational challenges.

Field Assessment

Lastly, two in-person field assessments were conducted by the project team to observe vulnerable road users and driver behavior along the corridor. The first field assessment was a walkshop conducted on Monday, September 9th, 2024 from 3:30 p.m. to 5:00 p.m. with University of Pittsburgh Staff. A second in-depth field assessment was conducted on Tuesday, September 17th, 2024 was conducted during the morning and afternoon peak hours. The results of these field assessments highlighted potential opportunities for improvements.

Additional documentation of the existing conditions on the corridor can be found in the Existing and Future Conditions Assessment report contained in the **Appendix**.

Signage and Sight Distance

Some signage along the corridor is missing or outdated, which contributes to confusing conditions along the corridor. Additionally, sight distance is a major concern as signage along the corridor obstructs sight distance for both drivers and pedestrians. For example, the UPMC wayfinding signage at the intersection of Terrace Street and Darragh Street obstructs drivers' ability to see pedestrians in crosswalks.

Lighting

Along De Soto Street, the pedestrian walkway is sufficiently lit due to the construction of the UPMC Bed Tower, but lighting should be reevaluated for adequacy upon completion of the Bed Tower. Overall corridor lighting conditions are insufficient. Several pedestrian walkway lights and cobra-head streetlights were not functioning during the field assessment. Lighting at intersections do not provide enough illumination to enhance pedestrian visibility in the crosswalks**. Figure 3** displays the approximate locations of outages and insufficient lighting as of September 2024.

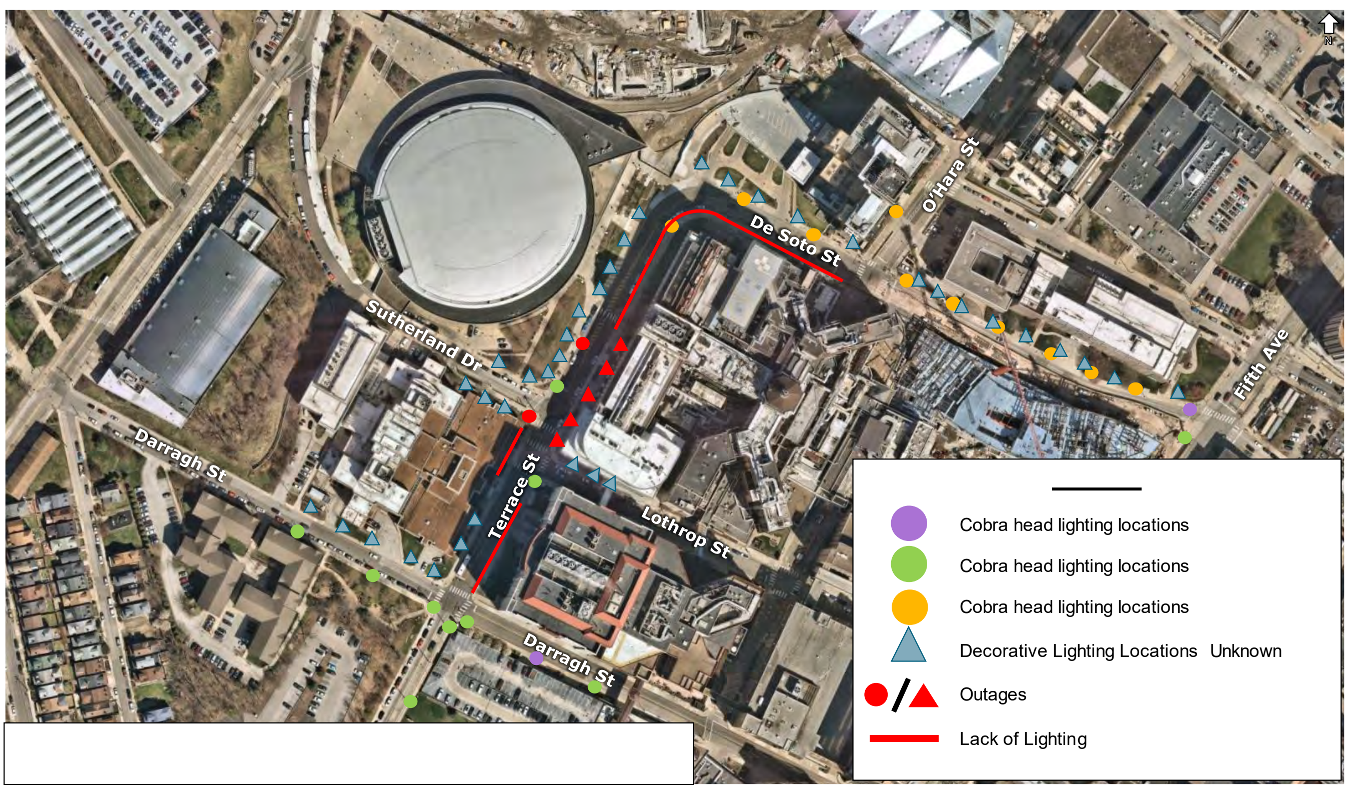

Figure 3: Existing Lighting Conditions

Aging Infrastructure

The existing signal equipment is out of date at both the Terrace Street/Darragh Street and the De Soto Street/O'Hara Street intersections. Modern signal equipment should include a retroreflective backplate which increases visibility, 12-inch signal heads, pedestrian countdown timers and accessible pedestrian signals. There are currently no pedestrian push buttons at the Terrace Street/Darragh Street intersection and the pedestrian push buttons at the De Soto Street/O'Hara Street intersection requires the push button to be pressed in order to activate the pedestrian scramble. Many intersections along the corridor are also lacking proper ADA accommodations, such as accessible grades and landing pads. Infrastructure deficiencies can encourage risky behavior and limit mobility in the study area.

Crashes and Safety

From 2019 to 2023 there were 28 crashes within the study area, with 7 of these crashes involving pedestrians. There were two fatalities along the corridor during this period. **Figure 4** shows a heat map displaying all crashes along the corridor and the locations of pedestrian-involved crashes. It indicates that the intersections of Terrace Street and Darragh Street and Fifth Avenue and De Soto Street have the greatest number of crashes in the study area. While 25% of the reported crashes involved vulnerable road users, near-miss events occur frequently and are often unreported.

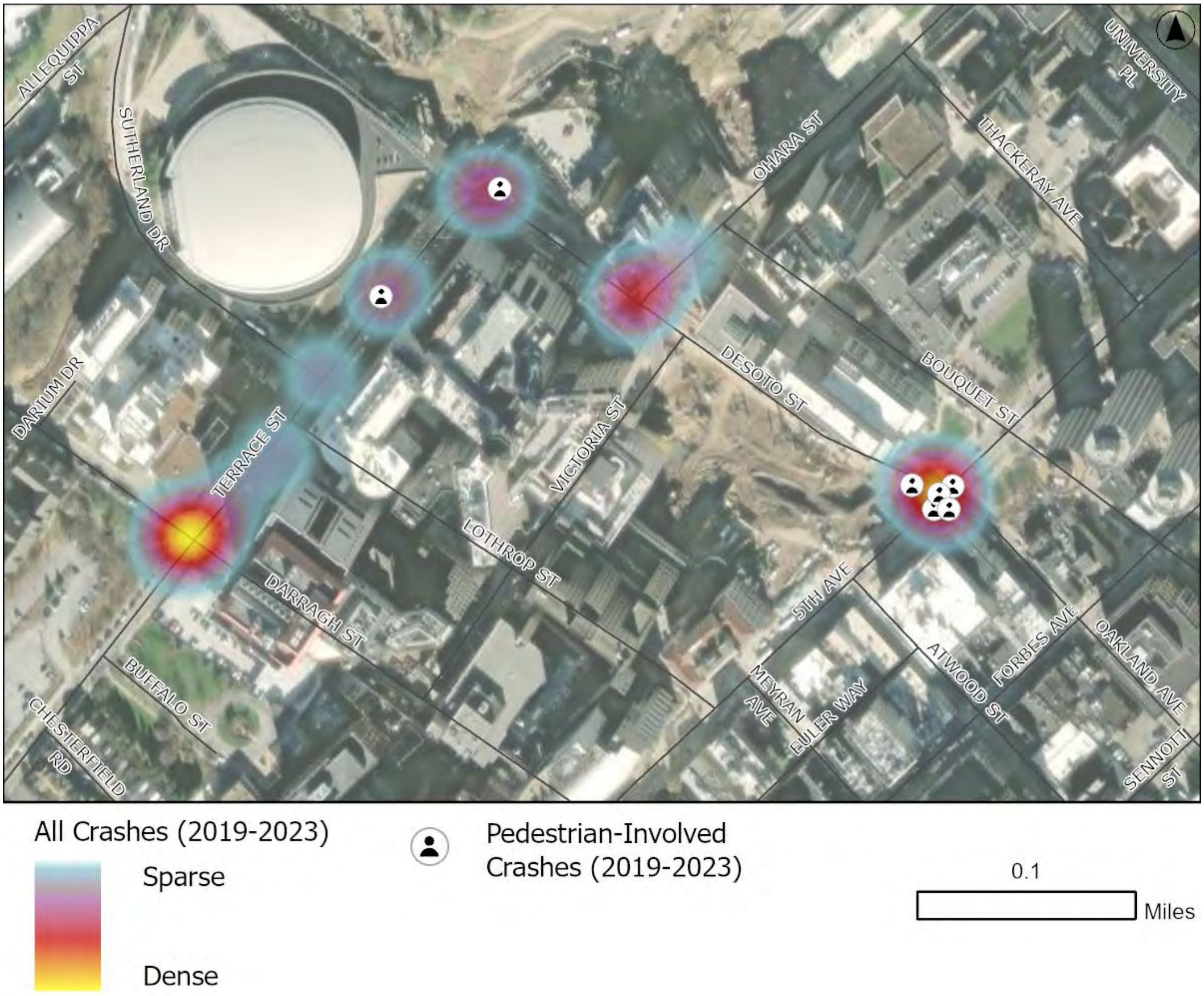

Figure 4: Heat Map of Crashes on the Study Area Corridor

Figure 5 displays the locations of the highest number of pedestrian-vehicle conflicts. These locations include the east leg of De Soto Street and O'Hara Street, the middle crosswalk at Terrace Street and Lothrop Street, the bend at Terrace Street, and the west and south legs of Terrace Street and Darragh Street. Within the Terrace Street bend, as many as 6 pedestrians were observed to cross within a 15-minute period during the field assessment.

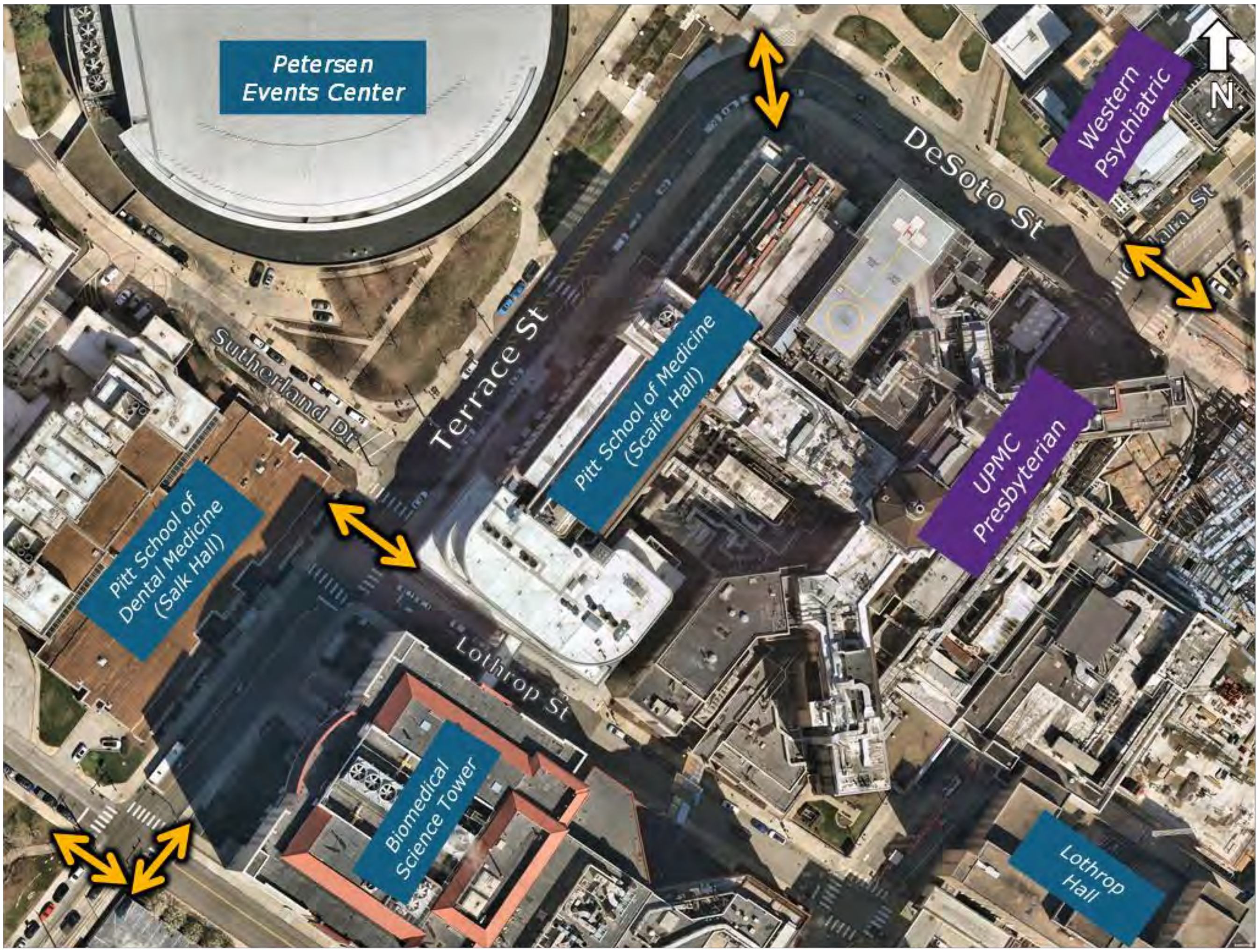

Figure 5: Locations with Highest Pedestrian-Vehicle Conflicts

Data collected for this study indicates that there is relatively high vehicle compliance with speed limits and traffic control. However, anecdotal accounts, near-miss event data, and field observations indicate that pedestrian behavior is a contributing factor in safety concerns. Behaviors such as jaywalking, non-compliance with traffic control, and the presence of e-bikes and e-scooters traveling in unexpected ways on the corridor (on the sidewalks and in the opposing travel lanes) make the corridor more unsafe for all travel modes.

Table 1 on the following page summarizes the existing conditions by location.

Table 1: Existing Conditions Summary

	Fifth Ave and De Soto St	De Soto St and O'Hara St	De Soto St / Terrace St Bend	Terrace St Midblock Crosswalk	Terrace St and Lothrop St/ Sutherland Dr	Terrace St and Darragh St
Limited Sight Distance		X	X		X	X
Number of Crashes (2019-2023)	7	5	3	1	4	9
Number of Pedestrian Involved Crashes (2019-2023)	5	-	1	1	1	-
Vehicle-Pedestrian Conflicts	X	X	X	X	X	X
Pedestrian Behavior Challenge	X	X	X		X	
Insufficient Lighting at Night			X	X	X	X
Number of Driveways	-	2	3*	-	-	-
Lack of ADA-Sufficient Ramps		X			X	X
Conflicting Shuttle Stops		X				X
Driver Behavior Challenges	X	X	X	X	X	X
Overabundance of Signage	X	X		X	X	X
Parking Concerns		X	X	X	X	X

*includes all UPMC Western Psychiatric Hospital (WPIC) parking garage driveways

Stakeholder Input

Throughout the duration of this study, stakeholders were engaged to provide feedback regarding safety concerns on the corridor and on proposed concepts. University of Pittsburgh stakeholders expressed various concerns regarding the existing conditions around campus. Primary issues included driver inattention, pedestrian safety at crosswalks, and confusion caused by excessive signage, which creates visual noise. There have been reports of scooter and bicycle conflicts with pedestrians on sidewalks, highlighting the need for improved safety measures. Signal timing issues at pedestrian crossings, particularly at O'Hara Street and Darragh Street, were also noted, with stakeholders pointing out the ineffectiveness of "Do Not Walk" indications at some intersections and pedestrian noncompliance with traffic signals. Additionally, poor parking signage and a lack of enforcement, especially along the Terrace Street bend, leads to unsafe sight distance restrictions. Stakeholders emphasized the importance of clearly marked and controlled spaces for all users, including pedestrians, cyclists, and vehicles. The risk posed by existing infrastructure, such as hazardous shuttle stops obstructing pedestrian pathways and intersections were also significant concerns.

Stakeholder meetings were also conducted with DOMI, UPMC, and Pitt Shuttle operators. During these meetings, the project team presented the safety findings during the existing conditions phase. Stakeholders validated the existing concerns and provided additional information and context for other observations. Additionally, these stakeholders expressed interest in partnering with the University to implement recommendations upon the completion of this study.

Once recommendations were developed, the project team met with the University of Pittsburgh stakeholders again to present improvements at each intersection along the corridor. Overall, stakeholders were in alignment with the proposed recommendations and provided additional considerations for implementation.

TOOLBOX OF IMPROVEMENTS

To address the safety challenges on the corridor, a toolbox of improvements was developed. These improvements were selected because they are easily implementable and effective in addressing the existing challenges. **Table 2** describes the improvements within this toolbox and includes the following for each improvement type:

- ***Safety Concern –*** Describes how the proposed improvement addresses one of the safety concerns mentioned in the existing conditions summary.
- ***Location –*** A location within the study area where this improvement is recommended for implementation.
- ***Cost –*** Ranked from $ to $$$. These are high-level planning estimates used for implementation.

    $ - little design effort anticipated, quick build, and simple implementation
    $$ - Higher construction and design costs, quick build, less complex installation but may include new technologies
    $$$ - may require extensive design, construction, and coordination

- ***Effectiveness –*** The expected crash reduction upon implementation.

Table 2: Toolbox of Improvements

Improvement	Safety Concern	Location	Cost	Effectiveness
Signalized Intersections				
No Turn on Red Signage	Protects pedestrians by reducing collisions between pedestrians in a crosswalk and vehicles turning right at a red light.	All signalized intersections	$	**3%** reduction in all crashes[2]
Leading Pedestrian Intervals (LPIs)	A signal timing change that gives pedestrians a 3-7 second head start to enter the intersection. This improves the visibility of pedestrians in the intersection and emphasizes their right-of-way to turning vehicles.	All signalized intersections	$	**13% reduction** in pedestrian-vehicle crashes at intersections[1]
Signal Infrastructure	Update existing, out-of-date signal infrastructure (including signal heads, poles, pedestrian push buttons, pedestrian countdown timer) to meet current standards. This would include retroreflective backplates and ADA-accessible pedestrian push buttons.	All signalized intersections	$$$	**15% reduction** in total crashes[1] **70% reduction in pedestrian crashes** with the installation of pedestrian countdown timers
Unsignalized Intersections				
Rectangular Rapid Flashing Beacon (RRFB)	Pedestrian-activated flashing LED lights, typically mounted on existing crosswalk signage, that alert drivers to pedestrians entering a crosswalk.	Terrace St Midblock Crossing Terrace St and Lothrop St/Sutherland Dr	$$	**47% reduction** in pedestrian crashes and potential to increase yielding vehicles to 98%[1]
Raised Crossings	Ramped speed tables that allow pedestrians to cross at grade with the sidewalk. This increases pedestrian visibility by bringing them in line with drivers' eyesight.	Midblock Terrace St Crossing	$$	**30% reduction** in all crashes[2]

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[1] https://highways.dot.gov/safety/proven-safety-countermeasures
[2] https://safety.fhwa.dot.gov/ped_bike/tools_solve/fhwasa18041/fhwasa18041.pdf

Improvement	Safety Concern	Location	Cost	Effectiveness
Curb Extensions	A sidewalk extension that shortens the distance and time it takes to cross the street. They can be used at corners or mid-block and can be built with paint, bollards, planters, or concrete.	De Soto St and O'Hara St Terrace St and Lothrop St/Sutherland Dr	$$	Crash reduction has not been widely studied yet but are expected to have safety benefits. For example, pedestrian refuge islands which reduce crossing distance have a 56% reduction in pedestrian crashes[1]
Traffic Calming				
Left-Turn Hardening	The use of modular curbs or in temporary cases, vertical delineators and striping, at intersections to prevent "corner-cutting". Left-turn hardening guides vehicles into the receiving lane and reduces turning speeds.	De Soto St and O'Hara St	$	**46% reduction** in all crashes[3]
Pavement Markings	Markings on roadways or sidewalks that direct traffic, encourage vehicles to slow down, or alert pedestrians to changing conditions.	Along study corridor	$	High-visibility crosswalks and additional signage/pavement markings can reduce pedestrian crashes up to **42%**[1]
Daylighting	Reducing the amount of allowable parking closest to the curb is called daylighting. This increases the visibility of pedestrians within a crosswalk or in an intersection.	Terrace St and Darragh St Midblock Terrace St Crossing Terrace St Bend	$	**30% reduction** in pedestrian crashes[2]
Multimodal Infrastructure	Designated travel areas for cyclists and scooter users removes them from vehicle lanes and sidewalks, reducing conflicts between different modes.	De Soto St from O'Hara St to Midblock Crossing	$$$	Bicycle lane additions can **reduce crashes up to 30%**[1]

[3] https://www.arlingtonva.us/Government/Programs/Transportation/Vision-Zero/Tools-and-Guidelines/Multimodal-Safety-Engineering-Toolbox-Web-Format/Hardened-Centerlines-and-Turn-Wedges

CORRIDOR RECOMMENDATIONS

The following section describes the recommended improvements identified for each study area location throughout the corridor. These recommendations are split into short-term, mid-term, and long-term recommendations based on cost and ease of implementation. Each set of recommendations build upon each other. Thus, recommendations in the short term, will still be applicable in the mid-term, and so on. Additional details and assumptions on cost are included in the later Additional Considerations section.

No single safety recommendation can fully address all safety concerns, so a multifaceted approach is essential to reduce the risk of failures. Pedestrian and driver education, while valuable, is insufficient by itself to alter user behavior. It is necessary to implement recommendations that not only promote safer behaviors but also counteract current risky practices, such as crossing outside of a marked crosswalk, which will likely continue despite additional education.

The implementation timeline is defined as the time when the University or project partners should *begin* the process to implement recommendations. Short-term improvements should be expected to begin within the next year (2025), mid-term improvements should be expected to begin within the next two to three years (2026-2027), and long-term improvements should be expected to begin beyond the next three years (2027+). This implementation timeline was developed with the goal of appropriately spreading out resources and funding. However, the University and project partners should feel empowered to implement recommendations as they see fit and as funding allows.

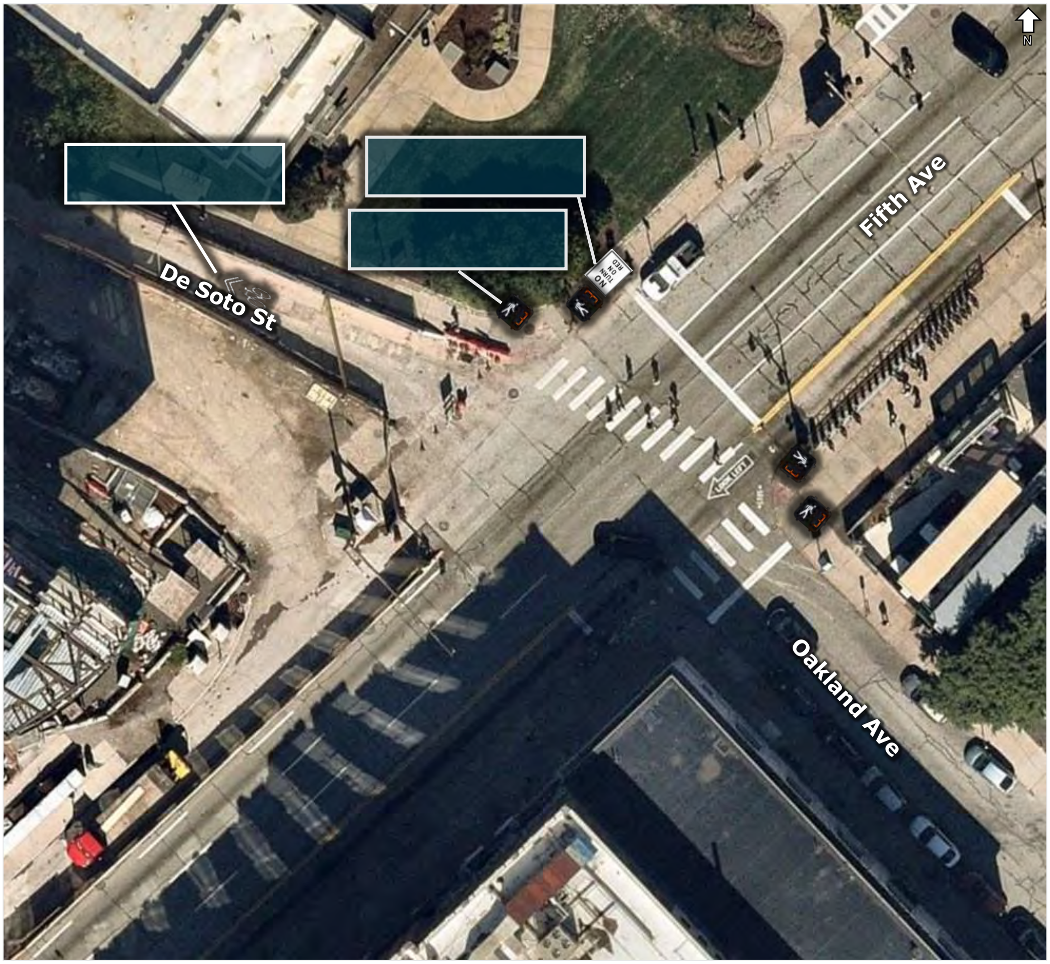
Intersection 1 – De Soto Street and Fifth Avenue

Existing Conditions Observations

- Fifth Avenue is a multi-lane, high volume arterial road that acts as a crucial spine street for the Oakland neighborhood. De Soto Street is characterized by its steep grade and has fewer vehicles. Both streets have high pedestrian volumes.
- During September 2024, one lane of Fifth Avenue and the entirety of De Soto Street were closed to vehicles due to construction. This led some pedestrians to take unsafe detours, such as walking in traffic lanes on Fifth Avenue. In general, pedestrians often ignore signage and safety warnings, opting for the most convenient routes.
- Cyclists and scooter users avoid Fifth Avenue's high speeds by using the sidewalks, creating potential conflicts with pedestrians.

Recommendations

Short-Term

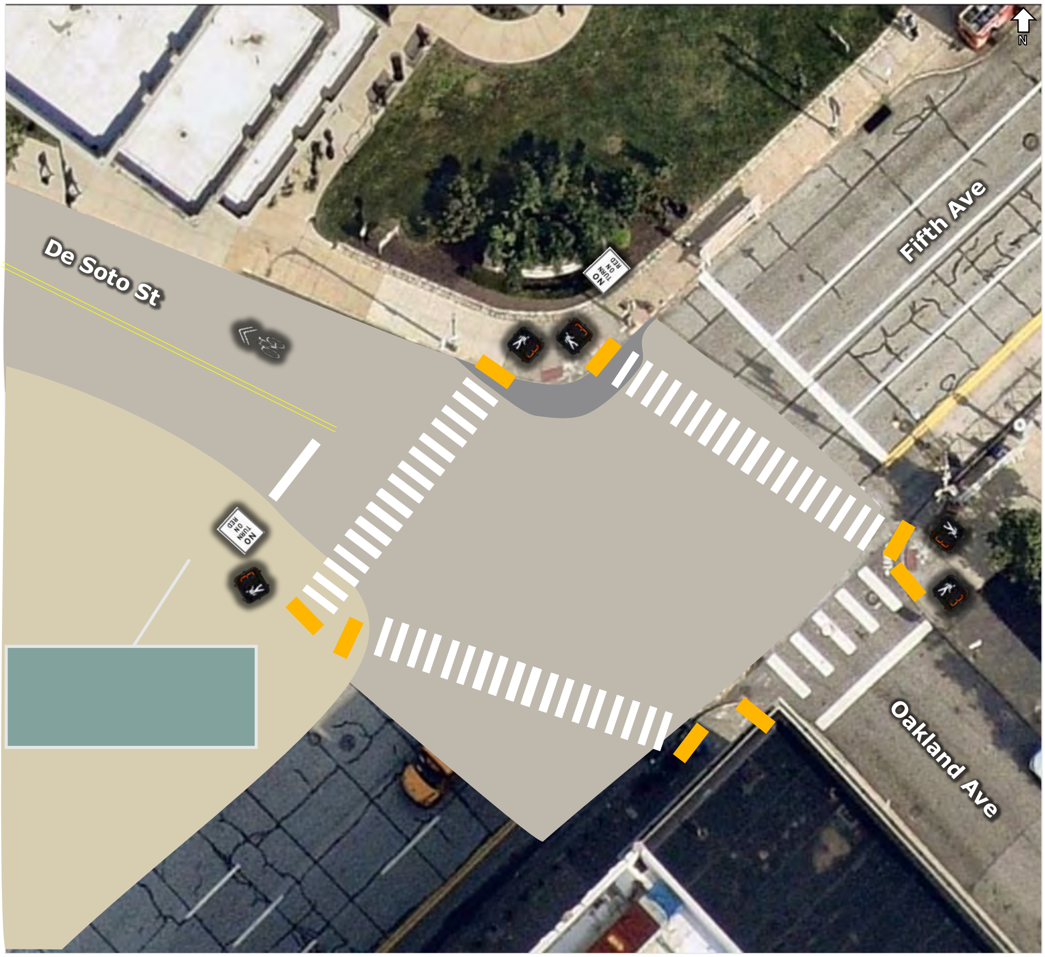


Pedestrian compliance with traffic signs/signal is a challenge along the entire study corridor. At the intersection of Fifth Avenue and De Soto Street/Oakland Avenue, a leading pedestrian interval (LPI) is recommended to increase the visibility of pedestrians in the intersection. Additionally, coupling the LPI with additional ‘No Turn on Red’ signage along Fifth Avenue reduces the potential for pedestrian-vehicular conflicts. Lastly, bicycle sharrow markings should be installed to direct multimodal users to use the traffic lane, rather than the sidewalk. The bicycle sharrow markings should be installed with the appropriate bicycle signage to warn drivers.

Cost: Approximately $7K - $8K

Additional Considerations: These short-term recommendations are to be implemented while the UPMC Bed Tower is still under construction. Coordination with the City will be necessary to implement signage and signal timing changes. These recommendations will still be applicable after the completion of the UPMC Bed Tower.

Mid-Term



The mid-term recommendations assume the UPMC Bed Tower is finished and the new configuration of the intersection of Fifth Avenue and De Soto Street is complete. The new configuration of the intersection removes the existing channelized right turn and replaces it with an extended sidewalk/pedestrian area and also adds a new high visibility crosswalk across Fifth Avenue. In addition to the reconfiguration of the southwest corner, curb bump outs are recommended in the northeast corner to provide additional space for pedestrians waiting to cross. The curb bump-outs would extend to the edge of the existing parking lane, ensuring no impact on traffic. The curb bump out may deter drivers who attempt to make a right turn on red despite the ‘No Turn on Red’ signage.

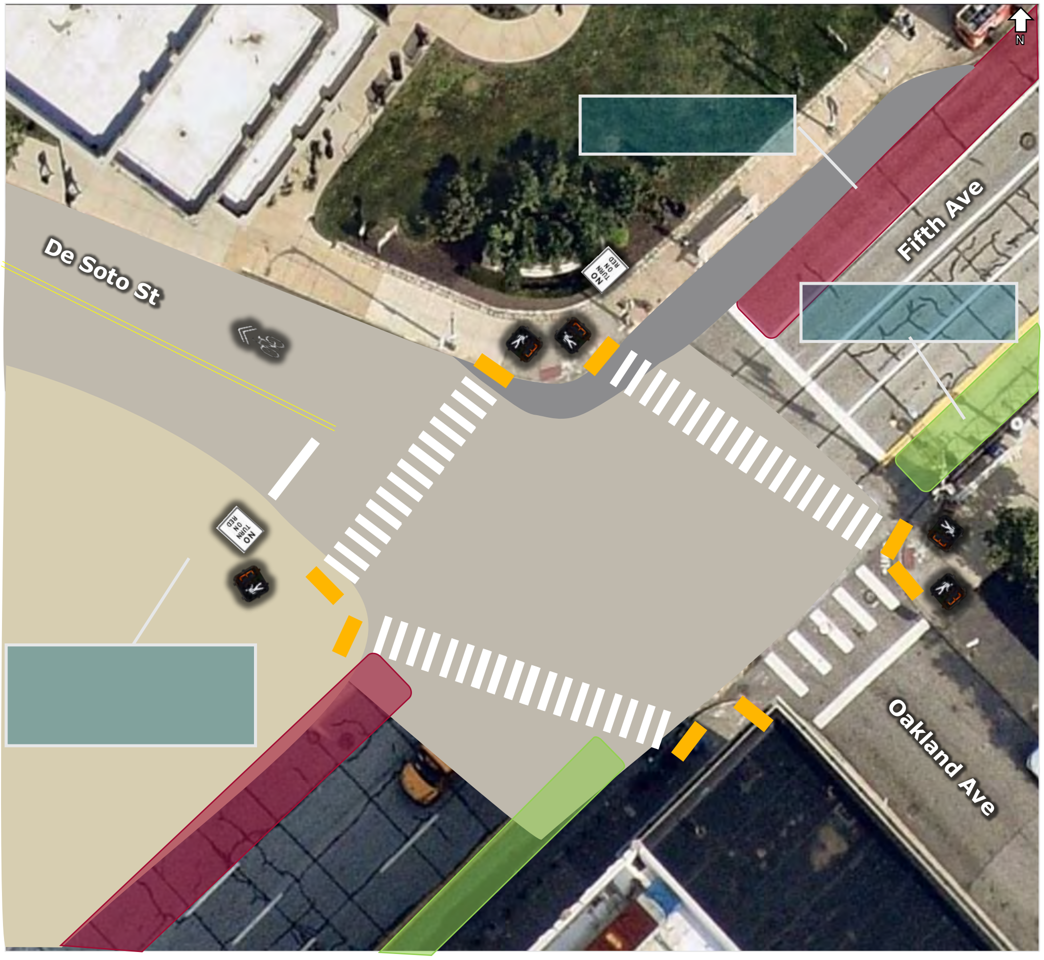
Cost: Approximately $41K - $47K

Additional Considerations: Coordination with the City will be necessary to install curb bump outs. These recommendations will still be applicable after the completion of the UPMC Bed Tower.

Long-Term

Building on the mid-term improvements, in the long-term, the future Pittsburgh Regional Transit (PRT) Bus Rapid Transit (BRT) Line through Oakland will be complete. This long-term scenario is the result of the Bus Rapid Transit project. The Bus Rapid Transit project includes a dedicated two-way cycle track to be built on Fifth Avenue as recommended in the Oakland Plan. This cycle track will provide a separated space for bicycles and scooters to safely travel through Oakland, thereby reducing the potential conflicts between bicycles and drivers as well as bicycles and pedestrians.

Cost: Funded through the PRT Bus Rapid Transit Project.



Additional Considerations: The rendering above displays what the proposed recommendations will look like once the Bed Tower Construction and BRT project is complete. Coordination between the City, PRT, and UPMC will be necessary. Supporting the implementation of the future BRT and cycle track infrastructure on Fifth Avenue is expected to have minimal cost to the University.

De Soto Street between Fifth Avenue and O'Hara Street

Existing Conditions Observations

- De Soto Street has two garage driveways near O'Hara Street without clear pavement markings or grade changes, making them difficult to distinguish for pedestrians. This lack of signage poses a safety hazard as pedestrians may unknowingly step into driveway entrances of the Public Health Building parking garage.
- The sidewalk is 8 feet wide and the grade increases steeply up to 13% grade near the Petersen Events Center, earning the nickname "Cardiac Hill".
- Due to the steep grade, alternative ADA-accessible routes are necessary for disabled individuals and those with strollers.

Recommendations

Short-Term

As pedestrians travel uphill from Fifth Avenue towards O'Hara Street, there are two garage driveways. As noted in the existing conditions assessment, there is limited sight distance entering and exiting the garages and there no signage or pavement markings denoting that a pedestrian is entering an active driveway. In the short term, it is recommended to install pedestrian warning stickers on the sidewalks to alert pedestrians of the oncoming driveway. Additionally, pedestrian detectable warning surfaces may be installed to improve accessibility and provide an additional way of alerting pedestrians of the oncoming garage driveway.

Cost: Approximately $9K - $11K

Additional Considerations: Throughout the corridor, illegal parking and double parking was observed during the existing conditions assessment. Upon completion of the UPMC Bed Tower, and when De Soto Street is open for traffic in both directions, it is recommended that the University and the City reevaluate allowable parking and ensure parking restrictions are clearly signed and marked. Any parking that may cause sight distance challenges are recommended to be removed and curbs to be painted yellow. These improvements will mainly require internal University coordination. The pedestrian detectable warning surface is largely a recommendation to provide an additional method of alerting pedestrians that they are approaching a curb, mainly through a tactile measure. The University and City may take liberty in deciding what method best suits the character and standards they have internally developed. This may include using pavers along the driveway apron or other tactile surfaces.

Mid-Term

An audio-visual alert system may be installed in the mid-term to enhance awareness of oncoming vehicles. This system will complement the visual cues recommended in the short-term by audibly alerting pedestrians that a car is approaching the driveway. Many garage operators throughout the United States have implemented similar technology to alert pedestrians and increase safety.

Cost: Approximately $16K - $20K

Additional Considerations: The implementation of an audio-visual alert system will mainly require internal University coordination given it is a University-owned garage.

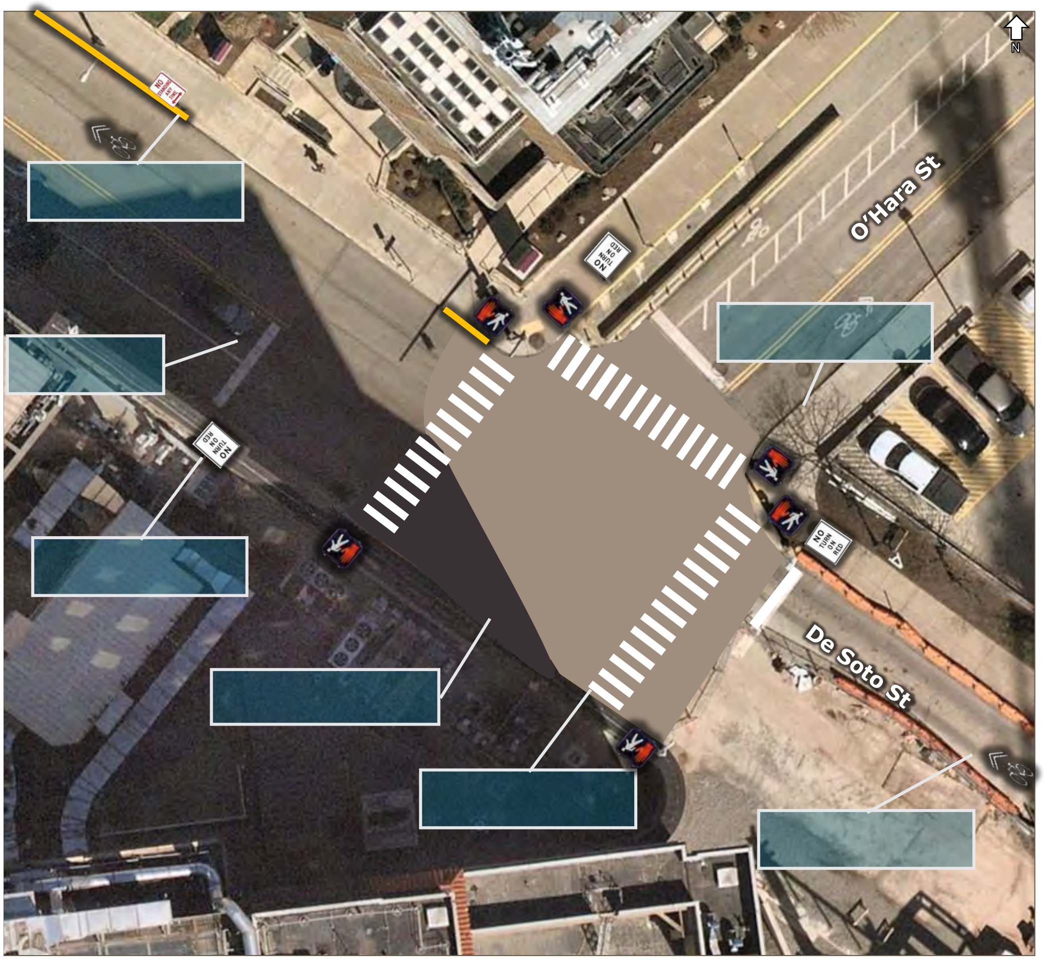
Intersection 2 – De Soto Street and O'Hara Street

Existing Conditions Observations

- Construction closures limit vehicle and pedestrian movements and relocate the UPMC Presbyterian's emergency ambulance entrance.
- The lack of communication about the need to press the pedestrian signal button, combined with long signal cycles, often results in pedestrians ignoring traffic signals.
- The protected left-turn phase for southbound vehicles is not clearly visible to northbound pedestrians, who often assume that they may cross upon seeing the red light restricting northbound vehicles. This creates confusion for drivers and increases risk.
- Increased use of e-bikes and e-scooters has introduced higher-speed differentials along the corridor, with many users exhibiting unsafe behaviors like using the wrong lanes and sidewalks.
- An unmarked UPMC shuttle stop on O'Hara Street causes vehicle blockages that spill into crosswalks and intersections, forcing pedestrians to navigate around idling cars and impacting overall safety and vehicle movement.

Recommendations

Short-Term



One of the biggest challenges at the De Soto Street and O'Hara Street intersection is a lack of pedestrian compliance with traffic signals and signs. Pedestrians were observed to cross O'Hara Street regardless of the signal phasing. This is in part due to the long cycle length at this intersection. Thus, it is recommended to retime the signal phases at this intersection to shorten the cycle length and change the pedestrian phases to be concurrent with the adjacent vehicle movement rather than having a separate 'pedestrian scramble' phase. This would align better with pedestrian expectations given how adjacent intersections operate and increase the frequency at which the pedestrian phase comes up.

Implementing pedestrian recall (automatically calls for the pedestrian phase without having to use the push button) and a leading pedestrian interval are also recommended. Finally, changing the southbound left-turn phase from leading to lagging in the signal sequence could reduce vehicle-pedestrian conflicts because the majority of pedestrians would clear the O'Hara Street crossing earlier in the cycle.

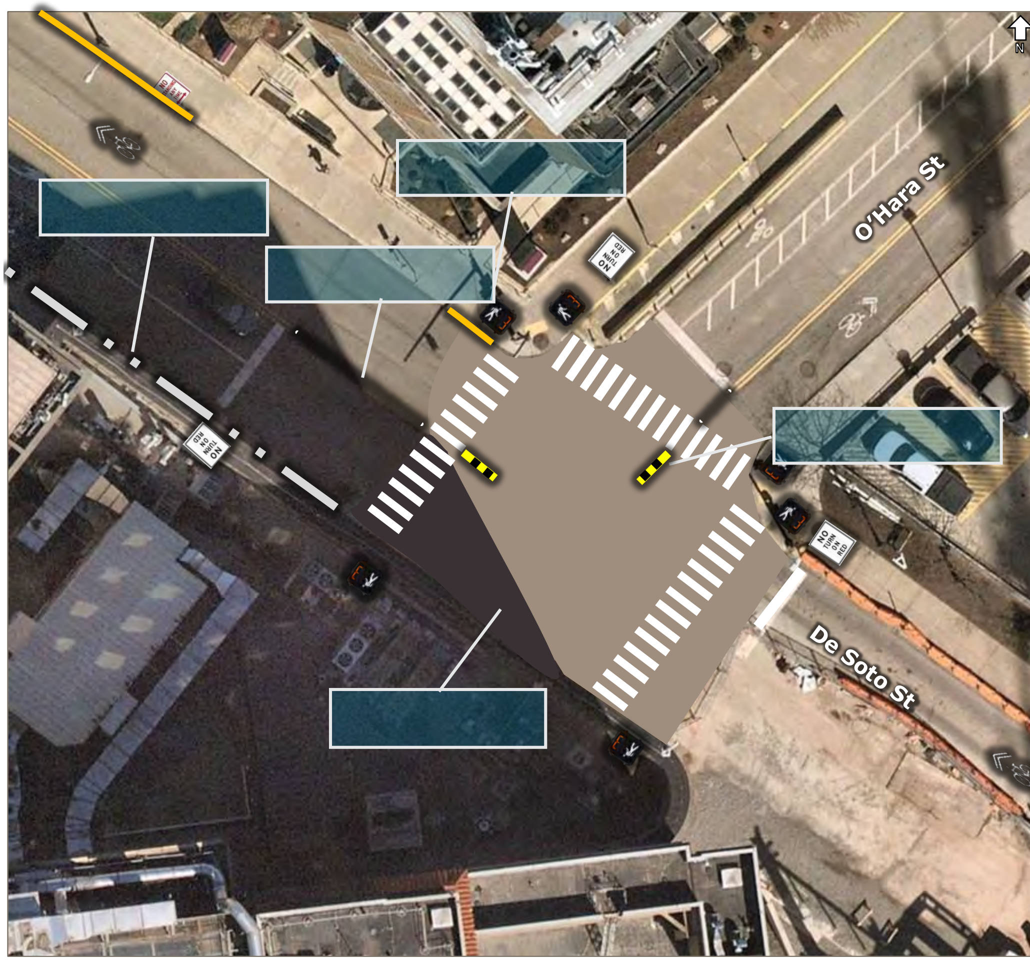
No Turn on Red signs should be installed given sight distance issues to reduce the number of potential pedestrian and vehicular conflicts. Pavement markings, such as yellow "No Parking" curb markings and high-visibility crosswalk markings should be refreshed. Lastly, the existing UPMC Shuttle Stop located on the northeast corner of the intersection should be moved to the intersection of O'Hara Street and S Bouquet Street to reduce vehicle backups that extend across the crosswalks and into the intersection, which often leads to pedestrians crossing in front of or behind shuttle busses and vehicles in the crosswalk.

The No Turn on Red signs and LPI were implemented in December 2024.

Cost: Approximately $32K - $36K

Additional Considerations: Coordination between the University, UPMC and the City will be required to implement recommendations.

Mid-Term

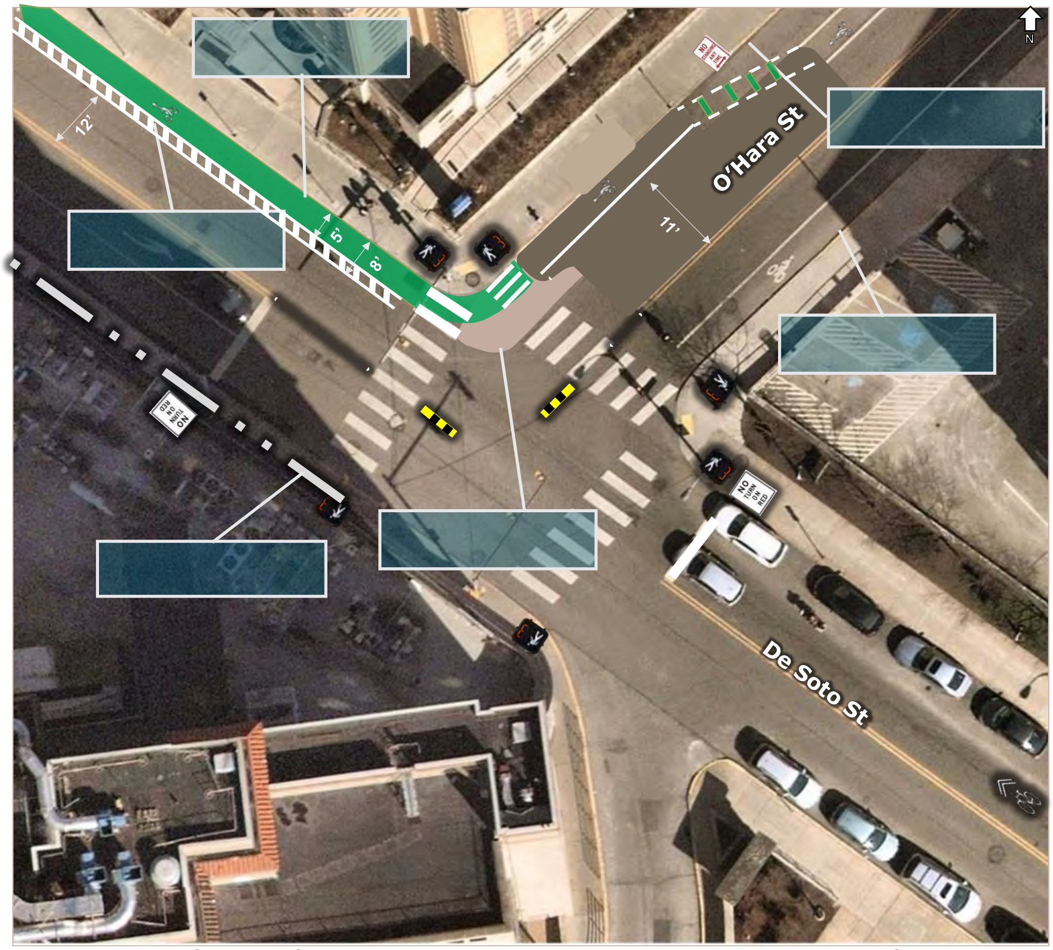


In the mid-term, all signal equipment, including enhanced pedestrian walk timers are recommended to be installed. Updated signal equipment should include retroreflective backplates for better visibility to drivers. A pedestrian walk timer will display the number of seconds pedestrians are left for a pedestrian to finish crossing the street. These timers will allow pedestrians to make informed decisions on whether to start crossing based on the remaining time, thus potentially reducing jaywalking and increasing safer crossing behavior. Installing fencing along the eastern side of De Soto Street could also reduce the potential for jaywalking. This fencing, similar to the existing fencing along Fifth Avenue, would extend towards the Petersen Events Center, stopping once parking is permitted. Lastly, left-turn hardening infrastructure such as flexible delineators and modular curbs, may be installed to reduce left-turning speeds and to guide vehicles into the receiving lane. This places drivers nearly perpendicular to the crosswalk, reducing the potential for conflict between turning vehicles and pedestrians.

Cost: Approximately $81K - $93K

Additional Considerations: Coordination between the University, UPMC and the City will be required to implement recommendations. The fencing proposed along the western side of De Soto Street is largely a recommendation to guide pedestrians to use marked crosswalks and discourage crossing at unmarked locations. The University may take liberty in deciding what method best suits the character and standards they have internally developed. This may include temporary barriers, planters, or bollards that better suit the vision of what campus should look like, however, a continuous barrier is important because any gaps would reduce the effectiveness of the measure. AutoTURN Vehicle Swept Path Analysis was conducted to assess the feasibility of vehicles navigating the intersection with the proposed left-turn hardening measure. The design vehicle that was evaluated was an AASHTO S-BUS-36 to represent the Pitt Shuttle Bus. Limits of left-turn hardening will need to be further evaluated at the design stage to avoid introducing conflict with Pitt Shuttle routes that turn at this intersection.

Long-Term



The long-term recommendations were developed based on the recommendations developed as part of the 2022 Oakland Plan. Two alternatives were proposed for a central Oakland/Pitt bicycle connection. Alternative 1 was a cycle track along Bouquet Street and alternative 2 was a cycle track on De Soto Street between Fifth Avenue to Terrace Street. Regardless of which alternative is ultimately chosen, a bicycle climbing lane along De Soto Street from O'Hara Street to Terrace Street is recommended to provide a safe place for cyclists to travel up the steep grade without conflict with vehicles. The climbing lane is a total of 8 feet wide, with 5 feet for travel and a 3-foot buffer. As a result, ADA parking along De Soto Street and O'Hara Street will need to be relocated. Lastly, a permanent curb bump out may be installed on the northeast corner of the De Soto Street and O'Hara Street intersection to provide more space for pedestrians to wait to cross. Field observations during the study noted pedestrians waiting within the street due to overcrowding. The permanent curb bump out also provides a protected, channelized turn for bicyclists to connect between the bicycle lanes on O'Hara Street and the climbing lane on De Soto Street.

Cost: Approximately $164K - $184K

Additional Considerations: The Oakland Plan recommended no significant changes to existing roadway geometry should be made until the construction of the UPMC Bed Tower is completed. Coordination with PRT may also be needed as draft plans for its Bus Line Redesign indicate additional bus routes could navigate this intersection in the future. Vehicle turns, similar to those related to left-turn hardening, should be further considered during the design stage.

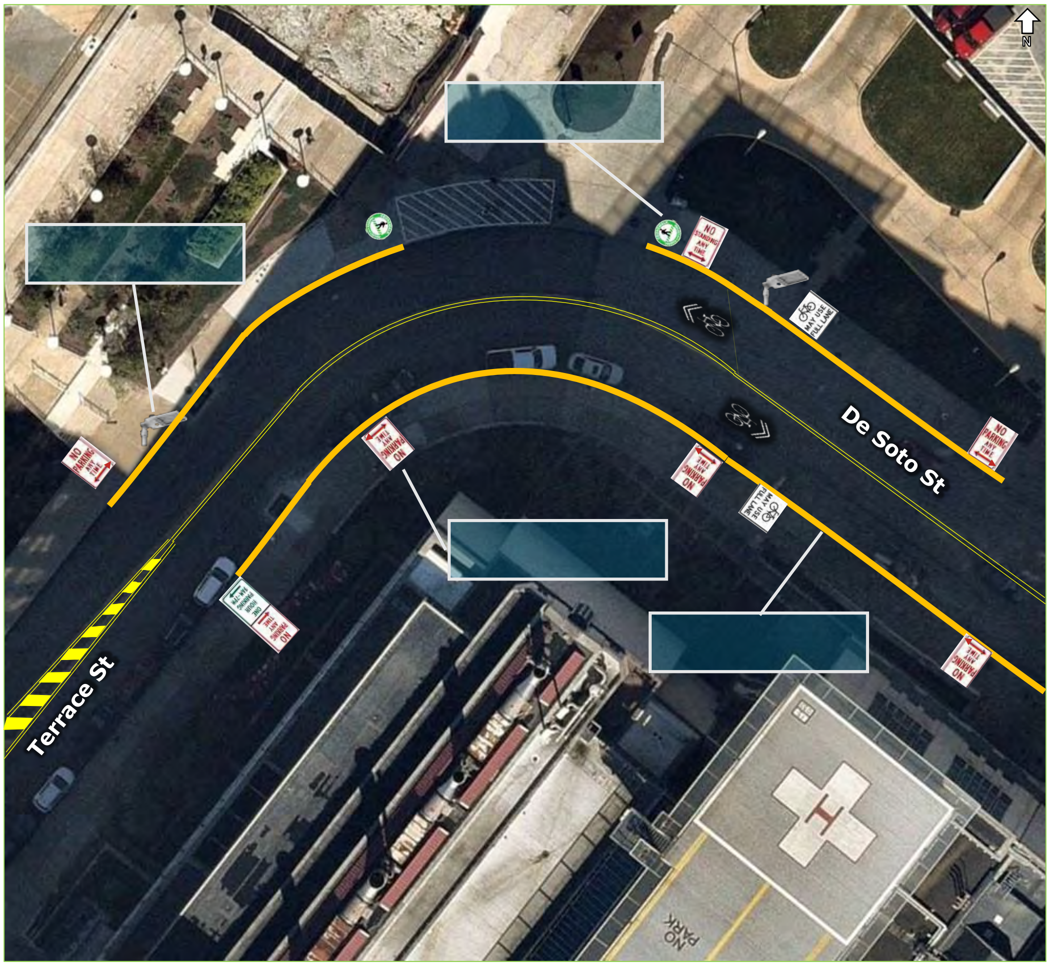
Terrace Street and De Soto Street Bend

Existing Conditions Observations

- The bend in the roadway from De Soto Street to Terrace Street, roughly 300 feet north of O'Hara Street, poses a significant challenge for pedestrians due to its steep grade, resulting in decreased awareness of their surroundings.
- An average of six pedestrians cross at this location every 15 minutes during peak periods, outside of designated crosswalks, with potential future expansions likely to increase this unsafe activity.
- Vehicle queues from De Soto Street to O'Hara Street back up to the curve, leading to potential conflicts, especially when visibility is obstructed by illegally parked cars, causing safety issues; near-miss events have been observed.
- Illegal parking in front of WPIC and Scaife Hall restricts sight distance for drivers, and there are multiple conflict points between pedestrians and vehicles at the driveways connecting to the WPIC parking garage.

Recommendations

Short-Term



In the existing conditions phase, the Terrace Street bend was classified as a dangerous and challenging area for both pedestrians and drivers. For pedestrians walking through the Petersen Events Center, the nearest crosswalks are approximately 250 feet or 300 feet away, depending on the direction the pedestrians are heading. As a result, pedestrians frequently cross the street at this location. The steep grade, curve, and illegal parking present along Terrace Street and De Soto Street make it difficult for drivers to see pedestrians who choose to jaywalk. The insufficient lighting along the bend is also a concern. Pedestrians who choose to cross outside of a marked crosswalk are not illuminated. The sidewalks on either side of the bend are also not sufficiently lit. It is recommended that new, LED lighting be installed. In the short term, it is recommended to improve the no parking signage and repaint all curbs where parking is prohibited to increase driver awareness. The curb repainting was implemented in December 2024. Using NO PARKING ANY TIME signs may be more explicit than the current signs that display the No Parking symbol with “or Stopping” text. Additionally, detectable warning surfaces and pedestrian warning stickers may be installed to improve awareness for pedestrians crossing the driveways of the WPIC parking garage.

Cost: Approximately $25K - $29K

Additional Considerations: Coordination between the University, UPMC and the City will be required to implement recommendations.

Mid-Term

As mentioned in the mid-term recommendations for the De Soto Street and O'Hara Street intersection, fencing is recommended along the western side of De Soto Street to guide pedestrians to a nearby crosswalk. Though driver speed limit compliance is generally high along the corridor, speed reduction markings are recommended to alert drivers of the need to slow down through the curve.

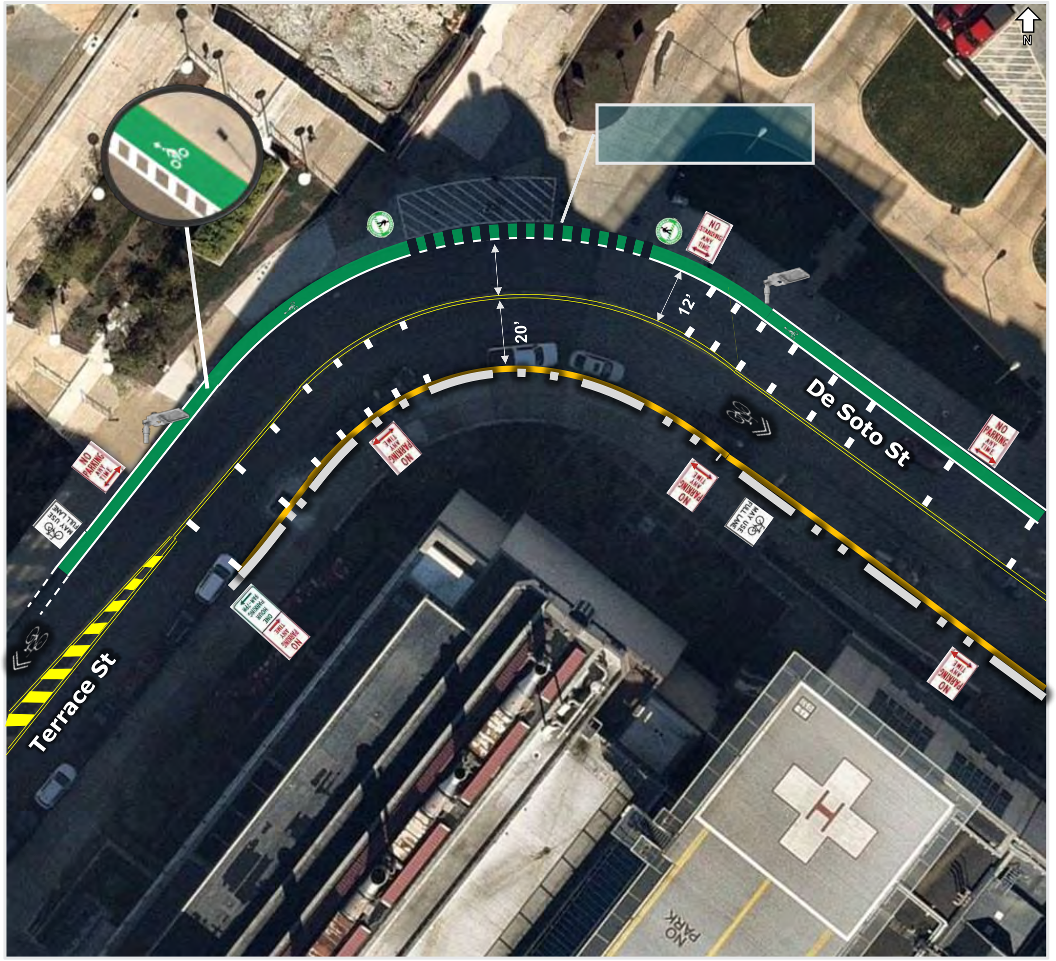
Cost: Approximately $65K - $74K

Additional Considerations:
Coordination between the University, UPMC and the City will be required to implement recommendations. The fencing proposed along the western side of De Soto Street is largely a recommendation to restrict jaywalking. The University may take liberty in deciding what method best suits the character and standards they have internally developed. This may include temporary barriers, planters, or bollards that better suit the vision of what campus should look like, however, a continuous barrier is important because any gaps would reduce the effectiveness of the measure. The fencing and associated pedestrian wayfinding signs inside or outside of the building, should be coordinated with the University's upcoming project to modify and improve the De Soto Street entrance and plaza for Scaife Hall. Additional crossing options for the mid-term or long-term that were considered and evaluated for this location are documented in the **Appendix**.

Long-Term

The long-term recommendations for the Terrace Street bend build upon the long-term recommendations for the De Soto Street and O'Hara Street intersection. The bicycle climbing lane will continue through the bend where it transitions to a shared lane for the remainder of Terrace Street.

Cost: Approximately $121K - $138K



Additional Considerations: The Oakland Plan recommended that no significant changes to existing roadway geometry should be made until the construction of the UPMC Bed Tower is completed. AutoTURN Vehicle Swept Path Analysis was conducted to assess the feasibility of vehicles navigating the curve with the reduction in travel lane width with buffered bicycle climbing lane. The design vehicle that was evaluated was an AASHTO S-BUS-36 to represent the Pitt Shuttle Bus. No concerns with the proposed improvements were observed.

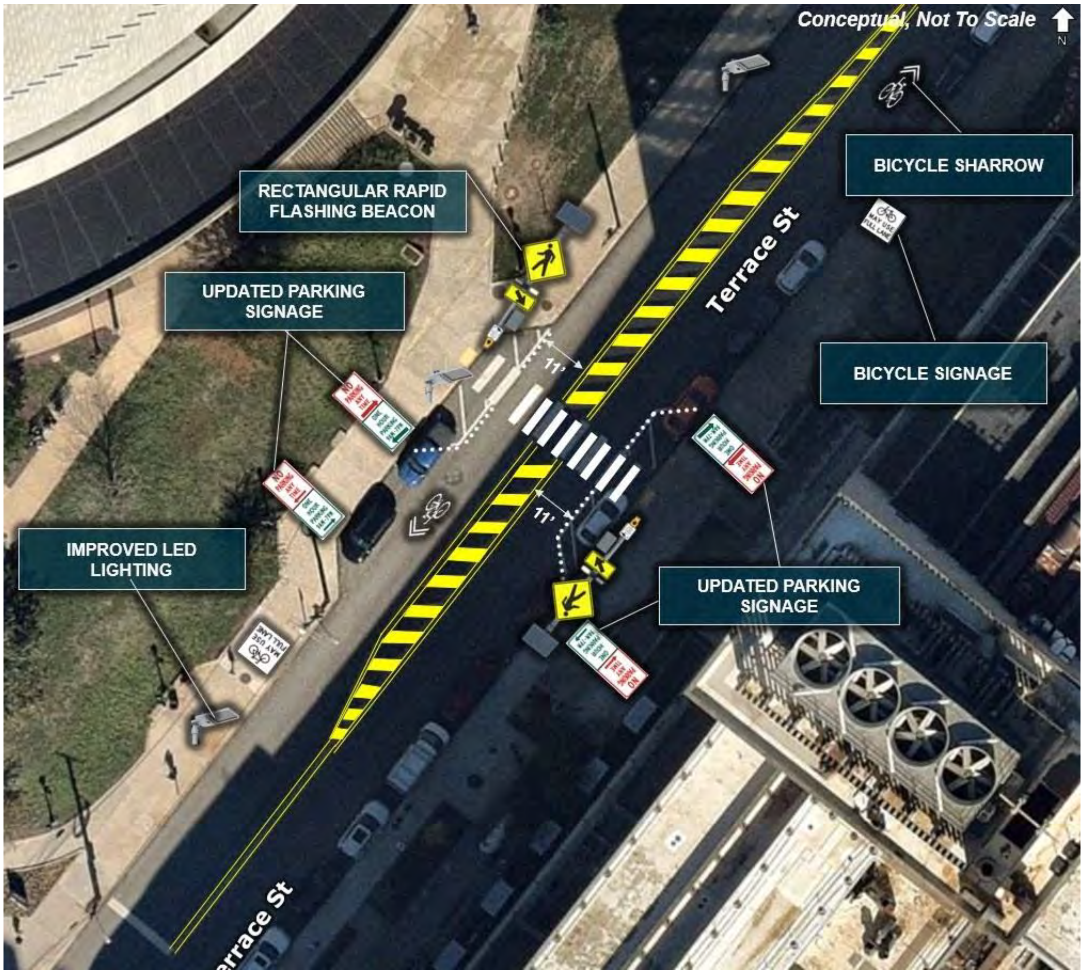
Terrace Street and Midblock Crosswalk

Existing Conditions Observations

- The midblock crossing on Terrace Street connects Scaife Hall to the ADA entrance of the Petersen Events Center, with cars often parking illegally in hatched areas, which blocks the crosswalk and poses safety concerns.
- Although parked cars did not cause traffic delays, their presence in the crosswalk area poses a safety risk as vehicles pull in and out, sometimes blocking pedestrian paths.
- Cyclists frequently did not yield to pedestrians. Existing State Law Yield to Pedestrians signs were poorly maintained or moved off the roadway.
- Insufficient lighting at night creates additional safety concerns, as existing streetlights and decorative lighting do not adequately illuminate the crossing area.

Recommendations

Short-Term



In the short term, improvements to the midblock crossing on Terrace Street are recommended to improve awareness of this crossing. Consistent with the recommendations at other areas of the corridor, parking signage and pavement markings should be improved and made more visible. As noted during the existing conditions phase, there is insufficient lighting along this stretch of the corridor as several lights were out. Thus, it is recommended to increase lighting by addressing the nonfunctioning light fixtures and to replace all cobra-head light fixtures with improved LED lighting. Near the crossing, many drivers continue to park in the hatched areas despite the No Parking signage and proximity to a crosswalk. It is recommended in the short term to install flexible delineators to restrict drivers from parking in the hatched areas. This will also provide additional separation between drivers and pedestrians waiting to cross. Lastly, to increase driver awareness to pedestrians within the crosswalk, rectangular rapid flashing beacons (RRFBs) are recommended. RRFBs consist of two, rectangular-shaped yellow indications, each with a

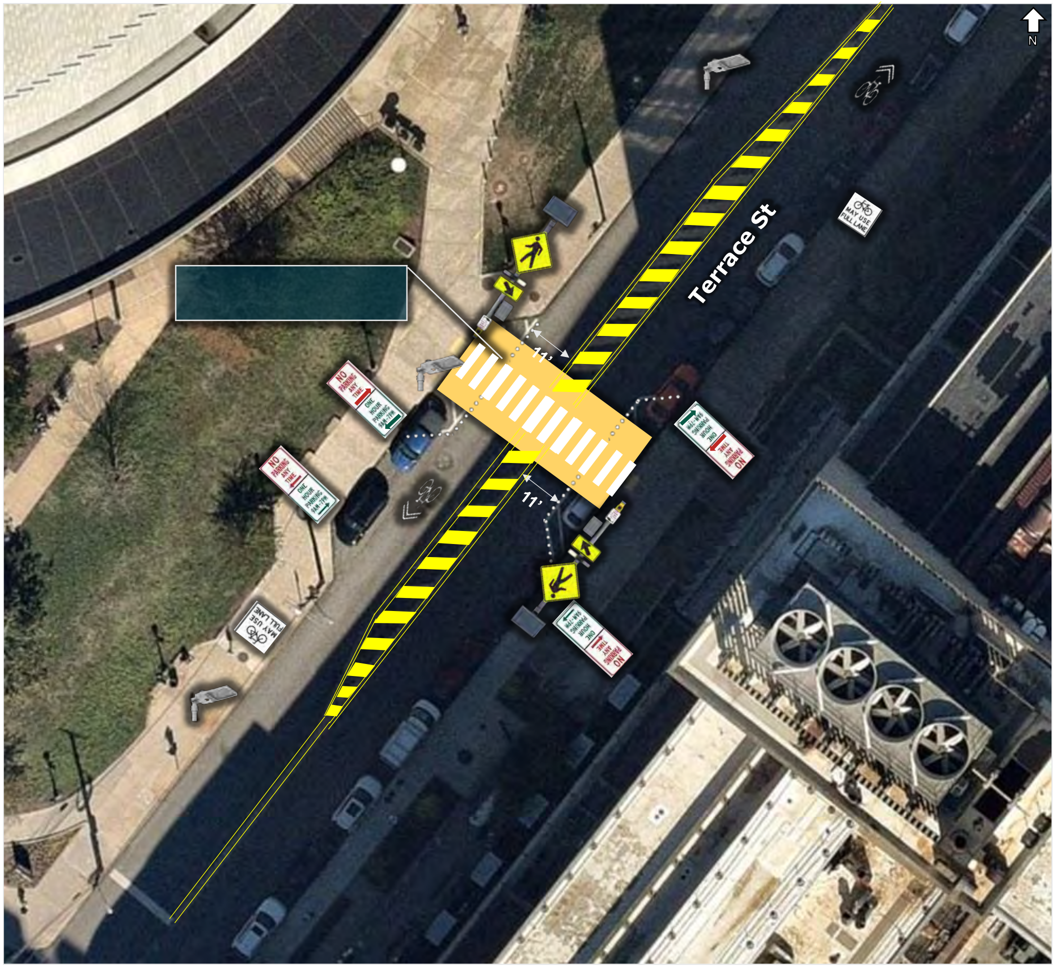
LED-array-based light source. RRFBs flash with an alternating high frequency when activated to enhance visibility of pedestrians at the crossing to drivers. These should be installed closest to the driver's side in each direction and should be dual faced. Typical RRFBs require a pedestrian to push a button in order to alert drivers. However, pedestrian compliance is a challenge along the corridor. As funding allows, the University should look to install non-actuated or automatic RRFBs to combat this challenge. As a pedestrian walks past the RRFB to cross, it will automatically alert drivers by flashing lights.

Cost: Approximately $52K - $59K

Additional Considerations: Coordination between the University, UPMC and the City will be required to implement recommendations.

Mid-Term – Option A

In the mid-term, a speed table may be installed to further improve pedestrian visibility, creating a safer crossing condition. Speed tables are midblock traffic calming devices that raise the entire wheelbase of a vehicle to reduce its traffic speed. Speed tables are longer than speed humps and flat-topped, with a height of 3 to 3.5 inches and a length of 22 feet, depending on the characteristics of the crossing location. When paired with a crossing, this is designated as a raised crosswalk.



Cost: Approximately $108K - $124K

Additional Considerations: Coordination between the University, UPMC and the City will be required to implement recommendations. Coordination with City Emergency Medical Services is also required to confirm navigability of emergency vehicles, however, this treatment has been used in other areas of the city including Bigelow Boulevard.

Mid-Term – Option B

An alternative mid-term recommendation for the Terrace Street midblock crossing includes installing permanent curb bump outs on both sides of Terrace Street. Curb bump outs or extensions visually and physically narrow the roadway, creating safer and shorter crossings for pedestrians while increasing the available space for street furniture, benches, plantings, and street trees. Additionally, a concrete median should be installed to reinforce slower driver speeds along the corridor and provide refuge to pedestrians.

Cost: Approximately $229K - $262K

Additional Considerations: There are additional maintenance implications and costs with more concrete work on the corridor. Coordination between the University, UPMC and the City will be required to implement recommendations.

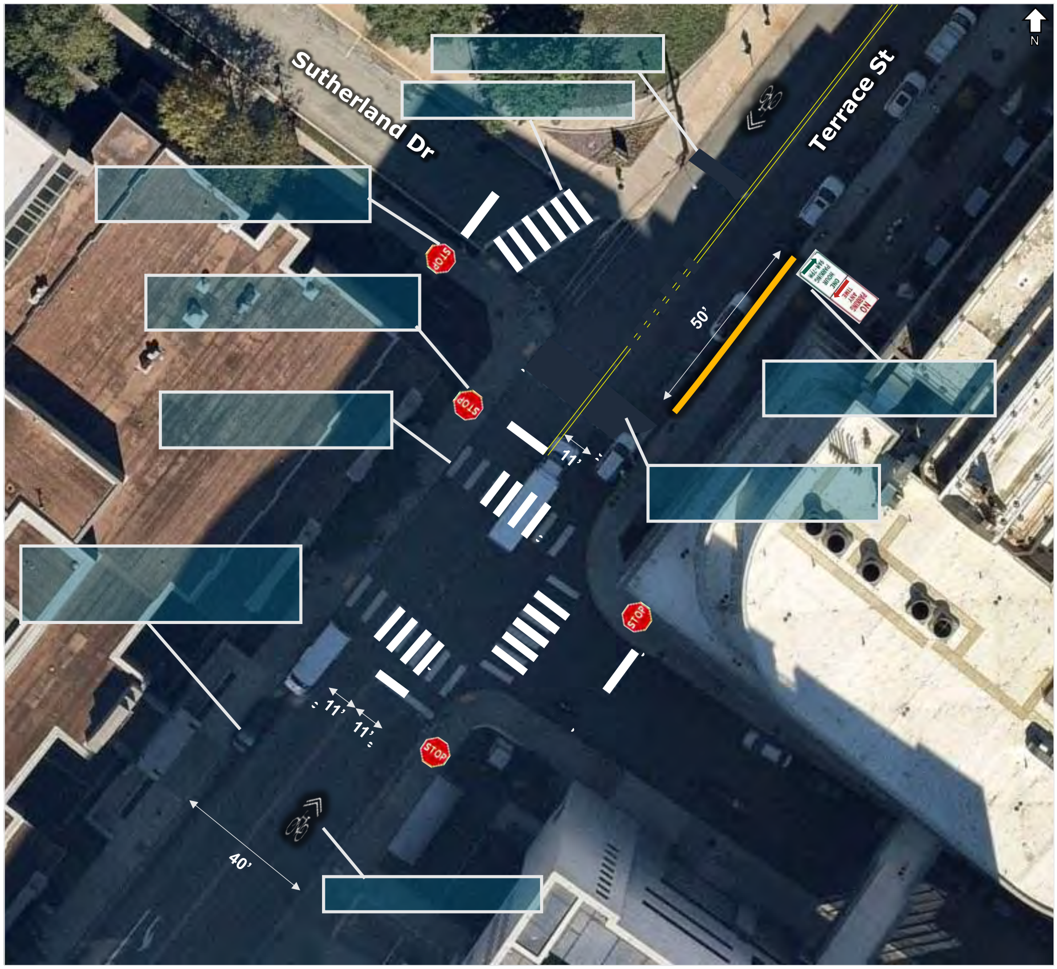
Intersections 3 and 4 – Terrace Street and Lothrop Street/Sutherland Drive

Existing Conditions Observations

- The intersections of Terrace Street, Lothrop Street, and Sutherland Drive are confusing for both drivers and vulnerable road users with three nearby crosswalks within 100 feet of each other.
- Drivers tend to exhibit two behaviors: speeding through the intersection due to confusion or cautiously navigating due to crosswalks.
- Inconsistent stop control on Terrace Street makes it difficult for drivers to predict other vehicle movements, particularly between Sutherland Drive and Lothrop Street.
- Limited visibility due to steep grades and wayfinding signage complicates pedestrian and vehicle maneuvering, especially for northbound traffic on Lothrop Street.
- Pedestrians often cross outside of crosswalks or while vehicles are moving through the crosswalks, creating unpredictability and potential conflicts with drivers.
- Cyclists frequently disregard stop signs at Sutherland Drive and Lothrop Street.
- The UPMC Garage C entrance and a nearby bus shelter create traffic congestion. Shuttles and vehicles often block lanes while picking up or dropping off passengers.
- Congestion and start-stop traffic, especially during peak periods, frustrate drivers and can increase the risk for pedestrians.

Recommendations

Short-Term



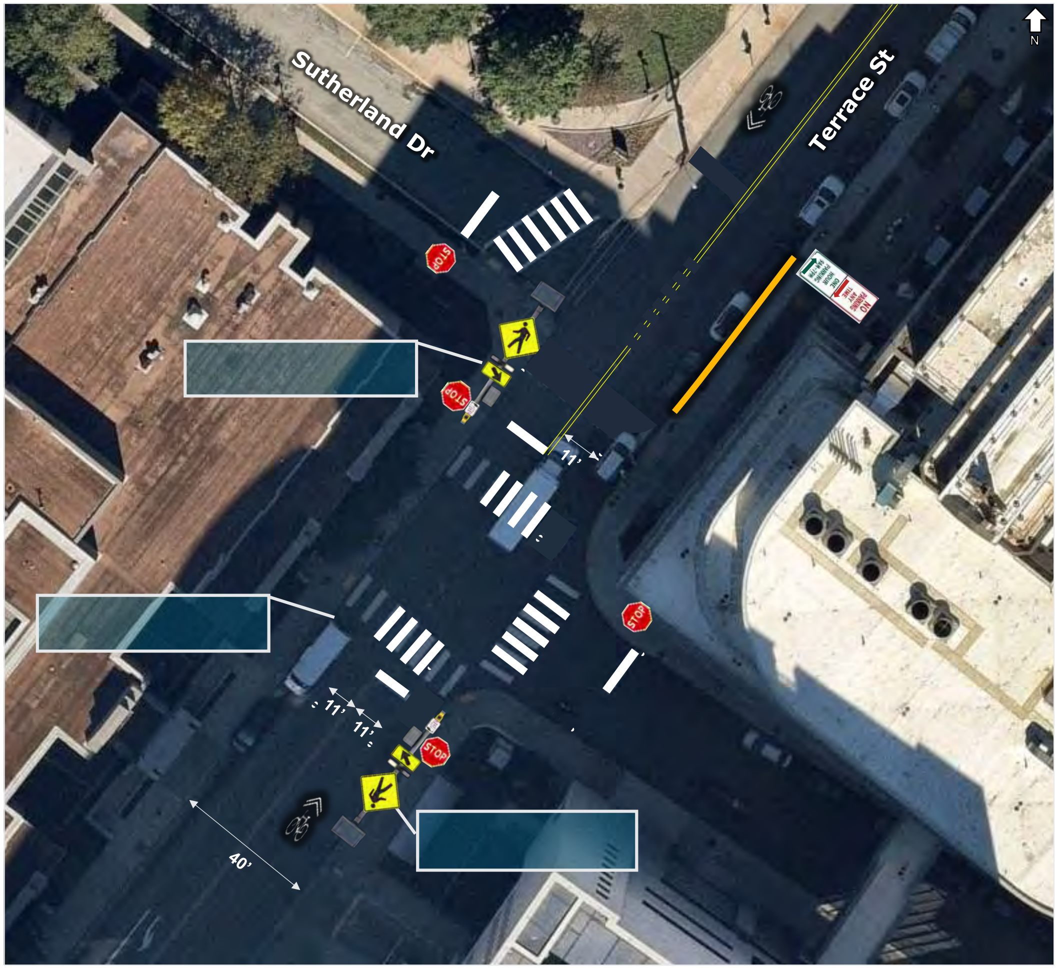
The existing configuration of the Terrace Street and Sutherland Drive/Lothrop Street intersection is confusing and disorienting. Conflicting approaches have different traffic controls which make it difficult for drivers to anticipate each other's behaviors. As noted during field visits, some drivers approach this stretch of the corridor cautiously due to the confusing lay out while others speed through the intersection with little regard to the traffic control in an effort to remove themselves from the intersection as quickly as possible. These driver challenges, coupled with high pedestrian activity creates an unsafe intersection. To address these concerns, it is recommended that the eastern-most crosswalk connecting Scaife Hall with Sutherland Drive should be removed. After the crosswalk is removed, the Stop sign for westbound drivers should be moved from before Sutherland Drive to after, right before the existing crosswalk. A supplemental Cross Traffic Does Not Stop sign can be added to the existing Stop sign on Sutherland Drive. Lastly, curb bump outs should be installed using flexible delineators and additional pavement markings to narrow the roadway, increase driver awareness of changing conditions, and to create a shorter crossing distance for pedestrians. In addition to these major infrastructure changes, and consistent with the rest of the corridor, parking signage, and pavement markings should be updated.

Cost: Approximately $61K - $70K

Additional Considerations: Coordination between the University, UPMC and the City will be required to implement recommendations. AutoTURN Vehicle Swept Path Analysis was conducted to assess the feasibility of vehicles navigating the intersection with the curb bump outs. The design vehicles that were evaluated included an AASHTO S-BUS-36 to represent the Pitt Shuttle Bus and an Ambulance for the access to UPMC Presbyterian Emergency Department Access on Lothrop Street. No concerns with the proposed improvements were observed for both design vehicles.

Mid-Term

In the mid-term, RRFBs are recommended to be installed to increase awareness to drivers of pedestrians crossing Terrace Street at the intersection. The changes along this intersection may confuse drivers initially, so the installation of RRFBs will increase their awareness to any changes or activity occurring in the crosswalks. Out of date cobra-head style lighting is also recommended to be replaced by newer LED lighting.



Cost: Approximately $101K - $115K

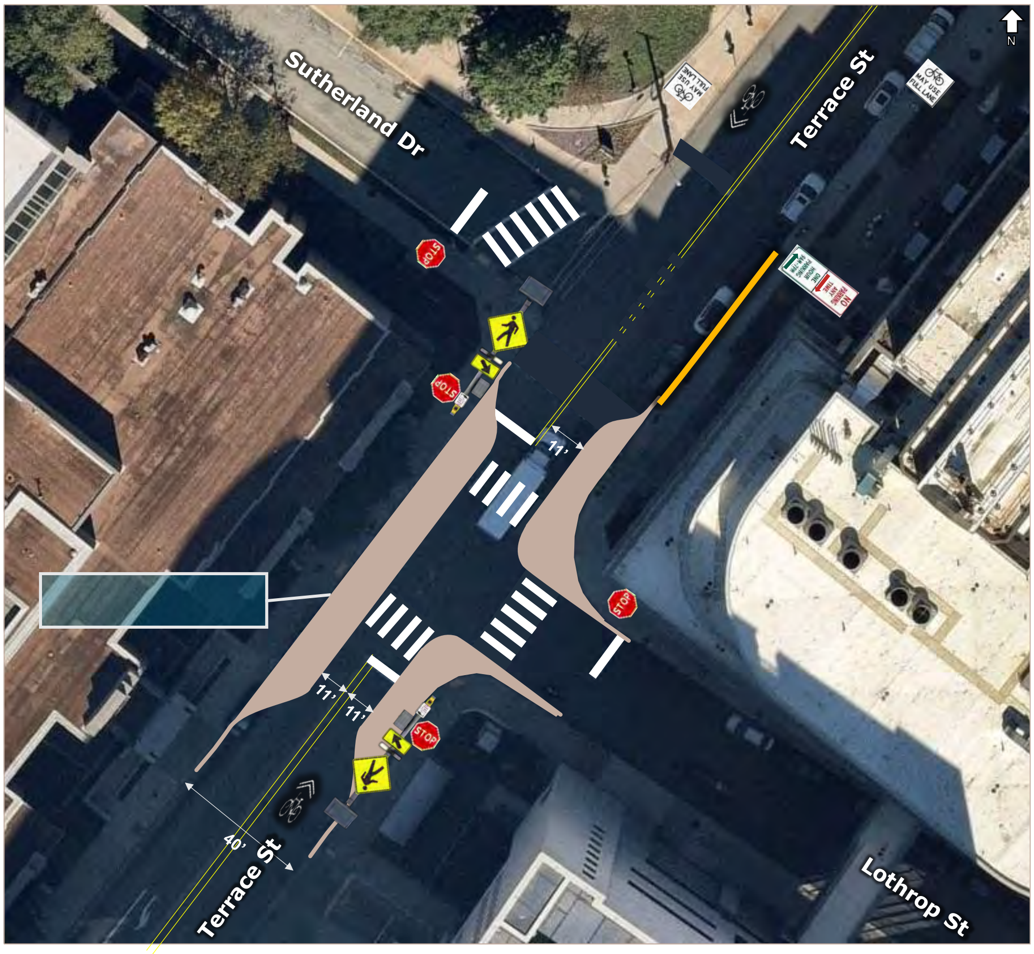
Additional Considerations: Coordination between the University, UPMC and the City will be required to implement recommendations.

Long-Term

In the long term, it is recommended to replace the flexible delineators and install permanent curb bump outs with ADA-compliant curb ramps and crosswalks. These bump outs will reinforce a slower and more cautious driving speed throughout this intersection. The addition of curb bump outs also provides pedestrians with additional space near the Terrace Street crosswalks.

Cost: Approximately $290K - $331K

Additional Considerations: Coordination between the University, UPMC and the City will be required to implement recommendations.



Intersection 5 – Terrace Street and Darragh Street

Existing Conditions Observations

- The intersection of Terrace Street and Darragh Street, a high-volume north-south traffic area, is marked by drivers accelerating up or traveling down the steep grade, often resulting in speeding and running yellow or red lights.
- This intersection typically sees more faculty, staff, and medical/dental students, who generally exhibit fewer risky movements compared to undergraduate students.
- A near-miss event was observed involving a pedestrian crossing Terrace Street and a northbound vehicle turning left from Darragh Street.
- Construction detours and the placement of shuttle stops near the intersection contribute to significant vehicular delays and congestion, especially during peak hours on event days.

Recommendations

Short-Term

In the short term, improved parking signage, No Turn on Red signage, and pavement markings are recommended. As with other intersections along the corridor, improved LED lighting is recommended to increase visibility. Similar to the other signalized intersections in the study corridor, a leading pedestrian interval should be implemented to improve pedestrian visibility. Lastly, it is recommended to relocate the existing Pitt shuttle stop from the corner of Terrace Street and Darragh Street to approximately 85 feet north near the Salk Hall loading dock driveway. This will reduce the queuing that builds up through the intersection, thereby reducing conflicts between stopped cars and pedestrians within the intersection. The recommendations for No Turn on Red signage, LPIs, and yellow "no parking" curb paint were implemented in December 2024.

Cost: Approximately $25K - $29K

Additional Considerations: Coordination between the University, UPMC and the City will be required to implement recommendations.

Mid-Term

In the mid-term, it is recommended to relocate the existing UPMC wayfinding signage. This existing sign obstructs driver sight distance, making it difficult for drivers to notice pedestrians in the crosswalk. Lastly, all signal equipment, including new pedestrian walk timers and push buttons, should be installed. This includes retroreflective backplates on signal heads which improves visibility during day and nighttime conditions. Additionally, a pedestrian walk timer will display the number of seconds pedestrians are left for a pedestrian to finish crossing the street. These timers will allow pedestrians to make informed decisions on whether to start crossing based on the remaining time, thus potentially reducing jaywalking and increasing safer crossing behavior.

Cost: Approximately $94K - $108K

Additional Considerations: Coordination between the University, UPMC and the City will be required to implement recommendations.

Long-Term

The existing utility structures create sight distance challenges at the intersection of Terrace Street and Darragh Street. Depending on the feasibility of and funding available, it is recommended to move existing mast arms and utility poles further outside of the intersection, or at the minimum, outside of the landing area of each curb ramp. During the field assessment, the project team noted the existing utility poles restrict sight distance for vehicles and conflicts with the landing areas of crosswalk curb ramps. By relocating the existing utility poles, these crosswalk curb ramps will become more accessible.

Cost: Approximately $238K - $272K

Additional Considerations: Coordination between the University, UPMC and the City will be required to implement recommendations.

COMPLEMENTARY RECOMMENDATIONS

The following section presents additional recommendations that may be deployed to supplement the infrastructure recommendations previously presented. Some of these recommendations arose as a result of stakeholder feedback while others were selected based on their precedence in the City. These recommendations may require additional study and design in order to implement.

Shuttle Technology

Stakeholders from UPMC shared an innovative technology they may be employing on their employee shuttles. This technology consists of an advanced driver assistance system that provides audible and visual alerts to the driver and audible alerts to pedestrians outside the vehicle when potential conflicts are dedicated. The system includes blind spot detection for the driver and notifications to pedestrians to alert them of a turning bus. This new technology may complement the infrastructure improvement recommendations by adding an additional layer of safety precautions. UPMC is testing this technology on a few vehicles before expanding to the fleet, and the University could explore this technology for its shuttles too.

Loading and Unloading Zones

As mentioned during the existing conditions phase, many stakeholders noted challenges with delivery drivers stopping in crosswalks, driveways, double parking, or illegally parking. These unsafe parking practices lead to an increase in pedestrian and vehicle conflicts, limited sight distance, and increase delay, congestion, and confusion among other drivers. To mitigate these negative effects, the University, in partnership with the City, may consider installing dedicated loading and unloading zones for deliveries. These are dedicated 15-minute drop off parking spaces in place of the more permanent parking spots. This will allow delivery drivers to park safely and in proximate locations to building entrances. There is already a precedence for loading and unloading zones in the city through the purple curb Smart Loading Zones program.

Parking Enforcement

Illegal parking is a concern noted along the entire Terrace Street/De Soto Street corridor. In addition to the recommended improvements to curb markings and parking signage, both the University and the City should look to increase parking enforcement in these areas. The purpose of increased parking enforcement is to ensure that vehicles are not impeding on sight distance or creating additional conflicts with vulnerable road users. Consistent enforcement discourages illegal parking habits, leading to safer streets for all users.

Educational Programs

The University of Pittsburgh currently employs a wide variety of educational materials and programs to teach community members how to safely be a pedestrian or bicyclist on campus. University police also host outreach events throughout the year to remind the community on safe walking and biking practices. With the changes to the Terrace Street and De Soto Street corridor, it is recommended that the University include additional educational programming and materials, specifically calling out how to interact with the new improvements along the corridor. **Figure 6** on the right is an example of signage that can be temporarily installed at intersections to educate users on the improvement type. In addition to increased signage along the corridor, buildings that front the corridor, such as Scaife Hall, should install signage at exit points alerting people of where to cross. This will help guide potential pedestrians to safe and marked crossing locations.

Figure 6: Sample Signage Located in Arlington, VA

ADDITIONAL CONSIDERATIONS

Improvement Matrix

The following table summarizes the improvements and provides an opinion of probable implementation cost, categorized by location and timeframe. Improvements denoted with an asterisk (*) have already been implemented in December 2024. Both timeframe-specific costs are cumulative total costs are reported. For example, the total long-term cost for a location includes applicable short-term, mid-term, and long-term measures, while the timeframe-specific reflects only the additional investment needed to upgrade from the measures implemented in the previous timeframe.

Location	Short-Term	Mid-Term	Long-Term
De Soto St and Fifth Ave	**Total: $7K-$8K** **---**	**Total: $41K-$47K** **Timeframe: $34K-$39K**	**N/A** **---**
	• Implement Leading Pedestrian Intervals (LPIs). • Install No Turn on Red signs for all hours.	• Consider expanding the existing curb space using curb bump outs.	• Support the implementation of future BRT and cycle track infrastructure by coordinating with the City and PRT. This is expected to have a minimal cost for the University.
De Soto St Driveways	**Total: $9K-$11K** **---**	**Total: $16K-$20K** **Timeframe: $7K-$9K**	**N/A** **---**
	• Add concrete stickers to alert pedestrians that they are entering an active driveway. • Install pedestrian detectable warning surfaces on both side of the driveways.	• Install audio/visual alert systems to alert pedestrians of an oncoming parking garage vehicle.	• No long-term recommendations.
De Soto St and ’ ara t	**Total: $32K-$36K** **---**	**Total: $81K-$93K** **Timeframe: $49K-$57K**	**Total: $164K-$188K** **Timeframe: $83K-$95K**
	• Retime signals to change pedestrian walk phasing, add LPIs*, and shorten the cycle length. • Consider a lagging left-turn to minimize pedestrian-vehicle conflicts. • Restripe high-visibility crosswalk markings. • Install No Turn on Red signs for all hours.* • Relocate UPMC Shuttle stop to the corner of O’Hara St and North Bouquet St.	• Install fencing along the bend extending until UPMC Presbyterian loading docks. • Update signal equipment to include retroreflective backplates, new signal heads, pedestrian walk timers, and accessible pedestrian push buttons. • Consider installing left-turn hardening infrastructure to slow down drivers and to move the driver’s field of vision to the crosswalk.	• Reinstall bike lanes on both sides of O’Hara St after construction is complete. • Consider installing a bicycle climbing lane on De Soto Street to connect to bicycle lanes on O’Hara St. • Install permanent curb bump outs past the new bike lane to increase the landing area for pedestrians.

Location	Short-Term	Mid-Term	Long-Term
Terrace St Bend	**Total: $25K-$29K** **---** • Improve lighting on Terrace St, particularly at bend. • Add concrete stickers at driveway entrances to alert pedestrians to potential vehicle conflicts. • Repaint curbs in restricted parking area* and improve No Parking signage.	**Total: $65K-$74K** **Timeframe: $40K-$45K** • Install fencing along the University of Pittsburgh Medical School, extending from the end of the parking zone on Terrace St to the UPMC Presbyterian loading dock on De Soto St. • Install transverse pavement markings to alert drivers to slow down as they approach the curve.	**Total: $121K-$138K** **Timeframe: $56K-$64K** • Consider installing a bicycle climbing lane on De Soto St to connect to bicycle lanes O'Hara St.
Terrace St Midblock Crosswalk	**Total: $52K-$59K** **---** • Install flexible delineators to reinforce parking and act as an interim curb bump out. • Maintain high visibility crosswalk striping. • Install Rectangular Rapid Flashing Beacons (RRFBs) and passive pedestrian detection, which does not require a user to activate the button. • Update parking signage along Terrace St to minimize sight distance impacts.	**Option A** **Total: $108K-$124K** **Timeframe: $56K-$65K** **Option B** **Total: $229K-$262K** **Timeframe: $177K-$203K** • Option A - Install a speed table to create a raised crosswalk to increase pedestrian visibility and to slow down speeds along the corridor. • Option B – Install permanent concrete curb bump outs and median.	**N/A** **---** • No long-term recommendations.
Terrace St and Lothrop St/ Sutherland Dr	**Total: $61K-$70K** **---** • Install flexible delineators for temporary curb bump outs to increase pedestrian space and decrease crossing length. • Install high visibility crosswalk striping at the Sutherland Dr crossing. • Eliminate Terrace St crossing at Sutherland Dr. • Move Stop sign to Lothrop St to reduce driver confusion and improve visibility.	**Total: $101K-$115K** **Timeframe: $40K-$45K** • Install RRFBs at both Terrace St crossings. • Install LED lighting at crossings to increase vulnerable road user visibility.	**Total: $290K-$331K** **Timeframe: $189K-$216K** • Install permanent curb bump outs

Location	Short-Term	Mid-Term	Long-Term
	• Add stop bar and supplemental cross traffic sign on Sutherland Dr. • Install a fully ADA-compliant curb ramp at the northern Terrace St crossing.		
Terrace St and Darragh St	**Total: $25K-29K** **---**	**Total: $94K-$108K** **Timeframe: $69K-$79K**	**Total: $238K-$272K** **Timeframe: $144K-$164K**
	• Implement LPIs.* • Improve LED lighting to increase visibility of pedestrians and vulnerable users. • Restripe yellow paint at curbs* and extend restricted parking zone. • Enforce parking restrictions to increase sight distance. • Remove redundant signage and reduce excess visual signage clutter. • Install No Turn on Red Signage at all approaches.* • Relocate Pitt Shuttle stop to the loading dock driveway of Salk Hall.	• Update signal equipment to include retroreflective backplates, new signal heads, pedestrian walk timers, and accessible pedestrian push buttons. • Relocate existing UPMC wayfinding signage on the southern corner of the intersection to improve visibility.	• Consider relocating mast arms and utility poles to increase landing pad space for curb ramps. • Install fully ADA-compliant curb ramps and landings at crossings.

Cost Assumptions

An opinion of probable cost was developed with the assumption that recommended improvements would be installed sequentially, from short-term to mid-term, and finally long-term improvements. The costs include a construction contingency, with 20% to 50% of construction costs assumed to establish the low and high ends of the estimates. Design and permitting costs were also included, assumed to be 10% of the construction costs. Mobilization costs may vary depending on the phasing of improvements, and mobilizing a Contractor for multiple improvements simultaneously may reduce overall mobilization costs. Adjustments to existing signal timing, including the implementation of LPIs, were not included in the costs as they will likely be absorbed by the City. The Engineer has no control over the cost of labor, materials, equipment, the Contractor's methods of determining prices, or competitive bidding and market conditions.

Implementation Timeline

The exact implementation of the recommendations presented in this report depend on the final design and funding available. The implementation timeline below provides a high-level schedule of when each recommendation may be installed. Improvements that were implemented during the study are indicated on the timeline with a checkmark. To reduce the impact of construction on the corridor, the University and partners should aim to complete similar recommendations at the same time across the corridor.

As mentioned earlier, some recommendations have started to be implemented prior to the finalization of this report. This report provides information on all recommendations, regardless.

Location	Recommendation	Short-Term		Mid-Term				Long-Term
		2025		2026		2027		2028+
De Soto Street and Fifth Avenue	Implement Leading Pedestrian Intervals (LPIs).	■						
	Install No Turn on Red Signs for all hours.	■						
	Consider expanding the existing curb space using curb bump outs.				■			
	Support the implementation of future BRT and cycle track infrastructure by coordinating with the City and PRT.							■
De Soto Street Driveways	Add concrete stickers to alert pedestrians that they are entering an active driveway.	■						
	Install pedestrian detectable warning surfaces on both side of the driveways.	■						
	Install audio/visual alert systems to alert pedestrians of an oncoming parking garage vehicle.					■		
De Soto Street and O'Hara Street	Retime signals to change pedestrian walk phasing, add LPIs, and shorten the cycle length.	■						
	Consider a lagging left-turn to minimize pedestrian-vehicle conflicts.	■						
	Restripe high-visibility crosswalk markings.	■						
	Install No Turn on Red signs for all hours.	✓						
	Relocate UPMC Shuttle stop to the corner of O'Hara Street and North Bouquet Street.	■						
	Install fencing along the bend extending until UPMC Presbyterian loading docks.					■		
	Update signal equipment to include retroreflective backplates, new signal heads, pedestrian walk timers, and accessible pedestrian push buttons.				■			
	Consider installing left turn hardening infrastructure to slow down drivers and to move the driver's field of vision to the crosswalk.			■				
	Reinstall bike lanes on both sides of O'Hara Street.							■
	Consider installing a bicycle climbing lane on De Soto Street to connect to bike lanes on O'Hara Street.							■
	Install permanent curb bump outs past the new bike lane to increase the landing area for pedestrians.							■
Terrace Street Bend	Improve lighting on Terrace St, particularly at bend.	■	■					
	Add concrete stickers at driveway entrances to alert pedestrians to potential vehicle conflicts.	■						
	Repaint curbs in restricted parking area and improve No Parking signage.	✓						
	Install fencing along the University of Pittsburgh Medical School, extending from the end of the parking zone on Terrace St to the UPMC Presbyterian loading dock on De Soto St.					■		
	Install transverse pavement markings to alert drivers to slow down as they approach the curve.			■				
	Consider installing a bicycle climbing lane on De Soto Street to connect to bike lanes on O'Hara Street.							■
Terrace St Midblock Crosswalk	Install flexible delineators to reinforce parking and act as an interim curb bump out.	■						
	Maintain high visibility crosswalk striping.	■						
	Install a Rectangular Rapid Flashing Beacons (RRFBs) and passive pedestrian detection.		■					
	Update parking signage along Terrace St to minimize sight distance impacts.	■						
	Option A - Install a speed table to create a raised crosswalk to increase pedestrian visibility and to slow down speeds along the corridor.			■				
	Option B – Install permanent concrete curb bump outs and median.			■				
Terrace Street, Lothrop Street and Sutherland Drive	Install flexible delineators for temporary curb bump outs to increase pedestrian space and decrease crossing length.	■						
	Install high visibility crosswalk striping at the Sutherland Dr crossing.	■						
	Eliminate Terrace St crossing at Sutherland Dr		■					
	Move Stop sign to Lothrop St to reduce driver confusion and improve visibility.		■					
	Add Stop bar and supplemental cross traffic sign on Sutherland Dr.		■					
	Install a fully ADA-compliant curb ramp at the northern Terrace St crossing.		■					
	Install RRFBs at both Terrace St crossings.			■				
	Install LED lighting.				■			
	Install permanent curb bump outs.							■
Terrace Street and Darragh Street	Implement LPIs.	✓						
	Improve LED lighting.	■						
	Restripe yellow paint at curbs and extend restricted parking zone.	✓						
	Enforce parking restrictions to increase sight distance	■	■	■	■	■	■	■
	Remove redundant signage. And reduce excess visual clutter.	■						
	Install No Turn on Red Signage at all approaches.	■						
	Relocate Pitt Shuttle stop to the loading dock driveway of Salk Hall.	■						
	Update signal equipment to include retroreflective backplates, new signal heads, pedestrian walk timers, and accessible pedestrian push buttons.			■				
	Relocate existing UPMC wayfinding signage on the southern corner of the intersection to improve visibility.					■		
	Consider relocating mast arms and utility poles to increase landing pad space for curb ramps.							■
	Install fully ADA-compliant curb ramps and landings at crossings.							■

NEXT STEPS

There are several opportunities for improved safety conditions throughout the Terrace Street/De Soto Street corridor. The recommendations explored during this planning study incorporated findings from stakeholders and community members as well as from traffic data collected and in-person field observations. While these recommendations are broken down into short-, mid-, and long- term recommendations, the University of Pittsburgh should feel empowered to advance recommendations as they see fit and as funding allows.

Upon the completion of this study, it is recommended that the University provide this study to the City of Pittsburgh and work with project partners to secure funding for design and implementation. The following are the suggested next steps:

1. **Prioritize Short-Term Actions:** Focus on the immediate implementation of low-cost, high-impact interventions such as LPIs, improved signage, and lighting upgrades. These changes will quickly enhance safety and set the stage for more extensive mid- and long-term projects.
2. **Secure Funding and Resources:** Engage with potential project partners, including the City of Pittsburgh, UPMC, and other stakeholders, to secure the necessary funding. This collaborative effort will help distribute the financial burden and ensure the timely implementation of the recommended improvements.
3. **Begin Design and Engineering Phases:** For the short-term recommendations, initiate the detailed design and engineering phases. This includes finalizing the specifications for signal timings, RRFBs, temporary and permanent curb bump-outs, and improved signage and lighting.
4. **Coordinate with Stakeholders:** Establish coordination meetings with all key stakeholders, including City officials, UPMC, and the University's internal departments. Effective communication ensures alignment on project goals, schedules, and potential disruptions during construction.
5. **Community Engagement:** Continue involving the community through public meetings and feedback sessions. Transparent communication regarding project progress, timelines, and benefits will foster community support and ensure that the interventions meet the needs and expectations of road users.
6. **Monitor and Evaluate:** After implementing the improvements, monitor their effectiveness and gather data on safety performance and user behavior. This evaluation will help refine future stages of the project and ensure continuous improvement.